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Getting Started With CCC

- System Requirements for CCC 7
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System Requirements for CCC 7

CCC is an advanced backup and file copying utility for the Mac.

System Requirements

- macOS 13 Ventura (13.1+)
- macOS 14 Sonoma
- macOS 15 Sequoia
- macOS 26 Tahoe
- CCC is a native application on both Intel and Apple Silicon Macs (i.e. a "Universal" application)

Older versions of CCC <https://bombich.com/download> are still available for users running older OSes. Note that these older versions are not actively being developed and support is provided on a case-by-case basis.

Supported configurations

- An APFS formatted volume is required for a backup of the macOS startup disk.
- SSDs and hard disk drives in Thunderbolt and USB enclosures — please see our list of recommended backup devices. <https://support.bombich.com/hc/articles/20686495048215#recommendations>
- CCC is supported only on Apple Macintoshes that officially support macOS Ventura (or higher)
- A minimum screen resolution of 1024x768 is required.

Configurations that are not supported

- Backing up to or from an unformatted or unmounted device — the source and destination must have a filesystem supported by macOS and visible in the Finder.
- Copying Windows system files <https://support.bombich.com/hc/articles/20686477050007>
- Backing up directly to optical media (e.g. CD-ROM or DVD-ROM).
- Backing to WebDAV, FTP, NFS and other "cloud" destinations.
- CCC is not a two-way synchronization solution designed to keep two Macs in sync with each other.
- Mass deployment – Apple discourages this sort of deployment <https://support.apple.com/en-us/HT208020> and offers additional resources here <https://support.apple.com/guide/deployment/welcome/web>, and there are alternative solutions to consider. <https://twocanoes.com/products/mac/mac-deploy-stick>
- While CCC can produce bootable copies of macOS via the Legacy Bootable Copy Assistant, this functionality is not recommended nor supported as part of a backup strategy <https://bombich.com/blog/2021/05/19/beyond-bootable-backups-adapting-recovery-strategies-evolving-platform>. In general, Apple designs macOS to be installed, not restored nor copied.
- CCC can copy virtual machine container files, but copying to or from a virtual machine is not supportable.

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Choosing a backup drive

When you're looking for a new backup device, we recommend purchasing a device that has twice the capacity of your source device(s). This allows for a modest amount of data growth and room for backup history (i.e. snapshots).

Specific storage device recommendations

Most external storage devices will work just fine for your backups, however performance and reliability vary. It would be impossible for us to curate an exhaustive list of every device, but we frequently get asked for a recommendation, so here's a list of some storage devices that we have tested with good results. Performance and price go hand-in-hand, we recommend that you avoid the cheapest devices.

USB and Thunderbolt Portable External SSD

These devices offer modest to ample storage and excellent performance. These are our top picks for backup devices:

Oyen Helix NVMe USB-C (1TB-8TB)
<https://oyendigital.com/products/helix-dura-usb-c-usb-3-2-gen2-nvme-portable-ssd-up-to-1050mb-s>
Oyen U34 Bolt Thunderbolt (4TB, 8TB) [Best performance for large media files]
<https://oyendigital.com/products/u34-bolt-usb4-40gbps-nvme-thunderbolt-4-usb-c-portable-ssd>
Samsung T7† Portable SSD USB-C (1TB, 2TB, 4TB††)
<https://www.amazon.com/SAMSUNG-Portable-SSD-2TB-MU-PC2T0H/dp/B0874YJP92/ref=as_li_qf_asin_il_tl?ie=UTF8&tag=bombich>
Samsung T9 Portable SSD USB-C (1TB, 2TB, 4TB) <https://amzn.to/3IveFlz>

† We do not recommend the Samsung T7 "Touch" model. The "touch" functionality uses a proprietary locking mechanism that requires Samsung drivers, and comes with a 27-34% price premium. This mechanism is not comparable to FileVault; CCC cannot automatically unlock these devices. The non-touch model provides the same functionality as far as a backup device is concerned, and can be encrypted easily with native macOS Encryption. In general, we do not recommend installing the third-party drivers or software that comes with an external storage device, we frequently see more trouble than benefit from that software.

†† July 2025: We received one report about some early-life failures of the 4TB Samsung T7, and we found some similar reports on the Internet for this same model (not affecting the 1TB and 2TB versions of the T7 though). If you're specifically looking for a 4TB SSD, you may want to consider the Samsung T9, or one of the Oyen devices instead.

USB 3.1, Desktop External Hard Drive Enclosure (with or without a disk)

Oyen Novus External USB-C Rugged Desktop Hard Drive Enclosure <https://amzn.to/2GPwNE1>

USB 3.1, External Enclosure (without a disk, suitable for internal SSDs)

Oyen Digital MiniPro 2.5" SATA to USB-C External Hard Drive/SSD Enclosure <https://amzn.to/3tLioEG>

Bare mechanical drive (SATA 3.5") 1TB - 10 TB

These drives are "bare" and will need an enclosure or dock to be used externally:

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WD Black Performance Internal Hard Drive - 7200 RPM Class, SATA 6 Gb/s, 256 MB Cache, 3.5" <https://amzn.to/4hjmJW6>

Not Recommended

Avoid disks that use Shingled Magnetic Recording

Many years ago Seagate introduced Shingled Magnetic Recording <https://en.wikipedia.org/wiki/Shingled_magnetic_recording> to increase the storage capacity of rotational hard drives, but at the expense of writing performance. We anticipate considerably worse performance for APFS in particular on these devices. Many vendors have not been particularly forthright about the use of SMR in their devices until recently. Some† devices that leverage SMR include:

- These Seagate disks <https://www.seagate.com/internal-hard-drives/cmr-smr-list/>
- These Western Digital disks <https://blog.westerndigital.com/wp-content/uploads/2020/04/2020_04_22_WD_SMR_SKUs_1Slide.pdf> (see also this newer-but-more-obtuse reference <https://support-en.wd.com/app/answers/detailweb/a_id/50697/~/steps-to-determine-if-an-internal-drive-uses-cmr-or-smr-technology>)
- These Toshiba disks <https://toshiba.semicon-storage.com/ap-en/company/news/news-topics/2020/04/storage-20200428-1.html>

† This is far from an exhaustive list. None of these manufacturers documents whether the disks in their branded enclosures are using SMR. Due to this lack of transparency and based on experience with these devices, we recommend that you avoid branded external storage *enclosures* from Seagate, Western Digital and Toshiba. Please bear in mind that this recommendation is specific to the branded **enclosures**. Many Western Digital bare hard drives, for example, have excellent specs and we recommend them above.

Avoid 5400RPM Rotational HDDs, aka "Slim", "Portable" or 2.5" hard drives

These disks are cheap and can be acquired by the pallet at your local consumer warehouse. Unfortunately, these disks are really slow! Here are a few examples of these slower devices:

- Seagate Backup Plus Slim Portable Drive
- Seagate Ultra Portable Drive
- Western Digital My Passport Ultra Portable
- Western Digital easystore
- Western Digital Elements
- LaCie Mobile Drive
- G-Technology G-DRIVE Mobile USB 3.0 Portable External Hard Drive

These devices can be acceptable for use as a backup disk if you already own one, but **you should expect poorer performance from these cheaper devices**. If you're shopping for a new backup disk, we recommend that you avoid these disks altogether.

USB "Thumb" drives and SD cards:

Despite being based on flash storage, which you'd think would be faster than rotational storage, USB thumb drives and SD cards are often quite slow. We don't recommend using these devices for backing up any substantive amount of data, these are usually only useful for ad hoc file sharing between computers. Flash-based memory like that used in SD cards and thumb drives also has limited write/erase cycles that are much lower than that of a traditional SSD or mechanical hard drive making them not appropriate as a primary backup

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device.

Sandisk Extreme SSDs

Many <https://www.engadget.com/western-digital-promises-to-release-firmware-update-for-failing-sandisk-extreme-ssds-211924180.html> incidents <https://arstechnica.com/gadgets/2023/05/sandisk-extreme-ssds-keep-abruptly-failing-firmware-fix-for-only-some-promised> of data loss <https://www.theverge.com/22291828/sandisk-extreme-pro-portable-my-passport-failure-continued> have been reported for these devices.

Backing up to Network Attached Storage (NAS)

The convenience of a wireless backup to a NAS device is appealing. Based on user feedback, however, we discourage people from relying on NAS devices for their primary backup for several reasons:

- Write performance to a NAS device is typically, at best, comparable to writing to a USB 2.0 HDD
- Performance of a NAS accessed via WiFi can be 10-100 times slower than the average locally-attached hard drive.
- Periodically validating the integrity of data on a NAS device may be impractical due to network performance.
- WiFi backups are only as reliable as the network connection and macOS's network filesystem client.
- Filesystem transactions on a network filesystem incur a lot more overhead than filesystem transactions on a locally-attached filesystem, leading to very long backup windows when your data set has lots of files (e.g. > 250K files).

For primary backups, we recommend that you procure a USB or Thunderbolt hard drive and create a backup on that locally-attached disk.

NAS devices that we specifically do not recommend

Western Digital MyCloud Home: The "Home" model of this NAS device requires the use of WD-proprietary software to access the storage securely; direct access to the storage via SMB is only available with Guest privileges. Users report <https://community.wd.com/t/use-my-cloud-home-with-finder-without-wds-app/216769/4> that performance of the storage while using WD's software is subpar in comparison to Guest access via SMB, and other users have reported to us that macOS is unable to create or mount disk images on the storage when mounted via Western Digital's software.

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How to set up your first backup

▶ Watch a video of this tutorial on YouTube <https://youtu.be/azM24RzMaZk>

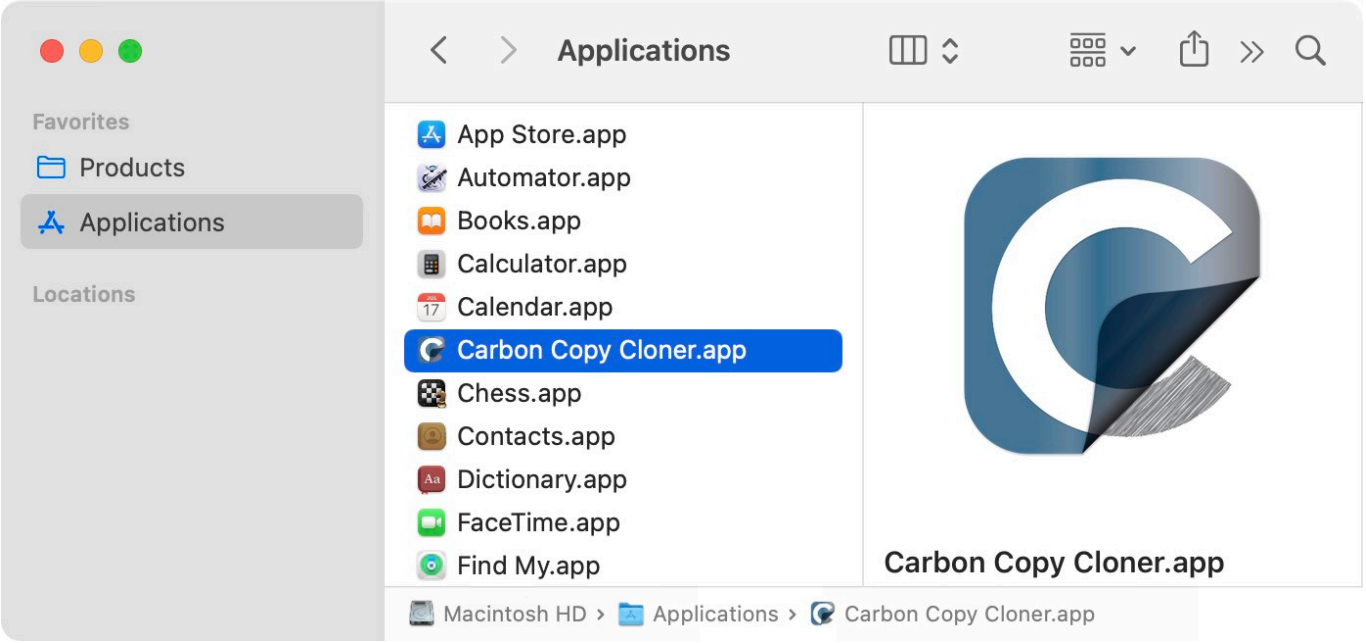
Most first-time CCC users are looking to back up the Macintosh HD "startup disk". We walk through the steps for setting up that first backup task here.

Attach the backup disk to your computer

See the Choosing a backup drive <https://support.bombich.com/hc/articles/20686495048215> Kbase article for advice and recommendations for external backup devices.

Open CCC

Applications > Carbon Copy Cloner

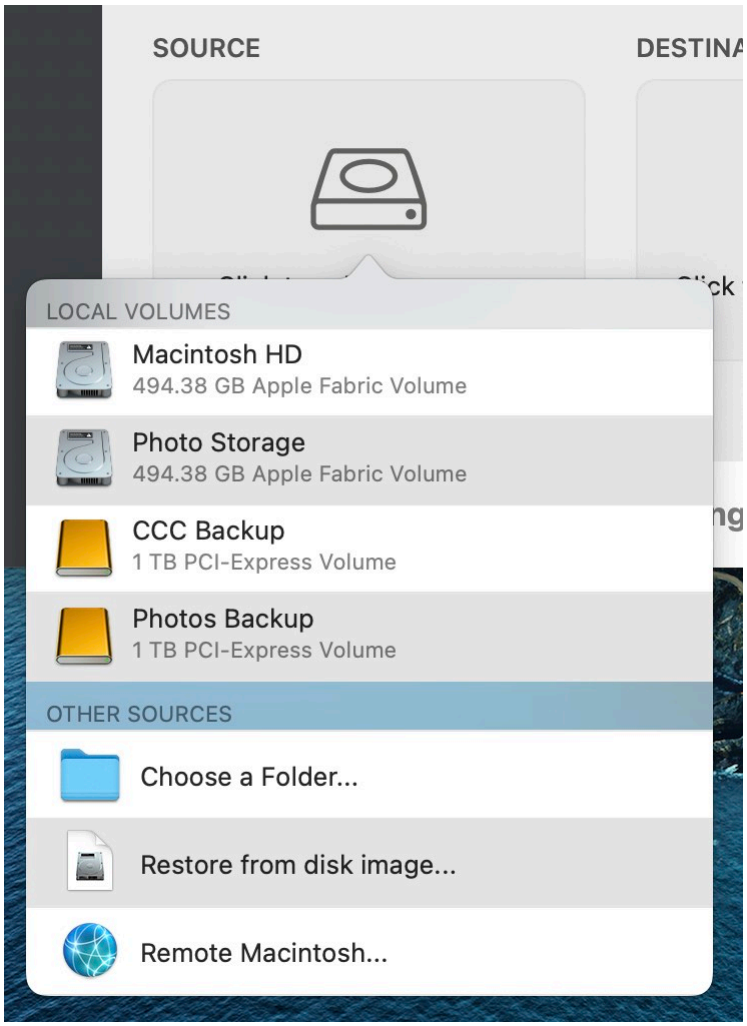


When you open CCC for the first time, you'll be guided through your first task setup. If you prefer to not be guided, click the **Tips** button in CCC's toolbar.

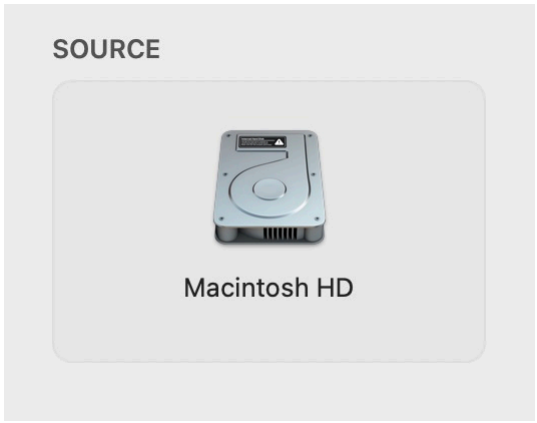
Select the Source

Click in the box under the SOURCE heading to view available sources.

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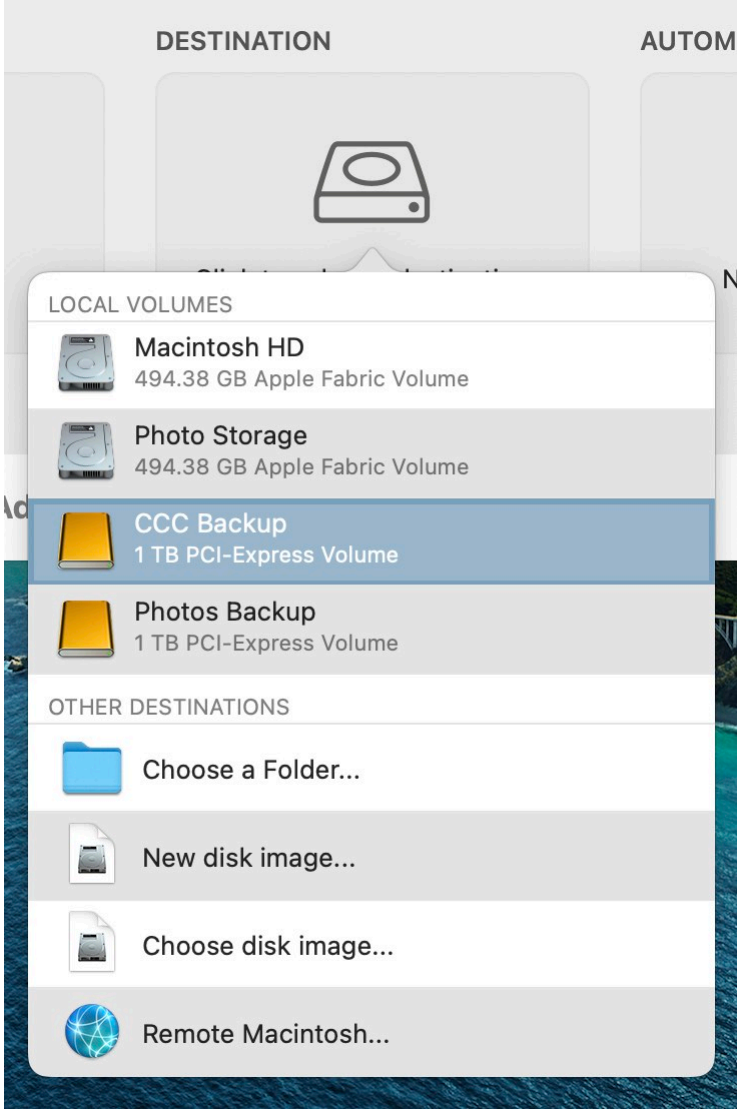
Select your startup disk from the menu of available volumes for the source.



Select the Destination

Click in the box under the DESTINATION heading to view available destinations, then select your new backup drive from the menu of available volumes for the destination.

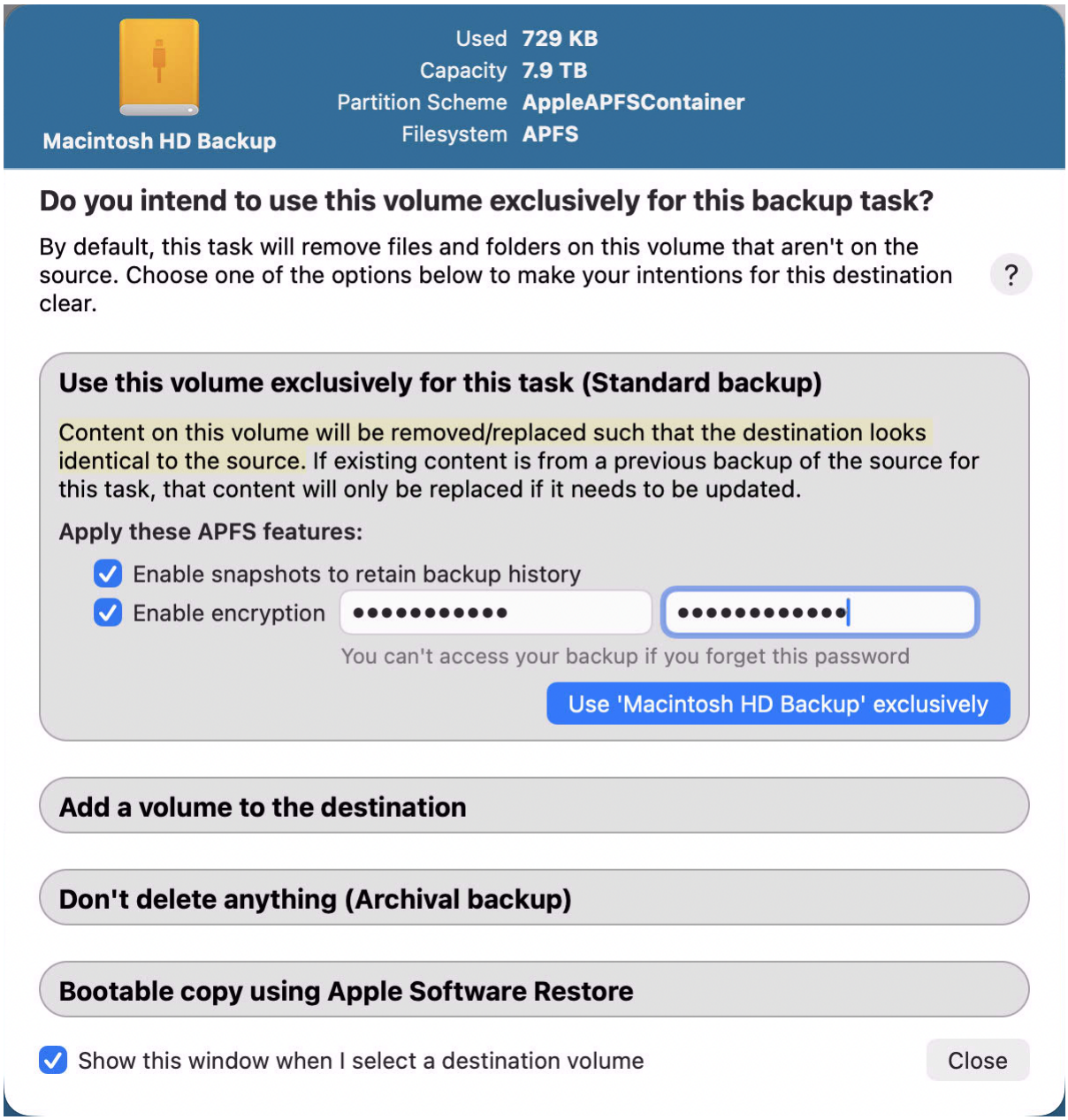
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Follow the guidance of CCC's Backup Volume Setup Assistant

The Backup Volume Setup Assistant is designed to get your backups started off on the right foot. This assistant asserts that the destination will be used exclusively for this backup task, and offers alternative options if the selected volume cannot be used exclusively. This assistant also takes care of volume formatting, snapshot support, and makes it easy to enable encryption (which is optional).

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What is the meaning of the badges on the source and destination icons?

You can hover your mouse over those badges for a description of what they indicate. You can also click on these badges to change the associated settings. Note that these badges are not presented when the settings are not applicable.

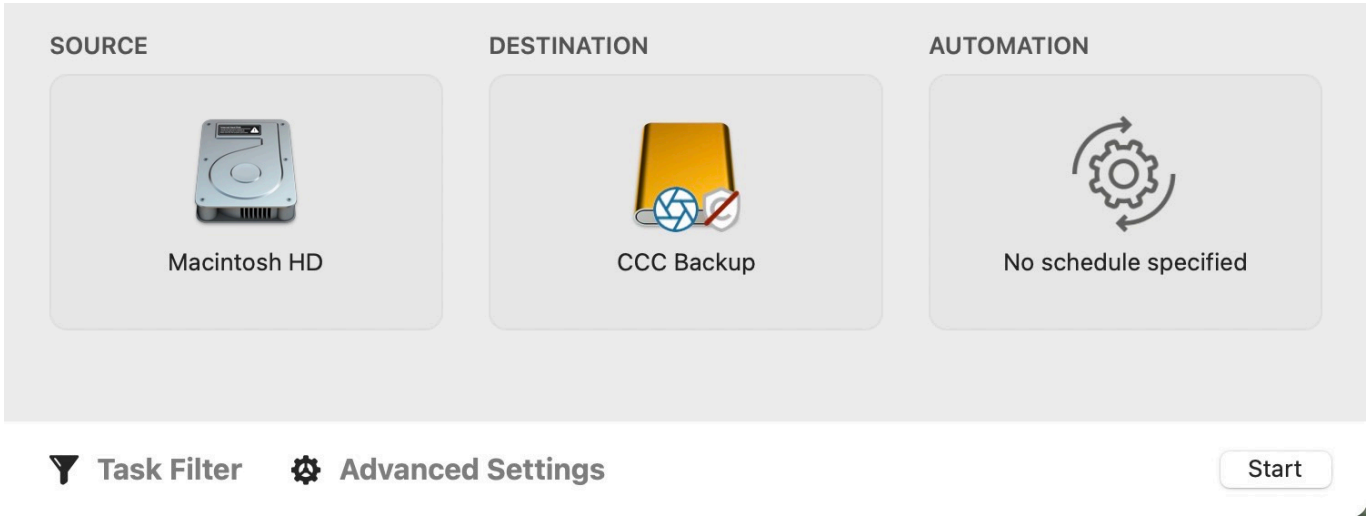
- SafetyNet is enabled [What is SafetyNet? <https://support.bombich.com/hc/articles/20686475366935>]
- SafetyNet is disabled
- Snapshots are enabled on this volume [What are snapshots? <https://support.bombich.com/hc/articles/20686443871383>]

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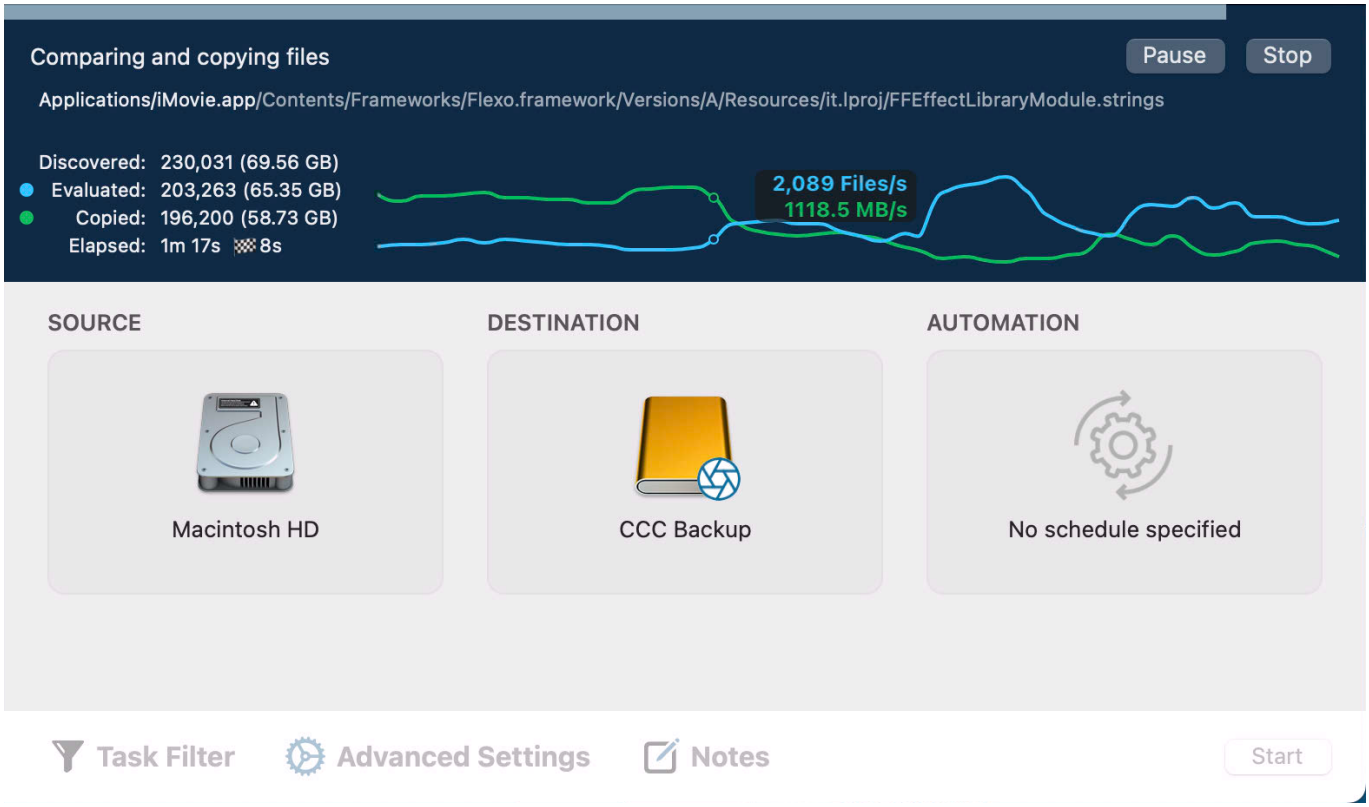
- Snapshots are disabled on this volume

Begin the backup task

Click **Start**. The first time you run a backup task, CCC will prompt you to grant it Full Disk Access, and also to authenticate so it can install its privileged helper tool. This helper tool is required to perform privileged tasks, e.g. to copy system settings and applications.



Congratulations - your first backup is in progress!



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Live Performance Chart

As CCC copies your files, you'll see a live performance chart like the one shown in the screenshot above. The white (or blue) line tracks the write rate and the green line tracks the number of files evaluated per second. Hover your mouse over the chart to see the numerical values. Click the color "dots" to the left of the Evaluated and Copied labels in the legend to change the color of those lines.

CCC also presents several statistics while the task is running:

- **Discovered**: indicates how many files CCC has found on the source.
- **Evaluated**: indicates how many of the "discovered" files have been evaluated to determine if they should be copied.
- **Copied**: the number of files copied.
- **Elapsed**: the length of time that the task has been running.
- : When CCC can make an estimate of time remaining, that estimate will be indicated next to this checkered flag icon.

Smart Updates

If you run the same backup task again, CCC will copy only the items that have changed. There's no special setting to achieve this behavior, simply click the **Run Now** (or **Start**) button again or configure your backup task to run automatically on a scheduled basis <https://support.bombich.com/hc/articles/20686449773847>.

Standard Copy vs. Run Now

You may notice a **Standard Copy** button adjacent to the **Run Now** button after your first task has completed, and the **Run Now** button has a new  icon. If you configured your destination via the Backup Volume Setup Assistant, CCC enabled the Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate> feature, which makes the backup task more efficient. When you click the **Run Now** button, CCC runs the task with the Quick Update feature applied. The **Standard Copy** button will run the task without the Quick Update setting applied. If you have made changes (or suspect that changes have been made) to the destination outside of the scope of the CCC task, then you can run a Standard Copy to perform a complete audit of the files on the destination <https://support.bombich.com/hc/articles/20686481162647#qu_audit>. Standard Copy is still a "Smart Update"; CCC will copy only the items that differ <https://support.bombich.com/hc/articles/20686432151959>.

Task icons

CCC uses the following icons to describe tasks in the CCC sidebar:

-  This item is a CCC task (task hasn't run, or the last result was dismissed)
-  This item is a CCC task group <https://support.bombich.com/hc/articles/20686444541975> (group hasn't run, or the last result was dismissed)
-  **Last event result**: Task completed successfully
-  **Last event result**: The task completed, but errors occurred while transferring some files

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- **Last event result**: An error occurred that prevented the task from completing
- This task is configured to run "When the source is modified" (blue: monitoring is active, yellow: monitoring is suspended)
- This task is waiting (e.g. for another task to complete, for AC power to be restored, or for a network location requirement to be met)

Last event result icons: If you select the task or group, you can click on that icon in the Task Plan to dismiss the status, i.e. to express, "I have acknowledged this result".

Related Documentation

- Granting Full Disk Access to CCC and its helper tool <https://support.bombich.com/hc/articles/20686443528727>
- Why doesn't my backup show up as a startup device? <https://support.bombich.com/hc/articles/20686428184727>
- How to verify or test your backup <https://support.bombich.com/hc/articles/20686511433623>
- How to restore from your backup <https://support.bombich.com/hc/articles/20686469175575>
- Common Scenarios and Best Practices <https://support.bombich.com/hc/sections/20686419485207>
- How do I get help? <https://support.bombich.com/hc/articles/20686487464855>

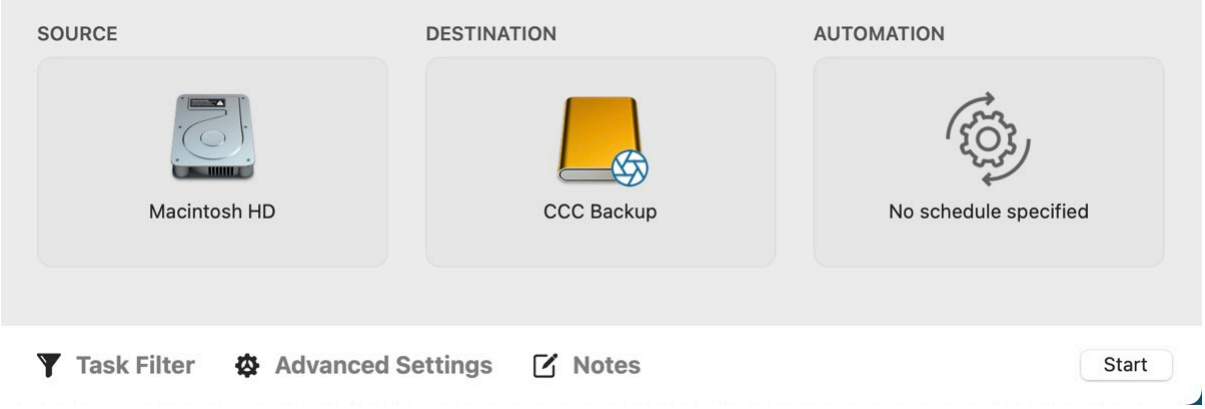
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How to schedule a backup

▶ Watch a video of this tutorial on YouTube <https://youtu.be/azM24RzMaZk?t=1m50s>

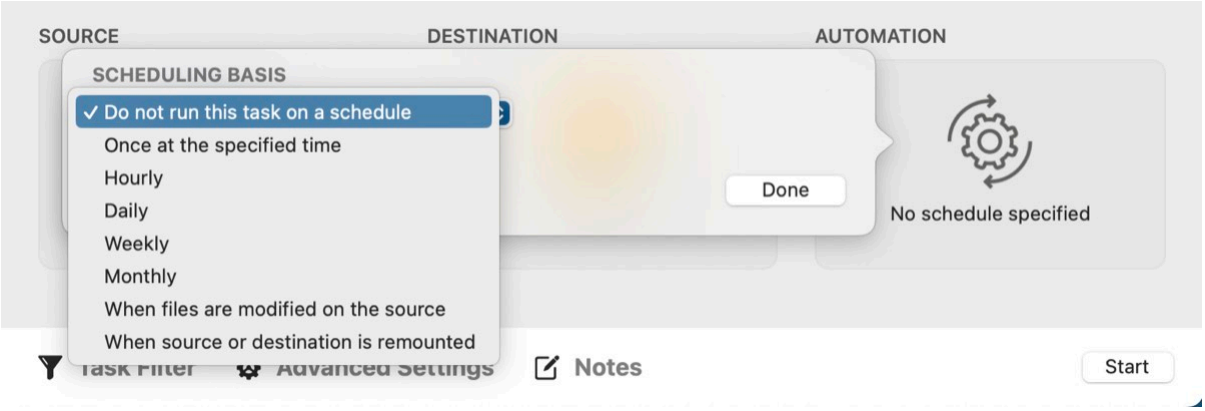
Product Tour: Learn how to schedule a task to run automatically

After configuring the source and destination <https://support.bombich.com/hc/articles/20686487352599> for your task, click the icon in the **Automation** box to view the scheduling options.



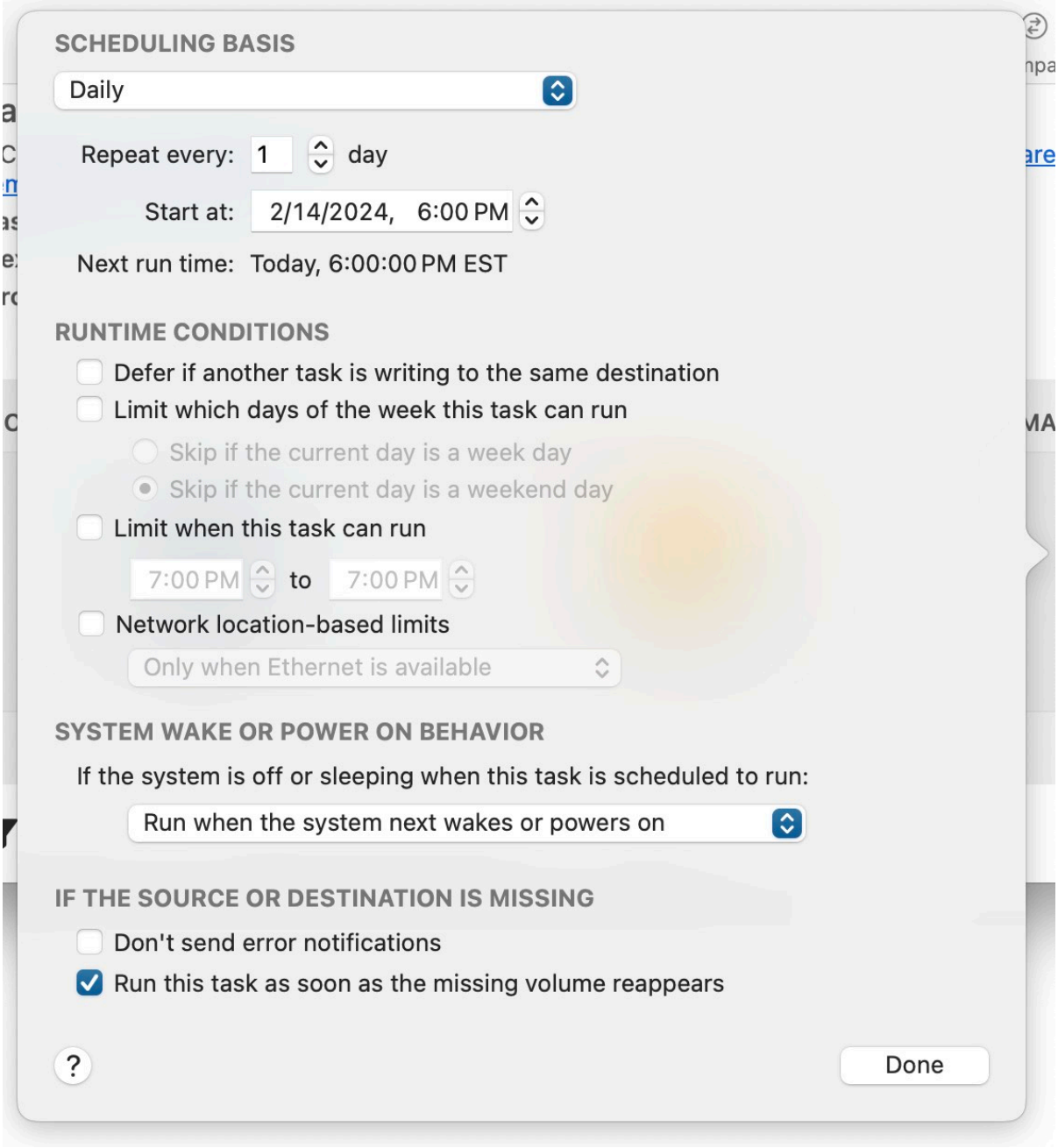
Design a Schedule

Select when you would like the task to run from the drop down menu. If you would like the task to run at a regular interval, choose to have the task run on an hourly, daily, weekly, or monthly basis. If you would like to have the task run when the source or destination volume is reconnected to your Mac, choose the **When source or destination is reconnected** option.



Make any desired changes to the schedule and then click **Done**.

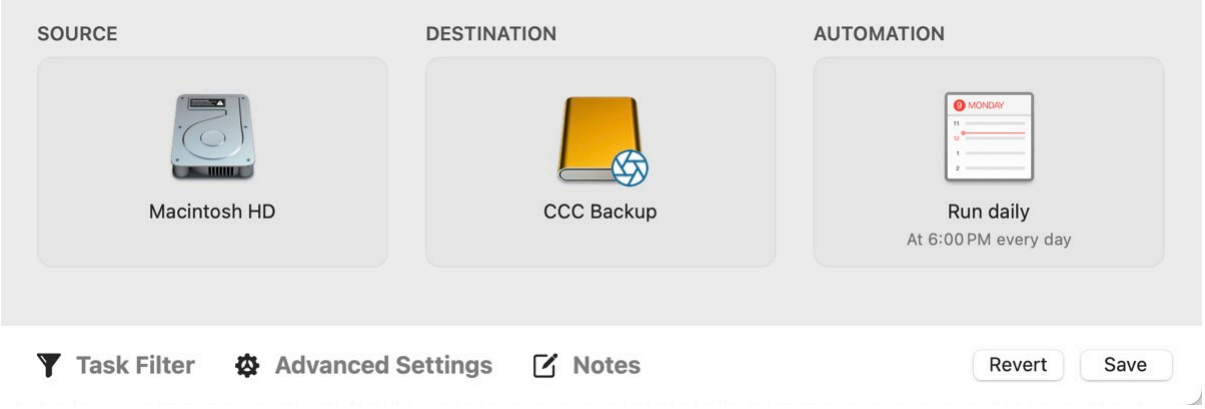
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Save the Task

Click **Save**.

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Your backup task will run at the times that you have scheduled!

Related Documentation

- How to modify a scheduled backup <https://support.bombich.com/hc/articles/20686457985175>
- Advanced Scheduling Options <https://support.bombich.com/hc/articles/20686389397015>
- Frequently Asked Questions about scheduled tasks <https://support.bombich.com/hc/articles/20686429854487>

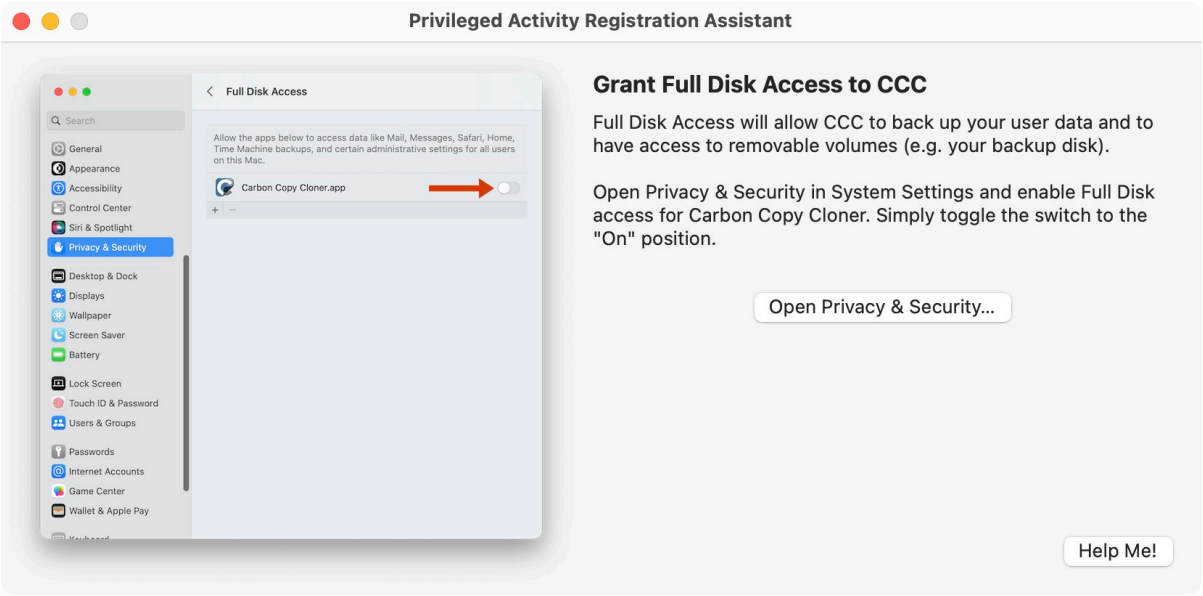
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Granting Full Disk Access to CCC

macOS imposes privacy restrictions that disallow, by default, access to certain application data (e.g. Mail, Messages, Safari, Photos), and all access to any external hard drives and network volumes.

macOS does not conveniently ask you to grant access to an application when that application tries to access that data. Instead, you're required to manually pre-approve the application. As a result, when you download an application specifically to back up your most precious data, that application can't back up that data until you specifically go out of your way to grant it access to that data.

To proactively grant full disk access to CCC, choose "Grant Full Disk Access to CCC..." from the Carbon Copy Cloner menu.



Troubleshooting Full Disk Access problems

If you have granted CCC Full Disk Access, and your backup tasks still report that CCC lacks Full Disk Access, examine the configuration of any antivirus software that you have running on your Mac. The Device Control feature in ESET Cyber Security, for example, can prohibit access to external storage in the same manner that a lack of Full Disk Access would prohibit CCC from accessing external storage.

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What's new in CCC 7?

Building Better Backups with CCC 7

CCC 7 focuses on helping you build a better backup strategy. Up to now we've given you the tools for creating backups, and of course CCC offered some coaching suggestions in the past, but largely has left the user to deal with some logistics that could be difficult for some people. CCC 7 introduces functionality that will not only tell you how to set up your backup correctly, but will do the more complicated parts for you.

We are also excited to announce a new iOS application that backs up media and files from your mobile device to locally-attached storage, to a NAS, or to CCC-managed storage on your Mac. Especially for anyone that generates a lot of content on their mobile device, this is a fast and convenient way to bring backups of photos and files on your mobile device into your CCC backup ecosystem.

Continue reading to learn more about all of the new features and functionality packed into CCC 7.

Backup Volume Setup Assistant

Most new disks come pre-formatted for Windows, and the default filesystem is not a great choice for making backups on macOS. CCC's documentation has coached you through reformatting the backup volume in the past, but CCC 7's new Backup Volume Setup Assistant takes all of these steps out of the initial setup procedure. When you select a destination volume, the setup assistant will present choices for how the destination volume should be configured. With just a couple clicks, you can get your new backup disk reformatted using the best filesystem for backups, enable snapshot support, and even enable encryption.

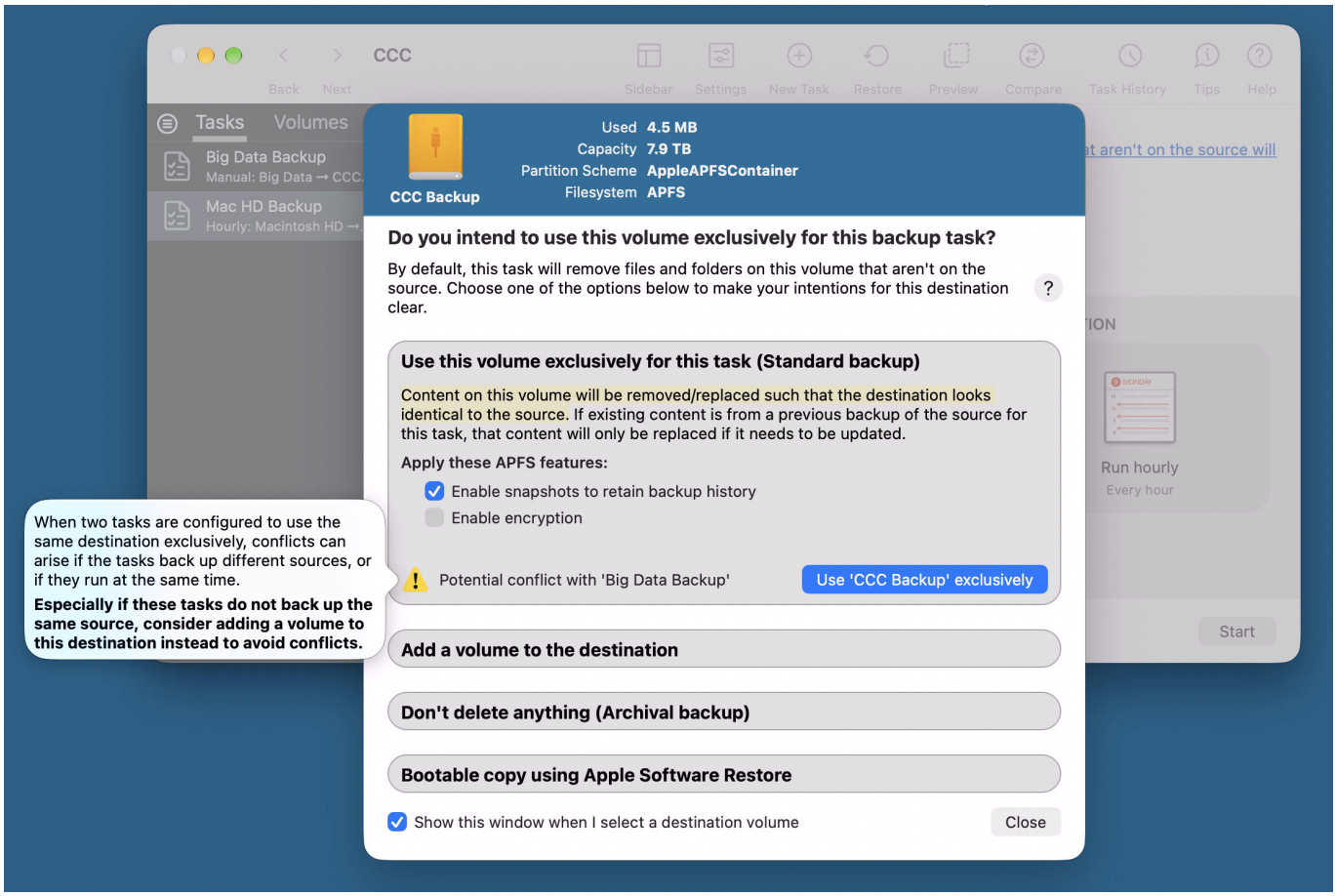
The Backup Volume Setup Assistant also aims to solve task conflicts by verifying that the destination is dedicated to the backup task. If another task is using the same destination (e.g. to back up some other source volume), the setup assistant will identify the other task, and offer an option to add a volume to the destination device instead.

When you agree to use the destination volume exclusively for the backup task, you add numerous benefits to your backup strategy:

- Avoid task conflicts
- Simplify future restore activity
- CCC's SafetyNet feature and the "Protect root-level items on the destination" setting are disabled, which avoids logistical constraints in the future and eliminates unnecessary redundancy
- If applicable to the source, CCC's Quick update feature is enabled by default, which greatly improves performance of regularly-scheduled backup tasks

The Backup Volume Setup Assistant is presented any time you select a volume as the destination to a backup task. You can also click on the Destination selector to access the setup assistant manually if you would like to revisit your current backup strategy.

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Related Documentation

- How to set up your first backup <https://support.bombich.com/hc/articles/20686487352599-How-to-set-up-your-first-backup>
- Use Quick Update when it's possible to collect a list of modified folders from macOS <https://support.bombich.com/hc/articles/20686481162647-Advanced-Settings#quickupdate>

More options for limiting and extending snapshot retention

"Permanent" snapshots

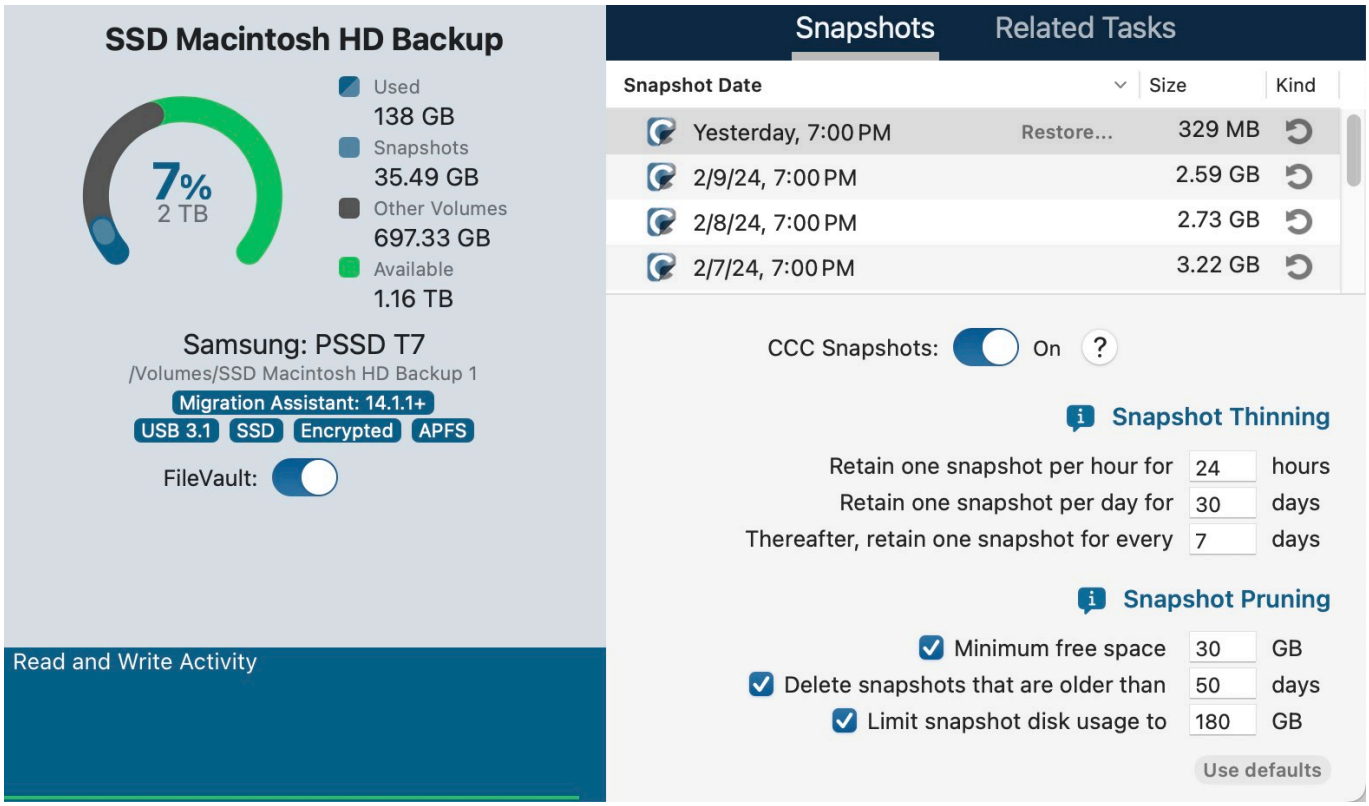
Many people have asked for a way to flag specific snapshots as "special", and have a way to retain these snapshots permanently (e.g. "This is my pre-upgrading to Sonoma backup"). CCC 7 offers support for protecting snapshots from automated deletion. Right-click any snapshot and choose "Protect Snapshot" to bestow that protection upon it. Protected snapshots can include comments that describe the snapshot's meaning to you.

Limit snapshot disk usage and max age

We also received frequent requests for limiting snapshot retention based on total snapshot disk usage, e.g. so that multiple volumes on a given disk can share space more democratically. You'll find that new option when you apply a custom Snapshot Retention Policy to any given volume. Likewise, we've seen some cases where people have snapshots that are several years old. If you don't think you'll be digging that deeply into your files' pasts, you can have CCC set a finite limit on snapshot age.

Click on CCC's Destination selector and choose **Manage snapshots on {volume name}** to find these new settings.

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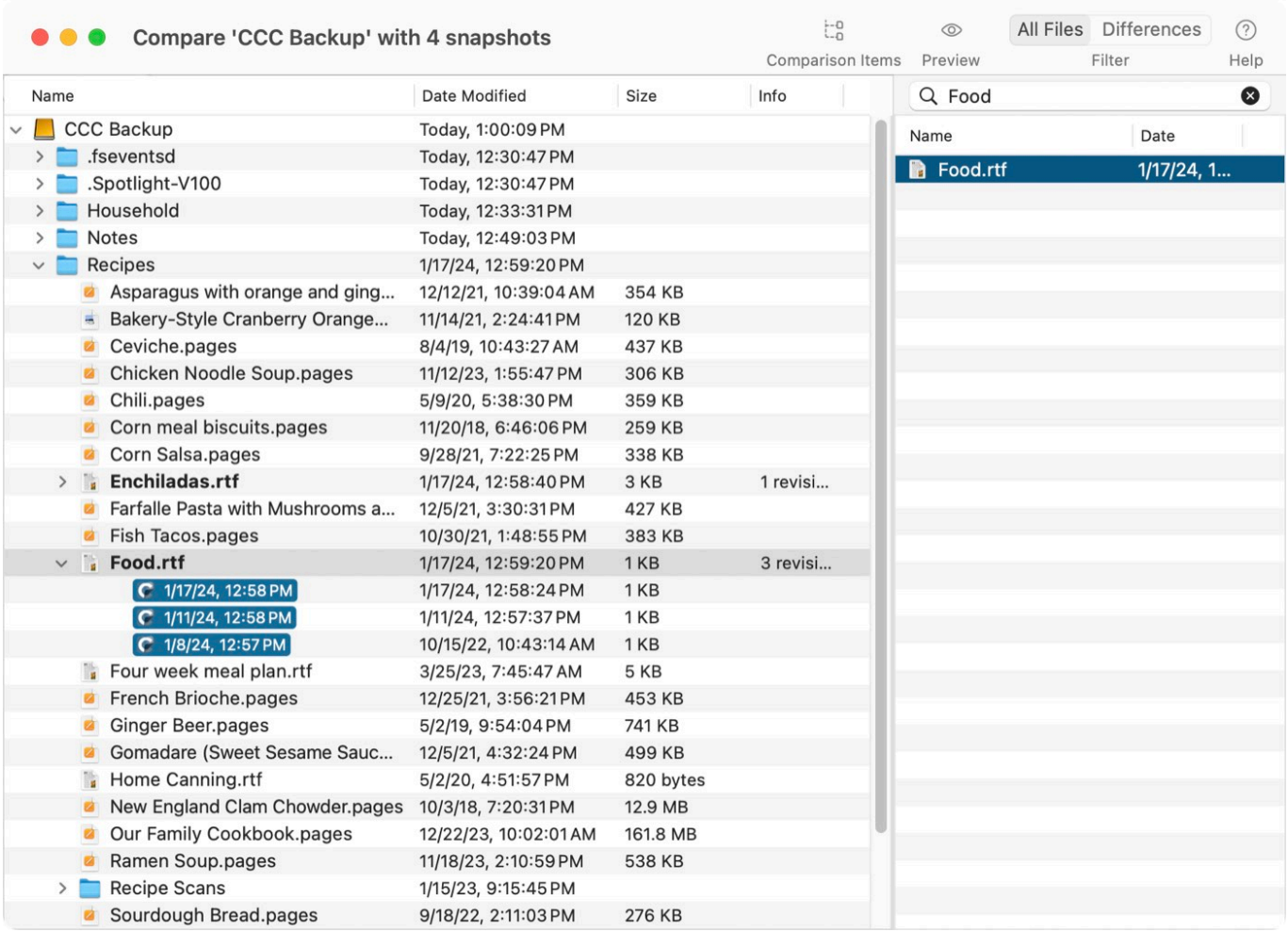
Related Documentation

- Snapshot thinning and pruning <https://support.bombich.com/hc/articles/21384373407127-Snapshot-thinning-and-pruning>
- Protecting and renaming snapshots <https://support.bombich.com/hc/articles/21384373407127#protected_snapshots>
- Product Tour: Learn how to customize the retention of backup history on your backup

Snapshot Searching

By popular demand, we added functionality to search snapshots by file name in CCC's Snapshot Browser. Select a volume in CCC's sidebar, select a snapshot(s), then right-click and choose "View in Snapshot Browser". The Snapshot Browser will compare the content of each snapshot against the current state of the backup. Enter a search term in the sidebar to find specific files in any of the snapshots, then see how the file differs in each snapshot.

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Related Documentation

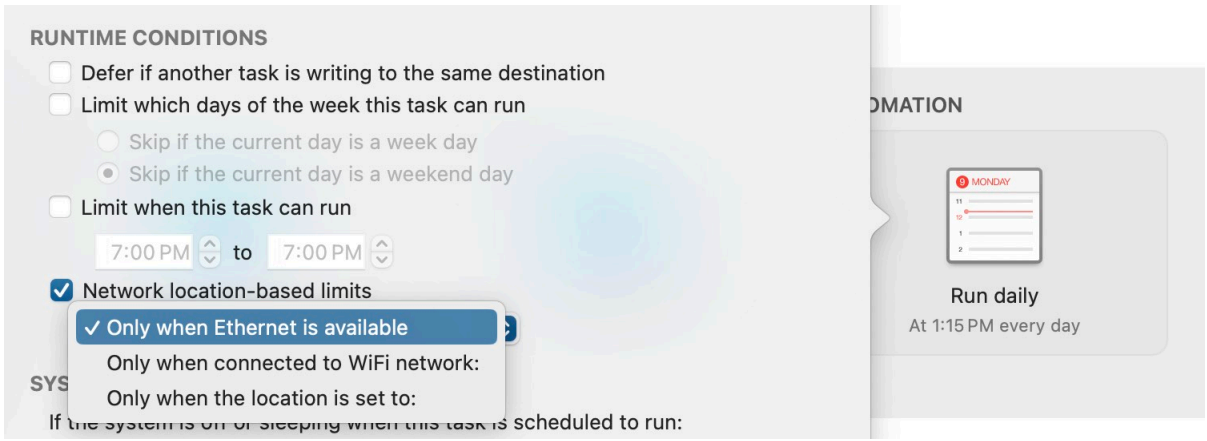
- Finding and comparing versions of files in the Snapshot Browser <https://support.bombich.com/hc/articles/21410262460823>
- Product Tour: Learn how to find and restore an older version of a file

Support for network-based task run time conditions

People that take their Macs on trips are sometimes annoyed that their backup tasks report errors when they're away from home (and away from their backup devices), or that their NAS-backup tasks run when their Mac isn't connected via ethernet. We added three new network-identity-based conditions that will limit scheduled tasks from running depending on the current network configuration:

- Only run if ethernet is available
- Only run when the Mac is connected to a specific WiFi network
- Only run when the Mac's location is set to a specific choice

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Related Documentation

- Applying runtime conditions to scheduled backup tasks <https://support.bombich.com/hc/articles/20686389397015#network_limits>
- Product Tour: Learn how to schedule a task to run automatically

The CCC Diplomat: Back up files and media from your iOS devices to your Mac

The CCC Dashboard includes a new tab named CCC Diplomat where you can designate a volume for your mobile device backups. The Diplomat advertises a service on your local network to iOS devices that are running the CCC Mobile companion application. Making wireless backups to the diplomat is easy and fast – typically a lot faster than backing up to storage that you attach directly to your mobile device. These backups also get folded into your CCC backup ecosystem. When CCC snapshot support is enabled on your Diplomat backup volume, CCC will create snapshots on that volume whenever your mobile devices make backups. CCC also records events and even task audits for your diplomat backups.



Related Documentation

- Backing up to Mac-attached storage hosted by a CCC Diplomat <https://support.bombich.com/hc/articles/20768465018519>
- CCC Dashboard: Configuring the CCC Diplomat for iOS backups

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<https://support.bombich.com/hc/articles/20686467217687#diplomat>

CCC's file copier handles renamed folders more efficiently

In the past when a folder was renamed on the source, the folder would be removed from the destination and recopied. CCC's next-generation file copier retains folder inode information, so now we can detect renamed folders and simply rename those folders on the destination. This functionality is currently limited to APFS source volumes.

Task Notes

Some people manage a **lot** of backup tasks, and the purpose of each task may not be entirely obvious from the task name alone. Likewise, even within a backup task, you might have different reasons for running individual events, e.g. "This is the backup made prior to installing XYZ.app on the source." CCC 7 adds Task Notes, which allow you to annotate individual tasks and events. Click **Notes** at the bottom of the CCC window to add notes to a task. To see notes associated with specific events, open the Task History window, select an event, then click the **Notes** button in the middle-of-the-window separator bar.

 Show me the Notes button

Vacation Snapshots

Previously, CCC would abort the task if the destination was unavailable. Some people that travel without their backup disk have been asking for a way to retain versioning on the source even when they're away from the office. Now, if snapshot support is enabled on the source volume, CCC will create a snapshot on the source at the scheduled run time even if the destination is absent.

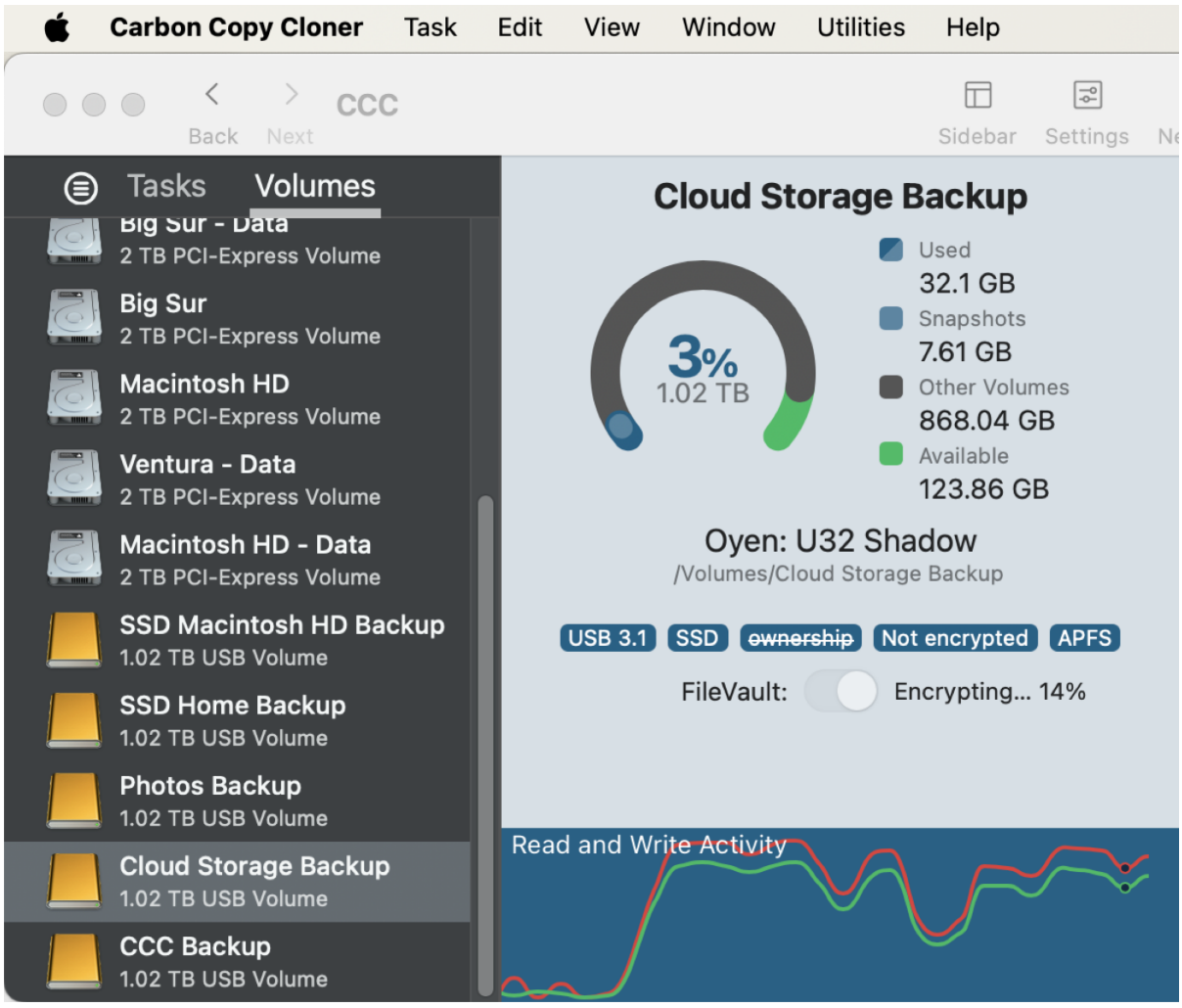
Related Documentation

- Should I enable snapshot support on my source volume?
<https://support.bombich.com/hc/articles/21385602599191#source_snapshots>

Enable/Disable APFS Encryption

When you select an APFS volume in CCC's sidebar, you'll find a new **FileVault** switch. Enabling encryption on a given APFS volume is now that simple – just flip a switch. CCC will also show progress indication of the conversion process.

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Related Documentation

- FileVault Encryption <https://support.bombich.com/hc/articles/20686438012951#encrypt>

Other new features and improvements

Our to-do list never ends, and we're constantly receiving great feedback from users on how we can improve CCC. Here are just a handful of the other improvements that we're excited to introduce in CCC 7:

- Product tours: These bubble-tip guided tours walk you through various scenarios and show where to find settings. We've peppered these throughout the documentation to provide better direction for getting to various settings and functionality.
- We added support for creating, deleting, listing and mounting snapshots in the CCC command-line utility <https://support.bombich.com/hc/en-us/articles/20686443072535>. Run the `ccc` utility without arguments to see the new options.
- You now have more granular control over the events that are shared with Notification Center <https://support.bombich.com/hc/articles/20686467217687#nc>, and the interruption level associated with each (e.g. should a notification be presented, should a sound be played?).
- We added a simulator for the Snapshot Retention Policy thinning settings. The thinning settings are designed to reduce overall snapshot disk usage while still providing a good breadth of backup history. The simulator allows you to adjust the settings and see exactly what kind of breadth and granularity you can expect in your backup history. Click the "i" bubble button next to the "Snapshot Thinning" header when customizing a Snapshot Retention Policy to find the Snapshot Thinning Simulator.

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- We added more granular control over postflight power management settings. Now when you add a restart or shut down action to your task, you can choose to have it be an immediate request, a request with the typical 60-second countdown dialog, or a forced event.

Upgrading from CCC 6

The upgrade path from CCC 6 to CCC 7 couldn't be simpler. Simply open CCC 7, and it will automatically update your CCC 6 tasks. If you kick the tires for 30 days and decide to stick with CCC 6, simply re-open CCC 6 and choose the option to downgrade. CCC 6 will then reload your original CCC 6 tasks and everything will be as it was prior to your trial of CCC 7.

Notable interface changes going from CCC 6 to 7

CCC 7 includes **no** notable interface changes, beyond the additions noted above. We recognize that many people are averse to UI changes, so we worked really hard to keep them to a minimum in this release!

Related Resources

- Download CCC <https://bombich.com/download>

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CCC 7 Release Notes

CCC 7.2.2

October 15, 2026

- Quick Update is smarter and more resilient. Quick Update now recovers more gracefully when a previous backup ran into errors. Previously, a few problem files (e.g., some flaky files during a long first backup to a NAS) could force a complete audit of the destination, which sometimes took hours. Now CCC re-checks just the folders that had trouble, and the rest of the backup stays fast with Quick Update.
- Quick Update now corrects out-of-scope changes on local backups. If something is modified on the backup volume outside of CCC, Quick Update now catches and corrects it on the next run. This functionality is limited to destination volumes that support FSEvents, so NAS volumes are not included. For those destinations, we still assert an assumption that the destination is not modified outside of the scope of the backup task <https://support.bombich.com/hc/en-us/articles/20686481162647-Advanced-Settings#exclusivity_assumption>. You can always run a full audit of any destination by holding down the Option key and clicking the Start button.
- CCC will no longer attain a user idle display lock assertion (which keeps the screen awake) when a task is started manually. CCC still attains that assertion when a task is repeated via the "Repeat affected tasks on login" setting.
- You can now select multiple tasks in the sidebar, then right-click on the selection to delete them all at once.
- Improved the performance of sparsefile copying.
- The Notifications settings that are managed by the CCC Dashboard application are now available in the Settings window of the main application.
- Items excluded via "Respect macOS exclusions" are now removed from the destination when the "Remove excluded files" setting is enabled. There is one very important exception to this behavior: bundle components are not removed. Removing bundle components could break some files, e.g. Photos Libraries, so we don't remove excluded items inside of a bundle file.
- When exporting a task audit or an ad hoc verification report in CSV format, CCC now correctly handles file names that include quotation marks.
- CCC's "correction" of modification dates with a "0" value (i.e. January 1, 1970, Midnight UTC) is now limited to destination volumes that specifically cannot accommodate a 0 value for modification dates (e.g. ExFAT, some NAS volumes).
- Fixed the alignment of the Size and Copied columns in the task audit view. These numeric values are now right-aligned instead of left-aligned, matching the task event table, and the presentation of numeric content in the Finder.
- Fixed a logic issue that was causing the "Remove excluded items" setting to be errantly disabled when loading the Task Filter window with a filter that is set to the "Include" default filter behavior.

CCC 7.2.1

September 24, 2026

- Corrected an oversight that caused the "Repeat affected tasks on login" setting to be enabled by default. That setting will be actively disabled for anyone updating from CCC 7.2 (builds 8399 or 8401). If you want that setting to be enabled, re-enable it after applying the update in CCC Settings > Advanced.
- CCC's Backup Coach now issues an advisory if the bootable destination lacks a volume owner, and encourages the user to authorize users in the Startup Disk app so the volume will actually be ready for

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booting.
- CCC's Installer Media Creation assistant now accommodates the Tahoe installer's larger volume size requirement.
- Golden Gate: Fixed a hang that can occur when CCC's helper tool attempts to mount a NAS volume if a previous attempt to mount an AFP volume was made.
- Golden Gate: When you select a task whose source or destination (or underlying source or destination) is on an AFP volume, CCC will now prompt you to switch to the SMB protocol.
- Fixed a logic issue that was preventing the export of an ad hoc verification report.
- When verifying files on the source or destination, CCC will calculate an MD5 checksum of a file if the task audit has an older MD5 checksum for that file (e.g. if the file was last copied by a version of CCC older than CCC 6.1.10).
- Run time limits are now adjusted for time zone changes. I.e. if you configure a task to run only between 7AM and 5PM, it runs between those times regardless of which time zone you're in.
- The disk image compaction subtask is now actively terminated if it times out. This avoids an inevitable failure to mount the disk image because `hdiutil compact` has an exclusive lock on the file.
- Addressed an errant "CloneKitService exception" that was presented when the system is rebooted shortly after a "When files are modified on the source"-scheduled task resumes monitoring of the source.

CCC 7.2

September 13, 2026

- The "When files are modified on the source" scheduling setting now allows the destination volume to remain unmounted while monitoring the source.
- The "When files are modified on the source" scheduling setting is also now allowed with network volume destinations. If the NAS volume is not mounted when the task initializes monitoring, CCC will not actively mount it until the FSEvents thresholds are met.
- As long as the macOS version remains the same on the source and destination, Bootable Backup tasks will now perform incremental updates to the destination, and allow the retention of snapshots for backup versioning. When macOS is updated on the source, CCC will prompt (by default) to update the OS on the destination by erasing and recloning the source.
- Modernized the UI in CCC's Settings window.
- Improved the handling of files that can't be opened when the screen is locked. <https://support.bombich.com/hc/en-us/articles/43296127799959-Some-files-can-t-be-opened-when-the-screen-is-locked>
- We made some adjustments to the collection of snapshots when a volume is selected in CCC's sidebar. The "Collecting snapshots" modal dialog has been laid to rest, and we resolved some queue blockages that could be caused by a single unresponsive volume.
- Addressed a Golden Gate-specific issue with making bootable copies of volumes that contain an older OS than the current startup disk (e.g. Tahoe).
- Made a small adjustment to accommodate a SAMBA configuration that hides certain files by default. When that policy is applied, the server ignores changes to the "hidden" file flag, and the absence of that flag was causing some files (e.g. "Icon\r") to reappear in CCC's Task audit every time the task runs (i.e. because CCC was repeatedly trying to reapply the flag).
- Added a global exclusion for the /.streams folder that contains QNAP-proprietary storage of NTFS filesystem metadata.
- Added support for OAUTH authentication via "Sign in with Microsoft" for sending email notifications.
- Improved the way the ccc command-line utility presents active task progress indication when using the --watch argument.
- Removed TouchBar support.

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CCC 7.1.6

July 15, 2026

This is the official qualification build of CCC for macOS 27 (Golden Gate).

- Added a "search" button to the header of the Snapshots table to make it easier to access the Snapshot Comparison Browser and "search for a file across snapshots" functionality.
- Improved search indexing performance in the Snapshot Comparison Browser by as much as 3X for SSDs. The performance gains are more modest for rotational media, only about 7%, but still an improvement.
- CCC's software updates will now be facilitated by CCC's helper tool whenever possible (this allows us to drop a deprecated system request). CCC now validates an ED25519 signature of software update archives (a notch more secure than validating the SHA256 checksum).
- Implemented a method that will instigate the Finder to more proactively update the size of a bundle file when CCC modifies the content of that bundle file. This doesn't change anything about what gets copied, it just avoids a situation where people reach an invalid conclusion about the content of the destination based on invalid Finder information.
- Fixed a handful of edge-case crashers.
- Fixed the reporting of file-specific errors when a stall is encountered while downloading cloud-only files.
- Protected snapshots now have a friendlier label when selected as the source to a Restore task.
- We have received a handful of new reports from Tahoe users that the mini task progress window is remaining on screen and unresponsive after all task activity has completed. This update includes some modifications to the memory management of that window that should resolve this issue.
- The "Last health check" event time is now presented next to the Backup Health Check frequency popup menu for additional context when making a health check frequency choice.
- Refactored the mechanism that is used to coordinate the "hide menubar icon" setting between CCC, the Dashboard, and the System Settings "Allow in the menubar" UI such that it no longer relies on a CCC global setting. If you were seeing an occasional request for authentication from the CCC Dashboard application on login, and you're logged in to a non-admin account, then this change should resolve those authentication requests.
- Fixed the "current file" feedback for tasks that specify a remote Mac as a source or destination.
- Fixed a logic error that avoided enabling ownership on a remote Mac destination.
- The Quick Update feature will now be suppressed for the next event if the user has enabled the "Remove excluded files" setting since the previous event (i.e. without making any other changes to the task filter). This avoids a situation where excluded files wouldn't be removed from the destination until some other modification was made to the containing folder on the source.
- The Quick Update setting is now disabled when "Temporarily download cloud-only files" is enabled. These settings are mutually exclusive because FSEvents can't detect changes to cloud-only content that might have occurred on some other device.

CCC 7.1.5

March 5, 2026

- Errors related to accessing the content of the "/private/var/protected" folder are now suppressed (because that folder is, very transparently, protected by System Integrity Protection).
- Fixed a crash that was occurring when choosing the option to convert a destination to APFS in the Backup Volume Setup Assistant.
- The "Temporarily download cloud-only content" setting is now only applied if the source is a folder. We're seeing too many cases where people have this setting applied to a task that backs up the whole startup disk, and that's leading to a din of annoying (albeit usually harmless) errors, and potential space

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constraints for future restore activity. See this Kbase article <https://support.bombich.com/hc/en-us/articles/20686419951767-Backing-up-the-content-of-cloud-storage-volumes#temp_download_best_practice> for additional details on this change.
- Implemented an alternate method for forcing the download of cloud-only file data in cases where macOS FileProvider claimed to download a file without error, but did not actually populate the data. This resolves a handful of reports we have received regarding the presence of 0-byte placeholder files on a backup volume despite the task being configured to download cloud-only content.
- Made small adjustment to how the WiFi SSID is obtained on macOS Tahoe that should be a little bit more reliable (i.e. when determining if a backup task should run based on network conditions).
- CCC's privileged helper tool now ignores requests from older versions of CCC. This change resolves a theoretical scenario in which an older version of the CCC command-line utility could be altered and manipulated to mount a snapshot without superuser privileges (but with at least administrator privileges). macOS doesn't require superuser privileges to mount snapshots, nevertheless we prefer to impose the superuser requirement for requests coming from CCC's command-line utility to ensure that they are performed with deliberate user intent and consideration. Thanks to Csaba Fitzl (@theevilbit) of Iru for raising this esoteric scenario to our attention.
- Attempts to mount a snapshot of the startup disk will now only be permitted via CCC's Disk Center <https://support.bombich.com/hc/articles/21384614166935-Mounting-and-browsing-the-contents-of-a-snapshot>. The mount will also be preceded by a dialog comparable to the one presented by Disk Utility in the same scenario, explaining that some protected folders will be accessible on the snapshot <https://support.bombich.com/hc/en-us/articles/21385602599191-Frequently-Asked-Questions-About-Snapshots#root_snapshots>.
- Added support for pausing tasks to the CCC command-line utility (e.g. Carbon Copy Cloner.app/Contents/MacOS/ccc task pause "task name").
- Improved the contrast of the text in the Action column in Task History Audits; particularly in cases where the user's macOS Theme color is Graphite.
- Fixed a handful of issues related to importing tasks, especially tasks that are arranged in groups.
- Fixed some logic that was preventing the Start button from getting disabled when you switch from a non-running task to a running task.
- Fixed the drawing of the snapshot navigator slider cell elements for macOS Tahoe.
- Fixed a logic issue that was preventing CCC from creating "vacation snapshots" on the source when the destination is a NAS that is unavailable.
- Improved CCC's responsiveness to macOS Appearance (i.e. Light vs. Dark) changes on macOS Tahoe.
- A Preview run will no longer create folders on the destination when the Task Filter behavior is set to "Include".
- Fixed some file size values (and the resulting "bytes copied" math) in a "Preview" audit in cases where those files are not copied, rather only their attributes are updated.

CCC 7.1.4

December 9, 2025

- Improved the contrast of the options presented in the Backup Volume Setup Assistant. The buttons in most of the option boxes now respond to the Return key press so they are colored with the accent color. This is very handy on Tahoe where buttons otherwise appear lifeless and practically fade into the background.
- Added an exclusion for an application installation staging folder that popped up in Tahoe and was causing some unnecessary errors.
- Improved the task audit's presentation of the quantity of data removed or replaced during an event. For Preview events, this information is now presented in red text.
- The "current" volume is now indexed in the Snapshot Comparison window so that files that are present on the current volume but not in one of the selected snapshots will show up in the search results.

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- Made some adjustments to the calculation of checksums for extended attributes to address the errant recopying of files that have an out-of-spec "com.apple.decmpfs" extended attribute on the source despite not actually being compressed.
- Fixed an issue where some files were repeatedly appearing in a task audit because CCC was attempting to re-apply the UF_TRACKED flag to those files. This was occurring on a MacFUSE volume that doesn't support that flag (nor complain when the flag is applied, nor retain the flag).
- "Suspend all tasks" is now available in the Dashboard contextual menu (e.g. right-click on the "C" icon in the menubar).
- Addressed an issue where CCC was showing "-1 bytes" of snapshot disk usage for volumes that had no snapshots.
- The search expression in the Task Audit table is now preserved when selecting a different task event.
- In addition to holding down the Control key (and clicking the "Start" button) to apply a Backup Health Check when it otherwise would not have been applied, you can now hold down the Control key to *disable* Backup Health Check if a Backup Health Check is due. This behavior was also extended to the "Run Task" contextual menu item for the CCC Dashboard (i.e. the menu you see when you right-click on the "C" icon in the menubar).
- Fixed an issue that was causing the Save button to immediately reappear after saving a "When source files are modified" task when applying a run time limit.
- The total snapshot disk usage presented in the Disk Center chart is now updated in a more timely manner after snapshots are deleted.
- Fixed an issue in which the Automation popover might hang when enabling a task runtime limit.
- Increased the font size of the Task Notes text view.
- We have received a handful of reports that the mini Task Progress window won't close on macOS Tahoe (despite an apparent effort to close the window). This build of CCC adds a second, slightly different close request that should resolve that. If you're still seeing this behavior, though, please choose "Report a problem" from CCC's Help menu to let us know about it.
- Added a "Comment" column to the Snapshots table to show comments associated with protected snapshots. This column is hidden by default, but can be enabled by right-clicking on the table header.

CCC 7.1.3

August 27, 2025

- Addressed the handling of vestigial, pre-Sonoma-era iCloud placeholder files. These placeholders should never exist on a post-Ventura version of macOS, but we found one case where the presence of these terds was leading to inconsistent results. These files are now treated like ordinary files and will no longer affect the copying of the "real" files that they reside next to.
- Addressed an issue that arose in 7.1.2 where sparse files located on a NAS volume (that claims to support sparse files) were getting recopied each time the backup task runs.
- CCC will now more effectively dissent requests to unmount the source volume snapshot when the task is actively using that volume for the duration of a task event. Requests to unmount that snapshot are pretty rare, but that can happen if free space on the source volume is very low, or during a logout event. This change resolves the errors that would ensue in those cases when the source is unmounted while we're using it.

CCC 7.1.2

August 20, 2025

This is the official qualification build of CCC for macOS 26 (Tahoe).

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- CCC has a new "glass" icon that looks great on macOS Tahoe! Big thanks to our UI designer Enelia at Abacus Finch <https://www.abacusfinch.com> who was able to find a way to keep our beloved page curl with the new glass material.
- The CCC menubar icon can now be moved around in the menubar, or removed by holding down the Command key while dragging the icon. Removing it in this manner will sync with the "Show CCC's icon in the menubar" setting in CCC Settings Dashboard. Tahoe users: If you disable the CCC menubar icon via the new System Settings > Menu Bar > Allow in the Menu Bar interface, CCC cannot be aware of that setting <https://developer.apple.com/forums/thread/788101>. For the best experience, we recommend that you use the settings inside of CCC for controlling whether the CCC menubar icon is visible.
- The "Find and replace corrupted files on the destination" setting is now officially named "Backup Health Check" <https://support.bombich.com/hc/articles/20686511433623#bhc>.
- Removed the "Standard Copy" button; the name of this button was a misnomer. This button was only present when Quick Update was enabled on a task, and in those cases, running the task with the Quick Update setting is the "standard" way of running that task. The Standard Copy button was added as a way to suppress the Quick Update feature in an ad hoc manner. This button was not frequently used, and its presence with that particular name was leading to some unnecessary confusion and concern. In lieu of a separate button, you can now hold down the Option key while clicking the Start button if you would like to have CCC rescan the entire source and destination (i.e. suppress Quick Update). Additionally, you can hold down the Control key to perform an ad hoc Backup Health Check <https://support.bombich.com/hc/articles/20686511433623#bhc>. The resulting behavior of the modifier key presses is reinforced by icons on the Start button that correspond to the Quick Update and Backup Health Check features, as well as customized tooltips that will appear when you hover your mouse over those buttons.
- Added a menu item to the Volumes sidebar contextual menu that offers to delete an APFS volume (e.g. if you accidentally added an extraneous volume via the Backup Volume Setup Assistant). Select the volume in the sidebar first, then right-click on the volume to get an option to delete it.
- Added yet another workaround for Apple's restriction on access to the current WiFi network name for the macOS Sequoia 15.6 update. CCC uses the WiFi network name only in support of the option to limit a scheduled task to running when the system is connected to a specific WiFi network.
- Improved the repopulation of extended attributes in cases where the "Don't support extended attributes" setting was *disabled* after initially populating the destination while the setting was enabled. In cases where this setting was initially enabled because the destination was a NAS volume, CCC will now proactively seek out absent resource fork and FinderInfo extended attributes on files that are otherwise unmodified if the task is subsequently configured to preserve extended attributes.
- Adding "/*" to the end of a search expression in a Task Audit will now show the content of a matching folder.
- Resolved an issue where CCC would fail to import tasks or restore the CCC application support folder if CCC's helper tool was not yet registered with macOS. CCC will now prompt to register the helper tool prior to importing tasks.
- Fixed a crasher that could occur if many, many tasks were started simultaneously (e.g. in response to a volume mount event).
- Fixed a logic issue that was causing some "Folder was deleted" audit transactions to get a "circle with plus" icon rather than the "circle with minus" icon. Addressed another issue that was leading to extraneous folder entries in an audit when those folders had not actually been modified.
- Orphaned compression attributes are dropped when transferring a file or dataless folder that does not have the associated "this file is compressed" flag (this part is not new). Addressed a logic issue that was causing files (or more commonly, no-longer-dataless folders) with these vestigial attributes to appear in the task audit every time the task is run, despite that the files were not actually getting modified.
- Addressed an issue in which CCC was prematurely aborting a task due to an apparent stall while collecting the attributes of files in a folder that had an exceptionally high file count (e.g. 100K).
- Fixed an issue that affected how sparse files are copied between volumes that have different optimal buffer sizes.

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- Improved the experience of switching between Simple Mode and Standard Mode, especially when CCC's helper tool has not yet been registered with macOS.
- CCC will avoid auditing a Quick Update task if the destination NAS filesystem URL has only a DNS-suffix difference (e.g. smb://user@host vs. smb://user@host._smb._tcp.local are now treated as the same).
- CCC now verifies that the device ID of the "_CCC SafetyNet" folder matches the device ID of the destination volume. If that folder has been replaced with a symlink that points to some other volume (for example), CCC will abort the task. This change resolves the errors that would occur if the SafetyNet folder was on some other volume (e.g. because files cannot be moved across device boundaries, they would have to be *copied, then deleted*). CCC only moves content into the SafetyNet folder — copying and then deleting the content defeats the purpose of the SafetyNet feature.
- Fixed an issue in which the Backup Volume Setup Assistant would be unresponsive when opened via the button in the Backup Coach window.
- Fixed the collection of total snapshot disk usage for the source and destination popup menu charts.
- Fixed an issue where CCC was failing to create a new folder because the parent folder was locked on the destination.
- Corrected an issue that was leading to "Audit failure" messages in the Task Filter window when a previously-excluded folder had been replaced by a symbolic link. CCC never follows symbolic links, so having filter rules that descend from a symlink is invalid — these obsolete rules are now removed from the filter whenever the filter window is opened.
- Fileflags (e.g. hidden, locked) that can be preserved on the destination are now preserved by default when backing up to or from a NAS volume.

CCC 7.1.1

April 17, 2025

- Removed a condition that was causing CCC to re-enable Spotlight on the destination in some cases.
- Fixed a localization issue that was causing notifications to be presented only in English.
- Fixed an issue that could lead to the wrong notes being presented for a task if you were to select another task before dismissing the Notes popover.
- Addressed an issue that could cause the Backup Volume Setup Assistant to be unresponsive.
- Corrected the handling of resource forks that are larger than 4GB.

CCC 7.1

March 31, 2025

- For Sonoma and Sequoia users, CCC now offers an option to set a custom icon on locally-attached source and destination volumes. Select an image of your own, or get creative with Apple's new Image Playground. Click on CCC's Source or Destination selector to find the new "Set custom icon" options. Apple's Image Playground requires an Apple Silicon Mac that supports Apple Intelligence and macOS Sequoia 15.2 or later.
- This version of CCC embraces new macOS functionality that allows us to avoid installing the CCC helper tool <https://support.bombich.com/hc/articles/20686388957719-What-is-CCC-s-Privileged-Helper-Tool> into Macintosh HD > Library > PrivilegedHelperTools. The helper tool will be "registered" with macOS, but will remain inside of the CCC application bundle. This new practice resolves a long list of complications that have arisen over the years with the legacy LaunchDaemon configuration as Apple has improved macOS platform security.
- Full Disk Access is no longer required separately for CCC's helper tool. CCC's coaching around this procedure has been updated to reflect the new requirement. No changes are required for current CCC installations.

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- CCC offers new UI in Settings > Advanced to specify the authorization requirements for a variety of CCC activities. For example, you may wish to require an admin user for CCC task changes, but allow non-admin users to start/stop tasks. Now you can configure that with ease in Advanced Settings.
- The Snapshot Comparison Browser search field now supports wildcard and regular expression searches.
- CCC Dashboard's "Suspend all tasks" dialog now offers a date picker option for those cases where the pre-set intervals are not flexible enough.
- In the Tasks tab of the CCC Dashboard application, the "Defer…" option is now available for any scheduled task even when that task is not running. This allows the user to proactively defer a task before its scheduled run time rather than having to wait until the task is actually running.
- If a task is configured to restart or shut down the system "after a 60 second delay", that delay will no longer be applied when the screen is locked. In those cases macOS will not present the restart/shutdown dialog at all, so CCC proceeds directly to the request instead. This does not affect the fate of unsaved documents. If an application requires attention before it can quit, that application will cancel the restart/shutdown request even if the screen is locked.
- Fixed a logic issue in the Dashboard that was causing the "Shutdown if previously off" feature to not work.
- Spotlight will now be disabled on the destination by default when selecting the option to use a destination volume exclusively for the CCC task in the Backup Volume Setup Assistant. Users can also select a volume in the sidebar and disable (or re-enable) Spotlight via a switch. This change will hopefully address the interference that Spotlight and its mediaanalysisd buddy are causing with regard to unmounting CCC destination volumes.
- Added an option to the ccc command-line utility to perform snapshot thinning and pruning on a specified volume according to its current Snapshot Retention Policy.
- Improved the recapturing of space savings on the destination when files have been duplicated on the source (e.g. in the Finder).
- The macOS Installer Media Assistant now requests 20GB when "borrowing" space for installer media. This accommodates the larger requirement for macOS Sequoia 15.3.1.
- The "Legacy Bootable Copy Assistant" functionality is now merged into the Backup Volume Setup Assistant.
- When a task is configured to make a legacy bootable copy of the source, the task is no longer automatically converted to a "Standard Backup" configuration after the cloning procedure has completed. When you subsequently run the task again, CCC will erase the destination and repeat the legacy bootable copy procedure.
- The "Present an alert dialog for reminders" Dashboard setting is now only applied to reminders, not to "Prompt before proceeding" task prompts.
- The "MobileSoftwareUpdate" folder is now hidden by default on the destination. This folder is technically not hidden at the root of the startup disk, but it's not exposed via a firmlink, and it exists exclusively on the Data volume, so it effectively does not appear in the Finder.

CCC 7.0.4

November 19, 2024

- The Snapshot Navigator now indexes bundle contents too, so we can search for files within, for example, a Photos library bundle file.
- Fixed a logic issue introduced in the 7.0.3 update that leads to an error when running "legacy bootable copy" tasks on Intel Macs running Sequoia.
- Fixed an issue introduced in the 7.0.3 update that would cause postflight shut down and restart requests to fail if the task was started manually.
- Added yet another workaround for Apple's restriction on access to the current WiFi network name in macOS Sequoia. These restrictions are affecting our ability to limit task execution to when the Mac is connected to a specific WiFi network. Thanks to the assembly of WiFi network name+location databases

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(e.g. collected by companies that provide street-view imagery), WiFi network names can be used for location fingerprinting. As such, Apple deems this to be "private" data. Access to this information is only granted to an application that specifically requests access to location information. That's way more information than we want or need for this particular feature within CCC. Making the matter yet worse, that location service isn't even available to background "daemon" applications, like CCC's helper tool. While this update includes a workaround that will temporarily allow us to continue pulling the current WiFi SSID from the system, we anticipate that Apple will eventually "fix" these gaps as well, and the feature will have to be disabled.
- Fixed an odd edge-case condition where CCC was failing a task in the readiness phase because a source NTFS volume lacked support for a common system call.

CCC 7.0.3

September 24, 2024

- Fixed an issue in which CCC's helper was occasionally not completely exiting on startup in cases where there were no scheduled tasks. This was leading to cases where the task history database would be closed, thus disallowing new entries to be recorded.
- Improved the experience of editing a password in the email server settings panel.
- Addressed an edge case scenario where file ownership/permissions were preserved despite using the "Don't preserve permissions" advanced setting in cases where files were cloned via the APFS clonefile() method (i.e. in cases where the source and destination are folders on the same APFS volume).
- CCC will apply a more strict 5GB minimum free space requirement when the destination is the startup disk (or a volume in the same APFS container as the startup disk).
- Adjusted how ASR is invoked when creating a legacy bootable copy of macOS Sequoia on Apple Silicon Macs. This corrects *some* cases where the destination would fail to boot and the macOS Boot Recovery Assistant would indicate that macOS would need to be reinstalled. This does not resolve *all* of those issues, though. We have still found ASR to be a little bit inconsistent in its ability to produce bootable devices on the Apple Silicon platform, despite creating perfect byte-for-byte copies.
- Implemented a workaround for some oddly-specific folder corruption on Lucidfs that occasionally prevents CCC from creating the write readiness cookie file, despite having no trouble creating other files in the same folder.
- Task groups no longer get a "success" icon if they run (e.g. on a schedule) but have no tasks to run (e.g. because all tasks within it are disabled, or because the group has no tasks at all).
- Fixed a false-positive postflight re-verification error that was affecting filesystem-compressed files on macOS Sequoia.
- Resolved a scenario where files that had been duplicated via the APFS clonefile() procedure were getting re-cloned on the destination during each run because macOS adds a GateKeeper extended attribute to files on the destination.

CCC 7.0.2

July 30, 2024 [macOS Sequoia qualification]

This build of CCC is qualified to run on macOS Sequoia.

- Addressed a scrolling performance issue in the "Verify files copied by this task" window that could occur when selecting multiple files.
- Corrected the appearance of the Notes text in Dark Mode.
- The Task Filter, Advanced Settings, and Notes icons at the bottom of the CCC window now use a badge to indicate that customizations are applied rather than relying on color alone.

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- UUID resetting is now disabled for ExFAT volumes because the exfat.util resets the UUID to all zeroes (bug filed with Apple: FB13813658).
- When a postflight power management setting is selected that involves presenting the system's 60 second countdown dialog, CCC now wakes the screen before making the request so that this dialog is presented more consistently.
- Fix a "missing character" font issue for a message in the Task Plan for tasks that are configured to run "When files are modified on the source".
- Fixed an issue where the "Delete snapshots that are older than {}" and "Limit snapshot disk usage to {}" values were getting swapped in the Snapshot Retention Policy table.
- "At rest" encrypted volumes (i.e. the internal storage in an Apple Silicon Mac, or an Intel Mac with a T2 chip) are no longer presented as "Encrypted" in the Disk Center unless FileVault is explicitly enabled with a password.
- When you select a volume in CCC's sidebar and enable encryption on that volume, CCC no longer saves the user-specified password in the System keychain. The prompt for password retention is deliberately limited to cases where an encrypted volume is selected as a source or destination to a CCC task.

CCC 7.0.1

May 22, 2024

- Improved the procedure of granting full disk access to CCC's helper tool.
- Network location-based limits can also be applied to task groups.
- Resolved an issue with creating hardlinks in cases where the destination was low on free space.
- The Snapshot Comparison browser now shows older versions of application bundles.
- Navigation activity to and from task groups is now included in the history that is tracked by the Back/Next buttons in the toolbar.

CCC 7.0

May 8, 2024

- A new Backup Volume Setup Assistant guides users through formatting destination volumes, and asserts that the destination is dedicated to the backup task to avoid conflicts with other backups and other purposes of disk usage. The new setup assistant should go a really long way towards getting backup tasks set up correctly the first time, and without a trip to the documentation.
- Added search functionality to the Snapshot Comparison Window.
- Added a snapshot disk usage limit to custom snapshot retention policies (i.e. so you can say, "I want to retain backup history, but I only want the 'history' part of my backup to consume 500GB of space").
- Added support for flagging specific snapshots to not be deleted by CCC snapshot thinning and pruning, "protected snapshots".
- Added support for manually creating snapshots on a volume.
- Scheduled tasks can now be limited to running only when the Mac is on ethernet, on a specific WiFi network, or set to a specific location.
- CCC's file copier can now detect renamed folders on APFS source volumes, and will rename the folder on the destination rather than recopying all of its content.
- You can now store notes alongside each task (e.g. to indicate the purpose of a task, or some other piece of helpful context).
- When snapshot support is enabled on the source, CCC will now create snapshots on the source at the scheduled task run time, even if the destination is unavailable. When you travel without a backup disk, this allows you to retain older versions of files on the source while you're traveling.
- You can now enable/disable encryption on APFS volumes via a simple switch. Select a volume in the

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sidebar to find this setting.
- We added support to the CCC command-line utility for creating, deleting, listing and mounting snapshots. Run the ccc utility without arguments to see the new options.
- The CCC Dashboard offers more granular control over which CCC Activity events are shared with Notification Center and the level of attention that the notifications will request.

CCC 6.1.7

September 5, 2023 [macOS Sonoma qualification]

CCC 6.1.3

September 19, 2022 [macOS Ventura qualification]

CCC 6.0.4

October 20, 2021 [macOS Monterey qualification]

CCC 6.0

May 18, 2021

Carbon Copy Cloner 5.1.22

October 16, 2020 [macOS Big Sur qualification]

Carbon Copy Cloner 5.1.10

August 20, 2019 [macOS Catalina qualification]

Carbon Copy Cloner 5.1.5

September 17, 2018 [macOS Mojave qualification]

Carbon Copy Cloner 5.1

April 24, 2018

Carbon Copy Cloner 5.0

August 24, 2017 [macOS High Sierra qualification]

Carbon Copy Cloner 4.1.10

September 16, 2016 [macOS Sierra qualification]

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Carbon Copy Cloner 4.1.4

September 1, 2015 [OS X El Capitan qualification]

Carbon Copy Cloner 4.0

October 1, 2014 [Mac OS X Yosemite qualification]

Carbon Copy Cloner 3.5.3

October 22, 2013

Carbon Copy Cloner 3.5

July 20, 2012

Carbon Copy Cloner 3.4

July 20, 2011

Carbon Copy Cloner 3.3

September 21, 2009

Carbon Copy Cloner 3.2

March 18, 2009

Carbon Copy Cloner 3.1

March 24, 2008

Carbon Copy Cloner 3.0

September 18, 2007

Carbon Copy Cloner 2.3

October 23, 2003

Carbon Copy Cloner 2.0

November 19, 2002

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Carbon Copy Cloner 1.0

January 18, 2002

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Credits

CCC includes, in source or binary form, the following open source projects.

vsdbutil and hfs.util

CCC contains portions of source code available under the Apple Public Source License. That code may be downloaded by clicking the links below.

- vsdbutil_main.c <https://opensource.apple.com/source/diskdev_cmds/diskdev_cmds-332.11.5/vsdbutil.tproj/vsdbutil_main.c.auto.html> (View our modifications: vsdbutil.h <https://bombich.com/software/opensource/vsdbutil.h> and vsdbutil.c <https://bombich.com/software/opensource/vsdbutil.c>)
- hfs_util <https://github.com/apple-oss-distributions/hfs/blob/hfs-704.40.4.0.1/hfs_util/hfsutil_main.c>(Our only modification is `#define HFS_UUID_SUPPORT 1` in hfsutil_main.c)

View the APSL 2.0 license <https://www.opensource.apple.com/apsl>

rsync

CCC also includes, independently in binary form, rsync version 3.0.6. rsync is made available under the GNU General Public License. Per the license requirements, the source code and our modifications may be downloaded via the links provided below. This modified software is provided at no cost and with no warranty, also per the GNU GPL.

- Download the complete rsync 3.0.6 project <https://rsync.samba.org/ftp/rsync/src/rsync-3.0.6.tar.gz>
- Download the rsync 3.0.6 patches <https://rsync.samba.org/ftp/rsync/src/rsync-patches-3.0.6.tar.gz>
- Download the diff file (diff between 3.0.6 + [crtimes.diff, fileflags.diff, log-checksum.diff, and backup-dir-dels.diff] and my modifications) <https://bombich.com/software/opensource/rsync_3.0.6-bombich_20190114.diff>
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CCC is not a derivative work of rsync. Rsync is called in binary form only. You can access the build of rsync that is included with CCC via the application bundle: right-click on the CCC application icon, choose "Show Package Contents", then navigate to Contents/Library/LoginItems/CCC Dashboard.app/Contents/Frameworks/CloneKit.framework/Versions/A/rsync.

Sparkle

CCC's software update mechanism was inspired by Sparkle <http://sparkle-project.org>. We're no longer using the Sparkle code base, but we'd still like to credit Andy Matuschak for his enduring contribution to the macOS third-party software community.

skpsmtpmessage

The SimpleSMTP class included with CCC is a derivative work of the skpsmtpmessage <https://code.google.com/p/skpsmtpmessage/> project. skpsmtpmessage is licensed under the MIT license:

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SQLCipher (Community Edition)

CCC leverages SQLCipher <https://www.zetetic.net/sqlcipher> for encrypting Task Audit databases. SQLCipher is distributed under a BSD License <http://www.opensource.org/licenses/bsd-license.php>, Copyright (c) 2008-2020 Zetetic LLC. All rights reserved. The following statement pertains to SQLCipher:

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xxhash

```
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 *
 * You can contact the author at:
 *   - xxHash homepage: https://www.xxhash.com
 *   - xxHash source repository: https://github.com/Cyan4973/xxHash
 */
```

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Purchasing CCC

- Bombich Software Sales Policies and Frequently Asked Questions
- Purchasing an Upgrade for CCC 7
- How do I purchase a license for older versions of CCC?
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- How does the free 30-day trial work?
- If I pay for CCC now, will I have to pay for future updates?
- Can I use one license of CCC on multiple Macs in my household?
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- Can I give CCC as a gift?
- Why isn't CCC on the Mac App Store?
- Do you offer telephone or remote support?

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- Need help?
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- How is CCC delivered?
- Which payment types do you accept?
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How can I purchase CCC?

Bombich Software products are available directly through our online store <https://bombich.com/store>, hosted by FastSpring <http://www.fastspring.com>, our e-commerce partner and Seller of Record.

Redemption codes that can be redeemed for single user licenses are also available from select consultants and resellers. For a list of authorized resellers, please see our license redemption page <https://cccreseller.com/redeem>.

Licenses are valid for prior versions of CCC. (e.g. If you purchase a CCC 7 license, it can be used with CCC 6 and 5.) For more info about purchasing CCC, see How much does CCC cost and how can I purchase it? <https://support.bombich.com/hc/articles/20686511201943>

What is your return policy?

As we offer a fully functional 30 day trial version of CCC <https://bombich.com/download> which you may use to evaluate its suitability for your needs prior to purchasing, all refund requests are evaluated on a case-by-case basis and may be subject to a minimum 15% processing fee. To request a refund, please contact our sales department <mailto:sales@bombich.com?subject=Refund%20Request> within 30 days of your purchase.

Need help?

If you are experiencing technical issues with CCC, we are happy to work with you to resolve them so that you can keep using CCC. To open up a support ticket, you can select **Ask a question about CCC...** from CCC's **Help** menu.

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Checks and Money Orders: We accept either company or personal checks. Please note that acceptance of checks and money orders varies by country. If you do not see this option at checkout, we do not accept this form of payment for your country. Checks are not accepted for subscription products, such as Maintenance.

PayPal: We accept payments originating from PayPal accounts.

Amazon Payments: We accept payments originating from Amazon Payments. If you do not see this option at checkout, we do not accept this form of payment for your country.

Alternative Payment Methods: In certain countries, we accept Giropay, iDEAL, Sofort, WebMoney and Alipay. If you do not see this option at checkout, we do not accept this form of payment for your country.

Do you accept purchase orders? Will you accept my PO terms?

We do not accept purchase orders as form of payment nor the terms and conditions commonly associated with purchase orders. We provide a fully functional 30 day trial for you to use while payment is being arranged.

We are able to keep our prices low by offering a standard End User License Agreement <https://bombich.com/software/CCC_EULA.rtf> to all our customers and do not offer commercial credit. Our payment terms are Net 0-day for all of our customers. Once full payment is received, we issue the license and send it via email. Please contact our Sales Department <mailto:sales@bombich.com> for more information.

Do you charge tax, such as VAT, or other duties?

Applicable taxes are charged at the discretion of the importing country, and are the responsibility of the customer. These costs may be added at the end of the checkout process and are not necessarily displayed on the product selection pages.

What kind of e-commerce security do you use?

E-commerce services for our online store are provided by FastSpring <http://www.fastspring.com>.

Review FastSpring's Privacy Policy <http://www.fastspring.com/privacy.php>

Where can I download your W-9 form?

We do not sell directly to the public. All sales are from our trusted reseller partner, Fastspring.

Fastspring's W-9 Form <http://www.fastspring.com/w9.pdf>

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Frequently Asked Questions

- How does the free 30-day trial work? <https://support.bombich.com/hc/articles/20686511098519>
- How much does CCC cost and how can I purchase it? <https://support.bombich.com/hc/articles/20686511201943>
- If I pay for CCC now, will I have to pay for future updates? <https://support.bombich.com/hc/articles/20686480266135>
- Purchasing an Upgrade for CCC 7 <https://support.bombich.com/hc/articles/20686511636759>
- Can I use one license of CCC on multiple Macs in my household? <https://support.bombich.com/hc/articles/20686509666583>
- Do you offer an academic discount? <https://support.bombich.com/hc/articles/20686492622615>
- Can I give CCC as a gift? <https://support.bombich.com/hc/articles/20686476582551>
- Do you offer a volume licensing program? <https://support.bombich.com/hc/articles/20686457651735>
- Why isn't CCC on the Mac App Store? <https://support.bombich.com/hc/articles/20686446385815>
- Do you offer telephone support? <https://support.bombich.com/hc/articles/20686459927831>

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Purchasing an Upgrade for CCC 7

Will my CCC 3.5, 4, 5, or 6 license work with CCC 7?

No, CCC 7 requires a new license. However, **if you purchased a CCC 6 license on or after January 1, 2024, we will grant you a FREE license for CCC 7**. CCC 6 licenses purchased prior to **January 1, 2024** are eligible for upgrade pricing.

I purchased a license for CCC 6 on or after January 1, 2024. How do I get my FREE CCC 7 license?

When you open CCC 7 for the first time, it will attempt to retrieve your new license using the details from your CCC 6 license. If this succeeds, you will receive an email containing your new license and details for applying the new license to CCC 7. If this does not occur (e.g. because your system can't be connected to the Internet), you can retrieve your license via our website <https://bombich.com/forgot>.

What licenses are eligible for online upgrade pricing?

CCC 5 and CCC 6 licenses are eligible for the following upgrade pricing:

If you have used CCC 1, 2, 3, or 4	no discount is offered
If you own a CCC 5 Personal & Household license	your discount is 25%
If you own a CCC 6 Personal & Household license	your discount is 50%
If you own a CCC 4 or 5 Corporate & Institutional or Pro license	no discount is offered
If you own a CCC 6 Corporate & Institutional or Pro license	your discount is 25%

Corporate and Institutional Licenses (Volume License Program) are eligible for an upgrade discount of 25% off the current corresponding price tier <https://bombich.com/store/corporate>. Upgrades are free if Maintenance has been purchased and is currently active.

How do I purchase a license for CCC 7 at upgrade pricing?

If you are (or were) using a registered copy of CCC 6, download and open CCC 7. CCC 7 will recognize your CCC 6 license and check it for upgrade eligibility. If our automated system can determine that it is eligible for upgrade pricing, CCC will retrieve a coupon code that will automatically be applied to your in-app purchase.

If you have any trouble upgrading in-app, you can also use our upgrade offer request form <https://bombich.com/store/upgrade>. If you have any problems with or questions about purchasing an upgrade, please don't hesitate to contact us for help <mailto:sales@bombich.com?subject=Upgrade%20Eligibility%20Question>.

My Mac is too old for CCC 7. If I purchase a license for CCC 7, will that work with CCC 5 or 6?

Yes! If you purchase a license for CCC 7, that license will be recognized by CCC 5 or later. If you upgrade your Mac at a later date, you can upgrade to CCC 7 and begin using your CCC 7 license.

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What licenses are not eligible for upgrade pricing?

Legacy licenses such as a Department or Site license are not eligible for upgrade pricing.

Can I apply an EDU discount to my upgrade purchase?

No, additional discounts cannot be applied to upgrade pricing.

Additional Resources

- What's New in CCC 7 <https://support.bombich.com/hc/articles/20686482705687>
- System Requirements for CCC <https://support.bombich.com/hc/articles/20686494824855>
- Contact Sales Support <mailto:sales@bombich.com?subject=Upgrade%20Eligibility%20Question>
- Download CCC <https://bombich.com/download>

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How do I purchase a license for older versions of CCC?

To purchase a license for CCC 5 or CCC 6, you simply purchase a license for the *current* version of CCC. **You can register CCC 5 and 6 with a CCC 7 license**.

Selling multiple versions of CCC licenses has the potential of creating too much confusion at checkout. To avoid this confusion altogether, we've simplified the licensing process such that older versions of CCC can use a license for a newer version of CCC. This not only simplifies the purchasing process, it makes it simpler for you to *use* that same CCC license on all of the Macs in your household, even if they're running different versions of macOS and CCC. Additionally, if your Mac is running an older version of macOS that requires an older version of CCC, you can continue to use the same CCC license with CCC 7 when you upgrade your Mac or your Mac's OS in the future.

Can I purchase a license for CCC 3 or CCC 4?

No, CCC 3 and 4 are no longer supported <https://bombich.com/download#ccc3>.

Related articles

- How much does CCC cost and how can I purchase it? <https://support.bombich.com/hc/en-us/articles/20686511201943-How-much-does-CCC-cost-and-how-can-I-purchase-it>
- CCC and macOS Compatibility chart <https://bombich.com/download>
- Download CCC 6 for macOS Catalina (15.x), Big Sur (11.x), or Monterey (12.x) <https://bombich.com/software/download_ccc.php?v=ccc6>
- Download CCC 5 for macOS Yosemite (10.10), El Capitan(10.11), Sierra (10.12), High Sierra (10.13), or Mojave (10.14) <https://bombich.com/software/download_ccc.php?v=ccc5>

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How much does CCC cost and how can I purchase it?

Pricing

A household license of CCC 7 costs $49.99 USD plus any applicable local taxes. In some countries, we offer a pre-set price in local currency in order to allow a greater number of payment types. In other countries, the price in local currency is calculated at the time of sale and depends upon the current exchange rate with USD.

Purchasing

Individuals can purchase CCC within the CCC application, or via our online store <http://fastspring.com>.

Businesses and institutions can purchase single workstation licenses, volume licenses and pro (technician) licenses in our **Corporate Store <https://bombich.com/store/corporate>**.

Bombich Software products are available directly through our online store <https://bombich.com/store>, hosted by FastSpring <http://fastspring.com>, our e-commerce partner and Seller of Record. CCC software delivery is electronic only. There is no actual shipment of a physical product. You can download the software at any time from our download page <https://bombich.com/download> and from within CCC you can request that your registration key be emailed if you have misplaced it.

Redemption codes that can be redeemed for single user licenses are also available from select consultants and resellers. For a list of authorized resellers, please see our license redemption page <https://cccreseller.com/redeem>.

Upgrade Pricing

If you own a CCC 5 or 6 household license, you can receive a discount when purchasing CCC 7.

- If you have used or owned CCC 1, 2, 3, or 4: no discount is offered.
- If you own CCC 5: your discount is 25%.
- If you own CCC 6: your discount is 50%.

Please visit our upgrade page to determine your discount offer <https://bombich.com/store/upgrade>.

Note: If you purchased CCC 6 on **January 1, 2024** or later, you already have a free CCC 7 license. Retrieve it here <https://bombich.com/forgot>.

Additional Resources

- Purchasing an Upgrade for CCC <https://support.bombich.com/hc/articles/20686511636759>
- Contact Sales Support <mailto:sales@bombich.com?subject=Upgrade%20Eligibility%20Question>
- Can I use one license of CCC on multiple Macs in my household? <https://support.bombich.com/hc/en-us/articles/20686509666583>
- How do I purchase a license for older versions of CCC? <https://support.bombich.com/hc/en-us/articles/32851171739415-How-do-I-purchase-a-license-for-older-versions-of-CCC>

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How does the free 30-day trial work?

You can try the complete feature set of CCC for 30 days before purchasing it. *No features are disabled during the trial.* We encourage you to use that time to explore CCC's automated, incremental backup functionality and versioned backups.

Download the latest and greatest version of CCC <https://bombich.com/download>

If you have any questions about the behavior or functionality of CCC either during the demo period or after purchase, you can select **Ask a question about CCC...** from Carbon Copy Cloner's **Help** menu.

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If I pay for CCC now, will I have to pay for future updates?

When updates consist of minor improvements and fixes (e.g. bug fixes, going from version 7.0 to 7.1, etc.), they are always free to licensed users.

From time to time, there will be new versions that require significant changes to our application. These upgrades are specified by a new version number (e.g. going from version 6 to 7) and will include new features and functionality and support for newer operating systems. This process requires significant research, design, development and testing time. These releases will be handled like most commercial software: current users will be offered an upgrade price but the previous version will continue to work on older OSes if you decline to purchase the update.

Volume license customers with current software maintenance agreements will receive any paid upgrades at no additional charge.

Please note that we do not support older versions of CCC indefinitely. To find out which versions of CCC are currently supported and anticipated support sunset dates, please see our download page <https://bombich.com/download>.

For more information about our current upgrade pricing options, please see How much does CCC cost and how can I purchase it? <https://support.bombich.com/hc/articles/20686511201943>

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Can I use one license of CCC on multiple Macs in my household?

Yes, the CCC License <https://bombich.com/software/CCC_EULA.rtf> allows you to install and use CCC on any computer that you own or control for personal, noncommercial use. If you're using CCC commercially or institutionally, check out our Corporate <https://bombich.com/store/corporate> or Academic <https://bombich.com/edu> purchasing options.

A CCC 7 license will also be accepted by CCC 5 and CCC 6. If you have multiple Macs in your household and some do not meet the requirements for CCC 7, you can use the same license on all of your Macs with CCC 5, CCC 6 and CCC 7. You can download all available versions of CCC at any time from our download page <https://bombich.com/download>.

Misplaced your license? Request the registration key from within CCC or via our website <https://bombich.com/forgot>.

To learn more about how to use the license on multiple Macs, please see How do I use CCC on multiple Macs in my household? <https://support.bombich.com/hc/articles/20686462495639>

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Do you offer an academic discount?

We offer a 25% academic discount.

Who is eligible?

To qualify for Bombich Software education pricing, you MUST be an Eligible Educational End User:

- Faculty, staff or administrator, currently employed at an accredited K-12 school or higher education institution, with a valid academic email address.
- Students who are currently enrolled at an accredited higher education institution, with a valid academic email address.

What is eligible?

New purchases of CCC Household licenses, Workstation licenses, Pro licenses, and Volume licenses qualify for an academic discount. Upgrade purchases are discounted for current license holders and are not eligible for an additional educational discount.

How do I receive a discount for personal use?

1. **Visit our EDU discount verification page <https://bombich.com/edu> to have a coupon code emailed to your academic email address.**
2. **Purchase CCC using the "Personal purchase" link in the email you just received.**

*We maintain a long list of academic email domains that are eligible for our automatic academic discount. If your domain is not on the list, you may still receive a discount but you will need to complete a manual verification process. If manual verification is necessary, we'll email you instructions.

How do I receive a discount for institutional use?

1. **Visit our EDU discount verification page <https://bombich.com/edu> to have a coupon code emailed to your academic email address.**
2. **Purchase CCC using the "Institutional purchase" link in the email you just received.**

*We maintain a long list of academic email domains that are eligible for our automatic academic discount. If your domain is not on the list, you may still receive a discount but you will need to complete a manual verification process. If manual verification is necessary, we'll email you instructions.

*If you have any questions about accepted payment methods, please email sales@bombich.com <mailto:sales@bombich.com>.

Is there anything else I should know?

Terms and Conditions

Personal Use: For personal use, each Eligible Education End User may purchase one CCC license per version and academic email address. Bombich Software reserves the right to request evidence of employment or

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student status before CCC has been sold with an academic discount. This may include proof of school accreditation, faculty or student ID, and/or email address verification.

Institutional Use: If CCC is purchased for institutional use, the one copy limit does not apply, although Bombich Software reserves the right to limit the number of purchases by a single institution. Bombich Software also reserves the right to request evidence of employment before CCC has been sold with an academic discount. This may include proof of school accreditation, faculty or student ID, and/or email address verification.

Prices do not include local taxes or local customs charges. Bombich Software reserves the right to change this offer at any time and to revoke discounts or cancel orders in their sole discretion.

What if I have questions?

Please email sales@bombich.com <mailto:sales@bombich.com> for assistance.

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Do you offer a volume licensing program?

Yes, you can save your organization money with volume licensing.

We offer multi-user license pricing for CCC. Volume licensing is open to anyone purchasing 5 or more licenses of CCC. A volume license agreement includes:

- Discounts off standard prices
- A single license key for all of your CCC licenses for easy administration
- Optional Software Maintenance

To learn more about our volume license, please see our Volume License and Maintenance Agreement.
<https://bombich.com/software/CCC_Volume_License_and_Maintenance_Agreement_2014.pdf>

Product Delivery and Ordering

We offer CCC volume licenses via download delivery only; we do not ship physical, boxed copies of the software.

To place your order, or obtain a price quote for a new volume license, please shop our Corporate Store <https://bombich.com/store/corporate>. To learn about our education discounts or place a discounted education order, please read about our Education Pricing <https://bombich.com/edu>. If you would like to add additional seats to an existing volume license, please email our Sales department <mailto:sales@bombich.com?subject=Add%20Volume%20License%20Seats%20to%20CCC%20License> for a custom quote.

Software Maintenance

Volume licenses offer the option of including software maintenance, a service which provides all updates to CCC at no additional charge beyond the subscription fee. Maintenance subscriptions can be cancelled at any time via a link found in your CCC volume license delivery email. For additional details, please see the CCC Maintenance Terms <https://bombich.com/software/maintenance_terms_2014.pdf>.

Sales Policies

For information on our sales policies, please refer to our Sales Policies and Frequently Asked Questions <https://bombich.com/sales-terms-and-conditions>.

If CCC is licensed at an education discount, then it may only be used by enrolled students, faculty, teachers and administrators at an accredited K-12 educational institution (or equivalent) or higher education institution organized and operated exclusively for the purpose of teaching its students. In addition, there are no portable or home use rights included with our volume licenses.

If you have any other questions, please send us an email. <mailto:sales@bombich.com>

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Can I give CCC as a gift?

Yes, using our Online Gift Store <http://sites.fastspring.com/bombich/product/ccc7?option=gift>.

CCC registration is tied to the name and email address that is entered in the order and our Online Gift Store <http://sites.fastspring.com/bombich/product/ccc?option=gift> allows you to specify a gift recipient. You will receive a receipt via email and the gift recipient will receive license information immediately via email.

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Why isn't CCC on the Mac App Store?

We would love to add the Mac App Store as a distribution channel for CCC, but there are certain classes of applications that do not meet the policy requirements imposed by Apple. Unless Apple changes these policies, you will never see a full-featured, advanced file copying and backup utility on the Mac App Store. You can send Apple some feedback <https://www.apple.com/feedback/> about this policy, but judging from the absence of the Mac App Store from Apple's Feedback page (for more than a decade now), and Apple's pertinacious position on this matter, we don't anticipate a change in this policy.

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Do you offer telephone or remote support?

Our support team is standing by to field your questions about using CCC. We do not staff a support desk on a scheduled basis for phone or remote support.

In supporting our customers since 2002, we have found that support is more efficient and of higher quality when interactions begin with an online submission. When you submit a support request directly through CCC's Help menu, your logs are (with your consent) submitted alongside your request, allowing us to analyze your unique CCC configuration and any error messages you're encountering. Frequently, we'll get requests with no more detail than "I'm having trouble getting this to work." That level of detail is OK. After a brief review of CCC's logs, we can very quickly follow up with a list of steps to resolve the problem, along with annotated screenshots.

Every support request is answered by a member of the Bombich Software support team, and we strive to respond within one business day. We provide online support, in English, Monday through Friday between 9:00 AM and 5:00 PM, US Eastern Time.

Please note that our support is primarily limited to answering questions about CCC and fielding bug reports. We cannot provide extensive consultative support for setting up extremely complex backup strategies, nor can we offer general troubleshooting for macOS issues that are outside the scope of our product. If you are interested in more in-depth, hands-on phone or screen-sharing setup assistance with CCC or macOS, we are happy to recommend a consultant who is familiar with CCC and can provide that level of assistance.

Related Documentation

- Establishing an initial backup <https://support.bombich.com/hc/articles/20686487352599>
- How do I get help? <https://support.bombich.com/hc/articles/20686487464855>
- About Us <https://bombich.com/about>

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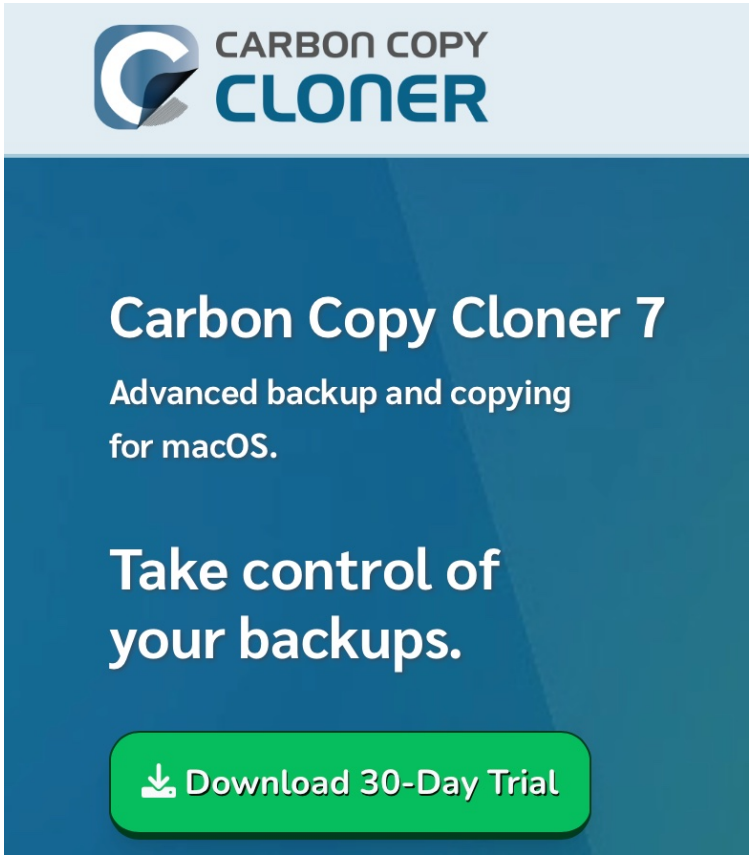
Downloading, Installing and Registering CCC

- How do I download and install CCC?
- Upgrading from CCC 6 to CCC 7
- Can I download the old versions of CCC?
- How to Manually Enter a CCC Registration Code
- How to Register CCC in One Click
- Trouble Applying Your Registration Information?
- How do I use one license of CCC on multiple Macs in my household?
- Oops, that license code is invalid...
- I already purchased CCC but can't find my registration code. Can you send it to me?
- How do I use a CCC Pro License?
- Migrating CCC tasks from one system to another

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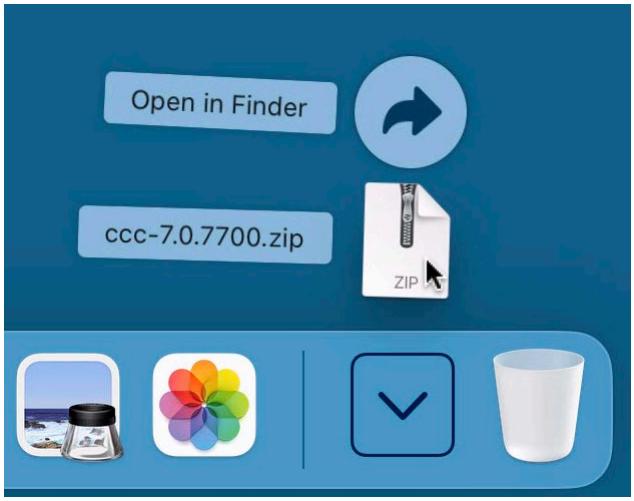
How do I download and install CCC?

Visit bombich.com



Go to https://bombich.com <https://bombich.com> and click on the **Download** button.

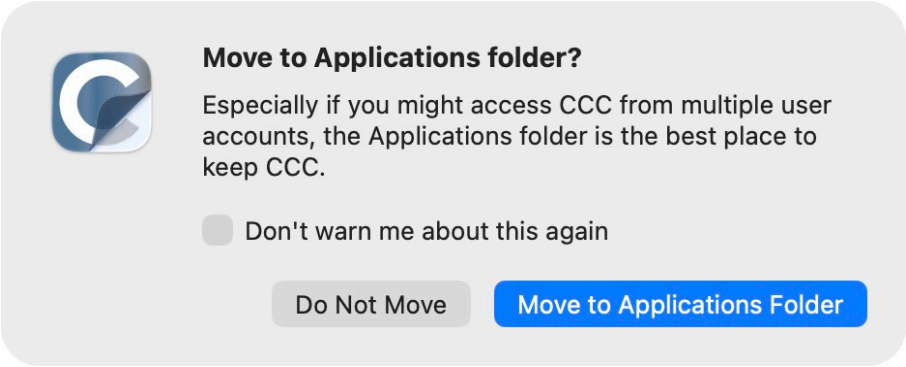
Allow download to complete and open the CCC Zip archive in your Downloads folder



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Once the download is complete, open the CCC zip archive in your Downloads folder to unarchive CCC.

Open CCC and allow it to move itself to the Applications folder



Click **Move to Applications Folder**. From now on you'll find CCC in your Applications folder with the rest of your applications.

(Optional) Add CCC to your Dock



To add CCC to your dock, drag and drop it from the Applications folder into your Dock.

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Upgrading from CCC 6 to CCC 7

If you download CCC 7 via the upgrade interface in CCC 6, CCC 7 will be downloaded to your Mac and placed adjacent to CCC 6. When CCC 7 opens for the first time, you will begin a full-featured, 30-day trial. Please take all of that time to evaluate CCC 7. When you're ready to purchase CCC 7, click the **Purchase** button in the Trial window that is presented when you open CCC.

I already have a license for an older version of CCC. Do I have to pay for the CCC 7 upgrade?

Yes, CCC 7 is a paid upgrade. However, CCC 5 or 6 license may be eligible for upgrade pricing. Check here for eligibility <https://bombich.com/store/upgrade>.

If I decide to not purchase the CCC 7 upgrade, can I downgrade to CCC 6?

Yes. Downgrading to CCC 6 restores your tasks as they were prior to upgrading. If you still have CCC 6 in your Applications folder, simply open it and choose the option to **Downgrade**. If you downloaded CCC 7 from our website and replaced your copy of CCC 6, you can re-download CCC 6 from our website <https://bombich.com/download#ccc6>.

I'm happy with CCC v7. How do I delete the older version of CCC?

To remove the older version of CCC, simply drag the older application file to the Trash. You don't have to uninstall any other components, all other components are shared with CCC v7.

Will my CCC v6 tasks work with CCC v7? Will I have to erase my backups?

The upgrade from CCC 6 to 7 should be seamless. Your existing tasks will be imported into CCC v7, and your existing backups should continue to run without requiring any changes.

Additional Resources

- Purchasing an Upgrade for CCC 7 <https://support.bombich.com/hc/articles/20686511636759>
- How does the free 30-day trial work? <https://support.bombich.com/hc/articles/20686511098519>
- What's new in CCC 7? <https://support.bombich.com/hc/articles/20686482705687>
- System Requirements for CCC 7 <https://support.bombich.com/hc/articles/20686494824855>
- CCC 7 Release Notes <https://support.bombich.com/hc/articles/20686469389719>
- Report a problem or ask a question about CCC 7 <https://bombich.com/software/get_help>

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Can I download the old versions of CCC?

Older versions of CCC can be downloaded at https://bombich.com/download <https://bombich.com/download>:

Download CCC 6 <https://bombich.com/software/download_ccc.php?v=ccc6>

Download CCC 5 <https://bombich.com/software/download_ccc.php?v=ccc5>

We no longer sell nor support CCC versions 3 or 4. If you already have a license for CCC 3 or 4 and you need to re-download that older version of CCC, please contact our sales support team. <https://bombich.com/contact>

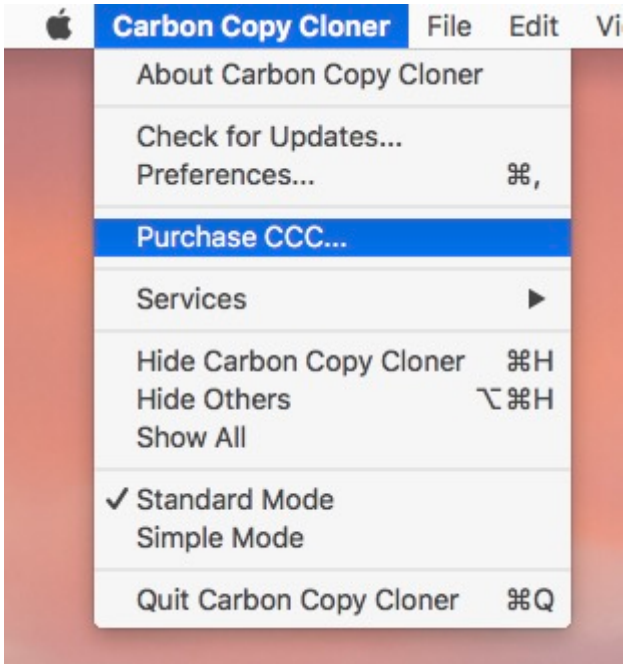
Related Articles

- How do I purchase a license for older versions of CCC? <https://support.bombich.com/hc/en-us/articles/32851171739415>

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How to Manually Enter a CCC Registration Code

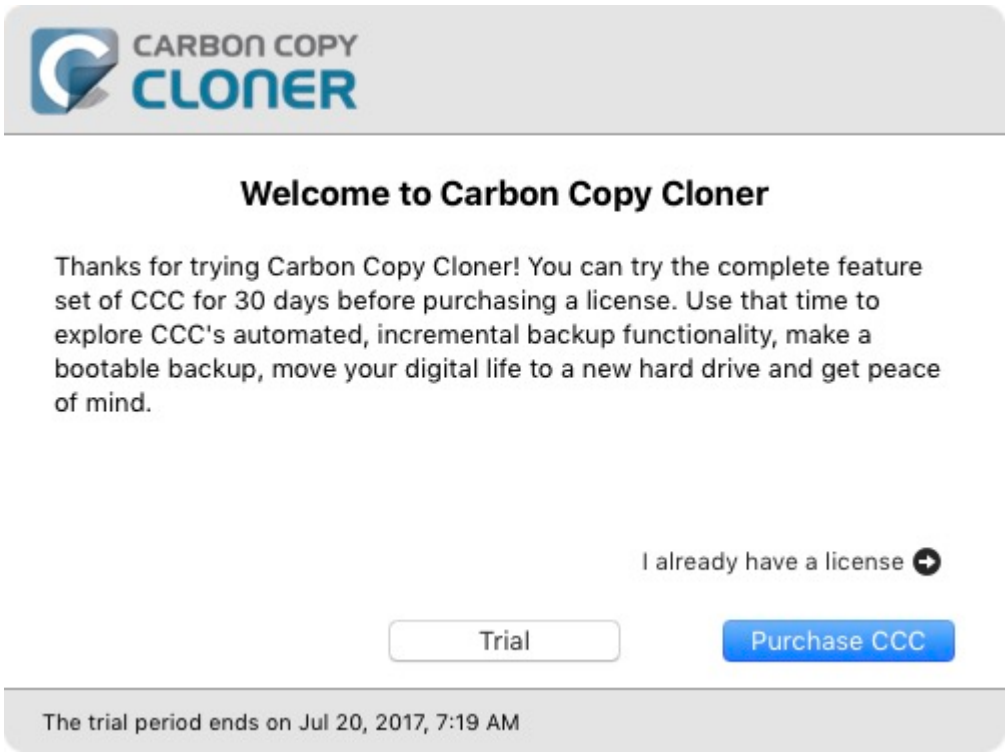
Open CCC and Check Registration Status



Click on the **Carbon Copy Cloner** menu. If you see a **Show Registration...** menu, then CCC is already registered on your Mac. You can select **Show Registration...** to view the registration details. If CCC is not yet registered, you will see a window that opens on launch indicating that CCC is currently running on a trial basis. If you already dismissed that window, you can choose **Purchase CCC...** from the Carbon Copy Cloner menu to reopen the Trial window.

Unregistered CCC

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If CCC is unregistered, you will see the **Welcome to CCC** registration screen. If you have previously purchased CCC, click on **I already have a license.**

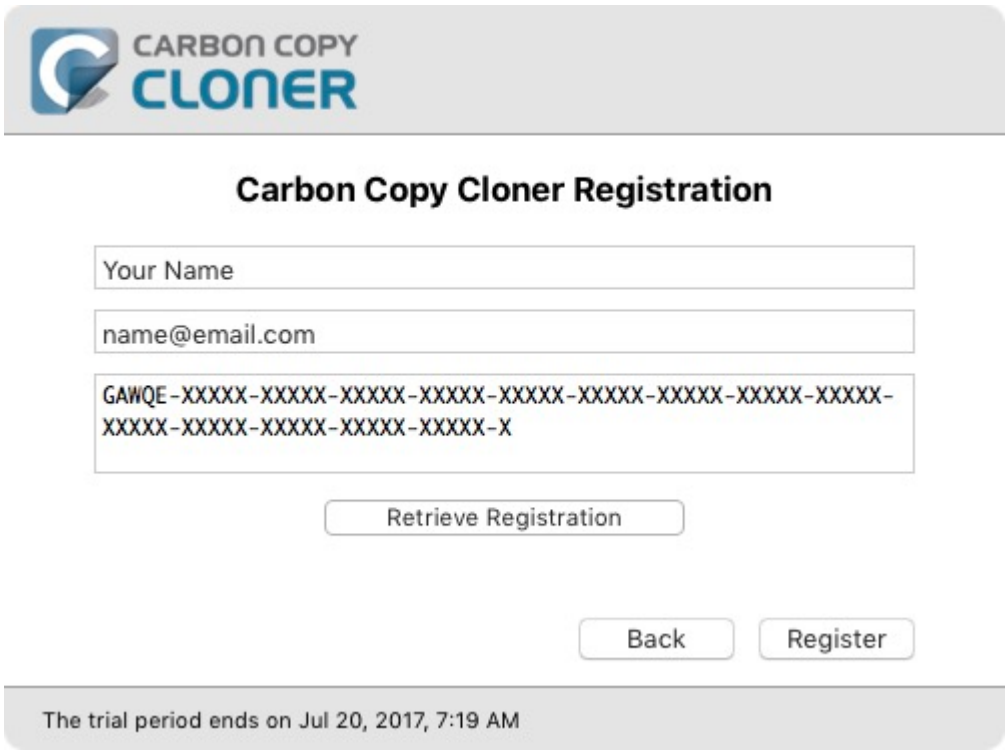
Copy and Paste in Registration Codes



Copy and paste in the name, email address and license key exactly from your registration email.
Note: If you try to use a different name or email address, the license key will show as invalid. Click **Register**.

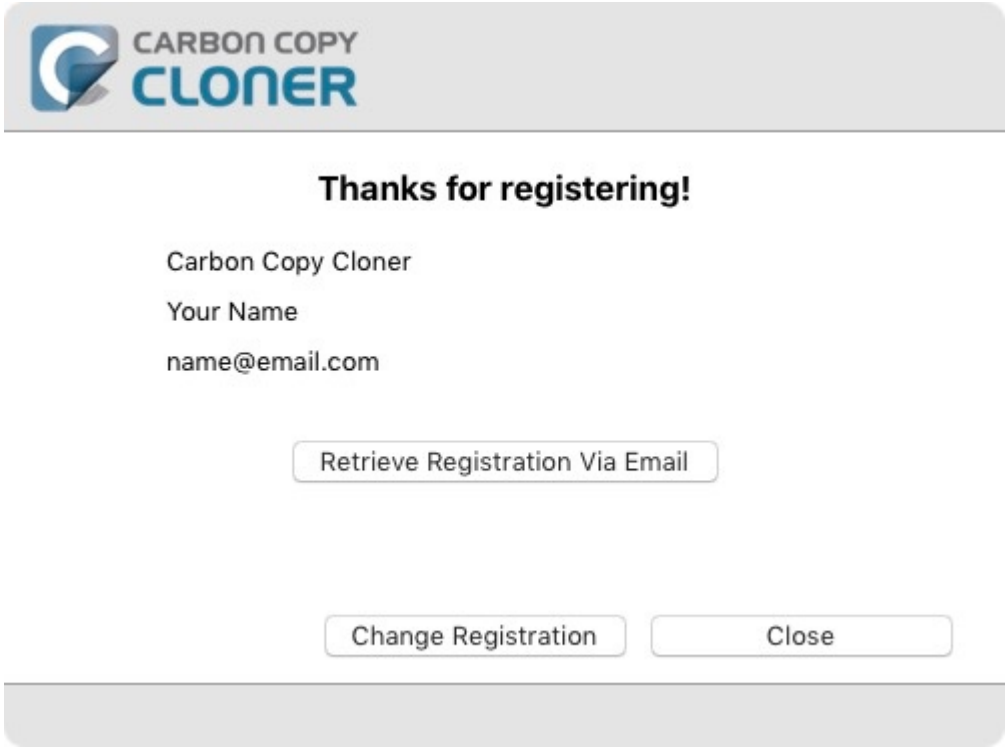
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Properly Entered Code



For your reference, here is what a registration code should look like. Note that the registration code automatically breaks between the two lines; do not use the Return key when entering your registration code.

Successfully Registered



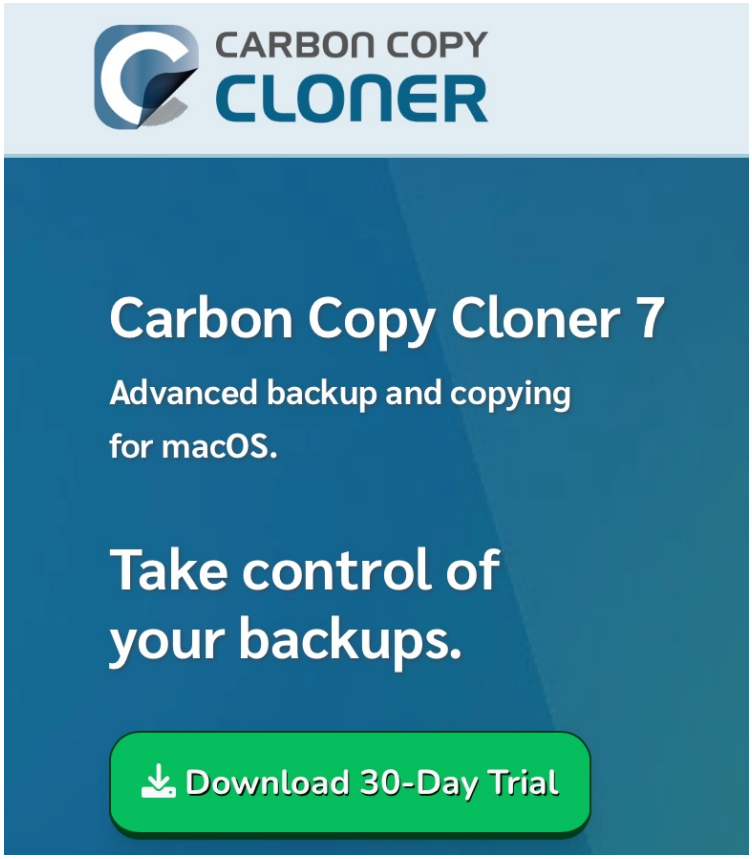
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Once your copy of CCC is successfully registered, you should see a "Thanks for registering!" screen.

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How to Register CCC in One Click

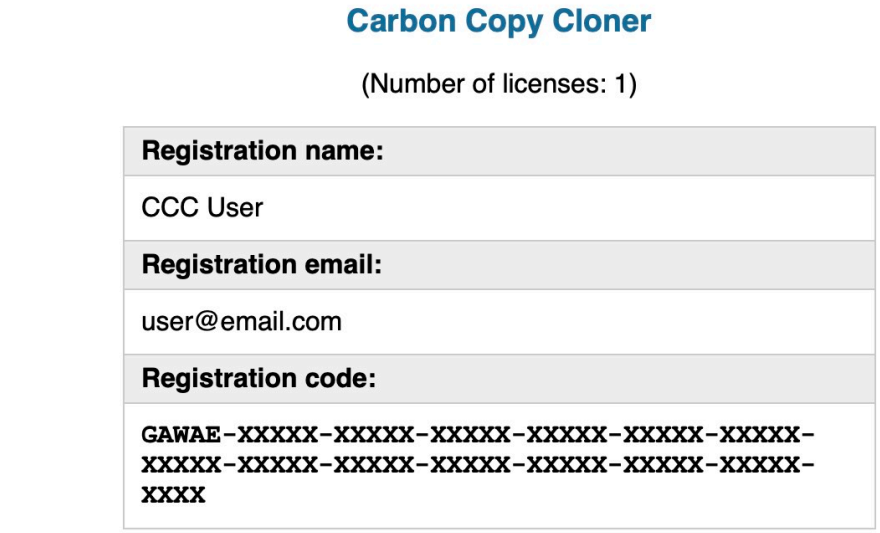
Install and Open CCC



For one-click registration to work, you must first install and open CCC. To download CCC, please visit https://bombich.com <https://bombich.com> and click on the download button.

Open Your Registration Email

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Open your registration email and click on the **Register CCC** button. That's it! You're all set!

Troubleshooting Note: If you get a message similar to "**Safari can't open com.bombich.ccc.lic://blah-blah-blah because macOS doesn't recognize Internet addresses starting with com.bombich.ccc.lic**", double-check that you have (1) downloaded CCC and (2) opened it on the Mac where you're trying to apply the registration settings. If you have already opened CCC and you're still getting this message, try entering the registration values manually <https://support.bombich.com/hc/articles/20686468690199>, or contact us for assistance <https://bombich.com/contact>.

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Trouble Applying Your Registration Information?

Frequently Asked Questions

1. How do I retrieve my registration information? I paid for CCC in the past, but now I'm trying to use CCC under another user account.
2. What if I can't retrieve my registration information?
3. When I click on the button to apply my registration settings, my browser says that it can't open this weird-looking URL.
4. How do I register CCC in one click?
5. How do I manually enter a CCC registration code?
6. I'm still having trouble. How do I get someone to help me?

How do I retrieve my registration information? I bought CCC, but it says that I'm unregistered.

If you see a prompt to purchase CCC and you have paid for CCC in the past, you can retrieve your registration information at our website <https://bombich.com/forgot>. Simply provide the email address that you used when you paid for CCC, and we'll send your registration information via email. Clicking a button in the email will instantly register CCC (no copying/pasting of registration codes is required) <https://support.bombich.com/hc/articles/20686492213015>.

Your registration code is tied to the name and email provided when the license was purchased. **If your email or name are entered incorrectly (capitalization matters!), the license will show as invalid**.

To ensure that the license information is applied correctly, just open your license email and click on the "Click Here to Register CCC" button to automatically apply the settings (if prompted, select CCC as the application to use when opening the link).

What if I can't retrieve my registration information?

There are several reasons that this might happen, e.g. you don't have access to the email account you used when you originally paid for CCC or you don't remember which email you used. If you can't automatically retrieve your registration information, we need to verify your previous purchase. Please submit a request for registration assistance <https://bombich.com/forgot?found=0> and we'll work it out as quickly as possible.

When I click on the button to apply my registration settings, my browser says that it can't open this weird-looking URL.

If you click on the "Click Here to Register CCC" button in the email that you received from us and you get a message similar to "Safari can't open com.bombich.ccc.lic://blah-blah-blah because macOS doesn't recognize Internet addresses starting with com.bombich.ccc.lic", that means that CCC hasn't yet been registered as the application that handles those URLs. Typically CCC is registered as that URL handler when you launch CCC, so be sure that you have downloaded CCC and opened it on the Mac where you're trying to apply the registration settings. If you have already opened CCC and you're still getting this message, try entering the registration values manually <https://support.bombich.com/hc/articles/20686468690199>, or contact us for assistance <https://bombich.com/forgot>.

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How do I register CCC in one click?

View step-by-step one-click registration directions, complete with pictures.
<https://support.bombich.com/hc/articles/20686492213015>

How do I manually enter a CCC registration code?

View step-by-step manual registration directions, complete with pictures.
<https://support.bombich.com/hc/articles/20686468690199>

I'm still having trouble. How do I get someone to help me with my registration?

We're here to help. Just contact us via this Registration Assistance form <https://bombich.com/forgot?found=0>, and we will help you sort it out as quickly as possible.

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How do I use one license of CCC on multiple Macs in my household?

The CCC license allows you to install and use CCC on any computer that you own or control for personal, non-commercial use. If you're using CCC commercially or institutionally, the instructions in this article also apply, but be sure to check out our Corporate and Education Licensing options <https://bombich.com/store/corporate> to ensure your use complies with the license.

Install and open CCC on the unregistered Mac first

Download CCC <https://bombich.com/software/download_ccc.php?v=latest> on the other Mac before attempting to apply the registration settings. Open CCC and allow CCC to move itself to your Applications folder when prompted. Full installation instructions are available here: How do I download and install CCC? <https://support.bombich.com/hc/articles/20686495592343>

Option 1: I can check my email on the unregistered Mac

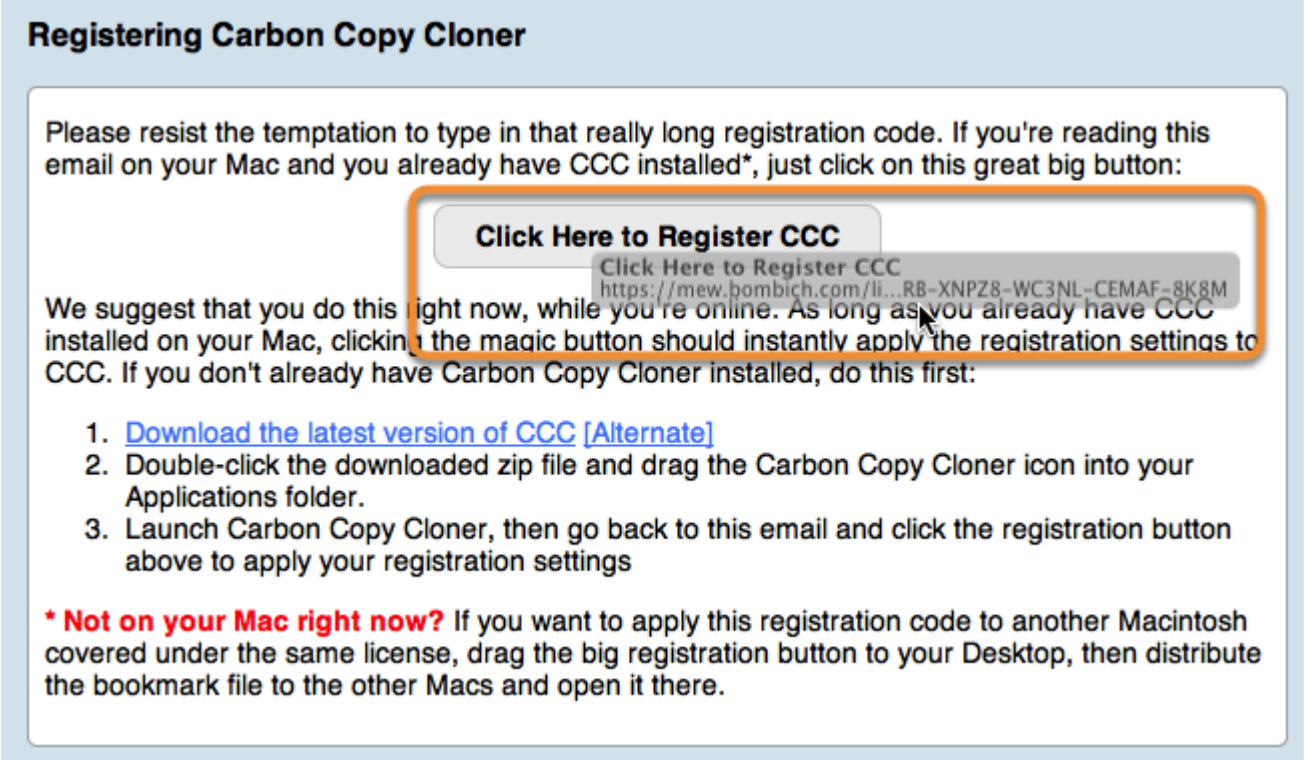
Open your email and locate your CCC registration email. Click on the "Click Here to Register CCC" link. For more info, see How to Register CCC in One Click <https://support.bombich.com/hc/articles/20686492213015>. Misplaced your registration email? Request a new one via our website <https://bombich.com/forgot>.

Option 2: I can't check my email on the unregistered Mac

1. Open the registration email on the already registered Mac

To apply the registration settings to another Mac, drag the **Click Here to Register CCC** button or link from your purchase confirmation email to your Desktop.

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2. Drag the registration link to your Desktop



When you drag the link to your Desktop, a bookmark file will appear there.

3. Transfer and double-click



Transfer this file to your unregistered Macs (via email, flash drive, file sharing, cloud storage, etc.) and double-click it to apply the CCC registration settings there.

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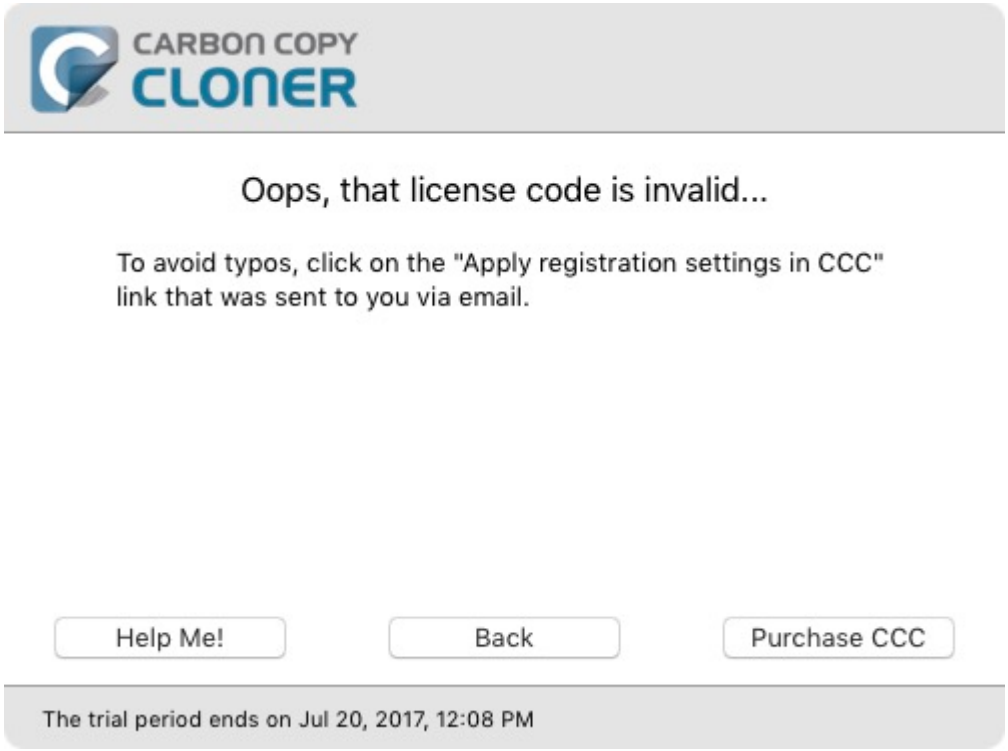
Oops, that license code is invalid...

If you see this window when trying to launch CCC

There are two common issues that cause this.

1. Your name, email address or registration code doesn't exactly match the information provided at the time of purchase. Your name and email must **exactly** match your registration email - **capitalization matters!** - or your license will show as invalid.
2. The version of CCC that you are running is damaged and needs to be replaced with a new copy downloaded from https://bombich.com/download <https://bombich.com/download>.

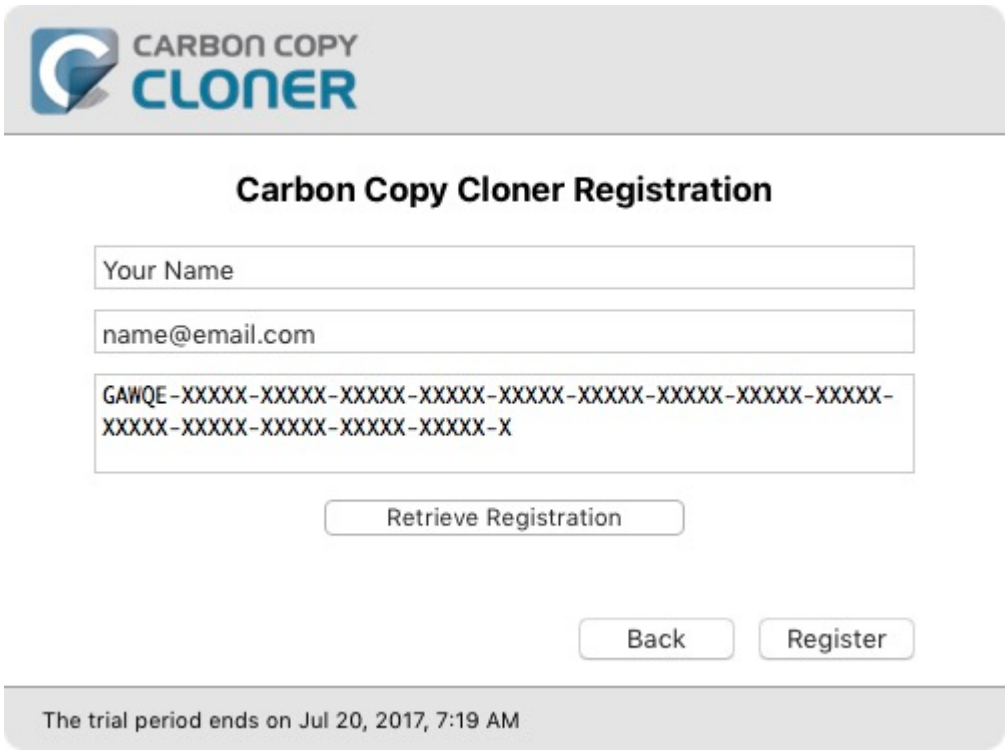
To check on the info entered in CCC, click on **Back**.



Registration Details

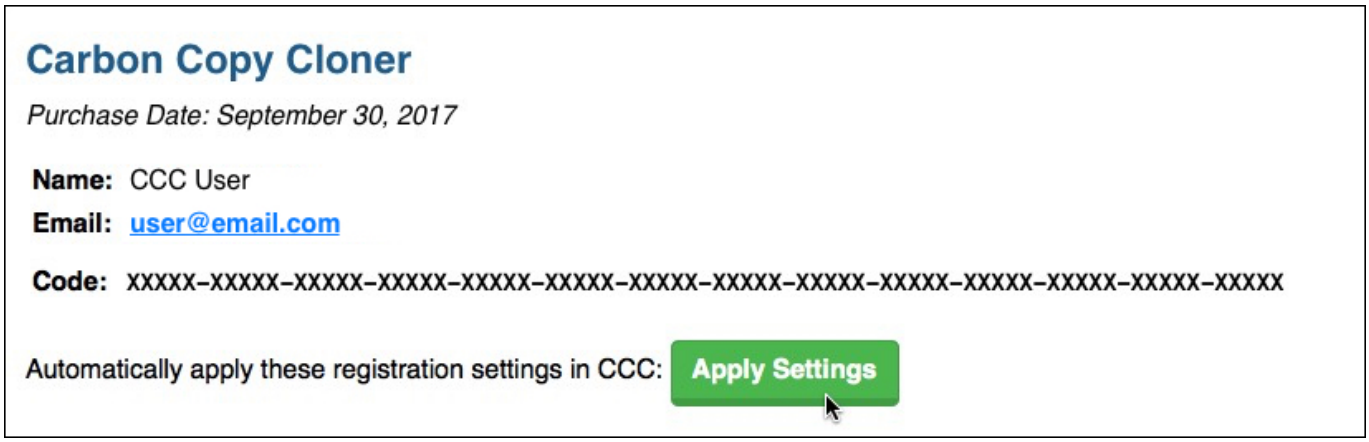
Open your registration email and verify that the information you see **exactly** matches. Click on **Register** when you are done.

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One-Click Registration

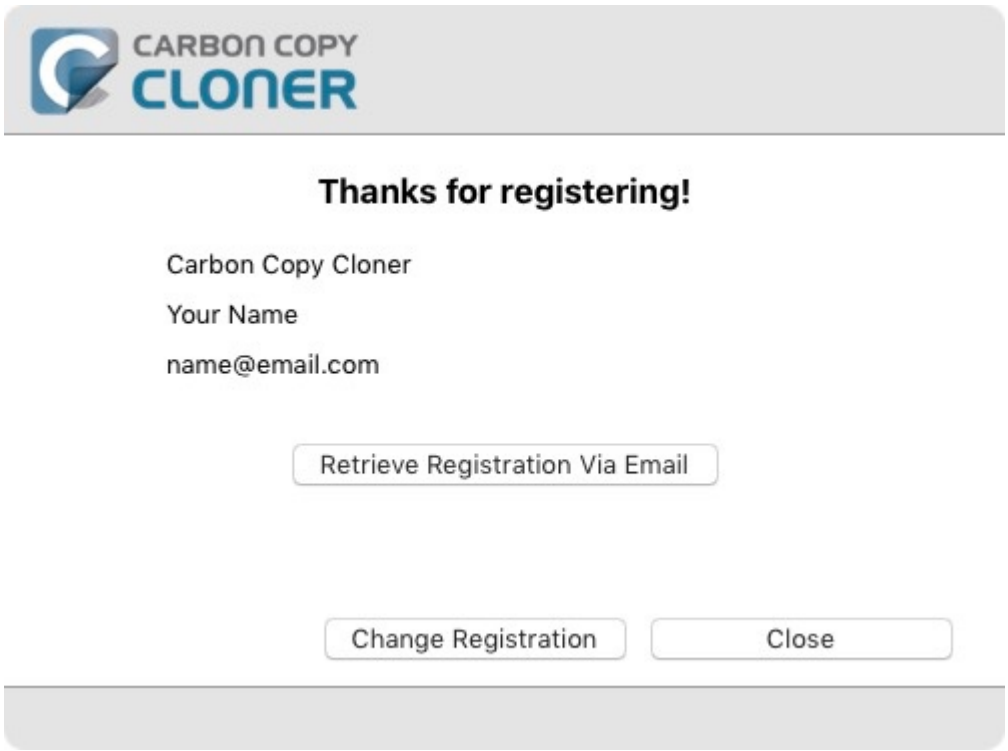
Tired of trying to make sure it matches? Just click on **Apply Settings** in your registration email and the information will be automatically entered for you.



Successful registration

Once you are successfully registered, you will see this window. Click **Close** and start backing up.

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I already purchased CCC but can't find my registration code. Can you send it to me?

Yes, you can request via our website <https://bombich.com/forgot>. If you're getting a message about a trial and you have already purchased CCC, or if you have any other questions or concerns about your registration, you can retrieve your registration code here <https://bombich.com/forgot>.

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How do I use a CCC Pro License?

Pro licenses <https://bombich.com/store/corporate> are issued to a single technician/support person to use CCC temporarily on an unlimited number of computers. CCC may not be permanently installed on client computers or used for scheduled backups on their computers. The Pro License is great for replacing a client hard drive, making an ad hoc backup of a single machine before servicing or replacing that system, or for a consultant setting up new computers for others.

There are two common configurations where a Pro License is applicable, and each has a different method for applying the CCC registration details.

Installing CCC and registering a Pro License on an administrative workstation

An "administrative workstation" is a Mac that is used by a single support technician to service other Macs. For example, the technician could attach other Macs to this workstation via Target Disk Mode, then make an ad hoc backup of the data on that system prior to performing other service on the system. In this scenario, you would apply the CCC Pro License registration details in the same manner as an ordinary license <https://support.bombich.com/hc/articles/20686492213015>. Making scheduled backups of this administrative workstation is permissible, however the license does not permit scheduled backups of other Macs.

Using CCC temporarily on a client Mac

The CCC Pro License permits using CCC in an ad hoc manner on an unlimited number of Macs by a **single technician**. For example, a technician that is providing "on site" support could attach a portable storage device to a client Mac, then use CCC from that external storage to make an ad hoc backup of the client's data before performing other service on the system. In this scenario, the CCC Pro License must **not** be applied to the client system. To facilitate this use case scenario, CCC can read a "sidecar" license file adjacent to the CCC application on the external storage. To generate the sidecar file:

1. Open a copy of CCC on an administrative workstation†
2. Apply the CCC Pro License registration details
3. Click on the **Carbon Copy Cloner** menu and select **Create Pro License Sidecar File**
4. A file named "Carbon Copy Cloner.license" will be created on the Desktop
5. Quit CCC
6. Copy the CCC application and the "Carbon Copy Cloner.license" file to an external storage device (the application and license must be in the same folder)

When you attach the external device to another Mac and open CCC, you can click on the **Carbon Copy Cloner** menu to verify that the registration is applied (non-persistently) via the sidecar file.

† If you don't have an administrative work station to use for this, you can apply the Pro License registration details to any Mac, generate the sidecar license file, then uninstall CCC <https://support.bombich.com/hc/articles/20686440822551> from that Mac when you're finished.

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Migrating CCC tasks from one system to another

If you wish to migrate your tasks from CCC on one system to CCC on another system, follow these steps:

1. Choose **Export All Tasks** from CCC's **Task** menu.
2. Specify a name for the exported settings file and a location where to save it.
3. Transfer the exported settings file to another Mac.
4. Install CCC onto the other Mac
5. Double-click the exported settings file.
6. As prompted, review the task settings and reset the source/destination selections as necessary.

Note that CCC uses a unique identifier to positively identify your source and destination volumes. While your other Mac may have a "Macintosh HD" volume and a "Backup" volume, those volumes will appear very different to CCC on the second Mac. Simply reselect those new volumes in CCC's Source and Destination selectors to update the task for your additional Mac.

Also, note that CCC keychain entries, task history, and task audit databases are not transferrable between Macs. If you migrate CCC tasks to a new Mac, you will have to re-supply CCC with any applicable volume, disk image, or SMTP passwords, and your task history will start fresh. Task history is not the same as backup versioning – task history is just a record of events, and starting fresh on a new system does not affect your ability to recover content from an older version of your backups.

Recovering tasks from a backup

Many people find that "cleaner" applications will aggressively remove CCC's tasks and preferences. If you have lost all of your backup tasks but you have a full backup of your startup disk, you can recover your tasks from the backup with these steps:

1. Open CCC.
2. Click **Settings** in the toolbar to open CCC's Settings window.
3. Click **DB Diagnostics** in the Settings window toolbar.
4. Click the **Restore...** button at the bottom of the window
5. In the Open panel, navigate to **{your backup disk}** > `/Library/Application Support`
6. Select the folder named **com.bombich.ccc**.
7. Click the **Open** button.
8. Your tasks should now be restored.

Note that you may have to activate suspended tasks, and/or reselect the source or destination volumes in your tasks.

Please note that you must locate the com.bombich.ccc application support folder that is located in the **root-level** Library folder (e.g. `CCC Backup > Library`, NOT `CCC Backup > Users > USER_NAME > Library`). **If you're looking in your home folder, you're in the wrong place.**

Related Kbase articles

- Uninstalling CCC <https://support.bombich.com/hc/articles/20686440822551-Uninstalling-CCC>

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Using CCC

- How to restore from your backup
- Configure the task filter to exclude files and folders from a task
- How to modify a scheduled backup
- How to verify a backup
- Monitoring backup tasks with the CCC Dashboard
- Preview: See what changes CCC will make to the destination
- Task History: See your task event details, statistics, and trends
- Files that aren't on the source may be removed from the destination
- The Disk Center
- Comparing the source and destination
- Simple Mode
- CCC SafetyNet: Temporary protection for destination content
- Creating legacy bootable copies of macOS

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How to restore from your backup

Restoring data to a new or different Mac, or to a clean installation of macOS on the same Mac

If you are trying to restore all of your data to a **new or different** Mac, or to a clean installation of macOS on the same Mac, you should generally use Migration Assistant to migrate that data; do not perform the restore with CCC.

Related Documentation

- I want to migrate data to a new Mac <https://support.bombich.com/hc/articles/20686482554519#dont_install_older_os_versions>

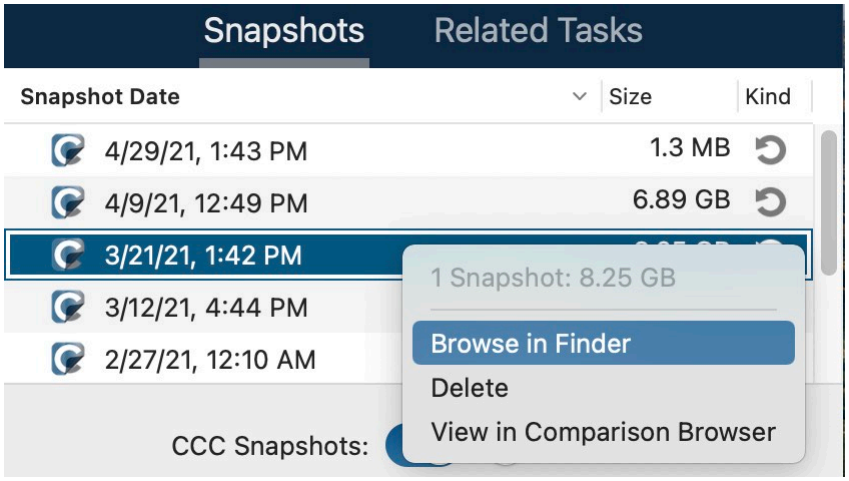
Restoring individual files from a backup

Drag and drop via the Finder

▶ How to find and restore individual files and folders from your CCC backup <https://youtu.be/qzGexY1Q46k>

You can restore individual items from your backup volume in the Finder via drag and drop — simply find that item on the backup disk, then drag it back to your startup disk. If the item you're looking for is hidden, or resides in a hidden folder, you can press Command+Shift+Period to toggle the Finder's display of hidden items.

If you would like to restore an older version of a file, you can restore that from a CCC snapshot (what's a snapshot?). Select your destination volume in CCC's sidebar, then **double-click on a snapshot** to reveal the snapshot in the Finder. The snapshot is mounted read-only, so it is impossible for you to make any harmful modifications to the snapshot. If you would like to restore a single item, you can simply drag the item from the snapshot to wherever you want to restore it to.



If you're trying to restore system files, applications, or perhaps everything from your backup, proceed with one of the other methods indicated below.

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Restoring a backup using CCC

▶ Restoring an entire volume from a CCC backup <https://youtu.be/veI4G8XMhSY>

▶ Restoring data to your startup disk from a CCC backup <https://youtu.be/FNi-H0QBjK8>

If you're working with a larger amount of content to restore, CCC can usually do it more efficiently than the Finder:

1. Quit all applications other than CCC
2. Click the **Restore** button in CCC's toolbar.
3. Click on the **Source** selector and choose your backup volume as the source.
4. Click on the **Destination** selector and choose your original source volume as the destination (e.g. "Macintosh HD").
5. If you are not trying to restore the entire backup, click the **Task Filter** button at the bottom of the window. Click the **Include** button in the toolbar, then explicitly select items that you would like CCC to restore.
6. Consider the warning below. If you do not want CCC to remove anything from the destination, click on the Destination selector and choose **Don't delete anything** from the SafetyNet submenu.
7. Click the **Start** button

Warning: When CCC restores content from the backup, files that aren't on the source may be removed from the destination <https://support.bombich.com/hc/articles/20686460256535>. That's deliberate, and usually required to produce the outcome you expect. Please note, however, that if you excluded something from your backup, that content will be removed during the restore procedure. If you do not want that result, click on the Destination selector and choose "Don't delete anything" from the SafetyNet submenu.

Note: Some background services may not "notice" the restored data until they are restarted (e.g. because they store state data in memory). Reboot after restoring if you're restoring data to your home folder.

Restoring a folder from a CCC backup

▶ Restoring a folder from a CCC backup <https://youtu.be/qtFeznrDn8k>

If you're trying to restore a specific folder, you should refine the scope of your restore task to avoid unintentional modifications to other content on the volume you're restoring to:

1. Quit all applications other than CCC
2. Click the **Restore** button in CCC's toolbar.
3. Click on the **Source** selector and choose **Choose a folder**. Select the folder on your backup volume that you would like to restore.
4. Click on the **Destination** selector and choose **Choose a folder**. Select the folder on your original source volume that you would like to restore to. Typically this folder will follow the same path as the source. E.g. if you are restoring (your backup disk) > Users > yourname > Desktop folder, you should select Macintosh HD > Users > yourname > Desktop as the destination.
5. If you do not want CCC to remove anything from the destination, click on the **Destination** selector and choose **Don't delete anything** from the SafetyNet submenu.
6. Click the **Start** button

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Restoring an older version of a backup

▶ Restoring an older version of a backup <https://youtu.be/eEkLNIpQAyc>

If you would like to restore an older version of a backup, you can restore from a snapshot on your backup disk.

1. Quit all applications other than CCC
2. Click the **Restore** button in CCC's toolbar.
3. Select your backup disk as the source to the task.
4. Click on the source selector and select a specific snapshot from the "available snapshots" menu.
5. Click on the Destination selector to select a destination volume or folder.
6. Click the Start button to run the task.

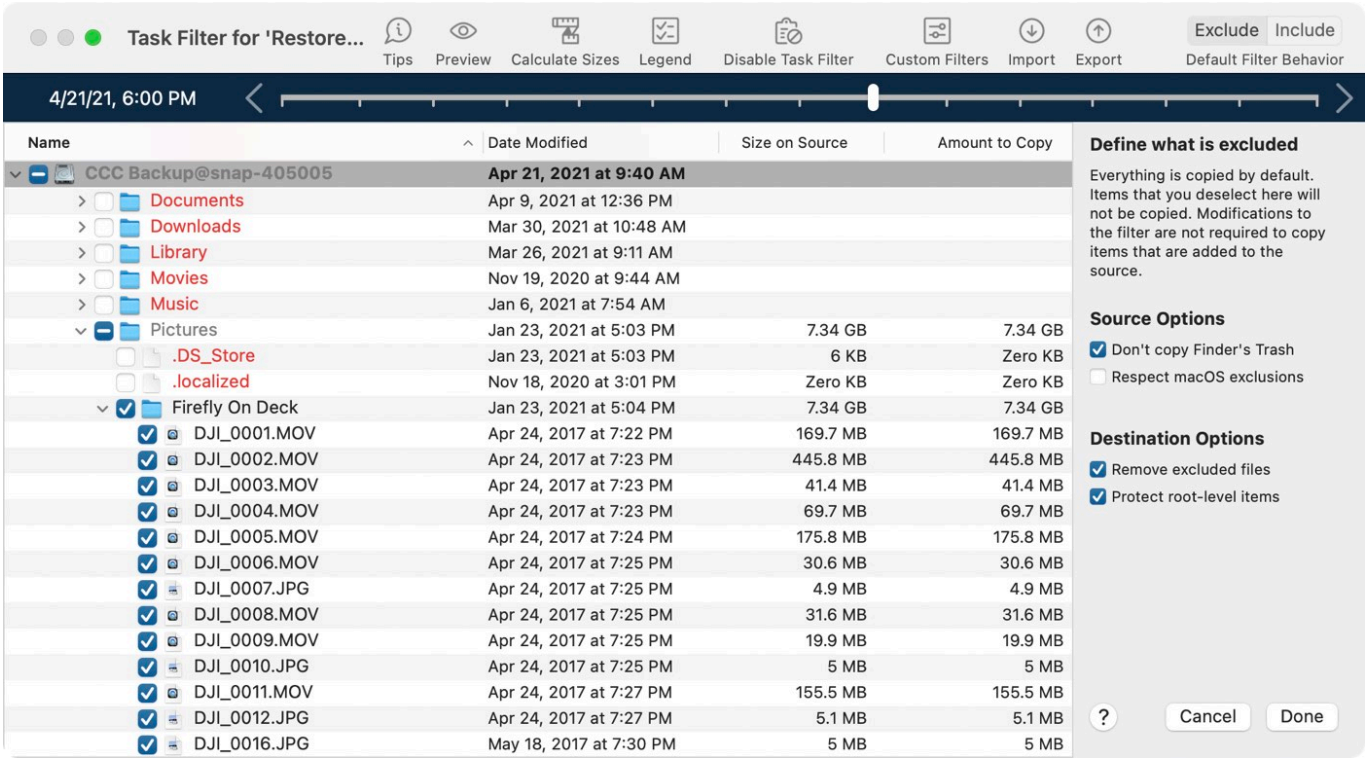


Restoring older versions of files using CCC's Snapshot Navigator

▶ Restoring an older version of a specific file from a CCC backup <https://youtu.be/eEkLNIpQAyc?t=145>

If you're planning to restore specific items, and especially if you would like to compare the contents of snapshots or look for a specific version of a file, you can use CCC's Snapshot Navigator:

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1. Quit all applications other than CCC
2. Click the **Restore** button in CCC's toolbar
3. Select a source volume, or a specific folder from your backup disk if you're restoring just a particular folder
4. Click on the Task Filter button at the bottom of the window to open the snapshot navigation interface
5. Click the **Include** button in the toolbar to set the Default Filter Behavior to **Define what is included**
6. Find the version of your files and folders that you would like to restore (see below for additional detail)
7. Check the boxes next to the items that you want to restore
8. Click the Done button
9. Click on the Destination selector to select a destination volume or folder
10. If you're not restoring the entire backup, click on the Destination selector and choose **Don't delete anything** from the SafetyNet submenu
11. Click the Start button to run the task

In the Task Filter window, use the slider to select specific snapshots. Alternatively, select an individual file that you're interested in restoring, then use the arrow buttons at the ends of the slider to navigate to previous and next versions of the file. When you have found the version of the item you would like to restore, you can either right-click on the item to reveal it in the Finder (then drag and drop the file to wherever you'd like to restore it to), or you can configure the task filter to restore specific items to a selected destination.

Note: Some background services may not "notice" the restored data until they are restarted (e.g. because they store state data in memory). Reboot after restoring if you're restoring data to your home folder.

Restoring files to your destination from a SafetyNet Snapshot

Note: This procedure is not available if you configured your backup using the Backup Volume Setup Assistant. The Setup Assistant asserts that the backup volume is dedicated to the backup task, and therefore disables SafetyNet.

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SafetyNet is a mechanism that is designed to protect files on your destination volume from accidental deletion. If you errantly selected the wrong volume as a destination, or if you were storing files on your destination that were unrelated to the source data set and you're now missing those files, you can restore those files to your destination from a SafetyNet Snapshot.

1. Open CCC and select the affected destination volume from CCC's sidebar.
2. Select the applicable SafetyNet Snapshot in the snapshots table.
3. Click the **Restore...** button.
4. Verify the task settings CCC creates for you, then click the Start button.

When you proceed with this restore task, CCC will copy the files from the snapshot back to your selected destination. Keep in mind that CCC cannot delete the snapshot that contains the files you're restoring before restoring them to the destination. As a result, the destination must have enough additional free space to accommodate a copy of all of the files that you're restoring. In some cases, it may not be practical to restore files back to the original destination; you may need to recover them to another disk first.

Related Documentation:

- SafetyNet snapshots vs. Backup snapshots <https://support.bombich.com/hc/articles/21384579432343>
- Excluding files and folders from a backup task <https://support.bombich.com/hc/articles/20686509510167>
- "Why does CCC report that the destination is full when it appears to have enough room for newer files?" <https://support.bombich.com/hc/articles/20686456811415#destination_is_tight_on_space>

Using Migration Assistant to restore your startup disk from a CCC backup

▶ Recovering your Mac from a CCC backup <https://youtu.be/eFTUmC1DiDs>

You can use Migration Assistant to migrate data from a CCC backup on locally-attached storage to a clean installation of macOS. Follow these steps to reinstall macOS and restore your data:

1. Boot your Mac while holding down Command+R (Intel Macs) or the Power button (Apple Silicon Macs) to boot into Recovery Mode <https://support.apple.com/HT204904>.
2. Use Disk Utility to erase the "Macintosh HD" volume group on your Mac's internal disk (Apple Silicon Mac users – see note below).
3. Quit Disk Utility.
4. Select the **Reinstall macOS** option and proceed to install macOS onto your new disk.
5. When macOS boots for the first time on your new disk, you will be prompted to migrate data — accept the migration offer.
6. When prompted to select a source for the migration, select your CCC backup volume and proceed as directed by Migration Assistant.

Apple Silicon Mac users: In lieu of steps 1-4, you can return the system to a "clean install" state via System Settings > General > Transfer or Reset > Erase all content and settings.

Migration Assistant will not accept a backup on NAS storage as a source for migration. Use the method described below to restore files and folders from a NAS backup.

Related Documentation

- I want to migrate data to a new Mac <https://support.bombich.com/hc/articles/20686482554519>

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Working around Migration Assistant restrictions

There are a handful of cases where Migration Assistant will not accept a volume as a source for migrating content. For example, if you have a volume that is formatted as case-sensitive, Migration Assistant will not allow you to migrate content from that volume to a case-insensitive-formatted startup disk, if any user account resources are missing from the volume (e.g. because they were excluded from the backup, or because they are damaged), or if you want to restore as a whole from a prior snapshot, Migration Assistant will not accept it as a source. CCC can help with these cases.

1. If you're currently proceeding through the first-boot Setup Assistant, decline the migration offer and instead continue to create a new user account.
2. Open Disk Utility
3. Choose "Show all devices" from the View menu
4. Select the startup disk (any volume associated with the startup disk, or its parent container)
5. Click the "+" button in the toolbar to add a new volume. Name it "Macintosh" or something similar (something you can live with long-term).
6. Open CCC and configure a new task to restore your backup to the "Macintosh" volume (You may also restore an older version of your backup)
7. When the task has completed, install macOS onto the "Macintosh" volume <https://support.bombich.com/hc/articles/20686469004567#install_macos>
8. When the macOS installation is complete, go back to Disk Utility and delete the "Macintosh HD" volume group to free up the space that it's using.

Restoring your startup disk from a bootable backup

1. Boot your Mac from the backup disk

Attach the backup disk to your Mac using a USB or Thunderbolt cable.

Shut down your computer, then press and hold the Power button until "Loading Startup Options" appears (Intel Macs: hold down the Option key while rebooting). Your backup disk should appear as a startup disk option in the Startup Manager.

Note: If you cannot boot your Mac from your backup disk, use the "Using Migration Assistant to restore your startup disk from a CCC backup" procedure documented above.

2. Open CCC

When your Mac has finished restarting, open CCC, e.g. in Applications > Carbon Copy Cloner.

Note: CCC will indicate that your backup tasks are suspended because your Mac is booted from the backup; that's a good thing, we don't want those tasks running and potentially overwriting what you're trying to restore. Keep your tasks disabled when prompted.

3. Create a New Restore Task

Click the **Restore** button in the toolbar.

4. Select the Source

Click on Source selector and select your backup volume as the Source.

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5. Select the Destination

Click on Destination selector and select the volume that you want to restore to (e.g. the internal "Macintosh HD" volume).

6. Click Start

Click the **Start** button to start the restore task.

7. Reset the Startup Disk

Open System Settings > General > Startup Disk

Select the restored volume as the startup disk and restart. On an Apple Silicon Mac, you'll be prompted to Authorize users; proceed with that when prompted.

Related Documentation

- Troubleshooting External Boot <https://carboncopycloner.zendesk.com/hc/articles/20686469004567>
- Creating bootable copies of macOS <https://support.bombich.com/hc/articles/20686422131479-Creating-legacy-bootable-copies-of-macOS>

Restoring from a backup on a NAS or network share

To restore data from a folder on a NAS volume:

1. Close all applications and all Finder windows
2. Open CCC and click the **Restore** button in CCC's toolbar to create a new restore task
3. Drag the folder that you would like to restore from the network share onto CCC's Source selector
4. Create a new folder at the location where you would like to restore data
5. Drag that new, empty folder onto CCC's Destination selector
6. Click the Start button

Bear in mind that NAS backups are not compatible with Migration Assistant. <https://support.bombich.com/hc/articles/20686464585239#nas_annoyances> You can restore specific folders from the NAS backup, but you need a backup on locally-attached storage to restore your complete "Mac experience" (e.g. system settings, user accounts).

Restoring a home folder from a backup on a NAS to a clean install of macOS

As noted above, NAS backups are not compatible with Migration Assistant. If you have a new Mac or an otherwise clean installation of macOS, and your only backup is on a NAS volume, then the following steps are the Best Practices method for restoring the user home folders and creating new user accounts.

1. Proceed through Setup Assistant, creating a new "utility" account. Do not use the same name as an account from the backup, and do not log in to iCloud.
2. Mount your NAS backup volume in the Finder.
3. Navigate to Macintosh HD > Users in the Finder. Create a new folder using the name of the user whose home folder you are restoring.
4. Download and open CCC.
5. Click **Restore** in the toolbar to create a new Restore task.

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6. Drag the user home folder from the NAS backup volume in the Finder onto CCC's Source selector.
7. Drag the user home folder from the Macintosh HD volume in the Finder onto CCC's Destination selector.
8. Click the Start button.
9. When the restore procedure has completed, open System Settings > Users & Groups.
10. Click **Add User…**
11. Configure a new user account. Set the "Account Name" to the same name as the home folder that you restored.
12. Log out, then log in to the restored user account. You may delete the "utility" account, if desired.

Migrating data from an Apple Silicon Mac booted in "Share Disk" mode

When Apple introduced Apple Silicon Macs, they replaced "Target Disk Mode" (TDM) with a new "Share Disk" mode. With TDM, you simply connect two Macs via FireWire or USB, and the storage of the TDM Mac appears and behaves as a locally-attached device. That device would be inherently compatible with Migration Assistant. Share Disk mode is completely different. Instead of behaving like a locally-attached device, the attached Mac shares a specific volume via SMB file sharing. That volume is *not compatible with Migration Assistant*, and due to some limitations of the SMB service on the sharing Mac, applications copied via the Finder do not work correctly.

CCC can work around these limitations and produce a backup of the Shared-Disk Mac that has functional applications and is compatible with Migration Assistant. Ideally you would have an ordinary CCC backup of the Shared-Disk Mac to use instead (i.e. a backup made while that Mac is booted from its own hard drive), but if you are only able to access the Mac via Share Disk mode, then you can use the following steps to migrate data from that Mac.

1. Follow Apple's instructions for sharing the startup disk of another Mac <https://support.apple.com/guide/mac-help/transfer-files-a-mac-apple-silicon-mchlb37e8ca7/mac>
2. Erase a new backup disk in Disk Utility <https://support.bombich.com/hc/articles/20686493728919> to use as a destination for the backup task, or add a volume to an existing backup disk <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume> that has enough space for the procedure.
3. Click the **New Task** button in CCC's toolbar.
4. Select the Shared-Disk volume as the source.
5. Select your local backup volume as the destination. Do not select your current startup disk as the destination to this task.
6. Click the **Start** button to run the task.
7. When the task has completed, eject the Shared-Disk volume and detach the second Mac.
8. Open Migration Assistant and migrate data from the CCC backup volume.

CCC won't run automated tasks while a restore task is running

To avoid any potential conflicts, CCC will avoid running any automated tasks while a Restore task is running. This is designed to prevent mishaps, e.g. overwriting the backup while you're restoring the backup to another volume. If you have an unrelated task that you would like to run while a restore task is running, you can start that task manually to override CCC's safety mechanism.

Related Documentation

- Restoring from a disk image <https://support.bombich.com/hc/en-us/articles/20686461378839>
- Restoring from a backup on a remote Macintosh

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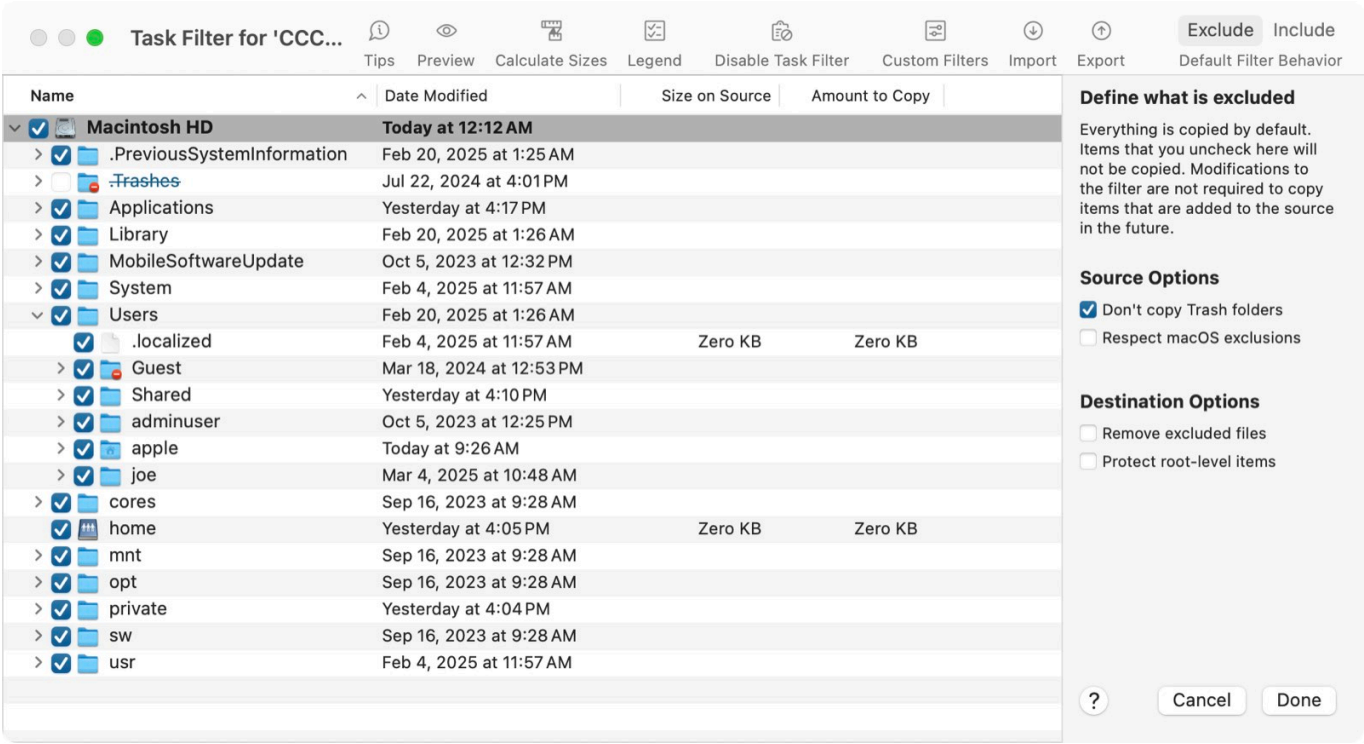
<https://support.bombich.com/hc/en-us/articles/20686444662167>

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Configure the task filter to exclude files and folders from a task

By default, CCC will copy everything from the volume or folder that you specify as the source. If you do not want to copy every item from the source, you can define a task filter to limit what items will be copied. Click the **Task Filter** at the bottom of the window to open the Task Filter window.

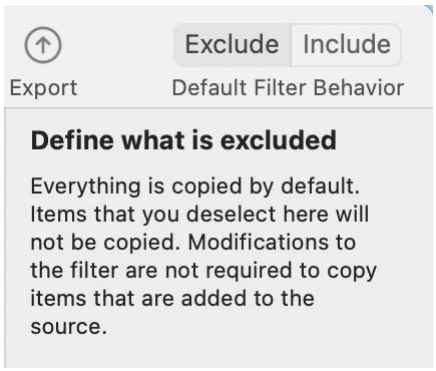
Show me the Task Filter button



Default Filter Behavior

The CCC task filter offers two paradigms for defining the task filter. The default filter behavior determines whether you will define what should be excluded (i.e. everything is copied by default, except for what you specifically exclude), or whether you will define what should be included (i.e. nothing is copied by default, except for what you specifically include). Which behavior you choose depends on what you want CCC to do with new items that are added to the source. You can change the default filter behavior by clicking the button in the top-right corner of the Task Filter window:

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Exclude: Define what is excluded

CCC's default behavior is to copy everything by default. In this mode you define what is excluded from the task by unchecking the box next to an item in the file list. This mode is simplest for users that only want to exclude a handful of items, but generally copy everything because you don't have to revisit the task filter to indicate that new items should be included in the task. If you add a file or folder to the source (e.g. in the future after defining your task filter), and that item is not in a folder that you have excluded from the task, that item will automatically be included in the task.

Include: Define what is included

In this mode, nothing is copied by default, and you define what is **included** in the task by checking the box next to an item in the file list. If you add an item to the source in the future, and that item is not in a folder that is specifically included by the task filter, that item will **not** be copied. This mode is helpful in cases where you only want to copy a handful of items on a volume whose subfolders frequently change.

When the Default Filter Behavior is changed, the task filter is reset

This behavior is intentional, the Include and Exclude Default Filter Behaviors and their rules are mutually exclusive. When you change the Default Filter Behavior, that makes a fundamental change to how each rule is defined by you and interpreted by CCC. As such, all previously-defined rules are inapplicable, so the "conventional" rules are cleared (in contrast to Custom Rules, which are left in place).

Consider this example — suppose the filter is configured to Exclude, and that you have excluded just one folder, "Applications". The task filter has exactly one rule, "Exclude /Applications". If you then change the filter behavior to "Define what is *Included*", that "Exclude /Applications" rule becomes irrelevant and extraneous. With an "Include" filter, *nothing* will be copied until you explicitly include it, therefore the Applications folder is already not going to be copied. Making matters potentially worse, though, suppose you next choose to include just one application. If we didn't clear the "Exclude /Applications" rule, there would be a conflict between "Exclude /Applications" and "Include /Applications/foo.app". To avoid these sorts of negative interactions as you start to define new Include rules, CCC removes the extraneous Exclude rules.

Calculating disk usage and "Amount to copy"

You can right-click on any folder and choose **Refresh size** to have CCC enumerate the contents of that folder and evaluate the task filter against its contents. CCC will report the total size of the folder on the source and the amount of data included to be copied. You can also click on the **Calculate Sizes** button in the toolbar to enumerate the contents of the entire source. This could take a while, especially for network volumes, so consider refreshing the disk usage of individual folders instead. If CCC is in the midst of enumerating a folder, you can right-click on that folder to stop enumeration, or click again on the **Calculate Sizes** button to stop the calculation.

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Source and destination options

Trash folders are excluded by default

By default, CCC won't copy the contents of the Trash folders because, well, it's Trash. If you want CCC to copy your Trash, click the **Task Filter** button, then uncheck the **Don't copy Trash folders** box in the Task Filter window sidebar to remove the exclusion. See this section of CCC's documentation <https://support.bombich.com/hc/articles/20686431327511> to learn more about the idiosyncrasies of the Finder Trash mechanism and how it relates to backing up and restoring the content of the Trash.

Note: The Trash exclusion behavior applies to any folder that is named ".Trash". If another application creates a .Trash folder, that content will be excluded if the **Don't copy Trash folders** box is checked.

Excluded files are not deleted from the destination

When you exclude an item from the CCC task, this tells CCC, "**Do not copy that item**". That does not, however, indicate that CCC should **delete** that item from the destination, e.g. if it had been copied there by a previous task. In fact, excluding an item from the task implicitly protects that item on the destination. If you have items on the destination that are now excluded from a task that you no longer want to retain on the destination, you can simply remove them from the destination by dragging them to the Trash. If you would like CCC to facilitate that cleanup, check the **Remove excluded files** checkbox in the sidebar.

The **Remove excluded files** option is ignored if your task is configured with the **Don't delete anything** SafetyNet setting. This setting also will not override CCC's explicit protections placed on the _CCC SafetyNet folder, so when this option is used in conjunction with CCC's "SafetyNet On" setting, items will be moved to the SafetyNet folder rather than deleted immediately. Likewise, the **Protect root-level items** setting overrides the **Remove excluded files** setting for root-level items.

When using the **Include** default filter behavior, the **Remove excluded files** option will only remove items that you have explicitly excluded via a custom filter. Items that are implicitly excluded (i.e. because you did not specifically include them using a conventional inclusion rule) will not be deleted from the destination.

We strongly recommend that you enable CCC's SafetyNet feature when using this setting until you are familiar with its behavior. Click on the Destination selector and choose **SafetyNet On** to enable SafetyNet.

The **Protect root level items** setting is described in more detail in the Advanced Settings article <https://support.bombich.com/hc/articles/20686481162647#protect>.

Special exception for Remote Mac tasks: If your task is configured to use a Remote Mac source or destination, and your filter is configured with the **Include** Default Filter Behavior, *and your filter defines a custom filter rule*, CCC **will** remove any items from the destination that are not explicitly included in the filter. This special exception is required because the Remote Macintosh option requires the use of CCC's legacy file copier, which is less flexible than CCC's modern file copier. To accommodate the proper detection of matches to custom rules in an Include filter, the legacy file copier will either create a bunch of empty folders on the destination (the option we chose to not take), or delete any folders that don't match your included content or the custom filter rule.

Respect macOS exclusions

Apple offers a method to third-party applications for flagging specific files to be excluded from Time Machine backups. When backing up to a locally-attached volume, CCC ignores these exclusion flags by default. You can check the **Respect macOS exclusions** checkbox in the sidebar to change that behavior. Note that CCC automatically enables this option when backing up a locally-attached source to a network volume destination to

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reduce the amount of unnecessary content being evaluated in NAS backup tasks.

CCC will show these excluded items in the Task Filter window when the **Respect macOS exclusions** setting is enabled. If you would like to get a complete list of files flagged in this manner, though, you can paste the following into the Terminal application (replace "/Users/yourname" with any folder you want to search within):

```
find /Users/yourname -xattrname "com.apple.metadata:com_apple_backup_excludeItem"
```

Custom Filters

If the files you want to match are scattered across your filesystem, it may be tedious to manually locate each of them and create conventional rules (i.e. check or uncheck the item in the file list). To address this, CCC offers custom filter options in which you define a filter rule using an expression. Click the **Custom Filters** button in the toolbar to reveal the custom filters table.

To add a custom filter rule, click the **+** button in the custom rules table header, or drag a file or folder from the file list into the custom filters table to add that item as a template. To reorder custom filters, simply drag and drop the items in the custom filters table. Custom filter rules will be evaluated by the task filter before conventional filter rules, and the effects of custom filter rules will be reflected in the outline view shown at the top of the window as you make changes to the custom rules.

Anchored path filter

An anchored path filter defines a rule using an absolute path relative to the root of the source. `/Library/Caches`, for example, is an anchored path filter because it starts with a "/". This filter would match /Library/Caches, but would not match /Users/someuser/Library/Caches. You can also include wildcards in the expression, e.g. `/Users/*/Library/Caches` would match the Library/Caches folder in each user home folder.

Subpath filter

A subpath filter defines a rule using a partial path or filename that does not start with "/". Continuing the example above, `Library/Caches` would match /Library/Caches and /Users/someuser/Library/Caches. Wildcards are accepted in the expression; to match a particular file type, use an expression like `*.mov` to match all .mov files.

Wildcard characters

Wildcard characters can be added to an expression to match a wider range of files and folders. * will match one or more characters in any single file or folder name, e.g. `*.mov` will match all movie files.

`/**/` will match one or more path components, e.g. `/Users/**/*.jpg` will match any JPEG photos in any user home folders, but won't match JPEG photos elsewhere, e.g. those in /Library/Desktop Pictures. You would also use the ** wildcard when defining an inclusion rule that should copy all items within a particular folder and its subfolders. For example, `/Users/yourname/Documents` would include only that folder itself, not any of its contents. `/Users/yourname/Documents/**` would include the Documents folder, all of its contents, and the contents of every subfolder within it.

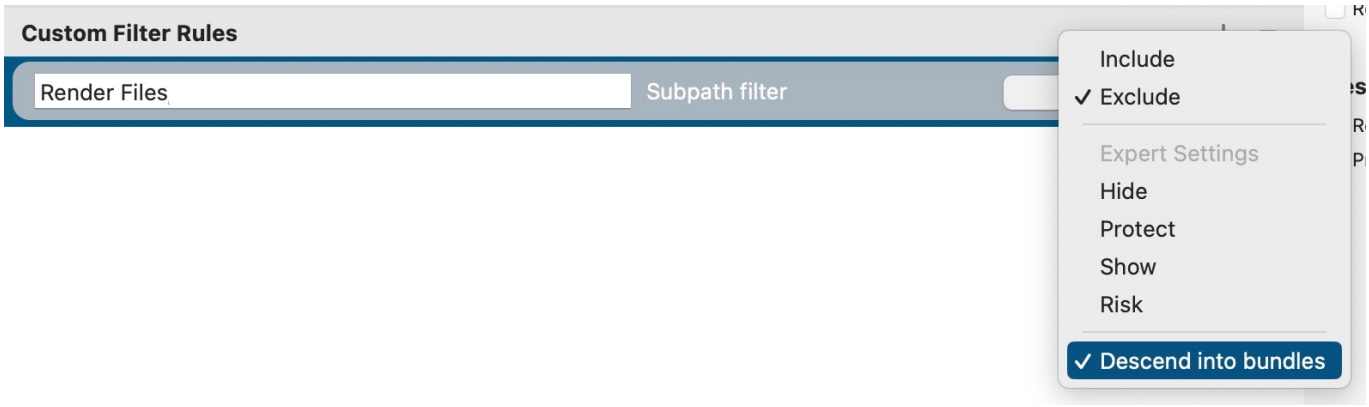
If you specify additional path components after a ** wildcard, then that wildcard is only applicable up to a match against the path component that follows the wildcard. For example, the exclusion rule `/Data/**/Marine/Invertebrates` would exclude `/Data/2018/Marine/Invertebrates`, but it would not exclude `/Data/2018/Marine/Benthic/Marine/Invertebrates`. In the latter case, `**/Marine` matches `2018/Marine`, but then the the next path component fails to match (and we are deliberately choosing to not allow the ** wildcard to match `2018/Marine/Benthic` in this case).

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? can be used to match any single character, e.g. `*.mp?` will match both .mp3 and .mp4 files. Use the ? wildcard sparingly, it will greatly increase the amount of time required to evaluate the task filter.

Excluding items that exist within a bundle file

CCC's Task filter does not expose the contents of bundle files (e.g. application files, Photos libraries) because bundle files should generally be kept whole, otherwise they may not function correctly when restored. If you have a specific reason to exclude some content from a bundle (e.g. cache files in a Final Cut Pro media bundle), you can do so with a custom exclusion rule. To make the rule apply to bundle components, click on the popup menu adjacent to the filter rule expression and toggle the **Descend into bundles** setting.



Expert settings

Custom filter rules are usually applied to include or exclude an item. Exclusions, however, are actually composed of two behaviors: a matching item on the source will not be copied (**Hide** the item from the copier), and a matching item on the destination will be protected (**Protect** the item from the copier). Likewise, Inclusions indicate that a matching item on the source will be copied (**Show** the item to the copier) and a matching item on the destination may be deleted (**Risk** the item). Occasionally it's helpful to define a rule that affects only matching items on the source or only on matching items on the destination. For example, if you have a folder named "Archives" on the destination that does not exist on the source, that item won't appear in the source list so it cannot be excluded (and thus protected) in the conventional manner. You could add an `/Archives` **Protect** rule to explicitly protect that item on the destination.

Including folders and their content with the 'Include' filter behavior and custom rules

Including a folder and its contents via a custom rule requires a non-intuitive expression, because the filter rule must match multiple path components. To include a folder and all of its contents, add ** to the end of the filter expression. For example, to include the Pictures folder from your home directory, the following expression would apply as an inclusion rule:

```
/Users/johnny/Pictures**
```

Exporting and Importing filters

A whole task filter can be imported or exported via the gear menu. When importing a filter, the current filter will be replaced with the filter you're importing. CCC will automatically purge conventional rules from the filter if they are not applicable to the currently-selected source. For example, if you had excluded /Applications in the filter, but /Applications does not exist on the current source, that rule will be removed from the filter to avoid unexpected results should an /Applications folder ever be added to the source. This purging is not applicable to custom filter rules.

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You can also export individual or groups of custom filter rules. Select the rule(s), then simply drag the items onto your Desktop. To import custom rules from a file exported in this manner, simply drag the file into the custom filter rules table.

Items automatically excluded

CCC excludes some items from the backup task by default. A complete list of exclusions along with an explanation for the exclusion is available in this section of the documentation <https://support.bombich.com/hc/articles/20686463321751>. If you would like to visualize the items that are automatically excluded, hold down the Option key while clicking on the Task Filter button to open the Task Filters window.

The CCC SafetyNet folder, "_CCC SafetyNet" is excluded by a global filter. See How do I restore files from the _CCC SafetyNet folder? <https://support.bombich.com/hc/articles/20686443321879#restore_archives> section of the documentation to learn how to restore items from that folder.

Additionally, CCC will exclude and protect system folders if you select the startup disk or a non-HFS+/APFS formatted volume as the destination. CCC will also exclude system files if you select a destination volume that is in the same APFS container as the current startup disk (because System Integrity Protection errantly prevents CCC from setting special flags on system files when copying files to another volume in the startup disk's container). If you would like to restore a specific item, such as the contents of /Library/Application Support, this protection can be avoided by choosing a specific folder at the source and destination via the Choose a folder <https://support.bombich.com/hc/articles/20686432643735> options in the Source and Destination selectors. With great power comes great responsibility — take care to avoid overwriting your system files.

Related documentation

- How to restore from your backup <https://support.bombich.com/hc/articles/20686469175575>
- Folder-to-Folder Backups <https://support.bombich.com/hc/articles/20686432643735>
- Some files and folders are automatically excluded from a backup task <https://support.bombich.com/hc/articles/20686463321751>
- Backing up and restoring Finder's Trash <https://support.bombich.com/hc/articles/20686431327511>

Disabling the Task Filter

If you would like to disable the task filter without discarding all of your exclusions, click the **Disable Task Filter** button in the toolbar. This will close the Task Filter window (saving any changes that were made to the filter), but then any user-defined inclusion or exclusion rules will be ignored for subsequent tasks. To re-enable the Task Filter, simply click the **Task Filter** button at the bottom of the window, then click the **Done** button. You'll know that your task filter is active if the icon of the Task Filter button at the bottom of the window is red.

Why is the "Task Filter" button sometimes disabled?

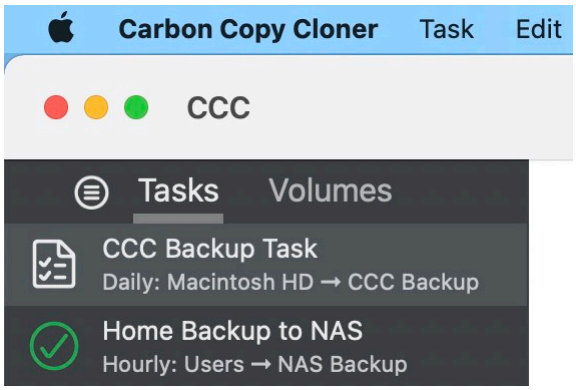
The Task Filter window dynamically evaluates the effect of your task filter, which requires that the source is available while the Task Filter window is open. The Task Filter button will be disabled if the source volume is not mounted, or (if applicable) if the selected source folder is missing. Additionally, the Task Filter button may be disabled if you configured the task to create a bootable copy of the system <https://support.bombich.com/hc/articles/20686422131479#exclude> via the Backup Volume Setup Assistant; in that case, a filter cannot be applied, so the Task Filter is not applicable.

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How to modify a scheduled backup

Select the Task

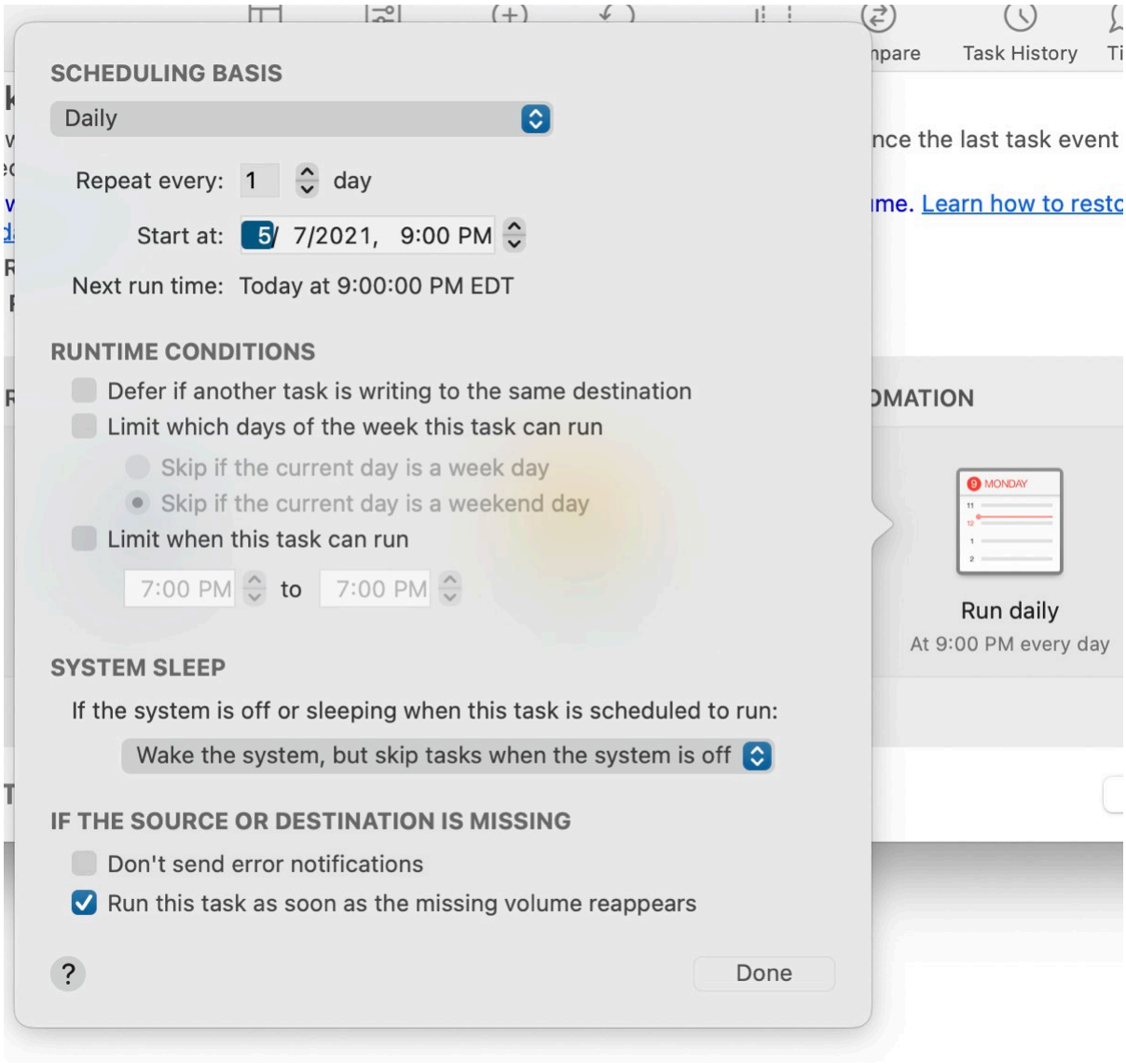
Select the **Task** to be modified. If necessary click **Show Sidebar** in CCC's toolbar to reveal scheduled tasks.



Modify the Schedule

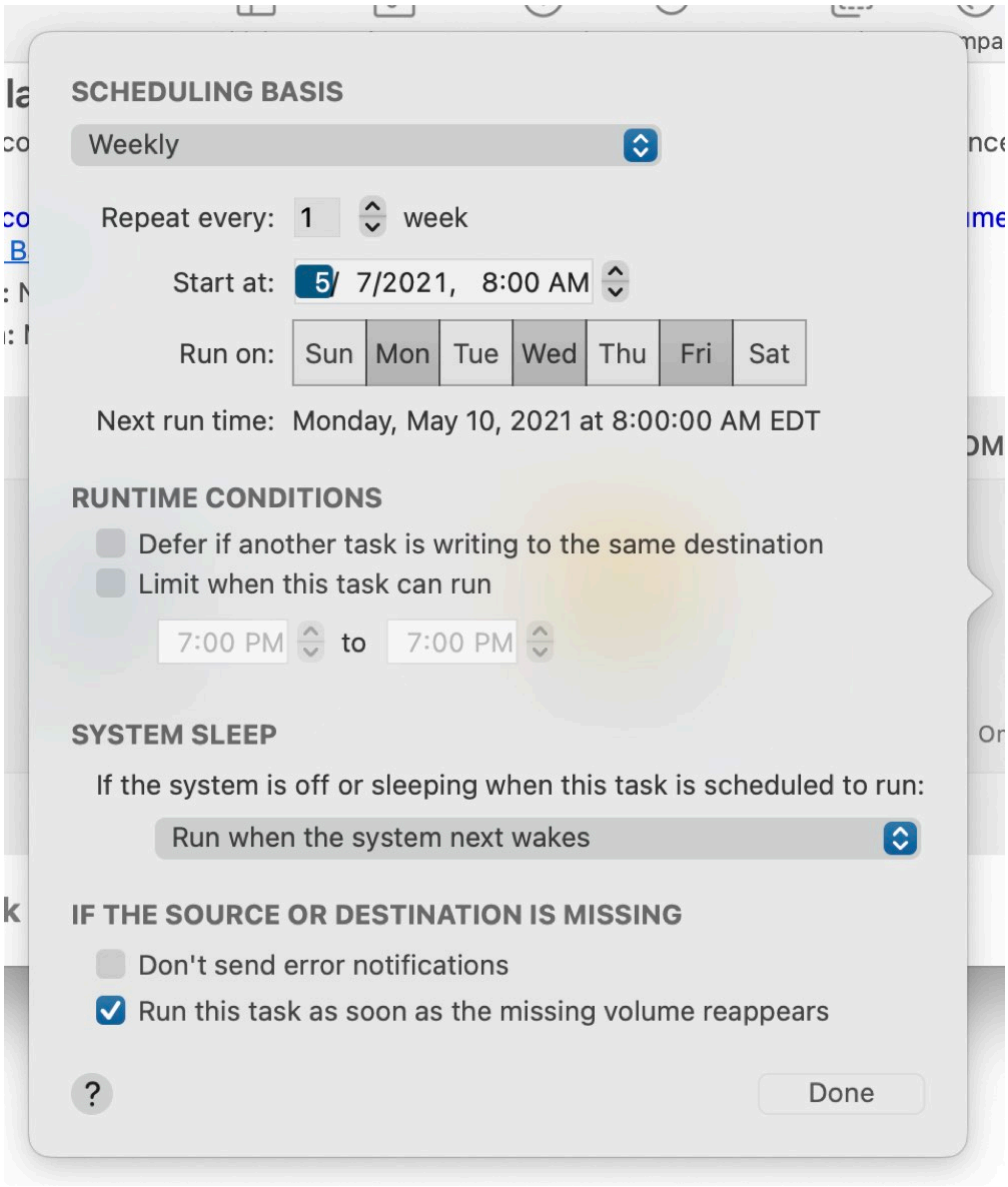
Click the icon in the center of the **Automation** box. If your task is currently scheduled to run "When files are modified on the source", click the  or  buttons to suspend source monitoring, then you can edit the schedule configuration.

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Modify the schedule. Click **Done**.

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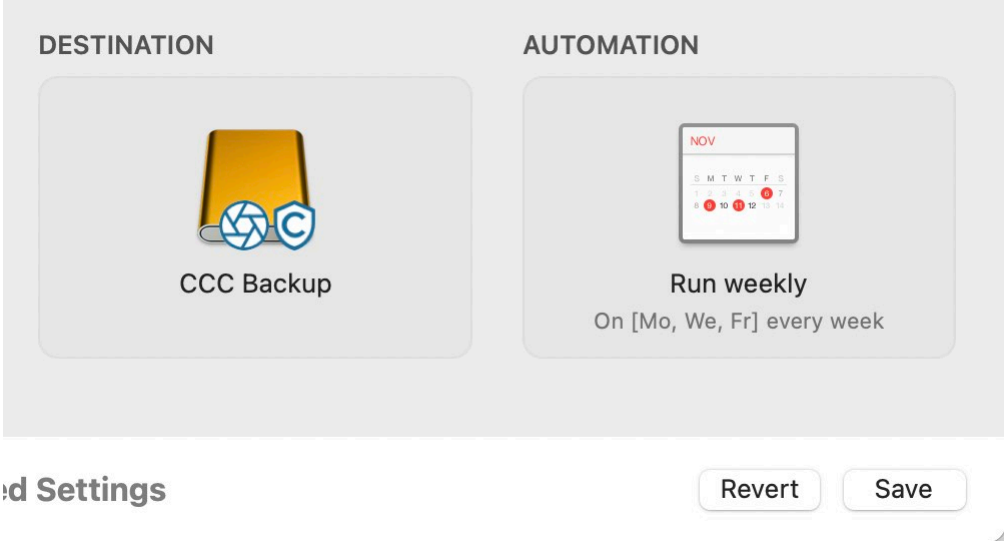


Save the Schedule

Click **Save**.

Note: If you have changed your mind about any changes you have made to your task settings, you can click the **Revert** button to revert the task to its last-saved settings.

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Your backup will now run according to the new schedule!

Related Documentation

- How to schedule a backup <https://support.bombich.com/hc/en-us/articles/20686449773847>

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How to verify a backup

CCC offers several different ways to verify data on the source and destination. The procedure that you use will depend on when you want to verify data and why you want to verify the data.

- Backup Health Check: Verify before copying, automatically replace corrupted destination files
- Postflight verification: Verify files that were copied during the current task event
- Ad hoc verification: Verify the source or the destination against the "last known state"

Backup Health Check: Verify before copying, automatically replace corrupted destination files

CCC normally uses file size and modification date to determine whether a file should be copied. When you use the **Backup Health Check** setting (Advanced Settings > Performance & Analysis), CCC will calculate a checksum of every file on the source and every corresponding file on the destination. If the checksums differ:

- If the source file is 100% readable, CCC will recopy the file to the destination.
- If the source file is not completely readable, the existing destination file will be left in place. CCC will record an error for the file in Task History and raise it to your attention when the task completes.

This option will increase your backup time (because CCC is tasked with re-reading every file on the source and destination), but it will expose any corrupted files within your backup set on the source and destination.

How do I use this feature?

1. Click **Advanced Settings** at the bottom of the CCC window
2. Select the **Performance & Analysis** tab
3. Check the box next to **Backup Health Check**
4. Optionally, select an interval from the popup menu adjacent to that setting

Show me the 'Backup Health Check' setting
<com.bombich.ccc7.action://guide/main/task?next=adv_settings_clickme.3.bottom&next=performance.408&next=arrow.452>

When and why would I use this feature?

Media failures occur on nearly every hard drive at some point in the hard drive's life. These errors affect your data randomly, and go undetected until an attempt is made to read data from the failed sector of media. If a file has not been modified since a previous (successful) backup, CCC will not ordinarily attempt to read every byte of that file's content. As a result, it is possible for a corrupted file to go unnoticed on your source or destination volume. Obviously this is a concern if the file is important, and one day you actually need to recover the contents of that file. **Use the "Backup Health Check" feature to avoid and to proactively deter bit rot.**

Frequent use of the checksum calculation option is unnecessary and may be a burden upon your productivity, so CCC offers additional options to limit how frequently the checksumming occurs (e.g. weekly, monthly, quarterly, on specific days of the week, etc.).

Note: CCC will never replace a valid file on your destination with an unreadable, corrupt file from the source. If CCC cannot read a file on your source volume, any existing backup of that file will remain intact on your backup volume and CCC will report an error, advising you to replace the source file with the intact backup version. The **Backup Health Check** setting will only automatically replace corrupted files on the destination, and only when

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the source file is completely readable.

What is a "corrupted" or "unreadable" file?

With regard to files on the source, CCC's **Backup Health Check** option specifically refers to files that cannot be **physically** read from the disk. It does not refer to files that have been mistakenly or maliciously altered such that they cannot be opened by the application that created them.

 Pro tip – ad hoc Backup Health Check: If Backup Health Check is not currently enabled on your task, or if a checksum event is not due, you can hold down the Control key and click the Start button to start the event with an ad hoc Backup Health Check. A icon will be added to the Start button to indicate the temporary settings change. Likewise, if a Backup Health Check event is due, you can hold down the Control key and click the Start button to *skip* the health check for the next event.

Postflight verification: Verify files that were copied during the current task event

As CCC copies files to the destination, it calculates a checksum of the data it's writing. If your task is configured to use the **Re-verify files that were copied** setting (Advanced Settings > Postflight), at the end of the task, CCC will read the destination files that were copied and verify that the data matches the data that was initially read from the source.

How do I use this feature?

1. Click **Advanced Settings** at the bottom of the CCC window
2. Select the **Postflight** tab
3. Check the box next to **Re-verify files that were copied**

Show me the 'Re-verify files that were copied' setting
<com.bombich.ccc7.action://guide/main/task?next=adv_settings_clickme.3.bottom&next=postflight.407&next=arrow.440>

When and why would I use this feature?

Generally this kind of verification is unnecessary — if no errors were reported by the destination filesystem while copying a file nor when closing the file on the destination, you should expect the destination device to have permanently retained the data of that file. However, media failures are only discovered when data is read from the destination device, so it is possible for a device to accept writes without failure, but then fail to deliver the data on a subsequent read due to media failure. **Especially if you are migrating data to a new device, or if you are planning to delete items from the source after completing the backup**, this additional verification confirms that the freshly-written files are intact on the destination.

Ad hoc verification: Verify the source or the destination against the "last known state"

When CCC copies files to your destination, it maintains a record of the files that were copied (by default; that setting is available in Advanced Settings > Performance & Analysis > "Maintain a record of transactions"). That record includes the size, modification date, and a checksum of the latest version of each file. On demand, CCC can evaluate either the source or the destination against those records to determine if any files differ since the files were copied. Click on the Source or Destination selector, then choose **Verify files copied by this task** to start that verification.

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How do I use this feature?

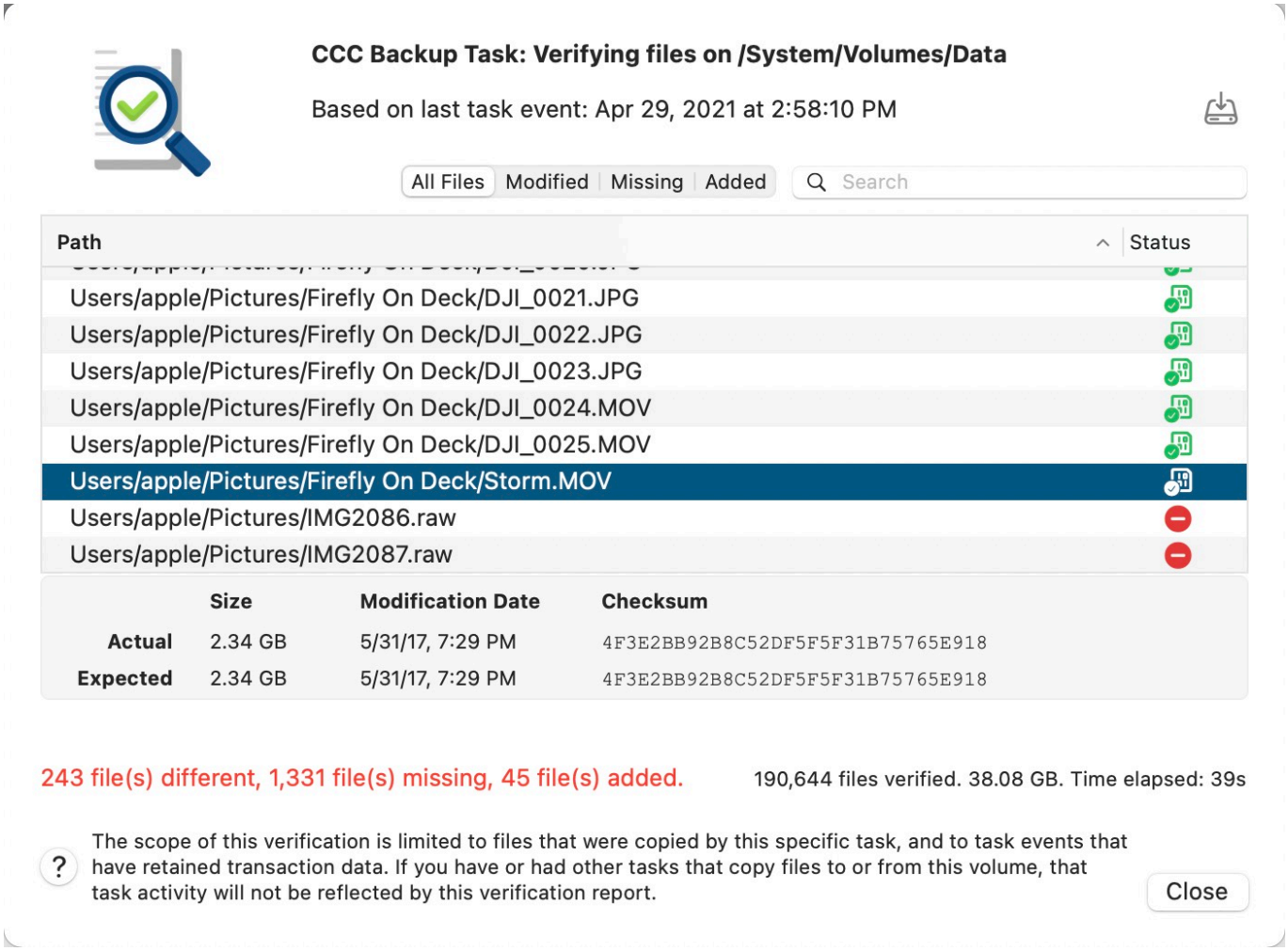
1. Click on the **Source** or **Destination** selector (i.e. the icon of your source or destination folder or volume)
2. Choose **Verify files copied by this task**

Show me the 'Destination' selector <com.bombich.ccc7.action://guide/main/task?next=select_destination.1>

When and why would I use this feature?

Unlike the previous two features that offer automated verification of files based on a comparison of the source against the destination, this feature is something you would use in an ad hoc manner. Suppose, for example, that you just installed some software, and now you're a bit concerned that something untoward has happened to your source volume. You can open CCC, click on the Source selector, then choose **Verify files copied by this task**. CCC will then read every file on the source and compare its checksum against the checksum of the file when it was last copied by the selected task. If any files have been modified since then, CCC will present those to you, along with context about the change (e.g. modification date, size, and/or checksum differences).

Another example: Suppose you want to restore some files from your backup, but prior to doing so, you want to verify that the files haven't been modified since the last CCC backup task. Open CCC, click on the Destination selector, then choose **Verify files copied by this task**. This time CCC will read the files on the destination and compare them against the same task records that hold the "last known state" information about those files.



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The verification report shows some differences. What do these mean?

The verification report shows the status of items found on the selected volume based on the attributes of the file at the last backup event:

-  This item matches the transaction record
-  This item was added since the task last ran
-  This item's content changed without affecting the size or modification date (flagged false positive, see below)
-  The modification date of this item differs
-  The size of this item differs
-  This item's checksum differs
-  This file is no longer present
-  No transaction record (see below)

Click on the status icon of the selected item to reveal the actual and expected size, modification date, and checksum of the selected item.

False positives

There are a handful of file types whose content can change without affecting the size or modification date. Database memory files are a good example. Based on our past experience, CCC will flag some items as "false positives", meaning that while the content changed without affecting the size or modification date, the modification is unlikely to be malevolent, nor an indication of something wrong with the file or the backup procedure.

CCC will also flag a modification date difference as a false positive if the original source file's modification date is corrupted (e.g. an absent value equates to "0", which would be presented as Dec 31, 1969 or January 1, 1970, depending on your time zone). When CCC finds a file with an invalid modification date, it sets the modification date on the file that it creates on the backup to the modification date of the file's parent folder. That value is also retained in the task audit database, so that becomes the value that CCC's verifier expects for the file. As a result, the verification should typically pass for these files on your backup, but they should be called out as "different" on the source.

No transaction record

Transaction records are created when CCC (v6 and later) copies a file from the source to the destination. If content was copied to the destination by another task or an older version of CCC, CCC won't have any transaction records for those files. Likewise, any items that are excluded from the backup task or protected on the destination by a filter will not have transaction records.

Rather than erasing your destination and re-establishing the backup to create those transactions, you can enable the **Backup Health Check** setting in Advanced Settings (Performance & Analysis) and run your task once to establish the transaction records.

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What do I do about differences noted in the verification report?

When the verification report shows differences, that means that the files on the selected volume are different now than they were when the selected task last copied those items. Before you draw any conclusions about differences identified by CCC's verification report, it's essential to keep in mind:

- CCC can only verify files that were copied by the selected task. Files that were (legitimately) modified by another backup task or another application will appear as "different". Likewise, files that are excluded from the backup task cannot be verified, and will appear as differences.
- It's normal for files to be modified on the source; differences identified on the source do not necessarily indicate an error condition, you may simply need to run your backup task again to get those files updated on the destination, and updated in CCC's transaction records.

If you're seeing differences on a destination volume, run the backup task again using CCC's **Backup Health Check** setting:

1. For reference, you can save a copy of the verification report before closing the window. Click the "Save Verification Report" icon in the top-right corner to save the report.
2. Close the Verification window
3. Click the **Advanced Settings** button at the bottom of CCC's window
4. Click the **Performance & Analysis** tab
5. Check the box next to **Backup Health Check**
6. Choose **Only on the next run** from the popup menu to the right of the "Backup Health Check" setting
7. Click the **Done** button
8. Click the **Start** button (or Save, then Start)
9. When the task has completed, click on the Destination selector and choose **Verify files copied by this task** to repeat the verification.

Differences found on a source volume indicate changes that were made to the source since the backup task last ran, or otherwise outside of the purview of the selected CCC task. If you are seeing differences on the source, then you should consider each difference that is noted and decide if the transaction records are simply out of date (i.e. if a file has been modified since the last backup, then you may simply need to re-run the backup to update the backup file and the transaction record), or if the files should be restored from a verified backup instead.

Verification cannot be effective when "Strict volume identification" is disabled and multiple destination volumes are used

If you're using a single task with multiple destinations, CCC isn't going to track transactions for each destination volume separately. As a result, attempts to verify a volume will only be effective for the last volume that was updated by your task. If you use the verification feature frequently, then we recommend that you use separate tasks for each of your destination volumes.

Transaction privacy and disabling transaction collection

Transaction records are maintained on a per-task basis in an encrypted database. These databases are only accessible to administrator users and can only be accessed via CCC.

Transaction records for any given task are deleted when:

- The CCC task is deleted
- All task events associated with the task are removed in the Task History window
- After changing the source or destination of the task, if you choose the **Remove Audit** option

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- When you specifically delete the Audit records for a task in CCC's Settings > DB Diagnostic > Audit Records
- When transaction collection is disabled for the task (see below)

To disable the collection of transactions in any particular task:

1. Click the **Advanced Settings** button at the bottom of the window
2. Click the **Performance & Analysis** tab
3. Uncheck the box next to **Maintain a record of transactions**

Can I delete, or otherwise reduce the size of the task audit records?

Task audit records are stored in a database on your startup disk, at Macintosh HD > Library > Application Support > com.bombich.ccc > TaskDBsV3. Tasks that record a lot of transactions will eventually create a large database file. CCC does take measures to limit the size and growth of these files, but that activity is balanced against a desire to retain transactions for as many task events as possible. Once transaction records are removed, you can no longer see the changes that were associated with a particular task event. If all transactions are removed for a task, the verification functionality noted above will no longer be available for that task.

You can see a list of these databases, as well as their size and health status, in CCC's Settings > DB Diagnostic > Audit Records.

If you would like to delete all of the records associated with a task:

1. Open CCC Settings
2. Click **DB Diagnostic** in the toolbar
3. Select the **Audit Records** tab
4. Select a task
5. Click the **Delete Records** button

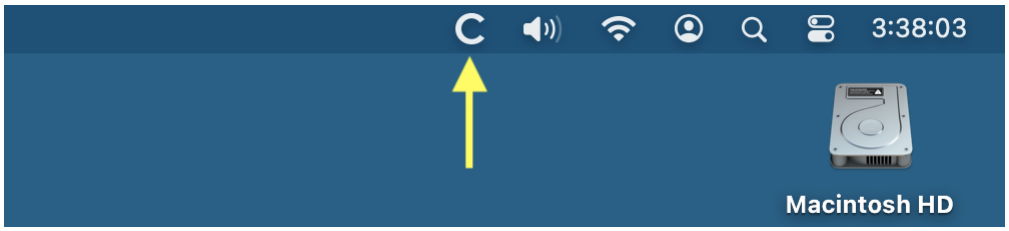
Alternatively, if you would simply prefer to reduce the size of a task's database, you can delete some of the task history events associated with that task:

1. Choose **Task History** from CCC's Window menu
2. Select a task from the filter popup menu at the top of the window
3. Select the some of the oldest events (i.e. click and drag to select multiple items)
4. Right-click on the selection and choose **Remove**

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Monitoring backup tasks with the CCC Dashboard

The CCC Dashboard in your Mac's menubar



CCC's Dashboard application gives you quick access to your tasks via a "C" icon in the macOS menubar so that you can quickly determine their status, see which tasks are running, and start, stop, or pause a particular task. The Dashboard also presents a stream of CCC activity, indicates snapshot disk usage on all of the APFS volumes mounted on your Mac, and proactively alerts you to excessive snapshot disk usage on the startup disk. At a glance, the icon that CCC presents in the menubar gives you information about CCC's state:

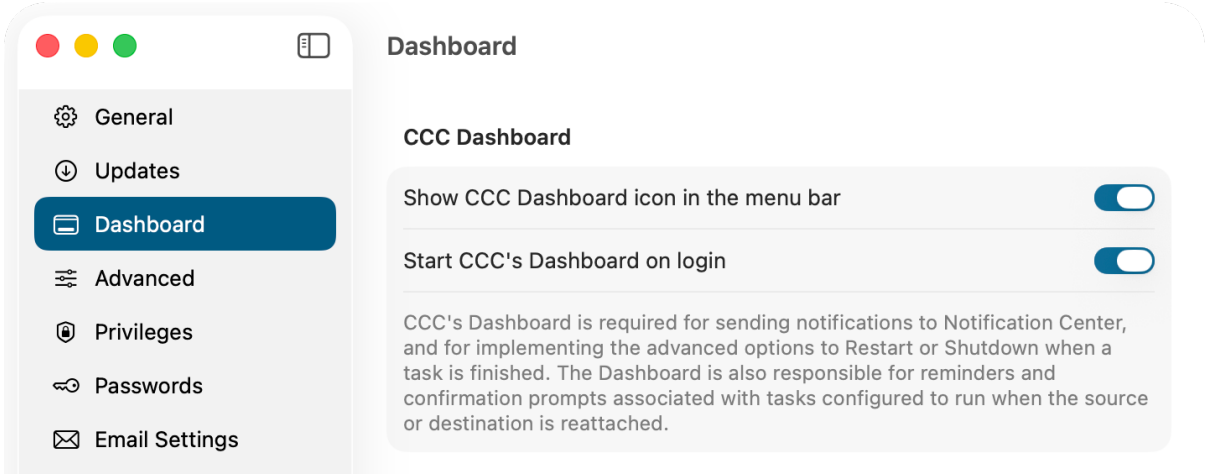
 : No tasks are running

 : One or more tasks are running

 : CCC requires your attention

 : CCC tasks are disabled

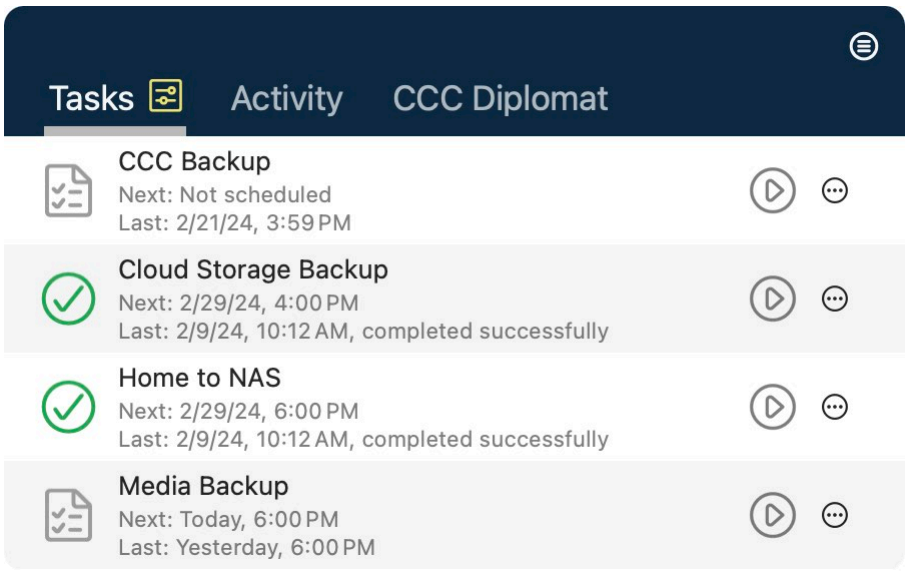
To choose whether CCC's Dashboard icon appears in your menubar, click **Settings** in the CCC toolbar, then click **Dashboard** in the Settings window sidebar.



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Task monitoring

In the Tasks tab of the CCC Dashboard, you can use the controls on each task to start, stop, or (when applicable) pause a task. Click on the "Additional controls" button for options to open the task in CCC and show the task's history.



The task icon will indicate the task's most recent state, e.g. a green checkmark to indicate that the task ran successfully, or a red "x" to indicate that the last task encountered an error. Below the task name, CCC will indicate the task's next run time by default. To change the information that is displayed here, click on the Tasks tab header to reveal the settings for this tab.

Tip: You can press the Option key to toggle the display of "Last run" vs. "Last successful run".

The mini task progress window

The mini task progress window is disabled by default. If you would like to have this window appear every time a task is running, click on the Tasks tab header, click on the icon to reveal the Tasks tab settings, then check the box to show the mini task progress window when a task is running. Note that the window only appears when a task is currently running.

Activity

The Dashboard's Activity tab shows a stream of CCC-related activity, e.g. when tasks start and complete, reminders to run tasks, and snapshot pruning. When an event occurs that deems your attention (e.g. if a task completes with an error), the CCC Dashboard icon will be adjusted accordingly, and an alert icon will be placed in front of the Activity tab's name. You can click the arrow button to the right of a task-related event to open the affected task in CCC.

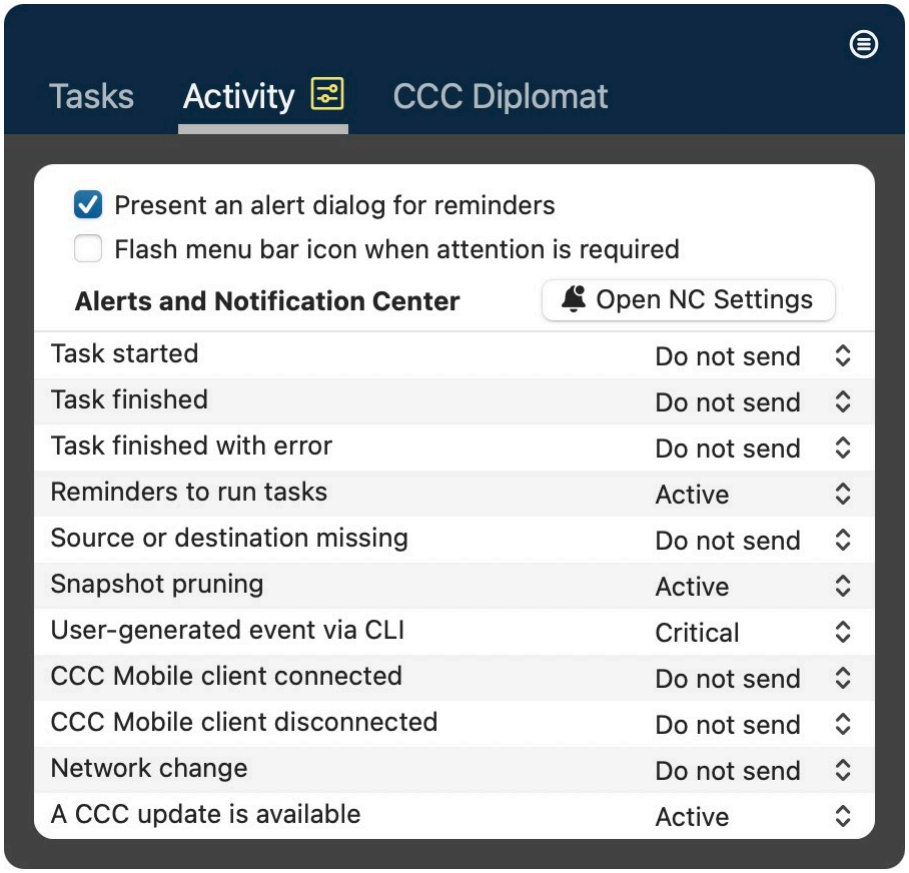
Removing activity

Events in the Activity tab are automatically cleared out every time you log in, and whenever CCC is updated – this is not designed to be a permanent record of CCC activity, rather it's a "live stream" of activity. You don't have to remove events from the Activity tab, but if you would like to remove events manually, simply select the event(s) and press the Delete key.

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Sharing alerts with the macOS Notification Center

If you would like CCC activity events to also appear in the macOS Notification Center, click on the Activity tab header, then click on the icon to reveal the Activity tab settings.



You can specify an alert level for each activity type:

- Do not send: These events aren't sent to Notification Center at all.
- Passive: The event will be added to the Notification Center list, but no alert will be presented and no sound will be played.
- Active: The event will be added to the Notification Center list and a notification will be presented, but no sound will be played.
- Critical: The event will be added to the Notification Center list, a notification will be presented, and the Notification Center alert sound will be played.

Note that adding notifications to the Notification Center list, the presentation of alerts/banners, and the playing of sounds are **all** dependent on the preferences you have defined in System Settings > Notification Center. CCC cannot override those preferences, nor can it define whether a notification will be presented as an alert or a banner. Click the **Open NC Settings** button to configure how these notifications are managed and presented by macOS's Notification Center.

Also note that notifications will not be sent to Notification Center if CCC or the Dashboard application is front-most.

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Removing CCC Dashboard from the Notification Center

If you would like to remove CCC Dashboard (or any third-party application for that matter) from the list in the Notification Center, simply select that application in the Notification Center list and press the Delete key.

CCC Diplomat

The CCC Diplomat is a service that you can enable to provide a destination for backups of photos and files on your iOS mobile devices. To set a destination, click on the Destination selector icon. The Backup Volume Setup Assistant will offer some guidance for configuring the volume or selecting an alternative volume. Alternatively, you may select a folder as the destination for your iOS backups.



Diplomat Settings

If you would like to regenerate the pass code used to connect to the Diplomat service, or configure CCC to unmount the backup volume when not in use, click on the icon to reveal the CCC Diplomat tab settings.

Making backups from an iOS device

Download CCC Mobile Backup from the Mac App Store to make backups of Photos and Files from your iOS device.



<https://apps.apple.com/app/ccc-mobile-backup/id6471621409>

Related Documentation

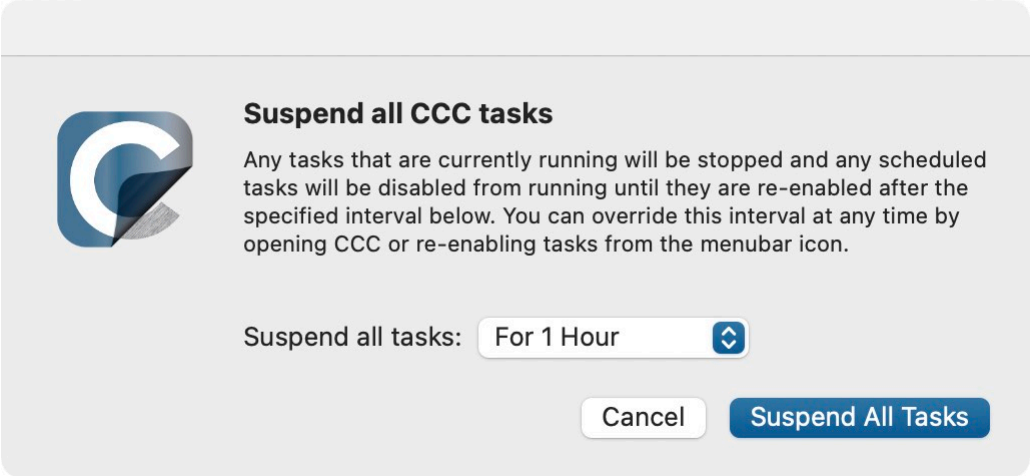
- CCC Mobile Backup Knowledge Base <https://support.bombich.com/hc/categories/14794478535191-CCC-Mobile>

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Suspending tasks

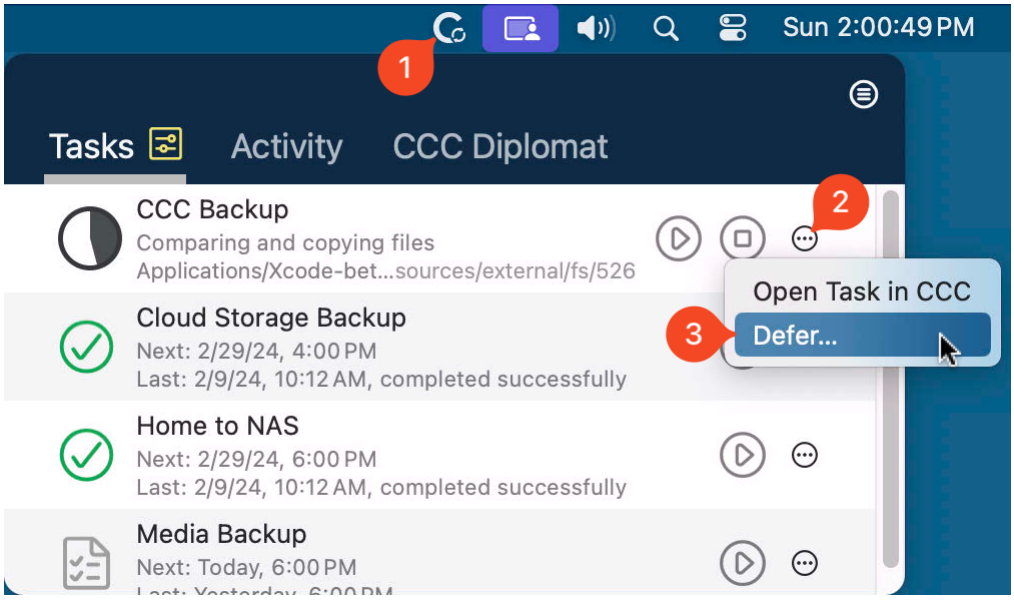
If you would like to suspend all tasks, click the "more actions" button in the Dashboard header, then choose **Suspend all tasks...**. CCC will offer a list of choices ranging from one hour to one week, and also an option to suspend tasks indefinitely. To re-enable tasks, choose **Re-enable all tasks** from the same menu, or simply open CCC and choose to re-enable tasks when prompted.

Note: If you would like to **disable** an individual task, choose **Open task...** from the task's "more actions" button. In CCC, right-click on the task you would like to disable and choose the option to disable the task. Note that task suspension and disabling tasks are separate. If you suspend all tasks, then later lift the suspension, any tasks that you had previously disabled individually will remain disabled.



Deferring a running task

If you find that a task is running at an inopportune time and you want to pause it for longer than a few minutes, you can defer the task to a specific time in the future. Click CCC's menubar icon to reveal the Dashboard, then choose "Defer..." from the "additional actions" menu for the task. A window will appear prompting you to select the date and time that the task should run again.



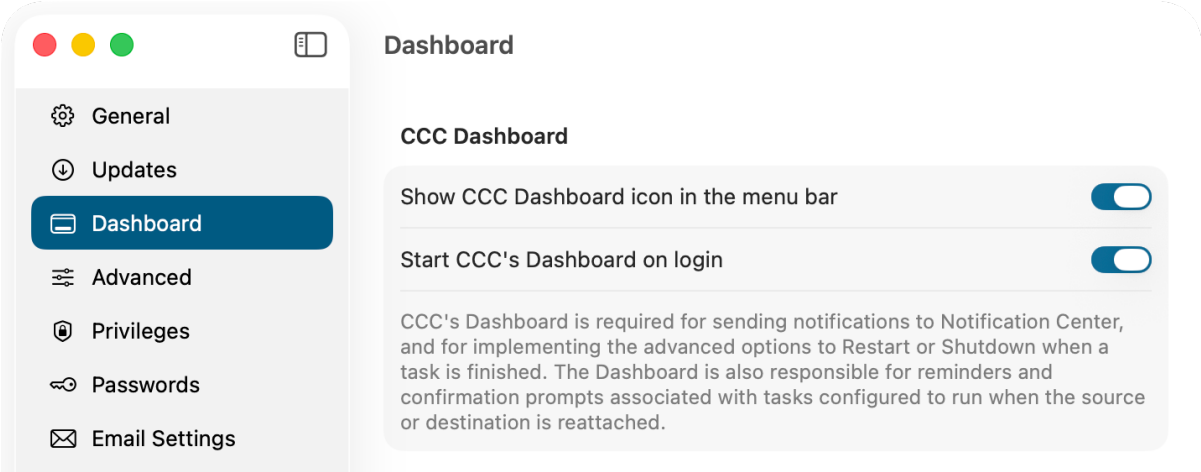
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Some features of CCC will be disabled if the CCC Dashboard is not configured to start on login

The CCC menubar application is named "CCC Dashboard", and is bundled inside of the CCC application file. The Dashboard places the CCC icon in the menubar and hosts its associated Dashboard window, but it also provides other proxy-like functionality for CCC's background helper tool. The following features are provided by the CCC Dashboard:

- **Task started** and **Task finished** Notifications
- The advanced options to **Restart or Shutdown when a task is finished**
- For tasks configured to run when the source or destination is reattached:
    - **Ask for confirmation before proceeding**
    - **Remind me if my task hasn't run in a while**

If you have not configured CCC's Dashboard to be opened on login, then the features listed above cannot be performed reliably. As a result, those features will be disabled until you configure the Dashboard as a login item. You can change the CCC Dashboard login item setting in the Dashboard section of CCC's Settings window at any time.



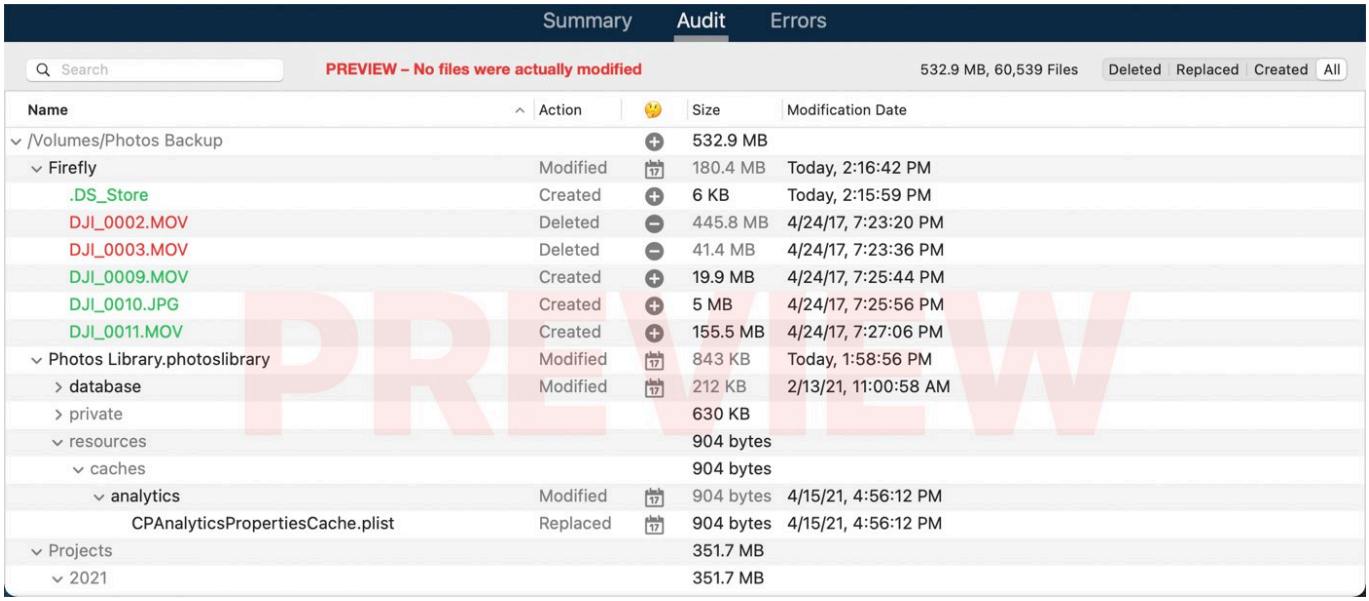
Related Documentation

- Configuring CCC's menubar application preferences
- How to find out when a backup last ran: CCC Task History <https://support.bombich.com/hc/articles/20686456355095>

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Preview: See what changes CCC will make to the destination

If you're configuring a task and you're a little bit uncertain about what might happen to the current content of the selected destination, **click the Preview button in CCC's toolbar** to perform a "dry run" of the backup task. When the task completes, CCC will present the transaction report in the Task History window:



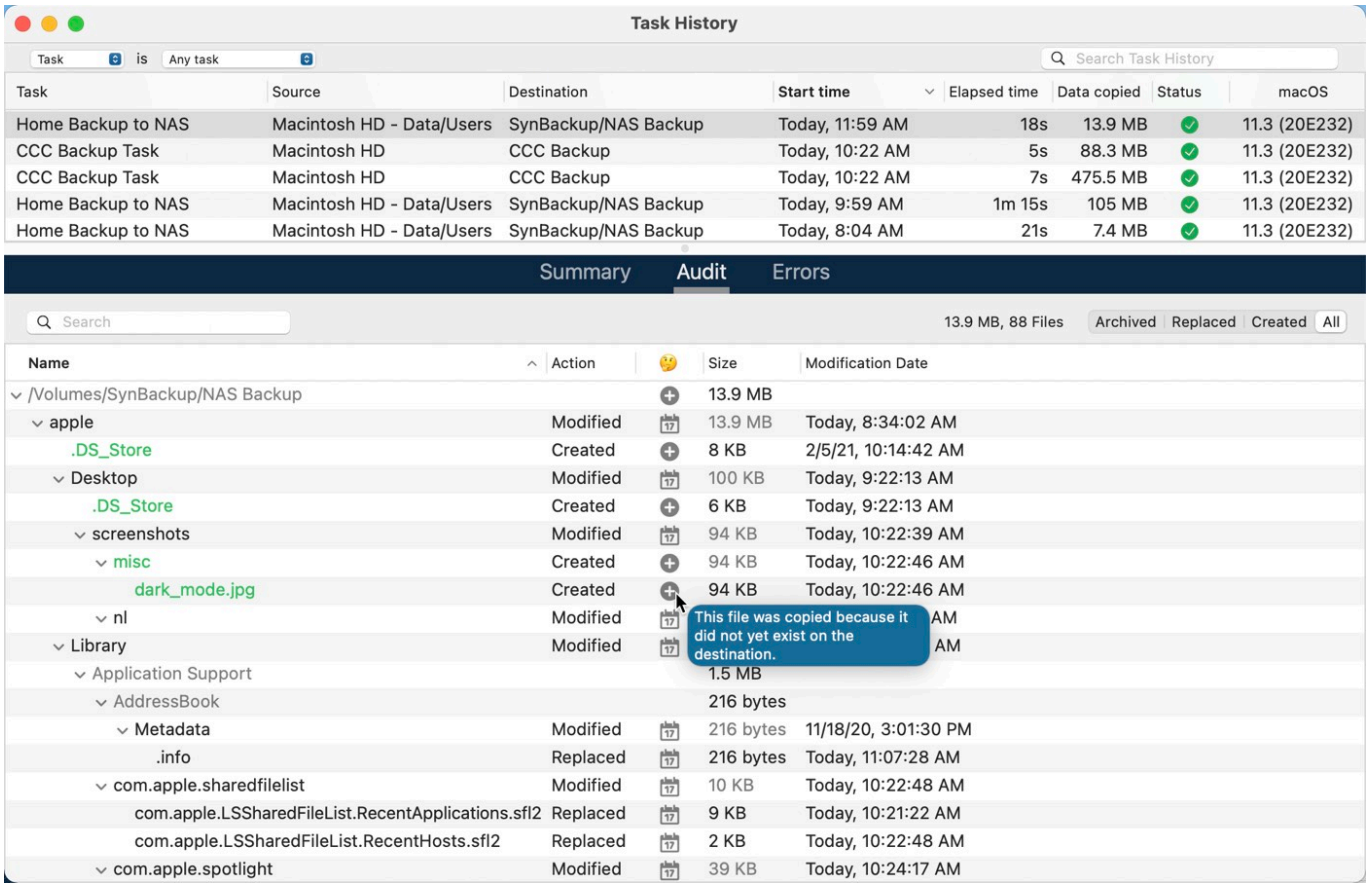
When you perform a task preview, CCC will go through all of the motions of the task, but won't make any changes to the destination. Note that there are some cases where the Preview will be unavailable, e.g. if the assessment of changes can't be made without actually making changes to the destination. The Preview is also unavailable to tasks that back up to or from a Remote Macintosh.

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Task History: See your task event details, statistics, and trends

Product Tour: Learn how to see which files were modified during a backup task

Each time CCC performs a backup or restore task, the results and statistics of that task are recorded and displayed in CCC's Task History window. To view task history, click the **Task History** button in the toolbar, or choose **Task History** from the Window menu.



Task events can be filtered and sorted by task name, source, destination, start time, or status. CCC will show up to 2000 task history events. Each event will indicate when the task started, how long it took, how much data was copied, the overall status of the task, and the CCC and macOS version at the time of the event. There are additional columns available that are hidden by default (e.g. CCC version, Total Size, Settings); right-click on the table header row to choose which columns should be visible.

The color of the status indicator is defined as follows:

- Green: Task completed successfully
- Yellow: The task was completed, but errors occurred while transferring some files

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-  Red: An error occurred that prevented the task from completing
-  Gray: The task was canceled

The Settings column may present the following icons:

-  Rocket: The Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate> feature was applied during this event (or the task is scheduled When files are modified on the source <https://support.bombich.com/hc/articles/20686389397015#when_modified>)
-  EKG: The Backup Health Check <https://support.bombich.com/hc/articles/20686511433623#bhc> feature was applied during this event

Audit: Viewing details about the modifications made by the backup task

When enabled for a particular task, CCC will record detailed information about the transactions that occurred during the task, e.g. files copied, files updated, folders created or updated, files deleted or archived. Each transaction will indicate the size and modification date of the file at the time of the backup, and the action that was applied to the item. A status icon in the "" column indicates why the action was taken, e.g. a file may have been replaced because its size or modification date differed on the source and destination. You can hover your mouse over this icon for detailed information about the differences that were noted for that particular item.

Search tip: Searching for a folder name will reveal just the matching folder in the audit table. Add /* to the end of your search term to view the matching folder *and its content*.

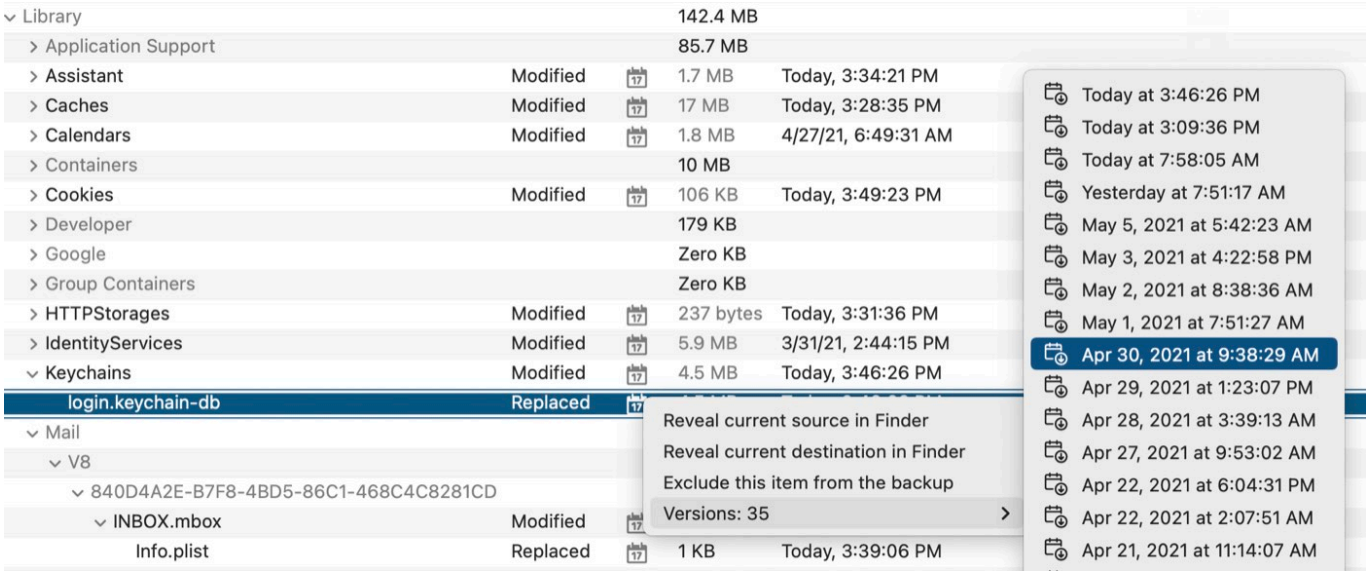
Actions applied to files and folders

- Created: (Files and Folders) This file or folder was created on the destination because it did not yet exist.
- Modified: (Folders only) The attributes of the folder were modified on the destination (e.g. creation date, permissions, owners).
- Replaced: (Files only) The file was replaced because the size, modification date, or checksum differed.
- Updated: (Files only) The file's content was not changed, but the attributes of the file were updated (e.g. creation date, permissions, owners).
- Cloned: (Files only) The file was not copied, rather it was created via the clonefile feature of the APFS filesystem.
- Deleted: The file or folder was deleted (note that if snapshot support is enabled on the destination, the item may still be retained by a snapshot).
- Archived: The file or folder was moved into the "_CCC SafetyNet" folder.
- Indexed: The file was not recopied, but CCC read the entire source file and calculated a checksum of this file for future reference.

Viewing the current item on the source or destination, viewing older versions

Right-click on a transaction to view a contextual menu of options specific to that item. If older versions of a file are available in a snapshot, those versions will be listed in the Versions sub menu. Note that these options will be disabled if your source and destination volumes are not mounted.

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CCC will prompt to remove a task's audit when you change the source or destination

Transactions stored within a task's audit are specific to the source and destination that were selected when the task ran. When you change the source or destination to a task, CCC will prompt you to either remove the current audit records or to create a new task. Removing the audit records won't affect any of the data on your source or destination, it only removes the record of changes that were made to the destination in the past. When you remove audit records, you'll no longer be able to see the transactions in the Task History window > Audit tab, and you won't be able to verify the integrity of files on the source or destination against the "last known state" <https://support.bombich.com/hc/articles/20686511433623#adhoc>.

If you no longer need a record of the changes made to the destination in the past, or if you've erased the destination, then we recommend that you remove the audit records.

If you're configuring a new source:destination pair, however, we recommend that you create a new task for that purpose. Ideally, you should retain a separate task for each source:destination pair that you have so you can avoid making constant changes to the source and destination configuration.

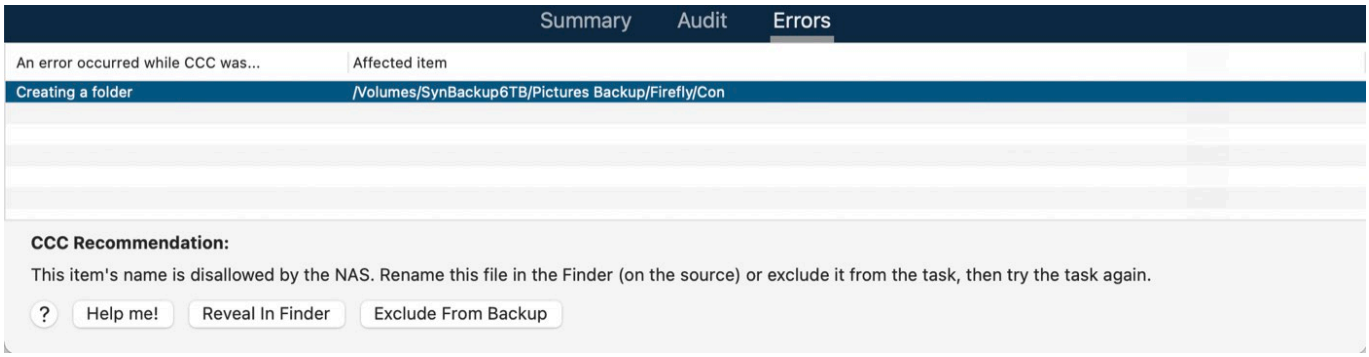
Related documentation

- Transaction privacy and disabling transaction collection <https://support.bombich.com/hc/articles/20686511433623#disable_transactions>

Errors

There are many hardware and filesystem problems that could affect your Mac's hard drives. Filesystem and media corruption are commonplace, and CCC delivers expert advice to you when errors occur. CCC's Task History window shows the results of all of your backup tasks, and details of any errors that occur. CCC enumerates these errors, analyzes them for common conditions, then explains the problem in simple terms with down-to-earth advice for fixing the problem.

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Exporting a list of affected files

If you would like to save a list of the affected files in the errors table, select the affected items (or press Command+A to **Select All**), then choose **Copy** from CCC's **Edit** menu (or Command+C) to copy the list of items to the clipboard. Please note that every error may not be the same. When you export a list of files, the per-file contextual information is not retained. Return to CCC's Task History window for the contextual information and advice specific to each file.

Getting help for common errors

When errors occur, CCC will categorize the error and offer troubleshooting advice. For some errors, CCC will offer helpful buttons at the bottom of the task history window that will, for example, take you to Disk Utility or reveal a corrupted file in the Finder. If the affected file is one that doesn't need to backed up, click the button to exclude the item from the backup task to avoid future errors on that file. Click on each error to see what CCC recommends to resolve the error. If you're stuck or overwhelmed, or if CCC's advice alone isn't helping you resolve the problem, click the "Help Me!" button to submit a summary of the problem to the Bombich Software Help Desk.

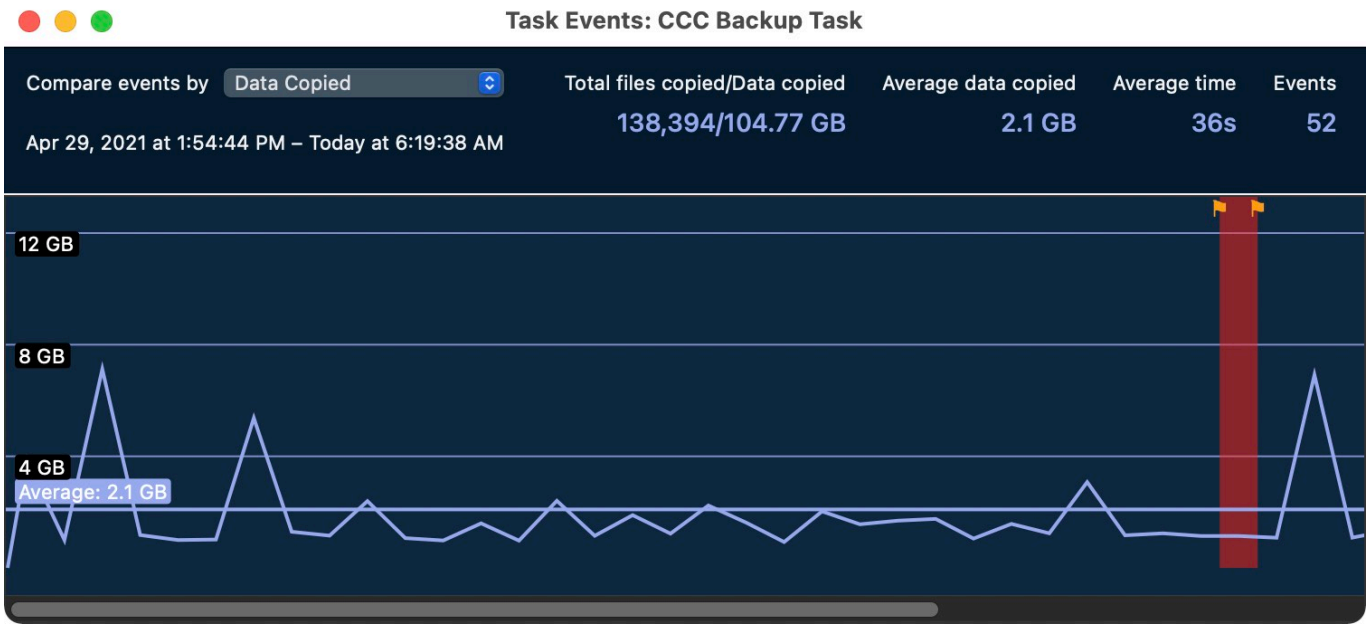
Related Documentation

- "Where can I find CCC's log file?" <https://support.bombich.com/hc/articles/20686443738135>

Task Trends Dashboard

To view task-specific statistics over time, right-click on a task event and choose **Show Task Trends Dashboard**. You can view the task trends based on elapsed time, total source data set size, the number of files copied, the amount of data copied, or the size of the largest file. Hover your mouse over the chart to see the details of each event. Click on an event to reveal that event in the Task History window.

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Can I remove events from CCC's Task History window?

To remove one or more task events from the history table, select the events, then right-click on the selection and choose **Remove** from the contextual menu. Removing task events from the Task History window has no effect on the backup, it only removes the event from CCC's Task History window, as well as any transactions stored in CCC's task history database. You must be logged in as an administrator user to delete task history events.

If you would like to clear all of CCC's task history, open the Task History window, then choose **Clear Task History...** from CCC's **Task** menu.

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Files that aren't on the source may be removed from the destination

CCC makes non-proprietary backups – when you configure a source and a destination to a CCC task, the objective is to have the same files on the source and destination, and in the same hierarchical arrangement. To achieve that objective, CCC will make exact copies of your source files on the destination, and CCC will also remove content from the destination that is not on the source.

The removal of content from the destination is important to consider when you select a destination volume. If you already have content on the destination that's unrelated to the source, that content will be deleted. If you are uncertain about the fate of files that you have on your destination volume, please click the Preview <https://support.bombich.com/hc/articles/20686447772183> button in CCC's toolbar.

Dedicate a volume to the backup task

We recommend that you dedicate a backup volume to each backup task. If you want to store other data on the backup disk (i.e. content that is unrelated to the source that you're backing up), store it on other volumes that are not specified as a CCC destination. You can add volumes to your backup disk in Disk Utility <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume>.

Retaining older versions of files and files that were deleted from the source

Snapshots retain older versions of your files, and files that were deleted from the source. When you select an APFS-formatted volume as the destination to your backup task, CCC enables snapshot support by default.

 The snapshot badge on CCC's Destination selector will indicate whether snapshot support is currently enabled for your destination. Click on the badge to manage snapshot retention settings, and to access the snapshots on your backup.

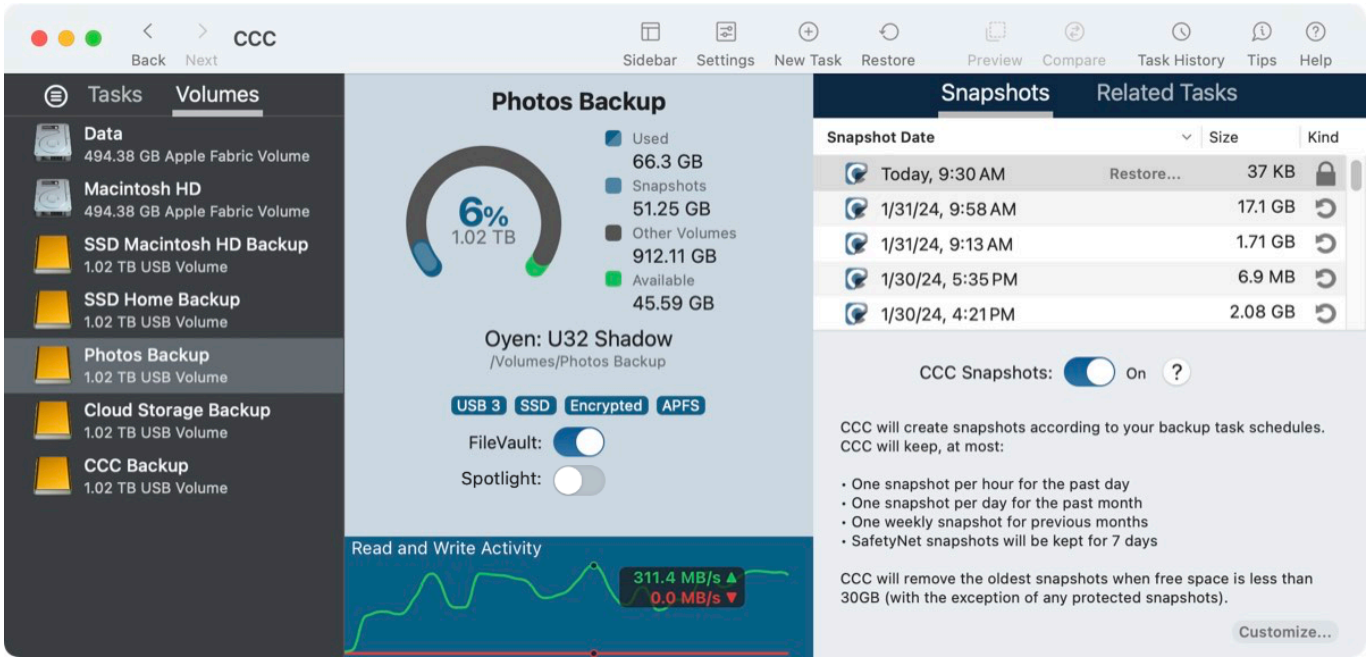
Related Documentation

- Preview: See what changes CCC will make to the destination <https://support.bombich.com/hc/articles/20686447772183>
- Adding volumes or partitions to a backup disk <https://support.bombich.com/hc/articles/20686485252759>
- Introduction to Snapshots <https://support.bombich.com/hc/articles/20686443871383>
- Protecting data that is already on your destination volume: The CCC SafetyNet <https://support.bombich.com/hc/articles/20686475366935>

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The Disk Center

CCC's Disk Center shows general volume information for each locally-attached volume mounted on your Mac, a list of snapshots and snapshot-related settings for APFS volumes, as well as read and write rate and error statistics for those volumes. Select a volume in CCC's sidebar (click **Sidebar** in the toolbar if it is hidden) to view that volume in the Disk Center. CCC also shows any backup tasks that are associated with the selected volume.



Basic volume information

The Disk Center table in the sidebar displays a list of locally-attached, mounted volumes. Click on one of these volumes to display information such as the volume name, filesystem, capacity, disk usage, and a list of snapshots on the volume, as applicable.

FileVault Encryption

Product Tour: Learn how to enable encryption on your backup volume

If you would like to **enable** FileVault on an APFS-formatted volume, simply flip the FileVault switch to the On position. CCC will prompt for a passphrase, then will enable encryption on that volume.

If you would like to **disable** FileVault on a volume that is already encrypted, simply flip the FileVault switch to the Off position. CCC will prompt for a passphrase, then will disable encryption on that volume.

Full disk encryption is limited to APFS volumes, and is not available for volumes that are (or were) members of a macOS startup volume group (i.e. volumes that have a "Data" or "System" role). If you would like to enable or disable FileVault on a volume that contains an installation of macOS, boot your Mac from that volume and change the FileVault state in System Settings.

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Both encryption and decryption are *conversion* processes. These processes can take several hours, and the conversion cannot be stopped or cancelled once it has started. The conversion process will proceed in the background without your attention as long as your Mac remains on AC power (conversion is suspended while the Mac is running on battery power). CCC will indicate progress if encryption or decryption conversion is underway. Note that APFS places a moratorium on snapshot-related activity while any conversion activity is underway. If you run your backup tasks while a volume is encrypting or decrypting, errors may be reported related to creating or removing snapshots. These are harmless, and will resolve themselves when the conversion is complete.

Can I change the password used to unlock the volume?

Yes, you can change the password in Disk Utility:

1. Choose "Disk Utility" from CCC's Utilities menu
2. Select the applicable volume in Disk Utility's sidebar
3. Choose "Change Password..." from the File menu

After you change the password, click on the volume in CCC's Source or Destination selector and choose the option to unmount that volume, then repeat to remount the volume. CCC will prompt you to update the password that is stored in the System keychain (i.e. that CCC uses to unlock the volume during an automated backup task).

Spotlight indexing

 Product Tour: Learn how to disable Spotlight indexing on your backup volume

Spotlight can be a very handy feature on most volumes. On a backup volume, however, Spotlight indexing may cause bandwidth contention that affects performance, or worse, prevent the volume from being unmounted. If you find that you're unable to unmount a CCC destination, select that volume in CCC's sidebar and toggle off the Spotlight switch to disable Spotlight indexing. If you want to re-enable Spotlight indexing later, simply flip the switch back on to have Spotlight reindex the volume.

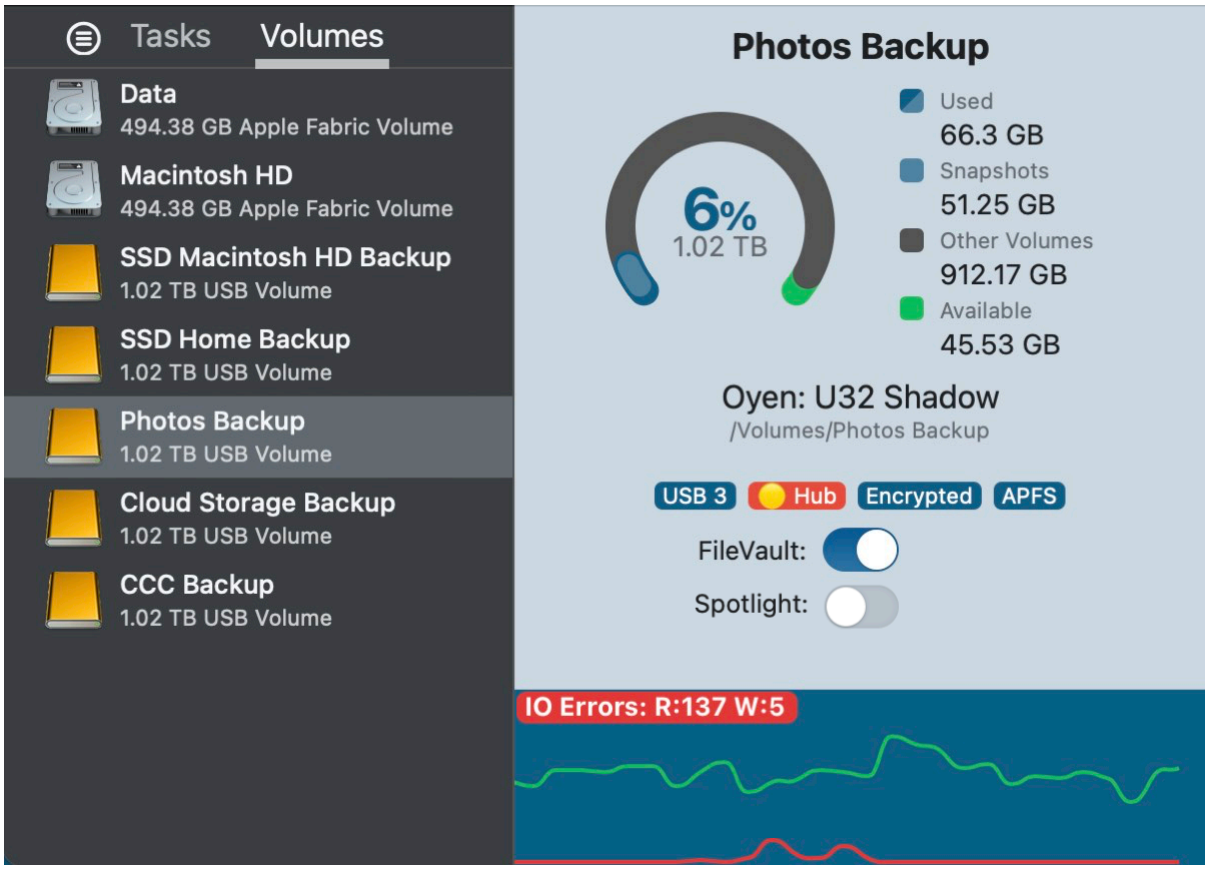
Drive Statistics

A chart at the bottom of the window shows current read and write activity for the selected volume. Disk activity is collected by macOS at the hardware interface, so data for multiple volumes residing on the same disk will be identical.

Disk error statistics

CCC will report read and write error statistics when they are present:

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Read and write errors indicate the number of read or write attempts that have failed since the disk was attached to your Mac (since startup for internal disks). Read errors often occur when files that are residing on damaged sectors cannot be automatically moved by the disk's firmware. Such files would also be unreadable by CCC, and CCC will report the failure to read these files at the end of the backup task. Read errors are not necessarily indicative of a failing hard drive. This number will rise steadily if multiple attempts are made to read the same corrupted file, for example. Read errors are, however, generally associated with physical hardware problems that will reduce the performance of a backup task. In some cases, macOS does not handle read failures well, and attempts to access the disk can lead to system-wide stalls.

Write errors are more serious. If you have a disk that is reporting write failures, there is either a hardware configuration problem with the device (e.g. bad cable, port, enclosure or USB hub), or the disk is failing.

Snapshot Management

If you select an APFS-formatted volume, CCC will display a list of volume snapshots and snapshot retention policy settings for that volume. Learn more information about Snapshot Management here <https://support.bombich.com/hc/articles/20686443871383>.

Disk Utility and [other third-party utility] doesn't report any problems with this disk, why does CCC?

Read and write errors statistics are stored by the lower-level storage drivers, they are not specific to a volume. Usually when a read error occurs, the hard drive firmware attempts to move data on the affected sector to another sector of the disk, then spare out the damaged sector. When that is successful, it's possible for the storage driver statistics to be stale. **These statistics will be reset when the affected disk is physically detached from your Mac, or upon reboot.**

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Related Documentation

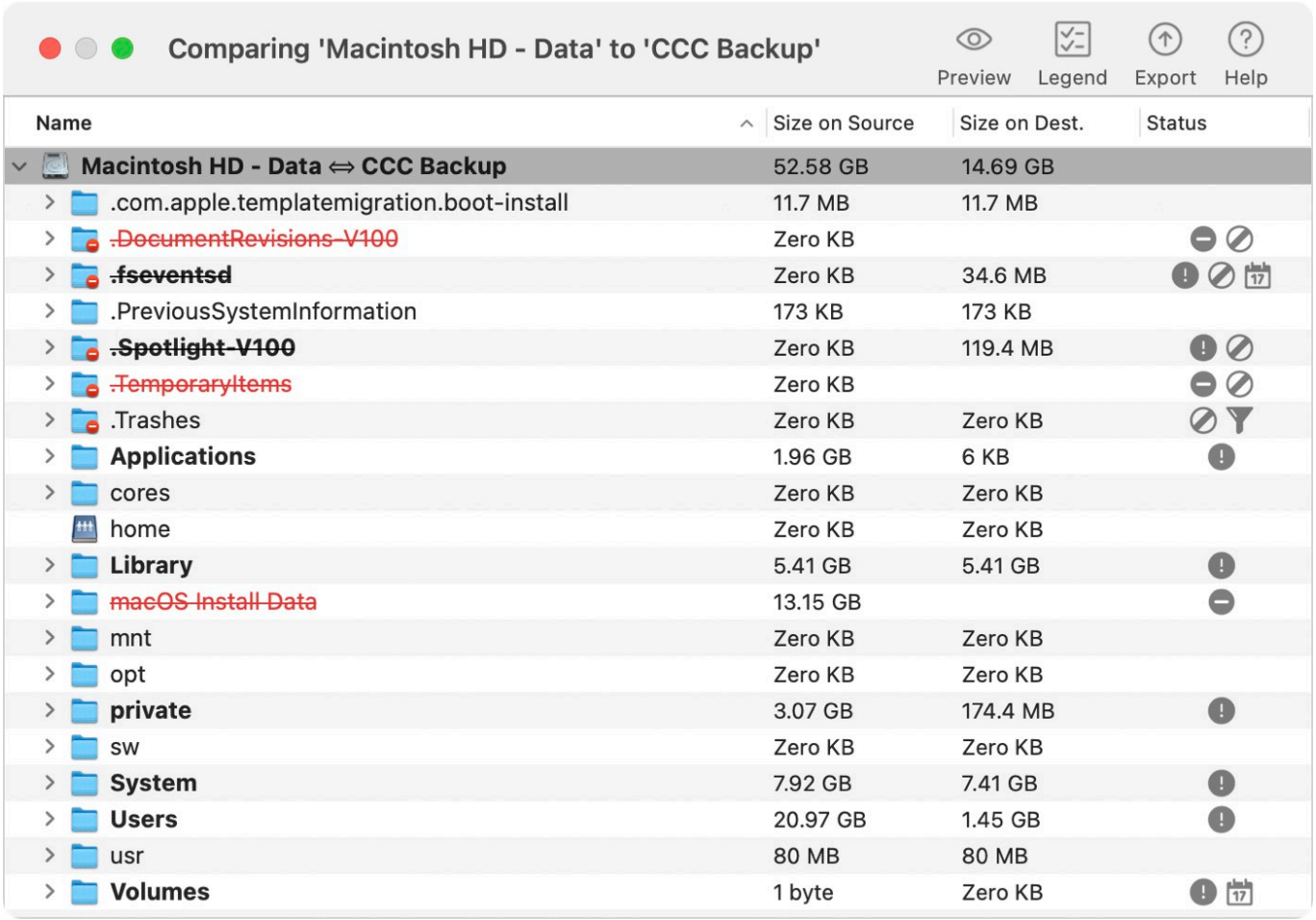
- Identifying and Troubleshooting Hardware-Related Problems <https://support.bombich.com/hc/articles/20686478629911>
- Troubleshooting "Media errors" <https://support.bombich.com/hc/articles/20686478629911#io_errors>

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Comparing the source and destination

Product Tour: Learn how to get a visual comparison of the source and destination

CCC's Compare window was designed to highlight any substantive folder size differences between the source and destination. When you click the Compare button in CCC's toolbar, CCC will enumerate the current contents of the source and destination, then present a report of the size differences of each folder.



Name	Size on Source	Size on Dest.	Status
Macintosh HD - Data ⇔ CCC Backup	52.58 GB	14.69 GB	
.com.apple.templatemigration.boot-install	11.7 MB	11.7 MB	
~~.DocumentRevisions-V100~~	Zero KB		
~~**.fseventsd**~~	Zero KB	34.6 MB	
.PreviousSystemInformation	173 KB	173 KB	
~~**.Spotlight-V100**~~	Zero KB	119.4 MB	
~~.TemporaryItems~~	Zero KB		
.Trashes	Zero KB	Zero KB	
Applications	1.96 GB	6 KB	
cores	Zero KB	Zero KB	
home	Zero KB	Zero KB	
Library	5.41 GB	5.41 GB	
~~macOS Install Data~~	13.15 GB		
mnt	Zero KB	Zero KB	
opt	Zero KB	Zero KB	
private	3.07 GB	174.4 MB	
sw	Zero KB	Zero KB	
System	7.92 GB	7.41 GB	
Users	20.97 GB	1.45 GB	
usr	80 MB	80 MB	
Volumes	1 byte	Zero KB	

The comparison is not a byte-by-byte verification of files

The Comparison feature is not designed to perform an in-depth, byte-by-byte comparison of files on the source and destination, rather it's designed to be a simpler and more approachable analysis of size-based differences. We're specifically aiming to address the very common question, "Why is the size of the source and destination different?" If you would like to do a checksum-based verification of the files that were copied by your CCC backup task, click on the Source or Destination selector and choose the option to verify your files.

- Learn more: How to verify a backup <https://support.bombich.com/hc/articles/20686511433623>

The comparison is not a preview of changes that CCC will make

Results in the Comparison window should not be used to determine what changes CCC will make to the destination. If you would like to see a preview of the changes CCC will make to the destination, click the **Preview** button in the toolbar instead.

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- Learn more: Preview: See what changes CCC will make to the destination <https://support.bombich.com/hc/articles/20686447772183>

The comparison shows some differences. What do these mean?

The comparison window shows the status of items on the source vs. the destination:

-  This item is only present on the source
-  This item is only present on the destination
-  This item is different on the source and destination
-  This item was modified since the task last ran
-  This item is wholly or partially excluded or protected by a CCC task filter
-  This folder could not be enumerated due to access restrictions

You can hover your mouse over the icons in the status menu to produce a tooltip that describes the status.

Common explanations for differences between the source and destination

If you're seeing unexpected differences between the source and destination, be sure to run your backup task to verify that CCC has recently attempted to update the destination.

Your startup disk is constantly being modified

If you're comparing your startup disk to its backup, you should **always** expect to see differences highlighted in the Compare window. This is not an indication that something is wrong, it's normal. macOS is constantly updating various cache and log files, and you'll see those differences even if you immediately compare the source and destination after running the backup task.

CCC doesn't copy virtual memory, Trash and other volume-specific system items

The disk usage on your startup disk does not reflect the amount of data that needs to be backed up; disk usage on the destination should be lower than disk usage on the source after making an initial backup of your startup disk. Special filesystem devices (e.g. filesystem snapshots) and some macOS service data either cannot or should not be copied to another volume. CCC automatically excludes these items to avoid compatibility problems and to avoid unnecessary disk usage. That list of exclusions is documented here: Some files and folders are automatically excluded from a backup task <https://support.bombich.com/hc/articles/20686463321751>.

The largest and most notable excluded item is the /private/var/vm/sleepimage file. The sleepimage file contains the live state of your Mac's RAM, so it will be as large as the amount of RAM that you have installed. This file is potentially very large, changes constantly and it gets recreated on startup, so CCC excludes this file from every backup task.

CCC also excludes the contents of the Trash. If you prefer that CCC copy the contents of the Finder Trash, you can enable that in the Task Filter.

- Learn more: Finder's Trash is excluded by default

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<https://support.bombich.com/hc/articles/20686509510167#trash>

Protect root-level items on the destination

When this advanced setting is enabled, CCC will protect items that are unique to the root level of the destination. If the Comparison window shows files and folders that only exist at the root of the destination, you can disable the "Protect root-level items on the destination" setting to have CCC remove those items the next time you run the backup task. Click **Advanced Settings** at the bottom of CCC's window, then select the **File Copying Settings** tab to find this setting.

- Learn more: Protect root-level items on the destination <https://support.bombich.com/hc/articles/20686481162647#protect>

Excluding content from the backup task does not cause it to be deleted from the destination

When you exclude an item from the CCC backup task, this tells CCC, "**Do not copy that item**". That does not, however, indicate that CCC should **delete** that item from the destination, e.g. if it had been copied there by a previous backup task. You can change this behavior by checking the box next to **Remove excluded files** in the sidebar of the Task Filter window.

- Learn more: Excluded files are not deleted from the destination <https://support.bombich.com/hc/articles/20686509510167#delete_excluded>

The sum of folder sizes often does not agree with total disk usage

Disk usage is not a simple matter of adding the size of every file on a volume. Special filesystem devices (e.g. hard links) have always complicated this math, but more recently Apple has introduced more special filesystem devices that complicate this even further. The cloning feature in Apple's APFS filesystem can lead to a scenario where it appears that you have more data on the disk than it can possibly contain, and the filesystem snapshots feature can lead to scenarios where disk usage is higher than the total size of the files on that volume. APFS also supports "sparse" files, which consume less space on disk than their file size would suggest. CCC can preserve sparse files between APFS volumes, but HFS+ does not support sparse files, so these files consume more space on an HFS+ formatted backup disk. See these sections of CCC's documentation for additional details on working with these challenges:

- Why doesn't the disk usage on my backup disk match the disk usage on the source disk? <https://support.bombich.com/hc/articles/20686448760599#math>
- ▶ Finder does not accurately represent the true disk usage of your files <https://youtu.be/KggyuL8mED0>
- ▶ Understanding disk usage when using snapshots <https://www.youtube.com/watch?v=4wqAC4YXiaY>
- Snapshots and space concerns; Deleting snapshots <https://support.bombich.com/hc/articles/21385447480983>
- Toggling snapshot support and setting a Snapshot Retention Policy <https://support.bombich.com/hc/articles/21384373407127>

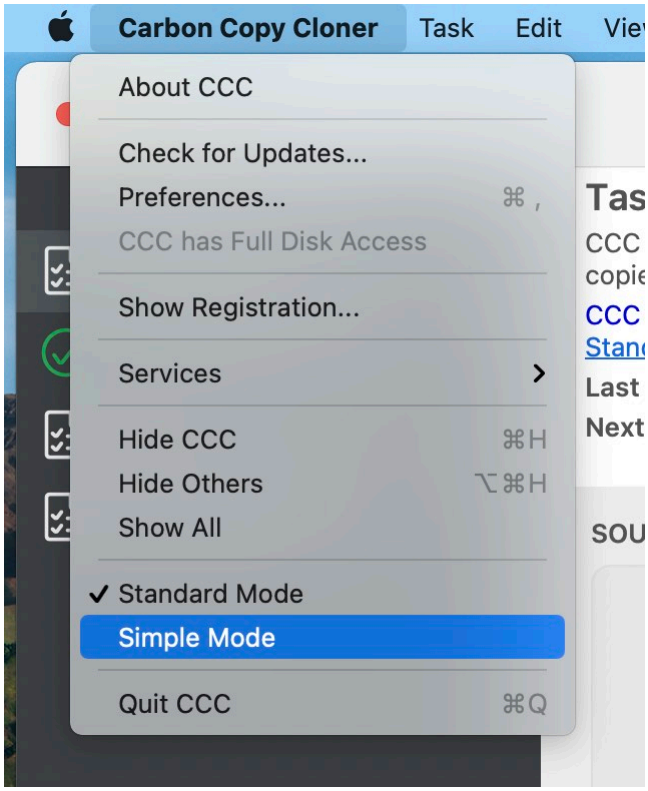
Exporting the differences from a comparison report

Click the Export button in the Comparison window toolbar to export a tab-delimited report of the size differences. This report will include only the differences noted in the window.

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Simple Mode

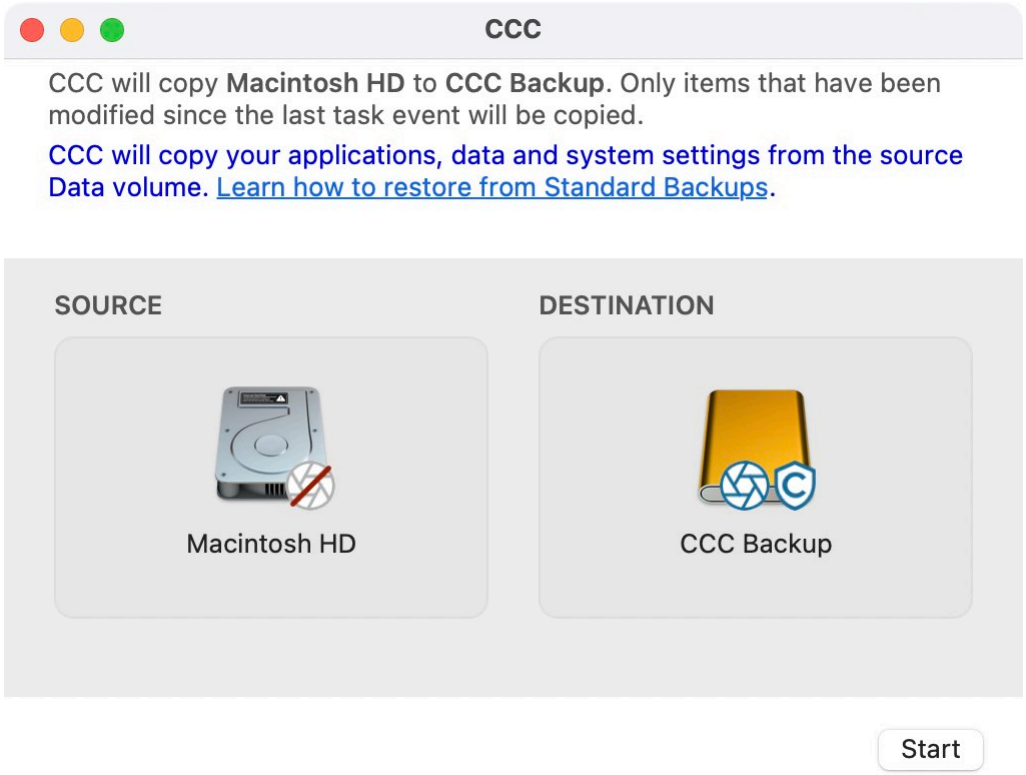
Simple Mode significantly reduces the number of user interface elements — the sidebar, toolbar, scheduling selector, and advanced settings are all suppressed, leaving the user with only three primary controls: Source, Destination, Start button. For users that desire a basic ad hoc copy from one volume to another and do not want to maintain scheduled tasks, this simplified interface is the perfect solution. To use Simple Mode, choose **Simple Mode** from the Carbon Copy Cloner menu.



Configuring a backup task in Simple Mode

1. Choose a source
2. Choose a destination
3. Click the Start button

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Can I choose a network volume? How do I schedule this backup? Can I exclude items from the backup task?

Simple mode aims to simplify **basic** backup tasks. For additional options, choose **Standard Mode** from the Carbon Copy Cloner menu to switch back to standard mode.

Additionally, CCC must remain open while a task is running — if you quit CCC, a running task will be stopped (after a confirmation prompt).

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CCC SafetyNet: Temporary protection for destination content

Sometimes people see lots of available space on a big 8TB disk and can't resist using it for "overflow" items — large video files, archives of old stuff. "*Hey, there's room for a CCC backup here too.*" CCC is designed to make non-proprietary, 1:1 copies. When you select a destination in CCC, CCC intends to make that destination **identical** to the source, and will do so by removing anything from the destination that isn't on the source.

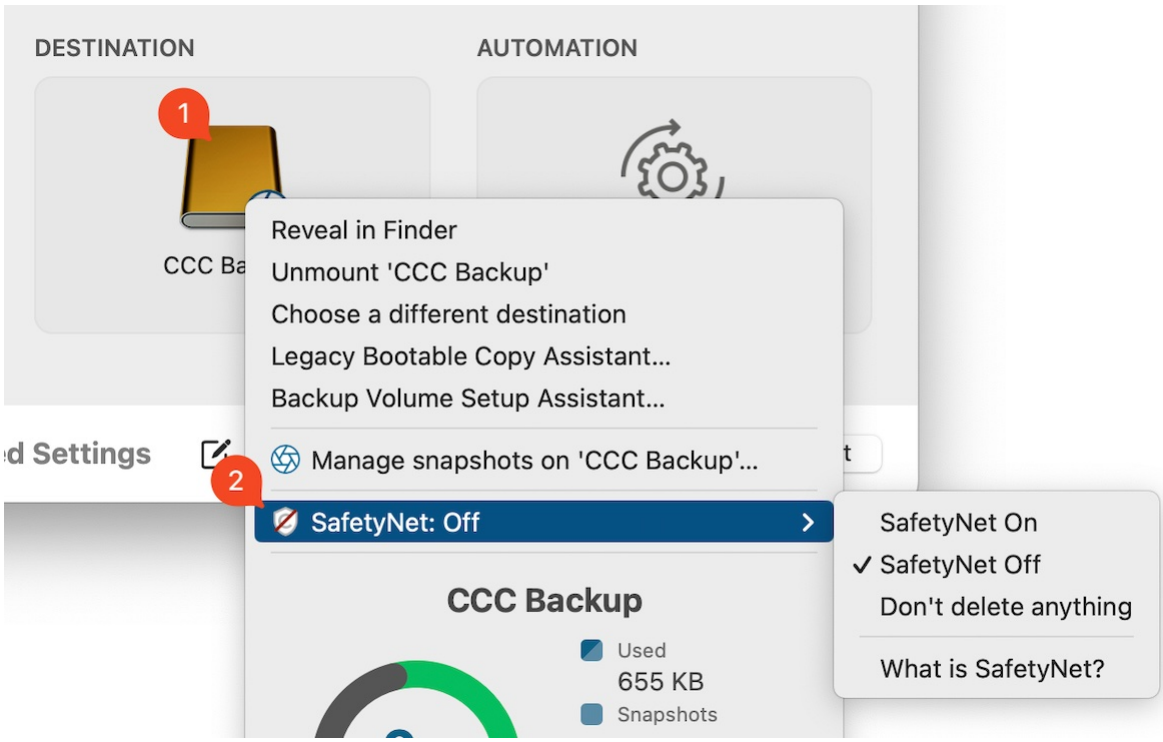
SafetyNet is a **safety mechanism** that is designed to avoid immediate loss of data if you were to accidentally select a destination to a CCC backup task that is not intended to be managed exclusively by CCC. When SafetyNet is enabled, CCC will temporarily protect files and folders on the destination that aren't on the source by retaining these items in the SafetyNet.

With the introduction of the Backup Volume Setup Assistant <https://support.bombich.com/hc/articles/20686487352599#bvsa> in CCC 7 which asserts destination exclusivity, the SafetyNet feature is largely obsolete. SafetyNet remains applicable only in cases where the Backup Volume Setup Assistant cannot be presented (e.g. if it was disabled by the user, or when you select a folder as the destination). When you select a destination and the Backup Volume Setup Assistant is not presented, SafetyNet will be enabled by default if the selected destination volume or folder is not empty.

***Best Practice**:* SafetyNet allows content to accumulate on the destination in a manner that is counter-productive to making backups. We recommend that you create a volume on your destination device for each source <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume> that you want to back up, and use that volume exclusively with CCC. When this exclusivity is defined, disable the SafetyNet feature – click on the Destination selector and choose "SafetyNet Off" from the SafetyNet submenu.

***Versioning**:* SafetyNet is not designed to provide backup versioning, and is poorly-suited to that functionality. If you want to retain access to older versions of your files, enable snapshot support on your APFS-formatted backup volume <https://support.bombich.com/hc/articles/20686443871383>, or enable snapshot support on your source volume <https://support.bombich.com/hc/articles/21385602599191#source_snapshots> if you're using a non-APFS destination.

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SafetyNet On

When CCC encounters an item on the destination that should be replaced or removed (i.e. because the item is different, or not present on the source), that item will be temporarily retained within the SafetyNet.

SafetyNet Off

When SafetyNet is off, any items on the destination that aren't on the source will be immediately deleted when your backup task runs (in other words, the destination will be treated like an ordinary backup). Bear in mind that this does not prevent you from accessing older versions of files in your backup when you have CCC Snapshot support enabled on your destination.

Don't delete anything [Archival backup]

With this setting, CCC won't delete anything from the destination. If a file exists on the destination and not on the source, that file will be left in place on the destination. If CCC is updating a file on the destination, the older version of the file will be retained in the SafetyNet.

This setting is useful for archiving when your source has well-organized content. For example, if you store photos by project name, and you like to remove those projects from the source when the project is complete, you can use the **Don't delete anything** SafetyNet setting to retain those archived projects on the destination. We recommend making additional backups of archives – when the content is removed from the source and the only remaining copy is on the destination, that archived content lacks a hardware-redundant backup.

One cautionary note about using this setting: Because older files will accumulate on the destination, the archive size may exceed the capacity of the original source, making restore activity logistically difficult. Also, if your files are not well organized, you may find future restore activity to be quite tedious because everything you've deleted from the source will still be on the archive.

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Where do files go when they are retained in "the SafetyNet"?

Snapshots enabled on an APFS destination

If you selected an APFS-formatted destination volume and CCC snapshot support is enabled on that volume, then CCC's SafetyNet feature is implemented via snapshots. At the beginning of the backup task, CCC creates a **SafetyNet Snapshot** on the destination. This snapshot captures the state of the destination volume before CCC makes any changes to it. When CCC proceeds to update the destination, it deletes and replaces files immediately as applicable. Because the files are retained by the SafetyNet Snapshot, those files are not permanently deleted until the snapshot is deleted. CCC deletes SafetyNet snapshots that are older than one week, or sooner if space is required for new backups.

SafetyNet snapshots are not part of backup versioning. Backup Snapshots store your backup history independently of SafetyNet: SafetyNet snapshots vs. Backup snapshots <https://support.bombich.com/hc/en-us/articles/21384579432343>

Legacy SafetyNet folder

If you're backing up to a non-APFS volume, or if you have snapshot support disabled for an APFS destination, then CCC's SafetyNet is implemented as a "_CCC SafetyNet" folder on the destination. Items that would otherwise be deleted immediately are moved into time-stamped "archives" within this SafetyNet folder. These timestamps are purely for organizational purposes, do not interpret these as an indication that this feature supports versioning.

Automated pruning of the legacy SafetyNet folder

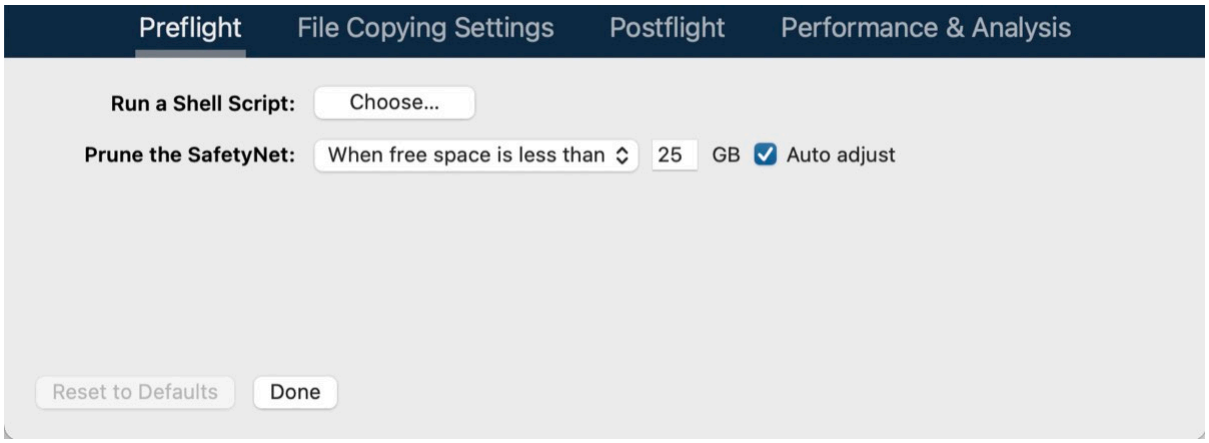
This section is not relevant when snapshot support is enabled on an APFS-formatted destination volume. See Snapshot thinning and pruning <https://support.bombich.com/hc/articles/21384373407127> *for more information on SafetyNet Snapshot retention.*

If left unmanaged, the SafetyNet folder would eventually consume all free space on your destination volume. To prevent that from happening, CCC prunes the contents of the SafetyNet folder at the beginning of each task if free space is less than 25GB. This limit is automatically adjusted if a 25GB limit is too low for a particular source and destination.

SafetyNet pruning occurs at the beginning of a backup task, so CCC will never delete an item that was archived in the current backup task. Additionally, pruning is always limited to the contents of the _CCC SafetyNet folder that is at the root of the destination. CCC's pruner won't delete the current versions of files on your destination, nor anything outside of the scope of the CCC backup task. Lastly, archive pruning works at a macro level. If any portion of an archive exceeds a pruning threshold, the entire archive (e.g. the time-stamped folder) will be pruned.

You can customize the pruning settings by clicking the **Advanced Settings** button at the bottom of CCC's main window.

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Prune archives in the SafetyNet when free space is less than [xx] GB

If your destination volume has less free space than the limit that you have specified, CCC will prune the oldest archives until the specified amount of free space has been achieved.

Auto Adjustment of the SafetyNet Free Space pruning limit

When the **Auto adjust** option is enabled (and it's enabled by default), CCC will automatically increase the free space pruning limit if your destination runs out of free space during the backup task. For example, if your pruning limit is set to the default of 25GB, and you have 25GB of free space at the beginning of the backup task, no pruning will be done at the beginning of the task. If that task proceeds to copy more than 25GB of data, however, the destination will become full. CCC will then increase the pruning limit by the amount of additional space that is required to complete the backup task. For example, if CCC needed to copy an additional 15GB of data when the destination became full, the pruning limit would be increased to 40GB.

Prune archives in the SafetyNet when they are older than [xx] days

CCC will prune archives that were created more than "xx" days ago.

Prune archives in the SafetyNet when they are larger than [xx] GB

Starting with the most recent archive, CCC will determine the amount of disk space that each archive consumes. When the cumulative total exceeds your specified limit, CCC will prune the remaining, older archives. If the newest archive is larger than the limit that you have specified, that archive will be completely removed. Note that this pruning method could take a very, very long time on NAS storage, because NAS enumeration is inherently slow.

Never prune archives in the SafetyNet

CCC will not automatically prune the contents of the "_CCC SafetyNet" folder at the root of the destination. SafetyNet content may eventually consume all of the free space on the destination, so you should periodically delete older archive folders to maintain enough free space for future backups. You may delete the contents of the SafetyNet folder without harm to the rest of your backup – SafetyNet is not part of the backup strategy.

Related Documentation

- ▶ Undoing a backup that was made to the wrong disk <https://youtu.be/tj8Hl78QmIg>
- Restoring files to your destination from a SafetyNet Snapshot <https://support.bombich.com/hc/articles/20686469175575#restore_safetynet_snapshot>

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- Frequently asked questions about the CCC SafetyNet <https://support.bombich.com/hc/articles/20686443321879>
- SafetyNet snapshots vs. Backup snapshots <https://support.bombich.com/hc/articles/21384579432343>
- Add dedicated volumes to an existing APFS-formatted backup disk <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume>

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Creating legacy bootable copies of macOS

In the past, a "bootable backup" was an indispensable troubleshooting device that even novice users could rely upon in case their production startup disk failed. On modern macOS and the Apple Silicon platform, External Boot brings more technical complexity to the table, and requires some compromises to a backup strategy that make it less desirable for the average user.

Additionally, copying Apple's system is now an Apple-proprietary endeavor; we support the mechanics of creating a bootable copy of the system, but our ability to troubleshoot bootability issues is limited. For the average user's default backup strategy, we recommend proceeding with a "Standard Backup". You can restore all of your documents, applications, and settings from a standard CCC backup <https://support.bombich.com/hc/articles/20686469175575#install_then_migrate> without the extra effort involved in establishing and maintaining a bootable device.

There are a handful of scenarios where it's handy to have a bootable copy of the system:

- You're migrating to a replacement storage device in an older Intel Mac
- You want to test a new OS version without affecting your production startup disk
- You have extreme uptime requirements, e.g. if anything is wrong with your Mac, you must get it running again within minutes, not hours

When you select a destination to your backup task, CCC's Backup Volume Setup Assistant will offer an option to create a bootable copy of the source.

Making a copy of the startup disk with Apple Software Restore

1. Choose your startup disk as the source.
2. Select a destination volume on a USB or Thunderbolt device
3. In the Backup Volume Setup Assistant, choose the option to make a **Bootable copy using Apple Software Restore.**
4. Click the **Allow CCC to erase '(destination)'** button.
5. Start the task.

Authorize users on the copy after the task completes

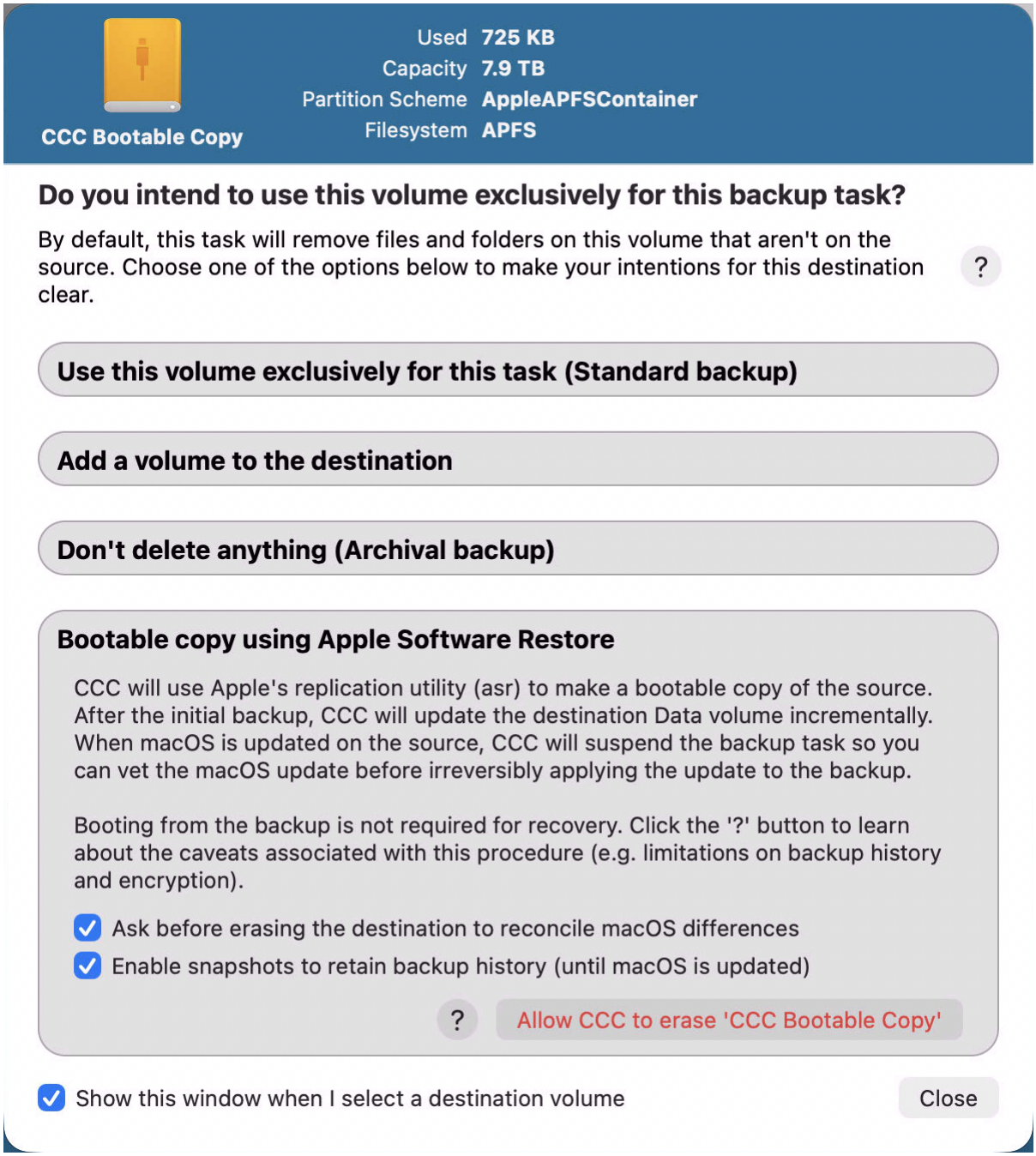
macOS startup volumes on Apple Silicon have a concept of "volume ownership". This ownership is not something that can be copied, rather it must be proactively granted and stored in the "Secure Enclave" of the Mac. Only macOS can facilitate this procedure. If you skip this step, you won't be able to boot your Mac from the copied volume (macOS Recovery would prompt you to reinstall macOS onto the copied volume).

1. Open System Settings > General > Startup Disk
2. Set the CCC-copied volume as the startup disk
3. Click the Restart button (this is required to prompt macOS to authorize users on that volume)
4. Authorize at least one user for the copied volume

Once the authorization has completed and the system has rebooted, reset the startup disk to your original

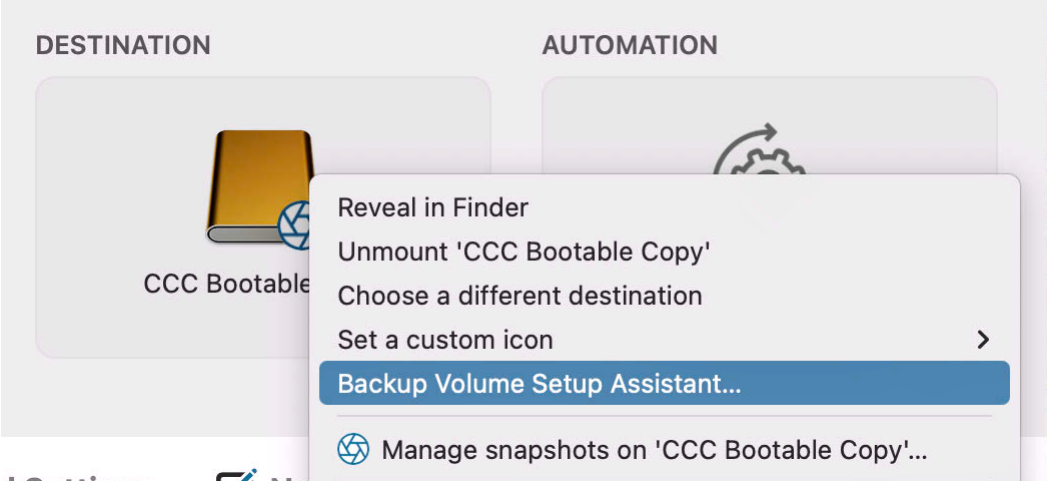
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source and reboot.



The Backup Volume Setup Assistant is presented automatically when you select a destination volume. To present it again for a volume that is already selected, click on the Destination selector and choose **Backup Volume Setup Assistant...**.

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Things to consider before relying on an external macOS boot device

Supportability

The bootable-cloning procedure relies on Apple's proprietary APFS replication utility, which is outside of our developmental control. We welcome feedback <https://bombich.com/software/get_help> on this functionality, but we may not be able to offer in-depth troubleshooting assistance for the bootability of the destination device beyond the suggestions offered in our External Boot Troubleshooting <https://support.bombich.com/hc/articles/20686469004567> kbase article. Don't let that stop you from asking for help; we'll make a valiant effort to get your backups working however you choose to approach them.

Additional logistics for backup encryption

CCC can trivially enable encryption on a Standard Backup. For a bootable backup volume, however, FileVault must be enabled in System Settings while your Mac is booted from the backup volume. The initial backup is established without encryption, and you must re-enable FileVault (by again booting from the backup) any time the backup is erased and recloned (i.e. whenever the OS is updated on the source).

Limits on backup versioning and auditing

As long as the source and destination OS versions are identical, CCC can retain snapshots on the destination <https://support.bombich.com/hc/articles/20686443871383-Introduction-to-Snapshots>, update the backup incrementally, and maintain a record of changes <https://support.bombich.com/hc/articles/20686456355095#audit> that CCC makes to the destination to keep it up to date (i.e. answering the question, "What files were modified on my source between backup events?"). Whenever the OS is updated on the source, however, the destination must be completely erased and recloned with Apple's replication utility to update the OS on the destination. When the destination is erased, all backup versions are erased as well, and the task audit associated with the task will be reset. This limits your ability to restore older versions of files, and your ability to view past task event audits.

Reliability when the internal storage fails

Solid state media often fails to a read-only condition, which may still support External Boot. An external bootable device will not serve as a rescue disk, however, if an Apple Silicon Mac's internal storage fails completely <https://bombich.com/blog/2021/05/19/beyond-bootable-backups-adapting-recovery-strategies-evolving-platfor

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m>.

Third-party kernel-space drivers aren't loaded during External Boot

Software that depends on kernel-space drivers may not work when an Apple Silicon Mac is booted from external storage. Third-party kernel extensions and kernel-space drivers will only be loaded when an Apple Silicon Mac is booted from its internal storage.

Frequently Asked Questions

When the task started running, the destination was renamed to the same as the source. And what's this "ASRDataVolume" volume?

Highly perceptive people may notice that the name of the destination volume changes as Apple's volume replicator goes to work. An additional volume may appear in CCC's sidebar as well. This is normal. These volumes will be aggregated into a "volume group" and presented as a single volume, and CCC will rename the destination to its original name when the replication is complete.

If Apple's APFS replication utility fails and you see an ASRDataVolume or ASRNewVolume persisting, then you may delete those vestigial volumes in Disk Utility. Simply select the volume, then click the "-" button in the toolbar.

Do I have to erase the destination to make a bootable copy of the system?

Yes. The macOS system volume can **only** be copied by Apple's ASR utility, and that utility only works by erasing the destination. You must dedicate a volume to your bootable copy of the system.

Can I use the destination device for storing other data as well?

On a separate, dedicated volume, yes. We recommend that you add an APFS volume to the destination APFS container and use that new volume for your other content. As long as the system copy and the other content are stored on separate volumes, these can coexist peacefully on the same physical device. Likewise, you may add a partition to your destination disk if the destination is not APFS formatted. For example, if you have an external hard drive that already has content on an HFS+ formatted volume, you can add a partition to the disk and use the new partition for the copy of the system.

Related documentation

- Adding a volume or partition to the destination <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume>

Can I exclude some content when making a bootable copy of the system?

No. The macOS system volume can **only** be copied by Apple's ASR utility, and that utility can only make a complete, byte-for-byte exact copy of the startup disk. If you must exclude content from the initial copy, then we recommend that you proceed with a Standard Backup.

I already have other volumes on my backup disk. Will those be erased?

No, only the selected destination *volume* will be erased when you proceed with the "Allow CCC to erase {destination}" option. Other volumes on the same physical device will be unaffected. Regardless, we never recommend that you target a disk that has data on it that is not backed up elsewhere. If those other volumes

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are not yet backed up, then back up that data before proceeding.

I added a volume, but I don't want the extra volume after all. Can I delete it?

Yes:

1. Click **Volumes** in CCC's sidebar
2. Select the volume you would like to delete in CCC's sidebar
3. Right-click on the selected volume and choose the option to delete that volume

Can I make the system copy on an encrypted volume?

You may select an encrypted volume as the destination, but the volume will be erased, and will not be encrypted when the task completes. Apple's APFS replication utility will not preemptively enable FileVault on the destination volume. To enable FileVault on the destination, you can boot from the system copy and enable FileVault in System Settings > Privacy & Security > FileVault.

Related documentation

- Troubleshooting APFS Replication <https://support.bombich.com/hc/articles/20686435861015>
- Working with FileVault Encryption <https://support.bombich.com/hc/articles/20686438012951#encrypt>
- External Boot Troubleshooting <https://support.bombich.com/hc/articles/20686469004567>

You can install macOS onto a "Standard Backup" to make it bootable

We recommend using the **Bootable copy using Apple Software Restore** option any time you have an **immediate** need to create a bootable copy of your startup disk. However, if some time in the future you find a need to boot from an external device, and you have an existing Standard Backup *on a non-encrypted APFS volume* that you would like to make bootable, you can install macOS onto that volume:

1. Download and open the macOS Installer: [Ventura <https://apps.apple.com/us/app/macos-ventura/id1638787999?mt=12>] [Sonoma <https://apps.apple.com/us/app/macos-sonoma/id6450717509?mt=12>] [Sequoia <https://apps.apple.com/us/app/macos-sequoia/id6596773750?mt=12>]
2. When prompted to select a disk, click the **Show All Disks…** button and select your backup disk
3. Proceed to install macOS onto your backup disk

Note that the macOS Installer may remove any snapshots on the backup volume, thus revoking any opportunities to restore older versions of your files.

Troubleshooting tip: Some users have discovered that macOS will stall when starting up from the backup disk. If you encounter this problem, try booting in Safe Boot mode (Intel Macs: hold down the Shift key on startup, Apple Silicon Macs: hold down the Power button on startup, then press the Shift key while selecting the startup volume) to disable the loading of third-party storage drivers. If applicable, see this Kbase article to see how to uninstall incompatible third-party storage drivers <https://support.bombich.com/hc/articles/20686428851607>.

Please note, however, that our recommended procedure for restoring your startup disk from a CCC backup is to install macOS onto a freshly-erased volume, then use Migration Assistant to migrate data from the CCC backup. A bootable volume is not required for this procedure.

Using Migration Assistant to restore your startup disk from a CCC backup <https://support.bombich.com/hc/articles/20686469175575#install_then_migrate>

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Common Scenarios and Best Practices

- I want to migrate data to a new Mac
- I want to back up my data to network attached storage (NAS)
- I want to back up multiple Macs or source volumes to the same hard drive
- Can I run a backup while I'm using my computer? If I have open files, will they be backed up?
- Can I restore my Mac's backup to another Mac?
- Can CCC back up my BootCamp (Windows) partition?
- Can I use CCC to copy a Time Machine backup?
- Copying one external hard drive to another external hard drive
- Folder-to-Folder Backups
- Using a CCC backup with a loaner Mac
- Backing up and restoring Finder's Trash
- Refining the scope of a backup task
- Upgrading your backup strategy from Time Machine to CCC
- Best practices for updating your Mac's OS
- Apple will stop supporting HFS+ Encrypted volumes in macOS 28 (October 2027)

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I want to migrate data to a new Mac

Use Migration Assistant to migrate data from a CCC backup to a new Mac.

The user accounts on your Mac have unique characteristics that are bound to a specific installation of macOS. When you get a new computer from Apple, you can't simply restore your old Mac's backup onto your new Mac using CCC; that could lead to permissions or authorization problems. Instead, you'll use Migration Assistant to migrate content from your old Mac's CCC backup to the new Macintosh.

- Boot your new Mac
- Accept the prompt to migrate data
- Choose the first option to migrate data from a backup
- Select your CCC backup as the source for the migration, then proceed as directed by Migration Assistant

Once you have migrated your user accounts and applications using Migration Assistant, you can continue using CCC to back up your Mac to the same backup volume you used for the old Mac.

Migration Assistant and the CCC SafetyNet

If your backup volume has a legacy "_CCC SafetyNet" folder, you can move that folder to the Trash before using Migration Assistant to avoid copying that folder during a migration. This is particularly important if that folder has a lot of data in it and you're migrating to a disk that is smaller than the backup volume. After you have completed the migration, return the "_CCC SafetyNet" folder to its original location, and you can resume backups to the same destination volume. We recommend that you enable CCC Snapshot support on the destination <https://support.bombich.com/hc/articles/20686443871383#srp> to avoid using the legacy SafetyNet folder moving forward.

Related Documentation

- Can I restore my Mac's backup to another computer? <https://support.bombich.com/hc/articles/20686491945111>
- How to set up your first backup [that is compatible with Migration Assistant] <https://support.bombich.com/hc/articles/20686487352599>
- Apple Kbase #HT204350: Move your content to a new Mac <https://support.apple.com/kb/HT204350>

How should I run my last backup on my old Mac?

A standard backup created with CCC's default settings <https://support.bombich.com/hc/articles/20686487352599> will work just fine with Migration Assistant. But, this is also a great time to verify the integrity of your backup, especially if you're planning on getting rid of your old Mac. So before you proceed to migrate data from your backup, we recommend that you run one last backup on your old Mac with the following steps:

1. Open CCC and select the backup task that backs up your Mac's startup disk
2. Hover your mouse over the Destination selector – if you do not see **CCC Snapshots: Enabled**, click on the Destination selector and choose **Backup Volume Setup Assistant**. If you are prompted to convert the volume to APFS, do that first. Check the box next to **Enable snapshots to retain backup history**, then click the button to use that volume exclusively.
3. Click **Advanced Settings** at the bottom of the window

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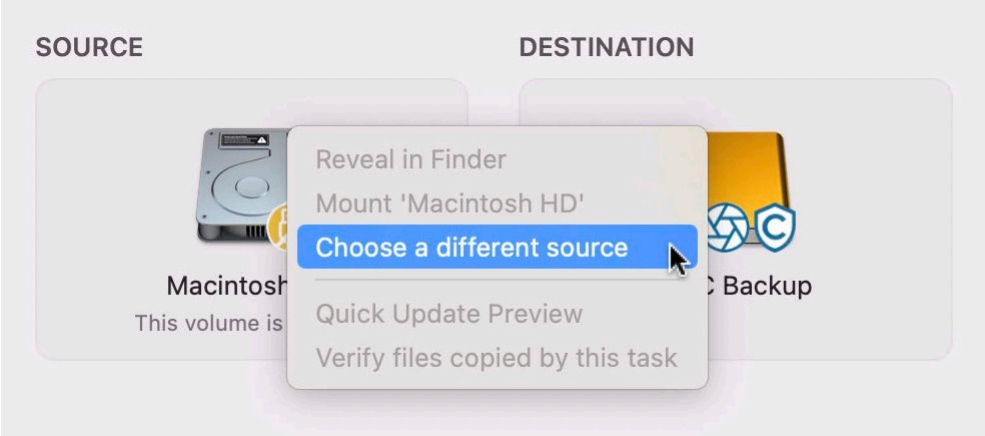
4. Select the **Postflight** tab
5. Check the box next to **Re-verify files that were copied**
6. Select the **Performance & Analysis** tab
7. Check the box next to **Backup Health Check**
8. Select **Only on the next run** from the popup menu adjacent to that setting
9. Click the **Done** button
10. Click the **Start** button

This task will take longer than usual to incrementally update the backup because CCC is going to re-read every file on the source and destination. By doing this, we'll proactively detect any files that have become corrupt due to media failure on either the source or destination. Then, you can take a moment to either correct the problem or simply note what might not be available when you proceed to migrate data to your new Mac.

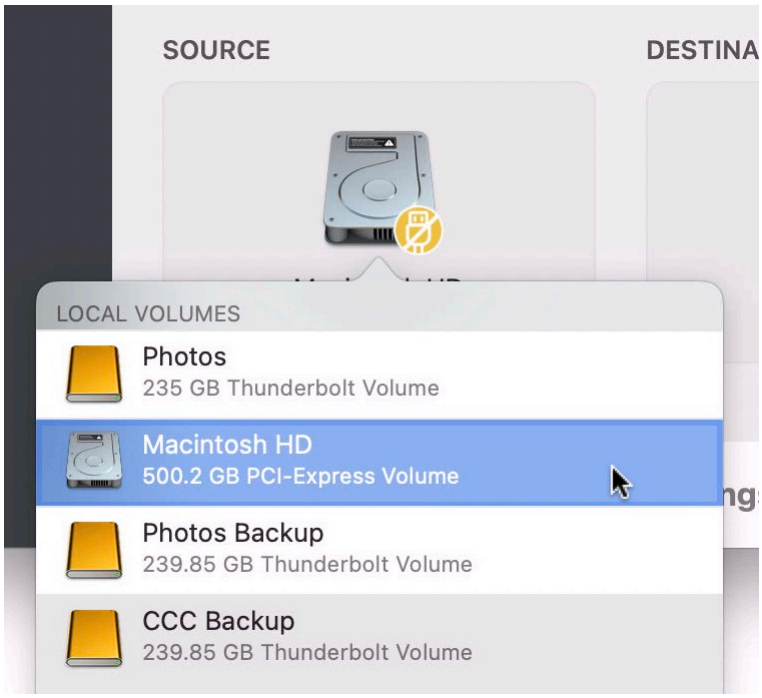
After you've migrated data to your new Mac...

Once you have migrated data with Apple's Migration Assistant, there will be some housekeeping to perform. Many software companies tie the registration to the disk or Mac it's installed on to reduce piracy, so some applications may need to be re-registered. Some applications may also need to have the location of their data storage re-selected. We cover some common application-specific issues that we've seen here: Why do some applications behave differently or ask for the serial number after restoring from the backup? <https://support.bombich.com/hc/articles/20686493025559>

CCC will also require some attention to get your backup tasks working on the new Mac. When you migrate tasks to a new Mac, CCC suspends the backup tasks to prevent them from running in error. Open CCC and select each task, choosing to activate the task when prompted. Any tasks that reference a volume from the old Mac will need to be updated to reference the new volume, even if the volume name is the same. For example, if your source was "Macintosh HD" on the old computer and is still "Macintosh HD" on the new Mac, you will have to reset the source to reference the new Macintosh HD volume. Click on the Source selector and choose the option to select a different source, then select the correct source volume.



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Once you're certain that you have migrated all of your data to the new Mac, you can clean up the old Mac before you hand it off to someone else. Apple offers some advice on that topic here: Apple Kbase #HT201065: What to do before you sell, give away, or trade-in your Mac <https://support.apple.com/en-us/HT201065>

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I want to back up my data to network attached storage (NAS)

Network storage appliances are very popular for providing shared "personal cloud" storage. Naturally, this storage looks very appealing as a backup destination. The thought of backing up all of your stuff without having to plug in a cable is very alluring. "Convenient" and "fast" often go hand-in-hand, but that often is not the case when backing up to a network volume. There are several factors that can greatly reduce the performance of your backup, and this backup strategy encounters several of them.

Backing up your data to a network volume

Before you proceed, your NAS volume should be mounted and accessible in the Finder. Instructions for gaining access to network volumes is available in the macOS Help Center <https://support.apple.com/guide/mac-help/connect-mac-shared-computers-servers-mchlp1140/mac>. If your network volume does not appear in CCC's Source or Destination menu, consult the documentation that came with the storage device you are trying to access, or choose "Mac User Guide" from the Finder's Help menu and search for "connecting to servers".

To back up a folder to a NAS volume with CCC:

1. Choose **Choose a folder** from the Source selector.
2. Select the folder that you would like to back up as the source
3. Choose **Choose a folder** from the Destination selector
4. Navigate to your NAS volume, then click the **New folder** button to create a new folder on this volume, e.g. named "CCC Backup". Click the OK button.
5. To improve the performance of future backup tasks, click **Advanced Settings** at the bottom of the window, select the **Performance & Analysis** tab, then check the box next to Use Quick Update when it's possible to collect a list of modified folders from macOS <https://support.bombich.com/hc/articles/20686481162647#quickupdate>. Click **Done**.
6. Click the **Start** button to run the task immediately, or schedule the task to run later.

Note: If you select your whole startup disk as the source to a task that backs up to a NAS volume, CCC will automatically exclude all system-related content. Generally when backing up to a NAS, you should drag a *specific* folder onto CCC's Source selector to reduce the scope of the task.

Caveats to backing up to NAS storage

Not compatible with Migration Assistant, no backup versioning, no encryption

First and foremost, backups to a NAS will not be compatible with Migration Assistant, and they do not support backup versioning or encryption. If you want those benefits in your backup strategy, you should use NAS storage only as a secondary backup. To create a backup of your startup disk that is compatible with Migration Assistant and supports backup versioning and encryption, configure a task to back up to locally-attached storage (e.g. a USB hard drive attached to your Mac).

NAS backups are slow

Backups to NAS volumes are inherently slow because NAS filesystem enumeration is inherently slow. Filesystem transactions to NAS volumes have a high amount of overhead, so even a simple task of comparing folders that

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have no changes can take longer than it seems it should. CCC's Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate> feature can go a very long way towards mitigating that slower performance on subsequent backups, but the performance of the initial transfer is mostly dependent on the performance of your NAS and network. We recommend connecting your Mac to your network via ethernet for the initial backup.

Not all data can be backed up to a NAS

Many NAS devices impose archaic Windows naming conventions that prevent you from copying some files to the NAS volume. GarageBand is a classic example – there is a folder named "Aux" in the GarageBand bundle that many NAS devices will refuse to accept.

Because NAS backups have several inherent limitations, we recommend using a NAS for a secondary backup. For primary backups, we recommend that you procure a USB or Thunderbolt hard drive and create a backup on that locally-attached disk. Local backups are much simpler, more reliable, offer the added security of "backup history", are compatible with Migration Assistant, and in general they're a lot easier to restore from.

Some files will consume more space on a NAS backup than on the source

APFS source volumes (e.g. your Mac's startup disk) have files that leverage space-savings features that are specific to APFS (and some other local filesystems). These "sparse", "hard-linked" and "cloned" files can be backed up to a NAS volume, but the space-savings attributes of these files cannot be preserved on a non-APFS volume. As a result, these files will consume more space on the NAS, and will subsequently consume more space if restored back to the original source.

Related Documentation

- Troubleshooting slow performance when copying files to or from a network volume <https://support.bombich.com/hc/articles/20686454126487>
- Restoring from a data backup on a NAS or network share <https://support.bombich.com/hc/articles/20686469175575#nas_restore>
- Choosing a backup drive <https://support.bombich.com/hc/articles/20686495048215>
- Some NAS services have obtuse file name restrictions <https://support.bombich.com/hc/articles/20686420950423#smb_special_characters>
- Character composition conflicts on NAS volumes <https://support.bombich.com/hc/articles/20686428119575>

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I want to back up multiple Macs or source volumes to the same hard drive

Backing up multiple volumes or multiple Macs to a single hard drive can be a messy proposition. If you back up each source volume to the same destination volume without some pre-planning, data from each source volume will be merged in a heap on the backup volume. Additionally, your tasks will archive or delete each other's backed up content.

Add dedicated volumes to an existing APFS-formatted backup disk

When you're backing up multiple volumes to the same APFS-formatted backup disk, create a dedicated volume on that backup disk for each source volume. In CCC:

1. Click on the Destination selector and select any volume on your backup disk. If you already have a volume selected, click on the Destination selector and select **Backup Volume Setup Assistant**.
2. Click **Add a volume to the destination** in the Backup Volume Setup Assistant.
3. Name the new volume and click **Add Volume**.

Or in Disk Utility:

1. Open Disk Utility
2. Choose "Show all devices" from the View menu
3. Select your current CCC destination volume in the sidebar
4. Choose **Add APFS Volume...** from the Edit menu
5. Name your new volume and click the Add button
6. Configure each of your CCC backup tasks to back up to its own dedicated volume on the destination

Add dedicated partitions to an HFS+ formatted backup disk

We recommend APFS for all backup volumes. If you have a disk formatted with the legacy format that cannot be erased or converted to APFS, you can add a partition to that disk for use as a backup:

1. Open Disk Utility
2. Choose "Show all devices" from the View menu
3. Click on the top-most parent device of your backup disk
4. Click the "Partition" button in the toolbar
5. Click the "+" button to add a second partition to the backup disk
6. Set the format of the new partition to **APFS** or **APFS (Encrypted)**
7. Configure each of your CCC backup tasks to back up to its own dedicated volume on the destination (see the section above for adding additional volumes)

Related Documentation

- Preparing your destination disk for a backup or restore <https://support.bombich.com/hc/articles/20686493728919>

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Backing up multiple data volumes to a non-APFS formatted disk

The easiest way to back up multiple data-only volumes to the same non-APFS formatted backup disk is to create a folder on the backup disk for each volume that you want to back up. Then you'll configure a task for each source volume that you want to back up, setting the destination to that disk's dedicated folder on the backup disk.

Note: This method is not recommended for making a backup of your startup disk. Backups of the startup disk that are made to a folder will not be compatible with Migration Assistant.

1. Click the **New Task** button in CCC's toolbar.
2. Choose your data volume from CCC's Source selector.
3. Create a new folder on the destination volume in the Finder, then drag that folder onto CCC's Destination selector.
4. Schedule the task, if desired, or choose **Save** from CCC's Task menu. You can run this task immediately or let it run on schedule later.
5. Repeat the steps above for other source volumes, creating a new folder for each at the root level of the destination volume.

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Can I run a backup while I'm using my computer? If I have open files, will they be backed up?

Generally, yes. Performance will be affected during the backup task (especially the first one) as CCC reads the entire source volume and writes to the destination volume. If your work is "disk bound" — that is your applications are reading or writing to either the source or destination, then you'll notice a performance hit. If you're just reading email or writing a document, then you probably won't notice the performance hit.

What happens if files are modified while they're being copied?

If your source volume is an APFS volume, then CCC will create a read-only snapshot of that volume and use that snapshot as a source for the backup task. With this configuration, any changes that you make to files on the source during the backup task will have no effect on the backup process. Likewise, those changes will not be part of the backup – expect the backup to contain exactly what was on the source at the moment that the backup task started.

If the source volume is not APFS-formatted, then some consideration should be given to the modification of files on the source during the backup task. Typically it's OK to work from the source volume while you're copying it, with the understanding that if CCC copied a file, then you open it, make changes, save it, then CCC completes the backup task, the modified version of your document is not backed up (this time around). Typically that's no big deal, the modifications will get backed up the next time the backup task runs. More importantly, though, if you're working with large files (mounted disk image, Outlook email database, VMWare/Parallels container) during the backup operation, it is possible that those large files could be modified while CCC is backing up that file. This won't affect the source file, but there's a good chance that the backup version of that file will be corrupt. For this reason it is a good idea to stop using applications that may be modifying large files for the duration of the backup task. Follow the link below for some example pre and postflight scripts that can help with suspending Parallels, for example, for the duration of the backup. Again, keep in mind that this is only applicable for non-APFS source volumes.

Related Documentation

- Introduction to Snapshots <https://support.bombich.com/hc/articles/20686443871383>
- Example pre- and postflight shell scripts <https://support.bombich.com/hc/articles/20686441421591#examples>

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Can I restore my Mac's backup to another Mac?

Yes! You can use Migration Assistant to migrate data from your CCC backup to another Mac. <https://support.bombich.com/hc/articles/20686482554519> We do not recommend using CCC to restore the data in this particular scenario. Migration Assistant has the privilege to "adopt" the user accounts on the other Mac, so Migration Assistant should be used when restoring a backup to another Mac.

Related Documentation

- I want to migrate data to a new Mac <https://support.bombich.com/hc/articles/20686482554519>

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Can CCC back up my BootCamp (Windows) partition?

CCC is not designed to work with Windows. CCC can back up data from a Boot Camp partition, but it should not be used to make copies of Windows system files. If your goal is to back up your user data on the Boot Camp partition, CCC will meet your needs. If you're looking to migrate your Boot Camp partition to a new hard drive, you might consider an alternative solution such as WinClone <https://twocanoes.com/products/mac/winclone>, or one of the commercial virtualization solutions that offer a migration strategy from Boot Camp. **CCC is not designed to accommodate backing up or restoring Windows system files or applications.**

Avoid copying Windows System files

We have received some reports that macOS will crash when Windows system files are accessed on an NTFS volume. If you encounter this problem, exclude the Windows system files from your backup task:

1. Open CCC and select the relevant backup task
2. Click the **Task Filter** button at the bottom of the window
3. Exclude **WINDOWS** and **Program Files**
4. Click the Done button
5. Click the Save button or choose **Save** from CCC's **Task** menu

Will CCC copy both my macOS and Windows partition at the same time?

No, CCC will copy only one volume at a time, and CCC will not modify the partitioning of the destination disk. You should apply your custom partitioning prior to restoring anything to your new disk.

I'm migrating to a larger disk, will CCC work for my Windows volume?

No, CCC will not create a bootable backup of your Windows volume.

Will CCC copy my Parallels/VMWare virtual machine containers?

Yes! These are just ordinary files as far as CCC is concerned, CCC can copy these just fine. Note that these files can be quite large, so occasionally problems are encountered when these files are in use or when the destination volume does not have sufficient space to accommodate the updated copy of the VM container file.

Related Documentation

- Can I run a backup while I'm using my computer? If I have open files, will they be backed up? <https://support.bombich.com/hc/articles/20686484434327>
- Example pre and postflight shell scripts (e.g. how to automatically suspend Parallels) <https://support.bombich.com/hc/articles/20686441421591#examples>

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Can I use CCC to copy a Time Machine backup?

No. Copying a Time Machine backup volume with anything other than the Finder is not supported (by us, nor Apple); CCC specifically disallows copying anything to or from a Time Machine backup volume. Apple does not document a procedure for making copies of Time Machine volumes.

Can I use CCC to restore content from a Time Machine backup?

Generally, no. If you want to restore content from a Time Machine backup, you should use Apple's Time Machine interface for that purpose. If you see a Time Machine snapshot in CCC's Snapshots table, however, you may restore files from that snapshot <https://support.bombich.com/hc/articles/20686469175575#restore_snapshot>.

Can I use the same backup disk for both CCC and Time Machine backups?

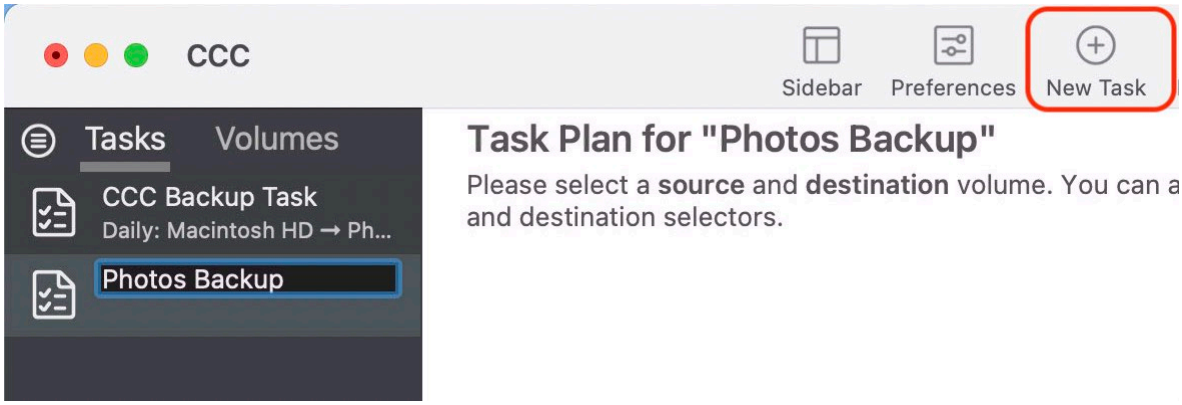
Yes, you may use the same physical device, however you should created dedicated volumes on the device for each backup <https://support.bombich.com/hc/articles/20686485252759>. We recommend applying a quota to the Time Machine volume to limit the growth of snapshots on its volume; without a limit applied at the time that you set up the Time Machine backup volume, eventually Time Machine will consume all space available on the device.

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Copying one external hard drive to another external hard drive

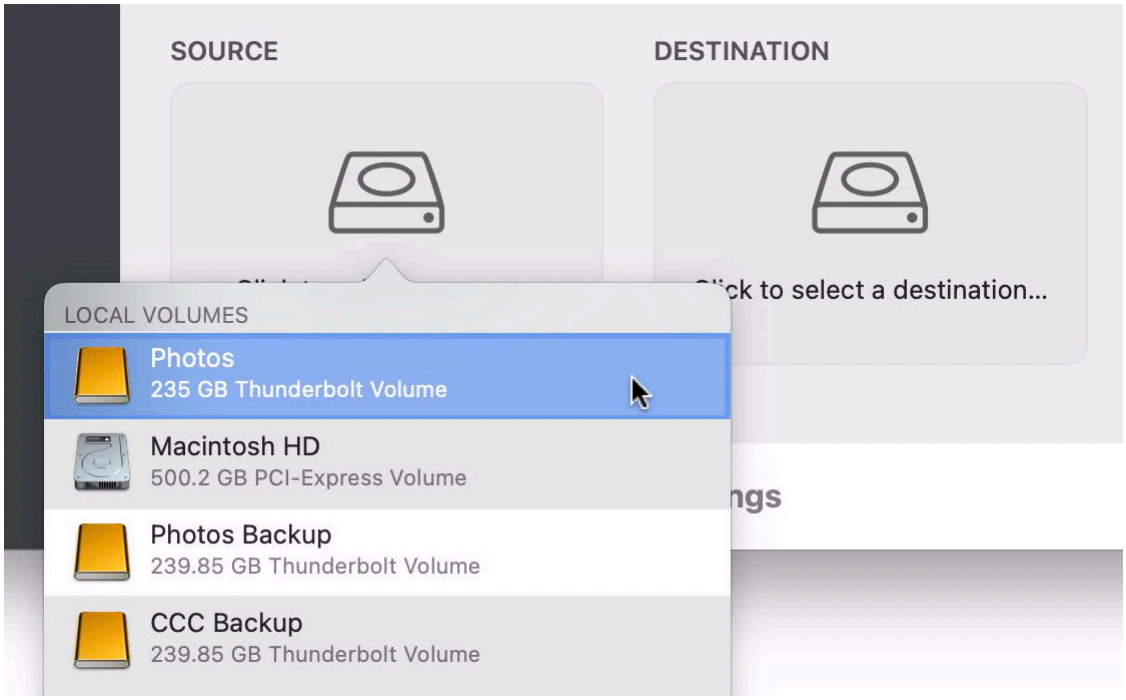
Create a new task

Click the **New Task** button in the toolbar to create a new task, then type in a name for the new task.



Select a source volume

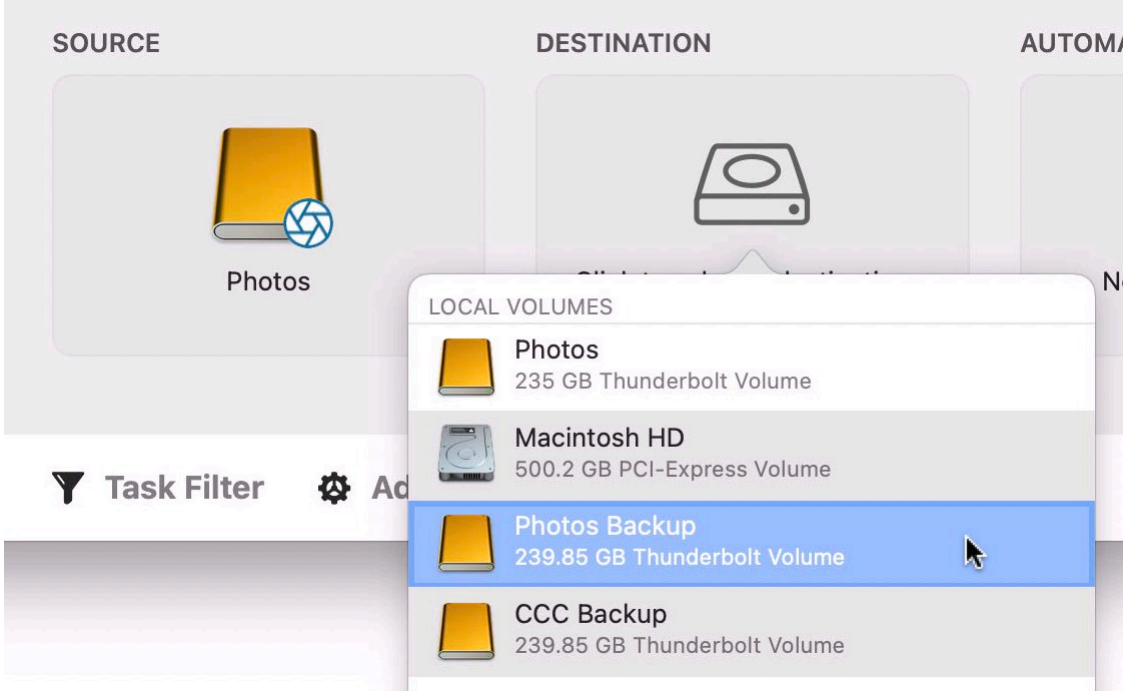
Click on the Source selector, then choose the volume that you want to copy files from.



Select a destination volume

Click on the Destination selector, then choose the volume that you want to copy files to.

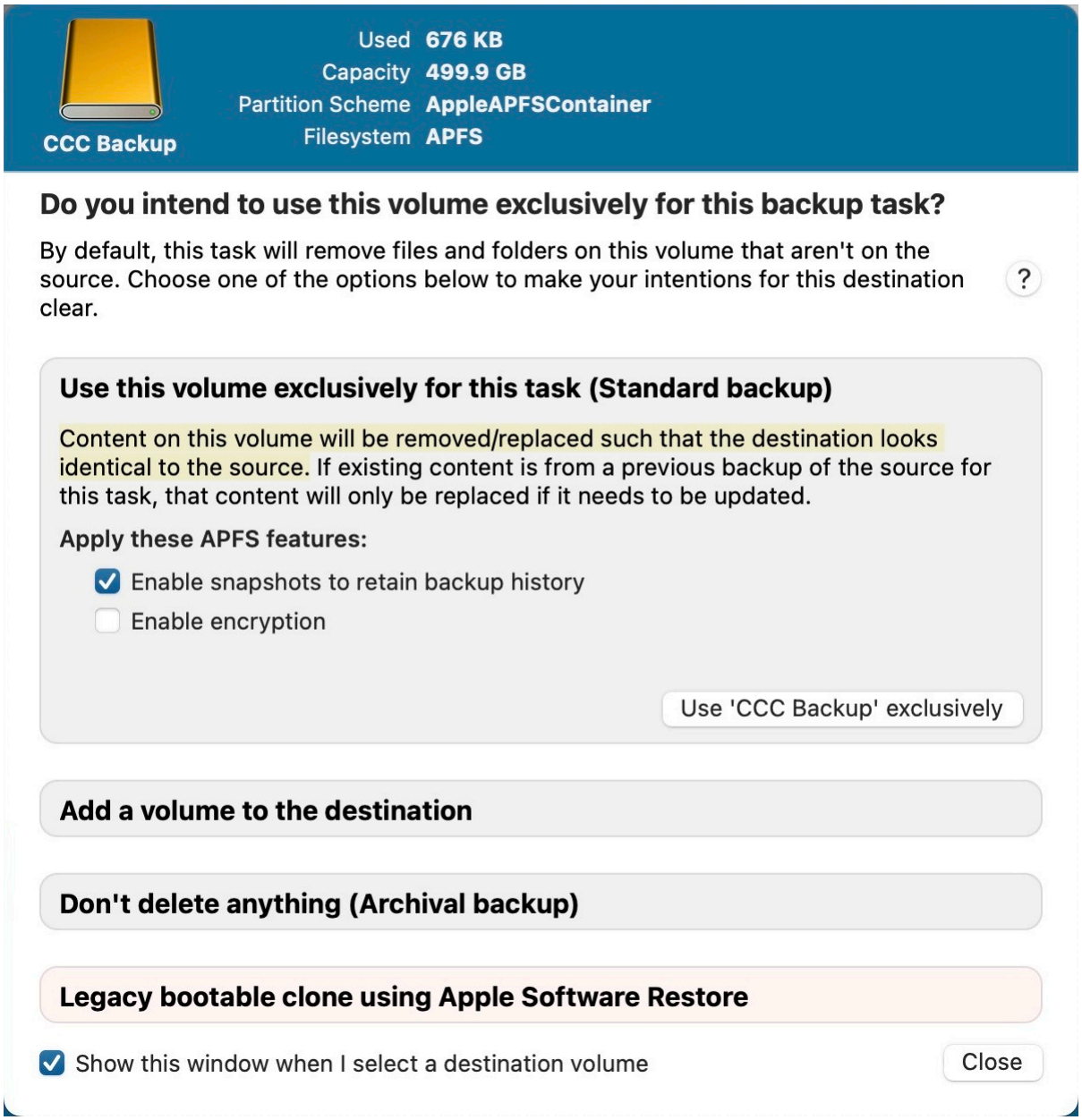
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Follow the guidance of CCC's Backup Volume Setup Assistant

The Backup Volume Setup Assistant is designed to get your backups started off on the right foot. This assistant asserts that the destination will be used exclusively for this backup task, and offers alternative options if the selected volume cannot be used exclusively. This assistant also takes care of volume formatting, snapshot support, and makes it easy to enable encryption (which is optional).

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Click the Start button

Click the Start button to copy files right away, or click the Scheduler selector to configure the task to run on a regular basis.

Related Documentation

- How to set up a scheduled backup <https://support.bombich.com/hc/articles/20686449773847>

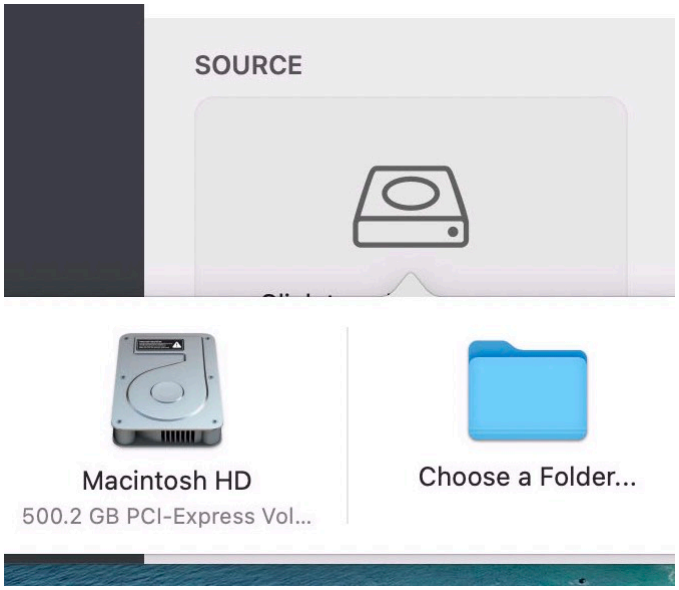
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Folder-to-Folder Backups

When you select a volume as the source and destination, CCC copies the entire contents of that volume (minus anything you exclude) to the destination volume, preserving the full hierarchy of folders on the source. If you don't want to preserve that hierarchy, you can back up a specific folder from the source to a specific folder on the destination. In this configuration, CCC will copy the contents of the selected folder to the selected destination folder, without the hierarchy up to that source folder.

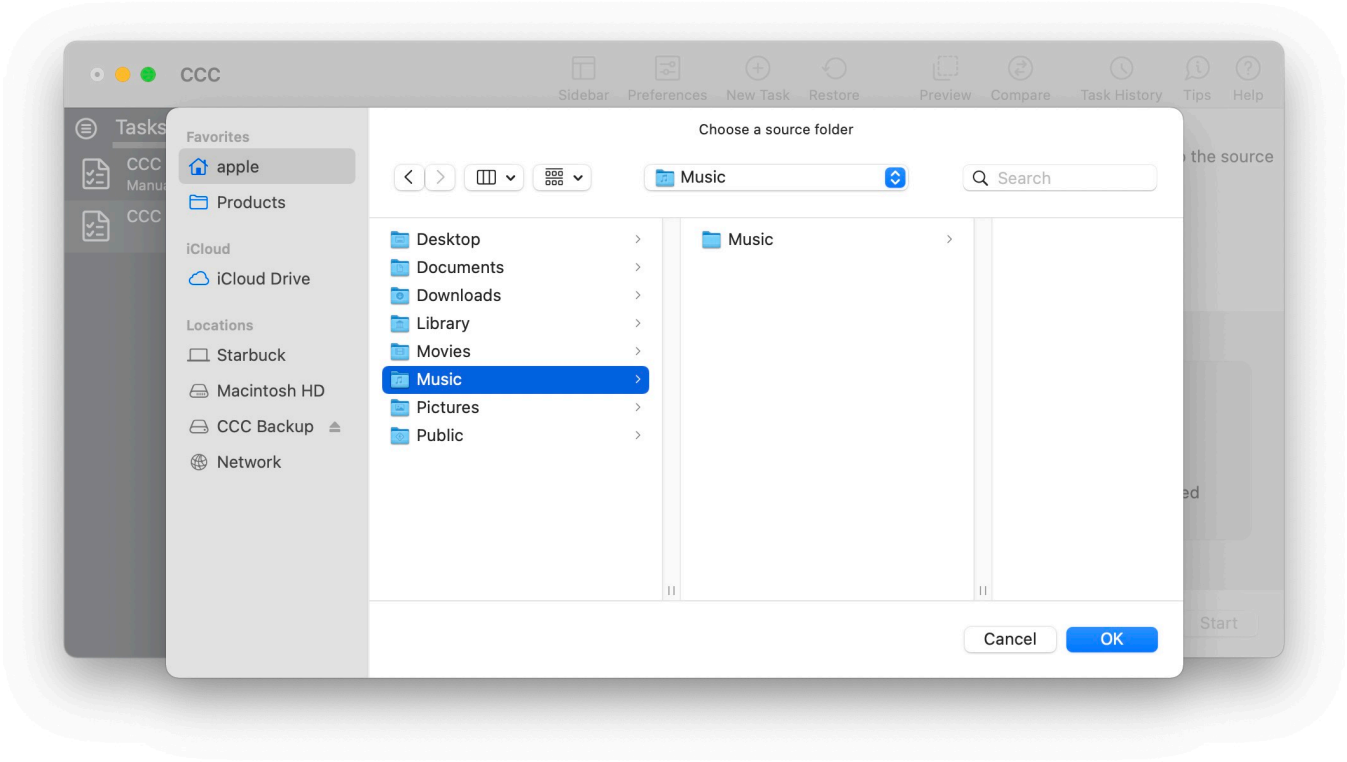
Choose your source

Click the Source selector and select **Choose a Folder...**

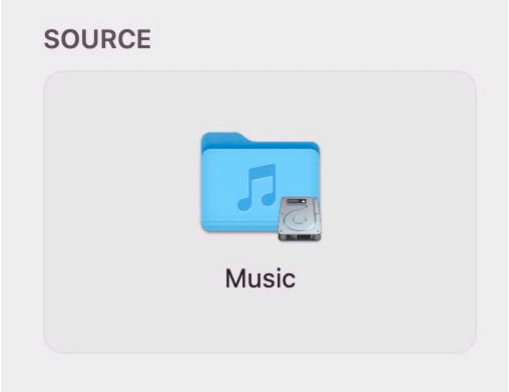


Select your source folder and click **OK**.

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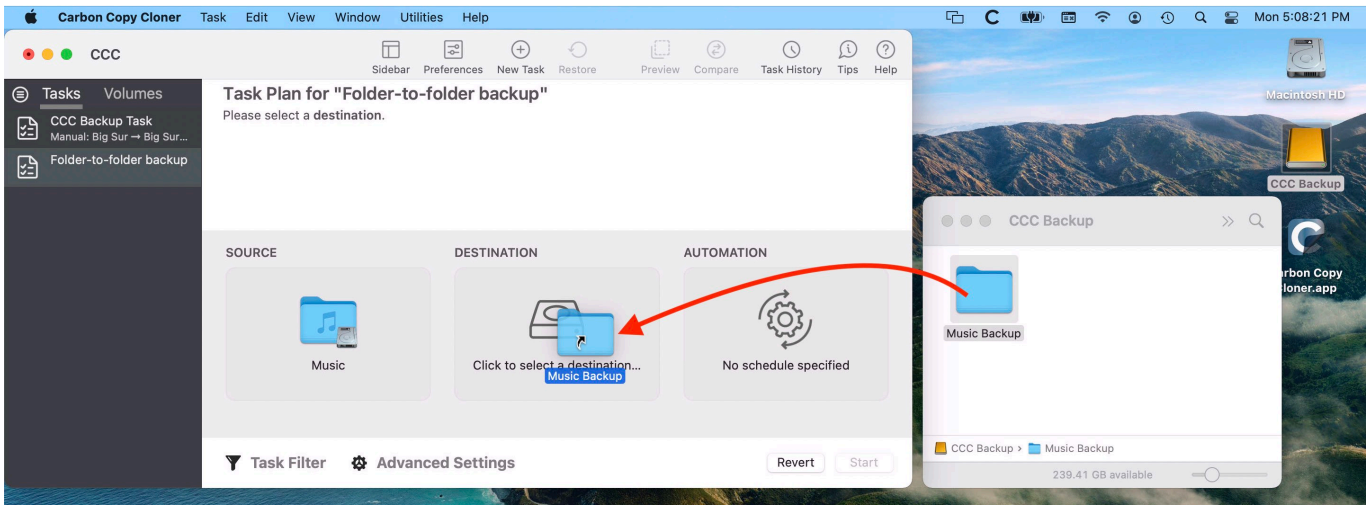
The Source box should display the icon of your selected folder and its name. You can click on the Source selector again for additional details about that selection. Click the **Task Filter** button at the bottom of the window if you would like to exclude some of the content of that folder from the backup task.



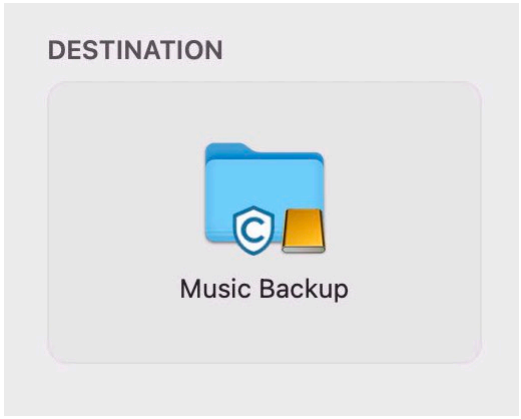
Choose your destination

You can repeat the steps above to select a destination. CCC also supports drag and drop selection, so we'll demonstrate that here. Find your destination folder in the Finder, then drag it onto CCC's Destination selector.

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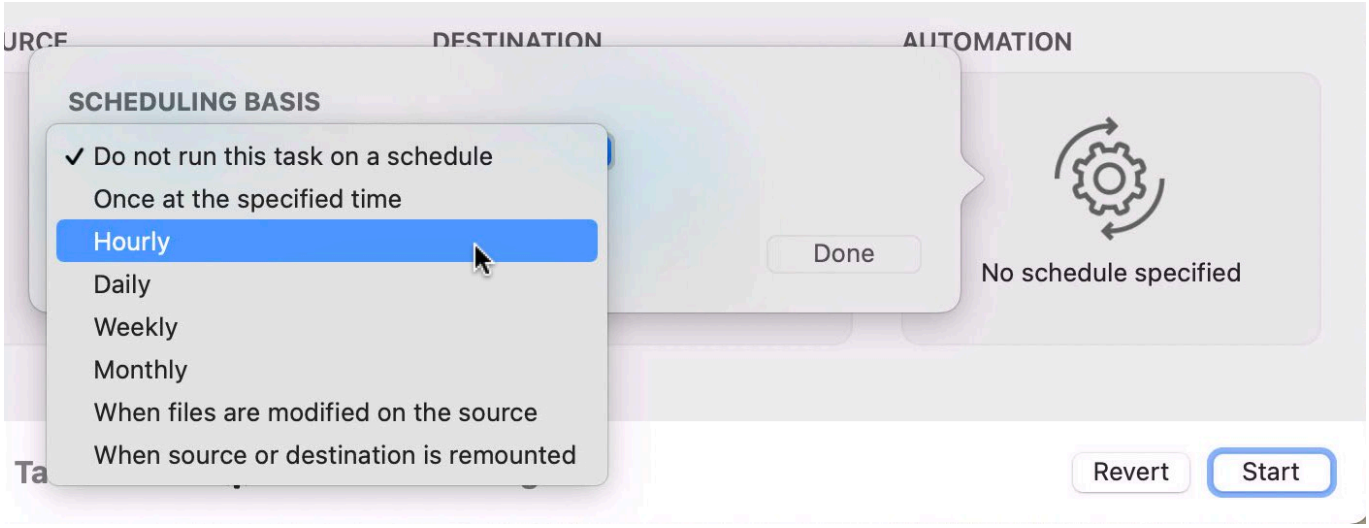
The Destination box should display the icon of your selected folder and its name. You can click on the Destination selector again for additional details and settings specific to that selection (e.g. CCC's SafetyNet feature). To learn more about SafetyNet, see CCC SafetyNet: Temporary protection for destination content <https://support.bombich.com/hc/articles/20686475366935>.



Schedule the backup

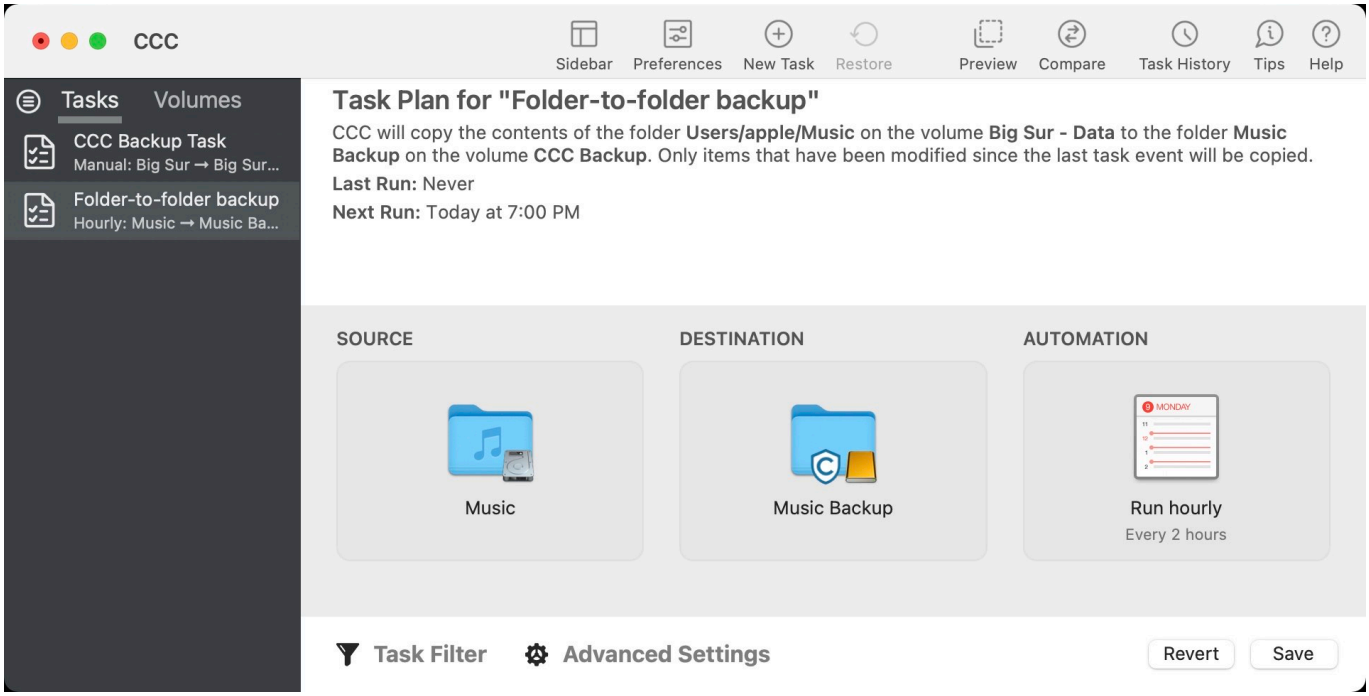
Click in the Automation box and design a backup schedule that meets your needs. Click **Done** when you have finished.

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Save and optionally run the task

Once you have your source, destination and schedule complete, click on Save in the bottom, right corner of the window. You may click the **Start** button to run the backup manually, or let it run on a schedule.



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Using a CCC backup with a loaner Mac

Sometimes when you send your Mac off for a repair, you just can't go without "your computer" for the duration of the repair. In this article we'll offer some best practices on how to quickly get your data backed up and transferred to a loaner Mac, how to get the data back to your Mac when it returns from the shop, and how to quickly and securely remove your data from the loaner Mac.

Before you send your original Mac out for repair

CCC's default settings are designed to create a backup of your Mac that can be easily migrated to another Mac. Configure a CCC backup task to back up your startup disk to a locally-attached, APFS-formatted device. This Kbase article offers step-by-step guidance: Establishing an initial backup <https://support.bombich.com/hc/articles/20686487352599>. Ideally, you already have a CCC backup. If you wait for your Mac to break before creating a backup, you might not have an opportunity to create one, or it may be logistically difficult (e.g. damaged display).

Before you accept the loaner Mac

Upgrading your data to a newer OS is usually uneventful. Downgrading your data, however, is virtually impossible, and is completely unsupported by Migration Assistant. If your current Mac is not on the latest OS, and if you specifically do not want to upgrade to a newer OS (e.g. when your Mac is returned), then you need to be very careful about what OS you migrate your data to. Before you accept a loaner Mac, verify that the OS installed on that Mac is the same as the OS that you're currently using (or newer, if you're willing to upgrade your Mac upon its return).

If you can't acquire a Mac that has the same OS as your current Mac, you should avoid migrating your data to that Mac. Instead, attach the backup disk to the loaner Mac and access your files directly from the backup. This is a less-ideal configuration because you lose some hardware redundancy when you work directly from the backup, but it's often less risk than dealing with the hassle of trying to downgrade your data from a newer OS.

When you get the loaner Mac

Prior to transferring data to the loaner Mac, we recommend that you enable FileVault on that Mac's startup disk. By enabling FileVault, your data is never placed onto the loaner Mac in an unencrypted form, and securely removing it from that Mac can be done in a matter of seconds.

Transfer data to the loaner Mac using the following steps:

1. Boot the loaner Mac (from its own internal disk).
2. If prompted in Setup Assistant, skip the option to migrate data.
3. Proceed to create a new user account. Name it something temporary, like "utility".
4. Once logged in, open System Settings > Privacy & Security and turn on FileVault.
5. Attach your CCC backup disk to the loaner Mac.
6. Go to System Settings > General > Transfer or Reset and click "Open Migration Assistant..."
7. Proceed to migrate data from "a backup" – choose the CCC backup volume as the source.

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While you're using the loaner Mac

Especially if you plan to use the loaner Mac for more than a day or so, we recommend that you establish a backup task that will back up any changes you make to your data while using the loaner Mac. This will also get you prepared for taking your data back to your original Mac when it gets back from the shop.

1. Open CCC.
2. When prompted, leave your other backup tasks suspended.
3. Configure a new backup task to back up the current startup disk to your backup disk.
4. Schedule the task to run at your preferred frequency.

Because all of your data is already on this backup, the task should go pretty quickly to update the changes that you're making on the loaner Mac.

When you get your original Mac back from the service center

1. On the loaner Mac, quit all applications except for CCC.
2. Run the CCC backup task one last time to get everything on the backup up to date.
3. Detach the backup disk from the loaner Mac; now just leave the loaner Mac as it is – don't delete anything from it yet.
4. Boot your original Mac (from its own internal disk).
5. When prompted by Setup Assistant, accept the offer to migrate data from a backup. †
6. Attach the CCC backup disk to your original Mac and select it as the source in Migration Assistant, then proceed as directed to migrate all of your data back to the original Mac.

† If your Mac was not returned from the service center with a clean installation of macOS, open System Settings > General > Transfer or Reset and click **Erase All Content and Settings...** prior to attaching your backup disk to the original Mac.

When the migration has completed

After migration is complete and you've logged in to your account on the original Mac, the very last step is to securely remove your data from the loaner Mac and return it in "clean install" condition.

1. On the loaner Mac, open System Settings > General > Transfer or Reset.
2. Click **Erase All Content and Settings...**
3. Authenticate in the Erase Assistant, then click Continue to remove your data from the loaner Mac.

When that process has completed, the system should reboot to Setup Assistant. Because you had enabled FileVault on the startup disk before transferring data, all of your data was 100% securely removed from that system, pretty much instantly. You can now turn off that system and return it.

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Backing up and restoring Finder's Trash

Backing up Trash content

CCC will not back up the contents of Finder's Trash by default, but CCC offers an option to back up the Finder's Trash <https://support.bombich.com/hc/articles/20686509510167#trash> in the Task Filter window. Click the **Task Filter** button at the bottom of CCC's window to reveal the task filter.

The Trash is not a simple folder, it's a complex mechanism that aggregates Trash folders from multiple volumes and user home folders on the startup disk; it behaves quite unlike other folders. When you back up the contents of the Trash, those items are copied to the Trash folder on the destination, and may reside in "the Trash" as viewed in the Finder. If you subsequently empty the Trash, that will delete the Trash on the backup disk if it is mounted when you empty the Trash. If you choose the option to back up the Finder Trash, we recommend that you unmount and detach your backup disk before emptying the Trash if you wish to retain the Trash on the backup disk.

Restoring Trash content

If you eject your backup disk and detach it from your Mac, and then you empty the Trash, you can simply reattach the backup disk to your Mac and the Trash will again appear to be filled. You can simply drag items out of the Trash to recover those items.

The Trash is a little bit more complicated than that

For external data-only volumes, the Trash behaves in the fairly straightforward manner previously described. For your startup disk, though, it's not quite that simple. There is more than one Trash folder on the startup disk, e.g. there is a Trash folder in each user's home folder. When you move an item (that you are the owner of) on your startup disk to the Trash, that item is placed in your home folder's Trash, not in the volume's trash folder. It still appears in "the Trash", but its location is important with regard to the backup. Suppose you do the following (with CCC configured to copy the Finder Trash):

1. Move an item from your Desktop to the Trash
2. Run a backup
3. Detach your backup disk
4. Empty the Trash
5. Reattach your backup disk

Result: That item is not in the Trash! The file is actually in a Trash folder on the backup disk, but the Finder doesn't show you items in the home folder trash folders on external volumes. Finder will also **not** reveal the hidden Trash folder when you reveal hidden items (e.g. press Command+Shift+Period). To force the Finder to reveal the content of the hidden Trash folder on the backup volume, run a command like the following in the Terminal application (replacing the CCC backup volume name and the name of your home folder, as applicable):

```
open "/Volumes/CCC Backup/Users/yourname/.Trash"
```

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Refining the scope of a backup task

We often see backup tasks configured with the whole startup disk selected as the source, and then everything excluded from the backup except for a single folder. This kind of configuration is suboptimal for several reasons:

- The entire folder hierarchy up to the non-excluded folder is preserved, so it takes longer to navigate to your files on the destination.
- With the startup disk selected, CCC may perform unnecessary subtasks related to making a legacy bootable copy on the destination.
- The task involves more overhead (e.g. evaluating lots of exclusion rules), so it will take longer.
- The scope of the task is very broad; CCC's effects are applicable to the whole destination rather than to a single folder.
- If the destination is a folder on the startup disk or on a non-Apple formatted volume, then the task will likely produce errors related to preserving special file flags of folders on the startup disk.

A better configuration is to create a folder-to-folder backup. With a specific folder selected as the source and a specific folder selected as the destination, you greatly reduce the scope of the task, thus reducing the amount of work that the task has to do and also reducing any risks to other content on the destination.

Converting a whole-disk, single folder task to a folder-to-folder backup

For the sake of an example, let's suppose you selected **Macintosh HD** as the source for a backup task, then configured a task filter that excluded everything except for Users > yourname > Documents > Work In Progress. Let's also suppose that you selected a volume named **CCC Backup** as the destination for this task. If you navigate to the **CCC Backup** volume in the Finder, you will find a folder hierarchy of Users > yourname > Documents > Work In Progress. To convert this backup configuration to a folder-to-folder backup, you would do the following:

1. Navigate to the **CCC Backup** volume in the Finder
2. Navigate to Users > yourname > Documents > Work In Progress
3. Move the Work In Progress folder to the root level of the **CCC Backup** volume
4. Move the (now containing empty folders) Users folder to the Trash
5. Open CCC and select the relevant backup task
6. Drag the Work In Progress folder from the **CCC Backup** volume onto CCC's Destination selector
7. Drag the Work In Progress folder from your home folder on the **Macintosh HD** volume onto CCC's Source selector
8. Save the task

Related Documentation

- Folder-to-Folder Backups <https://support.bombich.com/hc/articles/20686432643735>

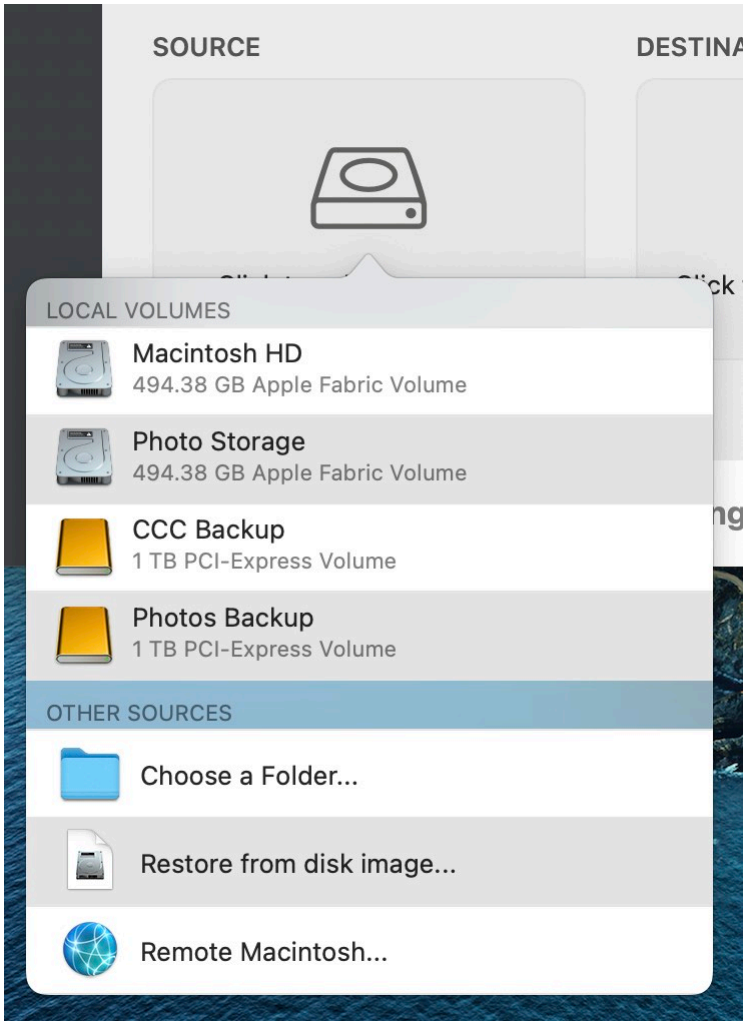
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Upgrading your backup strategy from Time Machine to CCC

Time Machine offers a very basic backup with very few customization options, so setting up CCC to mimic "a Time Machine backup" is simple.

Choose "Macintosh HD" as the source

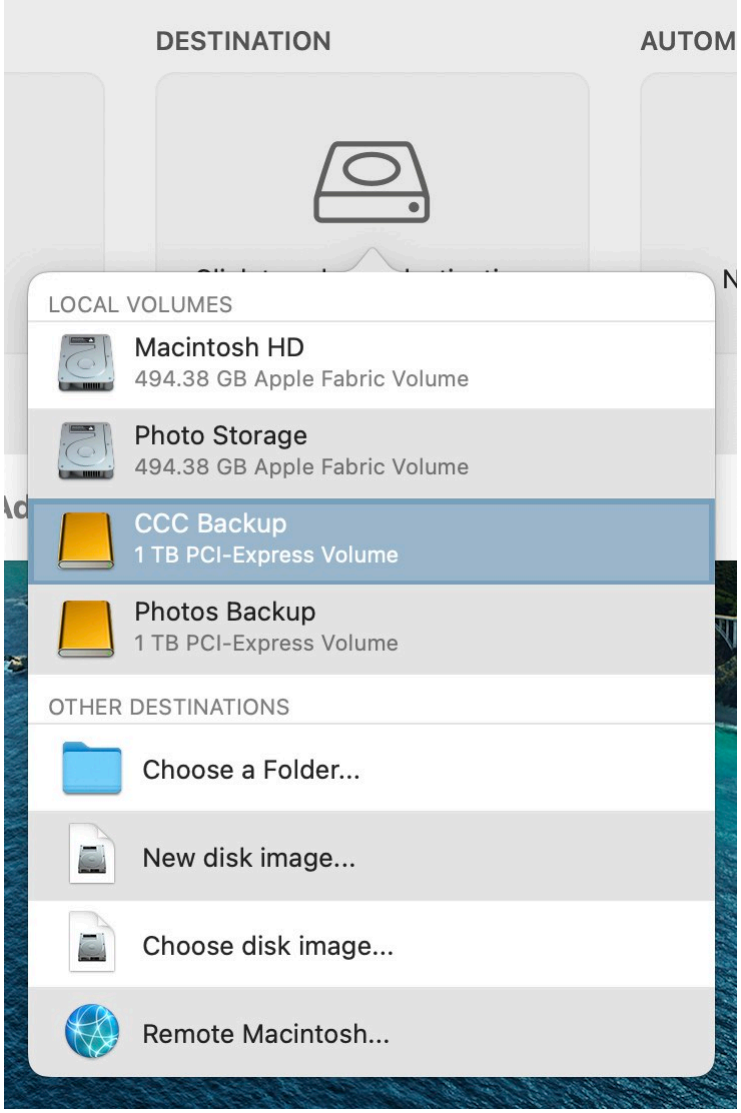
By default, Time Machine backs up your "Macintosh HD" disk. Click on CCC's Source selector and choose **Macintosh HD** as the source to your backup task.



Choose your backup disk as the destination

The most common Time Machine setup is to back up to an external disk that is connected to your Mac. In CCC, simply select that drive as your destination.

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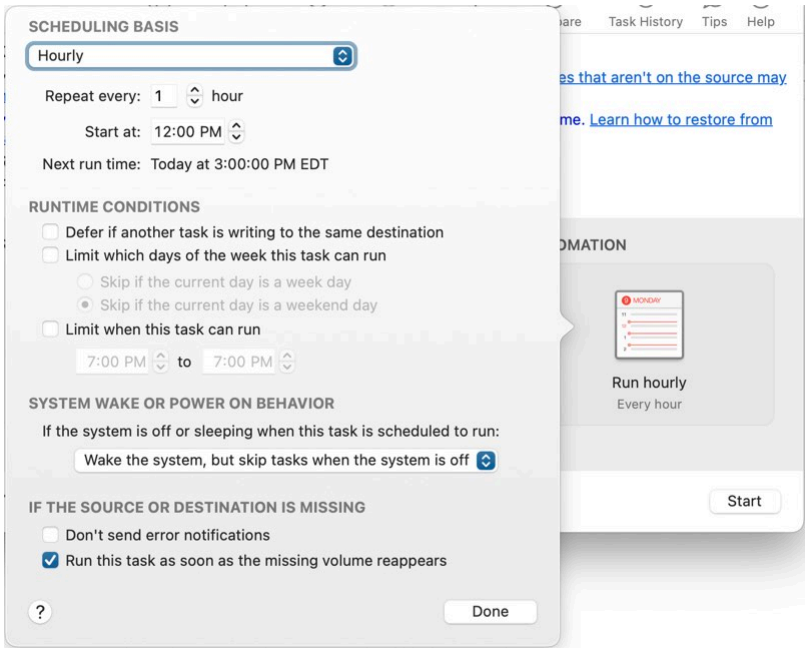
Can I use my Time Machine backup disk for my CCC backups?

CCC and Time Machine cannot share a backup volume, but the backups can reside on the same disk. If you select a Time Machine backup volume as the destination to your task, CCC's Backup Volume Setup Assistant will help you create a new volume on that disk for your CCC backup. If you want to replace Time Machine entirely with CCC, you can select the Time Machine backup volume in Disk Utility, then click the "-" button in the toolbar to remove that volume. For additional configuration options for your backup disk, see this section of CCC's documentation: I want to back up multiple Macs or source volumes to the same hard drive <https://support.bombich.com/hc/articles/20686485252759>

Set "Automation" to run hourly

Time Machine requires that your backup runs every hour, or manually – that's it. In CCC, click on the Automation box, then choose **Hourly** from the **Scheduling Basis** popup menu (or any other timing that suits your preference).

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That's it! You have now matched Time Machine feature-for-feature. But why stop there, there is a bunch of other functionality in CCC that will greatly enhance your backup strategy. Check out these other features of CCC:

- Make backups of files that are only stored in "the cloud" (e.g. in iCloud, Dropbox, GoogleDrive, OneDrive, etc.) <https://support.bombich.com/hc/articles/20686419951767#temp_download_best_practice>
- Integrity checking of files on the source and destination — proactively detect and deter "bit rot" <https://support.bombich.com/hc/articles/20686511433623>
- Make incremental updates to your backup even faster with Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate>
- See detailed backup history, granular error reporting, and a list of changes made in each task event <https://support.bombich.com/hc/articles/20686456355095>
- Compare the source and destination to see what the current differences are <https://support.bombich.com/hc/articles/20686430989207>
- Apply granular control over what should and should not be included in your backups <https://support.bombich.com/hc/articles/20686509510167>
- Apply granular control over when your backup tasks run <https://support.bombich.com/hc/articles/20686389397015>
- Apply granular control over how long your backup history is retained <https://support.bombich.com/hc/articles/21384373407127>

Encrypting backups

When you select a destination in CCC, simply check the box in the Backup Volume Setup Assistant to enable encryption on that volume if you prefer your backups to be encrypted.

If you already have a backup task configured and you want to encrypt your current backup, click **Volumes** in CCC's sidebar, select your backup volume in the sidebar, then toggle the **FileVault** switch.

Related documentation

- How to set up your first backup <https://support.bombich.com/hc/articles/20686487352599>

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- Enabling encryption on APFS volumes <https://support.bombich.com/hc/articles/20686438012951#encrypt>

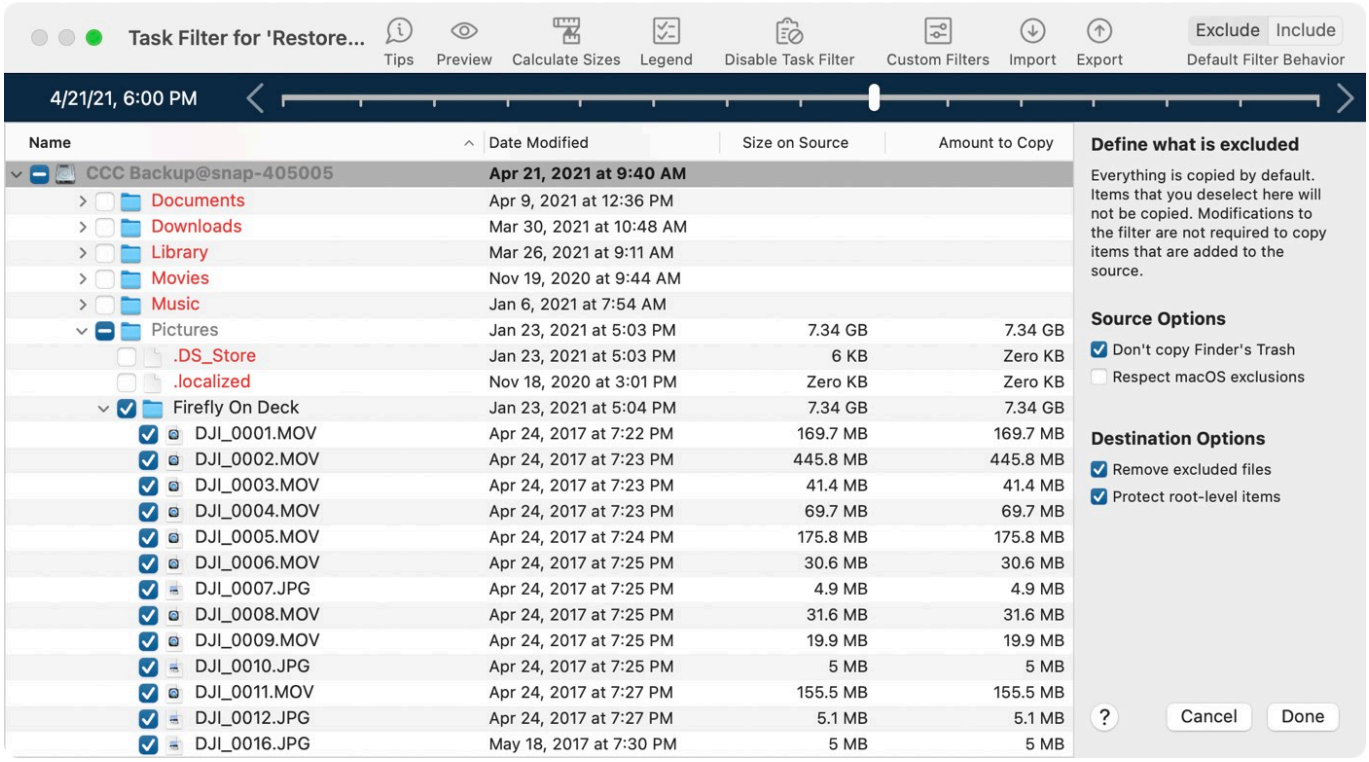
Menu bar icon

Time Machine offers a menu bar icon that tells you the current status of Time Machine, and gives you an option to manually run the backup or "Enter Time Machine" (view older snapshots of files). CCC also has a menu bar icon <https://support.bombich.com/hc/articles/20686467217687> with status information for all your backup tasks and notification preferences.

Browsing your file history

You can use CCC's Snapshot Navigator to browse older versions of your files:

1. Click **Restore** in CCC's toolbar
2. Click on the **Source** selector and choose your backup disk as the source
3. Click **Task Filter** at the bottom of the window
4. Select a file, then use the navigation controls to navigate backwards and forwards through your backup history



For additional details about restoring from a backup, including tutorial videos, see this section of CCC's documentation: Restoring an older version of a backup <https://support.bombich.com/hc/articles/20686469175575#restore_whole_snapshot>

Backing up to a network volume

When making a backup to a network volume, Time Machine backs up to a disk image. You could certainly configure CCC to back up to a disk image on a NAS volume too — choose "New Disk Image..." in CCC's Destination selector to set that up.

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But we don't recommend that, in fact we explicitly discourage it <https://support.bombich.com/hc/articles/20686447588631>. NAS-hosted disk images are very sensitive to network connectivity loss, and that fragility eventually leads to corruption of the disk image. You see that with Time Machine too — there are countless reports of "The (Time Machine) backup is corrupt, it needs to be recreated" on the Internet, and most of those would trace back to corruption of the disk image.

You can select a NAS volume, or a folder on a NAS volume as the destination to a CCC backup task. We specifically present this direct-to-NAS functionality in contrast to the inflexibility that Time Machine offers. But we also recommend using NAS backups only as a secondary option for a subset of your most important data. For the **most** reliable primary backup, and also for more functionality from your backup, we recommend that you procure a USB or Thunderbolt hard drive <https://support.bombich.com/hc/articles/20686495048215> and create a backup on that locally-attached disk. Local backups are much simpler, faster, compatible with Migration Assistant, and offer file versioning via snapshots.

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Best practices for updating your Mac's OS

Note: Apple does not support downgrading macOS because that is considered a security risk <https://support.apple.com/guide/security/system-security-overview-sec114e4db04/1/web/1>:

> The update system is designed to prevent downgrade attacks, so that devices can’t be rolled back to an older version of the operating system (which an attacker knows how to compromise) as a method of stealing user data.

Downgrading is not an impossible task if you made a CCC backup prior to the upgrade, but it is a long procedure that may be too complicated for many users. Consider this very carefully before upgrading your Mac.

Should I upgrade my Mac?

Major system upgrades are often disruptive, so we have always recommended a very conservative approach to applying them. Consider the following:

- Is the upgrade required for my Mac?
- Does the upgrade offer any compelling features?
- Will this upgrade improve the performance of my Mac, or degrade performance?
- Does the upgrade fix a problem that is preventing me from effectively using my Mac?
- What software will no longer work after applying the upgrade?
- Does the application of this upgrade to my aging Mac hasten its obsolescence?

If the upgrade turns out poorly and you have to downgrade, you certainly may downgrade using a CCC backup from an earlier OS <https://support.bombich.com/hc/articles/20686420473367#downgrade>. These sorts of procedures require time and effort, though, so you should weigh that potential hassle against the potential gain of the OS upgrade.

Lastly, we recommend that any users that rely heavily upon the availability of their Mac for work or other productivity consider waiting for several OS updates before making a major upgrade. The early releases are exciting, but that excitement involves risk. Early adopters inevitably find some shortcomings and bugs which are resolved in minor OS updates.

Can I test the new OS before committing to it on my Mac's production startup disk?

Yes! Especially if you have lots of software that could be rendered unusable on the new OS, it's a great idea to test the new OS with your data in a manner that doesn't require a commitment on your production startup disk <https://support.bombich.com/hc/articles/20686465518871#p>.

Do not use your production CCC backup <https://support.bombich.com/hc/articles/20686465518871#p> for this procedure. This procedure will erase any backup history (e.g. snapshots) on the volume that you use. We recommend that you acquire an external hard drive†, ideally an SSD, that has enough capacity to fit all of the data that is on your current production startup disk. See this CCC Kbase article for some recommendations

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<https://support.bombich.com/hc/articles/20686487352599>.

1. Click "New Task" in CCC's toolbar to create a new task.
2. Choose your startup disk in the Source selector.
3. Choose your backup volume in the Destination selector. Be sure to use APFS as prompted in the Backup Volume Setup Assistant.
4. Click the Start button. When the backup procedure is complete, the destination will have a copy of all of your applications, user data and system settings.
5. Open the macOS Installer (e.g. for the newer OS that you want to test).
6. Click "Show all disks", then proceed to install the new OS onto the new external disk.

When the installation is complete, your Mac will boot from the external disk automatically, and all of your user data and applications will be "adopted" by the new OS. Open your apps, kick the tires, etc.

When you're done testing, reset the startup disk to your Mac's internal disk and reboot. You can then erase the new external disk and use it for some other purpose. If you're happy with how the new OS was working on the external test device, you can proceed to install it onto your Mac's production startup volume. If not, simply stick with the OS that you're currently running.

† Apple Silicon Mac users take note: Applications that leverage deprecated kernel extensions will not function correctly while an Apple Silicon Mac is booted from an external device. If you need to verify that an application that uses deprecated kernel extensions will function on a newer OS, create a new volume on your Mac's *internal* disk to use for testing the new OS.

Make a CCC backup before upgrading

If you've read this far and you've decided to proceed with upgrading your Mac's production startup disk, the first thing you should do is make a backup of your Mac with CCC.

1. Get a backup disk. If you would like a recommendation, we offer some here in CCC's documentation <https://support.bombich.com/hc/articles/20686487352599>.
2. Download CCC <https://bombich.com/software/download_ccc> and open it.
3. Choose your startup disk in the Source selector.
4. Choose your backup volume in the Destination selector.
5. Click the Start button.
6. **Detach your backup disk from your Mac and set it aside**. Until you are ready to commit to the newer OS, you don't want the backup disk to be upgraded automatically by a scheduled backup task.

Upgrade to the new OS

Download the newest OS from the Mac App Store and apply the upgrade.

Make sure everything is working… then resume your backups

Take some time to run the applications that are most important to you. Keep in mind that when you open an Apple application (e.g. Mail, Photos, etc.) on the newer OS, those applications will immediately and irreversibly upgrade the user data for those applications. If you decide later that you want to downgrade, you cannot simply reinstall Sonoma (for example), then go about your day with the upgraded user data; the Sonoma versions of those Apple applications can't use the upgraded data from Sequoia. **If you need to downgrade to a previous OS, it is imperative that you have a CCC backup of your Mac as it was prior to the upgrade.**

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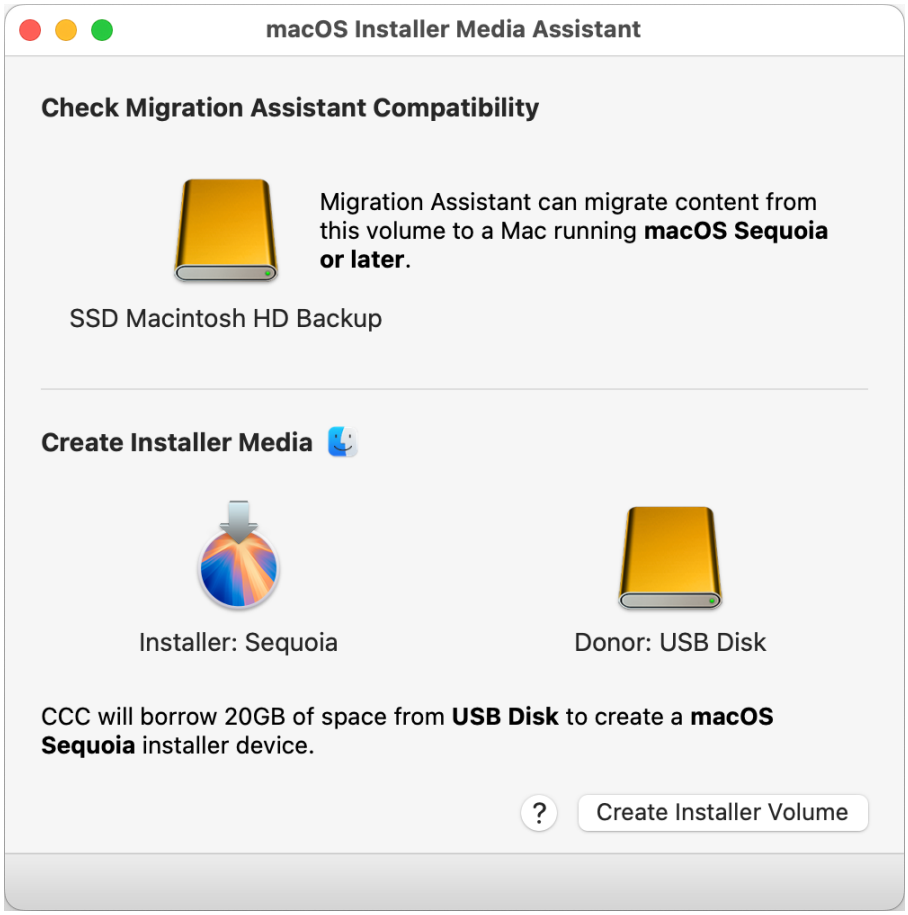
If, after a week or so you decide that everything is copacetic and you are ready to commit to the new operating system, attach your backup disk to your Mac, open CCC and re-run your backup task with the same settings. This is an important step — once the backup task has completed, you will no longer be able to use the backup to downgrade to the previous OS.

Downgrading your Mac with a CCC backup

▶ Downgrading your Mac's OS with CCC <https://youtu.be/mid5869tdNI>

Note: If you created or modified any documents while the system was running the newer operating system, the older versions of your files will be restored. Unfortunately, your personal data created by **Apple applications (e.g. Mail, Photos, etc.)** while using the newer OS will be incompatible with an older OS <https://support.bombich.com/hc/article_attachments/29304407076759>, so it is not possible to restore changes that were made while you were using the newer OS.

CCC's macOS Installer Media Assistant will help you navigate the more complicated steps of downgrading your OS. CCC's macOS Installer Media Assistant is available to CCC v7 license holders.



1. Open CCC. If you have any tasks configured to run on a schedule, or automatically when the backup disk is attached, right-click on those tasks in CCC's sidebar and choose the option to disable them.
2. Attach your backup disk to your Mac.
3. Choose "macOS Installer Media Assistant" from the Utilities menu.
4. Drag your backup volume onto the box at the top of the window to verify compatibility with Migration Assistant.
5. Download a macOS Installer. Click on the macOS/Finder icon for convenient download links.
6. Drag the installer application onto the box indicated in the Installer Media Assistant window.

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7. Drag an empty volume with more than 15 GB of free space from a USB or Thunderbolt device onto the "donor volume" box.
8. Click the "Create Installer Volume" button.
9. When the installer volume creation has completed successfully, shut down your Mac.
10. Power on your Mac while holding down the Power button (Apple Silicon Macs) or the Option key (Intel Macs). Continue holding that key down until the Apple Logo appears.
11. Select the installer device as the startup disk and proceed with startup.
12. Open Disk Utility.
13. Choose "Show all devices" from the View menu.
14. Select the parent-level device of your Mac's internal storage in the sidebar.
15. Click the Erase button in the toolbar. Erase the internal disk with the APFS format.
16. [Intel Macs]: Quit Disk Utility.
17. [Apple Silicon Macs]: Proceed when prompted to "fully erase the Mac".
18. [Apple Silicon Macs]: The system will automatically reboot into Recovery Mode and prompt you to activate the Mac. Connect to WiFi or ethernet; the Mac will activate itself.
19. [Apple Silicon Macs]: Shutdown, then boot the system while holding down the Power button.
20. [Apple Silicon Macs]: Select the installer device as the startup disk and proceed with startup.
21. Choose the option to reinstall macOS, then proceed to reinstall macOS on the internal disk of your Mac.
22. When prompted during Setup Assistant, accept the option to migrate data. Proceed as directed by Migration Assistant to migrate data from your CCC backup volume.

"I don't have a pre-upgrade backup, and now I want to downgrade. What can I do?"

Downgrading without a pre-upgrade CCC backup is possible (using the procedure described above), but will not be as successful. There are some items that the older system applications can't read, e.g. Apple Mail, Photos – basically all of the Apple applications won't be able to use the upgraded data stores.

Additional Resources

- Everything you need to know about CCC and APFS <https://support.bombich.com/hc/articles/20686448760599>
- Preparing your backup volume for an installation of macOS <https://support.bombich.com/hc/articles/20686493728919>
- ▶ Working with Disk Utility to prepare your CCC backup disk <https://youtu.be/5mBO3o570Ak>
- Testing your CCC backup <https://support.bombich.com/hc/articles/20686511433623>

We're here to help

If you get stuck or need some advice, you can get help right from within CCC. Choose "Ask a question" from CCC's Help menu to pose a question to our Help Desk.

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Apple will stop supporting HFS+ Encrypted volumes in macOS 28 (October 2027)

Apple introduced the APFS filesystem in 2018 with the release of macOS High Sierra (13.x). macOS Mojave (14.x) was the last version of macOS that could format a volume using the HFS+ Encrypted format. While current versions of macOS can still unlock and mount HFS+ Encrypted volumes, that support will come to a predictable end in October 2027 when Apple releases macOS 28 <https://developer.apple.com/documentation/macos-release-notes/macos-26_6-release-notes#:~:text=Encrypted%20HFS+%20(CoreStorage)%20is%20deprecated%20and%20will%20not%20be%20supported%20in%20macOS%2028.%20If%20you%20use%20Encrypted%20HFS+%20backups%20on%20external%20drives%2C%20begin%20backing%20up%20to%20encrypted%20APFS%2Dformatted%20external%20drives%20instead.>. With that eventuality in mind, you can avoid losing access to your data by adopting APFS for volumes that require encryption.

What should I do for HFS+ Encrypted backups?

Backup disks are the "easy" scenario, you can simply erase the volume as APFS Encrypted, then re-establish your backups. Apple does not support *converting* HFS+ Encrypted volumes to APFS, so there isn't a migration option that will preserve the data on the backup. HFS+ doesn't offer support for snapshots, though, so HFS+ backups only have the "current" version of your data. Erasing the volume and repopulating the backup is the best path forward. CCC makes this really easy:

1. Open CCC and select a backup task that has a HFS+ Encrypted destination.
2. Click on the Destination selector and choose **Backup Volume Setup Assistant…**
3. Check the box to enable encryption and specify a password.
4. Click the button to erase the volume.
5. Click the **Start** button to run the backup task and repopulate the backup.

What should I do for an HFS+ Encrypted volume that is not a backup volume?

If you have a production data volume that is HFS+ Encrypted, you can back up the data on that volume to an APFS Encrypted volume, then erase the original source as APFS Encrypted, then restore the data. CCC can help you with this as well, and has a built-in verification feature that makes this process safer.

Establish and verify the backup

1. Click **New Task** in CCC's toolbar to create a new task.
2. Click on the **Source** selector and select your HFS+ Encrypted volume as the source. If you're prompted to save the volume's password in the System keychain, click **Don't Save Password**.
3. Click on the **Destination** selector and choose a volume on a disk that has ample space to back up the data from the source.
4. When you select the destination, CCC will presents its Backup Volume Setup Assistant. If you selected a volume that already has other data on it, select the "Add a volume" box. Check the box to encrypt the destination, then provide a password. Add the new volume, or click the button to use the currently-

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selected destination volume exclusively for this task.
5. Click **Advanced Settings** at the bottom of the window.
6. Select the **Postflight** tab.
7. Check the box next to **Reverify files that were copied**.
8. Click **Done**, then click the **Start** button.

Or, if you already have an established backup task for this volume, you can update and verify *that* backup before erasing the primary source:

1. Open CCC and select the applicable backup task
2. Click **Advanced Settings** at the bottom of the window.
3. Select the **Postflight** tab.
4. Check the box next to **Reverify files that were copied**.
5. Click **Done.**
6. Hold down the Control key and click the **Start** button to perform an ad hoc Backup Health Check <https://support.bombich.com/hc/articles/20686511433623#bhc>. CCC will update the content of the destination to match the source, and verify that every file on the backup volume matches the source.

Restore the backup

1. Click **Restore** in CCC's toolbar to create a new Restore task.
2. Select the backup volume from the **Source** selector.
3. Select the original HFS+ Encrypted source volume from the **Destination** selector.
4. Click on the Destination selector and choose **Backup Volume Setup Assistant…**
5. Uncheck the box next to "Enable snapshots to retain backup history" (we don't recommend enabling snapshots on a primary source volume).
6. Check the box to enable encryption, then provide a password.
7. Click the button to erase the destination volume.
8. Click the Start button to perform the restore.

When the Restore task has completed, you can delete the Restore task. Right-click on the Restore task in CCC's sidebar and choose the option to delete that task.

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Snapshots and Backup Versioning

- Introduction to Snapshots
- Snapshot thinning and pruning
- Mounting and browsing the contents of a snapshot
- Snapshots and space concerns; Deleting snapshots
- Finding and comparing versions of files in the Snapshot Browser
- CCC snapshots vs. Time Machine snapshots
- SafetyNet snapshots vs. Backup snapshots
- Frequently Asked Questions About Snapshots

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Introduction to Snapshots

▶ Watch a video of this tutorial on YouTube <https://youtu.be/wRs0Lvf5aWE>

What is a snapshot?

Snapshots are a feature of Apple's APFS filesystem that facilitate backup versioning. A snapshot is a point-in-time representation of a volume on a hard drive. Every file on the volume is frozen within a snapshot, perfectly capturing its state at the exact moment that the snapshot was created. Even if you change or delete a file later, the file in its previous state remains available within the snapshot. CCC backups are built around APFS snapshot functionality, allowing you to restore older versions of your files and files that you've accidentally deleted.

Note: Snapshots are only available for APFS-formatted volumes.

The Role of Snapshots in a Comprehensive Data Protection Strategy

There are several aspects of data protection that a backup aims to provide. Protection against:

- Accidental file deletion or modification
- Malicious file modification (e.g. malware/ransomware)
- Hard drive failure
- Computer theft
- Catastrophic loss (e.g. tornado, hurricane, flood -- loss of both original and backups)

Support for snapshots at the filesystem level is an important and integral component of a backup strategy, but snapshots are not a complete replacement for a true backup on physically separate hardware. If your startup disk fails, snapshots on that disk aren't going to help you restore your startup disk and data. Having a backup on an external disk gives you protection against hardware failure.

	Snapshots	External Backup	Backup to Remote Macintosh
Accidental file deletion	✔	✔	✔
Malware/ransomware	✔	✔	✔
Hard drive failure		✔	✔
Theft		✔	✔
Catastrophic loss			✔

When you develop your backup strategy, consider all of the possible risks to your data and decide whether and how you will mitigate those risks. At minimum, we recommend regularly scheduled backups to a locally-attached hard drive. With a regularly scheduled backup, you will have very good protection against the most common risks to your data.

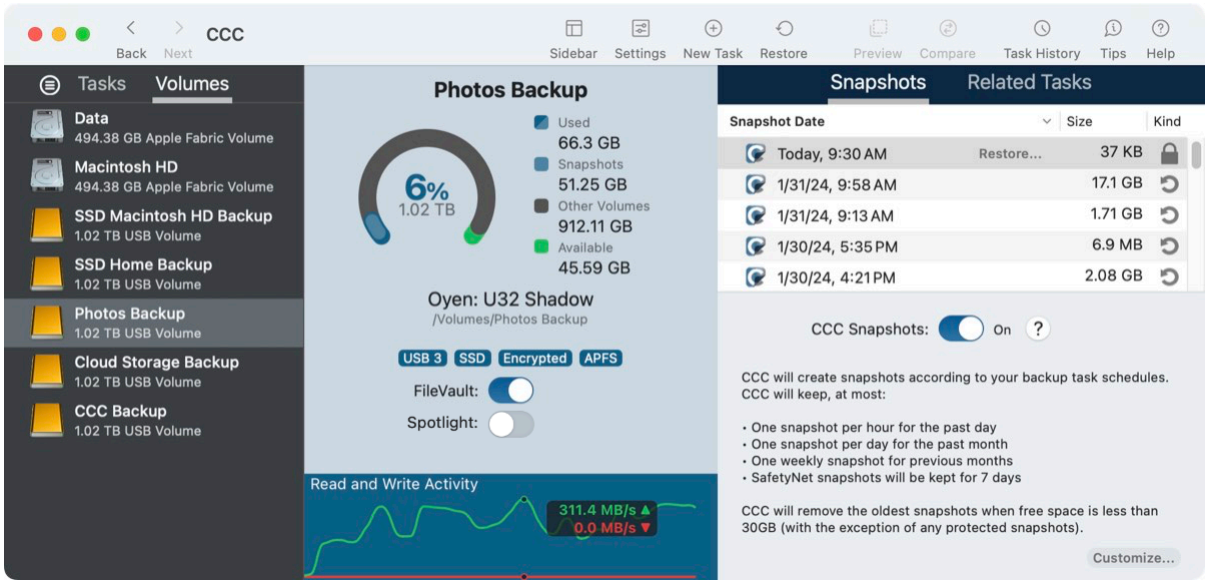
Using snapshots in CCC

CCC considers snapshot support on an individual volume basis. When you select a destination volume for your backup task, CCC's Backup Volume Setup Assistant <https://support.bombich.com/hc/articles/20686487352599-How-to-set-up-your-first-backup#bvsa> will encourage you to use the APFS format and provide an option to enable snapshot support. *For basic snapshot*

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support, you don't need to configure any settings; CCC will automatically manage your snapshots using a sensible set of defaults.

To view or change a volume's snapshot support or retention policy, reveal CCC's sidebar, then click on the volume in CCC's sidebar. CCC will list any snapshots currently present on the volume and will display the retention policy for that volume. Remember that snapshot support is limited to APFS volumes. If you select a non-APFS formatted volume in CCC's sidebar, you won't see any snapshot settings.



Related Documentation

- Snapshot thinning and pruning <https://support.bombich.com/hc/articles/21384373407127-Snapshot-thinning-and-pruning>
- Mounting and browsing the contents of a snapshot <https://support.bombich.com/hc/articles/21384614166935-Mounting-and-browsing-the-contents-of-a-snapshot>
- Restoring an older version of a backup <https://support.bombich.com/hc/articles/20686469175575-How-to-restore-from-your-backup#restore_whole_snapshot>

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Snapshot thinning and pruning

▶ Watch a video of this tutorial on YouTube <https://youtu.be/wRs0Lvf5aWE?t=1m30s>

Product Tour: Learn how to customize the retention of backup history on your backup

CCC will "thin out" snapshots at the beginning of the backup task to reduce overall snapshot disk usage while retaining a broad age range of backup versions. After thinning, CCC will then prune the oldest snapshots if free space is below a threshold. By default, CCC will apply the following retention settings:

- Hourly snapshots will be retained for 24 hours
- Daily snapshots will be retained for 30 days
- Weekly snapshots will be retained indefinitely
- SafetyNet snapshots will be retained for 7 days
- [Pruning] The oldest snapshots will be deleted when free space is less than 30GB, regardless of the thinning settings noted above.

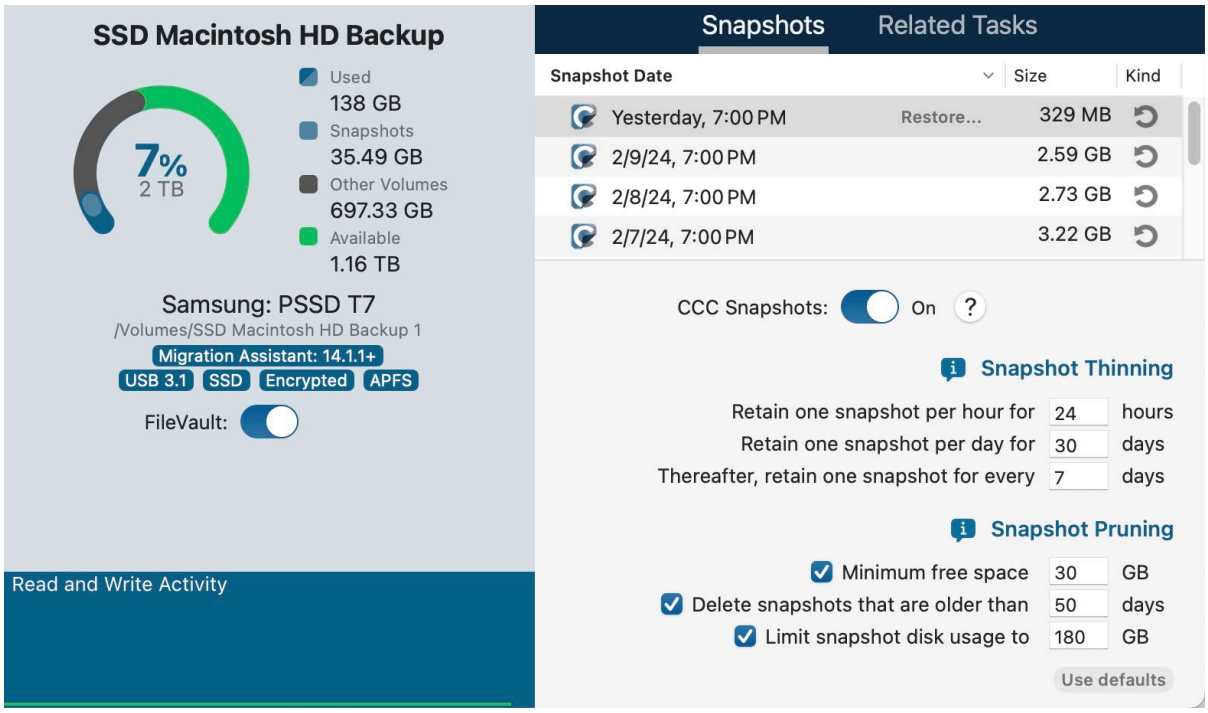
Customizing the retention policy

The default retention settings work well for a simple one-source, dedicated-backup configuration. These settings provide a good balance between version granularity, max retention age, and snapshot disk usage. If your backup requirements are more complex, you can define a custom snapshot retention policy. With a custom policy you could choose to retain hourly snapshots indefinitely (at one extreme), or choose to remove snapshots that are older than a specific number of days, or apply a specific free space or snapshot disk usage requirement so that snapshot disk usage can be balanced more fairly among multiple backup volumes on the same disk.

Select a volume in CCC's sidebar, then click the **Customize** button in the lower-right corner of the window to customize the snapshot retention policy for that volume. Click **Use defaults** to return to the default settings.

Product Tour: Show me how to customize the snapshot retention policy for my backup volume

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The Snapshot Pruning settings are optional when using a customized retention policy. If you don't want CCC to delete snapshots when the disk fills up, you can disable the **Minimum free space** setting. Note that your backup tasks will fail with an error if the destination runs out of space and CCC is not allowed to remove snapshots. You can also configure CCC's Dashboard to send notifications about snapshot pruning to the macOS Notification Center <https://support.bombich.com/hc/articles/20686467217687#nc>.

When might I want to customize a retention policy?

If you have more than one backup volume on the same physical device, customized retention policies can help "democratize" the retention of snapshots on those volumes. Or, perhaps you don't want the retention to be equal, perhaps you want one backup to get more space for snapshots. Custom retention policies give you granular control so you can build these preferences into your backup strategy. Here are two examples:

Equal versioning for both backups

Example scenario: I have business data on two separate volumes – 500GB each. I use both volumes frequently, and I want to retain backup versions for at least a year. My backup volumes are named "Jupiter Backup" and "Saturn Backup", and the backup disk capacity is 2TB.

Recommendation: With 1TB space used on the source and a 2TB backup disk, we have 1TB of space to work with for versioning. Retain snapshots on both volumes for 365 days, and set the max snapshot disk usage for each volume to 500GB.

Jupiter Backup & Saturn Backup:

- Minimum free space: 30GB (default)
- Delete snapshots that are older than: 365 days
- Limit snapshot disk usage: 500GB

The pruning limits are applied in the same order that you see in the UI, so it's possible that snapshots won't be retained for a full year, e.g. if snapshot disk usage for one of the volumes grows past 500GB. That's the point of this limit, it prevents one backup from pigging all the space we have available for backup versioning.

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Backup versioning is less important for one of the backups

Example scenario: I have my startup disk and a data disk each backing up to different volumes on the same 8TB backup disk. My startup disk uses 300GB, the data disk usages 1TB. My startup disk backup isn't unimportant, but my *most* important data is on that data disk. Also, I'd tend to look for older versions of files for my Data volume, but not so much for the startup disk. Sometimes my backup tasks copy 80GB of new content from my Data volume. My startup disk backups are around 5-10GB per day.

Recommendation: Set a 100GB free space limit to accommodate that "sometimes 80GB backed up in one event" condition. Retain snapshots of the startup disk backup for just 30 days, retain Data backup snapshots for as long as possible.

Macintosh HD Backup:

- Minimum free space: 100GB
- Delete snapshots that are older than: 30 days
- Limit snapshot disk usage: 100GB

Data Backup:

- Minimum free space: 100GB
- Delete snapshots that are older than: [not enabled]
- Limit snapshot disk usage: [not enabled]

Snapshots created by other applications

During snapshot thinning and pruning, **CCC will never delete snapshots created by other applications**. If you would like to remove snapshots created by another application, select the relevant volume in CCC's sidebar, select the snapshots you would like to remove, then press the Delete key.

Snapshot thinning is only applied when snapshots are enabled for that volume

If you disable CCC snapshot support for a volume that contains previously-created CCC snapshots, CCC will not perform automated snapshot thinning on that volume. When you disable snapshot support, you are welcome to delete the snapshots listed above the snapshot toggle button. Simply select one or more snapshots listed in the table, then press the Delete key. Note that CCC will *prune* the oldest snapshots from a destination volume if more space is needed for new backups, but that pruning only occurs when CCC has exhausted free space on the destination.

The snapshot retention policy defines which snapshots will be retained, not when they will be created

CCC creates snapshots when your backup tasks run, and only when your backup tasks run. CCC will never create snapshots outside of a scheduled or manually-run backup task. As such, a retention policy that saves "up to one snapshot per hour for 24 hours" does not imply that you will have 24 snapshots for the last day. If you have a backup task configured to run only on a daily basis, you should expect to see only one snapshot on the volume. If you want to have hourly snapshots, be sure to configure your backup task to run on an hourly basis.

CCC will override your free space limit if that's required to complete a backup

The default free space limit of 30GB will generally ensure that CCC can write 30GB of data to your destination volume during each backup task. If CCC finds more than 30GB of data to copy and runs out of room on the destination, *and only when the **Minimum free space** setting is enabled*, CCC will remove additional snapshots

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during the backup task to free additional space. When this "emergency" thinning takes place, CCC will add a notification to your backup task event (in the Task History window), suggesting that you review the Snapshot Retention Policy for your destination volume.

To review the Snapshot Retention Policy: Click on the destination volume in CCC's sidebar, then click on the **Customize** button to customize the retention policy settings. The specific setting that you should consider changing is the one labeled "**Minimum free space xx GB**". When reviewing the free space limit, consider whether your backup tasks generally copy more than 30GB (you can make that assessment in CCC's Task History window <https://support.bombich.com/hc/articles/20686456355095>). Specify a value that will leave enough space to accommodate the amount of data that usually gets copied to the destination to avoid the emergency thinning and associated notification.

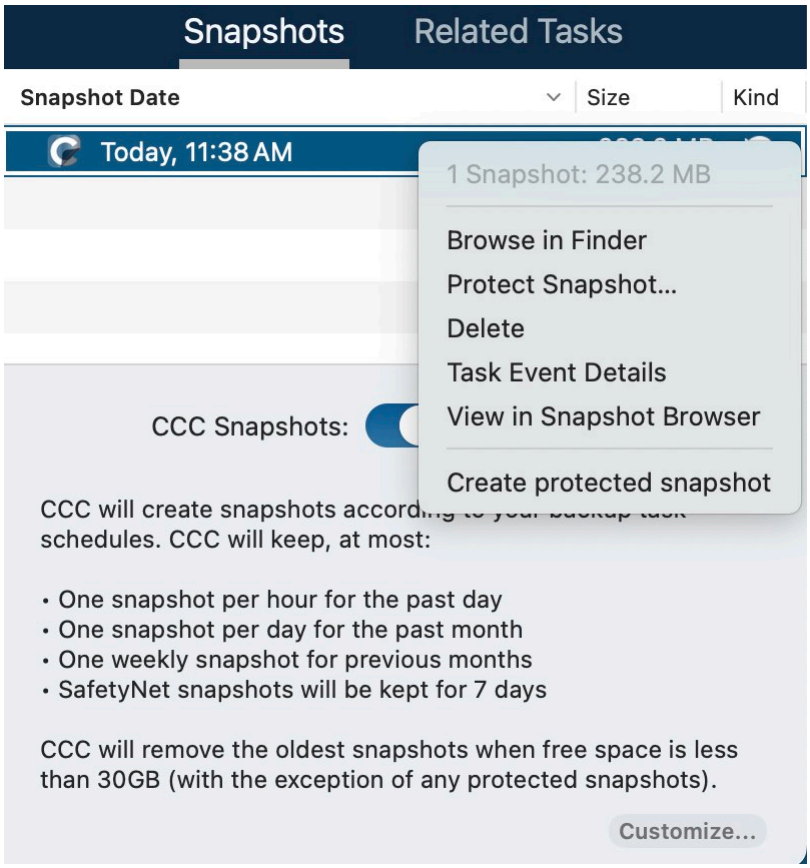
If you notice that your backup task is suddenly copying a lot more data than usual, please take a moment to look for potential problems. For example, if you have more than one backup task backing up different sources to the same destination, those tasks may be conflicting, removing each others' files. You should also determine if disk usage on the destination is unusually high compared to the source (excluding snapshot disk usage). If the disk usage looks suspicious, or if the amount of data that CCC is copying is difficult to explain, please don't hesitate to contact us for an additional review <https://bombich.com/software/get_help> of your setup.

Protected Snapshots

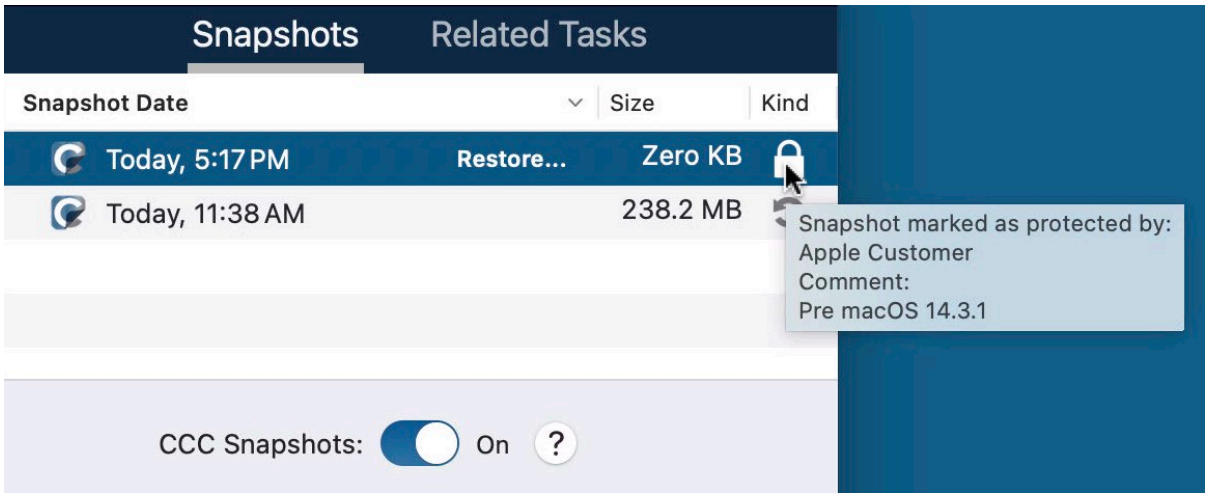
At times you may want to create a snapshot manually, or preserve a particular snapshot independently of the Snapshot Retention Policy. CCC Protected Snapshots provide that functionality. Protected snapshots are spared during automated snapshot thinning and pruning activity, e.g. at the beginning of a backup task, and whenever free space gets too low during a backup task. Note that snapshot protection does not prevent you from manually deleting a snapshot, nor can it protect the snapshot from being deleted by other applications.

To create a new protected snapshot on a volume, select that volume in CCC's sidebar, then right-click on the Snapshots table and choose **Create protected snapshot** from the contextual menu. To mark an existing snapshot as protected, right-click on that snapshot, then select **Protect Snapshot…**. CCC will present a dialog that gives you the opportunity to specify an optional comment while protecting the snapshot.

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To view the comment later, hover your mouse over the lock icon that identifies the snapshot as protected.



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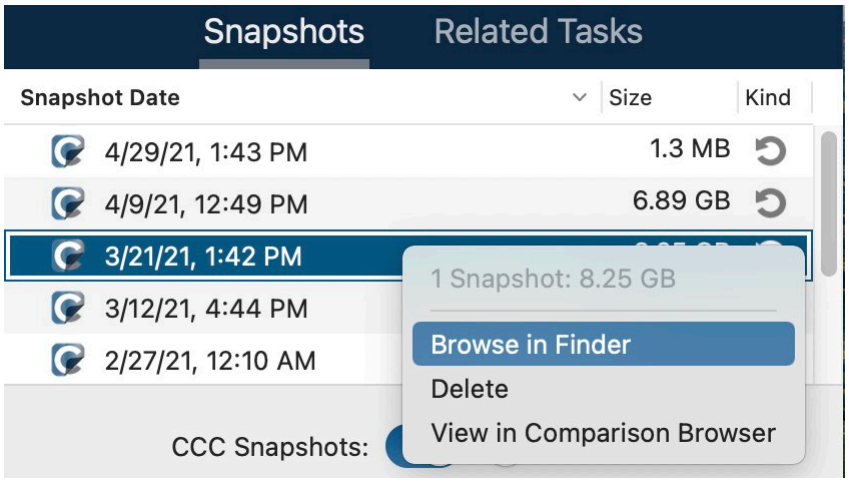
Mounting and browsing the contents of a snapshot

▶ Watch a video of this tutorial on YouTube <https://youtu.be/wRs0Lvf5aWE?t=5m1s>

If you would like to browse the contents of a snapshot:

- Click **Volumes** in CCC's sidebar
- Select an APFS-formatted volume in the sidebar
- Select a snapshot in the snapshots table, then right-click and choose the **Browse in Finder** option. Or, simply **double-click on the snapshot**.

You may then browse the contents of that snapshot in the customary manner in the Finder. The snapshot is mounted read-only, so it is impossible for you to make any harmful modifications to the snapshot. If you would like to restore a single item, you can simply drag the item from the snapshot to wherever you want to restore it to. When a snapshot is mounted, the creator icon of the snapshot in the Snapshots table will have a green dot to indicate that it is mounted.



Note: Neither the Finder nor Disk Utility shows mounted snapshots by default, so you cannot typically unmount a snapshot in those applications. CCC will indicate when a snapshot is mounted by placing a small green dot on the snapshot creator icon in the snapshots table. You can right-click on a mounted snapshot in CCC and choose the **Unmount** option to manually unmount a snapshot. For your convenience, however, CCC will automatically unmount any snapshots that it mounted when you quit CCC.

Related Documentation

- How to restore from your backup <https://support.bombich.com/hc/articles/20686469175575>

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Snapshots and space concerns; Deleting snapshots

Initially, snapshots do not inherently consume space. When you create a snapshot, the disk usage on the volume containing the snapshot remains unchanged. However, because the snapshot retains references to every file on the volume, space is not freed when you delete a file.

Suppose you have a 100GB hard drive with 80GB of content. You create a snapshot, then delete 20GB of files. The resulting disk usage is still 80GB. What you see in the Finder adds up to 60GB, and the "snapshot size" is now 20GB. That 20GB of space is not freed until the snapshot is deleted.

This free space behavior is an important factor to consider when you decide whether to enable snapshots for any particular volume, including your startup disk. If you have a hard drive that is particularly full, then maintaining snapshots on that volume may not be a practical solution. In contrast to Time Machine, CCC offers a lot of flexibility in whether snapshots are enabled for a particular volume, and how those snapshots are maintained over time. Additionally, CCC allows you to find and delete specific snapshots with ease.

To delete a snapshot in CCC:

1. Select **Volumes** in the sidebar
2. Select a volume (to remove a snapshot from the startup disk, select the volume named "Data" or "Macintosh HD - Data")
3. Select one or more snapshots in the Snapshots table
4. Press the **Delete** key

Total snapshot disk usage is not a simple sum of individual snapshot sizes

The disk usage indicator in the center of the window will show the space consumed by all snapshots. Separately and unrelated, the "size" value listed for an individual snapshot is an indication of the amount of space that will be freed if you delete *only that snapshot*. "Size" is not a great title for that column, but "Amount of space that would be freed if you were to delete this individual snapshot" is too long. Also, note that the size of the snapshot does not indicate the total amount of data referenced by the snapshot.

You may be tempted to add up all of the individual snapshot sizes and compare that to the total snapshot disk usage presented in the chart in the center of the window. Don't do that, these values are not directly comparable. Calculating the "size" of an individual snapshot is complex and dynamic – as you delete snapshots, the "size" (again, "space that would be freed if you were to delete just that individual snapshot") of other snapshots may change as those snapshots become the last reference holder for files on the disk.

Consider this over-simplified example. Suppose you started with an empty disk on Monday, and created a 2GB file. Your backups then run on Monday, Tuesday and Wednesday. Your backup disk now has the following:

- 2GB file visible in Finder
- Snapshot (Monday): 0KB
- Snapshot (Tuesday): 0KB
- Snapshot (Wednesday): 0KB
- Total snapshot disk usage: 0KB

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The 2GB file is still present on disk, so despite that each snapshot has a reference to that 2GB file, deleting any individual snapshot would not free any space because the file hasn't been deleted.

Next, you delete the file on Thursday and run your backup again. Your backup disk now has the following:

- Snapshot (Monday): 0KB
- Snapshot (Tuesday): 0KB
- Snapshot (Wednesday): 0KB
- Snapshot (Thursday): 0KB
- Total snapshot disk usage: 2GB

Each snapshot shows "0KB" because deleting any *individual* snapshot would not free any space, and that's because the Monday/Tuesday/Wednesday snapshots each has a reference to the 2GB file. If you delete all three snapshots, that would remove the last reference holders to the 2GB file, and that would free the space. Likewise, if you delete both the Monday and Tuesday snapshots, no space would be freed, but now the Wednesday snapshot would show a size of 2GB. That's because the Wednesday snapshot is now the last reference holder to that 2GB file. The Thursday snapshot doesn't have references to any files because it was created after the 2GB file was deleted, so it's size is always 0KB.

This video demonstrates the concept:

▶ Learn more about snapshots and disk usage concerns <https://youtu.be/wRs0Lvf5aWE?t=7m03s>

If you want to see how much space would be freed if you were to delete more than one, but not all of the snapshots, select a swath of snapshots and then right-click on the selection. CCC will calculate the disk usage of that collection of snapshots, which will (typically) be larger then the sum of their individual sizes.

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Finding and comparing versions of files in the Snapshot Browser

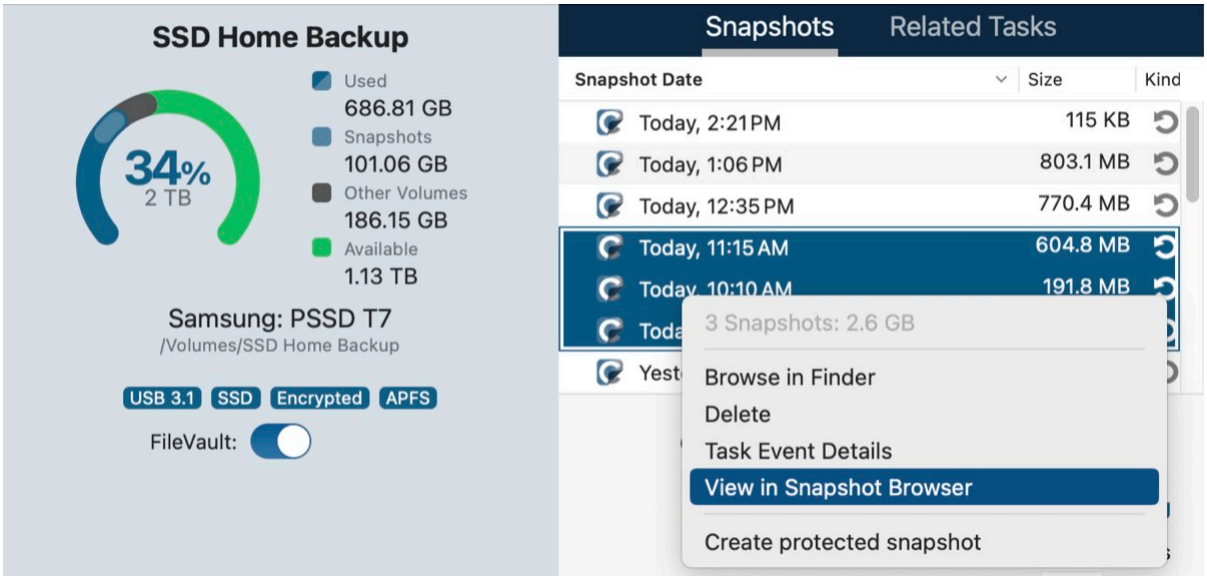
▶ Watch a video of this tutorial on YouTube <https://youtu.be/wRs0Lvf5aWE?t=10m16s>

Product Tour: Learn how to find and restore an older version of a file

Snapshots will retain multiple versions of your files, as well as files you've deleted. These can add up, leading to an overwhelming effort to try to sort through various versions. When you're looking for a specific file in a snapshot, or when you want to compare versions of a file across multiple snapshots, use CCC's Snapshot Browser.

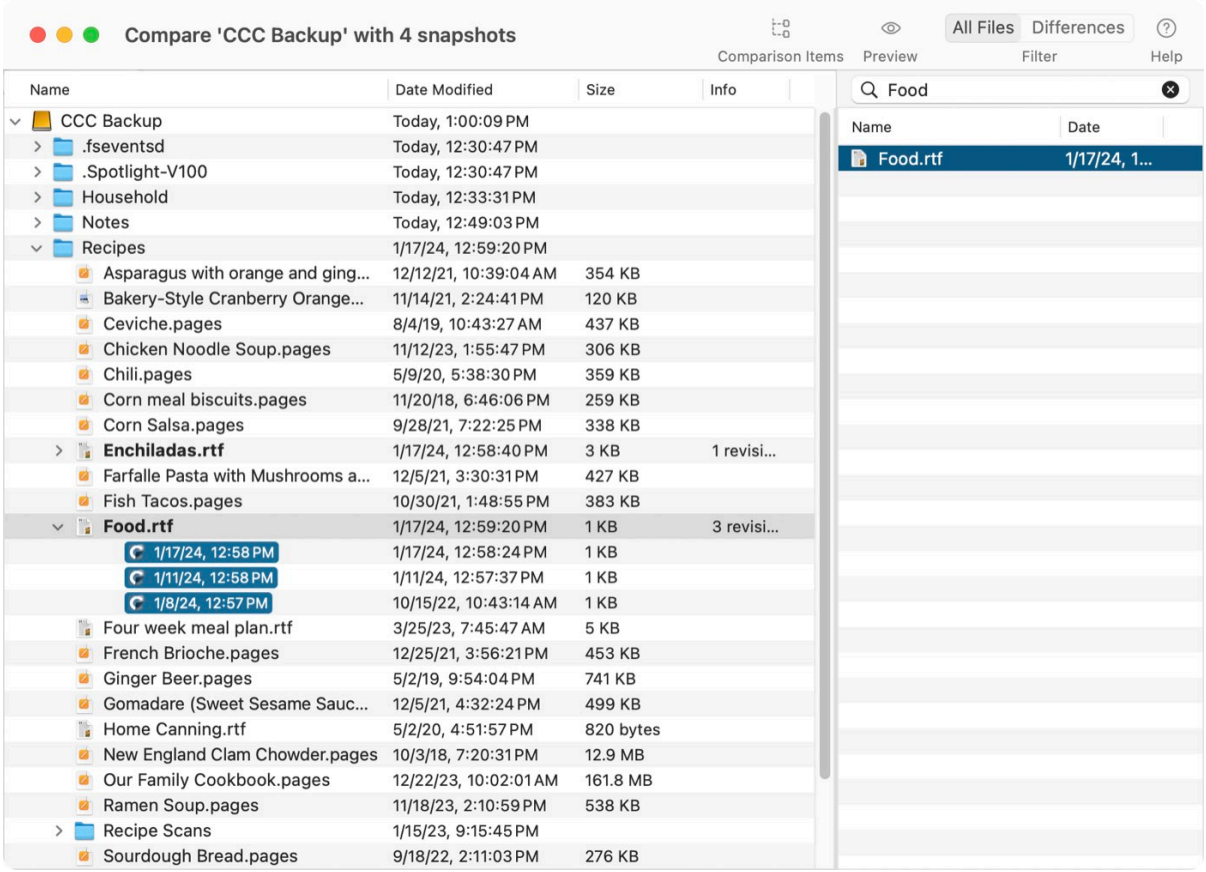
1. Click **Volumes** in CCC's sidebar
2. Select your backup volume
3. Select one or more (up to all†) snapshots in the Snapshots table
4. Right-click on the selection and choose **View in Snapshot Browser**

† The amount of time required to index snapshots for searching increases linearly as you add snapshots to the browser. If you plan to search by file name, select fewer snapshots for faster search performance. Note that you can select discontiguous snapshots by holding down the Command key as you make your selections.



The Snapshot Browser will load the current state of the destination volume, then interleave the differences from each snapshot. When multiple versions of a file are present, click the disclosure triangle next to that file to view the available versions:

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The "current" version of the file is listed first, then each version is listed beneath it with a date indicating when the snapshot was created. To see a preview of the file, select any version of the file, then click **Preview** in the toolbar. You can then use the arrow keys to toggle the preview between versions. When you select an older version of the file, the attribute differences are indicated in the sidebar.

Files that are not present in the "current" state of the destination (i.e. files that were deleted from the source prior to the most recent backup), but retained in snapshots, will be indicated in red, along with a "Deleted" token in the Info column. Click the disclosure triangle next to these files to see previous versions of those files.

Restoring files from the Snapshot Browser

If you find a version of a file that you would like to recover, simply right-click on that item (in the left pane) and choose **Restore this item...**. CCC will prompt you to select a location where you would like to have the file restored.

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CCC snapshots vs. Time Machine snapshots

CCC and Time Machine are both capable of creating snapshots on a given APFS volume. The snapshots that are created by each are exactly comparable – there's no technical difference between a snapshot created by CCC vs. a snapshot created by Time Machine. If you enable Time Machine and you do not specifically exclude your CCC source or backup volume from Time Machine's purview, Time Machine will automatically create and delete its own snapshots on those volumes. CCC is ambivalent about the snapshots that it presents for restoring, so it is acceptable to allow Time Machine to create snapshots on your CCC source and destination volumes.

However, you should carefully consider whether you want to allow both CCC and Time Machine to create snapshots on any given volume. Redundant snapshots managed by different retention policies is not harmful, but will probably result in a less effective retention schedule. Time Machine only retains snapshots for 24 hours, though, so the concern is only applicable to one day's worth of snapshots.

Disabling Time Machine snapshots for an individual volume

Many users find that snapshots are still created on a volume even after disabling snapshot support within CCC for that volume. Disabling snapshot support only affects CCC's creation and removal of snapshots from that volume, it does not affect Time Machine. CCC's snapshot list will indicate the icon of the application that created the snapshot:

-  Snapshot created by CCC
-  Snapshot created by Time Machine

If you would like to prevent Time Machine from creating snapshots on a given volume, you can exclude that volume from Time Machine:

1. Open the System Settings application and click **General** in the sidebar
2. Open the Time Machine panel
3. Click on the **Options...** button
4. Click the **+** button and select the volume you would like to exclude

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SafetyNet snapshots vs. Backup snapshots

SafetyNet is a feature unique to CCC that aims to protect data on your destination volume. Suppose, for example, that you have three volumes: **Macintosh HD**, **Backup**, and **Photos**. If you created a backup task and accidentally selected the **Photos** volume as your destination, some copying applications would simply erase the destination or delete the files on that volume, with no recourse! With SafetyNet enabled, CCC benevolently retains those items on the destination, but cordons them off to a separate folder so you can recover them later if necessary.

On a snapshot-enabled volume, the SafetyNet is now implemented as a pre-flight snapshot. Before CCC makes any changes to the destination, it will create a "SafetyNet Snapshot" of the destination. Then the task will proceed in the normal manner, copying files from the source to the destination. If you later realize that you had configured the task with the wrong destination, or that you had placed files on the destination volume and they're missing after running your backup task, you can restore those items to the destination from the SafetyNet Snapshot.

At the end of the backup task, CCC will create a second snapshot; a "Backup Snapshot". This second snapshot represents the state of the source for the current backup event. If you ever wanted to restore data back to the original source or to a replacement disk (e.g. because the source disk failed), you would use a Backup Snapshot to restore that data. This is a very important point: you generally will never use a SafetyNet snapshot to restore data back to the original source. SafetyNet Snapshots are used to restore files that were errantly deleted or modified on the destination.

Summarizing, keep these two points in mind:

- SafetyNet Snapshots allow you to recover files on the destination that were **unrelated to your backup task**
- Backup Snapshots give you point-in-time restores of the data from your source volume

Do I need SafetyNet?

You typically do not need SafetyNet to be enabled on your backup tasks. SafetyNet snapshots offer protection from configuration mistakes, e.g. selecting the wrong destination, or using the destination to store files that are not related to the backup task. As long as your destination is dedicated to the backup task, SafetyNet is an unnecessary layer of snapshot redundancy.

SafetyNet is a safety mechanism, it's not a strategy for retaining other stuff on your backup volume

Your backup volume should be dedicated to your backup task. If you want to take advantage of some extra space on your backup disk, we recommend that you add a volume to that disk specifically for storing the other data <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume_startup_disk>. That other volume will be outside of CCC's purview, thus protected from any unintentional alterations. Open Disk Utility and select your backup disk, then choose **Add an APFS Volume...** from the Edit menu to add a volume to your backup disk.

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Frequently Asked Questions About Snapshots

The retention policy says it will save one snapshot per hour. Why don't I see more hourly snapshots on my disks?

To give you the most control over the creation of snapshots on your disks, CCC only creates snapshots when your backup tasks run (this is specifically in contrast to Time Machine's non-configurable hourly snapshots). If your backup task is configured to run on a daily or weekly basis, then CCC will not produce hourly snapshots. The retention policy will keep **at most** one snapshot per hour for the specified interval, but that does not imply that you will have **at least** one snapshot per hour for that interval. If you would like to have snapshots created on an hourly basis, then you can schedule your tasks to run on an hourly basis.

Where did the _CCC SafetyNet folder go?

When working with non-APFS volumes, or APFS volumes that have CCC snapshot support disabled, CCC creates a "_CCC SafetyNet" folder at the root of the destination volume when the SafetyNet feature is enabled. As CCC updates the destination, any files that don't exist on the source or that are getting replaced by an updated version will be moved into that SafetyNet folder. When snapshot support is enabled on an APFS destination, however, that folder is no longer used as part of the SafetyNet mechanism. Instead, CCC creates a SafetyNet Snapshot at the beginning of the task, then proceeds to update the destination. Older versions of files and files that don't exist on the source are immediately removed from the destination (but still protected by the SafetyNet Snapshot!), so at the end of the task, the source and destination look identical.

If you enable snapshots on an APFS destination volume that has a legacy SafetyNet folder, CCC will first create a SafetyNet Snapshot. After having successfully created the SafetyNet Snapshot (which will retain your legacy SafetyNet folder), the legacy SafetyNet folder is removed. That SafetyNet Snapshot is then subject to the SafetyNet retention setting defined by the Snapshot Retention Policy for your destination volume. If you would like to access the contents of that SafetyNet folder, double-click the SafetyNet Snapshot to reveal it in the Finder.

If you're familiar with using the SafetyNet for recovering older versions of your files, please keep in mind that Backup Snapshots are designed for that purpose. You should only be looking into a SafetyNet Snapshot if you had kept something on the destination and then lost it after running a backup task.

I just enabled encryption on my APFS-formatted volume. Why am I now getting errors that CCC can't create snapshots?

The APFS filesystem won't create nor remove snapshots while encryption conversion is underway. You can select your volume in CCC's sidebar to see conversion progress. Once the conversion has completed, CCC won't have any trouble creating or deleting snapshots.

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Should I enable snapshot support on my source volume?

CCC will not automatically enable snapshot support on the source. Sometimes, however, it does make sense to use storage space on your source for retaining older versions of your files. For example, suppose you don't travel with your backup disk and you want a modicum of versioning support when you travel. If your backup volume is missing when your task runs, but snapshot support is enabled on the source, CCC will create "vacation" snapshots on the source. That's not a backup (i.e. a copy of your data on redundant hardware), but it does give you access to some older versions of your files while your backup disk is absent.

Likewise, if you're making a backup to a NAS volume, then using space on the source for snapshots would provide file versioning.

To enable snapshot support on your source volume, click on CCC's Source selector and choose **Manage snapshots on '[volume name]'**.

Retaining snapshots will increase disk usage over time, so we recommend limiting retention of snapshots on the source <https://support.bombich.com/hc/articles/21384373407127>. Additionally, if you enable CCC Snapshot support on the startup disk, bear in mind that Apple's Installer may delete all snapshots from the startup disk when applying updates or major OS upgrades. Snapshots are not a permanent data storage strategy.

Why does CCC create a snapshot on the source even when CCC snapshot support is disabled for that volume?

When your backup tasks run, CCC will automatically create a snapshot on an eligible source volume and use that snapshot as the source for the backup task. Because the snapshot is mounted read-only, changes that you make to files while the backup task runs won't cause errors during the backup task — you'll get a true point-in-time backup of your data. If you do not have snapshots enabled for the source volume, CCC will automatically remove the temporary source snapshot at the end of the backup task.

Mounting snapshots on the startup disk

Access to various folders within your home folder on the startup disk is typically restricted by the macOS "Transparency, Consent, and Control" subsystem. For example, applications would normally require your explicit permission to access your Photos or Contacts. Those access controls are not extended to a mounted snapshot of the startup disk. While snapshots are mounted read-only (and by nature can *only* be accessed in a read-only manner), folders that would normally be inaccessible to most applications will be accessible on the snapshot.

This is a platform decision consciously made by Apple, and is not, all by itself, an inherent privacy concern. Rather, it's simply a situation that you should be aware of when you mount a snapshot of the startup disk. To that end, when you attempt to mount a snapshot of the startup disk, CCC will present a prompt reminding you that some protected folders will become accessible. If there are applications running on your Mac that you do not want to have access to your protected folders, then this is an opportunity to terminate those applications prior to mounting the snapshot.

Lastly, bear in mind that CCC does not retain snapshots on the startup disk by default, so this scenario is only applicable if you have manually enabled CCC snapshot support on your startup volume, or if you are attempting to mount a snapshot that was created by some other application (e.g. Time Machine).

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Troubleshooting

- How do I get help?
- Why doesn't the disk usage on my backup disk match the disk usage on the source disk?
- External Boot Troubleshooting
- Why do some applications behave differently or ask for the serial number after restoring from the backup?
- Identifying and Troubleshooting Hardware-Related Problems
- Keeping CCC up to date
- Uninstalling CCC
- CCC reported that the destination is full. What can I do to avoid this?
- Troubleshooting "CCC was unable to modify the keychain entry" errors
- Antivirus software may interfere with a backup
- What criteria does CCC use to determine if a file should be recopied?
- "CCC found multiple volumes with the same Universally Unique Identifier"
- Finder or App Store finds other versions of applications on the backup volume
- "The task was aborted because a subtask did not complete in a reasonable amount of time"
- Troubleshooting slow performance when copying files to or from a network volume
- Where can I find CCC's log file?
- Why can't I eject the destination volume after the backup task has completed?
- Some third-party storage drivers may cause hardware misbehavior
- Coping with errors caused by filesystem corruption
- macOS-Specific Issues That We're Tracking
- Troubleshooting APFS Replication
- Preserving Finder comments and tags
- Character composition conflicts on NAS volumes

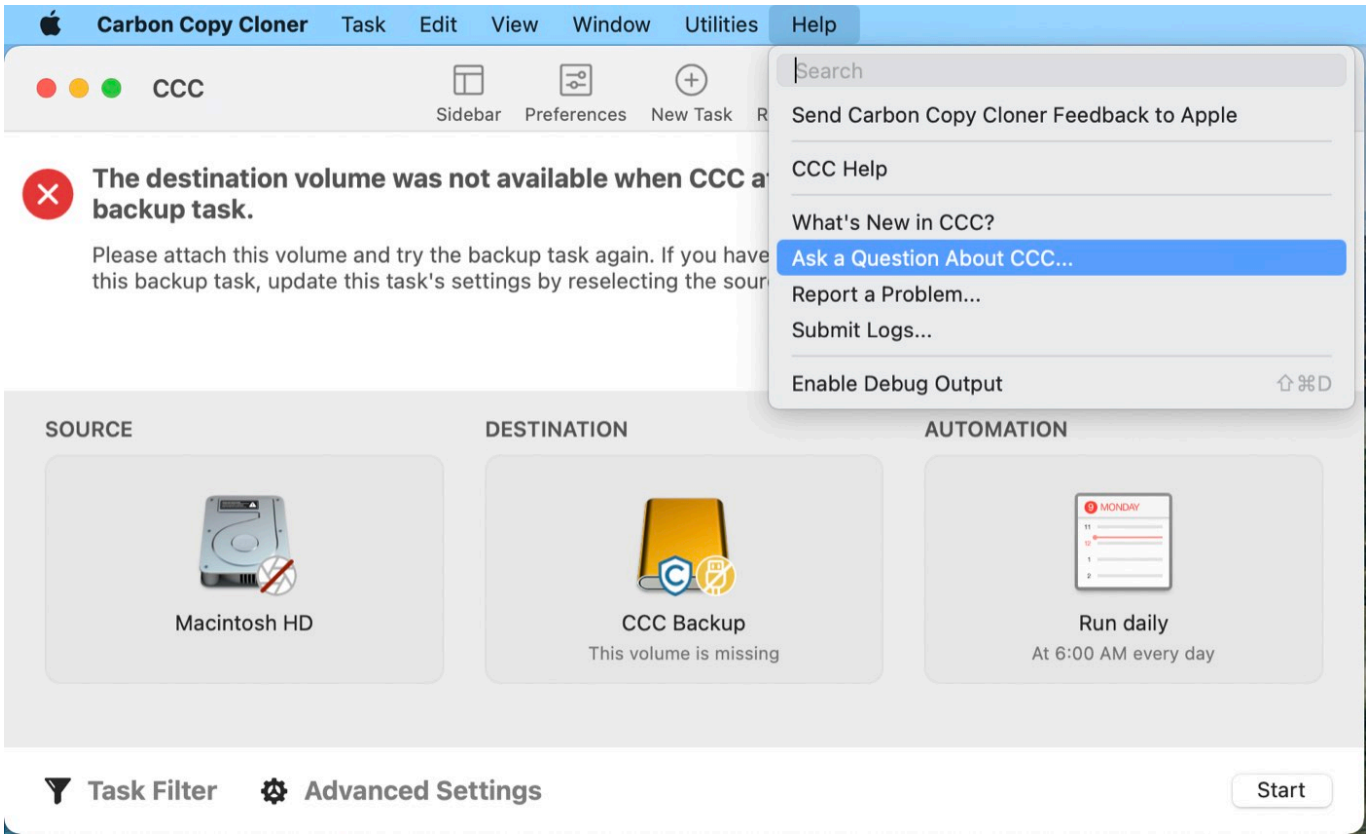
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How do I get help?

The best way to receive help is by requesting it from within the CCC application. Please note that we provide support in English only and we try to respond within one business day.

Open Help

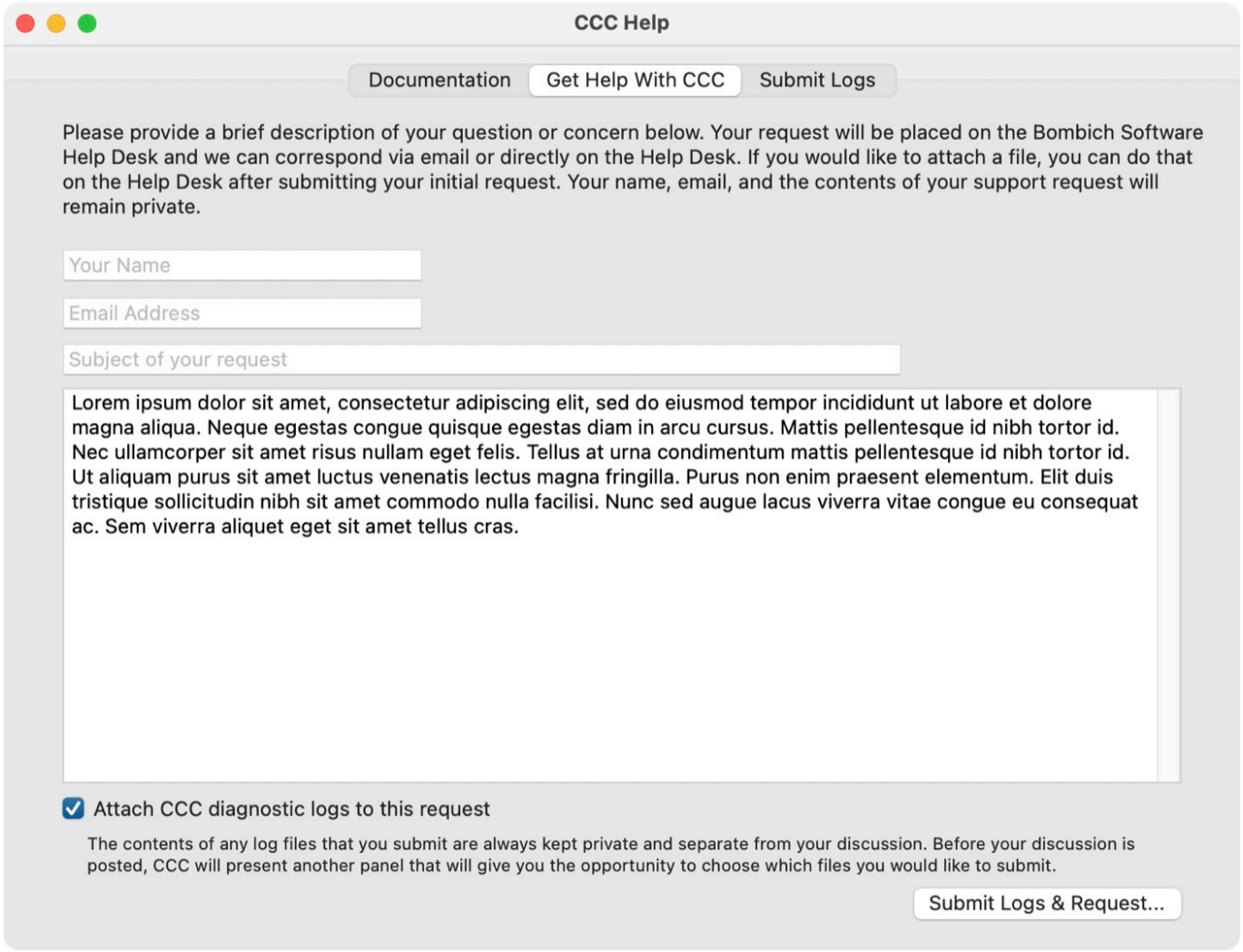
If you have a question about CCC or you need help solving a problem, we're here to help you. Choose Ask a **Question About CCC...** from CCC's **Help** menu.



Describe your question

Provide your name, email address, a brief subject, and let us know how we can help you. For the fastest assistance, please include your logs with your help request. We usually get back to folks within one business day from their support request - and often much faster than that.

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Why doesn't the disk usage on my backup disk match the disk usage on the source disk?

The disk usage on your startup disk is always higher the amount of data that needs to be backed up. As a result, disk usage on the destination will typically be lower than disk usage on the source after making an initial backup of your startup disk. Special filesystem devices (e.g. filesystem snapshots) and some macOS service data either cannot or should not be copied to another volume. That list of exclusions is documented here: Some files and folders are automatically excluded from a backup task <https://support.bombich.com/hc/articles/20686463321751>.

CCC doesn't copy virtual memory, Trash, nor snapshots

The largest and most notable excluded item is the /private/var/vm/sleepimage file. The sleepimage file contains the live state of your Mac's RAM, so it will be as large as the amount of RAM that you have installed. This file is potentially very large, changes constantly and it gets recreated on startup, so CCC excludes this file from every backup task.

CCC also excludes the contents of the Trash, so you may want to empty the Trash, then compare again the source and destination.

Lastly, filesystem snapshots may consume a considerable amount of space on your source volume. Select the source volume in CCC's sidebar to see snapshot-related disk usage. Snapshots retain references to files that have been deleted or modified, they are not a representation of your current data set, and cannot be copied from one volume to another.

Disk usage math is not straightforward

Disk usage is not a simple matter of adding the size of every file on a volume. Special filesystem devices (e.g. hard links) have always complicated this math, but Apple has introduced more special filesystem devices that complicate this even further. The cloning feature in Apple's new APFS filesystem can lead to a scenario where it appears that you have more data on the disk than it can possibly contain (i.e. the total backup size is larger than the source disk usage). On the flip side, filesystem snapshots retain storage space outside of the source data set (so total backup size is smaller than source disk usage). APFS also supports "sparse" files, which consume less space on disk than their file size would suggest (so again, making the backup size larger than source disk usage). CCC can preserve sparse files between APFS volumes, but HFS+ does not support sparse files, so these files consume more space on an HFS+ formatted backup disk. These two videos demonstrate of couple of the complicating factors:

- ▶ Finder does not accurately represent the true disk usage of your files <https://youtu.be/KggyuL8mED0>
- ▶ Understanding disk usage when using snapshots <https://www.youtube.com/watch?v=4wqAC4YXiaY>

Finder's Get Info panel often presents outdated disk usage

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information

We get frequent reports that the Finder's Get Info panel shows differences between folders on the source and destination. More often than not, these differences are not real, rather they are the result of Finder showing invalid, outdated information. Making the matter worse, the Get Info panel doesn't show when its values were collected, nor does it provide any indication that it's actively working in the background to update the disk usage values.

So how can I tell that all of my data was actually copied?

Click the **Compare** button in CCC's toolbar to perform a comparison of the currently-selected task's source and destination. This comparison will help visualize any actual differences between the two volumes.

Related Documentation

- Common explanations for differences between the source and destination <https://support.bombich.com/hc/articles/20686430989207#common>

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External Boot Troubleshooting

The macOS System resides on a "Signed System Volume" <https://developer.apple.com/news/?id=3xpv8r2m>. This volume is cryptographically sealed, and that seal can only be applied by Apple; ordinary copies of the System volume are non-bootable without Apple's seal. When you configure a CCC backup task using the Legacy Bootable Copy Assistant, CCC will automatically use Apple's proprietary APFS replication utility (ASR) to make a block-for-block exact copy of the source. If that does not produce a bootable volume, and if you have exhausted the Firmware Discoverability Troubleshooting steps below, then we recommend that you install macOS onto the backup. If that does not produce a bootable device, then the device is not suitable for functioning as a bootable device on your Mac.

Only Apple can make an external device bootable. Our support for system copying and bootability is limited to the suggestions noted above.

Related Documentation

- Bootable backups have been deprecated for several years <https://bombich.com/blog/2024/12/19/bootable-backups-have-been-deprecated-for-several-years>
- Troubleshooting APFS Replication <https://support.bombich.com/hc/articles/20686435861015>
- Creating legacy bootable copies of macOS <https://support.bombich.com/hc/articles/20686422131479>
- Installing macOS onto a CCC backup

No Mac will ever boot from an OS that is older than what it shipped with

Apple has never supported booting a new Mac from an OS that is older than what it shipped with. If you're trying to migrate content to a new Mac, use Migration Assistant for that purpose <https://support.bombich.com/hc/articles/20686482554519> — **do not attempt to restore an older Mac's backup onto a new Mac**.

Related Documentation

- Can I restore my Mac's backup to another computer? <https://support.bombich.com/hc/articles/20686491945111>
- Apple Kbase #HT204350: Move your content to a new Mac <https://support.apple.com/en-us/HT204350>

Sometimes the Mac's firmware cannot detect your backup device

When you boot your Mac while holding down the Option key (Intel Macs) or the Power button (Apple Silicon Macs), the Mac Startup Manager <https://support.apple.com/en-gb/HT202796#startupmanager> will display a list of available startup devices. Using only device drivers that are stored on your Mac's firmware chip, the firmware will scan all of your SATA, PCI, USB, and Thunderbolt busses for hard drive devices, then read those hard drive volume headers to determine if a macOS system is available on each volume. Ordinarily, a CCC-created copy of your system volume will appear in this list, but occasionally your Mac's firmware may have difficulty discovering the hardware that hosts your backup.

Here are a few common reasons for devices to not appear, and then some troubleshooting steps you can try to resolve it.

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Enable "External Boot" on T2 Macs (this is not required on Apple Silicon Macs)

If you are attempting to boot a Mac with an Apple T2 controller chip <https://support.apple.com/en-us/HT208862> (e.g. a 2018 MacBook Pro or an iMac Pro) from your CCC bootable copy, be sure to change your Mac's **External Boot** policy to allow booting from an external hard drive. Apple describes the procedure in this Apple Kbase article <https://support.apple.com/en-us/HT208198>, but the steps are:

1. Restart your Mac while holding down Command(⌘) and the "R" keys.
2. Choose **Startup Security Utility** from the Utilities menu in the menu bar (see this screenshot for clarification <https://bombich.com/images/help-clone-wont-boot/startup_security_utility.jpg>)
3. Click the **Enter macOS Password** button, then choose an administrator account and enter its password.
4. Change the **External Boot** (or "Allowed Boot Media") setting to **Allow booting from external media**
5. Restart

Please do not, however, change the **Secure Boot** setting for the purpose of booting from a backup. "Full Security" is the default setting, and that setting is compatible with booting a T2 from its own backup. Do note the exception to this when attempting to boot one of these Macs from a different Mac's backup **– booting a T2 Mac from another Mac's backup is not supportable**.

Note for users with non-QWERTY keyboards: When you initially boot into Recovery mode, you'll be prompted to select a language. Be sure to select a language that matches your keyboard, otherwise the Startup Security Utility may not accept your password.

Can I leave this setting unchanged and change it only in the future when I actually need to boot from my backup?

Generally no. Changing settings in the Startup Security Utility requires a functional user account on the internal disk of your Mac. If your Mac's startup disk were to fail, it would be impossible to change the startup security settings. Because the primary purpose of a bootable backup is to function as a rescue disk in the event that your Mac's startup disk fails or otherwise becomes non-functional, we recommend leaving your Mac configured to allow booting from external devices.

For additional startup security, you can apply a firmware password. When a firmware password is applied, your Mac will require a password to load the Startup Manager on startup.

Apple Kbase HT204455: How to set a firmware password on your Mac
<https://support.apple.com/en-us/HT204455>

Rule out generally incompatible configurations and filesystem anomalies

If you are using an external hard drive enclosure, see whether your enclosure is listed at the bottom of this page <https://support.bombich.com/hc/articles/20686469004567#known_issues> as an enclosure that we've seen problems with in the past.

Eliminate all hubs and adapters between your Mac and the external storage. Your external device should be plugged directly into a USB or Thunderbolt port on your Mac using a cable that has the correct plugs on each end (no adapters).

Troubleshoot discoverability issues in the Mac's Startup Manager

1. Turn off your Mac
2. Detach all peripherals from your Mac except for the keyboard and mouse (including any secondary

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displays)
3. Attach the backup disk directly to a USB or Thunderbolt port on your Mac (no hubs, no adapters, no monitor ports, no daisy chaining, no third-party USB cards)
4. Start up your Mac while holding down the Option key (Intel Macs) or the Power button (Apple Silicon Macs). [Note: A wired keyboard may be required for this step]
5. Wait about 30 seconds to see if the backup volume appears. **If your backup volume appears at this step and the boot process proceeds past the Apple logo,** skip to the section below**.**
6. Press Option-Shift-Command-Period at the Startup Manager window to load any Option ROM firmware that is present and required for an external hard drive enclosure.
7. Detach, then reattach the backup volume's USB or Thunderbolt cable from/to your Mac and wait up to another 30 seconds. If your backup volume appears, select it and proceed with the startup process.
8. If the backup volume still does not appear as an option, shut down your Mac completely. Then start it up holding down the Option key (Intel Macs) or the Power button (Apple Silicon Macs), waiting another 30 seconds for the volume to appear.
9. Repeat the steps above, but using another interface (e.g. USB if you tried Thunderbolt, Thunderbolt if you already tried USB) and see if the volume appears.
10. If the hard drive enclosure is bus powered, try plugging in its DC power supply before starting up your Mac. Bus powered enclosures often take a bit longer to spin up or simply don't make themselves available that early in the boot process.

Additional USB device troubleshooting

Here are a couple additional steps you can perform to try to get your Mac to "see" your USB device early in the startup process.

1. Reboot your Mac while holding down the Option key (Intel Macs) or the Power button (Apple Silicon Macs).
2. If your Mac has multiple USB ports, try attaching your destination disk to each port (and be sure to use the ports on your Mac directly — not a hub, keyboard, or display)

Reset the Mac's Parameter RAM

Lastly, try resetting your Mac's parameter RAM. PRAM maintains settings related to starting up your Mac, and it's possible that invalid settings are interfering with your Mac's discovery of the external enclosure. To reset your PRAM on an Intel Mac:

1. Hold down Command+Option+P+R on startup
2. Hold down those keys until you hear the second startup chime.
3. Release all but the Option key after you hear the second startup chime.

Definitively rule out an incompatible enclosure

If the volume still won't boot, it may be impossible for your firmware to detect your enclosure (despite that macOS, once booted and having access to far more device drivers, can see the enclosure just fine). The Golden Litmus Test for bootability would be to install macOS directly onto the volume. **If the macOS Installer fails to make the disk bootable, then your external device will not function as a startup device.**

The backup volume starts to boot the Mac, but fails to get to the Finder, or the Mac reboots and boots from the internal disk

If your backup volume showed up in the Startup Manager, and you selected it and proceeded with the startup process, but...

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Your Mac doesn't display the Apple logo (e.g. you get a blank, black or gray screen after selecting the backup volume): try installing macOS onto the volume to verify its suitability as a startup device.

The Apple logo and a progress indicator appears, but the startup process never completes (and perhaps the Mac reboots from the internal disk): There may be an storage driver conflict at play, or a compatibility issue specific to the enclosure.

1. Choose "About This Mac" from the Apple menu to verify that your Mac really did not boot from the volume that you selected
2. Detach all unnecessary peripherals, including secondary displays.
3. Reboot the Mac and hold down Option (Intel Macs) or the Power button (Apple Silicon Macs) to load the Startup Manager
4. Select the backup disk
5. As you click the button to proceed with the startup process, hold down the Shift key to boot in Safe Boot mode

If your Mac successfully boots from the selected volume in Safe Boot mode, open the Terminal application and paste in the following command:

```
sudo kextcache --clear-staging
sudo kextcache -system-prelinked-kernel
sudo kextcache -system-caches
```

Press the Return key after pasting in each line and authenticate when prompted. Then try again to boot from the same volume without Safe Boot mode. If your Mac still fails to boot from the selected volume, try installing macOS onto the volume to verify its suitability as a startup device.

Related documentation:

- Some third-party storage drivers may cause hardware misbehavior <https://support.bombich.com/hc/articles/20686428851607>

Performance expectations while the Mac is booted from the backup

The performance of your Mac while booted from the backup depends almost entirely on the performance of the hardware, and more specifically, the performance of the *filesystem* on that hardware. If your backup disk is an SSD, you can expect very good performance — comparable to the performance that you get when you boot your Mac from its internal SSD. If your backup disk is a rotational HDD, then performance will vary from adequate to very poor, depending on the specific performance characteristics of your backup disk. For example, performance is considerably worse for 5400RPM disks and disks that use Shingled Magnetic Recording <https://support.bombich.com/hc/articles/20686495048215#smr>. You may find the performance of one of these slower HDDs to be unusable for booting your Mac.

Related documentation

- Choosing a backup drive: Devices that we recommend <https://support.bombich.com/hc/articles/20686495048215#recommendations>
- Using Migration Assistant to restore your startup disk from a CCC backup <https://support.bombich.com/hc/articles/20686469175575#install_then_migrate>

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You can install macOS onto a "Standard Backup" to make it bootable

We recommend using the **Legacy bootable clone using Apple Software Restore** option any time you have an **immediate** need to create a bootable copy of your startup disk. However, if some time in the future you find a need to boot from an external device, and you have an existing Standard Backup *on a non-encrypted APFS volume* that you would like to make bootable, you can install macOS onto that volume:

1. Download and open the macOS Installer: [Ventura <https://apps.apple.com/us/app/macos-ventura/id1638787999?mt=12>] [Sonoma <https://apps.apple.com/us/app/macos-sonoma/id6450717509?mt=12>] [Sequoia <https://apps.apple.com/us/app/macos-sequoia/id6596773750?mt=12>]
2. When prompted to select a disk, click the **Show All Disks...** button and select your backup disk
3. Proceed to install macOS onto your backup disk

Note that the macOS Installer will remove any snapshots on the backup volume, thus revoking any opportunities to restore older versions of your files.

Configurations with which we have seen some problems

- USB thumb drives, flash drives and SD cards will not function as external boot devices.
- We have received a report that the Nexstar 6G <http://www.vantecusa.com/products_detail.php?p_id=25&p_name=NexStar+6G&pc_id=2&pc_name=3.5%22+Enclosure&pt_id=1&pt_name=Hard+Drive+Enclosures> USB 3.0 hard drive enclosure may not bootable due to a discoverability issue.
- We have received several reports that multiple-bay hard drive enclosures provide inconsistent boot results. In each case, the Mac can boot from the external disk as long as the hard drive is placed in the first bay of the enclosure. When placed in other bays, the bootable volume is not discoverable by the Mac's firmware. If you have trouble booting from a disk in a multi-bay enclosure, try swapping the drive positions within the enclosure.
- We have received a report that the Orico 3588US3 USB3 enclosure is not bootable due to a discoverability issue.
- Some users have reported discoverability issues with ASM1352R enclosures from ASMedia.
- One user reported that the MyDigitalSSD Boost enclosure is not bootable.
- Sonnet Customer Support has confirmed that any device attached to the Sonnet Allegro Pro USB 3 PCI card cannot function as a startup disk.
- Some users have reported bootability issues with the Inateck USB 3.0 2.5" hard drive enclosure with a model number of "FEU3NS-1".
- We have received a report that the **Sabrent Rocket Pro 2TB NVMe USB 3.1 External Aluminum SSD** is not bootable.
- We have received at least two reports that the **LaCie d2** is not bootable.
- We have received a report that the **GMM M.2 NVMe enclosure** is not bootable (test case was a MacPro running Monterey, confirmed by booting the same storage in another enclosure).
- We have received a report that the the Samsung SSD drivers (i.e. those provided by Samsung) cause macOS to either stall or kernel panic when attempting to boot from a Samsung T7 SSD. We recommend that you avoid installing the Samsung storage drivers, they are redundant to the built-in macOS storage drivers.
- We have received several reports that various external devices fail to boot macOS. The common thread in these reports is that the macOS Installer hangs with "one minute remaining", and never completes the installation procedure (and users are trying the installer as a last resort). As noted above, if the macOS Installer can't produce a bootable installation of macOS on your external device, then that device is

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simply not going to be capable of booting your Mac. We recommend using that storage for a Standard Backup <https://support.bombich.com/hc/articles/20686422131479#standard_backups> instead.

Related Documentation

- Can I restore my Mac's backup to another computer? <https://support.bombich.com/hc/articles/20686491945111>
- Apple Kbase: About the screens you see when your Mac starts up <https://support.apple.com/en-us/HT204156>

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Why do some applications behave differently or ask for the serial number after restoring from the backup?

Some applications won't work when transferred to a new disk or when run on a different Mac. This has nothing to do with whether or how CCC backs up your data, it comes down to the serialization requirements imposed by the software vendor (i.e. their anti-piracy strategy). Some applications will work just fine, some will simply require that you re-enter your serial number (Microsoft Office and Adobe apps frequently fall in this category), while other applications will require a reinstallation from the original install media or online reactivation via the vendor's website. **CCC cannot (technically or legally) subvert activation requirements imposed by other software vendors.**

Also note that some applications consider the presence or absence of peripherals as well as other hardware characteristics during the installation process. If these conditions are different when running the application on a new hard drive or Macintosh, you may encounter problems. We have seen these types of problems with some high-end audio software packages in the past, particularly with the installation or configuration of various plugins.

We recommend that you always retain a copy of your applications' installers and serial numbers in case the applications have special serialization or installation requirements.

Non-registration-related, application-specific oddities

In addition to application registration issues that occur when running your apps on a new volume, there are occasionally other oddities that you may encounter after restoring from a backup (any backup, even Time Machine backups). The following is a list of potentially unexpected behavior that has been reported to us that a) appears to be a consequence of running an application from a different volume or on a different Macintosh and b) does not appear to be or cannot be accommodated/resolved in the backup process:

- GateKeeper (a facility in macOS) may reverify non-notarized applications that were previously verified on the source (e.g. you will see a dialog "Verifying iMovie.app" when opening that item).
- Time Machine may no longer recognize your original source volume because the UUID has changed
- Finder preferences may not be respected (e.g. whether to show disks on the Desktop, the contents of the "All my files" item may be empty)
- Photoshop may require that you reset the Scratch Disk preference
- Finder may not resolve aliases to files on a backup volume. Finder will give you the opportunity to "readdress" these aliases when you try to open them.
- Network settings may not be respected on (or even migrated to) another Macintosh. If you have an extensive VPN configuration that you want to preserve, we recommend that you export those settings to a file before you lose access to the original Mac.
- The **Prevent App Nap** setting applies to specific instances of applications, so this setting will not be applied to copies of an application (e.g. on a backup volume).
- The **Local Items** Keychain is a local repository of passwords and other form data eligible to be synced via iCloud to your other devices running iOS 7 or newer. Safari and Mail store passwords in the Local Items keychain. Some items in **Local Items** Keychain cannot be migrated to another Mac (this setting cannot be overridden, even by the user), and the rest can only be migrated to another Mac if your backup volume is encrypted.

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- If you open an Adobe Lightroom catalog from a restored volume, Lightroom may indicate that your photos cannot be found because the catalog references the name and path of the original source volume. See this Adobe support article <https://helpx.adobe.com/lightroom/help/locate-missing-photos.html> for instructions on how to re-link your catalog to the photo folders on your restored volume, or ▶ watch this video on our YouTube channel <https://youtu.be/vZEdy_aVbeo> to see a demonstration of the problem and solution. **Another tip**: renaming the restored volume the same as the original volume name may help Lightroom resolve catalog links to the media.
- TeamViewer Product Support recommends that TeamViewer be reinstalled when restoring a backup to a different Macintosh.
- Signatures in the Preview application won't be recognized when migrating data to another Mac, they're only recognized on the Mac upon which they were created.
- **Apple Pay** may function incorrectly after migrating data from a backup. Apple documents some suggestions here <https://support.apple.com/en-us/HT209016>, but we have found that simply creating a new admin account, then logging in to your iCloud account in the new account will work around the issue. You do not have to use the new account regularly, just create it and log in to Apple ID, then go back to using your production account. Apple is apparently aware of the awkwardness (and it is actually unrelated to migrating data from a backup) and have intentions to resolve it in a future OS update.

References to third-party solutions/workarounds are provided as information only. We have not tested these solutions and we cannot endorse them.

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Identifying and Troubleshooting Hardware-Related Problems

There are several behavior patterns that inevitably boil down to a problem with a hardware component between your Mac and the storage. Any time you see random errors, stalls, crashes, the destination volume "disappearing" in the middle of a backup task, reports from the Finder that a disk was ejected improperly, Finder lockups and other unruly behavior, we have to turn to old-fashioned troubleshooting to rule out the problematic component. Everything is on the table – USB ports, cables, plugs, adapters, hubs, hard drive enclosures, storage devices – a problem with any of these components can lead to mayhem.

Many times that hardware problems occur, CCC will get meaningful errors from the filesystem that plainly indicate some sort of hardware problem, and CCC will report these at the end of the backup task. In some cases, however, macOS or CCC will detect a hung filesystem and you will see one of the following messages from CCC:

"The task was aborted because the [source or destination] disappeared."

If you see this message, macOS's kernel recognized that the affected filesystem was not responding and terminated it. While this is obviously an abrupt end to your backup task, it beats the alternative macOS behavior described next.

"The task was aborted because the [source or destination] filesystem is not responding."

CCC will present this message when the source or destination volume hasn't accepted read or write activity in at least ten minutes, and a deliberate followup test verifies that a simple read or write request fails. In these cases, macOS's kernel has failed to take action on the misbehaving filesystem and you can expect to see stalls in any application that attempts to read from or write to the affected volume. To break the stall, the affected disk must be forcibly detached from your Mac or you must reboot by holding down the power button if the disk is internal.

In other cases, you'll see a report from the Finder:

Disk Not Ejected Properly

"Eject 'Your Backup Disk' before disconnecting or turning it off."

Even if this event occurred when a CCC task was running, please note that CCC can *never* be responsible for a device's apparent detachment from the system – CCC never interacts with hardware at that level. CCC is simply copying files from one volume to another. If simple file copying leads to volume disappearance, the most common explanation is that a communication failure occurred due to a crash of the storage device's firmware, or due to the (typically transient) failure of a component between the Mac and the storage (most often it's a USB hub or adapter). These events also may coincide with sleep/wake cycles, e.g. if a device does not handle the power state transition well. Many times these messages will be perplexing because the storage device reboots and then immediately reappears, possibly before you see the message from the Finder. Other times the device may not reappear until it is physically detached and reconnected to your Mac.

When you see these messages – there is a hardware problem or a negative hardware:macOS interaction afoot. We cannot solve these problems with a change to CCC, but the steps below can help you identify the problematic component.

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See also: [Blog] "Disk Not Ejected Properly" : what that macOS alert really means <https://bombich.com/blog/2026/07/07/disk-not-ejected-properly>

Troubleshooting steps

When CCC suggests that you might have a hardware problem, here are the steps that we recommend you take to isolate the problem. Repeat the backup task between each step, and stop if something has resolved the problem:

1. If the affected volume resides on an external hard drive, detach that disk from your Mac, then reattach it. Otherwise, restart your Mac before proceeding. Note that this generally only resolves the acute problem of a filesystem stalling. While the disk may appear to function fine once it is reattached, it's not unlikely for problems to recur.
2. Run Disk Utility's **First Aid** tool on the source and destination volumes. Note that Disk Utility's First Aid will rarely **fix** filesystem corruption. If filesystem corruption is detected, we recommend that you erase the volume to resolve the corruption.
3. If you have any other hardware devices attached to your Mac (e.g. USB webcams, printers, iPhones — anything other than a display, keyboard, mouse, and the source/destination disks), detach them.
4. If your source or destination volume is plugged into a USB hub, keyboard, or display, reconnect it to one of your Mac's built-in ports. **USB hubs are the most common cause of "disk not ejected properly" errors.**
5. Replace the cable that you're using to connect the external hard drive enclosure to your Mac (if applicable). Do not use an adapter to connect the device to your Mac, use a cable that has the correct plugs on each end for the device and your Mac. **USB adapters are another common cause of "disk not ejected properly" errors.**
6. If you have any third-party storage drivers, uninstall them. We frequently receive reports of problems caused by third-party storage drivers <https://support.bombich.com/hc/articles/20686428851607>.
7. Try connecting the external hard drive enclosure to your Mac via a different interface (if applicable)
8. Try the same hard drive in a different external hard drive enclosure (we offer some recommendations here <https://support.bombich.com/hc/articles/20686495048215#recommendations>).
9. Reformat the hard drive in Disk Utility.
10. If none of the previous steps has resolved the problem, then the hard drive is failing or defective. Replace the hard drive.

"Why does CCC eject the destination?" or "Why is CCC making my whole computer stall?"

We hear this one a lot, and we generally reply, "don't shoot the messenger." In most cases, CCC is either the only application copying files to the affected volume, or it is at least the application doing most of the access, so it only seems like the problem is specific to CCC. A typical backup task will make millions of filesystem requests, so it comes as no surprise to us when CCC uncovers hardware problems in a disk. CCC is merely copying files from one disk to another, and this is not the kind of task that should cause a system-wide stall. Whenever multiple applications are stalling while trying to access a volume, the fault lies entirely within the macOS kernel, which is mishandling hardware that is either failing or defective. If you're uncertain of this assessment, please send us a report from CCC's Help window. When CCC detects a stalled filesystem, it collects diagnostic information to determine where the stall is occurring. We're happy to review the diagnostics and confirm or deny the presence of a hardware problem.

"But Disk Utility says that there is nothing wrong with the disk..."

Disk Utility is competent at detecting structural problems with the filesystem, but it can't necessarily detect hardware failures that can cause a filesystem to stop responding to read and write requests. Additionally, even

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if your disk is SMART capable and "Verified", the attributes that SMART status reports on are weighted, and may not yet indicate that the hardware is in a pre-fail condition. **Disk Utility does not scan for bad sectors, it only checks the health of the filesystem**. **Bad sectors will not be reported by Disk Utility**. Don't take a "Verified" status to indicate that your disk has no hardware problems whatsoever.

"But Disk Warrior/Tech Tool/[other third-party utility] says the hardware is fine, I'm sure the hardware is fine!"

There are no hardware diagnostic utilities on the market that will inform you of a problem with a cable, port, or enclosure, or report a bug in the firmware of a hard drive or SSD. The tools currently available on the Mac platform will inform you of software-based filesystem problems, media failure, and the results of SMART diagnostics which are specific to the hard drive device inside of an enclosure. While these tools are great at identifying the problems within that scope, the inability to detect problems with a cable, port, or enclosure, or a firmware bug on a hard drive, leaves a gaping hole that can only be filled with old-fashioned troubleshooting — isolate components, rule out variables, run multiple tests.

Other factors that can lead to stalls

Hardware is often the culprit when a backup task stalls, but sometimes other software can interfere with a backup task and even cause the whole system to stall. If you are using an external hard drive enclosure that came with custom software, try disabling or uninstalling that software before trying your next backup task. Otherwise, reboot your Mac while holding down the Shift key to boot into Safe Boot mode. Third-party software is disabled in Safe Boot mode, so if the backup task runs successfully in Safe Boot, there is likely a third-party application causing some interference.

Related

- Some third-party storage drivers may cause hardware misbehavior <https://support.bombich.com/hc/articles/20686428851607>
- We have received several reports that ProSoft's Drive Pulse software can cause the backup task to stall. Disabling scanning of the CCC destination volume should effectively resolve the problem, however we have received one report in which that was not effective. Uninstalling Drive Pulse did resolve the stall in that case.

Additionally, some hard drive enclosures respond poorly to sleep/wake events. If the problems that you are encountering tend to occur only after your system has slept and woken, you should try a different hard drive enclosure or interface to rule out enclosure-specific sleep problems.

Troubleshooting Media errors

Read errors are typically a result of media damage — some of the sectors on the hard drive have failed and macOS can no longer read data from them. Read errors can occur on the source or destination volume, and they can affect old disks as well as brand-new disks – even SSDs and NVMe storage. **When read errors occur, the file or files that are using the bad sector must be deleted.** Bad sectors are spared out — permanently marked as unusable — only when the files on those sectors are deleted.

If CCC has reported dozens or hundreds of files that are unreadable due to media errors, we recommend replacing the affected hard drive because it is likely failing. Small numbers of unreadable files, however, are not necessarily an indication that a hard drive is failing. The steps below indicate how to resolve media errors.

1. Click on the affected item in the Task History window, then click on the **Reveal in Finder** button.
2. Move the affected files and/or folders to the Trash.

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3. Empty the Trash.
4. If you had to delete items from your source volume, locate those items on your backup volume and copy them back to the source (if desired).†
5. If CCC reported problems with more than a few files or folders, we strongly recommend that you reformat the affected disk in Disk Utility.

† If you're looking for an item that is hidden in the Finder, press Command+Shift+Period to toggle the Finder's display of hidden items.

Once you have deleted the affected files, you should be able to re-run your backup task with success.

Note: If you do not have a backup of the affected files, please scroll to the top of this document and exhaust the hardware-based troubleshooting techniques first. As indicated above, read errors are *typically* a result of media damage. In some rare cases, though, media errors can be errantly reported when a hardware-based problem exists (e.g. a bad port, cable, or enclosure). If deleting your only copy of a file is the suggested resolution, then it's prudent to rule out everything else as the cause of an issue before deleting that file.

Errors on read or write that are caused by physical drive malfunction

If your source or destination hard drive is experiencing a significant physical malfunction (errors that go beyond "input/output" read errors described above), you may have a narrow window of opportunity to back up the data from that disk to another hard drive. Time is precious; components could fail at any moment rendering the drive completely unmountable. Read activity is stressful on a dying volume, especially a full-volume backup. We recommend that you immediately back up the files that are most important to you. When you have backed up the most important data, next try to do a full-volume backup. When you have recovered as much data as possible, we recommend that you replace the affected hard drive.

What if the dying drive's volume won't mount?

More often than not, you're completely out of luck. You may be able to revive a hard drive for small amounts of time by letting the drive cool down (somewhere cool and dry, not cold) and then powering it up attached to a service workstation.

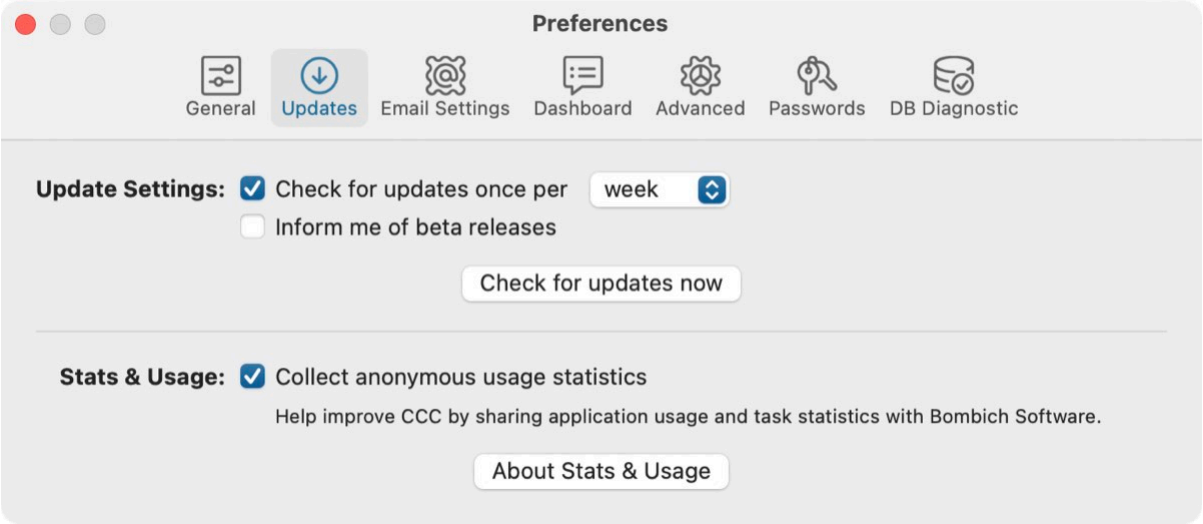
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Keeping CCC up to date

Open Settings

Click the **Settings** button in CCC's toolbar, or select **Settings** from the **Carbon Copy Cloner** menu

Select Updates



You can immediately check for updates by clicking on **Check for updates now**.

By default, CCC will automatically check for updates once per **week**. You can change this preference to **day** or **month**. To disable automatic update checking, uncheck the box next to **Check for updates once per...**.

Do not use third-party update mechanisms

We have received numerous reports of poor update experiences when users use third-party update services, such as MacUpdate Desktop or CNET's Installer. In some cases, the third-party update services install **other promotional software** alongside the update, or completely mangle the update such that CCC is unusable. Please do not use these services to apply updates to CCC; use CCC's built-in software update mechanism.

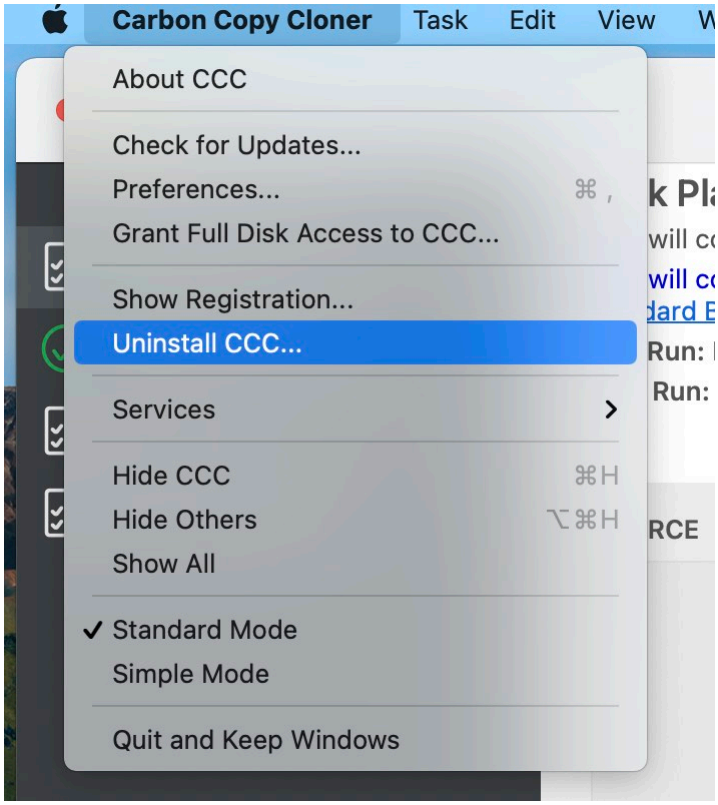
Additionally, bear in mind that CCC employs a privileged helper tool to which you have granted Full Disk Access. Managing the update of that helper tool, **securely**, is not a task to be performed casually by software that is not intimately familiar with CCC's helper tool. Performing updates to CCC incorrectly via third-party software could expose your data to unnecessary risks.

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Uninstalling CCC

Uninstalling from within CCC

To Uninstall CCC, press and hold down the Option key and choose **Uninstall CCC...** from the Carbon Copy Cloner menu. When you uninstall CCC, CCC's privileged helper tool and all saved tasks will be immediately deleted. The CCC application file and CCC's preferences will then be moved to the Trash.



"I can't get the Uninstall CCC menu option to appear"

Try it with these steps:

1. Press and hold down the Option key on your keyboard. Continue to hold down the Option key for the next two steps.
2. Click on the **Carbon Copy Cloner** menu
3. Select **Uninstall CCC...**

Remove snapshots before uninstalling CCC

If you're permanently removing CCC from your Mac, you should remove any CCC-created snapshots first. Select each volume in CCC's sidebar to see if there are any snapshots present on that volume. If you see any snapshots listed in the Snapshots table, select all of them, then press the Delete key to remove them.

Snapshots and space concerns; Deleting snapshots
<https://support.bombich.com/hc/articles/21385447480983>

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Manually removing files associated with CCC

If you deleted the CCC application before leveraging the Uninstall feature, you can manually remove the following files and folders associated with CCC:

- /Library/Application Support/com.bombich.ccc †
- /Library/LaunchDaemons/com.bombich.ccchelper.plist
- /Library/PrivilegedHelperTools/com.bombich.ccchelper
- /Users/yourname/Library/Application Support/com.bombich.ccc
- /Users/yourname/Library/Application Support/CCC Stats Service
- /Users/yourname/Library/Caches/com.bombich.ccc
- /Users/yourname/Library/Caches/com.bombich.ccc.stats
- /Users/yourname/Library/Caches/com.bombich.ccc.dashboard
- /Users/yourname/Library/Cookies/com.bombich.ccc.binarycookies
- /Users/yourname/Library/Preferences/com.bombich.ccc.plist

To get to the Library folder in your home directory, hold down the Option key and choose **Library** from the Finder's **Go** menu. When finished moving items to the Trash, restart your computer, then empty the Trash.

† You may have trouble deleting this folder in CCC's helper tool is still running in the background. If you have deleted the CCC application, restart your computer before attempting to delete this folder.

Manually disabling the CCC Dashboard and the com.bombich.ccchelper privileged helper tool

When you install and use CCC, two background utilities are installed to support CCC tasks. The helper application runs and coordinates tasks, it is required for all task-related activity. The helper tool will automatically exit if you do not have any scheduled tasks configured, and if you do not have CCC configured to display CCC's icon in the menubar. The helper tool will launch automatically when you open CCC, and whenever the CCC Dashboard is running.

The CCC Dashboard relays notifications from the helper tool to Notification Center, and also presents prompts and reminders to the user, and delivers a subset of error conditions to the user. The CCC Dashboard will automatically exit if you do not have CCC configured to display CCC's icon in the menubar, you do not have any scheduled tasks configured, no tasks are currently running, and if CCC is not running.

If you have a specific reason to disable these applications, for example, if you use CCC infrequently, you can do the following when you are done using CCC:

1. Configure CCC to not show its icon in the menubar (CCC toolbar > Settings > Dashboard)
2. While holding down Command+Option (⌘ ⌥), click on the Carbon Copy Cloner menu
3. Choose **Disable All Tasks & Quit** (the keyboard shortcut is Command+Option+Q)

Please note that any scheduled tasks will not run as long as CCC's privileged helper tool is disabled.

Related Documentation

- What is CCC's Privileged Helper Tool? <https://support.bombich.com/hc/articles/20686388957719>
- Monitoring backup tasks with the CCC Dashboard <https://support.bombich.com/hc/articles/20686467217687>

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CCC reported that the destination is full. What can I do to avoid this?

CCC attempts to automatically manage free space on your destination by deleting older backups as the disk starts to get full. There are a few scenarios that can lead to CCC being unable to fit your backups onto the destination. Here are some things you can do to get past a "destination is full" error.

Use an APFS formatted destination

APFS offers several space-savings features that are not supported by other filesystems. If your source is an APFS volume and the destination is formatted with some other filesystem, some files may consume more space on the destination. If you're backing up to a locally-attached device, click on CCC's Destination selector and choose **Backup Volume Setup Assistant** to get the destination volume formatted correctly. If you cannot change the destination format, consider the additional suggestions below.

Disable the SafetyNet feature, and disable "Protect root-level items on the destination"

SafetyNet is not part of the backup strategy, rather it is a legacy safety mechanism that can lead to overly-conservative retention of content on your destination volume. When your destination volume is dedicated to the backup task, SafetyNet should be disabled.

1. Select your task in CCC's main application window.
2. Click on the Destination selector and choose **SafetyNet Off** from the SafetyNet sub menu.
3. If prompted, choose the **Remove SafetyNet** option to have the existing SafetyNet folder deleted from the destination immediately.
4. Click **Advanced Settings** at the bottom of the window, then select the **File Copying Settings** tab. Verify that the box next to Protect root-level items on the destination <https://support.bombich.com/hc/articles/20686481162647#protect> is unchecked.
5. If applicable, empty the Trash in the Finder.
6. Save and run the backup task.

When you disable the SafetyNet, all files on the destination are subject to permanent removal – any file that does not exist on the source will be deleted. If you have any doubt about whether content on the destination may be removed, click the **Preview** button in CCC's toolbar to preview the changes before running the task.

Use a larger destination

Ideally, your destination volume will have about twice the capacity as space consumed on the source. That allows ample room for data growth and snapshot retention. If your source data set is larger than, or very close to the capacity of the destination, then it may not be possible to perform safe updates to files on the destination.

Choosing a backup drive: Devices that we recommend
<https://support.bombich.com/hc/articles/20686495048215#recommendations>

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Related Documentation

- Preparing a disk for a backup or restore <https://support.bombich.com/hc/en-us/articles/20686493728919>
- Snapshots and space concerns; Deleting snapshots <https://support.bombich.com/hc/articles/21385447480983>
- Why is disk usage different between the source and destination? <https://support.bombich.com/hc/articles/20686481271191>
- Add dedicated volumes to an existing APFS-formatted backup disk <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume>

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Troubleshooting "CCC was unable to modify the keychain entry" errors

Technical background (optional reading)

In the CCC 7.1 update, we changed the bundle identifier of CCC's helper tool to make for a smoother transition to a new method of registering the helper tool with macOS. The bundle identifier is a key component for determining whether an application has access to a keychain item, so this change could have rendered the CCC keychain items inaccessible to the CCC 7.1 helper tool. To make pre-7.1 CCC keychain items accessible to the post-7.1 helper tool, we included a small keychain item upgrade in the CCC 7.0.4 and CCC 6.1.12 updates. When loading those versions of CCC (which still used the older bundle identifier, and thus still had access to the CCC-created keychain entries), the access control lists on the CCC-created keychain items would be updated to allow access from the forthcoming helper tool bundle identifier.

If you upgraded to CCC 7.1 from a version of CCC older than 6.1.12, or if you updated to CCC 7.1 from a version of CCC prior to 7.0.4, then the newer version of CCC will not be able to access the CCC keychain entries stored in the System keychain. In those cases, you may encounter errors when CCC attempts to mount a network volume, unlock an encrypted volume, send an email, or while updating the passwords associated with those activities.

To solve this access issue, you must delete the CCC-created keychain entries in the Keychain Access application.

Solution

1. Navigate in the Finder to Macintosh HD --> System > Library > CoreServices > Applications [**Ventura and Sonoma users**: Navigate to the Applications > Utilities folder
2. Open the Keychain Access application
3. Select the **System** keychain in the sidebar
4. Type "**CCC**" in the search field in the toolbar (if this comes up empty, select the login keychain in the sidebar, then re-select the System keychain and repeat the search)
5. Select any keychain entries that start with "CCC: "
6. Right-click on the selection and choose the option to delete the keychain entries; authenticate when prompted
7. Open CCC
8. Try again to save the password in CCC

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Antivirus software may interfere with a backup

Some antivirus applications may prevent CCC from reading certain files, mounting or unmounting disk image files, or, in general, degrade the performance of your backup. In some cases, antivirus applications can even affect the modification date of files that CCC has copied, which will cause CCC to recopy those files every time as if they have substantively changed. In another case, we have seen such software create massive cache files on the startup disk during a backup, so much so that the startup disk became full. We recommend that you temporarily disable security software installed on your Mac (e.g. for the duration of your backup task) if problems such as these arise.

If CCC reports that antivirus software may be interfering with your backup task, here are some troubleshooting steps that you can take to resolve the problem:

1. Determine whether the files in question are being quarantined by your antivirus software. Perform a system scan with your antivirus software and address any issues that are reported. Please refer to the Help documentation associated with your antivirus product for more information.
2. If the problem persists, try running your backup task with the antivirus software temporarily disabled.

If the antivirus software's behavior cannot be resolved, you may be able to workaround the problem with an advanced setting. Select your task in CCC's main application window, then:

1. Click the **Advanced Settings** button
2. Select the **File Copying Settings** tab
3. Check the box next to **Don't update newer files on the destination**
4. Click the **Done** button
5. Save and run your task

If these steps do not address the issue, or if you do not have antivirus software installed, please open a support request <https://bombich.com/software/get_help> and we'll do our best to help you resolve the problem.

"Real time" protection scanning and Digital Loss Prevention applications have significant performance ramifications

We regularly receive reports that the backup task is running too slow, only to find that some "real time" protection application is directly causing the problem by taking too long to either scan content that CCC is writing, or by taking too long to permit the filesystem requests that CCC makes to the source or destination. While these applications do provide a valuable service to protect your Mac from malware, they're doing a disservice if they're interfering with backups.

The following applications are frequently implicated in these scenarios:

- Symantec DLP (com.symantec.dlp.fsd)
- Avira (avguard-scanner)
- Sophos File Protection (OnAccessKext)

Problem reports related to antivirus software

- BitDefender may generate excessive read activity on the destination volume during a backup task, and may cause the destination device to spontaneously eject. Add the destination volume to BitDefender's

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exclusion list to avoid the problem.

- We have received and confirmed a report in which Sophos CryptoGuard can have a debilitating effect on system performance while running a backup task.
- We have received several reports that McAfee's FileCore and Symantec's Data Loss Prevention software can cause the backup task to hang or to take a very, very long time. The applicable daemon processes may also consume an exceptional amount of CPU during a backup task leading to debilitating system performance for the duration of the task.
- We have received a report that ESET Endpoint Security can cause the backup task to hang or to take a very, very long time.
- We have received a report that Bit9 Carbon Black can cause the backup task to hang or to take a very, very long time.
- We have received a report that TrendMicro's "filehook" service can cause the backup task to hang or to take a very, very long time.
- We have received a report that Cylance's "CyProtectDrvOSX" kernel extension can cause the backup task to hang or to take a very, very long time.
- We have multiple reports in which CoSys Endpoint Protector <https://www.endpointprotector.com/> prevents CCC from backing up a pair of video-related system files (e.g. /Library/CoreMediaIO/Plug-Ins/DAL/AppleCamera.plugin).
- We have received reports that Avira antivirus may terminate CCC's file copier resulting in an incomplete backup. Avira "Real time protection" will also cause the backup task to take a very long time and consume an exceptional amount of CPU resources.

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What criteria does CCC use to determine if a file should be recopied?

CCC will copy only items that are different between your source and destination. So if you complete a backup task, then run it again the next day, CCC will copy only the items that were created or modified since that last backup task. CCC determines that a file is different using its size and modification date. If a file's size or modification date is at all different on the source and destination, CCC will copy that file to the destination.

You can select your most recent completed task in CCC's Task History window and review the task audit <https://support.bombich.com/hc/articles/20686456355095#audit> to see precisely what was copied, and why. It is not uncommon for as much as 2-5GB of files to be updated between daily backups, for example, even when it seems that you have made no changes to the source volume. macOS is constantly updating various cache and log files, and these can really add up over the course of a day.

Organizational changes will lead to large amounts of data being recopied

If you have made large organizational changes on your source volume, e.g. moved a folder that had a lot of data in it, that will result in many items being recopied to the destination because the path to those items has changed. You can avoid this recopying behavior by applying the same organizational changes to the destination prior to running your backup task.

Some antivirus applications may actually change file modification dates

After CCC has copied a file to the destination, the very last thing that it does is to set the file's modification date to match the modification date of the source file. This filesystem activity prompts the AV software to scan the file, which is generally OK (albeit with a performance hit to the backup task). Reading a file is not sufficient to change the file's modification date, so well-written AV applications should cause no harm by scanning the files that CCC copies. When an AV application "touches" the file, however, or otherwise makes changes to the file, the modification date will be updated to the current date.

If the modification date of the files on your destination are getting set to the date and time of the backup tasks, there's a good chance that AV software or some other background service is making changes to the files after CCC has copied them. If you cannot resolve the modification date tampering of your AV software (or other software), you can configure CCC to avoid updating files that are newer on the destination. To apply this setting, select your backup task in CCC's main application window, then:

1. Click the **Advanced Settings** button.
2. Check the **Don't update newer files on the destination** setting in the **File Copying Settings** tab.
3. Save and run your task.

Related Documentation

- Antivirus software may interfere with a backup <https://support.bombich.com/hc/articles/20686461466391>
- Advanced Settings <https://support.bombich.com/hc/articles/20686481162647>

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A time zone shift can affect modification dates on some filesystems

HFS+, APFS, NTFS, and other modern filesystems store the modification date of files based on the Coordinated Universal Time (UTC — comparable to GMT). FAT filesystems, on the other hand, store file modification dates based on the local time zone setting of your computer. Generally this difference isn't a problem, but there is a drawback if you copy files between FAT volumes and NTFS or Mac-formatted volumes (or between Mac-formatted filesystems and a NAS device that uses local time for time stamps). During time zone shifts and the Daylight Saving Time/Summer Time shift, the modification dates of files on FAT32 volumes will appear to have shifted. As a result, CCC will see these files as out of date and will recopy each file. Unfortunately CCC cannot remediate this shortcoming of the FAT filesystem, so if you have to copy files to or from a FAT volume, we recommend that the corresponding source or destination volume is also FAT formatted.

Microsoft MSDN Library: File Times <https://msdn.microsoft.com/en-us/library/ms724290(VS.85).aspx>

Mail's "Log Connection Activity" setting creates enormous files

If you enable "Log Connection Activity" in the Connection Doctor window in Mail and you forget to disable that setting, Mail will create enormous log files that will eventually fill up your startup disk. If you find that CCC is copying an unusually large amount of data during every backup, even backups run back-to-back, try the following to verify that this large amount of data is not related to Mail activity logs:

1. Open Mail
2. Choose "Connection Doctor" from the Window menu.
3. Uncheck the box next to "Log Connection Activity".
4. Click the "Show Logs" button.
5. Delete the large log files.

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"CCC found multiple volumes with the same Universally Unique Identifier"

Occasionally a circumstance arises in which CCC presents the following error message before creating or running a backup task:

> **CCC found multiple volumes with the same Universally Unique Identifier that was associated with the volume you designated as the source/destination for this task.**
>
> CCC cannot proceed with confidence in having correctly identified the volume you originally chose when you configured this backup task. Unmount one of the conflicting volumes and try the task again, or please choose "Ask a question" from CCC's Help menu to get help resolving the issue.

Most modern operating systems apply a universally unique identifier to a new volume when you format that volume (e.g. in Disk Utility). Volumes should never have the same identifier, these identifiers are called "universally unique" because they're supposed to be unique, universally! Wikipedia <https://en.wikipedia.org/wiki/Universally_unique_identifier#Random_UUID_probability_of_duplicates> notes that, for 122 bit UUIDs, there is a 50/50 chance of having a single duplicate UUID if 600 million UUIDs were allocated to every person on Earth. The chances of two volumes having the same UUID should, then, be slim enough that the UUID can be reliably used to positively identify the source and destination volumes.

Given these odds, it is statistically more likely that CCC's discovery of a duplicate UUID is due to a hardware or software problem rather than to two volumes randomly having the same UUID. Therefore, CCC makes the conservative decision to not back up to either volume if another volume with the same UUID is detected.

Solution

Reformatting one of the affected volumes will resolve the problem, however there is a non-destructive solution:

1. Click **Volumes** in CCC's sidebar
2. Hold down Control+Option and click on one of the volumes that was identified as having a non-unique unique identifier in CCC's sidebar
3. Choose the "Reset UUID" contextual menu item
4. Try configuring your backup task again

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Finder or App Store finds other versions of applications on the backup volume

Occasionally we receive reports of odd system behavior, such as:

- When opening a document, the application on the backup volume is opened rather than the version from your startup disk
- When trying to update an application in App Store, the update appears to fail — the older version is always present
- The destination volume cannot be (gracefully) unmounted because various applications or files are in use
- When choosing **Open With...** from a Finder contextual menu, duplicates of your applications appear in the list
- Some applications complain that multiple copies of the application are present (e.g. TurboTax)

These problems consistently go away if the destination volume is ejected.

These problems are ultimately caused by problems with the LaunchServices database (or perhaps misguided/poorly-implemented anti-piracy efforts), which is an issue outside of the scope of the backup process. There are a few things that you can do to address the problem:

Disable Spotlight on the destination volume

Disabling Spotlight indexing on the destination volume should prevent new additions being made to the LaunchServices database that reference the destination. Open System Settings > Siri & Spotlight, scroll down and click **Spotlight Privacy...**, then drag your destination volume into the privacy table. Check whether applications still open by default from the destination volume, because this step may be enough to address the issue.

Configure CCC to unmount the destination volume at the end of the backup task

In the **Postflight** section of CCC's Advanced Settings, you can configure CCC to unmount the destination <https://support.bombich.com/hc/articles/20686441421591#dest_postactions> when CCC has finished copying files to it. By keeping the destination volume unmounted, Finder and App Store will be unable to find applications on that volume. You'll save wear and tear on that hard drive by keeping it spun down as well.

Reset the LaunchServices database

macOS maintains a list of application-to-file-type associations in the LaunchServices database. That database is consulted every time you try to open a file or application. Sometimes that database becomes corrupted, or contains outdated or invalid information, and those discrepancies can lead to problems with opening documents or applications. Paste the following into the Terminal application to reset the LaunchServices database:

```
sudo
/System/Library/Frameworks/CoreServices.framework/Versions/A/Frameworks/LaunchServices.framework/Versions/A/Support/lsregister -delete -domain local -domain system -domain user
```

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Press the Return key after pasting that line into the Terminal window, then authenticate when prompted. **Restart your computer for the change to take effect.** macOS will automatically rebuild the LaunchServices database.

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"The task was aborted because a subtask did not complete in a reasonable amount of time"

Occasionally a backup task can stall if the source or destination stops responding. To avoid waiting indefinitely for a filesystem to start responding again, CCC has a "watchdog" mechanism that it uses to determine if its file copying utility has encountered such a stall. By default, CCC imposes a ten minute timeout on this utility. If ten minutes pass without hearing from the file copying utility, CCC will collect some diagnostics information, then stop the backup task. Our support team can analyze this diagnostic information to determine what led to the stall.

Common factors that lead to stalls

Hardware problems are the most common cause of a stall. There are a few other factors that can lead to a stall, though, depending on how the backup task is configured:

- The source or destination hardware is failing or in a pre-fail condition
- It can take a really long time to get a folder list from folders with extremely high file counts <https://bombich.com/blog/2023/01/18/folders-high-file-counts>
- Filesystem corruption or media problems on the source or destination can prevent that filesystem from providing a file or folder's filesystem entry
- A firmware problem in an external hard drive enclosure can cause that device to stop responding
- File sharing service errors can lead a network volume to become unresponsive
- Access to a network volume via a wireless connection may become slow enough that the volume stops responding
- Excessive bandwidth competition from other software can cause a volume to appear unresponsive, though it may just be responding very slowly

Troubleshooting suggestions

The first thing you should do if a task ends with this result is to view the event in CCC's Task History window to see if any specific errors are listed in the Errors tab <com.bombich.ccc7.task.history://show?tab=errors>.

If no specific files or folders were called out in the Task History window, reboot your Mac and run the task again. In many cases, an unresponsive filesystem is a transient problem, and the simple act of restarting will get the volume remounted in a better state. If the problem recurs, please choose **Report a problem** from CCC's Help menu and our support team can offer more specific troubleshooting suggestions. Below is a list of some of the troubleshooting suggestions we may offer depending on how your task is configured.

- Use Disk Utility's **First Aid** tool to check for any filesystem problems on the source volume. If any are discovered and the source is your startup disk, reboot while holding down Command+R (Intel Macs) or the Power button (Apple Silicon Macs) to boot in Recovery Mode <https://support.apple.com/en-us/HT201314>, then use Disk Utility to repair the problems. Please note: A report of "No problems found" from Disk Utility does not mean that there are no problems with that volume. There are no hardware diagnostic utilities on the market that will inform you of a problem with a cable, port, or enclosure, or report a bug in the firmware of a hard drive or SSD.
- Exclude a file or folder from the backup task. Click the **Task Filter** button at the bottom of the window,

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then uncheck the box next to the item that the source filesystem is unable to read.

- Remove a corrupted item from the destination volume.
- Erase the destination volume (we make this recommendation sparingly, and only when the stall can be definitively identified as a filesystem problem on the destination).
- Disable Spotlight on the destination volume to reduce bandwidth competition. To disable Spotlight, open System Settings > Siri & Spotlight, scroll down and click **Spotlight Privacy…**, then drag the backup volume into the Privacy table. This only affects the destination volume, and it's reversible, you can remove it from that list should you decide that you want to re-enable indexing.
- If the stalling volume is a network volume, connect your Mac and the host of the network volume to the network via a wired connection (i.e. rather than via a wireless connection, if applicable).
- If the stalling volume is a network volume, eject that volume in the Finder, then remount the volume using a different file sharing protocol <https://support.bombich.com/hc/articles/20686420950423#nas_EINVAL>.
- If you have DriveGenius installed, that software may be performing a verification on the destination that "freezes" the volume for the duration of the verification. DriveGenius support suggests that you create a file in the root of the destination volume with the name ".com.prosofteng.DrivePulse.ignore" (no quotes) to stop Drive Pulse from acting on that volume.
- Hold down the Shift key while rebooting your Mac to boot into Safe Boot mode, then try running the task again. If the stall does not recur, then third-party software may be causing the stall.
- Set a longer timeout on CCC's file copier. Click **Settings** in CCC's toolbar, then click **Advanced** in the Settings window toolbar to find the file copying subtask timeout setting.

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Troubleshooting slow performance when copying files to or from a network volume

Network performance is usually the bottleneck of a backup task that copies files to or from a network volume, but there are several other factors that can affect performance as well. Here are some suggestions for improving the performance of your NAS-based backups.

Use ethernet instead of WiFi

Backing up data over a wireless connection will be considerably slower than backing up over an ethernet connection. 802.11n networks support approximately 300 Mb/s of rated (theoretical) bandwidth under the best conditions, but they usually operate at much lower speeds (130 Mbps and below, which is comparable to 16 MB/s). Bandwidth drops considerably as you get further from the base station (a wooden door between your Mac and the router will cut the signal in half), and the file sharing protocol overhead will reduce your achievable bandwidth yet more. So practically speaking, you're lucky to get 8 MB/s over a wireless connection while sitting right next to the base station. That performance can be cut in half due to Apple Wireless Direct Link (AWDL), which causes the Airport card's interface bandwidth to be shared between your ordinary WiFi network and an ad hoc network hosted by your Mac.

We performed a simple bandwidth test to a fourth generation Airport Extreme Base Station (802.11n) to demonstrate the performance decline. We copied a 100MB file to an external hard drive attached to the base station via USB in three scenarios: 1. An ethernet connection to the base station, 2. Sitting a few feet from the base station, and 3. Sitting across the house from the base station (~35 feet, no line of sight to the base station). The results were 6.5s (15.5 MB/s), 18.7s (5.3 MB/s), and 256s (0.39 MB/s) for the three scenarios, respectively. So, before you try to back up over a wireless network, consider running a simple test in the Finder to see just how fast your connection is. If it takes more than a minute to copy a 100MB file, your connection is too slow to be practical for backup purposes.

Use Quick Update after establishing a backup of a local source

Once you have established the initial, complete backup to a destination network volume, you can use CCC's Quick Update feature to greatly reduce the length of subsequent backup tasks. When Quick Update is enabled, CCC queries the FSEvents service for a list of folders that were modified on the source since the last backup event. In many cases, this folder list is just a small fraction of the total number of folders. By limiting the scope of the task to just the modified folders, CCC will have far fewer folders to enumerate on the destination.

Related Documentation

- Use Quick Update when it's possible to collect a list of modified folders from macOS <https://support.bombich.com/hc/articles/20686481162647#quickupdate>

Exclude unnecessary content from the backup task

The more content you have in your backup task, the longer it will take to copy that content to a NAS and update that data set later. Especially if you're using the NAS as a secondary backup, we recommend excluding content

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that is more easily restored from other sources, e.g. applications archives can often be re-downloaded from the App Store faster than the decompressed files can be restored from a NAS backup. Click the Task Filter button at the bottom of the CCC window to exclude content from the backup task <https://support.bombich.com/hc/articles/20686509510167>.

In particular, we recommend excluding the **Applications** folder if you're making a backup of your startup disk. The Applications folder has a tedious number of really small files. It's typically faster to restore applications by redownloading them rather than restoring them from a NAS backup.

Disable support for extended attributes

Most NAS volumes are very slow at working with extended attributes, so we recommend disabling this setting if you do not specifically require them to be backed up. Apple considers extended attributes to be "disposable" because some filesystems cannot support them.

CCC automatically disables this setting when backing up to or from a network volume

1. Open CCC and select your backup task.
2. Click the **Advanced Settings** button.
3. Check the box next to **Don't preserve extended attributes** in the **File Copying Settings** tab.
4. Save and run the task.

Try using AFP instead of SMB to connect to the NAS

Apple deprecated AFP many years ago, but it may still be faster than SMB on Intel Macs (not the case on Apple Silicon Macs). To try AFP instead of SMB:

1. Eject the NAS volume if it's currently mounted
2. Open CCC and select the applicable backup task
3. Click on the Source or Destination selector (whichever references the NAS volume)
4. Hold down the Option key and choose **Switch to AFP** (provide the credentials for the NAS volume again if prompted)
5. Save and run the task

Avoid running tasks simultaneously if they read from or write to the same NAS device

Especially with locally-attached source volumes, CCC won't have any trouble saturating your network connection with a single backup task. If you run more than one task at the same time, especially to the same NAS device, the network connection or the NAS device may not be able to handle the load. Leverage CCC's task chaining functionality <https://support.bombich.com/hc/articles/20686441421591#chain_tasks>, or place your tasks into a task group <https://support.bombich.com/hc/articles/20686444541975> so that they will be run sequentially instead.

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Where can I find CCC's log file?

It is our aim to have the Task History window provide the user with enough information to find and troubleshoot any problems they're having with their backup tasks. For debugging and support purposes, however, CCC logs its activity in the following files:

- Task Activity: /Library/Application Support/com.bombich.ccc/pht_debug.log
- Task Editing: ~/Library/Application Support/com.bombich.ccc/ccc_debug.log
- CCC Dashboard: ~/Library/Application Support/com.bombich.ccc/ua_debug.log
- Remote Mac Authentication Agent: ~/Library/Application Support/com.bombich.ccc/sshauth_debug.log

Tip: Hold down Command+Option and choose **Open Debug Logs** from the Carbon Copy Cloner menu to open these four files in the Console application.

If there's something specific that you're retrieving from the log that is not presented in the Task History window, please let us know <https://bombich.com/software/get_help>. We'd prefer to consider exposing that information in the Task History window so you don't have to dig through the log. Also, note that basic details of task history are exposed in CCC's command-line utility, so that may be an easier way to get the information.

Where can I find a list of every file that CCC has copied?

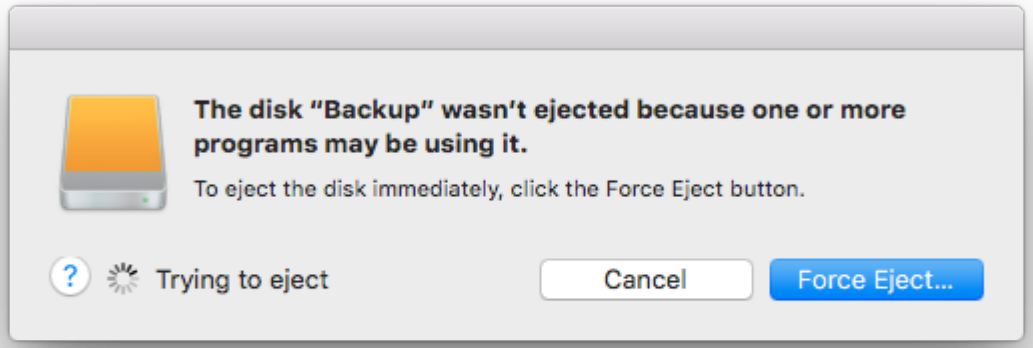
You can find a transaction list for each task history event in the Audit tab of CCC's Task History window.

Related documentation

- Task Audit: Viewing details about the modifications made by the backup task <https://support.bombich.com/hc/articles/20686456355095#transactions>
- Using the ccc Command Line Tool to Start, Stop, and Monitor CCC Backup Tasks <https://support.bombich.com/hc/articles/20686443072535>
- How do I get help? <https://support.bombich.com/hc/articles/20686487464855>

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Why can't I eject the destination volume after the backup task has completed?



Occasionally this annoying message comes up when you're trying to eject your destination volume. If CCC is currently using that volume as a source or destination to a **running** backup task, then CCC will effectively prevent the volume from being unmounted. If your backup task is not running, though, CCC isn't preventing the volume from being unmounted. But what application is?

If this occurs within a minute or so after the backup task completes, it's typically caused by a macOS or third party service that is scanning or reindexing content that was just copied to the backup volume. Those processes usually finish after a minute or two, and usually the destination can be ejected when that completes. If this frequently affects your backup volume, you can ask CCC to unmount the destination after the backup task completes. CCC will make multiple attempts to unmount the destination, resulting in a more reliable (and automated!) ejection of the destination at the end of the backup task:

1. Open CCC and select your backup task
2. Click the Advanced Settings button at the bottom of the window <https://support.bombich.com/hc/article_attachments/29634464544791>
3. In the **Postflight** tab, choose the option to unmount the destination volume <https://support.bombich.com/hc/articles/20686441421591#dest_postactions> after the backup task completes.
4. Click the Done button, save and run your backup task

If the volume cannot be unmounted several minutes after the backup task has completed, or if CCC is also unable to eject the destination, open CCC's Task History window and view the error noted in the Errors tab for more information, if available, about the identity of the dissenting application.

Applications that frequently prevent volumes from unmounting

We've received (and confirmed) reports of the following applications causing trouble with volume unmounts. If

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you have one of these applications, you should see if you can add your CCC backup volume to a "whitelist" within that software to avoid the interference it causes. The name of the offending process (which is what you would see in the Console application) is noted in parentheses.

- BitDefender (BDLDaemon)
- Time Machine (backupd)
- Spotlight (mds or mds_stores)
- Disk Drill (cfbackd)
- Retrospect (RetrospectInstantScan)
- CleanMyDrive
- Intego Virus Barrier (virusbarriers)
- AppCleaner (AppCleaner SmartDelete)
- AVG AntiVirus (avgoad)
- ClamXAV
- Photos (mediaanalysisd)

A deeper technical analysis of volume unmounting

When you attempt to unmount a volume, the unmount request goes to the macOS DiskArbitration service (which is implemented by a service named "diskarbitrationd"), which goes through several steps to effect the unmount.

System-wide unmount notification

When DiskArbitration receives an unmount request, it sends out a notification of the request to any application that has subscribed to "unmount notifications". Any application that subscribes to these notifications has an opportunity to dissent the unmount request. CCC, for example, subscribes to these notifications and dissents volume unmount requests for the source and destination volumes involved in any *currently running* backup task. If no task is running that involves the affected volume, CCC returns an "allow" response.

Applications that subscribe to these requests are *obliged* to respond in a reasonable amount of time — dissent, or allow. Not responding is rude, and unnecessarily delays the unmount request.

When an application replies to DiskArbitration with a dissent response, they also have the opportunity to include a comment. Using CCC as an example again, CCC will dissent with a comment like "The CCC task 'Hourly Backup' is currently running a backup task to this volume." Sadly, macOS does not present these comments in the Finder, nor does it consistently present even the name of the dissenting application.

Attempt to unmount

If no application dissented the unmount request, DiskArbitration will attempt to unmount the volume. At this point, the volume should unmount! If any application has an open file on the affected volume, however, the unmount request will fail. Occasionally the ensuing dialog will indicate which application is using the volume, but often you get a very generic message that the disk wasn't ejected, "because one or more programs may be using it."

Finding the offending file and application

If you've just seen a dialog that a volume can't be ejected, you can find the offending item in the Terminal application. Open the Terminal application and paste in the following:

```
sudo lsof | grep "CCC Backup"
```

Replace "CCC Backup" with the name of your own backup volume, then press the Return key. You will be

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prompted for your admin password; enter your password, then press the Return key again. The "list open files" utility will print a list of open files specific to that volume, and will include the name of the application that has the open file reference.

It's usually Spotlight

More often than not, some Spotlight process is retaining an open file on the backup volume and preventing it from being unmounted. If you find "mds" or "mds_stores" listed in the `lsof` output, you can disable Spotlight on your backup volume to prevent the interference. To disable Spotlight:

1. Click Volumes in CCC's sidebar
2. Select your backup volume in the sidebar
3. Toggle the Spotlight switch to the Off position

 Product Tour: Learn how to disable Spotlight indexing on your backup volume

Once you have disabled Spotlight indexing, Spotlight **should** immediately cease indexing activity on that volume. The same underlying problem that might be causing Spotlight to fail to release an open file, however, (e.g. a stall) may also prevent Spotlight from ceasing the indexing activity. If you are still unable to unmount the volume after a) confirming that it was Spotlight with an open file, and b) adding the volume to the Spotlight Privacy table, you can either terminate the mds and mds_stores processes in the Activity Monitor application, or simply restart the system.

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Some third-party storage drivers may cause hardware misbehavior

We occasionally receive reports of strange behavior from USB devices, e.g. slow performance, disks dropping offline in the middle of the backup task. In some of those cases we've discovered that third-party storage drivers are causing the problem. In particular, the SAT-SMART drivers and some ancient BlackBerry USB drivers can lead to problems.

If you're troubleshooting a USB device behavior or performance problem, we recommend that you consider uninstalling these drivers.

Removing BlackBerry drivers

Assuming you're not actively using any USB BlackBerry devices with your Mac, we recommend uninstalling that old software. BlackBerry doesn't offer an uninstallation guide, but this helpful forum post makes a recommendation <https://superuser.com/questions/647762/how-can-i-remove-blackberry-tools-entirely-from-os-x>. Simplifying those instructions a bit:

Choose "Computer" from the Finder's Go menu, then navigate to these locations to find extension and agent components (you may not have all of these locations on your version of macOS):

```
Macintosh HD > Library > LaunchAgents
Macintosh HD > Library > LaunchDaemons
Macintosh HD > Library > Extensions
Macintosh HD > System > Library > Extensions
Macintosh HD > Library > StagedExtensions > Library > Extensions †
```

If you find the BlackBerry components in those folders, just drag them to the Trash, authenticating when prompted. When you're done, reboot. Here's a complete list of components that the website recommended that you remove (you may not find all of these components, but hopefully you can at least find and remove the extensions):

```
/Library/Application Support/BlackBerry
/Library/Application Support/BlackBerryDesktop
/Library/Frameworks/RimBlackBerryUSB.framework
/Library/LaunchAgents/com.rim.BBLaunchAgent.plist
/Library/LaunchDaemons/com.rim.BBDaemon.plist

/System/Library/Extensions/BlackBerryUSBDriverInt.kext
/System/Library/Extensions/RIMBBUSB.kext
/System/Library/Extensions/RIMBBVSP.kext
```

Removing SAT-SMART drivers

The SAT-SMART drivers <https://github.com/kasbert/OS-X-SAT-SMART-Driver> aim to offer SMART support for USB devices. These drivers have not been actively maintained since late 2016, so their compatibility with newer macOS releases is dubious. Their uninstallation instructions may also be out of date for newer macOS releases, so we offer the following suggestion.

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Choose "Computer" from the Finder's Go menu, then navigate to these locations to find extension components (you may not have all of these locations on your version of macOS):

```
Macintosh HD > Library > Extensions
Macintosh HD > System > Library > Extensions
Macintosh HD > Library > StagedExtensions > Library > Extensions †
```

If you find the SAT-SMART components in those folders, just drag them to the Trash, authenticating when prompted. When you're done, reboot. Here's a list of components that may be installed by the SAT-SMART installer in any of the folders noted above (you may not find all of these components, remove as many as you find):

```
SATSMARTDriver.kext
SATSMARTLib.plugin
```

Removing staged extensions

System Integrity Protection will prevent the removal of staged extensions, but you can paste this command into the Terminal application to ask the system to clear all staged extensions:

```
sudo kmutil clear-staging
```

Removing Samsung drivers

The Samsung FAQ for its Portable SSD products <https://semiconductor.samsung.com/consumer-storage/support/faqs/portable> provides the following instructions for removing their drivers:

> On a Mac PC, remove the Portable SSD from the Thunderbolt port and use the CleanupAll.scpt from the directory where the software is installed (e.g., Home/Library/Application Support/PortableSSD) with osascript to uninstall it (osascript CleanupAll.scpt). For more information, please refer to the User Manual.

A CCC user discovered that this does not remove the entries from the KextPolicy database. We can't recommend that you manually modify the KextPolicy database, however, in the interest of documenting a potential solution, that user indicated that the Samsung kext driver policy could be removed by booting into Recovery Mode, then running the following command in the Terminal application:

```
/Volumes/Macintosh\ HD/usr/bin/sqlite3 /Volumes/Macintosh\ HD\ -\
Data/private/var/db/SystemPolicyConfiguration/KextPolicy 'delete from kext_policy
where team_id = "8S33FS7Q5Q"'
```

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Coping with errors caused by filesystem corruption

We regularly see cases of filesystem corruption that lead to errors during a backup task. This corruption is typically presented in an error like one of these:

```
readlink_stat("/Photos/Foo/2020_Dumpster_fire.jpg") failed: Illegal byte sequence
(92)
rename("/Photos/Foo/.2020_Dumpster_fire_out_of_control.jpg.asdfgh" ->
"/Photos/Foo/2020_Dumpster_fire_out_of_control.jpg") failed: No such file or
directory (2)
```

When CCC encounters these errors, the affected items are listed in CCC's Task History window, often with this advice:

> When an error occurs while trying to read or modify a file or folder's filesystem attributes (e.g. ownership and permissions, modification date, file name, what folder it's in, etc.), that usually suggests that there is some corruption in that item's filesystem entry. The file may need to be deleted and, if applicable, restored from a backup.

In both of the error cases in the above example, the file or the parent folder is corrupted, and the filesystem will not allow any modifications to those items. Sometimes you can simply delete the affected items, but sometimes this is not possible because the Finder does not reveal these corrupted items to you (because they are corrupted). Typically Disk Utility does not even detect this filesystem corruption, and it will never repair the corruption if doing so would require the removal of files or folders. Sadly, lacking any other utilities to repair the damage, your only remaining option for *resolving* the corruption is to erase the affected volume.

The folder swap method

If you are unable to see a corrupted item in the Finder (and therefore unable to delete it to resolve the corruption), there is one alternative that you may be able to consider. Often when errors are encountered while trying to make changes to a file (especially its name or location), the corruption is affecting the parent folder, not the file itself. In those cases you can replace the folder to remove the corruption. Supposing CCC is reporting errors on a file at "My Media Volume" > Photos > Foo > 2020_Dumpster_fire.jpg, you could do the following to replace the folder while retaining the bulk of its content:

1. If the item you're looking for resides in a hidden folder (e.g. "/Users/yourname/Library"), you can press Command+Shift+Period to toggle the Finder's display of hidden items
2. Navigate in the Finder to "My Media Volume" > Photos
3. Create a new folder here named "Foo new"
4. Select all of the items in "Foo" (e.g. Command+A) and drag them into "Foo new"
5. Move "Foo" to the Trash†
6. Rename "Foo new" --> "Foo"

† This does not *solve* the corruption problem, rather it only cordons the corruption off to a separate (and disposable) folder. In most of these cases, you'll find that Finder cannot empty the Trash, claiming that the files are "in use". That's just the Finder's way of expressing that it can't cope with the corrupted content, and has no advice that would actually be helpful. If you are unable to empty the Trash, and you would rather not erase the affected volume to remove the corruption, then you can create a new folder on the affected volume, e.g. "Corrupted Items" and move the items from the Trash into that new folder. You can then exclude that folder

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from your backup task <https://support.bombich.com/hc/articles/20686509510167> to avoid the errors that its content would cause.

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macOS-Specific Issues That We're Tracking

CCC is fully compatible with macOS Ventura, Sonoma, Sequoia, Tahoe and Golden Gate. We're tracking the following issues specific to some OS versions.

SMBFS mishandles symbolic links on macOS Golden Gate 27.2

We have received several reports of verification errors that occur while verifying symbolic links created on an SMB network volume. The issue appears to be specific to Macs that have been updated to 27.2.

Diagnosis

SMBFS doesn't have native support for symlinks, so the macOS SMBFS client will create "Minshall-French symbolic links". These are ordinary text files on the server with a special format, size and content. When an SMBFS client sees that a plain text file matches the pattern of an MF Symlink, it's supposed to present that file to filesystem clients (i.e. Finder, CCC) as a symbolic link. That's the part that is failing after the 27.2 update. Creating symlinks on a network volume still works correctly, but the symlink cannot be (consistently) re-interpreted as a symbolic link by the macOS SMBFS client filesystem.

We reported this issue to Apple (November 2, 2026, FB25411656). We anticipate that this problem will be temporary; there are other, more severe problems reported on Apple's Discussions <https://discussions.apple.com/thread/256386117?sortBy=rank>, for example, that should carry enough weight to encourage Apple to address this issue quickly.

Solution

We have implemented a workaround in CCC 7.2.3 (currently available as a beta) that will effectively verify these symlinks on an SMB destination, as well as successfully restore these symlinks from an SMB source. If you've upgraded to macOS 27.2 and you're seeing verification errors in your backups or invalid symlinks restored from an SMB source, download the CCC 7.2.3 beta build <https://bombich.com/software/download_ccc.php?v=latestbeta> to verify the fix.

ExFAT filesystem corruption on macOS Ventura

We're tracking a new ExFAT-specific filesystem bug in macOS Ventura. We have seen a handful of cases where a folder's inode number is identical to the inode number of its parent folder. Some filesystem enumeration facilities (e.g. `fts`) identify this (correctly) as an insane "directory cycle" (i.e. infinite loop) condition and refuse to enumerate the content of the corrupted subfolder. CCC (6.1.4+) identifies this result, reports it as an error, and suspends any deletion/archival activity on the destination when this condition is encountered to avoid errantly removing content from the destination that was copied in a previous backup task.

In the handful of cases we're tracking, the issue appears to be both transient and recurrent, e.g. sometimes the condition is absent when running the task again at a later time, and sometimes it recurs immediately after remounting the source volume. We have seen other related aberrant behavior on these volumes, e.g. folder inode numbers change when the volume is remounted. These aberrations are harmless as far as a backup/file copying task is concerned, but could cause trouble for other applications that expect folder inode numbers to be constant.

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We consider this a serious filesystem bug, however we are not concerned that this will lead to data loss on ExFAT source volumes. This bug is exposed only when performing a complete enumeration of the volume starting from the root folder, it's not something that would necessarily affect the collection of an individual folder's content (e.g. in the Finder). Regardless, this condition is not sane and could lead to unexpected results from applications that are not guarding against this kind of filesystem corruption. Our recommendation right now is to avoid using ExFAT on macOS Ventura if you're not specifically using that filesystem to share files with a non-macOS device. Except when required to share files with a non-Mac system, ExFAT is generally a poor choice on macOS. It's very slow on macOS (usually 2-4x slower than APFS), and uses space much less efficiently.

We have reported this bug to Apple (FB11834215, November 29, 2022).

Update October 2023: Apple reports that this issue is resolved in macOS Sonoma. If you're seeing this corruption, then our primary recommendation is to upgrade to Sonoma, if possible.

Workaround: A "folder swap" on the source should resolve individual occurrences of this problem. For example, if CCC identifies that a folder named "Projects" is affected, then you would:

- Create a new folder adjacent to "Projects" named "Projects-new" [on the source volume]
- Move the content of "Projects" into the "Projects-new" folder
- Move the (now empty) "Projects" folder to the Trash
- Rename "Projects-new" to "Projects"
- Run your CCC backup task again to complete the backup

Solution: After you have resolved any corrupted folder issues (see above), you can do the following to migrate your data away from the ExFAT volume:

- If your destination is also ExFAT formatted, erase that volume in Disk Utility using the APFS format <https://support.bombich.com/hc/articles/20686493728919>
- Run your CCC backup task again to complete an error-free backup
- Click the Compare button in CCC's toolbar <https://support.bombich.com/hc/articles/20686430989207> to verify that the content of the destination matches that of the source
- Erase the affected source volume in Disk Utility using the APFS format <https://support.bombich.com/hc/articles/20686493728919>
- Click **Restore** in CCC's toolbar to configure a new task to restore your data to the new volume from the backup <https://support.bombich.com/hc/articles/20686469175575#ccc>

If you have any concerns about this procedure, or you would like a review of your case prior to erasing the source, please don't hesitate to ask us for help <https://bombich.com/software/get_help>. We greatly prefer to get involved **before you erase your source** if you have any questions or nagging concerns about the procedure.

Apple's APFS replication utility ('asr') may fail to produce a bootable USB device on Apple Silicon Macs

When using the Legacy Bootable Copy Assistant on an Apple Silicon Mac running macOS Ventura or later, the resulting volume may not be bootable if it resides on a USB-attached device. ASR can produce bootable copies to the same device on an Intel Mac. This does not appear to be a general shortcoming of USB devices on this platform, rather it appears to be a shortcoming of the Apple asr utility.

Workaround: Use a Thunderbolt device if you're trying to make a bootable copy of macOS on an Apple Silicon Mac.

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Workaround: If you only have access to a USB device, proceed with a Standard Backup <https://support.bombich.com/hc/articles/20686422131479#standard_backups> (do not use CCC's Legacy Bootable Copy Assistant). When the backup is complete, open the macOS Installer (or boot into Recovery Mode) and proceed to install macOS onto the USB device.

Finder will not show, nor allow you to set custom icons on macOS startup volumes

Finder will show and allow you to customize the volume icon for your current startup disk, but not for other startup volumes that your Mac is not currently booted from. This problem is not specific to CCC nor the manner in which CCC makes legacy bootable copies of the system, rather it is the result of a design flaw in the implementation of custom icons in an APFS volume group. Long ago the custom volume icon was stored in a file at the root of the startup disk named ".VolumeIcon.icns". To keep the System volume read-only, yet allow the apparent modification of this icon file, Apple chose to create a symbolic link at the root of the startup disk that points to System/Volumes/Data/.VolumeIcon.icns. For the current startup disk, this path resolves correctly because the Data member of the volume group is mounted at /System/Volumes/Data. That's not the case for external volumes, those Data volumes are mounted at /Volumes/Bootable Copy - Data (for example). As a result, the symbolic link to .VolumeIcon.icns is unresolvable for any volume that is not the current startup disk.

We reported this issue to Apple in May 2020 (FB7697349). We do not anticipate a response nor solution.

Alternative: We recommend creating "Standard" backups instead of creating a legacy bootable copy. Finder will issue no challenges to customizing the icon of a volume with a Standard Backup.

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Troubleshooting APFS Replication

Apple's APFS replicator is typically fast and flawless, but it does not handle some conditions with grace (or at all). CCC works to avoid as many of these ungraceful results as possible, but we have the following recommendations for the cases where Apple's APFS replicator flops.

CCC reported that the APFS replication failed

If your first bootable copy attempt failed, try the following steps.

1. Restart your Mac
2. Rule out general hardware problems <https://support.bombich.com/hc/articles/20686478629911#steps>, and verify that your destination device is attached directly to a USB or Thunderbolt port on your Mac (avoid hubs). Consider removing any potentially-conflicting hardware drivers <https://support.bombich.com/hc/articles/20686428851607>.
3. Open Disk Utility
4. Choose **Show All Devices** from the View menu
5. Unmount your destination volume – this redundant step is often necessary to avoid failures in step 7.
6. Select the **parent device** of your destination volume in Disk Utility's sidebar †
7. Click the Erase button in the toolbar
8. If you see a volume named "ASRDataVolume_xxx", select that volume and click the "-" button in the toolbar to remove it.
9. Back in CCC, click on the Destination selector box and choose **Choose a different destination**. Choose the freshly-erased volume as the destination.
10. Choose the **Bootable copy using Apple Software Restore** option
11. Click the Start button

† If you have other volumes or partitions on your destination disk that you do not want to lose, do not erase the whole disk. Instead, select the destination volume in this step. Click the "Erase Volume Group" button if it is presented in the Erase Volume panel.

If APFS replication fails repeatedly

Apple's APFS replicator will fail if there are problems with your installation of macOS, filesystem corruption on the source, storage driver conflicts, problems with the hardware, or if there are any media read failures. In short, it's just not very tolerable of real-world conditions. CCC's file copier is battle-tested — we've built years of experience into it to handle all sorts of challenging conditions with grace.

In cases where Apple's APFS replicator simply can't get the job done, we recommend that you configure CCC to perform a Standard Backup. A Standard Backup is a complete backup of all of your data, settings, and applications. This backup will be suitable for migrating all of your applications, data, and settings to a fresh installation of macOS should that ever be required. Creation of the backup alone is sufficient to protect your data, however this will not address any problems with the source.

To proceed with a Standard Backup, click the "X" button in the top-left corner of the destination volume icon in the Destination selector box to clear out the current destination selection. Then click on the Destination selector box again and reselect the destination volume.

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Related documentation

- Installing macOS onto a Standard Backup <https://support.bombich.com/hc/articles/20686422131479#install_macos>
- How to restore from your backup <https://support.bombich.com/hc/articles/20686469175575>

CCC reported that my source or destination is reporting read/write errors

Apple's APFS replicator clones the source volume at a very low level. Rather than copying individual files, it copies the filesystem data structures directly. Because this utility is not examining files on an individual basis, it's not able to deal with media failure nor filesystem corruption in a graceful manner (FB7338920). When ASR encounters media failure or filesystem corruption, the cloning task will fail and the destination volume will be in a corrupted state. The presence of media errors makes it very unlikely that ASR will be able to complete the clone, so CCC will not use the ASR utility if the source or destination is reporting read/write errors.

Solution: We recommend that you proceed with a Standard Backup, then address the hardware concern that led to the read/write errors, then restore your data from the backup (if the problem was affecting the source).

Related documentation

- How to restore from your backup <https://support.bombich.com/hc/articles/20686469175575>
- Identifying and Troubleshooting Hardware-Related Problems <https://support.bombich.com/hc/articles/20686478629911>
- Disk error statistics <https://support.bombich.com/hc/articles/20686438012951#errors>

The ASR copy failed because encryption keys were unavailable

On Apple Silicon Macs, per-file (Data Protection) encryption is *always* in effect regardless of the FileVault setting on the startup disk. Each file has an encryption key that is held by the Mac's "Secure Enclave", and those files can only be opened (i.e. decrypted) if the encryption key is available. Those encryption keys are made available when you log in to the computer, but some of them are discarded again when an idle screen lock occurs. In both cases (after reboot, before login, and after idle screen lock), the unavailability of the encryption keys will cause an ASR copying task to fail.

If CCC reports that an ASR copy failed because encryption keys were unavailable, you can repeat the procedure after logging in or unlocking the screen. When you run the task manually, CCC will attain an idle display sleep assertion, which will prevent the screen from locking so the task can complete successfully.

Related documentation

- Apple Kbase: Data Protection overview <https://support.apple.com/guide/security/data-protection-overview-secf6276da8a/web>
- Apple Kbase: Data Protection classes <https://support.apple.com/guide/security/data-protection-classes-secb010e978a/web>

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Preserving Finder comments and tags

CCC copies all of the information required to preserve Finder tags and comments, but sometimes the Finder interferes with the preservation of these data, or reverts them to previous states.

Finder tags and comments are stored as extended attributes associated with a file or folder (tags are stored as a "com.apple.metadata:_kMDItemUserTags" extended attribute, comments are stored as a "com.apple.metadata:kMDItemFinderComment" extended attribute). Some associated data related to tags and comments is also stored in the hidden .DS_Store folder-specific Finder preference file. When backing up to a locally-attached volume, CCC will preserve these extended attributes and the .DS_Store files. Whether the Finder accepts these attributes, however, depends on whether the Finder has cached older information for the affected files and folders. If you open the destination in the Finder prior to running your backup task, Finder will cache a bunch of those ".DS_Store" preference files. If you then run the backup task, and then revisit those folders on the destination, Finder will not only present cached .DS_Store content (i.e. content that does not reflect your comments and tags), but it will also replace the .DS_Store files that were copied by CCC with the cached versions. The older .DS_Store files will then conflict with the Finder comment and tag extended attributes, and the Finder will not show the tags and comments despite the data being present on the destination files.

You should be able to do the following to get the Finder comments and tags preserved:

1. Restart your Mac (or log out and log back in)
2. Do not open the destination volume in the Finder (no peeking!)
3. Run the backup task
4. At this point you should be able to view the content on the destination, and the comments and tags should be preserved

Preserving Finder comments and tags on network volume backups

NAS volumes traditionally offer poor performance and reliability for preserving extended attributes, so CCC does not preserve extended attributes by default when backing up to a network volume. As a result, Finder comments and tags are not preserved by default when backing up to a network volume.

To preserve Finder comments and tags on a network volume, click the **Advanced Settings** button, then uncheck the box next to **Don't preserve extended attributes** in the File Copying Settings tab.

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Character composition conflicts on NAS volumes

If you copy folders to your NAS device from a Windows system or via SSH (e.g. using rsync) that have accented characters in their names (e.g. é, ö), then you can later run into file or folder name conflicts when you try to access those folders via SMB file sharing. When these conflicts affect a CCC backup task, you'll see errors in CCC suggesting that there is a permissions problem on the NAS volume, or that you should try restarting the the NAS device. This article explains how these conflicts arise, how to spot them in the Finder, and how to ultimately resolve them to achieve error-free backups.

Some brief background about character encoding

The "ASCII" character set is composed of 255 1-byte characters — all of the characters that you'd find in any English word. Non-English languages have numerous other characters, however, that can't possibly fit in a set of just 255 characters. These other characters are defined in the Unicode standard, and typically consume 2 or 3 bytes per "code unit". Most modern filesystems support the Unicode standard, however there are some characters within the Unicode standard that can present challenges to filesystems, and can lead to conflicts when transferring content between filesystems or across a network filesystem protocol.

Let's take the character "é" as an example that can lead to conflicts. This character is described as "Latin small letter e with acute". In the UTF-8 standard, this character can be presented as a single two-byte code unit (0xC3A9), or it can be generated by composition, i.e. by combining "Latin small letter e" (ASCII, 0x65) code unit with a "combining acute accent" (0xCC81) code unit. What individual filesystems do when faced with these ambiguous characters is a potential source of conflict. Some filesystems normalize the characters (i.e. choose one variant when storing file names, e.g. HFS+), some accept both but treat the characters as identical (composition-preserving [usually], composition-insensitive, e.g. APFS), and other filesystems accept both and treat the variants as unique/different characters (composition-sensitive, e.g. EXT4, a common format used on NAS devices).

Network filesystems (AFP, SMB) are in an awkward middle place — they can't dictate how the underlying filesystem behaves, so composition conflicts can place them in an unsupportable position.

Creating conflict

Let's suppose you have a folder named **Beyoncé** in your Music library. Long ago (e.g. prior to macOS High Sierra), your library was on an HFS+ filesystem, so that é character was stored in the composed form, 0x65CC81. Way back then, let's suppose you used rsync to copy this library directly to your NAS via SSH. On the NAS, the backend filesystem is EXT4, which is composition-sensitive. The EXT4 filesystem stored the folder name using the same encoding as on the source — the composed variant. Fast-forward many years later. You have a new Mac and your startup disk is now APFS formatted. You migrated content from an HFS+ volume to an APFS volume, and the é in that Beyoncé folder name was "normalized" to the two-byte, single character variant. You still have the same NAS, but now you're preparing to use CCC to make the backups to that NAS via SMB. Many factors have changed!

If you were to navigate to this Beyoncé folder on the SMB-mounted volume in the Finder, you might be surprised to find that the folder *appears* to be empty. In fact, the Finder is failing to query the content of that folder, because the macOS SMB client queries the content of the folder using the normalized variant of the name (which the NAS correctly reports as "not there"). If you try to copy content into that folder, Finder will ask you to

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authenticate, then present an error indicating that you don't have permission to make the change. This is not actually a permissions problem! It's not necessarily a Finder bug either, rather it is an unsupportable configuration — that folder can't be effectively accessed by SMB or AFP. You'll see the same problem if you try to delete that folder in the Finder.

Resolving character encoding conflicts

The correct solution in a case like this is to delete the "old" folder from the NAS. You won't be able to do this in the Finder (nor CCC for that matter), though, because the macOS SMB client normalizes folder names when it makes requests to the NAS. So despite that the SMB client can see the composed variant of a name in the parent folder listing, if we subsequently ask the SMB volume to remove the composed variant of a folder, the SMB client relays that request to the NAS using the normalized variant of the folder name, which doesn't exist on the NAS.

Solution: Log in to the NAS device's web admin interface, or connect to it via SSH to remove the affected folders.

Workaround: Alternatively, you can configure CCC to back up to a new folder on the NAS. This alternative approach is ideal if you have non-Mac clients that access the content in the original folders (and therefore tend to just re-introduce the same problem).

For the Terminally-curious

Here is what a pair of composition-conflicting folder names would look like on the backend EXT4 filesystem (i.e. logged in to the NAS via SSH):

```
admin@baltar:/volume2/SynBackup6TB/FunWithEncoding$ ls -li
total 16
30421978 drwxrwxrwx+ 2 admin users 4096 Dec 20 17:31 Beyoncé
30421986 drwxrwxrwx+ 2 admin users 4096 Dec 20 17:31 Beyoncé
```

This would appear to be illegal — two folders cannot coexist in the same folder having the same name. But if we pipe the listing to xxd to see the hexadecimal representation of the characters, we can see that the é characters do actually differ (note, this output is slightly massaged for easier reading):

```
admin@baltar:/volume2/SynBackup6TB/FunWithEncoding$ ls | xxd
4265 796f 6e63 65cc 81  Beyonce..
4265 796f 6e63 c3a9     Beyonc..
```

The first item has the composed é character, the second item has the single-character-two-byte code point. Now suppose each of these folders has a different file within it. Here is the NAS perspective:

```
admin@baltar:/volume2/SynBackup6TB/FunWithEncoding$ ls -l Beyonc*
Beyoncé:
total 0
-rwxrwxrwx+ 1 admin users 0 Dec 20 17:31 composed

Beyoncé:
total 0
-rwxrwxrwx+ 1 admin users 0 Dec 20 17:31 single
```

But the macOS SMB client normalizes the folder listing result and requests, so we see different results from the

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macOS perspective:

```
[bombich:/Volumes/SynBackup6TB/FunWithEncoding] ls | xxd
4265 796f 6e63 65cc 81   Beyonce..
4265 796f 6e63 65cc 81   Beyonce..

[bombich:/Volumes/SynBackup6TB/FunWithEncoding] ls -l Beyonc*
Beyoncé:
total 0
-rwx------ 1 bombich staff 0 Dec 20 17:31 single

Beyoncé:
total 0
-rwx------ 1 bombich staff 0 Dec 20 17:31 single
```

This last result is the most curious. We can see from the parent folder that two separate "Beyoncé" folders exist here, but when we ask for details about each folder and a folder listing of each folder, we only get results pertaining to the folder that has the normalized name. Yet stranger, Finder only presents one of these (although you might catch a glimpse of both folders right before Finder removes one from view!). This is why requests to add files to the folder named with the composed character will fail, and it's also why attempts to delete the folder with the composed character will fail — the SMB client simply will not make the request correctly using the composed variant of the character.

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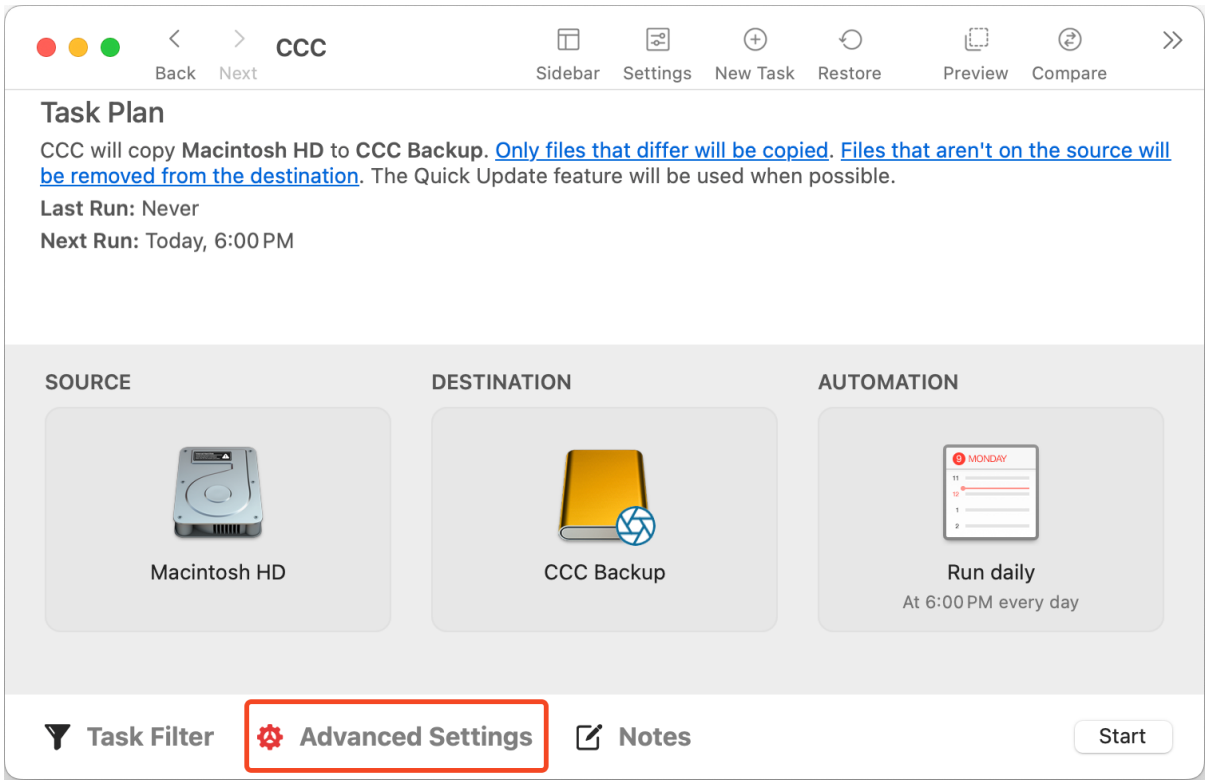
Advanced Topics

- Advanced Settings
- Task Organization
- Addressing Common Performance Problems
- Some files and folders are automatically excluded from a backup task
- Performing actions Before and After the backup task
- Running shell scripts before and after the backup task
- Advanced Scheduling Options
- Backing up the content of cloud storage volumes
- Configuring Email Notifications
- Backing up to/from network volumes and other non-macOS-formatted volumes
- Using CCC to back up to/from another Macintosh on your network
- Restoring from a backup on a remote Macintosh
- Backing up to a disk image
- Restoring from a disk image
- Using the ccc Command Line Tool to Start, Stop, and Monitor CCC Backup Tasks
- Outgoing network connections made by CCC
- Modifying CCC's Security Configuration
- What is CCC's Privileged Helper Tool?
- Password Storage in the macOS System Keychain
- Some files can't be opened when the screen is locked

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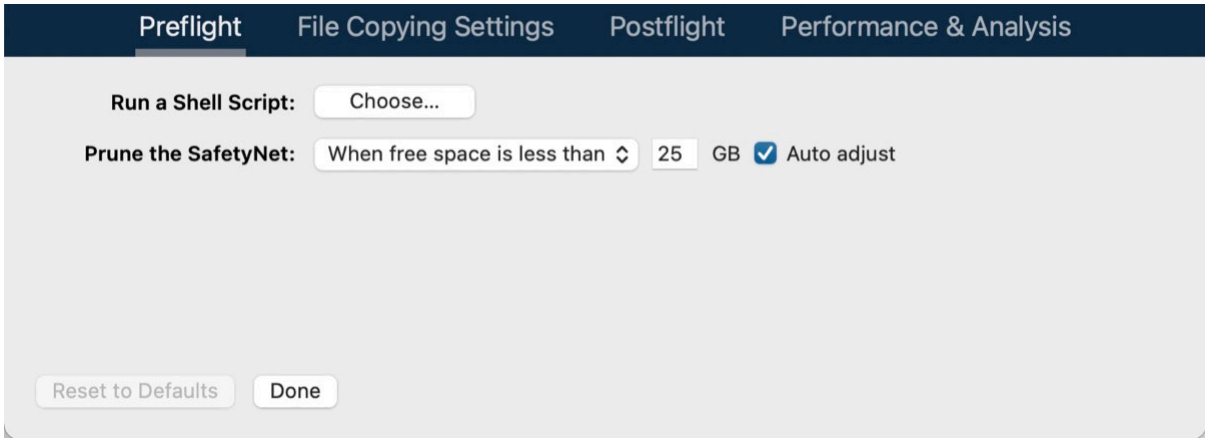
Advanced Settings

To access the advanced settings, click the **Advanced Settings** button at the bottom of the window.



The "gear" icon to the left of the Advanced Settings button will be red if any advanced settings have been customized from the default settings.

Preflight



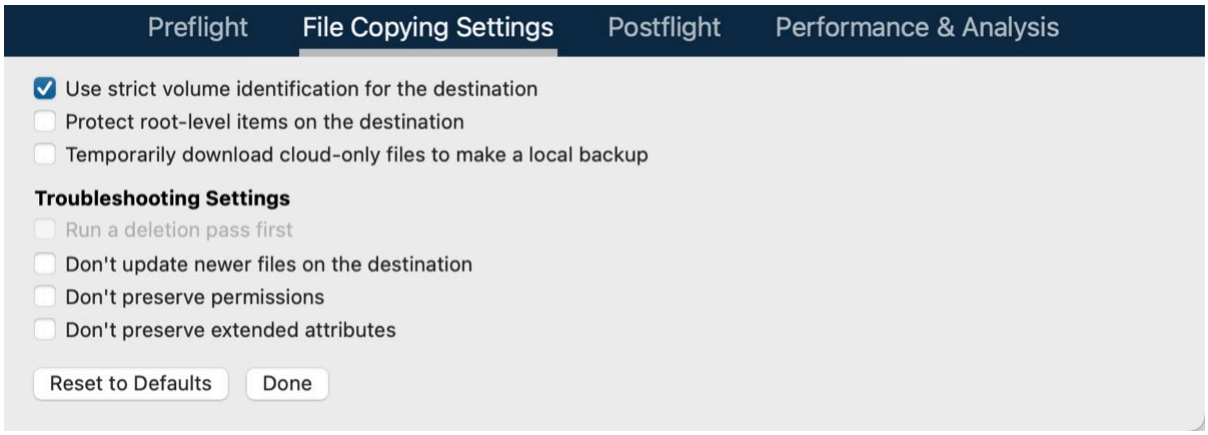
See these two sections of documentation for detailed information about the settings available in the Preflight tab:

- Performing actions Before and After the backup task <https://support.bombich.com/hc/articles/20686441421591>

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- Automated pruning of the legacy CCC SafetyNet folder <https://support.bombich.com/hc/articles/20686475366935#pruning>

File Copying Settings



Use strict volume identification for the destination

By default, CCC uses the name and Universally Unique Identifier (UUID <https://en.wikipedia.org/wiki/Uuid>) of your source and destination to positively identify those volumes. By verifying both of these identifiers, there is less risk in, for example, backing up to a volume that has the same name as your usual destination but is not actually the destination.

While beneficial, this behavior can sometimes have the wrong result. For example, if you rotate between a pair of external destination hard drives, CCC will not back up to both of them even though they have the same name (e.g. **Offsite Backup**). CCC will instead claim that the UUID of one of the volumes does not match that of the originally chosen destination.

To accommodate a "rotating pair of backup volumes" solution, you can uncheck this option to indicate that CCC should only use the volume name to identify the destination volume. When deselecting this option, be vigilant that you do not rename your destination volume and that you never attach another non-backup volume to your Mac that is named the same as your destination volume.

This option is automatically disabled when the destination volume does not have a UUID. Network volumes and some third-party filesystems, for example, do not have volume UUIDs. This option is also disabled if the originally-selected destination device is not attached.

Note: This setting is only applicable to the **destination** volume. CCC **always** uses the name and UUID to positively identify the source volume.

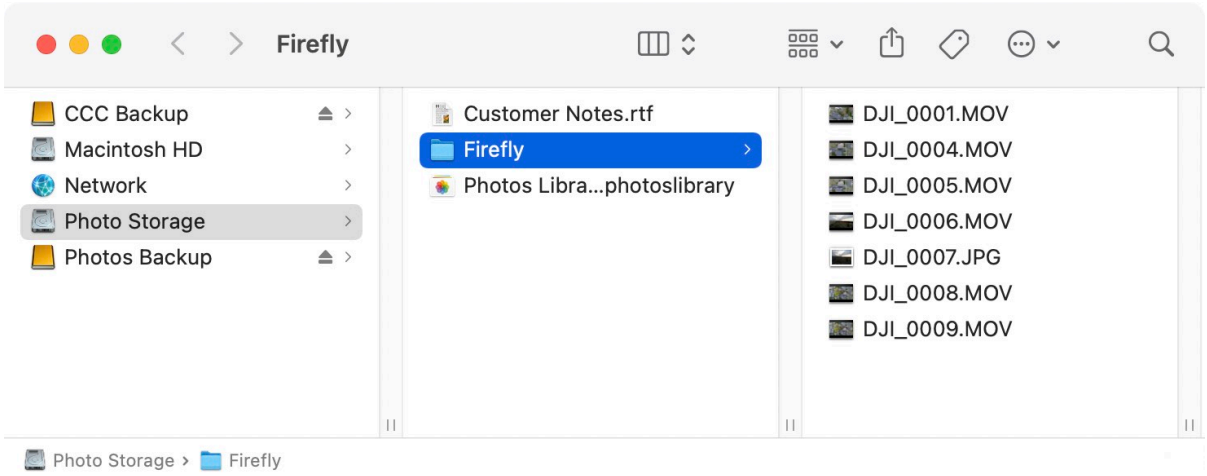
Note: If your rotating destination volumes are encrypted, CCC will only be able to unlock and mount the **original** encrypted volume selected as the destination for your backup task. CCC must have a unique identifier of the destination volume in order to unlock that volume, and CCC will only retain that information about one destination volume for a particular task. If you would like to rotate a pair of backup disks that are encrypted, we recommend using two separate tasks for that purpose; one for each encrypted destination.

Protect root-level items

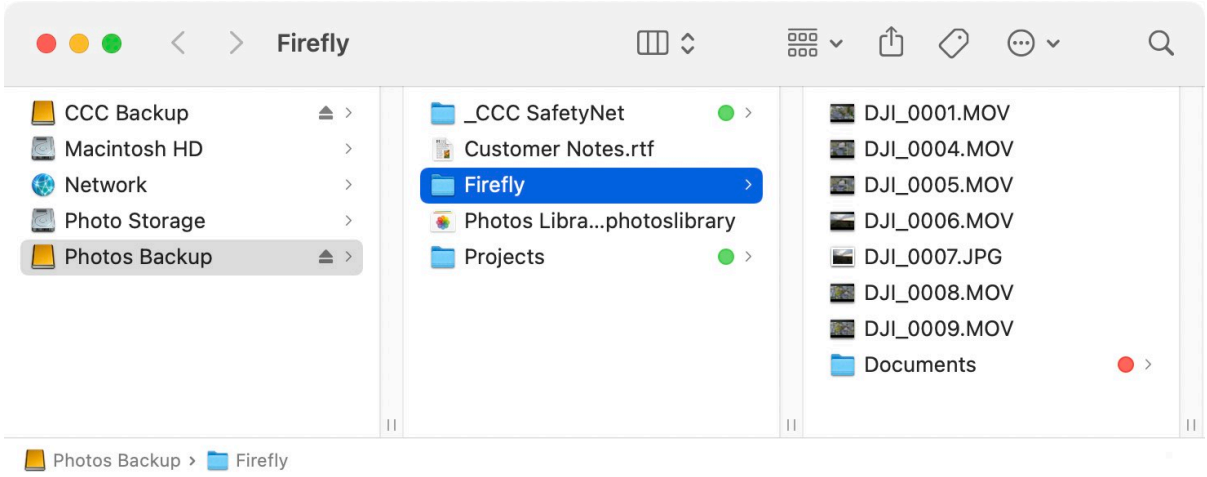
If you have files and folders that are unique to the root-level on your destination volume and you want them to be left alone, yet you want to keep your backup "clean", use the **Protect root-level items** option. To

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understand how this feature works, suppose you have these items on your source volume:



And you have these items on the destination volume:



With the **Protect root-level items** option, the **Projects** folder will **not** be deleted because it is unique to the root level of the destination. The **Firefly** folder is **not** unique to the root of the destination (it also exists on the source), though, so its contents will be updated to match the source. As a result, the **Documents** folder will be deleted.

The "root" of the destination refers to the first or top-most folder relative to your **selected** destination. If you selected a volume named **CCC Backup** as the destination, then the root level refers to the root of the volume — what you see when you open that volume in the Finder (the middle pane in the screenshot above). If you selected a folder as the destination for your task, then the "items at the root of the destination" refers to the items that you find in that specific folder that you selected as the destination, not the root of the whole volume. When you select a folder as the destination, anything outside of that folder is completely outside of the scope of the backup task, and will be left alone by that particular backup task.

Temporarily download cloud-only files to make a local backup

When CCC encounters a cloud-only file, and that file is not yet backed up (or differs from the online version), CCC will ask the system to download the file when this setting is enabled. If the file is downloaded successfully, CCC will copy the file to the destination, then "evict" the file from the source (so that it is once again a cloud-only file and not consuming space on the source). macOS limits file eviction to processes running in the logged-in user's security context, so CCC's Dashboard application provides this functionality. In support of providing this

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functionality reliably, this setting will be disabled if the Dashboard is not configured to open on login.

This setting should not be enabled for a task that backs up the entire startup disk. See this section of CCC's documentation for a larger discussion of this subject and Best Practices for making local backups of cloud-only content:

Backing up the content of cloud storage volumes <https://support.bombich.com/hc/articles/20686419951767>

Run a deletion pass first

This setting is only applicable when using a Remote Macintosh source or destination. In all other cases, CCC will automatically perform a deletion pass when necessary.

CCC typically deletes unique items from the destination as it encounters them. CCC iterates through the folders on your source alphabetically, so some files are often copied to the destination before all of the files that will be deleted have been deleted from the destination. If your destination volume has very little free space, CCC may not be able to complete a backup to that volume. This option will cause CCC to run a deletion pass through the entire destination before copying files. Use of this option will make your backup task take longer.

This option is not applicable when the SafetyNet option is enabled.

Don't update newer files on the destination

Files on the source are generally considered to be the authoritative master, and CCC will recopy a file if the modification date is at all different — newer or older — on the source and destination. Occasionally there are circumstances where the modification date of files on the destination is altered after a backup task runs (e.g. by anti-virus applications), and this alteration causes CCC to copy these files every time. This option can work around these circumstances when the root cause of the modification date alteration cannot be addressed.

Don't preserve permissions

This setting will avoid the errors generated by network volumes that disallow the modification of permissions and ownership on some files. It will also prevent CCC from enabling ownership on the destination volume. Use of this option while backing up applications or macOS system files will prevent those items from working correctly on the destination.

Don't preserve extended attributes

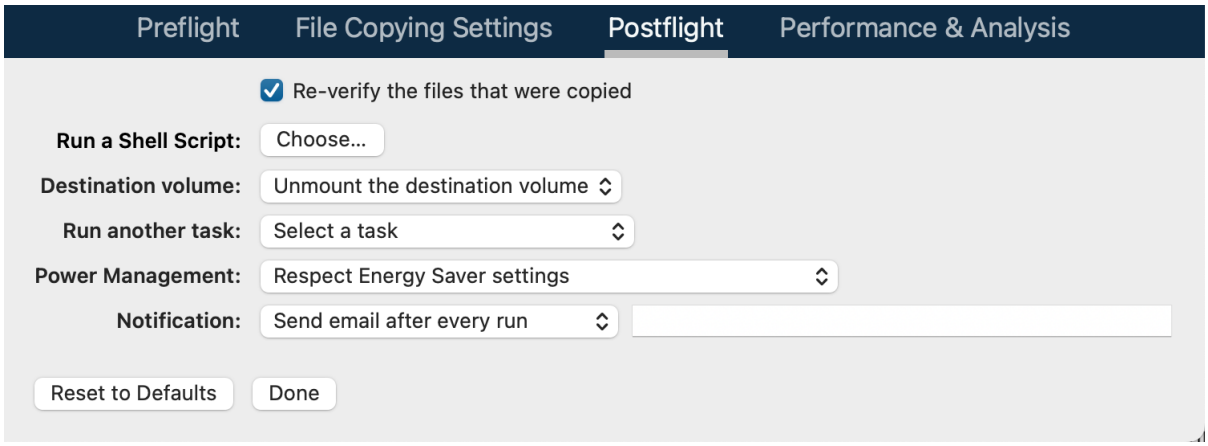
This setting will disable support for reading and writing extended attributes, such as Finder Info, resource forks, and other application-proprietary attributes. Extended attributes store data about the file. Apple explicitly recommends that developers do not store irreplaceable user data in extended attributes when saving a file, because extended attributes are not supported by every filesystem, and could be silently dropped (e.g. by the Finder) when copying a file.

This option is helpful in cases where the source or destination filesystem offers exceptionally poor performance for reading and writing extended attributes, or offers very limited support for macOS native extended attributes such that many errors are reported when trying to copy these metadata.

This setting is enabled by default when you select a NAS source or destination.

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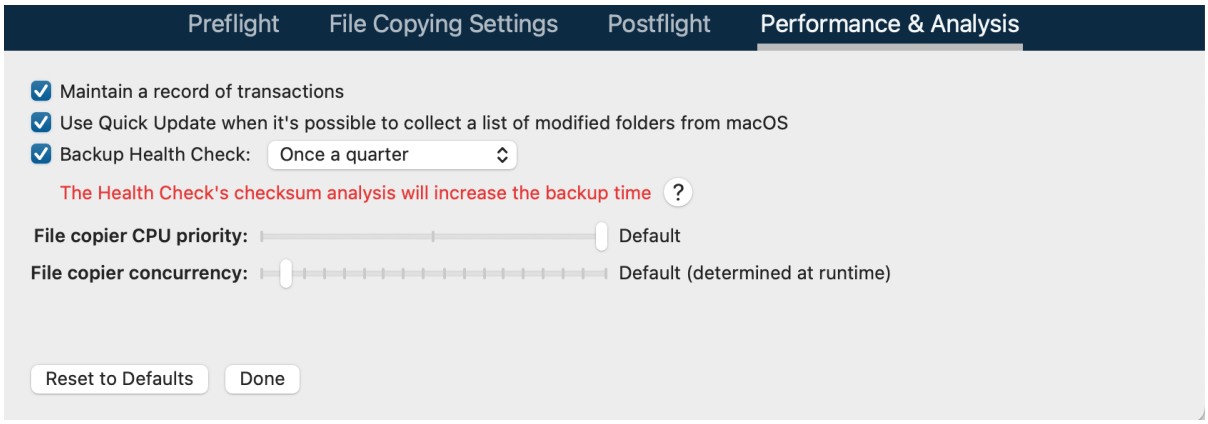
Postflight



See these sections of documentation for detailed information about the settings available in the Postflight tab:

- Postflight verification: Verify files that were copied during the current task event <https://support.bombich.com/hc/articles/20686511433623#postflight>
- Performing actions Before and After the backup task <https://support.bombich.com/hc/articles/20686441421591>

Performance & Analysis



Maintain a record of transactions

This option enables the collection of a list of files and folders that were modified by each task event. See these articles for more information about CCC's collection and use of transactions:

- Audits: Viewing details about the modifications made by the backup task <https://support.bombich.com/hc/articles/20686456355095#transactions>
- Transaction privacy and disabling transaction collection <https://support.bombich.com/hc/articles/20686511433623#disable_transactions>

"Maintain a record of transactions" is not available for "Remote Macintosh" tasks

The collection of transactions relies on functionality that is only available in CCC's new file copier. Remote Macintosh tasks use the legacy file copier, so cannot store records of the files that were copied.

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Use Quick Update when it's possible to collect a list of modified folders from macOS

macOS operates a service that tracks filesystem activity on locally-attached volumes. This "FSEvents" service can be queried to get a list of folders that have been modified since a particular time. When this feature is enabled, the CCC task will limit its enumeration of the source to only the folders that were modified since the last time this particular task ran successfully. This feature can greatly decrease the overall run time for each backup task event, especially in cases where your source has a very high file count, and a large number of folders that are not modified frequently.

This feature assumes that the destination is not modified outside of the task's purview. This is not an insignificant assumption, and that's why this feature is only enabled by default when you assert exclusivity of the destination volume in the Backup Volume Setup Assistant. You must assess your usage of the destination when deciding whether to use this feature. If you make modifications to the destination outside of CCC, or by another CCC backup task, then those modifications may not be accommodated for (or corrected, for example, if you deleted something from the destination) when this feature is enabled.

Sometimes the Quick Update feature will be overridden in favor of a full audit of the destination

CCC will perform a full audit of the destination in lieu of the Quick Update feature in the following situations:

- If the source or destination selection is modified, or if any changes are made in the Task Filter window
- If the source is unable to produce a list of filesystem change events dating back to the start time of the last successful task event
- If the task has not completed successfully within the last two weeks
- When a backup task ends with errors, CCC will retrieve FSEvents dating back to the start time of the last successful task event.
- When the "Temporarily download cloud-only files to make a local backup" setting is enabled.

Tip: Right-click on the table header in the Task History window, then enable the "Settings" column to see an indication of when Quick Update or Backup Health Check was applied to a particular task event.

Quick Update and the "Disable strict volume identification" setting

If you are using a "rotating" pair of backup devices for a single task, i.e. by disabling the "Use strict volume identification" setting, note that Quick Update will be ignored every time the destination volume's unique identifier has changed since the previous task event. If you would like to use Quick Update with a pair of rotating backup volumes, we recommend that you configure separate tasks for each destination.

Quick Update requires a locally-attached, APFS or HFS+ formatted source, and is not available for "Remote Macintosh" tasks

The Quick Update feature relies on functionality that is only available in CCC's new file copier. Remote Macintosh tasks use the legacy file copier, so cannot take advantage of the Quick Update feature.

Additionally, the Quick Update feature draws information from the macOS FSEvents service. CCC will only make FSEvents queries to an APFS or HFS+ formatted source volume. Tasks that specify a network volume as a source cannot use the Quick Update feature.

Quick Update can be periodically audited

The Quick Update feature and the Backup Health Check settings were designed to complement each other. Quick Update provides a way to quickly determine the files that were modified since a previous task – trusting the changes reported by a macOS service, while "Backup Health Check" offers a more thorough, "trust but verify" analysis of changes to both the source and destination. You can complement the Quick Update feature

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with a weekly or monthly audit by the Backup Health Check <https://support.bombich.com/hc/articles/20686511433623#bhc> setting (the time-based application of that feature is available in the popup menu to its right).

 Pro tip: You can also disable the Quick Update setting for a single manual event by holding down the Option key and clicking the Start button to start the task. When you press the Option key, the icon will be removed from the Start button to indicate the temporary settings change.

Backup Health Check

See this Kbase article for additional details on the **Backup Health Check** option:

- Backup Health Check: Verify before copying, automatically replace corrupted destination files <https://support.bombich.com/hc/articles/20686511433623#bhc>

File copier CPU priority

By default, CCC runs its file copier at the default CPU priority for maximum performance. If you find that your backups have a noticeable impact on system performance, you can either schedule your tasks to run at a more convenient time, or you can reduce the CPU priority of the file copier. This will generally make the task take longer, but the task should have a less noticeable impact on system performance.

File copier concurrency

When your task runs, CCC decides how much concurrency is appropriate for your selected source and destination devices. If both the source and destination can be identified as Solid State devices, CCC will simultaneously process up to four folders at once, and copy up to eight files at a time. In other cases, CCC will simultaneously process two folders and two files at a time. If you have solid state media in an enclosure that hides the hardware details (or in a NAS device), you may find that you get better performance by increasing the number of file copier queues. See this section of CCC's documentation for additional insight into the File copier queues setting:

- CCC's file copier is tuned for modern, high performance storage <https://support.bombich.com/hc/articles/20686480713367#cce>

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Task Organization

Most organization tasks are available via the Task menu in the menubar, via the Task Actions menu in the Tasks table header (i.e. the "circle with three lines" icon to the left of "Tasks"), or by right-clicking on a task or task group in CCC's sidebar.

Adding a task

Tasks can be added in several different ways. To create a new task with default settings, choose **New Task** from Task Actions menu in the Tasks table header, or choose **New Task** from CCC's Task menu, or click the **New Task** button in CCC's toolbar. You can also duplicate an existing task: select the task in the task list, then choose **Duplicate** from CCC's Task menu, or right-click on the task and choose the option to duplicate it.

If you exported tasks from CCC previously (on your current Mac or on another Mac), double-click the task configuration file to import the task(s) into CCC.

Removing a task

To remove a task, select the task in CCC's sidebar and then choose **Delete Task** from the Task Actions menu in the Tasks table header, or choose **Delete Task...** from CCC's Task menu, or right-click on the task and choose the option to delete the task. Deleting a task only removes the task configuration from CCC's database, it has no effect on any data that the task backed up to a destination volume.

Task Sorting

Tasks are sorted alphabetically in ascending order by default. To change the sort order or criteria, click on the Task Actions menu in the header of the Tasks table. Tasks can be sorted by name, last run time, next run time, last run status, or manually in the order that you define. When defining a manual sort order, simply drag and drop tasks to adjust their order. Note that disabled tasks are always placed last in a list, prior to applying other sort criteria.

Task Groups

Choose **Add Task Group** from the Task Actions menu in the top-left corner of CCC's sidebar to create a new task group. Add tasks to the group by dragging a task into the group. If you would like to add a task to multiple groups, hold down the Option key while dragging the task from one group to another. Task groups cannot be modified while the Task Group is running.

In their most basic form, task groups serve to organize your tasks. Each task in the group can be scheduled and configured independently of the other tasks. Task groups can also be used to run the tasks as a collection. You can run all of the tasks within a group by selecting the Task Group and clicking the Start button at the bottom of the window. CCC will run the tasks sequentially in the order defined in the **Upcoming Group and Task Events** table.

Setting the run order of tasks within a group

The order in which tasks will be run within a group is defined in the **Upcoming Group & Task Events** table. Select the Task Group in the sidebar, then click the **Upcoming Group & Task Events** button at the bottom of the window to reveal the task run order. Drag tasks within that table to set the run order.

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Note that this order may differ from the order of the tasks in the Tasks sidebar — task sort order in the sidebar is defined by the sort criteria selection in the "task actions" menu in the top-left corner of the sidebar. There is one exception to that. When the sort criteria for the tasks sidebar is set to "Manually," tasks listed within a group in the Tasks table in the sidebar will be sorted based on the order in which they are set to run (again, based on the order set in the **Upcoming Group & Task Events** table).

Scheduling task groups

Task groups can be scheduled in the same manner as individual tasks; simply click on the Automation selector, choose a scheduling basis, then define when the group should run. Tasks will be run sequentially within the group. If a task has its own schedule configuration, that task will also run independently of the task group. If the task is already running when the task group wants to start it, the task group will move on to the next task in the group. If a task is already running via the task group when its own scheduled run time arrives, the task will continue to run, and will not be run an additional time. Individual task runtime conditions will be taken into account when running the task via the task group. For example, if a task is configured to not run on weekends, that task won't run via the group if the task group runs on the weekend. The only exception to this is when you choose to run a task group manually. In that case, runtime conditions are overridden.

When a task group runs, every non-disabled task will be executed regardless of the success/failure of previous tasks in the group. The only exception is when a task is stopped. If you stop a task that was started via a task group, no more tasks in the group will be executed via the task group.

Exporting tasks and groups

Tasks can be exported individually by right-clicking the task in the Tasks table, then choose the option to export the task. You may also export all of the tasks within a task group by right-clicking the task group and choosing the option to export the group, or by choosing **Export Task Group...** from CCC's Task menu. If you would like to export all of your tasks, choose **Export All Tasks...** from CCC's Task menu.

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Addressing Common Performance Problems

There are several factors that affect the performance of your backup tasks. Here we describe the most common conditions that affect backup performance, and offer some suggestions for mitigating the effects of those conditions.

Use CCC's Quick Update feature

The Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate> feature can greatly reduce the amount of time it takes to compare items on the source and destination. Rather than evaluating all files and folders in the source data set, CCC will collect a list of folders that have been modified since the last backup task from the macOS FSEvents service. Especially for data sets with a lot of small files in folders that are infrequently modified, this feature can improve performance by many orders of magnitude. Click the **Advanced Settings** button at the bottom of the CCC window, then you'll find the Quick Update option in the **Performance & Analysis** tab.

Reduce the number of files considered for backup

If the aforementioned Quick Update feature is not applicable (e.g. because the source volume doesn't support it), and if you have a particularly high number of files on your source volume, you may be able to reorganize your data set and apply some exclusions to improve task performance. For example, if you have a large number of files that never change (perhaps some old, completed projects), you can collect these into a folder named "Archives", back it up once, then exclude it from future backups. CCC will not delete excluded items from your destination (unless you configure the Task Filter to do so), so as long as you keep the original on your source volume, you will always have two copies of your archived content. Because these items are excluded from your daily backups, CCC will not spend time enumerating through those files for changes.

Related Documentation

- Excluding files and folders from a backup task <https://support.bombich.com/hc/articles/20686509510167>
- Folder-to-Folder Backups <https://support.bombich.com/hc/articles/20686432643735>

Trim unnecessary content from the backup task

macOS is constantly touching log and cache files, and those files can add up to a lot of changes for every backup task. Take a moment to review your task audits to see if there is content that doesn't have to be backed up. A few minutes reviewing the audit can add up to lots of time shaved off your regular backups.

1. Click **Task History** in the toolbar to open CCC's Task History window
2. Select one of your regularly-recurring task events
3. Click on the **Audit** tab in the center of the window
4. Sort the list by **Size**, then browse through the changes
5. If you see something in the audit that you don't feel needs to be backed up, especially cache folders with a particularly high file count or a large amount of data, right-click on the item and choose the option to exclude it from the backup task.

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Related Documentation

- Audit: Viewing details about the modifications made by the backup task <https://support.bombich.com/hc/articles/20686456355095#audit>

Avoid simultaneous writes to the same destination

When two tasks are writing to the same destination at the same time, the two tasks could take more than twice as long to complete when running at the same time vs. when they are run sequentially. This is particularly true when writing to network volumes, the resulting CPU load on the NAS server can be more than it can handle. CCC offers two features to avoid running automated tasks simultaneously to the same destination:

- If you have multiple tasks that write to different folders on the *same* destination volume, click on the Automation selector for each task and check the box next to **Defer if another task is writing to the same destination**.
- Rather than scheduling the individual tasks, place the tasks into a task group <https://support.bombich.com/hc/articles/20686444541975>, then configure the group to run on a schedule. The group will then run the tasks sequentially.

Hard drive performance and interface bandwidth

Your backups will be no faster than your slowest disk. Performance will be worse for smaller rotational hard drives (e.g. physically smaller, like those in 2.5" hard drive enclosures), for older hard drives, and for hard drives that are nearly full and thus more likely to be fragmented.

You will also get longer copy times when you have lots of small files vs. a volume filled with just a few very large files. Finally, you will see better performance with faster/more efficient interfaces — USB 3.1 is faster than USB 3.0, USB 3.0 is faster than USB 2.0, etc.

Rotational hard drive performance will diminish as the disk fills up

Sectors on the disk are arranged in concentric circles. On the outside edge of the disk (the "beginning" of the disk), the disk spins faster, so data can be read at a faster rate. On a 5400RPM disk, for example, the linear speed of the outside edge of the disk is about 60 miles per hour. At the center of the disk, the linear speed is just 16 miles per hour – 4 times slower. As such, read performance at the end of the disk is considerably slower. You can easily see this performance difference if you partition a disk in half. The first partition will consistently get much faster performance than the second partition.

Another performance-affecting factor comes into play when a rotational disk gets close to its maximum capacity – fragmentation. As the filesystem becomes fuller, it becomes harder for the filesystem to find large, contiguous blocks to place files, so the filesystem starts to become fragmented. That fragmentation causes the disk to spend more time seeking when retrieving any individual file (because the pieces of the file are scattered all over the disk). Often you can hear this "chattiness" from the disk as the drive head darts back and forth across the disk.

If your source volume is nearly full and is a rotational disk, we recommend that you replace it with a larger hard drive to avoid the performance implications of filesystem fragmentation.

Filesystem performance on rotational devices

The filesystem format applied to your disks can also affect the performance of a backup task. Apple's legacy HFS+ format, for example, was designed specifically to deal with the performance characteristics of rotational

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devices – storage at the fastest part of the disk is preallocated for the filesystem metadata so that folder enumeration requests aren't negatively affected by seek activity. When Apple designed its newer APFS filesystem, it designed that filesystem to excel on media that has no seek penalty (SSDs). On rotational media, however, APFS has a distinct performance disadvantage <https://bombich.com/blog/2019/09/12/analysis-apfs-enumeration-performance-on-rotational-hard-drives>, and that difference is most acutely noticed on the slowest rotational devices (e.g. 2.5" "slim" disks, and 5400RPM disks – Western Digital My {anything} and many Seagate Backup disks are among these devices).

Unless you are specifically using a disk to share files with a Mac running an OS older than High Sierra, we recommend using APFS for all backup devices – despite any potential performance disadvantage. The information above is not intended to dissuade you from choosing APFS, rather just to set expectations for performance when using an exceptionally slow rotational device. Disks that were noticeably slow on older OSes will be even slower with APFS applied. Despite the slower performance, however, an APFS backup device will offer better compatibility with the file types on your APFS sources, as well as features that are exclusive to APFS (e.g. filesystem snapshots, support for encryption).

If you're finding performance on an older/slower backup disk to be exceptionally poor, we recommend replacing the disk with something faster. An SSD is not required, but when shopping for a rotational disk, we recommend that you avoid the "slim" disks.

Related Documentation

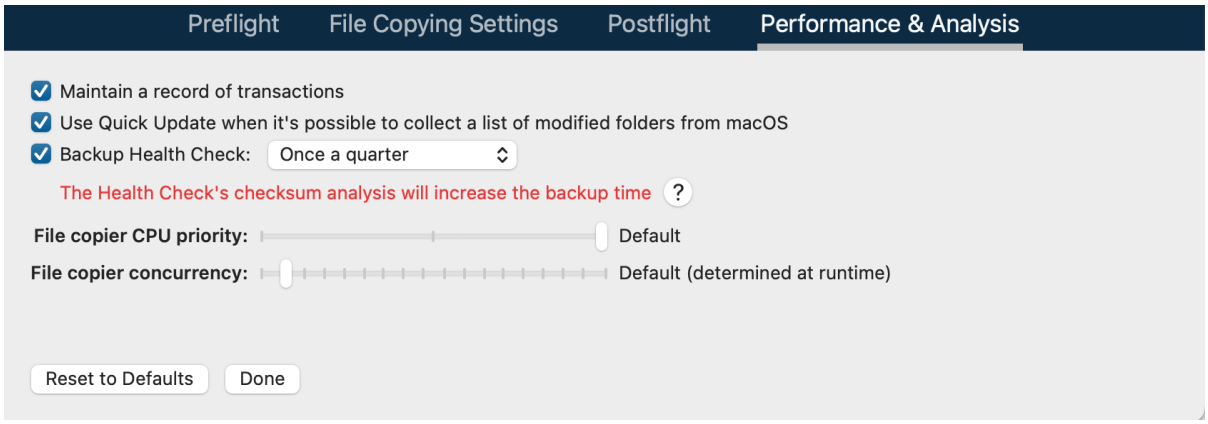
- Choosing a backup drive: Devices that we recommend <https://support.bombich.com/hc/articles/20686495048215#recommendations>

CCC's file copier is tuned for modern, high performance storage

When we developed our new file copier in CCC v6, one of our design goals was to take full advantage of the performance that is available from modern SSD and NVMe storage devices. The CCC "Core Copy Engine" will process up to four folders at once, and copy up to eight files at a time by default when both the source and destination devices can be positively identified as APFS-formatted solid state devices. This multi-threaded approach yields blazing-fast transfers of very large amounts of data between fast devices – typically exceeding CCC v5's legacy file copier performance by 50% or more, and meeting or exceeding Finder copying performance.

When CCC cannot identify a device as a solid state device, CCC throttles back the concurrency of its file copier to a default that works better for rotational media. In these cases, CCC will still evaluate up to four folders at once, but it will only copy 1-2 files at a time (depending on file size). If you have a solid state device placed into a generic USB hard drive enclosure, that enclosure won't identify the media type to macOS, and you won't see the full potential of that device when using it with CCC. In those cases, you can improve performance by manually increasing the "File copier concurrency" setting in Advanced Settings > Performance & Analysis:

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CCC sometimes uses the APFS clonefile function to use storage space more efficiently

If both the source and destination are APFS-formatted, and CCC can verify that they are both solid state devices, and snapshot support is enabled on the destination, then CCC uses a special procedure to handle updates to files that are larger than 1GB. For this procedure, CCC will create a duplicate of the existing file on the destination using the "clonefile" function of the APFS filesystem. At this point, the duplicate copy doesn't consume any additional disk space because it's a "clone" of the original destination file. CCC will then open the source and cloned destination file and proceed through them one block at a time to compare the blocks. If a block differs, it's copied, if not, the existing block is left in place. When the cloned destination file is completely updated, the original file on the destination is deleted. Any space consumed by blocks that aren't used by the cloned file will be freed (or retained in a snapshot, if applicable).

The benefit of using this procedure can be quite substantial when snapshot support is enabled on the destination volume. Consider two alternatives. Suppose you have a 40GB VM container file that changes every day, but only about 1GB of data within that file changes in any given day. If CCC were to recopy that whole file every time it changes, then every snapshot would uniquely reference at least 40GB of disk space. This will add up quickly, and will impose a lower practical limit on the number of snapshots that can be retained. When using the clonefile procedure, however, only the blocks that have been modified on the source will be modified on the destination, so the 1GB of daily changes to that VM container file will have a very low net impact on snapshot disk usage.

The clonefile procedure has great benefits for using storage space more efficiently, however it is not a *faster* procedure than simply recopying the file. The performance of this procedure on rotational media is poor enough to make it impractical, and even on solid state media, we chose to limit the procedure based on file size so that we're only taking a performance hit when there is a large potential storage efficiency benefit.

Spotlight Indexing

Anything that causes CCC to compete for bandwidth on your source or destination volume will increase the amount of time that it takes to back up your data. Spotlight indexing is one such process that CCC typically must compete with for disk bandwidth. As you copy new data to your destination volume, for example, Spotlight wants to read those "new" files so it can index their contents. Having a Spotlight index of your backup volume may be unnecessary; typically you want to search for files only on your source volume.

To disable Spotlight indexing on a volume that is dedicated to backup, open the **System Settings** application, select **Siri & Spotlight** in the sidebar, scroll to the bottom of the window and click **Spotlight Privacy…**. Drag the icon of the destination volume into the "Privacy" table. If you decide later that you do want the backup volume indexed, drag its icon out of the "Privacy" table and indexing will start immediately.

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Backup Health Check

CCC offers an advanced "Backup Health Check" <https://support.bombich.com/hc/articles/20686481162647#checksum> option. When using this option, CCC will re-read every file on the source and every file on the destination, calculating a checksum of each file. CCC then compares these checksums to see if a file should be recopied. While this is an excellent method for finding unreadable files on the source or destination, it will dramatically increase the amount of time that your backup task takes, and it will also increase CPU and hard drive bandwidth consumption on your Mac. We recommend limiting the use of this option to weekly or monthly, or to one of the other options offered in the popup menu adjacent to that setting.

Tips: You can hover your mouse over the time-intervals popup menu to see when this setting was last applied to your backup task. You can also see icons that indicate whether this setting was applied to a task event in the Settings column of the Task History window. Right-click on the table header in the Task History window to reveal the Settings column.

Other applications and conditions that can lead to performance problems

Over the years we have received numerous queries about poorer performance than what is expected. Careful analysis of the system log and Activity Monitor will usually reveal the culprit. Here are some things that we usually look for:

- Other backup software copying simultaneously to the same volume, a different volume on the same disk, or across the same interface as CCC's destination.
- Utilities that watch filesystem activity and do things when file changes are detected. Antivirus software <https://support.bombich.com/hc/articles/20686461466391> is a common culprit, but we have also seen problems caused by other watcher applications, such as memeod and Western Digital's SmartWare.
- Slow interfaces — **USB hubs (including the ports on a USB keyboard or display) and even some USB cables can reduce the bandwidth to your disk dramatically**. If you're using USB, be sure that your device is plugged directly into one of the USB ports on your Mac.
- Using a wireless network connection to connect to a network volume. If you're seeing poor performance with a wireless connection, compare the performance when using a wired (ethernet) connection.
- Third-party USB device drivers can reduce the performance and/or reliability of your USB storage devices <https://support.bombich.com/hc/articles/20686428851607>. Examples include the "SAT-SMART" drivers, as well as some ancient BlackBerry drivers.
- Symantec's Digital Loss Prevention (DLP) can cause performance problems when backing up a specific Microsoft font cache (e.g. /Users/yourname/Library/Containers/com.microsoft.Outlook/Data/Library/Application Support/Microsoft/FontPreviewCache). The problem appears to be specific to DLP's ability to cope with the dorky emojis that Microsoft uses in the file names in this folder (i.e. replacing the word "family" with the family emoji). Exclude that FontPreviewCache folder from your backup task <https://support.bombich.com/hc/articles/20686509510167> to avoid the performance problem.

If you're still having trouble identifying a performance problem, we're here to help <https://bombich.com/software/get_help>.

Related Documentation

- Troubleshooting slow performance when copying files to or from a network volume <https://support.bombich.com/hc/articles/20686454126487>

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Using the Dynamic Performance Chart to understand factors that affect performance

When a task is running, CCC presents a live chart of file evaluation rate (i.e. the number of files compared per second) and data write rate. Hover your mouse over the chart to see the rates at various points on the chart:



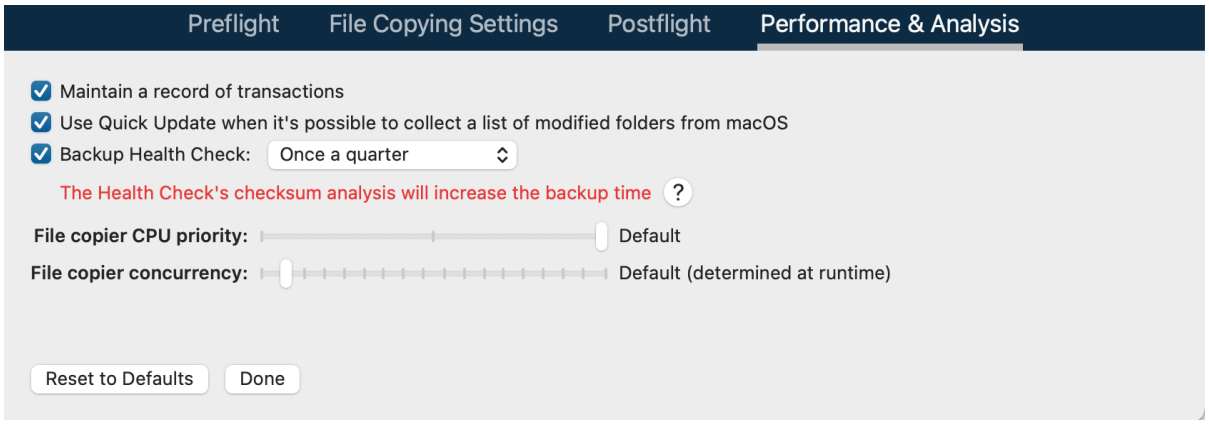
File evaluation rate and write rate are often complementary. This dynamic performance chart was designed to show how these two factors relate to each other, and also to show how the characteristics of your source data set interact with the performance characteristics of your source and destination devices. For example, you will find that when CCC is copying very large files, file evaluation rate will be low, but write rate will get very high – close to the maximum bandwidth potential of the destination (if that's slower than the source device's read rate). In contrast, when CCC is processing lots of smaller files, the file evaluation rate will get higher and the write rate will be considerably less than the maximum write rate that is achievable on that device. This is normal – it takes longer to copy a million 1KB files than it would take to copy a single 1GB file, even though you're copying the same amount of data.

The dynamic performance chart will bring NAS protocol performance into sharp focus. While we can typically process thousands of files per second on a locally-attached filesystem, NAS filesystems (e.g. AFP and SMB) can typically process tens or hundreds of files per second. This performance is wholly dependent on the NAS device, its storage, and is also strongly influenced by the overhead of the SMB and AFP protocols. The key to improving performance on a task that involves a NAS device is to reduce the number of filesystem transactions that must occur, and the only way to do that is to reduce the number of files and folders that are compared during the backup task. CCC's Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate> feature can be instrumental in achieving that goal.

Reducing the impact of a backup task on your Mac's performance and usability

Sometimes backup tasks can have a noticeable impact on system performance. By default, the CPU priority of CCC's file copier will be comparable to that of a foreground application, yielding the fastest possible file copying performance. If you would like to reduce the impact that a particular task has on the system, you can reduce the File copier CPU priority in the **Performance & Analysis** tab of CCC's Advanced Settings.

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Pausing a task

If you would like to immediately cease a task's impact on the system without stopping the task altogether, you can pause the task. Click the Pause button adjacent to the Stop button in CCC's main window to pause the task. The CCC Dashboard also offers a Pause button for quicker access to this functionality. Paused tasks will resume automatically after five minutes, or you can click the Continue button to resume the task. The five minute timeout can be adjusted in the Advanced section of CCC's Settings window.

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Some files and folders are automatically excluded from a backup task

Based on Apple recommendations and years of experience, CCC maintains a list of files and folders that are automatically excluded from a backup task. Feedback on CCC's global exclusions is always welcome <https://bombich.com/software/get_help>.

Legend
Items prefixed with a "/" indicate that they will only be ignored if located at the root of the volume.
Items postfixed with a "/*" indicate that only the contents of those folders are ignored, the folders themselves will be copied.
Items postfixed with a "*" indicate that the filename will be matched up to the asterisk.

Filesystem implementation details

- .HFS+ Private Directory Data*
- /.journal
- /.journal_info_block
- .afpDeleted*
- ._*
- .AppleDouble
- .AppleDB
- /lost+found
- Network Trash Folder
- .TemporaryItems

These items only show up if you're running an older OS than what was used to format the source volume, and on some third-party implementations of AFP and SMB network filesystems. These items should never be manipulated by third-party applications.

Volume-specific preferences or data stores

- .metadata_never_index
- .metadata_never_index_unless_rootfs
- /.com.apple.timemachine.donotpresent
- .VolumeIcon.icns
- /TheVolumeSettingsFolder
- /private/var/db/dslocal/nodes/Default/secureaccesstoken.plist
- .DocumentRevisions-V100*
- .Spotlight-V100
- Library/Metadata/CoreSpotlight
- /private/var/db/Spotlight-V100/BootVolume/*
- /.fseventsd
- /.hotfiles.btree

These items are excluded by default because they record volume-specific preferences, e.g. for Spotlight, Time

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Machine, and a custom icon for the volume.

Apple-proprietary data stores

- /private/var/db/systemstats
- /private/var/db/searchparty
- /private/var/db/ConfigurationProfiles/Store
- /private/var/folders/*/*/C
- /private/var/folders/*/*/T
- /private/var/folders/*/*/0/com.apple.nsurlsessiond
- /System/Library/AssetsV2/analytics
- /Library/Application Support/Apple/AssetCache/Data

These items are Apple-proprietary data stores that get regenerated when absent. Their respective apps typically reject these items when restored from a backup and will recreate them as necessary.

The DocumentRevisions data store is used by the Versions feature in macOS. The Versions database stored in this folder contains references to the inode of each file that is under version control. File inodes are volume-specific, so this dataset will have no relevance on a backup volume.

Dynamically-generated devices

- /Volumes/*
- /dev/*
- /automount
- /Network
- /.vol/*
- /net

These items represent special types of folders on macOS. These should not be backed up, they are dynamically created every time you start the machine.

Quota real-time data files

- /.quota.user
- /.quota.group

When these files are copied to a destination volume using an atomic file copying procedure, the macOS kernel will prevent the destination from being gracefully unmounted. The contents of these files is never accurate for the destination volume, so given the kernel's unruly behavior with copies of these files, CCC excludes them. According to the quotacheck man page, these files **should** be regenerated every time a quota-enabled volume is mounted (e.g. on startup). We have not found that to be consistently true. If you're using quotas, run `sudo quotacheck /` after restarting from your backup volume or a restored replacement disk to regenerate these files.

Large data stores that are (or should be) deleted on startup

- /private/var/vm/*
- /private/tmp/*
- /cores
- /macOS Install Data

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- /.PKInstallSandboxManager
- /Library/InstallerSandboxes/.PKInstallSandboxManager
- /.PKInstallSandboxManager-SystemSoftware
- /.AppInstallationStaging

macOS stores virtual memory files and temporary items in these folders. Migration Assistant won't migrate this content, and even if you restored it manually, macOS would remove it on startup.

Trash

- .Trash
- .Trashes

Moving an item to the trash is typically considered to be an indication that you are no longer interested in retaining that item. If you don't want CCC to exclude the contents of the Trash, you can modify each task's filter:

1. Click **Task Filter** at the bottom of CCC's window
2. Uncheck the box next to **Don't copy the Finder's Trash** in the sidebar
3. Click the **Done** button

Time Machine backups

These folders store Time Machine backups on volumes formatted with the legacy HFS+ format. Legacy Time Machine backups use proprietary filesystem devices that Apple explicitly discourages third-party developers from using. Additionally, Apple does not support using a duplicated Time Machine volume and recommends instead that you start a new Time Machine backup on the new disk.

- /Backups.backupdb
- /.MobileBackups
- /.MobileBackups.trash
- /private/var/db/com.apple.backupd.backupVerification

Corrupted iCloud Local Storage

iCloud leverages folders in your home directory for local, offline storage. When corruption occurs within these local data stores, macOS moves/renames the corrupted items into the folders indicated below. macOS doesn't report these corrupted items to you, nor does it attempt to remove them. CCC can't copy the corrupted items, because they're corrupted. To avoid the errors that would occur when trying to copy these corrupted items, CCC excludes the following items from every backup task:

- Library/Mobile Documents.* [Note: This exclusion is specific to Mobile Documents.{something} folders that have a corruption suffix, not to the non-corrupted "Mobile Documents" folder]
- .webtmp

Special files

Files included in this section are application-specific files that have demonstrated unique behavior.

- /private/var/audit/*.crash_recovery
- /private/var/audit/current
- Library/Caches

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- /PGPWDE01
- /PGPWDE02
- /.bzvol
- /Library/Backblaze.bzpkg/bzdata/bzvol_system_volume/bzvol_id.xml
- /.cleverfiles
- /Library/Application Support/Comodo/AntiVirus/Quarantine
- /private/var/spool/qmaster
- $Recycle.Bin
- @Recycle
- /@Recently-Snapshot
- .Transporter Library
- Library/Preferences/ByHost/com.apple.loginwindow*
- Library/Containers/*/Data/tmp
- .dropbox.cache <https://www.dropbox.com/help/desktop-web/cache-folder>
- /private/var/db/atpstatdb*
- Library/Logs/Acronis
- .@__thumb
- /.com.prosofteng.DrivePulse.ignore
- com.apple.photolibraryd/tmpoutboundsharing
- *.photoslibrary/.tmp.driveupload
- *.photoslibrary/database/search
- /Library/Application Support/Fitbit Connect/Minidumps
- Library/Application Support/FileProvider/*/wharf
- Library/CloudStorage/*/.tmp
- Library/CloudStorage/GoogleDrive*/.Encrypted
- Library/CloudStorage/GoogleDrive*/.file-revisions-by-id

CCC SafetyNet folders

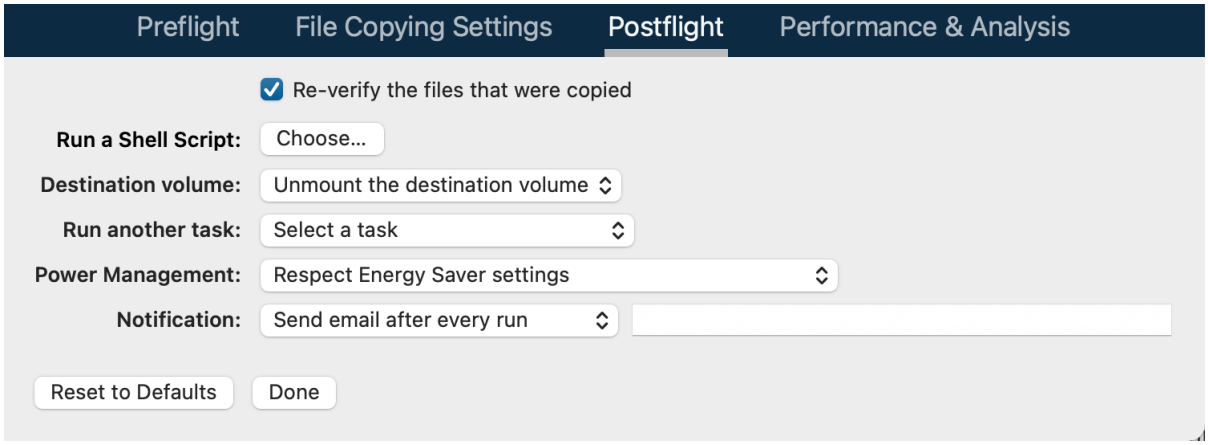
When CCC's SafetyNet feature is enabled and snapshot support is not enabled on the destination, CCC creates a _CCC SafetyNet folder at the root of the selected destination volume or folder. If you accidentally specify the wrong volume as a destination to a CCC backup task, the mistake does not catastrophically delete every file from the selected destination; you simply recover the items from the _CCC SafetyNet folder.

The protection that the SafetyNet folder imparts is specific to the volume upon which the SafetyNet folder resides. As such, CCC never includes the contents of the _CCC SafetyNet folder in a backup task. So, for example, if your hard drive fails and you restore your backup to a replacement disk, the _CCC SafetyNet folder is automatically excluded from that restore task. If you have several tasks backing up to separate folders on a backup volume, for example, the _CCC SafetyNet folders that are created in those subfolders would not be included in a secondary backup task that copies your backup disk to a third disk.

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Performing actions Before and After the backup task

Often when you have a backup task that runs on a scheduled basis, there are associated tasks that you would like to perform before or after files are actually copied. CCC offers the option to run shell scripts before and after a backup task, unmount the destination, run another CCC backup task, and power management options such as restart and shutdown. If you would like to perform any of these pre- or postflight tasks, click the **Advanced Settings** button at the bottom of CCC's main window and select the **Preflight** or **Postflight** tab.



Mounting the source or destination volume before a backup task begins

Without any additional configuration, CCC will attempt to mount your source and destination volumes when a backup task begins. This applies to many different volume types — ordinary volumes on locally-attached hard drives, disk images, network volumes, encrypted volumes – even encrypted volumes on remote Macs. If your source or destination volume is on a disk that is physically attached to your Mac (e.g. via Thunderbolt or USB), but it is not mounted, CCC can "see" that device and will attempt to mount it. If your source or destination is a network volume, CCC will obtain the credentials that you use to mount that device when you create the backup task, and will use those credentials to mount the volume before the task begins.

This also applies for nested volumes. For example, suppose you are backing up to a disk image on a network volume. CCC will first attempt to mount the network volume, then it will attempt to mount the disk image. Likewise, suppose you have a task configured to back up the contents of a folder on an encrypted volume. If you have saved the encrypted volume's passphrase in CCC's keychain, CCC will unlock and mount the encrypted volume before the backup task begins.

CCC's attempts to mount the source and destination volumes occur automatically before any other tasks, including preflight shell scripts (described below), therefore **it is not necessary to implement a shell script to pre-mount the source or destination**.

Little Snitch may prevent the automated mounting of network volumes

If you're using Little Snitch to monitor and filter your inbound and outbound network traffic, you may find that CCC has trouble automatically mounting a network volume. If you run into this problem, configure Little Snitch to allow network access to the NetAuthSysAgent system service. NetAuthSysAgent is the macOS system service

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that fulfills application requests to mount network volumes.

Destination volume options

If you would like CCC to unmount your destination volume at the end of the backup task, choose **Unmount the destination volume** from the Destination volume management menu. If your destination is a folder, the text will be **Unmount the underlying volume**. If the destination is a disk image, CCC always unmounts the disk image volume, so this setting refers to the underlying physical volume upon which the disk image resides.

If an application has open files on the destination volume, CCC's attempt to unmount the volume will fail. CCC does not report this as a task failure, though it will make a note of the event in the Errors tab of the Task History window.

Power management options

By default, at the end of a backup task, CCC will not perform any power management tasks. Instead, the system will perform as defined by the settings in the Energy Saver Settings pane. For example, if you have the system configured to idle sleep after 20 minutes, the system will go to sleep if there hasn't been any user activity in the last 20 minutes. CCC activity is not considered user activity, so often the system will go to sleep immediately after CCC finishes a backup task.

If you choose one of the options from the Power management menu, CCC will reboot or shut down your Mac when the backup task finishes. With the exception of the options that indicate "forcefully", the reboot and shutdown options are not forceful, rather these are "requests". If you have a document open with unsaved modifications, for example, the application would prompt you to save the document. If a save dialog is not attended to, the shutdown or reboot request will time out.

Turn off the computer if it was previously off

This option is applicable if you would like to have CCC shut down your Mac at the end of the task, but only in cases where the Mac was off (and then turned on by the scheduled power event) at the task's scheduled run time. If your backup task runs when the system has been on for a while or has been sleeping, CCC will not shut down the Mac when using this option.

This option will only be enabled for tasks configured to run on a schedule.

Power Management options are ignored in some cases

Power management options will not be applied to backup tasks that are cancelled (e.g. you click the Stop button). Additionally, power management tasks will not be applied if other CCC backup tasks are running or queued to run immediately after the current task finishes running. If your task is running as part of a Task Group, power management options will be deferred to when all tasks within the group have completed.

Specific to the "with 60s countdown dialog" options, note that macOS will not present these dialogs if the screen is locked. If your task tends to run when the displays is asleep, and you require a password to unlock the screen, the 60s countdown options will not consistently reboot or shut down the system.

Power Management options are applied regardless of task success

Power management options will be applied whether the backup task completes successfully or not. If you prefer for a backup task to perform the power management action only when the backup task exits without error, see the pm_on_success.sh postflight script below.

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Run another backup task (task chaining)

If you have more than one CCC backup task configured, the other tasks will be listed in this popup menu. To create a task chain (e.g. to run tasks sequentially), simply choose one of these tasks to have that task run automatically after the current task finishes. Tasks run in this manner will start after the current task has finished completely. Chained tasks will run regardless of the exit status of a preceding task in the chain, e.g. if the first task reports errors or fails to run at all, the second task will still run. Only the first task in a chain needs to be scheduled to start the chain.

Note: Postflight tasks will not be started if the current task was started via a task group <https://support.bombich.com/hc/articles/20686444541975>. When you run a task group, we're specifically aiming to run exactly the tasks within that task group, and within the order specified. If you run the task manually, however, or if the task is run separately from the group on its own schedule, then the task's postflight task will be run.

Related Documentation

- Running shell scripts before and after the backup task <https://support.bombich.com/hc/en-us/articles/21608812482455>

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Running shell scripts before and after the backup task

If there is functionality that you need that does not exist within CCC, pre- and postflight shell scripts may be the solution for you. Preflight shell scripts run after CCC has performed "sanity" checks (e.g. are the source and destination volumes present?, is connectivity to a remote Macintosh established?) but before copying files. **If you need your preflight script to run before CCC does the source/destination sanity checks, specify the preflight script as a global preflight script in the Advanced section of CCC's Settings window.** Note that global preflight scripts run prior to every task, they are not task-specific. Also, please bear in mind that CCC automatically attempts to mount the source and destination at the beginning of the task, you should not be implementing a shell script to achieve that functionality. If you're having trouble with CCC pre-mounting the source and destination, please ask us for help <https://bombich.com/software/get_help> rather than attempt to address the issue with a preflight shell script.

Postflight shell scripts run after CCC has finished copying files and performing its own internal cleanup, but before unmounting any volumes.

CCC passes several parameters to pre- and postflight shell scripts. For example, the following shell script:

```
#!/bin/sh

echo "Running $0"
echo `date`
echo "Source: $1"
echo "Destination: $2"
echo "Third argument: $3" # Exit status for postflight scripts, underlying volume
path for a disk image for preflight scripts
echo "Fourth argument: $4" # Destination disk image path, if applicable
```

Would produce the following output (you can redirect this output to a file of your own specification) if implemented as a postflight script:

```
Running /Library/Application Support/com.bombich.ccc/Scripts/postaction.sh
Thu Jan 29 08:28:24 EST 2026
Source: /private/tmp/18@1117440A/c/
Destination: /Volumes/Offsite Backup
Third argument: 0
Fourth argument:
```

First parameter

The path to the source volume or folder. For a postflight script, if the source volume is APFS-formatted, then this path will usually be the path to a temporary, read-only snapshot of the source (or the path to the source folder on the temporary, read-only snapshot). If the source volume is a macOS startup volume, CCC will send the path to a snapshot of the Data sibling of that volume as the first parameter.

Second parameter

The path to the destination volume or folder. If the destination is a disk image, this is the path to the mounted disk image. If the destination volume is a macOS System volume, CCC will send the path to the Data sibling of

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the destination as the second parameter, e.g. "/Volumes/Bootable Copy - Data".

Third parameter

- Preflight script: The underlying mountpoint for the volume that holds the destination disk image, if applicable.
- Postflight script: The exit status of the file copying phase of the backup task.

Fourth parameter

The path to the destination disk image, if applicable.

Controlling the CCC task via the preflight script exit status

If your preflight script exits with a non-zero exit status, it will cause CCC to abort the backup task. This can be used to your advantage if you want to apply preconditions to your backup operation. If you want to be certain that errors in your preflight shell script never cause the backup task to be aborted, add "exit 0" to the end of your script. If you would like that script to silently cancel the backup task, add "exit 89" to the end of the script. If the script is a global preflight script (specified in the Advanced section of CCC's Settings window), you can add "exit 104" to the end of the script to cancel the backup task **and** to avoid recording a Task History event.

The postflight script will run whether the backup task exits successfully or not. If your script should behave differently depending on the result of the task, you can test whether the third parameter is zero (an exit status of "0" means the task ended successfully). For example:

```
#!/bin/sh

source="$1"
dest="$2"
exitStatus=$3

if [ "$exitStatus" = "0" ]; then
        # task succeeded
else
        # task failed or reported errors
fi
```

If your postflight script exits with a non-zero exit status, CCC will not report this as a failure of the backup task. The failure will be noted in the Task History window, however.

Running a preflight script prior to evaluating the source and destination availability

Per-task preflight scripts run after CCC has evaluated the availability of the source and destination. This order is deliberate — CCC passes the path of the source and destination to the preflight script, and we guarantee that these paths are available and correct when your preflight script is called. If you need your preflight script to take special measures to make the source or destination available (e.g. establishing a VPN connection), then you can perform those tasks in CCC's Global Preflight Script, specified in CCC Settings > Advanced. If you would like to limit the functionality of your global preflight script to a specific task, you can add logic to your script for that purpose. This example global preflight script <https://bombich.com/software/files/tools/global_pretask_preflight.sh.zip> demonstrates how to do this.

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AppleScripts are not supported

You cannot specify an AppleScript as a pre- or postflight script, CCC currently only supports running shell scripts.

Shell scripts require a shell interpreter line

CCC does not assume a default shell environment when running your pre- or postflight script. Not doing so gives users a great deal of flexibility; they can choose to write their scripts in any shell or programming language (e.g. bash, python, perl, ruby, C). For CCC to execute a shell script as an application, though, the system needs to know what shell should be used to interpret the script, and that value needs to be defined in your shell script. This is done simply by placing a shell interpreter line at the top of the file, e.g. `#!/bin/sh`.

Shell scripts run as the root user

CCC's pre- and postflight shell scripts are executed as the System Administrator (aka "root"). As such, any references to your own shell environment will be invalid. When referencing tools that lie outside of the default $PATH, be sure to either specify the full path to the item (e.g. /usr/local/bin/foo), or export your own $PATH at the top of your script. Likewise, if you make relative references to files (e.g. ~/Desktop/foo.log), those files will be created in the root user account, e.g. /var/root/Desktop/foo.log. Use absolute paths for more reliable results.

Another implication of running scripts as the root user is that interaction between the script and applications running via the logged-in user are generally not possible. For example, special steps are required if you want to open or close an application. See the quit_application.sh and open_application.sh scripts at the bottom of this document for an example of how to do this. Interaction with those applications usually will not work.

Security implications of pre- and postflight shell scripts

To prevent unauthorized modifications to your shell scripts, we recommend that you restrict the ownership and permissions of these scripts and to the folder in which they are contained. The parent folder and scripts should be writable only by the root user. For example, running the following in the Terminal application would secure any shell scripts located in the default location for pre- and postflight scripts:

```
sudo chown -R root:wheel /Library/Application\ Support/com.bombich.ccc/Scripts
sudo chmod -R 755 /Library/Application\ Support/com.bombich.ccc/Scripts
```

To further enhance the security of your pre and postflight scripts, CCC will require that scripts stored in the default location are owned by the root user and writable only by the root user, and that the Scripts folder itself is also owned and writable only by the root user. If a script that resides within the default Scripts folder does not meet these requirements, CCC will refuse to execute that script and the associated task will report an error.

After copying scripts into CCC's Scripts folder or making changes to those scripts, you can choose "Secure CCC's Scripts folder" from CCC's Utilities menu to correct any ownership or permissions concerns. Please note that these additional security requirements are only applied to scripts stored within the /Library/Application Support/com.bombich.ccc/Scripts folder. If you prefer to manage the security of your shell scripts on your own, you may store them in another location.

If CCC's Scripts folder is already secure, the "Secure CCC's Scripts folder" menu item will be labeled "Reveal CCC's Scripts folder" instead.

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Capturing your script's output

CCC will capture your script's output to the CCC global task activity log <https://support.bombich.com/hc/articles/20686443738135-Where-can-I-find-CCC-s-log-file>, but will otherwise not present that output to you (e.g. in the Task History window). While debugging your scripts, we recommend that you redirect its output to a log of your own choosing, e.g.:

```
#!/bin/sh

log="/Users/Shared/ccc_scripts.log"
source="$1"
dest="$2"
exitStatus=$3

echo `date: Running $0` >> "$log"
echo "Source: $source" >> "$log"
echo "Destination: $dest" >> "$log"
echo "Exit Status: $exitStatus" >> "$log"
```

Example pre- and postflight shell scripts

To use any of these example scripts, download the script and place it somewhere on your startup disk. By default, CCC looks in /Library/Application Support/com.bombich.ccc/Scripts.

parallels_pause.sh <https://bombich.com/software/files/tools/parallels_pause.sh.zip>
This is a preflight script that you can use to pause all currently-running Parallels VM containers. This script will also retain state information that can be read by the corresponding parallels_start.sh postflight script to resume these VMs after the backup task has completed. Note: This script relies on command-line tools offered only in Parallels Desktop for Mac Pro or Business Edition.

parallels_start.sh <https://bombich.com/software/files/tools/parallels_start.sh.zip>
This postflight script will resume any Parallels VM containers that were suspended by the parallels_pause.sh preflight script. Note: This script relies on command-line tools offered only in Parallels Desktop for Mac Pro or Business Edition.

play_sound.sh <https://bombich.com/software/files/tools/play_sound.sh.zip>
If you want to play a unique sound, use this script. You can plug in the path to any audio file of your liking or try one of the examples included.

eject_source_and_destination.sh
<https://bombich.com/software/files/tools/eject_source_and_destination.sh.zip>
CCC's option to automatically unmount the destination volume is a volume-level task, not a device task. It's also limited to the destination. If you want to eject the destination device, or if you want to unmount or eject the source, use this postflight script instead. Note that ejecting a device will unmount all volumes on the device. Also note that this example script adds a 60-second delay to accommodate snapshot creation on the destination.

quit_application.sh and open_application.sh
<https://bombich.com/software/files/tools/quit_and_open_application.zip>
This pair of scripts can be used to quit and open an application before and after the backup task. Open these scripts in a text editor to define the application that should be quit or opened.

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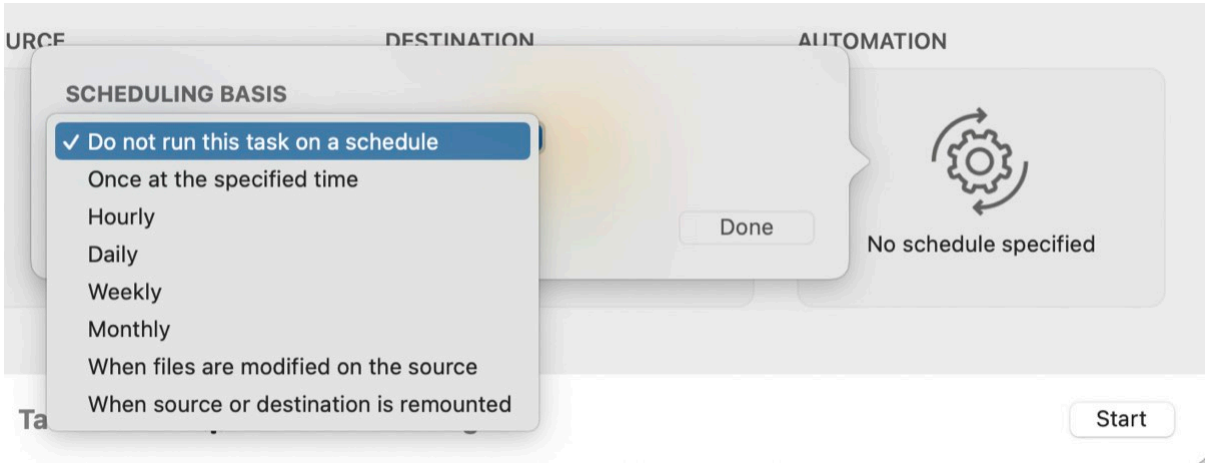
post_to_slack.sh <https://bombich.com/software/files/tools/post_to_slack.sh.zip>
This postflight script will post the status of your backup task to a Slack <https://slack.com> channel.

ifttt_maker.sh <https://bombich.com/software/files/tools/ifttt_maker.sh.zip>
This postflight script will post an IFTTT Maker Event <https://ifttt.com/maker_webhooks> of the status of your backup task.

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Advanced Scheduling Options

Scheduling Basis



CCC offers seven different bases for automating backup tasks, giving you exceptional control over how and when your backup tasks run.

Do not run this task on a schedule

Select this option when you prefer that the task only run when you click the Start button. Note that you do not have to select this option to prevent a scheduled task from running. If you would like to temporarily disable a task, right-click on the task in CCC's sidebar and choose the option to disable the task. Likewise, you can suspend all tasks via the CCC Dashboard <https://support.bombich.com/hc/articles/20686467217687#disable_tasks>.

Run once at the specified time

This option is convenient when you would like to run a task in the near future, but not automatically thereafter. When the task completes, it will be reset to "Do not run this task on a schedule".

Hourly, Daily, Weekly, Monthly

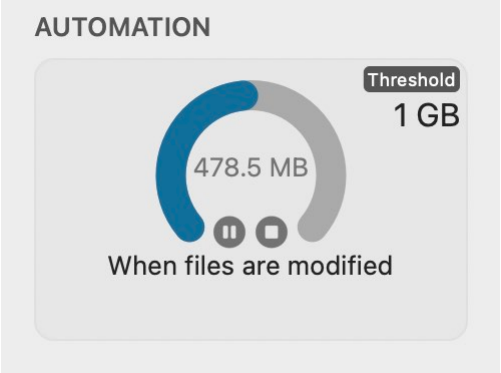
When you want your task to run at specific times or intervals, these options give you the most precision.

When files are modified on the source

This scheduling choice causes the task to monitor filesystem activity on the source. When folders are modified on the source, CCC will periodically enumerate the changes in those specific folders to determine how much data has been modified on the source since the task's last successful run. When the changes exceed your specified threshold, the task will run, copying just the items that have changed. The data-change threshold is defined in GB, but you can specify 0.01, for example, to specify a lower value than 1GB. You can also specify 0 to have the task run whenever *any* changes are made to the source (once the time-based threshold is reached).

This setting also offers a time-based threshold to avoid running the task too frequently.

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When a task is actively monitoring the source, the Automation box will present a graphic that indicates how much data has been modified as a percentage of your defined threshold. If the data modification threshold has been reached, but the time threshold has not yet been reached, CCC will indicate that the task will run when the time threshold is met. Data changes are updated approximately every 30 seconds.

When a task is currently monitoring source filesystem activity, task settings cannot be modified (including the thresholds that determine when the task will run). If you would like to make changes to the task settings, click the ⏸ button in the Automation box to temporarily suspend monitoring. If you would like to remove the filesystem monitor altogether, click the ⏹ button in the Automation box.

CCC will suspend source volume monitoring if:

- The task is running and you stop the task (if we don't suspend monitoring, it would simply start running again)
- If the source or destination volume is unmounted

You can click the "play" button to resume monitoring. If monitoring was suspended because the source or destination was unmounted, CCC will automatically resume monitoring when the missing volume is remounted.

Overriding Quick Update behavior to perform a complete scan of the source: You can click the **Run Now** button any time to immediately update the destination using the Quick Update behavior. If you would like the task to perform a complete scan of the source, click the **Standard Copy** button instead.

This option requires an APFS or HFS+ source volume: Our testing of this functionality has been focused on Apple-formatted filesystems, so it is currently limited to source volumes formatted as APFS or Mac OS Extended, Journaled. We welcome your feedback on this <https://bombich.com/software/get_help>, and we will consider making this option available for other source volume formats in the future.

This option is not available for "transient" destinations: This feature relies on the source and destination being reliably available for monitoring. While CCC will accommodate the mounting and unmounting of local volumes for this scheduling option, this option is not available for tasks involving network volumes or disk image destinations.

This option is not recommended for tasks configured to download cloud-only files
The Temporarily download cloud-only files to make a local backup <https://support.bombich.com/hc/articles/20686419951767-Backing-up-the-content-of-cloud-storage-volumes> setting is conceptually exclusive to making task-running decisions based on when files are modified on the source. The content of cloud-backed folders can change outside the purview of the macOS FSEvents service (e.g., on another device), so changes to those folders cannot influence the decision to start a task. For the most reliable backup of cloud-backed folders, we recommend configuring the task to run on a schedule.

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When the source or destination is remounted

Use this option when you want your task to run when your source or destination volume is remounted. When a task is configured in this manner, volume mount notifications are used to trigger the task. A task will only run when both volumes are present **and mounted**. Note that CCC will not automatically mount the source, for example, if it is not mounted when the destination reappears. Also note that CCC imposes a deliberate 60-second moratorium on task activity when the system is turned on. This task automation option is not designed to run tasks when volumes are mounted on startup.

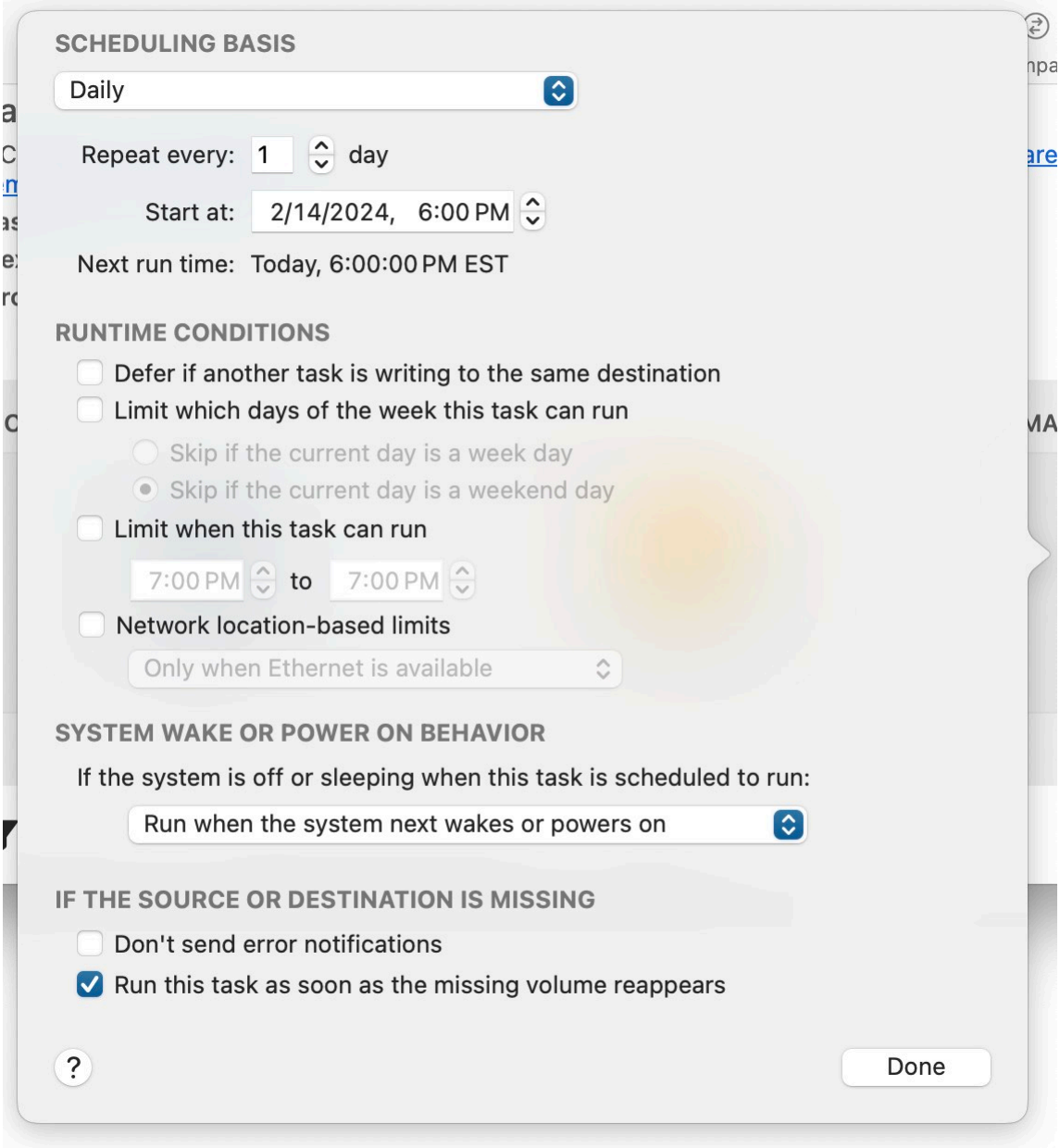
By default, CCC will immediately run a task configured in this manner when the source or destination reappears. If you prefer, CCC can prompt you to run the task when a volume reappears, and CCC can also present a reminder if the task hasn't run after a particular amount of time. These prompts are presented by the CCC Dashboard <https://support.bombich.com/hc/articles/20686467217687#activity>, which offers additional settings for how reminders are presented to you. Click on the Activity tab's Settings icon in the CCC Dashboard to configure those settings.

Lastly, you can configure a "throttle" to prevent these tasks from running too frequently. If you detach and reattach your backup disk frequently throughout the day, for example, you can configure the task to run no more frequently than once per day. Note that this interval can be specified as a decimal value. For example, if you would like the task to run no more frequently than twice per day, you can configure the threshold as "0.5".

Runtime Conditions

Sometimes, time-based scheduling is insufficient to describe exactly how you want your tasks to run. CCC offers **runtime conditions** that allow you to restrict the running of your tasks under certain conditions when the task is normally scheduled to run.

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Defer if another task is writing to the same destination

If you have more than one scheduled task that writes to the same destination volume, you may want to configure the tasks to wait for one another such that only one task is writing to the volume at a time. When you configure a task with this setting and the scheduled run time elapses, CCC will place the task into a queue for deferred execution if another task is already writing to that same destination. Assuming another run time condition does not prevent it, CCC will run the deferred task as soon as the first task finishes writing to the shared destination volume.

Limit which days of the week this task can run

This option allows you to limit a task to running only during weekdays or only during weekend days. This option is not applicable to the "weekly" and "monthly" scheduling settings.

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Limit when this task can run

This option allows you to limit a task to running during specific hours of the day. For example, if you don't want your hourly task to run in the afternoons, you could set a start limit of 6 PM and an end limit of 12 PM. This limit would allow the task to start any time after 6 PM and any time up to 12 PM, thus preventing the task from running between 12 PM and 6 PM. If the task is already running (e.g. if it started at 11:55 AM), CCC will stop the task if it is still running when the end limit is reached.

Note: Set the task start time before you attempt to set time limits. CCC will not allow you to specify a time limit that does not contain the current start time of the task.

Network location-based limits

Sometimes your backup device is tied to a specific location, but your Mac is not. Network location-based limits allow you to restrict a scheduled task to running only when certain network conditions apply, e.g. when your Mac is connected to ethernet, connected to a specific WiFi network, or assigned to a specific location.

If a scheduled run time elapses and your network runtime condition is not met, CCC will defer the task without presenting an error. When a network change occurs, CCC will re-evaluate the network environment and run the task if the condition is met.

System wake or power on behavior

By default, CCC will not schedule a wake event when your tasks are scheduled to run. You can change this setting in the **System Wake Or Power On Behavior** section of the Automation popover. There are five options:

Wake the system, but skip tasks when the system is off

CCC will schedule a wake event to wake the system shortly before the task runs, so the task should run on schedule. If the system is turned off, this wake event will not turn on the system. When the system is restarted (i.e. after having been turned off for a while), any tasks missed while the system was off will run at the next scheduled run time.

This setting wakes the display. If you do not want your display to wake, use the **Run when the system next wakes** setting instead.

Wake or power on the system

CCC will configure a **wake or power on** event to wake the system or turn it on shortly before the task runs, so the task should run on schedule.

This setting wakes the display. If you do not want your display to wake, use the **Run when the system next wakes** setting instead.

*Pro tip: You can view scheduled wake/power on events in the System Information application. Choose **About This Mac** from the Apple menu, click **More Info**, scroll down and click on **System Report**, then select the **Power** item in the sidebar.*

Notes: A Mac will not power on automatically if it is not connected to AC power. This setting is not available when FileVault is enabled on the startup disk. When FileVault is enabled, you must enter a password on startup for the system to complete the boot process.

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Run when the system next wakes

Upon receiving a wake notification from the system, CCC will run the backup task if its scheduled run time has passed. The task will not run exactly when it is scheduled, though CCC can run tasks during macOS **Dark Wake** events (aka **PowerNap**, aka **Maintenance Wake**), which occur every couple of hours. If you want your backup tasks to run in the middle of the night without turning on your display, this is the right option for you.

Run when the system next wakes or powers on

Like the setting above, except that tasks missed when the system was off will start when the system is turned on (after a 60-second startup delay).

Skip this task

CCC will run the task only at its scheduled run time if the system is awake at that time. Upon receiving a wake notification from the system, CCC will not run the task if the scheduled run time has passed.

Configuring behavior for when the source or destination is missing at the scheduled run time

Don't send error notifications

By default, CCC will report an error if the source or destination volume is unavailable when the task is scheduled to run. By enabling this option, CCC will suppress these errors. Additionally, if you have configured your task to send an email when errors occur, this option will suppress that email.

This option is not applicable for the **When the source or destination is reconnected** scheduling setting, because a task configured in that manner will only attempt to run if both the source and destination are present.

Run this task as soon as the missing volume reappears

If a backup task is missed because the source or destination was missing at the scheduled run time, this option will cause CCC to run the backup task as soon as that missing volume reappears.

Related Documentation

- Frequently asked questions about scheduled tasks <https://support.bombich.com/hc/articles/20686429854487>

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Backing up the content of cloud storage volumes

There are several cloud storage solutions available that allow you to synchronize content that's stored locally on your Mac with storage hosted on the Internet. Naturally we want to be able to back up all of your data whether it's stored in the cloud or not. The manner in which cloud syncing solutions store data locally, however, can complicate how you go about backing up and restoring that data. There are two complicating factors that we will address in this article:

- The actual location of your locally-stored data may be in a hidden location, making it difficult to find the files on your backup.
- Some, or possibly even all of your cloud-synced files may not be permanently stored on your Mac; content that is only stored in the cloud is not immediately available for making a local backup.

Local storage of cloud content is kept in a hidden location

You're typically used to accessing your cloud-synced content in the Finder's sidebar. In many cases the cloud storage solution may place an alias in your home folder that conveniently points to the location of the local copy of your data. Typically, though, that content is not stored in an obvious location, rather it's stored in the hidden "Library" folder in your home folder. Knowing where that data "lives" is key to understanding how to access that content on your backups.

Finding your cloud-synced content on the backup

If you make an ordinary backup of your startup disk, all of your locally-stored cloud content is on the backup. That content is in a hidden location, though, so follow these steps to locate that content on your backup disk:

1. Choose **Computer** from the Finder's Go menu
2. Select your backup disk, then navigate to Users > (yourname)
3. Press **Command+Shift+Period** to toggle the Finder's display of hidden items
4. **iCloud**: Navigate to Library > Mobile Documents
5. **Other cloud storage**: Navigate to Library > CloudStorage

Pro tip: Navigate to your home folder, then press Command+J, then check the box next to "Show Library Folder" to permanently reveal the Library folder. After your next backup, the Library folder will be permanently revealed on your backups too.

Alternatively, you can create an alias in your home folder takes you directly to the CloudStorage folder. Paste the following into the Terminal application to create that alias:

```
cd ~
ln -s Library/CloudStorage CloudStorage
```

Finding OneDrive content on the backup

OneDrive creates a convenient alias at the root of your home folder that takes you to your OneDrive content *on the startup disk*. While that link is really helpful *on the startup disk*, it's really awkward to navigate to your backup and have that link take you right back to OneDrive **on your startup disk**. When you're looking for OneDrive content on your backup disk, you should ignore the OneDrive alias that's at the root of your home

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folder, it will only lead to confusion and frustration. Instead, following the instructions in the previous section for finding that content on the backup volume.

"iCloud Drive" is not a volume nor folder, it's actually a collection of many disparate folders

When you open "iCloud Drive" in the Finder sidebar, you see a simple list of files and folders. Some of those folders may have special icons representing the application that stores data in that folder, e.g. for Preview, Pages, TextEdit, etc. Looking at the content of iCloud Drive in the Finder, you might assume that there is a folder somewhere ("in the sidebar") that has all of those items collected together.

iCloud Drive does not work like that. What you see in the Finder is a Finder trick. iCloud Drive is actually a collection of folders hidden away in the Library folder in your home directory. Files and folders that you manually add to iCloud Drive are stored here:

```
Macintosh HD --> Users > (yourname) > Library > Mobile Documents >
com~apple~CloudDocs
```

Application storage folders are kept elsewhere. If you have a Pages folder in iCloud Drive, for example, that content would be stored here:

```
Macintosh HD --> Users > (yourname) > Library > Mobile Documents > com~apple~Pages >
Documents
```

Making matters even more complicated, if you choose to sync your Desktop & Documents folders (i.e. System Settings > Apple ID > iCloud Drive > Options), the Finder will make it appear as if your Desktop and Documents folders actually reside within iCloud Drive. In fact, those folders still exist in their normal locations:

```
Macintosh HD --> Users > (yourname) > Desktop
Macintosh HD --> Users > (yourname) > Documents
```

But you won't see those folders in those locations when you navigate there in the Finder — Finder hides them.

Backing up cloud-only content

Most cloud storage service providers offer features that allow (or even encourage/force) you to store your files only online, thus freeing up space on your hard drive. Files that are only available online will typically have a "cloud" icon or badge in the Finder, e.g.: , and these files will exist as a 0-byte "placeholder" file on your startup disk. You can choose **Cloud Storage** from CCC's Source selector to configure a task to make a backup of your cloud-only content.

Best practice for setting up a CCC task to back up cloud-only data

1. Open CCC and click **New Task** in the toolbar; name the new task something like "Local Backup of Cloud Storage".
2. Click on the Source selector and choose **Cloud Storage**
3. Click on the Destination selector and choose a backup volume. If you select the same volume that you use for backing up your startup disk, be sure to add a new volume in the Backup Volume Setup Assistant.
4. Click on the Automation selector to schedule the task, or click **Start** to run it immediately.

The **Cloud Storage** source option automatically enables the **Temporarily download cloud-only files to make a local backup** setting in Advanced Settings. When this setting is enabled, CCC will temporarily

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download cloud-only files that are not yet on the destination, or that are newer than the corresponding file on the destination. After copying the temporarily downloaded files, CCC will "evict" the files to free up the space that they consumed. CCC attempts to retain no more than 100 files and no more than 2GB of temporarily-downloaded content at a time.

The "download cloud-only files" setting should be used with a limited-scope source selection

In a typical backup, CCC will create a temporary snapshot on the source volume and use that read-only snapshot for the duration of the backup task. Working from a read-only snapshot avoids a din of errors that could occur if changes are made to files while CCC is attempting to copy them.

To make a local backup of cloud-only files, CCC must temporarily download those files to your startup disk – a task that is at odds with the desire to work from a read-only source. To allow those temporary changes to the source, CCC must work directly from the read/write volume. For a task that is scoped to only your cloud-backed storage folders, we can (and must) deal with any errors that occur as a result of working from a read/write source. Imposing that burden on folders that are outside of the scope of cloud storage is unnecessary, so we encourage you to only use the **Temporarily download cloud-only files to make a local backup** setting with folders that might have cloud-only content.

Avoid space constraints in a future restore scenario

In addition to the potential errors described above, allowing the backup of the cloud-only files to co-mingle with the rest of your startup disk's backup could lead to a situation where it is impossible to restore your entire backup to the original disk due to space constraints. To avoid that, we recommend making backups of your cloud-only storage to a separate volume on your backup disk – separate from the backup of your startup disk.

Follow the best-practice steps noted above when creating your cloud-only backup task to avoid these logistical pitfalls.

The Cloud Storage task creates a custom filter

The Cloud Storage source will create a filter that automatically includes the following folders in your home directory:

- Desktop
- Documents
- Library > Mobile Documents
- Library > CloudStorage

The first three folders are specific to iCloud, and the first two folders are only applicable if you have iCloud Drive configured to sync your Desktop and Documents folders. If you don't sync your Desktop and Documents folders to iCloud, you can click **Task Filter** at the bottom of the CCC window, then uncheck the boxes next to your Desktop and Documents folder to not include those folders in this backup task.

Configuring a backup of iCloud Drive specifically

The "Cloud Storage" option in CCC's Source selector is a convenient way to configure a backup task that backs up **all** cloud-stored content from iCloud Drive and storage provided by other Cloud Storage service providers. If you want to make a local backup of just iCloud Drive, or just one specific cloud storage item, then you can configure the task as follows:

1. Open CCC and click **New Task** in the toolbar; name the new task something like "Local Backup of iCloud Drive".
2. Click on the Source selector and choose **Choose a Folder…**

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3. In the "Choose a folder" dialog, select iCloud Drive (or any other Cloud Storage service) in the sidebar, then click **OK**.
4. Click on the Destination selector and choose a backup volume. If you select the same volume that you use for backing up your startup disk, be sure to add a new volume in the Backup Volume Setup Assistant.
5. Click **Advanced Settings** at the bottom of the window.
6. Select the **File Copying Settings** tab
7. Check the box next to **Temporarily download cloud-only files to make a local backup**
8. Click Done, then schedule the task or run it immediately.

Some iCloud cloud-only content will not be temporarily downloaded

Starting in macOS Monterey (12.3, January 2022), Apple disallowed cloud syncing by means of a System Extension. Cloud-syncing service providers like Google, Microsoft, and Dropbox were "encouraged" to adopt the "FileProvider" service within macOS instead. Prior to macOS Sonoma, Apple had not yet adopted that service for their own iCloud Drive cloud syncing solution. Rather, Apple continued to use a proprietary syncing service on macOS Monterey and Ventura that relied on proprietary placeholder files.

Lack of adoption of their own standard leads to some idiosyncrasies when dealing with iCloud cloud-only content on Ventura. The only notable problem that proved too difficult for us to work around involves bundle files <https://support.bombich.com/hc/articles/20686465518871#b>. iCloud uses a single file placeholder for bundle files (vs. dataless folders via FileProvider). This (lack of) structure posed logistical and practical issues that we decided were too costly to resolve, especially in light of the fact that Apple migrated iCloud to FileProvider in macOS Sonoma. As such, cloud-only iCloud files that are bundle files will not be downloaded on Ventura, rather the placeholder file will be copied instead.

Other notable caveats regarding the temporary downloading of cloud-only content

CCC's helper tool must have access to icloud.com for the entire duration of the task event

If connectivity is not available or is lost to that host (regardless of the service provider that hosts your cloud-backed content), CCC will suspend downloading activity in the task. We do this because it's not possible to revoke requests to download files from the cloud. If we plowed through all of the files and requested *all* of them, iCloud/FileProvider would resume downloading all of those files as soon as connectivity was restored. Making matters worse, this would happen outside of the purview of the task, and CCC would not be able to evict the downloaded files, likely leading to space constraints on the startup disk.

CCC's Dashboard application must be running for the entire duration of the backup task

Only the logged-in user can "evict" file content, so CCC passes those requests to the CCC Dashboard service. If CCC cannot reliably evict files, it will not download files. If/when this occurs, CCC will report an error for the task event.

Verification discrepancies

If you perform an ad hoc verification <https://support.bombich.com/hc/articles/20686511433623#adhoc> on a source with cloud-only content, the cloud-only placeholder files will fail verification. This is the correct result because the (empty) content of the cloud-only placeholder file does not match the content of the "rehydrated" file that was temporarily downloaded. CCC's transaction only retains a checksum of the data that was downloaded, not the empty placeholder file.

Cloud-only placeholder files will not be downloaded for checksum analysis.

When using the **Backup Health Check** setting, CCC will not download cloud-only placeholder files from the Internet just to calculate their checksums. If CCC copied these files in the past (either via temporary download

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or prior to eviction), then the task audit will already have the checksum for those files. To verify those files, click on the Destination selector for your dedicated CloudStorage backup task and choose **Verify files copied by this task**.

Ad hoc verification: Verify the source or the destination against the "last known state" <https://support.bombich.com/hc/articles/20686511433623#adhoc>

Cloud-only files in storage that does not adopt Apple's FileProvider interface cannot be downloaded

CCC's functionality to temporarily download cloud-only files relies on the FileProvider interface provided by macOS. Most cloud storage providers have completed the migration to this interface (typically years ago), but some may not have adopted it yet. Dropbox, for example, still has a large contingent of users that have not made the migration. If you have Dropbox content on an external storage device, for example, that content does not leverage the FileProvider interface, and CCC cannot temporarily download cloud-only content in that data set to make a local backup.

To determine if your cloud storage provider has adopted the FileProvider interface, hold down the Option key and choose **Library** from the Finder's Go menu, then navigate into the **CloudStorage** folder. If you see your cloud storage provider's folder in this location, then it has adopted the FileProvider interface and should be compatible with CCC's "Temporarily download cloud-only files to make a local backup" setting.

Quick Update <https://support.bombich.com/hc/articles/20686481162647#quickupdate> and the When files are modified on the source <https://support.bombich.com/hc/en-us/articles/20686389397015-Advanced-Scheduling-Options#when_modified> scheduling option are not recommended for cloud storage backup tasks

The **Temporarily download cloud-only files to make a local backup** setting is conceptually exclusive to making task-running decisions based on when files are modified on the source. The content of cloud-backed folders can change outside of the purview of the macOS FSEvents service (e.g. on some other device), so some changes to those folders cannot influence the decision to start a task. For the most reliable backup of cloud-backed folders, we recommend configuring the task to run on a schedule.

Likewise, if you enable the Quick Update setting on a task that is configured to back up cloud-only content, that task may not detect files that have been modified on other devices. We do not recommend enabling Quick Update on a task that is configured to download cloud-only files.

Configure Photos to download originals to your Mac

iCloud Photos offers two options for photo storage: **Download Originals to this Mac** and **Optimize Mac Storage**. When you have **Optimize Mac Storage** enabled, Photos will retain lower-resolution versions of your photos and offload the full-resolution versions to iCloud.

Unlike the cloud-syncing solutions noted above (including iCloud), iCloud Photos does not offer functionality to download the full-resolution versions of these files temporarily, nor does it use cloud-only placeholders so CCC can not tell that a given file is not full resolution. If you would like to make a local backup of your full-resolution photos, select the **Download Originals to this Mac** storage option in Photos Settings > iCloud.

Cloud service problems can prevent CCC from downloading cloud-only files

Naturally your own Internet connectivity problems can prevent CCC from downloading cloud-only files, but so can service problems on the cloud-provider's end. Most cloud-service providers offer a dashboard showing their server status. Here are a handful for your convenience:

- Apple System Status [iCloud Drive] <https://www.apple.com/support/systemstatus/>

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- Microsoft Office 365 Service Health [OneDrive] <https://portal.office.com/ServiceStatus>
- Dropbox System Status <https://status.dropbox.com>
- Box Status <https://status.box.com>
- Google Workspace Status Dashboard [GoogleDrive] <https://www.google.com/appsstatus/dashboard/>

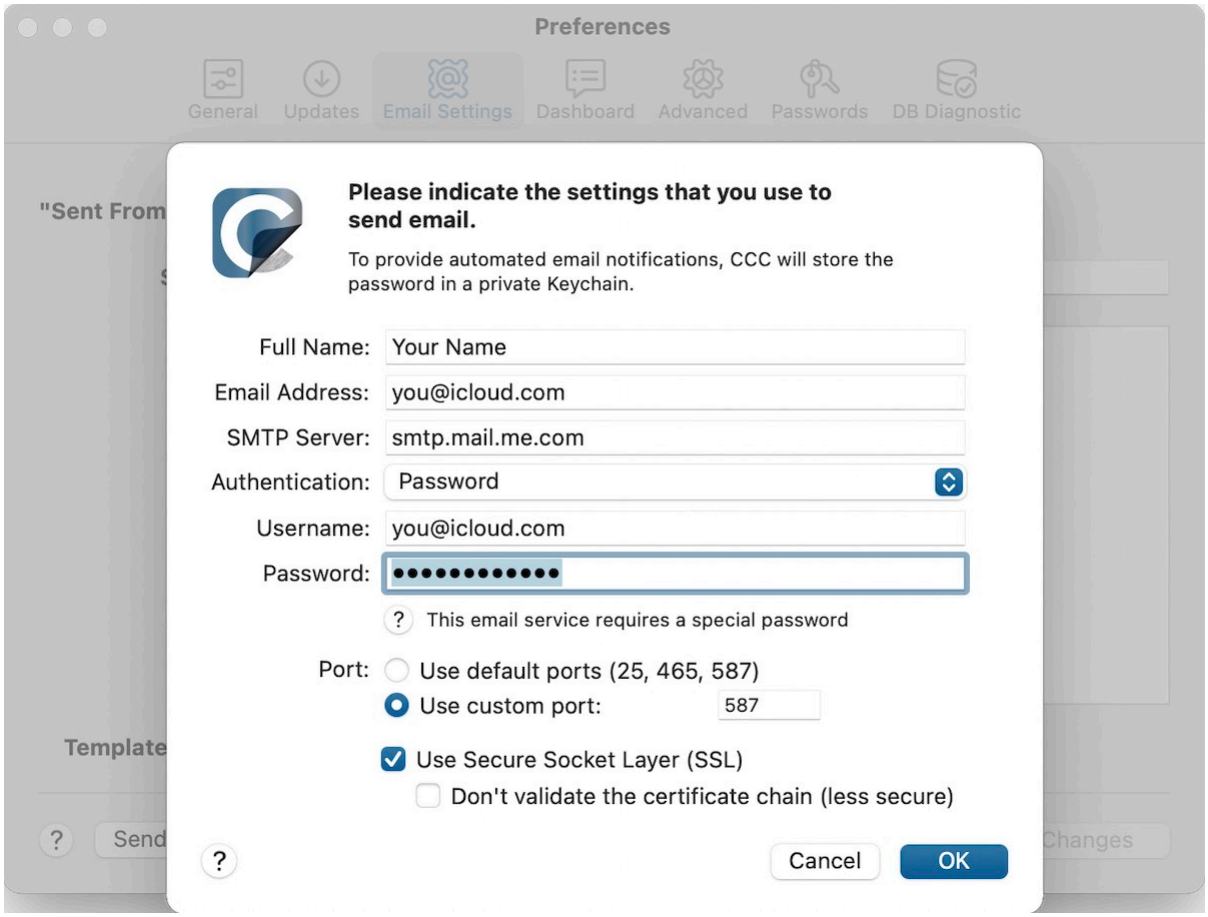
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Configuring Email Notifications

If you would like CCC to send your tasks' results via email, you must first configure a sending email account in CCC's Email Settings.

1. Click **Settings** in the CCC toolbar.
2. Click the **Email Settings** button in the toolbar of the Settings window.
3. Choose from one of the accounts imported from Mail in the ***Sent From* Email** popup menu, then verify the details and provide your account credentials in the form that is provided.
4. Click the **OK** button when you are finished entering your account details.

Note for advanced users: If your SMTP server requires SSL and uses a **self-signed** security certificate, check the **Don't validate the certificate chain** checkbox. Alternatively, you can add your server's security certificate to the **System** keychain in the Keychain Access application and explicitly trust that certificate.



[Optional] Modify the email subject and body template

The subject and body of the email that CCC sends upon task completion can be customized. For example, if you want to know which of your Mac's a particular email is coming from, you could customize the subject of the message:

Jon's iMac: ##Task Name##: ##Exit Status##

When CCC sends an email notification, it will replace the template values (enclosed in double # characters) with

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the attributes of your task, e.g.:

Jon's iMac: Daily Backup: Backup Finished Successfully

Most of the available template values are already present in the default template. You can rearrange the template values and modify the text around them, but do not modify the text inside of the double # characters. If you would like to add a template value:

1. Place the cursor where you would like to place the template value, e.g. in the subject or body text field.
2. Select a template value from the **Template values** popup menu.
3. Click the **Insert** button.

When you are finished making changes to your subject and body templates, click on the **Save Changes** button. This template will be used for all email notifications sent by CCC.

If you have suggestions for additional template values, please let us know <https://bombich.com/software/get_help>!

Send a test email

Click the **Send Test Email...** button at the bottom of the window. You will be prompted to provide an email address to send the test email to. When CCC indicates that the test email has been sent, check your email to confirm that you can receive it and that the template provides the information you wish to receive when your tasks complete.

Select a notification level in your backup task

Close the Settings window, then select the task to which you would like to add email notifications. Click the **Advanced Settings** button at the bottom of the window, then select the **Postflight** tab to reveal the email notification option. There are three notification levels:

- Don't send email: CCC will never send an email when this tasks finishes.
- Send after every run: CCC will send an email at the end of every task (i.e. successful tasks and those that report errors).
- Only send on errors: CCC will send an email only when errors occur for this task.

Select a notification level, then specify the email address(es) that you would like CCC to notify when the task completes. If you would like to have emails sent to multiple addresses, separate those addresses with a comma, or simply press the return key after typing in each address. The recipient text field may only show one address at a time. Use the arrow keys to see each address.

Once you have configured a notification level and recipients, choose **Save** from CCC's Task menu to save the changes.

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Sending email with an SMTP service that requires an App Password

Because CCC sends emails from a background application, possibly when no user is logged in at all, CCC cannot practically support two-factor authentication. Many applications have this same logistical constraint, and most email providers will allow those applications to use the SMTP service, provided that you have created an application-specific password for that purpose. If you attempted to send an email with your Gmail or iCloud account (for example), and you get an error that "the username and password are invalid", or that "authentication failed", you can resolve the problem by creating an App Password.

Create an App Password for iCloud

Visit your Apple ID account page and create an application-specific password for CCC:

1. Sign in to your Apple ID account page <https://appleid.apple.com/account/home>.
2. In the Security section, click the **Generate Password...** link under the **APP-SPECIFIC PASSWORDS** heading and follow the steps provided.
3. Paste the application-specific password into the Email Settings panel of CCC's Preferences window.
4. Note: Be sure to use an @mac.com, @me.com, or @icloud.com email address for the user name.

Apple's reference: Using app-specific passwords <https://support.apple.com/kb/HT6186>

Ventura users: macOS 13.5 introduces a bug in Safari that prevents it from correctly generating App Passwords. **Workaround**: use a different browser on macOS 13.5 to generate App Passwords.

Create an App Password for Yahoo

Visit your Account Security page to generate an application-specific password for CCC:

1. Visit your Account Security page <https://login.yahoo.com/account/personalinfo>.
2. Click on the **Generate app password** link at the bottom of the page.
3. Click **Select yourapp** and choose **Other App**. Type in CCC as the custom name.
4. Click the **Generate** button.
5. Copy and paste the application-specific password into the Email Settings panel of CCC's Preferences window. Note: We recommend that you **copy and paste** the code. If you choose to transcribe it, take care not to insert spaces. The code is presented in four groups, but it does not actually contain spaces; it should be exactly 16 characters.

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Create an App Password for AT&T

Visit your AT&T Profile page to generate an application-specific password for CCC. AT&T does not use the industry standard term "app-specific password" and instead calls this a "secure mail key":

1. Visit your AT&T Profile <https://m.att.com/myatt/native/deepLink.html?action=Profile&appInstall=N> and choose **Sign-in info**.
2. Select the email account that needs a secure mail key. (You'll find a menu at the top if you have multiple accounts.)
3. Scroll to **Secure mail key** and select **Manage secure mail key**.
4. Choose the email address that you'd like to use if you have more than one.
5. Select **Add secure mail key** and then enter a nickname for the secure mail key to make it easier to recognize (Like "CCC").
6. Choose **Create secure mail key**.
7. Select **Copy secure mail key to clipboard**
8. Paste the application-specific password into the Email Settings panel of CCC's Preferences window.

Create a secure mail key <https://www.att.com/support/article/email-support/KM1240308>, Set up or update AT&T email - Apple Mail (OS X) <https://www.att.com/support/article/dsl-high-speed/KM1010489>

Create an App Password for Gmail

Note: An App Password is **required** for sending emails from CCC with a Gmail account. Additionally, you cannot create App Passwords for a Gmail account unless two-factor authentication is enabled. If you do not see an option to create an App Password in your Gmail account (e.g. when clicking on the "App passwords page" link below), verify that you have two-factor authentication enabled on your Gmail account <https://myaccount.google.com/two-step-verification/phone-numbers>, or use a different email account for sending emails from CCC.

Visit your Gmail App Passwords page to generate an application-specific password for CCC:

1. Visit your App passwords page <https://security.google.com/settings/security/apppasswords>.
2. Click **Select app** and choose **Other (custom name)**. Type in CCC.
3. Click the **Generate** button.
4. Paste the application-specific password into the Email Settings panel of CCC's Preferences window. Note: We recommend that you **copy and paste** the code. If you choose to transcribe it, take care not to insert spaces. The code is presented in four groups, but it does not actually contain spaces; it should be exactly 16 characters.
5. Note: Be sure to use an @gmail.com email address for the user name. **G Suite accounts are not supported.**

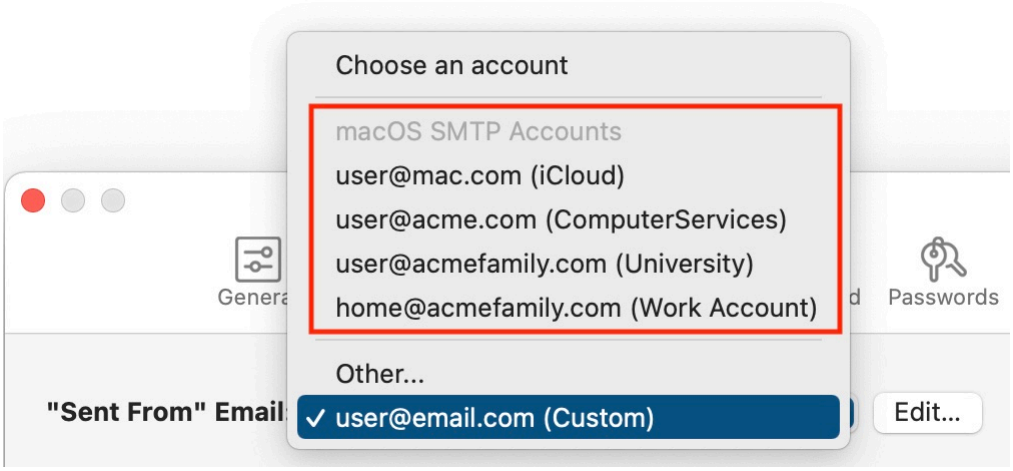
Google's reference: Sign in using App Passwords <https://support.google.com/accounts/answer/185833>

Some email services cannot be supported

Some email service providers do not support the creation of App Passwords. If an email service provider requires two-factor authentication and does not provide an App Password option, that service cannot be used to send emails from CCC.

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How can I remove older email accounts listed in CCC's Email Accounts popup menu?



CCC collects email account information from the macOS Accounts service dynamically when you open the Settings window. The email accounts listed under the "macOS SMTP Accounts" heading are not email accounts that CCC retains within its own preferences, rather those come from the Accounts Preference Pane in the System Settings application. These accounts can't be removed from within CCC – again, because CCC doesn't retain information about these accounts. If you would like to remove these accounts from your Mac, you can remove them in the Internet Accounts panel in the System Settings application.

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Backing up to/from network volumes and other non-macOS-formatted volumes

In addition to backing up to volumes formatted with the macOS standard HFS+ or APFS format (collectively referred to as "macOS-formatted" from here forward), CCC can copy user data files to network volumes (e.g. AFP and SMB via macOS and Windows File Sharing) and to other non-macOS-formatted volumes such as FAT32 or ExFAT. Non-macOS-formatted volumes are presented in CCC's Source and Destination selectors in the same manner as macOS-formatted volumes, so there are no special steps required for backing up to or from these filesystems. However, these filesystems offer limited support for macOS-filesystem features, so special consideration must be given when backing up to these volumes. In general, you can reasonably expect to back up user data — files that belong to your user account — to and from non-macOS-formatted volumes. Specific considerations are noted below.

You can mount network volumes in the Finder, or via the **Mount a network volume...** option in CCC's **Utilities** menu. Please note that network volumes mounted by third-party software is generally not supportable.

CCC will only back up system-related files to or from locally-attached macOS-formatted filesystems

macOS can only be installed on a macOS-formatted volume. This requirement is also carried to a backup volume. When system files are copied to or from non-macOS filesystems, important metadata are unavoidably lost, resulting in files that cannot be restored to their original functionality. To prevent any misunderstandings about this result, CCC will exclude system-related files from a backup task if the destination is not a locally-attached, macOS-formatted volume. Likewise, CCC will not copy system-related files **from** a network volume, e.g. if you were to mount the startup disk of another Mac via File Sharing, the system files on that network volume cannot be copied in a meaningful way.

Note that the "locally-attached" caveat is an important distinction. Even if your destination volume is macOS-formatted, if it is attached to another Mac that you're connecting to via File Sharing (for example), then you're accessing the volume via file sharing. If you open the Get Info panel for the volume, you will see that the volume format is "AppleShare" or "SMB", not HFS+ or APFS.

Ownership and permissions concerns

Network filesystems pose some interesting challenges in regards to preserving ownership and permissions. When you connect to another computer that is hosting a shared volume, you usually authenticate by providing a username and password. The account whose credentials you provide is an account on that other computer, and it is this account's privileges that determine what access you have to files and folders on the shared volume. Additionally, any files that are copied to the shared volume will be owned by that user account, regardless of the ownership of those files on the source volume. This is not a behavior specific to CCC, it is simply the nature of network filesystems.

An example will be very helpful in understanding the implications of this behavior. Suppose Sally would like to back up some Movies from her Mac's home folder to another Mac shared by Bob and Joe. On Sally's Mac, there is a user account named "sally". On Bob and Joe's Mac, File Sharing has been enabled in the System Settings >

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General > File Sharing, and there are two user accounts, "joe" and "bob". Bob has attached an external hard drive named "Backup" to his Mac that he and Joe have been using for backup, and he has created a folder named "Sally's Movies" on this volume to which Sally will copy files. Sally does the following to connect to Bob and Joe's Mac:

1. In the Finder, open a new window, then click on "Bob and Joe's Mac" in the Shared section of the sidebar.
2. Click on the **Connect as...** button.
3. In the authentication dialog, provide Bob's username and password, then click on the Connect button.
4. Choose the "Backup" volume from the list of shared volumes.

The Backup volume now appears on Sally's Desktop, and in CCC's Destination selector in the Network Volumes section. Next, Sally chooses **Choose a folder...** from CCC's Source selector and locates the folder of movies that she would like to copy to Bob and Joe's Mac. She then chooses **Choose a folder...** from the Destination selector and locates the "Sally's Movies" folder on the Backup network volume. She clicks the **Start** button and the Movies are backed up.

Later that day, Joe is using his computer and he notices that he can see some of the movies in the "Sally's Movies" folder, but some of the subfolders have a universal "No access" badge and he cannot view those folders' contents. This occurred for two reasons:

1. Sally mounted the network volume using Bob's credentials, so the files and folders created when she copied her files to the Backup volume are now owned by Bob's user account.
2. Some of the folders on Sally's computer prevented access by "other" users.

As a result, the folders on the Backup volume are owned by Bob and some of them limit access to other users (Joe in this case). Joe asks Sally about this and she decides to try copying some of the movies to one of Joe's folders on the backup volume. When she chooses **Choose a folder...** from CCC's Destination menu, however, she sees the same universal "No Access" badge on Joe's folder. Sally can't copy files to this folder (nor can CCC) because the Backup volume was mounted using Bob's credentials, and Joe's backup folder on the backup volume happened to be inaccessible to Bob. Sally unmounts the backup volume and reconnects to it using Joe's credentials, and she is then able to copy files to Joe's private folder.

What can I do when there are permissions or ownership issues that prevent CCC from copying items to/from or updating items on a network volume?

First, it is important to keep in mind that no application can modify the ownership of a file or folder on a network share. Ownership changes must be applied on the computer or device that is hosting the network volume. Additionally, permissions changes can only be made to files and folders owned by the user whose credentials were used to mount the network volume. For this reason, it is generally easier to apply both ownership and permissions changes on the computer or device hosting the network volume.

If the computer hosting the network volume is a Mac, you can modify ownership and permissions in the Get Info panel for that folder (on the Mac hosting the network volume):

1. In the Finder, click on the folder whose permissions or ownership you would like to change.
2. Choose **Get Info** from the File menu.
3. In the **Sharing & Permissions** section at the bottom, click on the lock icon to make the permissions editable.
4. To change permissions, choose **Read & Write** from the popup menu next to the owner of the file or folder.
5. If the owner of the item is not the user account that you use to connect to this Macintosh, click on the **+** button
6. In the window that appears, select the user account that you use to connect to this Macintosh, then click

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the Select button.
7. Set the access privileges to **Read & Write**.
8. Click on the "additional actions" menu and choose to apply the change to enclosed items.
9. Try your backup task again.

If the computer or device that is hosting the network volume is not a Macintosh, consult that device's documentation to learn how to change permissions and ownership of files and folders.

Alternative #1: If you have mounted the network volume with **Guest** privileges, unmount and remount the network volume using the credentials of an account on the machine or device hosting the network volume.

Alternative #2: You can create a new folder on the shared volume and specify that folder as the destination in CCC by choosing **Choose a folder...** from the Destination selector.

Why can't I change the username when CCC prompts for NAS volume credentials?

When you select a NAS volume as the source or destination to a CCC task, CCC will prompt for the credentials that were used to mount that volume. CCC already knows the user name for that volume, that value is published in the "filesystem URL" attribute of the mounted NAS volume (you can type `mount` into the Terminal application to see that value). CCC asks for the password so that CCC can remount the NAS volume automatically later. In order to avoid ownership or permissions issues, CCC will remount the NAS volume using the exact same user account that was used to mount the NAS volume in the Finder – this is why the username field cannot be modified.

If you would like to use a different user account to mount the NAS volume, then you should eject the NAS volume in the Finder and remount it using the preferred user account. Once the volume is remounted, reselect the NAS volume (or a folder on that NAS volume) as the source or destination to your task. If CCC does not have the credentials for the user account that was used to mount the NAS volume, CCC will again prompt for those credentials.

Limitations of non-macOS-formatted filesystems

When you choose a non-macOS-formatted volume as a destination, CCC's Backup Coach will proactively warn you of any compatibility issues between the source and destination volumes. You can view the Backup Coach's warnings by clicking on the yellow caution button in the Task Plan box. If you have selected a source and destination volume, and the caution button is not present, then there are no configuration concerns.

Support for third-party filesystems

CCC offers limited support for third-party filesystems, such as those provided by FUSE for OS X <https://osxfuse.github.io>. Due to the large number of filesystems that can be provided by FUSE, CCC provides generic support for these "userland" filesystems rather than specific support. CCC takes a best effort approach by determining the capabilities of the source and destination filesystems, warns of potential incompatibilities, then presents only unexpected error conditions that arise during a backup.

Backing up to FUSE volumes mounted without the allow_root flag is not currently supported (e.g. BitCasa). Please contact the vendor of your proprietary filesystem to ask that they offer the ability to mount the volume with the allow_root flag if you would like to use that volume as a source or destination to a CCC backup task.

The Western Digital MyCloud Home NAS device is another special case. The "Home" model of this NAS device requires the use of WD-proprietary software to access the storage securely; direct access to the storage

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via SMB is only available with Guest privileges. Users report <https://community.wd.com/t/use-my-cloud-home-with-finder-without-wds-app/216769/4> that performance of the storage while using WD's software is subpar in comparison to Guest access via SMB, and other users have reported to us that macOS is unable to create or mount disk images on the storage when mounted via Western Digital's software. When you mount WD MyCloud Home NAS storage using WD's software, the volume is vended by a 'kddfuse' filesystem. CCC won't allow these volumes as a source or destination device. To back up to a WD MyCloud Home NAS, mount the storage via SMB in the Finder instead <https://support-en.wd.com/app/answers/detail/a_id/24148/kw/smb%20macos#subject1>. Be sure to choose the "Guest" user option when prompted to authenticate, because the MyCloud Home device doesn't support authenticated access via SMB.

Writable NTFS filesystems

We have seen several reports of problems copying large amounts of data (e.g. > 4GB) to writable NTFS filesystems. In most cases, the underlying software that vends the filesystem (e.g. Tuxera, Paragon, and others) crashes and the volume is rendered "mute". While it may be possible to complete a backup to these filesystems in chunks (e.g. 4GB at a time), we recommend using a more reliable, writable filesystem if you encounter these problems.

Related Documentation

- Learn more about formatting volumes on macOS <https://support.bombich.com/hc/articles/20686493728919>

Backing up a Boot Camp installation of Windows

CCC can back up the user data on a Boot Camp volume, but it cannot make an installation of Windows bootable. If your goal is to back up your user data on the Boot Camp volume, CCC will meet your needs. If you're looking to migrate your Boot Camp volume to a new hard drive, you might consider an alternative solution such as WinClone, or one of the commercial virtualization solutions that offer a migration strategy from Boot Camp.

Backing up the contents of an NTFS volume

The NTFS filesystem supports "named streams", a feature that is comparable to extended attributes on macOS-formatted volumes and many other filesystems. Unlike extended attributes, however, there is no limit to the amount of data that can be stuffed into NTFS named streams (aside from standard file size limitations). Extended attributes on macOS have a 128KB size limit. As a result, any attempts to copy a named stream larger than 128KB to a non-NTFS filesystem will fail. CCC will copy the standard file data just fine, but will not copy named streams larger than 128KB. CCC's Backup Coach will warn of this kind of incompatibility, and any errors related to this limitation will be logged to the CCC log file, however these errors will not be raised to your attention.

This limitation applies when copying files between volumes on Windows as well, so application developers tend to use named streams only for data that can be regenerated (e.g. thumbnail icons, summary or statistical information), not for storage of irreplaceable user data.

NAS service failures can lead to unreliable backups

Access to the contents of a network volume is provided by an application that runs on another computer or Network Attached Storage (NAS) device. Every NAS device and operating system has its own vendor-specific version of the file sharing application, so we occasionally see problems with some NAS devices that don't occur

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on others. Problems can be minor, such as being unable to set file flags (e.g. hidden, locked) on an item, or more significant, like not being able to store or retrieve resource forks. When these problems are encountered during a backup task, CCC will copy as many files and as much data as possible, then offer a report on the items or attributes that could not be copied.

When you encounter an error caused by the file sharing service that hosts your network volume, there are a few workarounds that you can try to avoid the errors:

- Eject the network volume on your Mac, then restart the computer or NAS device that is hosting the network volume. Reconnect to the network volume and try the backup task again.
- Connect to the network volume using a different protocol. A different application is responsible for each protocol, so if the AFP service on your server has a bug, connecting to the SMB service may work more reliably (and vice versa). Follow these steps to connect to the server using a different protocol:
    1. Eject the NAS volume if it's currently mounted
    2. Open CCC and select the applicable backup task
    3. Click on the Source or Destination selector (whichever is applicable for your particular task)
    4. Hold down the Option key and choose "Switch to {the other protocol}" (provide the credentials for the NAS volume again if prompted)
    5. Save and run the task
- If the errors persist when connecting to the network volume via both AFP and SMB, and restarting the file server does not change the outcome, then we recommend that you back up to locally-attached storage instead.

Some NAS services have obtuse file name restrictions

Some NAS file sharing services will automatically rename files to "DOS compatible" names, or simply issue errors when working with various file names. In particular, files or folders that start or end with a space character, or names that contain a colon (:) or slash (/) character are unacceptable. When the file sharing service encounters files or folders with these disallowed characters, it will either report an "invalid argument" error, or it will automatically rename these items, e.g. " filename.txt" would become "_1CZVG~B". This "mangling" of file and folder names inevitably leads to errors during a backup task.

Non-ASCII characters (e.g. é, ö) can also lead to conflicts on NAS volumes. If you see errors where each "affected item" has a non-ASCII character somewhere in its path, refer to Character composition conflicts on NAS volumes <https://support.bombich.com/hc/articles/20686428119575> to see how to identify and resolve the issue.

Another common issue that people encounter when copying files to a NAS volume is errors that are the result of a name restriction. For example, Synology NAS devices (and many others) disallow file names <https://kb.synology.com/en-ca/DSM/tutorial/file_or_folder_name_displayed_as_12HWA0_8> that start with .lock, CON, PRN, AUX, NUL, COM0 - COM9, LPT0 - LPT9, _vti_, desktop.ini, any filename starting with ~$. These NAS devices often produce bogus error codes in these cases, e.g. "File name too long". Some NAS devices have specific character restrictions as well, e.g. NAS devices that follow the Microsoft OneDrive naming conventions <https://support.microsoft.com/en-us/office/invalid-file-names-and-file-types-in-onedrive-and-sharepoint-64883a5d-228e-48f5-b3d2-eb39e07630fa>, which exclude " * : < > ? / \ |, and leading and trailing spaces in file or folder names also aren't allowed. Many people run into this same problem when making backups of the GarageBand application because there is a folder in the application bundle named "Aux".

There are three different ways to avoid these errors:

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Rename the offending files or folders on the source

If you're only seeing this error on a handful of files, then renaming the files on the source to appease the Windows naming conventions may be the simplest way to resolve the errors. Do not attempt to rename folders that reside inside of an application bundle, though (e.g. GarageBand.app).

Connect to the NAS device using AFP instead

Windows naming conventions are typically only applied by the SMB file sharing service, so you may be able to connect via AFP instead to avoid the NAS limitation. Note that some NAS devices no longer support AFP, so this workaround may not be an option in your case.

1. Eject the NAS volume if it's currently mounted
2. Open CCC and select the applicable backup task
3. Click on the Source or Destination selector (whichever is applicable for your particular task)
4. Hold down the Option key and choose "Switch to AFP" (provide the credentials for the NAS volume again if prompted)
5. Save and run the task

Change the SMB service configuration on the NAS

If your NAS device allows changes to its SMB configuration, you can add "mangled names = no" to the end of its smb.conf file to disable SMB name mangling (that setting is documented here <https://www.samba.org/samba/samba/docs/man/manpages/smb.conf.5.html#idp60809664>). We can't offer documentation on how to do this for every NAS device available, but we do a fair amount of testing against Synology's DiskStation, and the procedure goes like this:

1. Connect to the DiskStation via ssh (e.g. in Terminal, `ssh admin@fileserver.local`)
2. Append the smb.conf file:
   ```
   sudo -s
   echo "mangled names = no" >> /etc/samba/smb.conf
   ```
3. Unmount, then remount your NAS volume, then try running your CCC backup task again

Please note that this change is explicitly not supported by Synology (nor us), so proceed at your own risk. We have, however, submitted a feature request to Synology to add support for changing this setting in the Disk Station Control Panel. It's the 2020s, Windows naming conventions from the 1990s are a bit archaic at this point.

If you have a QNAP NAS device, you can use QNAP's instructions for adjusting SMB name mangling here: Correct mangle filename for all shared folders in one time.(8.3 Filename)
<https://www.qnap.com/en-us/how-to/faq/article/scrambled-filefolder-names-when-viewed-via-samba>

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Using CCC to back up to/from another Macintosh on your network

CCC offers the option of securely copying your selected data to another Macintosh on your network (or anywhere on the Internet for that matter) via the **Remote Macintosh...** options in the Source and Destination selectors. After a brief setup procedure to establish trust between your Mac and the destination Mac, simply choose the source or destination volume/folder on the remote Mac and CCC will take care of the rest.

Before setting up CCC to back up to a remote Macintosh, you must:

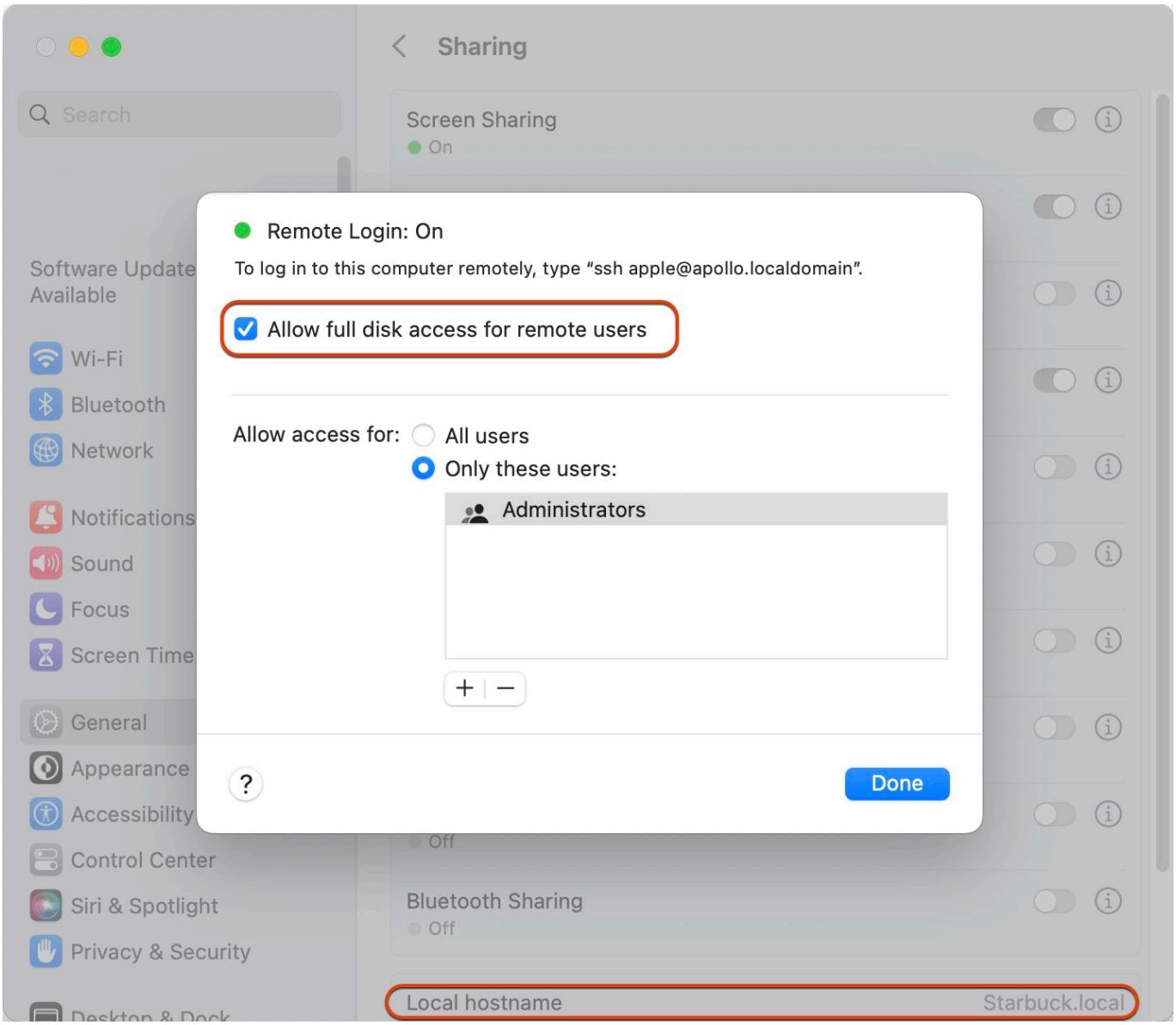
1. Confirm that the remote Macintosh is running a supported OS (OS X 10.15 or later)
2. Enable Remote Login in the Sharing Preference Pane on the remote Macintosh
3. Verify that any firewalls between the two Macs are permitting "secure shell" traffic over port 22 (or a custom port that you specify).

Enabling Remote Login on the remote Macintosh

To enable Remote Login on your remote Macintosh:

1. Log in to that machine as an admin user.
2. Open the **System Settings** application.
3. Click **General** in the sidebar, then select the **Sharing** category.
4. Enable the switch next to **Remote Login**.
5. Click the Info button adjacent to Remote Login to reveal the service settings. Be sure to allow access to **All users**, or explicitly add the **Administrators** group to the list of restricted users and groups.
6. Verify that the box next to **Allow full disk access for remote users** is checked, then click **Done**.
7. Make a note of your remote Mac's hostname. The hostname is indicated in the **Local hostname** text field. In the screenshot below, "Starbuck.local" is the hostname of the remote Macintosh.

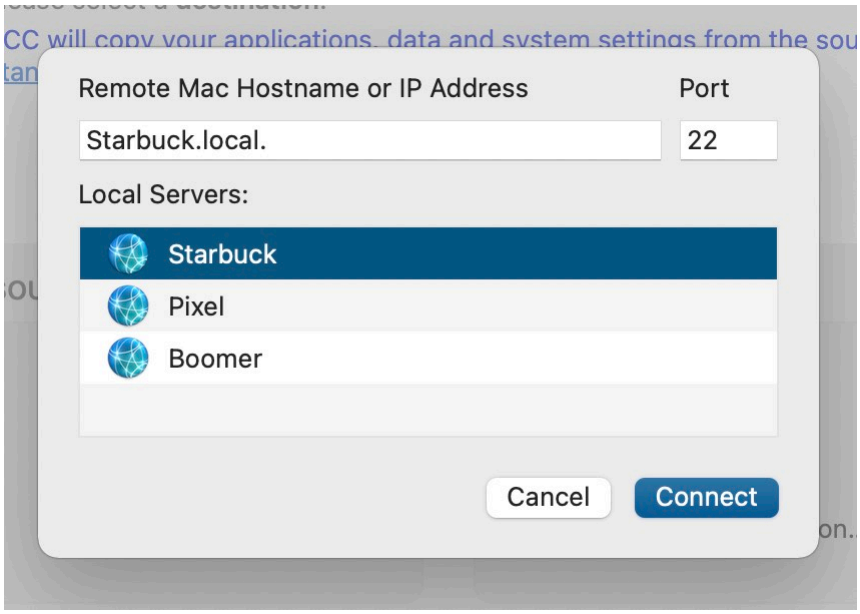
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Configuring a Remote Macintosh source or destination

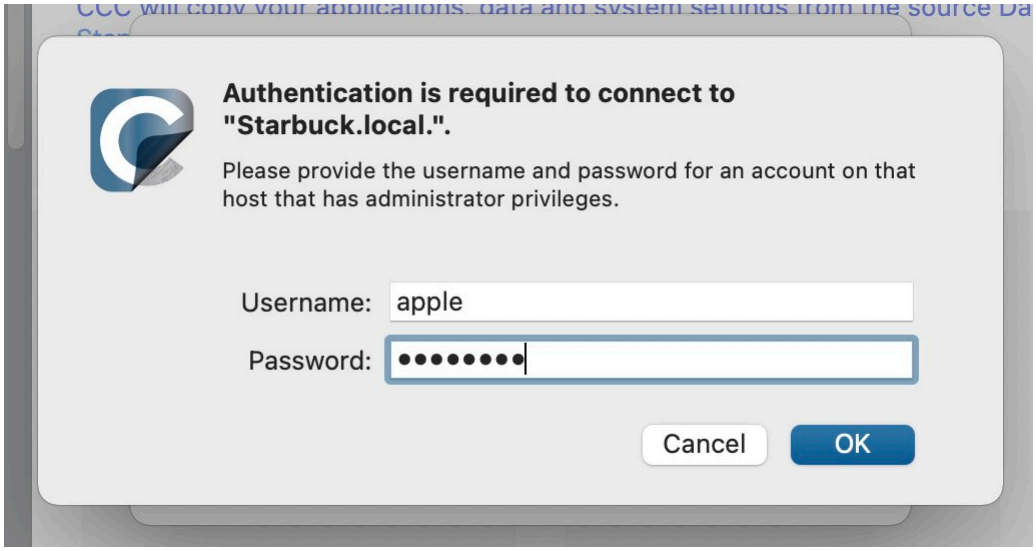
With the Remote Login service enabled on the remote Mac, the next step is to choose **Remote Macintosh...** from CCC's Source or Destination selector. CCC will present a browser that lists any hosts on your local network that advertise the Remote Login service. Find and select your remote Mac in this list, then click the Connect button. If you do not see your Mac listed here, type in the hostname of your remote Mac, then click the Connect button. If the remote Mac is not on your local network, you may need to specify the IP address of the public-facing router that your Mac resides behind. Be sure to configure the router to forward port 22 traffic to the IP address that is assigned to the remote Mac.

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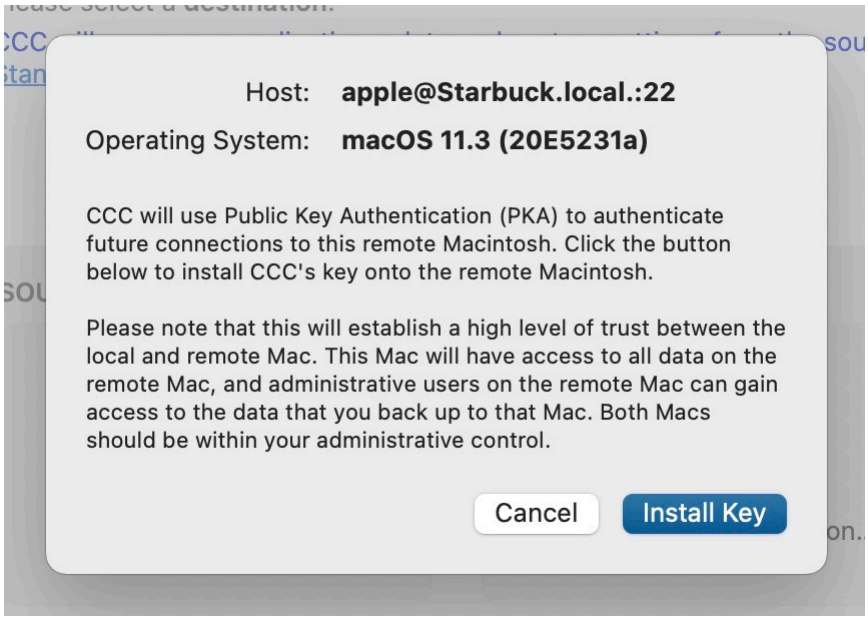


Once CCC has established a connection to the remote Mac, you will be prompted to install a Mac-specific Public Key Authentication (PKA) key pair onto the remote Mac. You must provide the username and password of an admin user on the remote Mac to permit this, and that admin user must have a non-blank password. Those requirements are only for the initial public key installation. For future authentication requests, CCC will use the PKA key pair.

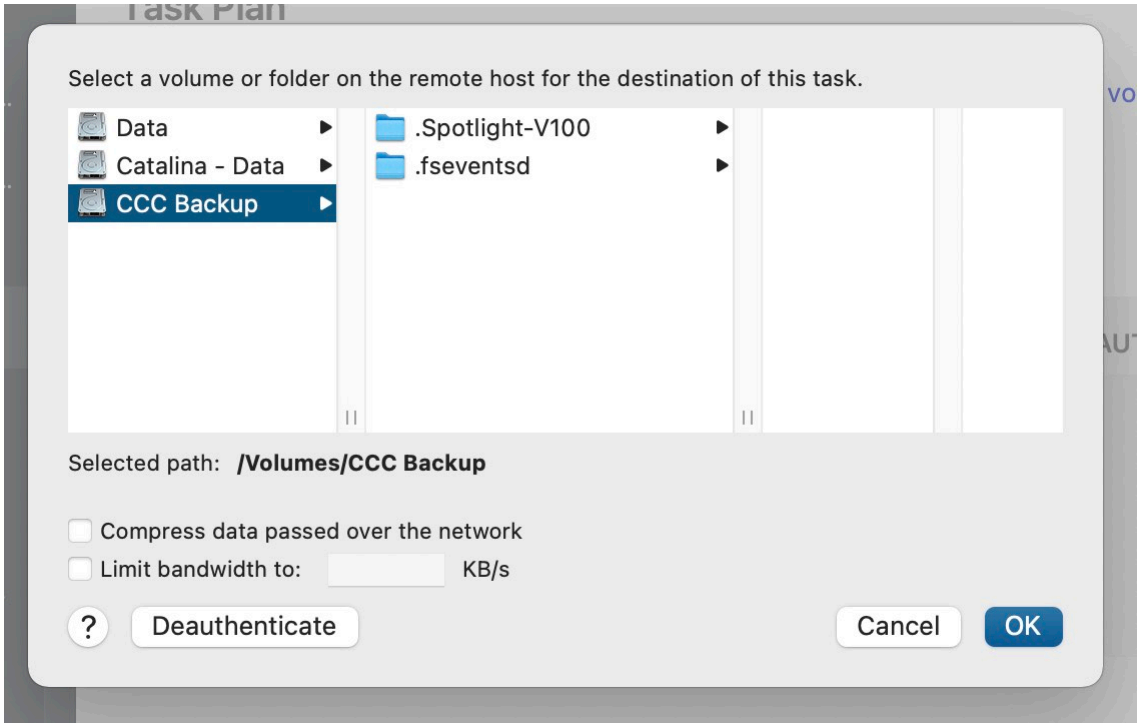
Note: This step establishes a high level of trust between the local and remote Mac; this is required to correctly preserve file ownership. The local Mac will have access to all data on the remote Mac, and administrative users on the remote Mac can gain access to the data that you back up to that Mac. Both Macs should be within your administrative control.



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Once you have connected to the remote Mac and installed CCC's key on that system, CCC will present a volume browser. Select the volume or folder to use as the source or destination for your task. Note: avoid selecting a volume or folder that contains an apostrophe (').



Bandwidth management options

CCC offers two options that can help you address bandwidth concerns. The option to **Compress data passed over the network** can greatly reduce your backup time and total bandwidth used. The time savings depend on just how slow the connection is between the two Macs. If you have a connection that is slower than 10MB/s, compression will make the transfer faster. If your bandwidth is better than that, compression may actually slow down your transfer. CCC will not compress certain file types that are already compressed, such as graphics files, movies, and compressed archives. Specifying the option to compress data passed over the network does not create a proprietary or compressed backup; files are automatically decompressed on the destination volume on

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the remote Macintosh.

CCC also offers a bandwidth limitation option. If your ISP requires that your transfers stay below a certain rate, you can specify that rate here. Note that CCC errs on the conservative side with this rate, so the average transfer rate may be slightly lower than the limitation that you specify.

De-authenticating a remote Macintosh

If you no longer wish to use a particular remote Macintosh, you can click the **Deauthenticate...** button to remove CCC's PKA key pair from the remote Mac.

Remote Macintosh prerequisites

At this time, CCC requires the use of the root account (though it does not have to be enabled) on both the source and destination Macs. To successfully back up to a remote Macintosh, you must have administrative privileges on both machines.

CCC also requires that the remote Macintosh be running macOS 10.13 or later. Non-Macintosh systems are not supported with the **Remote Macintosh** feature.

Additional pointers for advanced users

CCC's public key-based authentication is designed to work with no additional configuration of the services required for backing up over a network connection. CCC uses rsync over an ssh tunnel to perform the backup. If you do make modifications to the sshd configuration, you should consider how that may affect your backup. For example, CCC requires use of the root account over ssh. If you set the "PermitRootLogin" key in the sshd_config file to "no", you will not be able to use CCC to or from that machine. It's an important distinction to note that the root account does not have to be **enabled**, but sshd must permit the use of the root account. The "PubkeyAuthentication" key must also not be set to "no", because Public Key Authentication is required for CCC to authenticate to the remote Mac. CCC will attempt to proactively present these configuration scenarios to you if authentication problems are encountered.

Additionally, the initial Public Key Authentication (PKA) setup requires the use of an admin user on the remote Macintosh. That admin user account must have a non-blank password, and the Remote Login service must permit password-based authentication. These requirements apply only to the initial installation of CCC's PKA credentials. Once CCC has installed these credentials on the remote Mac, CCC will use PKA for authentication to the remote Mac.

Troubleshooting connectivity problems to a remote Macintosh

Problems connecting to a remote Macintosh generally are caused by configuration problems with the Remote Login service on the remote Macintosh. Try the following if you are having trouble making a backup to a remote Mac:

1. Verify that the Remote Login service is enabled in the Sharing preference pane on the Remote Macintosh.
2. Verify that access to the Remote Login service is allowed for **All users**.
3. Re-select Remote Macintosh from CCC's Source or Destination selector and verify that authentication to the remote Mac is configured.
4. Verify that your firewall and the remote Mac's firewall permits traffic on port 22. If you have an application firewall in place (e.g. Little Snitch), verify that access is granted to CCC's privileged helper tool, "com.bombich.ccc.helper".
5. If your local Mac and remote Mac are not on the same network (e.g. you're connecting across a VPN or

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through a router and over the Internet), confirm that a connection can be established between the two Macs. How you do this will vary from one scenario to the next, but you can generally verify connectivity by typing "ssh root@192.168.1.1" into the Terminal application (replace 192.168.1.1 with the hostname or IP address of your remote Mac). If you see a request for a password, then connectivity is established. If not, your network configuration isn't permitting the traffic, or the hostname that you're connecting to is invalid or unavailable. If you are accessing a remote Mac that is behind a router, consult the router's port forwarding documentation and verify that port 22 traffic is directed to the internal IP address of the remote Mac.

VPN and port forwarding configuration is outside of the scope of support for CCC, though our support staff will make every effort to identify whether problems are occurring within that configuration or within the service configuration on your remote Mac. If you have worked through the troubleshooting steps above and are still having trouble backing up to a remote Macintosh, please choose **Report a problem** from CCC's Help menu and submit a support request.

Meraki router intercepts Secure Shell traffic

Some users that have a Meraki router involved in their configuration have reported that its default configuration will interrupt Secure Shell traffic. The firewall rule that causes interference is in place to protect the network from vulnerabilities that are irrelevant between two modern Macs <http://cve.mitre.org/cgi-bin/cvename.cgi?name=2002-0639>. Nonetheless, the firewall intercepts traffic after initially allowing a connection, which is presented by CCC as a "lost connection" or a failure to authenticate to the remote Mac. The following steps correct the Meraki configuration concern:

1. Log into the Meraki as an administrative user and open the "Security report"
2. Filter the log for SSH events
3. Click the "SSH_EVENT_REPOVERFLOW" event from the list to open it and review the blocked event
4. To allow the blocked traffic of this type, click "Yes" to add this event to the whitelist.

Thomson Gateway router intercepts Secure Shell traffic

Similar to the problem described above for Meraki router, the Thomson Gateway router can also cause interference that appears as an authentication failure. Forwarding traffic to a non-standard secure shell port (e.g. 2222, then be sure to specify that port when connecting to the Remote Macintosh in CCC) resolves the problem.

Norton Security "Connection Blocking" will intercept Secure Shell traffic

If you use this product on the Remote Mac, remove any "Connection Blocking" rules <https://support.norton.com/sp/en/us/home/current/solutions/v137832125> that are applicable to that Mac's Remote Login service, then restart. When prompted to allow a connection on that Mac (i.e. when you run the Remote Mac CCC task), allow the connection to proceed.

A note about access privileges to backed up data

While logged in to your remote Macintosh, you may not have permission to view the contents of your backup in the Finder. Your access to the files will be based on the unique id that is associated with the user account that you're logged in to on the remote Macintosh and the one associated with the account(s) on the other Mac(s) that you're backing up. The first administrator account always gets a uid of "501", and subsequent accounts are assigned incrementally higher uids — 502, 503, etc. For security and privacy purposes, macOS restricts access to the contents of user home directories to the owners of those home directories, and these restrictions are preserved when your data is backed up to a remote Macintosh.

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To learn what user id is associated with your account:

1. Open the **System Settings** application.
2. Click on **Users & Groups** in the sidebar.
3. Control+click on your account and choose "Advanced options...". Authenticate when prompted.

You will see your User ID in the panel that appears.

This may be annoying from the perspective of trying to access those files on your remote Macintosh, but it is important for CCC to preserve the ownership and permissions information when backing up your data. If/when you want to do a restore, you could do either of the following:

a) Attach the external drive directly to the machine that you want to restore files to — the accounts on those systems will be able to access their backed up files.

b) Do a restore directly within CCC <https://support.bombich.com/hc/articles/20686444662167> from the original source Macintosh.

If you must have read access to some of this data (e.g. the original Mac is gone, the user account changed, etc.), you can change the ownership of the home folder and its contents in the Finder:

1. Choose **Get Info** from Finder's File menu.
2. In the **Sharing and Permissions** section at the bottom, click on the lock icon to make the permissions editable.
3. Click on the **+** button.
4. In the window that appears, select your account, then click the Select button.
5. Set the access privileges to **Read & Write**.
6. Click on the Gear menu and choose to apply the change to enclosed items.

Some CCC features are not supported on remote Macs

CCC uses its legacy file copier when using a Remote Macintosh source or destination. When using the legacy file copier, some features are not supported, e.g. Quick Update <https://support.bombich.com/hc/articles/20686481162647#qu_remotemac> and the When files are modified on the source <https://support.bombich.com/hc/articles/20686389397015#when_modified> scheduling option, smart folder renaming <https://support.bombich.com/hc/articles/20686482705687#renamed_folders>, backing up cloud-only files <https://support.bombich.com/hc/articles/20686419951767-Backing-up-the-content-of-cloud-storage-volumes>, task auditing and file copier concurrency. Snapshot support is not available for volumes attached to a remote Macintosh.

Backing up to a remote Macintosh that has no user logged in

For improved detachability, macOS will unmount any non-internal volumes that are attached to the system when you log out. So, for example, if you log out of your computer while a USB or Thunderbolt hard drive enclosure is attached, you can detach those hard drive enclosures from the system without having to manually unmount them first. This is a good thing — it would be annoying if you had to log back in to your system just to eject a drive. The downside of this, though, is that if you have a CCC backup task that runs when no user is logged in, the destination volume may be unavailable. For a local backup, CCC will attempt to manually mount the destination volume. When the destination of your backup task is a remote Macintosh, however, CCC will not be able to mount that volume prior to backing up.

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If you anticipate backing up to a remote Macintosh that may be sitting at the loginwindow, you can change the behavior of macOS to not unmount detachable volumes. To change this behavior, run this command in the Terminal application on the remote Macintosh:

```
sudo defaults write /Library/Preferences/SystemConfiguration/autodiskmount
AutomountDisksWithoutUserLogin -bool YES
```

Related Documentation

- Restoring from a backup on a remote Macintosh <https://support.bombich.com/hc/articles/20686444662167>

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Restoring from a backup on a remote Macintosh

Restoring files from a remote Macintosh is nearly the same procedure as backing up to a remote Macintosh:

1. Open CCC
2. Click the **New Task** button in the Toolbar
3. Select **Remote Macintosh...** from the Source selector
4. Configure the hostname of the remote Macintosh and connect to the remote Mac
5. Choose the path to the volume or folder that has the backup.
6. Select a destination volume (do not select a macOS system volume), or a folder
7. Click the **Start** button

Related Documentation

- Using CCC to back up to/from another Macintosh on your network <https://support.bombich.com/hc/articles/20686445637655>

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Backing up to a disk image

We discourage the use of writable disk image destinations

Writable sparse disk images are particularly sensitive to connectivity loss between the disk image volume and the disk image file. Reports of disk image corruption have grown steadily worse, especially since the introduction of APFS, and especially when the disk image is hosted on NAS storage. If you're currently using a disk image as part of your backup strategy and it's working for you, you're welcome to continue using it. This functionality is still present within CCC, and we will continue to support it in scenarios where the disk image is working reliably. As you make changes to your backup strategy in the future, however, and especially if you encounter trouble mounting a disk image or accessing its content, we recommend that you migrate away from writable disk images and back up directly to a folder or volume on the underlying storage.

Related documentation

- Folder-to-Folder Backups <https://support.bombich.com/hc/articles/20686432643735>
- Add dedicated volumes to an existing APFS-formatted backup disk <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume>
- Encrypting a locally-attached backup volume <https://support.bombich.com/hc/articles/20686438012951#encrypt>
- Use Quick Update when it's possible to collect a list of modified folders from macOS <https://support.bombich.com/hc/articles/20686481162647#quickupdate>

A disk image is a single file that contains the entire contents of another hard drive (except for the free space). When you want to access the contents of that filesystem, you double-click on the disk image to mount the disk image as if it were an external drive attached to the machine.

To back up to an existing disk image (e.g. a disk image created in Disk Utility), simply drag and drop the disk image file onto CCC's Destination selector box.

Read/write "sparseimage" disk images

Use of this older disk image format is not recommended

A sparseimage disk image is a type of read/write disk image that grows as you copy files to it. In general, sparse disk images only consume as much space as the files they contain consume on disk, making this an ideal format for storing backups. Please note that sparseimage files are monolithic and potentially very large files. If the underlying filesystem has a 2TB file size limit and the sparseimage file reaches that limit, the sparseimage file cannot be grown. In most of these cases the sparseimage file becomes corrupted when the underlying filesystem limit is reached, so we don't recommend this disk image format for large data sets.

Read/write "sparsebundle" disk images

A sparse bundle disk image is similar to a sparseimage insofar as it grows as you add data to it, but it retains its data in many smaller files inside of a bundle rather than inside a single file.

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Running out of space on a sparse disk image

CCC reported that the destination is full, but the underlying disk has plenty of free space. CCC initially sets the capacity of your disk image to the amount of free space on the underlying disk. If you have freed up some space on that disk since you created the disk image, you can manually expand the capacity of the destination disk image in Disk Utility. Choose **Resize...** from the Images menu in Disk Utility, select your destination disk image, then expand it as desired. We recommend that you do not expand the disk image such that it is larger than the capacity of the underlying disk.

The disk image file is larger than the amount of data it contains, why? Sparseimage and sparsebundle disk images grow as you add data to them. They do not, however, automatically shrink when files are deleted from them. As a result, the amount of disk space that the disk image file consumes will not necessarily reflect the amount of data that they consume. To reclaim disk space that is occupied by the free space on your sparse disk image, CCC will compact the disk image before attempting to mount it if the free space on the underlying volume is less than 25GB, or is less than 15% of the total disk capacity. In most cases, you do not need to compact the disk image yourself, but this functionality is documented here so you'll understand why you might see CCC spending time "Compacting the destination disk image" at the beginning of a backup task.

If you would like to compact a disk image manually, you can use the command-line `hdiutil` utility to compact the disk image (e.g. `hdiutil compact "/path/to/disk image.sparsebundle"`). Be sure to unmount the disk image volume if it is already mounted. Also, note that the compacting process can take a while (e.g. an hour for a 100GB disk image on a locally-attached volume). Finally, be sure that your system is running on AC power. The system utility that compacts the disk image will refuse to run while the system (e.g. a laptop) is running on battery power.

CCC applies more aggressive SafetyNet pruning to disk image volumes

When you configure a task to back up to a new disk image, CCC will configure the task's SafetyNet pruning to prune anything older than 1 day. You are welcome to change these settings <https://support.bombich.com/hc/articles/20686442467095>, but we have found that more aggressive SafetyNet pruning will avoid excessive use of disk space on the underlying device, and will reduce the need to compact the disk image.

Please keep in mind that SafetyNet is not intended to offer access to older versions of your files, it is a safety mechanism that is designed to avoid the loss of data on an errantly-selected destination volume <https://support.bombich.com/hc/articles/20686475366935>. SafetyNet is generally not applicable to disk image backups because the disk image is typically dedicated to the backup task. However, enabling SafetyNet with even a very aggressive pruning limit does offer a modicum of protection in cases where you've accidentally removed files from the source.

If you're looking for a solution that retains older versions of your files and your source volume is APFS-formatted, consider CCC's snapshot functionality instead. Snapshots are disabled on disk image destinations by default, but you can enable snapshot support <https://support.bombich.com/hc/articles/20686443871383> either on the disk image volume or on the source volume.

Read-only disk images

Read-only disk images cannot be modified without invalidating the built-in checksum, therefore they are a good container for storing archived material. Compression rates vary on the content of your source, but you can typically expect to reduce the size of your disk image by about half when using compression. There is a subtle behavior that you should take note of when considering this option as a space-saving measure: CCC will first create a read/write disk image, copy the selected items to it, and then convert the disk image to read-only

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compressed. In this case, you will actually need twice the space on your destination as the items to be copied consume on the source.

Encrypting disk images

If any of the data that you are backing up is sensitive, and if your backup device may be in an insecure location, encrypted disk images can improve the security of your backup. CCC offers 128 bit and 256 bit AES encryption <https://en.wikipedia.org/wiki/Advanced_Encryption_Standard> to encrypt disk images. To create an encrypted disk image, select one of the encryption levels from the Encryption menu. After you click on the OK button, you will be prompted to specify a passphrase for the new disk image, and CCC will give you an opportunity to save the passphrase in your own keychain. CCC will also store the passphrase in a private keychain so the disk image can be mounted automatically during scheduled backup tasks.

Note: If you create a read-only, encrypted disk image, the intermediate disk image that CCC creates is NOT encrypted. This intermediate disk image file is deleted once the final, read-only, encrypted disk image has been created, but it is not shredded. Take this into consideration when choosing your destination media. If the destination may be placed in an insecure location, use Disk Utility to securely erase free space on the underlying destination volume after you have created your encrypted disk image archive.

Running a backup task whose destination is a disk image on the startup disk

If you specify a disk image that resides on your startup disk as the destination to a scheduled task, CCC will impose some more conservative requirements on this task. To proceed with this configuration, **one of the following requirements must be met**:

- The amount of free space on the startup disk is at least 1GB larger than the amount of consumed space on the source volume.
- The disk image won't grow, e.g. it is a .dmg file, not a sparseimage or sparsebundle disk image.

These requirements prevent the startup disk from running out of free space, which can cause instability on macOS. If you cannot accommodate the free space requirement, we recommend that you create a **.dmg** disk image in Disk Utility (choose File > New... > Blank Disk image, set the image format to **read/write disk image**). Disk Utility will pre-allocate exactly as much space as you request, and CCC will gladly use this disk image without fear of filling up the startup disk.

A message for new Mac users coming from the Windows world

Backups on a Windows system are very different from those on a Macintosh. If you're coming from a Windows background, the term "imaging" and the concept of making a disk image backup is probably familiar to you. Restoring from disk image backups is made simpler on Windows because the startup environment is built around them. That's not the case for a Macintosh. When you create a disk image backup of your Mac's startup disk, the logistics of restoring that backup are actually fairly complicated. Due to these complications, **we don't recommend using a disk image as your primary backup on a Mac**. Disk images may have a place in some backup configurations, but for your Mac's startup disk, we recommend that you back up directly to a disk that is attached to your Mac; not to a disk image.

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Related Documentation

- Restoring from a disk image <https://support.bombich.com/hc/articles/20686461378839>

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Restoring from a disk image

You can access the contents of a disk image the same way that you access other volumes and external hard drives on macOS. Double-click on the disk image file to mount its filesystem, then navigate the filesystem in the Finder to access individual files and folders. If you have the permission to access the files that you would like to restore, simply drag those items to the volume that you would like to restore them to.

Restoring individual items or an entire disk image to another hard drive using CCC

To restore files or an entire filesystem from a disk image:

1. Open CCC
2. Drag the disk image file onto CCC's Source selector. CCC will mount the disk image for you.
3. Choose a volume from the Destination selector. You may not choose the current startup disk as a destination, however you may choose to restore to a folder on the current startup disk.
4. If you do not want to restore everything, click the **Task Filter** button and define a filter to exclude any content that you do not wish to restore.
5. Click the Start button.

Using Migration Assistant to migrate data from a disk image

If you have a clean installation of macOS and want to restore your user data from a full-system backup on a disk image, you can use Migration Assistant for this task. Starting with a fresh installation of macOS:

1. Decline the initial Migration Assistant offer.
2. Proceed to create a new "dummy" account, log in to the new account.
3. Attach the external storage or mount the NAS volume that has your disk image file.
4. Double-click the disk image file to mount the disk image volume.
5. Open System Settings > General > Transfer or Reset.
6. Click **Open Migration Assistant...**
7. When prompted, select the mounted disk image volume as the source to the migration.

Note that Migration Assistant will only accept a disk image that has a full system backup or a whole Data volume backup, it will not accept a collection of user data (e.g. just a user home folder).

Migration Assistant and the CCC SafetyNet

If your backup volume has a "_CCC SafetyNet" folder, you can move that folder to the Trash before using Migration Assistant to avoid copying that folder during a migration. This is particularly important if that folder has a lot of data in it and you're migrating to a disk that is smaller than the backup volume. If you would like to retain the SafetyNet folder on the backup volume, don't empty the Trash. After Migration Assistant has completed, then you can move the SafetyNet folder back to the root of the backup volume.

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Using the ccc Command Line Tool to Start, Stop, and Monitor CCC Backup Tasks

CCC includes a command line utility that allows you to start, stop, and monitor the progress of specific CCC backup tasks. The utility is located inside of the CCC application bundle. To get basic usage instructions, invoke the utility without arguments in the Terminal application, e.g.:

```
user@Mac ~ % "/Applications/Carbon Copy Cloner.app/Contents/MacOS/ccc"
ccc -v|--version
                Prints the version of the CCC command-line utility (this is not the
same as the main application version)
ccc -s"Task Name" | --start="My Backup Task" (-w|--watch)
                -w|--watch:        Keep running and print task output until the task
is finished. Ignored for task groups.
ccc -x["Task Name"] | --stop[="My Backup Task"] [-r]
                Stop all tasks, or the specified task.
                By default the task is treated as if cancelled.
                Use -r to report the event (e.g. via Notification Center and, if
configured, email).
                Use another non-zero value if you would like task notifications to
be sent.
ccc -h|--history [-c|-d]
                Print a summary of task history, i.e. the data you would see in the
table at the top of the Task History window.
                -c prints in CSV format
                -d prints dates in seconds since Midnight Jan 1, 1970 (rather than
formatting the date)
ccc -p|--print-schedules [-c|-d]
                List each task and when it will next run.
                -c prints in CSV format
                -d prints dates in seconds since Midnight Jan 1, 1970 (rather than
formatting the date)
ccc -w["Task Name" | --watch[="Task name"]
                Watch task progress (press Control+C to exit)
                Specify a task name to limit task output to the indicated task
ccc -i|--status
                Print a status line for each task.
ccc -g|--global globalDefaultName [bool|int|float|string] globalDefaultValue
                Set a global default value.
ccc -g|--global globalDefaultName delete
                Delete a global default value.
ccc -n|--notification notificationTitle notificationBody
                Send a notification to the Notification Center.
ccc -z["Task Name"] | --disable[="Task Name"]
ccc -e["Task Name"] | --enable[="Task Name"]
                Disable or enable all tasks [or a specific task].
```

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```
ccc -u | --uuids
                Print task names and their unique identifiers.
ccc -k | --key
                Prints the access key for the internal DBs (root privileges
required)
ccc -t | --no-running-tasks
                Exits with a non-zero exit status if any tasks are running,
otherwise exits with a zero exit status
ccc --decrypt_db /path/to/encrypted_db /path/to/decrypted_db
                Decrypts a CCC-created database (e.g. task history or task audit).
Requires sudo, both paths must be on the startup disk.
ccc --xxhash /path/to/file
                Print the xxHash digest for the specified file.
ccc --resolve inodeNumber /Volumes/SomeVolume
                Resolve an inode address to a file path on a specified volume.
Requires sudo.

Snapshot-related activity requires superuser privileges. Call ccc with 'sudo' when
requesting these options:

sudo ccc -l | --list  for list of snapshots ([-c] prints in CSV format)
                [-c] prints the list in CSV format
sudo ccc -C | --create  []
                When a comment is provided, CCC will create a "protected" snapshot.
sudo ccc -m | --mount
sudo ccc --unmount
sudo ccc -M | --rename
sudo ccc -R | --remove | --delete
sudo ccc -P | --prune
                Perform thinning and pruning according to this volume's current
Snapshot Retention Policy.
```

Here are some examples of how to use the CCC command-line tool to start and stop a task, and get its last history event:

```
[user:~] cd "/Applications/Carbon Copy Cloner.app/Contents/MacOS"
[user:/Applications/Carbon Copy Cloner.app/Contents/MacOS] ./ccc -s"CCC Backup Task"
-w
04/24 12:52:19  : CCC Backup Task [Data copied: Zero KB, Progress: -1.000000%]
Preparing...
04/24 12:52:20  : CCC Backup Task [Data copied: Zero KB, Progress: -1.000000%]
Testing write responsiveness of the destination...
04/24 12:52:20  : CCC Backup Task [Data copied: 126 bytes, Progress: 0.076235%]
Comparing and copying files
04/24 12:52:21  : CCC Backup Task [Data copied: 126 bytes, Progress: 1.146266%]
Comparing and copying files
04/24 12:52:21  : CCC Backup Task [Data copied: 126 bytes, Progress: 1.963699%]
Comparing and copying files
04/24 12:52:22  : CCC Backup Task [Data copied: 126 bytes, Progress: 3.048320%]
Comparing and copying files
^C
```

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```
[user:/Applications/Carbon Copy Cloner.app/Contents/MacOS] ./ccc -x"CCC Backup Task"
Stopping CCC Backup Task

[user:/Applications/Carbon Copy Cloner.app/Contents/MacOS] ./ccc -h | head -n 1
CCC Backup Task|Macintosh HD|SSD Macintosh HD Backup|4/24/20, 12:52 PM|0:19|126
bytes|Cancelled|0
```

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Outgoing network connections made by CCC

If you're using an application firewall such as Little Snitch <https://www.obdev.at>, you will see several outgoing network connections coming from CCC. We explain below what connections you should expect to see, and also explain why some connections that **look** unexpected are simply misreported by Little Snitch.

Ordinary activity

CCC will make external network connections for the following activity:

- † When you launch CCC and it is a scheduled time to check for a software update (bombich.com and mc.bombich.com)
- † When anonymous application usage statistics are submitted
- When you submit a ticket to our help desk (mc.bombich.com and carboncopycloner.zendesk.com)
- When you view the documentation (carboncopycloner.zendesk.com)
- When you visit our store (which also takes you to our website, bombich.com and our sales vendor, sites.fastspring.com)
- If you have set up email notifications for completed tasks
- If your backup task specifies a network volume or remote Macintosh as the source or destination

† These activities are enabled only upon your assent when you first start using CCC, and can be suppressed any time later via the Update section of CCC's Settings window. No personal data, nor personally-identifiable data is **ever** sent to these services.

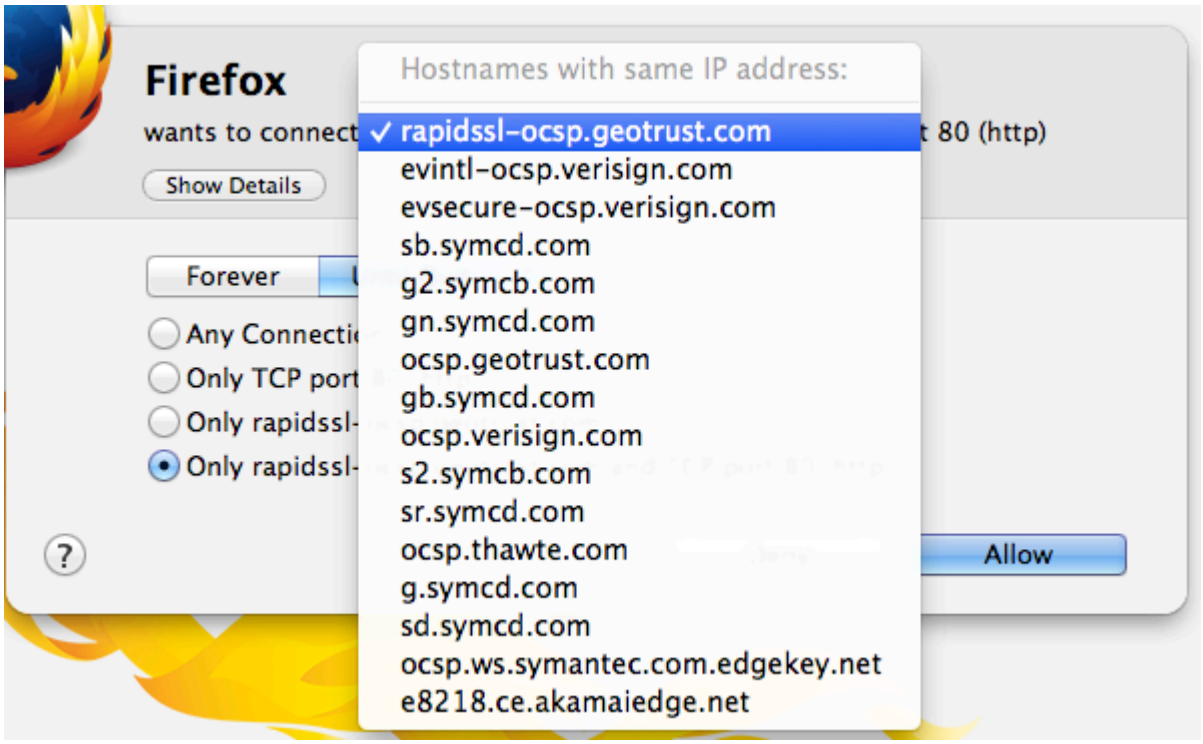
When you view the documentation via CCC, you connect to carboncopycloner.zendesk.com just as you would in your web browser. Like most websites, the documentation web pages connect to other domains for certain purposes. We use Content Delivery Networks (CDNs) <https://en.wikipedia.org/wiki/Content_delivery_network> to serve our static content, such as file downloads, images, styling, fonts, and so on. The CDNs we use are bootstrapCDN (which is hosted by maxCDN) for styling, jquery and fastly for scripts, Google for fonts, Rackspace (bombich.scdn1.secure.raxcdn.com, hosted by akamai) for files and images, and NewRelic for performance and uptime monitoring (nr-data.net, newrelic.com). CDNs not only provide powerful servers, they also have servers around the world and pick the one nearest to the user so that content can be delivered faster.

FastSpring is our e-commerce partner that handles everything to do with pricing and purchasing. If you go to our store, you are directed to their website. They use Cloudfront, Amazon's CDN service, to host some of their static content.

Why does Little Snitch indicate that CCC is connecting to google.com and other unrelated-seeming domains?

When CCC connects to any server, Little Snitch (or any monitor) sees the IP address only. It then makes a guess as to the domain name associated with that connection, which makes it much easier for the user to recognize. Because CDNs are used to serve files for hundreds of different websites and companies, everything is very interconnected, and sometimes an IP address has dozens of different domain names associated with it. You can actually see Little Snitch's other possible guesses by clicking the domain name in bold in the Little Snitch window:

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It could pull any host name from the list, and we don't know what algorithm Little Snitch uses to decide which one to choose.

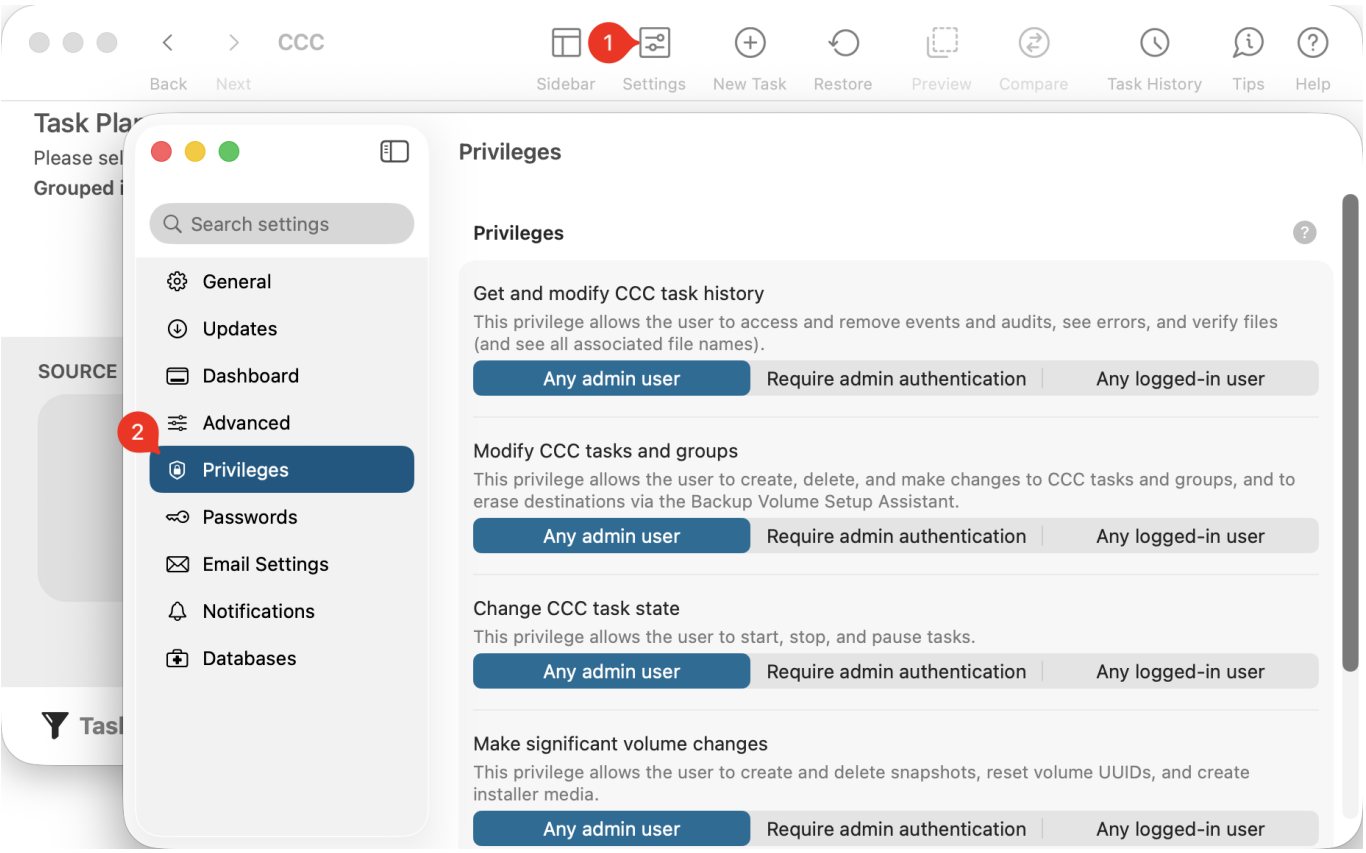
The result: google.ca, google.com, googleapis.com, and ytimg.com are all domains associated with Google's servers. We aren't actually connecting to all of these domains, but when we connect to Google Web Fonts, for example, we're accessing some of the same servers.

You can view a list of the CDNs that we use here <http://www.cdnplanet.com/tools/cdnfinder/#site:http://bombich.com> (and also look at any other websites you are curious about).

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Modifying CCC's Security Configuration

Rather than requiring you to enter admin credentials every time you want to run a task or make changes to a task, CCC only requires users with administrative privileges to authenticate once when CCC is initially installed. While this configuration is easier to use, there are situations where this configuration is not appropriate. If you leave your system unattended with an admin user logged in, someone with physical access to your system can modify or run your CCC backup tasks. If you cannot rely upon the physical security of your Mac to prevent someone from using your Mac, you can adjust CCC's security settings in the Privileges section of CCC's Settings window.



Security Levels

CCC offers three levels of security for each privilege:

Require an admin user (default)

The privilege is granted automatically for a user that has administrative privileges on the computer (e.g. the first account that you create in Setup Assistant).

Non-admin users: Non-admin users cannot attain this privilege; an authentication dialog will only be presented to admin users, and only when the security token has been forcefully expired.

Privilege expiration: The privilege will expire upon logout, or upon quitting both CCC and the CCC Dashboard.

Require an admin, and authentication (higher security)

The privilege is never granted automatically. When the first request to use the privilege is made, the privilege

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will be granted when an admin user successfully authenticates.

Non-admin users: Non-admin users *will* be presented with an authentication dialog when a privilege with this security level is requested, and that privilege will be granted when admin user authentication credentials are provided. If you usually log in to your Mac with a non-admin user account, this is probably the security level that you will want to apply to each CCC privilege (and it is the security level that is applied by default if CCC is initially installed via a non-admin user account).

Privilege expiration: The privilege will expire upon logout, or upon quitting both CCC and the CCC Dashboard.

Any logged-in user (lower security)

The privilege will be granted to any logged in user, including non-admin users. We recommend using this security level with careful consideration. For example, this level of privilege would not be appropriate if the physical security of the Mac cannot be guaranteed. Likewise, follow Best Practices with regard to third-party software installation and malware detection. If you make these privileges available to any user, then they are available to any software running as those users too.

Privilege expiration: expiration is not applicable in this case.

Other privileges are granted simultaneously when an individual privilege's requirements are met

If you have more than one privilege configured to require an admin and authentication, for example, then all of those privileges will be granted as soon as an admin user authenticates in response to an individual privilege request. CCC does not require you to authenticate separately for each privilege. That only applies to privileges that have a matching or lower level security requirement; if you acquire a privilege that was set to "Require an admin" via logging in to the Mac as an admin user, then another privilege set to "Require an admin, and authentication" will not be granted until the privilege is requested and you successfully authenticate when prompted.

Modifying CCC's privileges programmatically in an MDM environment

If you're working with Macs managed by MDM or other management software, it can be helpful to modify these privileges via the command line.

If you're starting with a fresh system that has never seen CCC before, you'll have to open a copy of CCC on the system to initialize the privileges in the authorization database. We added a convenience method to CCC that can handle that via the command-line (CCC will open, apply the privileges, then exit):

```
open -n -W -a "/Applications/Carbon Copy Cloner.app" --args --install-auth-rights
```

Once the default privileges are in place, you can use the security utility to make changes to the privileges, e.g.:

Set "Require an admin, and authentication":

```
security authorizationdb read com.bombich.ccc.modify_tasks > /tmp/ccc.plist
defaults write /tmp/ccc "authenticate-user" -bool YES
plutil -convert xml1 /tmp/ccc.plist
security authorizationdb write com.bombich.ccc.modify_tasks < /tmp/ccc.plist
```

Set "Any logged in user":

```
security authorizationdb read com.bombich.ccc.modify_tasks > /tmp/ccc.plist
```

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```
defaults write /tmp/ccc "session-owner" -bool YES
defaults write /tmp/ccc "authenticate-user" -bool NO
defaults delete /tmp/ccc "group"
plutil -convert xml1 /tmp/ccc.plist
security authorizationdb write com.bombich.ccc.modify_tasks < /tmp/ccc.plist
```

If you need to get back to defaults, you can remove the authorization privileges.

Remove all authorization rights from the database (and basically "reset to defaults" the next time CCC is opened):

```
security authorizationdb remove com.bombich.ccc.global_settings
security authorizationdb remove com.bombich.ccc.modify_tasks
security authorizationdb remove com.bombich.ccc.history_privacy
security authorizationdb remove com.bombich.ccc.change_task_state
security authorizationdb remove com.bombich.ccc.volume_changes
```

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What is CCC's Privileged Helper Tool?

At its core, CCC is a product that is designed to make backups of your Mac's user data, applications and system settings. In order for CCC to be able to make copies of system files (e.g. user accounts), CCC needs to have the privilege of copying files that can't be read nor written by just any user. Likewise, CCC is often tasked with copying the data associated with multiple users. macOS prevents you from accessing files that belong to other users. If you, as the administrator of the Mac, want CCC to back up everybody's files, then again, CCC requires elevated privileges.

Asking the user to grant elevated privileges to CCC is a huge responsibility, and that's a responsibility that we take very seriously.

Acquiring elevated privileges on macOS

There are a few different ways to perform a task on macOS with elevated privileges. The simplest – and least secure – method to do this would be to prompt the user to authenticate when he opens the application, and then relaunch the application as the "root" user. The application would then have all of the privileges it needs. This would grant far too much privilege <https://developer.apple.com/library/archive/documentation/Security/Conceptual/SecureCodingGuide/Articles/AccessControl.html#//apple_ref/doc/uid/TP40002589-SW6>, though, because it also gives the user (or malware that is exploiting the application) privileged access to other users' files.

A better way to securely acquire elevated privileges is to isolate the code that requires those privileges into a separate, "faceless" application. This is a common practice known as privilege separation <https://en.wikipedia.org/wiki/Privilege_separation>. Even here, though, there is a right way and a wrong way for the isolated application to gain elevated privileges. The antiquated technique is for the parent application to ask for administrator authentication, then launch the faceless application as root. Apple specifically discourages this practice <https://developer.apple.com/library/archive/documentation/Security/Conceptual/SecureCodingGuide/Articles/AccessControl.html#//apple_ref/doc/uid/TP40002589-SW18> as well.

Adhering to a higher standard of security

Starting in Mac OS X 10.6 (Snow Leopard), Apple introduced a more secure paradigm for performing tasks with elevated privileges <https://developer.apple.com/documentation/servicemanagement/1431078-smjobbless?language=objc>. Rather than blindly granting privileged access to an application, developers can ask the system to install a "privileged helper tool". macOS then invokes the privileged helper tool on demand, and the calling application can only communicate with the helper when it has met stringent requirements:

- The calling application and the privileged helper tool must be code signed (and valid).
- The calling application must have a valid authorization reference.
- (Optional) The calling application and helper tool can require that the "other" application meets a specific code-signing requirement before establishing a communication channel.

These requirements prevent unauthorized use of the helper tool and they prevent maliciously modified applications from making requests to the helper tool.

CCC has leveraged a privileged helper tool since CCC v3 and Mac OS X Snow Leopard – right from the start. CCC and its helper tool also apply strict code-signing requirements on the other component when establishing a

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communication channel to prevent unauthorized access to the privileges that the user has granted to CCC's helper tool.

CCC's helper tool loads automatically on startup

To facilitate automation of backup tasks, CCC's helper tool will load automatically on startup. If it finds no work to do (e.g. no automated tasks), it will exit, then load only when you open CCC.

The CCC application must be accessible to the system on startup

CCC's helper tool loads very early in the startup process, even before a user is given the opportunity to log in. If the CCC application is kept in a home folder on a separate, encrypted volume, for example, then macOS will not be able to access the application to load the helper tool. If the helper tool does not load on startup, scheduled tasks will not run on schedule. We recommend keeping CCC installed in the Applications folder so that it is immediately accessible to macOS on startup.

Related Documentation

- Modifying CCC's Security Configuration <https://support.bombich.com/hc/articles/20686407933719>
- Uninstalling CCC <https://support.bombich.com/hc/articles/20686440822551>
- Granting Full Disk Access to CCC and its helper tool <https://support.bombich.com/hc/articles/20686443528727>
- System problems can lead to a failure to install CCC's helper tool <https://support.bombich.com/hc/articles/20686436274199>

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Password Storage in the macOS System Keychain

CCC stores authentication credentials that facilitate automated backup tasks in the macOS System keychain. Specifically, CCC will store these sorts of credentials:

- SMTP account settings that you define in CCC's Preferences > Email Settings
- NAS device username/password for mounting NAS volumes specified as a source or destination to a CCC task
- Encrypted volume passwords that you ask CCC to store
- Encrypted disk image passphrases for disk images that you ask CCC to create

You can remove individual keychain entries, or remove all CCC-added keychain items from the macOS System keychain

If you would like to see and/or remove individual keychain entries, open CCC's Settings window and select the **Passwords** pane. To remove a keychain entry, simply select the entry and press the Delete key. Click **Reset Keychain** to remove all CCC-created entries from the System keychain.

You can also see CCC-created keychain entries in the System keychain via the Keychain Access application. Open **Keychain Access**, then select the **System** keychain in the sidebar. All CCC-created entries are prefixed with "CCC".

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Some files can't be opened when the screen is locked

There are a few ways that applications can protect the files that they create. Ownership and permissions are an obvious and transparent mechanism, but that protection has limitations. For even more protection of the most privacy-sensitive data, macOS defines a handful of "data protection classes". Two of those data protection classes indicate that a file can't be opened unless you're logged in and the screen is unlocked. Any application can bestow this protection upon files that they create. For example, some Apple applications (like Mail) use this protection class to protect files that store recent search history, and WhatsApp applies this protection to downloaded image files.

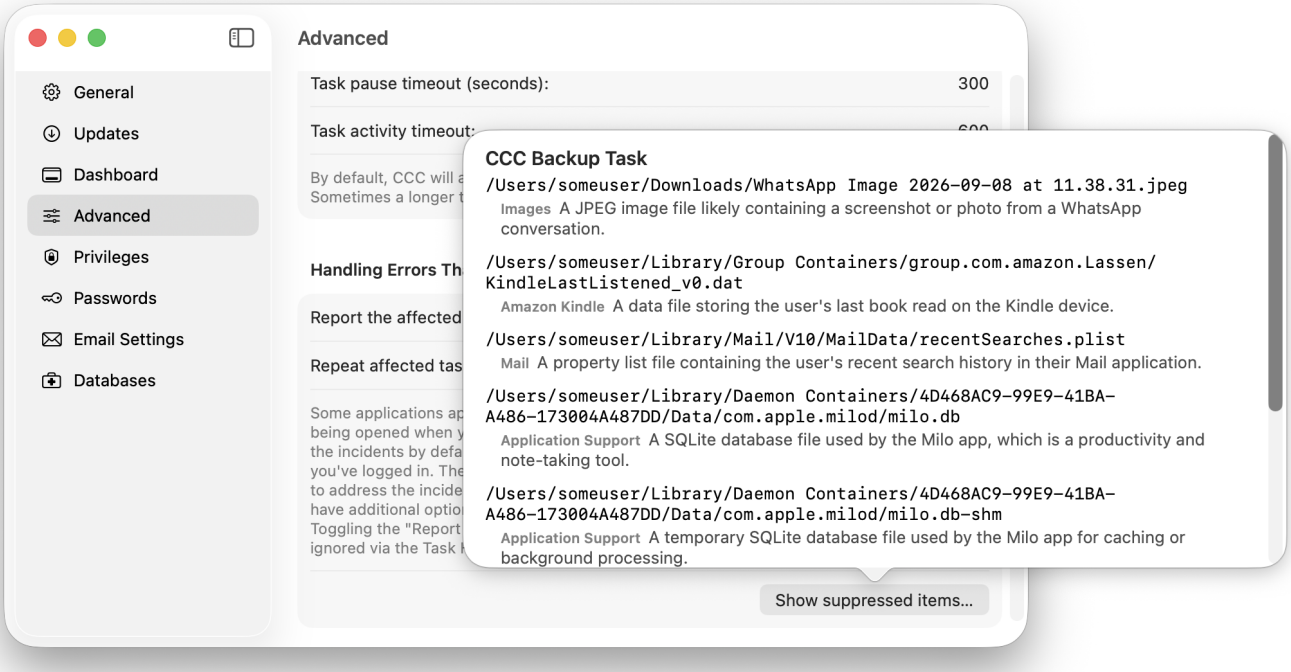
How does this affect your backup tasks?

If a backup task runs when you're not logged in, CCC won't be able to open the files that have this special protection. By default, CCC doesn't treat these incidents as errors, rather it simply tries again to back up those files when the backup task next runs. The condition is often transient, and based on a lot of feedback, most users found the errors to be a nuisance when we briefly set "report as errors" as the default behavior during beta testing.

There is no "one size fits all" solution for this condition. What's right for your backup really depends on what sorts of files have this protection on your startup disk, whether your backups tend to run when the screen is locked, how aggressive you want to be in getting these files onto your backup, and whether you even want to have these files in your backups at all.

To help you make the best decision for your own backups, CCC pulls together as much context about the files as possible. CCC retains a list of affected files and will present a notice in the Backup Coach (look for the ⚠ icon in the Task Plan) where you'll be able to see the list of affected files. You can also see a list of affected files for all tasks (if any are present) in the Advanced pane of CCC's Settings window. If Apple Intelligence is available and enabled on your Mac, CCC will use on-device Apple Intelligence to offer some additional context about the content and purpose of each file, based on the file's name and location.

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Customizing the handling of these files when they can't be opened

CCC offers a couple options that allow you to see the affected files and to apply granular control over their handling. Click Settings in CCC's toolbar, then select the Advanced pane in the Settings window sidebar to find these options. If any files are in a deferred position, click the **Show suppressed items...** button to see a list of the affected files.

Report the affected files as errors

When CCC is unable to open a file protected by a Data Protection class and this setting is enabled, the task will conclude with an error. Each affected file will be listed in the Errors tab of CCC's Task History window. When an affected item is selected, you can click the "Ignore this error for this file" button to suppress future errors affecting that file (but the file will still be backed up whenever the task runs while you're logged in). Click the "Exclude From Backup" button if you don't want to include the file in your backups.

Repeat affected tasks on login

When this setting is enabled, CCC will automatically repeat an affected task when you log in to your Mac or unlock the screen. The affected files will be backed up, thus immediately resolving the transient condition.

Retaining the confidentiality of information in these files

The data protection that's applied to these files is unique to an Apple Silicon Mac's startup disk; that protection doesn't carry over to a backup disk. If you want to retain the confidentiality of these files, be sure to enable encryption on your destination volume. To enable encryption on your backup volume, click **Volumes** in CCC's sidebar, then select your backup volume in the sidebar and toggle on the FileVault switch.

Related Documentation

- Enabling encryption on an APFS-formatted backup volume <https://support.bombich.com/hc/articles/20686438012951#encrypt>

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- Apple Kbase: Data Protection overview <https://support.apple.com/guide/security/data-protection-overview-secf6276da8a/web>
- Apple Kbase: Data Protection classes <https://support.apple.com/guide/security/data-protection-classes-secb010e978a/web>
- Apple Kbase: Volume encryption with FileVault <https://support.apple.com/guide/security/volume-encryption-with-filevault-sec4c6dc1b6e/web>

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Frequently Asked Questions (FAQ)

- Why does my backup volume consume more space than my source volume?
- Frequently asked questions about scheduled tasks
- Why doesn't my backup show up as a startup device?
- Glossary of Terms
- Preparing a disk for a backup or restore
- Everything you need to know about CCC and APFS
- Working with APFS Volume Groups
- I have a full-volume backup in a folder, but it's not accepted by Migration Assistant. How can I restore everything?
- Frequently asked questions about the legacy CCC SafetyNet folder
- Can I run backup tasks while my system is on battery power?
- System problems can lead to a failure to register or install CCC's helper tool
- Can I pause a CCC task?

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Why does my backup volume consume more space than my source volume?

When you configure a backup on a locally-attached backup disk, CCC will recommend that you enable backup versioning by default. When backup versioning ("CCC Snapshots") is enabled, those versions of your backups will consume some amount of space, and that will add up to more disk usage than what you have on the source. Eventually that disk usage can consume most of the free space on your backup disk. Do not be alarmed by this, this is normal – CCC will automatically manage the free space on your backup volume.

My backup disk is nearly full. Should I get a larger backup disk?

In most cases, no – you don't need to get a larger backup disk. If your backup disk has a substantively larger capacity than the disk usage of the source, then CCC will be able to manage the free space on the backup disk just fine. By default, CCC will delete the oldest backups when free space is less than 30GB. If CCC needs more than that to complete a backup, it will remove additional backup versions to make more free space available. Again, this is completely automated, you don't have to intervene to make more space available.

There are some cases, though, where you may want to consider getting a larger backup disk. For example, suppose you have a 1TB backup disk and 850GB of data on your startup disk. This leaves just 150GB of free space overhead on the destination – space that must be shared between backup versioning and making a safe update to the backup. If you have really large files in your data set (e.g. virtual machine files), this may not be enough free space. With any data set, though, 150GB may not be enough space for a long retention of backup versions.

You may also prefer to get a larger backup disk if you want to use storage space on the backup disk for things other than your CCC backup. If this describes your situation, there are two important details to bear in mind:

1. You should dedicate a volume on your backup disk specifically to your CCC backup task. CCC backups are non-proprietary, so having a dedicated backup volume is the only way we can guarantee that you will be able to restore the source back to its original state.
2. You can fine-tune how much space backup versions are allowed to consume by setting a custom Snapshot Retention Policy for your CCC backup volume.

You can learn more about these topics from the resources listed below.

OK, I do need a larger backup disk. Can I migrate my existing backup to the new disk? Should I create a new backup task?

Backup versions cannot be migrated to a different disk, and generally you should establish your new backup using the original source volume as the source to the task (not the old backup disk). If you're *replacing* your backup disk, use the same CCC backup task – click on the Destination selector and choose **Choose a different destination**. If you're *adding* a new backup disk, create a new task for the new source:destination setup.

Related Resources

- Add dedicated volumes to an existing APFS-formatted backup disk <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume>
- Choosing a backup drive <https://support.bombich.com/hc/articles/20686495048215-Choosing-a-backup-drive>

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- Introduction to Snapshots
  <https://support.bombich.com/hc/articles/20686443871383-Introduction-to-Snapshots>
- Snapshot thinning and pruning
  <https://support.bombich.com/hc/articles/21384373407127-Snapshot-thinning-and-pruning>
- Choosing a backup disk: How big should the backup disk be?
  <https://support.bombich.com/hc/articles/20686495048215#how_big>
- Product Tour: Learn how to customize the retention of backup history on your backup

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Frequently asked questions about scheduled tasks

Does CCC have to be running for a scheduled task to run?

No. Once you have saved your tasks, you can quit CCC. Even if tasks are running, it's OK to quit CCC -- they will continue to run. A helper application, named "com.bombich.ccchelper" will be running quietly in the background, handling task operations. This helper application also loads automatically when you restart your computer, so you don't have to launch CCC again unless you want to make changes to your task configurations or scheduling.

What happens if no one is logged in when a task is scheduled to run?

The scheduled task will run whether someone is logged in to the machine or not. You can also log in or log out while tasks are running and the tasks will continue to run.

Will CCC run when the computer is turned off?

If your backup task is configured to "Wake or power on the system", CCC will schedule a "Wake or power on" event with the Power Management service and your system will turn on shortly before the task is scheduled to run.

FileVault exception

There is one notable exception to powering on the system for a scheduled task: **If you have FileVault enabled on your startup disk, your computer would turn on, but it would not proceed past the FileVault authentication prompt.** It is not possible for CCC to subvert this security feature, so the **Wake or power on the system** option will be disabled if FileVault is enabled on your startup disk. This limitation is applicable only when the system is turned off; CCC can wake a system with FileVault protection enabled and proceed to run a backup task.

Related Documentation

- How to modify a scheduled backup <https://support.bombich.com/hc/articles/20686457985175>

Will CCC run when my laptop's lid is closed?

If your laptop is running on battery power, the system will not wake while the lid is closed and CCC backup tasks will not run. If your laptop is plugged into AC power, then a CCC-scheduled wake event can wake the system to start your scheduled task if the lid is closed. See the section above for the settings that indicate whether a task can wake the system.

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How is system sleep handled?

By default, CCC will not wake your computer when your tasks are scheduled to run. You can change this setting in the **System Wake Or Power On Behavior** section when scheduling a task. As long as your Mac is running on AC power, CCC will prevent the system from sleeping for the duration of a backup task.

Related Documentation

- System wake or power on behavior <https://support.bombich.com/hc/articles/20686389397015#sleep>
- How to modify a scheduled backup <https://support.bombich.com/hc/articles/20686457985175>

Why does my laptop sometimes go to sleep during a backup task?

If your Mac is a laptop, note that CCC will only be able to wake the system or prevent idle sleep if the system is running on AC power. CCC will attempt to thwart sleep while the system is running on battery power, but macOS may sleep the system anyway if there is no user activity while running on battery power.

Why does my screen turn on shortly before a backup task starts?

If your task is configured with one of the **Wake the system** options, CCC will schedule a wake event to occur 20 seconds before the task is scheduled to run. Whether the system is sleeping or not, macOS turns on the display when a scheduled wake event occurs, and there is nothing that CCC can do to prevent this. Additionally, note that if macOS detects an Apple Watch in the vicinity of the computer, it will attempt to use that watch to unlock the screen.

If you prefer that your display does not turn on, e.g. in the middle of the night, use one of the **Run when the system next wakes** settings instead to have CCC tasks run during macOS **Dark Wake** cycles (aka **PowerNap**, aka **Maintenance Wake**).

What if the backup disk is not available when a task is scheduled to run?

If your backup disk is attached to your Mac and unmounted, CCC will attempt to mount the backup volume, then proceed with the backup task if that is successful. If the volume cannot be mounted or is not attached to your Mac, CCC will, by default, report an error, then run the task immediately when the backup disk is reattached to your Mac. You can fine-tune CCC's handling of this scenario using the options at the bottom of the Automation panel.

Can I stop a backup task before it finishes?

Yes, you can stop the backup task at any time. The next time you run the backup task, CCC will copy only the files that have changed or were missed since the last backup task.

How can I disable/suspend a task?

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If CCC's sidebar is not revealed, reveal it by choosing **Show Sidebar** from CCC's View menu. To disable a task, right-click on that task in the sidebar and choose **Disable** from the contextual menu. Use the same procedure to re-enable the task. If you would like to disable all tasks, hold down Command+Option and choose **Disable All Tasks & Quit** from the Carbon Copy Cloner menu. You may also disable tasks via the CCC Dashboard in the menubar <https://support.bombich.com/hc/articles/20686467217687#disable_tasks>.

Can I configure a task to run immediately after the computer is turned on?

CCC doesn't offer an option specifically to run tasks on startup. Running a task immediately after the system is turned on often introduces a lot of extra disk activity that will compete with the disk activity that occurs normally during system startup. Also, it makes less sense to run backup tasks after the computer has been off, because no files have been modified while the system was off. We recommend configuring backup tasks to run sometime toward the end of your work day instead. You can also configure the task to shut down your Mac when the task completes <https://support.bombich.com/hc/articles/20686441421591#power_mgmt_options>.

If your work day does not end at a regular time but begins at a fairly consistent time, then there may be one other option available to you. You can configure a backup task to run before your work day begins, and then configure that task to "Wake or power on the system". CCC will then schedule a "wake or power on" energy saver event, and then after the system powers on at that time, CCC will run your scheduled task. Note that this option is not available if you have FileVault enabled on your Mac's startup disk.

Related Documentation

- How do I schedule a backup task? <https://support.bombich.com/hc/articles/20686449773847>
- Advanced scheduling options <https://support.bombich.com/hc/articles/20686389397015>
- Configuring Scheduled Task Runtime Conditions <https://support.bombich.com/hc/articles/20686389397015#runtime_conditions>

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Why doesn't my backup show up as a startup device?

CCC 'Standard Backups' do not include the operating system

By default, CCC does not back up the read-only "System" component of the startup disk; that part of macOS cannot be restored, it can only be reinstalled by the macOS Installer. When you configure a backup of your startup disk, CCC will back up the contents of the Data volume. *That's all of your data, all of your applications, and all of your system settings – everything about your Mac that is customized.* You don't have to be able to boot your Mac from the CCC backup to restore data from it. You can restore individual files and folders using Finder or CCC while booted from your production volume <https://support.bombich.com/hc/articles/20686469175575>. If you ever need to restore *everything* from a non-bootable backup, you can install macOS via Recovery mode (or acquire a replacement Mac), then migrate data from the backup via Migration Assistant <https://support.bombich.com/hc/articles/20686469175575#install_then_migrate>. CCC backups are compatible with Migration Assistant, and we support that method of recovery alongside numerous restore options within CCC.

Why aren't the Apple applications on my backup disk?

If you compare the Applications folders on your startup disk and backup volume, you may notice that a couple dozen applications are not present on the backup volume, e.g. Mail, Calendar, and all of the other Apple-provided applications that are installed as part of the macOS installation. These applications are actually located on the read-only "System" volume <https://support.bombich.com/hc/articles/20686462332055#applications>. Because these applications are stored on a read-only volume, they can't be modified by you, nor affected by malware, nor can they be restored — they can only be reinstalled via the macOS installer. As such, it doesn't make any sense to include these in a backup. Note that this does not affect the backup of the *data that is associated with these applications. All of the data associated with these applications resides on the writable partition of the startup disk, and CCC backs up all of that content.*

Can I still make a bootable copy of my startup disk with CCC?

Yes, although we don't recommend relying on External Boot as part of a *backup* strategy. See Creating legacy bootable backups of macOS <https://support.bombich.com/hc/articles/20686422131479> for more information on how to configure CCC to make bootable copies of the startup disk.

Related resources

- Bootable backups have been deprecated for several years <https://bombich.com/blog/2024/12/19/bootable-backups-have-been-deprecated-for-several-years>
- How to restore from your backup <https://support.bombich.com/hc/articles/20686469175575>
- Using Migration Assistant to restore your startup disk from a CCC backup <https://support.bombich.com/hc/articles/20686469175575#install_then_migrate>
- Best practices for updating your Mac's OS <https://support.bombich.com/hc/articles/20686420473367>

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Glossary of Terms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

Apple File System (APFS) — APFS is a new filesystem introduced by Apple in macOS High Sierra as a replacement for the legacy HFS+ filesystem. See also: Everything you need to know about CCC and APFS <https://support.bombich.com/hc/articles/20686448760599>

Apple Filing Protocol (AFP) — AFP is a file sharing protocol that allows you to access the files on other computers and NAS devices on your network. CCC can copy files to and from folders and sharepoints on SMB and AFP sharepoints. AFP is deprecated in favor of the SMB protocol starting with OS X Yosemite.

B

Backup — A backup <https://en.wikipedia.org/wiki/Backup>, or the process of backing up, refers to the copying and archiving of computer data so it may be used to restore the original after a data loss event. The verb form is *back up,* in two words, whereas the noun is *backup*. In other words, you back up your data using CCC. When you have done that, you have a backup of your data on physically disparate media.

Boot selector — See Startup Manager.

Bundle file — Bundle files are actually folders that the Finder presents as a single file. Application files (e.g. Safari.app) and various library files (e.g. Photos Library files) are bundle files; you can right-click on a bundle file and choose "Show Package Contents" to see the internal structure of a bundle file.

C

Checksumming or "Find and replace corrupted items" — With this option, CCC will calculate a checksum of every file on the source and every corresponding file on the destination. CCC then uses these checksums to determine if a file should be copied. This option will increase your backup time, but it will expose any corrupted files within your backup set on the source and destination. This is a reliable method of verifying that the files that have been copied to your destination volume actually match the contents of the files on the source volume.

Clone (CCC) — A copy of a folder or volume; a non-proprietary backup. Clone is a common word used (historically) for a CCC backup, although it is not a term that we use any more due to the ambiguity introduced by the "cloning" feature that Apple introduced in the APFS filesystem.

Clone (APFS) — APFS cloning allows the user to instantly create copies of files on the same volume without consuming extra storage space. When cloning a file, the file system doesn’t create copies of the data, rather it creates a second reference to the file that can be modified independently of the first file. The two files will share storage on the disk for portions of the files that remain identical, but changes to either file will be written to different parts of the disk.

Container (APFS) — A container on an APFS formatted drive is similar to a partition, but allow several volumes to share the space in the container more flexibly. See: Working with APFS Volume Groups <https://support.bombich.com/hc/articles/20686462332055>

Cruft — Another term for digital detritus, e.g. files that could (should) be deleted because they're no longer needed nor desired by the user. This term was coined to describe the large collections of technical equipment

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piled in the corridors of the Cruft lab at MIT <https://en.wikipedia.org/wiki/Cruft> in the 1980s and 90s.

D

Destination — The location where files from the source are copied. The destination can be a disk attached directly to your Mac, a network location (e.g. a NAS or a share from another computer), or a disk image file. Destination is a relative term. When making an ordinary backup, the destination is your backup volume. When restoring, however, the destination is your original volume, or a replacement device.

Differential backup — A differential backup is a type of data backup that preserves data, saving only the difference in the data since the last full backup. CCC uses a differential backup method, but does not store the differential data in a proprietary manner. Rather, the files are copied to the destination among the already-up-to-date items such that the destination is a backup of the source.

Disk image — Disk images are data containers that emulate disks. When you open a disk image file, a virtual volume is mounted that allows you to browse the files held by the disk image – as if you were browsing a physical disk device. Backing up to a disk image <https://support.bombich.com/hc/articles/20686447588631>

E

EFI Partition — The EFI partition is an Apple-proprietary partition. That partition is created automatically when a disk is partitioned with the GUID partition scheme, and its contents are managed internally by OS X. Third-party applications shouldn't attempt to modify, nor copy that volume.

Extended Attribute — Extra data that is associated with a file. Extended attributes typically contain non-user-created data that was placed there by the application that created the file. For example, photo applications may place thumbnail icon data into an extended attribute. CCC attempts to copy extended attributes when possible, but extended attribute data is generally considered to be disposable because it can be regenerated by the application that created it. Advanced Settings: Don't preserve extended attributes
<https://support.bombich.com/hc/articles/20686481162647#ignore_xattrs>

F

Filesystem, or file system — A volume's filesystem controls how files and folders on that volume are stored and retrieved, and also controls who can access those items.

FileVault Encryption — Volume level encryption built into the macOS. When enabled on a volume, a password is required to unlock and mount that volume. Unlike ownership-based restrictions, FileVault protection persists when attaching the disk to another computer.
Apple Kbase #HT204837: Use FileVault to encrypt the startup disk on your Mac
<https://support.apple.com/en-us/HT204837>

Firmlink — A firmlink is described by Apple as a "bi-directional wormhole" between two filesystems. A firmlink transparently redirects the navigator from a read-only folder on a System volume to a writable folder on a Data volume. These are similar to aliases, but they are only applicable to folders, and they cannot be created by the user.

H

HFS+, or "OS X Extended, Journaled" — A legacy Apple filesystem format. Apple introduced the Apple File System in 2018 to replace the legacy HFS+ filesystem.

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I

Incremental backup — An incremental backup is one that provides a backup of files that have changed or are new since the last backup; it is one that backs up only the data that has changed since the last backup. When making a backup for the first time, an incremental backup copies all files.

M

Migration Assistant — A tool from Apple that allows you to migrate applications, settings, and documents from a backup or older computer to a new computer or fresh installation of the OS. You can use a CCC backup on a USB- or Thunderbolt-attached hard drive as a source for Migration Assistant.
I want to migrate data to a new Mac
<https://support.bombich.com/hc/articles/20686482554519-I-want-to-migrate-data-to-a-new-Mac>

N

Network Attached Storage (NAS) — NAS systems are networked appliances (e.g. a router or a specialized storage device that connects to your router) that contain one or more hard drives. They typically use SMB add/or AFP networking protocols to make sharepoints available to macOS, Windows, and Linux clients.

P

Partition — In verb form, partition refers to the process of creating a division on a hard drive that defines one or more volumes. When you purchase a new hard drive, it often must be partitioned to make it suitable for use on your Macintosh. In noun form, partition is colloquially used in the same manner as a volume. A partition table refers to a hidden structure on a disk that defines the size and position of the volumes on a disk. CCC does not copy the partition table, nor multiple partitions on a disk. Rather, a CCC backup task is defined with one source volume and one destination volume. Preparing your destination disk for a backup or restore
<https://support.bombich.com/hc/articles/20686493728919>

Production startup disk, or Production backup disk — This refers to the disk that you ordinarily use for that purpose. For most users, "Macintosh HD" is the "production" startup disk.

Prune — Remove older, archived material that was cached on the destination volume.

Permissions — A file and folder specification that defines the access that various users and groups will have with regard to reading or modifying that item.

Preflight/Postflight script — An advanced feature; shell scripts that can be added to the beginning or end of a CCC backup task to extend the task's functionality. Running shell scripts before and after the backup task
<https://support.bombich.com/hc/articles/20686441421591#scheduler_shell_scripts>

R

RAID ("**Redundant Array of Inexpensive Disks" or "Redundant Array of Independent Disks")** — A collection of hard drives that using software or hardware are presented as one or more volumes. There are several levels of RAID that balance speed and redundancy. See this Wikipedia article
<https://en.wikipedia.org/wiki/RAID> for more details.

Root — the root folder (also known as the root directory) is the first or top-most folder in a hierarchy. When you

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double-click on a hard drive icon in the Finder, the folder that appears first is the root-level folder.

S

SafetyNet — A legacy safety feature in CCC that protects files on the destination from being accidentally deleted. If you have files on your destination device that don't exist on the source, those files get protected by the SafetyNet when that feature is enabled. When space is constrained on the destination, CCC will start to remove older items from the SafetyNet. SafetyNet is disabled by default when you assert that the destination volume will be used exclusively by the backup task in the Backup Volume Setup Assistant.

Seed — Initially populating a destination volume while it is attached directly to your Mac. This "seeded" volume can then be attached to a remote Macintosh at a distant location, and subsequent backups will be faster because less data will be copied over the Internet.

Server Message Block (SMB) — SMB is a file sharing protocol that allows you to access the files on other computers and NAS devices on your network. CCC can copy files to and from folders and sharepoints on SMB and AFP sharepoints.

Shell Script — A text file containing command-line arguments that can automate tedious tasks. CCC backups can be configured with pre and postflight shell scripts to extend the functionality of the backup task. For example, you could implement a postflight script to unmount the source volume. Running shell scripts before and after the backup task <https://support.bombich.com/hc/articles/20686441421591#scheduler_shell_scripts>

Sidebar — An interface element that appears on the left side of CCC's main window when you click the **Show Sidebar** button in CCC's toolbar. A table at the top of CCC's sidebar lists your CCC backup tasks, while a table at the bottom of the sidebar lists all of the locally-attached volumes that are currently mounted on your Mac. The contents of the sidebar are also accessible via CCC's **View** menu.

Simple Mode — A simplified user interface. Simple Mode significantly reduces the number of user interface elements — the sidebar, toolbar, scheduling selector, and advanced settings are all suppressed, leaving the user with only three primary controls: Source, Destination, Start button. Simple Mode <https://support.bombich.com/hc/articles/20686454203671>

Snapshot — A snapshot is a representation of a volume at a particular point in time. Similar to how a photograph captures a moment in time, a snapshot preserves the state of every file on a volume at the very moment that the snapshot was created.

Source — The folder or volume that holds the data that you want CCC to copy.

Span — Spreading a backup across multiple volumes. CCC does not support spanning multiple destinations.

Sparse file — Sparse files consume less space on disk than their file size would suggest. Sparse files are occasionally used for log files, databases and virtual machine files. CCC can preserve sparse files between APFS volumes, but HFS+ does not support sparse files, so these files consume more space on an HFS+ formatted backup disk.

Startup Manager — A system tool from Apple that allows you to select a startup volume as the Mac is starting up. The Startup Manager is part of your Mac's firmware; hold down the Option key while turning on your Mac to bring up the Startup Manager.
Apple Kbase #HT204417: How to select a different startup disk <https://support.apple.com/en-us/HT204417>

T

Target Disk Mode — An alternate startup configuration in which the computer does not boot to the

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loginwindow nor Finder. Rather, a Firewire, USB, or Thunderbolt icon appears on the Mac's screen, and when you attach the Mac to another Mac via Firewire, USB or Thunderbolt, the internal storage of the Mac in Target Disk Mode appears on the Desktop of the other Mac. In other words, Target Disk Mode makes your Mac behave like an ordinary external hard drive enclosure.
Apple Kbase #HT201255: Mac startup key combinations <https://support.apple.com/en-eg/HT201255>

Task — A collection of settings in CCC that define a source, destination, items to be copied, and automation.

Task chaining — A feature in CCC that allows you to run another task at the end of a task, see: Performing actions Before and After the backup task: Run another backup task (task chaining) <https://support.bombich.com/hc/articles/20686441421591#chain_tasks>.

Thunderbolt — Thunderbolt is a hardware interface developed by Intel that allows the connection of external peripherals to a computer. Thunderbolt is a popular, albeit pricier interface for connecting external hard drives to your Mac.

U

Universally Unique Identifier (UUID) — A 36-character hexadecimal code (characters A-F, 0-9) that uniquely identifies a volume, e.g. "F5B1D7B0-66EC-4082-A34C-86FFD294FA61". When you erase a volume with Disk Utility, the new volume gets a new unique identifier. CCC uses this identifier, along with the name of the volume, to positively identify the source and destination before copying any files. Due to the unique nature of these identifiers, they prove more reliable than volume name when identifying a volume, because there's nothing stopping you from naming all of your disks "Macintosh HD".

Universal Serial Bus (USB) — An industry standard for cables, connectors, and communication between a computer and some external devices like a hard drive, keyboard, or mouse. Macs and USB devices can adhere to the USB 2 or USB 3 versions of the protocol, depending on when the device was manufactured. USB 3 is considerably faster than USB 2.

V

Volume — The terms "disk" and "volume" are often used interchangeably. Ambiguity arises, however, when you modify the partitioning of a disk such that it has multiple volumes. The term "disk" refers to the physical, whole device. A disk contains volumes, and its a volume that you see in the Finder (frequently with a hard disk icon, bringing the confusion full circle). A helpful graphic is available in this section of CCC's documentation. <https://support.bombich.com/hc/articles/20686462332055>

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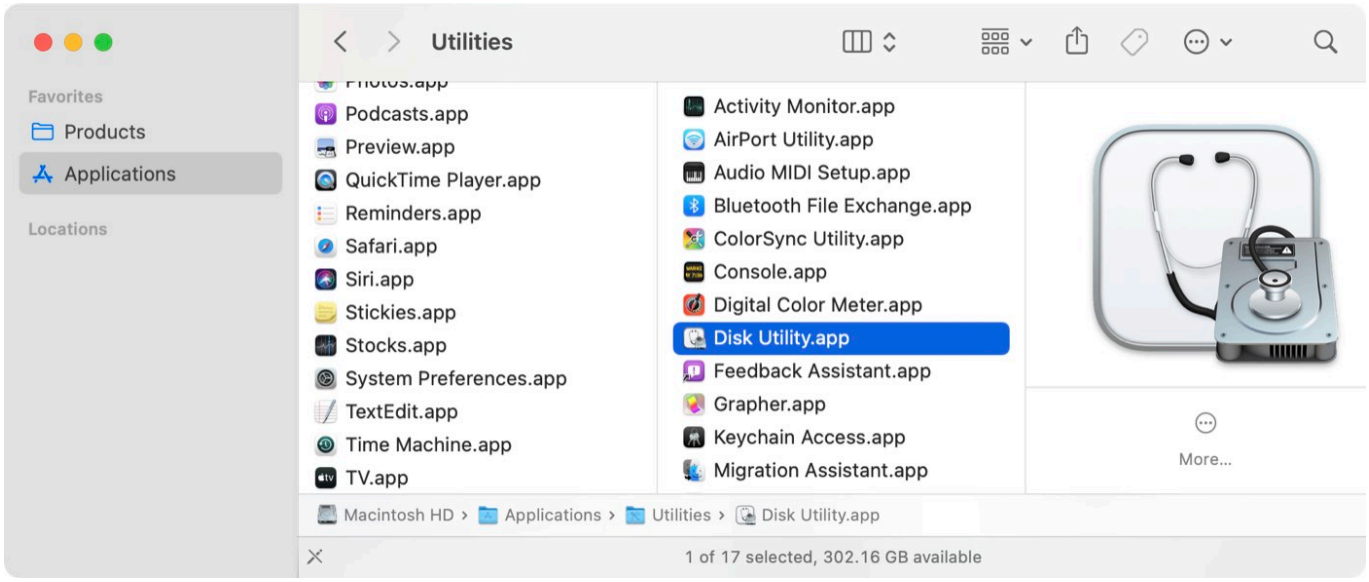
Preparing a disk for a backup or restore

Note: When you select a destination volume, CCC will present a Backup Volume Setup Assistant, which performs all of these steps for you. These instructions are only provided as an additional reference on Best Practices.

▶ Watch a video of this tutorial on YouTube <https://youtu.be/5mBO3o570Ak>

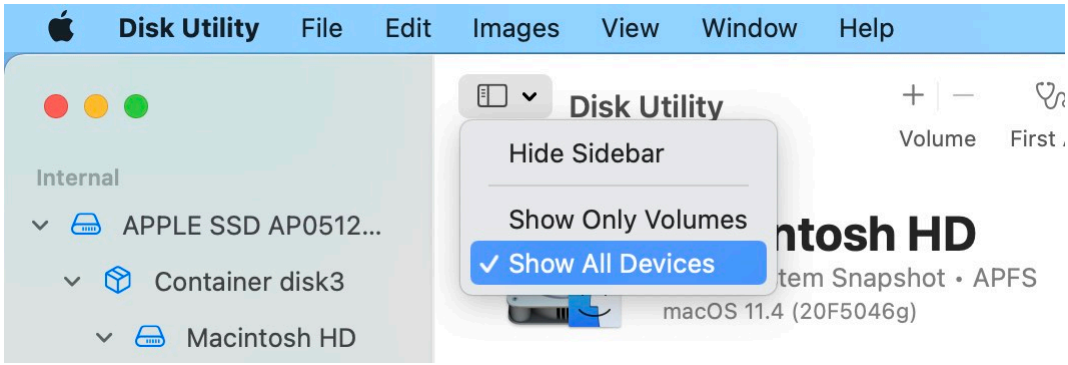
Launch Apple's Disk Utility

Open a Finder window and navigate to **Applications > Utilities** and double click on **Disk Utility.**



Show All Devices

Disk Utility offers a very simplified view of your devices by default. Unfortunately, this hides the devices that you need to select to modify the partitioning of your backup disk. Before doing anything else in Disk Utility, choose **Show All Devices** from the View menu, or from the View popup button in Disk Utility's toolbar.

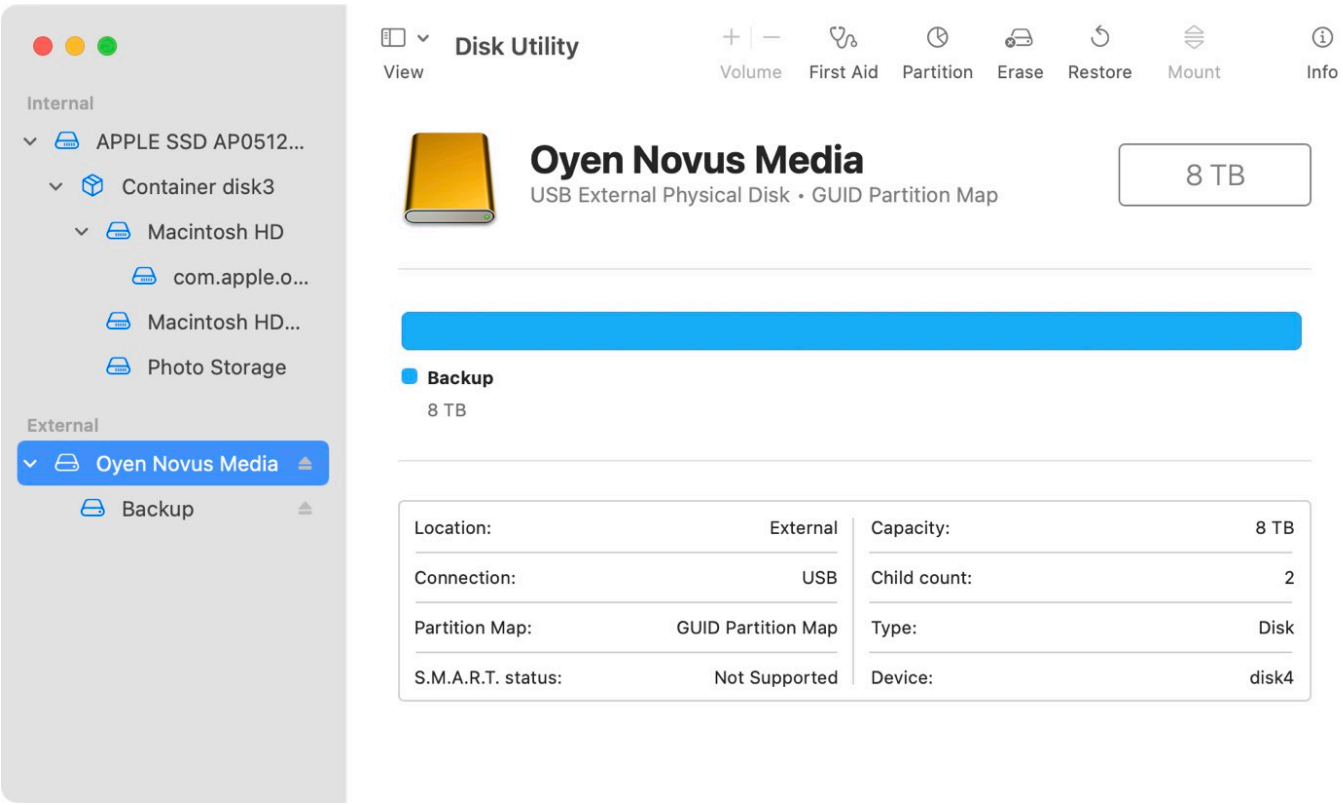


Select the destination disk

Select the disk in the sidebar that you would like to use as the destination for your CCC backup or restore task. The name of a new disk will often include the manufacturer's name (e.g. WD My Book 111D Media...). Please

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pay particular attention to selecting the **disk**, not one of the volumes on the disk. You must select the whole disk to correctly initialize the device.



Unmount any volumes on the specified disk

Disk Utility occasionally has problems with unmounting a volume while attempting to erase it (e.g. because Spotlight prevents the unmount request). Click the Eject button next to any volumes on the disk to preemptively unmount them before erasing the disk.

Erase the specified disk

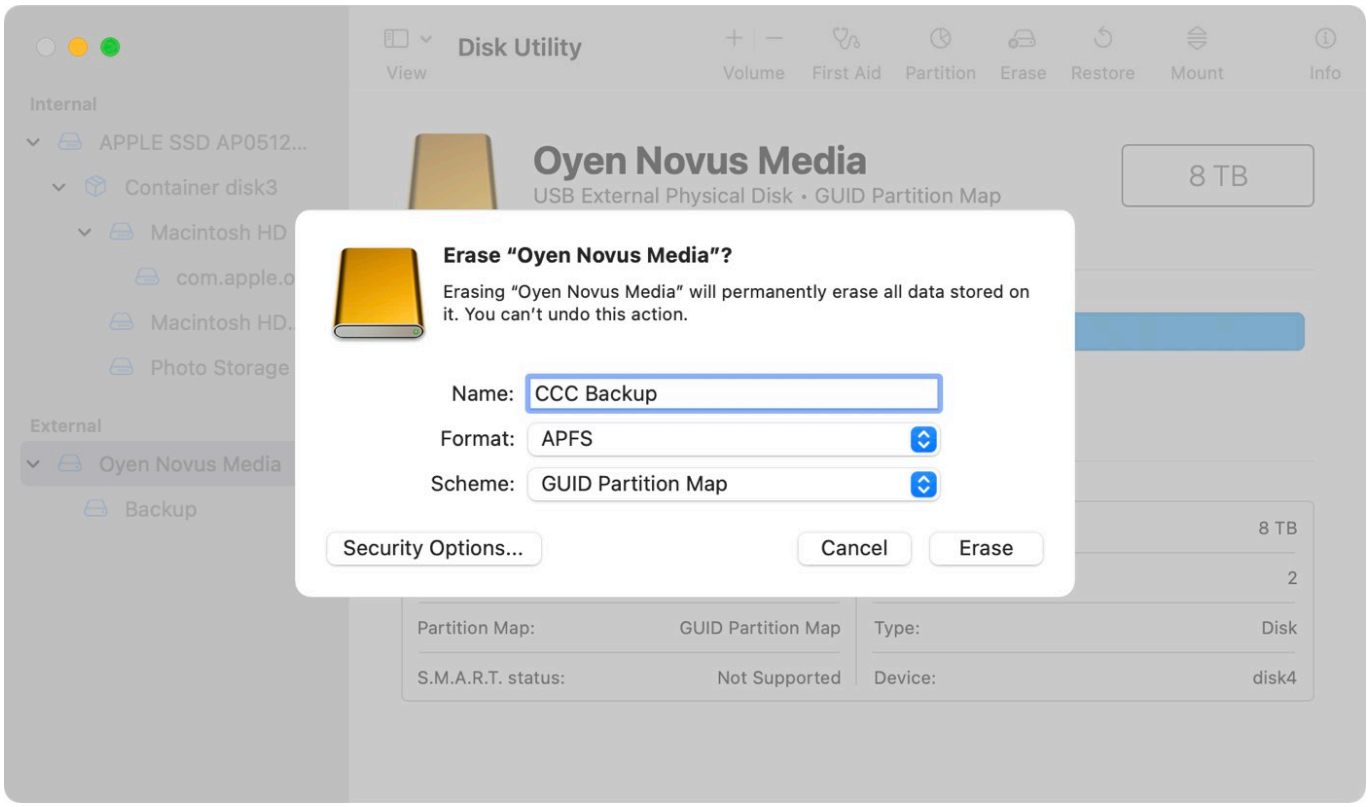
Click the **Erase** button in Disk Utility's toolbar, then configure the name, format, and partitioning scheme of your disk. You can set the name to whatever you like, but when formatting a backup disk, set the Scheme to **GUID Partition Map**. If you do not see the **Scheme** option (and you're erasing an external storage device), go back two steps and select the whole disk device, not one of the volumes on the disk.

Choosing a Format for your destination volume

Choose **APFS** or **APFS Encrypted**. If you intend to create a legacy bootable copy <https://support.bombich.com/hc/articles/20686422131479>, **do not choose APFS Encrypted**; rather you will encrypt your bootable copy by enabling FileVault while booted from the copy.

Click the **Erase** button when you are finished configuring the name, format, and partition scheme for your destination. If you are given an **Erase Volume Group** choice, choose that option to erase the whole volume group.

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Add a volume or partition (optional)

If you're backing up multiple source volumes to this same backup disk, you can keep things organized by adding volumes or creating partitions. If you formatted your backup volume as APFS, select the volume and choose "Add APFS volume..." from Disk Utility's Edit menu. If you chose another format, select the backup volume, then click the "Partition" button in Disk Utility's toolbar.

Don't Use Time Machine

When you're prompted to use your new volume with Time Machine, click **Don't Use.** You may use the same backup disk for both Time Machine and CCC backups, but if you do so, you must use a dedicated partition for the Time Machine backup (not simply an additional volume in the APFS container). Otherwise Time Machine will consume all available space on the backup volume and make it impossible for CCC to use the backup volume.



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Your new hard drive is now ready for CCC!

Related Documentation

- Support for third party filesystems (e.g. NTFS, FAT32) <https://support.bombich.com/hc/articles/20686420950423>
- Using Migration Assistant to restore your startup disk from a CCC backup <https://support.bombich.com/hc/articles/20686469175575#install_then_migrate>

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Everything you need to know about CCC and APFS

- What's a filesystem?
- Does CCC support encrypted APFS volumes?
- I heard that APFS has a "cloning" feature. Is that the same as what CCC is doing?
- Why doesn't the disk usage on my backup disk match the disk usage on the source disk?
- What role does APFS's snapshot feature play in my backup strategy? <https://support.bombich.com/hc/articles/20686443871383>
- What are these "{volume name} - Data" volumes on my startup disk? <https://support.bombich.com/hc/articles/20686462332055>

What's a filesystem?

The file system is perhaps the most important piece of software on your Mac. It’s also one of the most transparent, at least when it’s working correctly. Every user and every application uses the file system. The file system keeps track of and organizes all of the files on the hard drive, and also determines which users and applications have access to those files. The file system also keeps track of how many files you have and how much space they consume. Every time you look for a file, open a file, move a file, save a file or delete a file, it's the filesystem that is fulfilling that action.

Does CCC support encrypted APFS volumes?

Yes, CCC can backup to and from encrypted APFS volumes (aka FileVault encryption). Note that CCC doesn't play any role in the encryption of the files – encryption is a function of the volume, not of the tool that's writing a file. If you enable FileVault on your startup disk, then the files on your startup disk will be encrypted. Those files are decrypted on-the-fly by the filesystem when they're opened by an application. Likewise, if you enable FileVault on your CCC backup volume, then the files on the backup will be encrypted. CCC doesn't have to encrypt those files, they're encrypted on-the-fly by the filesystem as the bits are written to disk.

I heard that APFS has a "cloning" feature. Is that the same as what CCC is doing?

No, the cloning functionality within APFS is completely unrelated to the copying that CCC performs, although in some cases CCC does leverage the APFS file cloning functionality.

APFS cloning allows the user to instantly create copies of files **on the same volume** without consuming extra storage space. When cloning a file, the file system doesn’t create copies of the data, rather it creates a second reference to the file that can be modified independently of the first file. The two files will share storage on the disk for portions of the files that remain identical, but changes to either file will be written to different parts of the disk. APFS file cloning only works when you make copies of a file on the same volume (e.g. duplicate a file or folder in the Finder). CCC is typically copying files **between** volumes, so APFS cloning isn't applicable for that kind of task. In some cases CCC may clone a file on the destination prior to updating its contents.

The important take-away is that APFS file cloning can save you space on your startup disk, but CCC backups can save your data if your source disk fails. They serve completely different purposes; APFS file cloning is not at all related to making backups.

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Why doesn't the disk usage on my backup disk match the disk usage on the source disk?

CCC's global exclusions <https://support.bombich.com/hc/articles/20686463321751> as well as the SafetyNet feature have traditionally led to legitimate differences in disk usage in the past. The aforementioned APFS file cloning feature, however, adds a new dimension to this concern. While APFS file cloning saves space on your source volume, those space savings can't be consistently applied when copying your files to another volume. Making matters worse, ▶ Finder does not accurately represent the true disk usage of your files <https://youtu.be/KggyuL8mED0>. Finder doesn't take into consideration whether one file is a clone of another, rather it sums up the total size of each file and folder, presenting a total value that is possibly astronomically higher than the capacity of the disk.

The disk usage on your source and destination may never add up, and therefore may not be a reliable measure for comparing the source and destination.

Related Documentation

- Comparing the source and destination <https://support.bombich.com/hc/articles/20686430989207>

Additional Resources

- How to verify a backup <https://support.bombich.com/hc/articles/20686511433623>

We're here to help

If you get stuck or need some advice, you can get help right from within CCC. Choose "Ask a question" from CCC's Help menu to pose a question to our Help Desk.

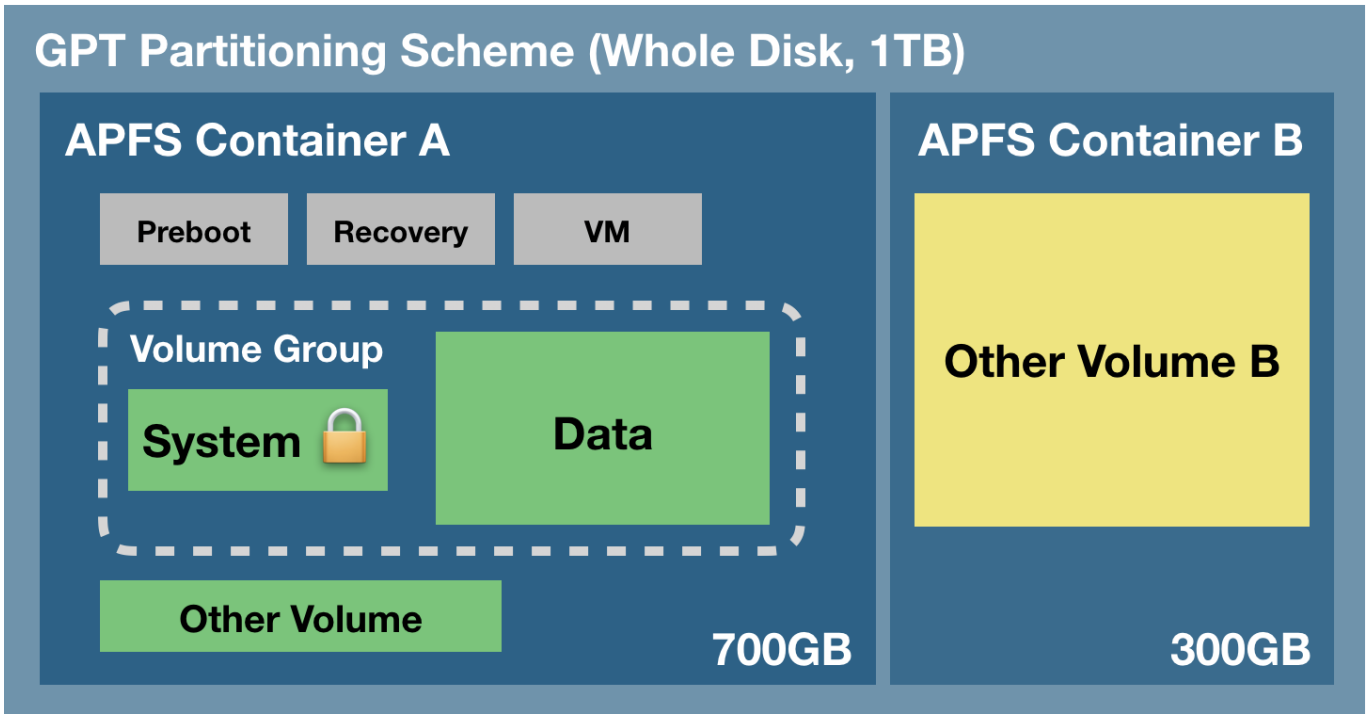
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Working with APFS Volume Groups

When Apple introduced the APFS filesystem, it came with a new concept: the APFS **container**. All APFS volumes reside within a container, and the container resides within the disk's partitioning scheme. All volumes within a container share the space that is available to the container; separate APFS containers do not share space with each other.

In macOS High Sierra, Apple added the concept of **roles** to volumes. At the time there were only three roles, and these went largely unnoticed by the average user: Preboot, Recovery, and VM (virtual memory). These roles allow the system to identify specific volumes for specific purposes, and then treat the volumes in specific ways (for example, any volume with the above roles would be hidden by default and also not mounted by default).

The following graphic demonstrates a few of these APFS concepts:



The partitioning scheme encompasses the entire physical disk. Within the partitioning scheme you can create one or more APFS containers, and within each container, you can create one or more APFS volumes. Unlike partitioning in the past, all of the volumes within the container share the space that is allocated to the container. In the example above, the three gray helper partitions, the System and Data volumes, and the "Other Volume" all have access to that 700GB chunk of storage. "Other Volume B" is in a separate container, though, and does not share space with the volumes in container "A". Normally a disk would not be partitioned in this manner, but it would be warranted, for example, if you wanted to maintain a backup of your startup disk on that same disk (e.g. for testing purposes by developers).

New concept: APFS Volume Groups

In macOS Catalina, Apple introduced another new concept to the APFS filesystem: **volume groups**. This is more of a conceptual grouping of volumes within an APFS container, not a new sub-structure. Apple also greatly expanded the number of roles available for APFS volumes (now there are 16 unique roles). When you upgrade to Catalina, your current macOS system volume is renamed, e.g. to "Macintosh HD - Data", its role is set to

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Data, and then a new volume is added to your startup disk's APFS container with the **System** role and simultaneously grouped with the Data volume. The two volumes within that group share special bonds and receive special treatment from the Finder and from each volume's filesystem. From the user perspective, these two volumes are treated as a single, unified volume. If you take a look at Disk Utility, however, you'll see the two volumes as distinct, separate items.

The Read-only System volume

Perhaps the single, largest change in macOS Catalina is the manner in which the System volume is mounted on startup – it's **read-only**. By mounting the volume read-only, it becomes impossible for attackers to make changes to the content of the macOS System volume. That doesn't mean that your Mac is 100% free from all possible attack vectors, rather it's just another line of defense against them.

In macOS Big Sur, Apple expanded on the protection of the System volume with the introduction of a cryptographically sealed "Signed System Volume" <https://developer.apple.com/news/?id=3xpv8r2m>. The System volume is no longer mounted **at all** on startup, rather a snapshot of the System volume is mounted and used as the startup disk. The snapshot is read-only and completely immutable.

The Data volume

You can think of the Data volume as a read-write "shadow" of the System volume. The Data volume contains all of your user data (e.g. your home folder, third-party applications), but also contains a handful of system components that can't reside on a read-only volume. For example, Apple has placed Safari on the Data volume, perhaps so it can be updated more frequently. The current startup disk's Data volume is mounted at a special mountpoint on the system. You can find it if you navigate in the Finder to Macintosh HD > System > Volumes > {Data volume name}. What you'll find there is a replica of the System volume's root-level folders. Within these folders are all of the system components that are still writable. Normally you won't see these items in the Finder, though, because the Finder visually mashes the content of the two volumes together to make them appear as a single volume. Also, the Finder won't list your Data volume alongside all of your other volumes – **the Data volume is mounted but hidden**.

Building bonds with firmlinks

To pull off the illusion of a single, unified volume, Apple added support to APFS for **firmlinks**. Like the name implies, a firmlink lies conceptually between a soft link and a hard link. That probably doesn't make them any more clear though (even for people familiar with soft and hard links!). A firmlink is described by Apple as a "bi-directional wormhole" between two filesystems. Let's take a look at the "Users" folder as an example – the Users folder at the root level of the System volume is actually a firmlink that points to the Users folder at the root level of the Data volume. If you attempt to navigate to the /Users folder on the System volume, you're actually going to see the content of the /Users folder on the Data volume. Likewise, suppose you're looking at a folder on your Desktop (so you're looking at the contents of the Data volume) and then you navigate upwards several levels. When you get to the parent of the "Users" folder, you're no longer looking at the Data volume, rather that firmlink has transported you back to the root level of the System volume.

There are about a couple dozen firmlinks on the macOS System volume that link various folders on the System volume to writable counterparts on the Data volume. If you're curious about these, you can find a complete list of firmlinks at /usr/share/firmlinks on your startup disk.

Finder shenanigans with the Applications folder

Firmlinks are mostly transparent, but there is one really noticeable exception: the Applications folder. The

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Applications folder at the root level of the System volume is a firmlink to the Applications folder at the root level of the Data volume. However, many Applications are not actually stored in the writable Applications folder on the Data volume. The Finder applies some magic here. The read-only System Applications folder actually resides at System > Applications on the System volume, and when you open the Applications folder in the Finder, you'll see the aggregation of that folder and the Data volume's root-level Applications folder (where all of **your** applications reside). To the average user, this is exactly what you expect to see, and that's great. However, you may notice that this same aggregation is not applied to other system volumes that your Mac is not currently booted from (e.g. a legacy bootable copy of your startup disk <https://support.bombich.com/hc/articles/20686422131479>). On those volumes, if you open the root-level Applications folder on the visible System volume, you'll only see the content of the firmlink to the root-level Applications folder on the Data volume (i.e. no Apple applications, just your third-party applications and Safari). In those cases, you'll find the Apple System applications at System > Applications.

Related Documentation

- Everything you need to know about CCC and APFS <https://support.bombich.com/hc/articles/20686448760599>

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I have a full-volume backup in a folder, but it's not accepted by Migration Assistant. How can I restore everything?

When you configure CCC to back up your startup disk directly to a locally-attached backup volume, that backup is automatically compatible with Migration Assistant. Occasionally people get into this sticky situation though -- "I have a backup of everything in a folder on the backup volume, I have a clean installation of macOS, now how do I get everything back to the way that it was before?"

This situation requires an intermediary restore to a new, empty volume.

Add a volume to your current startup disk

1. Open Disk Utility and select the **Macintosh HD** volume.
2. Click the **+** button in the toolbar.
3. Name the new volume something like **Macintosh HD Restore** (you can rename this later)

Restore your backup to the new volume

1. Open CCC and click **Restore** in the toolbar to create a new Restore task.
2. Drag the folder that contains the complete backup of your previous startup disk onto CCC's Source selector.
3. Select the new **Macintosh HD Restore** volume as the destination.
4. Click the Start button.

Install macOS onto the new volume

1. Boot your Mac while holding down Command+R (Intel Macs) or the Power button (Apple Silicon Macs) to boot into Recovery Mode <https://support.apple.com/en-us/HT204904>.
2. Select the **Reinstall macOS** option and proceed to install macOS onto the **Macintosh HD Restore** volume.

When the installation is complete, you should be able to log in to your restored account, which was adopted by the macOS Installer.

Clean up

1. Open Disk Utility
2. Select the **Macintosh HD** volume in the sidebar.
3. Click the - button in the toolbar. When prompted, choose the **Delete Volume Group** button.
4. Right-click on **Macintosh HD Restore** and choose the option to rename it; rename it to **Macintosh HD**.

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Reconfigure your backup strategy to create a Migration Assistant-compatible backup

Finally, make a new backup of your startup disk <https://support.bombich.com/hc/articles/20686487352599> directly to the root of a locally-attached backup disk so you'll have a Migration Assistant-compatible backup from here forward. If you have other data on that backup disk that you want to leave in place, add a new volume to the backup disk <https://support.bombich.com/hc/articles/20686485252759#apfs_add_volume> for your CCC backup.

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Frequently asked questions about the legacy CCC SafetyNet folder

Note: The topics in this article are not relevant to APFS-formatted destination volumes that have CCC snapshot support enabled <https://support.bombich.com/hc/articles/20686443871383>. For those volumes, CCC leverages snapshots to implement the SafetyNet functionality, and those snapshots aren't affected by any of the shortcomings described here. Also, bear in mind that SafetyNet is a safety mechanism; it is not designed to be part of the backup strategy. We recommend using the destination exclusively for one backup task and disabling SafetyNet.

How do I restore files from the _CCC SafetyNet folder?

CCC's SafetyNet folder ("_CCC SafetyNet") is excluded from CCC's backup tasks by default because it contains older versions of modified files and files that were deleted from the source volume. Typically, when you restore data from your backup volume, you will want to avoid restoring the items in this folder, choosing instead to restore the most recent backup of your files.

If there is something that you would like to restore from the CCC SafetyNet folder, a drag-and-drop restore in the Finder is usually the easiest way to do so. If you would like to restore many items or merge them into an existing folder, choose **Choose a folder...** from CCC's Source selector and choose the folder from which you would like to restore. If you choose the _CCC SafetyNet folder as the source, note that the full path to your archived files will be preserved, e.g., 2021-07-27 (July 27) 14-11-18/Users/fred/Documents/some file.pdf. In most cases, you will want to choose a subfolder within the archives folder as your source. Likewise, choose **Choose a folder...** from CCC's Destination selector, then select the specific folder you want to restore items to.

Why can't I open some files in the _CCC SafetyNet folder?

When CCC evaluates the items on your destination and determines whether they should be archived or left in place, it does so on a file-by-file basis. This poses a challenge for bundle files — files that are actually a folder of files, but presented by the Finder as a single file. As a result, bundle files (e.g., applications, some types of libraries, some custom file types) may appear in an incomplete form within the CCC SafetyNet folder.

Unless all of the components within a bundle file are modified, only the items that have been updated will be present. Incomplete bundle files are generally not useful on their own, but their contents can be. For example, if you accidentally deleted a photo from your iPhoto library, you would be able to recover that lost photo from the archived iPhoto library bundle. To reveal the content of an incomplete bundle file in a CCC SafetyNet folder, right-click (or Control+click) on the item and choose **Show package contents** from the contextual menu.

SafetyNet is a safety mechanism; it was not designed to provide access to older versions of files. If you would like access to older versions of files on your APFS-formatted backup disk, we recommend that you enable snapshot support on that volume <https://support.bombich.com/hc/articles/20686443871383#srp>.

Why can't I delete some items from the SafetyNet folder? The Finder says that some

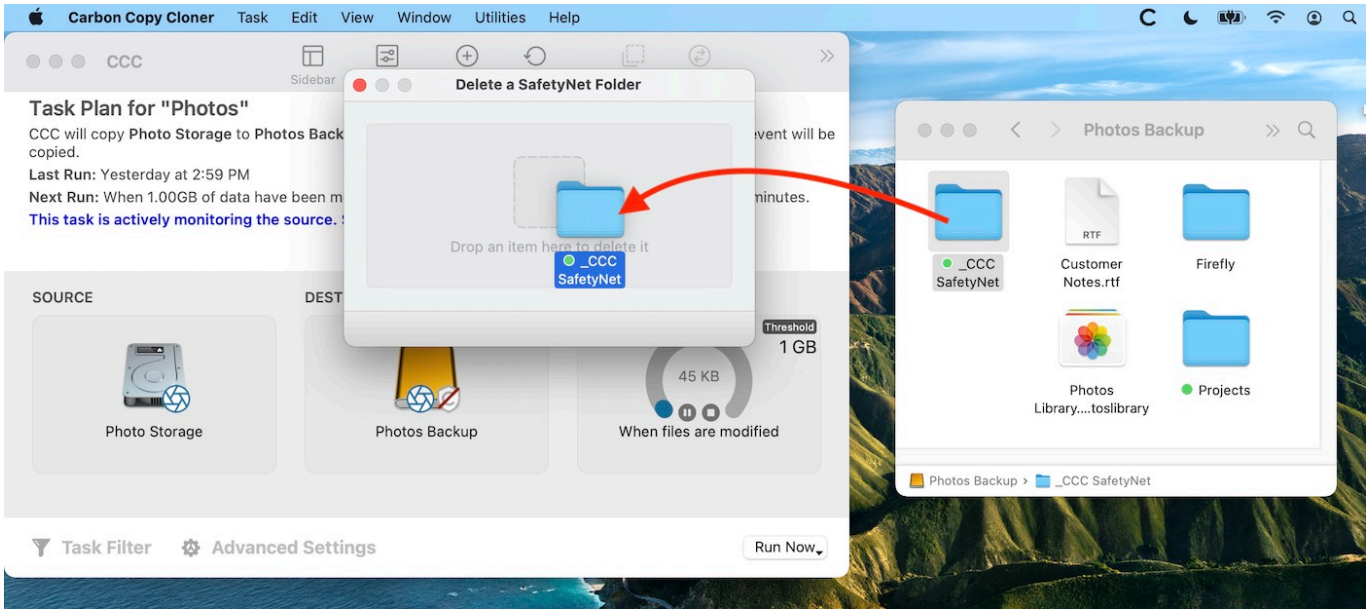
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items are in use.

System Integrity Protection (SIP) and filesystem problems will occasionally cause Finder to report that files in the Trash cannot be deleted because they are in use, or because they are protected. If you try to delete these items in the Terminal application, you'll get a more distinct error message, "Operation not permitted".

CCC won't have any trouble pruning the SafetyNet folder on its own during ordinary backup tasks. If you would like to remove an item from the SafetyNet manually, however, or if you would like to remove the entire folder:

1. Choose **Delete a Stubborn file or folder** from CCC's Utilities menu (it may also be titled **Delete a SafetyNet folder**)
2. Drag the file or folder you want to delete onto the window that is presented. Alternatively, you can click the drop zone in the window that appears to make your selection from a navigation panel.



If you're still having trouble after trying that, don't hesitate to ask us for help <https://bombich.com/software/get_help>.

How can I prevent Migration Assistant from copying the CCC SafetyNet folder during a migration?

If your backup volume contains a "_CCC SafetyNet" folder, you can move that folder to the Trash before using Migration Assistant to avoid copying that folder during a migration. This is particularly important if that folder has a lot of data in it and you're migrating to a disk that is smaller than the backup volume. If you would like to retain the SafetyNet folder on the backup volume, don't empty the Trash. After Migration Assistant has completed, you can move the SafetyNet folder back to the root of the backup volume.

I have SafetyNet enabled, why can't I find a "_CCC SafetyNet" folder on the destination?

There are three primary reasons that the SafetyNet folder will be missing or difficult to find on the destination:

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An empty SafetyNet folder will be removed at the end of the backup task

If CCC finds nothing to archive over the course of the backup task, the SafetyNet archive will be empty at the end of the backup task. If CCC finds that the SafetyNet archive is empty at the end of the task, CCC will remove it. Likewise, if the "_CCC SafetyNet" folder is subsequently empty, that folder will also be removed at the end of the backup task.

The Legacy SafetyNet folder is not used when snapshots are enabled on the destination

When snapshots are enabled on an APFS-formatted destination volume, CCC will implement the SafetyNet feature using snapshots rather than placing files into a separate folder on the destination. Select your destination volume in CCC's sidebar to find these SafetyNet snapshots.

The root level of an APFS Data volume is not visible in the Finder

CCC stores the SafetyNet at the root level of the destination. When you're making a backup of macOS Catalina or later, the destination will be an APFS Volume Group <https://support.bombich.com/hc/articles/20686462332055>, and the SafetyNet will be placed at the root level of the Data member of that group. Root-level items of the Data volume are not immediately visible in the Finder. To reveal the SafetyNet folder on an APFS volume group, right-click on your **CCC Backup - Data** volume (for example) in CCC's sidebar and choose the **Reveal in Finder** option.

Related documentation

- SafetyNet snapshots vs. Backup snapshots <https://support.bombich.com/hc/articles/21384579432343>

I selected "Don't delete anything." Why is CCC placing items in the "_CCC SafetyNet" folder on the destination?

When you select the **Don't delete anything** SafetyNet setting, CCC applies that setting very literally. If CCC encounters a file on the destination that must be replaced with a newer version from the source, CCC cannot delete the older version of that file that is on the destination. That older file is instead placed into the "_CCC SafetyNet" folder on the destination.

CCC is pruning my SafetyNet, but the disk is still pretty full at the end of the backup task

The purpose of CCC's SafetyNet pruning is to make space for additional backups. CCC also avoids pruning items that were very recently archived — after all, it wouldn't make sense to archive an item on the destination, then immediately delete it. To accommodate both goals, CCC prunes archives in the SafetyNet before the backup task runs. Pruning the SafetyNet immediately before copying files provides greater assurance that the requested amount of free space (for example) will be available for the current backup. Be sure to consider this detail when specifying your SafetyNet pruning settings. If you want to retain additional space on your backup volume beyond what is required for your CCC backups, specify more liberal limits (e.g., 100GB of free space rather than 25GB).

Can I use the _CCC SafetyNet folder for long-term archiving of specific items?

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No – you should expect anything that is in the "_CCC SafetyNet" folder to be deleted at some point, possibly as soon as the next backup task runs. If you would like to maintain a permanent archive of items on your backup volume outside your CCC backup, we recommend creating a separate volume on your backup disk for this purpose <https://support.bombich.com/hc/articles/20686485252759>.

We also recommend that you maintain a backup of your archived data on another volume! If you don't have a backup of your long-term archived items, you'll lose them forever if your backup disk fails.

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Can I run backup tasks while my system is on battery power?

CCC **can** run backup tasks while the system is running on battery power, but will not (by default) start **automated** tasks when your laptop is running on battery power. Backup tasks generate a lot of disk read and write activity, and that can run your battery down. Additionally, macOS tends to aggressively put the system to sleep when it's on battery power, causing task completion to be deferred until the system is awoken. For the best performance of your backup tasks and your battery, we recommend running your backup tasks when the system is attached to an AC power supply.

Can I configure CCC to start automated tasks when the system is running on battery power?

Yes. Click the **Settings** button in CCC's toolbar to access settings related to running tasks while on battery power.

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System problems can lead to a failure to register or install CCC's helper tool

CCC 7.1 (and later)

When the CCC application is moved, macOS's helper tool registration system will place the helper in a "penalty box". Typically CCC can address the situation by simply unregistering and re-registering the helper tool (without intervention). We have seen a handful of cases, however, where all of CCC's attempts to free its helper tool from the "penalty box" fail, and the user sees a cycle of requests to re-register the helper tool that have no apparent effect. The underlying issue appears to be an invalid code-signing cache entry stored by macOS. If you're finding that behavior, you can try the following steps to correct the problem.

1. Move the CCC application file to the Trash, then empty the Trash (this will not affect your backup tasks; search for "Carbon Copy Cloner" via Spotlight to verify that no other copies are lingering)
2. Open System Settings > General > Login Items & Extensions – if all copies of CCC are gone, then the "Carbon Copy Cloner" item should be removed from the "Allow in the background" section
3. Shut down the computer
4. Press and hold the Power button until "Loading startup options" appears
5. Click on "Macintosh HD" to select that volume as the startup disk
6. Hold down the Shift key and click the "Continue in Safe Mode" button
7. Log in, then restart the computer again (nothing special, ordinary reboot)
8. Re-download CCC from here <https://bombich.com/software/download_ccc.php?v=latest>

The brief boot into Safe Boot mode clears out some caches, including the macOS code signature caches. When you open CCC again, you should be prompted to register CCC's helper tool again, and this time it should work normally.

Related Documentation

- What is CCC's Privileged Helper Tool? <https://support.bombich.com/hc/articles/20686388957719>

CCC 7.0 through CCC 7.0.4

If you are encountering problems with installing CCC's helper tool and you are using a version of CCC that is older than 7.1, we recommend that you apply the 7.1 update prior to attempting any of the troubleshooting suggestions below.

Configuration files for privileged helper tools are placed in the /Library/LaunchDaemons folder on your startup disk. CCC never touches this folder directly, rather it uses the macOS "Service Management" service to install and load its helper tool configuration. If the permissions or ownership of this folder are incorrect, however, the Service Management daemon (smd) will fail to install the helper tool configuration, and this service offers no recourse. Often the helper tool installation will fail with a nondescript error, e.g. "CFErrorDomainLaunchd error 2". In most cases, reinstalling macOS does not repair the affected system folders. We have reported this system problem to Apple (FB11188842) and we are currently waiting for a response, but there are a handful of options that you can leverage to resolve this permissions problem.

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Preliminary troubleshooting of helper tool installation failures

Reboot

The first troubleshooting step is always "**Reboot your Mac**". After rebooting, open CCC to see if you are still prompted to load CCC's helper tool.

Toggle the CCC background item

If the problem persists after rebooting:

1. Quit CCC
2. Open the System Settings applications
3. Navigate to General > Login Items
4. Toggle the switch next to "Carbon Copy Cloner" (On, or if it's already on, toggle it off, then back on).
5. Open CCC to see if you are still prompted to load CCC's helper tool

Force-load the helper tool via the legacy system interface

If the problem still persists, then you can try forcefully loading CCC's helper tool in case some application used an older macOS interface to disable it. Paste the following into the Terminal application:

```
sudo launchctl bootstrap system /Library/LaunchDaemons/com.bombich.ccchelper.plist
```

```
sudo launchctl enable system/com.bombich.ccchelper
```

Press the Return key after pasting in each line, then authenticate when prompted. Afterwards, try again to open CCC and save/run a backup task.

Advanced troubleshooting when more serious system problems are present

Remove the contents of the affected folders, then correct their ownership and permissions

If the problem persists after trying the steps above, then the next troubleshooting step is to remove the affected system folders and recreate them with the correct ownership and permissions. To avoid exposing yourself to potential security vulnerabilities, it is imperative that you **remove** the content of these folders rather than simply correcting the ownership and permissions. Make a note of any applications listed in these folders – those applications should later be re-opened so they have an opportunity to reinstall their helper tools.

Paste the following into the Terminal one line at a time. Press the Return key at the end of each line, authenticate when prompted:

```
cd /Library
sudo rm LaunchDaemons/*
sudo rm PrivilegedHelperTools/*
sudo chown root:wheel LaunchDaemons
sudo chmod 755 LaunchDaemons
sudo chown root:wheel PrivilegedHelperTools
sudo chmod 1755 PrivilegedHelperTools
```

If any of these commands produces an "Operation not permitted" error, or if you are still unable to save a task in CCC, then proceed to the next section.

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Replace the folders via Recovery Mode

If macOS security and privacy restrictions prevent you from correcting the issue while booted from your Mac's production startup disk, you can perform the tasks in the Terminal application while your Mac is booted in Recovery mode.

1. Intel Macs: Hold down Command+R while rebooting. Apple Silicon Macs: Shut down, hold down the Power button until the startup options appear, then select **Options**.
2. Choose **Terminal** from the Utilities menu in the menubar.
3. Type the following into the Terminal one line at a time, pressing the Return key at the end of each line:

```
cd "/Volumes/Macintosh HD/Library"
rm -rf LaunchDaemons
rm -rf PrivilegedHelperTools
mkdir LaunchDaemons
chown root:wheel LaunchDaemons
chmod 755 LaunchDaemons
mkdir PrivilegedHelperTools
chown root:wheel PrivilegedHelperTools
chmod 1755 PrivilegedHelperTools
```

Note: If your production startup disk's name is not "Macintosh HD", substitute the correct name in the first line above.

After you have completed those steps, reboot your Mac, open CCC, and try again to save or run a backup task.

Related Documentation

- What is CCC's Privileged Helper Tool? <https://support.bombich.com/hc/articles/20686388957719>

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Can I pause a CCC task?

Most tasks can be paused during the "Comparing and copying files" phase of the task. When a task is in a pausable phase, the Pause button will be enabled in CCC's main window, and the button with the "media pause" icon will be enabled in CCC's Dashboard application. Click the Pause button to temporarily pause the task. Click the Continue button to resume the task.

Paused tasks will resume automatically after 5 minutes

After 5 minutes, a paused task will automatically resume. You can change that period in CCC Settings > Advanced, although we recommend that you avoid setting that to very large values. Pausing a task will only pause the task's filesystem activity, it will not pause other filesystem activity on the source and destination volumes. The longer a task is paused, the greater chance there is of state inconsistencies arising between the filesystem and CCC's file copier.

Paused tasks are aborted when the computer is shut down.

A paused task will not resume after a restart or shutdown.

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