Imaging OS X Computers with the Casper Suite

Technical Paper
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Contents

Introduction

Target Audience

This guide is designed for IT administrators who want to image or re-image the OS X computers in their environment.

What's in This Guide

This guide provides information to help you decide whether Target Mode Imaging (TMI) or a NetBoot Image is the best imaging method for your environment. It also provides a best-practice workflow for each imaging method.

Choosing an Imaging Method

When imaging OS X computers with the Casper Suite, it is important to choose the best imaging method for your environment so that the process goes as smoothly and quickly as possible. The following flowchart will help you make a decision about the imaging method to use.
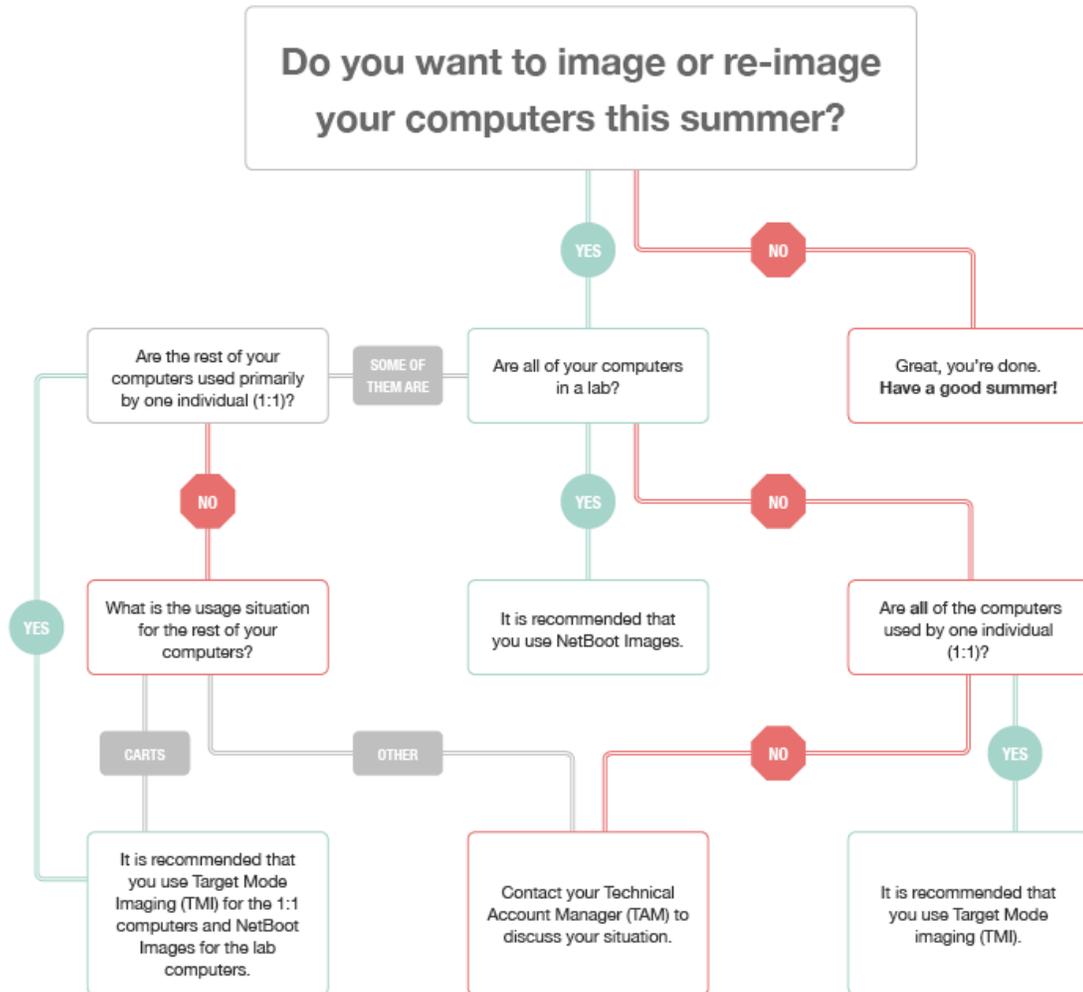
Target Mode Imaging

Target Mode Imaging (TMI) allows you to image multiple computers consecutively by connecting them to a host computer using a FireWire or Thunderbolt cable. This can be ideal when using a network connection is not optimal.

To use TMI, you run Casper Imaging on a host computer. Then you boot the computers being imaged (target computers) to target disk mode and connect them to the host computer.

This section provides a basic, best practice workflow for imaging computers by using TMI.

Best practices for TMI differ based on the scope of the project. Consider the following when planning your TMI project:

- Number of staff available
- Number of target computers
- Number of host computers available
- Time constraints
  Note: It is recommended that you set up a test environment prior to the project's start date to help estimate how long it will take to complete the project in each unique environment.

Requirements

To use TMI, you need:

- Target computers that support target disk mode
- A host computer with Casper Imaging installed and a FireWire or Thunderbolt port
  Note: It is recommended that you use a dedicated host computer for TMI.
- A configuration with a base image and packages
  If you have not created the configuration or base image yet, see Create a Configuration with a Base Image and Packages for detailed instructions.
- A distribution point
  While you can use a file share distribution point on the network, it is recommended that you use a local distribution point for optimal data transfer speeds. (For detailed instructions, see Create a Local Distribution Point.)
- A Thunderbolt to Thunderbolt cable (recommended) or FireWire cable
- A naming scheme (For more information, see Naming Scheme.)

Before You Begin

The following instructions will help you prepare for imaging.

Note: If asset stickers need to be applied to new computers, consider applying them during the TMI project.

Create a Configuration with a Base Image and Packages

Configurations allow you to quickly specify what needs to be installed and configured on computers during imaging. Configurations can be created using the JAMF Software Server (JSS) or Casper Admin.

Note: It considered best practice to use configurations when imaging computers using TMI. However, if you are not using configurations, click **Show Custom** in Casper Imaging and then use the tabs and options to customize the imaging process.

If you need a base OS image, see [Creating a Minimal Base OS Image](#) for detailed instructions.

Using the JSS to Create a Configuration

1. Log in to the JSS with a web browser.
2. In the top-right corner of the JSS, click **Settings**.
3. Click **Computer Management**.
4. In the "Computer Management" section, click **Configurations**.
5. Use the General payload to configure basic settings for the configuration.
6. Use the Packages, Scripts, Printers, and Directory Bindings payloads to add items to the configuration.
7. Use the Management payload to set or create a management account.
   This ensures that computers imaged with the configuration are managed.
8. Click **Save**.

Using Casper Admin to Create a Configuration

1. Open Casper Admin on the host computer.
2. Select "New Config ".
3. Enter basic configuration information.
4. Click **Save**.
5. Drag packages from the right pane to the configuration in the sidebar.

For more information about Configurations, see "Configurations" in the *Casper Suite Administrator's Guide*.

Create a Local Distribution Point

A local distribution point created on the host computer can greatly increase the efficiency and speed of the imaging process.

1. Create a new folder in the root of the host computer's main hard disk.

2. Open Casper Admin on the host computer.

3. Drag a folder from the host computer into the sidebar of Casper Admin.

4. Select the folder in the sidebar and click **Replicate**.
   Note: The entire distribution point will be replicated to the host computer's drive. Be aware of available space on the drive.

5. When replication to the local folder is complete:

   a. Select "Choose Local Drive" from the **Distribution Point** pop-up menu in Casper Imaging and browse to the Local Distribution Point folder.

   b. Click **Choose**.

6. In the main Casper Imaging window, verify that the **Distribution Point** displays the path to the Local Distribution Point folder.

Naming Scheme

You can use Casper Imaging to specify how to assign names to target computers when imaging computers using TMI.

1. Open Casper Imaging on the host computer.

2. From the **Computer Names** pop-up menu, choose how to assign names to target computers:

   - To be prompted to manually enter a name for each computer, choose "Prompt for Each Computer".

   - To automatically generate names in numerical order, choose "Use Numerical Order". Then enter a starting number, and a prefix and suffix as needed, and click **OK**.

   - To use each computer's MAC Address as the name, choose "Use MAC Address". Then enter a prefix and suffix for the MAC Address as needed and click **OK**.

   - To use each computer's serial number as the name, choose "Use Serial Number". Then enter a prefix and suffix for the serial number as needed and click **OK**.

   - To assign names based on the contents of a CSV file, choose "Upload CSV File" and upload the file. For more information, see Creating a CSV File to Assign Computer Names During Target Mode Imaging.

Imaging Computers

You can use TMI to image a single target computer or multiple target comp uters consecutively.

Image a Single Target Computer

Imaging a single target computer involves the following steps:

1. Prepare the host computer.
2. Image the target computer.

Step 1: Prepare the Host Computer

1. Ensure no computers are connected to the host computer.
2. On the host computer, open Casper Imaging and authenticate locally.
3. Authenticate to the JSS when prompted.
4. Choose "Target Mode Imaging" from the **Target Drive** pop-up menu.
5. Choose the naming scheme from the **Computer Names** pop-up menu.
6. Choose a configuration from the **Configuration** pop-up menu.
7. Choose the distribution point from the **Distribution Point** pop-up menu.
8. From the **Computers Will Check In with JSS** pop-up menu, choose the approximate amount of time until computers check in with the JSS.
   Select a larger value if you are unsure how long it will take for the computers to get an internet connection and check in with the JSS. If the enrollment window expires, computers will need to be enrolled in the JSS using a different method.

Step 2: Image the Target Computer

1. Verify the settings are correct in Casper Imaging and click **Start** .
   Warning: Casper Imaging begins to look for connected computers at this point.
2. Boot a target computer to target disk mode.
   To do this, turn on the computer and immediately press and hold down the T key until a FireWire or Thunderbolt symbol is displayed.
3. Use a FireWire or Thunderbolt cable to connect the target computer to the host computer, and then click **OK** if prompted.
   The imaging process starts immediately.
   If configured to prompt for computer name, Casper Imaging prompts for the new computer name.
4. When the imaging process is complete, disconnect the target computer.
   The target computer will attempt to connect to the JSS at startup and then every 5 minutes until it successfully enrolls the computer.

Image Multiple Target Computers

You can use TMI to image multiple target computers. The imaging station method is ideal for environments in which the target computers are easily moved. The mobile host computer method is intended for environments in which a portable computer can be used as the host computer and carried to each target computer.

Regardless of which method you use, imaging multiple target computers involves the following steps:

1. Prepare the host computer.
2. Image the target computers.

Imaging Station Method

If the target computers are able to be moved easily, it is possible to set up one or more imaging stations to perform the TMI process. In addition, multiple imaging stations can be implemented if multiple staff members are available.

Note: To avoid network strain, it is recommended that you use a local distribution point when using multiple imaging stations. (For detailed instructions on how to create a local distribution point, see [Creating a Local Distribution Point](#).)

Step 1: Prepare the Host Computer

1. Set up a dedicated table for the host computer (the imaging station).
2. Ensure no computers are connected to the host computer.
3. On the host computer, open Casper Imaging and authenticate locally.
4. Authenticate to the JSS when prompted.
5. Choose "Target Mode Imaging" from the **Target Drive** pop-up menu.
6. Choose the naming scheme from the **Computer Names** pop-up menu.
7. Choose a configuration from the **Configuration** pop-up menu.
8. Choose the distribution point from the **Distribution Point** pop-up menu.
9. From the **Computers Will Check In with JSS** pop-up menu, choose the approximate amount of time until computers will check in with the JSS.
   Select a larger value if you are unsure how long it will take for the computers to get an Internet connection and check in with the JSS. If the enrollment window expires, computers will need to be enrolled in the JSS using a different method.

Step 2: Image the Target Computers

1. Bring the target computers to the table.

2. Boot a target computer to target disk mode.
   To do this, turn on the computer and immediately press and hold down the T key.

3. Use a FireWire or Thunderbolt cable to connect the target computer to the host computer, and then click **OK** if prompted.
   The imaging process starts immediately.

4. When the imaging process is complete, disconnect the target computer.
   The target computer will attempt to connect to the JSS at startup and then every 5 minutes until it successfully enrolls the computer.

5. Proceed to image target computers in assembly line fashion by repeating steps 2–4, and then returning the target computer to the desired location (either boxes for storage or to a physical location).

Mobile Host Computer Method

If it is more practical to leave the target computers in place, a portable computer can be used as the host computer and carried to each target computer.

Multiple host computers can be in used in this scenario.

Warning: Leave the host computer plugged in to a power source for the duration of this procedure. Imaging is a power intensive process, and a power failure during the TMI process may cause data loss.

Step 1: Prepare the Host Computer

1. Set up the host computer on a portable computer.

2. Ensure no computers are connected to the host computer.

3. On the host computer, open Casper Imaging and authenticate locally.

4. Authenticate to the JSS when prompted.

5. Choose "Target Mode Imaging" from the **Target Drive** pop-up menu.

6. Choose the naming scheme from the **Computer Names** pop-up menu.

7. Choose a configuration from the **Configuration** pop-up menu.

8. Choose the distribution point from the **Distribution Point** pop-up menu.

9. From the **Computers Will Check In with JSS** pop-up menu, choose the approximate amount of time until computers check in with the JSS.
   Select a larger value if you are unsure how long it will take for the computers to get an Internet connection and check in with the JSS.

Step 2: Image the Target Computers

1. Boot a target computer to target disk mode.
   To do this, turn on the computer and immediately press and hold down the T key.

2. Use a FireWire or Thunderbolt cable to connect the target computer to the host computer, and then click **OK** if prompted.
   The imaging process starts immediately.

3. When the imaging process is complete, disconnect the target computer.
   The target computer will attempt to connect to the JSS at startup and then every 5 minutes until it successfully enrolls the computer.

4. Move the host computer to each target computer and repeat steps 1–3.

Post-imaging Enrollment

After target computers have been imaged, they can be stored or turned on.

If the computers are stored immediately, they are not enrolled with the JSS until the next time they are turned on. Any issues enrolling computers with the JSS will not be discovered until the day of the rollout, and must be resolved at that time. This method completes the TMI process in the fastest time.

If the computers are immediately turned on, they are automatically enrolled with the JSS and successful enrollment can be verified. Using this method, it is possible to verify that the computers are fully prepared for the rollout day.

Troubleshooting

Target computers not detected by Casper Imaging

If target computers are not detected during the "Searching for Computers" phase:

1. Verify that both ports are Thunderbolt-capable.
   - The label on the port should be the Thunderbolt symbol (lightning bolt).
   - Use the System Information to determine if the computer is Thunderbolt-capable.

2. Unplug the Thunderbolt cable from the target computer, wait 10 seconds, and then re-insert the cable.

   Note: A variety of issues may occur if imaging is done on multiple target computers in succession using a single host computer. Regularly scheduled reboots after imaging 2-5 target computers can help resolve imaging issues that arise. The number of target computers that can be imaged between reboots can vary based on the host computer.

Packages missing from the imaged computer

If packages are missing or don't deploy during imaging:

1. Verify the packages are listed on the sidebar of Casper Imaging prior to clicking "Image".

2. To determine whether a specific package is causing the issue: Deploy the package to a test computer that is not part of the imaging process and ensure the intended results are achieved.

3. Use the JSS to check the Casper Imaging logs for the target computer. For more information, see "Viewing Casper Imaging Logs for a Computer" in the *Casper Suite Administrator's Guide*.

Casper Imaging Debug Mode

If you are not able to resolve TMI issues, put Casper Imaging into full debug mode and contact your Technical Account Manager (TAM). Putting Casper Imaging into debug mode will help your TAM identify the issue. To put Casper Imaging into full debug mode, execute the following command on the host computer and then reopen Casper Imaging:

```
sudo touch /Applications/Casper\ Suite/Casper\ Imaging.app/Contents/Support
/debug
```

When full debug is enabled in this way, a log is created on the target computer. This log can be found in the following location:

```
/Library/Logs/JAMF/ImagingScripts.log
```

A debug log is also created on the host computer running Casper Imaging. This log can be found in the following location:

```
~/Library/Logs/JAMF/CasperImagingDebug.log
```

Logs and any screenshots of the issue are also helpful. From the target computer, the logs to provide are:

- `/var/log/system.log`
- `/var/log/jamf.log`
- `/var/log/install.log`

From the JAMF Software Server, the log to provide is:

```
/path/to/jss/logs/JAMFSoftwareServer.log
```

NetBoot Images

This section provides a basic, best practice workflow for imaging computers by using NetBoot images. The workflow involves the following steps:

1. Determine which NetBoot images you need to create.

2. Create clean base OS images.

3. Create the NetBoot images.

4. Upload the NetBoot images.

5. (Optional) Create configurations.

6. Boot the target computers to a NetBoot image.

7. Image a computer.

8. Set up Autorun imaging.

Requirements

To image computers by using a NetBoot image, you need:

- A NetBoot server. The server can be one of the following:

  - A server with OS X Server installed and access to OS X Server's NetInstall service (recommended)
  - A Linux server with the [NetBoot/SUS Appliance](#) (Net/SUS) installed

  It is recommended but not required that the server be a dedicated NetBoot server.

- A tool for creating NetBoot images. The tool can be one of the following:

  - [Casper NetInstall Creator](#)
  - [AutoCasperNBI](#)

- A host computer with Casper Imaging installed
  The "host" computer is the computer on which you plan to create the NetBoot image.

- The target computers

- A network switch
  A gigabit network switch is recommended but not required.

- Network cables (one for the server and one for each computer)

- A Thunderbolt to Ethernet or USB to Ethernet adapter for computers that do not have built-in Ethernet ports

Step 1: Determine Which NetBoot Images to Create

The number and type of NetBoot images you create depends on the OS X models in your environment. Typically, a NetBoot image must be created on hardware that matches the target computer. Additionally, each OS X model supports a different range of OS X versions, so you need to make sure that the version in the NetBoot image is supported on the target hardware.

To start, create an advanced search that lets you view the OS X models in your environment. Then, use the information in the System Requirements section to determine which OS X versions are supported on that hardware and then how many NetBoot images you need to create.

Viewing the OS X Models in Your Environment

1. Log in to the JAMF Software Server (JSS) with a web browser.
2. Click **Computers** at the top of the page.
3. Click **Search Inventory**.
4. Click **New**.
5. To save the search, select the **Save this Search** checkbox.
6. Enter "Device Models and Years" in the **Display Name** field.
7. Click the **Display** tab.
8. Click **Hardware** and then select **Model**.
9. Click **Save**.
10. Click **View** to view the search results.
11. Sort the results by model by clicking the Model column heading.

System Requirements

Use the information in this section to determine which OS X versions are supported on the OS X models in your environment.

Note: The information in this section may not cover every computer in your environment. For a more comprehensive list, see the Mac OS X Versions (Builds) for Computers article from Apple.

iMac

iMac Year	Minimum Supported OS	Maximum Supported OS
Late 2012	OS X v10.8.2	OS X v10.11.x
Early 2013	OS X v10.8.2	OS X v10.11.x
Late 2013	OS X v10.8.4	OS X v10.11.x

iMac Year	Minimum Supported OS	Maximum Supported OS
Mid-2014	OS X v10.9.3	OS X v10.11.x

MacBook Air

MacBook Air Year	Minimum Supported OS	Maximum Supported OS
Mid-2009	OS X v10.5.6	OS X v10.11.x
Late 2010	OS X v10.6.4	OS X v10.11.x
Mid-2011	OS X v10.7	OS X v10.11.x
Mid-2012	OS X v10.7.4	OS X v10.11.x
Mid-2013	OS X v10.8.4	OS X v10.11.x
Early 2014	OS X v10.9.2	OS X v10.11.x

MacBook Pro

MacBook Pro Year	Minimum Supported OS	Maximum Supported OS
Mid-2012	OS X v10.7.3	OS X v10.11.x
Early 2013	OS X v10.8.2	OS X v10.11.x
Late 2013	OS X v10.9	OS X v10.11.x

Mac Mini

Mac Mini Year	Minimum Supported OS	Maximum Supported OS
Early 2009	OS X v10.5.6	OS X v10.11.x
Late 2009	OS X v10.6	OS X v10.11.x
Mid-2010	OS X v10.6.4	OS X v10.11.x
Mid-2011	OS X v10.7	OS X v10.11.x
Late 2012	OS X v10.8.2	OS X v10.11.x

Step 2: Create Clean Base OS Images

Now that you know what NetBoot images you need to create, create a clean base OS image for each one. For instructions, see the [Creating a Minimal Base OS Image](#) Knowledge Base article.

Step 3: Create the NetBoot Images

The procedure for creating a NetBoot image differs depending on the tool. Follow the procedure for the tool you are using.

Using the Casper NetInstall Image Creator

To avoid complications with server-to-client compatibility, create the NetBoot image on the server that will host the image. The NetBoot image must be created with an operating system that is running the same or later version than the operating system used to image client computers.

1. Download the Casper NetInstall Image Creator from JAMF Nation.
2. Follow the instructions in the Creating a NetBoot Image and Setting Up a NetBoot Server Knowledge Base article.

Using the AutoCasperNBI

The NetBoot image can be created on any OS X computer, regardless of version.

1. Download AutoCasperNBI from macmule.
2. Open AutoCasperNBI.app.
   Note: This requires administrator credentials for the computer or server.
3. Select the OS.dmg.
4. Select Casper Imaging.app.
5. Enter the JSS URL. For example, "https://jss.mycompany.com:8443/" (excluding the quotation marks).
6. Enter a name for the NetBoot image.
   It is recommended that you include the version number of the operating system in the name.
   Important: (NetBoot/SUS only) Do not use spaces in the name as they can break the imaging process in the NetBoot/SUS Appliance.

Step 4: Upload the NetBoot Images

The procedure for uploading a NetBoot image differs depending on the tool. Follow the procedure for the tool you are using.

For NetInstall

1. From the NetBoot server, put the NetBoot image in `/Library/NetBoot/NetBootSP0/`.
2. Turn on the NetInstall service in Server.app.
3. Ensure that a green status icon is displayed next to the NetBoot image in the NetInstall pane, indicating that the image is available for deployment.

For NetBoot/SUS Appliance

1. Log into the Net/SUS server web application.
   The default credentials are:
   Username: webadmin
   Password: webadmin
   Note: It is recommended that you change the default credentials for better security.

2. Click **NetBoot Server**.
   On a smartphone or iPod touch, this option is in the pop-up menu.

3. Click **Upload Net Boot Image**.
   This connects you to the SMB share where NetBoot images are stored.

4. Enter credentials to the share and click **Connect**.
   The default credentials are:
   Username: smbuser
   Password: smbuser
   Note: It is recommended that you change the default credentials for better security.

5. Copy the NetBoot image to the SMB share.
   Important: The name of the folder cannot contain any spaces.

6. Return to the NetBoot/SUS server web application and refresh the page.

7. Choose the NetBoot image from the pop-up menu.

8. Choose subnets for the NetBoot image by entering a subnet and a netmask. Then click **Add Subnet**.

9. Click **Enable NetBoot**.
   A green status icon is displayed next to the NetBoot image in the NetInstall pane.
   If a red status icon is displayed, do one of the following:

   - Ensure you are using the subnet that includes the NetBoot server. (For more information, see http://www.subnet-calculator.com.)

   - Ensure there are no spaces in the NetBoot image filename.

Step 5: (Optional) Create Configurations

Configurations give you a quick way to specify what should be installed and configured on computers during imaging. Using configurations can speed up the imaging process. For more information, see "Configurations" in the *Casper Suite Administrator's Guide*.

Step 6: Boot the Target Computers to a NetBoot Image

The NetBoot server must be on the same subnet as the target computers. For information about booting computers across subnets, see the OS X Server: How to Use NetBoot Across Subnets article from Apple.

This section explains two ways to boot to a NetBoot image: manually and using a policy. The manual method is useful for testing purposes, and testing is recommended before deploying a policy that boots all computers to the NetBoot image.

Note: If you are booting an OS X v10.11 computer to a NetBoot image, the computer must first trust the NetBoot server. For more information, see the Booting OS X v10.11 or Later Computers to a NetBoot Image Using a Policy or Casper Remote Knowledge Base article.

Manually Booting a Computer to a NetBoot Image

1. From the target computer, navigate to **Apple menu > System Preferences**.

2. Click **Startup Disk**.

3. Select the NetBoot image.
   Note: Hover over the NetBoot image to view its IP address.

4. Click **Restart**.

Using a Policy to Boot Computers to a NetBoot Image

1. Log in to the JSS with a web browser.

2. Add the NetBoot server to the JSS by doing the following:

   a. In the top-right corner of the page, click **Settings**.

   b. Click **Computer Management**.

   c. In the "Computer Management-Server Infrastructure" section, click **NetBoot Servers**.

   d. Click **New**.

   e. Configure the settings on the pane, making sure to choose "Use default image" from the **NetBoot Image** pop-up menu.

   f. Click **Save**.

3. Click **Computers** at the top of the page.

4. Click **Policies**.

5. Click **New**.

6. Use the General payload to configure basic settings for the policy, including the trigger and execution frequency.

7. Select the Restart Options payload , and choose "Restart immediately" from the **No Users Logged In Action** or **User Logged In Action** pop-up menu.

8. Choose the server that is hosting the NetBoot image from the **Boot Computers To** pop-up menu.

9. Click the **Scope** tab and specify the computers you want to boot to the NetBoot image.

10. Click **Save**.

Step 7: Image a Computer

1. From the target computer, open Casper Imaging.

2. Modify the basic imaging settings as needed.

3. Click **Image**.

Step 8: (Optional) Set Up Autorun Imaging

Automating the imaging process can be helpful in certain environments, such as a lab environment. With Autorun imaging, you can store imaging settings in the JSS so you don't have to configure them at imaging time and also fully automate the imaging process. For detailed information about setting up and using Autorun imaging, see "Autorun Imaging" in the _Casper Suite Administrator's Guide_.

Troubleshooting

Target computers not booting to the NetBoot image

If target computers are not booting to the NetBoot image:

1. Identify where the failure occurred.

2. Boot the target computer in verbose mode.

   - Hold down Command-V.

   - Additional messaging will display on the computer screen at startup and help to identify the failure.

3. Ensure the server and client(s) are on the same subnet range.

4. Isolate your server and client(s) to a private network on a dumb switch.

5. Recreate the NetBoot image.

Computers failing to block copy

If block copying of the base OS fails, is skipped, or Casper Imaging begins "Installing Base OS":

Create a base operating system using a different method. For more information, see the OS X Server: Diskless NetBoot troubleshooting article from Apple.

Casper Imaging Debug Mode

If a computer does not finish imaging, put Casper Imaging into full debug mode and contact your Technical Account Manager (TAM). Putting Casper Imaging into debug mode will help your TAM identify the issue. To put Casper Imaging into full debug mode, execute the following command when creating the NetBoot image:

```
sudo touch /Applications/Casper\ Suite/Casper\ Imaging.app/Contents/Support
/debug
```

When full debug is enabled in this way, a log is created on the target computer. This log can be found in the following location:

`/Library/Logs/JAMF/ImagingScripts.log`

A debug log is also created on the host computer running Casper Imaging. This log can be found in the following location:

`~/Library/Logs/JAMF/CasperImagingDebug.log`

Logs and any screenshots of the issue are also helpful. From the target computer, the logs to provide are:

- `/var/log/system.log`
- `/var/log/jamf.log`
- `/var/log/install.log`

From the JAMF Software Server, the log to provide is:

`/path/to/jss/logs/JAMFSoftwareServer.log`

Additional Resources

See the following documentation for more information about NetBoot-related concepts and procedures:

- *Casper Suite Administrator's Guide*
- *NetBoot/SUS Server User Guide*
- Automating the Imaging Process Knowledge Base article

- [Booting OS X v10.11 or Later Computers to a NetBoot Image Using a Policy or Casper Remote](#) Knowledge Base article

- Apple's [How Many NetBoot Clients Can Connect to a Server](#) Knowledge Base article

- Apple's [NetBoot clients cannot start up from the server](#) Knowledge Base article