How to Configure Auto-install on Managed Switches

Table of Contents

Concepts

Auto Install is a software feature that provides for the configuration of a switch automatically when the device is initialized and no configuration file is found on the switch. The downloaded configuration file is not distributed across a stack. When an administrator saves configuration, the config file is distributed across a stack. The Auto Install process requires DHCP to be enabled by default in order for it to be completed. The downloaded config file is not automatically saved to startup-config. An administrator must explicitly issue a save request in order to save the configuration. The Auto Install process depends on the configuration of other devices in the network, including a DHCP or BOOTP server, a TFTP server and, if necessary, a DNS server. There are three phases to Auto Install:

1. Configuration or assignment of an IP address for the device.
2. Assignment of a TFTP server.
3. Obtaining a configuration file for the device from the TFTP server.

Components

The following requirements are needed when using this guide for implementation:

Product	Model/Release	Version
NETGEAR Fully Managed Switch	GSM/XSM Series	GSM series firmware version 7.x and above XSM series firmware version 8.x and above

Configuration Steps

Switch IP Address Assignment

If BOOTP or DHCP is enabled on the switch and an IP address has not been assigned, the switch issues requests for an IP address assignment. The behavior of BOOTP or DHCP with respect to IP address assignment is unchanged by the addition of the Auto Install feature. That is, the following information returned from the server is recognized.

- The IP address (yiaddr) and subnet mask (option 1) to be assigned to the switch
- The IP address of a default gateway (option 3), if needed for IP communication. Some network configurations require the specification of a default gateway through which some IP communication can occur. The default gateway is specified by Option 3 of a BOOTP or DHCP response.

After an IP address is assigned to the switch, if a host name is not already assigned, then Auto Install issues a DNS request for the corresponding host name. This host name is also displayed as the CLI prompt the same as if the hostname command was used.

TFTP IP Address and the Configuration File Name

The following information is also processed, any of which can be returned by a BOOTP or DHCP server:

- The name of the configuration file (bootfile or option 67) to be downloaded from the TFTP server.
- The identification of the TFTP server from which to obtain the bootfile. This is given by any of the following fields:
  - The host name of the TFTP server (option 66 or sname). Either the TFTP address or name is specified, not both, in most network configurations. If a TFTP host name is given, a DNS server is required to translate the name to an IP address.
  - The IP address of the TFTP server (option 150).
  - The address of the TFTP server (siaddr) to be used for Auto Install requests.

No configuration assigned by BOOTP or DHCP is saved in startup-config.

Handling Conflicting TFTP Server Configurations

The TFTP server IP address can be deduced from the multiple sources. It is selected from one of the following fields, listed from the highest priority to the lowest:

- The sname field of a DHCP or BOOTP reply.
- The TFTP server name (option 66) of a DHCP reply.
- The TFTP server address (option 150) field of a DHCP reply.
- The siaddr field of a DHCP or BOOTP reply.The TFTP server IP address can be deduced from the multiple sources. It is selected from one of the following fields, listed from the highest priority to the lowest:

DNS Server Requirements

A DNS server is needed to resolve the IP address of the TFTP server only if the sname or option 66 values are used.

Obtaining a Config File

After obtaining IP addresses for both the switch and the TFTP server, the Auto Install process attempts to download a configuration file. A host-specific configuration file is downloaded, if possible. Otherwise, a network configuration file is used as a bridge to get the final configuration. The methods are described in the following sections.

Host-Specific Configuration File

The switch attempts to download a host-specific configuration file if a bootfile name was specified by the DHCP or BOOTP server. The switch makes three unicast TFTP requests for the specified bootfile. If the unicast attempts fail, or if a TFTP server address was not provided, Auto Install process stops. No Broadcast attempts are made.

Note: The bootfile is required to have a file type of *.cfg. The bootfile cannot have the following names: fastpath.cfg, startup-config and hpc_broad.cfg. These are reserved.

Default Network Configuration File

Attempts are made to download a default network configuration file with the name fp-net.cfg if the specified bootfile cannot be found, a failure occurs in the download, or the switch was not provided a specific bootfile name by the DHCP server. The switch issues TFTP requests for a network configuration file in the same manner as it attempts to download a host-specific configuration file.

The default network configuration file should have IP address to host-name mappings using the command ip host <hostname> <address>. If the default network configuration file does not contain the switch IP address, the switch uses DNS to attempt to resolve its host name.

A sample fp-net.cfg file follows:

```
config
...
ip host switch_to_setup 192.168.1.10
ip host another_switch 192.168.1.11
... <other hostname definitions>
exit
```

Once a host name has been determined, the switch then issues a TFTP request for a file named **<hostname>.cfg** file, where <hostname> is the first eight characters of the switch's host name. If the switch is unable to map its IP address to a host name, Auto Install sends TFTP requests for the default configuration file host.cfg. The following table summarizes the config files that can be downloaded, and the order in which they are sought.

Order Sought	File Name	Description	Final File Sought
1	`<bootfile>.cfg`	Host-specific config file, ending in a *.cfg file extension	Yes
2	`fp-net.cfg`	Default network config file	No
3	`<hostname>.cfg`	Host-specific config file, associated with host name	Yes
4	`host.cfg`	Default config file	Yes

The following table displays the determining factors for issuing unicast TFTP requests.

TFTP Server Address Available	Host-Specific Router Config File Name Available	TFTP Request Method
Yes	Yes	Issue a unicast request for the host-specific router config file to the TFTP server.
Yes	No	Issue a unicast request for a default network or router config file to the TFTP server.

Monitoring and Completing the Auto Install Process

Upon boot-up in the absence of a saved config file, a message displays on the console stating that the Auto Install procedure is beginning. A message subsequently displays when Auto Install is complete. The message also indicates that configuration must be saved to avoid performing Auto Install on the next reboot.

When Auto Install has been successfully completed, the messages are in buffered log, not on the console. You can execute a show running-config command to validate the contents of configuration. You must be logged in as administrator.

Saving Configuration

An administrator must explicitly save the downloaded configuration in nonvolatile memory so that the configuration will be available on the next reboot. If you are using the CLI, first make sure the configuration is correct, then issue a copy running-config startup-config command.

Host-Specific Config File Not Found

If the Auto Install process fails to download any configuration file, a message is logged. If a "final" configuration file is not downloaded, as described above, the entire process continues every 10 minutes.

Terminating the Auto Install Process

You can terminate the Auto Install process at any time prior to the downloading of the config file. This is most optimally done when the switch is disconnected from the network, or if the requisite configuration files have not been configured on TFTP servers. Termination of the Auto Install process ends further periodic requests for a host-specific file.

Managing Downloaded Config Files

The configuration files downloaded through Auto Install are stored in the nonvolatile memory. The files can be managed (viewed, displayed, deleted) along with files downloaded through the configuration scripting utility. A file is not automatically deleted after it is downloaded. However, the file does not take effect upon a reboot. If you opt to save the config file, the saved configuration takes effect upon reboot. If you do not opt to save the config file, the Auto Install process occurs again on a subsequent reboot. This might result in a previously downloaded files being overwritten.

Restarting the Auto Install Process

The Auto Install process is automatically started on a subsequent reboot if the configuration file is not found on the switch. This can occur if configuration has not ever been saved on the switch, or if the administrator has issued a command to erase the configuration file.

During a particular session, the Auto Install process can be restarted if the administrator has previously stopped the Auto Install process, and then chooses to restart it. This action re-initiates the process for this login session only. NETGEAR recommends that this action be performed only when the administrator is certain that configuration is clear in order to have predictable results.

Reinitialization of the switch after a clear config automatically activates the Auto Install process if there is no configuration file stored on the switch.

Logging

A message is logged for each of the following events:

- The Auto Install component receiving a config file name and other options upon resolving an IP address by DHCP or BOOTP client. The boot option values are logged.
- The Auto Install component initiating a TFTP request for a boot (config) file, receiving the file, or timing out of that request. File names and server IP addresses and host names are logged.
- The Auto Install component initiating a request for a host name. The IP address and resolved hostname are logged.
- The Auto Install component initiating a TFTP request for a <hostname>.cfg file, receiving the file, or timing out of that request. File names and server IP addresses and host names are logged.
- The beginning of applying a config script.
- The failure of the CLI scripting utility to apply a config file.
- The completion of AutoInstall.
- A conflict in the name of a config file to be downloaded with a reserved config file name.

Auto Install Configuration

Stacking

The downloaded configuration file is not distributed across a stack. When an administrator saves configuration, the config file is distributed across a stack.
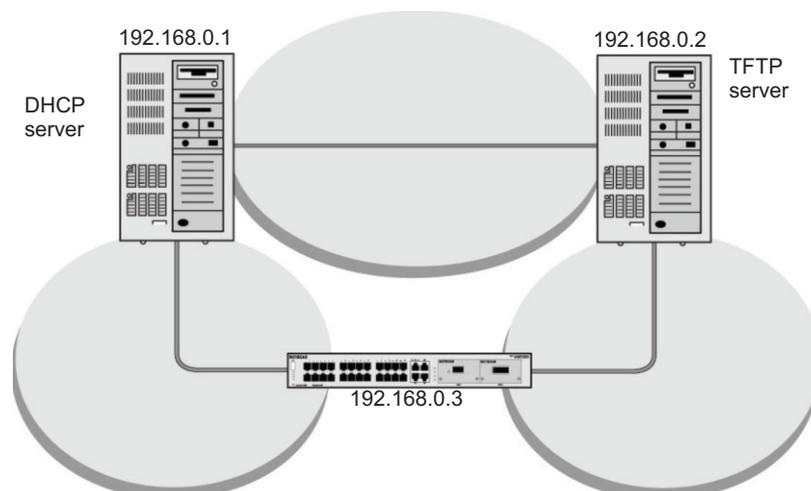
Figure 1. Configuration File Distrubuted across a Stack

DHCP Server Configuration

The following information is configured on the DHCP or BOOTP server:

- The IP address (yiaddr) and subnet mask (option1)
- The name of the configuration file (bootfile or option 67)
- The IP address of the TFTP server (option 150)

TFTP Server Configuration

The configuration file is on the TFTP server (for example, switch.cfg).

CLI: Switch Configuration

1. Have the configuration file saved after download from the TFTP server.

   ```
   (Netgear Switch) #boot autoinstall auto-save

   (Netgear Switch) #boot autoinstall start
   ```

   Autoinstall starts and waits for the boot options from the DHCP server.

   ```
   (Netgear Switch) #network protocol dhcp

   Changing protocol mode will reset ip configuration.

   Are you sure you want to continue? (y/n)y
   ```

2. Request an IP address, configuration file name, and TFTP IP address from the DHCP server.

   ```
   (Netgear Switch) #

   Config file 'startup-config' created successfully.
   ```

   AutoInstalled configuration is saved.

   ```
   (GSM7224P) #show autoinstall
   AutoInstall Mode.............................. Stopped
   AutoInstall Persistent Mode................... Enabled
   AutoSave Mode................................. Disabled
   AutoInstall Retry Count....................... 3
   AutoInstall State............................. AutoInstall is completed.
   ```

   Autoinstall is now completed.

Web Interface

To use the Web interface to configure the Auto Install:

1. From the main menu, select Maintenance > Save Config >Auto Install Configuration. A screen similar to the following displays.
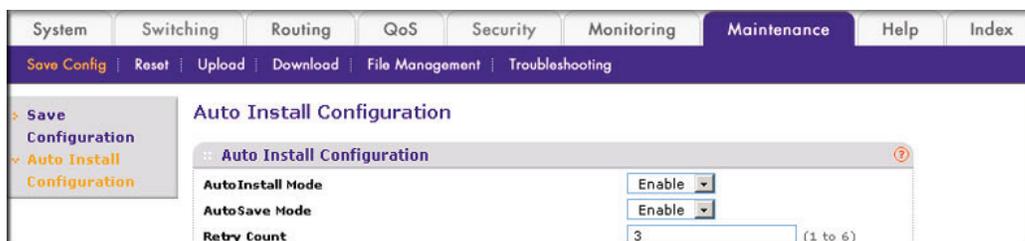
2. Select Start in the AutoInstall Mode field.

3. Select Enable in the AutoSave Mode field.

4. Click Apply.

Conclusion

Automatic configuration with DHCP and BootP Auto Install eases large deployments with scalable configuration file management capability, IP address and host name mapping, and provides individual configuration files to multiple switches as soon as they are initialized on the network. For instance, factory-default configuration settings can be changed for GSM7xxxS series rear I/O bays – reverting them to Ethernet mode instead of Stacking mode when deployed in standalone applications. Auto-install is a pragmatic, scalable solution for accelerating out-of-the-box provisioning and deployment processes.

NETGEAR®
Connect with Innovation™