# Cisco Smart Install Configuration Guide

October 2012

# C O N T E N T S

# Preface

## Purpose

This guide provides procedures for using the commands that have been created for using Smart Install. For information about other standard Cisco IOS Release 12.2 commands or Cisco IOS Release 15.0, see the Cisco IOS documentation set available from the Cisco.com home page at Products & Services > Cisco IOS and NX OS Software> Cisco IOS.

This guide does not describe system messages you might encounter or how to install your device. For more information, see the system message guide and the hardware installation guide for the device.

For documentation updates, and other late information, see the release notes for the specific device for this release.

## Conventions

This publication uses these conventions to convey instructions and information:

Command descriptions use these conventions:

- Commands and keywords are in **boldface** text.
- Arguments for which you supply values are in *italic*.
- Square brackets ([ ]) mean optional elements.
- Braces ({ }) group required choices, and vertical bars ( | ) separate the alternative elements.
- Braces and vertical bars within square brackets ([{ | }]) mean a required choice within an optional element.

Interactive examples use these conventions:

- Terminal sessions and system displays are in `screen` font.
- Information you enter is in `boldface screen` font.
- Nonprinting characters, such as passwords or tabs, are in angle brackets (< >).

Notes and cautions use these conventions and symbols:

> **Note** Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

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**Caution**     Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

# Related Publications

- Catalyst 6500 Supervisor Engine 2T-10GE

  http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html

- Catalyst 3750-X

  http://www.cisco.com/en/US/products/ps10745/tsd_products_support_series_home.html

- Catalyst 3560-X

  http://www.cisco.com/en/US/products/ps10744/tsd_products_support_series_home.html

- Catalyst 3750-E

  http://www.cisco.com/en/US/products/ps7077/tsd_products_support_series_home.html

- Catalyst 3560-E

  http://www.cisco.com/en/US/products/ps7078/tsd_products_support_series_home.html

- Catalyst 3750

  http://www.cisco.com/en/US/products/hw/switches/ps5023/tsd_products_support_series_home.html

- Catalyst 3560

  http://www.cisco.com/en/US/products/hw/switches/ps5528/tsd_products_support_series_home.html

- Catalyst 2975

  http://www.cisco.com/en/US/products/ps10081/tsd_products_support_series_home.html

- Catalyst 2960 and Catalyst 2960-S

  http://www.cisco.com/en/US/products/ps6406/tsd_products_support_series_home.html

- Etherswitch Network Modules

  https://www.cisco.com/en/US/docs/ios/lanswitch/configuration/guide/lsw_enet_switch_net_external_docbase_0900e4b18090920b_4container_external_docbase_0900e4b18096f791.html

# Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.

**C H A P T E R** 1

# Smart Install Description

Smart Install is a plug-and-play configuration and image-management feature that provides zero-touch deployment for new switches. This means that a customer can ship a switch to a location, place it in the network and power it on with no configuration required on the device.

- Overview, page 1-1
- DHCP and Smart Install, page 1-9
- Adding a Client Switch to the Network, page 1-10
- Backing Up the Client Configuration, page 1-11
- Upgrading Client Switches, page 1-13
- Connecting to a Client Switch, page 1-14
- Smart Install Guidelines and Recommendations, page 1-14

## Overview

A network using Smart Install includes a group of networking devices, known as clients, that are served by a common Layer 3 switch or router that acts as a director. The director provides a single management point for images and configuration of client switches. When a client switch is first installed into the network, the director automatically detects the new switch, and identifies the correct Cisco IOS image and the configuration file for downloading. It can allocate an IP address and host name to a client. If a standalone switch in the network is replaced by another switch of the same SKU, that is a switch with the same product ID, it automatically gets the same configuration and image as the previous one. The director can also perform on-demand configuration and software image updates of a switch or a group of switches in the network.

The director can act as a DHCP and TFTP server and can store the configuration and image files. These files can also be stored on a third party TFTP server for the director to use. The client can download the image and configuration files from the director TFTP server or from a remote server.

> **Note**  The director must be Smart Install capable, that is, it must be a Layer 3 switch running Cisco IOS Release 12.2(52)SE or later for Catalyst 2k and 3k switches, or 15.1(1)SY or later, or a router running Cisco IOS Release 15.1(3)T or later. Clients running Cisco IOS Release 12.2(52)SE or later or 15.1(1)SY or later are Smart Install capable devices. Switches running releases earlier than 12.2(52)SE are not Smart Install capable, but they can be Smart Install clients if they support the **archive download-sw** privileged EXEC command. Smart Install clients can be Layer 2 or Layer 3 switches.

See Appendix A, "Supported Devices for Smart Install" for a list of supported routers and switches, the roles they can play (client or director), and the required software releases. See Appendix B, "Features by Release" for Smart Install features added since the first release and the release introducing each feature.

In a typical Smart Install network, a client switch uses DHCP to get an IP address and the director snoops DHCP messages. For a client to participate in Smart Install zero-touch upgrade, it must use DHCP, and all DHCP communication must pass through the director so that it can snoop all DHCP packets from clients. The most automatic operation is when all switches in the Smart Install network use DHCP and are Smart Install capable. However, any client switch that supports the **archive download-sw** privileged EXEC command to download a software image can be used in a zero-touch Smart Install network. See Appendix A, "Supported Devices for Smart Install" for a complete list of supported routers and switches, the roles they can play (client or director), and the required software releases.

**Note**     A Smart Install network can have only one director.

A client switch can participate in Smart Install even if not directly connected to the director. The Smart Install network supports up to seven hops. Intermediate switches or clients connected to the director through an intermediate switch in a multihop environment can be, but do not have to be, Smart Install capable switches.

Figure 1-1 shows a Smart Install network with external DHCP and TFTP servers. There can be only one director and one TFTP server in any Smart Install network. The director can also serve as the DHCP and TFTP server.

*Figure 1-1          Typical Smart Install Network Diagram*
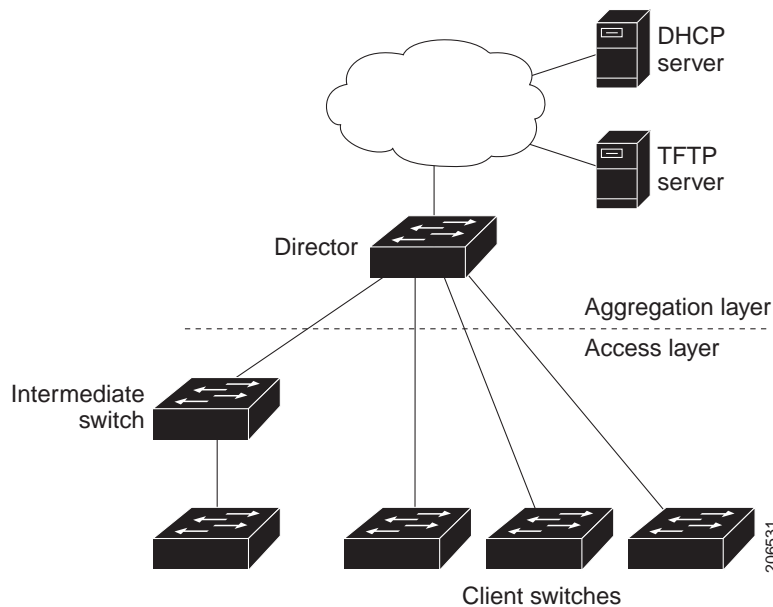


A Smart Install network can be:

*   A network where all client switches are of the same product ID (PID), for example, WS-2960G-48TC-L. In this case, you can identify a default image and a seed or basic configuration to use on all client switches.

- A network that includes switches with different PIDs. In these networks, you can configure switch groups and specify that the same images and seed configuration files are applied to all switches in the group. A group can be based on a predefined PID, or you can create groups based on product ID, MAC address, switch stack number, MAC address, or client switch connectivity to a specific upstream neighbor. When switches in a group are replaced by another switch with the same product ID, the replacement switch receives the same configuration and image.

After a switch has an image and basic configuration, you can configure specific features on individual switches and save the configuration to the startup configuration file.

Switches participating in Smart Install zero-touch upgrades must use DHCP to obtain their IP addresses. DHCP options are used to send:

- the image file name and location
- the TFTP server IP address
- the hostname
- the configuration file name
- the director IP address to the other switches.

When a director is configured and a client joins the Smart Install network, Smart Install is automatically enabled on these devices. Beginning with Cisco IOS Release 12.2(58)SE and 15.1(1)SY, you can disable Smart Install on a device and also shut down its Smart Install TCP ports by entering the **no vstack** global configuration command on the client or director. When Smart Install is disabled on a device, any Smart Install configuration on it remains in the running configuration but does not take effect while Smart Install is disabled. To reenable Smart Install on the device, enter the **vstack** global configuration command.

These sections include more detailed information on Smart Install components:

- Smart Install Director, page 1-3
- Smart Install Clients, page 1-5
- Smart Install Groups, page 1-8

## Smart Install Director

The director in a Smart Install network must be a Layer 3 switch running Cisco IOS release 12.2(52)SE or later for Catalyst 2k and 3k switches, or 15.1(1)SY or later, or a router running Cisco IOS Release 15.1(3)T or later. See Appendix A, "Supported Devices for Smart Install" for a list of routers and switches that can perform the role of Smart Install director. Features supported by the director depend on the running version of software. See Appendix B, "Minimum Cisco IOS Release for Major Features" for more information.

To configure a device as director, enter the IP address of one of its Layer 3 interfaces in the **vstack director** *ip_ address* global configuration command and enable it as director by entering the **vstack basic** command.

> **Note** If you have entered the **no vstack** global configuration command to disable Smart Install on a device, the **vstack director** *ip_ address* and **vstack basic** global configuration commands are not allowed on the device. To reenable Smart Install on a device, enter the **vstack** global configuration command.

When a device is configured as director, DHCP snooping is enabled automatically on VLAN 1, and the director begins building the director database. You can use the **vstack startup-vlan** global configuration command to specify another VLAN that should be used for Smart Install management.

The database lists the client devices in the Smart Install network and includes this information:

- Type of switch (PID) for all switches, including switches in a stack
- MAC addresses for all switches, including switches in a stack
- IP address of the switch or stack
- Hostname
- Network topology including neighbors interfacing with the switch
- Serial number (only Smart Install capable switches)

**Note** When the director is a switch, DHCP snooping is enabled on VLAN 1 by default. It is also enabled on other Smart Install management VLANs that are configured by entering the **vstack vlan** *vlan-range* global configuration command. You can use the **vstack startup-vlan** global configuration command to specify another VLAN that should be used for Smart Install management.

In a Smart Install network that uses DHCP to assign IP addresses, you only need to configure the director. Client switches do not require any configuration. Although you can enter command-line interface commands on clients, configuration commands do not take effect unless the switch assumes the role of director.

There can be only one director for a set of clients and you cannot configure a backup director. If the director fails:

- the director database must be rebuilt.
- any upgrade being performed for a non-Smart Install-capable switch might fail.
- the accumulated download status is lost.
- a configuration backup might not occur before the director restarts.

The director can change status and become a client switch if:

- the director interface that has the director IP address shuts down.
- the director interface that has the director IP address is deleted
- the director IP address is changed.

If the director becomes a client, DHCP snooping is disabled, and the director database is no longer used.

If the director IP address is provided by DHCP and you configure a different director IP address on a client switch, the client is longer part of the director's Smart Install network.

Smart Install relies on a TFTP server to store image and configuration files. The TFTP server can be an external device, or the director can act as a TFTP server. If the director is the TFTP server, the available flash file space on the director must be adequate to accommodate the client Cisco IOS image and configuration files. See the "Configuring the TFTP Server" section on page 2-5.

In a Smart Install network using DHCP, the DHCP server can be an external device or the director can act as the DHCP server. See the "Configuring the DHCP Server" section on page 2-2. The director snoops all DHCP packets that pass through it on VLANs that are configured as Smart Install management VLANs. All network DHCP packets from intermediate or client switches or from an external DHCP server must pass through the director. The director must be able to snoop all DHCP packets from clients.

Overview

**Note** Smart Install options in the DCHP offer are option 125, suboption 5 (the imagelist file), option 125 suboption 16 (the director IP address), and option 67 (the configuration file).

The director builds a topology director database for the network by collecting information from the network Smart Install switches. The director uses the database:

- To assign a configuration file and image to a client.
- As a reference to obtain the PID, the image name, and the configuration file for an on-demand upgrade of network switches.

The director periodically updates the director database based on CDP updates that it receives from neighbor switches and from Smart Install messages sent to the director by Smart install capable clients. The updates contain information about the client neighbors.

## The Imagelist File

An imagelist identifies the images to be loaded on the client. The imagelist file is the file that contains the correct image name for the client. When the director is the TFTP server, this file is stored in flash memory. Otherwise, it is stored in a remote, third-party TFTP server.

- When the file is stored in the director, the prefix for the imagelist is **flash:**// or **usbflash0:**//.
- When the file is stored in a remote TFTP server, the prefix is **tftp:**//*ip_address*/*image*.**tar**.

All images must be stored in the same location on either the director or on the third-party TFTP server.

For a standalone switch, the imagelist file contains a single image. For a stack, the imagelist contains images for all members of the stack, which could be the same image or different images. For a switch stack, the director creates the imagelist file after the user specifies the tar file for each switch in the stack.

Starting with Cisco IOS Release 12.2(55)SE or 15.1(1)SY, when the user specifies the tar file for each switch, the director automatically creates the imagelist file.

## Configuration Files

The director manages these configuration files:

- Startup configuration—The configuration that a client uses when it boots.
- Seed configuration—A configuration on the director that is the basis for the client startup configuration.
- Backup configuration—An exact copy of a client startup configuration stored in the director.

# Smart Install Clients

Client switches have a direct or indirect connection to the director so that they can receive image and configuration downloads from it. A switch becomes a Smart Install client when it is discovered by the director or when the director IP address is configured on the switch manually or through DHCP. Client switches use the director database for image and configuration downloads and receive the image and configuration files from the Smart Install TFTP server.

A client switch can be an intermediate switch connected to another client switch. A client can be a standalone switch or a switch stack.

- Clients that are not Smart Install capable can have images and configuration downloaded by the director but are entered into the director database only if they are connected to a Smart Install capable switch. The director can telnet to the client switch and use the **archive download-sw** privileged EXEC command to download software to the switch. Note that the director must know the client switch password to perform the download.

- Smart Install capable switches can communicate directly with the director to update switch information, can have images and configuration downloaded, and can be managed by the director. A Smart Install capable client with the director IP address and connectivity to the director sends switch and neighbor information to the director by using the Smart Install protocol.

See Appendix A, "Supported Devices for Smart Install" for the required software releases for Smart Install capable switches.

All switches in the network with network connectivity to the director can be clients, whether or not they are Smart Install capable. A client switch needs an IP address for management communication and the director must be able to communicate with that IP address. Client switch IP addresses are assigned by DHCP or statically configured.

Smart Install capable clients send switch and neighbor information to the connected director for the director database. Client switches that are not Smart Install capable or that are not connected to a Smart Install capable switch are not entered into the director database. In a multihop topology, for the director to get the complete topology overview, any client switch upstream of a group of clients must be Smart Install capable. Clients not in the director database can get an on-demand upgrade, but they cannot get a zero-touch or group upgrade.

Figure 1-2 shows some possible ways that clients can be interconnected in a network. Table 1-1 and Table 1-2 show the director database knowledge of each client and the type of upgrade that is supported.

Note    The topology shown in Figure 1-2 does not represent a typical Smart Install topology but is used to demonstrate possible types of client interconnections.

*Figure 1-2        Possible Interconnections of Smart Install Clients*
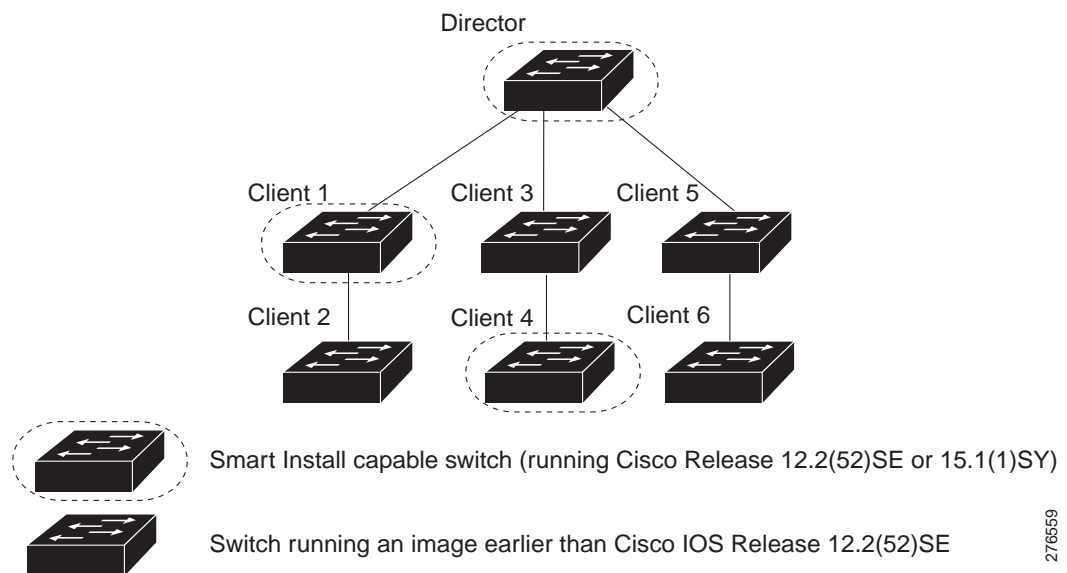
**Note** 15.1(1)SY supports only the Director role.

Table 1-1 shows which of these switches are in the director database and how the director obtained the information. When a client is a single hop from the director, the client uses CDP to send the director information about itself. When a client is a Smart Install capable switch, it sends information to the director about itself and its neighbors.

*Table 1-1        Director Database Contents of Client Switches*

| Client Switch | In Director Database? | Source of Database Information |
|---|---|---|
| Client 1 | Yes | Learned from CDP and from Smart Install. The client also sends information about its neighbor (client 2). |
| Client 2 | Yes | Information received from client1. |
| Client 3 | Yes | Learned from CDP. |
| Client 4 | Yes | Through Smart Install. The client also sends information about its neighbor (client 3). |
| Client 5 | Yes | Learned from CDP. |
| Client 6 | No | No information available. The client is not an immediate neighbor of the director or another Smart Install switch. |

*Table 1-2        Types of Upgrades Supported by Each Client*

| Device | Software Version | Zero-Touch Upgrade | On-Demand Upgrade of Client | On-Demand Upgrade of Group |
|---|---|---|---|---|
| Director | 12.2(52)SE or later or 15.1(1)SY | — | — | — |
| Client 1 | 12.2(52)SE or later | Yes | Yes | Yes |
| Client 2 | Earlier than 12.2(52)SE | Yes | Yes | Yes |
| Client 3 | Earlier than 12.2(52)SE | Yes | Yes | Yes |
| Client 4 | 12.2(52)SE or later | Yes | Yes | Yes |
| Client 5 | Earlier than 12.2(52)SE | Yes | Yes | Yes |
| Client 6 | Earlier than 12.2(52)SE | Yes | Yes | No. Switch not in director database. |

To see the types of Smart Install clients in a network, enter the **show vstack status** privileged EXEC command.

```
Director# show vstack status
SmartInstall:  ENABLED
Status: Device_type Health_status Join-window_status Upgrade_status
Device_type:  S - Smart install N - Non smart install P - Pending
Health_status:  A - Active I - Inactive
Join-window_Status:  a - Allowed  h - On-hold  d - Denied
Image Upgrade:  i - in progress    I - done        X - failed
Config Upgrade: c - in progress    C - done        x - failed
Director Database:
```

```
DevNo   MAC Address       Product-ID         IP_addr           Hostname     Status
=====   ==============    ================   ===============   ==========   =========
0       0018.7363.4200    WS-C3750-24TS      172.20.249.54     IBD-MXD-ST   Director
1       0016.4779.b780    WS-C3750G-24TS     172.20.249.54     IBD-MXD-ST   Director
2       d0d0.fd37.5a80    WS-C3750X-48P      172.20.249.54     IBD-MXD-ST   Director
3       0026.5285.7380    WS-C3750E-24TD     172.20.249.54     IBD-MXD-ST   Director
4       0024.13c6.b580    WS-C3750E-24TD     172.20.249.115    DEV-c6.b5c   S A a
5       0021.a1ab.9b80    WS-C2960-48TC-S    172.20.249.249    DEV-ab.9bc   S A a I C
6       0024.5111.0900    WS-C3750E-24TD     172.20.249.222    DEV-11.094   S A a I C
7       001d.45f3.f600    WS-C3750G-24TS     172.20.249.87     DEV-90.f64   S A a
8       0016.c890.f600    WS-C3750G-24TS     172.20.249.87     DEV-90.f64   S A a
9       001f.2604.8980    WS-C2960-48TC-S    172.20.249.89     DEV-04.89c   S A a I C
10      001b.d576.2500    WS-C3750E-24PD     172.20.249.91     DEV-a6.1cc   S A a I C
```

These fields were added in Cisco IOS Release 12.2(58)SE or 15.1(1)SY to provide more information about each client:

- Device type: S (Smart Install capable, running Cisco IOS release 12.2(52)SE or later or 15.1(1)SY), N (not a Smart Install device), or P (pending, unable to determine)

- Device health status: Active (the director is receiving periodic updates from the device) or Inactive (the device is disconnected or has not provided updates for three consecutive keepalive periods)

- Join window status: a (allowed), h (on hold), or d (denied). See the "Using a Join Window" section on page 1-12.

- Upgrade status: An image upgrade is i (in progress), I (complete), or X (failed). A configuration upgrade is c (in progress), C (complete), or x (failed).

# Smart Install Groups

When all switches in a Smart Install network have the same PID, they can run the same image and the same seed (basic) configuration file. In this case, you can assign a default image and configuration file for all clients. However, if there is more than one PID in the network or if you want a different configuration file to run on some switches, depending on their function in the network, you should configure Smart Install groups and assign an image and configuration file for each group.

- Custom groups take precedence over built-in groups and are based on:

  – Stack group—For switches in a stack, you can configure groups based on their number in the stack. Stack groups are used only for switch stack upgrades, and clients do not need to be in the director database. Starting with Cisco IOS release 12.2(58)SE or 15.1(1)SY, if a stack is homogenous (all one switch type), you do not need to identify each switch type.

  – MAC address—You can create a custom group of specific switches by using the MAC addresses of the switches to configure the group. You can include switches with the same or different product IDs, as long as they use the same image and configuration file. Enter the **show vstack neighbors all** privileged EXEC command to see the MAC addresses of switches in the Smart Install network.

  – Connectivity—You can configure a custom group based on network topology; that is, all switches that have the same upstream neighbor. Connectivity groups take precedence over groups with matching product IDs or stack numbers. Connectivity groups include only standalone switches (not switch stacks), and clients must be in the director database.

  – Product IDs (PIDs)—These product IDs are all supported models, including newer PIDs that were not shipping when the software was released and therefore are not in the CLI. PID groups include only standalone switches (not switch stacks), and clients do not need to be in the director database.

The priority of custom groups from high to low is: stack group, MAC address, connectivity, and product-ID.

- Built-in groups are based on PIDs that you can select from the CLI. These represent the fixed Ethernet switching products that were shipping when the software was released, for example, 3750, 3560, 2975, 2960.

Switches that belong to a group use the image and configuration file assigned to that group. If a client switch does not belong to a group in the director database, it is assigned the default image and configuration file.

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**Note**    If there is more than one switch PID in the network, we recommend configuring built-in or custom groups. The default image and configuration is used in networks with only one product ID.

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An example of the use of custom groups is a network where all client switches are the same PID, but one requires a different configuration. For example, a retail store might have checkout counters and a pharmacy, and the pharmacy switch requires a different configuration. The checkout counters would use the default configuration, but you would create a custom group for the pharmacy.

# DHCP and Smart Install

DHCP is recommended in Smart Install networks and is required for zero-touch upgrades. On-demand upgrades do not require DHCP. In a DHCP network, DHCP snooping is automatically enabled on the director. The director snoops DHCP offers and requests to and from the client switches and uses DHCP snooping to insert the DHCP options used in the Smart Install operation.

However, because DHCP snooping is not supported on routed ports, you should not connect routed ports directly to the client or the director.

A DHCP server in a Smart Install network can be positioned in one of these ways:

- The Smart Install director can act as the DHCP server in the network. When the DHCP offer goes to the client switches, the director allocates the IP addresses and assigns configurations and images and the hostname as DHCP options in the DHCP offer and DHCP acknowledgement. DHCP snooping is automatically turned on for the director.

- The DHCP server can be another device (third-party server) in the Smart Install network. In this case, DHCP packets between the clients and DHCP server must pass through the director.

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**Note**    You can configure a join-window time period so that the director can only modify the DHCP offer and send the image and configuration files to the client during the configured window. The join window restricts Smart Install for a specified period of time and acts as a security precaution to control when a client can receive these files. See the "Using a Join Window" section on page 1-12.

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- A third-party server and the director DHCP server can coexist in a network. In this case, the director is responsible only for the DHCP requests of the switches in the Smart Install network. The director maintains the Smart Install database and pool; other DHCP database functions are maintained by the third-party server.

See the "Configuring the DHCP Server" section on page 2-2 for configuration instructions.

If the Smart Install DHCP server is the director or another device running Cisco IOS and the network reloads, the server might assign new IP addresses to participating switches. If a switch IP address changes, it might no longer be reachable. If the director IP address changes, it is no longer the Smart Install director, which could break the director and client switch relationships. This is an unlikely but possible corner-case occurrence. To prevent this occurrence, you should enable *DHCP remembering* by entering the **ip dhcp remember** global configuration command or the **remember** DHCP-pool configuration command on the DHCP server,

Non Cisco IOS third-party DHCP servers require an IP-address-to-MAC-address binding to ensure that the same IP address is given to a switch on a reload.

**Note**   In Smart Install networks that do not use DHCP, you must manually configure the director IP address on each client switch by entering the **vstack director** *ip-address* global configuration command. Client switches require only the director IP address. Smart Install networks that do not use DHCP cannot support zero-touch upgrades but can support on-demand upgrade.

# Adding a Client Switch to the Network

When a switch arrives from the factory, it contains the factory default image. When it is plugged in and connected to the network and boots up, it tries to get its IP address from DHCP. When a device is added to the network, a notification is sent to the director that a new client has joined. If the switch is connected (directly or indirectly) to the Smart Install director, the director recognizes the new switch through DHCP offers and acknowledgements. The director searches its database to determine if the switch belongs to a configured group. If not, the director determines if the switch matches the Smart Install network default PID. If the director has a configuration for the type of client that was added and if the join window is open, the new client receives the image and configuration files.

**Note**   When clients in a Smart Install network consist of more than one PID, you should configure built-in groups or custom groups based on MAC address, connectivity, stack group, or product-ID, and define the image and configuration files for each group.

If the DHCP server is an external device (not the director), the director does not store the client image and configuration in its database. When an external DHCP server sends image and configuration file information through the director to the client, the DHCP options are not modified. After the director database is updated by Cisco Discovery Protocol (CDP), the director modifies the image and configuration file information and sends the correct image and configuration file to the client.

**Note**   If a join window has been configured, the Smart Install configuration and image files are sent to the client only during the configured time period. A client switch sends an error message if it cannot download an image or configuration file due to misconfiguration, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs beyond the configured time frame. See the "Using a Join Window" section on page 1-12 for more information.

After a switch has been added to the Smart Install network, you can do an on-demand download of an image or configuration file to the client at any time if the switch meets these criteria:

- A switch that is not Smart Install capable must have an enable mode password and a valid IP interface.
- A switch running the Smart Install image must have a valid IP interface.

If a client switch in the Smart-Install network is running Cisco IOS Release 12.2(55)SE or later and is replaced with a switch with the same product ID, the new client receives the same image and configuration as the replaced client. Se the "Replacing a Client Switch" section on page 1-11.

See Chapter 2, "Configuring Cisco Smart Install Devices" for typical configurations.

# Backing Up the Client Configuration

After a client boots up, it sends a copy of its startup configuration to the director. This file is the backup configuration for that client. Any time the user, directly or through the director, saves a client configuration, a backup configuration is created. The configuration is stored on the local repository on the director or on a remote repository on a server. The backup file is used to reconfigure a client during a zero-touch replacement.

> **Note**    Client backup is supported only when the director and client are running Cisco IOS Release 12.2(55)SE or later.

Client configuration backup is enabled by default. You can disable it by entering the **no vstack backup** global configuration command. You enable the file backup feature on the director by entering the **vstack backup** and you can configure a repository for the backup files. If you do not specify a repository, the files are stored in the director **flash:/vstack** directory.

A client configuration backup is triggered:

- when the **write memory** privileged EXEC command is entered on the client.
- when the director boots up, it requests configuration information from clients and backs up these configurations.

# Replacing a Client Switch

You can use zero-touch replacement to exchange and install a like-type client in the Smart Install network. When a new switch is added to the network, a CDP database update is sent to the director, which determines if this is a new MAC address and therefore a new client. When a client needs to be replaced and is removed from the network, the CDP database lists the removed client as *inactive*. If another client MAC address with the same product-ID is detected on the same port, this client is considered a *replacement* client. The director gives it the same image and configuration that the previous client had.

The director removes the entry for the replaced client from the director database. If the replaced client is put elsewhere in the network, the director creates a new entry for it that includes the client's new information.

During a zero-touch replacement, the replacement client receives the last backed-up configuration file, which is stored in the director or a remote repository. Client configuration files are backed up by default, unless you disable this functionality on the director.

Only one Smart Install client can be replaced at a time on the same branch and only if there is one path to the director.

**Note**    Zero-touch replacement is supported only when the director and the replaced client are running Cisco IOS Release 12.2(55)SE or later or 15.1(1)SY or later. When a client switch running an earlier release is replaced, the new switch receives a seed replacement.

When the replacement client and existing client do not have the same product ID, port connections, or interfaces, the replacement client is considered new to the Smart Install network. For example, a replacement client must be connected to the same ports on the director and on other client switches as was the original client. When a new device is added to the network, a notification is sent to the director that a new client has joined. If the director has a configuration for the type of client that was added and if the join window is open, the new client receives the image and configuration files.

# Using a Join Window

A join window is a time window during which the client can upgrade image or configuration files. The director can provide information about the image and configuration to the client only during this window. A client attempting to join the Smart Install network outside the join window is not allowed to do so and cannot upgrade the image and configuration files.

Use the **vstack join-window mode auto** global configuration command to automatically upgrade clients with the latest image and configuration files when they are added during a join window. Use the **no vstack join-window mode** global configuration command to put the client in a hold state.

You configure a time window to control downloads of configuration and image files to client switches by entering the **vstack join-window start** [*date*] *hh:mm* [*interval*] [**end** *date*] [**recurring**] global configuration command.

- You can manually close a join window by entering the **vstack join-window close** global configuration command.

- You can manually open a join window by entering the **no vstack join-window close** global configuration command.

If a join window *is* configured, a zero touch upgrade is possible only during the configured window. If a switch connects to the director at any time other than during the join window, the Smart Install configuration and image files are not automatically downloaded. Instead, the new switch receives the default files from the DHCP server. This feature provides control of the files and prevents unauthorized switches from receiving the Smart Install configuration.

If a join window *is not* configured, a zero touch upgrade can happen at any time because that is the default state.

When a join window is configured, and the DHCP acknowledgement occurs outside of the configured window, a client switch sends an error message that it cannot download an image or configuration file.

## Configuring Join Window Mode

The join window mode includes a *hold* state that adds an extra level of security for the client. The hold state lets you control whether or not the client can receive a software upgrade, and how the upgrade is performed. The hold-state is either *on* or *off* when the join window is active.

You configure automatic join window mode with the **vstack join-window mode auto** global configuration command. In this mode, when a client joins the network, the director automatically upgrades it when the join window is open.

When you set the mode to manual by entering the **no vstack join-window mode** global configuration command, when a client joins the network during an open join window, the client is put on the hold list.

You can review clients on the hold list by entering the **show vstack status** user EXEC command. You can remove a client from the hold list by entering the **vstack on-hold-clients remove** global configuration command.

✎
**Note**    When a client has been removed from the hold state to allow that client to join the network, you must restart the client to again put it in the hold state (if the mode is manual) or to automatically upgrade if the mode is auto and the join window is open.

When a new client joins the network and the mode is set to auto, the join window state is active, whether or not the join window is open or closed. When the mode is set to manual and the join window is open, the client is put on the hold list. If the join window is closed, the client cannot join the network (denied).

Table 1-3 lists the join window states and the actions that are allowed or not allowed for each state.

*Table 1-3        Join Window States and Functionality*

| Join window state | Zero-touch upgrades | On-demand upgrades | Configuration backup |
|---|---|---|---|
| Active | Allowed | Allowed | Allowed |
| Deny | Not allowed | Allowed | Allowed |
| Hold | Allowed with user intervention | Allowed | Not allowed |

Starting with Cisco IOS Release 12.2(58)SE or 15.1(1)SY, you can manually change the join window state for a client or multiple clients from the denied state to the active or held state by using the **vstack join-window-status index** *client-id* {**allowed** | **held**} privileged EXEC command.

# Upgrading Client Switches

Supported types of image and configuration upgrades:

- Zero-touch upgrade—This is for a client switch with no configuration. This could be for the initial installation of an image and configuration on a new client, for image and configuration installation on a client after a **write erase** and **reload**, or, in case of a replacement switch, if **vstack backup** is enabled. The Smart Install network must run DHCP to perform zero-touch upgrades.

- On-demand upgrade—This is for client switches that are already in the network and connected to the director. On-demand upgrades can be performed on single switches or on all clients that belong to a built-in group. DHCP is not required for on-demand upgrades. The director needs the IP address of a client for a single-switch upgrade if the client is not in a built-in group. For an on-demand upgrade of a switch running an image earlier than 12.2(52)SE, the switch must have an enable password and an IP interface configured.

You can do zero-touch or on-demand upgrades to any Smart Install client switches. You can also use the **vstack download-image** and **vstack download-config** privileged EXEC commands from the director to upgrade the image or configuration of any switch as long as the director has a connection (directly or

through another switch) to the switch. You could also telnet to a client switch and use the **archive download-sw** privileged EXEC command to upgrade switch software. Note that when you telnet to a client switch, you must know the switch enable passwords to do any configuration.

Beginning with Cisco IOS Release 12.2(58)SE or 15.1(1)SY, you perform a simultaneous upgrade of multiple clients that have the same product ID and password by entering the index numbers from the director database in the **vstack download-image** privileged EXEC command.

## Zero-Touch Upgrades

A zero-touch upgrade is an upgrade initiated by the director on a client switch that has no configuration. You can perform a zero-touch upgrade on Smart Install capable switches and non-Smart Install switches. The zero-touch upgrade occurs automatically with little or no intervention. A switch with no configuration can be a new, out-of-box switch or one on which you have entered the **write erase** and **reload** privileged EXEC commands.

During a zero-touch upgrade, do not touch the console keyboard or attempt to enter a command or a return on the switch or the auto install and Smart Install processes stop. To recover and restart the process, you need to return to the system prompt, enter **write erase** and **reload** commands, and restart the process.

If the TFTP server is the director, the file is saved in the director root directory. If the server is another device, it is saved in the *tftproot directory*. This is the default directory in the TFTP server where the files to be sent using TFTP are stored. The imagelist file, the new configuration file, and the image are also stored in this directory.

See the "Configuring the TFTP Server" section on page 2-5.

## Connecting to a Client Switch

To connect to the client switch command-line interface, enter the **vstack attach** {*client-index* | *client_ip_address*} privileged EXEC command. The client-index number represents active clients in the Smart Install network, displayed in the command-line help by entering a question mark (?) after the **vstack attach** command. The same client number is valid until the client reboots.

```
Director# vstack attach ?
  1        c3750-2042 @ IP 10.0.0.1 : MAC 0000.0040.4080
  2        c3750-2045 @ IP 10.0.0.2 : MAC 0000.000c.0d80
  A.B.C.D  IP address of remote node to attempt attaching to
```

To attach to a client, the client switch must be configured for telnet service and have a configured enable password.

## Smart Install Guidelines and Recommendations

- A Smart Install zero-touch upgrade refers to an out-of-box switch that is shipped to a customer with no configuration file. The customer can connect it to the network, and after it has booted up, it automatically downloads the appropriate image and configuration. Zero-touch upgrades also take place on preconfigured switches after you have entered the **write erase** and **reload** privileged EXEC commands to clear the configuration.

> ⚠️
>
> **Caution**   If you touch the console keyboard during a zero-touch upgrade and attempt to enter a command or a return on the switch, the auto install and Smart Install processes stop. To recover and restart the process, at the system prompt, enter the **write erase** and **reload** commands on the client and restart the process.

- If, for some reason, the startup configuration fails to download, the client can go into an infinite loop because there is no startup configuration to upgrade. The only way to recover from the loop is to press Enter when the client is coming up after a reload so that the upgrade process stops.

- When performing a zero-touch upgrade, you should always upgrade both the image and the startup configuration files. To upgrade only the image or only the configuration file, use the **vstack download-image** or **vstack download-config** privileged EXEC commands for an on-demand download instead.

- Switches are upgraded one hop at a time. The director cannot upgrade switches in hop 2 while it is upgrading switches in hop 1.

- Because DHCP snooping is not supported on routed ports, you should not connect routed ports directly to the client or the director. Without DHCP snooping, the director would not detect a DHCP request from the client, preventing Smart Install from working on that client. Routed ports cannot participate in Smart Install.

- For client switches with only 16 Mb of flash memory, before upgrading the Cisco IOS image, ensure that there is enough free flash space available to download a new image. Delete unnecessary files. The configuration file might not be necessary because Smart Install can provide the configuration file when the client boots up.

- In Catalyst 6500 Supervisor Engine 2T switches, flash size supports onboard and external disk to download the image and the configuration file.

- The director can act as the TFTP server, eliminating the need for an external TFTP serving device. Follow these guidelines when configuring the director as TFTP server:

  – The total flash space (used and free) on the director must be large enough to contain the director image and configuration file and the image and configuration files required for client switches.

  – There must be enough available flash on the director to hold the client Cisco IOS images and configuration files. The Cisco IOS image files vary in size, depending on the client switch product IDs and whether or not crypto images are being installed.

  – When the director is the TFTP server, a copy of the configuration file for each client switch is stored in the root directory of the flash file system on the director. There must be enough space for each planned client group.

  – Most director switches have enough flash memory to hold one client Cisco IOS image and a small number of client configuration files. For example, the Catalyst 3750 switch can have a maximum flash size of 64 MB, which accommodates only 4 or 5 images, based on the image size.

  – If the Smart Install network includes client switches with more than one product ID, you should use an external TFTP server.

- If the TFTP server is a third-party (non-Cisco) device, you should disable the server option to change the name of a file if another file is created with the same name. Otherwise, duplicate imagelist files might be created.

- Although we recommend that the director be configured to act as DHCP server for the clients, Smart Install can also use an external DHCP server. If you use an external device as DHCP server, you could configure the DHCP server to send option 125/suboption 6 for the director IP address to avoid the possibility of fake DHCP servers.

- We recommend configuring a Cisco IOS DHCP server to **remember** IP bindings to ensure that devices in the Smart Install network retain the same IP address in the event of a network or device reload.

- In networks that do not use DHCP to assign IP addresses to the clients, you must configure the IP address of the director on each client switch.

- Client switches with static IP addresses cannot get zero-touch downloads but can receive on-demand downloads.

- If the director temporarily loses communication with the client switches, there is no impact to the Smart Install feature unless the client is in the middle of installing Cisco IOS images or downloading configuration. If this happens, manual intervention might be required to restart the process.

- Client switches can be on any VLANs other than the default if the director is configured to snoop on that VLAN (enter the **vstack vlan** *vlan-id* global configuration command) and if traffic from the VLAN flows through the director.

  – The director can snoop on multiple VLANs extending to clients on different Layer 2 subnets.

  – Client switches can be on different routed subnets as long as there are routes between the director and the subnet. In these cases, a relay agent between a client and director is required for Smart Install downloads.

  – Smart Install does not function if the client is connected directly to a routed port on the director.

- We recommend that configuration files do not include **boot host dhcp.** If a configuration file does include this configuration, do not apply the configuration file to switches with interfaces that do not have a configured IP address.

- Stacking considerations:

  – If the director is in a switch stack and a master switchover occurs when a non-Smart Install client switch is being upgraded, the client switch upgrade is not completed.

  – If the client switch is a stack and not all members are up and operational, downloading of new images to the stack members fails.

  – Upgrading a stack requires configuring a custom group matching the stack group.

  – When a stack is upgraded, you should restart all stack members at the same time.

  – When a stack is deliberately partitioned, the new stacks should have the required configuration for upgrades, that is, the stack group members must be configured correctly,

- For Catalyst 3750-X, 3750-E, 3650-X, and 3650-E client switches, install the appropriate license files before upgrading the image. Smart Install does not apply to image licensing.

- To disable Smart Install on a director or client, enter the **no vstack** global configuration command on the device. Enter the **show vstack status** privileged EXEC command to see if Smart Install is enabled or disabled on a device.

C H A P T E R **2**

# Configuring Cisco Smart Install Devices

This section includes some basic scenarios and tasks that you might configure in a Smart Install network.

Most configuration commands are visible and can be entered on the director or on a client, but only the ones configured on the director take effect. If you enter commands on a client switch, they do not take effect now, but if the client later becomes the director, the commands are then valid.

# Configuration Guidelines

- A Smart Install zero-touch upgrade refers to an out-of-box switch that is shipped to a customer with no configuration file. The customer can connect it to the network, and after it has booted up, it automatically downloads the appropriate image and configuration. Zero-touch upgrades also take place on preconfigured switches after you have entered the **write erase** and **reload** privileged EXEC commands to clear the configuration.

⚠️

**Caution**   If you touch the console keyboard during a zero-touch upgrade and attempt to enter a command or a return on the switch before the client has obtained an IP address, the auto install and Smart Install processes stop. To recover and restart the process, at the system prompt, enter the **write erase** and **reload** commands on the client and restart the process.

- If, for some reason, the startup configuration fails to download, the client can go into an infinite loop because there is no startup configuration to upgrade. The only way to recover from the loop is to press Enter when the client is coming up after a reload so that the upgrade process stops.

- When performing a zero-touch upgrade, you should always upgrade both the image and the startup configuration files. To upgrade only the image or only the configuration file, use the **vstack download-image** or **vstack download-config** privileged EXEC commands for an on-demand download instead.

- Client switches with static IP addresses cannot get zero-touch downloads but can receive on-demand downloads.

- If the director temporarily loses communication with the client switches, there is no impact to the Smart Install feature unless the client is in the middle of installing Cisco IOS images or downloading configuration. If this happens, manual intervention might be required to restart the process.

- We recommend that configuration files do not include **boot host dhcp.** If a configuration file does include this configuration, do not apply the configuration file to switches with interfaces that do not have a configured IP address.

- When a director is configured and a client joins the Smart Install network, Smart Install is automatically enabled on these devices. Beginning with Cisco IOS Release 12.2(58)SE or 15.1(1)SY, you can disable Smart Install on a device and also shut down its Smart Install TCP ports by entering the **no vstack** global configuration command on the client or director.

  – When Smart Install is disabled on a device, any Smart Install configuration on the device remains in the running configuration but does not take effect while Smart Install is disabled.

  – When Smart Install is disabled on a device, the **vstack director** *ip_ address* and **vstack basic** global configuration commands are not allowed.

  – If you disable Smart Install on the director and there were Smart Install DHCP IP addresses configured, you need to manually unconfigure them.

  – To reenable Smart Install on the device, enter the **vstack** global configuration command.

# Configuring the DHCP Server

To perform zero-touch upgrades, the Smart Install network must be running DHCP. The DHCP server could be the director, another Cisco device running Cisco IOS, or a non-Cisco third-party server. You can also have the director act as the Smart Install DHCP server and have another device perform all other DHCP server functions.

Either way, use one of the following procedures to set up a Cisco device as DHCP server, or if you choose to configure a non-Cisco third-party device as DHCP server, follow the instructions in the product documentation for configuring a network address and a TFTP server.

Note    You should not configure any client switches participating in Smart Install as the DHCP server.

- Configuring the Director as the DHCP Server, page 2-3
- Configuring Another Device as DHCP Server, page 2-4

Note    If the DHCP server is the director or another Cisco IOS device and the network reloads, it is possible that DHCP could assign new IP addresses to the devices. This is an unlikely occurrence, but if it does happen, you might need to reassociate the director and client switches by manually entering the director IP address on the director or the client switches. To prevent this occurrence, configure the DHCP server to remember the IP bindings by entering the **ip dhcp remember** global configuration command or the **remember** DHCP pool configuration command.

# DHCP Configuration Guidelines

- Although we recommend that the director be configured to act as DHCP server for the clients, Smart Install can also use an external DHCP server. If you use an external device as DHCP server, you could configure the DHCP server to send option 125/suboption 16 for the director IP address to avoid the possibility of fake DHCP servers.

- We recommend configuring a Cisco IOS DHCP server to **remember** IP bindings to ensure that devices in the Smart Install network retain the same IP address in the event of a network or device reload.

- In networks that do not use DHCP to assign IP addresses to the clients, you must configure the IP address of the director on each client switch.

# Configuring the Director as the DHCP Server

You can configure the director as DHCP server and create DHCP server pools directly from the Smart Install director.

Beginning in privileged EXEC mode, follow these steps on the director to configure it as the DHCP server:

| | Command | Purpose |
|---|---|---|
| Step 1 | **config terminal** | Enter global configuration mode. |
| Step 2 | **vstack director** *ip_ address* | Configure the device as the Smart Install director by entering the IP address of an interface on the device. |
| Step 3 | **vstack basic** | Enable the device as the Smart Install director. |
| Step 4 | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| Step 5 | **vstack dhcp-localserver** *poolname* | Create a name for the Smart Install DHCP server address pool, and enter vstack DHCP pool configuration mode. |
| Step 6 | **address-pool** *network-number mask prefix-length* | Specify the subnet network number and mask of the DHCP address pool.<br><br>**Note**    The prefix length specifies the number of bits that comprise the address prefix. The prefix is an alternative way of specifying the network mask of the client. The prefix length must be preceded by a forward slash (/). |
| Step 7 | **default-router** *ip_address* | Specify the IP address of the DHCP default router for the pool.<br><br>**Note**    You can use the **vstack startup-vlan** global configuration command to specify another VLAN that should be used for Smart Install management. |
| Step 8 | **file-server** *address* | Specify the IP address of the TFTP server.<br><br>**Note**    If the director is also the TFTP server, you must enable it. See the "Configuring the TFTP Server" section on page 2-5. |
| Step 9 | **exit** | Return to global configuration mode. |

| | Command | Purpose |
|---|---|---|
| Step 10 | ip dhcp remember | (Optional) Configure the DHCP server to remember the IP bindings of a device. If the network or device reloads, the DHCP server issues the same IP address to a client that it had before the reload. This command is supported in Cisco IOS Release 12.2(53) or later on switches and in Cisco IOS Release 15.1(3)T or later on routers. |
| Step 11 | end | Return to privileged EXEC mode. |
| Step 12 | copy running-config startup config | (Optional) Save your entries in the configuration file. |
| Step 13 | show dhcp server | Verify the configuration by displaying the DHCP servers recognized by the device. |

This example shows how to configure the Smart Install director as the DHCP server:

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack dhcp-localserver pool1
Director(config-vstack-dhcp)# address-pool 1.1.1.0 255.255.255.0
Director(config-vstack-dhcp)# default-router 1.1.1.30
Director(config-vstack-dhcp)# file-server 1.1.1.40
Director(config-vstack-dhcp)# exit
Director(config)# ip dhcp remember
Director(config)# end
```

DHCP snooping is automatically enabled on the director. Therefore, you do not need to enable it when the director is the DHCP server.

# Configuring Another Device as DHCP Server

If the Smart Install director is not the DHCP server, you can use the traditional Cisco IOS DHCP commands to configure a server pool outside the Smart Install network. The director must have connectivity to the DHCP server. For procedures to configure other DHCP server options, see the "Configuring DHCP" section of the "IP Addressing Services" section of the *Cisco IOS IP Configuration Guide, Release 12.2* or the "IP Addressing Services" section of the *Cisco IOS IP Configuration Guide, Release 15.1* from Cisco.com. This procedure shows the minimum steps that you need to perform to configure a DHCP server.

Note    Do not configure a client switch as DHCP server. Configuring DHCP server commands on a client switch would cause the switch to assign IP addresses, which would make it unable to participate in Smart Install.

Beginning in privileged EXEC mode, follow these steps:

| | Command | Purpose |
|---|---|---|
| Step 1 | config terminal | Enter global configuration mode. |
| Step 2 | ip dhcp pool *poolname* | Create a name for the DHCP server address pool, and enter DHCP pool configuration mode. |
| Step 3 | bootfile *filename* | Specify the name of the configuration file to be used. |

| | Command | Purpose |
|---|---|---|
| Step 4 | **network** *network-number mask prefix-length* | Specify the subnet network number and mask of the DHCP address pool. |
| | | **Note** The prefix length specifies the number of bits that comprise the address prefix. The prefix is an alternative way of specifying the network mask of the client. The prefix length must be preceded by a forward slash (/). |
| Step 5 | **option 150** *address* | Specify the IP address of the TFTP server. |
| Step 6 | **remember** | (Optional) Configure the DHCP pool to remember the IP bindings of a device. If the network or device reloads, the DHCP server issues the same IP address to a client that it had before the reload. |
| Step 7 | **end** | Return to privileged EXEC mode. |

This example shows how to configure another device as a DHCP server:

```
Switch # configure terminal
Switch(config)# ip dhcp pool pool1
Switch(dhcp-config)# network 10.10.10.0 255.255.255.0
Switch(dhcp-config)# bootfile config-boot.text
Switch(dhcp-config)# option 150 10.10.10.1
Switch(dhcp-config)# remember
Switch(config-if)# end
```

When the director is a Layer 3 switch, DHCP snooping is automatically enabled on it. However, when there is a relay agent between the DHCP server and the director, you must enable DHCP snooping on the relay agent.

To enable DHCP snooping on a Cisco DHCP relay device, enter these global configuration commands:

> **ip dhcp snooping**
>
> **ip dhcp snooping vlan** *vlan-id* for other configured Smart Install VLANs
>
> **no ip dhcp snooping information option** (if the DHCP server is running Cisco IOS)

You must also enter the **ip dhcp snooping trust** interface configuration command on the director interface that is connected to the server.

If the director and the DHCP server are on different VLANs, you must enable IP routing on the VLAN interface connected to the client switches, and enter this command:

> **ip helper** *address* (IP address of the DHCP server)

# Configuring the TFTP Server

Smart Install stores image and configuration files on a TFTP server. The director can function as the TFTP server, eliminating the need for an external TFTP-serving device. If the director is the TFTP server, image and configuration files are stored in the director flash memory. If the director does not have available memory storage space, you can store the files on a third-party server and point to that location.

- If the TFTP server is a third-party (non-Cisco) device, you should disable the server option to change the name of a file if another file is created with the same name. Otherwise, duplicate imagelist files might be created.

In Catalyst 6500 Supervisor Engine 2T switches, flash size supports onboard and external disk to download the image and the configuration file.

Guidelines when selecting the director to be the TFTP server:

- The total flash memory space (used and free) on the director must be large enough to contain the director image and configuration file and the image and configuration files required for client switches.

- There must be enough available flash memory on the director to hold the client Cisco IOS images and configuration files. The Cisco IOS image files vary in size, depending on the client product IDs and size of the images being installed.

- When the director is the TFTP server, a copy of the configuration file for each client is stored in the root directory of the flash file system on the director. There must be enough space for each planned client.

- Most director devices have enough flash memory to hold one client Cisco IOS image and a small number of client configuration files. For example, the Catalyst 3750 switch can have a maximum flash size of 64 MB, which accommodates only 4 or 5 images, based on the image size.

- If the director is a switch and the Smart Install network includes client switches with more than one product ID, you should use an external TFTP server.

Beginning with this release, you do not need to configure the director as TFTP server. The director automatically gets the required image and configuration files and acts as the TFTP server when you specify **flash**: as the location from which to retrieve the files.

For example, for zero-touch upgrades of a default image and a configuration file, entering these commands on the director automatically configures the director as the TFTP server and enables the director DHCP server to provide these files to the clients.

```
vstack config flash:new_configuration_file
vstack image flash:image_name.tar
```

# Establishing a Remote Client Session

You can perform configuration tasks on the client through a remote connection from the director. From the director, issue the **vstack attach** {*client - index*} | {*client IP address*} command in EXEC mode to attach to a client interface and temporarily enable it as director. Select a client by either choosing from a list that shows the active clients that are available within the Smart Install network or by entering the client IP address.

The client index list is dynamically generated in the Cisco Internet Operating System (IOS) help text. If the director device is not rebooted, then the client-index is retained and it can be used in future configurations.

# Configuring a Network with Single or Mixed Switch Types

# Configuring a Network That Includes a Single Switch Type

When all client switches in the Smart Install network are the same switch product ID and are performing the same functions, all clients would use the same image and the same seed (base) configuration file. In this case, you can configure a default image and a seed configuration file for all clients in the network.

Beginning in privileged EXEC mode, follow these steps on the director to set the default image and configuration file for all clients in the network.

|  | Command | Purpose |
|---|---|---|
| Step 1 | **config terminal** | Enter global configuration mode. |
| Step 2 | **vstack director** *ip_ address* | Configure the device as Smart Install director by entering the IP address of an interface on the device. |
| Step 3 | **vstack basic** | Enable the device as the Smart Install director. |
| Step 4 | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| Step 5 | **vstack image** {**flash:***image_name*.**tar** \| **tftp:**//*location image_name*.**tar**} | Enter the location and image.<br><br>**Note**    Although visible in the command-line help, these options are not supported: **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.**<br><br>• **flash:***image_name*.**tar**—Enter if the director is the TFTP server and the image is in the director flash memory.<br><br>**Note**    Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**<br><br>• **tftp:**//*location image_name*.**tar**<br><br>• *image_name*.**tar:** Enter the name of the default image tar file for clients in the network. |

| | Command | Purpose |
|---|---|---|
| Step 6 | **vstack config** {**flash:** *config.txt* \| **tftp://***location config.txt*} | Enter the location and the default configuration file name. The configuration file is a text file that contains the configuration file to be downloaded to the client. |
| | | **Note**    Although visible in the command-line help, these options are not supported: **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:**. |
| | | • For location, enter **flash:** if the TFTP server is the director and the configuration file is in the director flash memory. |
| | | **Note**    Instead of **flash:,** you can also enter **flash0:**, **flash1:,** or **usb:**. |
| | | • For location, enter **tftp:** if the TFTP server is not the director or if the file is not in the director flash memory. In this case enter **tftp://***director ip_address*. |
| | | • *config_filename*—Enter the filename of the default seed configuration file for clients in the network. |
| Step 7 | **end** | Return to privileged EXEC mode. |
| Step 8 | **copy running-config startup config** | (Optional) Save your entries in the configuration file. |
| Step 9 | **show vstack config** | Verify the configuration. |

A client switch sends an error message if it is unable to download an image or a configuration file due to mis-communication, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside the configured time frame. If a Cisco device is being used as the TFTP server, you should configure it as described in the "Configuring the TFTP Server" section on page 2-5

This example shows how to configure a default image and configuration file for a Smart Install network if the director is the TFTP server and the default image and configuration file are in the director flash memory:

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack image flash:c2960-lanbase-tar.122-52SE.tar
Director(config)# vstack config flash:2960lanbase_config.txt
Director(config)# end
```

This example shows how to configure a default image and configuration file when the TFTP server is not the director:

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack image tftp://101.122.33.10/c2960-lanbase-tar.122-52SE.tar
Director(config)# vstack config tftp://101.122.33.10/2960LANBase_config.txt
Director(config)# end
```

# Using Built-In Groups to Configure a Mixed Network with Two Switch Types

You can use built-in groups in a Smart Install network to configure a group of switches that have one product ID with an image and configuration file and to configure a second group of switches that have another product ID with another image file and configuration. You could also have other clients in the network that do not belong to either of these groups that could use the default image and configuration if they match the default product ID.

Beginning in privileged EXEC mode, follow these steps on the director to configure the image and configuration file for two different product IDs in the Smart Install network:

|        | Command | Purpose |
|--------|---------|---------|
| Step 1 | **config terminal** | Enter global configuration mode. |
| Step 2 | **vstack director** *ip_ address* | Configure the device as Smart Install director by entering the IP address of an interface on the device. |
| Step 3 | **vstack basic** | Enable the device as the Smart Install director. |
| Step 4 | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| Step 5 | **vstack group built-in** *product_family1 port_config* | Identify the first built-in group product ID, and enter Smart Install group configuration mode for the group. |
| Step 6 | **image** *location image_name*.**tar** | Enter the location and image name for group 1.<br><br>• For location, enter **flash:** (if the TFTP server is the director and the file is stored in the director flash memory).<br><br>Note    Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**.<br><br>• For location, enter **tftp:** and the location of the configuration file for group 1 if the file is not stored in the director flash memory.<br><br>Note    Although visible in the command-line help, these options are not supported: **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.**<br><br>• *image_name*.**tar**:Enter the name of the image tar file for clients in group 1. |

| | Command | Purpose |
|---|---|---|
| Step 7 | **config** *location config_filename.* | Enter the location and configuration file for group 1. |
| | | • For location, enter **flash:** (if the TFTP server is the director and the file is stored in the director flash memory). |
| | | **Note**    Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**. |
| | | • For location, enter **tftp:** and the location of the configuration file for group 1 if the file is not stored in the director flash memory. |
| | | **Note**    Although visible in the command-line help, these options are not supported: **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.** |
| | | • *config_filename*—Enter the filename of the configuration file for group 1. |
| Step 8 | **exit** | Return to global configuration mode. |
| Step 9 | **vstack group built-in** *product_family2 port_config* | Identify the second built-in group product ID, and enter Smart Install group configuration mode for the group. |
| Step 10 | **image** *location image_name.***tar** | Enter the location and image name for group 2. |
| | | • For location, enter **flash:** (if the TFTP server is the director and the file is stored in the director flash memory). |
| | | **Note**    Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**. |
| | | • For location, enter **tftp:** and the location of the configuration file for group 2 if the file is not stored in the director flash memory. |
| | | **Note**    Although visible in the command-line help, these options are not supported: **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.** |
| | | • *image_name.***tar**—Enter the name of the image tar file for clients in group 2. |

| | Command | Purpose |
|---|---|---|
| **Step 11** | **config** *location config_filename* | Enter the location and configuration file for group 2. |
| | | • For location, enter **flash:** (if the TFTP server is the director and the file is stored in the director flash memory). |
| | | **Note** Instead of **flash:,** you can also enter **flash0:, flash1:,** or **usb:.** |
| | | • For location, enter **tftp:** and the location of the configuration file for group 2 if the file is not stored in the director flash memory. |
| | | **Note** Although visible in the command-line help, these options are not supported: **ftp:, http:, https:, null:, nvram:, rcp:, scp:, system:, tmpsys:.** |
| | | • *config_filename*—Enter the filename of the configuration file for group 2. |
| **Step 12** | **end** | Return to privileged EXEC mode. |
| **Step 13** | **copy running-config startup config** | (Optional) Save your entries in the configuration file. |
| **Step 14** | **show vstack group built-in detail** | Verify the configurations. |

A client switch sends an error message if it cannot download an image or a configuration file due to misconfiguration, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside of the configured time frame.

This example uses built-in groups to configure all 3560 24-port switches in the network with one image and configuration file and to configure all 2960 24-port switches in the network with another image file and configuration.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack group built-in 3560 24
Director(config-vstack-group)# image tftp://101.122.33.10/c3560-ipbaselmk9-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/3560-24-ipbase_config.txt
Director(config)# exit
Director(config)# vstack group built-in 2960 24
Director(config-vstack-group)# image tftp://101.122.33.10/c2960-lanbasek9-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/2960-24-LANbase_config.txt
Director(config)# end
```

# On-Demand Upgrade to a New Image or Configuration

When a director is established and default or group images and configuration files are defined and there is connectivity between the director and a client switch, you can perform on-demand image and configuration upgrades. You can use this capability on a new client switch to make it Smart Install capable or on existing clients to upgrade the image or configuration.

You can initiate an on-demand download if the switch has a valid IP interface. For on-demand download on a switch that is not Smart Install capable, the switch must also have an enable password configured. Beginning with Cisco IOS Release 12.2(58)SE or 15.1(1)SY, you can perform on-demand upgrades to multiple clients at the same time.

Beginning in privileged EXEC mode, follow these steps on the director to perform an on-demand upgrade on a client switch.

|  | **Command** | **Purpose** |
|---|---|---|
| **Step 1** | **config terminal** | Enter global configuration mode. |
| **Step 2** | **vstack director** *ip_ address* | Configure the device as the Smart Install director by entering the IP address of an interface on the device. |
| **Step 3** | **vstack basic** | Enable the device as the Smart Install director. |
| **Step 4** | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| **Step 5** | **end** | Return to privileged EXEC mode. |
| **Step 6** | **vstack download-image tar** *image_URL* {*ip_address* \| **index** *name*} *remote_switch_password* [**override**] **reload** [**in** *time*]<br><br>or<br><br>**vstack download-image built-in** *product_family port_config remote_switch_password* [**override**] **reload** [**in** *time*]<br><br>or<br><br>**vstack download-image** {*imagelist_file _URL* {*ip_address* \| **index** *name*} / **built-in** *product_family port_config*} *remote_switch_password* [**override**] **reload** [**in** *time*] | Start an on-demand tar image download on a Smart Install client switch:<br><br>• Enter the *image_name*.**tar** filename and location and the IP address of the client.<br>or<br>Enter the *image_list* filename and location and the IP address of the client (for releases earlier than 12.2(55)SE)<br><br>• *ip_address*—Enter the IP address of the client switch.<br><br>• **index** *name*—Enter the index name from the director database for multiple clients or a range of clients (for example, 1-3, 4). This feature was added in Cisco IOS Release 12.2(58)SE or 15.1(1)SY.<br><br>• Enter **built-in**, and select the product family and port configuration from the command-line help.<br><br>**Note**  Use this option if you have identified the image for the specified built-in group by entering the **image** *location image_name*.**tar** Smart Install group configuration command.<br><br>• *remote_switch_password* —Enter the password for the client switch.<br><br>**Note**  A password is needed only if the switch is running a Cisco IOS image earlier than 12.2(52)SE. It is not required for switches already in the Smart Install network. If you are upgrading the image for multiple clients, all clients must have the same password or must have no password (None).<br><br>• (Optional) **override**—Override the existing image on the client switch.<br><br>• **reload**—Reload the client switch.<br><br>• (Optional) **in** *time*—Specify the *time* to reload the switch by using the format hh:mm. The range is from 00:00 to 23:59. If no time is specified, the reload occurs when you exit the CLI. |

|  | Command | Purpose |
|---|---|---|
| Step 7 | vstack download-config {*config_URL ip_address* / **built-in** *product_family port_config*} *remote_switch_password* **startup** [**reload**] [**in** *time*] | Start an on-demand configuration download on a Smart Install client switch:<br><br>• Enter the configuration file name and location and the IP address of the client<br><br>• Enter **built-in**, and select the product family and port configuration from the command-line help.<br><br>Note   Use this option if you have identified the configuration for the specified built-in group by entering the **config** *location config_filename* Smart Install group configuration command.<br><br>The remaining keywords have these meanings:<br><br>• *remote_switch_password* —Enter the password for the client switch.<br><br>Note   A *password* is required only for switches that are not Smart Install capable. It is not required for switches already in the Smart Install network.<br><br>• **startup**—Apply the configuration to the switch startup configuration.<br><br>• (Optional) **reload**—Reload the switch.<br><br>• (Optional) **in** *time*—Specify the *time* to reload the switch using the format hh:mm. The range is from 00:00 to 23:59. If no time is specified, the reload occurs when you exit the CLI. |
| Step 8 | **show vstack download-status** | Check status of the download. |

This example shows how to configure a Smart Install director to schedule an on-demand download of an image and configuration file to the client switch with the IP address 1.1.1.30 and password of *mypassword*. The download takes place in 6 hours and 30 minutes.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# end
Director# vstack download-image tar tftp://101.122.33.10/c2960-lanbasek9-tar.122-52.SE.tar
1.1.1.30 mypassword reload in 06:30
Director# vstack download-config tftp://101.122.33.10/2960LANBase_config.txt 1.1.1.30 my
password reload in 06:30
```

This example shows the same configuration for a built-in group.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# end
Director# vstack download-image built-in 3750 24 mypassword override reload in 6:30
Director# vstack download-config built-in 3750 24 mypassword reload in 06:30
Using Custom Groups to Configure Groups Based on Connectivity, MAC Address, Stack Number,
or Product ID
```

You can configure a custom group to set up the image and configuration file for all client switches that match connectivity, MAC address, stack number, or product IDs for switches in a stack.

A client switch sends an error message if it cannot download an image or configuration file due to misconfiguration, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside of the configured time frame.

# Custom Group Based on Connectivity

You can configure a custom group based on the connectivity or topology of switches in a Smart Install network. For example, you would use a connectivity match to configure a group of switches that are connected to the director through a single interface or switches that are connected to the director through a specific intermediate switch. A connectivity match takes priority over product-ID or stack number custom groups and over built-in groups, but not over groups based on MAC addresses. The switches that do not match the connectivity configuration would get the configuration and image in a built-in group or the default configuration.

Beginning in privileged EXEC mode, follow these steps on the director to configure a custom group based on connectivity:

|  | Command | Purpose |
|---|---|---|
| Step 1 | **config terminal** | Enter global configuration mode. |
| Step 2 | **vstack director** *ip_ address* | Configure the device as the Smart Install director by entering the IP address of an interface on the device. |
| Step 3 | **vstack basic** | Enable the device as the Smart Install director. |
| Step 4 | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| Step 5 | **vstack group custom** *group_name* **connectivity** | Identify a custom group based on a connectivity match, and enter Smart Install group configuration mode for the group. |
| Step 6 | **match host** *ip_address* **interface** *interface-id* | Identify the client switches for the custom group:<br><br>• **host** *ip_address*—the IP address of the upstream neighbor of the client (this could be the director or an intermediate device).<br><br>• **interface** *interface-id*—Identify the interface on the upstream neighbor to which the clients is connected. The interface ID must be the full identifier for the interface, such as GigabitEthernet 2/0/1. |
| Step 7 | **image** *location image_name***.tar** | Enter the location and image file for the custom group.<br><br>• *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory, or enter **tftp:** and the location of the imagefile: Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**.<br><br>Note     Although visible in the command-line help, these options are not supported: **flash1:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.**<br><br>• *image_name***.tar** is the image tar file that you want to download. For a switch stack, there could be multiple images for members of the stack. |

| | Command | Purpose |
|---|---|---|
| Step 8 | **config** *location config_filename.* | Enter the location and configuration file for the custom group.<br><br>• *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory, or enter **tftp:** and the location of the configuration file. Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**.<br><br>Note    Although visible in the command-line help, these options are not supported: **flash1:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:**.<br><br>• *config_filename*—Enter the filename of the configuration file for the group. |
| Step 9 | **end** | Return to privileged EXEC mode. |
| Step 10 | **copy running-config startup config** | (Optional) Save your entries in the configuration file. |
| Step 11 | **show vstack group custom detail** | Verify the configuration. |

This example creates a custom group named *testgroup2* for all switches that are connected to the specified host and interface and configures the group to use the specified image file and configuration.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack group custom textgroup2 connectivity
Director(config-vstack-group)# match host 1.1.1.10 interface GigabitEthernet 1/0/3
Director(config-vstack-group)# image tftp://101.122.33.10/c3750-ipbase-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/3750-24-ipbase_config.txt
Director(config-vstack-group)# exit
Director(config)# end
```

# Custom Group Based on MAC Address

You can configure a custom group based on the MAC addresses of switches in a Smart Install network. A MAC address match takes priority over any other matches. The switches that do not match the MAC addresses in the group would get the configuration and image for another group or the default configuration.

Beginning in privileged EXEC mode, follow these steps on the director to configure a custom group based on connectivity:

| | Command | Purpose |
|---|---|---|
| Step 1 | **config terminal** | Enter global configuration mode. |
| Step 2 | **vstack director** *ip_ address* | Configure the device as the Smart Install director by entering the IP address of an interface on the device. |
| Step 3 | **vstack basic** | Enable the device as the Smart Install director. |
| Step 4 | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| Step 5 | **vstack group custom** *group_name* **mac** | Identify a custom group based on a MAC address match, and enter Smart Install group configuration mode for the group. |

| | **Command** | **Purpose** |
|---|---|---|
| Step 6 | **match** *mac_address* | Enter the MAC address of the client switch to be added to the custom group. Repeat the command for each MAC address to be added. |
| | | **Note** To see MAC addresses of switches in the Smart Install network, enter the **show vstack neighbors all** privileged EXEC command. Switches added to the group must be able to use the same image and configuration file. |
| Step 7 | **image** *location image_name*.**tar** | Enter the location and image file for the custom group. |
| | | • *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory, or enter **tftp:** and the location of the image. Instead of **flash:,** you can also enter **flash0:,** **flash1:,** or **usb:**. |
| | | **Note** Although visible in the command-line help, these options are not supported: **flash1:, ftp:, http:, https:, null:, nvram:, rcp:, scp:, system:, tmpsys:.** |
| | | • *image_name*.**tar** is the image tar file that you want to download. For a switch stack, there could be multiple images for members of the stack. |
| Step 8 | **config** *location config_filename.* | Enter the location and configuration file for the custom group. |
| | | • *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory, or enter **tftp:** and the location of the configuration file. Instead of **flash:,** you can also enter **flash0:, flash1:,** or **usb:**. |
| | | **Note** Although visible in the command-line help, these options are not supported: **flash1:, ftp:, http:, https:, null:, nvram:, rcp:, scp:, system:, tmpsys:.** |
| | | • *config_filename*—Enter the filename of the configuration file for the group. |
| Step 9 | **end** | Return to privileged EXEC mode. |
| Step 10 | **copy running-config startup config** | (Optional) Save your entries in the configuration file. |
| Step 11 | **show vstack group custom detail** | Verify the configuration. |

This example creates a custom group named *testgroup3* that includes the three switches identified by MAC address, and configures the group to use the specified image file and configuration.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack group custom textgroup3 mac
Director(config-vstack-group)# match mac 0023.34ca.c180
Director(config-vstack-group)# match mac 001a.a1b4.ee00
```

```
Director(config-vstack-group)# match mac 00:1B:54:44:C6:00
Director(config-vstack-group)# image tftp://101.122.33.10/c3750-ipbase-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/3750-24-ipbase_config.txt
Director(config-vstack-group)# exit
Director(config)# end
```

# Custom Group Based on Stack Number

You can configure a custom group based on the number of the switch in the stack. Any switch in a stack that matches the stack number and product ID gets the same configuration.

> **Note**    A client switch in a stack can be upgraded only when it belongs to a custom stack group. It cannot belong to the default group.

Beginning in privileged EXEC mode, follow these steps on the director to configure a custom group based on the stack number:

| | Command | Purpose |
|---|---|---|
| **Step 1** | **config terminal** | Enter global configuration mode. |
| **Step 2** | **vstack director** *ip_ address* | Configure the device as Smart Install director be entering the IP address of an interface on the device. |
| **Step 3** | **vstack basic** | Enable the device as the Smart -Install director. |
| **Step 4** | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| **Step 5** | **vstack group custom** *group_name* **stack** | Identify a custom group based on matching the stack number and enter Smart Install group configuration mode for the group. |
| **Step 6** | **match** *switch_number stack product_family port_config* | Identify the client switches for the custom group:<br><br>• *switch_number*—Number of the switch in the stack. The range is from 1 to 9.<br><br>• *product_family*—Select the stack product family from the command-line help.<br><br>• *port_config*—Switch port configuration. To see the available port configurations, enter a **?** after the product family. |

| | **Command** | **Purpose** |
|---|---|---|
| **Step 7** | **image** *location image_name***.tar** | Enter the location and image file for the custom group. |
| | | • *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory or enter **tftp:** and the location of the imagefile. Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**. |
| | | **Note**    Although visible in the command-line help, these options are not supported: **flash1:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:**. |
| | | • *image_name***.tar** is the image tar file that you want to download. |
| **Step 8** | **config** *location config_filename.* | Enter the location and configuration file for the custom group. |
| | | • *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory or enter **tftp:** and the location of the configuration file for the group. Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**. |
| | | **Note**    Although visible in the command-line help, these options are not supported: **flash1:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:**. |
| | | • *config_filename*—Enter the filename of the configuration file for the group. |
| **Step 9** | **end** | Return to privileged EXEC mode. |
| **Step 10** | **copy running-config startup config** | (Optional) Save your entries in the configuration file. |
| **Step 11** | **show vstack group custom detail** | Verify the configuration. |

This example creates a custom group named *testgroup* for all switches that are identified as switch member 2 in a Catalyst 3750 24-port stack to use the specified image file and configuration.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack group custom testgroup stack
Director(config-vstack-group)# image tftp://101.122.33.10/c3750-ipbase-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/3750stack_config.txt
Director(config-vstack-group)# match 1 3750 24poe
Director(config-vstack-group)# match 2 3750 24poe
Director(config-vstack-group)# match 3 3750 24poe
Director(config-vstack-group)# exit
Director(config)# end
```

# Custom Group Based on Product ID

You can configure a custom group based on the product ID of switches in a Smart Install network. The switches that do not match the product ID in the group can have the configuration and image for another group or the default configuration.

Beginning in privileged EXEC mode, follow these steps on the director to configure a custom group based on connectivity:

| | Command | Purpose |
|---|---|---|
| Step 1 | **config terminal** | Enter global configuration mode. |
| Step 2 | **vstack director** *ip_ address* | Configure the device as the Smart Install director by entering the IP address of an interface on the device. |
| Step 3 | **vstack basic** | Enable the device as the Smart Install director. |
| Step 4 | **vstack startup-vlan** *vlan_value* | Specify the default VLAN that the director should use for Smart Install management. |
| Step 5 | **vstack group custom** *group_name* **product-id** | Identify a custom group based on a product-ID match, and enter Smart Install group configuration mode for the group. |
| Step 6 | **match** *product-id* | Enter the product ID of the client switches in the custom group.<br><br>**Note**    The product ID can be the same as that of a built-in group. If a client matches a built-in group and a custom group, the custom group takes precedence. |
| Step 7 | **image** *location image_name***.tar** | Enter the location and image file for the custom group.<br><br>• *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory, or enter **tftp:** and the location of the image. Instead of **flash:,** you can also enter **flash0:, flash1:,** or **usb:.**<br><br>**Note**    Although visible in the command-line help, these options are not supported: **flash1:, ftp:, http:, https:, null:, nvram:, rcp:, scp:, system:, tmpsys:.**<br><br>• *image_name***.tar** is the image tar file that you want to download. For a switch stack, there could be multiple images for members of the stack. |

| | Command | Purpose |
|---|---|---|
| Step 8 | **config** *location config_filename.* | Enter the location and configuration file for the custom group. <br><br>• *location*—Enter **flash:** if the TFTP server is the director and the file is stored in the director flash memory, or enter **tftp:** and the location of the configuration file. Instead of **flash:,** you can also enter **flash0:**, **flash1:**, or **usb:**.<br><br>**Note**    Although visible in the command-line help, these options are not supported: **flash1:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.**<br><br>• *config_filename*—Enter the filename of the configuration file for the group. |
| Step 9 | **end** | Return to privileged EXEC mode. |
| Step 10 | **copy running-config startup config** | (Optional) Save your entries in the configuration file. |
| Step 11 | **show vstack group custom detail** | Verify the configuration. |

This example creates a custom group named *testgroup4* that includes switches that match the product ID WS-C2960-48TC-L, and configures the group to use the specified image file and configuration.

```
Director# configure terminal
Director(config)# vstack director 1.1.1.20
Director(config)# vstack basic
Director(config)# vstack group custom textgroup4 product-id
Director(config-vstack-group)# match WS-C2960-48TC-L
Director(config-vstack-group)# image tftp://101.122.33.10/c2960-lanbase-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/c2960-lanbase_config.txt
Director(config-vstack-group)# exit
Director(config)# end
```

# Managing Client Configuration Files

You can manage the client configuration files through the director that is set up as TFTP server, or through a third-party TFTP server. Only supported devices that are Smart Install capable can perform the role of director and save client configuration files to a repository. See Appendix A, "Supported Devices for Smart Install" to see a list of devices that can be a Smart Install networkdirector.

The backup feature does not need to be enabled; it is on by default. However, if you have disabled it and want to save the configuration files to a repository, use the **vstack backup** global configuration command to enable the feature. After enabling the backup feature, use the **vstack backup** *file-server* global configuration command to specify a repository on the TFTP server to save the configurations files. The repository will define where the files are saved.

Every time the **write memory** privileged EXEC command is issued on the client, its configuration files are saved to the director-TFTP server or third-party TFTP server.

These names are assigned to the client backup files:

• *Hostname*MAC address.rev1

• *Hostname*MAC address.rev2 (most recent version)

When the client undergoes a hostname change, the configuration files are not backed up until you enter the **write memory** command. When a new mapping is created between the client with a new hostname and the two configuration files, the existing mapping is removed. On a third-party TFTP server, after a new mapping is created between the client with a new hostname and the two configuration files, the files are not removed.

> **Note**   Do not remove the backed-up client files from the third-party TFTP server repository. Otherwise, the backup feature does not work properly.

## Backing up Files after Loss of Connection

If the client-to-director connection is lost after issuing the **write memory** command, the back-up process fails. You must re-establish the connection so that the client file is backed up on the director. If you entered the **write memory** command more than once, the files associated with the last **write memory** command event are backed up on the director. If the client reloads or fails before receiving feedback that the backup was successful, any changes made to the client startup do not take effect until you reload the client.

## Extracting and Displaying Tar Files

When the client sends a tar file to the director, you can use the **vstack untar** *source-url* [*destination-url*] command in EXEC mode to extract and display the files in a specified location. However, when the client sends a tar file to a third-party TFTP server, you cannot use the director to extract and display the files.

The tar files are placed into the preconfigured directory within the repository. If the directory is not configured, the files are extracted and displayed in the director root directory flash memory.

# Other Configuration Options

- "Disabling Smart Install on a Device" section on page 2-21
- "Managing File Downloads on Clients" section on page 2-22
- "Configuring a Client Hostname Prefix" section on page 2-22
- "Configuring Additional Smart Install Management VLANs" section on page 2-23

## Disabling Smart Install on a Device

When a director is configured and a client joins the Smart Install network, Smart Install is automatically enabled on these devices. Beginning with Cisco IOS Release 12.2(58)SE or 15.1(1)SY, you can disable Smart Install on a device and also shut down its Smart Install TCP ports by entering the **no vstack** global configuration command on the client or director. When Smart Install is disabled on a device, any Smart Install configuration on it remains in the running configuration but does not take effect while Smart Install is disabled.

When Smart Install is disabled on a device, the **vstack director** *ip_ address* and **vstack basic** global configuration commands are not allowed on the device. To reenable Smart Install on a device, enter the **vstack** global configuration command.

# Managing File Downloads on Clients

You can use download management to download image and configuration files to a client. For non-Smart Install clients, an HTTP emulation process \ manages files downloads. For Smart Install capable clients, file downloads are performed when a request is received from the director.

## Download Management for Non-Smart Install Clients

For non-Smart Install capable clients, you can initiate downloads from the director through HTTP emulation. The client initiates a new connection to the director, and the director initiates a new HTTP connection to the non-Smart Install client on port 80. The image file name and configuration file name from the group database is gathered, and a download is issued on the non-Smart Install client through HTTP emulation. After the download is complete, a **reload** is issued on the client.

> **Note** Stackable switches must have the correct configuration present because they do not have a default image and configuration.

## Download Management for Smart Install Clients

For Smart Install-capable clients to receive image and configuration files, the client performs a **write erase** and **reload**. The client establish connectivity with the director and gathers information about the image and the configuration files. When this information is gathered, the client begins the upgrade. When the upgrade is complete, the Smart Install-capable client **reboots**.

# Configuring a Client Hostname Prefix

When configuring switches out of the box, to help identify the switches and their locations in the network, you can enter this global configuration command on the director:

> **vstack hostname-prefix** *prefix*

You can then enter a prefix to the hostname for clients in the Smart Install network. The last part of the switch hostname for a switch that had a DCHP request snooped through the director contains the last 3 bytes of the switch MAC address.

This example shows how to configure the hostname *Cisco* for a client that has been DHCP-snooped. The second display shows the resulting switch hostname assignment:

```
Director(config)# vstack hostname-prefix Cisco
Director(config)# exit
```

If you then telnet to that switch from the director, the hostname is shown:

```
Director#
*Mar  1 17:21:43.281: %SYS-5-CONFIG_I: Configured from console by console
*Mar  1 17:21:52.399: %DHCP-6-ADDRESS_ASSIGN: Interface Vlan1 assigned DHCP address
172.16.0.17, mask 255.255.0.0, hostname
```

```
CISCO-bf.97c0#
```

# Configuring Additional Smart Install Management VLANs

Client switches can be on any VLANs if you configure the director to snoop on the VLAN by entering the **vstack vlan** *vlan-id* global configuration command and if traffic from the VLAN flows through the director. The director can snoop on multiple VLANs extending to clients on different Layer 2 subnets.

By default, when the director is an Ethernet switch, VLAN 1 is the Smart Install management VLAN and the only VLAN that DHCP snoops on. You can, however, use the **vstack startup-vlan** global configuration command to specify another default VLAN.

You can add additional Smart Install management VLANs or a range of VLANs to participate in DHCP snooping. You can configure any number of Smart Install management VLANs.

**vstack vlan** *vlan-id*

This command is not supported when the director is a router. On a router, after you enable Smart Install with the **vstack basic** command, clients connected to any Layer 3 interface on the router will continue to communicate with Smart Install. Clients must have a default route to reach the director as specified in its DHCP pool.

Beginning in privileged EXEC mode, follow these steps on the director to configure a startup VLAN:

|         | Command                             | Purpose                                                                                                                                                                               |
| ------- | ----------------------------------- | ------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------- |
| Step 1  | **config terminal**                 | Enter global configuration mode.                                                                                                                                                      |
| Step 2  | **vstack director** *ip_ address*   | Configure the device as the Smart Install director by entering the IP address of an interface on the device.                                                                          |
| Step 3  | **vstack basic**                    | Enable the device as the Smart Install director.                                                                                                                                      |
| Step 4  | **vstack vlan** *vlan-id*           | Specify the VLAN for Smart Install management.                                                                                                                                        |
| Step 5  | **vstack startup-vlan** *vlan_value* | Specify the startup VLAN that the director should use for Smart Install management. <br><br> **Note**    Ensure that this VLAN is already present in the system as a VLAN for Smart Install management. |
| Step 6  | **no vstack startup-vlan**          | Remove the VLAN as the startup VLAN so that VLAN 1 now becomes the startup VLAN for Smart Install management.                                                                          |
| Step 7  | **end**                             | Return to privileged EXEC mode.                                                                                                                                                       |
| Step 8  | **no vstack vlan**                  | (Optional) Remove the earlier *vlan-id* VLAN from the Smart Install management VLAN list.                                                                                             |
| Step 9  | **copy running-config startup config** | (Optional) Save your entries in the configuration file.                                                                                                                            |
| Step 10 | **show vstack group custom detail** | Verify the configuration.                                                                                                                                                             |

# Smart Install Configuration Examples

These are examples of how to configure a client default configuration on the director. The director should have Layer 3 enabled with multiple Layer 3 interfaces. The director has an IP address on the VLAN that is used for Smart Install management, and configures an IP address on the client VLAN interface. All clients are the same model type and use the default configuration. Clients added to the network are out-of the box switches with no configuration, or switches that have had a **write erase** and **reload**.

> **Note**    VLANs are not required when the director is a router.

These examples show how to configure a default configuration with the director as TFTP server and with a third-party server.

- The Director as the TFTP Server, page 2-24
- Third-Party, Non-Cisco IOS Device as the TFTP Server, page 2-26

## The Director as the TFTP Server

In this example, the director is the TFTP server and the image and configuration file are stored in the director flash memory.

### Before Configuring the Director

#### Define the Configuration File and Cisco IOS Image

Step 1    You must transfer files to the director. TFTP is the preferred method of transferring files to and from the director. Locate a TFTP server that is IP-reachable by the director and put all files to be transferred on that server.

Step 2    Using a text editor, create a file with the configuration commands for your default switch. In this example, the file name is *default_configuration.txt*.

Step 3    Save the *default_configuration.txt* to the TFTP server.

Step 4    Identify the Cisco IOS image you want loaded as the default image on the switches, for example, *c2960-lanbase-tar.122-53.SE.tar*. Put that file in the TFTP server.

You should have two files on the TFTP server: the configuration file and the Cisco IOS image

> **Note**    After the director is enabled and configured with the default image name, it creates a tailored configuration file for boot up and an imagelist file with the default image and puts them in flash memory.

#### Transfer These Files to the Director

Step 1    Before you start, make sure that you have room in the flash memory for the Cisco IOS image.   The output of the **dir** command shows the available space near the end of the output. If you do not have enough space for the image, do one of these:

- Remove files to free up some space.

- Consider using an external TFTP server for the Smart Install. (That is a different scenario that is not described here.)

**Step 2**    To transfer files to the director, you must copy *from* the director, not *to* the director. The director must initiate the transfer. From the Cisco IOS console, enter these commands:

```
Director# copy tftp://tftp ip address/default_configuration.txt flash:
Director# copy tftp://tftp ip address/IOS_image_file.tar flash:
```

**Note**    This normally takes several minutes.

## Configure a Director

By default, new Ethernet switches shipped from Cisco (for example, Catalyst 2960 switches) boot up without a configuration file. These switches issue a DHCP request on the default VLAN that is configured for the Smart Install director. The director recognizes the DHCP request on the VLAN and responds.

In this example, the director is both the TFTP server and the DHCP server, and it serves IP addresses on VLAN 1.

**Note**    If the director is a router, all clients connected to Layer 3 interfaces on the router will be recognized.

**Step 1**    Assign an IP address to the director on the VLAN 1 interface. If the director is a router, assign an IP address on any Layer 3 interface. You can also use a loopback interface on the director. In this example, the *director_ip_address* is 192.168.1.1.

```
Director(config)# interface vlan 1
Director(config)# ip address 192.168.1.1 255.255.255.0
```

**Step 2**    Configure the director for the default image and configuration file.

```
Director(config)# vstack config flash:default_configuration.txt
Director(config)# vstack image flash:IOS_image_file_name.tar
```

**Step 3**    Configure the director to serve as the DHCP server for clients.

```
Director(config)# vstack dhcp-localserver smart_install_pool
Director(config-vstack-dhcp)# address-pool network_ip_address 255.255.255.0
Director(config-vstack-dhcp)# file-server network_ip_address
Director(config-vstack-dhcp)# default-router network_ip_address
Director(config-vstack-dhcp)# exit
Director(config)# ip dhcp remember
```

**Step 4**    Enable Smart Install on the director.

```
Director(config)# vstack director director_ip_address
Director(config)# vstack basic
```

Any switch that boots up without a configuration file on the default Smart Install VLAN or on an Layer 3 interface on the router becomes a Smart Install client of the director. As clients are powered up and discovered by the director, they are upgraded and given the configuration defined in *default_configuration.txt*.

**Note**    If the configuration file is not present when the smart install client boots up, the client attempts to retrieve the DHCP address from VLAN 1. If VLAN 1 is not allowed in the network, then the smart install client attempts to identify the startup VLAN from the CDP packets that it receives from the upstream data (that is, data received either from a smart install client that is already part of the network, or from the director that the client is connected to).

Use these commands to see the Smart Install network.

To see the upgrade of new clients in progress: `Director#` **`show vstack download`**

To see the clients and information about them: `Director#` **`show vstack status`**

# Third-Party, Non-Cisco IOS Device as the TFTP Server

In this example, the customer stores all client image and configuration files on an external, third-party server reachable by the director and client switches.

## Before Configuring the Director

### Define the Configuration File and Cisco IOS Image

**Step 1**    You must transfer files to the director and TFTP is the preferred method. Locate a TFTP server that is IP-reachable by the director, and put all files to be transferred on the TFTP server.

**Step 2**    Using a text editor, create a file with the configuration commands that you want for the default switch. In this example, the file name is *default_configuration.txt*.

**Step 3**    Save the *default_configuration.txt* to the TFTP server.

**Step 4**    Identify the Cisco IOS image you want loaded as the default image on the switches, for example *c2960-lanbase-tar.122-53.SE.tar*. Put that file in the TFTP server.

You should have two files on the TFTP server: the configuration file and the Cisco IOS image.

**Note**    After the director is enabled and configured with the default image name, it automatically creates a tailored configuration file and an imagelist file for boot up and stores the files in the TFTP server.

## Configure the Director

By default, new Ethernet switches shipped from Cisco (for example, Catalyst 2960 switches) boot up without a configuration file. These switches send a DHCP request on the default Smart Install VLAN. The director recognizes the DHCP request and responds.

**Note**    If the director is a router, all clients connected to Layer 3 interfaces on the router are recognized.

In this example, the director is not acting as the TFTP server. It is acting as the DHCP server, and it serves IP addresses on VLAN 1.

**Step 1**    Assign an IP address to the director on the VLAN 1 interface on a switch or any Layer 3 interface on a router. In this example, the *director_ip_address* is 192.168.1.1.

```
Director(config)# interface vlan 1
Director(config)# ip address 192.168.1.1 255.255.255.0
```

**Step 2**    Configure the director for the default configuration file and image.

```
Director(config)# vstack config tftp://server-ip-address/default_configuration.txt
Director(config)# vstack image tftp://server-ip-address/default_image_file.tar
```

**Step 3**    Configure the director as the DHCP server for clients.

```
Director(config)# vstack dhcp-localserver smart_install_pool
Director(config-vstack-dhcp)# address-pool network_ip_address 255.255.255.0
Director(config-vstack-dhcp)# file-server network_ip_address
Director(config-vstack-dhcp)# default-router network_ip_address
Director(config-vstack-dhcp)# exit
Director(config)# ip dhcp remember
```

**Step 4**    Enable Smart Install on the director.

```
Director(config)# vstack director director_ip_address
Director(config)# vstack basic
```

Any switch that boots up without a configuration file on the default Smart Install VLAN or on a Layer 3 interface on the router, becomes a Smart Install client of the director. As clients power up and are discovered by the director, they are upgraded and given the configuration defined in *default_configuration.txt*.

**Note**    If the configuration file is not present when the smart install client boots up, the client attempts to retrieve the DHCP address from VLAN 1. If VLAN 1 is not allowed in the network, then the smart install client attempts to identify the startup VLAN from the CDP packets that it receives from the upstream data (that is, data received either from a smart install client that is already part of the network, or from the director that the client is connected to).

Use these commands to see the Smart Install network.

To see the upgrade of new clients in progress: Director# **show vstack download status**

To see the clients and information about them: Director# **show vstack status**

**C H A P T E R** 3

# Cisco Smart Install CLI Commands

# clear vstack

To clear the director database or the download list, use the **clear vstack** privileged EXEC command on the Smart Install director.

**clear vstack** {**director-db** [**entry** *index-number*] | **download-list**}

**Syntax Description**

| | |
|---|---|
| **director-db** | Clears all entries in the Smart Install director database. |
| **entry** *index-number* | (Optional) Clear the specified client index from the Smart Install director database. The index number range is from 1 to 255. |
| **download-list** | Clears the Smart Install download-status list, a table of the Smart Install image and configuration download successes and failures. |

**Defaults**        No default is defined.

**Command Modes**    Privileged EXEC

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 12.2(58)SE | The **entry** *index-number* keywords were added. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    You can enter this command only on a director.

Use the **entry** *index-number* keywords to remove inactive clients from the director database. However, take care not to delete valid (active) entries from the director database. If you enter the client index number of a valid client and configuration backup is enabled, a replacement switch does not get the configuration file. The switch sends a message to alert you of this.

**Examples**    This example shows how to clear the director database:

```
Director# clear vstack director-db
```

This example shows the message received if you try to delete a valid client from the director database:

```
Director# clear vstack director-db entry 2
Config backup feature is ON. If IBC is replaced by another switch, that wont get backup
config file. proceed?[confirm]
```

**Related Commands**

| Command | Description |
|---------|-------------|
| **vstack basic** | Enables the switch or router as the Smart Install director. This command is accepted only if the director IP address is on the switch or router. |
| **vstack director** | Configures a Smart Install director IP address. |

# debug vstack

To enable debugging of the Smart Install feature, use the **debug vstack** privileged EXEC command. To disable debugging, use the **no** form of this command.

**debug vstack** {**all** | **backup** | **cli** | **director-db** | **download** | **emulation** | **fsm** | **group** | **join-window** | **protocol**}

**no debug vstack** {**all** | **backup** | **cli** | **director-db** | **download** | **emulation** | **fsm** | **group** | **join-window** | **protocol**}

**Syntax Description**

| | |
|---|---|
| **all** | Displays all Smart Install debug messages. |
| **backup** | Displays all Smart Install backup management debug messages. |
| **cli** | Displays Smart Install command-line interface (CLI) debug messages. |
| **director-db** | Displays Smart Install director database messages. |
| **download** | Displays Smart Install download debug messages. |
| **emulation** | Displays Smart Install emulation debug messages. |
| **fsm** | Displays Smart Install session-management debug messages. |
| **group** | Displays Smart Install group debug messages. |
| **join-window** | Displays all Smart Install join window debug messages. |
| **protocol** | Displays Smart Install protocol debug messages. |

**Command Default**  Smart Install debugging is disabled.

**Command Modes**  Privileged EXEC

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**  The **undebug vstack** command is the same as the **no debug vstack** command.

**Related Commands**

| Command | Description |
|---|---|
| **show debugging** | Displays information about the types of debugging that are enabled. |

# match (Smart Install group configuration)

To configure the match type for a Smart Install custom group, use the **match** Smart Install group configuration mode command on the Smart Install director. To return to the default setting, use the **no** form of this command. Note that the available keyword depends on the type of custom group defined.

**match host** *ip_address* **interface** *name*

**no match host** *ip_address* **interface** *name*

**match mac** *mac_address*

**no match mac** *mac_address*

**match** *product-id*

**no match** *product-id*

**match** *switch_stack_number product_family port_config*

**no match** *switch_stack_number product_family port_config*

| Syntax Description | host *ip_address* interface *name* | This keyword is visible when the custom group is defined by **connectivity**. Configure a client group based on the switch topology, where **host** *ip_address* is the IP address of the upstream neighbor of the client. If a client matches more than one group characteristic, a connectivity match takes precedence over product ID or stack number, but not over MAC address matches. |
|---|---|---|
| | | Identifies the interface on the upstream neighbor to which the client is connected. The interface ID must be the full identifier for the interface, such as GigabitEthernet 2/0/1. |
| | mac *mac_address* | This keyword is visible when the custom group is defined by the **mac** keyword. Configure a client group to include switches with the specified MAC addresses. Enter a **match** command for each MAC address to be included. If a client matches more than one group characteristic, a MAC address match takes precedence over any other match. |
| | *product-id* | This keyword is visible when the custom group is defined by **product-id**. Configure a client group based on the model number of the switch associated with the group, where *product-id* is the product ID for the group starting with *WS-Cnnnn-* * (for example, WS-C2960-48TC-L). |
| | | Note    The product ID can be the same as that of a built-in group. If a client matches a built-in group and a custom group, the custom group takes precedence when assigning image and configuration files. |

| | |
|---|---|
| *switch_stack _number product_family port_config* | This keyword is visible when the custom group is defined by the **stack** keyword. Configure a client in a group based on custom stack configuration. |
| | • *switch_number*—Number of the switch in the stack. The range is from 1 to 9. |
| | • *product_family*—Stack product family. To see the available product families, enter a **?** after the switch number. |
| | • *port_config*—Switch port configuration. The available configurations vary, depending on the product family. To see the available port configurations, enter a **?** after the product family. |
| | If a client matches more than one group characteristic, a stack match takes precedence over product ID, but not over MAC address or connectivity matches. |

**Defaults**    No match criteria is identified.

**Command Modes**    Smart Install group configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 12.2(55)SE | The *mac_address* match option was added. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Although you can enter this command on a client, the configuration does not take effect. Only configuration commands entered on the director are valid. Should a client become a director at some point, the configuration file entered on it is then valid.

To define the custom group type and enter Smart Install group configuration mode, enter the **vstack group custom** *group_name* {**connectivity** | **mac** | **product-id** | **stack**} global configuration command.

Use the **match host** *ip_address* **interface** *name* command to define connectivity groups based on the network topology; that is, based on the upstream neighbor to which the client is connected. The upstream neighbor could be the director or an intermediate device. If a client matches more than one group characteristic, a connectivity match takes precedence over product ID or a stack match, but not over a MAC address match.

Use the **match** *mac_address* command to define groups based on switch MAC addresses. You can include switches with the same or different product IDs, as long as they use the same image and configuration file. Enter the **show vstack neighbors all** privileged EXEC command to see the MAC addresses of switches in the Smart Install network.

Use the **match** *product-id* command to match any product ID, including those not defined in the **vstack group built-in** command. These could be supported devices that were not shipping when the software version was released.

Use the **match** *switch_stack _number product_family port_config* command to identify switches in a stack. For example, **match 3 3750e WS-3750E-24PD** matches switch 3 in a Catalyst 3750E stack with a port configuration of 24 PoE ports.

**Examples**     This example shows how to identify a custom group named *test* based on matching connectivity, to enter Smart Install group configuration mode, to specify that the group includes clients connected to the host with the IP address 2.2.2.2 through interface Gigabit Ethernet 0/1, and to identify the image and configuration files to be obtained through TFTP for the group:

```
Director(config)# vstack group custom test connectivity
Director(config-vstack-group)# match host 2.2.2.2 interface gigabitethernet0/1
Director(config-vstack-group)# image tftp://101.122.33.10/c3560-ipservices-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/3560-24-ipbase-config.txt
```

This example creates a custom group named *testgroup3* that includes the three switches identified by MAC address and configures the group to use the specified image file and configuration.

```
Director(config)# vstack group custom textgroup3 mac
Director(config-vstack-group)# match mac 0023.34ca.c180
Director(config-vstack-group)# match mac 001a.a1b4.ee00
Director(config-vstack-group)# match mac 0019.309d.5c80
Director(config-vstack-group)# image tftp://101.122.33.10/c3750-ipbase-tar.122-52.SE.tar
Director(config-vstack-group)# config tftp://101.122.33.10/3750-24-ipbase_config.txt
```

You can verify the group settings by entering the **show vstack group custom** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show vstack group built-in** | Displays configured Smart Install built-in groups. |
| **vstack group custom** | Configures Smart Install custom groups. |

# show vstack

To display Smart Install information, use the **show vstack** privileged EXEC command on the Smart Install director or a client.

show vstack {**config** | **host** *ip_address* | **join-window configuration** | **status** [**detail**]}

show vstack {**download-status** [**detail**]

show vstack client {**1** | *client_ ip_address* | **all** | **group** {**built-in** *product_family port_config* | **custom** *group_name*} *client-password* {**running-config** | **tech-support** | **version**}

show vstack group {**built-in** *product_family* {[*port_config*] **detail**} | **custom** [*group_name*] **detail**}

show vstack neighbors [**1** | *client_ ip_address* | **all** | **group built-in** *product_family port_config*]

| Syntax Description | | |
|---|---|---|
| | **config** | Displays Smart Install configuration parameters. |
| | **download-status** | Displays a tabulated output of the Smart Install image and configuration download successes and failures. |
| | | **Note**    Use this command to determine the status of upgrades. |
| | **detail** | Displays detailed information for the previous keyword. For example, **show vstack download-status detail** can display a detailed reason for a zero-touch upgrade failure. |
| | **host** | Displays information about a client within the Smart Install topology. This command is available only on the director. |
| | *ip_address* | Enter the IP address of the director or a client. |
| | **join-window configuration** | Displays the join-window configurations. |
| | **status** | Displays the status of the CDP database. This command is available only on the director. |
| | **client** | Displays client information through the remote command |
| | **1** | Displays information about client 1 in the Smart Install network. Numbers are shown for as many clients as are in the network. |
| | *client_ ip_address* | Displays information about the client with the specified IP address. |
| | **all** | Displays information about all clients. |
| | **group** | Displays Smart Install group information. |
| | **built-in** | Displays information about preconfigured (built-in) groups. |
| | *product_family* | Enter the built-in product family. To see the available product families, enter **?** after **built-in**. |
| | *port_config* | Enter the switch port configuration. The available configurations vary, depending on the product family. To see the available port configurations, enter **?** after the *product_family*. |
| | **running-config** | Displays the current operating configuration for the selected client. |
| | **tech-support** | Displays system information for technical support assistance. |
| | **version** | Displays system hardware and software status. |
| | **custom** | Displays information about user-defined groups. |

| | |
|---|---|
| *group_name* | Enter the user name of remote hosts. |
| **neighbors** | Displays information about the specified neighbors: |
| | • **1**—the neighbors of client 1 |
| | • *client_ip_address*—the neighbors of the specified client |
| | • **all**—all neighbors in the Smart Install network |
| | • **group**—neighbors of the specified group or groups |

**Command Modes**    Privileged EXEC

**Note**    The command with some, but not all, of the keywords are available at the user EXEC level.

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 12.2(55)SE | The **client**, **join-window configuration**, **neighbors**, **1**, **running-config**, **tech-support**, and **version** keywords were added. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    The outputs of the **show** commands are different when entered on the director or on the client. Not all keywords are available on the client.

In Cisco IOS Release 12.2(58)SE and later or 15.1(1)SY, the output of the **show vstack status** command shows whether or not Smart Install is enabled on the director. If enabled, it also includes this additional information about clients:

- device status (Smart Install capable or not)
- health status (active or inactive)
- join-window status (allowed, hold, or denied), and
- upgrade status for image or configuration (in progress, complete, or failed).

If you disable Smart Install on the director by entering the **no vstack** global configuration command, the output of the **show vstack status** [**detail**] and **show vstack download-status** [**detail**] commands shows only Smart Install: DISABLED. The output of the **show vstack config** command shows the Smart Install configuration even though it is not in effect.

**Examples**    This is example output from the **show vstack config** command on a client:

```
Director# show vstack config
Role: Client
 Vstack Director IP address: 1.1.1.163
```

This is example output from the **show vstack config** command on a director:

```
Director# show vstack config
Role: Director
 Vstack Director IP address: 1.1.1.163
```

```
Vstack Mode: Basic
Vstack default management vlan: 1
Vstack start-up management vlan:1000
Vstack management Vlans: none
Vstack Config file: tftp://1.1.1.100/default-config.txt
Vstack Image file: tftp://1.1.1.100/c3750e-universalk9-tar.122-
Join Window Details:
        Window: Open (default)
        Operation Mode: auto (default)
Vstack Backup Details:
        Mode: On (default)
        Repository: flash:/vstack (default)
```

These are example outputs from the **show vstack download-status** command on a director:

```
Director# show vstack download-status
Total no of entries : 3
No    client-IP       client-MAC      Method          Image-status Config-status
s
===   ===============  ==============  ==============  ============ =============
=
1     172.20.249.3     001e.be67.3000  image-upgrade   UPGRADED     **
2     172.20.249.1     0022.5699.c800  zero-touch      UPGRADING    UPGRADED
3     172.20.249.2     0022.0d26.6300  image-upgrade   NOT STARTED  **


Director# show vstack download-status
Total no of entries : 3
No    client-IP       client-MAC      Method          Image-status Config-status
===   ===============  ==============  ==============  ============ =============
1     172.20.249.3     001e.be67.3000  image-upgrade   UPGRADED     **
2     172.20.249.1     0022.5699.c800  zero-touch      NOT STARTED  FAILED
3     172.20.249.2     0022.0d26.6300  image-upgrade   NOT STARTED  **
```

This is example output from the **show vstack host** command:

```
Director# show vstack host 1.1.1.1
Host Info :
Code :
ClNum  MAC Address      Product-ID         IP_addr          DevID      status
=====  ==============   =================  ===============  ==========  =========
1      001d.71ba.f780   WS-C2960PD-8TT-L   1.1.1.1          2960pd-47


Neighbor Info:

MAC Address     Dev ID           IP_addr          Local Int     Out Port
==============  ===============  ===============  ============  =============
0023.5e32.3780  3750e-163-smi    1.1.1.163        Fas 0/7       Gig 1/0/1
```

This is example output from the **show vstack join-window configuration** command:

```
Director# show vstack join-window configuration

Join Window Configuration Details:
        Window: Open (default)
          Mode: auto (default)
        No Join Window start/end dates and times configured
```

This is example output from the **show vstack status** command:

```
Director# show vstack status
SmartInstall:  ENABLED
Status: Device_type Health_status Join-window_status Upgrade_status
Device_type:  S - Smart install N - Non smart install P - Pending
Health_status:  A - Active I - Inactive
Join-window_Status:  a - Allowed  h - On-hold   d - Denied
```

```
Image Upgrade:  i - in progress   I - done        X - failed
Config Upgrade: c - in progress   C - done        x - failed
Director Database:
DevNo  MAC Address      Product-ID         IP_addr          Hostname    Status
=====  ==============   ================   ==============   ==========  =========
0      0018.7363.4200   WS-C3750-24TS      172.20.249.54    IBD-MXD-ST  Director
1      0016.4779.b780   WS-C3750G-24TS     172.20.249.54    IBD-MXD-ST  Director
2      d0d0.fd37.5a80   WS-C3750X-48P      172.20.249.54    IBD-MXD-ST  Director
3      0026.5285.7380   WS-C3750E-24TD     172.20.249.54    IBD-MXD-ST  Director
4      0024.13c6.b580   WS-C3750E-24TD     172.20.249.115   DEV-c6.b5c  S A a
5      0021.a1ab.9b80   WS-C2960-48TC-S    172.20.249.249   DEV-ab.9bc  S A a I C
6      0024.5111.0900   WS-C3750E-24TD     172.20.249.222   DEV-11.094  S A a I C
7      001d.45f3.f600   WS-C3750G-24TS     172.20.249.87    DEV-90.f64  S A a
8      0016.c890.f600   WS-C3750G-24TS     172.20.249.87    DEV-90.f64  S A a
9      001f.2604.8980   WS-C2960-48TC-S    172.20.249.89    DEV-04.89c  S A a I C
10     001b.d576.2500   WS-C3750E-24PD     172.20.249.91    DEV-a6.1cc  S A a I C
```

This is example output from the **show vstack status** command if you have disabled Smart Install on the director by entering the **no vstack** global configuration command:

```
Director #show vstack status
SmartInstall:  DISABLED
```

This is example output from the **show vstack status detail** command:

```
Director# show vstack status detail
SmartInstall:  ENABLED
----------------------------------------------
Device Num    : 0
Device ID     : 3750e-163-smi
MAC Address   : 0023.5e32.3780
IP Addr       : 1.1.1.163
Hop value     : 0
Serial        : FDO1239V026
Product-ID    : WS-C3750E-24PD
Version       : 12.2(0.0.242)DEV
Image         : C3750E-UNIVERSALK9-M
Entry Role    : Entry
(N-1)HOP Entry : Already Root
Backup done   :  no
Latest backup file: none
Latest backup client name: none
File checksum    : none
Status           : Director


----------------------------------------------
Device Num    : 1
Device ID     : 3560g-10net-11
MAC Address   : 0013.c4b4.bc00
IP Addr       : 10.5.113.11
Hop value     : 1
Serial        : Not Found
Product-ID    : WS-C3560G-24PS
Version       : 12.2(50)SE3
Image         : C3560-IPSERVICESK9-M
Entry Role    : IBC Entry
(N-1)HOP Entry : 0023.5e32.3780
Backup done   :  no
Latest backup file: none
Latest backup client name: none
File checksum    : none
Status           : NSI


----------------------------------------------
Device Num    : 2
```

```
Device ID       : 2960pd-47
MAC Address     : 001d.71ba.f780
IP Addr         : 1.1.1.1
Hop value       : 1
Serial          : FOC1138Z6P7
Product-ID      : WS-C2960PD-8TT-L
Version         : 12.2(0.0.242)DEV
Image           : C2960-LANBASEK9-M
Entry Role      : IBC Entry
(N-1)HOP Entry  : 0023.5e32.3780
Backup done     : Yes
Latest backup file: flash:/vstack/2960pd-47-001d.71ba.f780.REV2
Latest backup client name: 2960pd-47
File checksum   : 426154BFAFE1425F527621DC8B647C38
Status          : ACT
```

This is example output from the **show vstack client running-config** command for client 1:

```
Director# show vstack client 1 password running-config
----- [show running-config] for 2960pd-47 @ 1.1.1.1 -----

Building configuration...

Current configuration : 2723 bytes
!
version 12.2
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname 2960pd-47
!
boot-start-marker
boot-end-marker
!
enable password test
!
!
!
no aaa new-model
system mtu routing 1500
authentication mac-move permit
<output truncated>
```

This is example output from the **show vstack group built-in** command:

```
Director# show vstack group built-in
2918    2918 product family
  2960    2960 product family
  2960g   2960g product family
  2960xs  2960xs product family
  2975    2975 product family
  3560    3560 product family
  3560e   3560e product family
  3560g   3560g product family
  3560x   3560x product family
  3750    3750 product family
  3750e   3750e product family
  3750g   3750g product family
  3750x   3750x product family
  detail  Show vstack product details
  nme-es  NME-ES product family
  sm-es2  SM-ES2 product family
```

```
  sm-es3    SM-ES3 product family
  sm-es3g   SM-ES3G product family
```

This is example output from the **show vstack group custom detail** command:

```
Director # show vstack group custom detail
-------------------------------------------------
Group Name:   2960-8
Image:        tftp://1.1.1.100/c2960-lanbasek9-tar.122-0.0.221.DEV.tar
Config File:  tftp://1.1.1.100/2960-8-config.txt
Connectivity Details (IP Adress:Interface):
 1.1.1.163:FastEthernet1/0/1
-------------------------------------------------
Group Name:   WS-C3560E-24TD
Image:        tftp://1.1.1.0/c3560e-ipbasek9-tar.122-0.0.221.DEV.tar
Config File:  tftp://1.1.1.100/3560e-config.txt
Product-ID:   WS-C3560E-24TD
-------------------------------------------------
Group Name:   lotr-stack
Image 1:      tftp://1.1.1.100/c3750e-universalk9-tar.122-0.0.221.DEV.tar
Image 2:      tftp://1.1.1.100/c3750-ipservicesk9-tar.122-0.0.221.DEV.tar
Config File:  tftp://1.1.1.100/lotr-stack-config.txt
Stack Details (Switch_number:Product-id):
              1:3750G 24
              3:3750G 24POE
```

This is example output from the **show vstack group custom detail** command:

```
Director #show vstack group custom detail

-------------------------------------------------
Group Name:   2960-8
Image:        tftp://1.1.1.100/c2960-lanbasek9-tar.122-0.0.221.DEV.tar
Config File:  tftp://1.1.1.100/2960-8-config.txt
Connectivity Details (IP Adress:Interface):
 1.1.1.163:FastEthernet1/0/1
-------------------------------------------------
Group Name:   WS-C3560E-24TD
Image:        tftp://1.1.1.0/c3560e-ipbasek9-tar.122-0.0.221.DEV.tar
Config File:  tftp://1.1.1.100/3560e-config.txt
Product-ID:   WS-C3560E-24TD
-------------------------------------------------
Group Name:   lotr-stack
Image 1:      tftp://1.1.1.100/c3750e-universalk9-tar.122-0.0.221.DEV.tar
Image 2:      tftp://1.1.1.100/c3750-ipservicesk9-tar.122-0.0.221.DEV.tar
Config File:  tftp://1.1.1.100/lotr-stack-config.txt
Stack Details (Switch_number:Product-id):
              1:3750G 24
              3:3750G 24POE
```

This is example output from the **show vstack neighbors** command for client 1:

```
Director #show vstack neighbors 1
MAC Address      Dev ID           IP_addr          Local Int       Out Port
==============   ==============   ==============   =============   ============
001d.71ba.f780   2960pd-47        1.1.1.1          Gig 1/0/1       Fas 0/7
```

show vstack

| Related Commands | Command | Description |
|---|---|---|
| | **vstack basic** | Enables the switch or router to be the Smart Install director. This command is accepted only if the director IP address is on the switch or router. |
| | **vstack director** | Configures a Smart Install director IP address. |

# vstack

To enable the Smart Install feature on a director or client device, use the **vstack** global configuration command. To disable the Smart Install feature on the a director or client device, use the **no** form of this command.

**vstack**

**no vstack**

**Syntax Description**     This command has no keywords.

**Defaults**     Smart Install is enabled.

**Command Modes**     Global configuration

**Command History**

| Release | Modification |
|---------|--------------|
| 12.2(58)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**     Configuring Smart Install on a director or client switch opens TCP port 4786 on the director and on the client. You can use the **no vstack** global configuration command on a director or client device to disable Smart Install and shut down the TCP port.

To enable Smart Install after it has been disabled, enter the **vstack** global configuration command.

When you enter the **no vstack** command to disable Smart Install on a director or client device, Smart Install configuration already present it remains in the running configuration, but does not take effect. This includes the Smart Install director IP address and other Smart Install configurations, such as group configurations.

If you disable Smart Install on a director and there were Smart Install DHCP IP addresses configured, you need to manually delete them.

When Smart Install is disabled on a device, the **vstack director** *ip_ address* and **vstack basic** global configuration commands are not allowed on the device.

No warning message is generated when you disable Smart Install.

To reenable Smart Install on a device, enter the **vstack** global configuration command.

To see if Smart Install is enabled on a device, enter the **show vstack status** privileged EXEC command.

If you disable Smart Install on the director by entering the **no vstack** global configuration command, the output of the **show vstack status** [**detail**] and **show vstack download-status** [**detail**] commands shows only Smart Install: DISABLED. The output of the **show vstack config** command shows the Smart Install configuration even though it is not in effect.

**Examples**   This example shows how to disable Smart Install on the device:

```
Director(config)# no vstack
Director(config)#
```

**Related Commands**

| Command | Description |
|---|---|
| **show vstack status** | Displays the Smart Install status. |

# vstack attach

To connect to a client from the director, use the **vstack attach** privileged EXEC command on the director.

**vstack attach** {*client - index* | *client IP address*}

| Syntax Description | | |
|---|---|---|
| | *client - index* | Client index number from the list of active clients within the Smart Install network. |
| | *client IP address* | Client IP address |

**Command Default**     There is no default setting.

**Command Modes**     Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.2(55)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**     Use this command to connect to the client user interface from the director. This command is a wrapper for the telnet command. Select the client either by choosing from a list that shows the active clients that are available within the Smart Install network or by entering the client IP address.

The client-index list is dynamically generated in the Cisco IOS help text. If the director device is not rebooted, then the same client-index numbers can be used in additional configurations.

**Examples**     This example shows how to use the client ID with the **vstack attach** command to connect to a client from the director.

```
Director# vstack attach ?
  1       c3750-2042 @ IP 10.0.0.1 : MAC 0000.0040.4080
  2       c3750-2045 @ IP 10.0.0.2 : MAC 0000.000c.0d80
  A.B.C.D  IP address of remote node to attempt attaching to
Director# vstack attach 2
```

This example shows how to use the client IP address with the **vstack attach** command:

```
Director# vstack attach 1.1.1.1
```

# vstack backup

To enable the backup feature and allow client configurations to be saved in the director's repository, use the **vstack backup** global configuration command. Use the **no vstack backup** command to disable the backup feature.

**vstack backup** [**file-server** *url*]

**no vstack backup**

| Syntax Description | **file-server** *url* | (Optional) Specifies the registry used for backup: |
|---|---|---|
| | | • **flash** |
| | | • **ftp** |
| | | • **http** |
| | | • **https** |
| | | • **rcp** |
| | | • **scp** |
| | | • **tftp**[1] |
| | | • **usb** |
| | | If no registry is specified, the local repository **flash**:/vstack is used. |

1. **tftp** is the only supported network *url*.

| Command Default | Backup is enabled. The local repository **flash**:/vstack is used. It is created if it does not exist. If the directory cannot be created, the **flash**:/ directory is used. |
|---|---|

| Command Modes | Global configuration mode |
|---|---|

| Command History | Release | Modification |
|---|---|---|
| | 12.2(55)SE | This command was introduced to support Smart Install devices. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

| Usage Guidelines | From the director, enter this command to enable the backup feature and allow clients' configurations to be saved in the director repository. You must enable this feature so that zero-touch replacement occurs when a client is replaced by another client with the same product ID. |
|---|---|
| | You can enter the **file-server** keyword to specify a repository to be used for the backup. Do not include the director IP address as part of the file-server URL. If the director IP address is part of the URL, the command is not rejected, but it does not work as expected. |

**Note**     This command works on both the director and the client. However, it is only meaningful when the device is the director.

**Examples**     This example shows how to enable the backup feature:

```
Director(config)#v stack backup
```

This example shows where you can specify the repositiory:

```
director(config)# vstack backup file-server ?
  flash:  Repository using flash:
  ftp:     Repository using ftp:
  http:    Repository using http:
  https: Repository using https:
  rcp:     Repository using rcp:
  scp: Repository using scp:
  tftp:    Repository using tftp:
```

# vstack basic

To enable switch or router as the Smart Install director, use the **vstack basic** global configuration command. This command is accepted only if the director IP address matches one of the device IP addresses. To disable the Smart Install director function on the switch or router, use the **no** form of this command.

> **vstack basic**

> **no vstack basic**

**Syntax Description**    This command has no arguments of keywords.

**Defaults**    Smart Install director is not enabled.

**Command Modes**    Global configuration

**Command History**

| Release | Modification |
| --- | --- |
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    There can be only one director managing a number of clients in a Smart Install network.

The director must be running a Smart Install-capable image.

If you have disabled Smart Install on the device by entering the **no vstack** global configuration command, this command is not allowed. You can reenable Smart Install by entering the **vstack** global configuration command.

For zero-touch upgrade, all DHCP transactions in the Smart Install network between the DHCP server and the clients must run through the director.

If you enter the **vstack basic** command on a device that does not have the director IP address (either assigned by the DHCP server or configured by entering the vstack **director** *ip-address* global configuration command), the command is not accepted. If the device is a switch, it must be a client.

If you enter the **vstack basic** command before a director IP address has been assigned or configured, the command is rejected with a message that the director is not configured.

When you enable the director by entering this command:

- DHCP snooping is enabled on the director for VLAN 1 and any other configured Smart Install VLANs. You can, however, use the **vstack startup-vlan** global configuration command to specify another default VLAN.

- The director starts building a director database of neighboring devices.

If you enter the **no vstack basic** command to disable director functionality on the device, Smart Install configurations are not deleted but do not take effect until the device is again enabled as a director. When you enter **no vstack basic**, DHCP snooping is disabled, and the director database is no longer valid.

If the director IP address is configured on an interface, and you shut down or delete the interface or change the interface IP address, the switch becomes a client and must find another director IP address.

**Examples**

This example shows how to enable the switch or router as a director when the director IP address is on the device:

```
Director(config)# vstack basic
Director(config)#
```

This example shows the error message that appears if you enter the command on a device when no director IP address has been configured or assigned by DHCP:

```
Director(config)# vstack basic
Command Rejected: Director IP is not configured
```

This example shows the error message that appears if you enter the command on a device configured with a director IP address that is not owned by the switch or router:

```
Director(config)# vstack basic
Command Rejected: The Director IP address does not match a switch IP address.
```

You can verify Smart Install director settings by entering the **show vstack config** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show vstack config** | Displays the Smart Install configuration. |
| **vstack director** | Configures a Smart Install director IP address. |

# vstack config

To identify the default configuration file for the clients, use the **vstack config** global configuration command on the Smart Install director. To remove the configuration file as the default, use the **no** form of this command.

**vstack config** *location config_filename*

**no vstack config**

| Syntax Description | *location* | Enter **flash:; flash0:,** or **flash1:** if the director is the TFTP server and the configuration file is in the director flash memory. Enter **tftp://** and the location of the default configuration file if the file is not in the director flash memory. If the director is the TFTP server, the location is the director IP address. |
|---|---|---|
| | | **Note**   Although visible in the command-line help, these options are not supported: **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.** |
| | *filename* | The syntax for entering the filename when not in the director flash is **tftp:**[[//*location*]/*directory*]/*config.txt* |

**Defaults**   No default file name is configured.

**Command Modes**   Global configuration

| Command History | Release | Modification |
|---|---|---|
| | 12.2(52)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**   Although you can enter this command on any device running a Smart Install image, the configuration does not take affect if the switch is not the director. Only configuration commands entered on a director are valid. If the client switch becomes the director, the entered configurations is then valid.

Use this command to define the configuration file when all switches in the network have the same product ID (PID). The configuration file is a text file that contains the configuration file to be downloaded to the client.

This is an optional configuration. When you configure a default configuration, the default configuration file is used when the configuration file for a client is not in a group configuration file.

A client sends an error message if it cannot download an image or configuration file due to misconfiguration, if the image or the configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside the configured time frame.

**Examples**     This is an example of Smart Install default configuration when there is only one type of product ID (24-port Catalyst 2960) in the network, the director is the TFTP server, and the configuration file is in the director flash memory:

```
Director(config)# vstack config flash:2960-24-lanbase-config.txt
```

This is an example of Smart Install default configuration when there is only one type of product ID (24-port Catalyst 2960) in the network and the configuration file is not in the director flash memory:

```
Director(config)# vstack config tftp://1.1.1.10/2960-24-lanbase-config.txt
```

You can verify Smart Install settings by entering the **show vstack config** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show vstack config** | Displays the Smart Install configuration. |
| **vstack image** | Configures a Smart Install default image file. |

# vstack dhcp-localserver

To configure the Smart Install integrated director as the Smart Install DHCP server, use the **vstack dhcp-localserver** global configuration command on the director. The command creates a Smart Install DHCP pool and enters Smart Install DHCP configuration mode. To delete the Smart Install DHCP pool, use the **no** form of this command.

> **vstack dhcp-localserver** *poolname*

> **no vstack dhcp-localserver** *poolname*

| Syntax Description | *poolname* | Enter the name of the Smart Install DHCP server pool. |
|---|---|---|

**Defaults**  The director is not the Smart Install DHCP server.

**Command Modes**  Global configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**  When the Smart Install DHCP server is the director or another device running Cisco IOS, if the network reloads, the server could assign other IP addresses to participating devices. If the director IP address changes, it is no longer the Smart Install director, which could break the director and client relationships. You must then reassociate the clients and the director. To ensure that this does not occur, you should enter the **ip dhcp remember** global configuration command to configure the DHCP pool to remember the IP bindings. If the network or device reloads, the DHCP server issues the same IP address to a client that it had before the reload.

Enter this command only on the director. Do not enter it on a client.

These configuration commands are available in Smart Install DHCP configuration mode:

- **address-pool** *ip-address* {*network_mask* | */prefix-length*}: Configures the IP address and network mask or prefix-length for the DHCP pool. The prefix length is the number of bits that comprise the address prefix and is another way to specify the network mask. Enter it as a number preceded by a forward slash (*/nn*).

- **default-router** *ip-address*: Configures the DHCP default router IP address for the pool.

- **exit**: Exits Smart Install DHCP configuration mode and returns to global configuration mode.

- **file-server** *ip-address*: Configures a default TFTP server IP address. This is the same parameter configured by entering the **option 150** *ip-address* keyword in DHCP pool configuration mode.

- **no**: Negates a command or sets its default.

**Examples**      This example shows how to configure a Smart Install DHCP pool named *smart_install1* by entering Smart Install DHCP configuration mode and assigning a network address and default router for the pool and a TFTP server:

```
Director(config)# vstack dhcp-localserver smart_install1
Director(config-vstack-dhcp)# address-pool 1.1.1.1 /22
Director(config-vstack-dhcp)# default-router 2.2.2.2
Director(config-vstack-dhcp)# file-server 3.3.3.3
Director(config-vstack-dhcp)# exit
```

You can verify Smart Install DHCP server settings by entering the **show dhcp server** or **show ip dhcp pool** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show ip dhcp pool** | Displays information about configured DHCP pools. |
| **show dhcp server** | Displays the DHCP servers. |
| **vstack basic** | Enables the switch or router to be the Smart Install director. This command is accepted only if the director IP address is on the device. |

# vstack director

To manually configure the IP address of the director, use the **vstack director** global configuration command on the Smart Install director or client. To remove the director IP address configuration, use the **no** form of this command.

> **vstack director** *ip-address*

> **no vstack director**

**Syntax Description**

| | |
|---|---|
| *ip-address* | Enter the IP address of the switch or an interface on the switch or router intended to be the Smart Install director. <br>• When entered on the director, the IP address should be one of the device interfaces.<br>• When entered on a client, the IP address should be an IP address on the director. |

**Defaults**   No director IP address is configured unless it was assigned by the DHCP server.

**Command Modes**   Global configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**   For a switch or router to be the director, the director IP address must be the IP address of a Layer 3 interface on the device. A Layer 2 switch cannot be the director.

If you have disabled Smart Install on the device by entering the **no vstack** global configuration command, this command is not allowed. You can reenable Smart Install by entering the **vstack** global configuration command.

This command is not mandatory if the director IP address is configured by DHCP. For DHCP to assign the director IP address, you must configure the DHCP server with options 125 and 16.

If the director IP address is not assigned by DHCP, you must enter the **vstack director** *ip-address* command on the director and on the other Smart Install switches.

When the director IP address has been configured by entering this command or it is assigned by a DHCP server, enable the Smart Install director by entering the **vstack basic** command on the switch or router.

There can be only one director for a set of clients and there is no way to configure a backup director. If the director fails, the switch must restart before you can resume plug and play operation.

The director must be the device in the network through which all DHCP transactions between the client switches and the DHCP server pass. The director must be running a Smart Install capable image.

If you enter the **vstack director** *ip-address* command on a client with an IP address that does not match the director IP address assigned by the DHCP server, the client cannot participate in a session with the director listed by the server.

If you enter the v**stack director** *ip-address* command on a client and change the IP address from that of the director, the client attempts to contact the new director. If the new IP address is on the client, that device becomes the director.

A director changes roles and becomes a client if you shut down or delete the interface on which the director IP address is configured or if you change the interface IP address.

**Examples**    This example shows how to configure the director IP address on a switch or router and then enable it as the director:

```
Director(config)# vstack director 1.1.1.1
Director(config)# vstack basic
Director(config
```

You can verify Smart Install settings by entering the **show vstack config** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show vstack config** | Displays the Smart Install configuration. |
| **vstack basic** | Enables the switch or router as the Smart Install director. This command is accepted only if the director IP address is on the device. |

# vstack download-config

To start an on-demand configuration download for clients, use the **vstack download-config** privileged EXEC command on the Smart Install director. This command is visible only on the director.

**vstack download-config** {*config_URL ip_address* | **built-in** *product_family port_config*} *remote_switch_password* **startup** [**reload** [**in** *time*]]

**Note**    There is not a **no** form for this command.

| Syntax Description | *config_URL* | Enter **tftp:** and the download configuration URL. |
| --- | --- | --- |
| | | **Note**    Although visible in the command-line help, these options are not supported: **bs:, cns:, flash1:, flash:,ftp:, http:, https:, null:, nvram:, rcp:, scp:, system:, tar:, tmpsys:, xmodem:, ymodem.** |
| | *ip_address* | Enter the IP address of the client. |
| | **built-in** *product_family* | Enter the identified (built-in) product family ID. To see the available product families, enter a **?** after **built-in**. |
| | *port_config* | Enter the switch port configuration. The available IDs depend on the product family. To see the available port configurations, enter a **?** after the product family. |
| | *remote_switch_ password* | Enter the password of the client switch. Enter *none* (or any word) for switches with no password, |
| | | **Note**    The password is required only for switches that are not Smart Install-capable. It is not required for switches already in the Smart Install network. |
| | **startup** | Applies the configuration to the startup configuration. |
| | **reload** | (Optional) Reloads the switch. |
| | **in** *time* | (Optional) Specifies the time to reload the switch in the format hh:mm. The range is from 00:00 to 23:59. If you do not specify a time, the reload occurs when you exit the CLI. |

**Defaults**    No download configuration is identified.

**Command Modes**    Privileged EXEC

| Command History | Release | Modification |
| --- | --- | --- |
| | 12.2(52)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Cisco Smart Install Configuration Guide**

**Usage Guidelines**   You can enter this command only on the director.

When you enter the **built-in** *product_family port_config* keywords for an on-demand configuration download, you must have first identified the configuration for the specified built-in group. Enter the **config** *location config_filename* Smart Install group configuration command.

The *remote_switch_password* is required only for switches that are not Smart Install-capable. It is not required for switches already in the Smart Install network.

**Examples**   This example shows how to start an on-demand image download of the configuration file for a Catalyst 2960 24-port switch on a client switch with the password *mypassword*. The download occurs when the switch starts in 10 hours:

```
Director# vstack download-config built-in 2960 24 mypassword startup reload in 10:00
```

To see the configuration files for built-in or custom groups, enter the **show vstack group** {**built-in** | **custom**} privileged EXEC command. To verify the download, enter the **show vstack download-status** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show vstack download-status** [**detail**] | Displays Smart Install download status. The **show vstack download-status detail** display includes detailed reasons for download failures. |
| **show vstack group** | Displays configures Smart Install groups. |

# vstack download-image

To configure an on-demand tar image download for clients, use the **vstack download-image** privileged EXEC command on the Smart Install director. This command is visible only on the director.

> **vstack download-image tar** *image_URL* {*ip_address* | **index** *name*} *remote_switch_password* [**override**] **reload** [**in** *time*]

> **vstack download-image built-in** *product_family port_config remote_switch_password* [**override**] **reload** [**in** *time*]

✎
**Note**    For releases earlier than 12.2(55)SE, you must create an imagelist so the command is **vstack download-image** {*imagelist_file URL ip_address* | **built-in** *product_family port_config*} *remote_switch_password* [**override**] **reload** [**in** *time*]

✎
**Note**    There is not a **no** form for this command.

| Syntax Description | **tar** *image-name.tar_URL* | Enter **tar** and **tftp:** and the URL for the tar image file. |
|---|---|---|
| | | **Note**    Although visible in the command-line help, these options are not supported: **bs:**, **cns:**, **flash1:**, **flash:**,**ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tar:**, **tmpsys:**, **xmoden:**, **ymodem.** |
| | *ip_address* | Enter the IP address of the remote host. |
| | **index** *name* | (Optional) Enter the index name from the director database for multiple clients or a range of clients. |
| | | •  *name*—Enter multiple clients or a range of clients, for example 1,3-5,7,9-11. |
| | **built-in** *product_family* | Enter the identified (built-in) product family ID. To see the available product families, enter a **?** after **built-in**. |
| | *port_config* | Enter the port configuration. The available configurations depend on the product family. To see the available configurations, enter a **?** after the product family. |
| | *remote_switch_ password* | Enter the password of the client or NONE if there is no password configured. |
| | | •  The password is required only for switches that are not Smart Install-capable. It is not required for switches already in the Smart Install network. |
| | | •  When upgrading multiple clients (by entering the**index** *name* keyword), all clients must have the same password or they must all have no password. |
| | **override** | (Optional) Override the existing image. |
| | **reload** | Reload the switch. |
| | **in** *time* | (Optional) Specify the time in Specify the **time** to reload the switch using the format hh:mm. The range is from 00:00 to 23:59. If no time is specified, the reload occurs when you exit the CLI. |

**Defaults**            No download image is identified.

**Command Modes**       Privileged EXEC

**Command History**

| Release | Modification |
|---------|--------------|
| 12.2(52)SE | This command was introduced. |
| 12.2(52)SE | The **index** *name* keywords were added. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    You can enter this command only on the director.

The image file must be a tar and not a bin file.

When you enter the **built-in** *product_family port_config* keywords for an on-demand image download, you must have first identified the image for the specified built-in group by entering the **image** *location image_name* Smart Install group configuration command.

The *remote_switch_password* is required only for switches that are not Smart Install-capable. It is not required for switches already in the Smart Install network.

When you use the **index** *name* keyword to upgrade multiple clients, all clients must have the same password, or must have no password configured.

When you use the **index** *name* keyword to upgrade multiple clients, if a client is not compatible with the specified image, the upgrade fails.

**Examples**            This example shows how to start an on-demand image download of the configured image file for a Catalyst 2960 24-port client switch with the password *mypassword*. The switch is set to reload in 10 hours:

```
Director# vstack download-image built-in 2960 24 mypassword reload in 10:00
```

This example shows how to start an on-demand image download of the configured image file for clients 1 through 3 and 4 in the director database and to reload in 10 hours:

```
Director# vstack download-image tar tftp://192.168.0.50/2960.tar index 1-3, 4 mypassword
reload in 10:00
```

To see the images in the director database, enter the **show vstack status detail** privileged EXEC command. To see images configured for built-in or custom groups, enter the **show vstack group** {**built-in** | **custom**} privileged EXEC command. To verify the download, enter the **show vstack download-status** privileged EXEC command.

**Related Commands**

| Command | Description |
|---------|-------------|
| **show vstack download-status** [**detail**] | Displays Smart Install download status. Entering **show vstack download-status detail** includes detailed reasons for download failures. |

**vstack download-image**

| Command | Description |
|---|---|
| **show vstack group** | Displays configures Smart Install groups. |
| **show vstack status detail** | Displays Smart Install images in the director database. |

# vstack group built-in

To identify a built-in Smart Install group and to enter Smart Install group configuration mode for the group, use the **vstack group built-in** global configuration command on the Smart Install director. The built-in groups are currently shipping products. To remove the configuration for the built-in group, use the **no** form of this command.

**vstack group built-in** *product_family port_config*

**no vstack group built-in** *product_family port_config*

| Syntax Description | | |
|---|---|---|
| | *product_family* | Enter the identified (built-in) product family ID. To see the available product families, enter a **?** after **built-in**. |
| | *port_config* | Enter the switch port configuration. The available choices depend on the product family. To see the available port configurations, enter a **?** after the product family. |

**Defaults**       No built-in groups are identified.

**Command Modes**       Global configuration

| Command History | Release | Modification |
|---|---|---|
| | 12.2(52)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**       Although you can enter this command on any device running a Smart Install image, the configuration does not take effect if the device is not the director. Only configuration commands entered on the director are valid. If the client at some point becomes the director, the entered configurations are then valid.

Use this command to define the configuration file for a group when there are multiple product IDs (PIDs) in the network. If all switches in the network have the same PID, you would use the **vstack config** *location config_filename* global configuration command to configure a default configuration file for all switches.

The built-in groups are shipping products that are present in the CLI.

You can use the **vstack group built-in ?** command to display a list of the product IDs built into the configuration. You can use the **vstack group built-in** *product_family* **?** command to display a list of the port configurations for a product family.

If a client does not match any custom group, the switch is configured by using a built-in group configuration and image. If a switch does not match any group, the default image and configuration are used.

---

**Note**       Image files are specific to a product family. Configuration files are specific to a port configuration.

A client sends an error message if it cannot download an image or configuration file due to misconfiguration, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside the configured time frame.

These configuration commands are available in Smart Install group configuration mode for built-in groups:

- **config**: Identifies the configuration file for the group.
- **exit**: Exits Smart Install group configuration mode and returns to global configuration mode.
- **image**: Identifies the image for the group, for example, *c3560-ipservices-mz.122-52.SE.tar.* This image must be a tar and not a bin file.
- **no**: Negates a command or sets its default.

To identify the group configuration file name (*config*) and the group image file name, enter **tftp:** followed by the filename.

Note    Although visible in the command-line help, these keywords are not supported: **flash1:**, **flash:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:**

**Examples**    This example shows how to identify a group as Catalyst 3560 8-port Power over Ethernet (PoE) switches and to enter Smart Install group configuration mode. It identifies the image to be obtained through TFTP for the group as `c3560-ipbase-mz.122-52.SE.tar`, which contains the 3560 IP base image for 12.2(52)SE and identifies the configuration file as the 3560 IP base image.

```
Director(config)# vstack group built-in 3560 8poe
Director(config-vstack-group)# image tftp://1.1.1.10/c3560-ipbase-mz.122-52.SE.tar
Director(config-vstack-group)# config tftp://1.1.1.10/c3560-24-ipbase-config.txt
```

You can verify group settings by entering the **show vstack group built-in** privileged EXEC command.

**Related Commands**

| Command | Description |
|---------|-------------|
| **show vstack group built-in** | Displays the configured Smart Install built-in groups. |
| **vstack group custom** | Configures Smart Install custom groups. |

# vstack group custom

To configure a user-defined Smart Install group and to enter Smart Install group configuration mode for the group, use the **vstack group custom** global configuration command on the Smart Install director. To return to the default setting or to remove the group, use the **no** form of this command.

**vstack group custom** *group_name* {**connectivity** | **mac** | **product-id** | **stack**}

**no vstack group custom** *group_name*

| Syntax Description | | |
|---|---|---|
| | *group_name* | Enter a name for the custom group. |
| | **connectivity** | Matches a custom group based on connectivity or network topology. All clients that have the same upstream neighbor. If a client matches more than one group characteristic, a connectivity match takes precedence over a stack match or product-id match, but not over a MAC address match. |
| | **mac** | Matches a custom group consisting of switch MAC addresses. If a client matches more than one group characteristic, a MAC address match takes precedence. |
| | **product-id** | Matches a custom group based on the product ID. |
| | **stack** | Matches a custom group based on switch stack membership. If a switch matches more than one group characteristic, a stack match takes precedence over product-id. |

**Defaults**    No custom group is identified.

**Command Modes**    Global configuration

| Command History | Release | Modification |
|---|---|---|
| | 12.2(52)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Although you can enter this command on any switch or router running a Smart Install image, the configuration does not take affect if the device is not the director. Only configuration commands entered on the director are valid. If the client switch becomes the director, the entered configurations are then valid.

When you enter Smart Install group configuration mode, use the **match** command to identify the group characteristics.

All members of a custom group must be able to run the same image and configuration file. For example, only Catalyst 3560 switches can run the image c3560-ipbase-tar.122-52.SE.tar, and each 3560 port configuration would run a different configuration file.

A custom group takes precedence over a built-in group. If a switch does not match any custom group, the switch is configured with the built-in group configuration. If a switch does not match *any* group, the default configuration and image are used.

Among custom groups, a group matched by MAC address takes precedence over other matches. A connectivity match takes precedence over one matched by product ID or stack, and a stack match takes precedence over product ID.

A client sends an error message if it cannot download an image or configuration file due to misconfiguration, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside the configured time frame.

These configuration commands are available in Smart Install group configuration mode for custom groups:

- **config**: Identifies the configuration file for the group.
- **exit**: Exits Smart Install group configuration mode and returns to global configuration mode.
- **image**: Identifies the image for the group, for example *c3750-ipservices-mz.122-52.SE.tar*. This image must be a tar and not a bin file.
- **match**: Configure the match type for the group. See the **match (Smart Install group configuration)** command for more information about defining criteria for the custom group.
- **no**: Negates a command or sets its default.

To identify the group configuration file name (*config*) and the group image file name, enter **tftp:** *config* followed by the filename.

✎

**Note**    Although visible in the command-line help, these keywords are not supported: **flash1:**, **flash:**, **ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:**

**Examples**    This example shows how to identify a custom group named *test* based on matching connectivity and to enter Smart Install group configuration mode. It specifies that the group includes clients connected to the host with the IP address 2.2.2.2 with an interface name of *finance*, and identifies the image and configuration to be obtained through TFTP for the group:

```
Director(config)# vstack group custom test connectivity
Director(config-vstack-group)# match host 2.2.2.2 interface finance
Director(config-vstack-group)# image tftp://1.1.1.10/c3560-ipbase-mz.122-52.SE.tar
Director(config-vstack-group)# config tftp://1.1.1.10/3560-24-ipbaseconfig.txt
```

You can verify the group settings by entering the **show vstack group custom** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **vstack hostname-prefix** | Configures group parameters to match for a custom group. |
| **show vstack group custom** | Displays the configured Smart Install custom groups. |
| **vstack group built-in** | Configures Smart Install built-in groups. |

# vstack hostname-prefix

To specify a prefix for the hostname for a client, use the **vstack hostname-prefix** global configuration command on the Smart Install director. To remove the prefix name setting, use the **no** form of this command.

**vstack hostname-prefix** *prefix*

**no vstack hostname-prefix**

| Syntax Description | *prefix* | Enter a prefix to the hostname for clients in the Smart Install network. The last part of the switch hostname for a switch that had a DCHP request snooped through the director would be the last 3 bytes of the switch MAC address. |
|---|---|---|

**Defaults**    No prefix name is identified.

**Command Modes**    Global configuration

| Command History | Release | Modification |
|---|---|---|
| | 12.2(52)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Although you can enter this command on any device running a Smart Install image, the configuration does not take effect if the device is not the director. Only configuration commands entered on the director are valid. If the nondirector becomes the director, the entered configurations are then valid.

When a DHCP request is snooped through the director and this command is entered, the switch hostname includes the configured hostname followed by the last 3 bytes of the switch MAC address.

**Examples**    This example shows how to configure the hostname *Cisco* for a client that has been DHCP-snooped:

```
Director(config)# vstack hostname-prefix Cisco
Director(config)# exit
```

If you then telnet to that switch from the director, the display shows the resulting switch hostname assignment:

```
Director#
*Mar  1 17:21:43.281: %SYS-5-CONFIG_I: Configured from console by console
*Mar  1 17:21:52.399: %DHCP-6-ADDRESS_ASSIGN: Interface Vlan1 assigned DHCP address
172.16.0.17, mask 255.255.0.0, hostname

    CISCO-bf.97c0#
```

You can verify the hostname prefix by entering the **show vstack config** privileged EXEC command on the director.

■  **vstack hostname-prefix**

| Related Commands | Command | Description |
|---|---|---|
| | **show vstack config** | Displays the Smart Install configuration. |

# vstack image

To configure the default image file name for all clients in a Smart Install topology, use the **vstack image** global configuration command on the Smart Install director. To remove the default image, use the **no** form of this command.

**vstack image** *location image_name.***tar**

**no vstack image**

**Syntax Description**

| | |
|---|---|
| *location* | Enter **flash:** if the director is the TFTP server and the default image is in the director flash memory. Enter **tftp://** and the location of the default image file if the image is not in the director flash memory. If the director is the TFTP server, the location is the director IP address. |
| | **Note**    Although visible in the command-line help, these options are not supported: **flash1:,ftp:**, **http:**, **https:**, **null:**, **nvram:**, **rcp:**, **scp:**, **system:**, **tmpsys:.** |
| *image_name.***tar** | Enter the image name, for example, *c2960-lanbase-tar.122-53.SE.tar.* The image must be a tar and not a bin file. |

**Defaults**    No default image name is identified.

**Command Modes**    Global configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Although you can enter this command on any device running a Smart Install image, the configuration does not take effect if the device is not the director. Only configuration commands entered on the director are valid. If the client becomes the director, the entered commands are then valid.

The image name is the image that you want to download, for example, *c3750-ipservices-mz.122-52.SE.tar.* This image must be a tar and not a bin file.

Use this command to define the image when all clients in the network have the same product ID (PID).

This is an optional configuration. When you configure a default image, the image file is used if a client does not belong to a custom group (first priority) or to a built-in group.

Use this command when all clients managed by the director are in the same product family.

A client sends an error message if it cannot download an image or configuration file due to misconfiguration, if the image or configuration file is not available, or if a join window is configured and the DHCP acknowledgement occurs outside the configured time frame.

■  **vstack image**

**Examples**         This is an example of Smart Install default configuration when there is only one type of product ID (24-port Catalyst 2960) in the network, the director is the TFTP server, and the image file is stored in the director flash memory:

```
Director(config)# vstack image flash:c2960-lanbase-tar.122-53.SE.tar.
```

You can verify group settings by entering the **show vstack config** privileged EXEC command.

**Related Commands**

| Command | Description |
|---|---|
| **show vstack config** | Displays the Smart Install configuration. |
| **vstack config** | Configures a Smart Install default configuration file. |

# vstack join-window close

To completely close the join-window, use the **vstack join-window close** global configuration command on the Smart Install director. To open the join-window, use the **no vstack join-window close** command.

**vstack join-window close**

**no vstack join-window close**

**Defaults**         The join window is open.

**Command Modes**    Global configuration mode

**Command History**

| Release | Modification |
| --- | --- |
| 12.2(55)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    From the director, use the **vstack join-window close** command in global configuration mode to close the join window. The join-window is a time frame during which a client that is coming up and joining the Smart Install network can be upgraded with a new image and configuration.

✎
**Note**    This command works on both the director and the client. However, it is only meaningful when the device is the director.

**Examples**    This example shows how to close the join window.

```
Director(config)# vstack join-window close
```

**Related Commands**

| Command | Description |
| --- | --- |
| **vstack join-window mode auto** | Configures the join window mode on the director. |
| **vstack join-window start** | Configures the time interval during which the director sends configuration and image files to clients. |

# vstack join-window mode auto

To configure the join window mode, use the **vstack join-window mode auto** global configuration command on the Smart Install director.

**vstack join-window mode auto**

**no vstack join-window mode**

**Defaults**     Clients are automatically upgraded when the join window is open.

**Command Modes**     Global configuration mode

**Command History**

| Release | Modification |
|---------|--------------|
| 12.2(55)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**     Entering the **vstack join-window mode auto** global configuration command automatically allows clients to be upgraded to the latest image and configuration after they join the Smart Install network as long as the join window is open. This is the default.

Entering the **no vstack join-window mode** global configuration command puts clients in a hold state when they join the network. You must enter the **vstack on-hold-clients install** privileged EXEC command for the immediate upgrade of clients in the hold state.

Note     You can enter this command on both the director and the client, but it is only meaningful when the device is the director.

**Examples**     This example shows how to configure the join-window manual mode on the director.

```
Director(config)# vstack join-window mode auto
```

**Related Commands**

| Command | Description |
|---------|-------------|
| **vstack join-window close** | Closes the join window completely. |
| **vstack join-window start** | Configures the time interval during which the director sends configuration and image files to clients. |
| **vstack on-hold-clients install** | Installs configuration and images files on a specified client. |

# vstack join-window start

To configure the time interval during which the director sends configuration and image files to clients, use the **vstack join-window start** global configuration command on the Smart Install director. To remove the join-window configuration, use the **no** form of this command.

**vstack join-window start** [*date*] *hh:mm* [*interval*] [**end** *date*] [**recurring**]}

**no vstack join-window start**

**Syntax Description**

| | |
|---|---|
| *date* | (Optional) Enter a start date for the director to send configuration and image files to the client in the format *day month year*:<br>• *day* is 1 to 31.<br>• *month* is the 3-letter abbreviation for the month (for example, Jun for June).<br>• *year* is 1993 to 2035. |
| *hh:mm* | Enter the time to start sending the files in the format *hh:mm*, using a 24-hour clock, 00:00 to 23:59. |
| *interval* | Enter the number of hours for which the join window remains active. The range is from 0 to 23, in the format *hh:mm*, for example, 01:30 is 1 hour and 30 minutes.<br><br>**Note**    The maximum duration that you can configure is 24 hours. |
| **end** *date* | (Optional) Enter the end date for the director to stop sending configuration and image files in the format *day month year*:<br>• *day* is 1 to 31.<br>• *month* is the 3-letter abbreviation for the month (for example, Jun for June).<br>• *year* is 1993 to 2035. |
| **recurring** | (Optional) Specifies that the time to send configuration and image files to the client occurs every day at the configured start time. |

**Defaults**    No director time interval is configured. When configured, if no dates or intervals are set, the start time is recurring.

**Command Modes**    Global configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Although you can enter this command on any device running a Smart Install image, the configuration does not take effect if the device is not the director. Only configuration commands entered on the director are valid. If the client becomes the director, the entered configurations are then valid.

**Note**    Before configuring a join window, you should verify that the director time is correct.

When a join window is configured and clients are detected outside the join window, the director does not send files to the client until the next configured join window. The auto-install process occurs on the client as if it were not a Smart Install client.

During the join window, clients cannot upgrade the image or configuration files except with files received from the director. Within the join window, the director passes the names and locations of the image and configuration files to the client, which then upgrades these files.

When a join window is configured, if the DHCP acknowledgement occurs outside the configured time frame, a client sends an error message that it cannot download an image or configuration file due to misconfiguration.

**Examples**    This example shows how to configure the director to insert DHCP options, starting at 10 a.m. and recurring every day at this time.

```
Director(config)# vstack join-window start 10:00 recurring
```

This example shows how to configure the join window to start on July 4, 2009, and remain on (no end date).

```
Director(config)# vstack join-window start 04 july 2009 09:00
```

This example shows how to configure the join window to start on July 4, 2009, and end on July 5, 2009.

```
Director(config)# vstack join-window start 04 july 2009 10:00 end 05 july 2009
```

This example shows how to configure the join window to start on July 4, 2009, at 10 a.m. and to continue for 4 hours:.

```
Director(config)# vstack join-window start 04 july 2009 10:00 04:00
```

This example shows how to configure the join window to start on July 7, 2009 at 10 a.m., operate for 4 hours, recur daily at that time until July 10, when the join window ends and remains shut.

```
Director(config)# vstack join-window start 07 july 2009 10:00 04:00 end 10 july 2009 recur
```

You can verify join-window settings by entering the **show vstack config** privileged EXEC command on the director.

**Related Commands**

| Command | Description |
| --- | --- |
| **show vstack config** | Displays the Smart Install configuration. |

# vstack join-window-status index

To move a client from the join-window deny state to the held or active state, use the **vstack join-window-status index** privileged EXEC command on the Smart Install director.

**vstack join-window-status index** *client-id* {**allowed** | **held**}

<table>
<tr><td rowspan="3">**Syntax Description**</td><td>*client-id*</td><td>Identify the client ID from the director database. The client ID can be a single client, multiple clients, or a range of clients, for example 1,3-5,7,9-11.</td></tr>
<tr><td>**allowed**</td><td>Change the join window state for the client or clients from deny or held to active. A client in the active state is allowed zero-touch upgrades, on-demand upgrades, or configuration backups when the join window is open.</td></tr>
<tr><td>**held**</td><td>Change the join window state for the client or clients from deny to held. A client in the held state is allowed zero-touch upgrades and on-demand upgrades, but not configuration backups when the join window is open.</td></tr>
</table>

**Defaults**     The join window state for all clients is determined by the vstack join-window mode global configuration command.

**Command Modes**     Privileged EXEC

**Command History**

| Release | Modification |
| --- | --- |
| 12.2(58)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**     Use this command to move a client or multiple clients out of the join-window deny state.

After you enter the command, you are asked to confirm the client state change.

You can see the current client states by entering the **show vstack status** privileged EXEC command.

**Examples**     This example shows how to manually change the join window state of clients 1 to 4 to active.

```
Director # vstack join-window-status index 1-4 allowed
```

**Related Commands**

| Command | Description |
| --- | --- |
| **show vstack status** | Displays Smart Install status, including the join window state for clients. |

# vstack on-hold-clients install

To authorize an immediate image and configuration upgrade to an on-hold client or to all on-hold clients, use the **vstack on-hold-clients install** privileged EXEC command on the Smart Install director.

> **vstack on-hold-clients install** {**all** | **client-id** *client index* | **ipaddr** *ip-address* | **mac** *mac address*} [**override**]

**Syntax Description**

| | |
|---|---|
| **all** | Install the image and configuration upgrade on all on-hold clients. |
| **client-id** *client index* | Install the image and configuration upgrade on clients with the specified client ID. The client ID range is 0 to 255. |
| **ipaddr** *ip-address* | Install the image and configuration upgrade on the client with the specified IP address. |
| **mac** *mac address* | Install the image and configuration upgrade on the client with the specified MAC address. |
| **override** | (Optional) Override the existing image. |

**Command Default**   There is no default setting.

**Command Modes**   Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.2(55)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**   This command is required only when you configure **no vstack join-window mode**. When the mode is **auto** (the default), clients joining the Smart Install network are automatically upgraded when the join window is open.

When you set the join window mode to manual by entering the **no vstack join-window mode** command, clients joining the Smart Install network are put in a *hold* state. Entering the **vstack on-hold-clients install** privileged EXEC command authorizes the director to immediately upgrade an on-hold client. Specify a client for upgrade by entering one of the keywords, or enter **all** to select all client devices for upgrade.

**Examples**   This example shows how to select all on-hold client devices for upgrade:

```
Director# vstack on-hold-clients install all
```

This example shows how to specify the on-hold client for upgrade by IP address:

```
Director# vstack on-hold-clients install ipaddr 10.10.10.1
```

| Related Commands | Command | Description |
|---|---|---|
| | **vstack join-window mode auto** | Configures the join window mode on the director. |
| | **vstack on-hold-clients remove** | Removes a specified client from the on-hold client allowed list. |

# vstack on-hold-clients remove

To remove a specified client or all clients from the hold state, use the **vstack on-hold-clients remove** privileged EXEC command on the director.

**vstack on-hold-clients remove** {**all** | **client-id** *client index* | **ipaddr** *ip-address* | **mac** *mac address*}

| Syntax Description | | |
|---|---|---|
| **all** | | Remove on all on-hold clients from the allowed list. |
| **client-id** *client index* | | Remove the client with the specified client ID. The client ID range is 0 to 255. |
| **ipaddr** *ip-address* | | Remove the client with the specified IP address. |
| **mac** *mac address* | | Remove the client with the specified MAC address. |

**Command Default**   There is no default setting.

**Command Modes**   Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.2(55)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**   When you set the join window mode to manual by entering the **no vstack join-window mode** command, new clients joining the Smart Install network are put in a *hold* state. They remain in this state until you enter the **vstack on-hold clients install** privileged EXEC command to start an upgrade on the client or until you remove them from the on-hold state.

Enter the **vstack on-hold-clients remove** privileged EXEC command on the director to remove a specified client or all clients from the list of clients in the hold state. When a client has been removed from the on-hold list and you enter the **vstack on-hold clients install** privileged EXEC command for the client, the request is denied.

When you remove a client from the on-hold list, you must restart the client for an upgrade to occur.

When the mode is **auto** (the default), clients joining the Smart Install network are automatically upgraded when the join window is open.

**Examples**   This example shows how to remove all on-hold client devices from the hold list:

```
Director# vstack on-hold-clients remove all
```

This example shows how to specify the on-hold client for removal by IP address:

```
Director# vstack on-hold-clients remove ipaddr 10.10.10.1
```

| Related Commands | Command | Description |
|---|---|---|
| | **vstack join-window mode auto** | Configures the join window mode on the director. |
| | **vstack on-hold-clients install** | Authorizes the director to grant an immediate upgrade to an on-hold client. |

# vstack startup-vlan

To specify the default VLAN that the director should use for Smart Install management, use the **vstack startup-vlan** global configuration command.

> **vstack startup-vlan** *vlan_value*

**Syntax Description**

| | |
|---|---|
| *vlan_value* | The VLAN to use for Smart Install Management. |

**Command Default**    None

**Command Modes**    Global configuration

**Command History**

| Release | Modification |
|---|---|
| 15.0(2)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Use this command to specify the default VLAN that the director should use for Smart Install operations. Depending on the VLAN that is specified in the command, DHCP snooping is enabled on that VLAN so that the director can identify new switches that are connected to the network. If this command is not entered, however, VLAN 1 is used as default.

**Examples**    This example shows how to specify VLAN 7 as the default VLAN for Smart Install:

```
Director# vstack startup-vlan ?
  <1-4094> Startup Management Vlan
Director# vstack startup-vlan 10
```

# vstack tar

To archive files into a tar file, use the **vstack tar** privileged EXEC command on the director.

**vstack tar** *destination-url* [*source-url*]

| Syntax Description | *destination-url* | Specifies the source URL alias for the local or network file system in which to archive files. The following options are supported: |
|---|---|---|
| | | • **flash:** *tar file name* |
| | | • **ftp:***t ar file name* |
| | | • **http:** *tar file name* |
| | | • **https:** *tar file name* |
| | | • **rcp:** *tar file name* |
| | | • **scp:** *tar file name* |
| | | • **tftp:** *tar file name* |
| | *source-url* | (Optional) Specifies the source URL. |
| | | **Note**     When a source URL is not specified, the entire local repository is archived. Specify the local repository with the **vstack backup file-server** command in global configuration mode. |

**Command Default**     There is no default setting.

**Command Modes**     Privileged EXEC mode

| Command History | Release | Modification |
|---|---|---|
| | 12.2(55)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**     Use the **vstack tar** command in privileged EXEC mode on the director to create a tar file into which to write files. Specify the destination URL for the local or network file system and the name of the tar file to be created. Specify the source URL (optional).

**Note**     If you do not specify a source URL, the local repository is archived. Specify the local repository with the **vstack backup file-server** global configuration command.

**Examples**     This example shows how to create an archive tar file (*archive.tar*) in flash memory and archive files from the repository into *mytar* directory in flash.

```
Director# vstack tar flash: archive.tar flash mytar
```

■   **vstack tar**

**Related Commands**

| Command | Description |
| --- | --- |
| **vstack untar** | Extracts and archives a tar file. |

# vstack untar

To extract archived tar files into a directory, use the **vstack untar** privileged EXEC command on the director.

**vstack untar** *source-url* [*destination-url*]

| Syntax Description | | |
|---|---|---|
| | *source-url* | Specifies the source URL alias for the local or network file system and the name of the tar file. The following options are supported: |
| | | • **flash**: *tar file name* |
| | | • **ftp**: *tar file name* |
| | | • **http**: *tar file name* |
| | | • **https**: *tar file name* |
| | | • **rcp**: *tar file name* |
| | | • **scp**: *tar file name* |
| | | • **tftp**: *tar file name* |
| | *destination-url* | (Optional) Specifies the destination URL. |
| | | **Note**    When you do not specify a destination URL, the local repository is used. Specify the local repository with the **vstack backup file-server** command in global configuration mode. |

**Command Default**    There is no default setting.

**Command Modes**    Privileged EXEC mode

| Command History | Release | Modification |
|---|---|---|
| | 12.2(55)SE | This command was introduced. |
| | 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Use the **vstack untar** command in privileged EXEC mode on the director to extract files from a tar file. Specify the source URL for the local or network file system and the name of the tar file. Specify the destination URL (optional).

**Note**    When you do not specify a destination URL, the local repository is used. Specify the local repository with the **vstack backup file-server** command in global configuration mode.

**Examples**    This example shows how to extract the tar file *archive.tar* from flash memory into the local repository.

```
Director# vstack untar flash: archive.tar
```

■  **vstack untar**

| Related Commands | Command | Description |
|---|---|---|
| | **vstack tar** | Creates a tar file and writes files into it. |
| | **vstack untar / table** | Archives tar files in a table, |

# vstack untar / table

To list the contents of a tar file, use the **vstack untar/ table** privileged EXEC command on the director.

> **vstack untar/table** *source-url*

| | | |
|---|---|---|
| **Syntax Description** | *source-url* | Specifies the source URL alias for the local or network file system and the name of the tar file. These options are supported: |

- **flash:** *tar file name*
- **ftp:** *tar file name*
- **http**: *tar file name*
- **https:** *tar file name*
- **rcp:** *tar file name*
- **scp:** *tar file name*
- **tftp:** *tar file name*

**Command Default**    None

**Command Modes**    Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.2(55)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Use the **vstack untar/table** command in privileged EXEC mode on the director to archive tar files. Specify the source URL for the local or network file system and the name of the tar file.

**Examples**    This example shows how to display the contents of the tar file *myconfig.tar* that is in flash memory.

```
Director# vstack untar/table flash:myconfig.tar
c3750-1-0000.0040.4080.REV2 (1785 bytes)
c3750-1-0000.0040.4080.REV1 (91 bytes)
c3750-0000.0040.4080.REV2 (1795 bytes)
c3750-0000.0040.4080.REV1 (1674 bytes)
c3750-ibc-0000.0040.4080.REV2 (1823 bytes)
```

**Related Commands**

| Command | Description |
|---|---|
| **vstack tar** | Creates a tar file and writes files into it. |
| **vstack untar** | Extracts and archives tar files. |

# vstack vlan

To configure Smart Install VLANs for DHCP snooping, use the **vstack vlan** global configuration command on the Smart Install director. To remove a Smart Install management VLAN, use the **no** form of this command.

**vstack vlan** *vlan-range*

**no vstack vlan** *vlan-range*

✎
**Note**    This command is not valid when the director is a router.

**Syntax Description**

| *vlan-range* | The VLAN ID or IDs for Smart Install management VLANs. You can specify a single VLAN identified by VLAN ID number, a range of VLANs separated by a hyphen, or a series of VLANs separated by a comma. The range is 1 to 4094. |
|---|---|

**Defaults**    The default Smart Install management VLAN is VLAN 1.

**Command Modes**    Global configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(52)SE | This command was introduced. |
| 15.1(1)SY | This command was integrated into Cisco IOS Release 15.1(1)SY. |

**Usage Guidelines**    Although you can enter this command on any device running a Smart Install image, the configuration does not take effect if the device is not the director. Only configuration commands entered on the director are valid. If the client becomes the director, the entered configurations are then valid.

When Smart Install is enabled on the director, DHCP snooping is automatically enabled on VLAN 1. You can, however, use the **vstack startup-vlan** global configuration command to specify another default VLAN instead of VLAN 1.

There is no limit to the number of Smart Install VLANs that you can configure.

This command does not apply to routers.

**Examples**    This example shows how to configure VLAN 10 as a Smart Install VLAN:

```
Director(config)# vstack vlan 10
```

This example shows how to configure multiple Smart Install VLANs:

```
Director(config)# vstack vlan 10-12,100,200
```

You can verify Smart Install settings by entering the **show vstack config** privileged EXEC command.

| Related Commands | Command | Description |
| --- | --- | --- |
| | **show vstack config** | Displays the Smart Install configuration. |

■ **vstack vlan**

# Smart Install MIBs and System Messages

- SNMP MIBs, page 4-1

- System Messages, page 4-3

## SNMP MIBs

- Cisco Smart Install MIB, page 4-1

- Downloading and Working with MIBs, page 4-2

Simple Management Network Protocol (SNMP) development and use is centered around the Management Information Base (MIB). An SNMP MIB is an abstract data base, i.e., a conceptual specification for information that a management application may read and modify in a certain form. This does not imply that the information is kept in the managed system in that same form. The SNMP agent translates between the internal data structures and formats of the managed system and the external data structures and formats defined for the MIB.

The SNMP MIB is conceptually a tree structure with conceptual tables. Relative to this tree structure, the term MIB is used in two senses.

- In one sense, it is actually a MIB branch, usually containing information for a single aspect of technology, such as a transmission medium or a routing protocol. A MIB used in this sense is more accurately called a MIB module, and is usually defined in a single document.

- In the other sense, a MIB is a collection of such branches. Such a collection might comprise, for example, all the MIB modules implemented by a given agent, or the entire collection of MIB modules defined for SNMP.

A MIB is a tree where the leaves are individual items of data called objects. An object may be, for example, a counter or a protocol status. MIB objects are also sometimes called variables.

## Cisco Smart Install MIB

The CISCO-SMART-INSTALL-MIB.my MIB module defines managed objects that facilitate the management of the Smart Install feature. Smart Install is a plug-and-play image and configuration management feature that enables zero-touch deployment of Cisco network devices in an enterprise branch network.

This MIB module is supported only on the director and is designed for the following:

- Checks most of the Smart Install configurations on the director.

- Supports monitoring of client devices discovered by the director.
- Provides status of the deployed client image and configuration as a result of operator-defined profiles.
- Provides notifications for these events:
  - New client joined
  - Client removed
  - Upgrade failure
  - Director functionality enabled or disabled

Note    SNMP set is not supported in this release.

# Downloading and Working with MIBs

These sections provide information about how to download the CISCO-SMART-INSTALL-MIB.my. for the Smart Install feature.

- Considerations for Working with MIBs
- Downloading MIBs

## Considerations for Working with MIBs

While working with MIBs, consider the following:

Mismatches on Datatype Definitions

- Mismatches on datatype definitions might cause compiler errors or warning messages. Although Cisco MIB datatype definitions are not mismatched, some standard RFC MIBs do mismatch. For example:

```
MIB A defines: SomeDatatype ::= INTEGER(0..100)
MIB B defines: SomeDatatype ::= INTEGER(1..50)
```

This example is considered to be a trivial error and the MIB loads successfully with a warning message.

The next example is considered as a nontrivial error (even though the two definitions are essentially equivalent), and the MIB is not successfully parsed.

```
MIB A defines: SomeDatatype ::= DisplayString
MIB B defines: SomeDatatype ::= OCTET STRING (SIZE(0..255))
```

If your MIB compiler treats these as errors, or you want to delete the warning messages, edit one of the MIBs that define this same datatype so that the definitions match.

- Many MIBs import definitions from other MIBs. If your management application requires MIBs to be loaded, and you experience problems with undefined objects, you might want to load the following MIBs in this order:

    RFC1213-MIB.my
    IF-MIB.my
    CISCO-SMI.my
    CISCO-PRODUCTS-MIB.my
    CISCO-TC.my

    • For information about how to download and compile Cisco MIBs, go to the following URL:

       http://www.cisco.com/en/US/tech/tk648/tk362/technologies_tech_note09186a00800b4cee.shtml

## Downloading MIBs

To download the MIBs onto your system if they are not already there, follow these steps:

**Step 1**    Review the considerations in the previous section ("Considerations for Working with MIBs").

**Step 2**    Go to one of the following Cisco URLs.
ftp://ftp.cisco.com/pub/mibs/v2

ftp://ftp.cisco.com/pub/mibs/v1

**Step 3**    Search for the CISCO-SMART-INSTALL-MIB.my. If the MIB you want to download is not there, try the other URL and search again.

**Step 4**    Click the link for a MIB to download that MIB to your system.

**Step 5**    Select **File > Save** or **File > Save As** to save the MIB on your system.

# System Messages

## How to Read System Messages

System log messages can contain up to 80 characters and a percent sign (%), which follows the optional sequence number or time-stamp information, if configured. Messages appear in this format:

*seq no:timestamp: %facility-severity-MNEMONIC:description (hostname-n)*

*seq no:timestamp: %facility-severity-MNEMONIC:description*

By default, a switch sends the output from system messages to a logging process. In a switch stack, stack members append their hostnames to the output from system messages and redirect the output to the logging process on the stack master.

Each system message begins with a percent sign (%) and is structured as follows:

%FACILITY-SEVERITY-MNEMONIC: Message-text

    • FACILITY is two or more uppercase letters that show the facility to which the message refers. A facility can be a hardware device, a protocol, or a module of the system software. The facility for Smart Install messages is *SMI*.

    • SEVERITY is a single-digit code from 0 to 7 that reflects the severity of the condition. The lower the number, the more serious the situation.

*Table 4-1        Message Severity Levels*

| Severity Level | Description |
| --- | --- |
| 0 – emergency | System is unusable. |
| 1 – alert | Immediate action required. |
| 2 – critical | Critical condition. |
| 3 – error | Error condition. |
| 4 – warning | Warning condition. |
| 5 – notification | Normal but significant condition. |
| 6 – informational | Informational message only. |
| 7 – debugging | Message that appears during debugging only. |

- MNEMONIC is a code that uniquely identifies the message.
- Message-text is a text string describing the condition. This portion of the message sometimes contains detailed information about the event, including terminal port numbers, network addresses, or addresses that correspond to locations in the system memory address space. Because the information in these variable fields changes from message to message, it is represented here by short strings enclosed in square brackets ([ ]). A decimal number, for example, is represented as [dec].

*Table 4-2        Variable Fields*

| Representation | Type of Information |
| --- | --- |
| [dec] | Decimal integer |
| [char] | Single character |
| [chars] | Character string |
| [enet] | Ethernet address (for example, 0000.FEED.00C0) |
| [hex] | Hexadecimal integer |
| [inet] | Internet address |

# Error Message Traceback Reports

Some messages describe internal errors and contain traceback information. Include this information when you report a problem to your technical support representative.

This message example includes traceback information:

```
-Process= "Exec", level= 0, pid= 17
-Traceback= 1A82 1AB4 6378 A072 1054 1860
```

Some system messages ask you to copy the error messages and take further action.

# Output Interpreter

The Output Interpreter provides additional information and suggested resolutions based on the output of many CLI commands, such as the **show tech-support** privileged EXEC command.

https://www.cisco.com/pcgi-bin/Support/OutputInterpreter/home.pl

## Bug Toolkit

The Bug Toolkit provides information on open and closed caveats. You can search for all known bugs in a specific Cisco IOS Release.

http://tools.cisco.com/Support/BugToolKit/

# Smart Install System Messages

**Error Message**    `SMI-3-IMAGELIST_FAILED: Default imagelist creation failed.`

**Explanation**    The creation of the default imagelist file failed in flash memory. Possible reasons for this failure are that there is insufficient space in the flash memory of the Smart Install director, that an error occurred while the default imagelist file was created, or that there is no default image configured.

**Recommended Action**    Verify that the director flash memory has sufficient space. If necessary, free some flash memory space (a default imagelist file would need about 100 bytes of space). If necessary, reconfigure the director.

**Error Message**    `SMI-3-IMG_CFG_NOT_CONFIGURED: [chars] (IP Address :[inet]) : The Director does not have a image list file or a configuration file configured for this Product-ID`

**Explanation**    The Smart Install director does not have an imagelist file or configuration file for the device, preventing a successful upgrade. [chars] is the Smart Install device on which the message is displayed, which can be either the client or director, and [inet] it the IP address of that device.

> **Note**    When the message appears on the director, [chars] provides redundant information.

**Recommended Action**    Make sure that the device is added to a built-in group or user-defined group. Configure an imagelist file or configuration file for the group by using the **vstack group built-in** global configuration command for the built-in group or **vstack group custom** global configuration command for the user-defined group.

**Error Message**    `SMI-3-INTERNAL_ERROR: [chars] - [dec]`

**Explanation**    An internal software error occurred on the Smart Install director switch. [chars] describes the error, and [dec] is the error return code.

**Recommended Action**    Copy the message exactly as it appears on the console or in the system log. Research and attempt to resolve the error by using the Output Interpreter. Use the Bug Toolkit to look for similar reported problems. If you still require assistance, open a case with the TAC, or contact your Cisco technical support representative, and provide the representative with the gathered information.

**Error Message**  SMI-3-NOMEMORY: Smart Install memory allocation failure; could not allocate [chars]

**Explanation**  The Smart Install client switch has failed to allocate memory. [chars] is the data table that is allocated during initialization for MIB objects.

**Recommended Action**  Copy the message exactly as it appears on the console or in the system log. Research and attempt to resolve the error by using the Output Interpreter. Use the Bug Toolkit to look for similar reported problems. If you still require assistance, open a case with the TAC, or contact your Cisco technical support representative, and provide the representative with the gathered information.

**Error Message**  SMI-3-SMI_CLIENT_BACKUP_FAILURE: Client Device startup configuration backup fail on repository

**Explanation**  The Smart Install client switch has failed to back up its startup configuration to the repository. (This message appears only on the client switch.)

**Recommended Action**  Verify that you can ping the director switch from the client switch. Verify that the client switch can reach the repository. On the director, look at the output of the **show vstack config** privileged EXEC command to verify that the configuration parameters are correct and that the backup mode is on. Verify that the directory setting on the repository is correct, especially if the repository is an external TFTP server.

**Error Message**  SMI-3-SMI_DIRECTOR_BACKUP_FAILURE: Client Device ([inet]) startup configuration backup fail on repository: [chars] - reason: [chars]

**Explanation**  The Smart Install client switch has failed to back up its startup configuration to the repository. [inet] is the IP address of the client switch. The first [chars] is the repository path, and the seconds [chars] is the reason for the failure. (This message appears only on the director switch.)

**Recommended Action**  Verify that you can ping the director switch from the client switch. Verify that the client switch can reach the repository. On the director, look at the output of the **show vstack config** privileged EXEC command to verify that the configuration parameters are correct and that the backup mode is on. Verify that the directory setting on the repository is correct, especially if the repository is an external TFTP server.

**Error Message**  SMI-3-TAILOR_FAILED: Legacy switches will not be upgraded

**Explanation**  The creation of a tailored Smart Install configuration file failed. Possible reasons for this failure are that there is insufficient space in the director flash memory or that an error occurred while the new configuration file was created.

**Recommended Action**  Verify that the director flash memory has sufficient space. If necessary, free some flash memory space (a tailored configuration would need about 100 bytes of space). If necessary, reconfigure the director.

**Error Message**  `SMI-3-UPGRD_FAILED: Device (IP address: [inet]) [chars] upgrade failed`

**Explanation**  The Smart Install client switch could not upgrade. [inet] is the IP address of the client switch. [chars] is the image or the configuration.

**Recommended Action**  Verify that the configuration on the director switch is correct. Verify that the client switch can reach the TFTP server. Verify that the image or configuration file exists on the TFTP server and is specified correctly.

**Error Message**  `SMI-5-DIRECTOR: Director is [chars]`

**Explanation**  The status of the Smart Install director changed. [chars] is the status (*Enabled* or *Disabled*).

**Recommended Action**  No action is required.

**Error Message**  `SMI-6-AUTOINSTALL: [chars] AUTOINSTALL`

**Explanation**  The auto install and Smart Install processes stopped or continued. [chars] is the status of the processes, which can be either *aborted* or *continued*.

**Recommended Action**  No action is required.

**Error Message**  `SMI-6-CLIENT_CONN_FAILED: Device (IP address: [inet]) failed to connect to Director (IP address : [inet])`

**Explanation**  A Smart Install client did not connect to the director because it did not have the IP address of the director or could not reach the director for other reasons. The first [inet] is the IP address of the client, and the second [inet] is the IP address of the director.

**Recommended Action**  Verify that the IP address of the director is correctly configured on the client.

**Error Message**  `SMI-6-INCORRECT_CFG: No image and config configured for this [chars] [chars]`

**Explanation**  The Smart Install director does not have a configuration for the device. The first [chars] is the type of device (*switch*, *switch-stack*, or *sku type*). If the type of device is *sku type*, the second [chars] is the model number.

**Recommended Action**  Configure a group with a configuration for the device.

**Error Message**  `SMI-6-SMI_CLIENT_BACKUP_SUCCESS: Client Device startup configuration backup successful on repository`

**Explanation**  The Smart Install client switch has successfully backed up its startup configuration to the repository. (This message appears only on the client switch.)

**Recommended Action**  No action is required.

**Error Message**  `SMI-6-SMI_DHCP_ERR: Device failed to [chars] DHCP [chars]`

**Explanation**  The Smart Install director did not configure or remove a DHCP parameter, such as a DHCP pool, subnet, or DHCP pool option. The first [chars] is the status, which can be *configure* or *remove*, and the second [chars] is the DHCP parameter.

**Recommended Action**  Verify that the DHCP parameter is a permitted value.

**Error Message**  `SMI-6-SMI_DIRECTOR_BACKUP_SUCCESS: Client Device ([inet]) startup configuration backup successful on repository: [chars]`

**Explanation**  The Smart Install client switch has successfully backed up its startup configuration to the repository. [inet] is the IP address of the client switch. [chars] is the repository path. (This message appears only on the director switch.)

**Recommended Action**  No action is required.

**Error Message**  `SMI-6-SMI_INVALID_MESSAGE: Received invalid message from [chars] (IP Address : [inet]), SMI Version : [dec] Message Type : [dec]`

**Explanation**  The Smart Install client or director received an invalid message type. This occurs when a newer version of the Smart Install Protocol interoperates with an older version of the protocol that does not support the new message. [chars] is the Smart Install device, which can be either the client or the director, and [inet] it the IP address of that device. The first [dec] is the Smart Install Protocol version on the device that sent the invalid message, and the second [dec] is the type of invalid message.

**Recommended Action**  Make sure that the director switch runs the latest version of the Smart Install Protocol. A director switch that runs the latest version of the protocol can interoperate with a client switch that runs an older version, but not the other way around.

**Error Message**  `SMI-6-SMI_JOIN_WINDOW_MESSAGE: SMI Join window [chars] on IBD(IP address: [inet]`

**Explanation**  A Smart Install join window was opened or closed. [chars] is the status of the window, which can be either *Start* or *End*, and [inet] is the IP address of the device on which the join window was opened or closed.

**Recommended Action**  No action is required.

**Error Message**  `SMI-6-SWITCH_ADD: New Device detected by Director with mac address: [enet]`

**Explanation**  The Smart Install director detected a new device and added it to the database. [enet] is the Ethernet address of the new device.

**Recommended Action**  No action is required.

**Error Message**    `SMI-6-SWITCH_REMOVE: Device [enet] removed from the Director Database`

**Explanation**    A device stopped communicating and was removed from the Smart Install director database. The device might have also been removed from the Smart Install network. [enet] is the Ethernet address of the device.

**Recommended Action**    No action is required.

**Error Message**    `SMI-6-SWITCH_REPLACE: Device [enet] is being replaced by [enet] Device`

**Explanation**    A device was replaced by another device in a Smart Install network. The first [enet] is the Ethernet address of the device that was replaced, and the second [enet] is the Ethernet address of the replacement device.

**Recommended Action**    No action is required.

**Error Message**    `SMI-6-UPGRD_STARTED: Device (IP address: [inet]) [chars] upgrade has started`

**Explanation**    An image or configuration file upgrade started on the Smart Install client. [inet] is the IP address of the client, and [chars] is the name of the image or configuration file.

**Recommended Action**    No action is required.

**Error Message**    `SMI-6-UPGRD_SUCCESS: Device (IP address: [inet]) [chars] has upgraded successfully`

**Explanation**    The Smart Install client was upgraded with a new image or configuration file. [inet] is the IP address of the client, and [chars] is the name of the new image or configuration file.

**Recommended Action**    No action is required.

System Messages

# Supported Devices for Smart Install

*Table A-1        Supported Switches*

| Switch | Can be Director? | Can be Client? |
|---|---|---|
| Catalyst 6500 Supervisor Engine 2T-10GE | Yes | No |
| Catalyst 3750-X | Yes | Yes |
| Catalyst 3750-E | Yes | Yes |
| Cisco 3750 | Yes | Yes |
| Cisco 3560-X | Yes | Yes |
| Cisco 3560-E | Yes | Yes |
| Cisco 3560-C | No | Yes |
| Cisco 3560 | Yes | Yes |
| Catalyst 2960-S | No | Yes |
| Catalyst 2960-C | No | Yes |
| Catalyst 2960 | No | Yes |
| Catalyst 2975 | No | Yes |
| SM-ES2-16-P | No | Yes |
| SM-ES3 SKUs | No | Yes |
| NME-16ES-1G-P | No | Yes |
| NM-16-ESW | Yes | No |

*Table A-2        Supported Routers*

| Router | Can be Director? | Can be Client? |
|---|---|---|
| Cisco 3900 Series Integrated Services Routers G2 | Yes | No |
| Cisco 2900 Series Integrated Services Routers G2 | Yes | No |
| Cisco 1900 Series Integrated Services Routers G2 | Yes | No |
| Cisco 3800 Series Integrated Services Routers | Yes | No |
| Cisco 2800 Series Integrated Services Routers | Yes | No |
| Cisco 1800 Series Integrated Services Routers | Yes | No |

*Table A-3        Minimum Software Releases for Directors and Clients*

| Directors | Minimum Software Release |
|---|---|
| Catalyst 6500 Supervisor Engine 2T-10GE | Cisco IOS Release 15.1(1)SY |
| Cisco 3900, 2900, and 1900 Series Integrated Services Routers G2 | Cisco IOS Release 15.1(3)T |
| Cisco 3800, 2800, and 1800 Series Integrated Services Routers | Cisco IOS Release 15.1(3)T |
| Catalyst 3750-E, 3750, 3560-E, and 3560 Switches | Cisco IOS Release 12.2(55)SE |
| Catalyst 3750-X and 3560-X Switches | Cisco IOS Release 12.2(55)SE |
| **Smart-Install Capable Clients[1]** | |
| Catalyst 3750-E, 3750, 3560-E, and 3560 Switches | Cisco IOS Release 12.2(52)SE |
| Catalyst 3750-X and 3560-X Switches | Cisco IOS Release 12.2(53)SE2 |
| Catalyst 3560-C Compact Switches | Cisco IOS Release 12.2(55)EX |
| Catalyst 2960 and 2975 Switches | Cisco IOS Release 12.2(52)SE |
| Catalyst 2960-S Switches | Cisco IOS Release 12.2(53)SE1 |
| Catalyst 2960-C Compact Switches | Cisco IOS Release 12.2(55)EX1 |
| SM-ES2-16-P, SM-ES3 SKUs, NME-16ES-1G-P | Cisco IOS Release 15.1(3)T |

1. Listed switches running earlier IOS releases are not Smart-Install capable, but can be clients in Smart Install networks as long as they support the **archive download-sw** privileged EXEC command.

# Features by Release

The first release of Smart Install was Cisco IOS Release 12.2(52)SE for Catalyst 2k and 3k switches and 15.1(1)SY.

## Minimum Cisco IOS Release for Major Features

Table 1 lists the minimum software release (after the first release) required to support the major features. Features not listed are supported in all releases.

*Table 1*        *Features Introduced After the First Release and the Minimum Cisco IOS Release Required*

| Feature | New or Revised Commands for the Release |
|---|---|
| **Cisco IOS Release 12.2(53)SE** | |
| Tailored configuration file automatically created by director. | — |
| Imagelist file automatically created by the director when the default image is stored in the director flash memory. | |
| Support for the **flash:** keyword instead of **tftp://** when the director is the TFTP server for storing the default image and a seed configuration file. | |

*Table 1        Features Introduced After the First Release and the Minimum Cisco IOS Release Required (continued)*

| Feature | New or Revised Commands for the Release |
|---|---|
| **Cisco IOS Release 12.2(55)SE** | |
| You can configure the Smart Install network for clients to join only if they are on the on-hold list and it is during the configured join window. | **vstack attach**<br>**vstack backup** |
| Support for two backup files per client. | **vstack backup file-server** |
| When backup is enabled, zero-touch replacement is supported for Smart Install clients (with some restrictions for stack replacement). The replacement configuration file is a seed configuration file with only the basic features. | **vstack join-window close**<br>**vstack join-window mode** |
| All imagelist file generation automatically done by the director. | **vstack on-hold clients install** |
| Configuration synchronization and directory structure for the director. | **vstack on-hold clients remove** |
| Configurable file repository for images and configuration in the Smart Install network. | **vstack tar** |
| Support for hostname changes on Smart Install clients if none is configured. | **vstack untar**<br>**vstack untar/table** |
| Ability of the director to transparently connect to any Smart Install client. | |
| You no longer need to specify the director port for zero-touch upgrades of non-Smart Install switches as 4787. | |
| No need to specify the imaglist name for on-demand downloads. You can use the image name instead, for example, **flash://image.tar.** | |
| In addition to **tftp**/**flash**/**flash1** for image and seed configuration file storage, the **usb** keyword is supported. | |
| Changes in the output of the **show vstack config** and **show vstack status** privileged EXEC commands. | |
| **Cisco IOS Release 12.2(58)SE** or **15.1(1)SY** | |
| Change the client health state from denied to the allowed or held state for the join window | **vstack join-window-status index** *client-id* {**allowed** | **held**} |
| Simultaneous on-demand upgrades of mutliple clients. | **vstack download-image tar** *image_URL* {*ip_address* | **index** *name*} *remote_switch_password* [**override**] **reload** [**in** *time*] (index name keywords) |
| Option to remove selected clients from director database. | |
| Better monitoring with more information in **show vstack status** command output to show client device status, health statue, and upgrade status. | **clear vstack** {**director-db** [**entry** *index-number*] |
| New predefined homogenous stack group. | [**no**] **vstack** (global configuration) |
| Command to disable and reenable Smart Install on client or director devices. | |