CNS Frame-Relay Zero Touch

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Restrictions for CNS Frame-Relay Zero Touch

The Cisco Networking Services Frame Relay Zero Touch solution does not support switched virtual circuits (SVCs).

The Frame Relay zero touch solution does not support IP over PPP over Frame Relay because routing to an interface (or subinterface) that supports IP over PPP over Frame Relay is not possible.

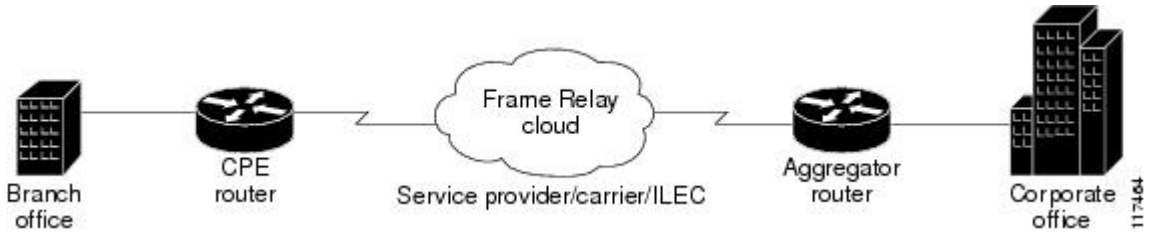
Information About CNS Frame-Relay Zero Touch

Cisco Networking Services Frame Relay Zero Touch

The Cisco Networking Services Frame Relay Zero Touch feature provides a Cisco Networking Services zero touch deployment solution over Frame Relay where the CPE router discovers its data-link connection identifier (DLCI) and IP address dynamically, and then contacts a Cisco Networking Services engine to retrieve its full configuration automatically. This capability is made possible through a single generic bootstrap configuration file common across all service provider end customers subscribing to the services. Within the Cisco Networking Services framework, customers who deploy Frame Relay can create this generic bootstrap configuration without device-specific or network-specific information such as the DLCI, IP address, interface type, controller type (if applicable), or the next hop interface used for the static default route.

The following image illustrates a typical customer network architecture using Frame Relay.

Figure 1: Connectivity in a Frame Relay Customer Network



The CPE router is deployed at multiple sites. Each site connects to a Frame Relay cloud through a point-to-point permanent virtual circuit (PVC). Connectivity from the Frame Relay cloud to the corporate office is through a PVC that terminates at the corporate office. IP traffic sent to the Cisco Networking Services configuration engine is routed through the corporate office. The PVC is identified by its DLCI. The DLCI can vary between branch offices. In order to support zero touch deployment, the CPE router must be able to learn which DLCI to use to connect to the Cisco Networking Services configuration engine.

To support the zero touch capability, the Frame Relay functionality has been modified in the following two ways:

- A new Cisco IOS command, the **ip address dynamic**command has been introduced to discover the CPE router's IP address dynamically based on the aggregator router's IP address. To configure IP over Frame Relay, the local IP address must be configured on the interface.
- The CPE router can now read Local Management Interface (LMI) messages from a Frame Relay switch and determine the list of available DLCIs.

The Cisco Networking Services connect functionality is configured with a set of Cisco Networking Services connect templates. A Cisco Networking Services connect profile is created for connecting to the Cisco Networking Services configuration engine and to implement the Cisco Networking Services connect templates on a CPE router. Cisco Networking Services connect variables can be used as placeholders within a Cisco Networking Services connect template configuration. These variables, such as the active DLCI, are substituted with real values before the Cisco Networking Services connect templates are sent to the router's parser.

When a CPE router is placed in a Frame Relay network, it contains a generic bootstrap configuration. This configuration includes customer-specific Frame Relay configuration (including the LMI type), Cisco Networking

Services connect templates, Cisco Networking Services connect profiles, and the **cns config initial** command. This command initiates the Cisco Networking Services connect function.

The Cisco Networking Services connect functionality begins by selecting the first available controller or interface specified by the Cisco Networking Services connect profile and then performs multiple ping iterations through all the associated active DLCIs. For each iteration, the Cisco Networking Services connect function attempts to ping the Cisco Networking Services configuration engine. If the ping is successful, the pertinent configuration information can be downloaded from the Cisco Networking Services configuration engine.

When iterating over the active DLCIs on a Frame Relay interface, the router must be able to automatically go through a list of active DLCIs returned by the LMI messages for that interface and select an active DLCI to use. When more than one of the active DLCIs allow IP connectivity to the Cisco Networking Services configuration engine, the DLCI used will be the first one tried by the Cisco Networking Services connect functionality. If the ping attempt is unsuccessful, the next active DLCI is tried and so on. If connectivity to the Cisco Networking Services configuration engine is unsuccessful for all active DLCIs, the Cisco Networking Services connect function removes the configuration applied to the selected controller or interface, and the Cisco Networking Services connect process restarts with the next available controller or interface specified by the Cisco Networking Services connect profile.

The Cisco Networking Services Frame Relay Zero Touch feature provides the following benefits:

- A service provider can have a single common bootstrap configuration.
- The generic bootstrap configuration does not require the IP address to be hard-wired.
- The point-to-point DLCI does not need to be known in advance.
- IP directly over Frame Relay is allowed.
- Use of a channel service unit (E1 or T1 controller) is allowed.

How to Configure CNS Frame-Relay Zero Touch

Deploying the Cisco Networking Services Device

Incremental or partial configuration allows the remote device to be incrementally configured after its initial configuration. You must perform these configurations manually through the Cisco Networking Services configuration engine. The registrar allows you to change the configuration templates, edit parameters, and submit the new configuration to the device without a software or hardware restart.

Before You Begin

Perform this task to manually install an initial Cisco Networking Services configuration.

Your remote device arrives from the factory with a bootstrap configuration. Upon initial power-on, the device automatically pulls a full initial configuration from the Cisco Networking Services configuration engine, although you can optionally arrange for this manually as well. After initial configuration, you can optionally arrange for periodic incremental (partial) configurations for synchronization purposes.

For more details on using the Cisco CNS configuration engine to automatically install the initial CNS configuration, see the *Cisco CNS Configuration Engine Administrator's Guide* at http://www.cisco.com/en/US/docs/net_mgmt/configuration_engine/1.3/administration/guide/ag13.html

Initial Cisco Networking Services Configuration

Initial configuration of the remote device occurs automatically when the device is initialized on the network. Optionally, you can perform this configuration manually.

Cisco Networking Services assigns the remote device a unique IP address or hostname. After resolving the IP address (using Serial Line Address Resolution Protocol (SLARP), ATM Inverse ARP (ATM InARP), or PPP protocols), the system optionally uses Domain Name System (DNS) reverse lookup to assign a hostname to the device and invokes the Cisco Networking Services agent to download the initial configuration from the Cisco Networking Services configuration engine.

Incremental Configuration

Before you can configure an incremental configuration, Cisco Networking Services must be operational and the required Cisco Networking Services agents configured.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **cns template connect** *name*
4. **cli** *config-text*
5. Repeat Step 4 to add all required CLI commands.
6. **exit**
7. **cns connect** *name* [**retry-interval** *interval-seconds*] [**retries** *number-retries*] [**timeout** *timeout-seconds*] [**sleep** *sleep-seconds*]
8. Do one of the following:
   - **discover** {**line** *line-type* | **controller** *controller-type* | **interface** [*interface-type*]}
   - **template** *name*
9. **exit**
10. **cns config initial** {*host-name* | *ip-address*} [**encrypt**] [*port-number*] [**page** *page*] [**syntax-check**] [**no-persist**] [**source** *interface name*] [**status** *url*] [**event**] [**inventory**]
11. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**cns template connect** *name* **Example:** `Device(config)# cns template connect template 1`	Enters Cisco Networking Services template connect configuration mode and defines the name of a Cisco Networking Services connect template.
Step 4	**cli** *config-text* **Example:** `Device(config-templ-conn)# cli encapsulation ppp`	Specifies commands to configure the interface.
Step 5	Repeat Step 4 to add all required CLI commands. **Example:** `Device(config-templ-conn)# cli ip directed-broadcast`	Repeat Step 4 to add other CLI commands to configure the interface or to configure the modem lines.
Step 6	**exit** **Example:** `Device(config-templ-conn)# exit`	Exits Cisco Networking Services template connect configuration mode and completes the configuration of a Cisco Networking Services connect template. **Note** Entering the **exit** command is required. This requirement was implemented to prevent accidentally entering a command without the **cli** command.
Step 7	**cns connect** *name* [**retry-interval** *interval-seconds*] [**retries** *number-retries*] [**timeout** *timeout-seconds*] [**sleep** *sleep-seconds*] **Example:** `Device(config)# cns connect profile-1 retry-interval 15 timeout 90`	Enters Cisco Networking Services connect configuration mode and defines the parameters of a Cisco Networking Services connect profile for connecting to the Cisco Networking Services configuration engine.
Step 8	Do one of the following: • **discover** {**line** *line-type* | **controller** *controller-type* | **interface** [*interface-type*]} • **template** *name* **Example:** `Device(config-cns-conn)# discover interface serial`	(Optional) Configures a generic bootstrap configuration. • **discover —**Defines the interface parameters within a Cisco Networking Services connect profile for connecting to the Cisco Networking Services configuration engine. or • **template —**Specifies a list of Cisco Networking Services connect templates within a Cisco Networking Services connect profile to be applied to a device's configuration.

	Command or Action	Purpose
	Example: `Device(config-cns-conn)# template template-1`	
Step 9	**exit** **Example:** `Device(config-cns-conn)# exit`	Exits Cisco Networking Services connect configuration mode and returns to global configuration mode.
Step 10	**cns config initial** {*host-name* | *ip-address*} [**encrypt**] [*port-number*] [**page** *page*] [**syntax-check**] [**no-persist**] [**source** *interface name*] [**status** *url*] [**event**] [**inventory**] **Example:** `Device(config)# cns config initial 10.1.1.1 no-persist`	Starts the Cisco Networking Services configuration agent, connects to the Cisco Networking Services configuration engine, and initiates an initial configuration. You can use this command only before the system boots for the first time. **Note** The optional **encrypt** keyword is available only in images that support Secure Socket Layer (SSL). **Caution** If you write the new configuration to NVRAM by omitting the **no-persist**keyword, the original bootstrap configuration is overwritten.
Step 11	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Configuration Examples for CNS Frame-Relay Zero Touch

Example: Using the Cisco Networking Services Frame-Relay Zero Touch

Configuring IP over Frame Relay

The following example shows the bootstrap configuration for configuring IP over Frame Relay on a CPE device:

```
cns template connect setup-frame
 cli encapsulation frame-relay
 exit
cns template connect ip-over-frame
 cli frame-relay interface-dlci ${dlci}
 cli ip address dynamic
 exit
cns template connect ip-route
 cli ip route 10.0.0.0 0.0.0.0 ${next-hop}
 exit
cns connect ip-over-frame
```

```
 discover interface Serial
 template setup-frame
 discover dlci
 template ip-over-frame
 template ip-route
exit
cns config initial 10.1.1.1
```

Configuring IP over Frame Relay over T1

The following example shows the bootstrap configuration for configuring IP over Frame Relay over T1 on a CPE device:

```
cns template connect setup-frame
 cli encapsulation frame-relay
 exit
cns template connect ip-over-frame
 cli frame-relay interface-dlci ${dlci}
 cli ip address dynamic
 exit
cns template connect ip-route
 cli ip route 0.0.0.0 0.0.0.0 ${next-hop}
 exit
cns template connect t1-controller
 cli framing esf
 cli linecode b8zs
 cli channel-group 0 timeslots 1-24 speed 56
 exit
cns connect ip-over-frame-over-t1
 discover controller T1
 template t1-controller
 discover interface
 template setup-frame
 discover dlci
 template ip-over-frame
 template ip-route
exit
cns config initial 10.1.1.1
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
WSMA commands	Cisco IOS Web Services Management Agent Command Reference
IP access lists	*Security Configuration Guide: Access Control Lists* in the *Securing the Data Plan Configuration Guide Library*
IP access lists commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	*Cisco IOS Security Command Reference*

Related Topic	Document Title
Public Key Infrastructure	*Public Key Infrastructure Configuration Guide* in the *Secure Connectivity Configuration Guide Library*
Secure Shell and Secure Shell Version 2	*Secure Shell Configuration Guide* in the *Securing User Services Configuration Guide Library*
Security commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	*Cisco IOS Security Command Reference*
WSMA schema files in XSD format	ftp://ftp.cisco.com/pub/wsma/schema/

RFCs

RFC	Title
RFC 2132	*DHCP Options and BOOTP Vendor Extensions*
RFC 2246	*The TLS Protocol Version 1.0*
RFC 4251	*The Secure Shell (SSH) Protocol Architecture*
RFC 4252	*The Secure Shell (SSH) Authentication Protocol*

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for CNS Frame-Relay Zero Touch

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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Table 1: Feature Information for Cisco Networking Services Frame-Relay Zero Touch

Feature Name	Releases	Feature Information
Cisco Networking Services Frame-Relay Zero Touch	12.3(2)XF 12.3(8)T	The Cisco Networking Services Frame Relay Zero Touch feature provides a Cisco Networking Services zero touch deployment solution over Frame Relay where the CPE device discovers its DLCI and IP address dynamically and then contacts a Cisco Networking Services engine to retrieve its full configuration automatically. The following commands were introduced or modified: **cli (cns)**, **cns config connect-intf**, **cns connect**, **cns template connect**, **config-cli**, **discover (cns)**, **line-cli**, **template (cns)**. **Note** The **cns config connect-intf** command was replaced by the **cns connect** and **cns template connect** commands. **Note** dT