



# Managing ISG Subscriber IP Addresses (Cisco IOS Release 12.2(28)SB)

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**First Published: March 20, 2006**  
**Last Updated: March 20, 2006**

Intelligent Service Gateway (ISG) is a Cisco IOS software feature set that provides a structured framework in which edge devices can deliver flexible and scalable services to subscribers. For an ISG subscriber to be routable within a given service domain, the subscriber must present a domain-specific IP address to the network. This document describes how to manage the assignment of domain-specific IP addresses to ISG subscribers.



**Note**

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This document applies to Cisco IOS Release 12.2(28)SB only. For information about managing IP addresses in Cisco IOS Release 12.2(31)SB2 or later releases, see the chapter [“Configuring ISG Access for IP Subscriber Sessions.”](#)

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## Finding Feature Information in This Module

*Your Cisco IOS software release may not support all features.* To find information about feature support and configuration and platform requirements, use the [“Feature Information for ISG Subscriber IP Address Management”](#) section on page 10.

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# Prerequisites for ISG Subscriber IP Address Management

For information about release and platform support, see the [“Feature Information for ISG Subscriber IP Address Management”](#) section on page 10.

# Restrictions for ISG Subscriber IP Address Management

ISG IP sessions and interface IP sessions are not supported on the Cisco 10000-PRE2.

# Information About ISG Subscriber IP Address Management

Before you configure ISG subscriber IP address management, you should understand the following concept:

- [Methods of ISG Subscriber IP Address Management, page 2](#)

# Methods of ISG Subscriber IP Address Management

ISG subscriber IP address management applies to IP sessions or Layer 2 (PPP) sessions that are terminated locally. For a subscriber to be routable within a given IP service domain, the subscriber must present a domain-specific IP address to the network. If a subscriber transfers between IP service domains (which includes any private domain managed by the access provider), the IP address presented to the network must change to reflect the new domain.

## Locally Terminated PPP Sessions

For locally terminated PPP sessions, ISG supports the following methods of IP address assignment:

- IP address in a user profile
- IP subnet in a user profile
- Named address pool in a user profile
- Local address pools
- Standard methods of IP address management for PPP (see the *Cisco IOS Dial Technologies Configuration Guide*, Release 12.2, for information about IP address management support for PPP sessions)

When a locally terminated PPP session is transferred from one VRF to another VRF, the peer IP address is renegotiated using IPCP.

## IP Subnet Sessions

For IP subnet sessions, the IP subnet is specified in the user profile.

## IP Interface Sessions

For IP interface sessions, ISG is not involved in (or aware of) the assignment of subscriber IP addresses.

## IP Sessions

For IP sessions, ISG supports the following methods of IP address assignment:

- Static IP addresses

If a subscriber's static IP address is configured correctly for the service domain, ISG does not need to be involved in the assignment of an IP address for the subscriber.

- DHCP

If DHCP is being used to assign IP addresses, and the IP address that is assigned by DHCP is correct for the service domain, ISG does not need to be involved in the assignment of an IP address for the subscriber.

If the IP address that is assigned by DHCP is not correct for the service domain, or if the domain changes because of a VRF transfer, ISG can be configured to influence the DHCP IP address assignment.

The following conditions must be met in order for ISG to influence DHCP IP address assignment:

- The ISG must be adjacent to the subscriber device.
- The ISG must be in the path of DHCP requests, by serving as a DHCP server or relay.
- Subscribers must not have statically configured IP addresses

For deployments that support it, DHCP is the recommended method of IP address assignment.

# How to Manage ISG Subscriber IP Addresses Using DHCP

Before you perform this task, you should understand the following concepts:

- [ISG Subscriber IP Address Assignment Using DHCP, page 3](#)
- [Prerequisites, page 4](#)

To assign ISG subscriber IP addresses using DHCP, perform the following tasks:

- [Configuring an ISG Interface for Dynamic DHCP Class Association, page 4](#)
- [Configuring a DHCP Class in a Service Policy Map, page 5](#)
- [Configuring a DHCP Class in a Service Profile or User Profile on the AAA Server, page 7](#)

## ISG Subscriber IP Address Assignment Using DHCP

When ISG is in the path of DHCP requests (as either a DHCP server or a DHCP relay), ISG can influence the IP address pool and DHCP server that are used to assign subscriber IP addresses. To enable ISG to influence the IP addresses assigned to subscribers, you associate a DHCP address pool class with an address domain. The DHCP address pool class must also be configured in a service policy map, service profile, or user profile, which is associated with a subscriber. When a DHCP request is received from a subscriber, DHCP uses the address pool class that is associated with the subscriber to determine which DHCP address pool should be used to service the request. As a result, on a per-request basis, an IP address is provided by the local DHCP server or relayed to a remote DHCP server that is defined in the selected pool.

ISG also uses DHCP events to determine the start and end of subscriber sessions. For information about the events that DHCP communicates to ISG and how to use DHCP to trigger subscriber IP sessions, see the module "[Configuring ISG Layer 3 Access \(Cisco IOS Release 12.2\(28\)SB\)](#)."

## Prerequisites

For ISG to use DHCP to assign IP addresses, the following prerequisites must be met:

- ISG must be adjacent to the subscriber device.
- ISG must be in the path of DHCP requests, serving as a DHCP server or relay.
- The appropriate IP subnets must be configured on the subscriber interface.

The tasks in this section assume that you have configured DHCP support in your network.

## Configuring an ISG Interface for Dynamic DHCP Class Association

Perform this task to enable ISG to influence the assignment of IP addresses to subscribers on the interface by providing the local DHCP component with a class name. The class name refers to a class configured using the **ip dhcp pool** command and can reference a pool of addresses or a relay destination.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask* [**secondary**]
5. **ip subscriber**
6. **initiator dhcp class-aware**
7. **end**

## DETAILED STEPS

|        | Command or Action  | Purpose  |
|--------|--|--|
| Step 1 | <b>enable</b><br><br><b>Example:</b><br>Router> enable   | Enables privileged EXEC mode.<br><ul style="list-style-type: none"><li>Enter your password if prompted.</li></ul>  |
| Step 2 | <b>configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal   | Enters global configuration mode.  |
| Step 3 | <b>interface</b> <i>type number</i><br><br><b>Example:</b><br>Router(config)# interface ethernet 0                                   | Specifies an interface for configuration, and enters interface configuration mode.   |
| Step 4 | <b>ip address</b> <i>ip-address mask [secondary]</i><br><br><b>Example:</b><br>Router(config-if)# ip address 10.1.0.1<br>255.255.0.0 | Sets a primary or secondary IP address for an interface.   |
| Step 5 | <b>ip subscriber</b><br><br><b>Example:</b><br>Router(config-if)# ip subscriber  | Enables ISG IP subscriber configuration mode.  |
| Step 6 | <b>initiator dhcp class-aware</b><br><br><b>Example:</b><br>Router(config-if) initiator dhcp class-aware                             | Configures ISG to create IP sessions upon receipt of DHCP DISCOVER packets.<br><ul style="list-style-type: none"><li>The <b>class-aware</b> keyword allows ISG to influence the IP address assigned by DHCP by providing DHCP with a class name.</li></ul> |
| Step 7 | <b>end</b><br><br><b>Example:</b><br>Router(config-if)# end  | (Optional) Returns to privileged EXEC mode.  |

## Configuring a DHCP Class in a Service Policy Map

Perform this task to assign a DHCP class to a service policy map. Subscribers for which this service policy map is activated will be assigned IP addresses from the DHCP pool or the remote server that is associated with the class.

### Prerequisites

A DHCP pool must be configured. Classes configured within the DHCP pool must match the DHCP classes configured in the service policy map.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **policy-map type service** *policy-name*
4. **classname** *class-name*
5. **end**

**DETAILED STEPS**

|               | <b>Command or Action</b>  | <b>Purpose</b>   |
|---------------|---|--|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br>Router> enable  | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>   |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal                                      | Enters global configuration mode.  |
| <b>Step 3</b> | <b>policy-map type service</b> <i>policy-name</i><br><br><b>Example:</b><br>Router(config)# policy-map type service | Creates a service policy map or specifies an existing service policy map for configuration, and enters service policy-map configuration mode.  |
| <b>Step 4</b> | <b>classname</b> <i>class-name</i><br><br><b>Example:</b><br>Router(config-service-policymap)# classname<br>blue    | Associates a DHCP pool with a service policy map.  |
| <b>Step 5</b> | <b>end</b><br><br><b>Example:</b><br>Router(config-service-policymap)# end  | (Optional) Returns to privileged EXEC mode.  |
| <b>Step 6</b> | <b>show policy-map type service</b><br><br><b>Example:</b><br>Router# show policy-map type service                  | (Optional) Displays the contents of all service policy maps. <ul style="list-style-type: none"> <li>• Use this command to verify that the DHCP class is associated with the service policy map.</li> </ul> |

**What to Do Next**

Once you have configured the DHCP address pool class in a service policy map, you may want to configure a method of activating the service policy map; for example, control policies can be used to activate services. For more information about methods of service activation, see the module [“Configuring ISG Subscriber Services.”](#)

## Configuring a DHCP Class in a Service Profile or User Profile on the AAA Server

Perform this task to add the vendor-specific attribute (VSA) for a DHCP class to a user profile or service profile. Subscribers for whom the user or service profile is activated will be assigned IP addresses from the DHCP pool or the remote server that is associated with the class.



### Note

User profiles take precedence over service profiles and service policy maps. If a DHCP class is assigned through a user profile, the class cannot be changed later through activation of a service.

### Prerequisites

A DHCP address pool must be configured. Classes configured within the DHCP address pool must match the DHCP address pool classes configured in the service or user profile.

### SUMMARY STEPS

1. Add the DHCP Class attribute to the user or service profile.

### DETAILED STEPS

|        | Command or Action  | Purpose   |
|--------|--|---|
| Step 1 | Add the DHCP Class attribute to the user or service profile.<br><br>26,9,1 = "subscriber:classname=class-name" | Associates a DHCP address pool with a service or specific subscriber. |

### What to Do Next

You may want to configure a method of activating the service policy map or service profile; for example, control policies can be used to activate services. For more information about methods of service activation, see the module [“Configuring ISG Subscriber Services.”](#)

## Configuration Examples for Managing ISG Subscriber IP Addresses

This section contains the following examples:

- [ISG Subscriber IP Address Assignment Using DHCP: Example, page 7](#)
- [DHCP Address Pool Classes and Relay Actions for ISG: Examples, page 8](#)

### ISG Subscriber IP Address Assignment Using DHCP: Example

In the following example, if a DHCP DISCOVER packet arrives on interface Ethernet0/0 and is associated with the DHCP address pool class “green” (through a service activation), the local DHCP component uses the DHCP address pool “green-pool” because (a) the DHCP address pool classes match

and (b) the subnet defined under the “network” statement corresponds to one of the subnets defined at the interface. Therefore the local DHCP component will provide the subscriber with an address from 10.1.0.0 255.255.0.0.

Following a change in the subscriber’s primary service, ISG returns the DHCP address pool class called “blue”. This address domain change causes the local DHCP component to provide a new IP address from the pool “blue-pool” because (a) the classes match and (b) the subnet defined in “relay source” corresponds to one of the subnets defined at the interface. Hence the DHCP DISCOVER is relayed to the server at address 10.10.2.1, and the local DHCP component acts as a relay.

```
Ethernet0/0
 ip address 10.1.0.1 255.255.0.0 vrf green
 ip address 20.1.0.1 255.255.0.0 vrf blue
 ip subscriber
 initiator dhcp class-aware

!
ip dhcp pool green-pool
 network 10.1.0.0 255.255.0.0
 class green

ip dhcp pool blue-pool
 relay source 20.1.0.0 255.255.0.0
 class blue
 relay destination 10.10.2.1 vrf blue

policy-map type service my_service
 classname blue
```

## DHCP Address Pool Classes and Relay Actions for ISG: Examples

### DHCP Server Co-Resident with ISG Configuration: Example

In the following configuration example, the ISPs are ABC and DEF companies. The ABC company has its addresses assigned from an address pool that is dynamically allocated using On-demand address pools (ODAP). The DEF company has its customer addresses assigned from the address pool 10.100.0.0/16. Customers not associated with any ISP will have an address allocated from the address pool 10.1.0.0/16, and the lease time is set to 10 minutes.

```
!Address pool for ABC customers

ip dhcp pool abc-pool
 origin dhcp
 class abc
!
!Address pool for DEF customers
!
ip dhcp pool def-pool
 network 10.100.0.0 255.255.0.0
 class def
!
!Address pool for customers without an ISP
!
ip dhcp pool temp
 network 10.1.0.0 255.255.0.0
 lease 0 0 10
 class default
```

### DHCP Relay Agent Co-Resident with ISG Configuration: Example

In the following configuration example, there are two ISPs, “abcpool and defpool”. The “abcpool” ISP and its customers are allowed to have addresses in the ranges 10.1.0.0/16 and 30.1.0.0/16, and are relayed to the DHCP server at 10.55.10.1. The “defpool” ISP and its customers are allowed to have addresses in the range 20.1.0.0/16 and 40.4.0.0/16, and are relayed to the DHCP server at 12.10.2.1.

```
!Address ranges:

interface ethernet1
 ip address 10.1.0.0 255.255.0.0
 ip address 20.1.0.0 255.255.0.0 secondary

interface ethernet2
 ip address 30.1.0.0 255.255.0.0
 ip address 40.4.0.0 255.255.0.0

!Address pools for abcpool1 and abcpool2:
 ip dhcp pool abcpool1
  relay source 10.1.0.0 255.255.0.0
  class abcpool1
  relay target 10.55.10.1

!Address pool for abcpool2:
 ip dhcp pool abcpool2
  relay source 30.1.0.0 255.255.0.0
  class abcpool2
  relay target 10.55.10.1

!Address pools for defpool1 and defpool2:
 ip dhcp pool defpool1
  relay source 20.1.0.0 255.255.0.0
  class defpool1
  relay target 12.10.2.1

 ip dhcp pool defpool2
  relay source 40.4.0.0 255.255.0.0
  class defpool2
  relay target 12.10.2.1
```

Configuration of secure Address Resolution Protocol (ARP) for the relay will use the same configuration command as secure ARP already uses on a DHCP server by using the **update arp** command in address-pool configuration mode. If the system is allocating an address from this address pool, it will add secure ARP. If the system is relaying a packet using this address pool, it will also add secure ARP.

### ISG-Supplied Class Name Configuration: Example

In the following configuration example, an ISG-supplied class name is to be used in selecting the remote DHCP server to which packets should be relayed.

```
ip dhcp pool abc-pool-1
 relay source 30.1.0.0 255.255.0.0
 relay destination 20.1.0.0
  class classname1
 relay target 10.20.10.1
  class classname2
 relay target 10.0.10.1
  class classname3
```

In the configuration above, an ISG-supplied class name, “classname1”, would relay the DHCP DISCOVER packet to the server at the relay target IP address, and ISG “classname2” would relay the DHCP DISCOVER packet to the server at the relay target IP address.

If the ISG returns “classname3”, then the default pool is the default address specified as the relay destination. If the ISG returns any class name other than “classname1”, “classname2”, or “classname3”, no relay action is taken.

## Additional References

The following sections provide references related to ISG subscriber IP address management.

### Related Documents

| Related Topic            | Document Title   |
|--------------------------|--|
| ISG commands             | <i>Cisco IOS Intelligent Service Gateway Command Reference</i>   |
| DHCP configuration tasks | <i>“Configuring DHCP” chapter in the Cisco IOS IP Configuration Guide, Release 12.2</i>                                    |
| DHCP commands            | <i>“DHCP Commands” chapter in the Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services, Release 12.2</i> |
| DHCP relay actions       | “DHCP Enhancements for Edge-Session Management,” Release 12.2(27)SBA new-feature document.                                 |

### Technical Assistance

| Description  | Link  |
|--|---|
| Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content. | <a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a> |

## Feature Information for ISG Subscriber IP Address Management

Table 25 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.2(28)SB or later releases appear in the table. If you are looking for information on a feature in this technology that is not documented here, see the “[Intelligent Service Gateway Features Roadmap](#).”

Not all commands may be available in your Cisco IOS software release. For details on when support for specific commands was introduced, see the command reference documents.

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**Note**

Table 25 list only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

**Table 25** *Feature Information for ISG Subscriber IP Address Management*

| Feature Name                  | Software Releases | Feature Configuration Information   |
|-------------------------------|-------------------|---|
| ISG:Policy Control:DHCP Proxy | 12.2(28)SB        | <p>This feature enables ISG to dynamically interact with DHCP and apply policies that influence the IP addresses that DHCP assigns subscribers.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">Methods of ISG Subscriber IP Address Management, page 2</a></li> <li>• <a href="#">How to Manage ISG Subscriber IP Addresses Using DHCP, page 3</a></li> </ul> |

Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

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