# Cisco SCMS SM DHCP Lease Query LEG Reference Guide

Release 3.1
May 2007

**Americas Headquarters**
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel:   408 526-4000
         800 553-NETS (6387)
Fax:   408 527-0883

# CONTENTS

# About This Guide

**Revised: May 30, 2007, OL-12486-01**

This document describes the concept of a DHCP Login Event Generator (LEG) and explains how to install and configure it on the SCMS Subscriber Manager (SM) platform and on a Service Control Engine.

**Note** This document assumes a basic familiarity with the Cisco SCMS Subscriber Management, subscriber integration concepts, and the DHCP protocol.

For complete information about Cisco's SCMS subscriber integration concept, see the *Cisco SCMS Subscriber Manager User Guide* .

This introduction provides information about the following topics:

- Audience
- Document Revision History
- Organization
- Document Conventions
- Related Publications
- Obtaining Documentation, Obtaining Support, and Security Guidelines

# Audience

This document is intended for system administrators and system integrators who are familiar with DHCP Lease Query concepts and the Cisco Service Control Subscriber Management and Subscriber Integration concepts.

# Document Revision History

| Cisco Service Control Release | Part Number | Publication Date |
|---|---|---|
| Release 3.1.0 | OL-12486-01 | May, 2007 |

**Description of Changes**

- Reorganization of chapters to separate coverage of installation on an SM and on an SCE. See Organization, Subscriber Manager Integration, and SCE Integration.
- The LEG now supports multiple policies. See Dynamic Assignment of Policy Information.

| Cisco Service Control Release | Part Number | Publication Date |
|---|---|---|
| Release 3.0.5 | OL-7808-04 | November, 2006 |

**Description of Changes**

- Changes in how to dynamically assign package information. See Dynamic Assignment of Policy Information.

| Cisco Service Control Release | Part Number | Publication Date |
|---|---|---|
| Release 3.0.3 | OL-7808-03 | May, 2006 |

**Description of Changes**

- Updated documentation for release 3.0.3.

| Cisco Service Control Release | Part Number | Publication Date |
|---|---|---|
| Release 3.0 | OL-7808-02 | December, 2005 |

**Description of Changes**

- Reorganization of documentation. No major changes or new features were added to this revision.

| Cisco Service Control Release | Part Number | Publication Date |
|---|---|---|
| Release 2.5.7 | OL-7808-01 | May, 2005 |

**Description of Changes**

- This is the first version of this document.

# Organization

The major sections of this guide are as follows:

***Table 1***

| Chapter | Title | Description |
|---------|-------|-------------|
| Chapter 1 | About the DHCP Lease Query LEG | Describes the Subscriber Manager DHCP Lease Query LEG software module and the terms and concepts used in this guide. It also provides a description of the DHCP Lease Query LEG process and transactions |
| Chapter 2 | Subscriber Manager Integration | Details the procedures for installing, uninstalling, and upgrading the software on the Subscriber Manager. |
| Chapter 3 | Subscriber Manager Integration - Configuration | Details the procedures for configuring and using the software on the Subscriber Manager. It also describes the command-line utility. |
| Chapter 4 | SCE Integration | Details the procedures for installing, uninstalling, and upgrading the software on an SCE device. |
| Chapter 5 | SCE Integration - Configuration | Details the procedures for configuring and using the software on an SCE device. It also describes the CLI. |
| Appendix A | DHCP Forwarder Application | Describes the DHCP Forwarder application, installation instructions, and adding and removing a resource. |

# Document Conventions

This guide uses the following conventions:

- **Bold** is used for commands, keywords, and buttons.
- *Italics* are used for command input for which you supply values.
- `Screen` font is used for examples of information that are displayed on the screen.
- **`Bold screen`** font is used for examples of information that you enter.
- Vertical bars ( | ) indicate separate alternative, mutually exclusive elements.
- Square brackets ( [ ] ) indicate optional elements.

- Braces ( { } ) indicate a required choice.

- Braces within square brackets ( [{}] ) indicate a required choice within an optional element.

**Note** Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the guide.

**Timesaver** Means the *described action saves time*. You can save time by performing the action described in the paragraph.

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

**Warning** **Means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and familiar with standard practices for preventing accidents. To see translated versions of warnings, refer to the *Regulatory Compliance and Safety Information* document that accompanied the device.**

# Related Publications

Use this *Cisco SCMS SM DHCP Lease Query LEG Reference Guide* in conjunction with the following Cisco documentation:

- *Cisco SCMS Subscriber Manager User Guide*

# Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, 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

# About the DHCP Lease Query LEG

This module describes the Subscriber Manager DHCP Lease Query LEG software module and the terms and concepts relevant to the DHCP Lease Query LEG.

- Information About the DHCP Lease Query LEG
- Information About DHCP Lease Query LEG Functionality

## Information About the DHCP Lease Query LEG

The SCMS SM DHCP Lease Query LEG is a software module that handles pull-requests from the different SCE platforms in the network. The LEG queries the DHCP server using a DHCP Lease-Query transaction. The DHCP Lease Query LEG can be run on the SM server or on the SCE device. If you use an SM, the LEG must be used on the SM, not on the SCE.

- DHCP Lease Query LEG Operation
- Terms and Concepts

### DHCP Lease Query LEG Operation

The following diagram represents the operation of the DHCP Lease Query LEG:

*Figure 1-1*          *DHCP Lease Query LEG Operation - SM  Installation*
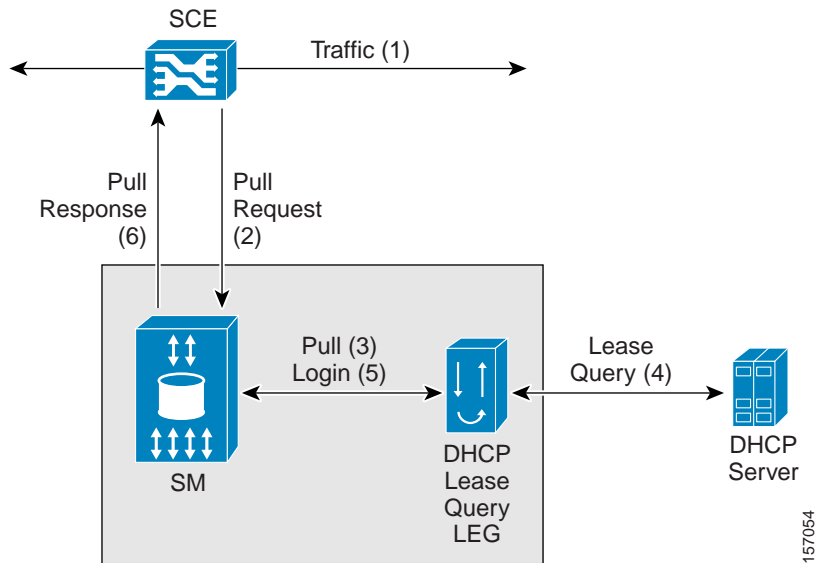


The subscriber's traffic (1) triggers a pull-request from the SCE (2). The SM receives the request for processing. If the SM does not find a subscriber with a matching IP address in the subscriber database, it passes the pull-request to the DHCP Lease Query LEG (3). The LEG queries the DHCP server. If the server finds a match for the IP address in its database, the server replies with the subscriber information (4). The LEG performs a login operation (5). This operation updates the subscriber database based on the received information and logs the subscriber into the SCE (6), which triggered the pull-request.

If desired, install the DHCP Lease Query LEG directly on the SCE device to integrate the SCE with DHCP servers without the use of an SM server. The following diagram represents the operation of the LEG when installed on the SCE device:

*Figure 1-2*        *DHCP Lease Query LEG Operation - SCE  Installation*
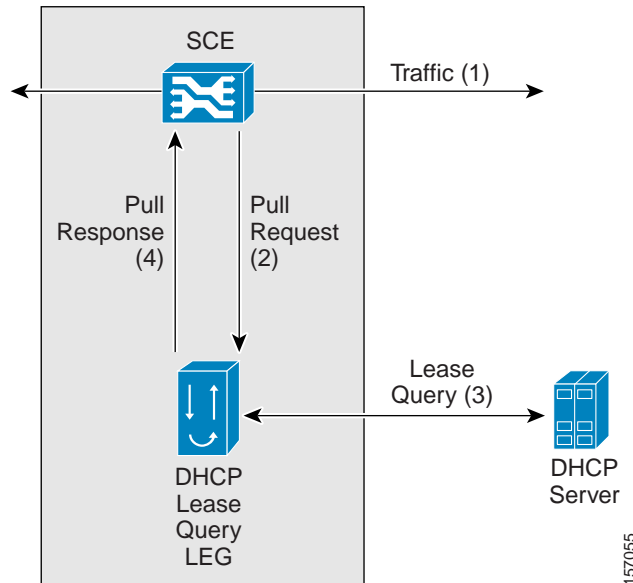


The subscriber's traffic (1) triggers a pull-request from the SCE (2). The Lease Query LEG receives the request and queries the DHCP server. If the server finds a match for the IP address in its database, the server replies with the subscriber information (3). Based on the received information, the LEG responds to the SCE with a pull-response, which includes the subscriber ID and the IP address lease-time returned from the DHCP server (4).

**Note**    An Internet Engineering Task Force (IETF) standard defines the DHCP Lease-Query transaction. The LEG supports the RFC 4388 standard. For more information, see the IETF website.

# Terms and Concepts

The following terms and concepts are necessary to understand the DHCP Lease Query LEG and SM configuration and operation. Additional information can be found in the *Cisco SCMS Subscriber Manager User Guide* .

- LEG (Login Event Generator)
- Cable/Satellite Modem
- CPE (Customer Premise Equipment)
- DHCP Lease Query Transaction
- Subscriber Mappings
- Pull-request
- Subscriber Domain
- Subscriber Package

## LEG (Login Event Generator)

A software component that performs subscriber login and logout operations on the SM/SCE. The LEG handles dynamic subscriber integration.

## Cable/Satellite Modem

A data modem that provides Internet access over cable and satellite networks. The modem usually corresponds to a single subscriber of the Internet Service Provider (ISP).

## CPE (Customer Premise Equipment)

Any equipment that an end-user can connect to the network through a modem. The end-user usually owns multiple CPE devices that are used to connect to the Internet through a single modem.

## DHCP Lease Query Transaction

The DHCP Lease Query transaction is a DHCP transaction with special message types that enable, among other things, clients to query DHCP servers regarding the owner and the lease-expiration-time of an IP address.

An IETF standard defines the DHCP Lease-Query transaction. For more information, see the IETF website.

## Subscriber Mappings

The SCE platform requires mappings between the network IDs (IP addresses) of the flows it encounters and the subscriber IDs. The SM database contains the network IDs that map to the subscriber IDs. The SCE network-ID-to-subscriber mappings are constantly updated from the SM database.

The main function of the DHCP Lease Query LEG is to provide the SM/SCE with network-ID-to-subscriber mappings in real time.

## Pull-request

A message sent from an SCE device to the SM or the LEG when it identifies the use of a new subscriber IP address in the network. The SM uses the IP address provided in this message to query the database to retrieve the subscriber data of the subscriber associated with this address and to send its data to the SCE.

## Subscriber Domain

The SM provides the option of partitioning SCE platforms and subscribers into subscriber domains. A subscriber domain is a group of SCE platforms that share a group of subscribers. Subscriber domains can be configured using the SM configuration file and can be viewed using the SM Command-Line Utility (CLU).

For additional information about domains and domain aliases, see the "Configuration File Options" chapter of the *Cisco SCMS Subscriber Manager User Guide* .

## Subscriber Package

A subscriber policy package usually defines the policy enforced by Cisco SCMS solutions on each subscriber. The DHCP Lease Query LEG can handle the package ID in any of the following ways:

- Set the package ID according to configurable options of the DHCP initial login or lease extension transactions

- Set the package ID using a constant default value

- Leave the package ID unset

For additional information, see Configuring Policy Association, and the *Cisco Service Control Application for Broadband (SCA BB) User Guide* .

# Information About DHCP Lease Query LEG Functionality

- DHCP Lease Query LEG Process

- DHCP Lease Query Transaction

- Installation and Usage

- Package Contents

## DHCP Lease Query LEG Process

The LEG processes DHCP Lease-Query transactions to the DHCP server using the IP address indicated in the pull-request from the SCE. The DHCP server replies whether there is an active lease (DHCPLEASEACTIVE message) for this IP address and provides information about the subscriber associated with this IP address according to a list of options requested by the LEG. By default, the LEG requests the lease time and the modem MAC and adds package association related options if needed.

The DHCP Lease Query LEG supports up to two redundant DHCP servers. The LEG identifies a server failure by counting the consecutive requests that time out. After a configurable threshold of timed-out requests, the LEG starts to send the requests to the recently activated server, which was previously in standby. The LEG does not return to the failed server until the activated server fails.

When installing the LEG on the SM server, it runs with the privileges assigned to the user **pcube** on this machine. On UNIX platforms, because only the super-user (root) can open ports under 1024, the LEG cannot open the DHCP ports. To solve this problem, a simple application is supplied with the LEG, which forwards the DHCP packets between the LEG and the DHCP servers. This application is the DHCP Forwarder, which is described in the DHCP Forwarder Application module.

When installing the LEG on the SCE device, there is no need to use the DHCP Forwarder application.

## DHCP Lease Query Transaction

The DHCP Lease Query transaction is a DHCP transaction where the client (LEG) sends a DHCPLEASEQUERY message to the server, indicating the information it wants to query. The LEG only queries the IP address. The server can reply with several types of messages; for example a DHCPLEASEACTIVE message means that an active lease was found and the request information is supplied, or a DHCPLEASEUNASSIGNED message means this IP is currently not assigned to any subscriber.

The following is a detailed description of the attributes extracted from the *DHCP Lease Query transaction* :

- Subscriber ID—By default, the subscriber ID is the modem MAC address, which you extract from option 82 (Remote ID sub-option of the DHCP Relay Agent Information Option). Therefore, the DHCP server must support and store option 82 for each Customer Premise Equipment (CPE). This default can be overwritten by configuration. Furthermore, the LEG can assign the IP address as a fallback if the option does not exist in the server's response. This fallback is disabled by default.

- Lease time—The assigned IP is added to the SM or SCE database with a lease time taken from option 51. Note that if option 51 does not appear in the DHCPLEASEACTIVE reply, an infinite lease time is assigned for this IP address.

- Package—Configurable options in the DHCP message determine how to assign the package information. The LEG includes a component that converts the package information data from the DHCP packet to a subscriber package ID. If the packet does not contain package information, it is possible to log in the subscriber with a default package, or log in the subscriber with no package information at all. The package options are assumed to be encoded as strings.

After extracting the preceding information, the LEG logs the subscriber into the SM/SCE.

# Installation and Usage

The DHCP Lease Query LEG is an external component (PQI file) that can be installed on the SM or SCE device.

For information about installing and using the DHCP Lease Query LEG on the SM, see Subscriber Manager Integration and Subscriber Manager Integration - Configuration. For information about installing and using the DHCP Lease Query LEG on the SCE, see SCE Integration and SCE Integration - Configuration.

# Package Contents

The DHCP Lease Query LEG distribution is part of the SM LEG distribution. The DHCP Forwarder application distribution and installation script are also part of the SM LEG distribution.

The DHCP Lease Query LEG uses the DHCP Forwarder application on UNIX machines. For more information, see DHCP Forwarder Application.

The LEG installation package includes a set of configuration files and command-line utilities for the LEG.

The SCMS SM LEG distribution file contains the DHCP Lease Query LEG distribution, which is located in the Lease_Query_LEG directory. Cisco supplies a DHCP Lease Query LEG distribution package. The following table describes the package contents:

*Table 1-1        File Layout of the DHCP Lease Query LEG  Distribution Package*

| Root | Folder (under root) | File name | Notes |
| --- | --- | --- | --- |
| *pkg-ext-dir* | | | |
| | | Install | LEG installation procedure description |
| | | install-forwarder.sh | DHCP Forwarder installation script |

*Table 1-1*        *File Layout of the DHCP Lease Query LEG  Distribution Package*

| Root | Folder (under root) | File name | Notes |
|---|---|---|---|
| | | linux-def.sh | Linux-specific definitions |
| | | solaris-def.sh | Solaris-specific definitions |
| | | dhcp_forwarder.tar.gz | DHCP Forwarder distribution |
| | | sm-common.sh | General utility script |
| | sce | | |
| | | dhcp_pkg.cfg | Default configuration file for package association |
| | | leaseq.pqi | DHCP Lease Query LEG distribution |
| | sm | | |
| | | leaseq.pqi | DHCP Lease Query LEG distribution |

**Note**    The directory to which the distribution is extracted is referred to as *pkg-ext-dir* .

<Ch a p t e r> 2

# SCE Integration - Configuration

This module describes how to configure the DHCP Lease Query LEG on the SCE and the CLI.

## Configuring the DHCP Lease Query LEG on the SCE

The DHCP Lease Query LEG on the SCE is configured using the CLI.

## Information About the DHCP Lease Query LEG CLI

### Configuration CLI

Use the Command-Line Interface (CLI) to configure the general LEG settings of the DHCP Lease Query LEG.

To enable the LEG:

```
SCE(config)# subscriber LEG dhcp-lease-query
```
To disable the LEG:

```
SCE(config)# no subscriber LEG dhcp-lease-query
```
To set the IP addresses of the DHCP servers (one or two addresses):

```
SCE(config)# subscriber LEG dhcp-lease-query servers STRING STRING
```
To reset the DHCP servers:

```
SCE(config)# no subscriber LEG dhcp-lease-query servers
```
To set the **session_timeout** configuration variable:

```
SCE(config)# subscriber LEG dhcp-lease-query session-timeout DECIMAL
```
To set the session_timeout variable to the default value:

```
SCE(config)# default subscriber LEG dhcp-lease-query session_timeout
```

The failover criteria configuration variable defines the number of consecutive request failures (timeouts) that triggers a fail-over. Because the queries are not answered when the server fails, these queries time out. The consecutive timed-out queries are counted and when they reach this threshold, the second server is set as the active server. The default value is 3.

To set the fail_over_criteria:

```
SCE(config)# subscriber LEG dhcp-lease-query failover-criteriaDECIMAL
```
To set the fail_over_criteria variable to the default value:

```
SCE(config)# default subscriber LEG dhcp-lease-query failover-criteria
```
To set subscriber ID option:

```
SCE(config)# subscriber LEG dhcp-lease-query sub-id-option
STRINGbinary|string[ip-fallback]
```
To set the subscriber ID option to the default value:

```
SCE(config)# default subscriber LEG dhcp-lease-query sub-id-option
```
For policy association, the LEG uses exactly the same file described in the Configuring Policy Association section. Set and load the configuration file with the following CLI (you must specify the full path and the file name):

```
SCE(config)# subscriber LEG dhcp-lease-query package-association-file STRING
```
The default package association configuration does not assign package information. To set the configuration back to the default configuration file:

```
SCE(config)# default subscriber LEG dhcp-lease-query package-association-file
```
To set all parameters of the DHCP lease query LEG to the default settings, use the following CLI:

```
SCE(config)# default subscriber LEG dhcp-lease-query
```

# Show CLI

To view the general configuration of the LEG, enter the following command:

```
SCE# show subscriber LEG dhcp-lease-query
```
To view the statistics counters of the LEG:

```
SCE# show subscriber LEG dhcp-lease-query counters
```
To reset the statistics counters of the LEG:

```
SCE# clear subscriber LEG dhcp-lease-query counters
```

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

# Subscriber Manager Integration - Configuration

This module describes how to configure the DHCP Lease Query LEG on the SM and how to use the CLU.

**Note** This module is relevant if you are using the Subscriber Manager server on your network. You should install the DHCP Lease Query LEG on the SM server and not on the SCE device.

- Information About Configuring the DHCP Lease Query LEG

# Information About Configuring the DHCP Lease Query LEG

The DHCP Lease Query LEG on the SM is configured using two configuration files: **leaseq.cfg** (general configuration) and **dhcp_pkg.cfg** (dynamic package association), which reside in the **~pcube/sm/server/root/config** directory.

The configuration files consist of sections headed by a bracketed section title; for example, **[DHCP-Lease-Query-LEG]**. Each section consists of several parameters having the format **parameter=value**. The number sign ("#") at the beginning of a line signifies that it is a remark.

- Configuring the DHCP Lease Query LEG
- Configuring Policy Association
- Information About the DHCP Lease Query LEG CLU

## Configuring the DHCP Lease Query LEG

The following is a description of the configuration variables of **leaseq.cfg**.

The **[DHCP-Lease-Query-LEG]** section contains the following parameters:

- `start`

  Defines whether the SM runs the DHCP Lease Query LEG at startup.

  Possible values for this parameter are **yes** and **no**. The default value is **no**.

  To run the LEG, this parameter must be set to **yes**.

- `max_concurrent_sessions`

  Defines the number of concurrent sessions the LEG should support. This parameter limits the resources used by this module.

Possible values for this parameter are integers. The default value is 256.

- `dhcp_servers`

  Defines to which DHCP servers the LEG can send requests.

  You must enter the IP addresses or hostnames of the DHCP servers separated by commas.

- `server_port`

  Defines the UDP port to which the DHCP servers listen and the Lease Query messages are sent. It is recommended to use 9067 when working with the DHCP Forwarder. The default value is 9067.

- `listening_port`

  Defines the UDP port to which the LEG listens and the Lease Query replies are sent. It is recommended to use 9068 when working with the DHCP Forwarder. The default value is 9068.

- `client_port`

  Defines the UDP port that the LEG uses when sending Lease Query messages to the DHCP servers. It is recommended to use 8068 when working with the DHCP Forwarder. The default value is 8068.

- `client_ip_address`

  Defines the source IP address of the lease-query packets sent to the DHCP servers. The giaddr field of the DHCP packet also uses this IP address. This parameter is useful for machines with multiple network interfaces.

  The default value is the loopback IP address of the machine.

- `support_auto_logout`

  Defines whether the LEG should query the DHCP servers whenever the auto-logout mechanism identifies an expired lease.

  Possible values for this parameter are **true** and **false**. The default value is **false**.

- `use_forwarder`

  Defines whether the LEG utilizes the DHCP Forwarder application on the local machine.

  Possible values for this parameter are **true** and **false**. The default value is **true**.

- `fail_over_criteria`

  Defines the number of consecutive request failures (timeouts) that triggers a fail-over. Since the queries are not answered when the server fails, these queries will time out. The consecutive timed-out queries are counted and when they reach this threshold, the second server is set as the active server. The default value is 3.

**Note**    The **session_timeout** parameter affects how long it will take to detect a failed server. Only when the configured amount of queries fail will the fail-over process be triggered.

- `log_timed_out_queries`

  Controls log messages regarding timed-out queries.

  Possible values for this parameter are **true** or **false**. The default value is **true**.

- `log_failed_queries`

  Controls log messages regarding queries that are not sent.

  Possible values for this parameter are **true** or **false**. The default value is **true**.

- `log_all_queries`

Controls log messages regarding each query sent and any reply received.

Possible values for this parameter are **true** or **false**. The default value is **false**.

Use this parameter only for troubleshooting.

- log_login_failures

  Controls log messages regarding replies that did not result in the login of a subscriber to the SM.

  Possible values for this parameter are **true** or **false**. The default value is **true**.

The **[Subscriber ID]** section defines the functionality of how the LEG handles the subscriber ID. The subscriber ID can be taken from a DHCP option, with the ability to fallback to using the allocated IP address as the subscriber ID. This section contains the following parameters:

- dhcp_option

  Defines which DHCP option to use as the subscriber ID. The format of this parameter is the option number itself; or for DHCP options that have sub-options, the format is the DHCP option and sub-option type, separated by a colon. For example: 43:123 or 61. The default value is 82:2 (Relay-Agent-Information using the Remote-ID information).

- dhcp_option_type

  Defines the format type of the DHCP option defined by the **dhcp_option** parameter.

  Optional values are **binary**, indicating a binary string converted to an ASCII hexadecimal string; or **string**, indicating an ASCII string. The default value is **binary**.

- default_id

  Defines whether in cases where the dhcp_option is not found in the DHCP packet, the LEG should fall back to a different way of defining the subscriber ID. The supported fallbacks are:

  - ip—Use the allocated IP address to create a subscriber ID in the format of: IP_aaa.bbb.ccc.ddd
  - Not setting this parameter—No fallback. No login will be performed.

- By default, this parameter is not set.

The **[DHCP-Lease-Query-Ids]** section contains the message type numbers of the different Lease Query transaction message types. This is necessary, because the DHCP Lease Query definition is an IETF draft. This section contains the following parameters:

- lease_query

  Defines the DHCPLEASEQUERY message type value. The default value is 13.

- lease_active

  Defines the DHCPLEASEACTIVE message type value. The default value is 16.

The following is a sample configuration file:

```
[DHCP-Lease-Query-LEG]
start=yes
dhcp_servers = 198.1.2.3, 198.5.6.7
fail_over_criteria=10
session_timeout=10
log_timed_out_queries=true
log_failed_queries=true
log_all_queries=true
log_login_failures=true
[Subscriber ID]
dhcp_option=44
dhcp_option_type=binary
```

```
[DHCP-Lease-Query-Ids]
lease_query=13
lease_active=16
```

# Configuring Policy Association

**Note**    The configuration described in this section is optional.

The subscriber policy configuration in the DHCP Lease Query LEG can be handled in one of the following ways:

- Dynamic assignment of policy information using information extracted from the DHCP packet. See Dynamic Assignment of Policy Information.

- Static assignment of a constant package ID for all subscribers who log on via the DHCP Lease Query LEG. See Static Assignment of Policy Information.

## Dynamic Assignment of Policy Information

Dynamic assignment of policy information is supported when policy information is submitted in the DHCP packets. The LEG concatenates the desired options and creates a *policy-name* . It is possible to map, using the configuration, between the *policy-names* and the application policy parameters such as package IDs and Virtual-links. The DHCP Lease Query LEG can support multiple policies.

To extract the policy information data from the DHCP packet, use the **dhcp_pkg.cfg** configuration file to define the option types that contain the policy information and define the conversion map of the *policy-names* to the package IDs (or any other policy) of the Service Control Application for Broadband (SCA BB).

The LEG is able to add additional data to the login operation based on the LEG configuration. This data is added as a key-value pair. Other modules in the login chain can use this data, such as the SOAP LEG (see the *Cisco SCMS SM SOAP LEG Reference Guide* ). This data can be created by concatenating the data of several DHCP options and can be given a user-defined label.

The **[DHCP.Policy.XXX]** sections contain the following parameters:

- options_order_for_policy_name

    Defines the DHCP options that contain the policy association information and defines the order of concatenation of the data. The DHCP header field called giaddr (Relay-Agent IP) is also supported; it requires the use of the type integer in the **option_type** parameter.

    This parameter has no default value.

    The format is: **option[:subtype],option[:subtype],giaddr**

- options_type

    Defines the format type of the DHCP options and fields defined by the *options_order_for_policy_name* parameter.

    Possible values for this parameter are **binary** (a binary string that is converted to an ASCII hexadecimal string), **string** (an ASCII string), or **integer** (a 4-byte integer converted to an IP address string in dotted notation). Order the list in the same way as **options_order_for_policy_name**.

    This parameter has no default value.

- name_seperator_value

Defines the separator character to use between two options when concatenating them to each other to create the policy name. Any character is accepted. The default value is '_'.

- use_default

Determines whether to use a default policy when no policy information can be extracted from the DHCP data, such as the configurable options are missing or no options were configured.

Possible values for this parameter are **true** or **false**. The default value is **false**.

- default_policy

Defines the default policy ID to use if no policy information is extracted from the DHCP data. This parameter is relevant only if the *use_default* parameter is set to **true**.

Possible values for this parameter are any integer number. This parameter has no default value.

- allow_login_with_no_policy

Defines whether to perform a login without policy information when no policy information can be extracted from the DHCP data and the *use_default* parameter is set to **false**.

This parameter is relevant only if the **use_default** parameter is set to **false**.

Possible values for this parameter are **true** or **false**. The default value is **true**.

- policy_property_name

Defines the name of the application property that contains the policy information. This parameter has no default value.

- log_all

Defines whether to write detailed user-log messages for all policy association events.

Possible values for this parameter are **true** or **false**. The default value is **false**.

- log_default_assignment

Defines whether to write a user-log message for every assignment of the default value (as defined by the **default_policy** parameter).

Possible values for this parameter are **true** or **false**. The default value is **false**.

- mapping_table.<policy_name>

Multiple entries containing the information to convert from the policy information as it appears in the DHCP packet to the policy property value to be used by the SCA BB application.

These entries do not have default values.

The **[Additional Data]** section of the configuration file contains the following parameters:

- label_options

Defines which DHCP option to extract to add to the login operation.

Possible values are the option number or, in the case of DHCP options with sub-options, the option and sub-option separated by a colon. For example, 43:123 or 61.

There is no default value for this parameter.

- label_keys

Defines the keys that should mark the DHCP options defined by the **label_options** parameter.

There is no default value for this parameter.

- label_options_type

Defines the format type of the DHCP option defined by the **label_options** parameter.

Possible values for this parameter are **binary**(a binary string that is converted to an ASCII hexadecimal string) or **string**(an ASCII string).

The default value is **binary**.

## Dynamic Assignment of Policy Information Example

Suppose that the policy information appears inside option 43 (Vendor Specific Option) of the DHCP packet and that both subtypes, 102 and 101, are in use. Configure the **options_order_for_policy_name** parameter as follows:

```
options_order_for_policy_name=43:102,43:101
```
Suppose that option 43 with subtype 102 contains the type of package (gold, silver, or bronze), and that option 43 with subtype 101 contains domain information (the package type has a different meaning in different domains). If the separator value is configured to the default value, configure the mapping_table entries as follows:

```
mapping_table.gold_domain1=11
mapping_table.gold_domain2=12
mapping_table.silver_domain1=13
mapping_table.silver_domain2=14
```
This configuration means that if the DHCP packet contains the value 'gold' inside option 43 with subtype 102, and the value 'domain1' inside option 43 with subtype 101, the package ID that will be associated to the subscriber in the SM will have the value 11.

The following configuration describes how to add the data of the Relay-Agent Circuit-Id option as additional data to the login operation:

```
[Additional Data]
label_options=82:1
label_keys=PORT_ID
label_option_type=string
```
The following is an example of the entire configuration file:

```
[DHCP.Policy.Package]
options_order_for_policy_name=43:102,43:101
name_separator_value=_
use_default=true
default_policy=1
policy_property_name=packageId
allow_login_with_no_policy=false
log_all=false
log_default_assignment=false
mapping_table.gold_domain1=11
mapping_table.gold_domain2=12
mapping_table.silver_domain1=13
mapping_table.silver_domain2=14
[Additional Data]
label_options=82:1
label_keys=PORT_ID
label_option_type=string
```

## Static Assignment of Policy Information

If the installation does not require dynamic assignment of package information, the configuration file **dhcp_pkg.cfg** should define the default package ID and default Virtual-Link to be assigned to all the subscribers, as shown in the following example:

```
[DHCP.Policy.Package]
policy_property_name=packageId
allow_login_with_no_policy=false
```

```
use_default=true
default_policy=1
[DHCP.Policy.VirtualLinkDownstream]
policy_property_name=downVlinkId
allow_login_with_no_policy=false
use_default=true
default_policy=0
[DHCP.Policy.VirtualLinkUpstream]
policy_property_name=upVlinkId
allow_login_with_no_policy=false
use_default=true
default_policy=0
```
All other configuration parameters should not be set.

# Information About the DHCP Lease Query LEG CLU

The p3leasequery utility displays the DHCP Lease Query LEG configuration, status, and statistics. The command format is **p3leasequery <operation>**.

The following table lists the p3leasequery operations.

*Table 3-1        p3leasequery Operations*

| Operation | Description |
|---|---|
| **--show** | Displays all of DHCP Lease Query LEG configurations and status |
| **--show-statistics** | Displays counters of DHCP messages handled and number of logon operations performed |
| **--show-version** | Displays the version number of the DHCP Lease Query LEG |
| **--help** | Displays a list of available operations and arguments with a short explanation of their meanings |

- Viewing the DHCP Lease Query LEG Status
- Viewing the DHCP Lease Query LEG Statistics
- Viewing the DHCP Lease Query LEG Version

## Viewing the DHCP Lease Query LEG Status

The following is an example using the **p3leasequery** command-line utility with the **show** operation:

```
>p3leasequery --show DHCP Lease-Query LEG:
====================
Active:    true
DHCP Servers:
Active:  10.1.2.3
Standby: N/A
Session timeout: 20
Fail over criteria: 3
Subscriber ID:
Option:   82:2
Format:   binary
```

```
Fallback: none
Command terminated successfully
>
```

## Viewing the DHCP Lease Query LEG Statistics

The following is an example of the **p3leasequery** command-line utility using the **show-statistics** operation:

```
>p3leasequery --show-statistics DHCP Lease-Query LEG Statistics:
===============================
Lease-Queries Sent:           16
Lease-Queries Replied:        16
Active Lease Replies:         16
Non-Active Lease Replies:     0
Total timed-out sessions:     0
Consecutive timed-out sessions: 0
Number of fail-overs          0
Invalid Replies:              0
Sessions in process:          0
Max-Concurrent sessions:      3
Command terminated successfully
>
```

## Viewing the DHCP Lease Query LEG Version

The following is an example of the **p3leasequery** command-line utility using the **show-version** operation:

```
>p3leasequery --show-version DHCP LEASE QUERY LEG 3.1.0 Build 176
>
```

<Ch A P T E R> **4**

# SCE Integration

> **Note** This section is relevant if you intend to install the DHCP Lease Query LEG directly on the SCE device in an SM-less installation.

This module describes the procedures for installing, uninstalling, and upgrading the DHCP Lease Query LEG on the SCE.

The SM-less integration supports a cascade SCE installation.

# How to Install, Uninstall, and Upgrade the DHCP Lease Query LEG

- Installing the DHCP Lease Query LEG on the SCE
- Uninstalling the DHCP Lease Query LEG from the SCE Device
- Upgrading the DHCP Lease Query LEG

## Installing the DHCP Lease Query LEG on the SCE

**Step 1** Install the PQI file of the DHCP Lease Query LEG.

Run the following CLI on the SCE device:

```
SCE2000#>configure
SCE2000(config)#>interface LineCard 0
SCE2000(config if)#>pqi install file LEG-PQI
```

> **Note** After the installation of the PQI file, the management agent restarts itself automatically. Please wait until the management agent is up before proceeding with configuring the LEG.

**Step 2** Configure the LEG using the SCE CLI.

Before you start using the LEG, you must configure the DHCP servers and start the LEG operation. See the Configuration CLI for more details.

## Uninstalling the DHCP Lease Query LEG from the SCE Device

**Step 1**    Uninstall the DHCP Lease Query LEG using the CLI on the SCE device.

Run the following CLI on the SCE device.

```
SCE2000#>configure
SCE2000(config)#>interface LineCard 0
SCE2000(config if)#>pqi uninstall file LEG-PQI
```

**Note**    After the uninstallation of the PQI file, the management agent restarts itself automatically. Please wait until the management agent is up before using the SCE device.

## Upgrading the DHCP Lease Query LEG

The DHCP Lease Query LEG must be upgraded as part of the SCE upgrade process, because previous versions of the DHCP Lease Query LEG are incompatible with the SM 3.x version. The upgrade for the DHCP Lease Query LEG should be performed together with the upgrade process of the SCE.

### SUMMARY STEPS

1. Backup the configuration files of the DHCP Lease Query LEG.

2. Uninstall the DHCP Lease Query LEG.

3. Perform an upgrade of the SCE.

4. Install the new version of the DHCP Lease Query LEG.

5. Configure the LEG using the SCE CLI.

### DETAILED STEPS

**Step 1**    Backup the configuration files of the DHCP Lease Query LEG.

The original configuration files are deleted by the uninstall process in the next step.

**Step 2**    Uninstall the DHCP Lease Query LEG.

Run the following CLI on the SCE device.

```
SCE2000#>configure
SCE2000(config)#>interface LineCard 0
SCE2000(config if)#>pqi uninstall file LEG-PQI
```

**Note**    After the uninstallation of the PQI file, the management agent restarts itself automatically. Please wait until the management agent is up before using the SCE device.

**Step 3**    Perform an upgrade of the SCE.

The SCE upgrade procedure is described in the *Cisco SCE Software Configuration Guide* .

**Step 4**    Install the new version of the DHCP Lease Query LEG.

Run the following CLI on the SCE device.

```
SCE2000#>configureSCE2000(config)#>interface LineCard 0SCE2000(config if)#>pqi install
fileLEG-PQI
```

**Note**    After the installation of the PQI file, the management agent restarts itself automatically. Please wait until the management agent is up before proceeding with configuring the LEG.

**Step 5**    Configure the LEG using the SCE CLI.

C H A P T E R **5**

# Subscriber Manager Integration

This module describes the procedures for installing, uninstalling, and upgrading the DHCP Lease Query LEG on the SM.

> **Note**  This module is relevant if you are using the Subscriber Manager server on your network. You should install the DHCP Lease Query LEG on the SM server and not on the SCE device.

- How to Install, Uninstall, and Upgrade the DHCP Lease Query LEG

# How to Install, Uninstall, and Upgrade the DHCP Lease Query LEG

- Installing the DHCP Lease Query LEG on the SM
- Uninstalling the DHCP Lease Query LEG from the SM Server
- Upgrading the DHCP Lease Query LEG

## Installing the DHCP Lease Query LEG on the SM

**SUMMARY STEPS**

1.  Install the DHCP Forwarder application
2.  Install the PQI file of the DHCP Lease Query LEG
3.  Edit the DHCP Lease Query LEG configuration files
4.  Edit the SM configuration file **p3sm.cfg** and set the subscriber introduction mode to be pull mode
5.  Load the configuration files to the SM using the **p3sm**CLU
6.  Add a resource to the Veritas Cluster Server

**DETAILED STEPS**

**Step 1**  Install the DHCP Forwarder application

The DHCP Forwarder application bridges between the LEG and the DHCP server. See Installing the DHCP Forwarder.

**Step 2**    Install the PQI file of the DHCP Lease Query LEG

    **a.**    Run the **p3inst** command-line utility (CLU) from the SM CLU directory **~pcube/sm/server/bin**

## Example:

```
>p3inst --install -f leaseq.pqi
```

✎
**Note**    After the installation of the PQI file, the SM restarts itself automatically.

**Step 3**    Edit the DHCP Lease Query LEG configuration files

The DHCP Lease Query LEG includes two configuration files under **~pcube/sm/server/root/config** :

- **leaseq.cfg** —Configures general attributes of the LEG
- **dhcp_pkg.cfg** —Configures rules for policy assignment

It is recommended to edit the files according to the configuration required at first use.

**Step 4**    Edit the SM configuration file **p3sm.cfg** and set the subscriber introduction mode to be pull mode

## Example:

```
[SM General]
# The following parameter defines whether the SM introduces
# the subscribers to
# the SCEs immediately after the subscriber's
# login operation (push-mode) or when the SE requests
# subscriber information specifically (pull-mode).
# Optional values: [pull, push]. Default: push.
introduction_mode=pull
```
**Step 5**    Load the configuration files to the SM using the **p3sm**CLU

This command-line utility loads the new configuration to the SM and activates it.

## Example:

```
>p3sm --load-config
```
**Step 6**    Add a resource to the Veritas Cluster Server

This can be done only on SM Cluster setups. To add a resource, see Adding a DHCP Forwarder Resource.

# Uninstalling the DHCP Lease Query LEG from the SM Server

**SUMMARY STEPS**

    **1.**    Run the **p3inst**command-line utility from the SM CLU directory **~pcube/sm/server/bin**

**2.** Uninstall the DHCP Forwarder Veritas Cluster Agent.

**3.** Uninstall the DHCP Forwarder application. See Uninstalling the DHCP Forwarder.

**DETAILED STEPS**

**Step 1**    Run the **p3inst**command-line utility from the SM CLU directory **~pcube/sm/server/bin**

**Example:**

```
>p3inst --uninstall -f leaseq.pqi
```

**Note**    After the uninstall process, the SM restarts itself automatically.

**Step 2**    Uninstall the DHCP Forwarder Veritas Cluster Agent.

This can be done only on SM Cluster setups. See Removing a DHCP Forwarder Resource.

**Step 3**    Uninstall the DHCP Forwarder application. See Uninstalling the DHCP Forwarder.

# Upgrading the DHCP Lease Query LEG

The DHCP Lease Query LEG must be upgraded as part of the SM upgrade process, because previous versions of the DHCP Lease Query LEG are incompatible with the SM 3.x version. The upgrade for the DHCP Lease Query LEG should be performed together with the upgrade process of the SM.

**SUMMARY STEPS**

**1.** Backup the configuration files of the DHCP Lease Query LEG.

**2.** Uninstall the DHCP Lease Query LEG by running the **p3inst** CLU

**3.** Perform an upgrade of the SM

**4.** Install the new version of the DHCP Lease Query LEG by running the **p3inst**CLU

**5.** Restore the configuration files of the DHCP Lease Query LEG

**6.** Load the new configuration of the SM by running the **p3sm** CLU

**DETAILED STEPS**

**Step 1**    Backup the configuration files of the DHCP Lease Query LEG.

The original configuration files are deleted by the uninstall process in the next step.

**Step 2**    Uninstall the DHCP Lease Query LEG by running the **p3inst** CLU

**Example:**

```
>p3inst --uninstall -f lease-query-pqi
```

**Note**    After the uninstall process, the SM restarts automatically.

**Step 3**    Perform an upgrade of the SM

The SM upgrade procedure is described in the *Cisco SCMS Subscriber Manager User Guide* .

**Step 4**    Install the new version of the DHCP Lease Query LEG by running the **p3inst**CLU

## Example:

```
>p3inst --install -f lease-query-pqi
```

**Step 5**    Restore the configuration files of the DHCP Lease Query LEG

**Step 6**    Load the new configuration of the SM by running the **p3sm**CLU

## Example:

```
>p3sm --load-config
```

C H A P T E R **6**

# DHCP Forwarder Application

This module describes how to install the DHCP forwarder application as well as adding and removing resources.

**Note** This module is only relevant when the DHCP Lease Query LEG is installed on the SM server.

The DHCP Forwarder application acts as a bridge between the DHCP Lease Query LEG and the DHCP servers. The LEG sends a request to the DHCP Forwarder, which then forwards the request to the appropriate DHCP server. The DHCP Forwarder passes the replies from the DHCP servers to the LEG. The LEG signals the forwarder which server should receive each request. Therefore, no special configuration is needed for this application.

Because only root privileged applications can open ports under 1024 (DHCP uses ports 67 and 68), the DHCP Forwarder runs with root privileges.

- Installing the DHCP Forwarder
- Uninstalling the DHCP Forwarder
- DHCP Forwarder VCS Agent

# Installing the DHCP Forwarder

**Step 1** Run the DHCP Forwarder installation script from the SM DIST root directory.

You must run the DHCP Forwarder installation script as **root**.

```
#./install-forwarder.sh
```
The installation script extracts the DHCP Forwarder distribution to the *sm-inst-dir* **\sm\server\addons\dhcp-forwarder** directory ( *sm-inst-dir* refers to the SM installation directory). The script adds the initialization scripts to their location according to the machine's OS.

**Step 2** Run the DHCP Forwarder application.

The DHCP Forwarder application can be run using one of the following methods:

- Restart the machine. The initialization script will start the application automatically.
- Run the following command as **root** :
- ```
  #/etc/init.d/p3dhcpforwarder start
  ```

**Note**    It is not possible to run the script if the **/etc/motd** file exists. The file should be moved *or* removed prior to running the **install-forwarder.sh** script.

# Uninstalling the DHCP Forwarder

**Step 1**    Stop the DHCP Forwarder application.

Run the following command as **root** to stop the application.

```
#/etc/init.d/p3dhcpforwarder stop
```

**Step 2**    Remove the DHCP Forwarder application startup and shutdown scripts.

Run the following command as **root** to remove the startup and shutdown scripts.

- For Solaris:

- `# rm /etc/rc*.d/[SK]*p3dhcpforwarder /etc/init.d/p3dhcpforwarder`

- For Red Hat:

- `# rm /etc/rc.d/rc*.d/[SK]*p3dhcpforwarder /etc/rc.d/init.d/ p3dhcpforwarder`

**Step 3**    Remove the DHCP Forwarder application directory.

Run the following command to remove the application.

```
# rm -r ~pcube/sm/server/addons/dhcp-forwarder
```

# DHCP Forwarder VCS Agent

To verify that the DHCP Forwarder process is active at all times, a Veritas Cluster Server (VCS) Agent of type *OnOnlyProcess* is added as a resource.

- Adding a DHCP Forwarder Resource

- Removing a DHCP Forwarder Resource

# Adding a DHCP Forwarder Resource

**Step 1**    Import the OnOnlyProcess agent's type from the **/opt/VRTSvcs/bin/OnOnlyProcess/OnOnlyProcess.cf** file.

**Step 2**    Add an OnOnlyProcess resource called *DHCP_Forwarder* to the service group.

**Step 3**    Note the path and arguments of the DHCP Forwarder.

Run the following command via a Telnet session on each of the servers:

```
>ps -ea -o pid,s,args
```
Look for the line containing the text "DHCP_FORWARDER". This line contains the path and arguments of the DHCP Forwarder to be used in the next step.

Step 4    Define the **OnlineCmd**, **PathName**, and **Arguments**parameters.

Define the parameters as follows:

- **OnlineCmd**—Type the DHCP Forwarder start command:

- `/etc/init.d/p3dhcpforwarder start`

- **PathName**—Type the DHCP Forwarder process path (from the previous step). For example: **/opt/pcube/j2re1.4.2_05/bin/java**

- **Arguments**—Type the DHCP Forwarder process arguments (from the previous step). For example: **DAPP=DHCP_FORWARDER -jar /opt/pcube/sm/server**.

For further information about the parameters, see the following figure.

*Figure 6-1*        *Adding a DHCP Forwarder Resource*
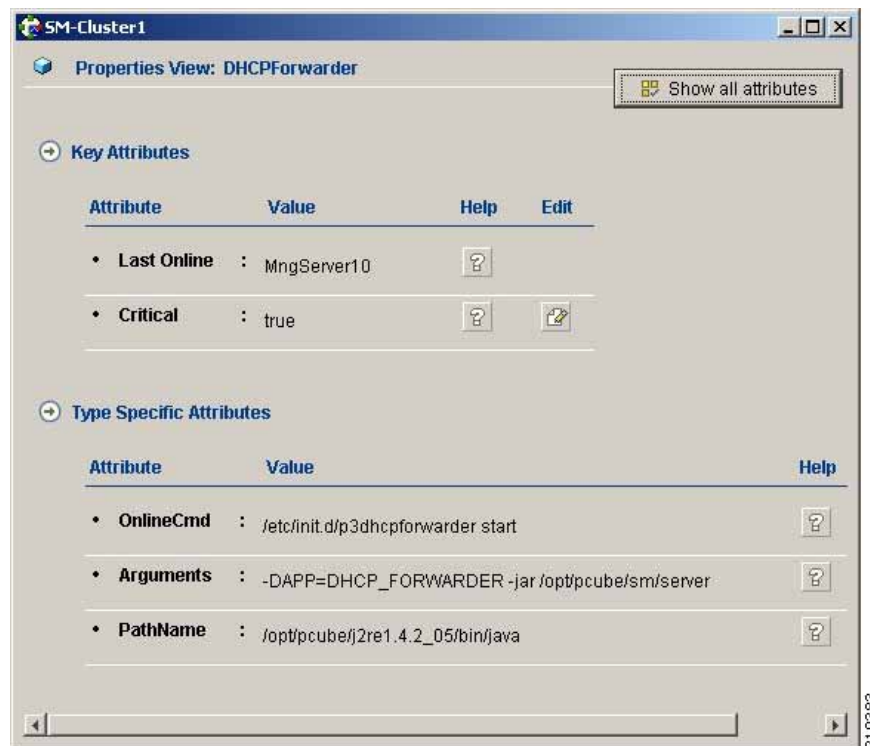


![Note] The arguments line might seem shorter than the actual full argument list. This is perfectly acceptable.

# Removing a DHCP Forwarder Resource

**Step 1**    Right-click on the DHCP Forwarder Resource icon and choose **Delete** from the drop-down menu.

*Figure 6-2        Removing a DHCP Forwarder Resource*