



## **Cisco SCMS SM DHCP Lease Query LEG**

### **Reference Guide**

Version 3.0.3  
OL-7808-03

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Customer Order Number: DOC-780803=  
Text Part Number: OL-7808-03



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## **Preface iii**

- Document Revision History iii
- Audience iii
- Organization iii
- Related Documentation iv
- Conventions iv
- Obtaining Documentation v
  - World Wide Web v
  - Documentation CD-ROM vi
  - Ordering Documentation vi
  - Documentation Feedback vi
- Obtaining Technical Assistance vi
  - Cisco.com vii
  - Technical Assistance Center vii

## **About the DHCP Lease Query LEG 1-1**

- DHCP Lease Query LEG Operation 1-1
- Terms and Concepts 1-3
  - LEG (Login Event Generator) 1-3
  - Cable/Satellite Modem 1-3
  - CPE (Customer Premise Equipment) 1-3
  - DHCP Lease Query Transaction 1-3
  - Subscriber Mappings 1-3
  - Pull-request 1-3
  - Subscriber Domain 1-4
  - Subscriber Package 1-4

## **DHCP Lease Query LEG Functionality 2-1**

- DHCP Lease Query LEG Process 2-1

DHCP Lease Query Transaction 2-1

### **Installing the DHCP Lease Query LEG 3-1**

Package Contents 3-1

Installing the DHCP Lease Query LEG on the SM 3-2

Uninstalling the DHCP Lease Query LEG 3-3

Installing the DHCP Lease Query LEG on an SCE Device 3-4

Uninstalling the DHCP Lease Query LEG 3-4

Upgrading the DHCP Lease Query LEG 3-5

### **Configuring the DHCP Lease Query LEG 4-1**

Configuring the DHCP Lease Query LEG on the SM 4-1

Example 4-4

Configuring Package Association 4-4

Dynamic Assignment of Package Information 4-4

Static Assignment of Package Information 4-6

### **DHCP Lease Query LEG CLU 5-1**

p3leasequery Utility 5-1

Viewing the DHCP Lease Query LEG Status 5-1

Viewing DHCP Lease Query LEG Statistics 5-2

Viewing the DHCP Lease Query LEG Version 5-2

### **DHCP Lease Query LEG CLI 6-1**

Configuration CLI 6-1

Show CLI 6-2

### **Using the DHCP Forwarder Application A-1**

Installing the DHCP Forwarder A-1

Uninstalling the DHCP Forwarder A-2

DHCP Forwarder VCS Agent A-2

Adding a DHCP Forwarder Resource A-2

Removing a DHCP Forwarder Resource A-3

### **Index I-1**



## Preface

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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.



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**Note**

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

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

## Document Revision History

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

### Description of Changes

No major changes or new features were added to this revision.

|             |            |                |
|-------------|------------|----------------|
| Release 3.0 | OL-7808-02 | December, 2005 |
|-------------|------------|----------------|

## 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.

## Organization

This guide contains the following topics:

| Chapter    | Title   | Description  |
|------------|---|--|
| Chapter 1  | <i>About the DHCP Lease Query LEG</i> (on page 1-1)       | Describes the Subscriber Manager DHCP Lease Query LEG software module and the terms and concepts used in this guide.   |
| Chapter 2  | <i>DHCP Lease Query LEG Functionality</i> (on page 2-1)   | Provides a description of the DHCP Lease Query LEG process and transactions  |
| Chapter 3  | <i>Installing the DHCP Lease Query LEG</i> (on page 3-1)  | Details the procedures for installing the software on either the Subscriber Manager or on an SCE device. It also describes uninstalling the software and upgrading procedures. |
| Chapter 4  | <i>Configuring the DHCP Lease Query LEG</i> (on page 4-1) | Describes the configuration procedure for the DHCP Lease Query LEG on the SM and configuring the Package Association   |
| Chapter 5  | <i>DHCP Lease Query LEG CLU</i> (on page 5-1)             | Provides a description of the command-line utility commands when the software is installed on the Subscriber Manager.  |
| Chapter 6  | <i>DHCP Lease Query LEG CLI</i> (on page 6-1)             | Provides a description of the command-line interface commands when the software is installed on the SCE device.  |
| Appendix A | <i>Using the DHCP Forwarder Application</i> (on page A-1) | Describes the DHCP Forwarder application, installation instructions, and adding and removing a resource.   |

## Related Documentation

This Reference Guide should be used in conjunction with the following Cisco documentation:

- *SCMS Subscriber Manager User Guide*

## Conventions

This document uses the following conventions:

| Convention           | Description   |
|----------------------|---|
| <b>boldface</b> font | Commands and keywords are in <b>boldface</b> .  |
| <i>italic</i> font   | Arguments for which you supply values are in <i>italics</i> .                         |
| [ ]                  | Elements in square brackets are optional.   |
| {x   y   z}          | Alternative keywords are grouped in braces and separated by vertical bars.            |
| [x   y   z]          | Optional alternative keywords are grouped in brackets and separated by vertical bars. |

| Convention                  | Description  |
|-----------------------------|--|
| string                      | A nonquoted set of characters. Do not use quotation marks around the string, or the string will include the quotation marks. |
| screen font                 | Terminal sessions and information the system displays are in screen font.  |
| <b>boldface screen font</b> | Information you must enter is in <b>boldface screen font</b> .   |
| <i>italic screen font</i>   | Arguments for which you supply values are in <i>italic screen font</i> .   |
| →                           | This pointer highlights an important line of text in an example.   |
| <>                          | Nonprinting characters, such as passwords, are in angle brackets.  |
| [ ]                         | Default responses to system prompts are in square brackets.  |
| !, #                        | An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.                    |

Notes use the following conventions:




---

**Note**

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

---

Cautions use the following conventions:




---

**Caution**

Means *reader be careful*. You are capable of doing something that might result in equipment damage or loss of data.

---

Warnings use the following conventions:




---

**Warning**

Means *reader be warned*. You are capable of doing something that might result in bodily injury.

---

## Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

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<http://www.cisco.com/pcgi-bin/marketplace/welcome.pl>
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## Obtaining Technical Assistance

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<http://www.cisco.com>

## Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

### Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

<http://www.cisco.com/tac>

P3 and P4 level problems are defined as follows:

- P3—Your network is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for *Cisco.com* (on page [vii](#)), go to the following website:

<http://tools.cisco.com/RPF/register/register.do>

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

<http://www.cisco.com/tac/caseopen>

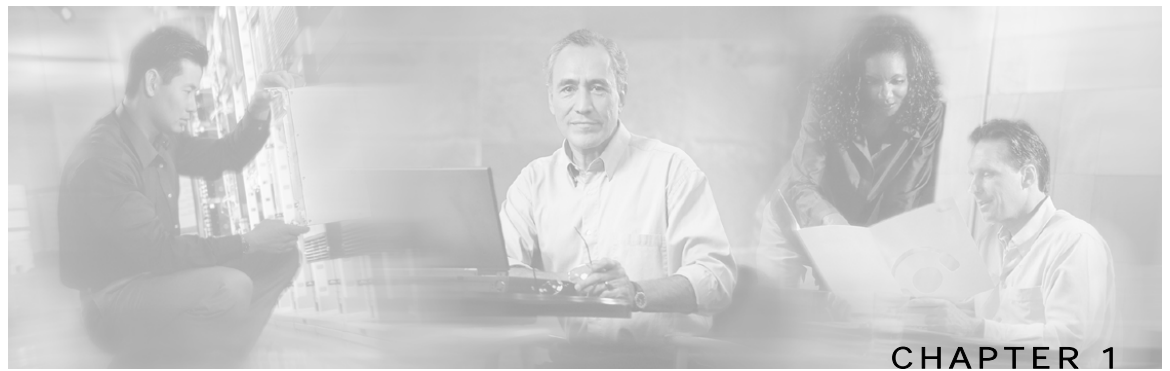
## Contacting TAC by Telephone

If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.



## About the DHCP Lease Query LEG

The DHCP Lease Query LEG is a software module that handles pull-requests from the different SCE platforms in the network that the Subscriber Manager (SM) could not handle. 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 as well, and not on the SCE.

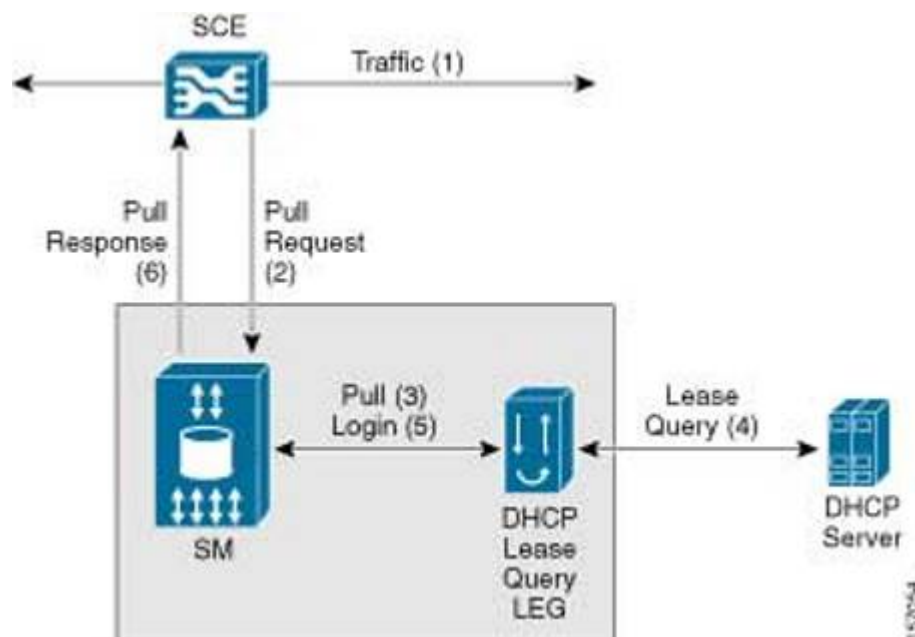
This chapter contains the following sections:

- [DHCP Lease Query LEG Operation](#) 1-1
- [Terms and Concepts](#) 1-3

## DHCP Lease Query LEG Operation

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

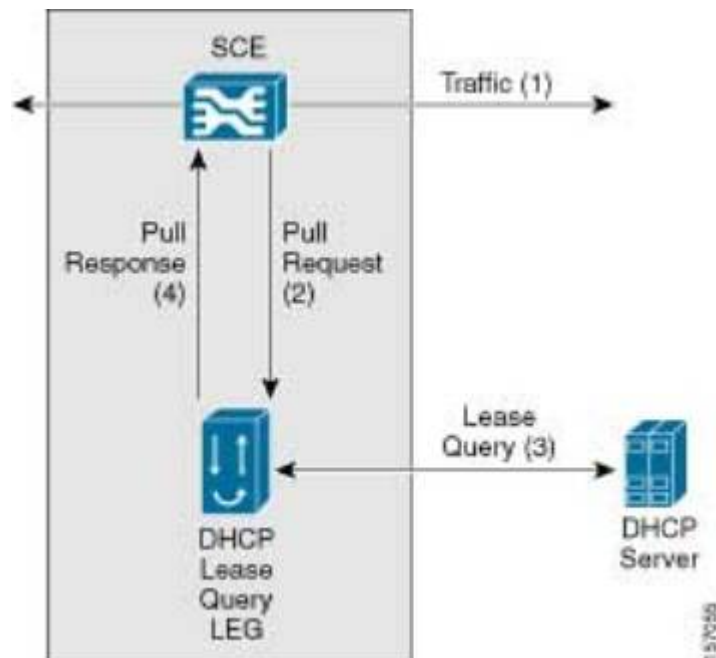
Figure 1-1: DHCP Lease Query LEG Operation



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, the DHCP Lease Query LEG can be installed 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 installed on an SCE device



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

The DHCP Lease-Query transaction is defined as an Internet Engineering Task Force (IETF) draft. The LEG supports version 7 of the draft and an earlier draft supported by the Cisco Network Registrar (CNR) DHCP server. For more information, see the *IETF website* (<http://www.ietf.org/internet-drafts/draft-ietf-dhc-leasequery-07.txt>).

## 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 *SCMS Subscriber Manager User Guide*.

### LEG (Login Event Generator)

A software component that performs subscriber login and logout operations on the SM/SCE. The LEG is used to handle 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 type of equipment that an end user can connect to the network through a modem. The end user can connect multiple CPE devices 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.

The DHCP Lease-Query transaction is defined in an IETF draft. For more information, see the *IETF website* (<http://www.ietf.org/internet-drafts/draft-ietf-dhc-leasequery-07.txt>).

### 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 so as 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 CLU.

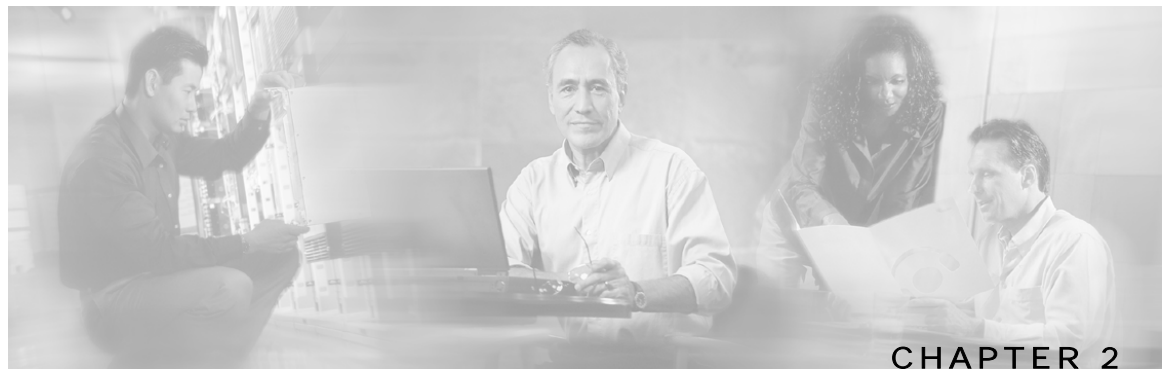
For additional information about domains and domain aliases, see *Appendix A* of the *SCMS Subscriber Manager User Guide*.

## Subscriber Package

The policy enforced by Cisco SCMS solutions on each subscriber is usually defined by a subscriber policy package. 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 [Package Association Configuration](#) ("[Configuring Package Association](#)" on page 4-4), and the *Service Control Application for Broadband (SCA BB) User Guide*.



## DHCP Lease Query LEG Functionality

---

This chapter contains the following sections:

- [DHCP Lease Query LEG Process 2-1](#)
- [DHCP Lease Query Transaction 2-1](#)

### 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.

If the LEG is installed 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) is allowed to 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 [Appendix A](#) ("[Using the DHCP Forwarder Application](#)" on page [A-1](#)) of this document.

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

### DHCP Lease Query Transaction

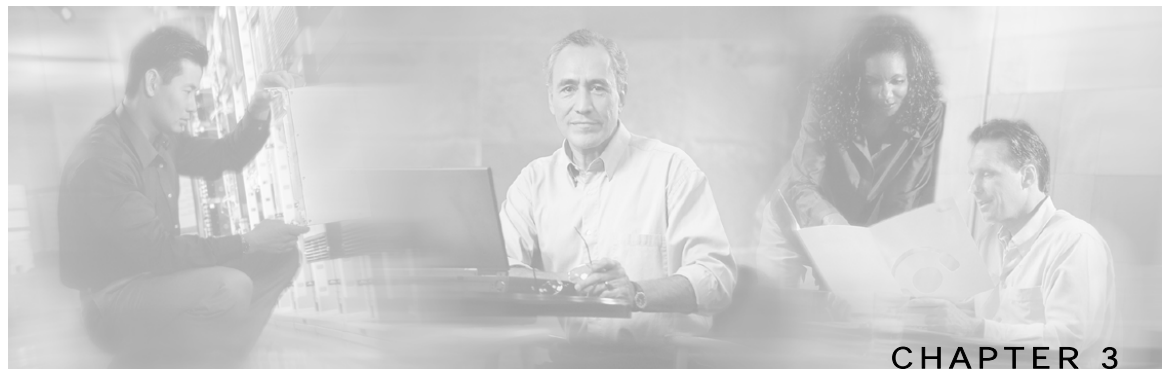
The DHCP Lease Query transaction is a DHCP transaction where the client (LEG) sends a DHCPLEASEQUERY message to the server, indicating the information it wants to query about. The LEG only queries about IP address. The server can reply with several types of messages, for example, DHCPLEASEACTIVE, which means that an active lease was found and the request information is supplied, or DHCPLEASEUNASSIGNED, which means this IP currently is 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 modem MAC address is used as the subscriber ID. The modem MAC address is extracted from option 82 (Remote ID sub-option of the DHCP Relay Agent Information Option). Therefore, the DHCP server is required to 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**—The package information is assigned according to configurable options in the DHCP message. The LEG includes a component that converts the package information data from the DHCP packet to a subscriber package ID. If the package information is not found in the packet, 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 above information, the LEG logs the subscriber into the SM/SCE.





## Installing the DHCP Lease Query LEG

This section describes the procedures for configuring and running the DHCP Lease Query LEG. It also describes the uninstall procedure.

The DHCP Lease Query LEG is provided as an external component (PQI file) that should be installed on the SM or SCE device, depending on your installation configuration. 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 *Appendix A, DHCP Forwarder Application* ("Using the DHCP Forwarder Application" on page A-1).

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

This chapter contains the following sections:

- [Package Contents 3-1](#)
- [Installing the DHCP Lease Query LEG on the SM 3-2](#)
- [Uninstalling the DHCP Lease Query LEG 3-3](#)
- [Installing the DHCP Lease Query LEG on an SCE Device 3-4](#)
- [Uninstalling the DHCP Lease Query LEG 3-4](#)
- [Upgrading the DHCP Lease Query LEG 3-5](#)

## Package Contents

The DHCP Lease Query LEG distribution is provided as part of the SCMS SM LEG distribution file and is located in the Lease\_Query\_LEG directory. The contents of the DHCP Lease Query LEG distribution package supplied by Cisco are described in the following table:

Table 3-1 File layout of the DHCP Lease Query LEG distribution package

| Root        | Folder<br>(under root) | File name             | Notes  |
|-------------|------------------------|-----------------------|--|
| pkg-ext-dir |                        |                       |  |
|             |                        | Install               | LEG installation procedure description             |
|             |                        | install-forwarder.sh  | DHCP Forwarder installation script                 |
|             |                        | 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                             |
|             | <b>sce</b>             |                       |  |
|             |                        | dhcp_pkg.cfg          | Default configuration file for package association |
|             |                        | leaseq.pqi            | DHCP Lease Query LEG distribution                  |
|             | <b>sm</b>              |                       |  |
|             |                        | leaseq.pqi            | DHCP Lease Query LEG distribution                  |



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

## Installing the DHCP Lease Query LEG on the SM



**Note** This section 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.

To install the DHCP Lease Query LEG on the SM server:

### Step 1 Install the DHCP Forwarder application

The DHCP Forwarder application bridges between the LEG and the DHCP server. See [Installing the DHCP Forwarder](#) (on page A-1).

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

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

```
> 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 package 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:

```
[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.

Run the p3sm command-line utility:

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

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

**Step 6** Add a resource to the Veritas Cluster Server (*optional*)

This can be done only on SM Cluster setups. To add a resource, see [Adding a DHCP Forwarder Resource](#) (on page A-2).

---

## Uninstalling the DHCP Lease Query LEG

To uninstall the DHCP Lease Query LEG:

---

**Step 1** Run the p3inst command-line utility from the SM CLU:

```
> 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 only be performed on SM Cluster setups. See [Removing a DHCP Forwarder Resource](#)

(on page [A-3](#)).

- Step 3** Uninstall the DHCP Forwarder application. See [Uninstalling the DHCP Forwarder](#) (on page [A-2](#)).

## Installing the DHCP Lease Query LEG on an SCE Device



**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. If you are using an SM server, you must skip this section.

To install the DHCP Lease Query LEG on an SCE device:

- 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 to proceed 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](#) (on page [6-1](#)) for more details.

## Uninstalling the DHCP Lease Query LEG

To uninstall the DHCP Lease Query LEG from 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 to proceed using the SCE device.

## 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 3.0 version.

The upgrade for the DHCP Lease Query LEG should be performed together with the upgrade process of the SM.

To upgrade the DHCP Lease Query LEG:

---

**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 following CLU:

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

---

**Note:** After the uninstall process, the SM restarts itself automatically. Please wait until the management agent is up to proceed using the SCE device.

---

**Step 3** Perform an upgrade of the SM as described in the *SCMS Subscriber Manager User Guide*.

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

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

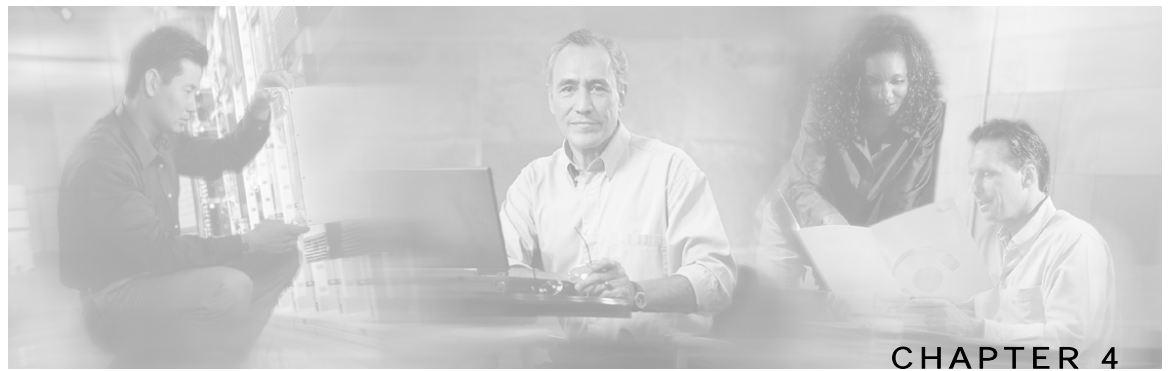
**Step 5** Restore the configuration files of the DHCP Lease Query LEG.

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

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

---





## 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 DHCP Lease Query LEG on the SCE is configured using the CLI and the dynamic package association is configured using a configuration file, which a location is specified by the user.

The configuration files are made up 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.

This chapter contains the following sections:

- [Configuring the DHCP Lease Query LEG on the SM](#) 4-1
- [Configuring Package Association](#) 4-4

## Configuring the DHCP Lease Query LEG on the SM



### Note

The configuration section is only relevant for SM installations. Configuration of the LEG on the SCE device is performed using the CLI. See the [Configuration CLI](#) (on page 6-1) section.

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 should run 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 is used to limit 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. This IP address is also used inside the giaddr field of the DHCP packet. 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. The default value is **false**.
- *use\_forwarder*  
Defines whether the LEG utilizes the DHCP Forwarder application on the local machine. 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.
- *session\_timeout*  
Defines the timeout in seconds for queries, starting at the time the DHCP Lease Query message is sent. If this timeout expires and no reply is received, the session is discarded. The default value is 20 seconds




---

**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 will 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**.  
This parameter should be used 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 needed, 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.

## Example

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 Package Association




---

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

---

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

- Dynamic assignment of package information using information extracted from the DHCP packet. See [Dynamic Assignment of Package Information](#) (on page 4-4).
- Static assignment of a constant package ID for all subscribers who log on via the DHCP Lease Query LEG. See [Static Assignment of Package Information](#) (on page 4-6).

### Dynamic Assignment of Package Information

Dynamic assignment of package information is supported when package information is submitted in the DHCP packets. The LEG concatenates the desired options and creates a package-name. It is possible to map the configuration between the package-names and the application package IDs.

To extract the package information data from the DHCP packet, the *dhcp\_pkg.cfg* configuration file should define the option types that contain the package information and define the conversion map of the package-names to the package IDs of the Service Control Application for Broadband (SCA BB).

The [Package Association] section contains the following parameters:

- *options\_order\_for\_package\_name*  
Defines the DHCP options (string) that contain the package association information and defines the order of concatenation of the option data.  
The format is: *option[:subtype],option[:subtype]*
- *name\_seperator\_value*  
Defines the separator character between two options when concatenating them to create the package name. Any character is accepted. The default value is '\_'.  
Possible values for this parameter are **true** or **false**. The default value is **true**.
- *use\_default*  
Determines whether to use a default package when no package information can be extracted from the DHCP data. This is used when the configurable options are missing or no options were configured.  
Possible values for this parameter are **true** or **false**. The default value is **true**.
- *default\_package*  
Defines the default package ID to use if no package information is extracted from the DHCP data. This parameter is relevant only if the *use\_default* parameter is set to **true**.  
Any integer value is allowed. This parameter has no default value.
- *allow\_login\_with\_no\_package*  
Defines whether a login without package information should be performed when no package 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 are **true** or **false**. The default value is **false**.
- *package\_property\_name*  
Defines the name of the application property that contains the package information. The default value is *packageId*, as used by SCA BB.

The [Package Names] section contains the information from the package information as it appears in the DHCP packet to the package ID number to be used by the SCA BB application.

## Example

Assuming that the package information appears inside option 43 (Vendor Specific Option) of the DHCP packet and that both subtypes, 102 and 101, are in use, the

*options\_order\_for\_package\_name* parameter should be configured as follows:

```
options_order_for_package_name=43:102,43:101
```

Assuming that option 43 with subtype 102 contains the type of package (gold, silver, or bronze), that option 43 with subtype 101 contains domain information (the package type has a different meaning in different domains), and that the separator value is configured to the default value, the package names section should be configured as follows:

```
[Package Names]
gold_domain1=11
gold_domain2=12
silver_domain1=13
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 is an example of the entire configuration file:

```
[Package Association]
options_order_for_package_name=43:102,43:101
name_separator_value=_
use_default=true
default_package=1
package_property_name=packageId

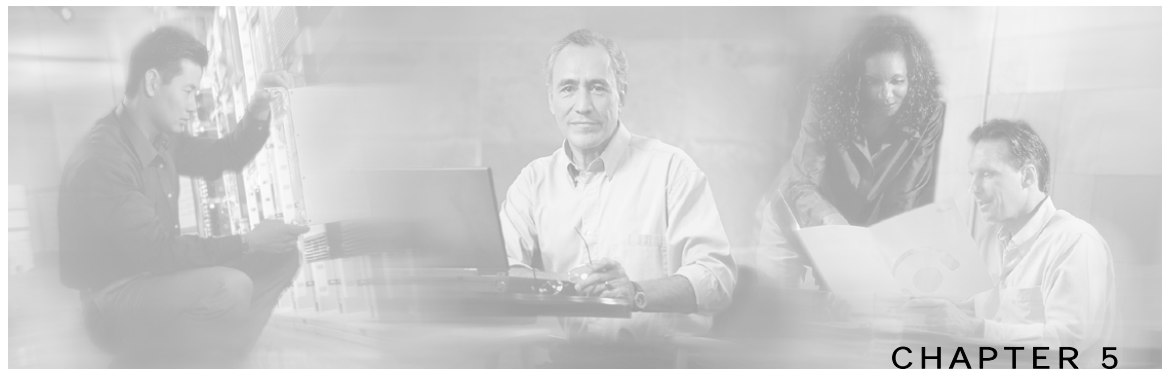
[Package Names]
gold_domain1=11
gold_domain2=12
silver_domain1=13
silver_domain2=14
```

## Static Assignment of Package Information

If dynamic assignment of package information is not required by the installation, the configuration file `dhcp_pkg.cfg` should define the default package ID to be assigned to all the subscribers, as shown in the following example:

```
[Package Association]
use_default=true
default_package=1
```

All other configuration parameters should not be set.



## DHCP Lease Query LEG CLU

**Note**

This chapter is only relevant when the DHCP Lease Query LEG is installed on the SM server.

This chapter contains the following sections:

- [p3leasequery Utility](#) 5-1

### p3leasequery Utility

The p3leasequery utility is used to view the DHCP Lease Query LEG configuration, status, and statistics. The command format is **p3leasequery** *operation*.

The following table lists the p3leasequery operations.

Table 5-1 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

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:   N/A
    Standby:  N/A
    Session timeout: 20
    Fail over criteria: 3
Subscriber ID:
    Option:   82:2
    Format:   binary
    Fallback: none
Command terminated successfully
>

```

## Viewing 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
>

```

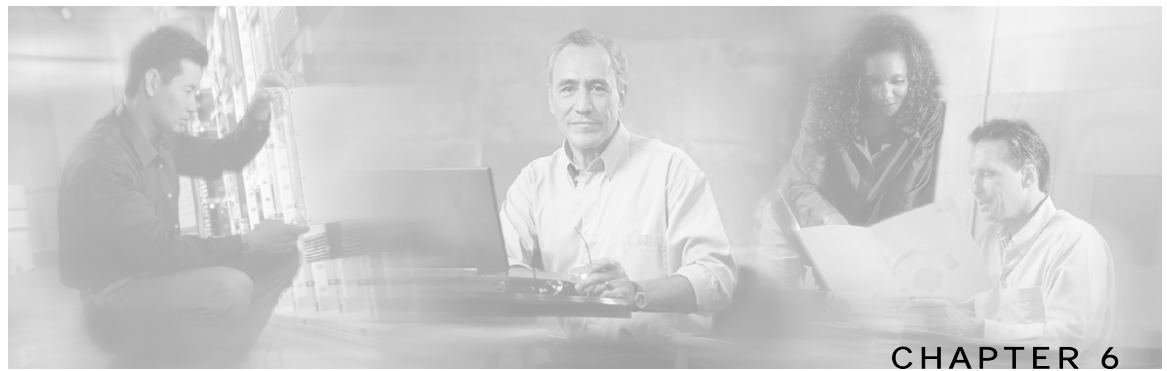
## Viewing the DHCP Lease Query LEG Version

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

```

> p3leasequery --show-version
DHCP LEASE QUERY LEG 3.0.5
>

```



## DHCP Lease Query LEG CLI

**Note**

This chapter is only relevant when the DHCP Lease Query LEG is installed on an SCE device.

This chapter contains the following sections:

- [Configuration CLI 6-1](#)
- [Show CLI 6-2](#)

## Configuration CLI

The DHCP Lease Query LEG is configured using the Command-Line Interface (CLI) for general LEG settings and a configuration file for package association.

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 (see [Configuring the DHCP Lease Query LEG on the SM](#) (on page 4-1)):

```
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 be 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.

## Show CLI

To set the `fail_over_criteria`:

```
SCE(config)# subscriber LEG dhcp-lease-query failover-criteria DECIMAL
```

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 STRING
<binary|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 package association, the LEG uses exactly the same file described in the [Package Association Configuration](#) ("Configuring Package Association" on page 4-4) section. The following CLI is used to set and load the configuration file (the full path and the file name must be specified):

```
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
```

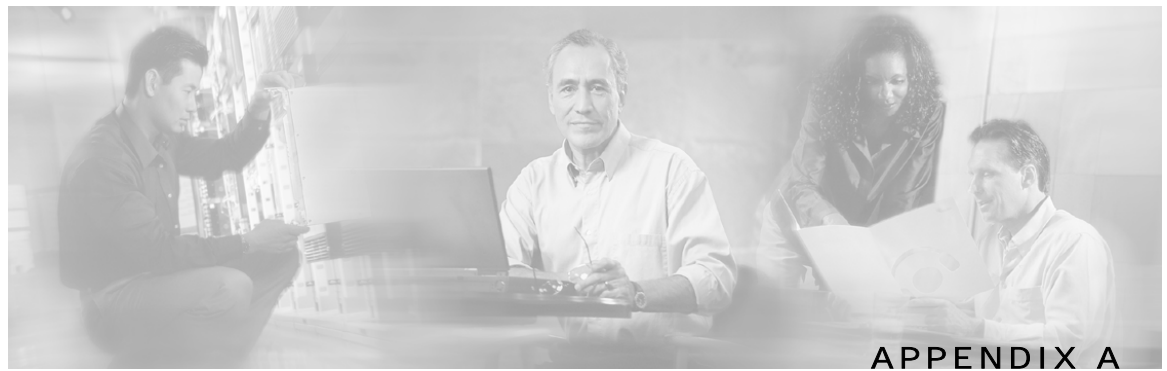
To view the statistics counters of the LEG:

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

To reset the statistics counters of the LEG:

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





## Using the DHCP Forwarder Application

---



**Note** This chapter 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

To install the DHCP Forwarder:

---

**Step 1** Run the DHCP Forwarder installation script from the SM DIST root directory (must be run 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 using one of the following procedures:

- a) Restart the machine. The initialization script will start the application automatically.
- b) Run the following command (must be run as root):

```
#!/etc/init.d/p3dhcpforwarder start
```

---

## Uninstalling the DHCP Forwarder

To uninstall the DHCP Forwarder:

---

**Step 1** Stop the application by running following command (must be run as root):

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

**Step 2** Remove the DHCP Forwarder application startup and shutdown scripts, by running the following command (must be run as root):

- 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, by running the following command:

```
# 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

To add a DHCP Forwarder Resource:

---

**Step 1** Import the OnOnlyProcess agent's type from the file:

```
/opt/VRTSvcs/bin/OnOnlyProcess/OnOnlyProcess.cf.
```

**Step 2** Add a OnOnlyProcess resource called *DHCP\_Forwarder* to the service group.

**Step 3** Run the following command via Telnet session on each one 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 following parameters (see the following figure):

- a) OnlineCmd—Type the DHCP Forwarder start command:

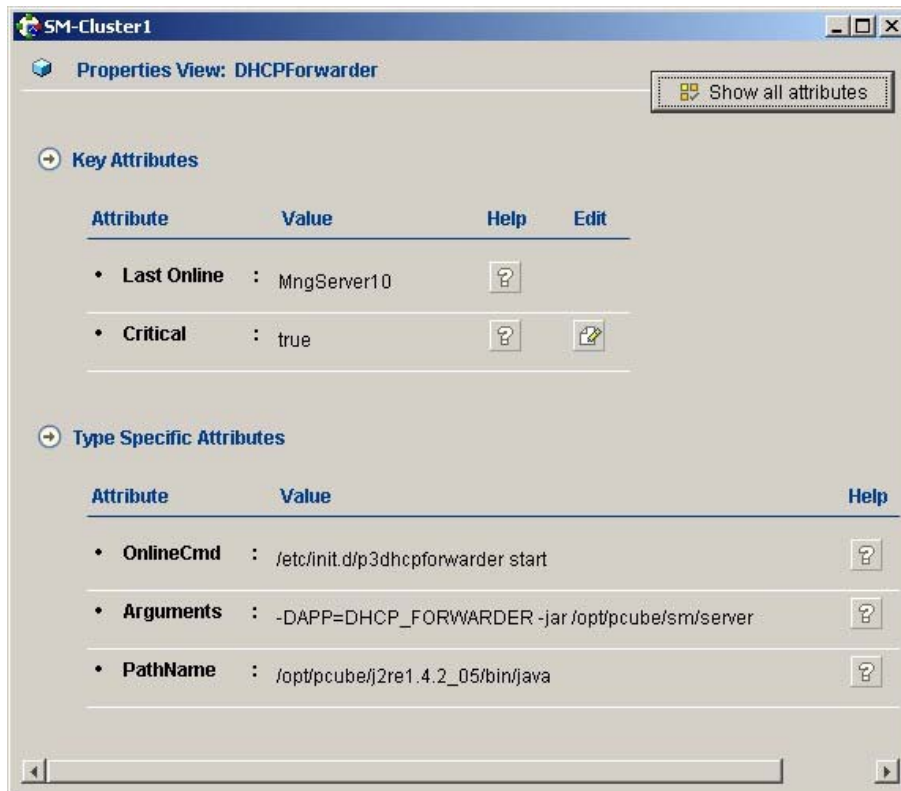
```
/etc/init.d/p3dhcpforwarder start
```

- b) PathName—Type the DHCP Forwarder process path (from the previous step). For example:

```
/opt/pcube/j2re1.4.2_05/bin/java
```

- c) Arguments—Type the DHCP Forwarder process arguments (from the previous step). For example:

```
DAPP=DHCP_FORWARDER -jar /opt/pcube/sm/server.
```

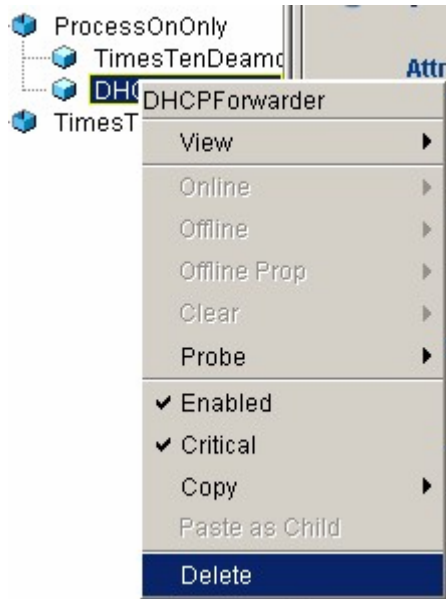


**Note** The arguments line might seem shorter than the actual full argument list. This is perfectly acceptable.

## Removing a DHCP Forwarder Resource

To remove a DHCP Forwarder Resource:

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





# Index

## A

about the DHCP Lease Query LEG • 1-1  
audience • iii

## C

cable/satellite modem • 1-3  
cisco.com • vii  
command-line interface (CLI)  
    DHCP Lease Query LEG configuration  
        CLI • 6-1  
    DHCP Lease Query LEG show CLI • 6-2  
commands, CLU  
    p3inst • 3-2, 3-3, 3-5  
    p3leasequery • 5-1  
    p3sm • 3-2, 3-5  
configuration  
    configuring package association • 4-4  
    configuring the DHCP Lease Query LEG  
        • 4-1  
configuration variables • 4-1  
conventions, document • iv  
customer premises equipment (CPE) • 1-3

## D

DHCP Forwarder • 2-1, 3-1, 3-2, 3-3, 4-1,  
    A-1  
DHCP Forwarder resource  
    adding • A-2  
    removing • A-3  
DHCP Lease Query transaction • 1-3, 2-1  
document organization • iii  
documentation, obtaining • vi

## I

installation  
    installing the DHCP Lease Query LEG •  
        3-1

installing the DHCP Lease Query LEG  
    on an SCE device • 3-4

installing the DHCP Lease Query LEG  
    on the SM • 3-2

Internet Engineering Task Force (IETF) • 1-  
    1, 1-3, 4-1

## L

login event generator (LEG) • 1-3

## O

obtaining documentation • vi  
obtaining technical assistance • vi

## P

package association, configuring • 4-4  
package ID • 1-4, 2-1, 4-4, 4-6  
package information  
    dynamic assignment • 4-4  
    static assignment • 4-6  
preface • iii  
pull-request • 1-3, 2-1

## R

related documentation • iv

## S

subscriber  
    domain • 1-4  
    mappings • 1-3  
    package • 1-4  
subscriber ID • 1-1, 1-3, 2-1, 4-1, 5-1, 6-1  
subscriber policy • See package

## T

Technical Assistance Center (TAC) • vii  
technical assistance, obtaining • vi  
terms and concepts • 1-3

transactions, DHCP Lease Query  
  DHCPLEASEACTIVE • 2-1, 4-1  
  DHCPLEASEQUERY • 2-1, 4-1  
  DHCPLEASEUNASSIGNED • 2-1

## U

uninstalling  
  uninstalling the DHCP Lease Query LEG  
    (SCE) • 3-4  
  uninstalling the DHCP Lease Query LEG  
    (SM) • 3-3  
upgrading  
  upgrading the DHCP Lease Query LEG •  
    3-5

## V

Veritas cluster server • 3-2, A-2