SCMS SM DHCP Lease Query Reference Guide

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SCMS SM DHCP Lease Query *Reference Guide*

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Preface

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

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

For complete information regarding Cisco's SCMS subscriber integration concept, see the *Subscriber Integration Guidelines* technical white paper and the *SCMS Subscriber Management User Guide.*

Audience

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

The following typographic conventions are used in this guide:

Typeface or Symbol	Meaning
Italics	References, new terms, field names, and placeholders.
Bold	Names of menus, options, and command buttons.
`Courier`	System output shown on the computer screen.
`Courier Bold`	CLU command code typed in by the user in examples.
`Courier Italic`	Required parameters for CLU commands.
`[italic in brackets]`	Optional parameters for CLU commands.
	Note. Notes contain important information.
	Warning. Warning means danger of bodily injury or of damage to equipment.

Technical Support

Cisco TAC Website

The Cisco TAC website (*http://www.cisco.com/tac*) provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The Cisco TAC website is available 24 hours a day, 365 days a year.

Accessing all the tools on the Cisco TAC website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a login ID or password, register at this URL: *http://tools.cisco.com/RPF/register/register.do*

TAC Case Priority Definitions

To ensure that all cases are reported in a standard format, Cisco has established case priority definitions.

Priority 1 (P1)—Your network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Priority 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Priority 3 (P3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Priority 4 (P4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Opening a TAC Case

The online TAC Case Open Tool (*http://www.cisco.com/tac/caseopen*) is the fastest way to open P3 (if your network is minimally impaired) and P4 (if you require product information) cases. After you describe your situation, the TAC Case Open Tool automatically recommends resources for an immediate solution.

If your issue is not resolved using these recommendations, your case will be assigned to a Cisco TAC engineer. For P1 (your production network is down) or P2 (your production network is severely degraded) cases, or if you do not have Internet access, contact Cisco TAC by telephone. Cisco TAC engineers are assigned immediately to P1 and P2 cases to help keep your business operations running smoothly.

To open a case by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

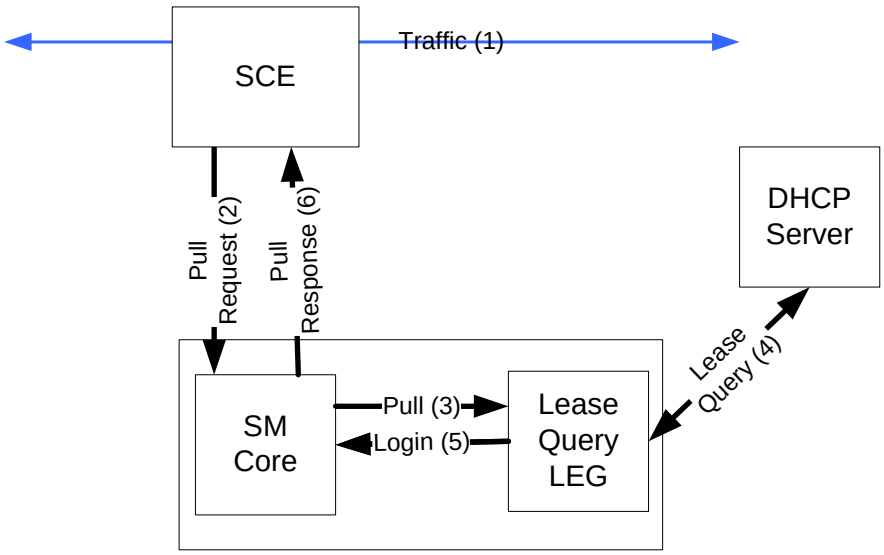
For a complete listing of Cisco TAC contacts, go to this URL: (http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml)

CHAPTER 1

About the DHCP Lease Query LEG

The DHCP Lease Query LEG is a software module that handles pull-requests that the SM (Subscriber Manager) could not handle. The DHCP Lease Query LEG handles the pull requests from the different SCEs (Service Control Engines) in the network. The LEG queries the DHCP server using a DHCP Lease-Query transaction. The DHCP Lease Query LEG is an extension of the SCMS SM software and runs as part of the SM.

Following is a flow diagram representing the operation of the LEG:



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 in its database, the server replies with the subscriber information (4). The LEG performs a login operation. (5) Based on the received information, this operation updates the subscriber database and logs the subscriber into the SCE (6) which triggered the pull request.

Note The DHCP Lease-Query transaction is defined as an IETF (Internet Engineering Task Force) 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 *http://www.ietf.org/internet-drafts/draft-ietf-dhc-leasequery-07.txt*.

This chapter contains the following sections:

- Terms and Concepts 1-2

Terms and Concepts

The following terms and concepts are necessary to understand the DHCP Lease Query LEG and SM configuration and operation. Additional information regarding 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. The LEG is used to handle dynamic subscriber integration.

CM/SM (Cable/Satellite Modem)

A data modem that provides Internet access over Cable/Satellite networks. The modem usually corresponds to a single subscriber of the Internet Service Provider.

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

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 *http://www.ietf.org/internet-drafts/draft-ietf-dhc-leasequery-07.txt*.

Subscriber Mappings

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

Pull-request

A message sent from an SCE device to the SM when it identifies a 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 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 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 logon 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* (on page 4-4), and the *User Guide* of the Cisco SCAS BB (Service Control Application for Broadband) application.

CHAPTER 2

DHCP Lease Query LEG Functionality

The LEG performs 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 redundancy of two DHCP servers. The LEG identifies a server failure by counting the consecutive requests that timeout. After a configurable threshold of timed-out requests, the LEG starts to send the requests to the recently activated (which was previously in standby) server. The LEG does not return to the failed server till the activated server fails.

The LEG runs as part of the SM process, which runs with the privileges assigned to the user **pcube** on this machine. On UNIX platforms only, since 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* ("DHCP Forwarder application" on page A-1) of this document.

This chapter contains the following sections:

- DHCP Lease Query transaction 2-2

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.

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 CPE. This default can be overwritten by configuration. Furthermore a 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 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 in to the SM.

CHAPTER 3

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) of the SM software that should be installed separately using the SM command-line utilities. The DHCP Lease Query LEG distribution is part of the SCMS SM CD. The DHCP Forwarder application's distribution and installation script are also part of the SCMS SM CD.

The DHCP Lease-Query LEG uses the DHCP Forwarder application on UNIX machines. For more information see *Appendix A- DHCP Forwarder application* ("DHCP Forwarder application" on page A-1)

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

This chapter contains the following sections:

- Installation Procedure Overview 3-1
- Installation Procedure 3-2
- Uninstalling the DHCP Lease Query LEG 3-3

Installation Procedure Overview

Following is a general overview of the DHCP Lease Query LEG installation procedure. Refer to the relevant sections for specific instructions.

To install the DHCP Lease Query LEG:

Step 1 Install the DHCP Forwarder application.

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

Step 3 Edit the configuration files of the DHCP Lease Query LEG.

Step 4 Edit the configuration files of the SM.

Step 5 Load the configuration files to the SM.

Step 6 Add a resource to the Veritas Cluster Server to monitor the DHCP Forwarder application.

Installation Procedure

Installing the DHCP Forwarder application

Step 1 The DHCP Forwarder application bridges between the LEG and the DHCP server. See *DHCP Forwarder Installation Procedure* (on page A-1).

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

Run the p3inst command-line utility from the SM CLU `sm-inst-dir/sm/server/bin (sm-inst-dir` refers to the SM installation directory):

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

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

Step 3 Edit the configuration files of the DHCP Lease Query LEG:

The DHCP Lease Query LEG includes 2 configuration files:

- `p3lease_query.cfg` - configures general attributes of the LEG
- `p3dhcp_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 configuration file of the SM.

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 from the SM CLU:

```
> 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 the resource, see *Adding DHCP Forwarder Resource* (on page A-2).

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 SM 3.0.

The upgrade for the DHCP Lease Query LEG should be performed together with the upgrade process of the SM, as follows:

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

Uninstall the DHCP Lease Query LEG by running the following CLU:

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

Step 2 Perform an upgrade of the SM as described in the SM user guide.

Restore the configuration files of the DHCP Lease Query LEG.

Step 3 Load the new configuration of the SM by running the following CLU:

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

Uninstalling the DHCP Lease Query LEG

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 application:

This can be done only on SM Cluster setups. See uninstall procedure: *Removing DHCP Forwarder Resource* (on page A-4).

Step 3 Uninstall the DHCP Forwarder Veritas Cluster Agent:

See uninstall procedure: *Uninstalling the DHCP Forwarder* (on page A-2).

Configuration

This chapter contains the following sections:

- General Configuration 4-1
- Package Association Configuration 4-4

The DHCP Lease Query LEG is configured using two configuration files: `p3lease_query.cfg`, and `p3dhcp_pkg.cfg`, which reside in the `sm-inst-dir/sm/server/root/config directory` (`sm-inst-dir` refers to the SM installation directory).

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.

General configuration of the DHCP Lease Query LEG, resides in `p3lease_query.cfg`. Configuration regarding dynamic package association resides in `p3dhcp_pkg.cfg`.

General Configuration

The following is a description of the configuration variables of `p3rdr_dhcp.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: integers. Default: 256.
- **dhcp_servers**

  Defines to which DHCP servers the LEG can send requests. This parameter must be entered by the user.

The value of this parameter is the server IP addresses or hostnames separated by commas.

- **server_port**

  Defines the UDP port that the DHCP servers listen to and that the lease-query messages are sent to. It is recommended to use 9067 when working with the DHCP Forwarder. The default value is 9067.

- **listening_port**

  Defines the UDP port that the LEG listens to and that the lease-query replies are sent to. It is recommended to use 9068 when working with the DHCP Forwarder The default value is 9068.

- **client_port**

  Defines the UDP the LEG uses as output port 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.

- **log_failures**
  Defines whether the SM should add messages about failures to the user log.
  Possible values for this parameter are `true` and `false`. The default value is `true`.

- **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 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.

- **session_timeout**

  Defines the timeout in seconds for queries, starting at the time the DHCP lease-query message is sent until a reply is expected. If this timeout expires, the session is discarded. Default: 20 seconds

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

- **log_timed_out_queries**

  Controls log messages regarding timed out queries. The default value is: `true`.

- **log_failed_queries**

  Controls log messages regarding queries that are not sent for any reason. The default value is: `true`.

- **log_all_queries**

Controls log messages regarding each query sent and any reply received. The default value is: false.

This parameter should be used only for trouble-shooting.

- **log_login_failures**

  Controls log messages regarding replies that did not result in a login of a subscriber to the SM. The default value is: `true`.

The `[Subscriber ID]` section defines how the LEG handles subscriber IDs. The subscriber ID can be taken from a DHCP option, with the ability to fallback to using the allocated IP as subscriber ID:

- **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 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*, i.e. binary string which is converted to an ASCII hexadecimal string; or *string*, i.e. ASCII string. The default value is: `binary`.
- **default_id**
  If the *dhcp_option* is not found in the DHCP packet, defines whether the LEG should fall back to a different way of defining the subscriber ID. The supported fallbacks are:
    - *ip*—use the allocated IP 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. These are needed because the DHCP Lease-Query definition is in a draft status:

- **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 of a 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=82:2
dhcp_option_type=binary
default_id=ip

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

Package Association Configuration

Note The configuration described in this section is optional.

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

- Dynamic assignment of package information using information extracted from the DHCP packet, see *Dynamic Assignment of Package Information* (on page 4-5).
- Static assignment of a constant package ID for all subscribers that 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 `package-names` and the application's package-IDs.

To extract the package information data from the DHCP package, the configuration file `p3dhcp_pkg.cfg` should define the option types that contain the package information and the conversion map of `package names` to the package IDs of SCAS 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 these option data.
  The format is: option[:subtype],option[:subtype]
- **name_seperator_value**
  Defines the separator character to use between each two options when concatenating them to create the package name. Any character is accepted. The default is '_'.
- **use_default**
  Determines whether a default package should be used when no package information can be extracted from the DHCP data. This option is used when the configurable options are missing or no options were configured.
  Possible values 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 use_default 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 `use_default` is set to false.
  This parameter is relevant only if `use_default` is set to `false`.
  Possible values are `true` or `false`. The default is `false`.
- **package_property_name**
  Defines the name of the application property that contains the package information. Default value is `packageId`, as used by SCAS BB.

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

Example

Suppose that the package information appears inside option 43 (Vendor Specific Option) of the DHCP packet, and suppose that both subtypes 102 and 101 are in use. Then the options order for package name should be configured as follows:

```
options_order_for_package_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, the package names should be configured as follows (for example):

```
[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, then the package ID that will be associated to the subscriber in the SM will have the value 11.

An example of the entire configuration file follows:

```
[Package Association]
options_order_for_package_name=43:102,43:101
name_seperator_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 `p3dhcp_pkg.cfg` should define the default package ID to be assigned to all the subscribers, as the following sample:

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

All the other configuration parameters should not be set.

DHCP Lease Query LEG CLU

This chapter contain

s the following sections:

- p3leasequery Utility 5-1

p3leasequery Utility

The **p3leasequery** utility is used for viewing DHCP Lease Query LEG configuration and statistics. Command format: `p3leasequery <OPERATION>`. The following tables list the **p3leasequery** operations and options.

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

The user of the DHCP Lease Query LEG can use the `p3leasequery` command-line utility to view the DHCP Lease Query LEG's status and statistics.

DHCP Lease Query LEG Status

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:  10.1.100.23
        Standby: 10.1.100.21
Command terminated successfully
>
```

DHCP Lease Query LEG Statistics

Following is an example of using the **p3leasequery** command-line utility with the `show-statistics` operation:

```
> p3leasequery --show-statistics
DHCP Lease-Query LEG Statistics:
================================
Lease-Queries Sent:       16
Lease-Queries Replied:    16
Send Failures:            0
Active Lease Replies:     16
Non-Active Lease Replies: 0
Repliy Failures:          0
Sessions in process:      0
Max-Concurrent sessions:  3
Command terminated successfully
>
```

APPENDIX A

DHCP Forwarder application

The DHCP Forwarder application acts as a bridge between the DHCP Lease-Query LEG and the DHCP servers. The request sent from the LEG is received by the Forwarder and is forwarded to the appropriate DHCP server. The replies from the DHCP servers are forwarded to the LEG. Since the LEG signals the Forwarder which server should receive each request, no special configuration is needed for this application.

Due to the fact that only root privileged applications can open ports under 1024 (DHCP uses ports 67 and 68) the DHCP Forwarder is run with root privileges.

DHCP Forwarder Installation Procedure

Run the DHCP Forwarder installation script.

Step 1 Run the installation script from the SM CD root directory (must be run as `root):`

```
#./install-forwarder.sh
```

The installation script extracts the DHCP Forwarder distribution to `sm-inst-dir\sm\server\addons\dhcp-forwarder` directory (`sm-inst-dir` refers to the SM installation directory). Then 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:

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

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

Uninstalling the DHCP Forwarder

Stop the DHCP Forwarder application:

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 initialization scripts:

Remove the startup and shutdown scripts, by running the following command, as appropriate (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:

Remove the DHCP Forwarder installation directory, by running the following command:

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

DHCP Forwarder VCS Agent

Adding DHCP Forwarder Resource

To add a DHCP Forwarder Resource:

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

Step 2 Add a ProcessOnOnly resource called *"DHCP_Forwarder*" to the service group.

Step 3 Run the following command via Telnet on each one of the servers:

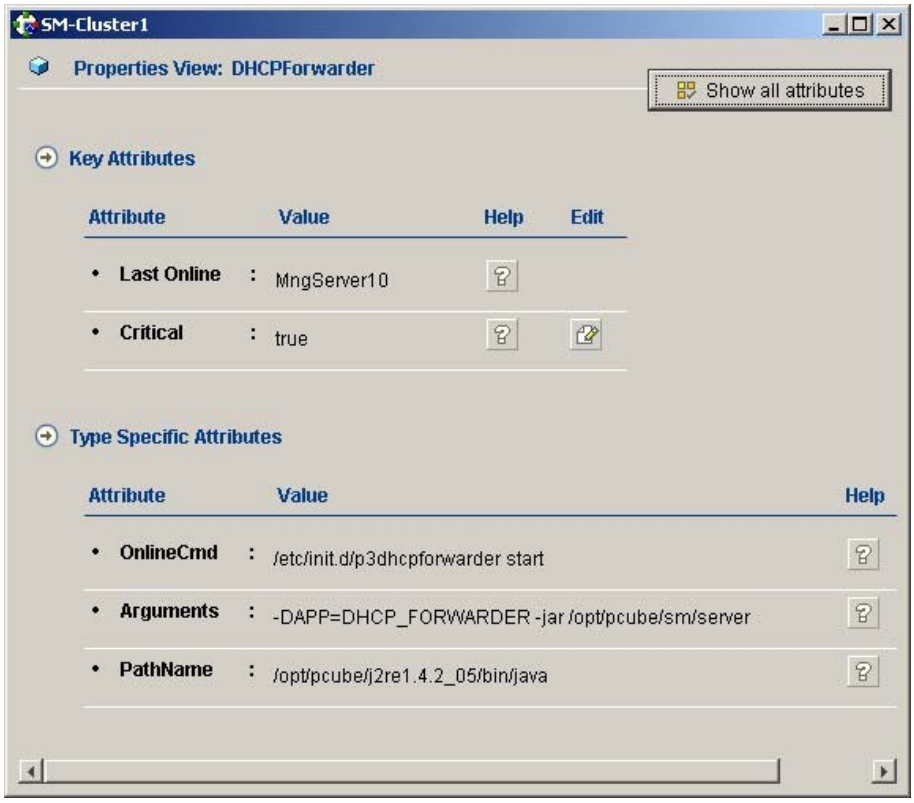
```
>ps -ea -o pid,s,args
```

Look for the line containing the following 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 following figure):

- 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.*

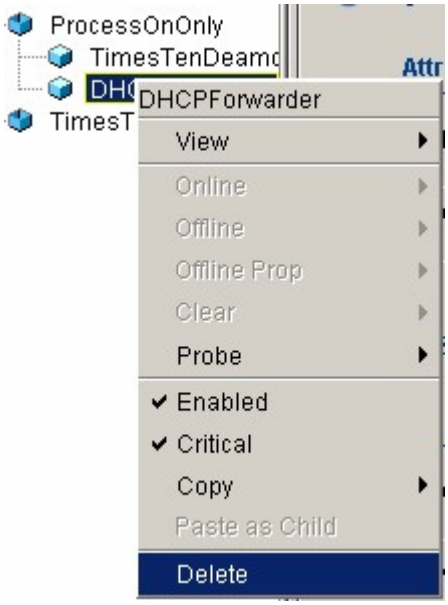


Note The arguments line is likely to seem shorter than the actual full argument list; that is perfectly acceptable.

Removing DHCP Forwarder Resource

To remove a DHCP Forwarder Resource:

Step 1 Click the right button of the mouse over the DHCP Forwarder resource icon and choose Delete from the drop down menu.



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