Net-Net OS-E

Release 3.6.0m5

System Administration Guide

400-1007-36
Revision 1.20
August 3, 2012

Notices

Contents

Preface

About Net-Net OS-E® Documentation xi
Revision History 3-xii
Conventions Used In this Manual xii
Typographical Conventions xiii
Acronyms xiv
Product Support xviii
Contacting Acme Packet, Inc. xviii
Product and Technical Support xviii
Product Damage xix

Chapter 1. Managing and Administering Net-Net OS-E Systems

About This Chapter 1-21
References 1-21
Administrator and User Roles 1-21
Enabling Management Access 1-22
CLI Session 1-22
Configuring Management Options 1-23
Local Console 1-24
CLI Session 1-24
Telnet 1-24
CLI Session 1-24
Secure Shell (SSH) 1-25
CLI Session 1-25
Web/HTTP 1-26

CLI Session 1-26
SNMP 1-26
CLI Session 1-27
HTTP\SOAP\WSDL Interface 1-27
Working with the Net-Net OS-E Configuration File 1-28
Building the Configuration File Using the CLI 1-28
CLI Session 1-29
Removing Objects From the Configuration File Using the CLI 1-29
CLI Session 1-29
Editing and Saving the Configuration File Using the CLI 1-30
Creating SIP Users and Passwords 1-30
CLI Session 1-31
Customizing the CLI 1-31
CLI Session 1-31
Setting Net-Net OS-E Global Properties 1-32
CLI Session 1-32
Net-Net OS-E Virtual System Partitions 1-33
IPMI Support 1-33
Specifying Management Preferences 1-33
Specifying DOS Query Preferences 1-34
Restarting and Shutting Down the System 1-35
CLI Session 1-35

Chapter 2. Enabling Net-Net OS-E Interfaces and Protocols

About This Chapter 2-37
Net-Net OS-E Sample Networks 2-38
Configuring Net-Net OS-E IP Interfaces 2-40
CLI Session for Eth0 2-40
CLI Session for Eth1 2-41
CLI Session for Eth2 2-41
Creating VLANs 2-42
CLI Session 2-42

Applying Routing and Classification Tags 2-43
CLI Sessions for “IP A” and “IP B” Ingress Networks on Eth3 2-45
Notes on Routing and Classification Tags 2-47
Related Commands 2-48
Configuring Overlapping IP Networks and Tag Routing 2-48
CLI Session for Ethernet Public and Private Sides of Network 2-48
CLI Sessions for Customer-A and Customer-B Networks 2-49
CLI Session for the Internal Private Network 2-50
CLI Session for the session-config-pool 2-51
Configuring VRRP 2-51
CLI Session 2-52
Configuring Signaling Failover 2-55
CLI Session 2-55
Configuring Web Interface Settings 2-56
CLI Session 2-56
Configuring Web Services 2-56
CLI Session 2-56
Enabling ICMP and Setting Rate Limits 2-57
CLI session 2-57
Enabling NTP and BOOTP Servers 2-57
CLI Session 2-58
Configuring the Network Time Protocol (NTP) Clients 2-58
CLI Session 2-58
Configuring the Bootstrap Protocol (BOOTP) Clients 2-59
CLI Session 2-59
Configuring SIP 2-59
CLI Session 2-60
Load Balancing Across Net-Net OS-E Interfaces 2-61
Configuring Media Port Pools 2-62
CLI Session 2-62
Configuring the External Firewalls 2-62
CLI Session 2-63

Configuring the STUN, TURN, and ICE Protocols 2-64
STUN 2-64
Traversal Using Relay NAT (TURN) 2-65
Interactive Connectivity Establishment (ICE) 2-65
Sample Configuration 2-66
CLI Session 2-66
Configuring Kernel Filtering 2-67
CLI Session 2-67
Configuring Messaging 2-68
CLI Session 2-68

Chapter 3. Enabling Net-Net OS-E Services

About This Chapter 3-69
Enabling Services on the Net-Net OS-E Master 3-69
Cluster-Master Services 3-70
CLI Session 3-70
Directory Services 3-70
CLI session 3-70
Accounting Services 3-71
CLI Session 3-71
Authentication Services 3-71
CLI Session 3-71
OS-E Database 3-72
CLI Session 3-72
Registration Services 3-72
CLI Session 3-72
Server Load 3-73
Call Failover (Signaling and Media) 3-73
CLI Session 3-73
Load-Balancing 3-74
CLI Session 3-75
File-Mirror 3-75

Route Server 3-76
CLI Session 3-77
Sampling 3-77
CLI Session 3-78
Third-Party-Call-Control (3PCC) 3-79
CLI Session 3-79
Enabling Event Logging Services 3-80
CLI Session 3-80
Configuring Threshold Monitors 3-81
CLI Session 3-81
Configuring Data and Archiving Locations 3-81
CLI Session 3-82
Configuring an External Database 3-83
CLI Session 3-83
Setting Net-Net OS-E Disk Thresholds 3-84
CLI Session 3-84
Scheduling Regularly Performed Tasks 3-84
CLI Session 3-84
Performing Database Maintenance 3-85
Setting Normal Database Maintenance Time-of-Day 3-85
CLI Session 3-86
Verifying Normal Database Maintenance 3-86
Scheduling Periodic Database Maintenance 3-86
CLI Session 3-87
Forcing Database Maintenance 3-87
Performing Database Vacuum-Full 3-87
Performing Other Database Maintenance Tasks 3-88
Managing Net-Net-2600 Database Size 3-89
Disabling REGISTER Message Logging 3-89
Preventing NOTIFY Message Logging 3-90
Backing Up the Database 3-93
CLI Session 3-94

Restoring a Database 3-95
Enabling and Configuring Local Archiving 3-95
CLI Session 3-96

Chapter 4. Configuring Net-Net OS-E Accounting and Archiving

About This Chapter 4-99
Accounting System Overview 4-99
Configuring the Accounting Settings 4-101
Configuring RADIUS Groups 4-102
CLI Session 4-103
Configuring the RADIUS Servers 4-104
CLI Session 4-104
Including the RADIUS Group 4-105
CLI Session 4-105
Configuring the Accounting Database 4-106
CLI Session 4-106
Configuring Syslog 4-108
CLI Session 4-108
Configuring the File System 4-110
CLI Session 4-111
Configuring an External File System Target 4-111
CLI Session 4-112
Configuring Diameter 4-113
Creating the Diameter Accounting Group 4-113
CLI Session 4-113
Configuring Diameter Servers 4-114
CLI session 4-114
Configuring Diameter Interfaces and Ports 4-115
CLI Session 4-115
Configuring Archiving 4-116
CLI Session 4-117
Using the Net-Net OS-E Archive Viewer 4-121

Chapter 5. Configuring Domain Name Systems (DNS)

About This Chapter 5-125
Domain Name System (DNS) Overview 5-125
Configuring the DNS Resolver 5-126
CLI Session 5-127
Configuring DNS Hosts and IPs 5-127
CLI Session 5-128
Mapping SIP Services 5-128
CLI Session 5-128
Configuring NAPTR 5-129
CLI Session 5-129
Configuring DNS Rejections 5-130
CLI Session 5-130

Chapter 6. Configuring SIP Servers, Directories, and Federations

About This Chapter 6-131
Servers, Directories, and Federations 6-131
Interoperating with SIP Servers 6-132
Configuring the SIP Server Pools 6-132
IBM Lotus Sametime 6-133
CLI Session 6-133
Microsoft LCS 6-133
CLI Session 6-133
Nortel MCS 6-134
CLI Session 6-134
Avaya PBX 6-135
CLI Session 6-135
SIP Hosts 6-135
CLI Session 6-136
SIP Gateways 6-137
CLI Session 6-137
SIP Registrars 6-138

CLI Session 6-138
H.323 Servers 6-139
SIP Connections 6-139
DNS Groups 6-140
Configuring Directories 6-140
Active Directory 6-141
CLI Session 6-141
LDAP 6-141
CLI Session 6-141
Notes Directory 6-142
CLI Session 6-142
Phantom Directory 6-142
CLI Session 6-142
Static Directory Description 6-143
CLI Session 6-143
XML Directory Description 6-143
CLI Session 6-143
Database Directory Description 6-144
CLI Session 6-144
CSV Directory Description 6-144
CLI Session 6-144

Preface

About Net-Net OS-E® Documentation

The Net-Net OS-E references in this documentation apply to the Net-Net OS-E operating system software that is used for the following Acme Packet and third-party SBC products:

- Net-Net Application Session Controller (ASC)
- Net-Net OS-E Session Director (SD) Session Border Controller (SBC)
- Net-Net 2600 Session Director (SD) Session Border Controller (SBC)
- Third-party products that license and use Net-Net OS-E software on an OEM basis

Unless otherwise stated, references to Net-Net OS-E in this document apply to all of the Acme Packet and third-party vendor products that use Net-Net OS-E software.

The following documentation set supports the current release of the OS-E software.

- *Net-Net OS-E – Net-Net 2610/2620 Quick Installation*
- *Net-Net OS-E – Network Interface Card Installation*
- *Net-Net OS-E – USB Creation and Commissioning Instructions*
- *Net-Net OS-E – Slide Rail Kit Installation Instruction*
- *Net-Net OS-E – Virtual Machine Information Guide*
- *Net-Net OS-E – System Installation and Commissioning Guide*
- *Net-Net OS-E – Management Tools*
- *Net-Net OS-E – System Administration Guide*
- *Net-Net OS-E – Session Services Configuration Guide*

- *Net-Net OS-E – Objects and Properties Reference*
- *Net-Net OS-E – System Operations and Troubleshooting*
- *Net-Net ASC — Web Services SOAP/REST API*
- *Net-Net ASC — Web Services Samples Guide*
- *Net-Net OS-E – Release Notes*

Revision History

This section contains a revision history for this document.

Date	Revision Number	Description
December 1, 2009	Revision 1.00	Initial release of the OS-E 3.6.0 software.
March 15, 2010	Revision 1.01	• Adds note about IPMI third-party support. • Updates configuration information on http-server in Configuring Archiving section. • Removes all references to MX-1 card support.
June 16, 2010	Revision 1.02	• Adds best practice recommendations for configuring HA clusters.
December 3, 2010	Revision 1.02	• Updates Acme Packet contact information.
June 24, 2011	Revision 1.10	• Changes references to the software from NN2600 to OS-E. • Adds 3.6.0m4 adaptations. • Removes Chapter 6. Managing Certificates and Keys with LCS and OCS • Removes Appendis A. Interoperating with BroadSoft Hosted PBS Services and Appendix B. Interoperating with Sylantro VoIP Servers.
September 30, 2011	Revision 1.11	• Changes references from Least Cost Routing (LCR) to route-server. • Removes obsolete Configuring Federations and Configuring 3PCC Servers sections.
August 3, 2012	Revision 1.20	• Adds 3.6.0m5 adaptations.

Conventions Used In this Manual

Typographical Conventions

Key Convention	Function	Example
KEY NAME	Identifies the name of a key to press.	Type **abc**, then press [ENTER]
CTRL+*x*	Indicates a control key combination.	Press CTRL+C
brackets [ ]	Indicates an optional argument.	`[portNumber]`
braces { }	Indicates a required argument with a choice of values; choose one.	`{enabled | disabled}`
vertical bar |	Separates parameter values. Same as "or."	`{TCP | TLS}`
Monospaced bold	In screen displays, indicates user input.	`config> config vsp`
Monospaced italic	In screen displays, indicates a variable—generic text for which you supply a value.	`config servers> config lcs name`
bold	In text, indicates literal names of commands, actions, objects, or properties.	...set as the secondary directory service (with the **unifier** property)...
bold italic	In text, indicates a variable.	...set the **domain** property of the ***directory*** object.

Acronyms

The OS-E manuals contain the following industry-standard and product-specific acronyms:

AAA	Authentication, authorization, and accounting
ALI	Automatic location identifier
ANI	Automatic number identification
ANSI	American National Standards Institute
AOR	Address of record
API	Application programming interface
ARP	Address Resolution Protocol
AVERT	Anti-virus emergency response team
B2BUA	Back-to-back user agen
BOOTP	Bootstrap Protocol
CA	Certificate authority
CAP	Client application protocol
CBC	Cipher block chaining
CBN	Call back number
CCS	Converged Communication Server
CDR	Call detail record
CIDR	Classless interdomain routing
CLI	Command line interface
CMOS	Comparison mean opinion score
CNAME	Canonical name record
CNI	Calling number identification
CODEC	Compressor/decompressor or coder/decoder
CPE	Customer-premise equipment
CRL	Certificate revocation list
CSR	Certificate signing request
CSTA	Computer-supported telecommunications applications
CSV	Comma-separated values
DDDS	Dynamic delegation discovery system
DHCP	Dynamic Host Configuration Protocol

DMZ	Demilitarized zone
DN	Distinguished name
DNIS	Dialed number identification service
DNS	Domain name service
DOS	Denial of service
EIM	Enterprise instant messaging
ESD	Electrostatic discharge
ESGW	Emergency services gateway
ESQK	Emergency services query key
ESRN	Emergency services routing number
FQDN	Fully qualified domain name
GUI	Graphical user interface
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
I2	National Emergency Number Association defined VoIP solution
ICAP	Internet Calendar Access Protocol
ICMP	Internet Control Message Protocol
IM	Instant messaging
IP	Internet Protocol
JDBC	Java database connectivity
JMX	Java management extensions
JRE	Java runtime environment
LATA	Local access and transport area
LCR	Least-cost routing
LDAP	Lightweight Directory Access Protocol
LIS	Location information service
MAC	Media access control
MCS	Multimedia Communications Server
MIB	Management information base
MOS	Mean opinion score
MSAG	Master street address guide
MTU	Maximum transmission unit

NAPTR	Naming authority pointer
NAT	Network address translation
NENA	National Emergency Number Association
NIC	Network interface card
NS	Name server
NSE	Named signaling events
NTLM	NT Lan Manager
NTP	Network Time Protocol
OCI	Open Client Interface
ODBC	Open database connectivity
OTP	Over temperature protection
OVP	Over voltage protection
PBX	Private branch eXchange
PEM	Privacy-enhanced mail
PERL	Practical Extraction and Reporting Language
PING	Packet internet groper
PKCS#12	Public Key Cryptography Standard #12
PKI	Public Key Infrastructure
PSAP	Public safety answering point
PSCP	PuTTY secure copy
PSTN	Public switched telephone network
QOP	Quality of protection
QOS	Quality of service
RADIUS	Remote Authentication Dial-in User Service
RTC	Real-time collaboration
RTCP	Real-time Control Protocol
RTP	Real-time Transport Protocol
RTT	Round-trip time
SATA	Serial ATA
SCSI	Small computer system interface
SDK	Software development kit
SDP	Session Description Protocol

SFTP	Secure Shell File Transfer Protocol
SIMPLE	SIP Instant Messaging and Presence Leveraging Extension
SIP	Session Initiation Protocol
SIPS	Session Initiation Protocol over TLS
SLB	Server load balancing
SMB	Server message block
SNMP	Simple Network Management Protocol
SOA	Server of authority
SOAP	Simple Object Access Protocol
SQL	Structured Query Language
SRTP	Secure Real-time Transport Protocol
SRV	Server resource
SSH	Secure Shell
SSL	Secure socket layer
SSRC	Synchronization source
STUN	Simple Traversal of UDP over NATs
TCP	Transmission Control Protocol
TDM	Time division multiplexing
TGRP	Trunk group
TLS	Transport Layer Security
TOS	Type of service
TTL	Time to live
UPS	Uninterruptable power supply
US	User agent
UAC	User agent client
UAS	User agent server
UDP	User Datagram Protocol
UID	Unique identifier
URI	Uniform resource identifier
URL	Uniform resource locator
UTC	Universal coordinated time
VoIP	Voice over IP

VLAN	Virtual local area network
VPC	VoIP positioning center
VRRP	Virtual Router Redundancy Protocol
VSP	Virtual system partition
VXID	Virtual router interface ID
WAR	Web application resource
WAV	Waveform audio
WM	Windows Messenger
WSDL	Web Services Description Language
XML	Extensible Markup Language
XSL	Extensible Stylesheet Language

Product Support

Contacting Acme Packet, Inc.

Acme Packet, Inc.
100 Crosby Drive
Bedford, MA 01730 USA
t: 781-328-4400
f: 781-275-8800

www.acmepacket.com

Product and Technical Support

Toll: +1-781-756-6920

Online: https://support.acmepacket.com

E-mail: support@acmepacket.com

For existing Acme Packet customers, product information, software updates, and documentation are available from the Acme Packet support web site. If you have difficulty logging on to the web site using your existing account, call Acme Packet at 781-756-6920 for assistance.

Product Damage

If you receive Acme Packet products that are damaged in shipping, contact the carrier immediately and notify Acme Packet for return shipping information and product replacement. Do not return any products until you receive instructions from Acme Packet.

Chapter 1. Managing and Administering Net-Net OS-E Systems

About This Chapter

The chapter describes the administrator tasks that you can perform when managing a new Net-Net OS-E system. Before using the information in this guide, be sure that you have properly installed the OS-E, as covered in the *Net-Net OS-E – System Installation and Commissioning Guide*

References

For detailed descriptions of the commands that you can use for administrative tasks, as well as instructions for using the management interfaces, refer to the *Net-Net OS-E – Objects and Properties Reference*.

For information on configuring policies, refer to the *Net-Net OS-E – Session Services Configuration Guide*.

Administrator and User Roles

The *administrator* is any person who configures and manages the OS-E system in the network.

The *user* is a SIP client, usually a VoIP call sender or receiver, of SIP messages that are transmitted to, and over the OS-E system to a destination. A SIP user may have one or more SIP URIs in SIP sessions that traverse the platform between the user's originating SIP application or device and the SIP server endpoint (such as Microsoft LCS, IBM Sametime, Avaya, etc.). SIP clients who establish SIP sessions are subject to SIP policies that are configured by the OS-E administrator.

Enabling Management Access

When you create one or more administrative users, the OS-E prompts for a username and password when anyone attempts to log in. Administrative users have read/write management access to the OS-E configuration file. Editing and saving the configuration file updates the OS-E configuration file named *cxc.cfg*. If desired, administrators can commit the configuration changes to the running OS-E configuration.

CLI Session

The following CLI session creates a user and password (with permissions) for management access across the entire OS-E system.

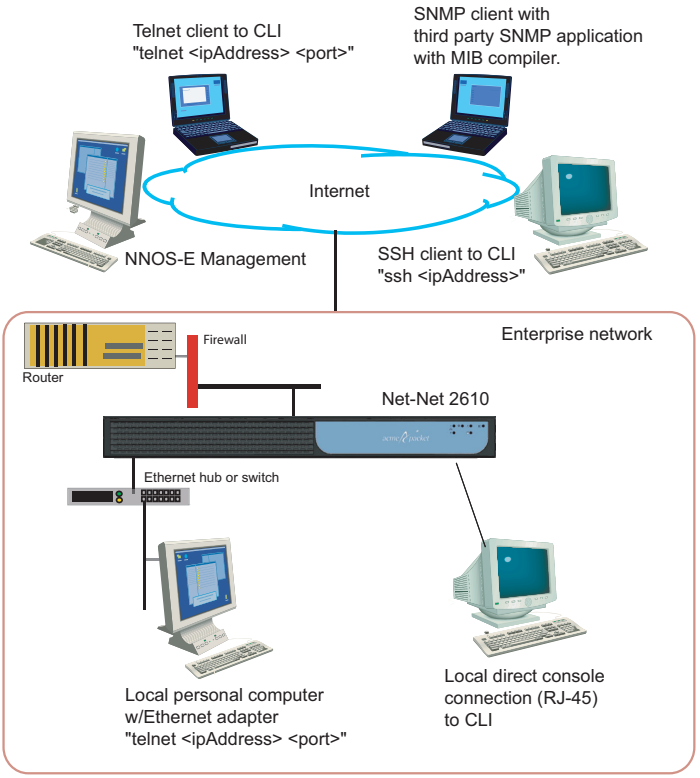
```
NNOS-E> config access
config access> config users
Creating 'users'
config users> config user "jane doe"
Creating 'user "jane doe"'
config user "jane doe"> set password abcXYZ
confirm:******************
config user "jane doe"> set permissions access permissions grant
Creating 'access\permissions grant'
config user "jane doe"> return
config users> return
config access> config permissions grant
Creating 'permissions grant'
config permissions grant> set ftp enabled
config permissions grant> set cms enabled-web-only
config permissions grant> set cli normal
config permissions grant> set config enabled
config permissions grant> set call-logs enabled
config permissions grant> set actions enabled
config permissions grant> set status enabled
config permissions grant> set user-portal enabled
config permissions grant> set web-services enabled
```

If you are using the CMS to configure administrative users and permissions, use the CMS Access tab.

For more information on the **access** configuration object and the other properties that you can configure, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Configuring Management Options

This section shows you how to set up the management options that allow you to configure the OS-E system. The following image illustrates a sample network showing the supported management options.



Local Console

If you are using a directly-attached local console or terminal to configure the OS-E for the first time, use a terminal emulation program such as HyperTerminal to set the console parameters.

The following CLI session configures the console settings for communicating with the OS-E ssytem. The example session shows the console default settings.

CLI Session

```
config> config box
config box> config console
config box> set rate 115200
config box> set data-bits 8
config box> set parity none
config box> set stop-bits 1
config box> set flow-control none
```

Telnet

Telnet is a standard TCP/IP-based terminal emulation protocol defined in RFC 854, *Telnet Protocol Specification.* Telnet allows a remote user to establish a terminal connection to the OS-E system over an IP network. By default, the Telnet protocol is enabled at installation time. To allow connections over Telnet, you must configure those users who are allowed access to the OS-E over Telnet.

The following CLI session configures the Telnet protocol on the local OS-E system, including the maximum number of concurrent Telnet sessions, the idle timeout period (in seconds) that ends a Telnet session due to inactivity, and the known TCP port for inbound and outbound Telnet messages.

CLI Session

```
config box> config interface eth0
config interface eth0> config ip local
config ip local> config telnet
config telnet> set admin enabled
config telnet> set max-sessions 10
config telnet> set idle-timeout 600
config telnet> set port 23
```

Secure Shell (SSH)

Secure Shell (SSH) Server Version 2 on the OS-E system provides secure client/server communications, remote logins, and file transfers using encryption and public-key authentication. To establish a secure connection and communications session, SSH uses a key pair that you generate or receive from a valid certificate authority (CA). By default, SSH is enabled at installation time.

An SSH session allows you to transfer files with Secure Shell File Transfer Protocol (SFTP), providing more secure transfers than FTP and an easy-to-use interface. SSH uses counters that record SFTP activity over the SSH connection.

When running SSH on the OS-E system, the SSH session is transparent and the CLI appears just as it would if you were connecting from a console or over Telnet. The OS-E implementation of SSH does not support all the user-configurable parameters typically supported by SSH workstations. If you try to change a parameter that the OS-E does not support, you will receive a notification that the parameter setting failed.

CLI Session

The following CLI session configures the SSH protocol on the local OS-E system, including the maximum number of concurrent SSH sessions, the idle timeout period (in seconds) that ends an SSH session due to inactivity, and the known TCP port for inbound and outbound SSH messages.

```
config box> config interface eth0
config interface eth0> config ip local
config ip local> config ssh
config ssh> set admin enabled
config ssh> set max-sessions 10
config ssh> set idle-timeout 600
config ssh> set port 22
```

Web/HTTP

The OS-E Management System allows you to configure and manage the OS-E system remotely using your web browser.

The OS-E interface supports all management capabilities provided by the CLI. Instead of entering information on a command line, you navigate menus and supply information in menu fields.

To manage the OS-E system over the Web, enter the IP address of the management IP interface in the Internet Explorer **File/Open** command window and log in. For example:

http://192.168.124.1/

CLI Session

The following CLI session enables Web access to the local OS-E and specifies the TCP port over which HTTPS traffic is sent and received on the IP interface.

```
config box> config interface eth0
config interface eth0> config ip local
config ip local> config web
config web> set admin enabled
config web> set protocol https 443
```

For detailed on using the CMS, refer to the *SIP Security and Management Solutions – System Management Reference*.

SNMP

The Simple Network Management Protocol (SNMP) allows you to communicate with the SNMP agent on the OS-E system from a remote management station. SNMP allows you to retrieve information about managed objects on the platform as well as initiate actions using the standard and enterprise Management Information Base (MIB) files that Acme Packet makes available with the product software.

The OS-E supports the SNMP versions SNMP v1 and SNMP v2c.

CLI Session

The following CLI session enables SNMP access to the local OS-E system, specifies the TCP port over which SNMP traffic is sent and received on the management interface, sets the SNMP community string, the SNMP version, and the target system IP address to which SNMP trap messages are forwarded.

```
config box> config interface eth0
config interface eth0> config ip local
config ip local> config snmp
config snmp> set admin enabled
config snmp> set port 161
config snmp> set version 2c
config snmp> set community private
config snmp> set trap-target 192.168.124.10
```

HTTP\SOAP\WSDL Interface

The OS-E software includes a software development kit (SDK) to provide Web Services Description Language (WSDL) accessibility to the OS-E.

WSDL is an XML-based language for describing Web services, and how to access them, in a platform-independent manner. Simple Object Access Protocol (SOAP) is a communication protocol for communication between applications, based on XML.

A WSDL document is a set of definitions that describe how to access a web service and what operations it will perform. The OS-E uses it in combination with SOAP and an XML Schema to allow a client program connecting to a web service to determine available server functions. The actions and data types required are embedded in the WSDL file, which then may be enclosed in a SOAP envelope. The SOAP protocol supports the exchange of XML-based messages, with the OS-E using HTTPS.

The OS-E can perform two roles in the WSDL exchange:

- As a web service server, where an external client can make web service requests on the OS-E system.
- As a web service client, where the OS-E can make web service “call outs” to get location and policy information from an external service endpoint.

The WSDL document (and its imported schema files, such as cxc.xsd) define every possible request and response provided for the service, including error responses. Depending on how you choose to integrate with the OS-E system, you can use the OS-E SDK (using Java) or you can simply take the WSDL document and generate tools in your desired language. Because web services are language independent, you can use virtually any modern language to generate the requests and the WSDL document defines what those requests need to look like for the receiving component.

For complete information on the WSDL interface, refer to the *Net-Net OS-E – Management Tools*.

Working with the Net-Net OS-E Configuration File

All OS-E systems use the startup configuration file named *cxc.cfg*. This file defines all aspects of the OS-E system and its configuration in the network.

- Ethernet interfaces (and their IP addresses) connecting the platform to the Ethernet switches and the Internet
- Configured protocols, services, accounting and logging
- Policies that define the rules and conditions to match with SIP enterprise the carrier traffic requests.

Building the Configuration File Using the CLI

The OS-E configuration file (*cxc.cfg*) is made up of configuration objects and property settings that control how the system processes and manages SIP traffic. As you open these objects and set properties using the CLI (or the CMS), the OS-E builds a configuration hierarchy of objects that are applied to SIP sessions. You can display this configuration hierarchy using the **show** and **show -v** commands.

For new users, as well as for users who are adding functionality to their configuration, you will need to open configuration objects using the **config** command to enable the default settings for those objects, even if you choose not to edit any of their associated properties. For example, if you need to enable the **ICMP** protocol and its default settings, you simply open the object and execute **return**, as shown in the session below. Notice that the ICMP object has been added to the configuration hierarchy at the end of the session on the eth4 interface.

CLI Session

```
config> config box interface eth4
config interface eth4> config ip 172.26.2.14
config ip 172.26.2.14> config icmp
config ip 172.26.2.14> return
config interface eth4> return
config box> return
config> show -v
   interface eth4
     admin enabled
     mtu 1500
     arp enabled
     speed 1Gb
     duplex full
     autoneg enabled
     ip 172.26.2.14
      admin enabled
      ip-address dhcp
      geolocation 0
      metric 1
      classification-tag
      security-domain
      address-scope
      filter-intf disabled
      icmp
       admin enabled
       limit 10 5
```

Removing Objects From the Configuration File Using the CLI

To remove an object from the configuration hierarchy, use the CLI or CMS **delete** command. For example, the CLI session below deletes the IP interface 172.26.1.14 from the configuration hierarchy:

CLI Session

```
config> config box interface eth4
config interface eth4> delete ip 172.26.1.14
```

Editing and Saving the Configuration File Using the CLI

There are three levels of configuration—the working config which keeps a record of configuration edits, the running configuration which is used by the system, and the startup configuration file from which the system boots.

1. The startup, or default, config is saved to the /cxc/cxc.cfg file. When the OS-E starts, it loads the startup config into the running config. Use the `save` command, either at the config prompt (`config>`) or at the top–level prompt `Net-Net>)` by default), to save the running config to the startup config.
2. The running config is the current operational configuration. You can display the running config using the following command:

   ```
   Net-Net> config show -v
   ```

   Edit the running config using the CLI `config` command, or OS-E Management application. You can save the running config to a file (either the startup config file or a different file) using the `config save` command.
3. When you edit a configuration object, you get a working copy of that object. The working config maintains a record of all configuration changes you have made since the last save to the running config. However, your changes are not applied to the running config until you explicitly commit them. While you're editing an object, the show command displays your working copy. Use the `commit` command, or **exit** from config mode and answer **yes** to the prompt, to save changes from the working configuration to the running configuration.

For detailed information on using the CLI and other management services that allow you to edit the config file, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Creating SIP Users and Passwords

The **user** configuration object allows you to define the users who can pass SIP traffic on this virtual system partition (VSP). (Refer to the OS-E Virtual System Partitions for more information about OS-E VSPs). The users object only applies if your SIP configuration requires local authentication in the **default-session-configuration** object under VSP, or in the **session-configuration** object under the policy configuration object.

When you enable the local authentication file, you configure the OS-E to prompt those users that are passing SIP traffic to log in. The user name and password tag they enter must match the entries in this file. However, you can also create policy that, for example, does not attempt to authenticate users listed in the Active Directory.

CLI Session

The following CLI session creates a locally authenticated SIP user.

```
NNOS-E> config vsp
config vsp> config user bob-pc@companySierra.com
Creating 'user bob-pc@companySierra.com'
config user bob-pc@companySierra.com> set admin enabled
config user bob-pc@companySierra.com> set password-tag abcXYZ
```

Unlike OS-E administrative users, SIP users who log in with a valid user name and password do not have read/write access to the OS-E configuration file.

Customizing the CLI

The OS-E software allows you to customize the CLI to accommodate the type of display you are using, as well as change the default OS-E that is pre-configured with the platform.

CLI Session

The following CLI session sets the number of rows that the CLI displays in a single page to 24 lines, and resets the default top-level prompt from Net-Net> to *boston1*>, and sets an optional text banner to appear when you start the CLI.

```
config box> config cli
config cli> set display paged 24
config cli> set prompt boston1>
config cli> set banner text
```

To temporarily change the CLI display mode with changing the default configuration, use the **display** command at the top level of the CLI.

```
NNOS-E> display paged 24
```

Whenever you use paged output, the --More-- prompt accepts the following keystrokes:

- [Enter] — Displays the next line of text

- [Tab] — Displays the remainder of the text
- [Esc], Q, or q — No more text
- Any keystroke — Displays the next page of text

To change from paged output to continuous scrolled output, enter the following command:

```
config cli> set display scrolled
```

Setting Net-Net OS-E Global Properties

You can configure global text properties associated with each OS-E system in the network. These global text properties include:

- hostname
- name
- description
- contact
- location
- timezone

CLI Session

The following CLI session enables the OS-E administrative state, and sets the optional text descriptions associated with this OS-E system.

```
NNOS-E> config box
config box> set admin enabled
config box> set hostname company.boston1.companySierra.com
config box> set name boston1
config box> set description Net-NetMasterBoston
config box> set contact adminFred
config box> set location corpDataCenter
config box> set timezone Pacific
```

Net-Net OS-E Virtual System Partitions

OS-E's virtual system partition (VSP) is the part of the system that holds the comprehensive customer-defined configuration that controls how the system processes, stores, directs, and routes SIP traffic. The VSP is where you can create session configurations, registration and dial plans, and policies that handle SIP REGISTER and SIP INVITE traffic (and other SIP methods) that OS-E will receive and forward to a SIP call destination, authentication and accounting database, VoIP service provider or carrier, enterprise server, and so on.

The VSP configuration uses objects and properties that control the majority of the OS-E functionality.

IPMI Support

Intelligent Platform Management Interface (IPMI) is supported on the NN2600 series hardware only. Acme Packet cannot guarantee it will function properly on any other third-party hardware.

For more information about configuring IPMI on the OS-E, see the *Net-Net OS-E — System Operations and Troubleshooting guide*.

Specifying Management Preferences

The **cms-preferences** object allows you to configure enumeration text strings to network, database, and SIP objects that support extensions, as well as preferences for reverse DNS, trap polling intervals, phone path mapping, and the cluster and box summary information to include on the Status summary page.

CLI Session

The following CLI session configures the `securityDomain` and the `sipHeaderNameEnum` strings, how frequently (in seconds) to check for SNMP traps

```
NNOS-E> config preferences
config preferences> config cms-preferences
config cms-preferences> set enum-strings securityDomain untrusted
config cms-preferences> set enum-strings sipHeaderNameEnum
   accept-encoding
```

```
config cms preferences> set trap-poll-interval 60
```

For more information on configuring the optional enumeration strings, refer to *Net-Net OS-E – Objects and Properties Reference*.

Specifying DOS Query Preferences

Denial of service (DOS) attacks are designed to disable networks by flooding them with useless traffic. The OS-E provides transport-layer and SIP-layer query and policy capabilities to manage DOS attacks. Queries allow you to sort and view incoming and outgoing traffic in an effort to better define policies. You can use policies to determine if a packet is attacking the box, and configure the responding action. These tools quickly identify and shutout dubious traffic, thereby limiting the damage caused by DOS attacks.

CLI Session

The following CLI session opens the **dos-queries** object and a named sip-query (companySierra), followed by the sip-query options that control how the query displays and sorts DOS traffic:

```
NNOS-E> config preferences
config preferences> config dos-queries
config dos-queries> config sip-query companySierra
Creating 'sip-query companySierra'
config sip-query companySierra> set description "SIP-layer queries"
config sip-query companySierra> set admin enabled
config sip-query companySierra> set select content-type
config sip-query companySierra> set group session-id
config sip-query companySierra> set sort timestamp
config sip-query companySierra> set order ascending
```

For more information on configuring the DOS query preferences, refer to the *Net-Net OS-E – Session Services Configuration Guide* and the *Net-Net OS-E – Objects and Properties Reference*.

Restarting and Shutting Down the System

At times, you may need to shut down or restart the system.

- To shut down the system completely, press the On/Off button on the chassis to OFF.
- To perform a warm or cold restart or a system halt, use the **restart** command. A **restart warm** resets the OS-E application software; a **restart cold** reboots the platform, **restart halt** suspends OS-E operation without rebooting or restarting.
- To simultaneously warm restart all systems in the network cluster, use the **restart cluster** command.

Caution: Always save your configuration before you shut down or restart the system.

When you restart the OS-E system, the system uses the latest saved configuration file. If you do not save a configuration prior to a reboot or shutdown, you lose any changes you made since you last saved the configuration file.

CLI Session

The following session performs an OS-E warm restart:

```
NNOS-E> restart warm
```

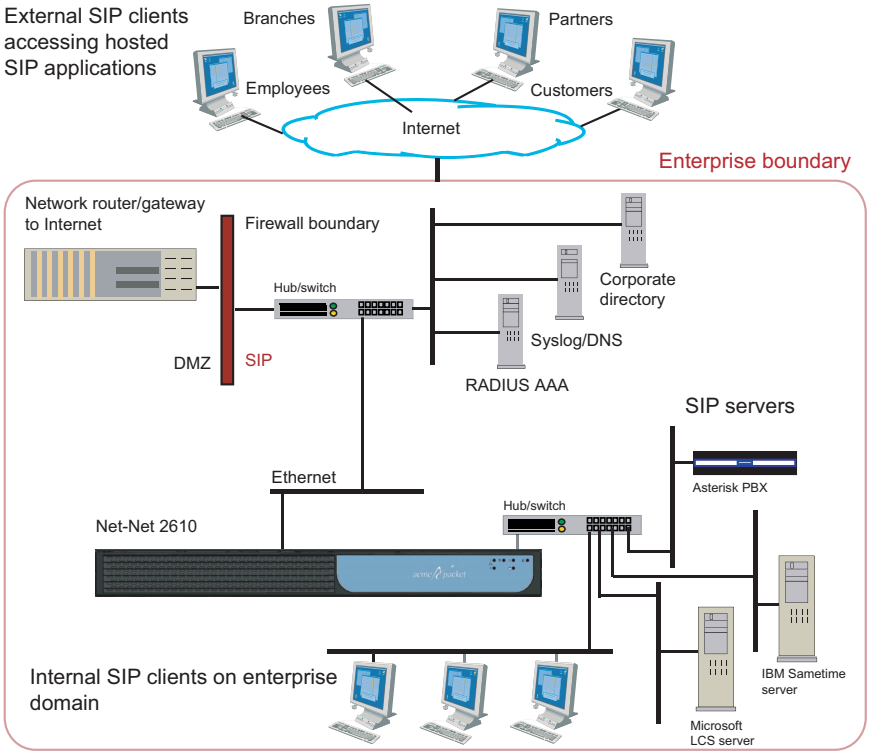
Chapter 2. Enabling Net-Net OS-E Interfaces and Protocols

About This Chapter

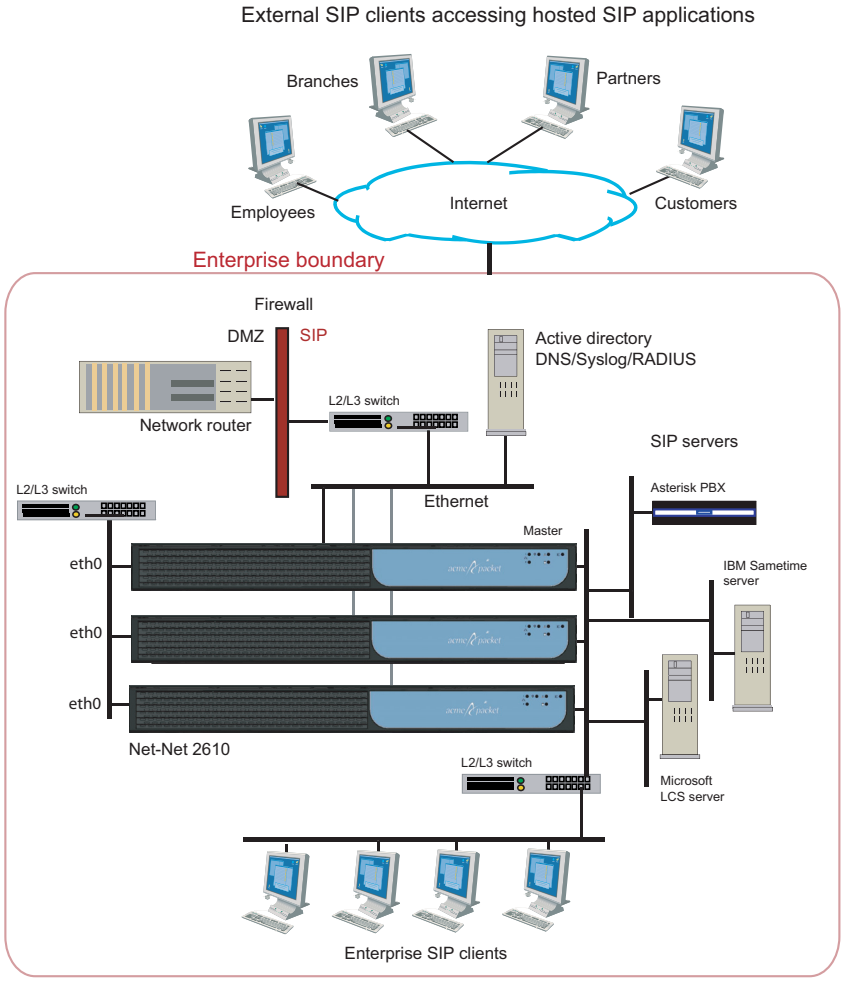
This chapter describes network interfaces and the protocols that you can enable on OS-E systems.

Net-Net OS-E Sample Networks

The following image illustrates a sample enterprise network with a single OS-E system.



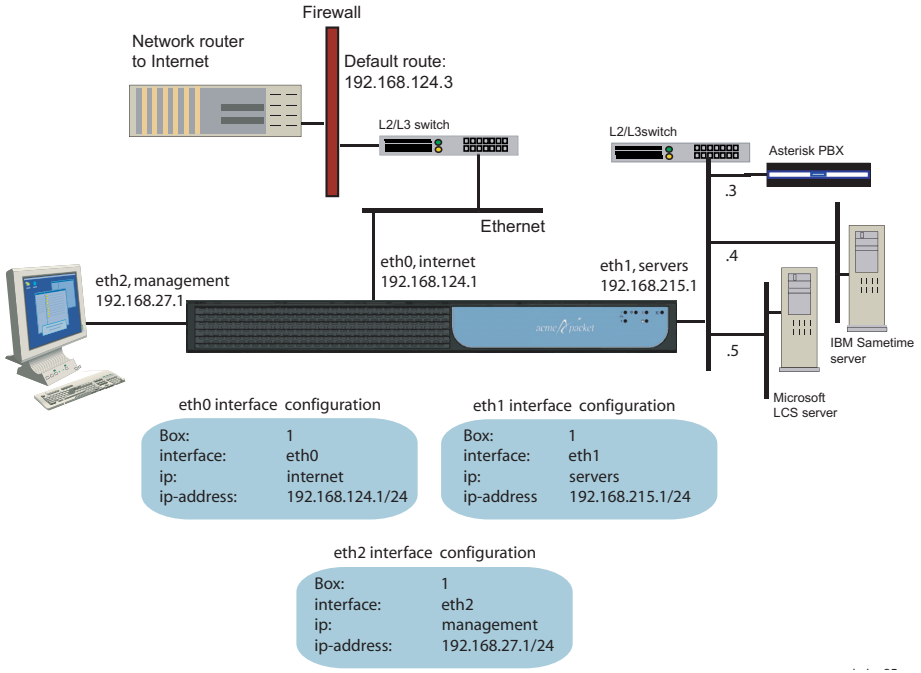
The following image illustrates a sample enterprise that uses an OS-E cluster.



Configuring Net-Net OS-E IP Interfaces

OS-E physical interfaces include multiple Ethernet 1000 Mbps auto-negotiation interfaces, such as eth0, eth1, eth2, and eth3. The number of interfaces depends on the specific platform you are using.

OS-E software uses IP objects — which are assigned a name by the system administrator — to uniquely identify IP connections. Each physical Ethernet interface can contain up to 255 uniquely named IP objects. The following image illustrates a sample network with one named IP object on each physical Ethernet interface.



CLI Session for Eth0

The network on physical interface eth0 uses the IP object that the system administrator named *internet.* The *internet* object specifies the IP address that connects to the external Internet local gateway using a default route.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip internet
Creating 'ip internet'
```

```
config ip internet> set ip-address static 192.168.124.1/24
config ip internet> return

config interface eth0> config ip internet
config ip internet> set ip-address static 192.168.124.2/24
config ip internet> config routing
config routing> config route internetGateway
config route internetGateway> set destination default
config route internetGateway> set gateway 192.168.124.3
```

CLI Session for Eth1

The network on physical interface eth1 uses the IP object named *servers.* The static IP address points to the SIP destination servers on the same network subnet, connected over Ethernet switch.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth1
config interface eth1> config ip servers
config ip servers> set ip-address static 192.168.215.1/24
config ip servers> return
config interface eth1>
```

CLI Session for Eth2

The network on physical interface eth2 uses the defined IP object named *management.* The management object specifies the IP address over which management traffic is carried, such as remote CLI session over Telnet, or an OS-E Management System session.

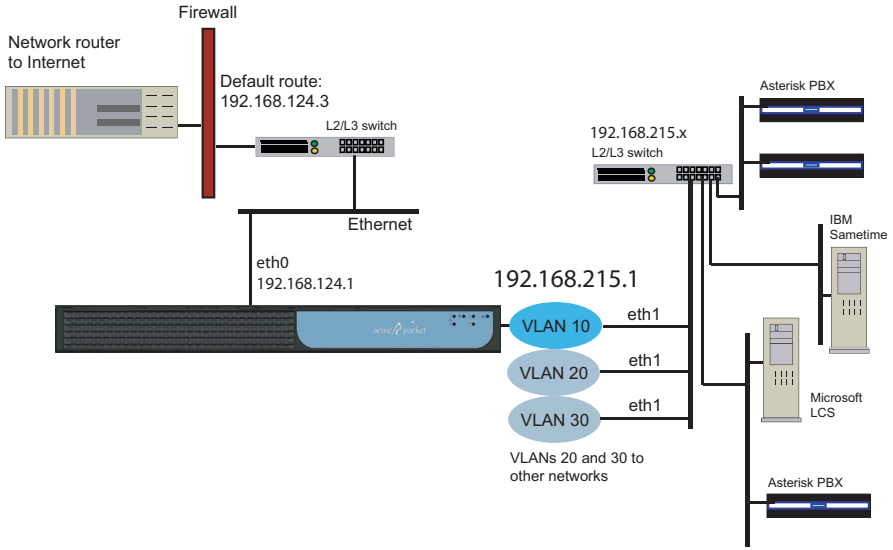
```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth2
config interface eth2> config ip management
config ip internet> set ip-address static 192.168.27.1/24
```

Creating VLANs

OS-E virtual LANs (VLANs) provide Layer 2 partitions to the communications servers. Creating one or more VLANs allows you to group LAN segments so that they appear to be on the same Layer 2 network. Each VLAN is identified by a VLAN ID, and ID must be unique within the physical OS-E system. This means that multiple logical OS-E systems (called VSPs) cannot use the same VLAN IDs. VLAN IDs can be in the range 1 to 4096.

Note: Refer to the *Net-Net OS-E – Release Notes* for the current number of supported VLANs per OS-E system.

The following image illustrates a sample VLAN configuration.



CLI Session

The following CLI session configures the VLAN 10 network. VLAN 10 supports three separate physical IP networks, and all appearing as if they are on the same Layer2 network.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth1
config interface eth1> config vlan 10
```

```
Creating 'vlan10'
config vlan 10> config ip servers
Creating 'ip servers'
config ip servers> set ip-address static 192.168.215.1/24
config ip servers> return
```

Applying Routing and Classification Tags

The system uses classification tags to classify incoming traffic and routing tags to control the egress route for a specific service type. Tags allow the IP routing table in Session Manger to be segmented into multiple routing tables. Once an interface has a configured routing tag, the interface is removed from the "null" (or system routing table).

When traffic comes arrives at an OS-E system on an identified interface, you can direct that traffic to a specific egress interface to the destination. This means that you would configure a **classification-tag** on the incoming interface that matches the **routing-tag** on the desired egress interface.

You can create multiple routing tags on the same named IP interface. However, only one classification tag is allowed per IP interface. Both routing and classification tags are case sensitive with the following configuration properties:

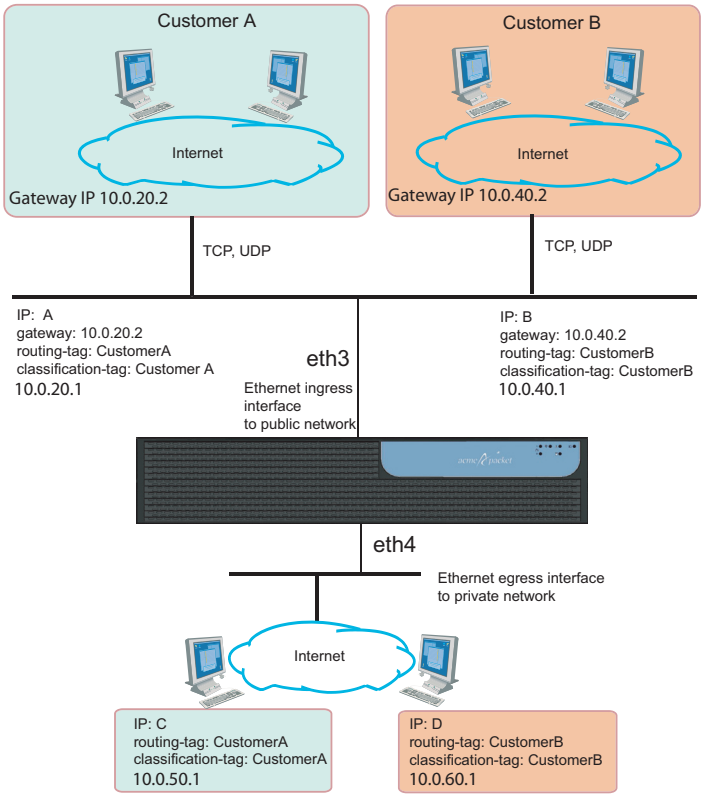
- **routing-tag**—Associates all the routes configured on an interface with this **routing-tag** and creates a service route table based on the routing-tag for each service enabled on this interface. The **routing-tag** applies to the *egress* interface over which the OS-E forwards service traffic. Once a **routing-tag** is configured for an interface, the service routes associated with that interface are installed in the service route table associated with the routing-tag(s).

  If you create an additional **routing-tag** for the interface with the name "null," the system installs the route in both the default service route table and the tag-specific service route table

- **classification-tag**—Creates a tag associated with inbound traffic on this interface. This means that you must configure a **classification-tag** on the *ingress* interface over which the OS-E domain initially receives the traffic, matching the **routing-tag**. (Classification tags in the session configuration **routing-settings** object also must match this routing tag set in the **ip** object.

Note: You can also configure ingress or egress classification tags through the session-config **routing-settings** object. If this property is configured in both places, the **routing-settings** configuration takes precedence.

The following image illustrates a sample network where routing and classification tags are configured on the ingress and egress OS-E interfaces, followed by sample configuration sessions for ingress and egress IP instances.



CLI Sessions for "IP A" and "IP B" Ingress Networks on Eth3

The following CLI sessions create the ingress side of the network illustrated in the image above, including the IP addresses, routing and classification tags, SIP settings, and a route to the IP using the gateways at IP addresses at 10.0.20.2 and 10.0.40.2. The OS-E uses classification tags to classify incoming traffic and routing tags to control the egress route. Configure a **classification-tag** on the incoming interface that matches the **routing-tag** on the egress interface.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth3
Creating 'interface eth3'
config interface eth3> config ip A
Creating 'ip A'
config ip A> set ip-address static 10.0.20.1/24
config ip A> set classification-tag CustomerA
config ip A> set routing-tag CustomerA
config ip A> config sip
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
config ip A> config icmp
config icmp> return
config ip A> config routing
config routing> config route default
Creating 'route default'
config route default> set gateway 10.0.20.2
config route default> return
config routing> return
config ip A> return


NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth3
Creating 'interface eth3'
config interface eth3> config ip B
Creating 'ip B'
config ip B> set ip-address static 10.0.40.1/24
config ip B> set classification-tag CustomerB
config ip B> set routing-tag CustomerB
config ip B> config sip
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
```

```
config ip B> config icmp
config icmp> return
config ip B> config routing
config routing> config route default
Creating 'route default'
config route default> set gateway 10.0.40.2
config route default> return
config routing> return
config ip B> return
```

CLI Sessions for "IP C" and "IP D" Egress Networks on Eth4

The following CLI sessions create the egress side of the network illustrated in the image above, including the IP addresses, routing and classification tags, SIP settings, and a default route. The OS-E uses classification tags to classify incoming traffic and routing tags to control the egress route. Configure a **classification-tag** on the incoming interface that matches the **routing-tag** on the egress interface.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth4
Creating 'interface eth4'
config interface eth4> config ip C
Creating 'ip C'
config ip C> set ip-address static 10.0.50.1/24
config ip C> set classification-tag CustomerA
config ip C> set routing-tag CustomerA
config ip C> config sip
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
config ip C> config icmp
config icmp> return
config ip C> config routing
config routing> config route default
Creating 'route default'
config route default> set destination default
config route default> return

NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth4
Creating 'interface eth4'
config interface eth4> config ip D
Creating 'ip D'
config ip D> set ip-address static 10.0.60.1/24
config ip D> set classification-tag CustomerB
config ip D> set routing-tag CustomerB
```

```
config ip D> config sip
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
config ip D> config icmp
config icmp> return
config ip D> config routing
config routing> config route default
Creating 'route default'
config route default> set destination default
config route default> return
```

Notes on Routing and Classification Tags

- Separate routing tables are maintained for the SIP and media service:
  - IP interfaces without SIP ports enabled will not appear in the SIP table
  - IP interfaces without media ports enabled will not appear in the media table.
- SIP or media traffic that is classified by a tag will only use the routing information and interfaces that have been configured with that routing tag.
- An address of record (AOR) will be assigned an ingress tag IF the REGISTER for that AOR
  - Ingresses on an IP interface with a configured **classification-tag**.
  - Matches a policy or registration-plan that applies a session configuration that has the **ingress-classification-tag** property configured. This overwrites the IP interface **classification-tag**, if configured.
  - Matches a calling-group. The **classification-tag** for the calling-group is only applied if a tag has not been assigned using the IP or session configuration.
- Traffic can be assigned an egress tag as follows:
  - From an ingress tag.
  - From a matching policy or dial-plan that applies a session configuration that has the **egress-classification-tag** configured. This overwrites the **classification-tag** configured on the interface.
  - From a server or carrier with the routing-tag configured, overwriting all other tags.

Related Commands

To assist troubleshooting, use the following commands from the OS-E prompt to display information about tag-routing.

- **show services-routing—**Displays routing tables for all tags.
- **show services-routing-tables—**Displays all configured tags.
- **service-route-lookup—**To view the destination where the OS-E routed a call**.**

Configuring Overlapping IP Networks and Tag Routing

A preferred method for creating networks, with overlapping IPs is to configure VLANs with routing tags. A routing tag associates all the routes configured on an interface and creates a service route table based on the tag for each service enabled the interface. Routing tags apply to the egress interface over which the OS-E forwards service traffic.

To perform tag routing, do the following:

1. Configure a **classification-tag** on the ingress interface over which the OS-E initially receives service traffic. The classification tag must match the configured **routing-tag**; each IP interface can have multiple routing tags.
2. Set the **egress-classification-tag** property under the **session-config/ routing-settings** when sending service traffic to servers and carriers.

CLI Session for Ethernet Public and Private Sides of Network

The following CLI session configures the OS-E *public* IP Ethernet interface and SIP settings.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth3
Creating 'interface eth3'
config interface eth3> config ip public
Creating 'ip public'
config ip public> set ip-address static 10.0.10.1/24
config ip public> config sip
config sip> set admin enabled
```

```
config sip> set nat-translation enabled
config sip> return
```

The following CLI session configures the OS-E *private* IP Ethernet interface and SIP settings.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth4
Creating 'interface eth4'
config interface eth4> config ip private
Creating 'ip private'
config ip private> set ip-address static 10.0.20.1/24
config ip private> config sip
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> return
```

CLI Sessions for Customer-A and Customer-B Networks

The following CLI sessions create the VLANs to the Customer-A and Customer-B networks, including the IP addresses, routing and classification tags, SIP settings, and a route to the IP using the gateways at IP addresses at 10.0.1.50 and 10.0.1.60. The OS-E uses classification tags to classify incoming traffic and routing tags to control the egress route. Configure a **classification-tag** on the incoming interface that matches the **routing-tag** on the egress interface.

```
config interface eth3> config vlan 10
Creating 'vlan 10'
config vlan 10> config ip 10.0.1.1
Creating '10.0.1.1'
config ip 10.0.1.1> set ip-address static 10.0.1.1/24
config ip 10.0.1.1> set classification-tag vlan10
config ip 10.0.1.1> set routing-tag vlan10
config ip 10.0.1.1> config sip
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
config ip 10.0.1.1> config icmp
config icmp> return
config ip 10.0.1.1> config routing
config routing> config route default
Creating 'route default'
config route default> set gateway 10.0.1.50
config route default> return
config routing> return
config ip 10.0.1.1> return
```

```
config interface eth3> config vlan 20
Creating 'vlan 20'
config vlan 20> config ip 10.0.1.1
Creating '10.0.1.1'
config ip 10.0.1.1> set ip-address static 10.0.1.1/24
config ip 10.0.1.1> set classification-tag vlan20
config ip 10.0.1.1> set routing-tag vlan20
config ip 10.0.1.1> config sip
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
config ip 10.0.1.1> config icmp
config icmp> return
config ip 10.0.1.1> config routing
config routing> config route default
Creating 'route default'
config route default> set gateway 10.0.1.60
config route default> return
config routing> return
config ip 10.0.1.1> return
```

CLI Session for the Internal Private Network

The following CLI session creates the VLAN to the internal *private* network, including the private IP address, routing and classification tags, SIP settings, and a default route to the public IP interface at 10.0.20.1. The OS-E uses classification tags to classify incoming traffic and routing tags to control the egress route. Configure a **classification-tag** on the incoming interface that matches the **routing-tag** on the egress interface.

```
config interface eth4> config vlan 30
Creating 'vlan 30'
config vlan 10> config ip 10.0.20.1
Creating '10.0.20.1'
config ip 10.0.20.1> set ip-address static 10.0.20.1/24
config ip 10.0.20.1> set classification-tag MAIN
config ip 10.0.20.1> set routing-tag MAIN
config ip 10.0.20.1> config sip
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> return
config ip 10.0.20.1> config icmp
config icmp> return
config ip 10.0.20.1> config routing
config routing> config route default
Creating 'route default'
config route default> set destination default
config route default> return
```

```
config routing> return
config ip 10.0.1.1> return
```

CLI Session for the session-config-pool

The following CLI session creates two session configuration entries for handling egress traffic from Customer-A and Customer-B to the OS-E. The session-config-pool is for any traffic routed to the private network. The **egress-classification-tag** property, which needs to match the appropriate VLAN routing-tag on VLAN 30, selects the interface to the private network.

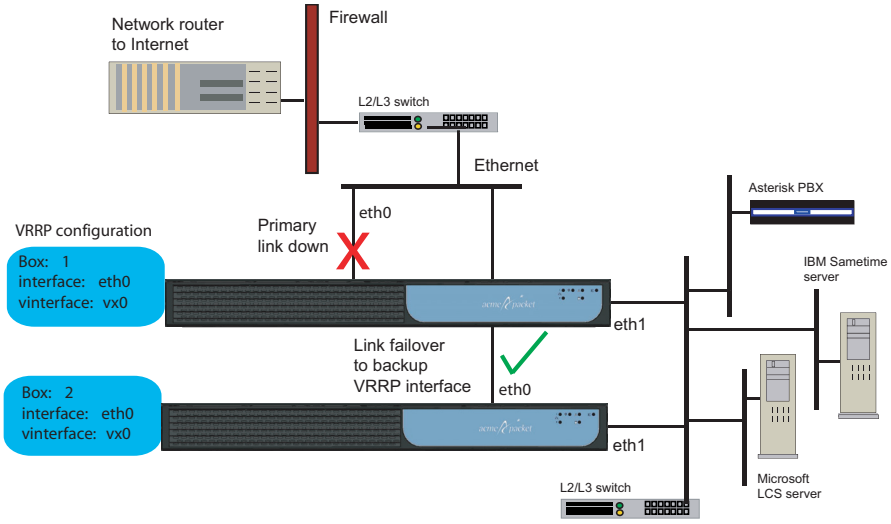
```
config> config vsp session-config-pool
config session-config-pool> config entry "Customer-A"
Creating entry "Customer A"
config entry "Custom A"> config routing-settings
config routing-settings> set egress-classification-tag MAIN
config routing-settings> return
config entry "Custom A"> return
config session-config-pool> config entry "Customer-B"
Creating entry "Customer B"
config entry "Custom B"> config routing-settings
config routing-settings> set egress-classification-tag MAIN
```

Configuring VRRP

The Virtual Router Redundancy Protocol (VRRP) provides redundancy of IP interfaces within an OS-E cluster. The configuration for IP interfaces includes a list of box/interface pairs. The first pair in this list is the *primary interface*. The second pair in the list is the *backup interface* and will take over if the primary goes down. You can configure additional levels of redundancy by specifying more box/interface pairs of lower priority. Priority is based on the positioning of the **set host-interface** command.

VRRP also provides redundancy of master services within a cluster. Each master service, including directory, database, and accounting, can be configured with a list of locations (box numbers within the cluster). The first location, such as box 1, is the primary; the second location (box 2) takes over if the primary fails. Specifying more locations in the list creates additional levels of redundancy.

The following image illustrates a sample network where VRRP reroutes traffic around a failed interface.



If the master VRRP interface becomes unavailable, the VRRP election protocol enables a backup VRRP interface to assume mastership using the next prioritized interface in the list. However, if the original master VRRP interface (the interface with the highest priority) should once again become available, VRRP returns mastership to that interface.

See RFC 2338, *Virtual Router Redundancy Protocol*, for detailed information about this protocol.

CLI Session

The following CLI session creates two VRRP virtual interfaces (vx0 and vx1), and configures the physical host interfaces associated with each vinterface. On the vx0 interface, physical interface eth0 on box 1 will failover to eth0 on box 2, and then to eth0 on box 3. Note that each VRRP interface has its own IP (or VLAN) configuration.

```
NNOS-E> config cluster
config cluster> config vrrp
config vrrp> config vinterface vx0
config vinterface vx0> set host-interface cluster box 1 interface eth0
config vinterface vx0> set host-interface cluster box 2 interface eth0
config vinterface vx0> set host-interface cluster box 3 interface eth0
config vinterface vx0> config ip name
Creating 'ip name'
```

```
config ip name> set ip-address static 1.1.1.1/24
config ip name> return
config vinterface vx0> return

config vrrp> config vinterface vx1
config vinterface vx1> set host-interface cluster box 3 interface eth1
config vinterface vx1> set host-interface cluster box 4 interface eth1
config vinterface vx1> config ip name
Creating 'ip name'
config ip name> set ip-address static 1.1.1.2/24
config ip name> return
config vinterface vx0> return
```

See RFC 2338, *Virtual Router Redundancy Protocol*, for detailed information about VRRP.

When configuring VRRP backing interfaces, Acme Packet recommends you have no more than two different OS-Es on the host list. You can, however, have more than one interface configured per box without any problems.

Here are some examples to illustrate acceptable and not acceptable configurations.

Not acceptable: There are interfaces from three different OS-Es listed for this VX interface. Acme Packet recommends you only have two OS-Es backing a VX.

```
config vrrp
 config vinterface vx10
  set group 1
  set host-interface cluster\box 1\interface eth1
  set host-interface cluster\box 2\interface eth1
  set host-interface cluster\box 3\interface eth1
  config ip 10.1.1.1
  return
 return
return
```

Not acceptable: There are interfaces from three different OS-Es listed for this VX interface and **preempt=true** is configured. This configuration is not supported at this time and will result in inconsistent behavior for the VX interface.

```
config vrrp
 config vinterface vx10
  set group 1
  set preempt true
  set host-interface cluster\box 1\interface eth1
  set host-interface cluster\box 2\interface eth1
  set host-interface cluster\box 3\interface eth1
```

```
  config ip 10.1.1.1
  return
 return
return
```

Acceptable: There are only two OS-Es listed as hosts for this VX.

```
config vrrp
 config vinterface vx10
  set group 1
  set host-interface cluster\box 1\interface eth1
  set host-interface cluster\box 2\interface eth1
  config ip 10.1.1.1
  return
 return
return
```

Acceptable: There are only two OS-Es listed as hosts for this VX, but each OS-E has two host interfaces configured on it.

```
config vrrp
 config vinterface vx10
  set group 1
  set host-interface cluster\box 1\interface eth1
  set host-interface cluster\box 1\interface eth2
  set host-interface cluster\box 2\interface eth1
  set host-interface cluster\box 2\interface eth2
  config ip 10.1.1.1
  return
 return
return
```

In either of these last two acceptable examples, it is okay to configure **preempt=true**.

Configuring Signaling Failover

The OS-E systems use signaling failover to preserve signaling sessions in a high-availability cluster. The cluster **master-service** maintains the signaling state of connections cluster-wide. With signaling failover, the signaling state information is transferred to the OS-E system taking over the signaling stream.

Note: The call must be connected (at the SIP level) in order for signaling failover to take place. Signaling states prior to the "connected" state are not maintained in the cluster wide state table. Additionally, for TCP and TLS connections, the user agent must re-establish the connection once the failover has occurred. Since TCP/TLS are connection-oriented protocols, signaling state information is not maintained across failover. If TLS is used, the appropriate certificate must be loaded on the OS-E systems in the cluster.

Signaling information is maintained so that accurate call logs are recorded at the end of the call.

Note: If there is a failure at the OS-E system holding the call log database, information will be lost.

Use the OS-E **show signaling-sessions** command to display failover state information.

CLI Session

```
NNOS-E> config cluster
config cluster> set share-signaling-entries true
```

The **share-signaling-entries** property specifies whether or not all OS-E systems in a cluster exchange active SIP session information. When set to *true*, the OS-E systems exchange data. If the primary link then goes down, a backup link can use SIP session information from the primary device to handle existing calls.

The **share-signaling-entries** property should be set to *true* if you have configured VRRP (to provide the redundancy support). If you have VRRP enabled and configured, and if **share-signaling-entries** is set to true, signaling failover can take place.

Configuring Web Interface Settings

The Web object enables the Web server, providing access to the OS-E Management System graphical user interface. If you want to view SNMP traps through the GUI, you must also enable the server as a trap target. You enable and configure Web services on Ethernet and VLAN interfaces.

CLI Session

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
config ip boston1> config web
config web> set admin enabled
config web> set protocol https 443 0 "vsp tls certificate
 OS-E.cert.com"
config web> set trap-target enabled
```

Configuring Web Services

The **web-service** object enables the Web Services Definition Language (WSDL). WSDL is an XML-based language for describing Web services, and how to access them, in a platform-independent manner. Simple Object Access Protocol (SOAP) is the communication protocol used for communication between applications, based on XML.

A WSDL document is a set of definitions that describe how to access a web service and what operations it will perform. The OS-E uses it in combination with SOAP and XML Schema to allow a client program connecting to a web service to determine available server functions. The actions and data types required are embedded in the WSDL file, which then may be enclosed in a SOAP envelope. The SOAP protocol supports the exchange of XML-based messages with the OS-E system using HTTPS.

CLI Session

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
config ip boston1> config web-service
config web-service> set admin enabled
```

```
config web-service> set protocol https 443 0 "vsp tls certificate
 OS-E.company.com"
```

For detailed information on WSDL, refer to the *Net-Net OS-E – Management Tools*.

Enabling ICMP and Setting Rate Limits

The Internet Control Message Protocol (ICMP), defined in RFC 792, is a TCP/IP protocol that determines whether a destination is unreachable. Using error and control messages between an host and an Internet gateway, ICMP verifies the validity of an IP address.

You can limit the rate at which ICMP messages are received on the OS-E system by setting ICMP rate and burst limits that prevent flooding of ICMP messages on the network. The rate setting is the maximum number of ICMP destination unreachable messages that the device can receive per second; the burst setting is the rate by which the number of ICMP messages that are discarded per second. Configuring the burst setting to a number lower than the rate setting will prevent ICMP message flooding.

CLI session

The following CLI session enables ICMP on the specified interface and sets ICMP rate and burst limits.

```
NNOS-E> config cluster box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
Creating 'ip boston1'
config ip boston1> config icmp
config icmp> set admin enabled
config icmp> set limit 12 6
```

Enabling NTP and BOOTP Servers

By default, Network Time Protocol (NTP) and BOOTP services are enabled. The OS-E system uses NTP to synchronize time with external and local clocks using an NTP server, and the BOOTP protocol to allow an OS-E network client to learn its own IP address and boot information from a BOOTP server.

If addition to configuring NTP and BOOTP clients, you need to ensure that the NTP and BOOTP services are enabled on OS-E IP interfaces.

CLI Session

The following session enables BOOTP services on the specified OS-E IP interface and port number.

```
NNOS-E> config cluster box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
Creating 'ip boston1'
config ip boston1> config bootp-server
config bootp-server> set admin enabled
config bootp-server> set port 67
```

The following session enables NTP services on the specified OS-E IP interface.

```
NNOS-E> config cluster box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
Creating 'ip boston1'
config ip boston1> config ntp-server
config ntp-server> set admin enabled
```

Configuring the Network Time Protocol (NTP) Clients

The OS-E system uses the Network Time Protocol (NTP) to synchronize time with external and local clocks. Synchronized time across a network is important for critical functions such as packet and event time stamps or certificate validation.

You can configure an external NTP server to synchronize network time on the OS-E system. When you configure NTP, the system receives packets from the external NTP server that updates the local OS-E clock at specified NTP poll intervals.

CLI Session

The following session configures an external NTP server on the local OS-E NTP client. The session enables the OS-E NTP client, specifies the IP address of the remote NTP server, and the sets the poll-interval (in minutes) between network time updates from the NTP server.

```
config box> config ntp-client
config ntp-client> set admin enabled
config ntp-client> set server 192.168.23.76
config ntp-client> set poll-interval 5
```

Configuring the Bootstrap Protocol (BOOTP) Clients

The BOOTP commands allow you to configure the Bootstrap Protocol (BOOTP) client and server settings in an OS-E network cluster. BOOTP, described in RFC 951, is the Internet protocol that allows a network client to learn its own IP address and boot information from a BOOTP server.

In a network cluster, a BOOTP client requests its own IP address from the OS-E BOOTP server, as well as the IP address of the BOOTP server itself using the hardware MAC address. The BOOTP server responds to BOOTP client requests over the configured server port.

If a BOOTP session cannot be established between the OS-E client and server, BOOTP closes the session across the BOOTP interfaces after 60 seconds.

CLI Session

The following session configures a bootp client on the OS-E system. The session enables the bootp client, and sets the known bootp client and server ports for bootp requests and responses. UDP port 68 is the known bootp client port; UDP port 67 is the known bootp server port.

```
config box> config bootp-client
config bootp-client> set admin enabled
config bootp-client> set client-port eth1 68
config bootp-client> set server-port eth0 67
```

Configuring SIP

For SIP applications running over Acme Packet networks, you need to enable the Session Initiation Protocol (SIP) on the OS-E IP interfaces. By default, the SIP protocol is enabled. However, you do need to configure the SIP operation mode, set the UDP, TCP, and TLS ports to use when listening for SIP messages, and include any certificates (generated and imported from a certificate authority) to be associated with the SIP interface.

- In *proxy* mode, the OS-E system only participates in SIP messages. Once the call is established, the phones send their voice traffic directly to each other without involving the proxy. SIP proxies offload tasks and simplify the implementation of end station telephones.
- The *B2BUA* is a SIP-based logical entity that receives and processes INVITE messages as a SIP User Agent Server (UAS). It also acts as a SIP User Agent Client (UAC) that determines how the request should be answered and how to initiate outbound calls. Unlike SIP proxy mode, the B2BUA maintains the call state and participates in all call requests.
- A *stateless* proxy forwards every request it receives and discards information about the request message once the message has been forwarded.

CLI Session

The following CLI session sets the SIP operation mode to "proxy."

```
NNOS-E> config vsp
config vsp> config default-session-config
config default-session-config> config sip-settings
config sip-settings> set mode proxy
```

The following CLI session enables the SIP protocol on the specified IP interface, specifies the TCP, UDP and TLS ports to use when listening for SIP messages, and includes a certificate from an authorized certificate authority (CA).

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
Creating 'ip boston1'
config ip boston1> config sip
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> set nat-add-received-from enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> set tls-port 5061
config sip> set certificate vsp tls certificate os-e.net.com
```

Load Balancing Across Net-Net OS-E Interfaces

Load balancing of SIP processing across interfaces requires both headed and backing interfaces.

The *headend* interface is the central distribution point. It does not perform SIP processing, it only forwards the calls to its configured backing interfaces. When you configure a SIP phone, configure the phone directly to the headend interface. To configure an IP interface as a headend interface, configure the **sip** object with backing interfaces. An interface is considered a headend interface if it has configured backing interfaces.

The *backing-interfaces* are identified within this **sip** object. In the **backing-interface** property, you reference previously configured IP interfaces. The backing interface is the location at which the OS-E terminates TCP and TLS connections (and where UDP transport messages arrive) and handles SIP processing. The OS-E uses round-robin load-balancing to distribute message across the configured backing interfaces.

To correctly configure load-balancing for SIP processing, you must do the following:

1. Configure the IP interfaces that will be used for both the headend and backing interfaces.
2. The SIP properties of the backing interfaces must match those of the head interface. For example, the interfaces must all use the same port assignments, and if you are using TLS, they must all use the same certificate.
3. You must enable the master services **registration** object so that the interfaces can share the registration database.

To verify your configuration, first ensure that all SIP properties match. From the CLI at the OS-E system that hosts the headend, execute the **show load-balance** command. This lists all associated backing interfaces (and statistics). From each box hosting a backing interface, execute **show backing-interface** to display configuration and statistics information.

CLI Session

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
config ip boston1> config sip
```

```
config sip> set admin enabled
config sip> set nat-translation enabled
config sip> set udp-port 5060
config sip> set tcp-port 5060
config sip> set tls-port 5061
config sip> set certificate "vsp tls certificate os-e.companyA.com"
config sip> set backing-interface "cluster box 1 interface eth0 ip
 backing1"
config sip> set backing-interface "cluster box 1 interface eth1 ip
 backing2"
config sip> set backing-interface "cluster box 2 interface eth0 ip
```

Configuring Media Port Pools

The **media-ports** object defines the ports and port ranges to assign to media streams on an Ethernet interface, such as NAT, media anchoring, and media recording.

CLI Session

The following CLI session enables the media-ports object, sets the starting port number, sets the total number of ports available for media streams, and enables the monitoring of idle ports (so that no traffic is sent to idle ports that are part of the media pool).

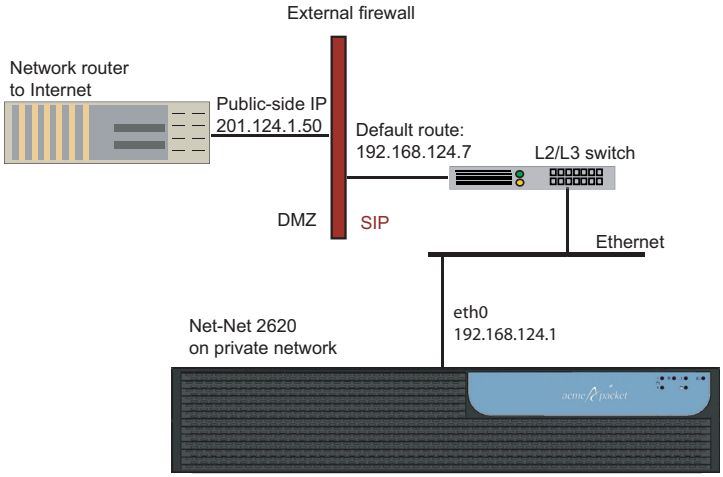
```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
Creating 'ip boston1'
config ip boston1> config media-ports
config media-ports> set admin enabled
config media-ports> set base-port 20000
config media-ports> set count 5000
config media-ports> set idle-monitor enabled
```

Configuring the External Firewalls

The **near-side-nat** object allows you to configure the OS-E system to perform Network Address Translation (NAT) on SIP traffic that traverses the enterprise firewall between the OS-E system and the Internet. By configuring the IP address of the public-facing interface on the enterprise firewall, the OS-E produces a contact header that replaces enterprise private IP addresses with the public-facing firewall address.

NAT, defined in RFC 1631, *The IP Network Address Translator*, ensures that internal private network addresses are rewritten so that they appear to come from the designated external network firewall address. The OS-E modifies outgoing packets so that the return address is a valid Internet host (the external firewall). The firewall then changes the destination address on incoming packets to the OS-E system's private address.

SIP traffic that matches the configured UPD and TCP port ranges will use NAT so that only the public-side IP address can be observed by remote SIP users across the Internet. The following image illustrates a sample network with showing the public-side IP address 204.124.1.50.



CLI Session

The following CLI session configures the external firewall public IP address to 201.124.1.50 and sets the UDP and TCP port ranges over which to listen for SIP messages and IP address replacement.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth#> config ip boston1
config ip boston1> config near-side-nat 201.124.1.50
Creating 'near-side-nat 201.124.1.50'
config near-side-nat 201.124.1.50> set admin enabled
config near-side-nat 201.124.1.50> set public-ip 201.124.1.50
config near-side-nat 201.124.1.50> set udp-range 5060 1
config near-side-nat 201.124.1.50> set tcp-range 5060 2
```

You typically configure UDP port 5060 and TCP ports 5060 and 5061 for SIP traffic. Be certain that the port numbers you enter here are the same as those you configured in the **ip sip** object, as described in this chapter.

In addition, you may configure the NAT pool addresses within this object, typically UDP ports 20000 through 30000.

Configuring the STUN, TURN, and ICE Protocols

The OS-E, as a STUN server, uses three protocols that operate together to handle SIP signaling and media traversal across NAT routers and firewalls. These protocols are:

- STUN—Simple Traversal of User Datagram Protocol Through Network Address Translators
- TURN—Traversal Using Relay NAT
- ICE—Interactive Connectivity Establishment

The OS-E system implements draft-ietf-behave-rfc3489bis-04 (for STUN, in addition to RFC3489), and draft-ietf-behave-turn-01, both released in July 2006.

For complete information on STUN and TURN refer to:

- RFC 3489—STUN - Simple Traversal of User Datagram Protocol (UDP) Through Network Address Translators (NATs)
- draft-ietf-behave-rfc3489bis-04—Simple Traversal Underneath Network Address Translators (NAT) (STUN)
- draft-ietf-behave-turn-01—Obtaining Relay Addresses from Simple Traversal of UDP Through NAT (STUN)

STUN

Simple Traversal of User Datagram Protocol (UDP) Through Network Address Translators (NATs) (STUN), described in RFC 3489, enables SIP clients to discover the presence and types of NATs and firewalls that exist between them and the public Internet. A STUN server and receives and transmits UDP messages over UDP port 3478 (default). The STUN protocol helps prevent NAT-associated network application failures by transmitting exploratory STUN messages over UDP between the server and clients.

STUN identifies the public side NAT details by inspecting exploratory STUN messages that arrive at the STUN server. The STUN-enabled client sends an exploratory message to the STUN server to determine the transmit and receive UDP port to use. The STUN server examines the incoming message and informs the client which public IP address and ports were used by the NAT. These are then used in the call establishment messages sent to the SIP destination server.

For complete information on STUN, refer to *RFC 3489 -STUN - Simple Traversal of User Datagram Protocol (UDP) Through Network Address Translators (NATs).*

Traversal Using Relay NAT (TURN)

Depending on the network topology and the NAT implementation, IP addresses obtained by STUN may not be usable by all peers. A client must be able to obtain a publicly visible transport address that can receive media from any peer that can send packets to the public Internet. This is done by relaying data though a server that resides on the public Internet.

The Traversal Using Relay NAT (TURN) protocol allows a client to obtain a transport address from a relay,

1. To send traffic to the peer through that address
2. To receive all traffic sent to that address by the peer

The **relay-interface** property specifies the interface over which the SIP client receives public visibility, as well as the interface from which the OS-E system allocates TURN relay ports. This interface must have **media-ports** enabled and a port pool range defined.

Interactive Connectivity Establishment (ICE)

Both STUN and TURN work in conjunction with the Interactive Connectivity Establishment (ICE) protocol to determine what type of NAT firewalls exist between SIP clients and to determine a set of “candidate” transport addresses by which they are able to establish contact. STUN and TURN are sometimes used by ICE.

An ICE-enabled client (the initiator) uses STUN and TURN, and a locally configured policy, to determine a prioritized list of candidate addresses before sending this list to the responder client in the SDP portion of a SIP message. When the responder client receives this message, it performs a "connectivity check" on each candidate address by sending a STUN request to that address and waiting for a reply. The highest priority candidate to pass the connectivity check is then used for the actual connection.

The OS-E system does not require any ICE-specific configuration.

Sample Configuration

For STUN to operate properly, follow these rules when configuring STUN servers:

- Create STUN server instances in pairs (for compliance with the RFC 3489).
- Put each instance of the pair on a different IP address.
- Assign exactly two UDP ports to each; the port number assignments must be identical for each.
- The secondary interface of each STUN server instance must point at the IP address of the other STUN server instance.

  For example, with a STUN server configured on interface A, ports 100 and 200, configure an additional STUN server on interface B, ports 100 and 200. In the interface A configuration, set the **secondary-interface** property to B, and vice versa.

The following CLI session configures a STUN server on the OS-E system.

CLI Session

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip a
config ip a> config stun-server
config stun-server> set admin enabled
config stun-server> set stun-auth-level allow
config stun-server> set port 3478
config stun-server> set allow-turn enabled
config stun-server> set relay-interface "cluster box 1 interface
   eth1 ip abc"
config stun-server> set secondary-interface "cluster box 1 interface
 eth0 ip b"
```

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip b
config ip b> config stun-server
config stun-server> set admin enabled
config stun-server> set stun-auth-level allow
config stun-server> set port 3478
config stun-server> set allow-turn enabled
config stun-server> set relay-interface "cluster box 1 interface
   eth1 ip abc"
config stun-server> set secondary-interface "cluster box 1 interface
 eth0 ip a"
```

For more information, and for information on setting all stun-server properties, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Configuring Kernel Filtering

Kernel filter rules provide a security mechanism that allows or denies inbound traffic on OS-E IP interfaces. The filter controls access to resources on the enterprise servers based on source IP address and/or subnet, source port, and protocol. When the OS-E processes kernel rules, it first interprets deny rules, then allow rules. In this way, you can deny a subnet access, and then allow specific endpoints.

The OS-E acts on kernel rules before the other, higher level rules such as DOS policy rules. This stops traffic from known problems early, tying up fewer processing resources.

CLI Session

The following CLI session creates and enables a deny rule named *evil-badguy* from source IP address 215.200.40.8, source port 56, over UDP.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
config ip boston1> config kernel-filter
config kernel-filter> config deny-rule evil-badguy
Creating 'deny-rule evil-badguy'
config deny-rule evil-badguy> set admin enabled
config deny-rule evil-badguy> set source-address/mask 215.200.40.8/24
config deny-rule evil-badguy> set source-port 56
config deny-rule evil-badguy> set protocol udp
```

Configuring Messaging

Messaging is the mechanism from which the OS-E system communicates with other systems in the cluster. Messaging sets up a listening socket on an interface, enabling the interface to receive messaging traffic and participate in clustering and media partnering.

In a cluster, the master looks through the configurations of all OS-E systems to find out which interface is used for messaging. (If multiple interfaces are configured, the master only communicates with one—the first it finds.) The master then communicates with the identified interface to share configuration and data.

In media partnering, you configure a specific IP address (on a different box) as a partner. On the box that owns that IP address, you need to configure and enable messaging for media partnering to operate.

CLI Session

The following CLI session configures messaging on box 1, interface eth0.

```
NNOS-E> config cluster
config cluster> config box 1
config box 1> config interface eth0
config interface eth0> config ip boston1
config ip boston1> config messaging
config messaging> set admin enabled
config messaging> set certificate vsp tls certificate name
config messaging> set port 13002
config messaging> set protocol tls
```

For detailed information on OS-E clusters and media partnering, refer to the *Net-Net OS-E – System Installation and Commissioning Guide*.

Chapter 3. Enabling Net-Net OS-E Services

About This Chapter

This chapter describes the services that you can enable on the OS-E platforms.

Enabling Services on the Net-Net OS-E Master

There are administrative services available on the OS-E master that are enabled by default. These master services are:

- Cluster-Master Services
- Directory Services
- Accounting Services
- Authentication Services
- OS-E Database
- Registration Services
- Server Load
- Call Failover (Signaling and Media)
- Load-Balancing
- File-Mirror
- Route Server
- Sampling

- Third-Party-Call-Control (3PCC)

If you are not using any of these services, you can globally disable them to conserve memory and system resources on the OS-E master.

Cluster-Master Services

The **cluster-master** services object configures the OS-E system that maintains the master configuration for the cluster. The master is responsible for providing configuration changes and updates to other devices in the cluster. If a different device becomes the cluster-master during a failover, this device then sends out its configuration to the other devices in the cluster.

CLI Session

```
NNOS-E> config
config> config master-services
config master-services> config cluster-master
config cluster-master> set admin enabled
config cluster-master> set host-box cluster box 2
config cluster-master> set host-box cluster box 1
```

Directory Services

When enabled, directory services allows the OS-E master to use enterprise (or corporate) directories that contain the identities of SIP users who are authorized to access the SIP enterprise communications servers.

You can configure the SIP communications servers and associated user and directory attributes under the VSP (Virtual System Partition), enterprise configuration object.

CLI session

The following session enables directory services on the OS-E master.

```
NNOS-E> config master-services
config master-services> config directory
config directory> set admin enabled
config directory> set host-box cluster box 1
config directory> set host-box cluster box 2
config directory> set group 1
```

Accounting Services

When enabled, accounting services supports RADIUS accounting, system logging (syslog), DIAMETER protocol services, the accounting database, archiving, and the accounting file-system.

You can configure one or more of these accounting mechanisms for capturing the OS-E network accounting activity and SIP call detail records under the VSP (Virtual System Partition) configuration object.

CLI Session

The following session enables the OS-E global accounting services on the master.

```
NNOS-E> config master-services
config master-services> config accounting
config accounting> set admin enabled
config accounting> set host-box cluster box 3
config accounting> set host-box cluster box 1
config accounting> set group 1
```

Authentication Services

Authentication services enables or disables all authentication functions on the OS-E device, such as RADIUS and local user profiles. If authentication is disabled, you can still configure the authentication services, but the services do not become active until you enable this master service.

CLI Session

The following session enables OS-E authentication services.

```
NNOS-E> config master-services
config master-services> config authentication
config authentication> set admin enabled
config authentication> set host-box cluster box 3
config authentication> set host-box cluster box 1
config authentication>
```

OS-E Database

The master-services **database** object allows you to configure maintenance and other settings for the OS-E system database. The database is the local repository for call accounting records and media files.

CLI Session

The following session enables OS-E database maintenance and sets the local maintenance time at 6 a.m. daily.

```
NNOS-E> config master-services
config master-services> config database
config database> set admin enabled
config database> set maintenance time-of-day 06:00
```

Registration Services

Enabling the registration service allows the OS-E to accept SIP REGISTER requests in behalf of other SIP servers (called *registrar peers*) that reside in other domains.

SIP registrars each maintain addresses of record bindings and contact addresses for their own domains in a location service database. Registrar peers exchange these location records with each other during REGISTER sessions. When the OS-E accepts a REGISTER request from a foreign domain, for example, the OS-E installs a binding in its location database so that subsequent SIP messages are forwarded to the SIP client.

For detailed information on registration and location services, refer to the *Net-Net OS-E – Session Services Configuration Guide*.

CLI Session

The following session enables the registration services on the OS-E master.

```
NNOS-E> config master-services
config master-services> config registration
config registration> set admin enabled
config registration> set host-box cluster box 1
config registration> set host-box cluster box 2
```

Server Load

The master-services **server-load** object configures the OS-E to calculate server load. This object must be enabled if your dial plan arbiter settings use least-load as the routing algorithm option. (The arbiter rules property sets the criteria by which the OS-E selects the server to which it forwards calls.)

CLI Session

The following session enables the server load functionality on the OS-E master.

```
NNOS-E> config master-services
config master-services> config server-load
config server-load> set admin enabled
config server-load> set host-box "cluster box 2"
config server-load> set host-box "cluster box 3"
```

Call Failover (Signaling and Media)

The master-services **call-failover** object configures failover for both the media and signaling streams across an OS-E cluster. Enabling **call-failover** ensures that there is an active copy of the database on another box in the cluster in the event of a failure. The first **host-box** property defines the primary OS-E system. Configure backup boxes in the event of primary failure by re-executing the **host-box** property.

CLI Session

The following session enables call-failover of the media and signaling streams.

```
NNOS-E> config master-services
config master-services> config call-failover
config call-failover> set admin enabled
config call-failover> set host-box cluster box 1
config call-failover> set host-box cluster box 2
```

The call must be connected at the SIP level for signaling failover to succeed. States prior to the "connected" state are not maintained in the cluster-wide state table. For TCP and TLS connections, the user agent (UA) must reestablish the connection after the failover, since TCP and TLS are connection-oriented protocols that do not maintain state information. If TLS is used, the appropriate certificate must be loaded on both devices in the cluster.

Accurate call logs are recorded at the end of the call. However, if the OS-E system maintaining the call log database fails over to the other OS-E system in the cluster, call information will not be recorded.

Use the OS-E **show signaling-sessions** action to view cluster-wide signaling state information.

```
NNOS-E> show signaling-sessions

  session-id: 342946641025485482
  fromURI: <sip:1234@dial-plan.com>
  toURI: <sip:5678@dial-plan.com>
  inLegCallID: 3c2a54ca1fbd-7intxouoq8zo@172-30-0-176
  inLegFromTag: xqkhmbwmiv
  inLegToTag: b432a8c0-13c4-454a1124-102dd42a-164adf67
  outLegCallID:
    CXC-279-61b29378-b432a8c0-13c4-454a1124-102dd42b-7023adbd@dial-pla
    n.com
  outLegFromTag: b432a8c0-13c4-454a1124-102dd42b-749c0b03
  outLegToTag: 152jkzyt73
  origInFromURI:
  origInToURI:
  origOutFromURI:
  origOutToURI:
  vthreadID: 278
  initialMethod: 0
  Box: 0.0.0.0
```

Load-Balancing

The master-services **load-balancing** object configures the OS-E systems to host the load-balancing master service. These devices (boxes) are responsible for keeping the rule database up to date. They do not need to be the same devices that host the head-end interfaces, although it is common to do so. (You can, for example, configure devices in the cluster that only serve as host devices without any head-end interfaces or backing interfaces.)

For more information on the load-balancing object, refer to the *Net-Net OS-E – Objects and Properties Reference*. For more information on configuring load-balancing across OS-E interfaces, see Load Balancing Across OS-E Interfaces.

CLI Session

The following CLI session enables load balancing on the master, specifies box 1 as the master box on which the rule database runs (subsequent host boxes 2 and 3 serve as backup) and associates the load balancing service with preconfigured VRRP group 1.

```
NNOS-E> config master-services
config master-services> config load balancing
config load-balancing> set host-box cluster box 1
config load-balancing> set host-box cluster box 2
config load-balancing> set host-box cluster box 3
config load-balancing> set group 1
```

File-Mirror

The master-services **file-mirror** object sets all participating OS-E systems to share particular files (the types of files shared are preset in the operating system), such as media recordings, log files, etc. The file-mirror master service distributes files to all OS-E systems listed as hosts for the service. It is used to make files highly available in the event that the box that created the file becomes unavailable. File mirroring includes keeping a record of each file in the file mirror database, and also keeping a copy of each file on the local disk drive.

When configured, file mirroring works as follows:

1. When a file gets saved to the master file system, a record of the file is saved to the master's database. The master database then sends a message to all backup databases indicating a change and updating the backup.
2. The backup box(es) then compare their own database to their file system to determine if any files are missing (the new file is missing).
3. The backup then pulls the missing file(s) from the master's file system.

Once the files are mirrored, you can play them back from any box that functions as a host. If accessing the file from a backup, the backup box first checks its database to make sure an entry is listed. It then checks its local disk for a copy of the file. If the file is not there (for example, an error during the pull operation) or is out of date, the backup again pulls the file from the master. In this way, file mirroring provides a secondary mechanism for assuring file availability. Non-host boxes also maintain a copy of the database and can pull files from the master as they are needed for processing. Use the **file-mirror-service** action to manage the mirrored files.

CLI Session

The following CLI session enables file-mirroring on the OS-E system. This CLI session also specifies box 1 as the master box on which file mirroring is run, associates the file mirroring process with VRRP group 1, and identifies *cxc_common/mirror1* as the location to which the OS-E writes the files.

```
NNOS-E> config master-services
config master-services> config file-mirror
config file-mirror> set admin enabled
config file-mirror> set group 1
config file-mirror> set host-box cluster box 1
config file-mirror> set file-mirror-directory /cxc_common/mirror1
```

Route Server

The master-services **route-server object** sets the route-server (RS) master service, which manages the server process. The master service handles requests from local or remote OS-E systems for route-server definitions. When presented with a request from the SIP process, the master service responds as follows, depending on the configuration:

- The master service retrieves one or more routes from the local (to the cluster) RS server. This is the result if the session configuration authorization object is set to **Local**.
- The master service sends a Diameter request to retrieve the route(s) from the configured remote RS server. This is the result if the session configuration authorization object is set to **Diameter**.
- The master service sends a request to an external policy service. This is the result if the session configuration authorization object is set to **WSDL**.

When multiple routes are returned, the dial-plan arbiter, if configured, resolves the best route. The application can be configured in two ways—either intracluster or intercluster. Each has different configuration requirements.

Note: This section describes how to configure intracluster routing. For more information about configuring intercluster routing, see *Net-Net OS-E – Objects and Properties Reference*

Note that because the OS-E propagates RS rate table updates to backup boxes, you do not need to configure the file-mirror service for it.

See *Net-Net OS-E – Session Services Configuration Guide*. for information on installing and implementing the route-server import client, a web application that imports routes into the database.

CLI Session

When two or more OS-E systems are within a cluster and the RS server resides in the cluster, you can use intracluster RS. In that case, the RS lookup process is handled by the OS-E system within the cluster running this master service.

To use intracluster routing, you must configure the following:

1. Set the primary and backup OS-E systems that will host the least-cost-routing master.
2. Enable the lookup destination by setting the **mode** property of the session configuration **authorization** object to **local**.

The following CLI session configures intracluster routing on the OS-E master, specifying box 1 as the primary box, and box 2 and box 3 as backup boxes. It also sets the authorization mode to local.

```
NNOS-E> config master-services
config master-services> config route-server
config route-server> set admin enabled
config route-server> set host-box cluster box 1
config route-server> set host-box cluster box 2
config route-server> set host-box cluster box 3
config route-server> return
config master-services> return
config>

config> config vsp
config vsp> config default-session-config
config default-session-config> config authorization
config authorization> set mode local
config authorization> return
config default-session-config> return
config vsp> return
config>
```

Sampling

The master-services **sampling** object opens the mechanism for setting the interval at which the OS-E samples operational aspects of the system for either:

- Display in the OS-E Management System, or
- For sending to an IBM Tivoli server.

By setting sampling for a status provider, you can view data for that provider over a specified period of time. The OS-E supports two sampling targets—a Postgres SQL database and an IBM Tivoli server. (Set the provider data sent to the target using the **status** and **provider** objects. See *Net-Net OS-E – Objects and Properties Reference* for more information on configuring these objects.)

When you execute a status-provider command from the CLI, the system just displays the results of the request at the time it was issued.

Once you have enabled sampling, the master service stores the samples in its local database. You can select a status provider underneath Trends in the Status tab of the OS-E Management System. The GUI trends graphs pull data from the database on the sampling master service box to display a time series graph of the results. Changes to the interval setting in the sampling subobjects do not effect the CLI results.

Note: If you have limited storage space, and are not using this feature, disable it. Otherwise, polling data is continuously written to the status database.

CLI Session

The following CLI session enables sampling services on the OS-E master:

```
NNOS-E> config master-services
config master-services> config sampling
config sampling> set admin enabled
config sampling> set host-box cluster box 1
config sampling> set host-box cluster box 2
config sampling> set host-box cluster box 3
config sampling> set group 1
config sampling> return
config master-services> return
config>
```

Third-Party-Call-Control (3PCC)

The master-services **3pcc** (third-party-call-control) object configures call control, allowing the OS-E or a CSTA client to control (become the third party) in a call. Specifically, this object controls the WAV files that the OS-E should play and the external status events reported to an external server for calls created by the OS-E. The third-party call controller (3PCC) functionality is used, for example, to enable the interworking of a uaCSTA with the Broadworks Open Client Interface. The OS-E converts between the two call control protocols. In this way, phone control can be integrated, for example, into Microsoft Office applications via the Phone Controls interface.This object can also be enabled in certain situations involving LCS/ Sametime interworking and other advanced OS-E applications. In all cases, it should only be enabled at the direction of Technical Support.

When the OS-E functions as a 3PCC, initiating communications to each endpoint in the session, this object configures the specific WAV file(s) to play in response to the state of the call destination. Specifically, when the OS-E receives an instruction from the CSTA client to establish a call, it first makes a call to the originator of the call and then to the destination. The destination responds with call progress information. If that information indicates that the phone is ringing, and the **ringback-file** property is configured, the OS-E plays the specified file. If the phone is busy or set to appear so, the OS-E plays any configured busy-file recording.

CLI Session

The following CLI session enables third-party-call-control services on the OS-E master:

```
NNOS-E> config master-services
config master-services> config 3pcc
config 3pcc> set admin enabled
config 3pcc> set host-box cluster box 1
config 3pcc> set host-box cluster box 2
config 3pcc> set host-box cluster box 3
config 3pcc> set group 1
config 3pcc> return
config master-services> return
config>
```

Enabling Event Logging Services

The OS-E event logger allows you to configure how event messages are filtered and captured. You can direct event messages to a remote syslog server (by IP address), to a named event log file stored on the OS-E system, or to the local OS-E database.

CLI Session

The following session configures the event logger to direct event messages to a remote syslog server.

```
NNOS-E> config services
config services> config event-log
config event-log> config syslog 192.168.124.89
```

The following session configures the event logger to direct event messages to a named file and sets the event log operational parameters: direct all messages to the file, limit the event log file size to 20 Mbytes, and set the maximum number of event log files to create when log files reaches the maximum size in megabytes.

```
NNOS-E> config services
config services> config event-log
config event-log> config file eventfile1
config file eventfile1> set admin enabled
config file eventfile1> set filter all error
config file eventfile1> set size 20
config file eventfile1> set count 5
```

The following session configures the event logger to direct event messages to the local OS-E database and sets the event log operational parameters: direct only SIP messages to the local database, and set the maximum number of days over which event messages are logged to the local database before the database is cleared and restarted.

```
NNOS-E> config services
config services> config event-log
config event-log> config local-database
config local-database> set admin enabled
config local-database> set filter sip error
config local-database> set history 50
```

Configuring Threshold Monitors

The **services/monitors** configuration object allows you to monitor the following statistics and thresholds for logging and SNMP trap generation:

- CPU usage
- Memory usage
- TLS connections statistics

Polling intervals are in minutes, memory and CPU usage in percent, and TLS connections and failures in actual numbers. At the specified polling interval(s), the OS-E checks memory and CPU usage, and TLS statistics. If a parameter setting is exceeded, the OS-E logs an event and an SNMP trap.

CLI Session

```
NNOS-E> config services
config services> config monitors
config monitors> config monitor usage
Creating 'monitor usage'
config monitor usage> set interval 60
config monitor usage> set parameter cpu-usage 90
config monitor usage> set parameter memory-usage 95
config monitor usage> return
config monitors> config monitor tls
Creating 'monitor tls'
config monitor tls> set interval 30
config monitor tls> set parameter tls-connections 1000
config monitor tls> set parameter tls-failures 10
```

Configuring Data and Archiving Locations

The **services/data-locations** configuration object allows you to specify the directory and path locations on the OS-E system where you are to save certain types of information. This information includes:

- RTP media (for call recording). Use the **rtp-recorded** property to select a location on the system disk for local archiving of call detail records and call recordings.
- RTP mixed (for playback of recorded calls). Use the **rtp-mixed** property to set the location for playback of recorded calls.

- File transfer. Use the **file-transfer-recorded** property to set the location for file transfer records.
- Log files. Use the **log** property to set the location for log files.

If you choose not to create specific locations for saved files, the OS-E provides default directory path locations. For example, the directory path */cxc_common* on hard-drive-1 is the default location for recorded RTP files and file transfers. You can display the default directory file paths using the **show** command.

CLI Session

```
config> config services data-locations
config data-locations> show

services
 data-locations
  rtp-recorded[1] /cxc_common/rtp_recorded
  rtp-recorded[2] /cxc/recorded
  rtp-mixed[1] /cxc_common/rtp_mixed
  rtp-mixed[2] /cxc/mixed
  rtp-mixed[3] /cxc/admin/archives
  file-transfer-recorded[1] /cxc_common/ft_recorded
  file-transfer-recorded[2] /cxc/recorded
  log /cxc_common/log
```

The following CLI session changes the default logging path from */cxc_common/log* to */cxc/admin/logfiles*.

```
config> config services data-locations
config data-locations> set log /cxc/admin/logfiles
```

The following CLI session sets the location for "mixed" RTP files to the directory */cxc/admin/RTPmixed;* the location for storing file transfer records is set to */cxc/admin/FTrecords.*

```
config> config services data-locations
config data-locations> set rtp-mixed /cxc/admin/RTPmixed
config data-locations> set file-transfer-recorded /cxc/admin/FTrecords
```

Configuring an External Database

If you want to use a database other than the one that is provided with the OS-E system, you can configure the OS-E to use an external database to store event logs, call detail records, and other accounting data. Depending on your network remote SQL server databases, for example, can provide large storage and resource capabilities.

To configure an external database, you will need the Open Database Connectivity (ODBC) driver name associated with the database, as well the user name and secret tags (and password) needed for the OS-E to access the database. Consult your database administrator for this information before configuring the remote database on the OS-E system.

The following CLI session configures the database driver named "My SQL Server" and sets the username, secret-tag, and password/password confirmation for this database.

CLI Session

```
config> config services database external
config database external> set driver "My SQL Server"
config database external> set username cxc
config database external> set secret-tag 123
password: *********
 confirm: *********
config database external>
```

The following CLI session configures the event log to direct *snmp* events with the severity *warning* to the SQL database named *corpDatabase* for a period of 150 days. The OS-E automatically associates the external database name to the services/ database configuration.

```
config services> config event-log
config event-log> config external-database corpDatabase
config corpDatabase> set admin enabled
config corpDatabase> set filter snmp warning
config corpDatabase> set history 150
```

For more information on the services/database object, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Setting Net-Net OS-E Disk Thresholds

The **storage-device** object allows you to set warning and failure thresholds for remaining disk space on OS-E hard drives. When a disk drive reaches the configured **fail-threshold** property setting, the OS-E begins WRITE operations to the next available disk drive. Warning messages are logged (in minutes) whenever disk threshold settings are matched.

The **storage-device** object operates on all installed disk drives. If all disk drives match the configured thresholds, media call recording, file transfers, and log files will no longer be written to the OS-E disks.

Note: Currently, the OS-E systems support two 250GB internal disk drives.

The following CLI session sets the fail thresholds for all installed disk drives. Writing to that disk fails when the remaining disk space drops to 20 GB.

CLI Session

```
config> config services
config services> config storage-device
config storage-device> set fail-threshold 20000
```

Scheduling Regularly Performed Tasks

The OS-E can automatically perform tasks on a configured schedule. This means that you do not have to physically execute an action at a specific time; the OS-E does it for you. Use the **set action ?** command to display the current list of tasks from which you can choose.

The following CLI session configures a directory reset for the *Boston1* enterprise directory at 3 pm.

CLI Session

```
config> config services
config services> config tasks
config tasks> config task directoryReset
```

```
config task 1> set action ?
  archive         Run the archiving task for a given vsp
  directory-reset Reset an enterprise directory

config task 1> set action directory-reset
config task 1> set schedule time-of-day 15:00:00
```

Performing Database Maintenance

The OS-E automatically runs a database maintenance script daily, at 3:00 A.M. This "normal" database maintenance purges (removes old files preventing OS-E disks from becoming too full), "vacuums" (reclaims unused disk space), reindexes, and analyzes the database. You can also selectively schedule periodic database maintenance or force database maintenance at any time.

Along with normal daily database maintenance, Acme Packet recommends that you perform a "vacuum-full" on the database monthly to reclaim unused disk space.

This section describes how to do the following database maintenance tasks:

- Set normal maintenance time-of-day.
- Schedule periodic database maintenance.
- Force manual database maintenance.
- Perform the database "vacuum-full" process (recommended monthly, in addition to normal maintenance).

Note: As a guideline, Acme Packet recommends that you perform database archiving more frequently than database maintenance. For example, archiving on a daily basis and performing maintenance every 7-days allows records in the database to age without the risk of removing records before those records are archived.

See Enabling and Configuring Local Archiving for information.

Setting Normal Database Maintenance Time-of-Day

The OS-E automatically runs database maintenance daily, at 3:00 A.M.

If you want to change the actual time-of-day when the OS-E runs normal database maintenance, use the **master-services** database object. If old records are found, the OS-E purges those records from the database. Optionally, you can configure a time period in hours, such as every 3 hours, if you want run maintenance at multiple time periods during a 24-hour day.

CLI Session

```
config> config master-services
config> config database
config database> set maintenance time-of-day 02:00:00
```

Verifying Normal Database Maintenance

To verify that normal maintenance has successfully completed, and that a table has been vacuumed automatically, view the system log file. The log file should display a message similar to the one shown below:

```
2008-04-16T05:39:45+12:00[notice] 1:SIP[system] An automatic VACUUM
FULL was performed on database table SipMessage to reclaim 895300
unused pointers
```

Scheduling Periodic Database Maintenance

The VSP **database** object allows you to configure the number of days to elapse before the OS-E purges old records from the database. You can selectively configure the number of days for each of the following database records:

- accounting
- call details
- media
- file transfer
- instant messages

Whenever records in the database become older than the configured number of days, the next maintenance natively purges the old files. The following CLI session configures the number of days to elapse for each database record type before the OS-E deletes the old records from the system disk.

CLI Session

```
config> config vsp
config> config database
config database> set accounting-history 7 days
config database> set call-details 10 days
config database> set media-history 10 days
config database> set file-transfer-history 3 days
config database> set im-history 2 days
```

Forcing Database Maintenance

Use the **database-maintenance normal** command to run a specific database maintenance operation at any time. This forces a database cleanup of any old database entries if you did not previously configure the VSP database settings. Use the show **database-tables** command to display the database contents after the cleanup.

CLI Session

```
NNOS-E> database-maintenance normal

Starting database maintenance as a background operation.

 -- this may take a very long time --

Please check database-maintenance-status for notification when this
operation is complete.
```

Performing Database Vacuum-Full

The normal (daily) vacuum process attempts to reclaim any unused space in the database (this is analogous to a hard drive defragmentation process, but on the database files) without locking any of the tables.

The **database vacuum-full** process locks each table, one at a time, and reclaims all possible disk space. Note that a table lock prevents the table in question from being written to by an application; i.e. the OS-E.

Acme Packet recommends performing a **database vacuum-full** on a monthly basis by scheduling a "maintenance/outage window." You should only run the process during a maintenance window because the process will lock tables, preventing them from being written to by the OS-E. This can affect the ability of a DOS rule from being triggered, and at the same time, affecting call-logs, recording of accounting data, and any other data that is written to the database. (However, running **database vacuum-full** will not affect the ability of the OS-E to pass sip/media traffic, accept/delegate registrations, route calls, and perform other directly service-related tasks).

If your site is logging a large volume of data, you may wish to perform a **vacuum-full** on a more frequent (e.g. weekly) basis.

Note the following **database vacuum-full** implementation tips:

- You perform a vacuum-full on the entire database (global) using the **database vacuum-full system** command.
- You vacuum a specific table using the **database vacuum-full system <table-name>** command. For example, you may wish to use this process if the OS-E logs a message stating that a specific table needs to be vacuumed.

Performing Other Database Maintenance Tasks

You use the VSP **database** object to perform other database maintenance tasks, as described below:

- **delete**—Purges the database of entries contained in the specified database, or entries in the table within the database. The **database delete** action (without qualifiers) deletes all rows in all tables in the database.
- **vacuum**—Based on SQL's VACUUM command, reclaims storage occupied by deleted entries and makes it available for re-use. The system can read and write to the table while the process is occurring (versus more extensive **vacuum-full process** during which the table is not available for read/write operations during the process).
- **drop**—Deletes all data stored in the specified table and removes the table definition from the database schema.
- **repair**—Initiates database repair options. If you select the **data-recovery** option, the system recovers data that was removed by the OS-E when it corrected a corrupted database. The **translate** option migrates earlier databases to a format compatible with OS-E Release 3.2 and later.

- **initialize**—Deletes all data and reinitializes the database.
- **snapshot**—Captures an archive of the database at a certain point(s) in time.

Refer to the *Net-Net OS-E – Objects and Properties Reference*for full description of how to use each of these database objects.

Managing Net-Net-2600 Database Size

This section describes ways to manage the size of the OS-E database. That is, it describes ways to reduce the amount of data that is being written to the database. You may wish to try one of these procedures if your database is growing too large, or if it is responding too slowly:

- Disable the logging of REGISTER messages.
- Configure a policy to prevent logging of NOTIFY messages.

Note: Backup the current OS-E configuration before attempting any of the procedures described in this section.

Disabling REGISTER Message Logging

To disable the logging of REGISTER messages in order to reduce the amount of data store in the database, do the following steps:

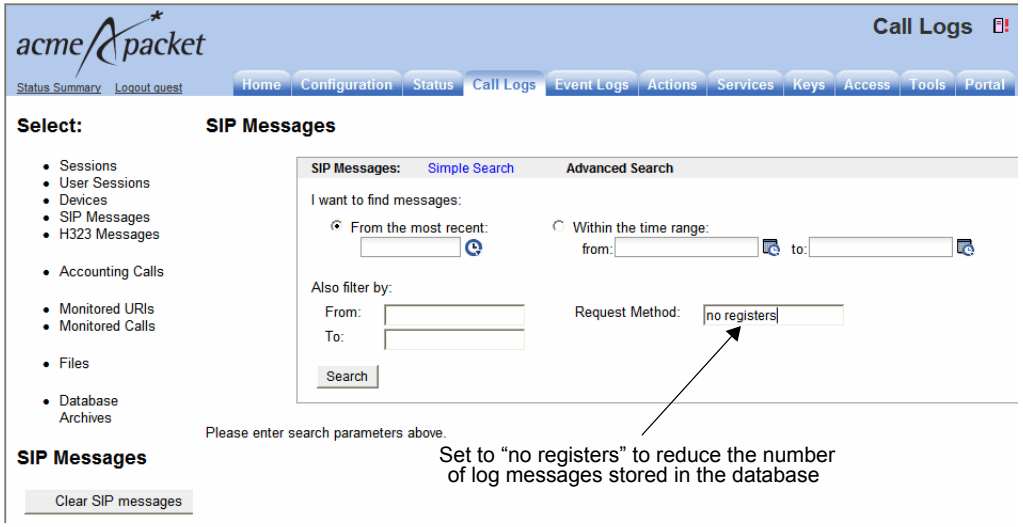
1. From the OS-E Management System, select **vsp->default-session-config-> log-alert**.
2. Set **message-logging** to **no-registers**, then click **Set** to save your changes. This change will take effect immediately.
3. Repeat Step 1 for any **session-configs** that have a **log-alert** configured (e.g. in session-config-pool entries, policies, dial/registration-plans, etc.).

To verify that REGISTER messages are no longer being logged, do the following steps:

1. From the OS-E Management System, click on the **Call Logs** tab.
2. From the left side of the window, click **SIP Messages**.
3. Click on **Advanced Search**.

4. Enter in **REGISTER** in the **Request Message** field.

   The OS-E searches for messages of type REGISTER. None should be found.



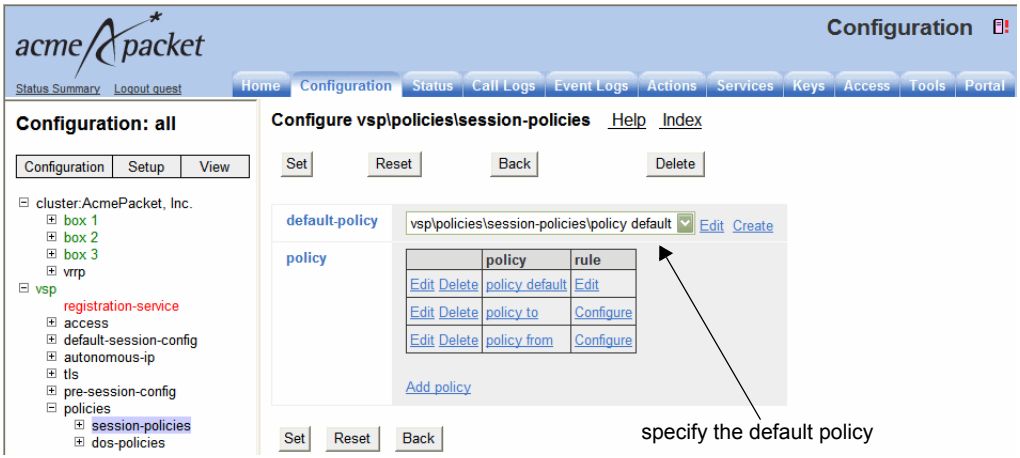
Preventing NOTIFY Message Logging

If you want to further reduce the amount of data that is being logged to the database, you can configure a policy to prevent logging of specific message types. For example, you may want to prevent the logging of NOTIFY messages that are received from phones (i.e. being received on the public IP interface). These messages are often used as “keep-alive” messages from the end device.

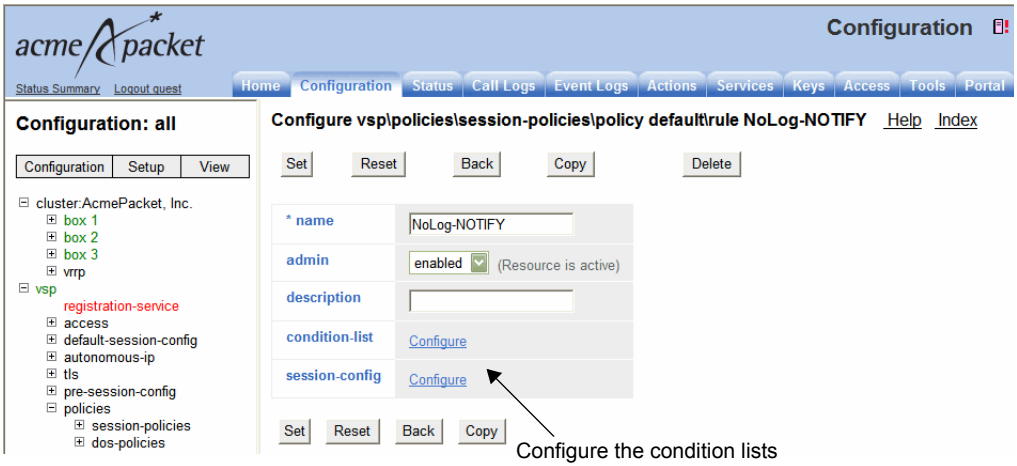
To configure a policy to prevent logging of NOTIFY messages from phones, do the following steps:

1. From the OS-E Management System, select **vsp->policies**.
2. Scroll to **session-policies**, then click **Add policy**.
3. Name the new policy “default” and then click **Create**.

If there is already a default-policy configured under **vsp->policies** skip to step 4, keeping in mind that in this example the default-policy is named "default."



4. Specify the "default" policy as your default-policy under **vsp->policies**-> **session-policies.**
5. Under **vsp->policies**-> **session-policies->policy default**, add a new rule. Name the new rule something obvious, for example, "NoLog-NOTIFY."
6. Under vsp->policies-> session-policies->policy default->rule-> NoLog-NOTIFY, configure the condition-list as follows:
   - Set the **default operation** to **AND**
   - Set the **mode** to **evaluate**



7. Under **vsp->policies-> session-policies->policy default->rule-> NoLog-NOTIFY->condition list**, add a **sip-message-condition**, as follows:
   - Set an **attribute** of **request-method**
   - Set the **match** to **match**
   - For the **request-method**, select **NOTIFY** (You could also select other SIP message types.)
8. Under **vsp->policies-> session-policies->policy default->rule-> NoLog-NOTIFY->condition list**, add a **sip-message-condition,** as follows:
   - Set an **attribute** of **local-ip**
   - Set the **match** to **match**
   - For the **local-ip**, enter the IP Address of the OS-E public interface, including the “slash” subnet mask notation. For example: 1.1.1.1/32.
9. Under **vsp->policies->session-policies->policy default->rule-> NoLog-NOTIFY->condition list**, add a **sip-message-condition**, as follows:
   - Set an **attribute** of **direction**
   - Set the **match** to **match**
   - For the **value**, select **RX**
10. Under **vsp->policies-> session-policies->policy default->rule-> NoLog-NOTIFY**, create a **session-config** container.

11. **Under vsp->policies-> session-policies->policy default->rule-> NoLog-NOTIFY->session-config**, configure a **log-alert** container, then set **message-logging** to **disabled**.

To check to see if the rule is being enforced, perform a "show rules" from the CLI. For example:

```
NNOS-E> show rules
name: policy default/rule NOTIFY
admin: enabled
evaluations: 10008082
successes: 8336316

NNOS-E> show rules
name: policy default/rule NOTIFY
admin: enabled
evaluations: 10008127
successes: 8336356
```

If the number of "successes" is increasing, then the condition-list "entry criteria" are causing SIP messages to be affected by the rule's session-config.

Backing Up the Database

The **database-backup backup** command allows you to create a backup file of the database, and save it to the OS-E.

Note: Performing the database backup procedure increases the load on the OS-E, slowing down the device. Therefore, Acme Packet recommends performing this task for debugging purposes only.

The database backup file is saved in /cxc/pg_dump/*name,* where *name* is the file name that you specify. When you enter the name for the backup database file, make certain to specify a path that begins with /cxc/pg_dump/.

For example, /cxc/pg_dump/database1 is correct. However, if you specify /cxc/database1, the operation will fail.

Note that by default the OS-E uses BZIP2 compression. This format is optimized for size, but can take longer to produce. If you would prefer to use GZIP compression, which is faster but results in a 30-40% larger archive, you can do so by supplying the **gz** suffix when you initiate the action. For example:

Enter this filename at the command line	Get an archive of this type
DBbackup	DBbackup.bz2
DBbackup.gz	DBbackup.gz

To create a database backup file and store it on the OS-E, perform the following steps:

1. Use the **show mounts** command and **shell** command to verify that you have enough storage space on the disk (preferably /mnt/hd2), as shown in the following sample CLI session:

```
NNOS-E> show mounts
device       device-name   mount-point   filesystem    disk-size  percent-free
------       -----------   -----------   ----------    ---------  ------------
cdrom        /dev/cdrom                                0          0
usb          /dev/usb1                                 0          0
hard-drive-1 /dev/root     /             reiserfs      234448     96
hard-drive-2 /dev/sdb                                  0          0
hard-drive-3

NNOS-E> shell
bash-3.00# du -sh /var/lib/pgsql
296M    /var/lib/pgsql
bash-3.00# exit
exit
```

2. Because this procedure is used most often as a debugging tool, the /cxc/pg_dump directory is not present during the initial OS-E installation. Therefore, you must create it using the **mkdir** command as shown in the following CLI session:

CLI Session

```
NNOS-E> shell
bash-3.00# mkdir pg_dump
bash-3.00# exit
exit
NNOS-E>
```

3. Execute the **database-backup backup** command, specifying a filename for the database backup file.

For example, the following CLI session creates a database backup file named **DBbackup.bz2** where **system** is the system database where call logs and accounting records are stored:

```
NNOS-E> database-backup backup system /cxc/pg_dump/DBbackup
Are you sure (y or n)?
Starting database backup as a background operation.
 -- this may take a very long time --
Please check database-maintenance-status for notification when this
operation is complete.
```

Restoring a Database

Use the **database-backup restore** command to restore a saved database backup file from the /cxc/pg_dump directory to the OS-E system.

Any restore action adds entries from that file to the database. If your goal is to overwrite the database, then you should first use the **database delete** action, and then use the **database-backup restore** action.

The following CLI session restores the backup file *backup.bz2*.

CLI Session

```
NNOS-E> database-backup restore system /cxc/pg_dump/backup
Are you sure (y or n)? y
Starting database restore as a background operation.
-- this may take a very long time --
Please check database-maintenance-status for notification when
this operation is complete.
```

Enabling and Configuring Local Archiving

Local archiving allows you to store call accounting records and media files at regular intervals on the OS-E platform before the records are removed by the database maintenance interval, as described in the previous section. Other archiving options "push" the data to alternate locations.

You can specify the types of information to store with the *include-* properties. If you do not include any of the message types, the archive will contain just the meta data (To, From, setup/connect/disconnect times, and call ID). All message types are included by default.

When archiving, the OS-E creates both a .zip file and an XML file of the archive contents. The XML file contains all of the XML data for the call except for the SIP messages. The .zip file contains the XML file and an additional file called sip.xml,which contains the SIP messages.

You enable local archiving using the **vsp\accounting\archiving object**. In addition, you must configure a server in one of the archiving sub-objects for the archiving mechanism to work.

- **windows-share**
- **ftp-server**
- **smtp-server**
- **db-server**
- **local**

The following CLI session enables archiving on the ftp server named *ftp1*.

CLI Session

```
NNOS-E> config vsp
config vsp> config accounting
config accounting> config archiving
config archiving> config ftp-server ftp1
config ftp-server ftp1> set admin enabled
config ftp-server ftp1> set username admin
config ftp-server ftp1> set password-tag xyz123abc
password: ************
confirm: ************
config ftp-server ftp1> set directory /archives
config ftp-server ftp1> set server 192.168.10.10
config ftp-server ftp1> set port 1998
config ftp-server ftp1> set timeout 100000
```

To locally archive on a scheduled basis, you need to schedule the archiving task.

```
config> config services
config services> config tasks
```

```
config tasks> config task archive
config task archive> set action archive
config task archive> set schedule time-of-day 15:00:00
```

For more information on archiving and archiving to multiple server locations away from the OS-E system, refer to Chapter 4, "Configuring Net-Net OS-E Accounting and Archiving," and the *Net-Net OS-E – Objects and Properties Reference*.

Chapter 4. Configuring Net-Net OS-E Accounting and Archiving

About This Chapter

This chapter describes the OS-E methods for capturing SIP call detail records (CDRs) and other accounting records associated with SIP sessions

Accounting System Overview

The OS-E system uses industry-standard accounting targets where SIP call detail records are forwarded. The supported accounting targets are:

- RADIUS
- Database
- Syslog
- File system
- DIAMETER
- Archiving

Accounting records are written to directories on the file system, providing a large storage queue for call records as they are written. The accounting software then reads and distributes the call records to the configured accounting target destination(s).

In the event that an accounting target is unable, call records are automatically resent when the accounting target destination(s) become available and when all targets have been updated successfully. Use the **accounting reapply** action to resend call records in the file-system that met the date range to the target regardless if they previously were sent to the target successfully (or not).

The following directory structure store accounting records prior to their distribution to the various accounting targets.

```
/cxc/accounting/
    Subdirectories:   #
        Files: #-sessionid
```

Base directory—The root location on the OS-E system for storing CDRs, such as */cxc/accounting*.

Subdirectories—A series of numbered subdirectories each containing the number of files specified by accounting **subdirectory-size** property. The naming convention is *# - sequential value*.

Files—Each entry is a discrete CDR record. The naming convention is *# - sequential value* followed by the session identifier.

As the accounting software reads and processes files in the subdirectories, it creates, updates and deletes the following status markers:

- **complete**—Indicates that the directory has been fully populated and that all of the files in the directory have been successfully processed.
- **lastprocessed**—Indicates that the directory is currently being populated and that all of the files have been processed successfully.
- **pending**—Indicates that the accounting software has selected the directory for processing and that processing has not yet begun.
- **inprogress**—Indicates the files in the directory are currently being processed.
- **reapply**—Indicates that the directory is currently being evaluated by the **accounting reapply** action.

The **services\data-locations** object contains the **accounting-root-directory** property to specify the directory where accounting records will be placed prior to being sent to the various accounting targets. The default location is the */cxc_common/accounting* directory.

Configuring the Accounting Settings

General accounting settings are available under the **vsp\accounting** configuration object.

- **admin—**Enables or disables all configured accounting targets.
- **retention-period**—Specifies how many days the accounting records should be retained before being purged from the file system. The default setting is 7. The range is 0 to 21 days.
- **subdirectory-size**—Specifies the number of records to be recorded in each of the sub-directories. The default is 1000. The range is 100 to 2000.
- **purge-criteria**—Specifies he criteria to be used when deleting records from the file system. The **purge-always** setting indicated that records should be deleted even if they have not been saved to all of the defined enabled targets. The **purge-only-when-complete** setting indicates that even expired CDRs should be retained if they have not been sent to all of the defined targets.
- **report**—Creates a named CDR summary report containing the specified field, match, and category criteria.

The **accounting purge** action forces an immediate purge and clears all CDRs on the file system that are eligible for deletion.

The **accounting reapply** action accepts a date range and selected groups and marks qualifying records on the file system back to an unprocessed state. The records are picked up and reapplied (resubmitted) to the configured accounting targets. Use this action if CDR data is lost for a selected target and the data needs to be recovered. This action is limited to data within the current retention period.

The **show accounting-status** command provides a summary of current accounting and processing information for existing targets, including any target exceptions.

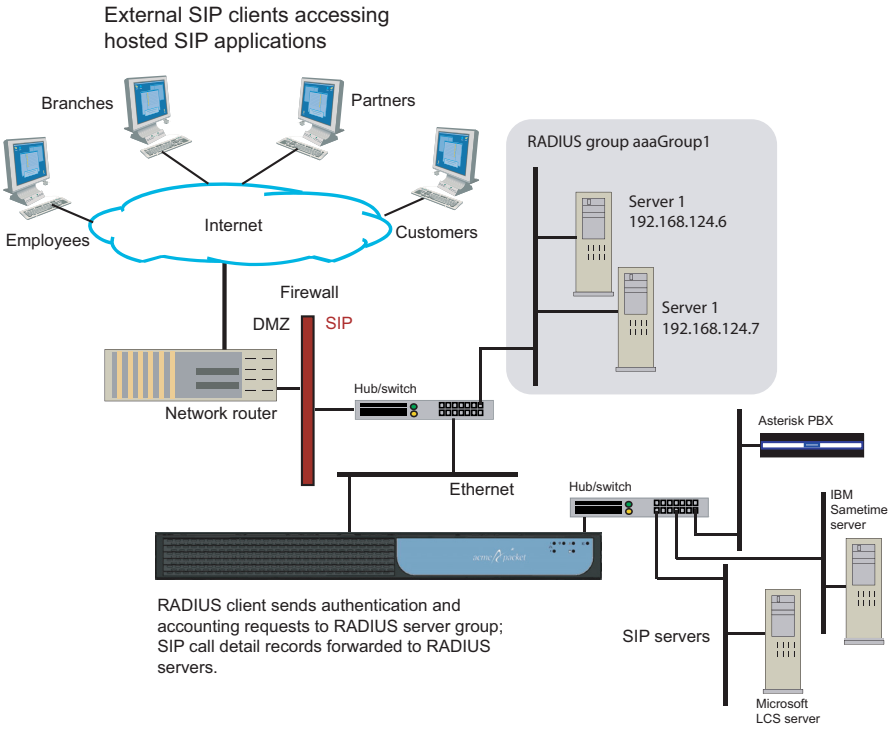
Configuring RADIUS Groups

The Remote Authentication Dial In User Service (RADIUS) implementation allows the OS-E system to operate as a RADIUS client that directs SIP call detail records to a RADIUS accounting server. The RADIUS accounting server receives the accounting request and returns a response to the client indicating that it has successfully received the request.

A RADIUS group is a uniquely named object that defines the authentication and accounting services associated with a group of RADIUS servers. Including a RADIUS group in one or more VSP configurations allows the OS-E system (the RADIUS client) to perform user authentication and forward accounting and SIP call detail records to RADIUS servers.This means that you have flexibility to create as many unique RADIUS groups as you need, and include them with the VSPs of your choice.

Within a RADIUS group, you set the RADIUS authentication and accounting modes that you are using, the type of RADIUS accounting format, and whether the RADIUS group is to be included as a default authentication and accounting group for SIP traffic that is not governed by configured authentication and accounting policies.

The following image illustrates a sample network using a RADIUS accounting group.



CLI Session

The following CLI session creates the RADIUS accounting group named **`aaaGroup1`** and sets the group operational properties.

```
NNOS-E> config vsp
config vsp> config radius-group aaaGroup1
Creating 'radius-group aaaGroup1'
config radius-group aaaGroup1> set admin enabled
config radius-group aaaGroup1> set accounting-mode duplicate
config radius-group aaaGroup1> set authentication-mode failover 3
config radius-group aaaGroup1> set type Cisco
```

In this session, the authentication and accounting modes are RADIUS operational algorithms. The duplicate algorithm issues multiple duplicate accounting requests to all servers in the RADIUS accounting group. A duplicate accounting request uses the same client source IP address and source UDP port. If you configure multiple authentication servers in the RADIUS group, the failover algorithm forwards authentication requests to secondary servers should the current authentication session fail. You can specify up to 256 failover attempts to other servers.

The default accounting method is cisco accounting, and the aaaGroup1 RADIUS group is a default group for all non-policy governed RADIUS requests between the OS-E system and the RADIUS servers.

Configuring the RADIUS Servers

You can configure multiple RADIUS servers in the RADIUS group, and you identify each server using a unique number and IP address, authentication port, accounting port, and other operational settings.

CLI Session

The following CLI session creates two numbered RADIUS servers and sets the operational properties for RADIUS requests and responses between the OS-E system and the RADIUS servers.

```
NNOS-E> config vsp
config vsp> config radius-group aaaGroup1
config radius-group aaaGroup1> config server 192.168.147.6
config server 192.168.147.6> set admin enabled
config server 192.168.147.6> set authentication-port 1800
config server 192.168.147.6> set accounting-port 1801
config server 192.168.147.6> set secret-tag abc123xyz
config server 192.168.147.6> set timeout 1500
config server 192.168.147.6> set retries 3
config server 192.168.147.6> set window 255
config server 192.168.147.6> set priority 2
config server 192.168.147.6> return

config vsp> config radius-group aaaGroup1
config radius-group aaaGroup1> config server 192.168.147.7
config server 192.168.147.7> set admin enabled
config server 192.168.147.7> set authentication-port 1800
config server 192.168.147.7> set accounting-port 1801
config server 192.168.147.7> set secret-tag abcXYZ123
config server 192.168.147.7> set timeout 1500
config server 192.168.147.7> set retries 3
config server 192.168.147.7> set window 255
config server 192.168.147.7> set priority 2
```

```
config server 192.168.147.7> return
```

For additional information on configuring RADIUS groups and servers, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Including the RADIUS Group

When you configure RADIUS groups, you include one or more groups with the VSP RADIUS accounting configuration. This tells the VSP what RADIUS servers to use when forwarding RADIUS accounting requests.

CLI Session

The following CLI session includes the RADIUS groups named **aaaGroup1** and **aaaGroup2** with the VSP RADIUS accounting configuration.

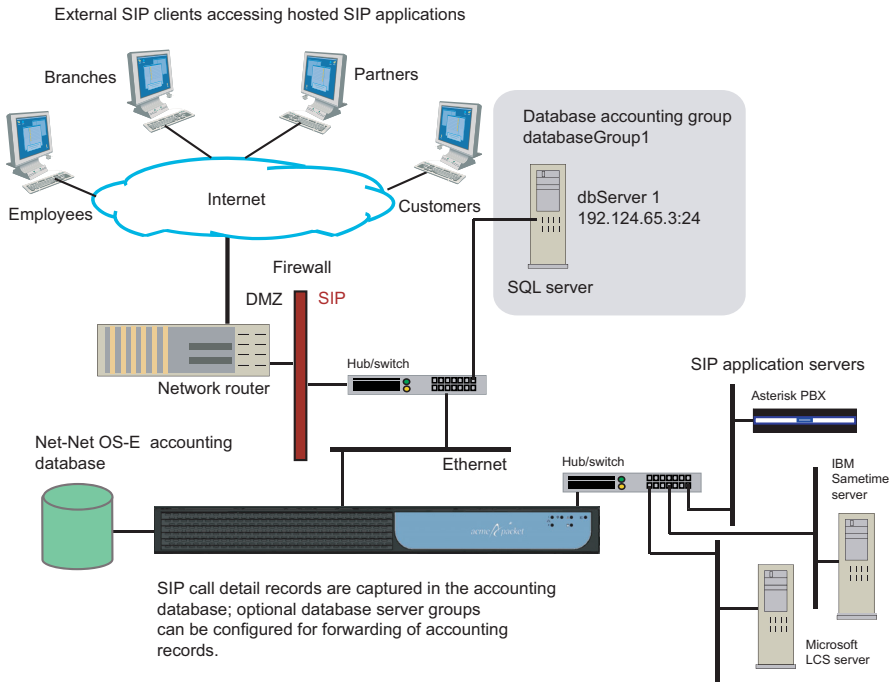
```
NNOS-E> config vsp
config vsp> config accounting
config accounting> config radius
config radius> set admin enabled
config radius> set group vsp radius-group aaaGroup1
config radius> set group vsp radius-group aaaGroup2
config radius> show

vsp
 accounting
  radius
   admin enabled
   group vsp\radius-group aaaGroup1
   group vsp\radius-group aaaGroup2
```

When using the set group command, specify the CLI path where you created the Radius group.

Configuring the Accounting Database

The OS-E accounting database is a subsystem that captures and stores SIP call detail records. If configured, these records can be forwarded to remote SQL database servers such as Oracle and Postgres where the call detail records are used with other accounting and billing applications. Access to a remote database group and server is restricted by configured user names and passwords.

Accounting policies direct SIP call detail records to specific accounting groups and servers. If you do not configure one or more remote database groups and servers, the SIP call detail records are stored in the OS-E accounting database only. The following image illustrates a sample network with a database server group.



CLI Session

The following CLI session creates the accounting database group named **`databaseGroup1`**, creates the associated server named **`dbServer1`**, and sets the group and server operating properties.

```
NNOS-E> config vsp
```

```
config vsp> config accounting
config accounting> config database
config accounting> set admin enabled
config database> config group databaseGroup1
Creating 'group databaseGroup1'
config group databaseGroup1> set admin enabled
config group databaseGroup1> set mode duplicate

config group databaseGroup1> config server dbServer1
Creating 'server dbServer1'
config group databaseGroup1> set admin enabled
config group databaseGroup1> set type sqlserver 192.124.65.3 24 srvr1
config group databaseGroup1> set username frank
config group databaseGroup1> set password-tag kj3k2
```

In this session, the duplicate mode algorithm issues a duplicate accounting request to all servers in the accounting group. A duplicate accounting request uses the same client source IP address and source UDP port. If you configure multiple database servers in the database group, the fail-over algorithm forwards one accounting request to each secondary servers should the current session fail.

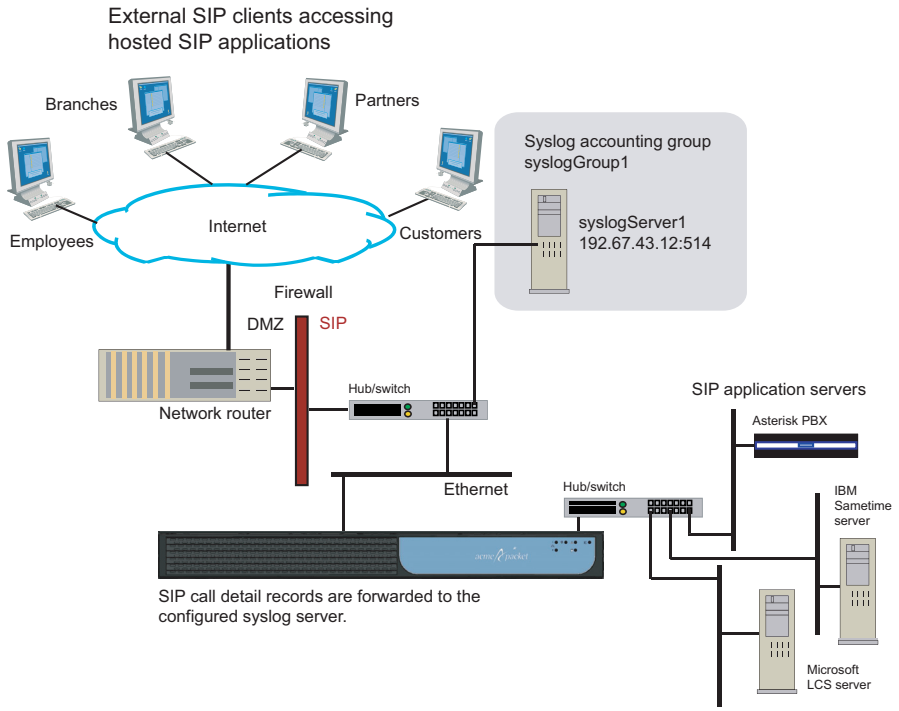
The **databaseGroup1** accounting group is a default group for all non-policy governed accounting database requests between the OS-E system and the database servers.

Note: If you set the server **type** to *local* while using the local database as the accounting target, set the **username** and the **password-tag** to *postgres*. If you edit the **username** and **password-tag** properties to anything other than *postgres*, data will not be written to the database.

For additional information on configuring accounting database groups and servers, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Configuring Syslog

Syslog allows you to log accounting information to a remote server using the configured syslog format: Acme Packet, CSV, tabular, or XML format. When enabled, SIP call detail records are forwarded to the specified syslog accounting group and server. The following image illustrates a sample network.



CLI Session

The following CLI session creates the syslog accounting group named **`syslogGroup1`**, specifies the associated syslog server at **`192.167.43.12`** on port **`514`**, and sets the syslog group and server operating properties.

```
NNOS-E> config vsp
config vsp> config accounting
config accounting> config syslog
config syslog> set admin enabled
config syslog> config group syslogGroup1
Creating 'group syslogGroup1'
config group syslogGroup1> set admin enabled
```

```
config group syslogGroup1> set format csv

config group syslogGroup1> config server 192.167.43.12:514
Creating 'server 192.167.43.12:514'
config server 192.167.43.12:514> set admin enabled
config server 192.167.43.12:514> set name syslogserver1
config server 192.167.43.12:514> set facility local0
config server 192.167.43.12:514> set priority info
config server 192.167.43.12:514> set include-timestamp true
```

In this session, **syslogGroup1** uses Comma-Separated Values (CSV) format. CSV format is a generic file format used for importing data into databases or spreadsheets, such as Microsoft Access or Excel (or several other database systems). CSV uses the .CSV file extension. The **syslogGroup1** accounting group is a default group for all non-policy governed accounting database requests between the OS-E and the syslog servers.

The syslog server at IP address and port **192.67.43.12:514** is enabled with the operator-defined name **syslogserver1**. The facility (local0 to local7) specifies where SIP call detail records are logged. Syslog facilities help isolate the origin of messages written to the syslog server. The syslog priority (info, emergency, alert, etc.) sets the message priority to be associated SIP call detail records. All OS-E accounting and SIP call detail records are assigned this priority before they are forwarded to the syslog server. A time stamp can also be applied to each accounting record.

For additional information on configuring accounting database groups and servers, refer to the *Net-Net OS-E – Objects and Properties Reference*.

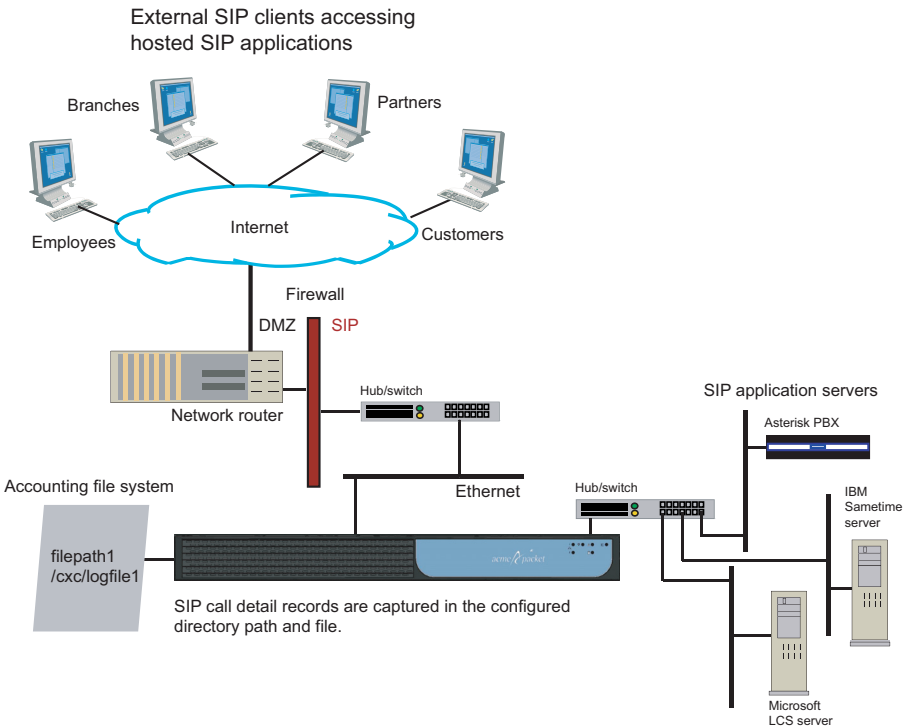
Configuring the File System

The accounting file system allows you to direct SIP call detail records to a named directory path and file using a specified format: CSV, tabular., Acme Packet text file format, or to a temporary output file in the case of postgres format.

There are two states that the file system cycles through as it processes raw CDRs and writes to the output file.

- Clear—The target is ready to write.
- Writing—The target is writing to the output file.

The following image illustrates a sample network.



CLI Session

The following CLI session creates the file system group named **filePath1,** specifies the format, file path, and target file name, and sets the file system operational properties.

```
NNOS-E> config vsp
config vsp> config accounting
config accounting> config file-system
config file-system> set admin enabled
config file-system> config path filePath1
Creating 'path filePath1'
config path> set admin enabled
config path> set format csv
config path> set call-field-filter recorded
config path> set file-path \cxc\logfile1.csv
config path> set roll-over never
config path> set purge-old-logs true
config path> set retention-period 1 days
```

In this session, **filePath1** uses Comma-Separated Values (CSV) format. CSV format is a generic file format used for importing data into databases or spreadsheets, such as Microsoft Access or Excel (or several other database systems). CSV uses the .CSV file extension. The OS-E target file path is **\cxc\logfile1.csv**, where **logfile1.csv** is the name of the file to which SIP call detail records are forwarded.

The **roll-over** property maintains and keeps the original time as it was first applied to the log file. The log file will continue to build under this time stamp. The **filePath1** file system accounting group is a default target group for capturing all non-policy governed SIP call detail records.

For additional information on configuring accounting database groups and servers, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Configuring an External File System Target

The external-file-system target allows you to send accounting records from the OS-E to a remote system. The target is able to read raw CDRs and write this information to a temporary output file in the format you specify during configuration.

There are four states that the external target cycles through as it processes raw CDRs, writes to the output file, and sends it to the remote system.

- Clear—The target is ready to write.

- Writing—The target is currently writing to the temporary file.
- Sending—The target is sending a file. At this time, the file can also be writing to a temporary file that will become the next file to send once the current file is successfully sent.
- Blocked—The target has one file in the middle of sending and another one ready to send. The target will not process anymore requests from the accounting server, but will send retries to the server giving retry interval based on its best estimate of when the retry can work.

If the configuration is modified or deleted, any files currently being processed are sent immediately and without retries. If the target is in the blocked state, there are two files immediately sent and if the target is in the sending or writing states, one file is sent. The modification or deleted is applied only after the send completes, successfully or not.

If there is a failure when sending a file to the external target, the send is retried every 30 seconds for an hour. After an hour, the send is retried once every hour until it succeeds.

The following is the format of the output file:

```
<target-name>-<yyyy-mm-dd-hh-mm>-<processingtype>-<seq-no>.<xtn>
```

- target-name—Name specified in the configuration.
- yyyy-mm-dd-hh-mm—The timestamp when the output file is created.
- processingtype—Hourly, daily, never.
- xtn—.csv, .tab, .cov, or .pg

CLI Session

The following CLI session creates the external file system target, sets the target format, URL address, and CDR processing.

```
NNOS-E>config vsp
config vsp>config accounting
config accounting>config external-file-system
config external-file-system>config url 7
Creating 'url test'
config url 7>
config url test>set admin enabled
config url test>set format csv
```

```
   config url test>set url ftp://lalenchery:BillGates#1@10.33.5.10:/
acct/test/
   config url test>set cdr-processing batch 10
   config url test>
```

For additional information on configuring external file system targets, refer to the *Net-Net OS-E — Objects and Properties Reference Guide*.

Configuring Diameter

The Diameter protocol, as described in RFC 3588, provides Authentication, Authorization and Accounting (AAA) services for applications such as IP mobility and SIP multimedia communications sessions. An OS-E system (SIP proxy), operating as Diameter client, sends an accounting request to the Diameter server where the Diameter server returns an accounting response to the Diameter client indicating that it has received and processed the accounting request.

Diameter is also an essential component for the Acme Packet route-server functionality. Refer to the *Net-Net OS-E – Session Services Configuration Guide* for detailed information on route-server.

Creating the Diameter Accounting Group

Like RADIUS, a Diameter group is a uniquely named object that defines the authentication and accounting services associated with a group of Diameter servers. Including a Diameter group in one or more VSP configurations allows the OS-E system (the Diameter client) to perform user authentication and forward SIP call detail records to Diameter servers.This means that you have flexibility to create as many unique Diameter groups as you need, and include them with the VSPs of your choice.

CLI Session

The following CLI session creates the Diameter accounting group named **`diameterGroup1`** and sets the group operational properties.

```
NNOS-E> config vsp
config vsp> config diameter-group 1
Creating 'diameter-group 1'
config diameterGroup1> set admin enabled
config diameterGroup1> set authentication-mode round-robin
config diameterGroup1> set application sip
```

```
config diameterGroup1> set origin-host text
config diameterGroup1> set origin-realm text
config diameterGroup1> set default-destination-realm text
```

In this session, the **authentication-mode**, sets the Diameter group authentication operational algorithm. This example allows continued authentication requests to primary and secondary servers until a valid authentication response is received (round-robin).

The **application** setting specifies the target application for the servers in this Diameter group. Choose **SIP** for standard AAA activities, **3GPPRx** for inter-operation with the Camiant policy server (enabled with the Rx object), and **Routing** for least-cost-routing between clusters.

The **origin-host** specifies the text written to the Origin-Host attribute field in any Diameter *requests* it sends. This should be the OS-E domain name.

The **origin-realm** specifies the text written to the Origin-Realm attribute field in any Diameter requests it sends. This should be the OS-E domain name.

The **default-destination-realm** specifies the text written to the Destination-Realm attribute field in any Diameter responses it sends. This setting operates with the 3Gpp Rx application.

Configuring Diameter Servers

You can configure multiple Diameter servers in the Diameter group, and you identify each server using a unique name, authentication port, and other operational settings.

CLI session

The following CLI session creates two numbered Diameter servers and sets the operational properties for Diameter requests and responses between the OS-E system and the Diameter peers.

```
NNOS-E> config vsp
config vsp> config diameter-group 1
Creating 'diameter-group 1'
config diameterGroup1> set admin enabled
config group diameterGroup1> config server diameterServer1
Creating 'server diameterServer1>
config diameterServer 1> set admin enabled
config diameterServer 1> set port 3868
config diameterServer 1> set transport tcp
```

```
config diameterServer 1> set authentication-port 3868
config diameterServer 1> set request-timeout 2
config diameterServer 1> set window 8
config diameterServer 1> set priority 1

NNOS-E> config vsp
config vsp> config diameter-group 1
Creating 'diameter-group 1'
config diameterGroup1> set admin enabled
config group diameterGroup1> config server diameterServer2
Creating 'server diameterServer2>
config diameterServer 2> set admin enabled
config diameterServer 2> set port 3868
config diameterServer 2> set transport tcp
config diameterServer 2> set authentication-port 3868
config diameterServer 2> set request-timeout 2
config diameterServer 2> set window 8
config diameterServer 2> set priority 1
```

For additional information on configuring Diameter groups and servers, refer to the *Net-Net OS-E – Objects and Properties Reference*.

Configuring Diameter Interfaces and Ports

The **diameter** configuration object under the **box\interface\ip object** identifies the IP interface on which the Diameter server application resides. This is the OS-E interface that listens for incoming Diameter connections. This interface must be configured on each OS-E domain that is referenced by a server in a Diameter group.

CLI Session

```
config box> config interface eth3
config interface eth3> config ip A

config ip A> config diameter
config diameter> set admin enabled
config diameter> set origin-host text
config diameter> set origin-realm text

config diameter> config port 3868
Creating 'port 3868'
config port 3868> set admin enabled
config port 3868> set transport tcp
config port 3868> set application sip
config port 3868> set peer-access-control transport
config port 3868> set peer ipaddress
```

The **origin-host** setting specifies the text written to the Origin-Host attribute field in any Diameter *responses* it sends. This should be the DNS name of the OS-E domain you are configuring.

The **origin-realm** specifies the text written to the Origin-Realm attribute field in any Diameter *responses* it sends. This should be the OS-E domain name.

The **port** configuration specifies properties for incoming Diameter connections. The **application** setting sets the application that the incoming connection must be running to use this port. Choose **SIP** for standard AAA activities, **3GPPRx** for inter-operation with the Camiant policy server (enabled with the Rx object), and **Routing** for least-cost-routing between clusters.

The **peer-access-control** setting specifies how the OS-E controls incoming peer connections. You can select to allow incoming connection from all peers or from peers on a configured list based on address or Host-IP-Address AVP.

The **peer** setting specifies the list of peers that are allowed to connect to this port. This property is not applied if the peer-access-control property is set to **none.** Indicate the peer by specifying the peer IP address.

Configuring Archiving

The **accounting/archiving** object allows you to configure an archiving location for SIP call detail records. Archiving is the persistent storage of the contents of the call (as opposed to the database or syslog server, which just records the placement of the call).

You must configure an archiving server in one of the archiving sub-objects for the archiving mechanism to work:

- **windows-share**—Archiving of accounting and SIP call records to a selected Windows server partition
- **ftp-server**—Archiving of accounting and SIP call records to a selected FTP server
- **http-server**—Archiving of accounting and SIP call records to a selected HTTP server

- **smtp-server**—Enables archiving of accounting and SIP call records to a selected Simple Mail Transfer Protocol (SMTP) server. When enabled, the OS-E sends out the archives in the form of an email attachment to the specified destination mailbox.
- **db-server**—Archiving of accounting and SIP call records to a selected database server
- **local**—Archiving of accounting and SIP call records to a location on the OS-E system

The following CLI session configures a remote database server for archiving of SIP call detail records.

CLI Session

```
NNOS-E> config vsp
config vsp> config accounting
config accounting> config archiving
config archiving> config db-server database1
Creating 'db-server database1'
config db-server database1> set admin enabled
config db-server database1> set username admin
config db-server database1> set password-tag xyz123abc
config db-server database1> set server 192.168.10.10
config db-server database1> set url www.companyABC.com
config db-server database1> set driver-class com.oracle.jdbc.Driver
```

If you are archiving using the **http-server** method, a server-side script designed to be run with Apache 2.0 and perl 5.8.5 on Linux is needed to handle the POST requests that are sent from the OS-E to transfer the archive zip files to the server. The following is an example:

```
#!/usr/bin/perl
#---Modify the above line to match the location of perl on your system---

#---This script has been tested running with OS-E software version 3.5.2
    sending
#to Apache 2.0.52 running on Redhat EL4 Linux with perl 5.8.5---

#---Make sure to modify file permissions for this script so that it can
#be executed by the user running the httpd daemon.---

#---Note this script is provided as an example, which makes no attempt to
    validate
#the values pulled from the HTTP POST to ensure execution security---

#---Require strict syntax---
use strict;
use warnings;
```

```
#---Use the CGI library provided with perl - CGI.pm---
use CGI;
#---The below lines are an example of code, provided as-is, used to take
#the multipart/form-data from an HTTP POST to this script, which
#apache presents on STDIN and write it out to the disk in the
#directory specified in the variable above, using the same filename
#presented in the HTTP POST---

#---Instantiate CGI object---
my $cgi = new CGI;
my %params = $cgi->Vars;

#---Get proper filehandle from unknown file param name---
my $filehandle;
my $anon_param;
foreach my $param (keys %params) {
$anon_param = "$params{$param}" if (("$param" ne "name") && ("$param" ne
    "path"))
};

$filehandle = $cgi->param($anon_param);

#---Pull target directory from "path" cgi variable; this comes from the
    "directory"
#in the OS-E config. Note: leave off the trailing slash------

#---Make sure to modify file permissions for target directory so that it can
#be executed and written to by the user running the httpd daemon.---
my $dir = $cgi->param('path');
#---Pull target filename from "name" cgi variable
#---Assemble directory and filename---
my $name = $cgi->param('name');
my $fullname = "$dir/$name";

#---Write out the file from the HTTP POST---
open(LOCAL, ">$fullname") or die $!;
binmode LOCAL;
while(<$filehandle>) { print LOCAL $_; }
close(LOCAL);

#---Needed for 200OK response---
print $cgi->header( "text/plain" ), "File received.";
```

The following example displays the way the OS-E must be configured for the http-server archiving to work:

```
   config archiving> config http-server server1
   config http-server server1> set admin enabled
   config http-server server1> set directory /tmp/archives
   config http-server server1> set url http://10.0.0.1/cgi-bin/
archive_http_upload_example.pl
   config http-server server1> set timeout 60000
```

- The server needs to be configured to allow CGI scripts.
- The script needs to be placed in the “cgi-bin” directory and given execute permission for the user running the server.
- The URL needs to include the name of the script.

- The directory needs to have “write” permissions for the user running Apache. This argument gets passed through the HTTP POST to the scripted. It is used to determine to which directory on the server the archive file is written.

For additional information on archiving accounting records, refer to the *Net-Net OS-E – Objects and Properties Reference*.

The OS-E also supports archiving as an accounting target, configured under the **accounting** object. Archiving targets can be configured as either **archive-local** or **archive-external**.

Once the archiving functionality is enabled and configured on the OS-E, the archiver listens for requests from the accounting server. A request from the server tells the archiver that there are calls that needs to be archived. The archiver creates a task for each CDR. This task gathers data to put in the archive by executing actions and status requests and querying databases.

The archiving target cycles through two states:

- Clear—The target is ready to handle requests.
- Blocked—The target has reached the maximum number of files it can save. You must remove saved archives to enable the target to start processing again.

When the OS-E sends an archive to a remote location and the send fails, the OS-E retries sending the archive as many times as it is configured to do so. If all retries fail, the OS-E saves the archive in the archive-save-folder and logs a message similar to the following.

```
Warning: “Target archive-test, saved 1234.zip containing records 1000
   to 1000 as /cxc_common/archive/saved/1234.zip (failure was: Connect
   timed out)”
```

You can configure the number of archives that can be saved in the archive-save-folder via the **max-saved-on-send-failure** property under the archive-external and archive-local objects. Once the OS-E hits this threshold, the target enters the “Blocked” state and stops processing any more CDRs until the saved archives are removed from the folder. When this condition is reached, the OS-E logs a message similar to the following:

```
Critical: “Target archive-test cannot process any more CDRs because
   the maximum of 200 archives that can be saved locally on failure is
   met or exceeded. Delete saved archives to enable further
   processing.
```

Note that the number of saved archives may be slightly higher than the configured number. This is because archives are not created in order and it is possible that some newer CDRs finished processing earlier than the archive that finally blocked the target.

Due to accounting server purges, there may be missing CDRs. The OS-E handles missing records by skipping over them and continuing the process. Missing records are logged and can be viewed in the status provider.

During an HA failover, the target on the new master OS-E picks up from where the previous master OS-E left off.

You configure the archiving targets under the **vsp > accounting** object.

```
vsp
 accounting
  admin enabled
  duration-type default
  retention-period 0 days 00:01:00
  subdirectory-size 100 records
  purge-criteria purge-always
  radius
  database
  syslog
  file-system
  external-file-system
  archiving
  purge-check-interval 0 days 01:00:00
  purge-disk-utilization-percent 90 %
  archive-local
  archive-external
archive-worker-threads automatic
  archive-max-inprogress 120
  archive-tries 2
  archive-name-format[1] recordID
  compatible-archives false
  server-idle-timeout 300
```

For more information on the new archiving configuration properties, see the *Net-Net OS-E Objects and Properties Reference Guide*.

The target can then be applied to a session-config via the **session-config > accounting** object.

```
config vsp>config default-session-config
config default-session-config>config accounting
config accounting>set target archive-external-file-system
    "vsp\accounting\archive-external\url""archivetest""
```

You can view information regarding archive targets using the following status providers.

The **show accounting-targets** action is a previously existing status provider that displays summary data from all accounting targets. This status action now includes archiving targets.

```
NNOS-E>show accounting-targets

                  type: archive-external
                  name: url archive-day1
              received: 641 CDRs
             processed: 641 CDRs
              failures: 0
        missing-records: 0
      last-acked-record: 1495276
   acked-pending-record: 1495276
average-processing-time: 2278 milliseconds/CDR
```

The **show accounting-targets-archive-tasks** action displays information about currently running archiving tasks on the OS-E.

```
NNOS-E>show accounting-targets-archive-tasks

name record               errors     in-progress
------                 ------     -----------
nnose-backup                       1170995             2          (send)
nnose-backup                       1171000             2          (send)
nnose-backup                       1171001             2          (send)
```

For more information on these status providers, see the *Net-Net OS-E Objects and Properties Reference Guide*.

Free-Form Accounting for CDRs

The OS-E supports free-form accounting for CDRs, meaning you have the ability to completely customize the list of columns created in CDRs by using the session-config's named variable table. These custom CDRs are supported for all accounting target types except internal database.

You still have the ability to use the pre-existing (default) accounting record columns. This is the OS-E's default behavior. Each target type supports both forms of accounting, but each individual target can have only one or the other. A target can have either the default accounting fields or custom accounting fields.

This feature differs from the existing CDR custom data fields because you create all of the columns yourself. In releases previous to 3.6.0m5, you could only get existing fields and filter those that you did not want. There also existed one column named **custom-field** that contained user-specified data.

To enable free-form accounting for CDRs:

1. Select the **Configuration** tab and click the **vsp > accounting** object.
2. Click **Configure** next to the type of target for which you want to create free-form accounting.
3. **admin—**Set to **enabled** and provide either a **group** or a **path** for the target (depending on which type of target you are configuring).
4. **custom-accounting**—Set to **enabled**.

   NOTE: The **custom-accounting** property overrides the **call-field-filter** property, where you configure the default accounting records.
5. Click **Set**. Update and save the configuration.

To create free-form CDRs, one mechanism to populate free-form CDRs is to use named variables in the session-config. Named variables can be added to sessions on the OS-E in multiple ways. They can be added via the **session-config > named-variables** object. For more information on configuring named-variables in the session-config, see Configuring Session Configuration Objects in the *Net-Net OS-E Objects and Properties Reference Guide*.

Named-variables can also be added via the **named-variable-add** action. For more information on this action, see the Named Variable Actions section of this guide.

The OS-E offers a list of pre-defined variables for you to use in free-form CDRs. These can be broken down into three types: **acct**, **cdr**, and **session**.

The **acct** class of named variables is derived from items that are already available through the **accounting-data > custom-data-field**.

Available variables for this class are:

- **$acct.box-id**—The box ID.
- **$acct.digest-realm**—The digest realm.
- **$acct.source-lnp**—The source LNP.

- **$acct.destination-lnp**—The destination LNP.
- **$acct.diversion-header**—The diversion header.
- **$acct.cluster-name**—The cluster name.
- **$acct.radius-caller-id**—The radius caller ID.
- **$acct.request-id**—The request ID.
- **$acct.connected**—The connected boolean.
- **$acct.scan-time**—The file scan time.
- **$acct.file-time**—The file time.
- **$acct.play-time**—The file play time.
- **$acct.disconnect-reason**—The disconnect reason.
- **$acct.final-reason-code**—The last response code.
- **$acct.post-dial-digits**—The post-dial digits.
- **$acct.source-leg-current-jitter**—The source leg's current jitter.
- **$acct.source-leg-max-jitter**—The source leg's maximum jitter.
- **$acct.destination-leg-current-jitter**—The destination leg's current jitter.
- **$acct.destination-leg-max-jitter**—The destination leg's maximum jitter.
- **$acct.source-leg-rtcp-max-jitter**—The source leg's RTCP maximum jitter.
- **$acct.destination-leg-rtcp-max-jitter**—The destination leg's RTCP maximum jitter.
- **$acct.source-leg-avg-jitter**—The source leg's RTCP average jitter.
- **$acct.destination-leg-rtcp-avg-jitter**—The destination leg's RTCP average jitter.
- **$acct.source-leg-rtcp-packets-lost**—The source leg's RTCP packets lost.
- **$acct.desination-leg-rtcp-packets-lost**—The destination leg's RTCP packets lost.
- **$acct.source-leg-rfactor**—The source leg's RFactor based on RTCP statistics.
- **$acct.destination-leg-rfactor**—The destination leg's RFactor based on RTCP statistics.

- **$acct.source-leg-mos**—The source MOS based on RTCP statistics.
- **$acct.dest-leg-mos**—The destination MOS based on RTCP statistics.

The **cdr** class of named variables is derived from the existing, default CDR values.

Available variables for this class are:

- **$cdr.session-id**—The unique internal session-ID.
- **$cdr.recorded**—An indicator as to whether the call was recorded or not.
- **$cdr.call-id**—The unique call ID from the user agent.
- **$cdr.to**—The To: URI.
- **$cdr.from**—The From: URI.
- **$cdr.method**—The SIP method that initiated the session.
- **$cdr.incoming-request-uri**—The request URI for the incoming leg.
- **$cdr.previous-hop-ip**—The IP address of the previous hop.
- **$cdr.previous-hop-via**—The Via: header for the previous hop.
- **$cdr.outgoing-request-uri**—The request URI for the outgoing leg.
- **$cdr.next-hop-ip**—The IP address of the next hop.
- **$cdr.next-hop-dn**—The domain name of the next hop.
- **$cdr.header**—An arbitrary header from the call.
- **$cdr.origin**—The origin header from the call.
- **$cdr.setup-time**—The time at which the call was set up.
- **$cdr.connect-time**—The time at which the call was connected.
- **$cdr.disconnect-time**—The time at which the call was disconnected.
- **$cdr.disconnect-cause**—The reason for the disconnection.
- **$cdr.duration**—Duration of the call in seconds.
- **$cdr.scp-name**—The VSP that handled the call.
- **$cdr.call-id-2**—The secondary call ID for the outgoing call.
- **$cdr.originating-gateway**—The origin Gateway.
- **$cdr.terminating-gateway**—The terminating Gateway.

- **$cdr.packets-received-on-src-leg**—The number of packets received on the source leg.
- **$cdr.packets-lost-on-src-leg**—The number of packets lost on the source leg.
- **$cdr.packets-discarded-on-src-leg**—The number of packets discarded on the source leg.
- **$cdr.pdv-on-src-leg**—The average jitter on the source leg.
- **$cdr.max-jitter-on-src-leg**—The maximum jitter on the source leg.
- **$cdr.codec-on-src-leg**—The codec on the source leg.
- **$cdr.mimetype-on-src-leg**—The mimetype on the source leg.
- **$cdr.latency-on-src-leg**—Average latency on the source leg.
- **$cdr.max-latency-on-src-leg**—Maximum latency on the source leg.
- **$cdr.packets-received-on-dest-leg**—The number of packets received on the destination leg.
- **$cdr.packets-lost-on-dest-leg**—The number of packets lost on the destination leg.
- **$cdr.packets-discarded-on-dest-leg**—The number of packets discarded on the destination leg.
- **$cdr.pdv-on-dest-leg**—The average jitter on the destination leg.
- **$cdr.max-jitter-on-dest-leg**—The maximum jitter on the destination leg.
- **$cdr.codec-on-dest-leg**—The codec on the destination leg.
- **$cdr.mimetype-on-dest-leg**—The mimetype on the destination leg.
- **$cdr.latency-on-dest-leg**—Average latency on the destination leg.
- **$cdr.max-latency-on-dest-leg**—Maximum latency on the destination leg.
- **$cdr.rfactor-on-dest-leg-times-1000**—The Rfactor on the destination leg.
- **$cdr.rfactor-on-src-leg-times-1000**—The Rfactor on the source leg.
- **$cdr.mos-fmt-on-dest-leg**—The MOS formatted on the destination leg.
- **$cdr.mos-fmt-on-src-leg**—The MOS formatted on the source leg.
- **$cdr.mos-on-dest-leg**—The MOS on the destination leg.
- $**cdr.mos-on-src-leg**—The MOS on the source leg.

- **$cdr.call-type**—The call type.
- **$cdr.disconnect-error-type**—The disconnect error type.
- **$cdr.ani**—The ANI.
- **$cdr.call-source-regid**—The source registration ID.
- **$cdr.call-dest-regid**—The destination registration ID.
- **$cdr.new-ani**—The new ANI.
- **$cdr.cdr-type**—The CDR type.
- **$cdr.hunting-attempts**—The number of hunting attempts.
- **$cdr.call-pdd**—The call PDD.
- **$cdr.call-source-realm-name**—The source realm name.
- **$cdr.call-dest-realm-name**—The destination realm name.
- **$cdr.call-dest-cr-name**—The destination CR name.
- **$cdr.inleg-peer-dest**—The in-leg peer destination.
- **$cdr.inleg-anchor-source**—The in-leg anchor source.
- **$cdr.inleg-anchor-dest**—The in-leg anchor destination.
- **$cdr.inleg-peer-sourcet**—The in-leg peer source.
- **$cdr.outleg-peer-dest**—The out-leg peer destination.
- **$cdr.outleg-anchor-source**—The out-leg anchor source.
- **$cdr.outleg-anchor-dest**—The out-leg anchor destination.
- **$cdr.outleg-peer-source**—The out-leg peer source.
- **$cdr.called-party-after-src-calling-plan**—The called party after source calling plan.
- **$cdr.last-status-message**—The last status message.
- **$cdr.last-pkt-timestamp-on-dest-leg**—The time of the last media packet on the destination leg.
- **$cdr.last-pkt-timestamp-on-src-leg**—The time of the last media packet on the source leg.
- **$cdr.setup-time-integer**—The setup-time as an integer.

- **$cdr.incoming-uri-stripped**—The stripped down version of the incoming request URI.
- **$cdr.dnis**—The DNIS.
- **$cdr.new-dnis**—The new DNIS.
- **$cdr.custom-data**—The custom data.
- **$cdr.creation-timestamp**—The time the accounting record was written to the target.

The **session** class of named variables is derived from the current session

Available variables for this class are:

- **$session.session-id**—The session-ID for this session.
- **$session.request-id**—The request ID for this session.
- **$session.caller-id**—The caller ID for this session.
- **$session.diversion-header**—The diversion-header for this session.
- **$session.pcharging-vector**—The p-charging-vector for this session.
- **$session.digest-realm**—The digest realm for this session.
- **$session.source-lnp**—The source LNP for this session.
- **$session.destination-lnp**—The destination LNP for this session.

Once you have the named-variables configured in the session-config, you can add them to your free-form CDRs. You can add named-variables to free-form CDRs via the **accounting > targets > named-variable-entries** property.

To add named-variables to free-form CDRs:

1. Access the **vsp > accounting > <*target*> > named-variable-entries** object where you have the **custom-accounting** property set to **enabled**. Click **Configure** next to **named-variable-entries**.

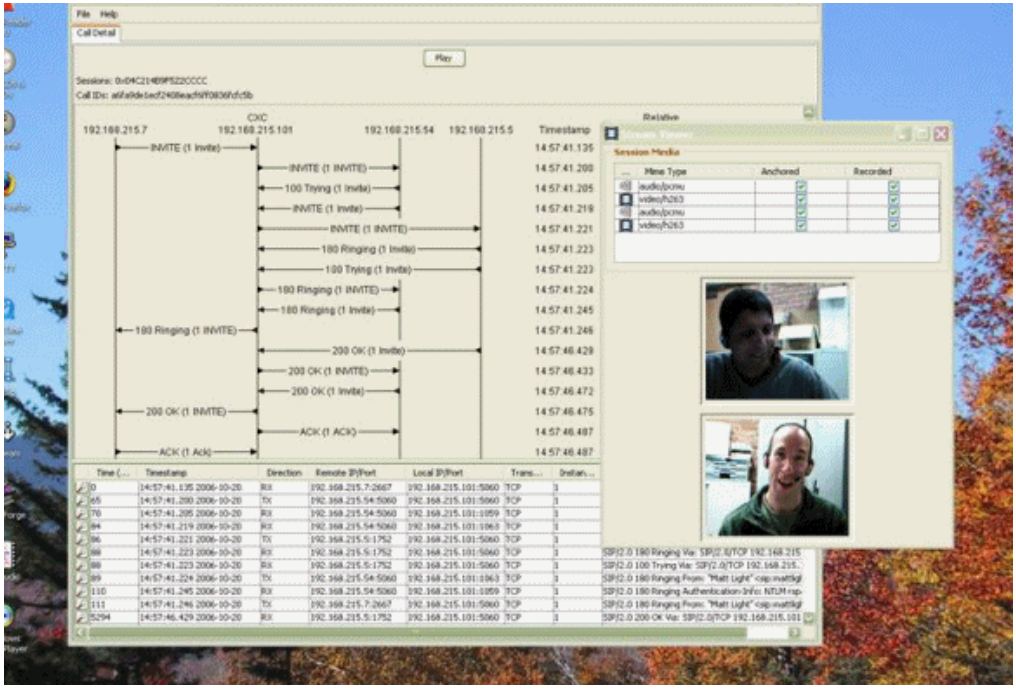
   Or, access the **vsp > session-config-pool > entry > accounting-data** object and click **Add named-variable-entry**.
2. Click **Add entry**.
3. From the **variable-name** drop-down list, select the named-variable to include.

4. **display-name**—Enter the name you want to be displayed for this column. This value is required if the accounting target is a database and the display-name complies with the column name rule of the corresponding database.
5. Click **Create**. Repeat this process for as many named-variables as you want to include.
6. Click **Set**. Update and save the configuration.

Using the Net-Net OS-E Archive Viewer

The archive viewer is a standalone utility that displays information and plays video recordings from archive files that have been stored locally on a client PC. The viewer allows you to see the call diagram and message details without having to run the OS-E Management System.

The following image illustrates a sample Archive Viewer display.



The Archive Viewer is contained in a ZIP file included with the OS-E release software. The file is named **nnSE360-av.zi**p.

Perform the following steps on a Windows PC, which is the only supported platform for the Archive Viewer:

1. Download the **nnSE360-av.zi**p file to a location on your PC. The file is available from the Acme Packet support site.
2. Double-click the .ZIP file, then select **Extract All**. A separate folder will be created using the same name, minus the .ZIP extension.
3. Open the folder that you just created, then double-click the **nnSE360-av.exe** file. This will launch the Archive Viewer.
4. Select **File->Open Archive**, or **File->Stream Viewer** to browse for the archived file. The Stream Viewer replays and mixes the two audio streams (one in each direction) with the video streams (one in each direction).

Note: You must configure the OS-E with both accounting and media recording enabled. You can enable archiving to periodically send the recorded files to a workstation, or you can create individual session archives on demand from the OS-E Management System **Call Logs** screen.

Chapter 5. Configuring Domain Name Systems (DNS)

About This Chapter

This chapter covers DNS configurations on the OS-E system.

Domain Name System (DNS) Overview

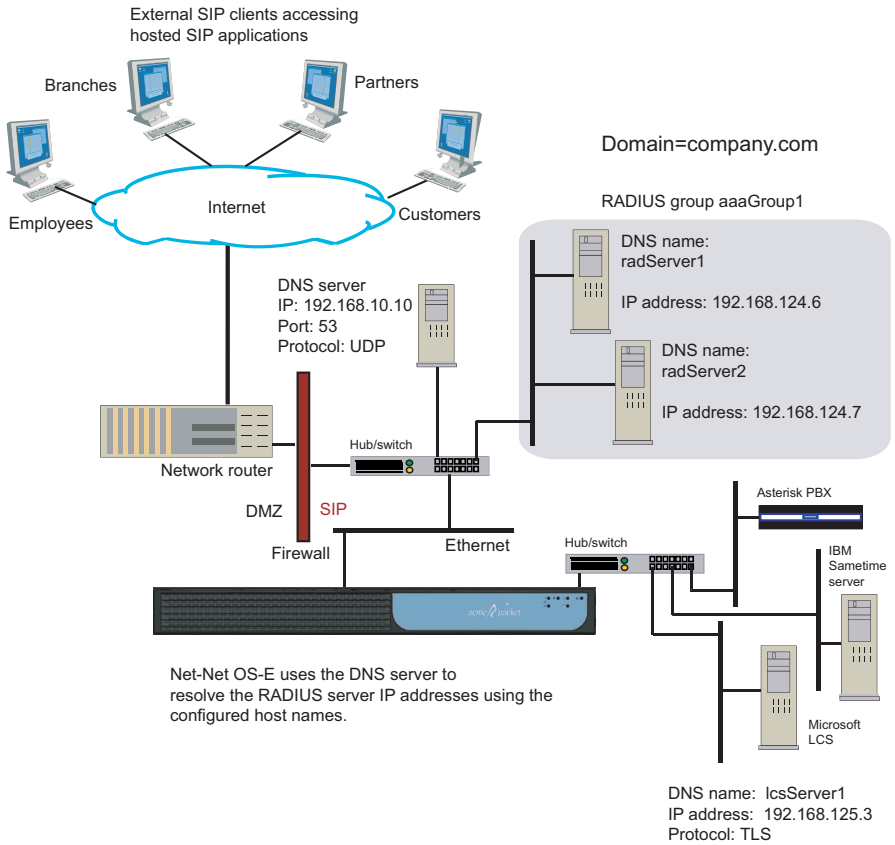
Domain Name System (DNS) servers are responsible for translating Internet domain and host names to IP addresses. DNS converts the name entered on a Web browser address bar to the IP address of the Web server that hosts that particular Web site. DNS uses a distributed database to store this name and address information for all public hosts on the Internet.

When an Internet client issues a request that involves an Internet host name, a DNS server determines the host's IP address. If the DNS server cannot service the request, it forwards the request to other DNS servers until the IP address is resolved, completing the Internet client request.

The OS-E maintains a cache of query responses—positive responses were successful and negative (reject) responses failed. This response is the DNS resource record, allowing the OS-E to consult its cache for mapping information before querying a server.

RADIUS and Diameter group accounting configurations, for example, require that you configure DNS to resolve the IP addresses associated with RADIUS and Diameter servers being used to capture call detail records.

The following image illustrates a sample network with a DNS server that resolves RADIUS server IP addresses using the domain name.



Configuring the DNS Resolver

The OS-E system functions as a DNS client (resolver) that forwards requests for IP address resolutions, but does not act as a server in accepting requests. As a resolver, the OS-E obtains resource records from DNS servers on behalf of resident or requesting applications. You must configure the resolver function before other objects within the DNS configuration object.

Note: You must configure the settings of the **resolver** object before setting other objects under DNS.

The DNS object configures the OS-E domain name, one or more DNS servers, and static mapping between host names and addresses. You can also configure static service locations, naming authority pointers, and how to resolve negative entries.

CLI Session

The following CLI session configures and enables the DNS resolver, sets the domain name to be used for DNS mappings, sets the DNS server IP address, port number and transport protocol, and the DNS query properties.

```
NNOS-E> config vsp
config vsp> config dns
config dns> config resolver
config resolver> set admin enabled
config resolver> set server 192.168.10.10 UDP 54
config resolver> set query-timeout 10
config resolver> set query-retries 5
config resolver> set cache-poll-interval 60
```

The **query-timeout** property specifies the time, in seconds (between 1 to 10), that a DNS lookup can go unanswered before it times out. The **query-retries property** specifies the number of DNS query (lookup) retries to execute if a DNS query times out. Enter a number of retries between 0 to 5, where 0 indicates no retries.

The **cache-poll-interva**l property specifies the number of seconds that the OS-E waits between refreshing the cache. The interval controls the rate at which the OS-E polls the location-cache to purge stale location bindings.

Configure as many DNS servers as you need. Refer to the *Net-Net OS-E – Objects and Properties Reference* for information on additional settings.

Configuring DNS Hosts and IPs

For each host in your network domain, you need to statically map IP addresses to host names. The **host** object requires that you supply a ***name*** variable. This is the name of an Internet node, for example, a SIP server, a RADIUS server, or a PC in your network.

You can enter:

- An existing name and new address — the corresponding address is mapped to the name for use in DNS lookups, or

- A new name and existing address — the system creates a named entry for DNS use.

CLI Session

The following DNS session configures the DNS host name for the RADIUS server named **radServer1** and sets the IP address to be returned in DNS lookups.

```
NNOS-E> config vsp
config vsp> config dns
config dns> config host radServer1
Creating 'host radServer1'
config host radServer1> set address 192.168.124.6
```

The following DNS session configures the DNS host name for the SIP server named **lcsServer1** and sets the IP address to be returned in DNS lookups.

```
NNOS-E> config vsp
config vsp> config dns
config dns> config host lcsServer1
Creating 'host lcsServer1
config host lcsServer1> set address 192.168.125.3
```

Mapping SIP Services

The DNS **service** object allows you to statically map SIP services to specific SIP servers. Using a configured rule, DNS resolves the SIP service and maps the service to a specific SIP server. By adding DNS server resource (SRV) records for each SIP service, SRV records provide contacts for the specific DNS servers.

The **rule** property establishes the preference level for selecting a named SIP service if you configure multiple SIP service mappings. Configuring the **service** object for each SIP service establishes the sequence to use when contacting the configured SIP servers.

CLI Session

The following CLI session maps the TLS service on the **company.com** domain. DNS resolves the TLS service to **lcsServer1** using the configured rule (port, priority, and weight settings).

```
NNOS-E> config vsp
config vsp> config dns
config dns> config service company.com tls
```

```
Creating 'service company.com tls'
config service company.com> set rule lcsServer1.company.com 5001 10 5
```

Configuring NAPTR

The Naming-authority pointer (called NAPTR) creates a static mapping of service information to a specific server or domain name. This mapping performs DNS lookups for requests in cases where the OS-E system cannot determine either the protocol or port of the destination.

Naming-authority pointer (NAPTR) records contain rules for converting each request to the correct configured service. Because each transport service over SIP is viewed as a different service (TCP, UDP, or TLS), they establish three different NAPTR records. This object configures the preference for use of an appropriate service for each domain.

Set one rule for each protocol—UDP, TCP, and TLS. Before a request can be forwarded on, the system must know the protocol and the port for the destination.

CLI Session

The following CLI session sets the NAPTR rules (protocol, order, preference) for SIP TLS, TCP and UDP services on the **company.com** domain. DNS uses the configured SIP services (TLS, TCP, UDP) to resolve the destination SIP server, using exact matching of the **company.com** domain name.

```
NNOS-E> config vsp
config vsp> config dns
config dns> config naptr company.com
Creating 'naptr company.com'
config naptr company.com> set match exact
config naptr company.com> set rule TLS 1 10
config naptr company.com> set rule TCP 2 10
config naptr company.com> set rule UDP 3 10
```

For more information on NAPTR and DNS on the OS-E system, refer to the *Net-Net OS-E – Objects and Properties Reference*

Configuring DNS Rejections

You can instruct DNS to ignore lookups that involve certain domain names. The DNS **reject** object requires that you supply a host name, service name, domain name, or IP address. Any request containing the specified name will be rejected.

Set the **type** property to identify which record type you are entering:

- A — IPv4 address
- AAAA — IPv6 address
- PTR — Address to name mapping
- NAPTR — NAPR rule

CLI Session

The following CLI session rejects DNS lookups that involve the domain named **`evilBadGuy.com`**., using the IPv4 address, matching the exact domain name as entered.

```
NNOS-E> config vsp
config vsp> config dns
config dns> config reject badNetwork.com naptr
Creating 'reject badNetwork.com naptr'
config reject badNetwork.com> set match exact
```

For more information on DNS rejections on the OS-E system, refer to the *Net-Net OS-E – Objects and Properties Reference***.**

Chapter 6. Configuring SIP Servers, Directories, and Federations

About This Chapter

This chapter provides information on configuring SIP servers, directories of SIP-addressable users, SIP hosts, and federations.

Servers, Directories, and Federations

Enterprise SIP servers, directories, and federations are components that interoperate with the OS-E system.

While SIP servers provide the SIP applications and endpoints for SIP sessions, directories store information about the users who are available to participate in SIP sessions. Whenever a SIP client attempts to contact a call recipient using a SIP INVITE message, either within the enterprise domain or across the Internet, the OS-E system performs a "lookup" in a configured directory. If a directory entry exists for the call recipient, and OS-E locates the recipient using entries in the location service database, OS-E connects the call participants. Each SIP call participant then communicates over the SIP session using the SIP application provided by the enterprise server(s), such as Microsoft LCS, SIP phones connected to SIP PBXs, etc.

The OS-E system applies a "default" policy to all SIP sessions, or if configured, a set of policies (rules and conditions) based on the type of call session, users participating in the call, and other policy settings. Policies are the mechanisms that provide the detailed security filtering on SIP sessions.

Federations are groupings of SIP servers that allow users of those servers to communicate. Federations provide the ability to connect across organizations, such as one LCS deployment to another or LCS-to-IBM Sametime. The two organizations, by joining the federation, designate each other as trusted federated partners.

The network configuration requires each partner in a federation to communicate through a connecting device. The OS-E system acts as the device in the middle (an access proxy for LCS, a SIP connector for Sametime, for example).

Interoperating with SIP Servers

The OS-E system is designed to interoperate with SIP servers, hosted SIP applications, and SIP PBX equipment for voice over IP applications. The OS-E system operates as a SIP proxy or back-to-back user agent (B2BUA) between the SIP clients and the SIP servers.

Configuring the SIP Server Pools

SIP servers are the endpoints that provide SIP-enabled real-time communication collaboration services for SIP sessions. Enterprise SIP communications servers include:

- IBM Lotus Sametime
- Microsoft Live Communications Server 2005
- Nortel MCS
- Avaya IP telephony PBX
- SIP hosts (generic SIP source, such as Windows Messenger clients, or destination servers)
- SIP connections
- SIP gateways (application servers, registrars, PSTN gateways, open-source Asterisk PBX)
- Domain Naming System (DNS) server groups

SIP servers allows enterprises to support features such as IP PBX-hosted VoIP services, Instant messaging (IM) between SIP users, mobile services, and presence-based applications.

A server pool is a group of enterprise servers, with all servers in the group having the same characteristics, and from the same vendor so that a matching dial-plan can apply to all servers in the pool. Servers configured in the pool can perform traffic balancing with the other servers.

IBM Lotus Sametime

The IBM Lotus Instant Messaging and Web Conferencing (Sametime) is IBM's real-time collaboration platform. It is used to manage the flow of instant messages, streaming audio and video, shared applications, and white board sessions. Sametime provides instant access to people and information through integrated presence awareness and brings together centralized and geographically dispersed participants.

CLI Session

The following CLI session shows the `sametime` object hierarchy.

```
NNOS-E> config
config> config vsp enterprise servers
config servers> config sametime name
Creating 'sametime name'
config sametime name>
```

Microsoft LCS

Microsoft Office Live Communications Server (LCS) is an instant messaging (IM) and real-time collaboration solution that enables enterprises to reach, collaborate, and respond to information more quickly than e-mail and telephone services. LCS uses SIP, SIP Instant Messaging and Presence Leveraging Extensions (SIMPLE), and the Real-Time Transport Protocol. In an environment where LCS is in use, there is also an Active Directory in use. Most of the LCS configuration is looking at LCS-specific attributes in the Active Directory.

CLI Session

The following CLI session shows the **lcs** object hierarchy and a basic configuration.

```
NNOS-E> config vsp enterprise servers
config servers> config lcs lcsServer1
Creating 'lcs lcsServer1'
config lcs lcsServer1> set admin enabled
config lcs lcsServer1> set domain lcsServer1.company.com
config lcs lcsServer1> set peer-identity sip:lcsServer1.company.com
```

```
config lcs lcsServer1> set directory
   vsp\enterprise\directories\active-directory lcsServer1.company
config lcs lcsserver1> set server-type lcs-2005

config lcs lcsServer1> config server-pool
config server-pool> config server lcsServer1
Creating 'server lcsServer1'
config server lcsServer1> set host 192.168.1.217
config server lcsServer1> set transport TCP
```

Nortel MCS

The Nortel Multimedia Communication Server (MCS) delivers SIP-based multimedia and collaborative applications to enterprises. Using industry-standard protocols, it enables businesses to augment existing voice and data infrastructures with advanced IP-based capabilities, such as multimedia (video conferencing and calling, picture caller ID); collaboration (conferencing, white boarding, file exchange, co-Web browsing); personalization (call screening, call logs, call management and routing - find me, follow me); presence and instant messaging.

CLI Session

The following CLI session shows the **mcs** object hierarchy and a sample configuration.

```
NNOS-E> config vsp enterprise servers
config servers> config mcs mcsServer1
Creating 'mcs lcsServer1'
config mcs mcsServer1> set admin enabled
config mcs mcsServer1> set domain mcsServer1.company.com
config mcs mcsServer1> set peer-identity sip:mcsServer1.company.com
config mcs mcsServer1> set directory
   vsp\enterprise\directories\active-directory mcsServer1.company
config mcs mcsServer1> set server-type nortel-mcs
config mcs mcsServer1> config server-pool
config server-pool> config server mcsServer1
Creating 'server mcs Server1'
config server lcsServer1> set host 192.168.1.218
config server lcsServer1> set transport TCP
```

Avaya PBX

Avaya's Converged Communication Server (CCS) integrates SIP telephony with existing voice networks to provide a range of services to subscribing users and devices. Using a standards-based architecture, CSS integrates SIP registrar, proxy, presence, instant message gateway, and instant messaging to provide full communications in a multivendor environment.

CLI Session

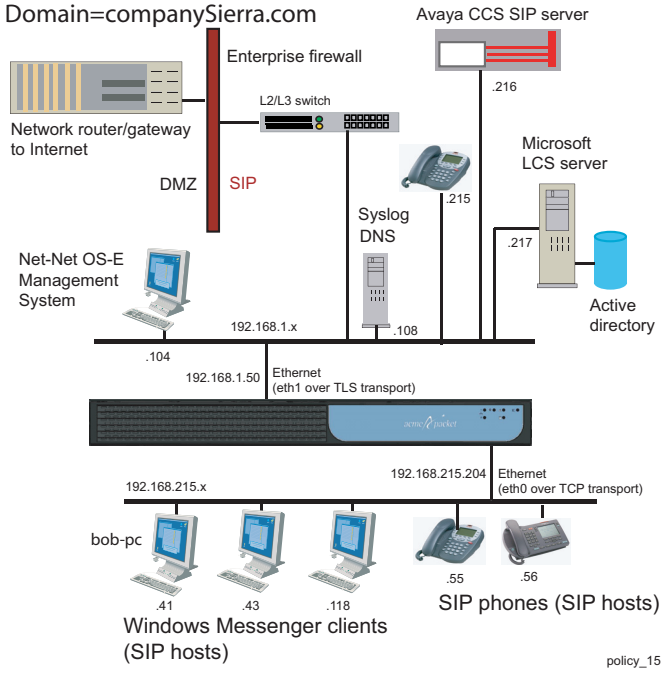
The following CLI session shows the **avaya** object hierarchy.

```
NNOS-E> config
config> config vsp enterprise servers
config servers> config avaya name
config avaya name>
```

SIP Hosts

A SIP host is usually a SIP client, such as a PC running Windows Messenger, that establishes SIP sessions with a SIP server. SIP hosts can also include SIP phones, as well as PCs and workstations that are running hosted SIP applications with a single network domain.

The following image illustrates a sample network using Window Messenger and SIP phones as hosts.



CLI Session

The following CLI session configures the SIP host at IP address 192.168.215.41, sets the domain name to which the sip host belongs, and sets the type, IP address and host domain name, and specifies that active directory providing naming services to this host.

```
config> config vsp enterprise servers
config servers> config sip-host 192.168.215.41
config sip-host 192.168.215.41> set admin enabled
config sip-host 192.168.215.41> set domain companySierra.com
config sip-host 192.168.215.41> set server-type windows-messenger
...192.168.215.41> set loop-detection tight
...192.168.215.41> set directory
   vsp\enterprise\directories\active-directory\companySierra
```

SIP Gateways

SIP gateways include SIP application servers, SIP registrars, PSTN gateways, and open-source Asterisk PBXs.

You can configure the OS-E to allow enterprises to continue call operations even if a service provider server is busy or down. You do this by configuring a public-switched telephone network (PSTN) gateway.

The OS-E normally forwards calls to a service provider application server. If the server has failed, and if the OS-E has location information for the provider, it forwards calls locally. Otherwise, the OS-E forwards calls to a PSTN gateway, configured using the sip-gateway server object.

The OS-E detects provider failure for one or more of the following reasons:

- No route to the provider.
- Registration failures.
- Outbound call from the OS-E to the provider reaches the maximum number of retransmissions.

Use the **sip-gateway failover-detection** property to control how the OS-E should behave if a SIP server failure is detected.

CLI Session

The following CLI session shows the **sip-gateway** object hierarchy. Specify the SIP URI for the gateway, in the format *sip:gatewayIdentity*. For example, *sip:server@provider1.com*.

```
config> config vsp enterprise
config enterprise> config servers
config servers> config sip-gateway pstn
config sip-gateway pstn> config server-pool
config server-pool> config server sip:pstn1@provider1.com
config server sip:pstn1@provider1.com> return
config server-pool> config server sip:pstn2@provider1.com
config server sip:pstn2@provider1.com> return
config sip-gateway pstn> set user OS-E
config pstn-gateway pstn> set password abc123xyz
config pstn-gateway pstn> return
config servers> return
config enterprise> return
```

SIP Registrars

SIP registrars are servers that handle SIP REGISTER requests. The OS-E system functions as a local SIP registrar, where the OS-E accepts SIP REGISTER requests on behalf of SIP clients. The OS-E also forwards and delegates SIP REGISTER requests to one or more registration peers, allowing the SIP clients and the registrars to communicate directly, where SIP user address-of-record updates are exchanged.

Use the **sip-gateway** object to configure the peer registrars to which the OS-E forwards REGISTER packets. The domain**,** peer-identity, and domain-alias properties define the addresses-of-record for the SIP registrar, as well as how strictly to enforce the matching of domains, aliases, and IP addresses contained in the To: header in SIP REGISTER messages.

The following CLI configures a registration peer and the associated contact information, and sets the communication properties for REGISTER sessions between the OS-E and the registrar peer.

CLI Session

```
config> config vsp enterprise
config vsp enterprise> config servers
config servers> config sip-gateway broadworks
config sip-gateway broadworks> set domain as.broadworks.net
config sip-gateway broadworks> set domain-alias broadworks.net
config sip-gateway broadworks> set domain-alias 12.39.208.251
config sip-gateway broadworks> set domain-alias 12.39.208.252
config sip-gateway broadworks> set peer-identity
   sip:broadworks@companyABC.com
config sip-gateway broadworks> config server-pool
config server-pool> config server sip:12.39.208.251
config server sip:12.39.208.21> return
config server-pool> config server sip:12.39.208.252
config server sip:12.39.208.21> return
config server-pool> return
config sip-gateway broadworks> set user OS-E
config sip-gateway broadworks> set password-tag abcXYX
config sip-gateway broadworks> return
config servers> return
```

For detailed on the SIP registrars and SIP registration, refer to the *Net-Net OS-E – Session Services Configuration Guide* and the *Net-Net OS-E – Objects and Properties Reference*.

H.323 Servers

H.323 is a widely-deployed multimedia conferencing protocol which includes voice, video, and data conferencing for use over packet switched networks. The OS-E system acts as a peer Gatekeeper on a H.323 system, supporting Gatekeeper-Routed Signaling or direct endpoint signaling. The OS-E supports H.323-to-SIP, SIP-to-H.323, and H.323-to-H.323 calls.

For detailed information on the H.323 server configuration settings, refer to the *Net-Net OS-E – Objects and Properties Reference*.

SIP Connections

A SIP connection configuration identifies the call admission point, or the PSTN lines from which SIP calls originate to the OS-E system.

The SIP connection server type provides a client/server model between the OS-E and customer premise equipment. The OS-E system fills the server role, while the connection (line) between the CPE and OS-E acts as client. This connection may be a single line, a shared line, or a group of shared lines to the enterprise or a residence. The point of connection on a shared line (the CPE) represents one or multiple direct inward dial (DID) numbers. Behind the CPE, however, may be many more endpoints. In this configuration, the client initiates, or re-establishes in the event of failure, the connection with the OS-E.

Using this server type allows you to create a configuration specific to an address-of-record (AOR). For instance, it allows you to control the number of concurrent calls to (emission control) and from (admission control) the specific AOR. You can override the global location cache settings that set the number of concurrent calls, and allow more or fewer calls based on the connection.

Additionally, the OS-E can learn client transport information through dynamic registration.Within the registration-plan, you can reference a **sip-connection** type server. Then, when a REGISTER comes in from the CPE (sip-connection server) and matches a registration-plan, when the OS-E installs a location cache entry, it saves the sip-connection name and reference in the location entry. If the sip-connection has unknown transport information (host, port, transport, local port and so on), the OS-E can use the dynamic learn feature (if enabled), to derive the sip-connection's transport information from the client registration.

DNS Groups

A dns-group is a server configuration template for servers that don't use a server pool configuration because they can be resolved by DNS. When the OS-E receives a REGISTER request, if the domain is the same as that configured for a dns-group, the OS-E clones the configuration of that dns-group for the server.

The OS-E then does three DNS lookups—NAPTR, SRV, and A—to resolve the transport protocol, port, and address. (If multiple records are found, the OS-E uses the preference set in the DNS server to select the primary.)

The OS-E then adds the server to the server pool. If the domain from the REGISTER is different from the dns-group, the OS-E creates a new server object and clones the configuration from the dns-group. Note that you must configure a dial plan and/or registration plan to point to the **dns-group**.

Configuring Directories

A directory is a database of user information—data such as name, group membership, address, position, office location, contact information, and any number of other identifiers. A directory is part of a centralized system that manages the SIP-addressable users who can participate in SIP sessions. SIP clients who wish to establish SIP sessions with other users will access the directory to look up user entries. If the lookup is successful, the OS-E system then applies policies that control the actual SIP session.

Directories include:

- Active directory
- LDAP directory
- Notes directory
- Phantom directory
- Static directory
- XML directory
- Database directory
- CSV (comma-separated values)

Active Directory

Active Directory is the directory service included with Windows 2000 Server. It identifies all resources on a network, making the information available to appropriately configured users. In addition, it provides security for network objects by verifying identities and controlling access.

By configuring the objects in the active-directory, you are providing the OS-E with access to the Active Directory service. From here, the OS-E can access the required databases to derive the recognized SIP addresses in your network.

CLI Session

The following CLI session shows the `active-directory` object hierarchy.

```
NNOS-E> config
config> config vsp
config> config enterprise
config enterprise> config directories
config directories> config active-directory name
config active-directory name>
```

LDAP

Lightweight Directory Access Protocol (LDAP) is a protocol definition for accessing specialized databases (directories). LDAP can interact with a variety of databases, and unifies the information for consistent management and security. It allows users to query and update information in an LDAP-based directory service.

Configure the LDAP server on the OS-E system if you don't use a Windows server in your enterprise. This configuration sets how the OS-E should recognize and query the LDAP schema. To define filters for LDAP queries, refer to RFC 2254, *The String Representation of LDAP Search Filter*s. Also see RFC 3377, *Lightweight Directory Access Protocol (v3): Technical Specification*.

CLI Session

The following CLI session shows the `ldap` object hierarchy.

```
NNOS-E> config
config> config vsp
config vsp> config enterprise
config enterprise> config directories
```

```
config directories> config ldap name
config ldap name>
```

Notes Directory

The notes directory is the LDAP directory service used by IBM Lotus Instant Messaging and Web Conferencing (Sametime). Sametime uses the Notes Enterprise Server for both messaging and applications. Notes services provide directory, storage, and web server support to enable synchronous collaboration support for users.

By configuring the objects in the notes-directory, you are providing the OS-E with access to the Domino Enterprise Directory service. The OS-E can then access the required databases to derive the recognized SIP addresses in your network.

CLI Session

The following CLI session shows the `notes-directory` object hierarchy.

```
NNOS-E> config
config> config vsp
config vsp> config enterprise
config enterprise> config directories
config directories> config notes-directory name
config notes-directory name>
```

Phantom Directory

The phantom directory is an internal directory that is derived from another directory. The phantom directory allows you to create and use multiple SIP aliases for each user. You do this by creating a phantom directory where additional SIP information is stored for the user.

Note: When you use the CLI to configure the `phantom` directory object, you are also required to specify the `tag`, `domain`, `parent-directory`, and `sip-address` properties for this object.

CLI Session

The following CLI session shows the `phantom` object hierarchy, using a sample phantom directory named *"bw"*.

```
NNOS-E> config
config> config vsp
```

```
config vsp> config enterprise
config enterprise> config directories
config directories> config phantom bw
config phantom phantom1> set tag bw
config phantom phantom1> set domain companyABC.com
config phantom phantom1> set parent-directory vsp\enterprise\
   directories\active-directory east
config phantom phantom1> config sip-address
config phantom phantom1> set value %@uid%
config phantom phantom1> return
```

Static Directory Description

The static directory is a list of users manually entered. Use this directory service if you do not have your users previously entered in a format that the OS-E can then extract them from (CSV, XML, or a database).

CLI Session

The following CLI session shows the `static` object hierarchy.

```
NNOS-E> config
config> config vsp
config> config enterprise
config enterprise> config directories
config directories> config static-directory name
config static-directory name>
```

XML Directory Description

The XML directory is a list of users derived from content of an XML document. Use this directory service if you do not have your users registered in an LDAP directory, but can extract them from an XML file.

CLI Session

The following CLI session shows the `xml-directory` object hierarchy.

```
NNOS-E> config
config> config vsp
config> config enterprise
config enterprise> config directories
config directories> config xml-directory name
config xml-directory name>
```

Database Directory Description

The database directory is a directory of users drawn from a series of database tables. Use this directory service if you have users listed in a database table instead of registered in an LDAP directory.

Note: When you use the CLI to configure the `database-directory` object, you are also required to specify the `tag, domain, and column` properties for this object.

CLI Session

The following CLI session shows the `database-directory` object hierarchy for a database-directory named *abc*.

```
NNOS-E> config
config> config vsp
config> config enterprise
config enterprise> config directories
config directories> config database-directory abc
config database-directory abc> set domain companyABC.com
config database-directory abc> set tag fromNotes
config database-directory abc> set column name 1
```

CSV Directory Description

The CSV directory is a directory of users derived from a comma-separated values (CSV) file. Use this directory service if you do not have your users registered in an LDAP directory, but are able to access them through a CSV file.

Note: When you use the CLI to configure the `csv-directory` object, you are also required to specify the `tag, domain, and source` properties for this object.

CLI Session

The following CLI session shows the `csv-directory` object hierarchy for a csv-directory named *xyz*.

```
NNOS-E> config
config> config vsp
config> config enterprise
config enterprise> config directories
```

```
config directories> config csv-directory xyz
config csv-directory xyz> set domain companyABC.com
config csv-directory xyz> set tag fromNotes
config csv-directory xyz> set source ftp://myftp.companyABC.com/
users.xml
```