Alcatel-Lucent 5620

SERVICE AWARE MANAGER | RELEASE 9.0 R7

3GPP OSS INTERFACE DEVELOPER GUIDE

3HE 06509 AAAG TQZZA Edition 01

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8.10 This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario. The application of the United Nations Convention on Contracts for the International Sale of Goods is hereby expressly excluded.

Preface

The Preface provides general information about the 5620 Service Aware Manager documentation suite, including this guide.

Prerequisites

Readers of the 5620 SAM documentation suite are assumed to be familiar with the following:

- 5620 SAM software structure and components
- 5620 SAM GUI operations and tools
- typical 5620 SAM management tasks and procedures
- device and network management concepts

5620 SAM documentation suite

The 5620 SAM documentation suite describes the 5620 SAM and the associated network management of its supported devices. Contact your Alcatel-Lucent support representative for information about specific network or facility considerations.

Table 1 lists the documents in the 5620 SAM customer documentation suite.

Table 1 5620 SAM customer documentation suite

Guide	Description
5620 SAM core documentation	
5620 SAM Release Description	The *5620 SAM Release Description* provides information about the new features associated with a 5620 SAM software release.

(1 of 4)

Guide	Description
5620 SAM Planning Guide	The *5620 SAM Planning Guide* provides information about 5620 SAM scalability and recommended hardware configurations.
5620 SAM System Architecture Guide	The *5620 SAM System Architecture Guide* is intended for technology officers and network planners to increase their knowledge of the 5620 SAM software structure and components. It describes the system structure, software components, and interfaces of the 5620 SAM. In addition, 5620 SAM fault tolerance, security, and network management capabilities are discussed from an architectural perspective.
5620 SAM | 5650 CPAM Installation and Upgrade Guide	The *5620 SAM | 5650 CPAM Installation and Upgrade Guide* provides OS considerations, configuration information, and procedures for the following: • installing, upgrading, and uninstalling 5620 SAM and 5650 CPAM software in standalone and redundant deployments • 5620 SAM system migration to a different system • conversion from a standalone to a redundant 5620 SAM system
5620 SAM User Guide	The *5620 SAM User Guide* provides information about using the 5620 SAM to manage the service-aware IP/MPLS network, including GUI basics, commissioning, service configuration, and policy management. The *5620 SAM User Guide* uses a task-based format. Each chapter contains: • a workflow that describes the steps for configuring and using the functions • detailed procedures that list the configurable parameters on the associated forms 5620 SAM management information specific to LTE network elements is covered in the *5620 SAM LTE ePC User Guide* and *5620 SAM LTE RAN User Guide*. 5620 SAM management information specific to 1830 PSS network elements is covered in the *5620 SAM Optical User Guide*.
5620 SAM Integration Guide	The *5620 SAM Integration Guide* provides procedures to allow the 5620 SAM to integrate with additional components.
5620 SAM Supervision Module User Guide	The *5620 SAM Supervision Module User Guide* provides information about how to configure and use the web-based 5620 SAM Supervision Module for fault management and at-a-glance network element monitoring.
5620 SAM Scripts and Templates Developer Guide	The *5620 SAM Scripts and Templates Developer Guide* provides information that allows you to develop, manage, and execute CLI-based or XML-based scripts or templates. The guide is intended for developers, skilled administrators, and operators who are expected to be familiar with the following: • CLI scripting, XML, and the Velocity engine • basic scripting or programming • 5620 SAM functions
5620 SAM Parameter Guide	The *5620 SAM Parameter Guide* provides: • parameter descriptions that include value ranges and default values • parameter options and option descriptions • parameter and option dependencies • parameter mappings to the 5620 SAM-O XML equivalent property names There are dynamic links between the procedures in the *5620 SAM User Guide* and the parameter descriptions in the *5620 SAM Parameter Guide*. Parameters specific to LTE network elements are covered in the *5620 SAM LTE Parameter Reference*. Parameters specific to 1830 PSS network elements are covered in the *5620 SAM Optical Parameter Reference*.
5620 SAM Statistics Management Guide	The *5620 SAM Statistics Management Guide* provides information about how to configure performance and accounting statistics collection and how to view counters using the 5620 SAM. Network examples are included.

(2 of 4)

Guide	Description
5620 SAM Maintenance Guide	The *5620 SAM Maintenance Guide* provides procedures for: • generating baseline information for 5620 SAM applications • performing daily, weekly, monthly, and as-required maintenance activities for 5620 SAM-managed networks

5620 SAM Troubleshooting Guide	The *5620 SAM Troubleshooting Guide* provides task-based procedures and user documentation to:
	• help resolve issues in the managed and management networks
	• identify the root cause and plan corrective action for:
	  • alarm conditions on a network object or customer service
	  • problems on customer services with no associated alarms
	• list problem scenarios, possible solutions, and tools to help check:
	  • network management LANs
	  • network management platforms and operating systems
	  • 5620 SAM client GUIs and client OSS applications
	  • 5620 SAM servers
	  • 5620 SAM databases

5620 SAM Alarm Reference	The *5620 SAM Alarm Reference* provides a list of all alarms that the 5620 SAM can raise. The reference is organized by network element type.
5620 SAM Glossary	The *5620 SAM Glossary* defines terms and acronyms used in all of the 5620 SAM documentation, including 5620 SAM LTE documentation.
5620 SAM Network Element Compatibility Guide	The *5620 SAM Network Element Compatibility Guide* provides release-specific information about the compatibility of managed device features in 5620 SAM releases.
5620 SAM LTE documentation	
5620 SAM LTE RAN Release Description	The *5620 SAM LTE RAN Release Description* provides information about the LTE RAN features associated with the release.
5620 SAM LTE ePC User Guide	The *5620 SAM LTE ePC User Guide* describes how to discover, configure, and manage LTE ePC devices using the 5620 SAM. The guide is intended for LTE ePC network planners, administrators, and operators. Alcatel-Lucent recommends that you review the entire *5620 SAM LTE ePC User Guide* before you attempt to use the 5620 SAM in your LTE network.
5620 SAM LTE RAN User Guide	The *5620 SAM LTE RAN User Guide* describes how to discover, configure, and manage the Evolved NodeB, or eNodeB, using the 5620 SAM. The guide is intended for LTE RAN network planners, administrators, and operators. Alcatel-Lucent recommends that you review the entire *5620 SAM LTE RAN User Guide* before you attempt to use the 5620 SAM in your LTE network.
5620 SAM LTE Parameter Reference	The *5620 SAM LTE Parameter Reference* provides a list of all LTE ePC and LTE RAN parameters supported in the 5620 SAM.
5620 SAM-O documentation	
5620 SAM XML OSS Interface Developer Guide	The *5620 SAM XML OSS Interface Developer Guide* provides information that allows you to: • use the 5620 SAM XML OSS interface to access network management information • learn about the information model associated with the managed network • develop OSS applications using the packaged methods, classes, data types, and objects necessary to manage 5620 SAM functions
5620 SAM 3GPP OSS Interface Developer Guide	The *5620 SAM 3GPP OSS Interface Developer Guide* describes the components and architecture of the 3GPP OSS interface to the 5620 SAM. It includes procedures and samples to assist OSS application developers to use the 3GPP interface to manage LTE devices.

(3 of 4)

Guide	Description
5620 SAM 3GPP OSS Interface Compliance Statements	The *5620 SAM 3GPP OSS Interface Compliance Statements* document describes the compliance of the 5620 SAM 3GPP OSS interface with the 3GPP standard.
5620 SAM optical documentation	
5620 SAM Optical User Guide	The *5620 SAM Optical User Guide* describes how to discover, configure, and manage optical devices using the 5620 SAM. The guide is intended for optical network planners, administrators, and operators. Alcatel-Lucent recommends that you review the entire *5620 SAM Optical User Guide* before you attempt to use the 5620 SAM in your network.
5620 SAM Optical Parameter Reference	The *5620 SAM Optical Parameter Reference* provides a list of all optical device parameters supported in the 5620 SAM.

(4 of 4)

Obtaining customer documentation

You can obtain 5620 SAM customer documentation:

- from the product
- on the web

On-product documentation

The 5620 SAM on-product customer documentation is delivered in HTML and PDF. Choose Help→User Documentation from the 5620 SAM client GUI to open the help system in a web browser.

The help system opens to the User Documentation Index, which provides a summary of and links to all 5620 SAM customer documents.

Click on the Using the help system tab on the User Documentation Index page to find usage tips for navigating and searching within the on-product customer documentation.

You can return to the User Documentation Index at any time by clicking on the Home icon, shown in Figure 1.

Figure 1 Home icon

Documentation on the web

The 5620 SAM customer documentation is available for download in PDF format from the Alcatel-Lucent Customer Support Center: http://www.alcatel-lucent.com/myaccess. If you are a new user and require access to this service, please contact your Alcatel-Lucent support representative.

In addition to the guides listed in Table 1, Release Notices and other documents not delivered on-product are posted to this site.

Working with PDFs

You can download PDFs of individual guides from the Alcatel-Lucent Customer Support Center, or you can choose to download a zip of all PDFs for a particular release.

You can use the Search function of Acrobat Reader (File→Search) to find a term in a PDF of any 5620 SAM document. To refine your search, use appropriate search options (for example, search for whole words only or enable case-sensitive searching). You can also search for a term in multiple PDFs at once, provided that they are located in the same directory. For more information, see the Help for Acrobat Reader.

Cross-book hotlinks, for example, from a parameter name in the *5620 SAM User Guide* to a description of that parameter in the *5620 SAM Parameter Guide*, work only if both PDF files are in the same directory.

Note — Users of Mozilla browsers may receive an error message when opening the PDF files in the 5620 SAM documentation suite. The offline storage and default cache values used by the browsers are the cause of the error message.

Alcatel-Lucent recommends changing the Mozilla Firefox offline storage or Mozilla 1.7 cache value to 100 Mbytes to eliminate the error message.

Documentation conventions

Table 2 lists the conventions that are used throughout the documentation.

Table 2 Documentation conventions

Convention	Description	Example
Key name	Press a keyboard key	Delete
Italics	Identifies a variable	*hostname*
Key+Key	Type the appropriate consecutive keystroke sequence	CTRL+G
Key-Key	Type the appropriate simultaneous keystroke sequence	CTRL-G
*	An asterisk is a wildcard character, which means “any character” in a search argument.	log_file*.txt
↵	Press the Return key	↵
—	An em dash indicates there is no information.	—
→	Indicates that a cascading submenu results from selecting a menu item	Policies→Alarm Policies

Procedures with options or substeps

When there are options in a procedure, they are identified by letters. When there are substeps in a procedure, they are identified by Roman numerals.

Example of options in a procedure

At step 1, you can choose option a or b. At step 2, you must do what the step indicates.

1 This step offers two options. You must choose one of the following.

   a This is one option.

   b This is another option.

2 You must perform this step.

Example of substeps in a procedure

At step 1, you must perform a series of substeps within a step. At step 2, you must do what the step indicates.

1 This step has a series of substeps that you must perform to complete the step. You must perform the following substeps.

   i This is the first substep.

   ii This is the second substep.

   iii This is the third substep.

2 You must perform this step.

Measurement conventions

Measurements in this document are expressed in metric units and follow the Système international d'unités (SI) standard for abbreviation of metric units. If imperial measurements are included, they appear in brackets following the metric unit.

Table 3 lists the measurement symbols used in this document.

Table 3 Bits and bytes conventions

Measurement	Symbol
bit	b
byte	byte
kilobits per second	kb/s

Important information

The following conventions are used to indicate important information:

Warning — Warning indicates that the described activity or situation may, or will, cause equipment damage or serious performance problems.

Caution — Caution indicates that the described activity or situation may, or will, cause service interruption.

Note — Notes provide information that is, or may be, of special interest.

Contents

5620 SAM 3GPP OSS interface

1 — Introduction

1.1 5620 SAM 3GPP OSS interface overview

The 3GPP OSS Interface is the CORBA-based API that provides a 3GPP-compliant layer for communication with a 5620 SAM-managed LTE network using a client application. It is included in the overall architecture of the 5620 SAM server as the 3GPP component of the 5620 SAM-O.

An OSS can communicate with the 5620 SAM using the following 5620 SAM-O interfaces:

- the JMS event stream and the SOAP XML API, which are collectively called the 5620 SAM XML OSS interface
- the 3GPP OSS interface

Note — See the *5620 SAM XML OSS Interface Developer Guide* for more information about developing OSS applications using the SOAP XML/JMS API.

Developers that create OSS applications for this interface are expected to be familiar with the following:

- CORBA architecture and framework
- 3GPP specifications, IRP layers and components
- OSS interfaces
- LTE managed devices
- 5620 SAM functionality

The supported 3GPP OSS interface network management functions include the following:

- alarm and event monitoring
- inventory management

See the *5620 SAM Alarm Reference* for information about 5620 SAM alarms. See the *5620 SAM User Guide* for information about 5620 SAM inventory management.

The following sections provide brief introductions to CORBA and 3GPP.

1.2 CORBA overview

Common Object Request Broker Architecture, or CORBA, is a standard architecture for distributed object systems. It allows a distributed, heterogeneous collection of objects to interoperate. Its framework provides access across platforms, operating systems, and programming languages. It is an object-oriented architecture that has the characteristics of object-oriented systems. It was developed by the Object Management Group, or OMG.

The following components of the CORBA specification enable interoperation with other systems:

- Interface Definition Language, or IDL
- Object Request Broker, or ORB
- GIOP and IIOP protocols

The IDL provides a language-neutral way of specifying the classes, called interfaces in the IDL, of the objects within the application. An interface consists of a set of named operations and the operation parameters.

The ORB is the core of the CORBA architecture. It establishes client-server relationships and provides platform independence to distributed CORBA objects. The ORB acts as the mediator and translator that enables client applications to request the services of CORBA objects and servers to make object services available to client applications.

The General Inter-ORB Protocol, or GIOP, defines the message formats for object communication in a distributed environment. The Internet Inter-ORB Protocol, or IIOP, is an implementation of GIOP that operates over TCP/IP.

1.3 3GPP overview

The 3rd Generation Partnership Project, or 3GPP, is a collaboration between groups of telecommunications associations to make a globally applicable third-generation mobile phone system specification within the scope of the International Mobile Telecommunications-2000 project of the International Telecommunication Union, or ITU.

The term “3GPP specification” includes all GSM specifications, for example GPRS, EDGE, W-CDMA, and LTE, including LTE-Advanced. The following terms are also used to describe networks that use the 3GPP specifications:

- UTRAN and UMTS in Europe
- FOMA in Japan

For more information about 3GPP, see the 3GPP website at http:\\www.3gpp.org.

2 — IRPs

2.1 IRP overview

The 3GPP management interface concept called Integration Reference Point, or IRP, promotes the adoption of standardized management interfaces in telecommunication networks. The IRP concept and associated methodology use protocol- and technology-neutral modeling methods, and protocol-specific solution sets.

The 3GPP publishes IRP specifications for operations and notifications for telecommunication domains such as alarm, configuration, and performance management. Detailed IRP specifications are available on the 3GPP website at http:\\www.3gpp.org\specifications.

2.2 IRP specification layers

A 3GPP IRP definition consists of layers that include the following:

- IRP requirements—high-level IRP description
- information service—detailed IRP description
- solution sets—low-level descriptions of the APIs for an IRP

The solution sets describe the low-level interoperability mechanisms of the API that the element managers and network managers must conform to. For the 5620 SAM 3GPP OSS interface, the supported solution set uses CORBA that is compliant with the R7 and R8 3GPP standards. See Appendix B for more information.

2.3 IRP components

The IRP specification describes the following main components:

- IRP agent—encapsulates a well-defined subset of network or NE functions; it interacts with IRP managers using one or more IRPs
- IRP manager—models a user of IRP agents and interacts with IRP agents through IRPS

The 5620 SAM is an IRP agent, and an OSS application is the IRP manager

2.4 5620 SAM 3GPP OSS interface IRPS

The 3GPP has defined a number of IRPs that map to telecommunications management domains in a 3GPP network. The 5620 SAM 3GPP OSS interface supports a subset of these IRPs that includes the following:

- Entry Point IRP—allows OSS applications to discover the management system and IRPs
- Notification IRP—allows OSS applications to subscribe to notifications and manage subscriptions
- Alarm IRP—allows OSS applications to detect and manage alarms and faults
- Communication Surveillance IRP—provides a communication heartbeat for monitoring OSS application communication with the network manager

- Basic CM IRP—allows OSS applications to control and monitor NE configurations and network resources
- Kernel IRP—provides OSS applications with a list of the version of all IRPs in the network and also defines notification on NEs for object creation, deletion, attribute value changes, state changes, and synchronization information
- Generic IRP—provides OSS applications with IRP version, method and notification profile information for a specific IRP

Note — Although the 3GPP OSS interface supports the IRPs described above, it may not support all interfaces and methods defined in the 3GPP standard specifications. See Appendix B for more information.

Because the 3GPP OSS interface uses the CORBA IRP solution set, the IRPs are defined by CORBA IDLs. These IDLs are located in the following directory on a 5620 SAM main server:

installation_directory/nms/integration/SAM_O/3GPP

where *installation_directory* is the 5620 SAM main server installation directory, typically /opt/5620sam/server

Each IRP supported by an IRP agent supports a set of methods and notifications. The 3GPP OSS interface IDLs include interfaces and methods that have operation and notification definitions. The 5620 SAM 3GPP OSS interface compliance statement includes information about whether an interface method is mandatory or optional, and 3GPP standard versions with which it is compliant.

Note — The Basic CM and Generic IRPs do not have notification interface definitions.

For example, Table 2-1 lists the interfaces that are defined for the Communication Surveillance, or CS, IRP.

Table 2-1 CS IRP compliance with 3GPP versions

Interface name	Method name	Support Qualifier	3GPP R7	3GPP R8
CSIRPOperations_1	getHeartbeatPeriod	Mandatory	Y	Y
	triggerHeartbeat	Mandatory	N	N
CSIRPOperations_2	setHeartbeatPeriod	Optional	N	N
CSIRPNotifications	notifyHeartbeat	Mandatory	Y	Y

Entry Point IRP

It is difficult for a network manager to discover all IRPs in an environment that contains several managed systems, or if there are multiple IRPs associated with each managed system. The Entry Point IRP provides a mechanism for the network manager to discover the managed systems and associated IRPs.

The Entry Point IRP allows a network manager to do the following:

- Discover IRP information that includes the DN, supported IRP versions, and management scope, the set of network resources in the managed system to which it has access.
- Obtain the references of the IRPs for a specific IRP version using the DN of the IRP that supports the required IRP version. The network manager can use the Entry Point IRP to tell the managed system which references it does not use. The managed system may release the references, if it is designed to do so.

During initialization, the 3GPP OSS interface generates an IOR for the Entry Point IRP and stores it in the following file on a 5620 SAM main server:

```
$CNBI_HOME/ior/EPIRP.ior
```

Code 2-1 shows an example of IRP reference retrieval using the Entry Point IRP.

Code 2-1: Entry Point IRP reference retrieval example

```
String iorDir = "$CNBI_HOME/ior directory";
String iorFile = iorDir + File.separator + "EPIRP.ior";

FileInputStream fis = new FileInputStream(iorFile);
BufferedReader reader = new BufferedReader(new
InputStreamReader(fis));
String ior = reader.readLine();
reader.close();

try
{
org.omg.CORBA.Object entryPointObj = orb.string_to_object(ior);
entryPointIRP = EPIRPHelper.narrow(entryPointObj);
}
catch (Exception e)
{
e.printStackTrace();
}
```

The Entry Point IRP includes the following methods:

- getIRPOutline—used to obtain information about all supported IRPs
- getIRPReference—used to request a CORBA reference for a specific IRP

getIRPOutline method

Code 2-2 shows the getIRPOutline method definition.

Code 2-2: getIRPOutline method

```
EPIRPConstDefs::Result get_irp_outline(
```

```
      in ManagedGenericIRPConstDefs::VersionNumber irp_version,
      out EPIRPConstDefs::SupportedIRPList supported_irp_list
   )
   raises (GetIRPOutline, InvalidIRPVersion);
```

Note — The interface returns IRP information for only the local IRP agent.

Code 2-3 shows an example of getIRPOutline method invocation.

Code 2-3: getIRPOutline method invocation example

```
try
{
String irp_version = "";
SupportedIRPListHolder supported_irp_list = new
SupportedIRPListHolder();
Result result =
entryPointIRP.get_irp_outline(irp_version,supported_irp_list);
SupportedIRP supportedIRP = supported_irp_list.value[0];
}
catch (Exception e)
{
e.printStackTrace();
}
```

getIRPReference method

Code 2-4 shows the getIRPReference method definition.

Code 2-4: getIRPReference method

```
   EPIRPConstDefs::Result get_irp_reference(
      in EPIRPConstDefs::ManagerIdentifier manager_identifier,
      in EPIRPConstDefs::DN system_dn,
      in EPIRPConstDefs::IRPId irp_id,
      out string irp_reference
   )
   raises (GetIRPReference,
           ManagedGenericIRPSystem::InvalidParameter);
```

Code 2-5 shows an example of getIRPReference method invocation for retrieving the reference to the Alarm IRP.

Code 2-5: getIRPReference method invocation example

```
try
{
entryPointIRP.get_irp_reference("n.a.", system_dn, "32.111-3 V8.0",
irp_reference);
org.omg.CORBA.Object alarmObj =
orb.string_to_object(irp_reference.value);
alarmIRP = AlarmIRPHelper.narrow(alarmObj);
}
catch (Exception e)
```

```
{
e.printStackTrace();
}
```

Note — The systemDn is a configurable value in the cnbi.properties file.

Alarm IRP

An evaluation of NE and network health requires the detection of faults in the network and the subsequent forwarding of associated alarms to the element manager or network manager. Depending on the nature of a fault, there may be a change in the operational state of the affected logical or physical resources.

Alarm and state-change detection and notification are essential. A list of the current network alarms, operational state information, and the associated history data are required for further fault analysis. Additionally, test procedures can be used to obtain more detailed information, if required, and to verify an alarm or operational state to ensure correct NE operation and the proper use of resources.

Contact Alcatel-Lucent technical support for a list of the notifications that the alarm IRP can raise.

Code 2-6 shows an example of Alarm IRP reference retrieval using the Entry Point IRP.

Code 2-6: Alarm IRP reference retrieval example

```
try
{
entryPointIRP.get_irp_reference("n.a.", system_dn, "32.111-3 V8.0",
irp_reference);
org.omg.CORBA.Object alarmObj =
orb.string_to_object(irp_reference.value);
alarmIRP = AlarmIRPHelper.narrow(alarmObj);
}
catch (Exception e)
{
e.printStackTrace();
}
```

The Alarm IRP includes the following methods:

- acknowledgeAlarm—acknowledges one or more alarms
- clearAlarms—clears one or more alarm instances in an alarm list
- commentAlarms—records a comment in one or more alarm information instances in an alarm list
- getAlarmList—returns the set of current alarms
- getAlarmCount—retrieves a list of alarm counts, by severity, for alarms in raised, cleared and acknowledgement states

acknowledgeAlarms method

Code 2-7 shows the acknowledgeAlarms method definition.

Code 2-7: acknowledgeAlarms method

```
ManagedGenericIRPConstDefs::Signal acknowledge_alarms (
         in AlarmIRPConstDefs::AlarmInformationIdAndSevSeq
            alarm_information_id_and_sev_list,
         in string ack_user_id,
         in ManagedGenericIRPConstDefs::StringOpt ack_system_id,
         out AlarmIRPConstDefs::BadAcknowledgeAlarmInfoSeq
            bad_ack_alarm_info_list
      )
      raises (AcknowledgeAlarms,
ManagedGenericIRPSystem::ParameterNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

The method updates the specified alarm in the following ways:

- sets the Acknowledgement State to Acknowledged
- adds the ackUserId and ackSystemId values as comments to the alarm
- sets the Acknowledgement Time of the alarm to the current time

Note 1 — The method performs no verification of the provided ackUserId and ackSystemId values.

Note 2 — A perceivedSeverity value in the request is ignored; an alarm is acknowledged based on the alarm ID only.

Code 2-8 shows an example of acknowledge_alarms method invocation.

Code 2-8: acknowledge_alarms method invocation example

```
BadAcknowledgeAlarmInfoSeqHolder badackalarmholder = new
BadAcknowledgeAlarmInfoSeqHolder();
StringOpt opt = new StringOpt();
opt.value("system_id");
AlarmInformationIdAndSev alarm = new AlarmInformationIdAndSev();
AlarmInformationIdAndSev alarm2 = new AlarmInformationIdAndSev();

ShortOpt op = new ShortOpt();
op.value((short) 1);
alarm.alarm_id = "1";
alarm.perceived_severity = op;
alarm2.alarm_id = "2";
alarm2.perceived_severity = op;
try
{
alarmIRP.acknowledge_alarms(new AlarmInformationIdAndSev[] { alarm,
alarm2 }, "user_id", opt, badackalarmholder);
BadAcknowledgeAlarmInfo[] info = badackalarmholder.value;
}
catch (Exception e)
{
Log.error(this, "ERROR", e);
```

```
fail(e.getMessage());
}
```

If an acknowledgeAlarms operation fails, the list of errors, which includes the alarm identifiers and error codes, is stored in the bad alarm information object. This object is defined as a CORBA holder, and has to be created and passed by reference to the method.

clearAlarms method

Code 2-9 shows the clearAlarms method definition.

Code 2-9: clearAlarms method

```
      ManagedGenericIRPConstDefs::Signal clear_alarms (
         in AlarmIRPConstDefs::AlarmInformationIdSeq
alarm_information_id_list,
         in string clear_user_id,
         in ManagedGenericIRPConstDefs::StringOpt clear_system_id,
         out AlarmIRPConstDefs::BadAlarmInformationIdSeq
            bad_alarm_information_id_list
      )
      raises (ClearAlarms,
ManagedGenericIRPSystem::OperationNotSupported,
              ManagedGenericIRPSystem::ParameterNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Note — The method performs no verification of the provided clearUserId and clearSystemId values.

Code 2-10 shows an example of clear_alarms method invocation.

Code 2-10: clear_alarms method invocation example

```
BadAlarmInformationIdSeqHolder badclearalarmholder = new
BadAlarmInformationIdSeqHolder();
StringOpt opt = new StringOpt();
opt.value("system_id");
ShortOpt op = new ShortOpt();
op.value((short) 1);
try
{
alarmIRP.clear_alarms(new String[]{"1", "2"}, "user_id", opt,
badclearalarmholder);
BadAlarmInformationId[] info = badclearalarmholder.value;
}
catch (Exception e)
{
e.printStackTrace();
fail();
}
```

If a clear_alarms operation fails, the list of errors, which includes the alarm identifiers and error codes, is stored in the bad alarm information object. This object is defined as a CORBA holder, and has to be created and passed by reference to the method.

commentAlarms method

Code 2-11 shows the commentAlarms method definition.

Code 2-11: commentAlarms method

```
      ManagedGenericIRPConstDefs::Signal comment_alarms (
         in AlarmIRPConstDefs::AlarmInformationIdSeq
alarm_information_id_list,
         in string comment_user_id,
         in ManagedGenericIRPConstDefs::StringOpt comment_system_id,
         in string comment_text,
         out AlarmIRPConstDefs::BadAlarmInformationIdSeq
            bad_alarm_information_id_list
      )
      raises (CommentAlarms,
ManagedGenericIRPSystem::OperationNotSupported,
              ManagedGenericIRPSystem::ParameterNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Note — The method performs no verification of the provided commentUserId and commentSystemId values.

Code 2-12 shows an example of comment_alarms method invocation.

Code 2-12: comment_alarms method invocation example

```
BadAlarmInformationIdSeqHolder badcommentalarmholder = new
BadAlarmInformationIdSeqHolder();
StringOpt opt = new StringOpt();
opt.value("system_id");
ShortOpt op = new ShortOpt();
op.value((short) 1);
try
{
alarmIRP.comment_alarms(new String[]{"1", "2"}, "user_id", opt,
"alarm comment", badcommentalarmholder);
BadAlarmInformationId[] info = badcommentalarmholder.value;

}
catch (Exception e)
{
e.printStackTrace();
fail();
}
```

If a commentAlarms operation fails, the list of errors, which includes the alarm identifiers and error codes, is stored in the bad alarm information object. This object is defined as a CORBA holder, and has to be created and passed by reference to the method.

getAlarmList method

Code 2-13 shows the getAlarmList method definition.

Code 2-13: getAlarmList method

```
AlarmIRPConstDefs::AlarmInformationSeq get_alarm_list (
   in ManagedGenericIRPConstDefs::StringOpt filter,
   in AlarmIRPConstDefs::DNOpt base_object,
   out boolean flag,
   out AlarmInformationIterator iter
)
raises (GetAlarmList, FilterComplexityLimit,
ManagedGenericIRPSystem::ParameterNotSupported,
        ManagedGenericIRPSystem::InvalidParameter);
```

Note — This operation is only supported in synchronous mode, which means that the data is returned using an iterator and not using a notification.

The returned alarm list contains all alarms in the current alarm list. Depending on the network manager fault management configuration, this may include the following:

- alarms that have a perceivedSeverity other than Cleared, and alarms that have a perceivedSeverity of Cleared but are not acknowledged
- only alarms that have a perceivedSeverity other than Cleared

The alarm life cycle reported by the interface is provided by the network manager.

Code 2-14 shows an example of get_alarm_list method invocation.

Code 2-14: get_alarm_list method invocation example

```
StringOpt filter = new StringOpt();
filter.value("$.filterable_data(h) == 1");
DNOpt base_object = new DNOpt();
base_object.value(base);
BooleanHolder flag = new BooleanHolder();
AlarmInformationIteratorHolder iter = new
AlarmInformationIteratorHolder();
alarmIRP.get_alarm_list(filter, base_object, flag, iter);
AlarmInformationIterator iterator = iter.value;
List<StructuredEvent> resultList = new ArrayList<StructuredEvent>();
EventBatchHolder alarm_informations = new EventBatchHolder();
while (iterator.next_alarm_informations((short) 10,
alarm_informations))
{
resultList.addAll(Arrays.asList(alarm_informations.value));
}
resultList.addAll(Arrays.asList(alarm_informations.value));
```

An iterator object is created and passed as a parameter to the get_alarm_list method. Alarm batches are retrieved using iterator calls to the next_alarm_informations method, which returns a Boolean value; if the value is true, batches are pending.

When the 5620 SAM main server becomes available after being unavailable for a time, the 3GPP OSS interface re-establishes a connection to the server. If the interface detects missed events, it sends a notifyAlarmListRebuilt notification to the OSS clients to inform them that the alarm list is again reliable. See chapter 3 for information about connection monitoring and redundancy.

getAlarmCount method

Code 2-15 shows the getAlarmCount method definition.

Code 2-15: getAlarmCount method

```
      void get_alarm_count (
         in ManagedGenericIRPConstDefs::StringOpt filter,
         out unsigned long critical_count,
         out unsigned long major_count,
         out unsigned long minor_count,
         out unsigned long warning_count,
         out unsigned long indeterminate_count,
         out unsigned long cleared_count
      )
  raises (GetAlarmCount, FilterComplexityLimit,
          ManagedGenericIRPSystem::OperationNotSupported,
              ManagedGenericIRPSystem::ParameterNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Code 2-16 shows an example of get_alarm_count method invocation.

Code 2-16: get_alarm_count method invocation example

```
StringOpt filter = new StringOpt();
IntHolder critical_count = new IntHolder();
IntHolder major_count = new IntHolder();
IntHolder minor_count = new IntHolder();
IntHolder warning_count = new IntHolder();
IntHolder indeterminate_count = new IntHolder();
IntHolder cleared_count = new IntHolder();
try
{
filter.value("");
alarmIRP.get_alarm_count(filter, critical_count, major_count,
minor_count, warning_count, indeterminate_count, cleared_count);
}
catch (Exception e)
{
e.printStackTrace();
}
```

The counters are defined as CORBA holders, and are created and passed by reference. The counter values are retrievable after the method invocation.

Basic CM IRP

Configuration Management, or CM, provides the ability to ensure correct and effective network operation. Basic CM actions control and monitor the NE and network resource configurations, and can be initiated by an operator or by functions in an NE operations system.

The Basic CM IRP allows OSS clients to invoke methods that retrieve basic data about the 3GPP NEs in the network. This data can be associated with data from other functions, for example, alarm management.

The Basic CM IRP supports the following NE attributes:

- Managed Element ID
- User Label
- Type
- Managed By
- User Defined State
- Software Version
- Location Name
- Vendor Name

Supported NE Types

The 5620 SAM 3GPP OSS interface supports the retrieval of data for the following NE types:

- eNodeB
- 9471 MME

Code 2-17 shows an example of Basic CM IRP reference retrieval using the Entry Point IRP.

Code 2-17: Basic CM IRP reference retrieva example

```
try
{
entryPointIRP.get_irp_reference(manager_identifier, system_dn,
BasicCMIRPImpl.NAME_TO_BIND, irp_reference);
org.omg.CORBA.Object basicCMObj =
orb.string_to_object(irp_reference.value);
basicCMIRP = _BasicCmIrpOperationsHelper.narrow(basicCMObj);
}
catch (Exception e)
{
e.printStackTrace();
}
```

The Basic CM IRP includes the following methods:

- getMOAttributes
- getContainment

The getMOAttributes and getContainment methods are included in the same CORBA solution set definition.

getMOAttributes and getContainment methods

Code 2-18 shows the getMOAttributes and getContainment methods definition.

Code 2-18: getMOAttributes and getContainment methods

```
BasicCmInformationIterator find_managed_objects(
         in BasicCMIRPConstDefs::DN base_object,
         in BasicCMIRPConstDefs::SearchControl search_control,
         in BasicCMIRPConstDefs::AttributeNameSet
requested_attributes)
      raises (
         FindManagedObjects,
         ManagedGenericIRPSystem::ParameterNotSupported,
         ManagedGenericIRPSystem::InvalidParameter,
         ManagedGenericIRPSystem::ValueNotSupported,
         ManagedGenericIRPSystem::OperationNotSupported,
         UndefinedMOException,
         IllegalDNFormatException,
         UndefinedScopeException,
         IllegalScopeTypeException,
         IllegalScopeLevelException,
         IllegalFilterFormatException,
           FilterComplexityLimit);
```

Code 2-19 shows an example of getMOAttributes and getContainment methods invocation.

Code 2-19: getMOAttributes and getContainment methods invocation example

```
String base_object = "";
BasicCmInformationIterator cmIterator = null;
ResultSetHolder batchHolder = new ResultSetHolder();
ResultContents result_contents =
ResultContents.NAMES_AND_ATTRIBUTES;
// remaining SearchControl fields are not supported
SearchControl search_control = new SearchControl(ScopeType.BASE_ONLY,
0, "useless filter", result_contents);
try
{
// empty base_object, NAMES_AND_ATTRS
cmIterator = basicCMIRP.find_managed_objects(base_object,
search_control, new String[]{});
boolean isDataPending =
cmIterator.next_basic_cm_informations((short)10, batchHolder);
Result[] result = batchHolder.value;

// given base_object, NAMES_AND_ATTRS
base_object =
"SubNetwork=IPSubNetwork,ManagedElement=network:135.159.1.1";
cmIterator = basicCMIRP.find_managed_objects(base_object,
search_control, new String[]{});
isDataPending = cmIterator.next_basic_cm_informations((short)1,
batchHolder);
result = batchHolder.value;

// empty base_object, NAMES only
base_object = "";
result_contents = ResultContents.NAMES;
search_control = new SearchControl(ScopeType.BASE_ONLY, 0, "useless
filter", result_contents);
cmIterator = basicCMIRP.find_managed_objects(base_object,
search_control, new String[]{});
```

```
isDataPending = cmIterator.next_basic_cm_informations((short)10,
batchHolder);
result = batchHolder.value;
// multiple batches
cmIterator = basicCMIRP.find_managed_objects(base_object,
search_control, new String[]{});
isDataPending = cmIterator.next_basic_cm_informations((short)1,
batchHolder);
result = batchHolder.value;
isDataPending = cmIterator.next_basic_cm_informations((short)1,
batchHolder);
result = batchHolder.value;
}
catch (Exception e)
{
Log.error(this, "testFindManagedObjects", "sw error during test
execution", e);
}
```

Notification IRP

NEs generate notifications about network events. Different kinds of events carry different kinds of information such as the following:

- a new alarm, as specified in Alarm IRP: Information Service
- an object creation, as specified in Basic CM IRP: Information Service

The Notification IRP defines an interface through which an IRP manager can subscribe to an IRP agent for receiving a notification.

The 5620 SAM 3GPP OSS interface supports the following notification types:

- alarm—forwarded when alarm events are received from the alarm feeder
- heartbeat—sent by the 3GPP OSS interface to each attached client
- kernel—sent when the 3GPP OSS interface host system notifies the interface about NE creation, deletion or modification

Code 2-20 shows an example of Notification IRP reference retrieval using the Entry Point IRP.

Code 2-20: Notification IRP reference retrieval example

```
StringHolder irp_reference;
irp_reference = new StringHolder();
try
{
entryPointIRP.get_irp_reference(manager_identifier, system_dn,
NotificationIRPImpl.NAME_TO_BIND, irp_reference);
org.omg.CORBA.Object notificationObj =
orb.string_to_object(irp_reference.value);
notificationIRP = NotificationIRPHelper.narrow(notificationObj);
}
catch (Exception e)
{
e.printStackTrace();
}
```

This Notification IRP includes the following methods:

- Subscribe—creates a subscription for receiving notifications
- Unsubscribe—cancels a subscription
- getSubscriptionStatus—obtains the subscription status and informs the IRP agent about whether a subscription is required
- changeSubscriptionFilter—replaces the current subscription filter
- getSubscriptionIds—obtains the ID assigned by the Notification IRP to each valid subscription; a valid subscription is a subscription that is not unsubscribed or removed by the IRP agent
- getNotificationCategories—obtains a list of the notification categories that the IRP agent supports

Subscribe method

Code 2-21 shows the Subscribe method definition. The attach_push call performs the subscription, and returns a subscription ID string.

Code 2-21: Subscribe method

```
      NotificationIRPConstDefs::SubscriptionId attach_push (
         in string manager_reference,
         in ManagedGenericIRPConstDefs::UnsignedLongOpt time_tick,
         in NotificationIRPConstDefs::NotificationCategorySetOpt
            notification_categories,
         in ManagedGenericIRPConstDefs::StringOpt filter
      )
      raises (Attach,
ManagedGenericIRPSystem::ParameterNotSupported,
              ManagedGenericIRPSystem::InvalidParameter,
AlreadySubscribed,
              AtLeastOneNotificationCategoryNotSupported);
```

Code 2-22 shows an example of Subscribe method invocation.

Code 2-22: Subscribe method invocation example

```
public static class SubscriberTest extends SequencePushConsumerPOA
{
.....
}
UnsignedLongOpt time_tick = new UnsignedLongOpt();
time_tick.value(1440);
NotificationCategorySetOpt notification_categories = new
NotificationCategorySetOpt();
notification_categories.value(new String[] {});
StringOpt filter = new StringOpt();
filter.value("");
SubscriberTest subscriber = new SubscriberTest();
org.omg.CORBA.Object subscriberReference = null;
String subscriptionId = null;
org.omg.PortableServer.POA rootpoa =
org.omg.PortableServer.POAHelper.narrow(orb.resolve_initial_referenc
es("RootPOA"));
rootpoa.the_POAManager().activate();
```

```
subscriberReference = rootpoa.servant_to_reference(subscriber);
subscriptionId = orb.object_to_string(subscriberReference);
notificationIRP.attach_push(manager_reference, time_tick,
notification_categories, filter);
```

UnSubscribe method

Code 2-23 shows the UnSubscribe method definition.

Code 2-23: UnSubscribe method

```
      void detach (
         in string manager_reference,
         in NotificationIRPConstDefs::SubscriptionIdOpt
subscription_id
      )
      raises (DetachException,
              ManagedGenericIRPSystem::ParameterNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Code 2-24 shows an example of UnSubscribe method invocation. The input parameters are the CORBA reference of the subscription and the subscription ID, which are obtained by the subscription operator in the Subscribe method.

Code 2-24: UnSubscribe method invocation example

```
SubscriptionIdOpt sub_id = new SubscriptionIdOpt();
sub_id.value(subscriptionId);
notificationIRP.detach(manager_reference, sub_id);
```

getSubscriptionStatus method

Code 2-25 shows the getSubscriptionStatus method definition.

Code 2-25: getSubscriptionStatus method

```
      NotificationIRPConstDefs::NotificationCategorySet
get_subscription_status
      (
         in NotificationIRPConstDefs::SubscriptionId
subscription_id,
         out ManagedGenericIRPConstDefs::StringOpt filter_in_effect,
         out NotificationIRPConstDefs::SubscriptionStateOpt
subscription_state,
         out ManagedGenericIRPConstDefs::UnsignedLongOpt time_tick
      )
      raises (GetSubscriptionStatus,
              ManagedGenericIRPSystem::OperationNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Note — An IRP manager must perform a getSubscriptionStatus operation within the specified timeTick period. Otherwise, the IRP agent removes the subscription.

Code 2-26 shows an example of getSubscriptionStatus method invocation. The input parameters are the CORBA reference of the subscription and the subscription ID, which are obtained by the subscription operator in the Subscribe method.

Code 2-26: getSubscriptionStatus method invocation example

```
StringOptHolder filter_in_effect = new StringOptHolder();
SubscriptionStateOptHolder subscription_state = new
SubscriptionStateOptHolder();
UnsignedLongOptHolder time_tick_holder = new UnsignedLongOptHolder();

String[] cats =
notificationIRP.get_subscription_status(subscriptionId,
filter_in_effect, subscription_state, time_tick_holder);
```

changeSubsciptionFilter method

Code 2-27 shows the changeSubsciptionFilter method definition.

Code 2-27: changeSubsciptionFilter method

```
      void change_subscription_filter (
         in NotificationIRPConstDefs::SubscriptionId
subscription_id,
         in string filter
      )
      raises (ChangeSubscriptionFilter,
              ManagedGenericIRPSystem::OperationNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Code 2-28 shows an example of changeSubsciptionFilter method invocation. The input parameters are the CORBA reference of the subscription and the subscription ID, which are obtained by the subscription operator in the Subscribe method.

Code 2-28: changeSubsciptionFilter method invocation example

```
String newFilter = "$.filterable_data(n) == 1";
notificationIRP.change_subscription_filter(subscriptionId,
newFilter);
```

getSubscriptionIds method

Code 2-29 shows the getSubscriptionIds method definition.

Code 2-29: getSubscriptionIds method

```
NotificationIRPConstDefs::SubscriptionIdSet get_subscription_ids (
         in string manager_reference
      )
      raises (GetSubscriptionIds,
              ManagedGenericIRPSystem::OperationNotSupported,
              ManagedGenericIRPSystem::InvalidParameter);
```

Code 2-30 shows an example of getSubscriptionIds method invocation. The input parameters are the CORBA reference of the subscription and the subscription ID, which are obtained by the subscription operator in the Subscribe method.

Code 2-30: getSubscriptionIds method invocation example

```
String[] subscriptions =
notificationIRP.get_subscription_ids(manager_reference);
```

getNotificationCategories method

Code 2-31 shows the getNotificationCategories method definition.

Code 2-31: getNotificationCategories method

```
NotificationIRPConstDefs::NotificationCategorySet
   get_notification_categories (
      out NotificationIRPConstDefs::NotificationTypesSetOpt
         notification_type_list
)
raises (GetNotificationCategories,
        ManagedGenericIRPSystem::OperationNotSupported);
```

Code 2-32 shows an example of getNotificationCategories method invocation. The input parameters are the CORBA reference of the subscription and the subscription ID, which are obtained by the subscription operator in the Subscribe method.

Code 2-32: getNotificationCategories method invocation example

```
NotificationTypesSetOptHolder notification_type_list = new
NotificationTypesSetOptHolder();
String[] ntfCats =
notificationIRP.get_notification_categories(notification_type_list);
```

Communication Surveillance IRP

Ensuring the availability and reliability of the network management solution requires automatic surveillance of the communication between the network manager and the managed system The Communication Surveillance, or CS, IRP, performs this function by sending a periodic heartbeat notification to each active subscriber.

The heartbeat interval is specified by the CNBI.ThreeGPPCORBA.HeartbeatPeriod parameter in the cnbi.properties file. The parameter range is 5 to 60m, and the default value is 5m. An OSS client can retrieve this value through the 3GPP OSS interface, but cannot modify it.

This Communication Surveillance IRP includes the following methods:

- getHeartBeatPeriod

The CS IRP allows an OSS client to detect whether the client subscription is valid. To keep a subscription active, a client must request the subscription status using the getSubscriptionStatus method in the Notification IRP within the time specified by the timeTick attribute in the Subscribe method. If a subscriber does not request the status within this time, the 3GPP OSS interface disables the subscription and stops sending heartbeat notifications to the client. A timeTick value of zero means that the subscription never ends.

The CS IRP is a bidirectional heartbeat mechanism: OSS clients keep subscriptions active by querying the subscription status, and the 3GPP OSS interface periodically sends the heartbeat notification to each active OSS client.

Code 2-33 shows an example of Communication Surveillance IRP reference retrieval using the Entry Point IRP.

Code 2-33: Communication Surveillance IRP reference retrieval example

```
try
{
entryPointIRP.get_irp_reference(manager_identifier, system_dn,
HeartBeatIRPImpl.NAME_TO_BIND, irp_reference);
org.omg.CORBA.Object heartBeatObj =
orb.string_to_object(irp_reference.value);
heartbeatIRP = CSIRPHelper.narrow(heartBeatObj);
}
catch (Exception e)
{
e.printStackTrace();
}
```

getHeartBeatPeriod method

Code 2-34 shows the getHeartBeatPeriod method definition.

Code 2-34: getHeartBeatPeriod method

```
CSIRPConstDefs::Result get_heartbeat_period(
   out CSIRPConstDefs::HeartbeatPeriod heartbeat_period
)
raises (GetHeartbeatPeriod);
```

Code 2-35 shows an example of getHeartBeatPeriod method invocation.

Code 2-35: getHeartBeatPeriod method invocation example

```
ShortHolder heartbeat_period = new ShortHolder();
heartbeatIRP.get_heartbeat_period(heartbeat_period);
```

Kernel IRP

The Kernel IRP contains a method that retrieves the list of network resource IRP versions. It also defines the notification capability for NEs and NE management systems. The 3GPP Kernel IRP standard supports the following notification types:

- object creation
- object deletion
- attribute value change
- requirement to partially or fully resynchronize the configuration information

Note — The 5620 SAM 3GPP OSS interface does not support the resynchronization notification.

This Kernel IRP includes the following methods:

- getNRMIRPVersion

Code 2-36 shows an example of Kernel IRP reference retrieval using the Entry Point IRP.

Code 2-36: Kernel IRP reference retrieval example

```
try
{
entryPointIRP.get_irp_reference(manager_identifier, system_dn,
KernelIRPImpl.NAME_TO_BIND, irp_reference);
org.omg.CORBA.Object kernelObj =
orb.string_to_object(irp_reference.value);
kernelIRP = _KernelCmIrpOperationsHelper.narrow(kernelObj);
}
catch (Exception e)
{
e.printStackTrace();
}
```

getNRMIRPVersion method

Code 2-37 shows the getNRMIRPVersion method definition.

Code 2-37: getNRMIRPVersion method

```
void get_nrm_irp_version
      (
         out ManagedGenericIRPConstDefs::VersionNumberSet
version_number_list,
         out ManagedGenericIRPConstDefs::VersionNumberSet
vse_version_number_list
      )
      raises (GetNRMIRPVersion);
```

Code 2-38 shows an example of getNRMIRPVersion method invocation.

Code 2-38: getNRMIRPVersion method invocation example

```
VersionNumberSetHolder version_number_list = new
VersionNumberSetHolder();
VersionNumberSetHolder vse_version_number_list = new
VersionNumberSetHolder();
kernelIRP.get_nrm_irp_version(version_number_list,
vse_version_number_list);
```

Generic IRP

Each IRP supports a set of common services. The Generic IRP defines the retrieval of IRP profile notification or operation information and the supported versions of a specific IRP. The methods defined in this section are inherited by other IRPs

The Generic IRP includes the following methods:

- getIRPOutline—returns the supported IRP versions for an interface
- getOperationsProfile—returns the operations supported by a specified IRP
- getNotificationProfile—returns the notifications supported by a specified IRP

Note — The returned values vary, depending on the IRP specified.

getIRPOutline method

Code 2-39 shows an example of getIRPOutline method invocation.

Code 2-39: getIRPOutline method invocation example

```
try
{
String irp_version = "";
SupportedIRPListHolder supported_irp_list = new
SupportedIRPListHolder();
Result result =
entryPointIRP.get_irp_outline(irp_version,supported_irp_list);
supported_irp_list.value[0].system_dn);
SupportedIRP supportedIRP = supported_irp_list.value[0];

}
catch (Exception e)
{
e.printStackTrace();
}
```

getOperationsProfile method

Code 2-40 shows an example of getOperationsProfile method invocation.

Code 2-40: getOperationsProfile method invocation example

```
try
{
Method[] methods = entryPointIRP
.get_ep_irp_operations_profile(EntryPointIRPImpl.VERSION);
}
catch (Exception e)
{
e.printStackTrace();
}
```

getNotificationsProfile method

Code 2-41 shows an example of getNotificationsProfile method invocation.

Code 2-41: getNotificationsProfile method invocation example

```
try
{
Method[] methods = entryPointIRP
.get_ep_irp_notification_profile(EntryPointIRPImpl.VERSION);
}
catch (Exception e)
{
e.printStackTrace();
}
```

3 — Communicating with OSS clients

3.1 Initial access

In order for OSS applications to connect to the 3GPP OSS interface, the OSS must have access to the list of supported IRPs and their corresponding CORBA references.

The Entry Point IRP provides a standard mechanism for discovering the supported IRPs and the associated CORBA references.

During startup, the 3GPP OSS interface generates the IOR for the Entry Point IRP. This IOR is stored in the following file:

```
$CNBI_HOME/ior/EPIRP.ior
```

The ORB is configured to ensure that this reference does not change when the 5620 SAM restarts.

After an OSS client is given this IOR, it can begin to interact with the 3GPP OSS interface.

Code 3-1 provides an example of how an OSS application can gain initial access to the 3GPP OSS interface.

Code 3-1: Gaining initial access to the 3GPP OSS interface

```
//get entryPoint reference
/input parameter, IOR directory
String iorFile = args[0] + File.separator + "EPIRP.ior";
FileInputStream fis = new FileInputStream(iorFile);
BufferedReader reader = new BufferedReader(new
InputStreamReader(fis));
String ior = reader.readLine();
reader.close();
org.omg.CORBA.Object entryPointObj = orb.string_to_object(ior);
EPIRP entryPointIRP = EPIRPHelper.narrow(entryPointObj);
```

3.2 Event monitoring

This section describe the event monitoring function.

Notification IRP initialization

The 3GPP OSS interface Notification IRP uses the CORBA notification service to send notifications such as alarms, heartbeats, and kernel events to the registered consumers, which are the OSS clients.

When the Notification IRP is initialized, for example, during 5620 SAM main server startup, it creates one event channel and connects a proxy push consumer for that channel with a push supplier. This supplier is used to send all 3GPP notifications.

Subscribing to event notifications

Before an OSS application can receive event notifications, it must do the following, in sequence, as described in Procedure 3-1:

- get the entryPoint reference
- get the notification IRP reference
- create an event consumer and send a subscription request
- wait for events

Procedure 3-1 To subscribe to and unsubscribe from event notifications

Perform this procedure to subscribe to event notifications using the 3GPP OSS interface.

1 Obtain the Entry Point reference using the method shown in Code 3-2.

Code 3-2: getEntryPoint method

```
//get entryPoint reference
/input parameter, IOR directory
String iorFile = args[0] + File.separator + "EPIRP.ior";
FileInputStream fis = new FileInputStream(iorFile);
BufferedReader reader = new BufferedReader(new
InputStreamReader(fis));
String ior = reader.readLine();
reader.close();
org.omg.CORBA.Object entryPointObj = orb.string_to_object(ior);
EPIRP entryPointIRP = EPIRPHelper.narrow(entryPointObj);
```

2 Obtain the Notification IRP reference using the method shown in Code 3-3.

Code 3-3: getNotificationIRP method

```
String manager_identifier = "n.a.";
String system_dn = ""; //Must match the one in cnbi.properties
StringHolder irp_reference;
irp_reference = new StringHolder();
entryPointIRP.get_irp_reference(manager_identifier, system_dn,
"NotificationIRP=1", irp_reference);
org.omg.CORBA.Object notificationObj =
orb.string_to_object(irp_reference.value);
NotificationIRP notificationIRP =
NotificationIRPHelper.narrow(notificationObj);
```

3 Send a subscribe request using the method shown in Code 3-4. The Notification IRP subsequently obtains a proxy push supplier from the event channel and connects the OSS client reference. which is the push consumer, to the proxy.

Code 3-4: attach_push method

```
UnsignedLongOpt time_tick = new UnsignedLongOpt();
time_tick.value(0);
NotificationCwait for eategorySetOpt notification_categories = new
NotificationCategorySetOpt();
```

```
notification_categories.value(new String[] {});
StringOpt filter = new StringOpt();
filter.value("");
SubscriberTest subscriber = new SubscriberTest();
org.omg.PortableServer.POA rootpoa =
org.omg.PortableServer.POAHelper.narrow(orb.resolve_initial_referenc
es("RootPOA"));
rootpoa.the_POAManager().activate();
org.omg.CORBA.Object corbaReference =
rootpoa.servant_to_reference(subscriber);
String manager_reference = orb.object_to_string(corbaReference);
String subscriptionId =
notificationIRP.attach_push(manager_reference, time_tick,
notification_categories, filter);
```

4 Use the 3GPP OSS interface to listen for incoming event notifications that the Notification IRP pushes to the proxy Push Consumer.

5 To unsubscribe from event notifications, use the method shown in Code 3-5.

Code 3-5: detach method

```
//unsubscribe event consumer
SubscriptionIdOpt sub_id = new SubscriptionIdOpt();
sub_id.value(subscriptionId);
notificationIRP.detach(manager_reference, sub_id);
```

Filtering

The 3GPP OSS interface supports a subset of 3GPP filters that can be used in alarm-list and alarm-count retrieval operations. Fault notifications are not filtered.

3GPP alarm filtering supports the following attributes:

- Probable cause
- Perceived severity
- Alarm type
- Ack state

Note — The Probable Cause value INDETERMINATE cannot be used for filtering.

You can combine these attributes using AND and OR operators to create more specific filters.

The supported filtering operations, syntax, and attribute names that can be included as filter criteria are listed in Appendix A.

Connection monitoring

The GPP OSS interface notification service maintains an event queue for each registered consumer. If the number of events in a queue reaches the maximum, for example, if a consumer cannot keep up with the notification rate, the 5620 SAM does the following:

- disconnects the consumer, and marks the consumer subscriptions as invalid
- discards all notifications for the consumer

The 5620 SAM 3GPP OSS interface provides bidirectional connection surveillance using a heartbeat function. If the 5620 SAM main server becomes unavailable, the OSS client requests received on the 3GPP interface fail, and an error message is sent to the OSS client. Subsequent requests succeed if the server becomes available. Contact Alcatel-Lucent technical support to obtain a list of the supported exceptions for a specific method. See chapter 2 for information about connection surveillance.

The 5620 SAM 3GPP OSS interface monitors the state of each client subscription. When a failure is detected, for example, when an exception is raised to the OSS client, the 3GPP OSS interface maintains the OSS client connection and tries to reconnect with the 5620 SAM main server. See section 3.4 for more information about connection failures and redundancy.

Error recovery

The 3GPP OSS interface can recover from system restarts and from client connection interruptions.

3GPP OSS interface restart

After the 3GPP OSS interface restarts, each CORBA reference is updated and the CORBA notification service is restarted, which re-establishes the event channel so that it can accept subscriptions from OSS Clients.

Connection recovery between clients and the interface

The absence of heartbeat notifications, or an invalid status returned by a subscription status query indicates a connection loss between an OSS client and the 3GPP OSS interface. To recover from a connection loss, an OSS client needs to perform the following steps, in sequence:

- Issue an unsubscribe request using the detach method.
- Resubscribe using the attach_push method
- Execute a full resync, which retrieves the alarm list and obtains any missed data.

3.3 Security

This section describes the security considerations for the 5620 SAM 3GPP OSS interface.

User security

Only a 5620 SAM user whose scope of command includes full access permissions on the oss and fm packages can perform 3GPP OSS interface operations. After a 5620 SAM main server installation or upgrade, and before you start the main server, you must add the 3GPP OSS user name and password to the 3GPP OSS configuration. After you start the main server, you must log in as the admin user and create a 5620 SAM 3GPP OSS user account. This account must have the same user name and password as the account defined in the 3GPP OSS configuration. See the *5620 SAM | 5650 CPAM Installation and Upgrade Guide* for 3GPP OSS configuration information. See the *5620 SAM User Guide* for information about creating 5620 SAM user accounts.

SSL security

If SSL is enabled for 5620 SAM main server communication with OSS clients, see the *5620 SAM User Guide* for information on how to enable SSL on the 3GPP OSS interface.

The 3GPP OSS uses a HTTP or HTTPS encryption protocol for sending requests and receiving responses through the 5620 SAM-O server. See the *5620 SAM User Guide* for information on how to configure the 5620 SAM server for HTTP or HTTPS.

Firewall support

The 3GPP OSS interface supports the configuration of a firewall between the 5620 SAM and 3GPP OSS clients. When you configure a firewall, consider the following:

- The firewall must allow inbound connections to at least one port.
- The 3GPP OSS interface must be configured to use the same port that the firewall allows connections to.
- If the inbound port is modified in the firewall rules after the 3GPP OSS interface is installed, you must reconfigure the 3GPP OSS interface, as described in Procedure 3-2.
- The firewall must be configured to allow outbound connections to a port.
- If the OSS client is behind a NAT router, the client must use a VPN with NAT traversal capabilities to reach the 3GPP OSS interface. The VPN is transparent to the 3GPP OSS interface.

Procedure 3-2 To configure a 3GPP OSS interface to operate through a firewall

Perform this procedure to enable OSS client communication with a 3GPP OSS interface through a firewall.

Note — In a redundant 5620 SAM deployment, you must perform this procedure on each 5620 SAM main server in the deployment.

1 Log in to the 5620 SAM main server as the samadmin user.

2 Open the *path*/nms/cnbi/home/config/cnbi.properties file using a plain-text editor

where *path* is the 5620 SAM main server installation location, typically /opt/5620sam/server

3 Locate the following line:

```
CNBI.ThreeGPPCORBA.OrbPort=
```

4 Edit the line to read:

```
CNBI.ThreeGPPCORBA.OrbPort=inbound_port
```

where *inbound_port* is the port value that the OSS clients must use to reach the 3GPP OSS interface

5 Save the file.

6 Close the file.

7 Open a console window on the main server station.

8 Navigate to the following directory:

path/nms/bin

where *path* is the 5620 SAM main server installation directory, typically /opt/5620sam/server

9 Enter the following at the prompt:

```
bash$ ./nmsserver.bash cnbiread_config ↵
```

The main server loads the updated configuration, and puts the new port value into effect.

10 Close the console window.

11 Log out of the 5620 SAM main server.

3.4 Redundancy

In a redundant 5620 SAM deployment, the 3GPP OSS interface must be installed on the primary and standby main servers. Each 3GPP OSS interface is unaware of the interface on the other main server. See the *5620 SAM | 5650 CPAM Installation and Upgrade Guide* for more information.

After a 5620 SAM server activity switch, the 3GPP OSS interface instance on the former primary main server becomes unresponsive, and heartbeat notifications are not sent to the OSS clients. Each connected OSS client must begin using the entry point IOR of the 3GPP OSS interface instance on the former standby main server, which is the new primary main server, and must subscribe the notification consumers using the Notification IRP of the new primary main server entry point.

Note — In a redundant 5620 SAM deployment, there are two entry point IOR files–one for each 3GPP OSS interface instance that is available to the OSS applications.

3.5 Multiple 3GPP release support

The 3GPP OSS interface can operate in 3GPP R7 or 3GPP R8 compatibility mode, but cannot operate in both modes simultaneously.

An OSS application can switch between the modes by configuring the CNBI.ThreeGPPCORBA.SupportedRelease property in the cnbi.properties file.

The main differences between the two releases are the following:

- the IRP versions
- the notification domain names
- the IRP names

4 — 5620 SAM 3GPP OSS domains

4.1 Fault management

A fault management OSS application can use the 5620 SAM 3GPP OSS interface to do the following:

- Receive network event notifications and current alarms using the Notification, Alarm, CS and Kernel IRPs.
- Retrieve alarms from the 5620 SAM using methods from the Alarm IRP.

See chapter 2 for more information about monitoring near-real-time events and alarms.

4.2 Workflow to obtain an alarm list

Perform the following steps to generate a request for listing alarm and event management information.

1 Get the Entry Point reference. See step 1 of Procedure 3-1 for more information.

2 Get the Alarm IRP reference. See "Alarm IRP" in section 2.4 for a code sample associated with this step.

3 Retrieve a list of alarms using the get_alarm_list method from the Alarm IRP. See "Alarm IRP" in section 2.4 for a code sample associated with this step.

4.3 Workflow to acknowledge an alarm list

Perform the following steps to generate a request to acknowledge alarm and event management information.

1 Get the Entry Point reference. See step 1 of Procedure 3-1 for more information.

2 Get the Alarm IRP reference. See "Alarm IRP" in section 2.4 for a code sample associated with this step.

3 Acknowledge a list of alarms using the acknowledge_alarms method from the Alarm IRP. See "Alarm IRP" in section 2.4 for a code sample associated with this step.

4.4 Inventory management

The inventory management OSS application has two mechanisms by which it can interface with the 5620 SAM 3GPP OSS interface to retrieve inventory information from LTE devices that are managed by the 5620 SAM:

- Basic inventory available using the CORBA methods defined by the Basic CM IRP.
- 3GPP compliant XML file that is automatically generated and updated daily.

Basic inventory

The 3GPP OSS interface provides the ability to retrieve a list of the LTE-managed NEs. This information acts as auxiliary fault management information, because it is a list of NEs against which alarms can be raised. A limited set of NE attributes is supported.

Note — The 3GPP base object support is limited to the NE level, which means that the 3GPP OSS interface does not recognize the names of objects below the NE level, such as shelves or MDAs.

See chapter 2 for information about the Basic CM IRP for inventory management.

3GPP compliant Inventory File generation and description

The 3GPP OSS Interface can be optionally configured to support the 3GPP Inventory Management IRP (TS 32.692, 32.695). For more information about 3GPP compliant TS, go to http://www.3gpp.org/specifications. Once configured, the 5620 SAM allows for the automatic daily generation of a 3GPP compliant XML Inventory File. This file has inventory data that contains information pertaining to the FRU on hardware, firmware and optional software units of LTE components in a 3G or 4G RAN.

Automatic generation of Inventory File

The generation of the Inventory file is disabled by default when the 3GPP OSS Interface is initially installed. In order to enable the automatic generation of the 3GPP XML Inventory file, the CNBI.SAMO.DATA.START_TIME property located in the *installation_directory*/nms/cnbi/home/config/cnbi.properties file must be configured. The *installation_directory* is the 5620 SAM main server installation directory, typically /opt/5620sam/server

The CNBI.SAMO.DATA.START_TIME property represents the time for the first execution of the inventory data retrieval task. The format expected is *HH:MM*, in 24 h format. Example: 15:35. This property is empty by default.

The following optional properties, also located in the cnbi.properties file, can be configured:

- CNBI.SAMO.DATA.FILENAME—This property is name of the Inventory File. The default value is 3GPP_Inventory_Data_<timestamp>.xml.
- CNBI.SAMO.DATA.RETENTION_PERIOD—This property is the maximum time that the Inventory File will be kept before it is deleted. The minimum and default value is 5 days.
- CNBI.SAMO.DESTINATION.DIRECTORY—This property specifies the destination directory for the Inventory File. The default value is *installation_directory*/lte/inventory.

After configuring the properties described above, you must to execute the following command as the samadmin user in the following directory:

```
installation_directory/nms/bin/nmsserver.bash cnbiread_config
```

Once all the mandatory properties are configured, a 3GPP compliant XML file is generated and placed in the directory specified by the CNBI.SAMO.DESTINATION.DIRECTORY property, and new files will be generated every 24 hours after the configured CNBI.SAMO.DATA.START_TIME. The oldest files will be deleted after the expiration of the time specified by the CNBI.SAMO.DATA.RETENTION_PERIOD property.

Note — It is important that the OSS application and/or system administrator manage the amount of available disk space where these XML files will be stored.

3GPP Inventory File properties description

The 3GPP Inventory file generated by the 3GPP OSS Interface has the following aspects:

- The Inventory File adheres to 3GPP InventoryNRM.xsd schema defined in TS 32.695.
- The next level in the containment is the Managed Elements. The InventoryUnit instances are grouped by the parent Network Element.
- The InventoryUnitId contains the full distinguished name (DN) of the managed object in 3GPP format.

Inventory file attributes

A managed object that contains any of the attributes listed in Table 4-1 will be included in the XML file report. The table indicates whether attributes are mandatory (M) or optional (O).

Table 4-1 Inventory file attributes

Attribute name	Support qualifier
inventoryUnitId	M
inventoryUnitType	M
vendorUnitFamilyType	O
vendorUnitTypeNumber	O
versionNumber	O
vendorName	M
serialNumber	O
dateOfManufacture	O
dateOfLastService	O
unitPosition	O
manufacturerData	O

Note — The optional attributes vendorUnitFamilyType, vendorUnitTypeNumber, and serialNumber in Table 4-1 are mandatory for hardware objects.

Sample 3GPP Inventory File

The sample file displayed below shows inventory data on three managed elements under the 5620sam network domain.

```
<?xml version="1.0" ?>

<InventoryUnit id="SubNetwork=5620sam">

<InventoryUnit  id=
"SubNetwork=5620sam,ManagedElement=138.120.128.126">

<InventoryUnit
id="SubNetwork=5620sam,ManagedElement=138.120.128.126,rack=eNB-1,she
lf=1,cardSlot=2,card=:NA:,BBCard=:NA:">

<attributes>

<inventoryUnitType>MOD: XCEMU</inventoryUnitType>

<vendorUnitFamilyType>BB</vendorUnitFamilyType>

<vendorUnitTypeNumber>300986049</vendorUnitTypeNumber>

<vendorName>ALU </vendorName>

<serialNumber>U80338 </serialNumber>

</attributes>

</InventoryUnit>
```

```
</InventoryUnit>

<InventoryUnit
id="SubNetwork=5620sam,ManagedElement=138.120.148.146">

<InventoryUnit
id="SubNetwork=5620sam,ManagedElement=138.120.148.146,rack=eNB-1,she
lf=1,cardSlot=2,card=:NA:,BBCard=:NA:">

<attributes>

<inventoryUnitType>MOD: XCEMU</inventoryUnitType>

<vendorUnitFamilyType>BB</vendorUnitFamilyType>

<vendorUnitTypeNumber>300986049</vendorUnitTypeNumber>

<vendorName>ALU </vendorName>

<serialNumber>U80338 </serialNumber>

</attributes>

</InventoryUnit>

<InventoryUnit
id="SubNetwork=5620sam,ManagedElement=138.120.148.146,rack=eNB-1,she
lf=1,cardSlot=1,card=:NA:,CBCard=:NA:">

<attributes>

<inventoryUnitType>MOD: XCCM-U BOARD</inventoryUnitType

<vendorUnitFamilyType>CB</vendorUnitFamilyType>

<vendorUnitTypeNumber>0600 </vendorUnitTypeNumber>

<vendorName>ALU </vendorName>

<serialNumber>9U0TS7 </serialNumber>

</attributes>

</InventoryUnit>

</InventoryUnit>

</InventoryUnit>
```

4.5 Workflow to obtain a list of NEs

Perform the following steps to generate a request that returns a list of managed NEs.

1. Get the Entry Point IRP reference. See "Entry Point IRP" in section 2.4 for a code sample associated with this step.
2. Get the Basic CM IRP reference. See "Basic CM IRP" in section 2.4 for a code sample associated with this step.
3. Retrieve a list of NEs using the find_managed_objects method from the Basic CM IRP. See "Basic CM IRP" in section 2.4 for a code sample associated with this step.

Appendices

A. 5620 SAM-O 3GPP code samples

A.1 Code samples

The 5620 SAM-O SDK includes XML interface script samples and 3GPP OSS interface Java code samples.

The library of 3GPP CORBA Java code samples includes fault management and inventory management samples to facilitate rapid OSS application integration with the 5620 SAM-O.

The samples in the 5620 SAM-O SDK library are intended to assist OSS developers with design. For more information about the Java samples that are not included in the 5620 SAM-O SDK library, contact Alcatel-Lucent technical support.

Fault management code samples

Table A-1 lists and describes the fault management code samples that are available for the 3GPP OSS interface.

Table A-1 Fault management Java code samples

Sample Name	Description
CORBA3GPPEventSubscriberSample.java	Sample code to create an event consumer that subscribes to the 3GPP OSS interface and processes events
CORBA3GPPAcknowledgeSample.java	Sample code to acknowledge a list of alarms
CORBA3GPPAlarmListSample.java	Sample code to retrieve a list of alarms

Basic inventory management code samples

Table A-2 lists and describes the basic inventory management code samples that are available for the 3GPP OSS interface.

Table A-2 Basic inventory Java code samples

Sample Name	Description
CORBA3GPPNeListSample.java	Sample code to retrieve a list of NEs

B. Standards compliance

B.1 Standards compliance

This appendix describes the 5620 SAM 3GPP OSS interface compliance with the 3GPP standards.

The scope of this information is restricted to the following IRPs:

- Entry Point
- Notification
- Communications Surveillance
- Basic CM
- Kernel
- Fault Management

Additionally, the Generic IRP, which is inherited by other IRPs, supports operations to obtain the version, operation, and notification profiles of the other IRPs.

The sources of the IRP information are the 3GPP 32-series R7 specification, published September, 2008, and the 3GPP 32-series R8 specification, published December, 2009.

See the *5620 SAM 3GPP OSS Interface Compliance Statements* document for detailed 3GPP compliance information.

C. Troubleshooting

C.1 3GPP OSS troubleshooting overview

The procedures in this appendix describe how to troubleshoot OSS application-specific problems. Use the information contained in this section and the *5620 SAM Troubleshooting Guide* to troubleshoot common client application issues for the 5620 SAM GUI and OSS.

C.2 Diagnosing typical 3GPP installation problems on the 5620 SAM server

You must verify the required platform, environment and license requirements before the 3GPP NBI can be installed. The installation of the 3GPP NBI may fail if the following requirements are not met:

- The 3GPP NBI is supported only on a Solaris x86-based platform. It is not supported on Windows or SPARC platforms.
- The 3GPP NBI requires a minimum of 12 GB of RAM if installed on a distributed architecture, and a minimum of 24 GB RAM if the SAM server and SAM database are collocated on the same machine. It will report an error if this minimum requirement is not met.
- The 3GPP NBI interface will not install if the minimum Solaris packages for the 3GPP NBI as described in the *5620 SAM | 5650 CPAM Installation and Upgrade Guide* are not installed.
- The 5620 SAM license key must include the license for the 5620 SAM-O.
- The minimum bandwidth requirement between the OSS and 3GPP NBI is 7.1 mbps.

Refer to the *5620 SAM Planning Guide* and *5620 SAM | 5650 CPAM Installation and Upgrade Guide* for more information about platform and environment configurations.

Typical installation problem

It is possible to accidentally skip the enabling of the "Enable 3GPP OSS Interface" option on the Main Server Configuration panel when installing the 5620 SAM server by using using the 5620 SAM/5650 CPAM server installer. You can verify whether the option is enabled by checking if the *installation_directory*/nms/cnbi directory exists. If the directory does not exist, then rerun the 5620 SAM/5650 CPAM server installer and choose Main Server Configuration when asked for the installation type. When you progress to the Main Server Configuration for Clients screen, enable the option for the 3GPP OSS Interface.

3GPP OSS user and password configuration problems

For a brand new installation of the 5620 SAM server, it is possible to forget to edit the cnbi.properties file before adding the CNBI.SAMO.USER and password to the 5620 SAM. If this happens, you must perform Procedure C-1 to update the cnbi.properties file and allow the 3GPP NBI to start successfully.

Note — The password must be MD5-hashed. You can use md5hash.bash utility in the *installation_directory*/nms/bin directory to create the md5hash password.

Procedure C-1 To update the cnbi.properties file in the 5620 SAM

Perform this procedure after configuring the 3GPP NBI user and password properties in the cnbi.properties file.

Note — You will need to perform this procedure when you install the 3GPP NBI on an existing 5620 SAM server.

1. Log into the 5620 SAM main server as the samadmin user.
2. Navigate to the following directory:

   path/nms/bin

   where *path* is the 5620 SAM main server installation directory, typically /opt/5620sam/server
3. Enter the following at the prompt:

   ```
   bash$ ./nmsserver.bash cnbiread_config ↵
   ```
4. If the 3GPP NBI application does not come up successfully, you may need to restart the 3GPP NBI processes by performing the following steps.

   i. Enter the following at the prompt:

   ```
   bash$ ./nmsserver.bash cnbistop ↵
   ```

   ii. Enter the following at the prompt:

   ```
   bash$ ./nmsserver.bash cnbistart ↵
   ```

Troubleshooting 3GPP OSS SSL communication problems

If the 5620 SAM server installation has been configured to support SSL and the OSS cannot communicate with the 3GPP NBI, it is possible that the 3GPP NBI has not been configured for SSL communications. If this is the case, then you must perform Procedure 3-2 to configure the required properties in the *installation_directory*/nms/cnbi/home/config/cnbi.properties file.

Procedure C-2 To verify that the 3GPP OSS Interface is successfully connected to the 5620 SAM server

1 Choose Administration→Security→5620 SAM User Security from the 5620 SAM main menu. The 5620 SAM User Security - Security Management form opens with the General tab displayed.

2 Click on the Sessions tab button.

3 Verify that the CNBI User has a Type of 5620 SAM-O JMS and a State of Active.

4 Click on the Messaging Connections tab button.

5 Verify that the CNBI User has a Client Type of 5620 SAM-O, a State of Connected, and that Durable is checked.

6 Verify the JMS status by performing the following steps:

i Log in to the 5620 SAM main server as the samadmin user.

ii Navigate to the following directory:

path/nms/bin

where *path* is the 5620 SAM main server installation directory, typically /opt/5620sam/server

iii Enter the following at the prompt:

```
bash$ ./nmsserver.bash jmsstatus ↵
```

iv Verify that the output of the command is similar to the following example:

```
--Subscription: durable? true clientid: cnbi@1288092720429
selector: ALA_clientId in ('cnbi@1288092720429', '') and
((ALA_category = 'FAULT' and MTOSI_NTType = 'NT_ALARM') or
(ALA_category = 'GENERAL' and MTOSI_objectType =
'netw.NetworkElement') or ((MTOSI_objectType =
'StateChangeEvent' and ALA_eventName = 'JmsMi ssedEvents') or
(MTOSI_objectType = 'KeepAliveEvent'))) and mirror is null
and mirrorli is null
```

Verifying that messages are being received by the 3GPP OSS interface from the 5620 SAM

If an OSS is not yet connected and you need to verify that JMS messages are being received by the 3GPP NBI, you should see events being processed in the logs. At least every 30 seconds the JMS KeepAliveEvent messages are being logged in the *installation_directory*/nms/jboss/server/alu_cnm_cnbi/log/cnb.log file similar to the following:

```
.....com.alu.cnm.cnbi.plugin.samo.SAMO_JMSListener.onMessage():
Processing event from SAM-O (START)...
.....com.alu.cnm.cnbi.plugin.samo.SAMO_JMSListener.onMessage:
discarding message with MTOSI object type: KeepAliveEven?..
.....com.alu.cnm.cnbi.plugin.samo.SAMO_JMSListener.onMessage():
Processing event from SAM-O (END), time ms: 1.....
```

Firewall preventing OSS client access to the 3GPP OSS Interface

If a firewall exists between the OSS and the 5620 SAM server, the firewall must be configured to allow outbound connections to any port and allow inbound connections to the CNBI.ThreeGPPCORBA.OrbPort port which is configured in the *installation_directory*/nms/cnbi/home/config/cnbi.properties file. The default value is 9735.

Problems referencing the Entry Point IOR

During initialization, the 3GPP OSS interface generates an IOR for the Entry Point IRP and stores it in the *installation_directory*/nms/cnbi/home/ior/EPIRP.ior file on the 5620 SAM main server. The OSS then uses this IOR to gain initial access to the 3GPP NBI via the Entry Point IRP.

If the OSS is having problems connecting to the 3GPP NBI, one of the first things to verify is whether you retrieved the correct EPIRP.ior from the 5620 SAM server. Copy the IOR from the 5620 SAM Server and compare it with the IOR that the OSS is using.

You can also verify whether the IOR is not corrupt, or whether it has the correct IP address of the SAM server and port by going to http://www2.parc.com/istl/projects/ILU/parseIOR/. Paste the full IOR information, and Parse. It should return the IP address and port on the SAM server.

Incorrect configuration of the System DN

The OSS needs to have defined the System DN. The default System DN is configured in the *installation_directory*/nms/cnbi/home/config/cnbi.properties file as SystemDN? = sam. If this value is different from the default value of "sam" you will receive the following error:

```
*
com.alu.cnm.cnbi.plugin.threegppCORBA.irp.EntryPointIRPImpl.get_irp_
reference(): user= Wrong system_dn parameter: <wrongdn>
```

If you change a value in the cnbi.properties file, you will need to perform the following command after editing the file to update the 5620 SAM:

```
bash$ ./nmsserver.bash cnbiread_config ↵
```

Problems receiving alarms and events when SPAN is configured

If your 5620 SAM server is configured to use SPANs to segment LTE nodes in the network, and you would like to only receive events from nodes in a specific SPAN, the CNBI.SAMO.SPAN.ID property in the cnbi.properties file can be used to configure the Span ID. It allows several SPAN ids separated by commas, as shown in the following example:

```
CNBI.SAMO.SPAN.ID=27, 32
```

C.3 Useful logs

The logs described in this section can provide you with more information to help with debugging problems.

The *installation_directory*/nms/log/cnbi directory contains the following logs:

- cnbi.log—provides the most detailed information on all the CNBI processes and communication
- cnbi_console.log—provides the latest updates on the status of the 3GPP NBI processes
- <date and time>cnbi—directory that saves historical cnbi.log and cnbi_console.log log files

The *installation_directory*/nms/cnbi/home/log directory contains the following logs:

- cnbi-activate_<date and time>.log—reports on the steps to perform the real CNBI application deployment into JBoss application server after the cnbi_install is complete
- cnbi-install_<date and time>.log—reports on the creation of the CNBI home directory structure, preparing the CNBI application deployment to the JBoss application server
- cnbi-pre-activate_<date and time>.log—reports on whether the pre-activation was successful
- cnbi-re-activate_<date and time>.log—reports on whether the re-activation was successful
- cnbi-run-status_twiddle.log—reports on the CNBI status
- cnbi-start_twiddle.log—reports on whether CNBI started

The *installation_directory*/nms/jboss/server/alu_cnm_cnbi/log directory contains the following detailed log:

- boot.log—provides detailed information on the CNBI activation process

The cnbi.log has the following logging or tracing levels:

- FATAL <F>
- ERROR <E>
- WARN <W>
- INFO <I>
- DEBUG <D>
- TRACE <T>

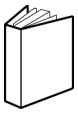
These levels indicate different verbosity and detail level from less to more detailed. FATAL, ERROR, WARN and INFO trace categories are active by default.

The following is an example of an entry in the cnbi.log file that is marked with <I> for INFO:

```
<2010.10.29 04:59:09 111
-0400><I><rockets><Timer-7><CNBILogger>com.alu.cnm.cnbi.plugin.three
gppCORBA.irp.notification.ConsumersQueueS
izeMonitorTask.handleConsumerStats(): Skipping subscription
CNBI.Notification.Consumer=1288199616340 because is not active.
```

The OSS user information logged with every CORBA action is mapped to the INFO trace category.

Customer documentation and product support



Customer documentation

http://www.alcatel-lucent.com/myaccess

Product manuals and documentation updates are available at alcatel-lucent.com. If you are a new user and require access to this service, please contact your Alcatel-Lucent sales representative.

Technical Support

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