



# APPENDIX **C**

## OSS Use Cases and Client Development

This appendix lists interceptors and use cases to resynchronize the NMS from the EMS. This appendix includes the following sections:

- [C.1 Use Cases to Resynchronize the NMS from the EMS, page C-1](#)
- [C.2 Developing a CTM GateWay/CORBA Client, page C-4](#)

### C.1 Use Cases to Resynchronize the NMS from the EMS

[Table C-1](#), [Table C-2](#), and [Table C-3](#) list use cases to resynchronize the NMS from the EMS.

**Table C-1**      *Use Cases to Resynchronize the NMS from the EMS*

Information	Detail
Name	The NMS retrieves CTM information.
Summary	The NMS retrieves all EMS and ME alarms and information for existing multilayer subnetworks, MEs, PTPs, CTPs, SNCs, and protection groups from CTM GateWay/CORBA interfaces.
Actor(s)	NMS.
Preconditions	The NMS locates the EmsSessionFactory object and obtains references to EMSMgr_I, MultiLayerSubnetworkMgr_I, ManagedElementMgr_I, EquipmentInventoryMgr_I, MaintenanceMgr_I, ProtectionMgr_I, and PerformanceManagementMgr_I interfaces.
Begins When	The NMS sends a request to retrieve all of the CTM information.

**Table C-1** Use Cases to Resynchronize the NMS from the EMS (continued)

Information	Detail
Description	<p>The NMS does the following to request information from the CTM GateWay/CORBA interface:</p> <ol style="list-style-type: none"> <li>1. Uses the <code>emsMgr::EMSMgr_I:: getAllEMSSystemActiveAlarms</code> interface to request all EMS alarms.</li> <li>2. Uses the <code>emsMgr::EMSMgr_I:: getAllTopLevelSubnetworks</code> interface to request all multilayer subnetworks in CTM. CTM returns a list of <code>MultiLayerSubnetwork_T</code> objects with detailed information about a multilayer subnetwork.</li> <li>3. Uses the <code>emsMgr::EMSMgr_I:: getAllTopLevelTopologicalLinks</code> interface to request all topological links across multiple multilayer subnetworks. CTM returns a list of <code>TopologicalLink_T</code> objects with detailed information about a topological link.</li> <li>4. For each <code>MultiLayerSubnetwork_T</code> object, uses the <code>multiLayerSubnetwork::MultiLayerSubnetworkMgr_I:: getAllManagedElements</code> interface to request all MEs that belong to that multilayer subnetwork. CTM returns a list of <code>ManagedElement_T</code> objects with detailed information about an ME. For each <code>ManagedElement</code> object, executes the use case “NMS Resynchronizes Information Specific to a Managed Element.”</li> <li>5. Uses the <code>multiLayerSubnetwork::MultiLayerSubnetworkMgr_I:: getAllVLANs</code> interface to request all VLANs associated with the multilayer subnetwork.</li> </ol>
Ends When	The NMS retrieves all CTM information.
Exceptions	Refer to the exceptions thrown by the individual interface method.
Post Conditions	<ul style="list-style-type: none"> <li>• The NMS synchronizes with CTM.</li> <li>• The NMS registers with CTM to retrieve notifications related to changes in the managed object on CTM, new alarms, and TCAs.</li> </ul>
Traceability	—

**Table C-2** NMS Resynchronizes Information Specific to a Managed Element

Information	Detail
Name	The NMS retrieves CTM information specific to the ME.
Summary	The NMS retrieves all PTP, CTP, SNC, and protection group information for the specific ME.
Actor(s)	NMS.
Preconditions	The NMS obtains references to <code>ManagedElementMgr_I</code> , <code>EquipmentInventoryMgr_I</code> , <code>MaintenanceMgr_I</code> , <code>ProtectionMgr_I</code> , and <code>PerformanceManagementMgr_I</code> interfaces. The NMS also obtains the ME name.
Begins When	The NMS sends a request to retrieve all information about an ME. The NMS identifies the name of the ME for which to retrieve information.

**Table C-2** NMS Resynchronizes Information Specific to a Managed Element (continued)

Information	Detail
Description	<p>The NMS does the following to request information from the CTM GateWay/CORBA interface:</p> <ol style="list-style-type: none"> <li>1. Uses the <code>managedElementManager::ManagedElementManager_I::getAllActiveAlarms</code> interface to request all current alarms on the ME.</li> <li>2. Uses the <code>equipment::EquipmentInventoryMgr_I::getAllEquipment</code> interface to request all existing equipment on the ME. CTM returns a list of <code>EquipmentHolder_T</code> objects with detailed information about equipment holders and equipment on the ME.</li> <li>3. For the equipment information retrieved in <code>EquipmentHolder_T</code> object, uses the <code>equipment::EquipmentInventoryMgr_I::getAllSupportedPTPs</code> interface to request all supported PTPs on the equipment. CTM returns a list of <code>TerminationPoint_T</code> objects with detailed PTP information, such as SDH or SONET port, admin state, service state, line code, frame format, and so on.</li> <li>4. For each <code>TerminationPoint_T</code> object, executes the “NMS Resynchronizes Information Specific to TerminationPoint” use case.</li> <li>5. Uses the <code>managedElementManager::ManagedElementManager_I::getAllSNCs</code> interface to request all SNCs originating, terminating, or passing through the ME. CTM returns a list of <code>SubnetworkConnection_T</code> objects with detailed SNC information, such as layer rate, SNC state, SNC protection state, a-end CTP, z-end CTP, and so on.</li> <li>6. Uses the <code>protection::ProtectionMgr_I::getAllProtectionGroups</code> interface to request all protection groups created on the ME. CTM returns a list of <code>ProtectionGroup_T</code> objects with detailed protection group information, such as 1:1, 1+1, or 2F-BLSR; revertive or nonrevertive; and so on.</li> </ol>
Ends When	The NMS retrieves all ME-specific information.
Exceptions	Refer to the exceptions thrown by the individual interface method.
Post Conditions	The NMS synchronizes information about an ME with CTM.
Traceability	—

**Table C-3** NMS Resynchronizes Information Specific to a Termination Point

Information	Detail
Name	The NMS retrieves CTM information specific to the termination point.
Summary	The NMS retrieves all loopback and threshold information for PTPs and CTPs used by the SNC.
Actor(s)	NMS.
Preconditions	The NMS obtains references to <code>ManagedElementMgr_I</code> , <code>MaintenanceMgr_I</code> , and <code>PerformanceManagementMgr_I</code> interfaces. The NMS also obtains a list of PTPs.
Begins When	The NMS sends a request to retrieve all threshold and loopback information on a PTP and on any in-use CTPs. The NMS identifies the name and type (PTP/CTP) of the TP for which to retrieve information.

Table C-3 NMS Resynchronizes Information Specific to a Termination Point (continued)

Information	Detail
Description	<p>The NMS does the following to request information from the CTM GateWay/CORBA interface:</p> <ol style="list-style-type: none"> <li>1. Uses the <code>maintenanceOps::MaintenanceMgr_I::getActiveMaintenanceOperations</code> interface to request all loopback information on the TP. <p>CTM returns a list of <code>CurrentMaintenanceOperation_T</code> objects with detailed information about the type of loopback set on the PTP, if any. CTM supports two types of loopback, <code>FACILITY_LOOPBACK</code> and <code>TERMINAL_LOOPBACK</code>. If there are no loopbacks set on the TP, the returned list is empty.</p> </li> <li>2. Uses the <code>performance::PerformanceManagementMgr_I::getTCATPPParameter</code> interface to request the threshold values set for all PM thresholds on the given TP object. <p>CTM returns the <code>TCAPParameter_T</code> object with detailed information about all PM threshold name/value pairs for the PTP.</p> </li> <li>3. For each PTP that the NMS specifies as the TP, uses the <code>managedElementManager::ManagedElementManager_I::getContainedInUseTPs</code> interface to request all CTPs contained in the PTP participating in an SNC. <p>CTM returns a list of <code>TerminationPoint_T</code> objects with detailed information about the CTPs participating in an SNC and the associated provisioning details, such as IPPM monitor status, J1 path trace status, and so on.</p> </li> <li>4. For each CTP object, uses the <code>performance::PerformanceManagementMgr_I::getTCATPPParameter</code> interface to request threshold information. <p>CTM returns a list of <code>TCAPParameter_T</code> objects with detailed information about the PM threshold name/value pairs for the CTP.</p> </li> </ol>
Ends When	The NMS retrieves loopback and threshold information for all PTPs and CTPs.
Exceptions	Refer to the exceptions thrown by the individual interface method.
Post Conditions	The NMS synchronizes information about a TP object with CTM.
Traceability	—

## C.2 Developing a CTM GateWay/CORBA Client

CTM GateWay/CORBA implements APIs defined by the TeleManagement Forum's Multi-Technology Network Management (MTNM) group. These APIs are defined for communication between an NMS and the EMS. The NMS must develop a client application that uses these APIs. The following sections describe the tools required for developing a client application. Sample code is provided.

### C.2.1 Recommended Tools

You can develop the CORBA client on UNIX or PC platforms. Cisco recommends the following development tools:

- Sun Microsystems Java Development Kit (JDK) 1.5 (available on <http://java.sun.com/>)
- jacORB 2.x

## C.2.2 Sample Code in Java

A typical CORBA client application involves the following steps:

- 
- Step 1** Initialize the client connection to the object request broker (ORB).
  - Step 2** Obtain a reference to the naming service.
  - Step 3** Resolve the reference to EMSSessionFactory. See [C.2.2.3 Get Reference to EMSSessionFactory, page C-7](#).
  - Step 4** Implement NmsSession\_IOperations. See [C.2.2.4 Implement NmsSession\\_IOperations, page C-7](#).
  - Step 5** Retrieve EmsSession by supplying the username and password. See [C.2.2.5 Log In and Retrieve EmsSession, page C-8](#).
  - Step 6** Query EmsSession and obtain a list of managers available for operations. See [C.2.2.6 Retrieve List of Managers, page C-9](#).
  - Step 7** Invoke the desired method on that manager. See [C.2.2.7 getEMS Operation on EMS Manager, page C-9](#).

If you want your client to receive notifications from CTM GateWay/CORBA, the following additional steps are required:

- Step 8** Obtain a reference to an EventChannel object in the notification server in [Step 2](#).
  - Step 9** Obtain a ConsumerAdmin object reference.
  - Step 10** Invoke obtain\_notification\_push\_consumer() on the SupplierAdmin object, specifying CosNotifyChannelAdmin::STRUCTURED\_EVENT as a parameter. This operation returns a reference to the StructuredProxyPushSupplier.
  - Step 11** Implement an instance of StructuredPushConsumer (defined by the OMG).
  - Step 12** Invoke the connect\_structured\_push\_consumer() operation on the StructuredProxyPushSupplier object to connect the StructuredPushConsumer implementation object to the notification channel.
  - Step 13** Monitor incoming notifications.
- 

The following sections show sample Java code for the steps required to develop a client application.



### Note

The sample code shown is for illustrative purposes only; the code might not compile as shown. The sample code does not handle all exceptions.

---

### C.2.2.1 Initialize the Client Connection

```
// Import OMG packages
import org.omg.CORBA.IntHolder;
import org.omg.CORBA.ORB;
import org.omg.CORBA.Policy;

// Import naming context packages.
import org.omg.CosNaming.NameComponent;
import org.omg.CosNaming.NamingContextExt;
import org.omg.CosNaming.NamingContextExtHelper;

// Import notify channel and event service packages.
import org.omg.CosEventChannelAdmin.AlreadyConnected;
```

```

import org.omg.CosEventChannelAdmin.TypeError;
import org.omg.CosNotifyChannelAdmin.AdminLimitExceeded;
import org.omg.CosNotifyChannelAdmin.AdminNotFound;
import org.omg.CosNotifyChannelAdmin.ClientType;
import org.omg.CosNotifyChannelAdmin.ConsumerAdmin;
import org.omg.CosNotifyChannelAdmin.EventChannel;
import org.omg.CosNotifyChannelAdmin.EventChannelHolder;
import org.omg.CosNotifyChannelAdmin.ProxySupplier;
import org.omg.CosNotifyChannelAdmin.StructuredProxyPushSupplier;
import org.omg.CosNotifyChannelAdmin.StructuredProxyPushSupplierHelper;
import org.omg.CosNotifyComm.StructuredPushConsumer;
import org.omg.CosNotifyComm.StructuredPushConsumerPOATie;

// Import POA packages
import org.omg.PortableServer.POA;
import org.omg.PortableServer.POAHelper;
import org.omg.PortableServer.POAPackage.ServantAlreadyActive;
import org.omg.PortableServer.POAPackage.WrongPolicy;

// Import TMF packages
import org.tmforum.mtnm.emsSession.EmsSession_I;
import org.tmforum.mtnm.emsSession.EmsSession_IHolder;
import org.tmforum.mtnm.emsSession.EmsSession_IPackage.managerNames_THolder;
import org.tmforum.mtnm.emsSessionFactory.EmsSessionFactory_I;
import org.tmforum.mtnm.emsSessionFactory.EmsSessionFactory_IHelper;
import org.tmforum.mtnm.nmsSession.NmsSession_I;
import org.tmforum.mtnm.nmsSession.NmsSession_IPOATie;
public static void main(String[] args)
{

    try {
        // Optional: set up ORB properties: you can set them here or in the launch file
        // for the client
        // Properties sys_properties = System.getProperties();

        // For JacORB
        // sys_properties.put("org.omg.CORBA.ORBClass",
        "org.jacorb.orb.ORB"
        // sys_properties.put("org.omg.CORBA.ORBSingletonClass",
        "org.jacorb.orb.ORBSingleton"

        // For Orbix
        // sys_properties.put("org.omg.CORBA.ORBClass",
        "com.iona.corba.art.artimpl.ORBImpl");
        // sys_properties.put("org.omg.CORBA.ORBSingletonClass",
        "com.iona.corba.art.artimpl.ORBSingleton");

        // For Visibroker
        // sys_properties.put("org.omg.CORBA.ORBClass",
        "com.inprise.vbroker.orb.ORB"
        // sys_properties.put("org.omg.CORBA.ORBSingletonClass",
        "com.inprise.vbroker.orb.ORBSingleton"

        // For other ORBs check the related ORB programming guide

        // Step 1: Initialize the ORB and obtain ROOT POA reference
        // Note: ORB_init will process any -ORB arguments
        // be called before any other argument processing.
        //
        global_orb = ORB.init(args, null);
        org.omg.CORBA.Object root_poa = global_orb.resolve_initial_references("RootPOA");
        POA rpoa = POAHelper.narrow(root_poa);
        POA poa = rpoa.create_POA("myPolicy",null, new Policy[0]);

```

```

        poa.the_POAManager().activate();
    }
    catch (SystemException ex) {
        // Exception handling
    }
}

```

### C.2.2.2 Get Reference to the Naming Service

```

// Get Nameservice reference
NamingContext nsRootContext = null;
try {
    // Step 2: Get reference to the name service
    // Option 1: Resolve initial reference (RIR)
    // org.omg.CORBA.Object obj = global_orb.resolve_initial_references("NameService");
    // or

    // Option 2: corbaloc URL
    String objRef = "corbaloc:iiop:gatewayserver.cisco.com:14005/NameServiceGWC";
    org.omg.CORBA.Object obj = global_orb.string_to_object(objRef);
    /* NOTE: Please replace "gatewayserver.cisco.com" with the name of the server on
    which CORBA Naming service is running. */
    // Narrow to root naming context
    NamingContextExt root_context = NamingContextExtHelper.narrow(obj);

}
catch (org.omg.CORBA.ORBPackage.InvalidName inEx) {
    // Exception handling
}

```

### C.2.2.3 Get Reference to EMSSessionFactory

Follow the example in [C.2.2.2 Get Reference to the Naming Service, page C-7](#) to obtain a reference to the naming service.

```

NameComponent name = new NameComponent[6];
name[0] = new NameComponent("TMF_MTNM", "Class");
name[1] = new NameComponent("Cisco Systems", "Vendor");
name[2] = new NameComponent("Cisco Transport Manager", "EMSInstance");
name[3] = new NameComponent(version, "Version"); //where version = "9_0" for CTM 9.0
name[4] = new NameComponent(ctm_sys_id, "EMS"); // ctm_sys_id = "CTM"
name[5] = new NameComponent("SessionFactory", "EmsSessionFactory");
try {
    org.omg.CORBA.Object emsSessionI = root_context.resolve(name);
}
catch (InvalidName inEx) {
    // Exception handling
}
catch (NotFound nfEx) {
    // Exception handling
}
}

```

### C.2.2.4 Implement NmsSession\_IOperations

```

import org.tmforum.mtnm.session.*;
import org.tmforum.mtnm.nmsSession.*;

public class SessionImpl implements NmsSession_IOperations {

```

```

Session_I myAssociatedSession = null;

public SessionImpl() {
    super();
    // TODO Auto-generated constructor stub
}

public void setAssociatedSession(Session_I emsSession) {
    myAssociatedSession = emsSession;
}
public Session_I getAssoicatedSession () { return myAssociatedSession;}

public void eventLossOccurred(String startTime, String notificationId) {
    // TODO Auto-generated method stub
}

public void eventLossCleared(String endTime) {
    // TODO Auto-generated method stub
}

public void historyPMDDataCompleted(String fileName) {
    // TODO Auto-generated method stub
}

public void historyPMDDataFailed(String errorReason) {
    // TODO Auto-generated method stub
}

public Session_I associatedSession() {
    // TODO Auto-generated method stub
    return null;
}

public void ping() {
    // TODO Auto-generated method stub
}

public void endSession() {
    // TODO Auto-generated method stub
}

}
}

```

### C.2.2.5 Log In and Retrieve EmsSession

To perform operations from CTM GateWay/CORBA, your client must log in using a username and password created on the CTM client. See [B.1 Creating an OSS Client Profile for CTM GateWay/CORBA, page B-1](#).

```

EmsSession_I m_emsSession = null;
SessionImpl mySessionImpl = new SessionImpl();
try {
    EmsSessionFactory_I ems_ref = EmsSessionFactory_IHelper.narrow(emsSessionI);

```

```

EmsSession_IHolder emsSessionHldr = new EmsSession_IHolder();
NmsSession_IPOATie tieobj = new NmsSession_IPOATie(mySessionImpl, poa);
poa.activate_object(tieobj);
NmsSession_I nmsSession_ref = tieobj._this();
if (ems_ref != null) {
    ems_ref.getEmsSession(user, password, nmsSession_ref, emsSessionHldr);
    m_emsSession = emsSessionHldr.value;
}

} catch (Exception ex) {
// System.out.println("Could not narrow");
ex.printStackTrace();
}
}

```

### C.2.2.6 Retrieve List of Managers

```

managerNames_THolder names = new managerNames_THolder();
m_emsSession.getSupportedManagers(names);
managers = names.value;
for (i = 0; i < managers.length; i++ )
{
    System.out.print("Manager ");
    System.out.print(i);
    System.out.println(" " + managers[i]);
}

```

### C.2.2.7 getEMS Operation on EMS Manager

```

EMS_T m_ems;
EMS_THolder m_emsHolder = new EMS_THolder();
try {
    Common_IHolder mgrHolder = new Common_IHolder();
    m_emsSession.getManager("EMS", mgrHolder);
    EMSMgr_I emsMgr = EMSMgr_IHelper.narrow(mgrHolder.value);
    emsMgr.getEMS(m_emsHolder);
}
catch (ProcessingFailureException pfe) {
    System.out.println("Processing Exception" + pfe.getMessage());
    pfe.printStackTrace();
}
m_ems = m_emsHolder.value;
System.out.println("Native EMS Name" + m_ems.nativeEMSName);

```

### C.2.2.8 Get Reference to EventChannel

```

EventChannel notifChannel;
EventChannelHolder chanHolder = new EventChannelHolder();
try {
    ...
    emsSession.getEventChannel(chanHolder);
}
catch (Exception ex){
    // handle exceptions
}
notifChannel = chanHolder.value;

```

### C.2.2.9 Obtain ConsumerAdmin Reference

```

//retrieve default consumer admin

```

```

try {
    ConsumerAdmin cadmin = notifChannel.get_consumeradmin(0);
}
catch (AdminNotFound anfSe) {
    // Exception handling
}

```

### C.2.2.10 Obtain ProxyPushSupplier

```

IntHolder id = new IntHolder();
try {
    ProxySupplier baseSupplier =
        cadmin.obtain_notification_push_supplier(
            ClientType.STRUCTURED_EVENT, id);
    structuredProxyPushSupplier =
        StructuredProxyPushSupplierHelper.narrow(baseSupplier);
}
catch (AdminLimitExceeded aleEx) {
    // Exception handling
}

```

### C.2.2.11 Implement StructuredPushConsumer

```

class StructuredPushConsumerImpl extends _StructuredPushConsumerPOA
{
    StructuredPushConsumerImpl() {
        super();
        System.out.println("StructuredPushConsumerImpl created.");
    }
    public void disconnect_structured_push_consumer() {
        System.out.println("Disconnect structured push consumer.");
    }
    public void push_structured_event(StructuredEvent notification) {
        System.out.println("Received notification.");
    }
    public void offer_change(EventType[] added,
        EventType[] removed)
        throws InvalidEventType
    {
        System.out.println("Offer changed.");
    }
}

```

### C.2.2.12 Connect StructuredPushConsumerImpl

```

try {
    StructuredPushConsumerImpl structProxyPushConsumer = new StructuredPushConsumerImpl();
    StructuredPushConsumerPOATie structuredPushConsumerTieObj = new
        StructuredPushConsumerPOATie (structProxyPushConsumer, poa);
    poa.activate_object(structuredPushConsumerTieObj);
    StructuredPushConsumer pushCon = structuredPushConsumerTieObj._this();
    structuredProxyPushSupplier.connect_structured_push_consumer(pushCon);

    global_orb.run();
}
catch (ServantAlreadyActive sae) {
    // Exception handling
}
catch (WrongPolicy wrongPolicyEx) {
    // Exception handling
}

```

```
}

```

## C.2.3 Running the Client

If the initial naming context is not resolved using the Option 2 method shown in [C.2.2.2 Get Reference to the Naming Service, page C-7](#), the following JVM flags must be used for CORBA clients written for Orbix 6.2, Visibroker, or jacORB:

- Orbix 6.2 or later:
 

```
-ORBInitRef NameService=corbaloc:iiop:1.2@<host name>:<port>/NameServiceGWC
```
- Visibroker:
 

```
-DORBInitRef NameService=corbaloc::<host name>:<port>/NameServiceGWC
-DORBInitRef NameService=corbaname::<host name>:<port>/NameServiceGWC
```
- jacORB:
 

```
-DORBInitRef.NameService=corbaname::<host name>:<port>/NameServiceGWC
```

In addition, if you do not set the system properties `org.omg.CORBA.ORBClass` and `org.omg.CORBA.ORBSingletonClass` in your client code before Step 1 in [C.2.2.1 Initialize the Client Connection, page C-5](#), you must set them in your client launch file:

- Orbix 6.2 or later:
 

```
-Dorg.omg.CORBA.ORBClass=com.ionacorba.art.artimpl.ORBImpl
-Dorg.omg.CORBA.ORBSingletonClass=com.ionacorba.art.artimpl.ORBSingleton
```
- Visibroker:
 

```
-Dorg.omg.CORBA.ORBClass=com.inprise.vbroker.orb.ORB
-Dorg.omg.CORBA.ORBSingletonClass=com.inprise.vbroker.orb.ORBSingleton
```
- jacORB:
 

```
-Dorg.omg.CORBA.ORBClass=org.jacorb.orb.ORB
-Dorg.omg.CORBA.ORBSingletonClass=org.jacorb.orb.ORBSingleton
```

For other ORBs, check the related ORB programming guide.

## C.2.4 Known Interoperability Issues When Using Orbix

If you use Orbix to set the following property in the `jacorb.properties` file:

```
Jacorb.compactTypecodes=0
```

Pay attention to the compatibility of the domain you use with Orbix. If you use an insecure domain, set the following property in the `jacorb.properties` file:

```
Jacorb.security.support_ssl = off
```

