



QoS Provisioning

Cisco IP Solution Center (ISC) supports quality of service (QoS) provisioning at the access circuit (CPE-to-PE link). ISC can provision QoS policies for a network independent of VPN services (IP QoS), or in addition to VPN services that have been provisioned by ISC.

Standard IP QoS is applied using service level and link level policies and is independent of VPN services. IP QoS provisioning is described in the [“Provisioning Example for IP QoS”](#) section on page 9-8.

QoS policies for VPN services are deployed on top of an existing VPN service request, such as MPLS VPN and L2VPN. ISC derives interface configuration information from the VPN service and applies the QoS policy to the interfaces. This type of QoS provisioning is described in the [“Provisioning QoS for Existing Services”](#) section on page 9-17.

This chapter describes QoS service concepts and the steps required to provision QoS services using the ISC API. The provisioning example includes the process flow from creating the inventory to auditing the service deployment.

For more information on QoS provisioning using ISC, refer to the [Cisco IP Solution Center Integrated VPN Management Suite Quality of Service User Guide, 4.0](#).

This chapter contains the following sections:

- [QoS Service Definitions, page 9-1](#)
- [QoS Service Requests, page 9-6](#)
- [Provisioning Example for IP QoS, page 9-8](#)
- [Provisioning QoS for Existing Services, page 9-17](#)

QoS Service Definitions

A QoS service definition specifies the QoS policy, which includes the service class policy and the QoS link profile. Policy attributes and service class attributes are defined in the **IPQoS** service definition details. The link profile is defined in the **Link** service definition details (or **EoMplsLink** for an L2VPN service request).

The QoS service definition can be a **QoS**, **Link**, or **EoMplsLink** policy subtype.

- The **QoS** policy consists of policy attributes and service class attributes. The service class contains additional QoS policy attributes, traffic classification, and avoidance properties. Use **QoS** to define the QoS policy and service class policy for an IP QoS policy.

- The **Link** policy (also called the link profile) consists of bandwidth, aggregated traffic shapers, link efficiency, and interface-based aggregated rate limiters. Use **Link** to define the link profile for an IP QoS policy.
- The **EoMplsLink** is the link profile for L2VPN links, and consists of the committed information rate (**CirBps**) and the committed burst (**BurstBytes**). Use the **EoMplsLink** to define the link profile for a QoS service request created from an L2VPN service request.

QoS Policy

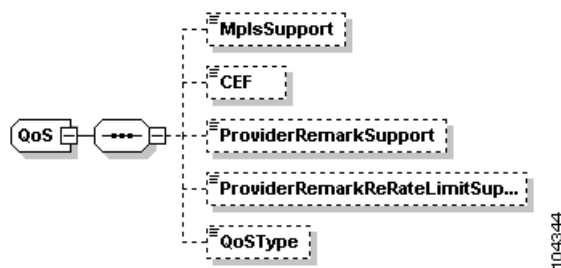
The QoS policy consists of policy attributes and service class attributes.

- Policy attributes include MPLS support for PE devices at the provider ingress interfaces. ISC supports remarking and rate-limiting at the provider ingress interface.
- Service class attributes include; traffic classification, congestion management, traffic shaping, rate limiting, and congestion avoidance.

QoS Attributes

Figure 9-1 shows the schema diagram for QoS policy attributes.

Figure 9-1 QoS Policy Schema Diagram



ISC supports the following properties for **QoS**:

- **MplsSupport**—Mark MPLS experimental (MPLS Exp.) value at provider ingress interface.
- **CEF**—Cisco Express Forwarding.
- **ProviderRemarkSupport**—Remark for differentiated services code point (DSCP) or IP Precedence value at provider ingress interface.
- **ProviderReRateLimitSupport**—Remark for rate limiting at provider ingress interface.
- **QoSType**—Specify IP QoS or Ethernet QoS.

Service Class Attributes

The service level QoS policy is the set of rules or conditions that apply to packets as they come across each device interface that has been assigned as a QoS link endpoint. This set of rules is defined in a QoS service class.

A QoS service class can include:

- Traffic classification (protocol, DSCP value, IP precedence value, source address)
- Traffic marking (DSCP or IP precedence values)
- Traffic shaping (average/peak, rate)
- Rate limiting (mean/peak rate, burst size, conform/exceed/violate actions)
- Congestion management (bandwidth and queue limit)
- Congestion avoidance (drop, exponential weighing constant)

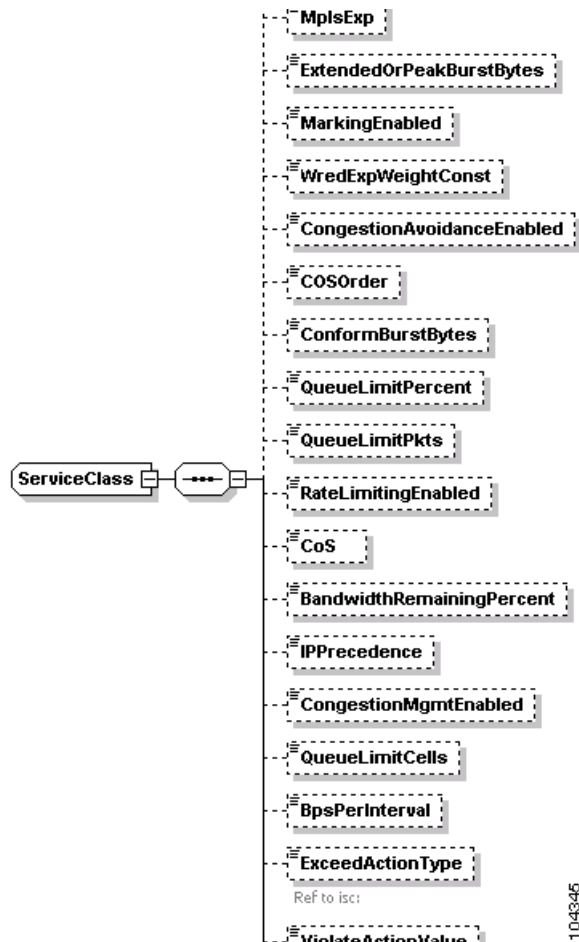
Most networks require at least one service class for interactive voice traffic, one for management traffic, and at least one service class for data traffic. ISC supports the following service class subtypes:

- **VOIP**
- **DATA**
- **BEST_EFFORT** (data)
- **ROUTING_PROTOCOL**
- **MANAGEMENT**

The properties for each service class in the QoS policy are defined in the service definition details.

[Figure 9-2](#) shows a partial schema diagram for a QoS policy service class.

Figure 9-2 Service Class Schema Diagram



The following XML example shows a partial list of the properties that can be specified for a service class with **Type=DATA**:


Tip

To *unset* integer type attributes in an XML request, set the value to -1.

```

<objectPath xsi:type="ns1:CIMObjectPath">
  <className xsi:type="xsd:string">ServiceClass</className>
  <properties xsi:type="ns1:CIMPropertyList"
    soapenc:arrayType="ns1:CIMProperty[]">
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">Name</name>
      <value xsi:type="xsd:string">Service1A</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">Type</name>
      <value xsi:type="xsd:string">DATA</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">ConformAction</name>
      <value xsi:type="xsd:string">transmit</value>
      <qualifier xsi:type="ns1:CIMQualifier">

```

```

        <name xsi:type="xsd:string">value</name>
        <value xsi:type="xsd:string">2</value>
      </qualifier>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">ExceedAction</name>
      <value xsi:type="xsd:string">drop</value>
      <qualifier xsi:type="ns1:CIMQualifier">
        <name xsi:type="xsd:string">value</name>
        <value xsi:type="xsd:string">1</value>
      </qualifier>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">ViolateAction</name>
      <value xsi:type="xsd:string">set-prec-transmit</value>
      <qualifier xsi:type="ns1:CIMQualifier">
        <name xsi:type="xsd:string">value</name>
        <value xsi:type="xsd:string">3</value>
      </qualifier>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">MarkingEnabled</name>
      <value xsi:type="xsd:string">TRUE</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">DSCP</name>
      <value xsi:type="xsd:string">ef</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">ShapingEnabled</name>
      <value xsi:type="xsd:string">TRUE</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">BpsShapingRate</name>
      <value xsi:type="xsd:string">100000000</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">CongestionMgmtEnabled</name>
      <value xsi:type="xsd:string">TRUE</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">BandwidthPercent</name>
      <value xsi:type="xsd:string">15</value>
    </item>

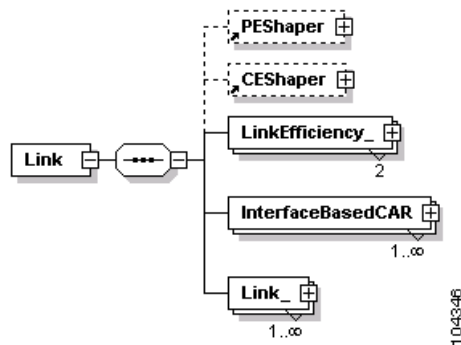
```

Link Policy

The **Link** portion of a QoS service definition (called the link profile) defines policy attributes specific to the CPE-to-PE links.

- Use **Link** for an IP QoS link profile. **Link** attributes are described in this section.
- Use **EoMplsLink** for an L2VPN link profile. **EoMplsLink** is described in the “[L2VPN Ethernet QoS Policy](#)” section on page 9-18.

Figure 9-3 shows the schema diagram for an IP QoS link profile.

Figure 9-3 QoS Link Profile Schema Diagram

IP QoS link profile attributes include:

- Aggregated traffic shaper types on the CE and PE devices, such as; Frame-Relay traffic shapers, ATM traffic shapers, and parent level traffic shapers for nested policies. (**PEShaper**, **CEShaper**).
- Link efficiency settings such as; FRF.12, LFI on MLPPP, and cRTP (**LinkEfficiency**).
- Interface-based aggregated rate limiters such as; traffic classification, direction, mean rate, burst size, and conform/exceed actions (**InterfaceBasedCAR**).
- Link bandwidth (**Link**).

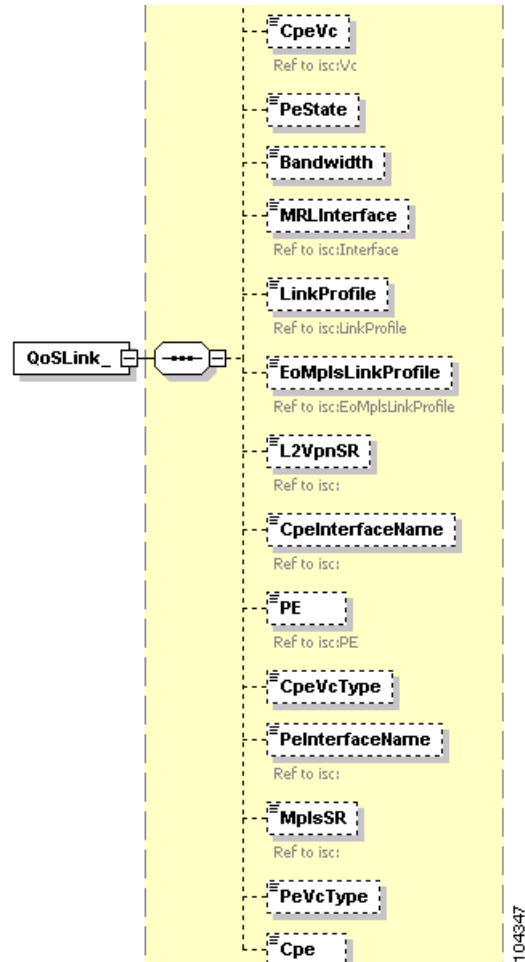
**Note**

The link bandwidth specified in the **Link** profile overrides any link bandwidth specified in the **QoSLink** parameter of the service request.

QoS Service Requests

A QoS service request contains the service definition, which includes the QoS link profile and the QoS policy, and the **QoSLink** properties. The **QoSLink** properties specify the link endpoint devices, the link bandwidth, and link policy attributes (see [Figure 9-4](#)).

Figure 9-4 QoS Service Request Schema Diagram



The following properties are specified with the **QoSLink** object:

- The PE and CPE devices and interfaces for the link endpoints
 - **PE**, **PeInterfaceName**, **PeVcType**
 - **Cpe**, **CpeInterfaceName**, **CpeVcType**
- The link profile to assign to this QoS link
 - **ServiceDefinitionType=Link**
 - **ServiceDefinition=EoMplsLinkProfile**

ISC supports three methods for creating QoS service requests:

- IP QoS service request, independent of VPN services
- QoS service request created from an MPLS VPN service request
- QoS service request created from an L2VPN service request

IP QoS is described in the following provisioning example. Refer to the [“Provisioning QoS for Existing Services” section on page 9-17](#) for information on QoS for VPN services.

Provisioning Example for IP QoS

This section describes the required steps for using the API to provision IP QoS and includes the operation, className, and required parameters for each step.

Prerequisites

**Note**

If you plan to use a metro Ethernet QoS policy (**QoSType= METROQOS**) on a Catalyst 3550 device, you must enable QoS on the device by entering the **mls qos** command. ISC does not provision this command on the device automatically, but it is required for the device to accept QoS configuration.

Process Summary

This QoS provisioning example includes the following steps:

- Create inventory
- Collect device configurations
- Mark device interfaces for QoS
- Create a network object for traffic classification (optional)
- Create a QoS service definition (policy)
- Create the IP QoS link profile (second part of the service definition)
- Create the IP QoS service request

Provisioning Process

This section provides an example provisioning process using QoS XML examples. The inventory of XML examples for the ISC API can be found at the following location:

http://www.cisco.com/univercd/cc/td/doc/product/rtrmgmt/isc/4_0/api/apiref/examples/index.htm

Create Inventory

Every network element that ISC manages must be defined as a device in the system. An element is any device from which ISC can collect configuration information.

Step 1

Create devices.

In most cases, devices are Cisco IOS routers and Catalyst switches.

Table 9-1 Create Devices

Operation	className	Required Keywords
createInstance	- CiscoRouter - CatOs	One or more of the following: - ManagementIPAddress - HostName - DomainName

XML Example:

- CreateCiscoRouter.xml

Step 2 Create a Provider and Region.

The provider is the administrative domain of an Internet service provider (ISP), with one border gateway protocol (BGP) autonomous system (AS) number. The network owned by the provider is called the backbone network. If an ISP has two AS numbers, you must define it as two provider administrative domains. Each provider can contain multiple regions.

Table 9-2 Create Provider and Region

Operation	className	Required Keywords
createInstance	Provider	- Name - AsNumber
	Region	- Name - Provider

XML Examples:

- CreateProvider.xml
- CreateRegion.xml

Step 3 Declare devices as PEs and assign them to regions.**Table 9-3 Create PEs**

Operation	className	Required Keywords
createInstance	PE	- Provider - Region - Role= - PE_CLE - PE_POP - Device - Interface

XML Example:

- CreatePE.xml

Step 4 Create a customer (Organization) and site.

Table 9-4 Create Customer and Site

Operation	className	Required Keywords
createInstance	Organization	• Name
	Site	• Name • Organization

XML Examples:

- CreateOrganization.xml
- CreateSite.xml

Step 5 Declare devices as CPEs and assign them to sites.

When you declare a device as a CPE, you also specify a **ManagementType** and interface information.

Table 9-5 Create CPEs

Operation	className	Required Keywords
createInstance	Cpe	• Site • Device • ManagementType

XML Example:

- CreateCpe.xml

Collect Device Configurations

A device configuration collection is a task. This task uploads the current configuration from the device to the ISC database. The collection task executed through a service request, and the service request is scheduled through a service order.

Table 9-6 Collect Device Configurations

Operation	className	Required Parameters
createInstance	ServiceOrder	• ServiceName • NumberOfRequests • ServiceRequest
	ServiceRequest	• RequestName • Type=Task • ServiceRequestDetails
	ServiceRequestDetails	• SubType=Collection • Device (or DeviceGroup) Note You must select at least one device or device group. • RetrieveVersion=true • RetrieveDeviceInterfaces=true

The following example is a partial XML request used to collect the configuration from device enqospel.

```
<objectPath xsi:type="ns1:CIMObjectPath">
  <className xsi:type="xsd:string">ServiceRequestDetails</className>
  <properties xsi:type="ns1:CIMPropertyList"
    soapenc:arrayType="ns1:CIMProperty[]">
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">SubType</name>
      <value xsi:type="xsd:string">COLLECTION</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">Device</name>
      <value xsi:type="xsd:string">enqospel</value>
    </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">RetrieveDeviceAttributes</name>
      <value xsi:type="xsd:string">true</value> </item>
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">RetrieveDeviceInterfaces</name>
      <value xsi:type="xsd:string">true</value> </item>
  </properties>
</objectPath>
```

XML Example:

- CreateTaskServiceOrderCollection.xml

Mark Device Interfaces for QoS

For QoS provisioning, you must mark both interfaces in the CPE-to-PE link. Typically, the service provider supplies the list of devices and interfaces to be marked for QoS provisioning. CPE devices are generally marked at provider-facing interfaces, and PE devices at customer-facing interfaces.

Create an XML request to modify the device, and mark the interface as a QoS link endpoint.

The following example shows a **modifyInstance** operation for CPE device enqosce52 and specifies **QoSLinkEndpoint=true** for interface ATM1/0.52.

```
<ns1:modifyInstance>
  <objectPath subAction="modifyInstance" xsi:type="ns1:CIMObjectPath">
    <className xsi:type="xsd:string">Cpe</className>
    <keyProperties xsi:type="ns1:CIMKeyPropertyList"
      soapenc:arrayType="ns1:CIMKeyProperty[]">
      <item xsi:type="ns1:CIMKeyProperty">
        <name xsi:type="xsd:string">Device</name>
        <value xsi:type="xsd:string">enqosce52</value>
      </item>
    </keyProperties>
    <objectPath subAction="createInstance" xsi:type="ns1:CIMObjectPath">
      <className xsi:type="xsd:string">Interface</className>
      <properties xsi:type="ns1:CIMPropertyList"
        soapenc:arrayType="ns1:CIMProperty[]">
        <item xsi:type="ns1:CIMProperty">
          <name xsi:type="xsd:string">Name</name>
          <value xsi:type="xsd:string">ATM1/0.52</value>
        </item>
        <item xsi:type="ns1:CIMProperty">
          <name xsi:type="xsd:string">QoSLinkEndpoint</name>
          <value xsi:type="xsd:string">true</value>
        </item>
      </properties>
    </objectPath>
  </objectPath>
</ns1:modifyInstance>
```

Table 9-7 Mark Interfaces

Operation	className	Required Parameters
modifyInstance	PE (or Cpe)	- Device - Interface
	Interface	- Name - QoSLinkEndpoint=true - QoSMarkingRL=true Note Use QoSLinkEndpoint to mark provider-facing PE and CE interfaces and QoSMarkingRL to mark customer-facing CE interfaces.

XML Examples:

- ModifyPE.xml
- ModifyCpe.xml

Creating a Network Object for Traffic Classification

This step is optional.

Create a network object to classify traffic based on network addresses contained in variables, instead of based on protocols. The **Name** value of the network object is used later in the process, in the traffic classification of a **ServiceClass** when you define the QoS policy in the service definition.

Table 9-8 Create Network Object

Operation	className	Required Keywords
createInstance	NetworkObject	- Name - Cpe - Type=NETWORK - Value

See the following example:

```
<ns1:createInstance>
  <objectPath xsi:type="ns1:CIMObjectPath">
    <className xsi:type="xsd:string">NetworkObject</className>
    <properties xsi:type="ns1:CIMPropertyList"
      soapenc:arrayType="ns1:CIMProperty[]">
      <item xsi:type="ns1:CIMProperty">
        <name xsi:type="xsd:string">Name</name>
        <value xsi:type="xsd:string">address_1</value>
      </item>
      <item xsi:type="ns1:CIMProperty">
        <name xsi:type="xsd:string">Cpe</name>
        <value xsi:type="xsd:string">engosce52</value>
      </item>
      <item xsi:type="ns1:CIMProperty">
        <name xsi:type="xsd:string">Type</name>
        <value xsi:type="xsd:string">NETWORK</value>
      </item>
      <item xsi:type="ns1:CIMProperty">
        <name xsi:type="xsd:string">Value</name>
        <value xsi:type="xsd:string">12.12.12.0/24</value>
      </item>
    </properties>
  </objectPath>
</ns1:createInstance>
```

XML Example:

- CreateNetworkObject.xml

Creating a QoS Policy

A QoS policy is a template of the parameters needed to define a QoS service request. After you define the policy template, it can be used by all QoS service requests that share a common set of attributes.

The QoS Policy consists of:

- Policy attributes—support for PE devices in an MPLS VPN network and re-marking and rate-limiting at the provider ingress interface.

- Service class attributes—traffic classification, congestion management, traffic shaping, rate limiting, and congestion avoidance.

This section describes how to set the **QoS** attributes of an IP QoS service definition. See the [“Creating the IP QoS Link Profile” section on page 9-15](#) for information on setting the **Link** attributes.

Table 9-9 Create QoS Policy

Operation	className	Required Parameters
createInstance	ServiceDefinition	• Name • Type=QoS • ServiceDefinitionDetails
	ServiceDefinitionDetails	• QoSType= – IPQOS – METROQOS • ServiceClass • TrafficClassification • Provider or Organization Note If you do not specify a Provider or Organization, the policy is global.
	ServiceClass	• Type= – VOIP – DATA – BEST_EFFORT – ROUTING_PROTOCOL – MANAGEMENT • TrafficClassification • Avoidance Note (You can have multiple traffic classification and avoidance parameters.)

To use a variable for traffic classification, include the name of a Network Object variable that has already been created.

In the following XML example, the **address_1** variable is called in the **TrafficClassification** class. This variable was created in the [“Creating a Network Object for Traffic Classification” section on page 9-13](#).

```
<objectPath xsi:type="ns1:CIMObjectPath">
  <className xsi:type="xsd:string">TrafficClassification</className>
  <properties xsi:type="ns1:CIMPropertyList"
    soapenc:arrayType="ns1:CIMProperty[]">
    <item xsi:type="ns1:CIMProperty">
      <name xsi:type="xsd:string">FromAddressVariable</name>
      <value xsi:type="xsd:string">address_1</value>
    </item>
  </properties>
```

```
</objectPath>
```

XML Example:

- CreateServiceDefnPolicy.xml

Creating the IP QoS Link Profile

This section describes how to set the **Link** attributes of an IP QoS service definition. See the “[Creating a QoS Policy](#)” section on page 9-13 for information on setting the **QoS** attributes.

**Note**

For L2VPN, use an EoMPLS link profile. See the “[L2VPN Ethernet QoS Policy](#)” section on page 9-18 for more information.

The IP QoS link profile sets the QoS **Link** attributes. The **Link** attributes include:

- Link bandwidth
- Aggregated traffic shapers
- Link efficiency settings
- Interface-based aggregated rate limiters

Table 9-10 Create Link Profile

Operation	className	Required Parameters
createInstance	ServiceDefinition	• Name • Type=Link • ServiceDefinitionDetails – Bandwidth
	ServiceDefinitionDetails	• PShaper • CShaper • LinkEfficiency • InterfaceBasedCAR

XML Example:

- CreateServiceDefnLink.xml

Creating an IP QoS Service Request

This section describes how to create a service request for IP QoS. The QoS service request is deployed through a service order. For information on provisioning QoS for an existing L2VPN or MPLS VPN service request, see the “[Provisioning QoS for Existing Services](#)” section on page 9-17.

A QoS service request contains the service definition, which includes the QoS link profile and the QoS policy, and the **QoSLink** properties. The **QoSLink** properties specify the link endpoint devices, link bandwidth, and link policy attributes.

**Note**

Use **performBatchOperation** to group the service order and service request into one XML request.

Table 9-11 Create Service Request

Operation	className	Required Parameters
createInstance	ServiceOrder	- ServiceName - NumberOfRequests - ServiceRequest
	ServiceRequest	- RequestName - Type=QoS - ServiceRequestDetails
	ServiceRequestDetails	- ServiceDefinition - ServiceDefinitionType=QoS - QoSLink - Bandwidth Note The bandwidth specified in the Link profile overrides any link bandwidth specified in the QoSLink parameter of the service request.
	QoSLink	- PE - PeInterfaceName - PeVcType - Cpe - CpeInterfaceName - CpeVcType Note Specify the PE interface information (PE, PeInterface, and PeVcType) the CPE interface information (Cpe, CpeInterfaceType, and CpeVcType), or both. - ServiceDefinition - ServiceDefinitionType=Link

**Tip**

Record the **LocatorId** value that is returned in the XML response for the service request. This value is required to perform a configuration audit of the service request.

XML Example:

- CreateQoSServiceOrder.xml

Auditing Service Requests

A configuration audit occurs automatically each time you deploy a service request. During this configuration audit, ISC verifies that all Cisco IOS commands are present and that they have the correct syntax. An audit also verifies that there were no errors during deployment by examining the commands configured by the service request on the target devices. If the device configuration does not match what is defined in the service request, the audit flags a warning and sets the service request to a *Failed Audit* or *Lost* state.

If you do not want the configuration audit to occur, change the value for the **Audit** parameter. The **Audit** parameter supports these values:

- **Audit**—This is the default. A successfully deployed service request is automatically audited unless this flag is changed.
- **NoAudit**—Do not perform a configuration audit when the service request is deployed.
- **ForceAudit**—Perform a configuration audit even if the service request deployment is not successful.

You can use the Audit parameter with a **Create**, **Modify**, or **Decommission** service request or a **Deployment** task. See the “[Service Decommission](#)” section on page 3-10 for more information. To perform a configuration audit as a separate task, see the “[Configuration Audit](#)” section on page 3-11.

Provisioning QoS for Existing Services

If your VPN services have been provisioned by ISC, you can add QoS policies to an existing service request. The following QoS attributes can be added to existing VPN services:

- For an L2VPN or VPLS network—Rate limiting, configured at the UNI.

**Note**

QoS policies applied to L2VPN or VPLS networks must be Ethernet QoS policies (*not* IP QoS).

- For an MPLS VPN network—Marking packets with MPLS Exp. values, configured at the PE device ingress interface.

When you provision QoS for an existing service, the preliminary operations of creating inventory, collecting configurations, and marking device endpoints are not required. You provision QoS for VPN services that are already in the *deployed* state, and the preliminary operations are specified within the existing L2VPN or MPLS VPN service request. During deployment, the QoS service request relies on port/interface configuration from the existing services.

QoS is provisioned with a service order that includes a QoS service definition, which defines the QoS policy and the appropriate link profile, and the L2VPN or MPLS VPN service request. The QoS service request is deployed through the service order.

L2VPN Ethernet QoS Policy

For an L2VPN network, ISC applies QoS rate-limiting parameters to traffic as it leaves the CLE device (the PE device UNI).

To provision QoS for an already deployed L2VPN service request, you need the L2VPN service request locator ID and a service definition with an EoMPLS link profile (**Type=EoMplsLink**). The EoMPLS link profile includes the committed information rate (**CirBps**) and the committed burst (**BurstBytes**).

Table 9-12 L2VPN Ethernet QoS Policy

Operation	className	Required Parameters
createInstance	ServiceOrder	- ServiceName - NumberOfRequests - ServiceRequest
	ServiceRequest	- RequestName - Type=QoS - ServiceRequestDetails
	ServiceRequestDetails	- ServiceDefinition - ServiceDefinitionType=QoS - QoSLink - Bandwidth
	QoSLink	- L2VpnSR - Name - LocatorId

XML Example:

- CreateQoSServiceOrderEoMPLS.xml

Provisioning QoS from an MPLS VPN Service Request

For an MPLS VPN network, ISC marks packets with an MPLS Exp. value at the PE device ingress interface.

ISC supports the following QoS parameters for MPLS VPNs:

- IP QoS, based on DSCP or IP Precedence values, before the packet enters the MPLS VPN network.
- Map DSCP or IP Precedence value to MPLS Exp. value at the ingress router to the MPLS VPN Network (PE device ingress interface).
- Per-hop-behaviors (PHBs), such as congestion management and congestion avoidance in the MPLS backbone based on the MPLS Exp. value.
- IP QoS, based on DSCP or IP Precedence values, continues after the packet leaves the MPLS VPN network.

Table 9-13 MPLS QoS Policy

Operation	className	Required Parameters
createInstance	ServiceOrder	• ServiceName • NumberOfRequests • ServiceRequest
	ServiceRequest	• RequestName • Type=QoS • ServiceRequestDetails
	ServiceRequestDetails	• ServiceDefinition – ServiceDefinitionType=QoS • QoSLink – Bandwidth
	QoSLink	• MplsSR – Name – LocatorId Note A link profile is not required when provisioning QoS with an MPLS service request.

XML Example:

- CreateQoSServiceOrder.xml

