Chapter 21

GMPLS Configuration Guidelines

To configure GMPLS, you must complete the following tasks:

Configure LMP on page 362

Configure MPLS Label-Switched Paths for GMPLS on page 369

NOTE: Although you can configure the GMPLS-related statements at the [edit logical-routers *logical-router-name*] hierarchy level, GMPLS is not supported on logical routers.

Configure LMP

You need to configure the Link Management Protocol (LMP) to define the data channel connection between devices.

```
[edit]
protocols {
    link-management {
        peer peer-name {
            address address;
            control-channel control-channel-name;
            te-link te-link-name;
        }
        te-link te-link-name {
            interface interface-name {
                local-address ip-address;
                remote-address ip-address;
                remote-id id-number;
            }
            local-address ip-address;
            remote-address ip-address;
            remote-id id-number;
        }
        traceoptions {
            file filename <files number> <no-stamp> <replace> <size size>
                <(world-readable | no-world-readable)>;
            flag flag <flag-modifier> <disable>;
        }
    }
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management]

[edit protocols link-management]

The sections that follow describe how to configure LMP:

Configure LMP TE Links on page 363

Configure LMP Peers on page 365

Configure Peer Interfaces in RSVP and OSPF on page 366

Configure MPLS Paths for GMPLS on page 368

Trace LMP Traffic on page 368

Configure LMP TE Links

An LMP TE link acts as a data channel connection between GMPLS devices.

To configure a TE link, include the te-link statement:

```
te-link te-link-name {
    interface interface-name {
        local-address ip-address;
        remote-address ip-address;
        remote-id id-number;
    }
    local-address ip-address;
    remote-address ip-address;
    remote-id id-number;
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management]

[edit protocols link-management]

Complete the procedures in the following sections to configure an LMP TE link:

Configure the Local IP Address for the TE Link on page 363

Configure the Remote IP Address for the TE Link on page 364

Configure the Remote ID for the TE Link on page 364

Configure the Local IP Address for the TE Link

Use the local-address statement to configure the local IP address associated with the TE link.

To configure the local IP address for the TE link, include the local-address statement:

```
te-link te-link-name {
    interface interface-name {
        local-address ip-address;
    }
    local-address ip-address;
}
```

For a list of hierarchy levels at which you can configure this statement, see the statement summary section for this statement.

We recommend that you configure a different IP address subnet for your TE link addresses from the subnet configured for your physical interfaces. This enables you to identify which addresses are physical and which addresses belong to the TE link.

Configure the Remote IP Address for the TE Link

You need to specify the address of the remote end of the data channel for each TE link. Use the remote-address statement to configure the remote IP address.

To configure the remote IP address for the TE link, include the remote-address statement:

```
te-link te-link-name {
    interface interface-name {
        remote-address ip-address;
    }
    remote-address ip-address;
}
```

For a list of hierarchy levels at which you can configure this statement, see the statement summary section for this statement.

We recommend that you configure a different IP address subnet for your TE link addresses from the subnet configured for your physical interfaces. This enables you to identify which addresses are physical and which addresses belong to the TE link.

Configure the Remote ID for the TE Link

The local ID for the TE link is automatically assigned by LMP. The post-identifier and labels for the interfaces (resources) in the TE link are also assigned automatically. However, you need to explicitly configure the remote ID for the TE link and the remote ID TE link interface. The remote ID for the interface must be based on the post-ID assignment of the peer node. The remote IDs are needed for static mapping of remote labels to local labels.

Before you can obtain the remote IDs for the TE link and TE link interface on the peer node, you must first configure the LMP peer as described in “Configure LMP Peers” on page 365. Once you have configured the LMP peer, you can obtain the TE link local ID and interface local ID by issuing the show link-management te-link command. Once you have these IDs, you can configure them as the remote IDs on the peer node.

To configure the remote ID for a TE link and for the TE link interface, include the remote-id statement:

```
te-link te-link-name {
    interface interface-name {
        remote-id id-number;
    }
    remote-id id-number;
}
```

For a list of hierarchy levels at which you can configure the remote-id statement, see the statement summary section for this statement.

Configure LMP Peers

You need to configure network peers for GMPLS. A peer is a network device that your router communicates with when setting up the control and data channels. The peer is often an optical cross-connect (OXC).

Configure an LMP peer name by including the peer statement:

```
peer peer-name {
    address ip-address;
    control-channel control-channel-interface;
    te-link te-link-name;
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management]

[edit protocols link-management]

The following sections describe how to configure the other statements needed for an LMP peer:

Configure the LMP Peer ID on page 365

Configure the Control Channel Interface on page 365

Configure the TE Link for the LMP Peer on page 366

Configure the LMP Peer ID

Configure the LMP peer ID by including the address statement. The default value for the LMP peer ID is the loopback address.

address *ip-address*;

You can configure the address statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management peer peer-name]

[edit protocols link-management peer *peer-name*]

Configure the Control Channel Interface

Configure the interface name for the control channel by including the control-channel statement:

control-channel *control-channel-interface*;

You can include the control-channel statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management peer *peer-name*]

[edit protocols link-management peer *peer-name*]

Configure the TE Link for the LMP Peer

Specify the name of a TE link to be associated with this peer by including the te-link statement:

te-link *te-link-name*;

You can include the te-link statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management peer *peer-name*]

[edit protocols link-management peer *peer-name*]

For information on how to configure a TE link, see “Configure LMP TE Links” on page 363.

Configure Peer Interfaces in RSVP and OSPF

After you have configured the LMP peers, add the peer interfaces to RSVP and OSPF. The peer interface name must match the peer name configured in LMP. Once the peer interfaces are added to the protocols, the TE link local and remote addresses can be signaled and advertised to peers like any other interface enabled for RSVP and OSPF. These act as virtual interfaces for GMPLS.

NOTE: When adding the virtual peer interfaces to RSVP and OSPF, do not configure the corresponding physical control channel interface in either protocol. If you include the interface all statement, you must disable the RSVP and OSPF protocols manually on the control channel interface.

To configure peer interfaces in RSVP and OSPF, complete the procedures in the following sections:

Configure Peer Interfaces in RSVP on page 367

Configure Peer Interfaces in OSPF on page 367

Configure Peer Interfaces in RSVP

To configure RSVP signaling for LMP peers, configure the LMP peer interface using the peer-interface statement:

```
peer-interface peer-interface-name {
    (aggregate | no-aggregate);
    authentication-key key;
    disable;
    hello-interval seconds;
    (reliable | no-reliable);
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols rsvp]

[edit protocols rsvp]

The statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols rsvp peer-interface *peer-name*]

[edit protocols rsvp peer-interface *peer-name*]

have the same functionality as the statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols rsvp interface]

[edit protocols rsvp interface]

Configure Peer Interfaces in OSPF

To configure OSPF routing for LMP peers, configure the name of the LMP peer using the peer-interface statement:

```
    ospf {
      area area-number {
        peer-interface peer-interface-name {
          dead-interval seconds;
          disable;
          hello-interval seconds;
          retransmit-interval seconds;
          transit-delay seconds;
        }
      }
    }
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols ospf area *area-number*]

[edit protocols ospf area *area-number*]

For information on how to configure OSPF statements see the *JUNOS Internet Software Routing Protocols Configur ation Guide* .

Configure MPLS Paths for GMPLS

As part of the configuration for GMPLS, you need to establish an MPLS path for each unique device connected through GMPLS. Configure the TE link remote address as the address at the [edit protocols mpls path *path-name*] hierarchy level. CSPF is supported so you can choose either the strict or loose option with the address.

See "Configure LMP" on page 362 for information about how to obtain a TE link remote address.

Configure the MPLS path as follows:

```
protocols {
    mpls {
        path path-name {
            next-hop-address (strict | loose);
        }
    }
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols mpls]

[edit protocols mpls]

See "Create a Named Path" on page 52 for information about how to configure MPLS paths.

Trace LMP Traffic

To trace LMP protocol traffic, include the traceoptions statement:

```
traceoptions {
    file filename <files number> <no-stamp> <replace> <size size>
        <(world-readable | no-world-readable)>;
    flag flag <flag-modifier> <disable>;
}
```

You can configure this statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols link-management]

[edit protocols link-management]

Use the file statement to specify the name of the file that receives the output of the tracing operation. All files are placed in the directory /var/log.

The following trace flags display the operations associated with the sending and receiving of various LMP messages:

all—Trace all available operations

init—Output from the initialization messages

parse—Operation of the parser

process—Operation of the general configuration

route-socket—Operation of route socket events

routing—Operation of the routing protocols

server—Server processing operations

show—Show command servicing operations

Each flag can carry one or more of the following flag modifiers:

detail—Provide detailed trace information

receive—Packets being received

send—Packets being transmitted

Configure MPLS Label-Switched Paths for GMPLS

To enable the proper GMPLS switching parameters, configure the LSP attributes that are appropriate for your network connection. The default value for switching-type is psc-1, which is also appropriate for standard MPLS.

To configure the LSP attributes, include the lsp-attributes statement:

```
lsp-attributes {
    gpid gpid;
    signal-bandwidth type;
    switching-type type;
}
```

You can configure these statements at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-name*]

[edit protocols mpls label-switched-path *lsp-name*]

If you include the no-cspf statement in the label-switched path configuration, you must also configure primary and secondary paths or the configuration cannot be committed.

The following sections describe how to configure each of the LSP attributes for a GMPLS LSP:

Configure the GPID on page 370

Configure the Signal Bandwidth Type on page 370

Configure GMPLS Bidirectional LSPs on page 371

Configure the GPID

You need to specify the type of payload carried by the LSP. The payload is the type of packet underneath the MPLS label. The payload is specified by the generalized payload identifier (GPID).

You can specify the GPID with any of the following values:

hdlc—High-level Data Link Control (HDLC)

ethernet—Ethernet

ipv4—Internet Protocol version 4 (default)

ppp—Point-to-Point Protocol (PPP)

To configure the GPID, include the gpid statement:

gpid *gpid*;

You can include the gpid statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-name* lsp-attributes]

[edit protocols mpls label-switched-path *lsp-name* lsp-attributes]

Configure the Signal Bandwidth Type

The signal bandwidth type is the encoding used for path computation and admission control. To configure the signal bandwidth type, include the signal-bandwidth statement:

signal-bandwidth *type*;

You can include the signal-bandwidth statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-name* lsp-attributes]

[edit protocols mpls label-switched-path *lsp-name* lsp-attributes]

Configure GMPLS Bidirectional LSPs

Because MPLS and GMPLS use the same configuration hierarchy for LSPs, it is helpful to know which LSP attributes control LSP functionality. Standard MPLS packet-switched LSPs are unidirectional, while GMPLS non-packet LSPs are bidirectional.

If you use the default packet switching type of psc-1, your LSP becomes unidirectional. To enable a GMPLS bidirectional LSP, you must select a non-packet switching type option, such as lambda, fiber, or ethernet, using the switching-type statement:

```
switching-type (lambda | fiber | ethernet);
```

You can configure this statement at the following hierarchy levels:

[edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-name* lsp-attributes]

[edit protocols mpls label-switched-path *lsp-name* lsp-attributes]