Chapter 12

IP Reassembly for Tunnels

This chapter describes IP packet reassembly for tunneled protocols on E-series routers; it contains the following sections:

Overview

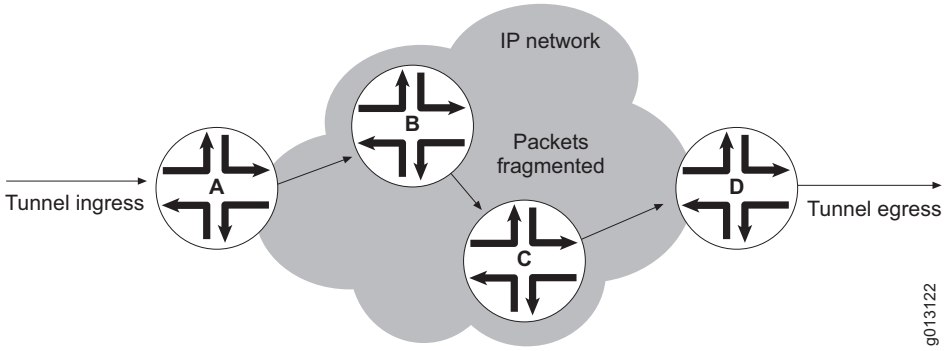
Tunneling protocols provide a method of forwarding packets of a particular protocol through a network of a different protocol type. For example, L2TP can transport a protocol such as PPP through a routed IP network. This capability requires a pair of devices that define the endpoints of the tunnel. Packets entering the tunnel are processed and encapsulated at the ingress endpoint, and packets exiting the tunnel are processed and de–encapsulated at the egress endpoint.

When packets are tunneled through an IP network, simple IP forwarding is performed. The IP forwarding process might fragment packets in the tunnel. Tunnel processing requires each packet to exit the tunnel in the same form in which it entered. Fragmented packets that are not reassembled before the tunnel egress processing are dropped.

For example, in Figure 21 on page 296, traffic is tunneled through an IP network that has four hops. Because the MTU of the link between routers B and C is smaller than that of previous hops, some packets are fragmented. Router D must reassemble the packets before tunnel egress processing and de-encapsulation are performed.

For more information about configuring tunnel-service interfaces, see *JUNOSe Physical Layer Configuration Guide, Chapter 6, Managing Tunnel-Service and IPSec-Service Interfaces*.

Figure 21: Tunneling Through an IP Network That Fragments Packets



Platform Considerations

For information about modules that support IP reassembly on the ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support IP reassembly.

For information about modules that support IP reassembly on the E120 router or the E320 router:

- See *E120 and E320 Module Guide, Table 1, Modules and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support IP reassembly.

Module Requirements

The types of modules that support IP reassembly for tunnel packets depend on the type of E-series router that you have.

ERX-7xx Models, ERX-14xx Models, and the ERX-310 Router

To configure IP reassembly on ERX-7xx models, ERX-14xx models, and the ERX-310 router, you must install one of a Service Module (SM), an IPSec Service line module (ISM), or a module that supports the use of shared tunnel-server ports. With these modules, an ERX router can perform reassembly of IP packets that it receives on DVMRP, GRE, IPSec, and L2TP tunnels.

Because IP reassembly is required only on tunnel egress packets, the router performs reassembly only on packets in which the IP destination address is local to the router and in which the underlying protocol is one of the supported tunneling protocols.

SMs provide dedicated tunnel-server ports that are always configured on the module. Unlike other line modules, SMs, and ISMs do not pair with corresponding I/O modules that contain ingress and egress ports. Instead, they receive data from and transmit data to other line modules with access to ingress and egress ports on their own associated I/O modules.

You can also create tunnels on router modules that support shared tunnel-server ports. You can configure (provision) a shared tunnel-server port to use a portion of the module's bandwidth to provide tunnel services. For a list of the modules that support shared tunnel-server ports, see the *ERX Module Guide*. For information about configuring tunnel services on dedicated and shared tunnel-server ports, see *JUNOSe Physical Layer Configuration Guide, Chapter 6, Managing Tunnel-Service and IPSec-Service Interfaces*.

E120 Router and E320 Router

To configure IP reassembly on an E120 router or an E320 router, you must install an ES2 4G line module (LM) with an ES2-S1 Service I/O adapter (IOA), or an IOA that supports the use of shared tunnel-server ports. For information about installing modules in these routers, see the *E120 and 320 Hardware Guide*.

The ES2 4G LM and ES2-S1 Service IOA combination provides a dedicated tunnel-server port that are always configured on the IOA. Unlike SMs, the ES2 4G LM requires the ES2-S1 Service IOA to condition it to receive and transmit data to other line modules. The ES2-S1 Service IOA also does not have ingress or egress ports.

You can also configure IP reassembly on IOAs that support shared tunnel-server ports. You can configure (provision) a shared tunnel-server port to use a portion of the IOA's bandwidth to provide tunnel services. For a list of the IOAs that support shared tunnel-server ports, see the *E120 and 320 Module Guide*.

For information about configuring tunnel services on dedicated and shared tunnel-server ports, see *JUNOSe Physical Layer Configuration Guide, Chapter 6, Managing Tunnel-Service and IPSec-Service Interfaces*.

Configuring IP Reassembly

You can enable IP reassembly on a virtual router basis. Also, on a systemwide basis, you can control how the router handles verification of sequence numbers in data packets that it receives on L2TP tunnels.

ip tunnel reassembly

- Use to enable the reassembly of fragmented IP tunnel packets that are received on the current virtual router.
- You configure tunnel reassembly on VPN routing and forwarding routers independent of the tunnel reassembly configuration on the parent virtual router.
- Example—Enables reassembly for virtual router vr12 and disables reassembly for virtual router vr8

  host1:vr12(config)#**ip tunnel reassembly**
  host1:vr12(config)#**virtual-router vr8**
  host1:vr8(config)#**no ip tunnel reassembly**

- Use the **no** version to return IP tunnel reassembly to the default, disabled.

l2tp ignore-receive-data-sequencing

- Use to prevent sequence number verification for data packets received on all L2TP tunnels in the router. This command does not affect the insertion of sequence numbers in packets sent from the router.
- If you are using IP reassembly, we recommend that you set up the router to ignore sequence numbers in received data packets. Because IP reassembly can reorder L2TP packets, out-of-order packets can be dropped if sequence numbers are being used on L2TP data packets.
- Example

  host1(config)#**l2tp ignore-receive-data-sequencing**

- Use the **no** version to cause the router to verify sequence numbers on received L2TP data packets.

Monitoring IP Reassembly

This section describes how to set a statistics baseline for tunnel reassembly statistics and how to display reassembly statistics.

Setting Statistics Baselines

You can use the **baseline ip tunnel-reassembly** command to set a statistics baseline for tunnel reassembly statistics on the current virtual router. The router implements the baseline by reading and storing the statistics at the time the baseline is set and then subtracting this baseline whenever you retrieve baseline-relative statistics.

baseline ip tunnel-reassembly

- Use to set a statistics baseline for tunnel reassembly statistics on the current virtual router.
- To display reassembly statistics relative to the baseline, use the **show ip tunnel reassembly statistics** command with the **delta** keyword. For information about displaying baselined statistics, see **show ip tunnel reassembly statistics** on page 299.
- Example

  host1:vr2#**baseline ip tunnel-reassembly**

- There is no **no** version.

Displaying Statistics

The router keeps several statistics that are useful for diagnostic purposes. These statistics are organized by virtual router, and some are broken out by protocol as well. You can display statistics for a single virtual router or for all virtual routers. You can also display statistics relative to a baseline.

show ip tunnel reassembly statistics

- Use to display tunnel reassembly statistics.
- To display statistics in brief form for the current virtual router, use the command with no keywords.
- To display statistics for all virtual routers, include the **all** keyword.
- To display detailed statistics, include the **detail** keyword.
- To display statistics relative to a baseline set with the **baseline ip tunnel-reassembly** command, include the **delta** keyword.

- Field descriptions
  - Tunnel IP Reassembly—Status of the IP reassembly feature: enabled, disabled
  - Total Fragments Received—Number of total fragments received for all tunneling protocols
  - Total Packets Reassembled—Number of packets reassembled; detailed display includes number of packets reassembled for each protocol; Control/Other increments for packets that are reassembled on a Tunnel Service module but are not forwarded, and instead sent to the SRP module
  - Reassembly Errors or Total Reassembly Errors—Number of errors in completing reassembly; detailed display includes types of reassembly errors
  - Reassembly Discards—Number of packets discarded because they were not reassembled
  - Reassembly Disabled Discards—Number of fragmented packets received when IP tunnel reassembly is disabled on the virtual router
- Example 1—Shows reassembly statistics for the default virtual router

```
host1#show ip tunnel reassembly statistics

Tunnel IP Reassembly Statistics for Virtual Router: default

        Tunnel IP Reassembly enabled
        Total Fragments Received:               15
        Total Packets Reassembled:              5
        Reassembly Errors:                      0
        Reassembly Discards:                    0
```

- Example 2—Shows detailed reassembly statistics for the default virtual router

```
host1#show ip tunnel reassembly statistics detail

Tunnel IP Reassembly Statistics for Virtual Router: default


        Tunnel IP Reassembly enabled
        Total Fragments Received:              15
        Total Packets Reassembled:              5
                L2TP:                           5
                GRE:                            0
                IPSec:                          0
                Control/Other:                  0
        Total Reassembly Errors:                0
                Fragmentation Errors:           0
                Too Many Fragments:             0
                Out of Resources:               0
                Packet Too Big:                 0
                Reassembly Timeout:             0

        Reassembly Disabled Discards:           0
```

- Example 3—Shows reassembly statistics for virtual router vr2 before and after setting a statistics baseline

  The following command shows reassembly statistics for vr2 before setting the baseline.

```
host1:vr2#show ip tunnel reassembly statistics

Tunnel IP Reassembly Statistics for Virtual Router: vr2

        Tunnel IP Reassembly enabled
        Total Fragments Received:               45
        Total Packets Reassembled:              15
        Reassembly Errors:                      0
        Reassembly Discards:                    0
```

  The following command sets a baseline for reassembly statistics on vr2.

```
host1:vr2#baseline ip tunnel-reassembly
```

  The following command shows reassembly statistics relative to the baseline before new packets arrive at the router for reassembly.

```
host1:vr2#show ip tunnel reassembly statistics delta

Tunnel IP Reassembly Statistics for Virtual Router: vr2

        Tunnel IP Reassembly enabled
        Total Fragments Received:               0
        Total Packets Reassembled:              0
        Reassembly Errors:                      0
        Reassembly Discards:                    0
```

  The following command shows reassembly statistics relative to the baseline as new packets start arriving at the router for reassembly.

```
host1:vr2#show ip tunnel reassembly statistics delta

Tunnel IP Reassembly Statistics for Virtual Router: vr2

        Tunnel IP Reassembly enabled
        Total Fragments Received:               15
        Total Packets Reassembled:              5
        Reassembly Errors:                      0
        Reassembly Discards:                    0
```