



Junos OS Radio-to-Router Protocols for Security Devices



Modified: 2017-01-22

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About the Documentation

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Documentation and Release Notes

To obtain the most current version of all Juniper Networks[®] technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

Supported Platforms

For the features described in this document, the following platforms are supported:

- LN Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:


```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see [CLI Explorer](#).

Documentation Conventions

[Table 1 on page ix](#) defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

[Table 2 on page ix](#) defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
Fixed-width text like this	Represents output that appears on the terminal screen.	<code>user@host> show chassis alarms</code> <code>No alarms currently active</code>
<i>Italic text like this</i>	<ul style="list-style-type: none">Introduces or emphasizes important new terms.Identifies guide names.Identifies RFC and Internet draft titles.	<ul style="list-style-type: none">A policy <i>term</i> is a named structure that defines match conditions and actions.<i>Junos OS CLI User Guide</i>RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none">To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.The console port is labeled CONSOLE.
< > (angle brackets)	Encloses optional keywords or variables.	stub <default-metric <i>metric</i>>;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Encloses a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none">In the Logical Interfaces box, select All Interfaces.To cancel the configuration, click Cancel.

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

- Online feedback rating system—On any page of the Juniper Networks TechLibrary site at <http://www.juniper.net/techpubs/index.html>, simply click the stars to rate the content, and use the pop-up form to provide us with information about your experience. Alternately, you can use the online feedback form at <http://www.juniper.net/techpubs/feedback/>.
- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or Partner Support Service support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>

- Download the latest versions of software and review release notes:
<http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications:
<http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [Radio-to-Router Protocols Overview on page 3](#)

CHAPTER 1

Radio-to-Router Protocols Overview

- [R2CP Radio-to-Router Protocol Overview on page 3](#)
- [PPPoE-Based Radio-to-Router Protocols Overview on page 4](#)

R2CP Radio-to-Router Protocol Overview

The Network Centric Waveform (NCW) radio-specific radio-to-router control protocol (R2CP) is similar to the PPPoE radio-to-router protocol. Both of these protocols exchange dynamic metric changes in the network that the routers use to update the OSPF topologies.

In radio-router topologies, the router connects to the radio over a Gigabit Ethernet link and the radio transmits packets over the radio frequency (RF) link. The radio periodically sends metrics to the router, which uses RF link characteristics and other data to inform the router on the shaping and OSPF link capacity. The router uses this information to shape the data traffic and provide the OSPF link cost for its SPF calculations. The radio functions like a Layer 2 switch and can only identify remote radio-router pairs using the Layer 2 MAC addresses. With R2CP the router receives metrics for each neighboring router, identified by the MAC address of the remote router. The R2CP daemon translates the MAC addresses to link the local IPv6 address and sends the metrics for each neighbor to OSPF. Processing these metrics is similar to the handling of PPPoE PADQ metrics. Unlike PPPoE, which is a point-to-point link, these R2CP neighbors are treated as nodes in a broadcast LAN.

You must configure each neighbor node with a per unit scheduler for CoS. The scheduler context defines the attributes of Junos class-of-service. To define CoS for each radio, you can configure virtual channels to limit traffic. You need to configure virtual channels for as many remote radio-router pairs as there are in the network. You configure virtual channels on a logical interface. Each virtual channel can be configured to have a set of eight queues with a scheduler and an optional shaper. When the radio initiates the session with a peer radio-router pair, a new session is created with the remote MAC address of the router and the VLAN over which the traffic flows. Junos OS chooses from the list of free virtual channels and assigns the remote MAC and the eight CoS queues and the scheduler to this remote MAC address. All traffic destined to this remote MAC address is subjected to the CoS that is defined in the virtual channel.

A virtual channel group is a collection of virtual channels. Each radio can have only one virtual channel group assigned uniquely. If you have more than one radio connected to

the router, you must have one virtual channel group for each local radio-to-router pair. Although a virtual channel group is assigned to a logical interface, a virtual channel is not the same as a logical interface. The only features supported on a virtual channel are queuing, packet scheduling, and accounting. Rewrite rules and routing protocols apply to the entire logical interface.

All nodes in the R2CP network are in a broadcast LAN. The point-to-multipoint over LAN protocol supports advertising different bandwidth information for neighbors on a broadcast link. The network link is a point-to-multipoint link in the OSPFv3 link state database, which uses existing OSPF neighbor discovery to provide automatic discovery without configuration. It enables each node to advertise a different metric to every other node in the network to accurately represent the cost of communication. The **p2mp-over-lan** interface type under the OSPFv3 interface configuration enables you to configure the interface. OSPFv3 then uses LAN procedures for neighbor discovery and flooding, but represents the interface as point-to-multipoint in the link state database.

The interface type and router LSA are available under the following hierarchies:

[protocols ospf3 area *area-id* interface *interface-name*]

[routing-instances *routing-instances-name* protocols ospf3 area *area-id* interface *interface-name*]

For example:

```
protocols {
  ospf3 {
    area 0.0.0.0 {
      interface ge-0/0/2.0 {
        interface-type p2mp-over-lan;
      }
    }
  }
}
```

**Related
Documentation**

- [Configuring the R2CP Radio-to-Router Protocol on page 9](#)

PPPoE-Based Radio-to-Router Protocols Overview

Support for PPPoE-based radio-to-router protocols includes the following extensions to the PPPoE protocol:

- Messages that define how an external device provides the router with timely information about the quality of a link connection
- A flow control mechanism that indicates how much data the router can forward

The router uses the information provided in these PPPoE messages to dynamically adjust the interface speed. When OSPF is notified of this change, it adjusts the cost of the link and updates the routing tables accordingly.

The radio provides ground-to-ground or ground-to-air communications with like devices. When the radio picks up a signal from another device, it initiates a PPPoE session with a directly connected router. The PPPoE session encapsulates the packets that are relayed over a PPP link between the local and remote routers. The remote radio then forwards traffic over an independent PPPoE session between the remote radio and the router to which it is connected. The two routers exchange LCP and IPCP messages to configure the link and exchange OSPF messages to establish the network topology.

The router and radio are deployed in highly dynamic environments, such as moving vehicles. The quality of the radio link between the routers can vary significantly as a vehicle moves behind an obstruction. Each radio monitors the link every 50 milliseconds for changes in the link bandwidth, quality, and utilization. If any changes are detected, the radios announce the new set of metrics to the respective routers through a PPPoE Active Discovery Quality (PADQ) message, which is a nonstandard extension to the PPPoE Discovery Protocol [RFC2516]. The router transforms these metrics into a bandwidth value for the PPP link and compares it to the value currently in use. When the router detects that the difference exceeds a user-specified threshold, it adjusts the speed of the PPP link. An event message notifies OSPF of the change, which then triggers OSPF to announce any resulting routing topology changes to its neighbors.

The PPPoE-based radio-to-router protocol notifies the router about neighbors joining or leaving the network and to create and maintain OSPF adjacencies over the dynamic links established between them. The costs assigned to these links are based on network conditions and flow control information sent by the radios. The calculations and requests to update interface speeds are performed by routines in a common library.

When PPPoE is used for applications, such as mobile radio, the radio links have variable bandwidth. So a mobile radio can function in a PPPoE environment, PPPoE messaging includes PADQ messages, which enable a link cost to be propagated to OSPF through the evaluation of various link quality metrics. The router uses information from these notifications along with user-configured parameters to calculate interface link costs that are used by the routing protocols.

A radio can send an optional PADQ at any time to query or report link quality metrics. When transmitting PPP streams over radio links, the quality of the link directly affects the throughput. The PADQ packet is used by the radio modem to report link metrics.

To support the credit-based flow control extensions described in RFC4938, PPPoE peers can also grant each other forwarding credits. The grantee can forward traffic to the peer only when it has a sufficient number of credits to do so. Credit-based forwarding allows both sides of the session to agree to use a non-default credit scaling factor during the PADR and PADS message exchange. Although this is used on both sides of the session, this feature provides the radio client with a flow control mechanism that throttles traffic by limiting the number of credits it grants to the router.

Related Documentation

- *Understanding the PPPoE-Based Radio-to-Router Protocol*

PART 2

Configuration

- [R2CP on page 9](#)
- [PPPoE on page 13](#)
- [Configuration Statements on page 21](#)

CHAPTER 2

R2CP

- [Configuring the R2CP Radio-to-Router Protocol on page 9](#)

Configuring the R2CP Radio-to-Router Protocol

To configure the R2CP protocol:

1. Configure the interfaces.

The following example creates four logical interfaces on ge-0/0/2, using unit 52 for R2CP control messages and units 101-193 for data traffic. The **per-unit-scheduler** statement is required for R2CP.

```
interfaces {
  ge-0/0/2 {
    per-unit-scheduler;
    vlan-tagging;
    unit 52 {
      vlan-id 52;
      family inet {
        address 52.1.1.1/24;
      }
    }
    unit 101 {
      vlan-id 101;
      family inet {
        address 101.1.1.1/24;
      }
    }
    unit 102 {
      vlan-id 102;
      family inet {
        address 102.1.1.1/24;
      }
    }
    unit 103 {
      vlan-id 103;
      family inet {
        address 103.1.1.1/24;
      }
    }
  }
}
```

```
}
```

2. Configure the R2CP protocol.

The following example configures ge-0/0/2.52 as the interface for R2CP control messages, vg1 as the virtual-channel group, and ge-0/0/2.101-103 as data interfaces using the radio-interface statement.

```
protocols {  
  r2cp {  
    radio myRadio {  
      interface ge-0/0/2.52;  
      virtual-channel-group vg1;  
      radio-interface ge-0/0/2.101;  
      radio-interface ge-0/0/2.102;  
      radio-interface ge-0/0/2.103;  
    }  
  }  
}
```

3. Configure class of service.

The following example defines virtual-channels, their initial shaping-rates, and the virtual-channel-group to which they belong. It also makes the association between radio-interface interfaces and virtual-channel-group. In the class of service configuration, the **vc-shared-scheduler** configuration statement is required for each interface configured as a radio interface in the R2CP protocol configuration.

```
class-of-service {  
  virtual-channels {  
    vc1;  
    vc2;  
    vc3;  
    vc4;  
  }  
  virtual-channel-groups {  
    vg1 {  
      vc1 {  
        scheduler-map sm;  
        shaping-rate 15m;  
        default;  
      }  
      vc2 {  
        scheduler-map sm;  
        shaping-rate 20m;  
      }  
      vc3 {  
        scheduler-map sm;  
        shaping-rate 20m;  
      }  
      vc4 {  
        scheduler-map sm;  
        shaping-rate 20m;  
      }  
    }  
  }  
  forwarding-classes {
```

```
    queue 0 DATA-queue;
}
interfaces {
  ge-0/0/2 {
    unit 101 {
      virtual-channel-group vg1;
      vc-shared-scheduler;
    }
    unit 102 {
      virtual-channel-group vg1;
      vc-shared-scheduler;
    }
    unit 103 {
      virtual-channel-group vg1;
      vc-shared-scheduler;
    }
  }
}
scheduler-maps {
  sm {
    forwarding-class DATA-queue scheduler sm-scheduler;
  }
}
schedulers {
  sm-scheduler {
    transmit-rate percent 20;
    buffer-size percent 20;
    priority low;
  }
}
}
```

Related Documentation • [R2CP Radio-to-Router Protocol Overview on page 3](#)

CHAPTER 3

PPPoE

- [Configuring PPPoE-Based Radio-to-Router Protocols on page 13](#)
- [Setting Tracing Options for PPPoE on page 14](#)
- [Credit Flow Control for PPPoE on page 14](#)
- [Displaying Statistics for PPPoE on page 15](#)
- [Verifying PPPoE Interfaces on page 16](#)
- [Verifying a PPPoE Configuration on page 16](#)
- [Verifying Credit-Flow Control on page 17](#)
- [Example: Configuring the PPPoE-Based Radio-to-Router Protocol on page 17](#)
- [PPPoE Credit-Based Flow Control Configuration on page 19](#)

Configuring PPPoE-Based Radio-to-Router Protocols

To configure the PPPoE-based radio-to-router protocol:

1. Configure PPPoE encapsulation for an Ethernet interface.
2. Configure radio-router on the logical Ethernet interface.
3. Specify the logical Ethernet interface as the underlying interface for the PPPoE session.
4. Configure the operational mode as server.
5. (Optional) Identify the access concentrator by a unique name.
6. Specify how many seconds to wait before attempting to reconnect.
7. Provide a name for the type of service provided by the access concentrator.
8. Configure the maximum transmission unit (MTU) of the interface.
9. Configure the MTU size for the protocol family.
10. Disable the sending of keepalive messages on the logical interface.

Related Documentation

- [*Understanding the PPPoE-Based Radio-to-Router Protocol*](#)
- [Example: Configuring the PPPoE-Based Radio-to-Router Protocol on page 17](#)

Setting Tracing Options for PPPoE

To trace the operations of the router's PPPoE process, include the `traceoptions` statement at the `[edit protocols pppoe]` hierarchy level:

```
[edit protocols pppoe]
traceoptions {
  file filename <files number> <match regular-expression> <size size> <world-readable |
    no-world-readable>;
  flag flag;
  level severity-level;
  no-remote-trace;
}
```

To specify more than one tracing operation, include multiple **flag** statements.

You can specify the following flags in the **traceoptions** statement:

- **all**—All areas of code
- **config**—Configuration code
- **events**—Event code
- **gres**—Gres code
- **init**—Initialization code
- **interface-db**—Interface database code
- **memory**—Memory management code
- **protocol**—PPPoE protocol processing code
- **rtsock**—Routing socket code
- **session-db**—Session management code
- **signal**—Signal handling code
- **state**—State handling code
- **timer**—Timer code
- **ui**—User interface code

- Related Documentation**
- *Understanding PPPoE Interfaces*
 - *Example: Configuring PPPoE Interfaces*

Credit Flow Control for PPPoE

To support the credit-based flow control extensions described in RFC4938, PPPoE peers can grant each other forwarding credits. The grantee is allowed to forward traffic to the peer only when it has a sufficient number of credits to do so. When credit-based

forwarding is used on both sides of the session, the radio client can throttle traffic by limiting the number of credits it grants to the router.

The **interfaces** statement includes the **radio-router** attribute, which contains the parameters used for rate-based scheduling and OSPF link cost calculations. It also includes the **credit** attribute to indicate that credit-based packet scheduling is supported on the PPPoE interfaces that reference this underlying interface. Interfaces that set the **encapsulation** attribute support the PPPoE Active Discovery Grant (PADG) and PPPoE Active Discovery Credit (PADC) messages in the same way that the **radio-router** attribute provides active support for the PPPoE Active Discovery Quality (PADQ) message.

The **credit interval** parameter controls how frequently the router generates credit announcement messages. For PPPoE this corresponds to the interval between PADG credit announcements for each session.

- Related Documentation**
- [PPPoE-Based Radio-to-Router Protocols Overview on page 4](#)
 - [Understanding the PPPoE-Based Radio-to-Router Protocol](#)
 - [Configuring PPPoE-Based Radio-to-Router Protocols on page 13](#)

Displaying Statistics for PPPoE

Purpose Display PPPoE statistics.

Action `user@host> show interfaces pp0.51 statistics`

```
Logical interface pp0.51 (Index 75) (SNMP ifIndex 137)
  Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
  PPPoE:
    State: SessionUp, Session ID: 1,
    Session AC name: None, Remote MAC address: 00:22:83:84:2f:03,
    Underlying interface: ge-0/0/4.1 (Index 74)
    Input packets : 20865
    Output packets: 284636
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 943 (00:00:06 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Opened, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  PAP state: Closed
  Security: Zone: Null
  Protocol inet, MTU: 1492
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 5.1.1.2, Local: 5.1.1.1
  Protocol inet6, MTU: 1492
    Flags: None
    Addresses, Flags: Is-Preferred
      Destination: fe80::/64, Local: fe80::21f:12ff:fed2:2918
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: feee::5:1:1:0/126, Local: feee::5:1:1:1
```

- Related Documentation**
- [Understanding CHAP Authentication on a PPPoE Interface](#)

- [Verifying Credit-Flow Control on page 17](#)

Verifying PPPoE Interfaces

Purpose Display PPPoE interfaces information.

Action • To display PPPoE interface information:

```
user@host> show pppoe interfaces pp0.51 detail
```

```
pp0.51 Index 75
State: Session up, Session ID: 1,
Service name: None,
Configured AC name: None, Session AC name: None,
Remote MAC address: 00:11:22:33:44:55,
Session uptime: 00:04:18 ago,
Auto-reconnect timeout: Never, Idle timeout: Never,
Underlying interface: ge-0/0/1.0 Index 70
PADQ Current bandwidth: 750 Kbps, Maximum 1000 Kbps
Quality: 85, Resources 65, Latency 100 msec.
Dynamic bandwidth: 3 Kbps
```

• To display PPPoE terse interface information:

```
user@host> show pppoe interfaces terse pp0.51
```

```
Interface  Admin Link Proto  Local          Remote
pp0.51      up  up   inet   5.1.1.1        --> 5.1.1.2
            inet6    fe80::21f:12ff:fed2:2918/64
                        feee::5:1:1:1/126
```

Related Documentation • [Understanding PPPoE Interfaces](#)
• [Example: Configuring PPPoE Interfaces](#)

Verifying a PPPoE Configuration

Purpose To verify a PPPoE configuration, you can issue the following operational mode commands:

Action • `show interfaces f0/0/port extensive`
• `show interfaces pp0`
• `show pppoe interfaces`
• `show pppoe statistics`

For more information about these operational mode commands, see the [CLI Explorer](#).

Related Documentation • [Configuring PPPoE Interfaces](#)

Verifying Credit-Flow Control

Purpose Display PPPoE credit-flow control information about credits on each side of the PPPoE session when credit processing is enabled on the interface.

Action user@host> show pppoe interface detail

```
pp0.51 Index 73
  State: Session up, Session ID: 3,
  Service name: None,
  Configured AC name: None, Session AC name: None,
  Remote MAC address: 00:22:83:84:2e:81,
  Session uptime: 00:05:48 ago,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/4.1 Index 72
  PADG Credits: Local: 12345, Remote: 6789, Scale factor: 128 bytes
  PADQ Current bandwidth: 750 Kbps, Maximum 1000 Kbps
  Quality: 85, Resources 65, Latency 100 msec.
  Dynamic bandwidth: 3 Kbps

pp0.1000 Index 71
  State: Down, Session ID: 1,
  Service name: None,
  Configured AC name: None, Session AC name: None,
  Remote MAC address: 00:00:00:00:00:00,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/1.0 Index 70
  PADG Credits: enabled
  Dynamic bandwidth: enabled
```

Related Documentation

- [Understanding CHAP Authentication on a PPPoE Interface](#)
- [Verifying Credit-Flow Control on page 17](#)

Example: Configuring the PPPoE-Based Radio-to-Router Protocol

This example shows how to configure the PPPoE-based radio-to-router protocol.

- [Requirements on page 17](#)
- [Overview on page 18](#)
- [Configuration on page 18](#)
- [Verification on page 19](#)

Requirements

Before you begin:

1. Configure network interfaces. See *Example: Creating an Ethernet Interface*.
2. Configure PPPoE interfaces. See *Example: Configuring PPPoE Interfaces*.
3. Configure PPPoE encapsulation on an Ethernet interface. See *Example: Configuring PPPoE Encapsulation on an Ethernet Interface*.

4. Configure PPPoE encapsulation on an ATM-over-ADSL interface. See *Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface*.
5. Configure CHAP authentication on a PPPoE interface. See *Example: Configuring CHAP Authentication on a PPPoE Interface*.

Overview

In this example, you configure the ge-3/0/3 interface and set the bandwidth, resource, latency, and quality to **100**. You also set the threshold value to **10**, and then configure options on the logical interface.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
[edit]
set interfaces ge-3/0/3 unit 1 radio-router bandwidth 100 resource 100 latency 100 quality
  100 threshold 10
set interfaces pp0 unit 1 pppoe-options underlying-interface ge-3/0/3 server
set interfaces pp0 unit 1 family inet unnumbered-address lo0.0 destination 192.168.1.2
set interfaces pp0 unit 1 family inet6 address lo0.0 destination fec0:1:1::2
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the [Junos OS CLI User Guide](#).

To configure the PPPoE-based radio-to-router protocol:

1. Enable the PPPoE-based radio-to-router protocol.

```
[edit]
user@host# edit interfaces ge-3/0/3 unit 1 radio-router
```

2. Set the interface speed for the virtual link.

```
[edit interfaces ge-3/0/3 unit 1 radio-router]
user@host# set bandwidth 100 resource 100 latency 100 quality 100
```

3. Set the calculated and current interface speeds, as a percentage.

```
[edit interfaces ge-3/0/3 unit 1 radio-router]
user@host# set threshold 10
```

4. Configure options on the logical interface.

```
[edit interfaces pp0 unit 1]
user@host# set pppoe-options underlying-interface ge-3/0/3
user@host# set pppoe-options server
user@host# set family inet unnumbered-address lo0.0 destination 192.168.1.2
user@host# set family inet6 address lo0.0 destination fec0:1:1::2
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show interfaces** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
user@host# show interfaces ge-3/0/3 {
  unit 1
  radio-router {
    bandwidth 100;
    resource 100;
    latency 100;
    quality 100;
    threshold 10;
  }
}
...
pp0 {
  unit 1 {
    pppoe-options {
      underlying-interface ge-3/0/3;
      server;
    }
  }
  family inet {
    unnumbered-address lo0.0 destination 192.168.1.2;
  }
  family inet6;
}
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the PPPoE-based Radio-to-Router Protocol

Purpose Verify the PPPoE-Based radio-to-router protocol.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- *Understanding the PPPoE-Based Radio-to-Router Protocol*

PPPoE Credit-Based Flow Control Configuration

This example shows a PPPoE credit-based flow control configuration.

```
[edit interfaces ge-0/0/1]
unit 0 {
  encapsulation ppp-over-ether;
  radio-router {
    credit {
      interval 10;
    }
    bandwidth 80;
    threshold 5;
  }
}
```

- Related Documentation**
- *Understanding the PPPoE-Based Radio-to-Router Protocol*
 - [Configuring PPPoE-Based Radio-to-Router Protocols on page 13](#)

CHAPTER 4

Configuration Statements

- [apply-groups on page 22](#)
- [bandwidth \(R2CP\) on page 22](#)
- [credit on page 23](#)
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- [disable \(Protocols R2CP\) on page 24](#)
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- [interface \(Protocols R2CP\) on page 25](#)
- [interval \(Interfaces\) on page 25](#)
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- [session-terminate-count on page 31](#)
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- [threshold on page 32](#)
- [traceoptions \(Protocols R2CP\) on page 33](#)
- [virtual-channel-group on page 34](#)

apply-groups

Syntax	<code>apply-groups;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 9.6. Statement modified in Junos OS Release 15.1.
Description	Apply the groups from which to inherit configuration data. If radio-router is set without any other attributes specified, the first four values become 100 and threshold stays at 10, and capacity, margin, and delay are deprecated. If radio-router is set, do not change the OSPF reference-bandwidth value because this generates an incorrect link cost.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13

bandwidth (R2CP)

Syntax	<code>bandwidth <i>weight</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 9.6.
Description	Configure the weight of the bandwidth factor when calculating an effective interface bandwidth for configuring PPPoE-based radio-to-router control protocol (R2CP).
Options	weight —Factor used to calculate interface bandwidth. Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13• R2CP Radio-to-Router Protocol Overview on page 3

credit

Syntax	credit { interval <i>seconds</i> ; }
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 10.1.
Description	Configure the credit-based packet scheduling.
Options	The remaining statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring PPPoE-Based Radio-to-Router Protocols on page 13

data-rate

Syntax	data-rate <i>weight</i> ;
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Release 10.2 of Junos OS .
Description	Configure the weight of the resource factor when calculating an effective data rate.
Options	<i>weight</i> —Factor used to calculate data rate. Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring PPPoE-Based Radio-to-Router Protocols on page 13

disable (Protocols R2CP)

Syntax	disable;
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Disable R2CP on the system.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

hub-assist

Syntax	hub-assist <i>weight</i> ;
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 10.2.
Description	Configure the weight of the resource factor when calculating an effective interface bandwidth.
Options	weight —Factor used to calculate interface bandwidth. Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13

interface (Protocols R2CP)

Syntax	<code>interface <i>interface-name</i> unit <i>unit</i></code>
Hierarchy Level	<code>[edit protocols r2cp radio <i>radio-name</i>]</code>
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the interface that receives R2CP messages.
Options	<p><i>interface-name</i>—Name of the radio interface.</p> <p><i>unit</i>—Radio unit number.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3 • Interfaces for Security Devices

interval (Interfaces)

Syntax	<code>interval <i>seconds</i>;</code>
Hierarchy Level	<code>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router credit]</code>
Release Information	Statement introduced in Release 10.1 of Junos OS.
Description	Configure the frequency that the router generates credit announcement messages.
Options	<p><i>seconds</i>—Interval between PADG credit announcements for each session.</p> <p>Range: 0 through 60</p> <p>Default: 1</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring PPPoE-Based Radio-to-Router Protocols on page 13

latency

Syntax	<code>latency <i>weight</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 9.6.
Description	Configure the weight of the latency factor when calculating an effective interface bandwidth.
Options	<i>weight</i> —Factor used to calculate interface bandwidth. Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13

node-terminate-count

Syntax	<code>node-terminate-count <i>count</i>;</code>
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the number of node terminate retransmits attempted when a node terminate ACK has not been received before radio/router adjacency is terminated.
Options	<i>count</i> —Number of node terminate retransmits Range: 1 through 5 Default: 3
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• R2CP Radio-to-Router Protocol Overview on page 3• Interfaces for Security Devices

node-terminate-interval

Syntax	<code>node-terminate-interval <i>interval</i>;</code>
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the interval between node terminate retransmits.
Options	<i>interval</i> —Interval in milliseconds. Range: 100 through 5000 Default: 1000
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3

quality

Syntax	<code>quality <i>weight</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 9.6.
Description	Configure the weight of the quality factor when calculating an effective interface bandwidth.
Options	<i>weight</i> —Factor used to calculate interface bandwidth. Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring PPPoE-Based Radio-to-Router Protocols on page 13

r2cp

Syntax r2cp {
 {enable | disable};
 traceoptions {
 flag flags;
 file filename;
 }
 server-port port-number;
 node-terminate-count *count*;
 node-terminate-interval *interval*;
 session-terminate-count *count*;
 session-terminate-interval *interval*;
 radio *radio-name* {
 interface *interface* unit *unit-number*;
 radio-interface interface unit *number*;
 virtual-channel-group *vc-group*;
 }
 }

Hierarchy Level [edit protocols]

Release Information Statement introduced in Release 10.2 of Junos OS.

Description Configure the network interfaces that are used for protocol updates. By default, the protocol is disabled on all interfaces.

Options The statements are explained separately.

Required Privilege Level routing—To view this statement in the configuration.
 routing-control—To add this statement to the configuration.

Related Documentation

- [R2CP Radio-to-Router Protocol Overview on page 3](#)

radio

Syntax	<pre>radio <i>radio-name</i> { interface <i>interface</i> unit <i>unit-number</i>; virtual-channel-group <i>vc-group-name</i>; radio-interface <i>interface</i> unit <i>number</i>; }</pre>
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the arbitrary name that describes the R2CP radio that exchanges messages and listens for acknowledgements. The interfaces and radio interfaces must reference the same Ethernet port for a particular radio. In addition, the logical interface configured by the radio interface can only be referenced by a single radio.
Options	<p><i>radio-name</i>—Name of the R2CP radio.</p> <p>The remaining statements are explained separately. See CLI Explorer.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3

radio-interface

Syntax	<pre>radio-interface <i>interface</i> unit <i>unit</i>;</pre>
Hierarchy Level	[edit protocols r2cp radio <i>radio-name</i>]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the attributes that identify the VLANs managed through the R2CP protocol.
Options	<p><i>interface</i>—Name of the interface.</p> <p><i>unit</i>—Unit number.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3 • Interfaces for Security Devices

radio-router

Syntax	<pre>radio-router { bandwidth <i>weight</i>; latency <i>weight</i>; quality <i>weight</i>; resource <i>weight</i>; threshold <i>percentage</i>; credit { interval <i>seconds</i>; } }</pre>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced in Junos OS Release 10.1.
Description	Configure the metric announcements that are received on the interface and processed by the router to control the flow of traffic and manage the speed of the link, resulting in a corresponding adjustment of OSPF cost.
Options	The remaining statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13

resource

Syntax	<pre>resource <i>weight</i>;</pre>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 9.6.
Description	Configure the weight of the resource factor when calculating an effective interface bandwidth.
Options	weight —Factor used to calculate interface bandwidth. Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13

server-port

Syntax	<code>server-port <i>port-number</i>;</code>
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the R2CP server that exchanges messages and listens for acknowledgements.
Options	<p><i>port-number</i>—Number of the server port.</p> <p>Default: UDP port 28762</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3 • <i>Interfaces for Security Devices</i>

session-terminate-count

Syntax	<code>session-terminate-count <i>count</i>;</code>
Hierarchy Level	[edit protocols r2cp radio]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the number of Session Terminate retransmits to be attempted when a Session Terminate ACK has not been received before the session terminated.
Options	<p><i>count</i>—Number of session terminate retransmits</p> <p>Range: 1 through 5</p> <p>Default: 3</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3 • <i>Interfaces for Security Devices</i>

session-terminate-interval

Syntax	<code>session-terminate-interval <i>interval</i>;</code>
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the interval between Session Terminate retransmits.
Options	<i>interval</i> —Interval in milliseconds Range: 100 through 5000 Default: 1000
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• R2CP Radio-to-Router Protocol Overview on page 3• Interfaces for Security Devices

threshold

Syntax	<code>threshold <i>percentage</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> radio-router]
Release Information	Statement introduced in Junos OS Release 9.6.
Description	Configure the percentage by which the effective interface speed for the session must change before the OSPF protocol is notified.
Options	<i>weight</i> —Factor used to calculate interface bandwidth Range: 0 through 100 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PPPoE-Based Radio-to-Router Protocols on page 13

traceoptions (Protocols R2CP)

Syntax	<pre> traceoptions { file <i>filename</i>; flag <i>flag</i>; } </pre>
Hierarchy Level	[edit protocols r2cp]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the trace options for R2CP.
Options	<p>file <i>filename</i>—Name of the file to receive the output of the tracing operation.</p> <p>flag <i>flag</i>—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. You can include the following flags:</p> <ul style="list-style-type: none"> • all—All tracing operations • configuration—Configuration operations • event—All tracing events • interface—Interface operations • node—Node events • packet—Packet events • rtsock —Routing socket operations • session—Session events • socket—Socket events • timer—Timer events • virtual-channel—Virtual channel events
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • R2CP Radio-to-Router Protocol Overview on page 3 • <i>Interfaces for Security Devices</i>

virtual-channel-group

Syntax	<code>virtual-channel-group <i>vc-group</i>;</code>
Hierarchy Level	[edit protocols r2cp radio <i>radio-name</i>]
Release Information	Statement introduced in Release 10.2 of Junos OS.
Description	Configure the virtual channel group that is used when allocating a virtual circuit for each learned MAC address.
Options	<i>vc-group</i> —Name of virtual channel group.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• R2CP Radio-to-Router Protocol Overview on page 3

PART 3

Administration

- [Operational Commands on page 37](#)

CHAPTER 5

Operational Commands

- `clear r2cp`
- `show r2cp`

clear r2cp

Syntax	<code>clear r2cp</code> <code><radio <i>radio-ID</i>> <all></code> <code><session <i>session-id</i>> <all></code> <code><statistics> <radio <i>radio-ID</i>> <session <i>session-id</i>></code>
Release Information	Command introduced in Junos OS Release 10.2.
Description	Reset R2CP sessions.
Options	all —Clears all radios. radio <i>radio-ID</i> —Clear radio by radio ID. session <i>session-id</i> —Reset R2CP sessions by session ID. All clears all sessions. statistics —Reset statistics by radio ID or session ID.
Required Privilege Level	clear
Related Documentation	<ul style="list-style-type: none">• show r2cp on page 39
List of Sample Output	clear r2cp radio on page 38 clear r2cp session on page 38 clear r2cp statistics on page 38
Output Fields	When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear r2cp radio

```
user@host> clear r2cp radio radio1
```

clear r2cp session

```
user@host> clear r2cp session session1
```

clear r2cp statistics

```
user@host> clear r2cp statistics radio1
```

show r2cp

Syntax	<pre>show r2cp <interfaces <i>interface-name</i>> <brief> <detail> <extensive> <radio <i>radio-name</i>> <brief> <detail> <extensive> <sessions <i>session-ID</i>> <brief> <detail> <extensive> <statistics></pre>
Release Information	Command introduced in Junos OS Release 10.2.
Description	Display the current operational state of all r2cp interfaces.
Options	<p>brief—(Optional) Display brief R2CP information.</p> <p>detail—(Optional) Display detailed R2CP information.</p> <p>extensive—(Optional) Display extensive R2CP information.</p> <p>radio—Display the R2CP radio information.</p> <p>session—Display the R2CP session information.</p> <p>statistics—Display R2CP statistics.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • clear r2cp on page 38
List of Sample Output	show r2cp on page 39

Sample Output

show r2cp

```
user@host> show r2cp sessions
Session: 3, Uptime: 00:00:12
  Destination MAC address 00:00:0c:0c:01:02
  Status: Established VLANs 100-101
  Virtual channel: 2
```


PART 4

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