



Using Multilink PPP over Dialer Interface Links

Multilink PPP is a method used to reduce latency and jitter for real-time traffic. This module contains conceptual information and configuration tasks for using Multilink PPP over dialer interface links.

Module History

This module was first published on May 2, 2005, and last updated on May 2, 2005.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the [“Feature Information for Using Multilink PPP over Dialer Interface Links” section on page 12](#).

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

Contents

- [Prerequisites for Using Multilink PPP over Dialer Interface Links, page 2](#)
- [Restrictions for Using Multilink PPP over Dialer Interface Links, page 2](#)
- [Information About Using Multilink PPP over Dialer Interface Links, page 2](#)
- [How to Configure Multilink PPP over Dialer Interface Links, page 3](#)
- [Configuration Examples for Using Multilink PPP over Dialer Interface Links, page 8](#)
- [Where to Go Next, page 9](#)
- [Additional References, page 10](#)
- [Glossary, page 11](#)
- [Feature Information for Using Multilink PPP over Dialer Interface Links, page 12](#)



Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

© 2007 Cisco Systems, Inc. All rights reserved.

Prerequisites for Using Multilink PPP over Dialer Interface Links

Knowledge

- Be familiar with the concepts in the [“Reducing Latency and Jitter for Real-Time Traffic Using Multilink PPP”](#) module.

Enable Queuing Mechanism

- Multilink uses first-in first out (FIFO) queuing for queuing and interleaving packets. Other queuing mechanisms such as low latency queuing (LLQ), weighted fair queuing (WFQ), and class-based weighted fair queuing (CBWFQ) can be used. If you want to use one of these alternative mechanisms, enable it before configuring Multilink.

Restrictions for Using Multilink PPP over Dialer Interface Links

RSP Support

- Route/switch processing (RSP) is not recommended when using Multilink PPP over dialer interface links.

Information About Using Multilink PPP over Dialer Interface Links

To use Multilink PPP over dialer interface links, you should understand the following concepts:

- [Dialer Profiles, page 2](#)
- [MQC and Multilink PPP over Dialer Interface Links, page 3](#)

Dialer Profiles

The dialer profiles implementation of dial-on-demand routing (DDR) is based on a separation between logical and physical interface configuration. Dialer profiles also allow the logical and physical configurations to be bound together dynamically on a per-call basis.

Dialer profiles are advantageous in the following situations:

- When you want to share an interface (ISDN, asynchronous, or synchronous serial) to place or receive calls.
- When you want to change any configuration on a per-user basis.
- When you want to maximize ISDN channel usage using the Dynamic Multiple Encapsulations feature to configure various encapsulation types and per-user configurations on the same ISDN B channel at different times according to the type of call.
- When you want to bridge to many destinations, and for avoiding split horizon problems.

Most routed protocols are supported; however, International Organization for Standardization Connectionless Network Service (ISO CLNS) is not supported.

If you decide to configure dialer profiles, you must disable validation of source addresses for the routed protocols you support.

For more information about dialer profiles and DRR, see the [“Preparing to Configure DDR”](#) module.

MQC and Multilink PPP over Dialer Interface Links

Before using Multilink PPP over dialer interface links, a traffic policy (also known as a policy map) must be created. (See the [“Prerequisites”](#) section on page 3.) Policy maps are created using the Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC).

The MQC is a CLI structure that allows users to create traffic policies (policy maps) and attach these policy maps to interfaces. A policy map contains a traffic class and one or more QoS features. A traffic class is used to classify traffic. The QoS features in the traffic policy determine how to treat the classified traffic.

For more information about MQC, see the [“Applying QoS Features Using the MQC”](#) module.

How to Configure Multilink PPP over Dialer Interface Links

This section contains the following procedures:

- [Configuring Multilink PPP over Dialer Interface Links, page 3](#) (required)
- [Associating the Dialer Interface with a BRI, page 6](#) (required)
- [Verifying the Multilink PPP over Dialer Interface Link Configuration, page 7](#) (optional)

Configuring Multilink PPP over Dialer Interface Links

To configure Multilink PPP over dialer interface links, complete the following steps.

Prerequisites

Before proceeding with this task, you must create a policy map. The policy map contains the configuration parameters used to apply the specific quality of service feature to the network traffic. To create a policy map, use the MQC. See the [“MQC and Multilink PPP over Dialer Interface Links”](#) section on page 3.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface dialer** *dialer-rotary-group-number*
4. **ip address** *ip-address mask* [**secondary**]
5. **ip unnumbered** *type number*
6. **encapsulation** *encapsulation-type*
7. **dialer pool** *number*
8. **dialer in-band** [**no-parity** | **odd-parity**]

9. **service-policy output** *policy-map-name*
10. **service-policy input** *policy-map-name*
11. **ppp authentication** {*protocol1* [*protocol2...*]} [**if-needed**] [*list-name* | **default**] [**callin**] [**one-time**] [**optional**]
12. **ppp chap hostname** *hostname*
13. **ppp chap password** *secret*
14. **ppp multilink** [**bap**]
15. **ppp multilink fragment delay** *milliseconds* [*microseconds*]
16. **ppp multilink interleave**
17. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface dialer <i>dialer-rotary-group-number</i> Example: Router(config)# interface dialer 1	Defines a dialer rotary group and enters interface configuration mode. <ul style="list-style-type: none"> Enter the dialer rotary group number.
Step 4	ip address <i>ip-address mask</i> [secondary] Example: Router(config-if)# ip address 10.10.100.1 255.255.255.0	Sets a primary IP address for an interface. This command can also set the optional secondary IP address for an interface. <ul style="list-style-type: none"> Enter the primary IP address (and, optionally, the secondary IP address).
Step 5	ip unnumbered <i>type number</i> Example: Router(config-if)# ip unnumbered ethernet 0	(Optional) Enables IP processing on a serial interface without assigning an explicit IP address to the interface. <ul style="list-style-type: none"> Enter the type and number of another interface on which the router has an assigned IP address. It cannot be another unnumbered interface.
Step 6	encapsulation <i>encapsulation-type</i> Example: Router(config-if)# encapsulation ppp	Sets the encapsulation method used by the interface. <ul style="list-style-type: none"> Enter the encapsulation method. For this feature, enter ppp.
Step 7	dialer pool <i>number</i> Example: Router(config-if)# dialer pool 3	(Optional) Specifies which dialing pool to use to connect to a specific destination subnetwork. <ul style="list-style-type: none"> Enter the dialing pool number.

	Command or Action	Purpose
Step 8	dialer in-band [no-parity odd-parity] Example: Router(config-if)# dialer in-band	(Optional) Specifies that dial-on-demand routing (DDR) is to be supported.
Step 9	service-policy output <i>policy-map-name</i> Example: Router(config-if)# service-policy output policy1	Attaches the previously created QoS traffic policy (policy map). See the “Prerequisites” section on page 3. The policy map evaluates and applies QoS features for traffic <i>leaving</i> the interface. <ul style="list-style-type: none"> Enter the policy map name.
Step 10	service-policy input <i>policy-map-name</i> Example: Router(config-if)# service-policy input policy1	Attaches the previously created QoS traffic policy (policy map). See the “Prerequisites” section on page 3. The policy map evaluates and applies QoS features for traffic <i>entering</i> the interface. <ul style="list-style-type: none"> Enter the policy map name.
Step 11	ppp authentication { <i>protocol1</i> [<i>protocol2...</i>]} [if-needed] [<i>list-name</i> default] [callin] [one-time] [optional] Example: Router(config-if)# ppp authentication chap	Enables at least one Point-to-Point Protocol (PPP) authentication protocol and specifies the order in which the protocols are selected on the interface. <ul style="list-style-type: none"> Enter the PPP authentication protocol to be used.
Step 12	ppp chap hostname <i>hostname</i> Example: Router(config-if)# ppp chap hostname ISPCorp	Creates a pool of dialup routers that all appear to be the same host when authenticating with Challenge Handshake Authentication Protocol (CHAP). <ul style="list-style-type: none"> Enter the name sent in the CHAP challenge.
Step 13	ppp chap password <i>secret</i> Example: Router(config-if)# ppp chap password 7	Enables a router calling a collection of routers that do not support this command (such as routers running older Cisco IOS software images) to configure a CHAP secret password to use in response to challenges from an unknown peer. <ul style="list-style-type: none"> Enter the secret password used to compute the response value for any CHAP challenge from an unknown peer.
Step 14	ppp multilink [bap] Example: Router(config-if)# ppp multilink	Enables multilink on an interface.
Step 15	ppp multilink fragment delay <i>milliseconds</i> [<i>microseconds</i>] Example: Router(config-if)# ppp multilink fragment delay 20	Specifies a maximum size in units of time for packet fragments on a Multilink PPP (MLP) bundle. <ul style="list-style-type: none"> Enter the maximum amount of time, in milliseconds.

	Command or Action	Purpose
Step 16	ppp multilink interleave Example: Router(config-if)# ppp multilink interleave	Enables interleaving of packets among the fragments of larger packets on a multilink bundle.
Step 17	end Example: Router(config-if)# end	(Optional) Exits interface configuration mode.

Associating the Dialer Interface with a BRI

The Basic Rate Interface (BRI) is used as the backup for the dialer interface. The BRI interface has multilink capability, and all the other characteristics of the dialer interface.

To associate the dialer interface with a BRI, complete the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface bri** *number*
4. **dialer pool-member** *number* [**priority** *priority*] [**min-link** *minimum*] [**max-link** *maximum*]
5. **dialer rotary-group** *interface-number*
6. **ppp multilink** [**bap**]
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface bri <i>number</i> Example: Router(config)# interface bri 1	Configures a BRI interface and enters interface configuration mode. <ul style="list-style-type: none"> • Enter port, connector, or interface card number.

	Command or Action	Purpose
Step 4	dialer pool-member <i>number</i> [priority <i>priority</i>] [min-link <i>minimum</i>] [max-link <i>maximum</i>] Example: Router(config-if)# dialer pool-member 3	(Optional) Configures a physical interface to be a member of a dialer profile dialing pool. <ul style="list-style-type: none"> Enter the dialer profile dialing pool number.
Step 5	dialer rotary-group <i>interface-number</i> Example: Router(config-if)# dialer rotary-group 1	(Optional) Includes a specified interface in a dialer rotary group. <ul style="list-style-type: none"> Enter the number of the dialer interface (defined in Step 4) in whose rotary group this interface is to be included.
Step 6	ppp multilink [ba] Example: Router(config-if)# ppp multilink	Enables Multilink on an interface.
Step 7	end Example: Router(config-if)# end	(Optional) Exits interface configuration mode.

Verifying the Multilink PPP over Dialer Interface Link Configuration

To verify the Multilink PPP over dialer interface link configuration, complete the following steps.

SUMMARY STEPS

- enable
- show interfaces [*type number*] [*first*] [*last*] [**accounting**]
- show ppp multilink [**active** | **inactive** | **interface** *bundle-interface* | [**username** *name*] [**endpoint** *endpoint*]]
- exit

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	show interfaces [<i>type number</i>] [<i>first</i>] [<i>last</i>] [accounting] Example: Router# show interfaces	(Optional) Displays statistics for all interfaces configured on the router or access server.

	Command or Action	Purpose
Step 3	<pre>show ppp multilink [active inactive interface bundle-interface [username name] [endpoint endpoint]]</pre> <p>Example: Router# show ppp multilink</p>	(Optional) Displays bundle information for the multilink bundles.
Step 4	<pre>exit</pre> <p>Example: Router# exit</p>	(Optional) Exits privileged EXEC mode.

Configuration Examples for Using Multilink PPP over Dialer Interface Links

This section contains the following examples:

- [Configuring Multilink PPP over Dialer Interface Links: Example, page 8](#)
- [Associating the Dialer Interface with a BRI: Example, page 9](#)
- [Verifying the Multilink PPP over Dialer Interface Link Configuration: Example, page 9](#)

Configuring Multilink PPP over Dialer Interface Links: Example

The following is an example of configuring Multilink PPP over a dialer interface link:

```
Router> enable
Router# configure terminal
Router(config)# interface dialer 1
Router(config-if)# ip address 10.10.100.1 255.255.255.0
Router(config-if)# encapsulation ppp
Router(config-if)# dialer pool 3
Router(config-if)# service-policy output policy1
Router(config-if)# service-policy input policy1
Router(config-if)# ppp authentication chap
Router(config-if)# ppp chap hostname ISPCorp
Router(config-if)# ppp chap password 7
Router(config-if)# ppp multilink
Router(config-if)# ppp multilink fragment delay 20
Router(config-if)# ppp multilink interleave
Router(config-if)# end
```

Associating the Dialer Interface with a BRI: Example

The following is an example of associating the dialer interface with a BRI:

```
Router> enable
Router# configure terminal
Router(config)# interface bri 1
Router(config-if)# dialer pool-member 3
Router(config-if)# ppp multilink
Router(config-if)# end
```

Verifying the Multilink PPP over Dialer Interface Link Configuration: Example

You can verify the Multilink PPP over dialer interface link configuration by using one or more of the following **show** commands:

- **show interfaces**
- **show ppp multilink**

The following section provides sample output of the **show ppp multilink** command only. For sample output of the other commands, see the appropriate Cisco IOS Release 12.3 T command reference publication.

show ppp multilink Command Output Example

The following is an example of the **show ppp multilink** command output. In this example, one multilink bundle called 7206-2 is on the system. This bundle has one member link.

```
Router# show ppp multilink

Dialer2, bundle name is 7206-2
  Username is 7206-2
  Endpoint discriminator is 7206-2
  Bundle up for 00:00:10, 1/255 load
  Receive buffer limit 12000 bytes, frag timeout 1500 ms
    0/0 fragments/bytes in reassembly list
    0 lost fragments, 0 reordered
    0/0 discarded fragments/bytes, 0 lost received
    0x0 received sequence, 0x0 sent sequence
  Member links:1 (max not set, min not set)
    BR2/0:1, since 00:00:09
```

Where to Go Next

To use Multilink PPP over Frame Relay, see the [“Using Multilink PPP over Frame Relay”](#) module.

To use Multilink PPP over ATM links, see the [“Using Multilink PPP over ATM Links”](#) module.

To use Multilink PPP over serial interface links, see the [“Using Multilink PPP over Serial Interface Links”](#) module.

Additional References

The following sections provide references related to Multilink PPP over dialer interface links.

Related Documents

Related Topic	Document Title
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	Cisco IOS Quality of Service Solutions Command Reference
LLQ, WFQ, CBWFQ, PQ, CQ, FIFO and other queueing mechanisms	“Configuring Weighted Fair Queueing” module
MQC	“Applying QoS Features Using the MQC” module
Dialer profiles and DDR	“Preparing to Configure DDR” module
Multilink PPP configuration information	“Configuring Media-Independent PPP and Multilink PPP” module
Multilink PPP overview module	“Reducing Latency and Jitter for Real-Time Traffic Using Multilink PPP” module
Multilink PPP over Frame Relay	“Using Multilink PPP over Frame Relay” module
Multilink PPP over ATM links (including ATM interfaces and ATM PVCs)	“Using Multilink PPP over ATM Links” module
Multilink PPP over serial interface links	“Using Multilink PPP over Serial Interface Links” module

Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
RFC 1990	The PPP Multilink Protocol (MP)
RFC 2686	Multiclass Extension to Multilink PPP (MCML)

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Glossary

BRI—Basic Rate Interface. ISDN interface composed of two B channels and one D channel for circuit-switched communication of voice, video, and data.

CHAP—Challenge Handshake Authentication Protocol. Security feature supported on lines using Point-to-Point Protocol (PPP) encapsulation that prevents unauthorized access. CHAP does not itself prevent unauthorized access, but merely identifies the remote end. The router or access server then determines whether that user is allowed access.

DDR—dial-on-demand routing. Technique whereby a router can automatically initiate and close a circuit-switched session as transmitting stations demand. The router spoofs keepalives so that end stations treat the session as active. DDR permits routing over ISDN or telephone lines using an external ISDN terminal adaptor or modem.

ISDN—Integrated Services Digital Network. Communication protocol offered by telephone companies that permits telephone networks to carry data, voice, and other source traffic.

PRI—Primary Rate Interface. ISDN interface to primary rate access. Primary rate access consists of a single 64-kbps D channel plus 23 (T1) or 30 (E1) B channels for voice or data.

RSP—Route/Switch Processor. Processor module in the Cisco 7500 series routers that integrates the functions of the route processor (RP) and the switch processor (SP).

Feature Information for Using Multilink PPP over Dialer Interface Links

[Table 1](#) lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For details on when support for specific commands was introduced, see the command reference documents.

For information on a feature in this technology that is not documented here, see the “[Reducing Latency and Jitter Using Multilink PPP Roadmap](#)” module.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

**Note**

[Table 1](#) lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 1 **Feature Information for Using Multilink PPP over Dialer Interface Links**

Feature Name	Software Releases	Feature Configuration Information
Distributed Link Fragmentation and Interleaving Over Leased Lines	12.2(8)T	<p>The Distributed Link Fragmentation and Interleaving over Leased Lines feature extends distributed link fragmentation and interleaving functionality to leased lines.</p> <p>This feature was extensively rewritten from the perspective of using Multilink PPP for link fragmentation and interleaving over dialer interface links.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • Information About Using Multilink PPP over Dialer Interface Links, page 2 • How to Configure Multilink PPP over Dialer Interface Links, page 3
Distributed Link Fragmentation and Interleaving for Frame Relay and ATM Interfaces on Cisco 7500 Series Routers	12.2(4)T	<p>The Distributed Link Fragmentation and Interleaving (dLFI) for Frame Relay and ATM Interfaces on Cisco 7500 Series Routers feature extends link fragmentation and interleaving functionality to VIP-enabled Cisco 7500 series routers.</p> <p>This feature was extensively rewritten from the perspective of using Multilink PPP for link fragmentation and interleaving over dialer interface links.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • Information About Using Multilink PPP over Dialer Interface Links, page 2 • How to Configure Multilink PPP over Dialer Interface Links, page 3

CCDE, CCENT, CCSI, Cisco Eos, Cisco HealthPresence, Cisco IronPort, the Cisco logo, Cisco Lumin, Cisco Nexus, Cisco Nurse Connect, Cisco Pulse, Cisco StackPower, Cisco StadiumVision, Cisco TelePresence, Cisco Unified Computing System, Cisco WebEx, DCE, Flip Channels, Flip for Good, Flip Mino, Flipshare (Design), Flip Ultra, Flip Video, Flip Video (Design), Instant Broadband, and Welcome to the Human Network are trademarks; Changing the Way We Work, Live, Play, and Learn, Cisco Capital, Cisco Capital (Design), Cisco:Financed (Stylized), Cisco Store, and Flip Gift Card are service marks; and Access Registrar, Aironet, AllTouch, AsyncOS, Bringing the Meeting To You, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, CCVP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Collaboration Without Limitation, Continuum, EtherFast, EtherSwitch, Event Center, Explorer, Fast Step, Follow Me Browsing, FormShare, GainMaker, GigaDrive, HomeLink, iLYNX, Internet Quotient, IOS, iPhone, iQuick Study, IronPort, the IronPort logo, Laser Link, LightStream, Linksys, MediaTone, MeetingPlace, MeetingPlace Chime Sound, MGX, Networkers, Networking Academy, Network Registrar, PCNow, PIX, PowerKEY, PowerPanels, PowerTV, PowerTV (Design), PowerVu, Prisma, ProConnect, ROSA, ScriptShare, SenderBase, SMARTnet, Spectrum Expert, StackWise, The Fastest Way to Increase Your Internet Quotient, TransPath, WebEx, and the WebEx logo are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0908R)

Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

© 2007 Cisco Systems, Inc. All rights reserved.