

ZebOS-XP® Network Platform

Version 1.4
Extended Performance

Segment Routing Command Reference

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IP Infusion Inc. Proprietary

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Preface

This document describes the IP Infusion Inc. commands for segment routing.

Audience

This document is intended for network administrators and other engineering professionals who configure and manage segment routing.

Conventions

Table P-1 shows the conventions used in this guide.

Table P-1: Conventions

Convention	Description
Italics	Emphasized terms; titles of books
Note:	Special instructions, suggestions, or warnings
monospaced type	Code elements such as commands, functions, parameters, files, and directories

Contents

This document contains these chapters and appendices:

- · Chapter 1, Command Line Interface
- Chapter 2, Segment Routing Commands

Related Documents

The following guides are related to this document:

- Segment Routing Developer Guide
- Segment Routing Configuration Guide
- Installation Guide

Note: All ZebOS-XP technical manuals are available to licensed customers at http://www.ipinfusion.com/support/document_list.

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CHAPTER 1 Command Line Interface

This chapter introduces the ZebOS-XP Command Line Interface (CLI) and how to use its features.

Overview

You use the CLI to configure, monitor, and maintain ZebOS-XP devices. The CLI is text-based and each command is usually associated with a specific task.

You can give the commands described in this manual locally from the console of a device running ZebOS-XP or remotely from a terminal emulator such as putty or xterm. You can also use the commands in scripts to automate configuration tasks.

Starting the Command Line Interface

You must start daemons as described in this section before you can use the CLI. The general steps are listed below. For details about the ZebOS-XP daemons, see the *Installation Guide*.

- 1. Start your terminal emulator and connect to the device or go to the console of the device running ZebOS-XP.
- 2. Connect to the directory where you installed the ZebOS-XP executables.
- 3. Start the Network Services Module (NSM).

```
# ./nsm -d
```

4. Start the protocol module daemons that your organization uses, such as mstpd, ospf6d, or ripd.

```
# ./mstpd -d
```

5. Start the Integrated Management Interface (IMI) daemon.

```
# ./imi -d
```

6. Start the IMI shell.

```
# ./imish
```

Note: Your organization may use a ZebOS-XP build that does not include imish. If that is the case, you must connect to a port on which a protocol daemon is listening. For details, see the *Installation Guide*.

You can now begin using the CLI.

Command Line Interface Help

You access the CLI help by entering a full or partial command string and a question mark "?". The CLI displays the command keywords or parameters along with a short description. For example, at the CLI command prompt, type:

```
> show ?
```

The CLI displays this keyword list with short descriptions for each keyword:

```
show ?
application-priority Application Priority
```

```
Internet Protocol (IP)
arp
bfd
                                Bidirectional Forwarding Detection (BFD)
                                Border Gateway Protocol (BGP)
bgp
                                Bi-directional lsp status and configuration
bi-lsp
bridge
                                Bridge group commands
ce-vlan
                                COS Preservation for Customer Edge VLAN
class-map
                                Class map entry
                                Show CLI tree of current mode
cli
clns
                                Connectionless-Mode Network Service (CLNS)
control-adjacency
                                Control Adjacency status and configuration
control-channel
                                Control Channel status and configuration
                                CSPF Information
cspf
                                Display Customer spanning-tree
customer
                                Display CVLAN information
cvlan
                                Debugging functions (see also 'undebug')
debugging
                                IEEE 802.1X Port-Based Access Control
dot1x
                                LACP etherchannel
etherchannel
ethernet
                                Layer-2
```

If you type the? in the middle of a keyword, the CLI displays help for that keyword only.

```
> show de?
debugging Debugging functions (see also 'undebug')
```

If you type the ? in the middle of a keyword, but the incomplete keyword matches several other keywords, ZebOS-XP displays help for all matching keywords.

Command Completion

The CLI can complete the spelling of a command or a parameter. Begin typing the command or parameter and then press the tab key. For example, at the CLI command prompt type sh:

```
> sh
```

Press the tab key. The CLI displays:

```
> show
```

If the spelling of a command or parameter is ambiguous, the CLI displays the choices that match the abbreviation. Type ${\tt show}\,\,\,\dot{\tt i}$ and press the tab key. The CLI displays:

The CLI displays the interface and ip keywords. Type n to select interface and press the tab key. The CLI displays:

```
> show in
> show interface
```

Type? and the CLI displays the list of parameters for the show interface command.

```
> show interface
  IFNAME Interface name
  | Output modifiers
```

```
> Output redirection
<cr>
```

The CLI displays the only parameter associated with this command, the IFNAME parameter.

Command Abbreviations

The CLI accepts abbreviations that uniquely identify a keyword in commands. For example:

```
> sh in eth0
```

is an abbreviation for:

> show interface eth0

Command Line Errors

Any unknown spelling causes the CLI to display the error Unrecognized command in response to the ?. The CLI displays the command again as last entered.

```
> show dd?
% Unrecognized command
> show dd
```

When you press the Enter key after typing an invalid command, the CLI displays:

where the ^ points to the first character in error in the command.

If a command is incomplete, the CLI displays the following message:

```
> show
% Incomplete command.
```

Some commands are too long for the display line and can wrap mid-parameter or mid-keyword, as shown below. This does *not* cause an error and the command performs as expected:

```
area 10.10.0.18 virtual-link 10.10.0.19 authent ication-key 57393
```

Command Negation

Many commands have a no form that resets a feature to its default value or disables the feature. For example:

- The ip address command assigns an IPv4 address to an interface
- The no ip address command removes an IPv4 address from an interface

Syntax Conventions

Table 1-1 describes the conventions used to represent command syntax in this reference.

Table 1-1: Syntax conventions

Convention	Description	Example
monospaced font	Command strings entered on a command line	show nvo vxlan
lowercase	Keywords that you enter exactly as shown in the command syntax.	show nvo vxlan
UPPERCASE	See Variable Placeholders	IFNAME
()	Optional parameters, from which you must select one. Vertical bars delimit the selections. Do not enter the parentheses or vertical bars as part of the command.	(A.B.C.D <0-4294967295>)
()	Optional parameters, from which you select one or none. Vertical bars delimit the selections. Do not enter the parentheses or vertical bars as part of the command.	(A.B.C.D <0-4294967295>)
()	Optional parameter which you can specify or omit. Do not enter the parentheses or vertical bar as part of the command.	(IFNAME)
{}	Optional parameters, from which you must select one or more. Vertical bars delimit the selections. Do not enter the braces or vertical bars as part of the command.	{intra-area <1-255> inter-area <1-255> external <1-255>}
[]	Optional parameters, from which you select zero or more. Vertical bars delimit the selections. Do not enter the brackets or vertical bars as part of the command. A '?' before a parameter in square brackets limits that parameter to one occurrence in a command string.	[<1-65535> AA:NN internet local-AS no-advertise no-export]
	Repeatable parameter. The parameter that follows a period can be repeated more than once. Do not enter the period as part of the command.	set as-path prepend .<1-65535>

Variable Placeholders

Table 1-2 shows the tokens used in command syntax use to represent variables for which you supply a value.

Table 1-2: Variable placeholders

Token	Description
WORD	A contiguous text string (excluding spaces)
LINE	A text string, including spaces; no other parameters can follow this parameter
IFNAME	Interface name whose format varies depending on the platform; examples are: eth0, Ethernet0, ethernet0, xe0
A.B.C.D	IPv4 address
A.B.C.D/M	IPv4 address and mask/prefix
X:X::X:X	IPv6 address
X:X::X:X/M	IPv6 address and mask/prefix
HH:MM:SS	Time format
AA:NN	BGP community value
XX:XX:XX:XX:XX	MAC address
<1-5> <1-65535> <0-2147483647> <0-4294967295>	Numeric range

Command Description Format

Table 1-3 explains the sections used to describe each command in this reference.

Table 1-3: Command descriptions

Section	Description	
Command Name	The name of the command, followed by what the command does and when should it be used	
Command Syntax	The syntax of the command	
Parameters	Parameters and options for the command	
Default	The state before the command is executed	
Command Mode	The mode in which the command runs; see Command Modes	
Example	An example of the command being executed	

Keyboard Operations

Table 1-4 lists the operations you can perform from the keyboard.

Table 1-4: Keyboard operations

Key combination	Operation
Left arrow or Ctrl+b	Moves one character to the left. When a command extends beyond a single line, you can press left arrow or Ctrl+b repeatedly to scroll toward the beginning of the line, or you can press Ctrl+a to go directly to the beginning of the line.
Right arrow or Ctrl-f	Moves one character to the right. When a command extends beyond a single line, you can press right arrow or Ctrl+f repeatedly to scroll toward the end of the line, or you can press Ctrl+e to go directly to the end of the line.
Esc, b	Moves back one word
Esc, f	Moves forward one word
Ctrl+e	Moves to end of the line
Ctrl+a	Moves to the beginning of the line
Ctrl+u	Deletes the line
Ctrl+w	Deletes from the cursor to the previous whitespace
Alt+d	Deletes the current word
Ctrl+k	Deletes from the cursor to the end of line
Ctrl+y	Pastes text previously deleted with Ctrl+k, Alt+d, Ctrl+w, or Ctrl+u at the cursor

Table 1-4: Keyboard operations (Continued)

Key combination	Operation
Ctrl+t	Transposes the current character with the previous character
Ctrl+c	Ignores the current line and redisplays the command prompt
Ctrl+z	Ends configuration mode and returns to exec mode
Ctrl+I	Clears the screen
Up Arrow or Ctrl+p	Scroll backward through command history
Down Arrow or Ctrl+n	Scroll forward through command history

Show Command Modifiers

You can use two tokens to modify the output of a show command. Enter a question mark to display these tokens:

```
# show users ?
    | Output modifiers
    > Output redirection
```

You can type the | (vertical bar character) to use output modifiers. For example:

```
> show rsvp | ?
begin Begin with the line that matches
exclude Exclude lines that match
include Include lines that match
redirect Redirect output
```

Begin Modifier

The begin modifier displays the output beginning with the first line that contains the input string (everything typed after the begin keyword). For example:

```
# show run | begin eth1
...skipping
interface eth1
  ipv6 address fe80::204:75ff:fee6:5393/64
!
interface eth2
  ipv6 address fe80::20d:56ff:fe96:725a/64
!
line con 0
  login
!
end
```

You can specify a regular expression after the begin keyword, This example begins the output at a line with either "eth3" or "eth4":

```
# show run | begin eth[3-4]
...skipping
interface eth3
```

```
shutdown
interface eth4
 shutdown
interface svlan0.1
 no shutdown
!
route-map myroute permit 3
route-map mymap1 permit 10
1
route-map rmap1 permit 3
line con 0
 login
line vty 0 4
 login
!
end
```

Include Modifier

The include modifier includes only those lines of output that contain the input string. In the output below, all lines containing the word "input" are included:

```
# show interface eth1 | include input
input packets 80434552, bytes 2147483647, dropped 0, multicast packets 0
input errors 0, length 0, overrun 0, CRC 0, frame 0, fifo 1, missed 0
```

You can specify a regular expression after the include keyword. This examples includes all lines with "input" or "output":

```
#show int eth0 | include (in|out)put
  input packets 597058, bytes 338081476, dropped 0, multicast packets 0
  input errors 0, length 0, overrun 0, CRC 0, frame 0, fifo 0, missed 0
  output packets 613147, bytes 126055987, dropped 0
  output errors 0, aborted 0, carrier 0, fifo 0, heartbeat 0, window 0
```

Exclude Modifier

The exclude modifier excludes all lines of output that contain the input string. In the following output example, all lines containing the word "input" are excluded:

```
# show interface eth1 | exclude input
Interface eth1
  Scope: both
  Hardware is Ethernet, address is 0004.75e6.5393
  index 3 metric 1 mtu 1500 <UP, BROADCAST, RUNNING, MULTICAST>
  VRF Binding: Not bound
  Administrative Group(s): None
  DSTE Bandwidth Constraint Mode is MAM
  inet6 fe80::204:75ff:fee6:5393/64
    output packets 4438, bytes 394940, dropped 0
    output errors 0, aborted 0, carrier 0, fifo 0, heartbeat 0, window 0
  collisions 0
```

You can specify a regular expression after the exclude keyword. This example excludes lines with "output" or "input":

```
# show interface eth0 | exclude (in|out)put
Interface eth0
   Scope: both
   Hardware is Ethernet Current HW addr: 001b.2139.6c4a
   Physical:001b.2139.6c4a Logical:(not set)
   index 2 metric 1 mtu 1500 duplex-full arp ageing timeout 3000
   <UP,BROADCAST,RUNNING,MULTICAST>
   VRF Binding: Not bound
   Bandwidth 100m
   DHCP client is disabled.
   inet 10.1.2.173/24 broadcast 10.1.2.255
   VRRP Master of: VRRP is not configured on this interface.
   inet6 fe80::21b:21ff:fe39:6c4a/64
        collisions 0
```

Redirect Modifier

The redirect modifier writes the output into a file. The output is not displayed.

```
# show history | redirect /var/frame.txt
```

The output redirection token (>) does the same thing:

show history >/var/frame.txt

Command Modes

Commands are grouped into modes arranged in a hierarchy. Each mode has its own set of commands. Table 1-5 lists the command modes common to all protocols.

Table 1-5: Common command modes

Name	Description
Executive mode	Also called <i>view</i> mode, this is the first mode to appear after you start the CLI. It is a base mode from where you can perform basic commands such as show, exit, quit, help, list, and enable.
Privileged executive mode	Also called <i>enable</i> mode, in this mode you can run additional basic commands such as debug, write, and show.
Configure mode	Also called <i>configure terminal</i> mode, in this mode you can run configuration commands and go into other modes such as interface, router, route map, key chain, and address family.
Interface mode	In this mode you can configure protocol-specific settings for a particular interface. Any setting you configure in this mode overrides a setting configured in router mode.
Router mode	This mode is used to configure router-specific settings for a protocol such as RIP or OSPF.

Command Mode Tree

The diagram below shows the common command mode hierarchy.

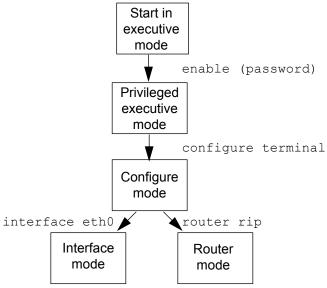


Figure 1-1: Common command modes

To change modes:

- 1. Enter privileged executive mode by entering enable in Executive mode.
- 2. Enter configure mode by entering configure terminal in Privileged Executive mode.

The example below shows starting imish and then moving from executive mode to privileged executive mode to configure mode and finally to router mode:

```
# ./imish
> enable mypassword
# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
(config) # router rip
(config-router) #
```

Note: Each protocol can have modes in addition to the common command modes. See the command reference for the respective protocol for details.

Debug Command

Whether the settings you make for a <code>debug</code> command persist between sessions depends on the mode where you make the settings:

- When you make settings for a debug command in executive mode, the configuration is valid for the current session only and is not saved in the Zebos.conf file.
- When you make settings for a debug command in configuration mode, the configuration is retained and saved in ZebOS.conf and used even after the session restarts.

CHAPTER 2 Segment Routing Commands

This chapter describes each segment routing command.

- prefix-sid value
- segment-routing mpls
- · segment-routing-static
- segment-routing-static edge-node
- · show ip ospf segment-routing announce-list
- show ip ospf segment-routing capability
- · show ip ospf segment-routing prefix-sid

prefix-sid value

Use this command to add a prefix segment identifier (SID) to the primary address of an interface. A SID corresponds to an MPLS label.

Note: You must configure a SID for each prefix on the interface manually the same as for configuring IP addresses.

Use the no form of this command to remove a SID.

Command Syntax

```
prefix-sid value <1024000-1048319>
no prefix-sid value <1024000-1048319>
```

Parameters

<1024000-1048319>

Segment identifier

Command Mode

Interface mode

Examples

#configure terminal
(config) #interface eth0
(config-if) #prefix-sid value 1035555

segment-routing mpls

Use this command to enable MPLS-based segment routing globally on the device.

Use the no form of this command to disable segment routing.

Command Syntax

```
segment-routing mpls (ospf|)
no segment-routing mpls (ospf|)
```

Parameters

ospf

Enable segment routing for OSPFv2 (default)

Command Mode

Configure mode

```
#configure terminal
(config) #segment-routing mpls
```

segment-routing-static

Use this command to create a static segment routing entry.

Use the no form of this command to remove a static segment routing entry.

Command Syntax

```
segment-routing-static A.B.C.D/M A.B.C.D INTERFACE {PREFIX-SID (nexthop-route|)}
segment-routing-static (vrf NAME|) A.B.C.D/M A.B.C.D INTERFACE {PREFIX-SID (nexthop-route|)}
no segment-routing-static A.B.C.D/M A.B.C.D INTERFACE {PREFIX-SID (nexthop-route|)}
no segment-routing-static (vrf NAME|) A.B.C.D/M A.B.C.D {INTERFACE PREFIX-SID (nexthop-route|)}
```

Parameters

NAME	VRF name
A.B.C.D/M	Prefix or FEC with mask
A.B.C.D	Next hop IPv4 address
INTERFACE	Outgoing interface name
PREFIX-SI	D Segment identifier (SID) for the prefix/FEC <1024000-1048319>
nexthop-r	oute The prefix belongs to the next hop; do <i>not</i> specify this parameter if the current device does penultimate hop popping (PHP)

Command Mode

Configure mode

```
#configure terminal
(config) #segment-routing-static 192.168.100.0/24 192.168.2.16 eth0 1035555
nexthop-route
```

segment-routing-static edge-node

Use this command to create static entries in the FTN and ILM tables in the MPLS data plane.

Note: After this command executes, the segment node is considered an edge node (first/last node of a segment routing capability cloud).

Use the no form of this command to remove static entries in the FTN and ILM tables.

Command Syntax

```
segment-routing-static edge-node
no segment-routing-static edge-node
```

Parameters

None

Command Mode

Configure mode

Example

#configure terminal
(config) #segment-routing-static edge-node

show ip ospf segment-routing announce-list

Use this command to display the self-originated link-state advertisement (LSA) prefix type-length-value (TLV) list.

Command Syntax

```
show ip ospf (<0-65535>|) segment-routing announce-list
```

Parameters

<0-65535>

Router process identifier.

Command Mode

Privileged Exec mode

show ip ospf segment-routing capability

Use this command to display the segment routing capabilities of OSPF advertisement routers.

Command Syntax

```
show ip ospf (<0-65535>|) segment-routing capability
```

Parameters

<0-65535> **Rou**

Router process identifier.

Command Mode

Privileged Exec mode

```
#show ip ospf segment-routing capability

Advertisement Router Capability :1.1.1.1

Algorithm :0

Total SID'S Supported :24320

SID Range List Count :1

SID's Range :1024000 - 1048319

Advertisement Router Capability :3.3.3.3

Algorithm :0

Total SID'S Supported :24320

SID Range List Count :1

SID's Range :1024000 - 1048319
```

show ip ospf segment-routing prefix-sid

Use this command to display the segment routing capabilities of ospf advertisement routers.

The prefix segment identifier (SID) data is displayed for non-connected routes of prefixes only because penultimate hop popping (PHP) is enabled by default.

Command Syntax

```
show ip ospf (<0-65535>|) segment-routing prefix-sid
```

Parameters

<0-65535> Router process identifier.

Command Mode

Privileged Exec mode

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