# Table of Contents

- debug ospf route ................................................. 40
- default-information originate .................................. 41
- default-metric ................................................... 42
- distance ......................................................... 43
- distribute-list ................................................... 44
- enable db-summary-opt .......................................... 45
- enable ext-ospf-multi-inst ..................................... 46
- host area ......................................................... 47
- ip ospf authentication ............................................ 48
- ip ospf authentication-key ........................................ 49
- ip ospf bfd ....................................................... 50
- ip ospf cost ....................................................... 51
- ip ospf database-filter ........................................... 52
- ip ospf dead-interval ............................................. 53
- ip ospf disable ................................................... 54
- ip ospf hello-interval ............................................. 55
- ip ospf message-digest-key ...................................... 56
- ip ospf mtu ......................................................... 57
- ip ospf mtu-ignore ................................................ 58
- ip ospf network .................................................... 59
- ip ospf priority .................................................... 60
- ip ospf resync-timeout ............................................ 61
- ip ospf retransmit-interval ..................................... 62
- ip ospf transmit-delay ............................................ 63
- max-concurrent-dd ................................................ 64
- maximum-area ..................................................... 65
- neighbor ......................................................... 66
- network .......................................................... 67
- ospf abr-type ...................................................... 68
- ospf restart grace-period ....................................... 69
- ospf restart helper ............................................... 70
- ospf router-id ..................................................... 71
- overflow database ................................................ 72
- overflow database external ..................................... 73
- passive-interface ................................................ 74
- redistribute ......................................................... 75
- restart ospf graceful ............................................. 76
- router ospf ......................................................... 77
- show debugging ospf .............................................. 78
- show ip ospf ....................................................... 79
- show ip ospf border-routers ..................................... 80
- show ip ospf database brief ....................................... 81
- show ip ospf database detail ..................................... 82
- show ip ospf igrp-shortcut-lsp ................................ 85
- show ip ospf igrp-shortcut-route ................................ 86
- show ip ospf interface ............................................. 87
- show ip ospf multi-area-adjacencies ............................. 88
<table>
<thead>
<tr>
<th>Command</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>show ip ospf neighbor</td>
<td>89</td>
</tr>
<tr>
<td>show ip ospf route</td>
<td>91</td>
</tr>
<tr>
<td>show ip ospf virtual-links</td>
<td>92</td>
</tr>
<tr>
<td>show ip protocols</td>
<td>93</td>
</tr>
<tr>
<td>summary-address</td>
<td>94</td>
</tr>
<tr>
<td>timers lsad arrival</td>
<td>95</td>
</tr>
<tr>
<td>timers throttle lsad</td>
<td>96</td>
</tr>
<tr>
<td>ipv6 ospf transmit-delay</td>
<td>127</td>
</tr>
<tr>
<td>ipv6 ospf retransmit-interval</td>
<td>128</td>
</tr>
<tr>
<td>ipv6 ospf restart helper</td>
<td>129</td>
</tr>
<tr>
<td>ipv6 ospf restart grace-period</td>
<td>130</td>
</tr>
<tr>
<td>ipv6 ospf priority</td>
<td>131</td>
</tr>
<tr>
<td>ipv6 ospf network</td>
<td>132</td>
</tr>
<tr>
<td>ipv6 ospf mtu-ignore</td>
<td>133</td>
</tr>
<tr>
<td>ipv6 ospf neighbor</td>
<td>134</td>
</tr>
<tr>
<td>ipv6 ospf link-lsa-suppression</td>
<td>135</td>
</tr>
<tr>
<td>ipv6 ospf display route single-line</td>
<td>136</td>
</tr>
<tr>
<td>ipv6 ospf hello-interval</td>
<td>137</td>
</tr>
<tr>
<td>ipv6 ospf cost</td>
<td>138</td>
</tr>
<tr>
<td>ipv6 ospf dead-interval</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf display route single-line</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf hello-interval</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf link-lsa-suppression</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf mtu-ignore</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf neighbor</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf network</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf priority</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf restart grace-period</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf restart helper</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf retransmit-interval</td>
<td></td>
</tr>
<tr>
<td>ipv6 ospf transmit-delay</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------</td>
</tr>
</tbody>
</table>
ipv6 router ospf ................................................................. 139
max-concurrent-dd ............................................................ 140
passive-interface ............................................................... 141
redistribute ................................................................. 142
restart ipv6 ospf graceful .................................................. 144
router-id ................................................................. 145
router ipv6 ospf .............................................................. 146
show debugging ipv6 ospf .................................................. 147
show ipv6 ospf .............................................................. 148
show ipv6 ospf database .................................................... 149
show ipv6 ospf interface .................................................... 151
show ipv6 ospf neighbor .................................................... 152
show ipv6 ospf route ......................................................... 153
show ipv6 ospf topology ..................................................... 154
show ipv6 ospf virtual-links ............................................... 155
summary-address ............................................................ 156
Index ............................................................................ 1
CHAPTER 1 ZebOS Command Line Interface Environment

Network administrators and application developers who configure the ZebOS® Network Platform use this command reference which includes the following information:

- An overview of the ZebOS Command Line Interface
- A complete reference of the commands used for Open Shortest Path First (OSPF) configurations

You can give the commands described in this manual locally from the console of a device running ZebOS or remotely from a terminal emulator such as putty or xterm.

Command Line Interface Overview

The ZebOS® Command Line Interface (CLI) is a text-based command interface. Each command is usually associated with a specific task. The commands can be used 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 daemons, see the ZebOS Network Platform Installation Guide.

1. Start your terminal emulator and connect to the device or go to the console of the device running ZebOS.
2. Connect to the directory where you installed the ZebOS executables.
3. Start the Network Services Manager (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 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 ZebOS Network Platform 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:

```
ZebOS> show ?
```

The CLI displays this keyword list with short descriptions for each keyword:
ZebOS Command Line Interface Environment

ZebOS> show ?
   access-list List IP access lists
   bfd Bidirectional Forwarding Detection (BFD)
   bgp Border Gateway Protocol (BGP)
   cli Show CLI tree of current mode
   clns Connectionless-Mode Network Service (CLNS)
   debugging Debugging functions (see also 'undebug')
   faults Show recorded faults
   history Display the session command history
   interface Interface status and configuration
   ip Internet Protocol (IP)
   ipv6 Internet Protocol version 6 (IPv6)
   isis Intermediate System-Intermediate System
   list Show command lists
   mrib MRIB
   nsm NSM
   privilege Show current privilege level
   proc-names Show process names
   process Process
   route-map route-map information
   router-id Router ID
   running-config Current Operating configuration

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

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

If the ? is typed in the middle of a keyword, but the incomplete keyword matches several other keywords, ZebOS displays help for all matching keywords.

ZebOS> show i? (CLI does not display the question mark).
   interface Interface status and configuration
   ip IP information
   isis ISIS information

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:

ZebOS> sh

Press the tab key. The CLI displays:

ZebOS> show

If the command or parameter spelling is ambiguous, the ZebOS CLI displays the choices that match the abbreviation. Type show i and press the tab key. The CLI displays:

ZebOS> show i
   interface ip ipv6 isis

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

ZebOS> show in
ZebOS> show interface

Type ? and the CLI displays the list of parameters for the show interface command.
ZebOS Command Line Interface Environment

ZebOS> 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 the show interface command.

Command Line Errors

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

   ZebOS> show dd?
   % Unrecognized command
   ZebOS> show dd

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

   ZebOS(config)# router ospf here
   ^
   % Invalid input detected at '^' marker.

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

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

   ZebOS> show
   % Incomplete command.

Some commands are too long for the display line and can wrap in mid-parameter or mid-keyword, as shown below:

   area 10.10.0.18 virtual-link 10.10.0.19 authentication-key 57393

Command Negation

Many commands can be negated using the no keyword. Depending on the command or the parameters, some command negation can disable one feature or a feature for a specific ID, interface, address or other identifier. However, some negation is for the base command only and the negated form does not take a parameter.
## Typographic Conventions

The following table describes the typographic conventions used in this reference.

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monospaced font</td>
<td>Command strings entered on a command line</td>
<td>show ip ospf</td>
</tr>
<tr>
<td>lowercase</td>
<td>Keywords that you enter exactly as shown in the command syntax.</td>
<td>show ip ospf</td>
</tr>
<tr>
<td>UPPERCASE</td>
<td>See Variable Placeholders</td>
<td>IFNAME</td>
</tr>
<tr>
<td>()</td>
<td>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.</td>
<td>(A.B.C.D</td>
</tr>
<tr>
<td>()</td>
<td>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.</td>
<td>(A.B.C.D</td>
</tr>
<tr>
<td>()</td>
<td>Optional parameter which you can specify or omit. Do not enter the parentheses or vertical bar as part of the command.</td>
<td>(IFNAME</td>
</tr>
<tr>
<td>{}</td>
<td>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.</td>
<td>{intra-area &lt;1-255&gt;</td>
</tr>
<tr>
<td>[]</td>
<td>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.</td>
<td>[&lt;1-65535&gt;</td>
</tr>
<tr>
<td>.</td>
<td>Repeatable parameter. The parameter that follows a period can be repeated more than once. Do not enter the period as part of the command.</td>
<td>set as-path prepend .&lt;1-65535&gt;</td>
</tr>
</tbody>
</table>
Variable Placeholders

The command syntax use the following tokens to represent command line variables for which you supply a value:

<table>
<thead>
<tr>
<th>Token</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORD</td>
<td>A contiguous text string (excluding spaces), such as IFNAME for the name of an interface</td>
</tr>
<tr>
<td>LINE</td>
<td>A text string, including spaces; no other parameters can follow this parameter</td>
</tr>
<tr>
<td>A.B.C.D</td>
<td>IPv4 address</td>
</tr>
<tr>
<td>A.B.C.D/M</td>
<td>IPv4 address and mask/prefix</td>
</tr>
<tr>
<td>X:X::X:X</td>
<td>IPv6 address</td>
</tr>
<tr>
<td>X:X::X:X/M</td>
<td>IPv6 address and mask/prefix</td>
</tr>
<tr>
<td>HH:MM:SS</td>
<td>Time format</td>
</tr>
<tr>
<td>AA:NN</td>
<td>BGP community value</td>
</tr>
<tr>
<td>XX:XX:XX:XX:XX</td>
<td>MAC address</td>
</tr>
<tr>
<td>&lt;1-5&gt;</td>
<td>Numeric range</td>
</tr>
<tr>
<td>&lt;1-65535&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;0-2147483647&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;0-4294967295&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Command Description Format

The following table explains the sections used to describe each command in this reference.

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Name</td>
<td>The command, what the command does, and when should it be used</td>
</tr>
<tr>
<td>Command Syntax</td>
<td>The syntax of the command</td>
</tr>
<tr>
<td>Parameters</td>
<td>Parameters and options for the command</td>
</tr>
<tr>
<td>Default</td>
<td>The status before the command is executed</td>
</tr>
<tr>
<td>Command Mode</td>
<td>The name of the mode in which this command is used. Examples include Exec or Configure modes.</td>
</tr>
<tr>
<td>Example</td>
<td>An example of the command being executed</td>
</tr>
</tbody>
</table>
Keyboard Operations

You can perform these operations from the keyboard:

<table>
<thead>
<tr>
<th>Key combination</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left arrow or Ctrl+b</td>
<td>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.</td>
</tr>
<tr>
<td>Right arrow or Ctrl-f</td>
<td>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.</td>
</tr>
<tr>
<td>Esc, b</td>
<td>Moves back one word</td>
</tr>
<tr>
<td>Esc, f</td>
<td>Moves forward one word</td>
</tr>
<tr>
<td>Ctrl+e</td>
<td>Moves to end of the line</td>
</tr>
<tr>
<td>Ctrl+a</td>
<td>Moves to the beginning of the line</td>
</tr>
<tr>
<td>Ctrl+u</td>
<td>Deletes the line</td>
</tr>
<tr>
<td>Ctrl+w</td>
<td>Deletes from the cursor to the previous whitespace</td>
</tr>
<tr>
<td>Alt+d</td>
<td>Deletes from the cursor to the end of line</td>
</tr>
<tr>
<td>Ctrl+k</td>
<td>Pastes text previously deleted with Ctrl+k, Alt+d, Ctrl+w, or Ctrl+u at the cursor</td>
</tr>
<tr>
<td>Ctrl+y</td>
<td>Transposes the current character with the previous character</td>
</tr>
<tr>
<td>Ctrl+t</td>
<td>Ignores the current line and redispays the command prompt</td>
</tr>
<tr>
<td>Ctrl+c</td>
<td>Ends configuration mode and returns to exec mode</td>
</tr>
<tr>
<td>Ctrl+z</td>
<td>Clears the screen</td>
</tr>
<tr>
<td>Ctrl+l</td>
<td>Scrolls backward through command history</td>
</tr>
<tr>
<td>Up Arrow or Ctrl+p</td>
<td>Scrolls forward through command history</td>
</tr>
</tbody>
</table>

Show Command Tokens

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

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

Output Modifiers

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

```
ZebOS>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:

```
ZebOS# 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":

```
ZebOS# 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
!
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:

```
ZebOS# 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":

```
ZebOS#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:

```
ZebOS# 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":

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

The output redirection token (>) does the same thing:
ZebOS# show history >/var/frame.txt

---

**Common Command Modes**

Commands are grouped into modes arranged in a hierarchy. Each mode has its own set of commands. The command modes common to all protocols are listed below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exec Mode</td>
<td>Also called the View mode, this the first mode to appear after logging in to the CLI. It is a base mode from where you can perform basic commands, such as show, exit, quit, help, list, and enable.</td>
</tr>
<tr>
<td>Privileged Exec Mode</td>
<td>Also called the Enable mode, this mode allows you to run additional basic commands, such as debug, write, and show.</td>
</tr>
<tr>
<td>Configure Mode</td>
<td>Also called Configure Terminal mode, this mode allows you to run configuration commands and to serve as a gateway into the Interface, Router, Line, Route Map, Key Chain, and Address Family modes.</td>
</tr>
<tr>
<td>Interface Mode</td>
<td>This mode is used to configure protocol-specific settings for a particular interface. Any attribute configured in this mode overrides an attribute configured in the Router mode.</td>
</tr>
<tr>
<td>Line Mode</td>
<td>This mode is used to make the access-class commands available.</td>
</tr>
</tbody>
</table>
Common Command Mode Tree

The diagram displays the common command mode tree.

To change modes:

1. Enter Privileged Executive Mode by typing `enable` from the Executive mode.
2. Enter Configure mode by typing `configuration terminal` from the Privileged Executive mode.

See the ZebOS Network Platform NSM Command Line Interface Reference Guide for information about command modes.

Note: Each protocol can have modes in addition to the common command modes. See the command reference for the respective protocol for details.
CHAPTER 2  OSPFv2 Commands

This chapter provides an alphabetized reference for each of the OSPFv2 commands. It includes the following commands:

- area authentication
- area default-cost
- area filter-list
- area multi-area-adjacency
- area nssa
- area range
- area shortcut
- area stub
- area virtual-link
- auto-cost reference bandwidth
- bfd all-interfaces
- capability cspf
- capability opaque
- capability restart
- clear ip ospf
- compatible rfc1583
- debug ospf
- debug ospf database-timer rate-limit
- debug ospf events
- debug ospf ifsm
- debug ospf lsa
- debug ospf nftsm
- debug ospf nsm
- debug ospf packet
- debug ospf route
- default-information originate
- default-metric
- distance
- distribute-list
- enable db-summary-opt
- enable ext-ospf-multi-inst
- host area
- ip ospf authentication
- ip ospf authentication-key
- ip ospf bfd
- ip ospf cost
- ip ospf database-filter
- ip ospf dead-interval
- ip ospf disable
- ip ospf hello-interval
- ip ospf message-digest-key
- ip ospf mtu
- ip ospf mtu-ignore
- ip ospf network
- ip ospf priority
- ip ospf resync-timeout
- ip ospf retransmit-interval
- ip ospf transmit-delay
- max-concurrent-dd
- maximum-area
- neighbor
- network
- ospf abr-type
- ospf restart grace-period
- ospf restart helper
- ospf router-id
- overflow database
- overflow database external
- passive-interface
- redistribute
- restart ospf graceful
- router ospf
- show debugging ospf
- show ip ospf
- show ip ospf border-routers
- show ip ospf database brief
- show ip ospf database detail
- show ip ospf igp-shortcut-lsp
- show ip ospf igp-shortcut-route
- show ip ospf interface
- show ip ospf multi-area-adjacencies
- show ip ospf neighbor
• show ip ospf route
• show ip ospf virtual-links
• show ip protocols
• summary-address
• timers lsa arrival
• timers throttle lsa
area authentication

Use this command to enable authentication for an OSPF area. Specifying the area authentication sets the authentication to Type 1 authentication or simple text password authentication (details in RFC 2328). Setting up a Type 1 authentication configures a 64-bit field for that particular network. All packets sent on this network must have this configured value in their OSPF header. This allows only routers that have the same passwords to join the routing domain. Give all routers that are to communicate with each other through OSPF the same authentication password.

Use the `ip ospf authentication-key` command to specify a simple text password (see `ip ospf authentication-key`).

Use the `ip ospf message-digest-key` command to specify MD5 password (see `ip ospf message-digest-key`).

Use the `no` parameter to remove the authentication specification for an area.

Command Syntax

```
area (A.B.C.D|<0-4294967295>) authentication
area (A.B.C.D|<0-4294967295>) authentication message-digest
no area (A.B.C.D|<0-4294967295>) authentication
```

Parameters

- `A.B.C.D` OSPF Area ID in IPv4 address format.
- `<0-4294967295>` OSPF Area ID as 4-octet unsigned integer value.
- `message-digest` Enables MD5 authentication in the specified area ID.

Default

Null authentication

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 authentication message-digest

ZebOS(config)#router ospf 100
ZebOS(config-router)#no area 1 authentication
```
area default-cost

Use this command to specify a cost for the default summary route sent into a stub or NSSA area. This command provides the metric for the summary default route, generated by the area border router, into the NSSA or stub area. Use this option only on an area border router that is attached to the NSSA or stub area. Refer to the RFC 3101 for information on NSSA.

Use the `no` form of this command to remove the assigned default-route cost.

**Command Syntax**

```
area (A.B.C.D|<0-4294967295>) default-cost <0-16777215>
no area (A.B.C.D|<0-4294967295>) default-cost
```

**Parameters**

- `A.B.C.D`  OSPF Area ID in IPv4 address format.
- `<0-4294967295>` OSPF Area ID as a decimal value.
- `default-cost` Indicates the cost for the default summary route used for a stub or NSSA area.
- `<0-16777215>` Stub's advertised default summary cost. The default is 1.

**Command Mode**

Router mode

**Examples**

This example sets the default-cost to 10 for area 1.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 default-cost 10

ZebOS(config-router)#area 1 default-cost
```
area filter-list

Use this command to configure a filter to advertise summary routes on an Area Border Router (ABR).

This command suppresses incoming and outgoing summary routes between this area and other areas. You use this command in conjunction with the prefix-list and access-list commands.

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

Command Syntax

area (A.B.C.D|<0-4294967295>) filter-list prefix WORD (in|out)
area (A.B.C.D|<0-4294967295>) filter-list access WORD (in|out)
no area (A.B.C.D|<0-4294967295>) filter-list prefix WORD (in|out)
no area (A.B.C.D|<0-4294967295>) filter-list access WORD (in|out)

Parameters

A.B.C.D  OSPF area ID as an IPv4 address.
<0-4294967295>  OSPF area ID as a decimal value.
prefix  Use prefix list to filter summary.
WORD  Name of the prefix list.
access  Use access list to filter summary.
WORD  Name of the access list.
in  Filter routes from other areas into this area.
out  Filter routes from this area into other areas.

Command Mode

Router mode

Examples

ZebOS#configure terminal
ZebOS(config)#access-list 1 deny 172.22.0.0/8
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 filter-list access 1 in
area multi-area-adjacency

Use this command to enable multi-area adjacency on the specified interface. Multi-area adjacency establishes adjacency between the Area Border Routers (ABRs). The specified interface of the ABR is associated with multiple areas. Multiple OSPF interfaces must be created for multiple areas.

Use the no parameter to disable multi-area adjacency.

Command Syntax

area (A.B.C.D|<0-4294967295>) multi-area-adjacency IFNAME neighbor A.B.C.D
no area (A.B.C.D|<0-4294967295>) multi-area-adjacency IFNAME (neighbor A.B.C.D|)

Parameters

<table>
<thead>
<tr>
<th>IFNAME</th>
<th>An alphanumeric string that is the interface name.</th>
</tr>
</thead>
<tbody>
<tr>
<td>neighbor</td>
<td>Set the neighbor.</td>
</tr>
<tr>
<td>A.B.C.D</td>
<td>Neighbor’s IP address.</td>
</tr>
</tbody>
</table>

Command Mode

Router mode

Examples

ZebOS#configure terminal
ZebOS(config)#router ospf 1
ZebOS(config)#router-id 10.10.10.10
ZebOS(config-router)#area 1 multi-area-adjacency eth1 neighbor 20.20.20.10
ZebOS(config-router)#no area 1 multi-area-adjacency eth1
area nssa

Use this command to set an area as a Not-So-Stubby-Area (NSSA). There are no external routes in an OSPF stub area, so you cannot redistribute from another protocol into a stub area. An NSSA allows external routes to be flooded within the area. These routes are then leaked into other areas. However, the external routes from other areas still do not enter the NSSA. You can configure an area to be a stub area or an NSSA, but not both.

This command simplifies administration when connecting a central site using OSPF to a remote site that is using a different routing protocol. You can extend OSPF to cover the remote connection by defining the area between the central router and the remote router as a NSSA.

Use the no form of this command to remove this designation.

Command Syntax

```
area (A.B.C.D|<0-4294967295>) nssa
area (A.B.C.D|<0-4294967295>) nssa (translate-candidate|translate-always)
area (A.B.C.D|<0-4294967295>) nssa {translator-role (candidate|always)| stability-interval <0-2147483647>|no-redistribution|default-information-originate (metric <0-16777214>|metric-type <1-2>|metric <0-16777214> metric-type <1-2>|metric-type <1-2> metric <0-16777214>||no-summary)
no area (A.B.C.D|<0-4294967295>) nssa
no area (A.B.C.D|<0-4294967295>) nssa {translator-role|no-redistribution|default-information-originate|no-summary}
```

Parameters

- **A.B.C.D**: OSPF Area ID in IPv4 address format.
- **<0-4294967295>**: OSPF Area ID as a decimal value.
- **translator-role**: NSSA-ABR translator role
  - **candidate**: Translate NSSA-LSA to Type-5 LSA if router is elected.
  - **always**: Always translate NSSA-LSA to Type-5 LSA.
- **stability-interval**: Stability timer for a NSSA area. If an elected translator determines its services are no longer required, it continues to perform its duties for this time interval. This minimizes excess flushing of translated Type-7 LSAs and provides a more stable translator transition.
  - **<0-2147483647>**: Stability interval in seconds.
- **no-redistribution**: Do not redistribute into the NSSA.
- **default-information-originate**: Originate Type-7 default LSA into the NSSA.
- **metric**: Specify metric for default routes.
  - **<0-16777214>**: Specify metric value.
metric-type Specify metric type (see RFC 3101).

<1-2> Specify metric type:
- 1: Type 1 external route
- 2: Type 2 external route

no-summary Do not inject inter-area routes into the NSSA.

translate-candidate
   Translate NSSA-LSA to Type-5 LSA if router is elected.

translate-always
   Always translate NSSA-LSA to Type-5 LSA.

Command Mode
Router mode

Examples
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 3 nssa translator-role candidate no-redistribution
default-information-originate metric 34 metric-type 2
area range

Use this command to summarize OSPF routes at an area boundary. A single summary route is then advertised to other areas by the Area Border Routers (ABRs). Routing information is condensed at area boundaries and outside the area. If the network numbers in an area are assigned in a way such that they are contiguous, the ABRs can be configured to advertise a summary route that covers all the individual networks within the area that fall into the specified range.

Use the no parameter with this command to disable this function.

Command Syntax

area (A.B.C.D|<0-4294967295>) range A.B.C.D/M
area (A.B.C.D|<0-4294967295>) range A.B.C.D/M advertise
area (A.B.C.D|<0-4294967295>) range A.B.C.D/M not-advertise
no area (A.B.C.D|<0-4294967295>) range A.B.C.D/M
no area (A.B.C.D|<0-4294967295>) range A.B.C.D/M (advertise|not-advertise)

Parameters

A.B.C.D OSPF Area ID in IPv4 address format.
<0-4294967295> OSPF Area ID as a decimal value.
A.B.C.D/M The area range prefix and length.
advertise Advertises this range.
not-advertise Does not advertise this range.

Default

Disabled

Command Mode

Router mode

Examples

ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 range 192.16.0.0/24

ZebOS(config)#router ospf 100
ZebOS(config-router)#no area 1 range 192.16.0.0/24
**area shortcut**

Use this command to configure the short-cutting mode of an area. An area shortcut enables traffic to go through the non-backbone area with a lower metric whether or not an ABR router is attached to the backbone area.

Use the `no` form of this command to disable this function.

**Command Syntax**

```
area (A.B.C.D|<0-4294967295>) shortcut (default|enable|disable)
no area (A.B.C.D|<0-4294967295>) shortcut
no area (A.B.C.D|<0-4294967295>) shortcut (enable|disable)
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.B.C.D</td>
<td>OSPF Area ID in IPv4 address format.</td>
</tr>
<tr>
<td>&lt;0-4294967295&gt;</td>
<td>OSPF Area ID as a decimal value.</td>
</tr>
<tr>
<td>default</td>
<td>Sets default short-cutting behavior.</td>
</tr>
<tr>
<td>enable</td>
<td>Forces short-cutting through the area.</td>
</tr>
<tr>
<td>disable</td>
<td>Disables short-cutting through the area.</td>
</tr>
</tbody>
</table>

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 shortcut default

ZebOS(config)#router ospf 100
ZebOS(config-router)#area 52 shortcut disable

ZebOS(config)#router ospf 100
ZebOS(config-router)#no area 42 shortcut enable
```
**area stub**

Use this command to define an area as a stub area. There are two stub area router configuration commands: the **stub** and **default-cost** commands. In all routers attached to the stub area, configure the area by using the **stub** option of the area command. For an area border router (ABR) attached to the stub area, use the **area default-cost** command.

Use the **no-summary** parameter with this command to define a totally stubby area. Define an area as a totally stubby area when routers in the area do not need to learn about summary LSAs from other areas.

Use the **no** form of this command to disable this function.

**Command Syntax**

```plaintext
area (A.B.C.D|<0-4294967295>) stub
area (A.B.C.D|<0-4294967295>) stub no-summary
no area (A.B.C.D|<0-4294967295>) stub
no area (A.B.C.D|<0-4294967295>) stub no-summary
```

**Parameters**

- **A.B.C.D**  
  OSPF Area ID in IPv4 address format.
- **<0-4294967295>**  
  OSPF Area ID as a decimal value.
- **no-summary**  
  Stops an ABR from sending summary link advertisements into the stub area.

**Default**

No stub area is defined.

**Command Mode**

Router mode

**Examples**

```plaintext
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 stub no-summary
```
area virtual-link

Use this command to configure a link between two backbone areas that are physically separated through other non-backbone area.

In OSPF, all non-backbone areas must be connected to a backbone area. If the connection to the backbone is lost, the virtual link repairs the connection. Configure virtual links between any two backbone routers that have an interface to a common non-backbone area. The protocol treats these routers joined by a virtual link as if they were connected by an unnumbered point-to-point network.

Configure the hello-interval to be the same for all routers attached to a common network. A short hello-interval results in the router detecting topological changes faster but also an increase in the routing traffic. The retransmit-interval is the expected round-trip delay between any two routers in a network. Set the value to be greater than the expected round-trip delay to avoid needless retransmissions.

The transmit-delay is the time taken to transmit a link state update packet on the interface. Before transmission, the link state advertisements in the update packet are incremented by this amount. Set the transmit-delay to be greater than zero. Also, take into account the transmission and propagation delays for the interface. Include the transit area ID and the corresponding virtual link neighbor’s router ID in each virtual link neighbor to properly configure a virtual link.

Use the no parameter with this command to remove a virtual link.

**Command Syntax**

```
area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D
area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D {authentication (message-digest|null)|authentication-key LINE|message-digest-key <1-255> md5 LINE|dead-interval <1-65535>|hello-interval <1-65535>|retransmit-interval <1-3600>|transmit-delay <1-3600>}
area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D {fall-over bfd}
no area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D
no area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D {dead-interval|hello-interval|retransmit-interval|transmit-delay|authentication|authentication-key|message-digest-key <1-255>}
no area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D {fall-over bfd}
```

**Parameters**

- **A.B.C.D** OSPF Area ID in IPv4 address format.
- **<0-4294967295>** OSPF Area ID as a decimal value.
- **A.B.C.D** Specify IP address of the virtual link neighbor.
- **authentication** Enable authentication on this virtual link
  - **message-digest** Cryptographic authentication.
  - **null** Null authentication.
- **authentication-key** Set authentication key.
  - **LINE** Authentication key ID of 8 characters.
- **message-digest-key**
**Set message digest key.**

\(<1-255>\)

Set message digest key.

**md5**

Specify the MD5 key.

**LINE**

MD5 key.

**dead-interval**

The interval during which no packets are received and after which the router acknowledges a neighboring router as off-line.

\(<1-65535>\)

The interval in seconds. The default is 40 seconds.

**hello-interval**

The interval the router waits before it sends a hello packet.

\(<1-65535>\)

The interval in seconds. The default is 10 seconds.

**retransmit-interval**

The interval the router waits before it retransmits a packet.

\(<1-3600>\)

The interval in seconds. The default is 5 seconds.

**transmit-delay**

The interval the router waits before it transmits a packet.

\(<1-3600>\)

The interval in seconds. The default is 1 second

**fall-over**

Specify fall-over detection.

**bfd**

Bidirectional Forwarding Detection (BFD)

### Command Mode

**Router mode**

### Examples

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#area 1 virtual-link 10.10.11.50 hello 5 dead 10
```
**auto-cost reference bandwidth**

Use this command to control how OSPF calculates the default metric for the interface.

By default, OSPF calculates the OSPF metric for an interface by dividing the reference bandwidth by the interface bandwidth. The default value for the reference bandwidth is 100Mbps. The auto-cost command is used to differentiate high bandwidth links. For multiple links with high bandwidth, specify a larger reference bandwidth value to differentiate cost on those links.

Use the `no` form of this command to assign cost based only on the interface bandwidth.

**Command Syntax**

```
auto-cost reference-bandwidth <1-4294967>
no auto-cost reference-bandwidth
```

**Parameters**

- `<1-4294967>`: The reference bandwidth in Mbps per second. The default is 100 Mbps.

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#auto-cost reference-bandwidth 50

ZebOS(config)#router ospf 100
ZebOS(config-router)#no auto-cost reference-bandwidth
```
**bfd all/interfaces**

Use this command to enable Bidirectional Forwarding Detection (BFD) on all interfaces. Use the `no` form of this command to disable BFD.

**Command Syntax**

```
bfd all-interfaces
no bfd all-interfaces
```

**Parameters**

None

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#bfd all-interfaces

ZebOS(config)#router ospf 100
ZebOS(config-router)#no bfd all-interfaces
```
**capability cspf**

Use this command to enable the CSPF (Constrained Shortest Path First) feature for an OSPFv2 or OSPFv3 instance. Use the `no` parameter with this command to disable CSPF functionality for the OSPFv2 or OSPFv3 instance.

**Command Syntax**

```
capability cspf
no capability cspf
```

**Parameters**

None

**Default**

Enabled

**Command Mode**

Router mode

**Examples**

```
ZebOS(config)#router ospf 100
ZebOS(config-router)#capability cspf

ZebOS(config)#router ospf 100
ZebOS(config-router)#no capability cspf
```
capability opaque

Use this command to enable opaque-LSAs which are Type 9, 10 and 11 LSAs that deliver information used by external applications.

Use the no form of this command to disable the feature.

Command Syntax

```
capability opaque
no capability opaque
```

Parameters

None

Default

Enabled

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#capability opaque

ZebOS(config)#router ospf 100
ZebOS(config-router)#no capability opaque
```
**capability restart**

Use this command to enable OSPF graceful restart or restart signaling. If a router is not restart-enabled, it cannot enter graceful restart mode and act as a helper.

Use the no parameter with this command to disable the features.

**Command Syntax**

```
capability restart (graceful|signaling)
no capability restart
```

**Parameters**

- **graceful**: Specify enabling OSPF graceful restart feature.
- **signaling**: Specify enabling OSPF signaling restart feature.

**Default**

Enabled

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#capability restart graceful

ZebOS(config)#router ospf 100
ZebOS(config-router)#no capability restart
```
clear ip ospf

Use this command to clear and restart all OSPF routing processes or a given OSPF routing process.

Command Syntax

```
clear ip ospf (<0-65535>|) process
```

Parameter

```
<0-65535> Specify the process ID.
```

Command Mode

Privileged Exec Mode

Examples

```
ZebOS#clear ip ospf process
ZebOS#clear ip ospf 555 process
```
**compatible rfc1583**

Use this command to restore the method used to calculate summary route costs per RFC.

RFC 1583 specified a method for calculating the metrics for summary routes based on the minimum metric of the component paths available. RFC 2328 specifies a method for calculating metrics based on maximum cost. With this change, it is possible that all of the ABRs in an area might not be upgraded to the new code at the same time. This command addresses this issue and allows the selective disabling of RFC 2328 compatibility.

Use the `no` parameter with this command to disable RFC 1583 compatibility.

**Command Syntax**

```
compatible rfc1583
no compatible rfc1583
```

**Parameters**

None

**Default**

By default, OSPF is RFC 2328 compatible.

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#compatible rfc1583

ZebOS(config)#router ospf 100
ZebOS(config-router)#no compatible rfc1583
```
**debug ospf**

Use this command to specify debugging options for OSPF.

Use the `no` parameter with this command to disable this function.

**Command Syntax**

```plaintext
debug ospf (all|bfd|database-timer|events|ifsm|lsa|n fsm|nsm | packet|route|)

no debug ospf (all|bfd|database-timer|events|ifsm|lsa|nsm|nsm| packet|route|)
undebug ospf (all|bfd|database-timer|events|ifsm|lsa|nsm|nsm| packet|route|)
no debug all ospf
undebug all ospf
no debug all
undebug all
```

**Parameters**

- `all` Enable or disable debugging for `ifsm`, `nsfm`, `lsa`, `nsm`, `events`, and `route`.
- `bfd` Debug Bidirectional Forwarding Detection (BFD)
- `database-timer` Debug OSPF rate-limiting values for LSA throttling (see `debug ospf database-timer rate-limit`)
- `events` Debug OSPF events information (see `debug ospf events`)
- `ifsm` Debug OSPF Interface State Machine (see `debug ospf ifsm`)
- `lsa` Debug OSPF Link State Advertisement (see `debug ospf lsa`)
- `nsm` Debug OSPF NSM information (see `debug ospf nsm`)
- `packet` Debug OSPF packets (see `debug ospf packet`)
- `route` Debug OSPF route information (see `debug ospf route`)

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```plaintext
ZebOS#debug ospf all
ZebOS#debug ospf bfd
ZebOS#no debug ospf bfd
```
**debug ospf database-timer rate-limit**

Use this command to log when link-state advertisement (LSA) rate-limiting timers will expire. These messages are logged only when *debug ospf lsa generate* or *debug ospf lsa refresh* is enabled.

Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ospf database-timer rate-limit

no debug ospf database-timer rate-limit
undebug ospf database-timer rate-limit
```

**Parameters**

None

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#debug ospf database-timer rate-limit

ZebOS#undebug ospf database-timer rate-limit
```
**debug ospf events**

Use this command to specify debugging options for OSPF event troubleshooting. Use this command without parameters to turn on all the options.

Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ospf events ({abr|asbr|lsa|nssa|os|router|vlink}|

no debug ospf events ({abr|asbr|lsa|nssa|os|router|vlink}|
undebug ospf events ({abr|asbr|lsa|nssa|os|router|vlink}|
```

**Parameters**

- `abr`  Debug OSPF ABR events.
- `asbr`  Debug ASBR events.
- `lsa`  Debug LSA events.
- `nssa`  Debug NSSA events.
- `os`  Debug OS interaction events.
- `router`  Debug other router events.
- `vlink`  Debug virtual link events.

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#no debug ospf event abr
ZebOS#debug ospf event asbr
ZebOS#debug ospf event lsa
ZebOS#no debug ospf event nssa
ZebOS#debug ospf event os
ZebOS#debug ospf event router
ZebOS#debug ospf event vl
```
**debug ospf ifsm**

Use this command to specify debugging options for OSPF Interface Finite State Machine (IFSM) troubleshooting. Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ospf ifsm ({events|status|timers}|
no debug ospf ifsm ({events|status|timers}|
undebug ospf ifsm ({events|status|timers})
```

**Parameters**

- **events**  
  Debug IFSM event information
- **status**  
  Debug IFSM status information
- **timers**  
  Debug IFSM timer information

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#no debug ospf ifsm events
ZebOS#debug ospf ifsm status
ZebOS#debug ospf ifsm timers
```
**debug ospf lsa**

Use this command to specify debugging options for OSPF Link State Advertisements (LSA) troubleshooting. Use the `no` parameter with this command to disable this function.

**Command Syntax**
```
depog ospf lsa {flooding|generate|install|maxage|refresh}]
```

```
no debug ospf lsa {flooding|generate|install|maxage|refresh}]
undebug ospf lsa {flooding|generate|install|maxage|refresh}]
```

**Parameters**
- `flooding`: Debug LSA flooding.
- `generate`: Debug LSA generation.
- `install`: Debug LSA installation.
- `maxage`: Debug the maximum age processing.
- `refresh`: Debug LSA refresh.

**Command Mode**
Privileged Exec mode and Configure mode

**Examples**
```
ZebOS#no debug ospf lsa refresh
ZebOS#debug ospf lsa flooding
ZebOS#debug ospf lsa install
ZebOS#debug ospf lsa maxage
ZebOS#debug ospf lsa generate
```
debug ospf nfsm

Use this command to specify debugging options for OSPF Neighbor Finite State Machines (NFSMs).
Use the no parameter with this command to disable this function.

Command Syntax

depth ospf nfsm ({events|status|timers}||)
	no depth ospf nfsm ({events|status|timers}||)
undepth ospf nfsm ({events|status|timers}||)

Parameters

events Debug NFSM event information
status Debug NFSM status information
timers Debug NFSM timer information

Command Mode
Privileged Exec mode Configure mode

Examples
ZebOS#debug ospf nfsm events
ZebOS#no debug ospf nfsm timers
**debug ospf nsm**

Use this command to specify debugging options for OSPF NSM information.
Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ospf nsm ({interface|redistribute}||)
```

```
no debug ospf nsm ({interface|redistribute}||)
undo debug ospf nsm ({interface|redistribute}||)
```

**Parameters**

- `interface` Debug NSM interface information.
- `redistribute` Debug NSM redistribute information.

**Command Mode**

Privileged Exec mode and Configure mode

**Example**

The `debug ospf nsm` command enables the display of debug information related to NSM.

```
ZebOS#debug ospf nsm interface
ZebOS#no debug ospf nsm redistribute
```
**debug ospf packet**

Use this command to specify debugging options for OSPF packets.
Use the no parameter with this command to disable this function.

**Command Syntax**

```
debug ospf packet ({hello|dd|ls-request|ls-update|ls-ack|send|recv|detail}|
no debug ospf packet ({hello|dd|ls-request|ls-update|ls-ack|send|recv|detail}|
undebug ospf packet ({hello|dd|ls-request|ls-update|ls-ack|send|recv|detail}|

Parameters
hello          Debug OSPF hello packets.
dd             Debug OSPF database.
ls-request     Debug OSPF link state requests.
ls-update      Debug OSPF link state updates.
ls-ack         Debug OSPF link state acknowledgments.
send           Debug OSPF sent packets.
recv           Debug OSPF received packets.
detail         Debug OSPF detailed information.

Command Mode
Privileged Exec mode and Configure mode

Examples
ZebOS#debug ospf packet detail
ZebOS#debug ospf packet dd send detail
ZebOS#no debug ospf packet ls-request recv detail
**debug ospf route**

Use this command to debug route calculation. Use this command without parameters to turn on all the options. Use the **no** parameter with this command to disable this function.

**Command Syntax**

```
debug ospf route ({ase|ia|install|spf}|
no debug ospf route ({ase|ia|install|spf}|
undebug ospf route ({ase|ia|install|spf}|
```

**Parameters**

- **ase**: Debug OSPF external route calculation.
- **ia**: Debug OSPF Inter-Area route calculation.
- **install**: Debug OSPF route installation.
- **spf**: Debug OSPF SPF calculation.

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#debug ospf route
ZebOS#no debug ospf route ia
ZebOS#debug ospf route install
```
default-information originate

Use this command to create a default external route into an OSPF routing domain.

Use the `no` parameter with this command to disable this feature.

The system acts like an Autonomous System Boundary Router (ASBR) when you use the `default-information originate` command to redistribute routes into an OSPF routing domain. An ASBR does not by default generate a default route into the OSPF routing domain.

When you give the `default-information originate` command, also specify a `route-map` to avoid a dependency on the default network in the routing table.

Command Syntax

```
default-information originate
default-information originate {metric <0-16777214>|metric-type (1|2)|route-map WORD|always}
no default-information originate
no default-information originate {metric|metric-type|route-map|always}
```

Parameters

- **always**
  - Used to advertise the default route regardless of whether there is a default route.
- **metric**
  - Sets the OSPF metric used in creating the default route.
    - `<0-16777214>`
      - Sets the OSPF metric used in creating the default route. The default metric value is 10. The value used is specific to the protocol.
- **metric-type**
  - The external link type associated with the default route advertised into the OSPF routing domain (see RFC 3101).
    - `1`
      - Sets OSPF External Type 1 metric.
    - `2`
      - Sets OSPF External Type 2 metric (default).
- **route-map**
  - Route map.
- **WORD**
  - Specify the name of route map.

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#default-information originate always metric 23 metric-type 2 route-map myinfo

ZebOS(config)#router ospf 100
ZebOS(config-router)#no default-information originate metric metric-type route-map
```
**default-metric**

Use this command to set a default metric for OSPF.

A default metric facilitates redistributing routes with incompatible metrics. If the metrics do not convert, the default metric provides an alternative. Use this command to use the same metric value for all redistributed routes. Use this command in conjunction with `redistribute`.

Use the `no` parameter with this command to return to the default state.

**Command Syntax**

```
default-metric <1-16777214>
```

```
no default-metric
no default-metric <1-16777214>
```

**Parameters**

- `<1-16777214>`  Default metric value.

**Default**

Built-in, automatic metric translations, as appropriate for each routing protocol.

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#default-metric 100
```
distance

Use this command to set OSPF administrative distances.

The administrative distance rates the trustworthiness of a routing information source. A higher distance value means a lower trust rating. For example, an administrative distance of 255 means that the routing information source cannot be trusted and should be ignored.

Use the no form of this command to restore the default value (110).

Command Syntax

```
distance <1-255>
distance <1-255> A.B.C.D/M (WORD)
distance ospf {intra-area <1-255>|inter-area <1-255>|external <1-255>}
no distance <1-255>
no distance <1-255> A.B.C.D/M (WORD)
no distance ospf
```

Parameters

- `<1-255>`: Used alone, this parameter specifies a default administrative distance used when no other specification exists for a routing information source.
- `intra-area`: Routes within an area.
  - `<1-255>`: Distance for all routes within an area.
- `inter-area`: Routes from one area to another area.
  - `<1-255>`: Distance for all routes from one area to another area.
- `external`: Routes from other routing domains learned by redistribution.
  - `<1-255>`: Distance for routes from other routing domains learned by redistribution.
- `A.B.C.D/M`: Distance for routes to prefixes whose nexthop matches this address.
- `WORD`: Name of access list to apply to route updates.

Default

The default distance for each type of route (intra-, inter-, or external) is 110.

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#distance ospf inter-area 20 intra-area 10 external 40
```
distribute-list

Use this command to filter networks in routing updates. This command redistributes other routing protocols into the OSPF routing table.

Use the no parameter with this command to disable this function.

Command Syntax

```
distribute-list WORD out (kernel|connected|static|rip|bgp|isis|ospf (<1-65535>|))
distribute-list WORD in
no distribute-list WORD out (kernel|connected|static|rip|bgp|isis|ospf (<1-65535>|))
no distribute-list WORD in
```

Parameters

- **WORD**: Specify the name of the access list.
- **in**: Filter incoming routing updates.
- **out**: Filter outgoing routing updates.
- **kernel**: Specify kernel routes.
- **connected**: Specify connected routes.
- **static**: Specify static routes.
- **rip**: Specify RIP routes.
- **bgp**: Specify BGP routes.
- **isis**: Specify IS-IS routes.
- **ospf**: Specify OSPF process.
- **<1-65535>**: Specify OSPF process ID <1-65535>. If not specified, this command redistributes all running OSPF processes.

Command Mode

Router mode

Examples

The following example shows the distribution of BGP routing updates based on the access list list1 (network 172.10.0.0).

```
ZebOS#configure terminal
ZebOS(config)#access-list list1 permit 172.10.0.0/16
ZebOS(config)#router ospf 100
ZebOS(config-router)#distribute-list list1 out bgp
ZebOS(config-router)#redistribute bgp
```
**enable db-summary-opt**

Use this command to enable the database summary list optimization for OSPFv2.

When this feature is enabled, the database exchange process is optimized by removing the LSA from the database summary list for the neighbor, if the LSA instance in database summary list is the same as or less recent than the listed LSA in the database description packet received from the neighbor.

Use the `no` form of this command to disable database summary list optimization.

**Command Syntax**

```
enable db-summary-opt
no enable db-summary-opt
```

**Parameters**

None

**Default**

Disabled

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf
ZebOS(config-router)#enable db-summary-opt
ZebOS(config-router)#no enable db-summary-opt
```
**enable ext-ospf-multi-inst**

Use this command to run multiple OSPF instances on a subnet.

Use the `no` parameter with this command to disable OSPF multiple-instance support and reset all OSPF instances to the default instance ID.

**Command Syntax**

```plaintext
  enable ext-ospf-multi-inst
  no enable ext-ospf-multi-inst
```

**Parameters**

None

**Defaults**

Multiple-instance support is disabled. The default instance ID is 0.

**Command Mode**

Configure mode

**Examples**

```plaintext
  ZebOS#configure terminal
  ZebOS(config)#enable ext-ospf-multi-inst
```
**host area**

Use this command to configure a stub host entry belonging to a particular area.

Using this command, you can advertise specific host routes in the router-LSA as stub link. Since stub host belongs to the specified router, specifying cost is not important.

Use the **no** form of this command to remove the host area configuration.

**Command Syntax**

```plaintext
host A.B.C.D area (A.B.C.D|<0-4294967295>)
host A.B.C.D area (A.B.C.D|<0-4294967295>) cost <0-65535>
no host A.B.C.D area (A.B.C.D|<0-4294967295>)
no host A.B.C.D area (A.B.C.D|<0-4294967295>) cost (<0-65535>||)
```

**Parameters**

- **A.B.C.D** Specify IP address of the host.
- **area** Set the OSPF area ID
- **A.B.C.D** OSPF Area ID in IPv4 address format.
  - `<0-4294967295>` OSPF Area ID as a decimal value.
- **cost** Specify cost for stub host entry.
  - `<0-65535>` Specify cost for stub host entry.

**Default**

No host entry is configured.

**Command Mode**

Router mode

**Examples**

```plaintext
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#host 172.16.10.100 area 1
ZebOS(config-router)#host 172.16.10.101 area 2 cost 10
```
**ip ospf authentication**

Use this command to send and receive OSPF packets with the specified authentication method on the current interface.

Use the `no` parameter with this command to disable the authentication.

**Command Syntax**

```
ip ospf authentication (null|message-digest|)
ip ospf A.B.C.D authentication (null|message-digest|)
no ip ospf (A.B.C.D|) authentication
```

**Parameters**

- **A.B.C.D**  
The IP address of the interface.
- **null**  
Use no authentication.
- **message-digest**  
Use message digest authentication.

**Command Mode**

Interface mode

**Examples**

In this example, interface `eth0` is configured to have no authentication. This will override any text or MD5 authentication configured on this interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf authentication null
```
ip ospf authentication-key

Use this command to specify an OSPF authentication password for neighboring routers.

This command creates a password (key) that is inserted into the OSPF header when ZebOS software originates packets. Assign a separate password to each network for different interfaces. All neighboring routers on the same network with the same password exchange OSPF routing data.

The key can be used only when authentication is enabled for an area with the area authentication command.

Simple password authentication allows a password to be configured for each area. Configure the routers in the same routing domain with the same password.

Use the no parameter with this command to remove an OSPF authentication password.

Command Syntax

```
ip ospf (A.B.C.D|) authentication-key LINE
no ip ospf (A.B.C.D|) authentication-key
```

Parameters

- **A.B.C.D** The IP address of the interface.
- **authentication-key** Specify the authentication password.
- **LINE** Specify the authentication password.

Default

Authentication password not specified.

Command Mode

Interface mode

Examples

In the following example, an authentication key test is created on interface eth0 in area 0. Note that first authentication is enabled for area 0.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#network 10.10.10.0/24 area 0
ZebOS(config-router)#area 0 authentication
ZebOS(config-router)#exit
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf 3.3.3.3 authentication-key test
```
ip ospf bfd

Use this command to enable Bidirectional Forwarding Detection (BFD).

Use this command with either the no or disable parameter to disable BFD.

Command Syntax

    ip ospf bfd (disable|)
    no ip ospf bfd (disable|)

Parameters

    disable Specify to disable BFD.

Command Mode

Interface mode

Examples

    ZebOS#configure terminal
    ZebOS(config)#interface eth0
    ZebOS(config-if)#ip ospf bfd
ip ospf cost

Use this command to explicitly specify the cost of the link-state metric in a router-LSA.

The interface cost indicates the overhead required to send packets across an interface. This cost is stated in the Router-LSA's link. The cost is inversely proportional to the bandwidth of an interface. By default, the cost of an interface is calculated based on the bandwidth ($10^6$/ bandwidth). Use this command to set the cost manually.

Use the no parameter with this command to reset the cost to its default value.

**Command Syntax**

```
ip ospf (A.B.C.D|) cost <1-65535>
no ip ospf (A.B.C.D|) cost
```

**Parameters**

- **A.B.C.D**
  - The IP address of the interface.

- **<1-65535>**
  - Specify the link-state metric. The default value is 10.

**Command Mode**

Interface mode

**Examples**

The following example shows setting the cost as 10 on interface **eth0** for IP address **10.10.10.50**.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf 10.10.10.50 cost 10
```
**ip ospf database-filter**

Use this command to turn on the LSA database-filter for a particular interface. OSPF floods new LSAs over all interfaces in an area, except the interface on which the LSA arrives. This redundancy ensures robust flooding. However, too much redundancy can waste bandwidth and might lead to excessive link and CPU usage in certain topologies, resulting in destabilizing the network. To avoid this, use this command to block flooding of LSAs over specified interfaces.

Use the *no* parameter with this command to turn off the filter.

**Command Syntax**

```
ip ospf (A.B.C.D|) database-filter all out
no ip ospf (A.B.C.D|) database-filter
```

**Parameters**

- **A.B.C.D**
  - The IP address of the interface.

**Default**

Disabled, all outgoing LSAs are flooded to the interface.

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf database-filter all out
```
**ip ospf dead-interval**

Use this command to set the interval during which the router waits to receive an OSPF hello packet from the neighbor before declaring the neighbor down. This value is advertised in the router's hello packets. It must be a multiple of hello-interval and be the same for all routers on a specific network.

Use the `no` parameter with this command to return to the default time. If you have configured this command specifying the IP address of the interface and want to remove the configuration, use the `no` parameter with the specified IP address (no ip ospf dead-interval A.B.C.D).

**Command Syntax**

```
ip ospf (A.B.C.D) dead-interval <1-65535>
no ip ospf (A.B.C.D) dead-interval
```

**Parameters**

- **A.B.C.D** The IP address of the interface.
- **dead-interval** Specify the interval.
- **<1-65535>** Specify the interval in seconds. The default interval is 40 seconds.

**Command Mode**

Interface mode

**Examples**

The following example shows configuring dead-interval for 10 seconds on eth0 interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf dead-interval 10
```
**ip ospf disable**

Use this command to completely disable OSPF packet processing on an interface.

This command overrides the `network area` command.

Use the `no` option with this command to return to the default setting.

**Command Syntax**

```
ip ospf disable all
no ip ospf disable all
```

**Parameters**

None

**Command Mode**

Interface mode

**Usage**

**Example**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf disable all
```
ip ospf hello-interval

Use this command to specify the interval between hello packets.
The hello-interval is advertised in the hello packets. Configure the same hello-interval for all routers on a specific
network. A shorter hello interval ensures faster detection of topological changes but results in more routing traffic.
Use the no parameter with this command to return to the default time.

Command Syntax

    ip ospf (A.B.C.D|) hello-interval <1-65535>
    no ip ospf (A.B.C.D|) hello-interval

Parameters

    A.B.C.D                The IP address of the interface.
    hello-interval        Specify the interval.
    <1-65535>             Specify the interval in seconds. The default interval is 10 seconds.

Command Mode

Interface mode

Examples

The following example shows setting the hello-interval for 3 seconds on interface eth0.

    ZebOS#configure terminal
    ZebOS(config)#interface eth0
    ZebOS(config-if)#ip ospf hello-interval 3
**ip ospf message-digest-key**

Use this command to register an MD5 key for OSPF authentication.

Use the `no` parameter with this command to remove an MD5 key.

Message Digest Authentication is cryptographic authentication. A key (password) and key-id are configured on each router. The router uses an algorithm based on the OSPF packet, the key, and the key-id to generate a message digest that is appended to the packet.

Use this command for uninterrupted transitions between passwords. This is helpful for administrators who want to change the OSPF password without disrupting communication. The system begins a rollover process until all the neighbors have adopted the new password. This allows neighboring routers to continue communication while the network administrator is updating them with a new password. The router will stop sending duplicate packets once it detects that all of its neighbors have adopted the new password.

Maintain only one password per interface, removing the old password whenever you add a new one. This prevents the local system from continuing to communicate with the system that is using the old password. Removing the old password also reduces overhead during rollover. All neighboring routers on the same network must have the same password value to enable exchange of OSPF routing data.

**Command Syntax**

```
ip ospf (A.B.C.D|) message-digest-key <1-255> md5 LINE
no ip ospf (A.B.C.D|) message-digest-key <1-255>
```

**Parameters**

- **A.B.C.D**: IPv4 address of the interface.
- **message-digest-key**: Specify a key ID.
- **<1-255>**: Specify a key ID.
- **md5**: Specify a key (password).
- **LINE**: Specify the OSPF password (1-16 characters).

**Default**

Disabled.

**Command Mode**

Interface mode

**Examples**

The following example shows OSPF authentication on the interface eth0 when IP address has not been specified.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf authentication message-digest
ZebOS(config-if)#ip ospf message-digest-key 1 md5 yourpass
```
The following example shows OSPF authentication on the interface eth0 for the IP address 1.1.1.1. (If the interface has two IP addresses assigned-- 1.1.1.1 & 2.2.2.2, OSPF authentication will be enabled only for the IP address 1.1.1.1)

```plaintext
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf 1.1.1.1 authentication message-digest
ZebOS(config-if)#ip ospf 1.1.1.1 message-digest-key 2 md5 yourpass
```

**ip ospf mtu**

Use this command to set MTU size for OSPF to construct packets based on this value. Whenever OSPF constructs packets, it uses interface MTU size as Maximum IP packet size. This command forces OSPF to use the specified value overriding the actual interface MTU size.

This command does not configure the MTU settings in the kernel. OSPF does not recognize MTU size changes made in the kernel until the MTU size is updated through this command.

Use the `no` parameter with this command to return to the default value.

**Command Syntax**

```plaintext
ip ospf mtu <576-65535>
no ip ospf mtu
```

**Parameters**

<table>
<thead>
<tr>
<th>mtu</th>
<th>Specify an MTU size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;576-65535&gt;</td>
<td>Specify an MTU size.</td>
</tr>
</tbody>
</table>

**Default**

By default, OSPF uses interface MTU derived from the kernel.

**Command Mode**

Interface mode

**Examples**

```plaintext
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf mtu 1480
```
ip ospf mtu-ignore

Use this command to configure OSPF so that it does not check the MTU size during DD (Database Description) exchange.

By default, during the DD exchange process, OSPF checks the MTU size described in DD packets received from its neighbor. If the MTU size does not match the interface MTU, the neighbor adjacency is not established. Using this command makes OSPF ignore this check and allows establishing of adjacency regardless of MTU size in the DD packet.

Use the no form of this command to make OSPF check the MTU size during DD exchange.

Command syntax

    ip ospf (A.B.C.D|) mtu-ignore
    no ip ospf (A.B.C.D|) mtu-ignore

Parameters

    A.B.C.D          IP address of the interface.

Command Mode

Interface mode

Examples

    ZebOS#configure terminal
    ZebOS(config)#interface eth0
    ZebOS(config-router)#ip ospf mtu-ignore
**ip ospf network**

Use this command to set the OSPF network type.
Use the no parameter with this command to return to the default value.

**Command Syntax**

```
ip ospf network (broadcast|non-broadcast|point-to-multipoint|point-to-point)
ip ospf network point-to-multipoint non-broadcast
no ip ospf network
```

**Parameters**

- **broadcast**  Sets the network type to broadcast.
- **non-broadcast**  Sets the network type to NBMA.
- **point-to-multipoint**  Sets the network type to point-to-multipoint.
- **non-broadcast**  Sets the network type to NBMA.
- **point-to-point**  Sets the network type to point-to-point.

**Default**

Broadcast type

**Command Mode**

interface mode

**Examples**

The following example shows setting the network to point-to-point type on the eth0 interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf network point-to-point
```
**ip ospf priority**

Use this command to set the router priority to determine the designated router (DR) for the network.

A router with the higher router priority becomes the DR. If the priority is the same for two routers, the router with the higher router ID takes precedence.

Only routers with a nonzero priority value are eligible to become the designated or backup designated router. Configure router priority for broadcast or NBMA networks only and not for point-to-point networks.

Use the no parameter with this command to return to the default value.

**Command Syntax**

```plaintext
ip ospf (A.B.C.D|) priority <0-255>
no ip ospf (A.B.C.D|) priority
```

**Parameters**

- **A.B.C.D** The IP address of the interface.
- **priority** Specify the router priority of the interface.
- **<0-255>** Specify the router priority of the interface. The default value is 1.

**Default**

The default priority is 1.

**Command Mode**

Interface mode

**Examples**

The following example shows setting the OSPF priority value to 3 on the `eth0` interface.

```plaintext
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf priority 3
```
ip ospf resync-timeout

Use this command to set the interval after which adjacency is reset if out-of-band re-synchronization has not occurred. The interval period starts from the time a restart signal is received from a neighbor.

Use the no parameter with this command to return to the default value.

**Command Syntax**

```
ip ospf (A.B.C.D) resync-timeout <1-65535>
no ip ospf (A.B.C.D) resync-timeout
```

**Parameters**

- **A.B.C.D** The IP address of the interface.
- **resync-timeout** Specify the re-synchronization timeout value of the interface.
- **<1-65535>** Specify the re-synchronization timeout value of the interface in seconds.

**Command Mode**

Interface mode

**Examples**

The following example shows setting the OSPF re-synchronization timeout value to 65 seconds on the eth0 interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf resync-timeout 65
```
ip ospf retransmit-interval

Use this command to specify the time between link-state advertisement (LSA) retransmissions for adjacencies belonging to the interface.

After sending an LSA to a neighbor, the router keeps the LSA until it receives an acknowledgement. If the router does not receive an acknowledgement during the retransmit interval, it retransmits the LSA. Set the retransmission interval value conservatively to avoid needless retransmission. The interval should be greater than the expected round-trip delay between two routers.

Use the no parameter with this command to return to the default value.

Command Syntax

```
ip ospf (A.B.C.D) retransmit-interval <5-65535>
nop ip ospf (A.B.C.D) retransmit-interval
```

Parameters

- **A.B.C.D** The IPv4 address of the interface.
- **retransmit-interval** Specify the interval.
  - **<5-65535>** Specify the interval in seconds. The default is 5 seconds.

Command Mode

Interface mode

Examples

The following example shows setting the ospf retransmit interval to 6 seconds on the eth0 interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf retransmit-interval 6
```
ip ospf transmit-delay

Use this command to set the estimated time it takes to transmit a link-state-update packet on the interface.

The transmit delay value adds a specified time to the age field of an update. If the delay is not added, the time in which the LSA transmits over the link is not considered. This command is especially useful for low speed links. Add transmission and propagation delays when setting the transmit delay value.

Use the no parameter with this command to return to the default value.

Command Syntax

```
ip ospf (A.B.C.D|) transmit-delay <1-65535>
no ip ospf (A.B.C.D|) transmit-delay
```

Parameters

- **A.B.C.D**
  - The IPv4 address of the interface.

- **transmit-delay**
  - Specify the time to transmit a link-state update.

- **<1-65535>**
  - Specify the time in seconds to transmit a link-state update. The default is 1 second.

Command Mode

Interface mode

Examples

The following example shows setting the OSPF transmit delay time to 3 seconds on the eth0 interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ip ospf transmit-delay 3
```
**max-concurrent-dd**

Use this command to limit the number of Database Descriptors (DD) that can be processed concurrently. This command is useful when a router’s performance is affected from simultaneously bringing up several OSPF adjacencies. This command limits the maximum number of DD exchanges that can occur concurrently per OSPF instance, thus allowing for all of the adjacencies to come up.

Use the `no` option with this command to remove the limit.

**Command Syntax**

```
max-concurrent-dd <1-65535>
no max-concurrent-dd
```

**Parameters**

- `<1-65535>` Specify the number of DD processes.

**Command Mode**

Router mode

**Examples**

The following example set the `max-concurrent-dd` value to 4.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#max-concurrent-dd 4
```
**maximum-area**

Use this command to configure the maximum number of OSPF areas.
Use the `no` parameter with this command to disable the limit.

**Command Syntax**

```
maximum-area <1-4294967294>
no maximum-area
```

**Parameters**

- `<1-4294967294>` Specify the maximum number of OSPF areas.

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#maximum-area 5
```
**neighbor**

Use this command to configure OSPF routers interconnecting to NBMA (Non-Broadcast Multi-Access) networks. Include one neighbor entry for each known non-broadcast network neighbor. Configure the neighbor address on the primary address of the interface.

Use the `no` parameter with this command to remove a configuration.

**Command Syntax**

```
neighbor A.B.C.D
neighbor A.B.C.D (priority <0-255>|poll-interval <1-2147483647>|cost <1-65535>)
neighbor A.B.C.D (cost <1-65535>)
no neighbor A.B.C.D
no neighbor A.B.C.D {priority (<0-255>|)}|poll-interval (<1-2147483647>|)}
no neighbor A.B.C.D (cost (<1-65535>|))
```

**Parameters**

- **A.B.C.D**: Specify the interface IP address of the neighbor.
- **priority**: Specify the router priority of the non-broadcast neighbor associated with the specified IP address. This parameter does not apply to point-to-multipoint interfaces.
  - `<0-255>`: Specify the router priority value of the non-broadcast neighbor associated with the specified IP address. The default is 0.
- **poll-interval**: The reduced rate at which routers continue to send hello packets when a neighboring router has become inactive.
  - `<1-2147483647>`: Dead neighbor polling interval in seconds. Set this value much larger than hello interval. The default is 120 seconds.
- **cost**: Specify the link-state metric to this neighbor.
  - `<1-65535>`: Specify the link-state metric to this neighbor.

**Command Mode**

Router mode

**Examples**

This example shows neighbor configured with a priority value and poll interval time.

```
ZebOS(config-router)#neighbor 1.2.3.4 priority 1 poll-interval 90
ZebOS(config-router)#neighbor 1.2.3.4 cost 15
```
**network**

Use this command to enable OSPF routing with a specified area ID (and optionally an instance ID) on interfaces with IP addresses that match the specified network address.

OSPF routing is enabled per IPv4 subnet basis. You define the network address using the prefix length or a subnet mask.

If OSPF multiple-instance support is enabled (using the `enable ext-ospf-multi-inst` command), different instance IDs can be enabled on the same subnet. By default, the instance ID is 0.

Use the **no** parameter with this command to disable OSPF routing on the interfaces.

**Command Syntax**

Network address defined using the prefix length:

```
network A.B.C.D/M area (A.B.C.D|<0-4294967295>) (instance-id <0-255>)
o network A.B.C.D/M area (A.B.C.D|<0-4294967295>) (instance-id <0-255>)
```

Network address defined using subnet mask:

```
network A.B.C.D A.B.C.D area (A.B.C.D|<0-4294967295>) (instance-id <0-255>)
o network A.B.C.D A.B.C.D area (A.B.C.D|<0-4294967295>) (instance-id <0-255>)
```

**Parameters**

- **A.B.C.D/M**  
  IPv4 network address with prefix length.
- **A.B.C.D**  
  IPv4 network address.
- **A.B.C.D**  
  Subnet mask where the bits on left side are set to 1 to represent the network part and the bits on the right side are set to 0 to represent the host part.
- **area**  
  Set the OSPF area ID
- **A.B.C.D**  
  OSPF area ID in IPv4 address format.
- `<0-4294967295>`  
  OSPF area ID as a decimal value.
- **instance-id**  
  Instance ID.
- `<0-255>`  
  Instance ID. The default is 0.

**Default**

No network area is configured.

**Command Mode**

Router mode

**Examples**

The following is the use of the `network` command with OSPF multiple-instance support disabled.

```
ZebOS#configure terminal
ZebOS(config-router)#network 10.0.0.0/8 area 3
ZebOS(config-router)#network 10.0.0.0/8 area 1.1.1.1
```
The following shows the use of the `network` command with OSPF multiple-instance support enabled.

ZebOS(config)#router ospf 100
ZebOS(config-router)#network 10.0.0.0/8 area 3 instance-id 4

---

**ospf abr-type**

Use this command to set an OSPF Area Border Router (ABR) type.

Use the `no` parameter with this command to revert the ABR type to the default setting (`cisco`).

Specifying the ABR type allows better functioning in a multi-vendor environment. The ABR types are:

- **Cisco (RFC 3509):** A router is considered an ABR if it has more than one area actively attached and one of them is the backbone area.
- **IBM (RFC 3509):** A router is considered an ABR if it has more than one area actively attached and the backbone area is configured. In this case the configured backbone need not be actively connected.
- **Standard (RFC 2328):** A router is considered an ABR if it has more than one area actively attached to it.
- **Shortcut (draft-ietf-ospf-shortcut-abr-02):** This improves the standard ABR by modifying the calculation of inter-area routes which are installed in non-backbone areas if the non-backbone path is better, thus providing a “shortcut” through these areas. To prevent routing loops, the inter-area routes are re-advertised only if they are associated with the backbone area.

**Command Syntax**

```
ospf abr-type (cisco|ibm|standard|shortcut)
no ospf abr-type (cisco|ibm|standard|shortcut)
```

**Parameters**

- **cisco**
  - Specify an alternative ABR using Cisco implementation. This is the default ABR type.
- **ibm**
  - Specify an alternative ABR using IBM implementation.
- **standard**
  - Specify a standard ABR.
- **shortcut**
  - Specify a shortcut ABR.

**Default**

ABR type `Cisco`

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#ospf abr-type ibm
```
**ospf restart grace-period**

Use this command to set the grace period for restarting the router.

If graceful restart is enabled, NSM is notified about the grace period. If the OSPF daemon unexpectedly shuts down, NSM sends this value to the OSPF daemon when it comes up again which uses this value to end the graceful state.

Use the `no` parameter with this command to revert to the default.

**Command Syntax**

```
ospf restart grace-period <1-1800>
no ospf restart grace-period
```

**Parameters**

- `grace-period` Specify the grace period.
- `<1-1800>` Specify the grace period in seconds.

**Command Mode**

Configure mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#ospf restart grace-period 250
```
**ospf restart helper**

Use this command to configure the helper behavior for graceful restart.

Use the `no` parameter with this command to revert to default.

**Command Syntax**

```
ospf restart helper {only-reload|only-upgrade|max-grace-period <1-1800>}
ospf restart helper never (router-id A.B.C.D)
no ospf restart helper (never router-id (A.B.C.D | all) | max-grace-period)
```

**Parameters**

- **only-reload**  
  Help only on software reloads.
- **only-upgrade**  
  Help only on software upgrades.
- **max-grace-period**  
  Help only if received grace-period is less than this value.
  ```
  <1-1800>
  ```
  Help only if received grace-period is less than this value.
- **never**  
  Prevent the neighbor from entering helper mode.
- **router-id**  
  Neighbor to never to act as helper.
  ```
  A.B.C.D
  ```
  Router ID of neighbor to never to act as helper.
- **all**  
  All neighbors to never to act as helper.

**Command Mode**

Configure mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#ospf restart helper never router-id 1.1.1.1

ZebOS#configure terminal
ZebOS(config)#ospf restart helper only-reload

ZebOS#configure terminal
ZebOS(config)#ospf restart helper only-reload max-grace-period 200

ZebOS#configure terminal
ZebOS(config)#no ospf restart helper never
```
**ospf router-id**

Use this command to specify a router ID for the OSPF process.

Configure each router with a unique router ID. In an OSPF router process which has active neighbors, a new router ID is used at the next reload or when you start the OSPF manually.

Use the `no` parameter with this command to force OSPF to use the previous router ID.

**Command Syntax**

```
ospf router-id A.B.C.D
router-id A.B.C.D

no ospf router-id
no router-id (A.B.C.D)
```

**Parameters**

- **A.B.C.D**
  
  Specify the router ID in IPv4 address format.

**Command Mode**

Router mode

**Examples**

The following example shows a specified router ID 2.3.4.5.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#ospf router-id 2.3.4.5
```
**overflow database**

Use this command to limit the maximum number of LSAs that can be supported by the OSPF instance. Use the `no` parameter with this command to have an unlimited number of LSAs.

**Command Syntax**

```
overflow database <0-4294967294> (hard|soft|)
no overflow database
```

**Parameters**

- `<0-4294967294>`
  - The maximum number of LSAs

- `hard`
  - Shutdown occurs if the number of LSAs exceeds the specified value.

- `soft`
  - Warning message appears if the number of LSAs exceeds the specified value.

**Command Mode**

Router mode

**Examples**

The following example shows setting the database overflow to 5 and a shutdown to occur if the number of LSAs exceeds 5.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#overflow database 5 hard
```
overflow database external

Use this command to limits the number of AS-external-LSAs a router can receive once it is in the wait state. Use the no parameter with this command to revert to default.

Command Syntax

overflow database external <0-2147483647> <0-65535>
no overflow database external

Parameters

<0-2147483647> The maximum number of LSAs. This value should be the same on all routers in the AS.
<0-65535> The number of seconds the router waits before trying to exit the database overflow state. If this parameter is 0, the router exits the overflow state only after an explicit administrator command.

Command Mode

Router mode

Examples

The following example shows setting the maximum number of LSAs to 5 and the time to recover from overflow state to be 3.

ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#overflow database external 5 3
**passive-interface**

Use this command to suppress sending Hello packets on all interfaces or on a specified interface.

This command configures OSPF on simplex Ethernet interfaces. Since a simplex interface represents only one network segment between two devices, configure the transmitting interface as a passive interface. This ensures that OSPF does not send hello packets for the transmitting interface. Both the devices can see each other via the hello packet generated for the receiving interface.

Use the `no` form with this command to resume sending hello packets on all interfaces, or on a specified interface.

**Command Syntax**

- `passive-interface IFNAME`
- `passive-interface (IFNAME A.B.C.D |)`
- `no passive-interface IFNAME`
- `no passive-interface (IFNAME A.B.C.D |)`

**Parameters**

- **IFNAME** The name of the interface.
- **A.B.C.D** IP address of the interface.

**Command Mode**

Router mode

**Examples**

```
ZebOS(config)#router ospf 100
ZebOS(config-router)#passive-interface eth0
```
**redistribute**

This command redistributes routes from a routing protocol, static route, and kernel route into an OSPF routing table. Use the no parameter with this command to disable this function.

**Command Syntax**

```
redistribute (kernel|connected|static|rip|bgp|isis|ospf (<1-65535>|)) {metric <0-16777214>|metric-type (1|2)|?route-map WORD|tag <0-4294967295>}
no redistribute (kernel|connected|static|rip|bgp|isis|ospf (<1-65535>|))
metric|metric-type|?route-map|tag}
```

**Parameters**

- **kernel** Specify kernel routes.
- **connected** Specify connected routes.
- **static** Specify static routes.
- **rip** Specify RIP routes.
- **bgp** Specify BGP routes.
- **isis** Specify IS-IS routes.
- **ospf** Specify OSPF instance to redistribute a particular OSPF instance into another OSPF instance.
- `<1-65535>` Specify an OSPF process ID
- **metric** Specify the external metric.
- `<0-16777214>` Specify the external metric.
- **metric-type** Specify the external metric-type (see RFC 3101):
  - 1 Set OSPF External Type 1 metrics.
  - 2 Set OSPF External Type 2 metrics.
- **route-map** Specify a route map reference.
- **WORD** Specify name of the route-map.
- **tag** Tag value to use as a “match” value for controlling redistribution via route maps
- `<0-4294967295>` Specify the route tag.

**Command Mode**

Router mode

**Examples**

```
ZebOS(config)#router ospf 100
ZebOS(config-router)#redistribute bgp metric 12
```

The following example shows redistributing OSPF instance 2 into OSPF instance 1.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 1
```
OSPFv2 Commands

ZebOS(config-router)#redistribute ospf 2

The following example shows redistributing OSPF instance 2 into OSPF instance 1, with an external metric of 10, metric type 1, a route-map named rmp1, and an external route tag of 3.

ZebOS#configure terminal
ZebOS(config)#router ospf 1
ZebOS(config-router)#redistribute ospf 2 metric 10 metric-type 1 route-map rmp1 tag 3

restart ospf graceful

Use this command to restart OSPF gracefully.

After this command is executed, the router immediately shuts down. NSM is notified that OSPF has shut down gracefully. NSM preserves routes installed by OSPF until the grace period expires.

Command Syntax

    restart ospf graceful (grace-period <1-1800>||)

Parameters

    grace-period  Specify a grace period.
    <1-1800>     Specify a grace period in seconds.

Command Mode

Privileged Exec mode and Exec mode

Examples

    ZebOS#restart ospf graceful grace-period 200
router ospf

Use this command to enter router mode and to configure an OSPF routing process.

Specify the process ID to configure multiple instances of OSPF. When running a single instance of OSPF, you do not need to specify a process ID.

Use the no parameter with this command to terminate an OSPF routing process.

Command Syntax

    router ospf
    router ospf <1-65535>

    no router ospf
    no router ospf <1-65535>

Parameters

    <1-65535>  Process ID; should be unique for each routing process.

Default

No routing process defined.

Command Mode

Configure mode

Examples

This example shows the use of the router ospf command to enter router mode. Note the change in the prompt.

    ZebOS#configure terminal
    ZebOS(config)#router ospf 100
    ZebOS(config-router)#
**show debugging ospf**

Use this command to display the set OSPF debugging option.

**Command Syntax**

```
show debugging ospf
```

**Parameters**

None

**Command Mode**

Privileged Exec mode

**Example**

This is a sample output from the `show debugging ospf` command. Some lines in this output wrap around, they might not wrap around in the actual display.

```
ZebOS#show debugging ospf
OSPF debugging status:
    OSPF packet Link State Update debugging is on
    OSPF all events debugging is on
ZebOS#te mo
ZebOS#2002/05/09 14:08:11 OSPF: RECV[LS-Upd]: From 10.10.10.70 via eth0:10.10.10.10 (10.10.10.10 -> 224.0.0.5)
2002/05/09 14:08:11 OSPF: LSA[10.10.10.10:10.10.10.70]: instance(0x8139cd0) created with Link State Update
2002/05/09 14:08:11 OSPF: RECV[LS-Upd]: From 10.10.10.70 via eth0:10.10.10.50 (10.10.10.10 -> 224.0.0.5)
2002/05/09 14:12:33 OSPF: SEND[LS-Upd]: Begin send queue
2002/05/09 14:12:33 OSPF: SEND[LS-Upd]: # of LSAs 1, destination 224.0.0.5
2002/05/09 14:12:33 OSPF: SEND[LS-Upd]: End send queue
2002/05/09 14:12:33 OSPF: SEND[LS-Upd]: To 224.0.0.5 via eth0:10.10.10.50.
```

**Examples**

```
ZebOS#show debugging ospf
```
**show ip ospf**

Use this command to display general information about all OSPF routing processes.

**Command Syntax**

```
show ip ospf (<0-65535>)
```

**Parameters**

- `<0-65535>`: The ID of the router process for which information will be displayed. If this parameter is specified, only the information for the specified routing process is displayed.

**Command Mode**

Privileged Exec mode

**Examples**

ZebOS#show ip ospf 1
Routing Process "ospf 1" with ID 4.1.1.1
Process uptime is 1 minute
Process bound to VRF default
Conforms to RFC2328, and RFC1583 Compatibility flag is disabled
Supports only single TOS(TOS0) routes
Supports opaque LSA
Supports Graceful Restart
This router is an ASBR (injecting external routing information)
SPF schedule delay min 0 secs 500 msecs
SPF schedule delay max 50 secs 0 msecs
Refresh timer 10 secs
Number of incoming current DD exchange neighbors 0/5
Number of outgoing current DD exchange neighbors 0/5
Initial LSA throttle delay 10 secs 0 msecs
Minimum hold time for LSA throttle 20 secs 0 msecs
Maximum wait time for LSA throttle 45 secs 0 msecs
Minimum LSA arrival 1 secs 0 msecs
Number of external LSA 5. Checksum 0x010632
Number of opaque AS LSA 0. Checksum 0x000000
Number of non-default external LSA 5
External LSA database is unlimited.
Number of LSA originated 6
Number of LSA received 0
Number of areas attached to this router: 1
  Area 0 (BACKBONE)
    Number of interfaces in this area is 1(1)
    Number of fully adjacent neighbors in this area is 0
    Area has no authentication
    SPF algorithm last executed 00:00:47.558 ago
    SPF algorithm executed 2 times
    Number of LSA 1. Checksum 0x0041e0
show ip ospf border-routers

Use this command to display the ABRs and ASBRs for OSPF instances.

**Command Syntax**

```
show ip ospf (<0-65535>|) border-routers
```

**Parameters**

- `<0-65535>`: The ID of the router process for which information will be displayed.

**Command Mode**

Privileged Exec mode

**Example**

This is a sample output from the `show ip ospf border-routers` command.

```
ZebOS#show ip ospf border-routers
OSPF process 1 internal Routing Table
Codes: i - Intra-area route, I - Inter-area route
i 10.15.0.1 [10] via 10.10.0.1, eth0, ASBR, Area 0.0.0.0
i 172.16.10.1 [10] via 10.10.11.50, eth1, ABR, ASBR, Area 0.0.0.0
```
**show ip ospf database brief**

Use this command to display a summary of the OSPF database.

**Command Syntax**

```
show ip ospf database (self-originate|max-age|adv-router A.B.C.D)
show ip ospf <0-65535> database(self-originate|max-age|adv-router A.B.C.D)
```

**Parameters**

- `<0-65535>`: The ID of the router process for which information should be displayed.
- `self-originate`: Display self-originated link states.
- `max-age`: Display LSAs which have reached the max-age (3600 seconds).
- `adv-router`: Advertising router link states.
- `A.B.C.D`: IPv4 address of advertising router.

**Command Mode**

Privileged Exec mode

**Examples**

```
ZebOS#show ip ospf database

OSPF Router process 1 with ID (10.10.11.60)
Router Link States (Area 0.0.0.1)
Link ID ADV Router Age Seq# CkSum Link count
10.10.11.60 10.10.11.60 32 0x80000002 0x472b 1

OSPF Router process 100 with ID (10.10.11.60)
Router Link States (Area 0.0.0.0)
Link ID ADV Router Age Seq# CkSum Link count
10.10.11.60 10.10.11.60219 0x80000001 0x4f5d 0
```
show ip ospf database detail

Use this command to display details of the OSPF database.

Command Syntax

```
show ip ospf database (asbr-summary|external|network|router|summary|nssa-external|opaque-link|opaque-area|opaque-as) (self-originate|adv-router A.B.C.D)
show ip ospf <0-65535> database (asbr-summary|external|network|router|summary) (self-originate|adv-router A.B.C.D)
show ip ospf database (asbr-summary|external|network|router|summary|nssa-external|opaque-link|opaque-area|opaque-as) A.B.C.D (self-originate|adv-router A.B.C.D)
show ip ospf <0-65535> database (asbr-summary|external|network|router|summary|nssa-external|opaque-link|opaque-area|opaque-as) A.B.C.D (self-originate|adv-router A.B.C.D)
```

Parameters

- `<0-65535>`: The ID of the router process for which information should be displayed.
- `asbr-summary`: Autonomous System Boundary Router (ASBR) summary LSAs.
- `external`: External LSAs.
- `network`: Network LSAs.
- `router`: Router LSAs.
- `summary`: LSA summary information.
- `nssa-external`: NSSA external LSAs.
- `opaque-link`: Type 9 LSAs which are not flooded beyond the local network.
- `opaque-area`: Type 10 LSAs which are not flooded beyond the borders of their area.
- `opaque-as`: Type 11 LSAs which are flooded throughout the Autonomous System (AS).
- `A.B.C.D`: Link state ID as an IP address.
- `self-originate`: Display self-originated link states.
- `adv-router`: Advertising router link states.
- `A.B.C.D`: IPv4 address of advertising router.

Command Mode

Privileged Exec mode

Examples

This is a sample output from the `show ip ospf database external` command with the `self-originate` option.

```
ZebOS#show ip ospf database external self-originate

OSPF Router process 100 with ID (10.10.11.50)

AS External Link States
LS age: 298
```
OSPFv2 Commands

Options: 0x2 (*|-|-|-|-|E|-)
LS Type: AS-external-LSA
Link State ID: 10.10.100.0 (External Network Number)
Advertising Router: 10.10.11.50
LS Seq Number: 80000001
Checksum: 0x7033
Length: 36
Network Mask: /24
Metric Type: 2 (Larger than any link state path)
TOS: 0
Metric: 20
Forward Address: 10.10.11.50
External Route Tag: 0

The following is a sample output from the `show ip ospf database nssa-external` command with the `adv-router` and `ip address` option:

ZebOS#show ip ospf nssa-external adv-router 10.10.11.50

OSPF Router process 100 with ID (10.10.11.50)
NSSA-external Link States (Area 0.0.0.0)
NSSA-external Link States (Area 0.0.0.1 [NSSA])
LS age: 78
Options: 0x0 (*|-|-|-|-|-|-|-)
LS Type: AS-NSSA-LSA
Link State ID: 0.0.0.0 (External Network Number For NSSA)
Advertising Router: 10.10.11.50
LS Seq Number: 80000001
Checksum: 0xc9b6
Length: 36
Network Mask: /0
Metric Type: 2 (Larger than any link state path)
TOS: 0
Metric: 1
NSSA: Forward Address: 0.0.0.0

--More--

OSPF Router process 100 with ID (10.10.11.50)
NSSA-external Link States (Area 0.0.0.0)
NSSA-external Link States (Area 0.0.0.1 [NSSA])
LS age: 78
Options: 0x0 (*|-|-|-|-|-|-|-)
LS Type: AS-NSSA-LSA
Link State ID: 0.0.0.0 (External Network Number For NSSA)

The following is a sample output from the `show ip ospf database opaque-as` command with the `self-originate` option:

ZebOS#show ip ospf opaque-as self-originate

OSPF Router process 100 with ID (10.10.11.50)
AS-Global Opaque-LSA
LS age: 325
Options: 0x2 (*|-|-|-|-|E|-)
LS Type: AS-external Opaque-LSA
Link State ID: 11.10.9.23 (AS-external Opaque-Type/ID)
Opaque Type: 11
Opaque ID: 657687
Advertising Router: 10.10.11.50
LS Seq Number: 80000001
Checksum: 0xb018
Length: 25
The following is a sample output from this command with the link state ID option.

ZebOS#show ip ospf  router 10.10.11.50
OSPF Router process 100 with ID (10.10.11.50)
Router Link States (Area 0.0.0.0)
  LS age: 878
  Options: 0x2 (*|-|-|-|-|E|-)
  Flags: 0x3 : ABR ASBR
  LS Type: router-LSA
  Link State ID: 10.10.11.50
  Advertising Router: 10.10.11.50
  LS Seq Number: 80000004
  Checksum: 0xe39e
  Length: 36
Number of Links: 1
  Link connected to: Stub Network
  (Link ID) Network/subnet number: 10.10.10.0
  (Link Data) Network Mask: 255.255.255.0
Number of TOS metrics: 0
  TOS 0 Metric: 10
Router Link States (Area 0.0.0.1)
  LS age: 877
  Options: 0x2 (*|-|-|-|-|E|-)
  Flags: 0x3 : ABR ASBR
  LS Type: router-LSA
  Link State ID: 10.10.11.50
  Advertising Router: 10.10.11.50
  LS Seq Number: 80000003

The following are the sample outputs from the show ip ospf database summary command using the adv-router option.

ZebOS#show ip ospf  summary adv-router 10.10.11.50
OSPF Router process 100 with ID (10.10.11.50)
Summary Link States (Area 0.0.0.0)
  LS age: 989
  Options: 0x2 (*|-|-|-|-|E|-)
  Flags: 0x3 : ABR ASBR
  LS Type: summary-LSA
  Link State ID: 10.10.11.0 (summary Network Number)
  Advertising Router: 10.10.11.50
  LS Seq Number: 80000001
  Checksum: 0x36ac
  Length: 28
  Network Mask: /24
  TOS: 0 Metric: 10
Summary Link States (Area 0.0.0.1)
  LS age: 989
  Options: 0x2 (*|-|-|-|-|E|-)
  LS Type: summary-LSA
  Link State ID: 10.10.11.0 (summary Network Number)
  Advertising Router: 10.10.11.50
  LS Seq Number: 80000001
  Checksum: 0x36ac
  Length: 28
  Network Mask: /24
  TOS: 0 Metric: 10
show ip ospf igp-shortcut-lsp

Use this command to show the IGP shortcut LSP used by OSPF.

Command Syntax

    show ip ospf igp-shortcut-lsp

Parameters

None

Command Mode

Exec mode

Example

ZebOS#show ip ospf igp-shortcut-lsp
    Tunnel-endpoint Tunnel-id Tunnel-metric
7.7.7.7 101 2
**show ip ospf igp-shortcut-route**

Use this command to show the IGP shortcut route calculated by OSPF.

**Command Syntax**

```
show ip ospf (<0-65535> |) igp-shortcut-route
```

**Parameters**

- `<0-65535>`
  - The ID of the router process for which information should be displayed.

**Command Mode**

Exec mode

**Example**

```
ZebOS#show ip ospf igp-shortcut-route
OSPF process 0:
  15.15.15.15/32 [0] tunnel-id: 101, 8.8.8.8
  20.20.15.0/24 [0] tunnel-id: 101, 8.8.8.8
```
show ip ospf interface

Use this command to display interface information for OSPF.

Command Syntax

    show ip ospf interface (IFNAME|)

Parameters

    IFNAME          Interface name.

Command Mode

Privileged Exec mode and Exec mode

Example

The following is a sample output of this command:

    ZebOS#show ip ospf interface eth1
    eth1 is up, line protocol is up
    Internet Address 1.1.1.1/24, Area 0.0.0.0, MTU 1500
    Process ID 0, Router ID 33.33.33.33, Network Type BROADCAST, Cost: 10
    Transmit Delay is 1 sec, State Waiting, Priority 1, TE Metric 0
    No designated router on this network
    No backup designated router on this network
    Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
    Neighbor Count is 0, Adjacent neighbor count is 0
    Crypt Sequence Number is 1106347721
    Hello received 0 sent 1, DD received 0 sent 0
    LS-Req received 0 sent 0, LS-Upd received 0 sent 0
    LS-Ack received 0 sent 0, Discarded 0
**show ip ospf multi-area-adjacencies**

Use this command to display multi-area adjacency information for OSPF.

**Command Syntax**

```
show ip ospf (<0-65535>|) multi-area-adjacencies
```

**Parameters**

- `<0-65535>`
  - The ID of the router process for which information should be displayed.

**Command Mode**

Privileged Exec mode and Exec mode

**Example**

The following is a sample output of this command:

```
ZebOS#show ip ospf 1 multi-area-adjacencies
Multi-area-adjacency on interface eth1 to neighbor 20.20.20.10
Internet Address 20.20.20.11/24, Area 0.0.0.1, MTU 1500
Process ID 1, Router ID 10.10.10.10, Network Type POINTOPOINT, Cost: 10
Transmit Delay is 1 sec, State Point-To-Point
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:02
Neighbor Count is 0, Adjacent neighbor count is 0
Crypt Sequence Number is 1229928206
Hello received 0 sent 513, DD received 0 sent 0
LS-Req received 0 sent 0, LS-Upd received 0 sent 0
LS-Ack received 0 sent 0, Discarded 0
```
**show ip ospf neighbor**

Use this command to display information on OSPF neighbors. Include the process ID parameter with this command to display information about specified instances.

**Command Syntax**

```
show ip ospf (<0-65535>|) neighbor
show ip ospf (<0-65535>|) neighbor all
show ip ospf (<0-65535>|) neighbor interface A.B.C.D
show ip ospf (<0-65535>|) neighbor A.B.C.D
show ip ospf (<0-65535>|) neighbor A.B.C.D detail
show ip ospf (<0-65535>|) neighbor detail
show ip ospf (<0-65535>|) neighbor detail all
```

**Parameters**

- `<0-65535>`: The ID of the router process for which information should be displayed.
- `all`: Include downstatus neighbor.
- `interface`: Interface name
- `A.B.C.D`: Address of the interface in IPv4 format
- `A.B.C.D`: Address of the neighbor in IPv4 format
- `detail`: Details of neighbors

**Command Mode**

Privileged Exec mode and Exec mode

**Example**

The following are sample outputs are from a variety of `show ip ospf neighbor` commands:

```
ZebOS#show ip ospf neighbor
OSPF process 1:
Neighbor ID PriState Dead Time Address Interface
10.10.10.50 1 Full/DR 00:00:38 10.10.10.50 eth0
OSPF process 100:
Neighbor ID PriState Dead Time Address Interface
10.10.11.50 1 Full/Backup 00:00:31 10.10.11.50 eth1

ZebOS#show ip ospf 1 neighbor
OSPF process 1:
Neighbor ID PriState Dead Time Address Interface
10.10.10.50 1 Full/DR 00:00:38 10.10.10.50 eth0

ZebOS#show ip ospf neighbor detail
Neighbor 10.10.10.50, interface address 10.10.10.50
In the area 0.0.0.0 via interface eth0
Neighbor priority is 1, State is Full, 5 state changes
DR is 10.10.10.50, BDR is 10.10.10.10
Options is 0x42 (*|O|-=|-|-|E=-)
Dead timer due in 00:00:38
Neighbor is up for 00:53:07
Database Summary List 0
Link State Request List 0
Link State Retransmission List 0
Crypt Sequence Number is 0
Thread Inactivity Timer on
Thread Database Description Retransmission off
**show ip ospf route**

Use this command to display the OSPF routing table.

**Command Syntax**

```
show ip ospf (<0-65535>) route
```

**Parameters**

- `<0-65535>`: The ID of the router process for which information will be displayed.

**Command Mode**

Privileged Exec mode

**Examples**

The following is a sample output from the `show ip ospf route` command.

```
ZebOS#show ip ospf route
OSPF process 10:
Codes: C - connected, D - Discard, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
C 50.0.0.0/24 [10] is directly connected, eth1, Area 0.0.0.10
C 60.0.0.0/24 [10] is directly connected, eth3, Area 0.0.0.10
```

The following is a sample output from the `show ip ospf route` command with the `<0-65535>` parameter.

```
ZebOS#show ip ospf 10 route
OSPF process 10:
Codes: C - connected, D - Discard, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
C 50.0.0.0/24 [10] is directly connected, eth1, Area 0.0.0.10
C 60.0.0.0/24 [10] is directly connected, eth3, Area 0.0.0.10
```
**show ip ospf virtual-links**

Use this command to display virtual link information.

**Command Syntax**

```
show ip ospf (<0-65535> |) virtual-links
```

**Parameters**

- `<0-65535>`: The ID of the router process for which information will be displayed.

**Command Mode**

Privileged Exec mode and Exec mode

**Example**

The following is the display of the virtual link information for two routers, one with the virtual link up and one with virtual link down.

```
ospfd#show ip ospf virtual-links
Virtual Link VLINK0 to router 10.10.0.9 is up
  Transit area 0.0.0.1 via interface eth0
  Transmit Delay is 1 sec, State Point-To-Point,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:02
  Adjacency state Full
Virtual Link VLINK1 to router 10.10.0.123 is down
  Transit area 0.0.0.1 via interface *
  Transmit Delay is 1 sec, State Down,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in inactive
  Adjacency state Down
```
show ip protocols

Use this command to display OSPF process parameters and statistics.

Command Syntax

    show ip protocols
    show ip protocols ospf

Parameters

    ospf        Display Open Shortest Path First (OSPF) information.

Command Mode

Privileged Exec mode

Usage

This is an example of the output from the show ip protocols command:

    ZebOS#show ip protocols
    Routing Protocol is "ospf 200"
    Invalid after 0 seconds, hold down 0, flushed after 0
    Outgoing update filter list for all interfaces is
    Redistribution kernel filtered by filter1
    Incoming update filter list for all interfaces is
    Redistributing: kernel
    Routing for Networks:
    192.30.30.0/24
    192.40.40.0/24
    Routing Information Sources:
    GatewayDistanceLast Update
    Distance: (default is 110)
    AddressMaskDistance List
summary-address

Use this command to summarize or suppress external routes with the specified address range.

Use the no option with this command to disable summary address.

An address range is a pairing of an address and a mask that is almost the same as IP network number. For example, if the specified address range is 192.168.0.0/255.255.240.0, it matches 192.168.1.0/24, 192.168.4.0/22, 192.168.8.128/25 and so on.

Redistributing routes from other protocols into OSPF requires the router to advertise each route individually in an external LSA. Use this command to advertise one summary route for all redistributed routes covered by a specified network address and mask. This minimizes the size of the OSPF link state database.

Command Syntax

```
summary-address A.B.C.D/M (not-advertise|tag <0-4294967295>|)
no summary-address A.B.C.D/M (not-advertise|tag (<0-4294967295>|))
```

Parameters

- **A.B.C.D/M** The range of addresses given as IPv4 starting address and a mask.
- **not-advertise** Suppress routes that match the range.
- **tag** Tag value to use as a “match” value for controlling redistribution via route maps.
  - `<0-4294967295>` Set a tag value. The default is 0.

Command Mode

Router mode

Examples

The following example uses the summary-address command to aggregate external LSAs that match the network 172.16.0.0/24 and assign a tag value of 3.

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#summary-address 172.16.0.0/16 tag 3
```
timers lsa arrival

This command sets the minimum interval to accept the same link-state advertisement (LSA) from OSPF neighbors. Use the no form of this command to restore the default value.

**Command Syntax**

```
timers lsa arrival <0-600000>
no timers lsa arrival
```

**Parameters**

- `<0-600000>`: The minimum delay in milliseconds between accepting the same LSA from neighbors.

**Default**

1000 milliseconds

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#timers lsa arrival 5000
```
timers throttle lsa

This command sets the rate-limiting intervals for OSPF link-state advertisement (LSA) generation. Use the `no` form of this command to restore the default values.

**Command Syntax**

```
timers throttle lsa all <0-600000> <1-600000> <1-600000>
no timers throttle lsa all
```

**Parameters**

- `<0-600000>`: Start interval: The minimum delay in milliseconds for the generation of LSAs. The first instance of LSA is always generated immediately upon a local OSPF topology change. The generation of the next LSA is not before the start interval.
- `<0-600000>`: Hold interval: The hold time in milliseconds. This value is used to calculate the subsequent rate limiting times for LSA generation.
- `<0-600000>`: Maximum interval: The maximum wait time in milliseconds between generation of the same LSA.

**Defaults**

- Default start interval: 0 milliseconds
- Default hold interval: 5000 milliseconds
- Default maximum interval: 5000 milliseconds

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#timers throttle lsa all 200 10000 45000
```
This chapter provides an alphabetized reference for each of the OSPFv3 commands. It includes the following commands:

- abr-type
- address-family ipv4 unicast
- area default-cost
- area nssa
- area range
- area stub
- area virtual-link
- auto-cost reference bandwidth
- capability cspf
- capability restart
- clear ipv6 ospf process
- debug ipv6 ospf
- debug ipv6 ospf events
- debug ipv6 ospf ifsm
- debug ipv6 ospf lsa
- debug ipv6 ospf nfsm
- debug ipv6 ospf nsm
- debug ipv6 ospf packet
- debug ipv6 ospf route
- default-information originate
- default-metric
- distance
- distribute-list
- enable db-summary-opt
- exit-address-family
- ipv6 ospf dead-interval
- ipv6 ospf display route single-line
- ipv6 ospf hello-interval
- ipv6 ospf link-lsa-suppression
- ipv6 ospf mtu-ignore
- ipv6 ospf neighbor
- ipv6 ospf network
- ipv6 ospf priority
OSPFv3 Commands

- ipv6 ospf restart grace-period
- ipv6 ospf restart helper
- ipv6 ospf retransmit-interval
- ipv6 ospf transmit-delay
- ipv6 router ospf
- max-concurrent-dd
- passive-interface
- redistribute
- restart ipv6 ospf graceful
- router-id
- router ipv6 ospf
- show debugging ipv6 ospf
- show ipv6 ospf
- show ipv6 ospf database
- show ipv6 ospf interface
- show ipv6 ospf neighbor
- show ipv6 ospf route
- show ipv6 ospf topology
- show ipv6 ospf virtual-links
- summary-address
abr-type

Use this command to set an OSPFv3 Area Border Router (ABR) type.

Use the no parameter with this command to revert the ABR type to the default setting (cisco).

Specifying the ABR type allows better functioning in a multi-vendor environment. The ABR types are:

- **Cisco (RFC 3509):** A router is considered an ABR if it has more than one area actively attached and one of them is the backbone area.
- **IBM (RFC 3509):** A router is considered an ABR if it has more than one area actively attached and the backbone area is configured. In this case the configured backbone need not be actively connected.
- **Standard (RFC 2328):** A router is considered an ABR if it has more than one area actively attached to it.

**Command Syntax**

```
abr-type (cisco|ibm|standard)
no abr-type (cisco|ibm|standard)
```

**Parameters**

- **cisco** Specify an alternative ABR using Cisco implementation. This is the default ABR type.
- **ibm** Specify an alternative ABR using IBM implementation.
- **standard** Specify a standard ABR.

**Default**

ABR type Cisco

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#abr-type standard
```
address-family ipv4 unicast

Use this command to enter address family mode where you can configure IPv4 unicast addresses for OSPFv3, including:

- Summarizing intra-area IPv4 routes (**area range** command)
- Create a default external route (**default-information originate** command)
- Redistributing IPv4 routes (**redistribute** command)
- Summarizing IPv4 external routes (**summary-address** command)

RFC 5838 defines the range of instance IDs below to use for each address family in OSPFv3.

<table>
<thead>
<tr>
<th>Instance ID#</th>
<th>Address Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 31</td>
<td>IPv6 unicast</td>
</tr>
<tr>
<td>64 - 95</td>
<td>IPv4 unicast</td>
</tr>
</tbody>
</table>

Multiple router processes can be configured per interface, but only one instance per router per interface can be configured. Each instance ID creates a separate OSPFv3 instance with its own neighbor adjacencies, link state database, and SPF computation. A single IPv4 or IPv6 OSPFv3 process running multiple instances on the same interface is not supported.

To leave the address family mode and return to the configure mode, use the **exit-address-family** command.

Use the **no** form of this command to remove the address-family configuration.

**Command Syntax**

```
address-family ipv4 unicast
no address-family
```

**Parameters**

None

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#address-family ipv4 unicast
```
area default-cost

Use this command to specify the cost for default summary route sent into a stub area. If an area is configured as a stub, the OSPFv3 router originates one type-3 inter-area-prefix-LSA into the stub area. This command changes the metric for this LSA.

Use the no parameter with this command to remove the assigned default cost.

Command Syntax

```
area (A.B.C.D|<0-4294967295>) default-cost <0-16777215>
no area (A.B.C.D|<0-4294967295>) default-cost
```

Parameters

- **A.B.C.D** OSPF Area ID in IPv4 address format.
- **<0-4294967295>** OSPF Area ID as a decimal value.
- **<0-16777215>** The advertised cost for the default summary route used for a stub or NSSA area. The default is 1.

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#area 1 default-cost 10
```
area nssa

Use this command to set an area as a Not-So-Stubby-Area (NSSA). There are no external routes in an OSPF stub area, so you cannot redistribute from another protocol into a stub area. An NSSA allows external routes to be flooded within the area. These routes are then leaked into other areas. However, the external routes from other areas still do not enter the NSSA. You can configure an area to be a stub area or an NSSA, but not both.

This command simplifies administration when connecting a central site using OSPF to a remote site that is using a different routing protocol. You can extend OSPF to cover the remote connection by defining the area between the central router and the remote router as a NSSA.

Use the no form of this command to make an area a normal area.

Command Syntax

area (A.B.C.D|<0-4294967295>) nssa
area (A.B.C.D|<0-4294967295>) nssa {translator-role (candidate|always)|stability-interval <0-2147483647>|no-redistribution|default-information-originate (metric <0-16777214>|metric-type <1-2>|metric <0-16777214> metric-type <1-2>|metric-type <1-2> metric <0-16777214> |)|no-summary}
area (A.B.C.D|<0-4294967295>) nssa (translate-candidate|translate-always)
no area (A.B.C.D|<0-4294967295>) nssa
no area (A.B.C.D|<0-4294967295>) nssa {translator-role|stability-interval|no-redistribution|default-information-originate|no-summary}

Parameters

A.B.C.D  OSPF Area ID in IPv4 address format.
<0-4294967295>  OSPF Area ID as a decimal value.
translator-role

NSSA-ABR translator role:
candidate  Translate NSSA-LSA to Type-5 LSA if router is elected.
always  Always translate NSSA-LSA to Type-5 LSA.
stability-interval

Stability timer for a NSSA area. If an elected translator determines its services are no longer required, it continues to perform its duties for this time interval. This minimizes excess flushing of translated Type-7 LSAs and provides a more stable translator transition.

<0-4294967295>

Stability interval in seconds.
noredistribution

Do not redistribute into the NSSA.
default-information-originate

Originate Type-7 default LSA into the NSSA.
metric

Specify metric for default routes.
<0-16777214>

Specify metric value.
metric-type Specify metric type (see RFC 3101).
<1-2> Specify metric type:
  1: Type 1 external route
  2: Type 2 external route

no-summary Do not inject inter-area routes into the NSSA.

translate-candidate
  Translate NSSA-LSA to Type-5 LSA if router is elected.

translate-always
  Always translate NSSA-LSA to Type-5 LSA.

Command Mode
Router mode

Examples
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#area 3 nssa translator-role candidate no-redistribution
default-information-originate metric 34 metric-type 2
area range

Use this command to configure the OSPF address range. This command summarizes intra-area routes for an area. The single summary route is then advertised to other areas by the Area Border Routers (ABRs). Routing information is condensed at area boundaries and outside the area. If the network numbers in an area are assigned in a way such that they are contiguous, the ABRs can be configured to advertise a summary route that covers all the individual networks within the area that fall into the specified range.

Use the `no` parameter with this command to remove the assigned area range.

**Command Syntax**

```
area (A.B.C.D|<0-4294967295>) range X:X::X:X/M
area (A.B.C.D|<0-4294967295>) range A.B.C.D/M
area (A.B.C.D|<0-4294967295>) range X:X::X:X/M (advertise|not-advertise)
area (A.B.C.D|<0-4294967295>) range A.B.C.D/M (advertise|not-advertise)
no area (A.B.C.D|<0-4294967295>) range X:X::X:X/M
no area (A.B.C.D|<0-4294967295>) range A.B.C.D/M
```

**Parameters**

- **A.B.C.D** OSPF Area ID in IPv4 address format.
- **<0-4294967295>** OSPF Area ID as a decimal value.
- **X:X::X:X/M** The area IPv6 range prefix and length.
- **A.B.C.D/M** The area IPv4 range prefix and length.
- **advertise** Advertises this range.
- **not-advertise** Does not advertise this range.

**Command Mode**

- Router mode
- Router address-family mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#area 1 range 2000::/3

ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf 10
ZebOS(config-router)#router-id 10.10.10.10
ZebOS(config-router)#address-family ipv4 unicast
ZebOS(config-router-af)#area 1 range 10.0.0.0/8
ZebOS(config-router-af)#exit-address-family
```
area stub

Use this command to define an area as a stub area on all routers. There are two stub area router configuration commands: the `stub` and `commands`. In all routers attached to the stub area, configure the area by using the `stub` option of the `area` command. For an area border router (ABR) attached to the stub area, use the `area` command. Use the `no` form of this command to make an area a normal area.

Command Syntax

```
area (A.B.C.D|<0-4294967295>) stub
area (A.B.C.D|<0-4294967295>) stub no-summary
no area (A.B.C.D|<0-4294967295>) stub
no area (A.B.C.D|<0-4294967295>) stub no-summary
```

Parameters

- `A.B.C.D` OSPF Area ID in IPv4 address format.
- `<0-4294967295>` OSPF Area ID as a decimal value.
- `no-summary` Stops an ABR from sending summary link advertisements into the stub area.

Default

No stub area is defined.

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#area 1 stub no-summary
```
area virtual-link

Use this command to configure a link between two backbone areas that are physically separated through other nonbackbone areas.

Use the no parameter with this command to remove the virtual link.

In OSPFv3, all non-backbone areas must be connected to a backbone area. If the connection to the backbone is lost, the virtual link repairs the connection. You can configure virtual links between any two backbone routers that have an interface to a common non-backbone area. The protocol treats these two routers joined by a virtual link as if they were connected by an unnumbered point-to-point network.

Configure the hello-interval to be the same for all routers attached to a common network. If the hello-interval is short, the router detects topological changes faster, but more routing traffic follows.

The retransmit-interval is the expected round-trip delay between any two routers in a network. Set the value to be greater than the expected round-trip delay to avoid needless retransmissions.

The transmit-delay is the time taken to transmit a link state update packet on the interface. Before transmission, the link state advertisements in the update packet are increased by this amount. Set the transmit-delay to be greater than zero. Also, take into account the transmission and propagation delays for the interface.

Command Syntax

```
area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D
area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D (dead-interval|hello-interval|retransmit-interval|transmit-delay) <1-65535>
area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D instance-id <0-255>
no area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D
no area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D (dead-interval|hello-interval|retransmit-interval|transmit-delay)
no area (A.B.C.D|<0-4294967295>) virtual-link A.B.C.D instance-id
```

Parameters

- **A.B.C.D**: OSPF Area ID in IP64 address format.
- **<0-4294967295>**: OSPF Area ID as a decimal value.
- **A.B.C.D**: Specify router ID associated with a virtual link neighbor.
- **dead-interval**: The interval in seconds during which no packets are received and after which the router acknowledges a neighboring router as off-line. The default is 40 seconds.
- **hello-interval**: The interval in seconds the router waits before it sends a hello packet. The default is 10 seconds.
- **retransmit-interval**: The interval in seconds the router waits before it retransmits a packet. The default is 5 seconds.
- **transmit-delay**: The interval in seconds the router waits before it transmits a packet. The default value is 1 second.
- **<1-65535>**: The timer interval.
- **instance-id**: The OSPFv3 instance.
- **<0-255>**: The OSPFv3 instance ID.
**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#area 1 virtual-link 10.10.11.50 hello 5 dead 10
ZebOS(config-router)#area 1 virtual-link 10.10.11.50 instance-id 1
ZebOS(config-router)#area 1 virtual-link 10.10.11.50 fall-over bfd
```
auto-cost reference bandwidth

Use this command to control how OSPFv3 calculates default metrics for the interface.

By default, OSPFv3 calculates the OSPFv3 metric for an interface by dividing the reference bandwidth by the interface bandwidth. The default value for the reference bandwidth is 100Mbps. The auto-cost command is used to differentiate high bandwidth links. For multiple links with high bandwidth, specify a larger reference bandwidth value to differentiate cost on those links.

Use the no form of this command to assign cost based only on the interface bandwidth.

Command Syntax

```
auto-cost reference-bandwidth <1-4294967>
no auto-cost reference-bandwidth
```

Parameters

`<1-4294967>` The reference bandwidth in Mbps per second. The default is 100 Mbps.

Command Mode

Router mode

Default

100 Mbps

Examples

This example changes the reference bandwidth to 1Gbps to change the Fast Ethernet interface cost from 1 to 10.

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf 1
ZebOS(config-router)#auto-cost reference-bandwidth 1000

ZebOS(config)#router ipv6 ospf 1
ZebOS(config-router)#no auto-cost reference-bandwidth
```
**capability cspf**

Use this command to enable the CSPF (Constrained Shortest Path First) feature for an OSPFv2 or OSPFv3 instance. Use the `no` parameter with this command to disable CSPF functionality for the OSPFv2 or OSPFv3 instance.

**Command Syntax**

```
capability cspf
no capability cspf
```

**Parameters**

None

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#no capability cspf
```
**capability restart**

Use this command to enable OSPFv3 graceful restart capability. If a router is not restart-enabled, it cannot enter graceful restart mode and act as a helper.

Use the `no` parameter with this command to disable the feature.

**Command Syntax**

```
capability restart graceful
no capability restart
```

**Parameter**

None

**Default**

Enabled

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf 100
ZebOS(config-router)#capability restart graceful

ZebOS(config)#router ipv6 ospf 100
ZebOS(config-router)#capability restart
```
clear ipv6 ospf process

Use this command to clear and restart all OSPFv3 routing processes or a given OSPFv3 routing process.

**Command Syntax**

```
clear ipv6 ospf (WORD|) process
```

**Parameters**

- **WORD**
  OSPFv3 process tag.

**Command Mode**

Privileged Exec Mode

**Examples**

```
ZebOS#clear ipv6 ospf ipi process
```
**debug ipv6 ospf**

Use this command to specify all debugging options for OSPFv3.

Use the `no` form of this command to disable the options.

**Command Syntax**

```
debug ipv6 ospf (all|events|ifsm|lsa|nfsm|nsm|packet|route)
```

```
no debug ipv6 ospf (all|events|ifsm|lsa|nfsm|nsm|packet|route)
```

```
undebug ipv6 ospf (all|events|ifsm|lsa|nfsm|nsm|packet|route)
```

```
no debug all ipv6 ospf
```

```
undebug all ipv6 ospf
```

```
no debug all
```

```
undebug all
```

**Parameters**

- `all`: Enables all debugging information.
- `events`: Debug OSPFv3 events (see `debug ipv6 ospf events`).
- `ifsm`: Debug OSPFv3 Interface State Machines (see `debug ipv6 ospf ifsm`).
- `lsa`: Debug OSPFv3 Link State Advertisements (see `debug ipv6 ospf lsa`).
- `nfsm`: Debug OSPFv3 Neighbor State Machines (see `debug ipv6 ospf nfsm`).
- `nsm`: Debug OSPFv3 NSM information (see `debug ipv6 ospf nsm`).
- `packet`: Debug OSPFv3 packets (see `debug ipv6 ospf packet`).
- `route`: Debug OSPFv3 route information (see `debug ipv6 ospf route`).

**Command Mode**

Privileged Exec and Configure mode

**Examples**

```
ZebOS#debug ipv6 ospf all
```
**debug ipv6 ospf events**

Use this command to display debug information related to OSPF internal events. Use this command without parameters to turn on all the options.

Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ipv6 ospf events {(abr|asbr|os|router|vlink|nssa)|}
```

```
no debug ipv6 ospf events {(abr|asbr|os|router|vlink|nssa)|}
```

```
undebug ipv6 ospf events {(abr|asbr|os|router|vlink|nssa)|}
```

**Parameters**

- `abr` Debug ABR events
- `asbr` Debug ASBR events
- `os` Debug OS interaction events
- `router` Debug other router events
- `vlink` Debug virtual link events
- `nssa` Debug NSSA events

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#no debug ipv6 ospf events abr
ZebOS#debug ipv6 ospf events asbr
```
debug ipv6 ospf ifsm

Use this command to specify debugging options for OSPFv3 Interface Finite State Machine (IFSM) troubleshooting. Use the no parameter with this command to disable this function.

**Command Syntax**

```
debug ipv6 ospf ifsm ({events|status|timers}|

no debug ipv6 ospf ifsm ({events|status|timers}|
undebug ipv6 ospf ifsm ({events|status|timers}|

Parameters

- **events**: Debug IFSM event information.
- **status**: Debug IFSM status information.
- **timers**: Debug IFSM timer information.

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#debug ipv6 ospf ifsm status
```
**debug ipv6 ospf lsa**

Use this command to specify the debugging options for OSPFv3 ZebOS Link State Advertisements (LSAs). Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ipv6 ospf lsa {(generate|flooding|install|maxage|refresh)}

no debug ipv6 ospf lsa {(generate|flooding|install|maxage|refresh)}
undebug ipv6 ospf lsa {(generate|flooding|install|maxage|refresh)}
```

**Parameters**

- `generate` Debug LSA generation.
- `flooding` Debug LSA flooding.
- `install` Debug LSA installation.
- `maxage` Debug the maximum age processing.
- `refresh` Debug LSA refresh.

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#debug ipv6 ospf lsa
```
**debug ipv6 ospf nfsm**

Use this command to specify debugging options for OSPFv3 Neighbor Finite State Machines (NFSMs). Use the `no` parameter with this command to disable this function.

**Command Syntax**

```
debug ipv6 ospf nfsm {(events|status|timers)}
```

```
no debug ipv6 ospf nfsm {(events|status|timers)}
undebug ipv6 ospf nfsm {(events|status|timers)}
```

**Parameters**

- `events`        Debug NFSM event information.
- `status`        Debug NFSM status information.
- `timers`        Debug NFSM timer information.

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#debug ipv6 ospf nfsm events
ZebOS#no debug ipv6 ospf nfsm timers
```
debug ipv6 ospf nsm

Use this command to specify the debugging options for OSPFv3 NSM information. Use the no parameter with this command to disable this function.

Command Syntax

```
debug ipv6 ospf nsm {(interface|redistribute)}
```

```
no debug ipv6 ospf nsm {(interface|redistribute)}
```

```
undebug ipv6 ospf nsm {(interface|redistribute)}
```

Parameters

- redistribute
  - Debug ZebOS redistribute.
- interface
  - Debug the NSM interface.

Command Mode

Privileged Exec mode and Configure mode

Examples

```
ZebOS#debug ipv6 ospf nsm interface
```
**debug ipv6 ospf packet**

Use this command to specify the packet debugging options for OSPFv3 ZebOS information.

Use the `no` parameter with this command to disable this function.

**Command Syntax**
```
debug ipv6 ospf packet ({hello|dd|ls-request|ls-update|ls-ack|send|recv|detail})
```
```
no debug ipv6 ospf packet ({hello|dd|ls-request|ls-update|ls-ack|send|recv|detail})
```
```
unddebug ipv6 ospf packet ({hello|dd|ls-request|ls-update|ls-ack|send|recv|detail})
```

**Parameters**
- `hello`  
  Debug OSPFv3 hello.
- `dd`  
  Debug OSPFv3 database description.
- `ls-request`  
  Debug OSPFv3 link state request.
- `ls-update`  
  Debug OSPFv3 link state update.
- `ls-ack`  
  Debug OSPFv3 link state acknowledgment.
- `send`  
  Debug packets sent.
- `recv`  
  Debug packets received.
- `detail`  
  Debug detail information.

**Command Mode**
Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#debug ipv6 ospf packet ls-request
```
**debug ipv6 ospf route**

Use this command to specify which route calculation to debug. Use this command without parameters to turn on all the options.

Use the **no** parameter with this command to disable this function.

**Command Syntax**

```
debug ipv6 ospf route {(ase|ia|install|spf)}
```

```
no debug ipv6 ospf route {(ase|ia|install|spf)}
undo debug ipv6 ospf route {(ase|ia|install|spf)}
```

**Parameters**

- **ase**
  - Debug external route calculations.
- **ia**
  - Debug inter-area route calculations.
- **install**
  - Debug the route installation.
- **spf**
  - Debug the SPF calculation.

**Command Mode**

Privileged Exec mode and Configure mode

**Examples**

```
ZebOS#no debug ipv6 ospf route
ZebOS#debug ipv6 ospf route ia
```
default-information originate

Use this command to create a default external route into an OSPF routing domain.

The system acts like an Autonomous System Boundary Router (ASBR) when you use the default-information originate command to redistribute routes into an OSPF routing domain. An ASBR does not by default generate a default route into the OSPF routing domain.

When you give the default-information originate command, also specify a route-map to avoid a dependency on the default network in the routing table.

Use the no parameter with this command to disable this feature.

Command Syntax

default-information originate

default-information originate {metric <0-16777214>|metric-type (1|2)|route-map WORD|always}

no default-information originate

no default-information originate {metric|metric-type|route-map|always}

Parameters

always Used to advertise the default route regardless of whether there is a default route.

metric Sets the OSPF metric used in creating the default route.

<0-16777214> Sets the OSPF metric used in creating the default route. The default metric value is 10. The value used is specific to the protocol.

metric-type The external link type associated with the default route advertised into the OSPF routing domain (see RFC 3101).

1 Sets OSPF External Type 1 metric.

2 Sets OSPF External Type 2 metric (default).

route-map Route map.

WORD Specify the name of route map.

Command Mode

Router mode

Router address-family mode

Examples

ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#default-information originate always metric 23 metric-type 2 route-map myinfo

ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#no default-information originate metric metric-type route-map
default-metric

Use this command to set a default metric for OSPF.

A default metric facilitates redistributing routes with incompatible metrics. If the metrics do not convert, the default metric provides an alternative. Use this command to use the same metric value for all redistributed routes. Use this command in conjunction with redistribute

Use the no parameter with this command to return to the default state.

Command Syntax

```
default-metric <1-16777214>
no default-metric
no default-metric <1-16777214>
```

Parameter

```
<1-16777214> Default metric value.
```

Default

 Built-in, automatic metric translations, as appropriate for each routing protocol.

Command Mode

Router mode

Examples

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#default-metric 100
```
distance

Use this command to define OSPFv3 route administrative distances based on route type. This command sets the distance for an entire group of routes rather than a specific route that passes an access list.

The administrative distance rates the trustworthiness of a routing information source. A higher distance value means a lower trust rating. For example, an administrative distance of 254 means that the routing information source cannot be trusted and should be ignored.

Use the no form of this command to restore the default value.

Command Syntax

```
distance <1-254>
distance ospfv3 {intra-area <1-254>|inter-area <1-254>|external <1-254>}
no distance <1-254>
no distance ospfv3
```

Parameters

- `<1-254>`: Used alone, this parameter specifies a default administrative distance used when no other specification exists for a routing information source.
- `intra-area`: Routes within an area.
  - `<1-254>`: Distance for all routes within an area
- `inter-area`: Routes from one area to another area.
  - `<1-254>`: Distance for all routes from one area to another area.
- `external`: Routes from other routing domains learned by redistribution.
  - `<1-254>`: Distance for routes from other routing domains learned by redistribution.

Command Mode

Router mode

Example

```
ZebOS#configure terminal
ZebOS(config)#router ospf 100
ZebOS(config-router)#distance ospfv6 inter-area 20 intra-area 10 external 40
```
**distribute-list**

Use this command to filter networks in routing updates. This command redistributes other routing protocols into the OSPF routing table.

Use the `no` parameter with this command to disable this function.

**Command Syntax**

```plaintext
distribute-list WORD out ((kernel|connected|static|rip|bgp|isis|ospf (WORD|<1-65535>|)))
distribute-list WORD in
no distribute-list WORD out ((kernel|connected|static|rip|bgp|isis|ospf (WORD|<1-65535>|)))
no distribute-list WORD in
```

**Parameters**

- **WORD**
  - Specify the name of the access list.
- **in**
  - Filter incoming routing updates.
- **out**
  - Filter outgoing routing updates.
- **kernel**
  - Specify kernel routes.
- **connected**
  - Specify connected routes.
- **static**
  - Specify static routes.
- **rip**
  - Specify RIP routes.
- **bgp**
  - Specify BGP routes.
- **isis**
  - Specify IS-IS routes.
- **ospf**
  - Specify OSPF routes. If a subparameter is not specified, this command redistributes all running OSPF processes.
  - **WORD**
    - Specify the OSPF process tag.
  - **<1-65535>**
    - Specify OSPF process ID <1-65535>.

**Command Mode**

Router mode

**Examples**

The following example shows the distribution of BGP routing updates based on the access list `list1 (network 172.10.0.0),`

```plaintext
ZebOS#configure terminal
ZebOS(config)#access-list list1 permit 172.10.0.0/16
ZebOS(config)#router ipv6 ospf 100
ZebOS(config-router)#distribute-list list1 out bgp
ZebOS(config-router)#redistribute bgp
```
enable db-summary-opt

Use this command to enable the database summary list optimization for OSPFv3.

When this feature is enabled, the database exchange process is optimized by removing the LSA from the database summary list for the neighbor if the LSA instance in the summary list is the same as or less recent than the LSA in the database description packet received from the neighbor.

Use the no form of the command to disable database summary list optimization.

**Command Syntax**

```
enable db-summary-opt
no enable db-summary-opt
```

**Parameters**

None

**Default**

Disabled

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ospf
ZebOS(config-router)#enable db-summary-opt
ZebOS(config-router)#no enable db-summary-opt
```
exit-address-family

Use this command to exit address-family mode and return to router mode.

Command Syntax

```
exit-address-family
```

Parameters

None

Default

Disabled

Command Mode

Router address-family mode

Examples

```
ZebOS # configure terminal
ZebOS (config) # router ipv6 ospf 10
ZebOS (config-router) # router-id 10.10.10.10
ZebOS (config-router) # address-family ipv4 unicast
ZebOS (config-router-af) # area 1 range 10.0.0.0/8
ZebOS (config-router-af) # exit-address-family
```
**ipv6 ospf cost**

Use this command to specify the link-cost described in LSAs.

The cost (or metric) of an interface in OSPF indicates the overhead required to send packets across a certain interface. The value is taken to describe Link State information, and used for route calculation.

Use the `no` parameter with this command to reset the cost to default.

**Command Syntax**

```plaintext
ipv6 ospf cost <1-65535>
ipv6 ospf cost <1-65535> instance-id <0-255>
no ipv6 ospf cost
no ipv6 ospf cost instance-id <0-255>
```

**Parameters**

- **cost**  
  Specify the link-state metric.
- `<1-65535>`  
  Specify the link-state metric. The default value is 10.
- **instance-id**  
  Specify the instance.
- `<0-255>`  
  Specify the instance ID.

**Command Mode**

Interface mode

**Examples**

```plaintext
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf cost 20 instance-id 1
```
**ipv6 ospf dead-interval**

Use this command to set the amount of time that the router waits to receive an OSPF hello packet from the neighbor before declaring the neighbor down.

The dead interval is advertised in hello packets. OSPF compares the dead interval in a received packet to the dead interval configured for the receiving interface. If the intervals do not match, the hello packet is discarded.

Use the **no** parameter with this command to reset the interval to default.

**Command Syntax**

```
ipv6 ospf dead-interval <1-65535>
ipv6 ospf dead-interval <1-65535> instance-id <0-255>
no ipv6 ospf dead-interval
no ipv6 ospf dead-interval instance-id <0-255>
```

**Parameters**

- **dead-interval**  
  Specify the interval.
  
  `<1-65535>`  
  Specify the interval in seconds. The default is 40 seconds.

- **instance-id**  
  Specify the instance.
  
  `<0-255>`  
  Specify the instance ID.

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf dead-interval 20
```
**ipv6 ospf display route single-line**

Use this command to display the output of the `show ipv6 ospf route` command with each route entry in a single-line.

Use the `no` parameter with this command to revert to default.

**Command Syntax**

```
ipv6 ospf display route single-line
no ipv6 ospf display route single-line
```

**Parameters**

None

**Default**

By default, the `show ipv6 ospf route` command displays routes in multiple lines.

**Command Mode**

Configure mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#ipv6 ospf display route single-line
```
**ipv6 ospf hello-interval**

Use this command to specify the interval between hello packets.

The hello interval is advertised in the hello packets. An OSPF router compares the hello interval in a received packet to the interval configured for the receiving interface. If this interval does not match, the hello packet is discarded. A shorter hello interval ensures faster detection of topological changes, but results in more routing traffic.

Use the **no** parameter with this command to reset the interval to default.

**Command Syntax**

```
ipv6 ospf hello-interval <1-65535>
ipv6 ospf hello-interval <1-65535> instance-id <0-255>
no ipv6 ospf hello-interval
no ipv6 ospf hello-interval instance-id <0-255>
```

**Parameters**

- **hello-interval** Specify the interval.
  - `<1-65535>` Specify the interval in seconds. The default is 10 seconds.
- **instance-id** Specify the instance.
  - `<0-255>` Specify the instance ID.

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf hello-interval 5 instance-id 1
```
**ipv6 ospf link-lsa-suppression**

Use this command to enable or disable link LSA (type 8) suppression. A type 8 LSA gives information about link-local addresses and a list of IPv6 addresses on the link.

If enabled and the interface type is *not* broadcast or NBMA, the router does not send type 8 link LSAs. This implies that other routers on the link determine the router's next-hop address using a mechanism other than the type 8 link LSA. This feature is implicitly disabled if the interface type is broadcast or NBMA.

**Command Syntax**

```
ipv6 ospf link-lsa-suppression (enable|disable)
ipv6 ospf link-lsa-suppression (enable|disable) instance-id <0-255>
```

**Parameters**

- `enable`: Enable type 8 link LSA suppression
- `disable`: Disable type 8 link LSA suppression (default).
- `<0-255>`: Interface instance identifier.

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf link-lsa-suppression enable
```
**ipv6 ospf mtu-ignore**

Use this command to configure OSPF so that it does not check the MTU size during DD (Database Description) exchange.

By default, during the DD exchange process, OSPF checks the MTU size described in DD packets received from its neighbor. If the MTU size does not match the interface MTU, the neighbor adjacency is not established. Using this command makes OSPF ignore this check and allows establishing of adjacency regardless of MTU size in the DD packet.

Use the `no` form of this command to make OSPF check the MTU size during DD exchange.

**Command syntax**

```
ipv6 ospf mtu-ignore
no ipv6 ospf mtu-ignore
```

**Parameters**

None

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
ZebOS(config)#int eth1
ZebOS(config-if)#ipv6 ospf mtu-ignore
```
ipv6 ospf neighbor

Use this command to connect OSPFv3 routers to non-broadcast multi-access (NBMA) networks.

One neighbor entry must be included for each known NBMA neighbor. The neighbor address must be a link-local address.

Note: For point-to-multipoint interfaces, the cost parameter is the only applicable option.

Use the no parameter with this command to remove a configuration.

Command Syntax

ipv6 ospf neighbor X:X::X:X (instance-id <0-255>|)
ipv6 ospf neighbor X:X::X:X {cost <1-65535>} (instance-id <0-255>|)
ipv6 ospf neighbor X:X::X:X {poll-interval <0-4294967295>|priority <0-255>} (instance-id <0-255>|)
no ipv6 ospf neighbor X:X::X:X ({cost <1-65535>}|{poll-interval <0-4294967295>}|priority <0-255>}|) (instance-id <0-255>|)

Parameters

X:X::X:X Specify a neighbor IP address.
instance-id Specify the instance.
<0-255> Specify the instance ID.
cost Cost of the interface. This parameter does not apply to NBMA networks.
<1-65535> Cost of the interface. The default is 10.
poll-interval Dead neighbor polling interval.
<0-4294967295> Dead neighbor polling interval in seconds. It is recommended to set this value much higher than the hello interval. The default is 120 seconds.
priority Specify a priority. This parameter does not apply to point-to-multipoint interfaces.
<0-255> Specify a priority <0-255>. The default is 1.

Command Mode

Interface mode

Examples

ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf neighbor 2000:500::1 cost 2 instance-id 3
**ipv6 ospf network**

Use this command to set an OSPFv3 network type.
Use the no option with this command to return to the default value.

**Command Syntax**

```
ipv6 ospf network (broadcast|non-broadcast|point-to-multipoint (non-broadcast|)|point-to-point) (instance-id <0-255>)
```

```
o ipv6 ospf network (broadcast|non-broadcast|point-to-multipoint (non-broadcast|)|point-to-point) (instance-id <0-255>)
```

**Parameters**

- **broadcast** Sets the network type to broadcast.
- **non-broadcast** Sets the network type to NBMA.
- **point-to-multipoint** Sets the network type to point-to-multipoint.
  - **non-broadcast** Sets the network type to NBMA.
- **point-to-point** Sets the network type to point-to-point.
- **instance-id** Specify the instance.
- **<0-255>** Specify the instance ID.

**Default**

Broadcast type

**Command Mode**

Interface mode

**Examples**

The following example shows how to set the network to point-to-point type on the eth0 interface.

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf network point-to-point
```
**ipv6 ospf priority**

Use this command to set the router priority for determining the designated router (DR) for the network.

A router with the higher router priority becomes the DR. If the priority is the same for two routers, the router with the higher router ID takes precedence.

Only routers with a nonzero priority value are eligible to become the designated or backup designated router. Configure router priority for broadcast or NBMA networks only and not for point-to-point networks.

Use the `no` parameter with this command to reset the value to default.

**Command Syntax**

```
ipv6 ospf priority <0-255>
ipv6 ospf priority <0-255> instance-id <0-255>
no ipv6 ospf (A.B.C.D) priority
no ipv6 ospf priority instance-id <0-255>
```

**Parameters**

- `priority`<0-255> Specify the router priority of the interface.
- `instance-id`<0-255> Specify the instance ID.

**Default**

The default priority is 1.

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf priority 127
```
**ipv6 ospf restart grace-period**

Use this command to enable the graceful restart feature and set the grace period for restarting the router. If graceful restart is enabled, NSM is notified about the grace period. If the OSPF daemon unexpectedly shuts down, NSM sends this value to the OSPF daemon when it comes up again which uses this value to end the graceful state. Use the `no` parameter with this command to revert to the default grace period.

**Command Syntax**

```
ipv6 ospf restart grace-period <1-1800>
no ipv6 ospf restart grace-period
```

**Parameters**

- `grace-period` \( <1-1800> \)
  - Specify the grace period.

**Default**

The default grace period is 120 seconds.

**Command Mode**

Configure mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#ipv6 ospf restart grace-period 250
```
**ipv6 ospf restart helper**

Use this command to configure the helper behavior for graceful restart.

Use the `no` parameter with this command to revert to the default.

**Command Syntax**

```
ipv6 ospf restart helper {only-reload|only-upgrade|max-grace-period <1-1800>}
ipv6 ospf restart helper never (router-id A.B.C.D)
no ipv6 ospf restart helper
no ipv6 ospf restart helper never
no ipv6 ospf restart helper {only-reload|only-upgrade|max-grace-period|never router-id (A.B.C.D|all)}
```

**Parameters**

- `only-reload`  
  Help only on software reloads.

- `only-upgrade`  
  Help only on software upgrades.

- `max-grace-period`  
  Help only if received grace-period is less than this value.

- `<1-1800>`  
  Help only if received grace-period is less than this value.

- `never`  
  Prevent the neighbor from entering helper mode.

- `router-id`  
  Router of neighbor to never to act as helper.

- `A.B.C.D`  
  Router ID of neighbor to never to act as helper.

**Command Mode**

Configure mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#ipv6 ospf restart helper never router-id 1.1.1.1

ZebOS#configure terminal
ZebOS(config)#ipv6 ospf restart helper only-reload

ZebOS#configure terminal
ZebOS(config)#ipv6 ospf restart helper only-reload max-grace-period 200

ZebOS#configure terminal
ZebOS(config)#no ipv6 ospf restart helper never
```
**ipv6 ospf retransmit-interval**

Use this command to set the interval between retransmission of Link State Update packets. This interval is also used to retransmit DD packets and Link State Request packets.

After sending an LSA to a neighbor, the router keeps the LSA on the LS-retransmission list until it receives an acknowledgement. If the router does not receive an acknowledgment from the neighbor during the retransmit interval, it sends the LSA to the neighbor again.

Use the no parameter with this command to reset the interval to the default value.

**Command Syntax**

- `ipv6 ospf retransmit-interval <1-65535>`
- `ipv6 ospf retransmit-interval <1-65535> instance-id <0-255>`
- `no ipv6 ospf retransmit-interval`
- `no ipv6 ospf retransmit-interval instance-id <0-255>`

**Parameters**

- `retransmit-interval`  
  Specify the interval.
- `<1-65535>`  
  Specify the interval in seconds. The default is 5 seconds.
- `instance-id`  
  Specify the instance.
- `<0-255>`  
  Specify the instance ID.

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf retransmit-interval 3
```
**ipv6 ospf transmit-delay**

Use this command to set the estimated time it takes to transmit a Link State Update packet over the interface. The transmit-delay value is added to the LS age of LSAs and is advertised through this interface whenever the LSAs are transmitted.

Use the `no` parameter with this command to reset the delay to the default value.

**Command Syntax**

```plaintext
ipv6 ospf transmit-delay <1-65535>
ipv6 ospf transmit-delay <1-65535> instance-id <0-255>
no ipv6 ospf transmit-delay
no ipv6 ospf transmit-delay instance-id <0-255>
```

**Parameters**

- `transmit-delay`: Specify the time to transmit a link-state update.
  - `<1-65535>`: Specify the time in seconds to transmit a link-state update. The default is 1 second.
- `instance-id`: Specify the instance.
  - `<0-255>`: Specify the instance ID.

**Command Mode**

Interface mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 ospf transmit-delay 2
```
ipv6 router ospf

Use this command to enable OSPFv3 routing on an interface.

Specify the process ID to configure multiple instances of OSPFv3. When running a single instance of OSPFv3, you do not need to specify a instance ID.

When OSPFv3 receives a packet, it checks if the instance ID in the packet matches the instance ID of the receiving interface.

Use the no parameter with this command to disable OSPFv3 routing on an interface.

Command Syntax

ipv6 router ospf area (A.B.C.D|<0-4294967295>)
ipv6 router ospf area (A.B.C.D|<0-4294967295>) instance-id <0-255>
ipv6 router ospf area (A.B.C.D|<0-4294967295>) tag WORD
ipv6 router ospf area (A.B.C.D|<0-4294967295>) tag WORD instance-id <0-255>
ipv6 router ospf tag WORD area (A.B.C.D|<0-4294967295>)
ipv6 router ospf tag WORD area (A.B.C.D|<0-4294967295>) instance-id <0-255>
no ipv6 router ospf area (A.B.C.D|<0-4294967295>)
no ipv6 router ospf area (A.B.C.D|<0-4294967295>) instance-id <0-255>
no ipv6 router ospf area (A.B.C.D|<0-4294967295>) tag WORD
no ipv6 router ospf area (A.B.C.D|<0-4294967295>) tag WORD instance-id <0-255>
no ipv6 router ospf tag WORD area (A.B.C.D|<0-4294967295>)
no ipv6 router ospf tag WORD area (A.B.C.D|<0-4294967295>) instance-id <0-255>

Parameters

area OSPF Area ID in IPv4 address format.
A.B.C.D OSPF area ID in IP address format.
<0-4294967295> OSPF area ID as a decimal value.
instance-id Specify the instance.
<0-255> Specify the instance ID.
tag Tag value to use as a "match" value for controlling redistribution via route maps.
WORD Set the tag value.

Command Mode

Interface mode

Examples

ZebOS#configure terminal
ZebOS(config)#interface eth0
ZebOS(config-if)#ipv6 router ospf area 1 tag IPI instance-id 1
max-concurrent-dd

Use this command to limit the number of Database Descriptors (DD) that can be processed concurrently. This command is useful when a router’s performance is affected from simultaneously bringing up several OSPFv3 adjacencies. This command limits the maximum number of DD exchanges that can occur concurrently per OSPFv3 instance, thus allowing for all of the adjacencies to come up.

Use the no option with this command to remove the limit.

Command Syntax

```
max-concurrent-dd <1-65535>
no max-concurrent-dd
```

Parameters

<1-65535> Specify the number of DD processes.

Command Mode

Router mode

Examples

The following example set the max-concurrent-dd value to 4.

```
ZebOS(config-router)#max-concurrent-dd 4
```
**passive-interface**

Use this command to suppress sending Hello packets on all interfaces, or on a specified interface.

This command configures OSPFv3 on simplex Ethernet interfaces. Since a simplex interface represents only one network segment between two devices, configure the transmitting interface as a passive interface. This ensures that OSPFv3 does not send hello packets for the transmitting interface. Both the devices can see each other via the hello packet generated for the receiving interface.

Use the **no** form with this command to resume sending **hello** packets on all interfaces, or on a specified interface.

**Command Syntax**

```
passive-interface (IFNAME |)
no passive-interface (IFNAME |)
```

**Parameters**

- **IFNAME**
  - Specify an interface name

**Command Mode**

Router mode

**Examples**

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#passive-interface eth0
```
**redistribute**

Use this command to import routes from other routing protocols, or from another OSPF instance, into OSPFv3 AS-external-LSAs.

OSPFv3 advertises routes learned from other routing protocols or from other OSPF instances, including static or connected routes. Each injected prefix is put into the AS-external-LSA with a specified metric and metric-type.

Use the `no` parameter with this command to stop redistribution.

**Command Syntax**

```
redistribute (kernel|connected|static|rip|bgp|isis|ospf (WORD|<1-65535>|)) {metric <0-16777214>|metric-type (1|2)|?route-map WORD|tag <0-4294967295>}

no redistribute(kernel|connected|static|rip|bgp|isis|ospf (WORD|))
```

**Parameters**

- **kernel** Specify kernel routes.
- **connected** Specify connected routes.
- **static** Specify static routes.
- **rip** Specify RIP routes.
- **bgp** Specify BGP routes.
- **isis** Specify IS-IS routes.
- **ospf** Specify OSPF routes.
- **WORD** Specify an OSPFv3 Process Tag
- **<1-65535>** Specify an OSPF process identifier
- **metric** Specify the external metric.
- **<0-1677214>** Specify the external metric.
- **metric-type** Specify the external metric-type (see RFC 3101):
  - **1** Set OSPF External Type 1 metric.
  - **2** Set OSPF External Type 2 metric.
- **route-map** Specify a route map reference.
- **WORD** Specify name of the route-map.
- **tag** Tag value to use as a “match” value for controlling redistribution via route maps
- **<0-4294967295>** Specify the route tag.

**Command Mode**

Router mode

Router address-family mode

**Examples**

The following example shows redistribution of BGP routes into the OSPFv3 routing table, with the metric as 10.
The following example shows redistribution of static IPv4 routes into the OSPFv3 routing table.

ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#address-family ipv4 unicast
ZebOS(config-router-af)#redistribute static
ZebOS(config-router-af)#exit-address-family
**restart ipv6 ospf graceful**

Use this command to restart OSPFv3 gracefully.

After this command is executed, the router immediately shuts down. NSM is notified that OSPF has shut down gracefully. NSM preserves routes installed by OSPF until the grace period expires.

**Command Syntax**

```
restart ipv6 ospf graceful (grace-period <1-1800> |)
```

**Parameters**

- `grace-period`: Specify a grace period.
- `<1-1800>`: Specify a grace period in seconds.

**Command Mode**

Privileged Exec mode and Exec mode

**Examples**

```
ZebOS#restart ipv6 ospf graceful grace-period 200
```
**router-id**

Use this command to specify a router ID for the OSPFv3 process.

Configure each router with a unique router-id. In an OSPFv3 router process that has active neighbors, a new router-id is used at the next reload or when you start the OSPFv3 manually.

Use the **no** form of this command to force OSPFv3 to stop the routing functionality.

**Command Syntax**

```
router-id A.B.C.D
no router-id (A.B.C.D|)
```

**Parameters**

A.B.C.D Specify the router ID in IPv4 address format.

**Command Mode**

Router mode

**Examples**

The following example shows a fixed router ID 43.3.3.3

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#router-id 43.3.3.3
```
**router ipv6 ospf**

Use this command to initiate OSPFv3 routing process and enter Router mode to configure OSPFv3 routing process. For making the OSPFv3 routing process functional, you must specify OSPFv3 process tag in router mode and enable OSPFv3 on at least one interface. OSPFv3 is only enabled on interfaces where OSPFv3 process tag matches the tag specified using ipv6 router ospf area command in Interface mode.

Use the `no` parameter with this command to remove OSPFv3 process.

**Command Syntax**

```
    router ipv6 ospf
    router ipv6 ospf WORD
    no router ipv6 ospf
    no router ipv6 ospf WORD
```

**Parameters**

- `WORD`  
  Tag value to use as a “match” value for controlling redistribution via route maps.

**Command Mode**

Configure mode

**Examples**

```
    ZebOS#configure terminal
    ZebOS(config)#router ipv6 ospf IPI
    ZebOS(config-router)#
```
show debugging ipv6 ospf

Use this command to display the OSPFv3 debugging options.

**Command Syntax**

```
show debugging ipv6 ospf
```

**Parameters**

None

**Command Mode**

Exec mode and Privileged Exec mode

**Examples**

```
ZebOS#show debugging ipv6 ospf

OSPFv3 debugging status:
 OSPFv3 all packet debugging is on
 OSPFv3 all NFSM debugging is on
ZebOS#
```
show ipv6 ospf

Use this command to display global and area information about OSPFv3.

Command Syntax

    show ipv6 ospf (WORD|

Parameters

    WORD  Tag value to use as a "match" value for controlling redistribution via route maps.

Command Mode

Privileged Exec mode and Exec Mode

Example

    ZebOS#show ipv6 ospf
    Routing Process "OSPFv3 0" with ID 1.2.3.4
    SPF schedule delay 5 secs, Hold time between SPFs 10 secs Minimum LSA interval 5 secs,
    Minimum LSA arrival 1 secs Number of external LSA 3. Checksum Sum 0x2CD6F
    Number of areas
    in this router is 1
    Area BACKBONE(0)
    Number of interfaces in this area is 1
    SPF algorithm executed 3 times
    Number of LSA 4. Checksum Sum 0x2A6AC
**show ipv6 ospf database**

Use this command to display information in the OSPFv3 Link State database.

**Command Syntax**

```
show ipv6 ospf database
show ipv6 ospf database (self-originate|max-age|adv-router A.B.C.D)
show ipv6 ospf database (router|network|inter-prefix|inter-router|external|nssa-external|link|intra-prefix|grace)
show ipv6 ospf database (router|network|inter-prefix|inter-router|external|nssa-external|link|intra-prefix|grace) (self-originate|adv-router A.B.C.D)
show ipv6 ospf database (router|network|inter-prefix|inter-router|external|nssa-external|link|intra-prefix|grace) A.B.C.D (self-originate|adv-router A.B.C.D)
show ipv6 ospf WORD database
show ipv6 ospf WORD database (router|network|inter-prefix|inter-router|external|nssa-external|link|intra-prefix|grace)
show ipv6 ospf WORD database (router|network|inter-prefix|inter-router|external|nssa-external|link|intra-prefix|grace) adv-router A.B.C.D
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>self-originate</td>
<td>Self-originated link states</td>
</tr>
<tr>
<td>max-age</td>
<td>LSAs in MaxAge list</td>
</tr>
<tr>
<td>adv-router</td>
<td>Advertising router as an IP address.</td>
</tr>
<tr>
<td>A.B.C.D</td>
<td>Router ID of the advertising router.</td>
</tr>
<tr>
<td>router</td>
<td>Router LSAs.</td>
</tr>
<tr>
<td>network</td>
<td>Network LSAs.</td>
</tr>
<tr>
<td>inter-prefix</td>
<td>Inter-Area-Prefix LSAs.</td>
</tr>
<tr>
<td>inter-router</td>
<td>Inter-Area-Router LSAs.</td>
</tr>
<tr>
<td>external</td>
<td>AS external LSAs.</td>
</tr>
<tr>
<td>nssa-external</td>
<td>NSSA LSAs.</td>
</tr>
<tr>
<td>link</td>
<td>Link LSAs.</td>
</tr>
<tr>
<td>intra-prefix</td>
<td>Intra-Area-Prefix LSAs.</td>
</tr>
<tr>
<td>grace</td>
<td>Grace LSAs.</td>
</tr>
<tr>
<td>A.B.C.D</td>
<td>Link state ID as an IP address.</td>
</tr>
<tr>
<td>WORD</td>
<td>Tag value to use as a “match” value for controlling redistribution via route maps.</td>
</tr>
</tbody>
</table>

**Command Mode**

Privileged Exec mode and Exec Mode

**Example**

This is a sample output from the `show ipv6 ospf database grace` command displaying the database summary for a specific LSA in the OSPFv3 database:
ZebOS#show ipv6 ospf database grace
OSPFv3 Router with ID (45.45.45.1) (Process *null*)

Grace-LSA (Interface eth1)
  LS age: 2
  LS Type: Grace LSA
  Link State ID: 0.0.0.3
  Advertising Router: 99.99.99.1
  LS Seq Number: 0x80000001
  Checksum: 0x9046
  Length: 36
show ipv6 ospf interface

Use this command to display OSPFv3 interface information.

**Command Syntax**

```
show ipv6 ospf interface
show ipv6 ospf interface IFNAME
```

**Parameters**

- **IFNAME**
  
  The name of the interface.

**Command Mode**

Privileged Exec mode and Exec mode

**Usage**

This is a sample output from the `show ipv6 ospf interface` command displaying the OSPFv3 interface information:

```
ZebOS#show ipv6 ospf interface
eth0 is up, line protocol is up
  Interface ID 3, Instance ID 0, Area 0.0.0.0
  IPv6 Link-Local Address fe80::248:54ff:fec0:f32d/10
  Router ID 1.2.3.4, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State Backup, Priority 1
  Designated Router (ID) 5.6.7.8
  Interface Address fe80::203:47ff:fe4c:776e
  Backup Designated Router (ID) 1.2.3.4
  Interface Address fe80::248:54ff:fec0:f32d
  Timer interval configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:01
  Neighbor Count is 1, Adjacent neighbor count is 1
```
show ipv6 ospf neighbor

Use this command to display information about an OSPFv3 neighbor.

Command Syntax

show ipv6 ospf neighbor
show ipv6 ospf WORD neighbor
show ipv6 ospf neighbor INTERFACE
show ipv6 ospf WORD neighbor INTERFACE
show ipv6 ospf neighbor INTERFACE detail
show ipv6 ospf WORD neighbor INTERFACE detail
show ipv6 ospf neighbor detail
show ipv6 ospf WORD neighbor detail
show ipv6 ospf neighbor A.B.C.D
show ipv6 ospf WORD neighbor A.B.C.D

Parameters

WORD  Tag value to use as a “match” value for controlling redistribution via route maps.
INTERFACE  Display the name of the Interface
A.B.C.D  Neighbor IP address.
detail  Details of neighbors

Command Mode

Privileged Exec mode and Exec Mode

Example

This is a sample output from the show ipv6 ospf neighbor command displaying information about the OSPFv3 neighbor.

ZebOS#show ipv6 ospf neighbor
OSPFv3 Process (*null*)
Neighbor ID Pri State Dead Time Interface Instance ID
5.6.7.8 1 Full/DR 00:00:38 eth0 0
show ipv6 ospf route

Use this command to display the IPv6 routing table for OSPFv3.

**Command Syntax**

```
show ipv6 ospf route
show ipv6 ospf WORD route
```

**Parameters**

**WORD**
Tag value to use as a “match” value for controlling redistribution via route maps.

**Command Mode**

Privileged Exec mode and Exec mode

**Example**

The routes can be displayed in two ways. One shows each routing entry in a single-line, the other in multi-line. By default, the routing table is displayed in the multi-line format, for a single line display use the ipv6 ospf display route single-line. The following is a sample output for a routing display in single-line and multi-line formats:

```
ZebOS#show ipv6 ospf route
Destination Metric Next-hop
3ffe:1:1::/48 10 directly connected, eth0
3ffe:2:1::/48 10 directly connected, eth0
3ffe:2:2::/48 10 directly connected, eth0
3ffe:3:1::/48 10 directly connected, eth0
3ffe:3:2::/48 10 directly connected, eth0
3ffe:3:3::/48 10 directly connected, eth0
E2 3ffe:100:1::1/128 10/20 via fe80::203:47ff:fe4c:776e, eth0
E2 3ffe:100:2::1/128 10/20 via fe80::203:47ff:fe4c:776e, eth0
E2 3ffe:100:3::1/128 10/20 via fe80::203:47ff:fe4c:776e, eth0
IA 3ffe:101:1::/48 20 via fe80::203:47ff:fe4c:776e, eth0
IA 3ffe:101:2::/48 20 via fe80::203:47ff:fe4c:776e, eth0
IA 3ffe:101:3::/48 20 via fe80::203:47ff:fe4c:776e, eth0

ZebOS#show ipv6 ospf route
Destination Metric Next-hop Interface
3ffe:1:1::/48 10
-- eth0
3ffe:2:1::/48 10
-- eth0
3ffe:2:2::/48 10
-- eth0
3ffe:3:1::/48 10
-- eth0
3ffe:3:2::/48 10
-- eth0
3ffe:3:3::/48 10
-- eth0
E2 3ffe:100:1::1/128 10/20
fe80::203:47ff:fe4c:776e eth0
```
**show ipv6 ospf topology**

Use this command to display information about OSPFv3 topology for each area.

**Command Syntax**

```
show ipv6 ospf topology
show ipv6 ospf WORD topology
show ipv6 ospf topology area (A.B.C.D|<0-4294967295>)
show ipv6 ospf WORD topology area (A.B.C.D|<0-4294967295>)
```

**Parameters**

- **WORD**
  - Tag value to use as a “match” value for controlling redistribution via route maps.
- **area**
  - OSPF area ID
  - **A.B.C.D**
    - OSPF Area ID in IPv4 address format.
  - **<0-4294967295>**
    - OSPF Area ID as a decimal value.

**Command Mode**

Privileged Exec mode and Exec Mode

**Example**

```
ZebOS#show ipv6 ospf topology
OSPFv3 paths to Area (0.0.0.0) routers
Router ID Bits Metric Next-Hop Interface
1.2.3.4 --
5.6.7.8 E 10 5.6.7.8 eth0
```
**show ipv6 ospf virtual-links**

Use this command to display information about OSPFv3 virtual-links.

**Command Syntax**

```
show ipv6 ospf virtual-links
show ipv6 ospf WORD virtual-links
```

**Parameters**

```
WORD                  Tag value to use as a “match” value for controlling redistribution via route maps.
```

**Command Mode**

Privileged Exec mode and Exec Mode

**Example**

```
ZebOS#show ipv6 ospf virtual-links
Virtual Link VLINK1 to router 5.6.7.8 is up
Transit area 0.0.0.1 via interface eth0, instance ID 0
Local address 3ffe:1234:1::1/128
Remote address 3ffe:5678:3::1/128
Transmit Delay is 1 sec, State Point-To-Point,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:01
Adjacency state Up
```
summary-address

Use this command to summarize or suppress external routes with the specified address range.

An address range is a pairing of a starting address and a mask that is almost the same as IP network number. For example:

- If the specified IPV6 address range is 2020:100:100:2000::/53, it matches 2020:100:100:2222::/64, 2020:100:100:2666::/64 and so on.
- If the specified IPV4 address range is 192.168.0.0/255.255.240.0, it matches 192.168.1.0/24, 192.168.4.0/22, 192.168.8.128/25 and so on.

Redistributing routes from other protocols into OSPF requires the router to advertise each route individually in an external LSA. Use this command to advertise one summary route for all redistributed routes covered by a specified network address and mask. This minimizes the size of the OSPF link state database.

Use the no form this command to remove summary addresses.

Command Syntax

```
summary-address X:X::X:X/M (not-advertise|tag <0-4294967295>||)
summary-address A.B.C.D/M (not-advertise|tag <0-4294967295>||)
no summary-address X:X::X:X/M
no summary-address A.B.C.D/M
no summary-address X:X::X:X/M (not-advertise|tag (<0-4294967295>|))
no summary-address A.B.C.D/M (not-advertise|tag (<0-4294967295>|))
```

Parameters

- **X:X::X:X/M**: The range of addresses given as IPv6 starting address and a mask.
- **A.B.C.D/M**: The range of addresses given as IPv4 starting address and a mask.
- **not-advertise**: Suppress routes that match the range.
- **tag**: Tag value to use as a “match” value for controlling redistribution via route maps.
  - `<0-4294967295>`: Set a tag value. The default is 0.

Command Mode

- Router mode
- Router address-family mode

Examples

The following example uses the `summary-address` command to aggregate external LSAs that match the network 172.16.0.0/24 and assign a tag value of 3.

```
ZebOS#configure terminal
ZebOS(config)#router ipv6 ospf
ZebOS(config-router)#summary-address 2020:100:100:2000::/53  tag 3
```
Symbols

, meaning in command syntax notation 4
(), meaning in command syntax notation 4

A

abbreviated commands 3
ABRs 104
address-family ipv4 unicast 100
area
  authentication 14
area authentication 14
Area Border Routers 104
area default cost 15
area default-cost 101
area filter-list 16
area multi-area-adjacency 17
area nssa 18, 102
area range 20, 104
area shortcut 21
area stub 22, 105
area virtual-link 23, 106
auto-cost reference bandwidth 25
auto-cost reference-bandwidth 108

B

begin 7
bfd all-interfaces 26

C

capability opaque 27, 28
capability restart 29
capability restart graceful 110
capability te 30, 111
clear ip ospf process 30
clear ipv6 ospf process 111
command abbreviation 3
command abbreviations 3
command completion 2
command line errors 3
command line help 1
command line interface syntax 2
command negation 6
command reference primer
typographic conventions 4
compatible rfc1583 31
Configure, command mode definition 9

D

default-information originate 41, 120
default-metric 42, 121
default-metric command 121
distance 43, 122
distance (OSPF command) 43, 122
distance ospf 43, 122
distribute-list 123
domain-id 45
domain-id 125
dump 46
exit-address-family 125

H

host area 47

I

Interface, command mode definition 9
ip ospf authentication 48
ip ospf authentication-key 49
ip ospf bfd 50
ip ospf cost 51
ip ospf database-filter 52

Index
ip ospf dead-interval 53
ip ospf disable all 54
ip ospf hello-interval 55
ip ospf message-digest-key 56
ip ospf mtu 57
ip ospf mtu-ignore 58
ip ospf network 59
ip ospf priority 60
ip ospf resync-timeout 61
ip ospf retransmit-interval 62
ip ospf transmit-delay 63
ipv6 ospf bfd disable 126
ipv6 ospf cost 126
ipv6 ospf dead-interval 127
ipv6 ospf display route single-line 128
ipv6 ospf hello-interval 129
ipv6 ospf link-lsa-suppression 130
ipv6 ospf mtu-ignore 131
ipv6 ospf neighbor 132
ipv6 ospf network 133
ipv6 ospf priority 134
ipv6 ospf restart grace-period 135
ipv6 ospf restart helper 136
ipv6 ospf retransmit-interval 137
ipv6 ospf6 transmit-delay 138
ipv6 router ospf 139

show ip ospf brder-routers 80
te-metric 95, 96

OSPF commands
area authentication 14
area default-cost 15
area filter-list 16
area nssa 18
area range 20
area shortcut 21
area stub 22
area virtual-link 23
auto-cost reference-bandwidth 25
bfd all-interfaces 26
capability opaque 27, 28
capability te 30
clear ip ospf process 30
compatible rfc1583 31
debug ospf 32
debug ospf database-timer rate-limit 33
debug ospf events 34
debug ospf ifsm 35
debug ospf ism 35
debug ospf Isa 36
debug ospf nsfsm 37
debug ospf nsm 38
debug ospf packet 39
debug ospf route 40
default-information originate 41, 120
default-metric 42
distance 43, 122
distribute-list 44
domain-id 45
enable db-summary-opt 45
enable ext-ospf-multi-inst 46
host area 47
ip ospf authentication 48
ip ospf authentication-key 49
ip ospf bfd 50
ip ospf cost 51
ip ospf database-filter 52
ip ospf dead-interval 53
ip ospf disable all 54
ip ospf hello-interval 55
ip ospf message-digest-key 56
ip ospf mtu 57
ip ospf mtu-ignore 58
ip ospf network 59
ip ospf priority 60
ip ospf resync-timeout 61
ip ospf retransmit-interval command 62
ip ospf transmit-delay 63
ipv6 ospf mtu-ignore 131
max-concurrent-dd 64
maximum-area 65
neighbor 66
network area 67
no parameter, action of 6

ospf abr-type 68
OSPF Commands
  access-class 14
  area multi-area-adjacency 17
  area nssa 18, 102
  capability restart 29
  debug ospf route 40
  debug ospf6 route 119
  debug ospf6 zebras 121
  overflow database external 72, 73
  passive-interface 74, 141
  restart ospf graceful 76

Index - 2
overflow database 72
overflow database external 73
passive-interface 74
redistribute 75
redistribute ospf 76
restart helper 70
router ospf 77
show debugging ospf 78
show ip ospf 79
show ip ospf igp-shortcut-lsp 85
show ip ospf igp-shortcut-route 86
show ip ospf interface 87
show ip ospf neighbor 89
show ip ospf route 91
show ip ospf virtual-links 92
show ip protocols 93
summary-address 94
time arrival 95
timers throttle lsa 96
ospf restart grace-restart 69
ospf router-id 71
OSPFv3 Commands
area default-cost 101
debg ipv6 ospf 115
debg ipv6 ospf packet 118
debug ospf6 ism 114
default-metric 121
ipv6 ospf transmit-delay 138
restart ipv6 ospf graceful 144
router-id 145
show debugging ipv6 ospf 147
show ipv6 ospf6 interface 151
OSPFv3 commands
abr-type 99
address-family ipv4 unicast 100
area nssa 102
area range 104
area stub 105
area virtual-link 106
auto-cost reference bandwidth 108
capability restart graceful 110
capability te 111
clear ipv6 ospf process 111
debg ipv6 ospf 112
debg ipv6 ospf lfsom 114
debg ipv6 ospf nsm 116
debug ipv6 ospf nsb 117
debug ipv6 ospf packet 118
debug ipv6 ospf route 119
default-metric 121
distribute-list 123
distribute db-summary-opt 124
disable address-family 125
ipv6 ospf bdf disable 126
ipv6 ospf cost 126
ipv6 ospf dead-interval 127
ipv6 ospf display route single-line 128
ipv6 ospf hello-interval 129
ipv6 ospf link-isa-suppression 130
ipv6 ospf neighbor 132
ipv6 ospf network 133
ipv6 ospf priority 134
ipv6 ospf restart grace-period 135
ipv6 ospf restart helper 136
ipv6 ospf retransmit-interval 137
ipv6 ospf6 transmit-delay 138
ipv6 router ospf 139
max-concurrent-dd 140
passive-interface 141
redistribute 142
restart ipv6 ospf graceful 144
router ipv6 ospf 146
router-id 145
show debugging ipv6 ospf 147
show ipv6 ospf database 149
show ipv6 ospf interface 151
show ipv6 ospf neighbor 152
show ipv6 ospf route 153
show ipv6 ospf topology 154
show ipv6 ospf virtual-links 155
summary-address 156
other conventions 6
overflow database 72
overflow database external 72, 73

P
passive-interface 74, 141
Privileged Exec, command mode definition 9

R
redistribute 142
redistribute command 75
redistribute ospf command 76
restart helper 70
restart ipv6 ospf graceful 144
restart ospf graceful 76
router ipv6 ospf 146
router ospf 77
router-id 145

S
show command options 7
exclude 8
include 8
redirect 8
show command tokens 6
output modifiers 6
show debugging ipv6 ospf 147
show debugging ospf 78
show ip ospf 79
border routers 80
--multiple instance 80
show ip ospf border-routers 80
show ip ospf igp-shortcut-lsp 85
show ip ospf igp-shortcut-route 86
show ip ospf interface 87
show ip ospf neighbor 89
show ip ospf route 91
show ip ospf virtual-links 92
show ip protocols 93
show ipv6 ospf database 149
show ipv6 ospf database, router 144
show ipv6 ospf interface 151
show ipv6 ospf neighbor 152
show ipv6 ospf route 153
show ipv6 ospf topology 154
show ipv6 ospf virtual-links 155
show ipv6 ospf6 interface 151
summary-address 94, 156
syntax help
  command abbreviations 3
  command completion 2
  command line errors 3

t
  te-metric 95
timers Isa arrival 95
timers throttle Isa 96
transmit-delay 138
typographic conventions 4