



USER MANUAL

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# Chapter 1 COMMANDS FOR LAYER 3 FORWARDING

## 1.1 Commands for Layer 3 Interface

### 1.1.1 bandwidth

- **Command:** `bandwidth <bandwidth>`
  - `no bandwidth`
- **Function:** Configure the bandwidth for Interface vlan. The “no bandwidth” command recovery the default value. The bandwidth of interface vlan is used to protocol account but not control the bandwidth of port. For instance, it is use the interface bandwidth (  $\text{cost} = 10^8 / \text{bandwidth}$  ) when OSPF account the link cost, so change the bandwidth can result in OSPF link cost changed.
- **Parameters:** `<bandwidth>` is the bandwidth for interface vlan. Range from 1bits to 10000000000 bits. It is can use unit “k, m, g”. There are no decimal numbers after conversion.
- **Command mode:** VLAN Interface Mode
- **Default:** The default bandwidth for interface VLAN is 100,000,000bit.
- **Usage Guide:** This command only can be used at interface VLAN mode. The conversion of unit: 1g=1,000m=1,000,000k=1,000,000,000bit.
- **Example:** Configure the bandwidth for vlan1 is 50,000,000bit.
- `Switch(Config-if-Vlan1)#bandwidth 50m`

### 1.1.2 description

- **Command:** `description <text>`
  - `no description`
- **Function:** Configure the description information of VLAN interface. The no command will cancel the description information of VLAN interface.
- **Parameter:** `<text>` is the description information of VLAN interface, the length should not exceed 256 characters.
- **Default:** Do not configure.
- **Command Mode:** VLAN interface mode
- **Usage Guide:** The description information of VLAN interface behind description and shown under the configured VLAN.
- **Example:** Configure the description information of VLAN interface as test vlan.
- `Switch(config)#interface vlan 2`
- `Switch(config-if-vlan2)#description test vlan`

### 1.1.3 interface loopback

- **Command:** `interface loopback <loopback-id>`
  - `no interface loopback <loopback-id>`

- **Function:** Create a Loopback interface; the no operation of this command will delete the specified Loopback interface.
- **Parameters:** *<loopback-id>* is the ID of the new created Loopback interface.
- **Default:** There is no Loopback interface in factory defaults.
- **Command Mode:** Global Configuration Mode.
- **Usage Guide:** IDs of the VLANs taken up by a Loopback interfaces start from 1006. If Loopback take up a VLAN whose ID is larger than or equal with 1006, users are forbidden to configure the corresponding VLAN. If a VLAN after VLAN 1006 is already configured, such as VLAN 1006, then the Loopback interface will take up the first available VLAN after that VLAN, such as VLAN 1007.
- **Examples:** Enter the interface configuration mode of Loopback 1.
  - Switch(config)#interface loopback 1
  - Switch(Config-if-Loopback1)#

#### 1.1.4 interface vlan

- **Command:** `interface vlan <vlan-id>`
  - `no interface vlan <vlan-id>`
- **Function:** Create a VLAN interface (a Layer 3 interface); the “`no interface vlan <vlan-id>`” command deletes the Layer 3 interface specified.
- **Parameters:** *<vlan-id>* is the VLAN ID of the established VLAN, ranging from 1 to 4094.
- **Default:** No Layer 3 interface is configured upon switch shipment.
- **Command mode:** Global Mode
- **Usage Guide:** When creating a VLAN interface (Layer 3 interface), VLANs should be configured first, for details, see the VLAN chapters. When VLAN interface (Layer 3 interface) is created with this command, the VLAN interface (Layer 3 interface) configuration mode will be entered. After the creation of the VLAN interface (Layer 3 interface), interface vlan command can still be used to enter Layer 3 Port Mode.
- **Example:** Create a VLAN interface (layer 3 interface).
  - Switch(config)#interface vlan 1
  - Switch(Config-if-Vlan1)#

#### 1.1.5 no interface IFNAME

- **Command:** `no interface IFNAME`
- **Function:** Delete the interface, deal with the interface vlan and interface loopback only.
- **Parameters:** IFNAME: interface name.
- **Command Mode:** Global mode.
- **Usage Guide:** This command is used to delete the layer 3 interface. It can deal with the situation that the interface name is spelt in special way. IFNAME can match multiple ways, such as vlan1, Vlan1, v1, V1 and etc.
- **Example:** Delete interface vlan1.
  - (config)# no interface vlan1

### 1.1.6 shutdown

- **Command:** shutdown
  - no shutdown
- **Function:** Shut down the specified VLAN interface of the switch. The no operation of the command will enable the VLAN interface.
- **Command Mode:** VLAN Interface Configuration Mode.
- **Default:** The VLAN interface is enabled by default.
- **Usage Guide:** While shutting down the VLAN interface of the switch, it will not send data frames. If this interface needs to obtain an IP address via BOOTP/DHCP protocol, it should be enabled.
- **Example:** Enable the VLAN1 interface of the switch.
- Switch(Config-if-Vlan1)#no shutdown

## 1.2 Commands for IPv4/v6 configuration

### 1.2.1 ipv4 hardware forwarding enable

- **Command:** ipv4 hardware forwarding enable
- **Function:** Enable IPv4 layer3 forwarding function.
- **Parameter:** None.
- **Default:** Disable.
- **Command Mode:** Global mode.
- **Usage Guide:** Become effective after reboot.
- **Example:** Enable IPv4 layer3 forwarding function.
- Switch(config)#ipv4 hardware forwarding enable

### 1.2.2 ipv4 hardware forwarding l3 <1-256>

- **Command:** ipv4 hardware forwarding l3 <1-256>
- **Function:** Set the L3 list number of IPv4.
- **Parameter:** None.
- **Default:** 256
- **Command Mode:** Global mode.
- **Usage Guide:** None.
- **Example:** Set the L3 list number to be 200.
- Switch(config)#ipv4 hardware forwarding l3 200

### 1.2.3 ipv4 hardware forwarding lpm <1-128>

- **Command:** ipv4 hardware forwarding lpm <1-128>
- **Function:** Set the Lpm list number of IPv4.
- **Parameter:** None.
- **Default:** 128

- **Command Guide:** Global mode.
- **Usage Guide:** None.
- **Example:** Set the Lpm list number to be 100.
- Switch(config)# ipv4 hardware forwarding lpm 100

#### 1.2.4 ipv6 hardware forwarding enable

- **Command:** ipv6 hardware forwarding enable
- **Function:** Enable IPv6 layer 3 forwarding function.
- **Parameter:** None.
- **Default:** Disable.
- **Command Guide:** Global mode.
- **Usage Guide:** Become effective after reboot.
- **Example:** Enable IPv6 layer 3 forwarding function.
- Switch(config)#ipv6 hardware forwarding enable

#### 1.2.5 ipv6 hardware forwarding l3 <1-256>

- **Command:** ipv6 hardware forwarding l3 <1-256>
- **Function:** Set the L3 list number of IPv6.
- **Parameter:** None.
- **Default:** 256
- **Command Mode:** Global mode.
- **Usage Guide:** None.
- **Example:** Set the L3 list number to be 200
- Switch(config)#ipv6 hardware forwarding l3 200

#### 1.2.6 ipv6 hardware forwarding lpm <1-128>

- **Command:** ipv6 hardware forwarding lpm <1-128>
- **Function:** Set the Lpm list number of IPv6.
- **Parameter:** None.
- **Default:** 128
- **Command Mode:** Global mode.
- **Usage Guide:** None.
- **Example:** Set the Lpm list number to be 100
- Switch(config)#ipv6 hardware forwarding lpm 100

#### 1.2.7 clear ip traffic

- **Command:** clear ip traffic
- **Function:** Clear the statistic information of IP protocol.
- **Parameter:** None.
- **Command mode:** Admin Mode.



- **Default:** None.
- **Usage guide:** Clear the statistic information of receiving and sending packets for IP kernel protocol, including the statistic of receiving packets, sending packets and dropping packets and the error information of receiving and sending packets for IP protocol, ICMP protocol, TCP protocol and UDP protocol.
- **Example:** Clear statistic information of IP protocol.
- Switch#clear ip traffic

### 1.2.8 clear ipv6 neighbor

- **Command:** clear ipv6 neighbors
- **Function:** Clear the neighbor cache of IPv6.
- **Parameter:** None
- **Command Mode:** Admin Mode
- **Default:** None
- **Usage Guide:** This command can not clear static neighbor.
- **Example:** Clear neighbor list.
- Switch#clear ipv6 neighbors

### 1.2.9 debug ip icmp

- **Command:** debug ip icmp
  - no debug ip icmp
- **Function:** The debugging for receiving and sending ICMP packets.
- **Parameter:** None.
- **Default:** None.
- **Command mode:** Admin Mode
- **Usage Guide:** None.
- **Example:**
  - Switch#debug ip icmp
  - IP ICMP: sent, type 8, src 0.0.0.0, dst 20.1.1.1

Display	Description
IP ICMP: sent	Send ICMP packets
type 8	Type is 8 (PING request)
src 0.0.0.0	Source IPv4 address
dst 20.1.1.1	Destination IPv4 address

### 1.2.10 debug ip packet

- **Command:** debug ip packet
  - no debug ip packet

- **Function:** Enable the IP packet debug function: the “no debug IP packet” command disables this debug function.
- **Parameter:** None
- **Default:** IP packet debugging information is disabled by default.
- **Command mode:** Admin Mode
- **Usage Guide:** Displays statistics for IP packets received/sent, including source/destination address and bytes, etc.
- **Example:** Enable IP packet debug.
  - Switch #debug ip packet
  - IP PACKET: sent, src 200.1.1.35, dst 224.0.0.9, size 312, proto 17, vrf 0
  - IP PACKET: rcvd, src 101.1.1.1, dst 224.0.0.9, size 312, proto 17, from Vlan200, vrf 0

### 1.2.11 debug ipv6 packet

- **Command:** debug ipv6 packet
  - no debug ipv6 packet
- **Function:** IPv6 data packets receive/send debug message.
- **Parameter:** None
- **Default:** None
- **Command Mode:** Admin Mode
- **Usage Guide:**
- **Example:**
  - Switch#debug ipv6 packet
  - IPv6 PACKET: rcvd, src <fe80::203:fff:fe01:2786>, dst <fe80::1>, size <64>, proto <58>, from Vlan1

Displayed information	Explanation
IPv6 PACKET: rcvd	Receive IPv6 data report
Src <fe80::203:fff:fe01:2786>	Source IPv6 address
Dst <fe80::1>	Destination IPv6 address
size <64>	Size of data report
proto <58>	Protocol field in IPv6 header
from Vlan1	IPv6 data report is collected from Layer 3 port vlan1

### 1.2.12 debug ipv6 icmp

- **Command:** `debug ipv6 icmp`
  - `no debug ipv6 icmp`
- **Function:** ICMP data packets receive/send debug message.
- **Parameter:** None
- **Default:** None
- **Command Mode:** Admin Mode
- **Usage Guide:** None
- **Example:**
  - `Switch#debug ipv6 icmp`
  - IPv6 ICMP: sent, type <129>, src <2003::1>, dst <2003::20a:ebff:fe26:8a49> from Vlan1

Displayed information	Explanation
IPv6 ICMP: sent	Send IPv6 data report
type <129>	Ping protocol No.
Src <2003::1>	Source IPv6 address
Dst <2003::20a:ebff:fe26:8a49>	Destination IPv6 address
from Vlan1	Layer 3 port being sent

### 1.2.13 debug ipv6 nd

- **Command:** `debug ipv6 nd [ ns | na | rs | ra | redirect ]`
  - `no debug ipv6 nd [ ns | na | rs | ra | redirect ]`
- **Function:** Enable the debug of receiving and sending operations for specified types of IPv6 ND messages. The ns, na, rs, ra and redirect parameters represent neighbor solicitation, neighbor advertisement, route solicitation, route advertisement and route redirect. No specification means to enable the debug for all five types of ND message. The no operation of this command will disable debug of receiving and sending operations for specified types of IPv6 ND messages, while no specification means to disable that for all five types of ND message.
- **Parameter:** None.
- **Default:** The debug of receiving and sending operations for all five types of IPv6 ND messages is disabled by default.
- **Command Mode:** Admin Mode
- **Usage Guide:** The ND protocol is an essential part of IPv6. This command can display the ND message of a specified type for troubleshooting.
- **Example:**

- Switch#debug ipv6 nd
- IPv6 ND: rcvd, type <136>, src <fe80::203:fff:fe01:2786>, dst <fe80::203:fff:fe01:59ba>

Displayed information	Explanation
IPv6 ND: rcvd	Receive ND data report
type <136>	ND Type
src <fe80::203:fff:fe01:2786>	Source IPv6 address
dst <fe80::203:fff:fe01:59ba>	Destination IPv6 address

#### 1.2.14 debug ipv6 tunnel packet

- This command is not supported by this switch.

#### 1.2.15 description

- This command is not supported by this switch.

#### 1.2.16 ipv6 proxy enable

- **Command:** ipv6 proxy enable
- **no ipv6 proxy enable**
- **Function:** This command enable the IPv6 proxy function of a chassis switch. The no operation of this command will disable IPv6 proxy function.
- **Parameter:** None.
- **Command Mode:** Global Configuration Mode.
- **Default:** The IPv6 proxy function in the system is disabled by default.
- **Usage Guide:** IPv6 proxy function means that, the board cards supporting IPV4 only will forward the IPv6 packets to the IPV6-supporting board cards in the system, implementing a process of wire-speed forwarding. The proxy provided by IPv6 board cards indirectly realizes the ipv6 hardware routing and forwarding function implemented by earlier board cards which only support IPv4.
- **Notice:** If the IPv6 proxy function is enabled, at least one board cards supporting IPv6 hardware forwarding should be plugged into the chassis switch. If all board cards in the chassis switch support IPv6 hardware forwarding, there would be no need to use the IPv6 proxy function. At present, the IPv6 proxy function does not support the proxy forwarding of IPv6 tunnel messages and multicast data messages.
- **Example:** Enable the IPv6 proxy function.
- Switch(config)#ipv6 proxy enable

### 1.2.17 ip address

- **Command:** `ip address <ip-address> <mask> [secondary]`
  - `no ip address [<ip-address> <mask>] [secondary]`
- **Function:** Set IP address and net mask of switch; the “`no ip address [<ip-address> <mask>] [secondary]`” command deletes the IP address configuration.
- **Parameter:** `<ip-address>` is IP address, dotted decimal notation; `<mask>` is subnet mask, dotted decimal notation; **[secondary]** indicates that the IP address is configured as secondary IP address.
- **Command Mode:** VLAN interface configuration mode
- **Default:** The system default is no IP address configuration.
- **Usage Guide:** This command configures IP address on VLAN interface manually. If optional parameter **secondary** is not configured, then it is configured as the primary IP address of VLAN interface; if optional parameter **secondary** is configured, then that means the IP address is the secondary IP address of VLAN. One VLAN interface can only have one primary IP address and more than one secondary IP addresses. Primary IP and Secondary IP all can be used on SNMP/Web/Telnet management. Furthermore, the switch also provides BOOTP/DHCP manner to get IP address.
- **Example:** The IP address of switch VLAN1 interface is set to 192.168.1.10/24.
- `Switch(Config-if-Vlan1)#ip address 192.168.1.10 255.255.255.0`

### 1.2.18 ipv6 address

- **Command:** `ipv6 address <ipv6-address/prefix-length> [eui-64]`
  - `no ipv6 address <ipv6-address/prefix-length> [eui-64]`
- **Function:** Configure aggregately global unicast address, site-local address and link-local address for the interface.
- **Parameter:** Parameter `<ipv6-address>` is the prefix of IPv6 address, parameter `<prefix-length>` is the prefix length of IPv6 address, which is between 3-128, **eui-64** means IPv6 address is generated automatically based on eui64 interface identifier of the interface.
- **Command Mode:** Interface Configuration Mode.
- **Default:** None.
- **Usage Guide:** IPv6 address prefix can not be multicast address or any other specific IPv6 address, and different layer 3 interfaces can not configure the same address prefix. For global unicast address, the length of the prefix must be greater than or equal to 3. For site-local address and link-local address, the length of the prefix must be greater than or equal to 10. For interface loopback port, the length of the prefix must be equaled to 128.
- **Example:** Configure an IPv6 address on VLAN1 Layer 3 interface: the prefix is 2001:3f:ed8::99 and the length of the prefix is 64.
- `Switch(Config-if-Vlan1)#ipv6 address 2001:3f:ed8::99/64`

### 1.2.19 ipv6 route

- **Command:** `ipv6 route <ipv6-prefix / prefix-length> {<ipv6address> | <interface-type interface-number> | {<ipv6address> <interface-type interface-number>} | tunnel <tunnel no> } [<precedence>]`
  - `no ipv6 route <ipv6-prefix / prefix-length> {<ipv6address> | <interface-type interface-number> | {<ipv6address> <interface-type interface-number>} | tunnel <tunnel no> } [<precedence>]`
- **Function:** Set IPv6 static route.
- **Parameters:** Parameter `<ipv6-prefix>` is the destination prefix of IPv6 static route, parameter `<prefix-length>` is the length of IPv6 prefix, parameter `<ipv6-address>` is the next hop IPv6 address of the reachable network, parameter `<interface-type interface-number>` is the name of interface from which to reach the destination, `<tunnel no>` is the output tunnel number of the tunnel route, parameter `<precedence>` is the weight of this route, the range is 1-255, the default is 1
- **Default:** There is not any IPv6 static route which is configured by default.
- **Command Mode:** Global Mode
- **Usage Guide:** When the next hop IPv6 address is link-local address, the interface name must be specified. When the next hop IPv6 address is global aggregatable unicast address and site-local address, if no interface name of the exit is specified, it must be assured that the IP address of the next hop and the address of some interface of the switch must be in the same network segment. As for tunnel route, interface name can be directly specified.
- **Example:** Configure static route 1 with destination address 3ffe:589:dfc::88, prefix length 64 and next hop 2001:8fd:c32::99 (the router has been configured IPv6 address of 2001:8fd:c32::34/64).
  - Switch(config)#ipv6 route 3ffe:589:dfc::88/64 2001:8fd:c32::99
  - Configure static route 2 with destination 3ffe:ff7:123::55, prefix length 64, next hop fe80::203:ff:89fd:46ac and exit interface name Vlan1.
  - Switch(config)#ipv6 route 3ffe:ff7:123::55/64 fe80::203:ff:89fd:46ac Vlan1

### 1.2.20 ipv6 redirect

- **Command:** `ipv6 redirect`
  - `no ipv6 redirect`
- **Function:** Enable IPv6 router redirect function. The no operation of this command will disable the function.
- **Parameters:** None.
- **Command Mode:** Global Configuration Mode.
- **Default Settings:** IPv6 router redirect function is disabled by default.
- **Usage Guide:** If router A, router B, and node C are on the same network link, and router A forwards IPv6 packets from node C to router B, expecting router B to continue the forwarding, then router A will send an IPv6 ICMPv6 redirect message to node C-source of the packet, notifying it that the best next hop of this destination address is router B.

By doing so, the forwarding overhead of router A will be decreased, so is the network transmission delay of node C.

- **Examples:** Enable IPv6 router redirect function.
- Switch(config)# ipv6 redirect

### 1.2.21 ipv6 nd dad attempts

- **Command:** `ipv6 nd dad attempts <value>`
  - `no ipv6 nd dad attempts`
- **Function:** Set Neighbor Solicitation Message number sent in succession by interface when setting Duplicate Address Detection.
- **Parameter:** `<value>` is the Neighbor Solicitation Message number sent in succession by Duplicate Address Detection, and the value of `<value>` must be in 0-10, NO command restores to default value 1.
- **Command Mode:** Interface Configuration Mode
- **Default:** The default request message number is 1.
- **Usage Guide:** When configuring an IPv6 address, it is required to process IPv6 Duplicate Address Detection, this command is used to configure the ND message number of Duplicate Address Detection to be sent, `value` being 0 means no Duplicate Address Detection is executed.
- **Example:** The Neighbor Solicitation Message number sent in succession by interface when setting Duplicate Address Detection is 3.
- Switch(Config-if-Vlan1)# ipv6 nd dad attempts 3

### 1.2.22 ipv6 nd ns-interval

- **Command:** `ipv6 nd ns-interval <seconds>`
  - `no ipv6 nd ns-interval`
- **Function:** Set the time interval of Neighbor Solicitation Message sent by the interface.
- **Parameter:** parameter `<seconds>` is the time interval of sending Neighbor Solicitation Message, `<seconds>` value must be between 1-3600 seconds, `no` command restores the default value 1 second.
- **Command Mode:** Interface Configuration Mode
- **Default:** The default Request Message time interval is 1 second.
- **Usage Guide:** The value to be set will include the situation in all routing announcement on the interface. Generally, very short time interval is not recommended.
- **Example:** Set Vlan1 interface to send out Neighbor Solicitation Message time interval to be 8 seconds.
- Switch(Config-if-Vlan1)#ipv6 nd ns-interval 8

### 1.2.23 ipv6 nd suppress-ra

- **Command:** `ipv6 nd suppress-ra`
  - `no ipv6 nd suppress-ra`

- **Function:** Prohibit router announcement.
- **Parameter:** None
- **Command Mode:** Interface Configuration Mode
- **Default:** Router Announcement function is disabled.
- **Usage Guide:** no **ipv6 nd suppress-ra** command enable router announcement function.
- **Example:** Enable router announcement function.
  - Switch(Config-if-Vlan1)#no ipv6 nd suppress-ra
    - **ipv6 nd ra-lifetime**
- **Command:** **ipv6 nd ra-lifetime <seconds>**
  - **no ipv6 nd ra-lifetime**
- **Function:** Configure the lifetime of router announcement.
- **Parameter:** parameter **<seconds>** stands for the number of seconds of router announcement lifetime, **<seconds>** value must be between 0-9000.
- **Command Mode:** Interface Configuration Mode
- **Default:** The number of seconds of router default announcement lifetime is 1800.
- **Usage Guide:** This command is used to configure the lifetime of the router on Layer 3 interface, seconds being 0 means this interface can not be used for default router, otherwise the value should not be smaller than the maximum time interval of sending router announcement. If no configuration is made, this value is equal to 3 times of the maximum time interval of sending routing announcement.
- **Example:** Set the lifetime of routing announcement is 100 seconds.
- Switch(Config-if-Vlan1)#ipv6 nd ra-lifetime 100

#### 1.2.24 ipv6 nd min-ra-interval

- **Command:** **ipv6 nd min-ra-interval <seconds>**
  - **no ipv6 nd min-ra-interval**
- **Function:** Set the minimum time interval of sending routing message.
- **Parameter:** Parameter **<seconds>** is number of seconds of the minimum time interval of sending routing announcement, **<seconds>** must be between 3-1350 seconds.
- **Command Mode:** Interface Configuration Mode
- **Default:** The default minimum time interval of sending routing announcement is 200 seconds.
- **Usage Guide:** The minimum time interval of routing announcement should not exceed 3/4 of the maximum time interval.
- **Example:** Set the minimum time interval of sending routing announcement is 10 seconds.
- Switch(Config-if-Vlan1)#ipv6 nd min-ra-interval 10

#### 1.2.25 ipv6 nd max-ra-interval

- **Command:** **ipv6 nd max-ra-interval <seconds>**



- **no ipv6 nd max-ra-interval**

- **Function:** Set the maximum time interval of sending routing message.
- **Parameter:** Parameter **<seconds>** is number of seconds of the time interval of sending routing announcement, **<seconds>** must be between 4-1800 seconds.
- **Command Mode:** Interface Configuration Mode
- **Default:** The default maximum time interval of sending routing announcement is 600 seconds.
- **Usage Guide:** The maximum time interval of routing announcement should be smaller than the lifetime value routing announcement.
- **Example:** Set the maximum time interval of sending routing announcement is 20 seconds.
- Switch(Config-if-Vlan1)#ipv6 nd max-ra-interval 20

### 1.2.26 ipv6 nd prefix

- **Command:** **ipv6 nd prefix <ipv6-prefix | prefix-length>{ [<valid-lifetime> <preferred-lifetime>] [ no-autoconfig | off-link[no-autoconfig] ]}**
  - **no ipv6 nd prefix <ipv6-prefix | prefix-length>**
- **Function:** Configure the address prefix and relative parameters for router announcement.
- **Parameter:** Parameter **<ipv6-prefix>** is the address prefix of the specified announcement, parameter **<prefix-length>** is the length of the address prefix of the specified announcement, parameter **<valid-lifetime>** is the valid lifetime of the prefix, parameter **<preferred-lifetime>** is the preferred lifetime of the prefix, and the valid lifetime must be no smaller than preferred lifetime. Parameter **no-autoconfig** says this prefix can not be used to automatically configure IPv6 address on the host in link-local. Parameter **off-link** says the prefix specified by router announcement message is not assigned to link-local, the node which sends data to the address including this prefix consider link-local as unreachable.
- **Command Mode:** Interface Configuration Mode
- **Default:** The default value of **valid-lifetime** is 2592000 seconds (30 days), the default value of **preferred-lifetime** is 604800 seconds (7 days). **off-link** is off by default, **no-autoconfig** is off by default.
- **Usage Guide:** This command allows controlling the router announcement parameters of every IPv6 prefix. Note that valid lifetime and preferred lifetime must be configured simultaneously.
- **Example:** Configure IPv6 announcement prefix as 2001:410:0:1::/64 on Vlan1, the valid lifetime of this prefix is 8640 seconds, and its preferred lifetime is 4320 seconds.
- Switch(Config-if-Vlan1)#ipv6 nd prefix 2001:410:0:1::/64 8640 4320

### 1.2.27 ipv6 nd ra-hoplimit

- **Command:** **ipv6 nd ra-hoplimit <value>**
- **Function:** Set the hoplimit of sending router advertisement.

- **Parameters:** <value> is the hoplimit of sending router advertisement, ranging from 0 to 255.
- **Command Mode:** Interface Configuration Mode.
- **Default:** The default hoplimit of sending router advertisement is 64.
- **Example:** Set the hoplimit of sending router advertisement in interface vlan 1 as 128.
- Switch#(Config-if-Vlan1)#ipv6 nd ra-hoplimit 128

### 1.2.28 ipv6 nd ra-mtu

- **Command:** `ipv6 nd ra-mtu <value>`
- **Function:** Set the mtu of sending router advertisement.
- **Parameters:** <value> is the mtu of sending router advertisement, ranging from 0 to 1500.
- **Command Mode:** Interface Configuration Mode.
- **Default:** The default mtu of sending router advertisement is 1500.
- **Example:** Set the mtu of sending router advertisement in interface vlan 1 as 500.
- Switch#(Config-if-Vlan1)#ipv6 nd ra-mtu 500

### 1.2.29 ipv6 nd reachable-time

- **Command:** `ipv6 nd reachable-time <seconds>`
- **Function:** Set the reachable-time of sending router advertisement.
- **Parameters:** <value> is the reachable-time of sending router advertisement, ranging from 0 to 3600000 milliseconds.
- **Command Mode:** Interface Configuration Mode.
- **Default Settings:** The default reachable-time of sending router advertisement is 30000 milliseconds.
- **Example:** Set the reachable-time of sending router advertisement in interface vlan 1 as 100000 milliseconds.
- Switch(Config-if-Vlan1)#ipv6 nd reachable-time 100000

### 1.2.30 ipv6 nd retrans-timer

- **Command:** `ipv6 nd retrans-timer <seconds>`
- **Function:** Set the retrans-timer of sending router advertisement.
- **Parameters:** <value> is the retrans-timer of sending router advertisement, ranging from 0 to 4294967295 milliseconds.
- **Command Mode:** Interface Configuration Mode.
- **Default:** The default retrans-timer of sending router advertisement is 1000 milliseconds.
- **Example:** Set the reachable-time of sending router advertisement in interface vlan 1 as 10000 milliseconds.
- Switch(Config-if-Vlan1)#ipv6 nd retrans-timer 10000

### 1.2.31 ipv6 nd other-config-flag

- **Command:** `ipv6 nd other-config-flag`
- **Function:** Set the flag representing whether information other than the address information will be obtained via DHCPv6.
- **Parameters:** None.
- **Command Mode:** Interface Configuration Mode.
- **Default:** Information other than the address information won't be obtained via DHCPv6.
- **Examples:** Set IPv6 information other than the address information in interface vlan 1 will be obtained via DHCPv6.
- `Switch(Config-if-Vlan1)#ipv6 nd other-config-flag`

### 1.2.32 ipv6 nd managed-config-flag

- **Command:** `ipv6 nd managed-config-flag`
- **Function:** Set the flag representing whether the address information will be obtained via DHCPv6.
- **Parameters:** None.
- **Command Mode:** Interface Configuration Mode.
- **Default:** The address information won't be obtained via DHCPv6.
- **Examples:** Set IPv6 address information in interface vlan 1 will be obtained via DHCPv6.
- `Switch(Config-if-Vlan1)#ipv6 nd managed-config-flag`

### 1.2.33 ipv6 neighbor

- **Command:** `ipv6 neighbor <ipv6-address> <hardware-address> interface <interface-type interface-name>`
  - `no ipv6 neighbor <ipv6-address>`
- **Function:** Set static neighbor table entry.
- **Parameters:** Parameter *ipv6-address* is static neighbor IPv6 address, same to interface prefix parameter, parameter *hardware-address* is static neighbor hardware address, *interface-type* is Ethernet type, *interface-name* is Layer 2 interface name.
- **Command Mode:** Interface Configuration Mode
- **Default Situation:** There is not static neighbor table entry.
- **Usage Guide:** IPv6 address and multicast address for specific purpose and local address can not be set as neighbor.
- **Example:** Set static neighbor 2001:1:2::4 on port E1/0/1, and the hardware MAC address is 00-03-0f-89-44-bc.
- `Switch(Config-if-Vlan1)#ipv6 neighbor 2001:1:2::4 00-03-0f-89-44-bc interface Ethernet 1/0/1`

### 1.2.34 interface tunnel

- This command is not supported by this switch.

### 1.2.35 show ip interface

- **Command:** `show ip interface [<ifname> | vlan <vlan-id>] brief`
- **Function:** Show the brief information of the configured layer 3 interface.
- **Parameters:** `<ifname>` Interface name; `<vlan-id>` VLAN ID.
- **Default:** Show all brief information of the configured layer 3 interface when no parameter is specified.
- **Command mode:** All modes.
- **Usage Guide:** None.
- **Example:**
- `Restarter#show ip interface vlan1 brief`
- | Index | Interface | IP-Address   | Protocol |
|-------|-----------|--------------|----------|
| 3001  | Vlan1     | 192.168.2.11 | up       |

### 1.2.36 show ip traffic

- **Command:** `show ip traffic`
- **Function:** Display statistics for IP packets.
- **Command mode:** Admin Mode
- **Usage Guide:** Display statistics for IP, ICMP, TCP, UDP packets received/sent.
- **Example:**
- `Switch#show ip traffic`
- IP statistics:
- Rcvd: 3249810 total, 3180 local destination
  - 0 header errors, 0 address errors
  - 0 unknown protocol, 0 discards
- Frags: 0 reassembled, 0 timeouts
  - 0 fragment rcvd, 0 fragment dropped
  - 0 fragmented, 0 couldn't fragment, 0 fragment sent
- Sent: 0 generated, 3230439 forwarded
  - 0 dropped, 0 no route
- ICMP statistics:
- Rcvd: 0 total 0 errors 0 time exceeded
  - 0 redirects, 0 unreachable, 0 echo, 0 echo replies
  - 0 mask requests, 0 mask replies, 0 quench
  - 0 parameter, 0 timestamp, 0 timestamp replies
- Sent: 0 total 0 errors 0 time exceeded
  - 0 redirects, 0 unreachable, 0 echo, 0 echo replies
  - 0 mask requests, 0 mask replies, 0 quench
  - 0 parameter, 0 timestamp, 0 timestamp replies
- TCP statistics:
- `TcpActiveOpens` 0, `TcpAttemptFails` 0
- `TcpCurrEstab` 0, `TcpEstabResets` 0

- TcpInErrs           0, TcpInSegs           3180
- TcpMaxConn        0, TcpOutRsts           3
- TcpOutSegs        0, TcpPassiveOpens    8
- TcpRetransSegs    0, TcpRtoAlgorithm       0
- TcpRtoMax         0, TcpRtoMin           0
- UDP statics:
- UdpInDatagrams    0, UdpInErrors           0
- UdpNoPorts        0, UdpOutDatagrams    0

Displayed information	Explanation
IP statistics :	IP packet statistics.
Rcvd: 3249810 total, 3180 local destination 0 header errors, 0 address errors 0 unknown protocol, 0 discards	Statistics of total packets received, number of packets reached local destination, number of packets have header errors, number of erroneous addresses, number of packets of unknown protocols; number of packets dropped.
Frag : 0 reassembled, 0 timeouts 0 fragment rcvd, 0 fragment dropped 0 fragmented, 0 couldn't fragment, 0 fragment sent	Fragmentation statistics: number of packets reassembled, timeouts, fragments received, fragments discarded, packets that cannot be fragmented, number of fragments sent, etc.
Sent : 0 generated, 0 forwarded 0 dropped, 0 no route	Statistics for total packets sent, including number of local packets, forwarded packets, dropped packets and packets without route.
ICMP statistics :	ICMP packet statistics.
Rcvd : 0 total 0 errors 0 time exceeded 0 redirects, 0 unreachable, 0 echo, 0 echo replies 0 mask requests, 0 mask replies, 0	Statistics of total ICMP packets received and classified information

<pre> quench 0 parameter, 0 timestamp, 0 timestamp replies </pre>	
<pre> Sent : 0 total 0 errors 0 time exceeded 0 redirects, 0 unreachable, 0 echo, 0 echo replies 0 mask requests, 0 mask replies, 0 quench 0 parameter, 0 timestamp, 0 timestamp replies </pre>	Statistics of total ICMP packets sent and classified information
TCP statistics:	TCP packet statistics.
UDP statistics:	UDP packet statistics.

### 1.2.37 show ipv6 interface

- **Command:** `show ipv6 interface {brief|<interface-name>}`
- **Function:** Show interface IPv6 parameters.
- **Parameter:** Parameter brief is the brief summarization of IPv6 status and configuration, and parameter interface-name is Layer 3 interface name.
- **Default:** None
- **Command Mode:** Admin and Configuration Mode
- **Usage Guide:** If only brief is specified, then information of all L3 is displayed, and you can also specify a specific Layer 3 interface.
- **Example:**
  - Switch#show ipv6 interface Vlan1
  - Vlan1 is up, line protocol is up, dev index is 2004
  - Device flag 0x1203(UP BROADCAST ALLMULTI MULTICAST)
  - IPv6 is enabled
  - Link-local address(es):
  - fe80::203:fff:fe00:10 PERMANENT
  - Global unicast address(es):
  - 3001::1 subnet is 3001::1/64 PERMANENT
  - Joined group address(es):
  - ff02::1
  - ff02::16
  - ff02::2

- ff02::5
- ff02::6
- ff02::9
- ff02::d
- ff02::1:ff00:10
- ff02::1:ff00:1
- MTU is 1500 bytes
- ND DAD is enabled, number of DAD attempts is 1
- ND managed\_config\_flag is unset
- ND other\_config\_flag is unset
- ND NS interval is 1 second(s)
- ND router advertisements is disabled
- ND RA min-interval is 200 second(s)
- ND RA max-interval is 600 second(s)
- ND RA hoplimit is 64
- ND RA lifetime is 1800 second(s)
- ND RA MTU is 0
- ND advertised reachable time is 0 millisecond(s)
- ND advertised retransmit time is 0 millisecond(s)

Displayed information	Explanation
Vlan1	Layer 3 interface name
[up/up]	Layer 3 interface status
dev index	Internal index No.
fe80::203:fff:fe00:10	Automatically configured IPv6 address of Layer 3 interface
3001::1	Configured IPv6 address of Layer 3 interface

### 1.2.38 show ipv6 route

- **Command:** `show ipv6 route [<destination>|<destination >|<length>| database| fib [local]] nsm [connected | static | rip| ospf | bgp | isis| kernel| database]|statistics]`
- **Function:** Display IPv6 routing table.
- **Parameter:** **<destination>** is destination network address; **<destination>|<length>** is destination network address plus prefix length; **connected** is directly connected router; **static** is static router; **rip** is RIP router; **ospf** is OSPF router; **bgp** is BGP router; **isis** is ISIS router; **kernel** is kernel router; **statistics** shows router number; **database** is router database.
- **Default Situation:** None.

- **Command Mode:** Admin and Configuration Mode.
- **Usage Guide:** show ipv6 route only shows IPv6 kernal routing table (routing table in tcpip), database shows all routers except the local router, fib local shows the local router, statistics shows router statistics information.
- **Example:**
- Switch#show ipv6 route
- Codes: C - connected, L - Local, S - static, R - RIP, O - OSPF,
  - I - IS-IS, B - BGP
- C ::/0 via ::, tunnel3 256
- S 2001:2::/32 via fe80::789, Vlan2 1024
- S 2001:2:3:4::/64 via fe80::123, Vlan2 1024
- O 2002:ca60:c801:1::/64 via ::, Vlan1 1024
- C 2002:ca60:c802:1::/64 via ::, tunnel49 256
- C 2003:1::/64 via ::, Vlan4 256
- C 2003:1::5efe:0:0/96 via ::, tunnel26 256
- S 2004:1:2:3::/64 via fe80:1::88, Vlan2 1024
- O 2006:1::/64 via ::, Vlan1 1024
- S 2008:1:2:3::/64 via fe80::250:baff:fe2:a4f4, Vlan1 1024
- C 2008:2005:5:8::/64 via ::, Ethernet0 256
- S 2009:1::/64 via fe80::250:baff:fe2:a4f4, Vlan1 1024
- C 2022:1::/64 via ::, Ethernet0 256
- O 3333:1:2:3::/64 via fe80::20c:ceff:fe13:eac1, Vlan12 1024
- C 3ffe:501:ffff:1::/64 via ::, Vlan4 256
- O 3ffe:501:ffff:100::/64 via ::, Vlan5 1024
- O 3ffe:3240:800d:1::/64 via ::, Vlan1 1024
- O 3ffe:3240:800d:2::/64 via ::, Vlan2 1024
- O 3ffe:3240:800d:10::/64 via ::, Vlan12 1024
- O 3ffe:3240:800d:20::/64 via fe80::20c:ceff:fe13:eac1, Vlan12 1024
- C fe80::/64 via ::, Vlan1 256
- C fe80::5efe:0:0/96 via ::, tunnel26 256
- C ff00::/8 via ::, Vlan1 256

Displayed information	Explanation
IPv6 Routing Table	IPv6 routing table status
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF, I - IS-IS, B - BGP > - selected route, * - FIB route,	Abbreviation display sign of every entry



p - stale info	
S 2009:1::/64 via fe80::250:baff:fe2:a4f4, Vlan1 1024	The static router in FIB table, of which the destination network segment is 2002::/64, via means passing fe80::250:baff:fe2:a4f4 is the next hop, VLAN1 is the exit interface name, 1024 is router weight.

### 1.2.39 show ipv6 neighbors

- **Command:** `show ipv6 neighbors [{vlan|ethernet|tunnel } interface-number | interface-name | address <ipv6address>]`
- **Function:** Display neighbor table entry information.
- **Parameter:** Parameter `{vlan|ethernet|tunnel} interface-number|interface-name` specify the lookup based on interface. Parameter `ipv6-address` specifies the lookup based on IPv6 address. It displays the whole neighbor table entry if without parameter.
- **Default Situation:** None
- **Command Mode:** Admin and Configuration Mode
- **Usage Guide:**
- **Example:**
- Switch#show ipv6 neighbors
- IPv6 neighbour unicast items: 14, valid: 11, matched: 11, incomplete: 0, delayed: 0,
- manage items 5
- IPv6 Address                      Hardware Addr      Interface      Port      State
- 2002:ca60:c801:1:250:baff:fe2:a4f4      00-50-ba-f2-a4-f4      Vlan1      Ethernet1/0/2  
reachable
- 3ffe:3240:800d:1::100                      00-03-0f-01-27-86      Vlan1      Ethernet1/0/3  
reachable
- 3ffe:3240:800d:1::8888                      00-02-01-00-00-00      Vlan1      Ethernet1/0/1  
permanent
- 3ffe:3240:800d:1:250:baff:fe2:a4f4      00-50-ba-f2-a4-f4      Vlan1      Ethernet1/0/4  
reachable
- 3ffe:3240:800d:2::8888                      00-02-01-00-01-01      Vlan2      Ethernet1/0/16  
permanent
- 3ffe:3240:800d:2:203:fff:fe3045      00-03-0f-fe-30-45      Vlan2      Ethernet1/0/15  
reachable
- fe80::203:fff:fe01:2786                      00-03-0f-01-27-86      Vlan1      Ethernet1/0/5  
reachable
- fe80::203:fff:fe3045                      00-03-0f-fe-30-45      Vlan2      Ethernet1/0/17  
reachable

- fe80::20c:ceff:fe13:eac1 reachable 00-0c-ce-13-ea-c1 Vlan12 Ethernet1/0/20
- fe80::250:baff:fe2:a4f4 reachable 00-50-ba-f2-a4-f4 Vlan1 Ethernet1/0/6
- IPv6 neighbour table: 11 entries

Displayed information	Explanation
IPv6 Address	Neighbor IPv6 address
Hardware Addr	Neighbor MAC address
Interface	Exit interface name
Port	Exit interface name
State	Neighbor status (reachable、statle、delay、probe、permanent、incomplete、unknow)

#### 1.2.40 show ipv6 traffic

- **Command:** show ipv6 traffic
- **Function:** Display IPv6 transmission data packets statistics information.
- **Parameter:** None
- **Default:** None
- **Command Mode:** Admin and Configuration Mode
- **Example:**
- Switch#show ipv6 traffic
- IP statistics:
- Rcvd: 90 total, 17 local destination
  - 0 header errors, 0 address errors
  - 0 unknown protocol, 13 discards
- Frags: 0 reassembled, 0 timeouts
  - 0 fragment rcvd, 0 fragment dropped
  - 0 fragmented, 0 couldn't fragment, 0 fragment sent
- Sent: 110 generated, 0 forwarded
  - 0 dropped, 0 no route
- ICMP statistics:

- Rcvd: 0 total 0 errors 0 time exceeded
  - 0 redirects, 0 unreachable, 0 echo, 0 echo replies

Displayed information	Explanation
IP statistics	IPv6 data report statistics
Rcvd: 90 total, 17 local destination0 header errors, 0 address errors0 unknown protocol, 13 discards	IPv6 received packets statistics
Frgs: 0 reassembled, 0 timeouts 0 fragment rcvd, 0 fragment dropped0 fragmented, 0 couldn't fragment, 0 fragment sent	IPv6 fragmenting statistics
Sent: 110 generated, 0 forwarded 0 dropped, 0 no route	IPv6 sent packets statistics

#### 1.2.41 show ipv6 redirect

- **Command:** show ipv6 redirect
- **Function:** Display the state IPv6 redirect switch.
- **Parameters:** None.
- **Default:** None.
- **Command Mode:** Admin and Configuration Mode.
- **Usage Guide:** This command can be used to check whether the IPv6 redirect function in the system is enabled.
- **Examples:**
  - Switch show ipv6 redirect
  - ipv6 redirect is disabled

#### 1.2.42 show ipv6 tunnel

- This command is not supported by this switch.

#### 1.2.43 tunnel source

- This command is not supported by this switch.

### 1.2.44 tunnel destination

- This command is not supported by this switch.

### 1.2.45 tunnel nexthop

- This command is not supported by this switch.

### 1.2.46 tunnel 6to4-relay

- This command is not supported by the switch.

### 1.2.47 tunnel mode

- This command is not supported by this switch.

## 1.3 Commands for IP Route Aggregation

### 1.3.1 ip fib optimize

- **Command:** ip fib optimize
- **no ip fib optimize**
- **Function:** Enables the switch to use optimized IP route aggregation algorithm; the “no ip fib optimize” disables the optimized IP route aggregation algorithm.
- **Default:** Optimized IP route aggregation algorithm is disabled by default.
- **Command mode:** Global Mode.
- **Usage Guide:** This command is used to optimize the aggregation algorithm: if the route table contains no default route, the next hop most frequently referred to will be used to construct a virtual default route to simplify the aggregation result. This method has the benefit of more effectively simplifying the aggregation result. However, while adding a virtual default route to the chip segment route table reduces CPU load, it may introduce unnecessary data stream to switches of the next hop. In fact, part of local switch CPU load is transferred to switches of the next hop.
- **Example:** Disabling optimized IP route aggregation algorithm.
- Switch(config)# no ip fib optimize

## 1.4 Commands for ARP Configuration

### 1.4.1 arp

- **Command:** arp <ip\_address> <mac\_address> {interface [ethernet] <portName>}
  - no arp <ip\_address>
- **Function:** Configures a static ARP entry; the “no arp <ip\_address>” command deletes a ARP entry of the specified IP address.

- **Parameters:** *<ip\_address>* is the IP address, at the same field with interface address; *<mac\_address>* is the MAC address; **ethernet** stands for Ethernet port; *<portName>* for the name of layer2 port.
- **Default:** No static ARP entry is set by default.
- **Command mode:** VLAN Interface Mode
- **Usage Guide:** Static ARP entries can be configured in the switch.
- **Example:** Configuring static ARP for interface VLAN1.
- Switch(Config-if-Vlan1)#arp 1.1.1.1 00-03-0f-f0-12-34 interface eth 1/0/2

#### 1.4.2 clear arp-cache

- **Command:** clear arp-cache
- **Function:** Clears ARP table.
- **Command mode:** Admin Mode
- **Example:**
- Switch#clear arp-cache

#### 1.4.3 clear arp traffic

- **Command:** clear arp traffic
- **Function:** Clear the statistic information of ARP messages of the switch. For box switches, this command will only clear statistics of APP messages received and sent from the current boardcard.
- **Command mode:** Admin Mode
- **Example:**
- Switch#clear arp traffic

#### 1.4.4 debug arp

- **Command:** debug arp {receive|send|state}
  - no debug arp {receive|send|state}
- **Function:** Enables the ARP debugging function; the “no debug arp {receive|send|state}” command disables this debugging function.
- **Parameter:** **receive** the debugging-switch of receiving ARP packets of the switch; **send** the debugging-switch of sending ARP packets of the switch; **state** the debugging-switch of APR state changing of the switch.
- **Default:** ARP debug is disabled by default.
- **Command mode:** Admin Mode.
- **Usage Guide:** Display contents for ARP packets received/sent, including type, source and destination address, etc.
- **Example:** Enable ARP debugging.
- Switch#debug arp receive
- %Jan 01 01:05:53 2006 IP ARP: rcvd, type REQUEST, src 172.16.1.251, 00-e0-4c-88-ad-bc, dst 172.16.1.110, 00-00-00-00-00-00 flag 0x0, pkt type 1, intf Vlan100.

- %Jan 01 01:05:53 2006 IP ARP: rcvd, type REQUEST, src 172.16.1.251, 00-e0-4c-88-ad-bc, dst 172.16.1.110, 00-00-00-00-00-00 flag 0x0, pkt type 1, intf Vlan100.
- e%Jan 01 01:05:53 2006 IP ARP: rcvd, type REQUEST, src 172.16.1.251, 00-e0-4c-88-ad-bc, dst 172.16.1.110, 00-00-00-00-00-00 flag 0x0, pkt type 1, intf Vlan100.
- %Jan 01 01:05:53 2006 IP ARP: rcvd, type REQUEST, src 172.16.1.251, 00-e0-4c-88-ad-bc, dst172.16.1.110, 00-00-00-00-00-00 flag 0x0, pkt type 1, intf Vlan100.

#### 1.4.5 ip proxy-arp

- **Command:** ip proxy-arp
  - no ip proxy-arp
- **Function:** Enables proxy ARP for VLAN interface; the no command disables proxy ARP.
- **Default:** Proxy ARP is disabled by default.
- **Command mode:** VLAN Interface Mode
- **Usage Guide:** When an ARP request is received on the layer 3 interface, requesting an IP address in the same IP segment of the interface but not the same physical network, and the proxy ARP interface has been enabled, the interface will reply to the ARP with its own MAC address and forward the actual packets received. Enabling this function allows machines to physically be separated but in the same IP segment and communicate via the proxy ARP interface as if in the same physical network. Proxy ARP will check the route table to determine whether the destination network is reachable before responding to the ARP request; ARP request will only be responded if the destination is reachable.
- **Note:** the ARP request matching default route will not use proxy.
- **Example:** Enable proxy ARP for VLAN 1.
- Switch(Config-if-Vlan1)#ip proxy-arp

#### 1.4.6 I3 hashselect

- This command is not supported by the switch.

#### 1.4.7 show arp

- **Command:** show arp [*<ipaddress>*] [*<vlan-id>*] [*<hw-addr>*] [type {static | dynamic}] [count] [vrf word]
- **Function:** Displays the ARP table.
- **Parameters:** *<ipaddress>* is a specified IP address; *<vlan-id>* stands for the entry for the identifier of specified VLAN; *<hw-addr>* for entry of specified MAC address; **static** for static ARP entry; **dynamic** for dynamic ARP entry; **count** displays number of ARP entries; **word** is the specified vrf name.
- **Command mode:** Admin Mode
- **Usage Guide:** Displays the content of current ARP table such as IP address, MAC address, hardware type, interface name, etc.
- **Example:**

- Switch#show arp
- ARP Unicast Items: 7, Valid: 7, Matched: 7, Verifying: 0, Incomplete: 0, Failed: 0, None: 0
- Address      Hardware Addr    Interface    Port      Flag
- 50.1.1.6      00-0a-eb-51-51-38    Vlan50      Ethernet1/0/11    Dynamic
- 50.1.1.9      00-00-00-00-00-09      Vlan50      Ethernet1/0/1      Static
- 150.1.1.2      00-00-58-fc-48-9f      Vlan150      Ethernet1/0/4      Dynamic

Displayed information	Explanation
Total arp items	Total number of ARP entries.
Valid	ARP entry number matching the filter conditions and attributing the legality states.
Matched	ARP entry number matching the filter conditions.
Verifying	ARP entry number at verifying again validity for ARP.
InCompleted	ARP entry number have ARP request sent without ARP reply.
Failed	ARP entry number at failed state.
None	ARP entry number at begin-found state.
Address	IP address of ARP entries.
Hardware Address	MAC address of ARP entries.
Interface	Layer 3 interface corresponding to the ARP entry.
Port	Physical (Layer2) port corresponding to the ARP entry.
Flag	Describes whether ARP entry is dynamic or static.

### 1.4.8 show arp traffic

- **Command:** show arp traffic
- **Function:** Display the statistic information of ARP messages of the switch. For box switches, this command will only show statistics of APP messages received and sent from the current boardcard.
- **Command mode:** Admin and Config Mode
- **Usage Guide:** Display statistics information of received and sent APP messages.
- **Example:**
  - Switch#show arp traffic
  - ARP statistics:
    - Rcvd: 10 request, 5 response
    - Sent: 5 request, 10 response

## 1.5 Commands for I3 station movement

### 1.5.1 I3-station-move

- **Command:** I3-station-move
- **no I3-station-move**
- **Function:** Enable I3-station-move, the no command disables I3-station-move function.
- When arp/nd switch over the port in normal condition, learn the port information of arp/nd entry again according to arp/nd packets. If PC or other network nodes switch over the port, non-security switchover (ARP packets are not sent or received) does not process to learn again. New I3 station movement is used to satisfy arp/nd switchover in specific condition. When MAC switch over the port, it is considered to be security switchover, any network packets (src mac is the network node that process switchover) received from new port spring arp/nd switchover, learn arp/nd to new port.
- **Parameters:** *<ip\_address>*: IP address at the same field with interface address
  - *<mac\_address>*: MAC address
  - **ethernet**: Ethernet port
  - *<portName>*: Layer 2 port name
- **Default:** Disable.
- **Command Mode:** Global mode
- **Usage Guide:** I3-station-move takes effect after reboot switch.
- **Example:**
  - Switch(Config)# I3-station-move



## Chapter 2 COMMANDS FOR ARP SCANNING PREVENTION

### 2.1 anti-arpscan enable

- **Command:** anti-arpscan enable
  - no anti-arpscan enable
- **Function:** Globally enable ARP scanning prevention function; “no anti-arpscan enable” command globally disables ARP scanning prevention function.
- **Parameters:** None.
- **Default Settings:** Disable ARP scanning prevention function.
- **Command Mode:** Global configuration mode
- **User Guide:** When remotely managing a switch with a method like telnet, users should set the uplink port as a Super Trust port before enabling anti-ARP-scan function, preventing the port from being shutdown because of receiving too many ARP messages. After the anti-ARP-scan function is disabled, this port will be reset to its default attribute, that is, Untrust port.
- **Example:** Enable the ARP scanning prevention function of the switch.
- Switch(config)#anti-arpscan enable

### 2.2 anti-arpscan port-based threshold

- **Command:** anti-arpscan port-based threshold <threshold-value>
  - no anti-arpscan port-based threshold
- **Function:** Set the threshold of received messages of the port-based ARP scanning prevention. If the rate of received ARP messages exceeds the threshold, the port will be closed. The unit is packet/second. The “no anti-arpscan port-based threshold” command will reset the default value, 10 packets/second.
- **Parameters:** rate threshold, ranging from 2 to 200.
- **Default Settings:** 10 packets /second.
- **Command Mode:** Global Configuration Mode.
- **User Guide:** the threshold of port-based ARP scanning prevention should be larger than the threshold of IP-based ARP scanning prevention, or, the IP-based ARP scanning prevention will fail.
- **Example:** Set the threshold of port-based ARP scanning prevention as 10 packets /second.
- Switch(config)#anti-arpscan port-based threshold 10

### 2.3 anti-arpscan ip-based threshold

- **Command:** anti-arpscan ip-based threshold <threshold-value>
  - no anti-arpscan ip-based threshold

- **Function:** Set the threshold of received messages of the IP-based ARP scanning prevention. If the rate of received ARP messages exceeds the threshold, the IP messages from this IP will be blocked. The unit is packet/second. The “no anti-arp scan ip-based threshold” command will reset the default value, 3 packets/second.
- **Parameters:** rate threshold, ranging from 1 to 200.
- **Default Settings:** 3 packets/second.
- **Command Mode:** Global configuration mode
- **User Guide:** The threshold of port-based ARP scanning prevention should be larger than the threshold of IP-based ARP scanning prevention, or, the IP-based ARP scanning prevention will fail.
- **Example:** Set the threshold of IP-based ARP scanning prevention as 6 packets/second.
- Switch(config)#anti-arp scan ip-based threshold 6

## 2.4 anti-arp scan trust

- **Command:** anti-arp scan trust [port | supertrust-port]
  - no anti-arp scan trust [port | supertrust-port]
- **Function:** Configure a port as a trusted port or a super trusted port;” no anti-arp scan trust <port | supertrust-port>”command will reset the port as an untrusted port.
- **Parameters:** None.
- **Default Settings:** By default all the ports are non- trustful.
- **Command Mode:** Port configuration mode
- **User Guide:** If a port is configured as a trusted port, then the ARP scanning prevention function will not deal with this port, even if the rate of received ARP messages exceeds the set threshold, this port will not be closed, but the non- trustful IP of this port will still be checked. If a port is set as a super non- trustful port, then neither the port nor the IP of the port will be dealt with. If the port is already closed by ARP scanning prevention, it will be opened right after being set as a trusted port.
- When remotely managing a switch with a method like telnet, users should set the uplink port as a Super Trust port before enabling anti-ARP-scan function, preventing the port from being shutdown because of receiving too many ARP messages. After the anti-ARP-scan function is disabled, this port will be reset to its default attribute, that is, Untrust port.
- **Example:** Set port ethernet 1/0/5 of the switch as a trusted port.
- Switch(config)#in e1/0/5
- Switch(Config-If-Ethernet1/0/5)# anti-arp scan trust port

## 2.5 anti-arp scan trust ip

- **Command:** anti-arp scan trust ip <ip-address> [<netmask>]
  - no anti-arp scan trust ip <ip-address> [<netmask>]

- **Function:** Configure trusted IP;” **no anti-arpscan trust ip <ip-address> [<netmask>]**” command reset the IP to non-trustful IP.
- **Parameters:** **<ip-address>**: Configure trusted IP address; **<netmask>**: Net mask of the IP.
- **Default Settings:** By default all the IP are non-trustful. Default mask is 255.255.255.255
- **Command Mode:** Global configuration mode
- **User Guide:** If a port is configured as a trusted port, then the ARP scanning prevention function will not deal with this port, even if the rate of received ARP messages exceeds the set threshold, this port will not be closed. If the port is already closed by ARP scanning prevention, its traffic will be recovered right immediately.
- **Example:** Set 192.168.1.0/24 as trusted IP.
- Switch(config)#anti-arpscan trust ip 192.168.1.0 255.255.255.0

## 2.6 anti-arpscan recovery enable

- **Command:** **anti-arpscan recovery enable**
  - **no anti-arpscan recovery enable**
- **Function:** Enable the automatic recovery function, “**no anti-arpscan recovery enable**” command will disable the function.
- **Parameters:** None
- **Default Settings:** Enable the automatic recovery function
- **Command Mode:** Global configuration mode
- **User Guide:** If the users want the normal state to be recovered after a while the port is closed or the IP is disabled, they can configure this function.
- **Example:** Enable the automatic recovery function of the switch.
- Switch(config)#anti-arpscan recovery enable

## 2.7 anti-arpscan recovery time

- **Command:** **anti-arpscan recovery time <seconds>**
  - **no anti-arpscan recovery time**
- **Function:** Configure automatic recovery time; “**no anti-arpscan recovery time**” command resets the automatic recovery time to default value.
- **Parameters:** Automatic recovery time, in second ranging from 5 to 86400.
- **Default Settings:** 300 seconds.
- **Command Mode:** Global configuration mode
- **User Guide:** Automatic recovery function should be enabled first.
- **Example:** Set the automatic recovery time as 3600 seconds.
- Switch(config)#anti-arpscan recovery time 3600

## 2.8 anti-arpscan log enable

- **Command:** anti-arpscan log enable
  - no anti-arpscan log enable
- **Function:** Enable ARP scanning prevention log function; "no anti-arpscan log enable" command will disable this function.
- **Parameters:** None.
- **Default Settings:** Enable ARP scanning prevention log function.
- **Command Mode:** Global configuration mode
- **User Guide:** After enabling ARP scanning prevention log function, users can check the detailed information of ports being closed or automatically recovered by ARP scanning prevention or IP being disabled and recovered by ARP scanning prevention. The level of the log is "Warning".
- **Example:** Enable ARP scanning prevention log function of the switch.
- Switch(config)#anti-arpscan log enable

## 2.9 anti-arpscan trap enable

- **Command:** anti-arpscan trap enable
  - no anti-arpscan trap enable
- **Function:** Enable ARP scanning prevention SNMP Trap function; "no anti-arpscan trap enable" command disable ARP scanning prevention SNMP Trap function.
- **Parameters:** None.
- **Default Settings:** Disable ARP scanning prevention SNMP Trap function.
- **Command Mode:** Global configuration mode
- **User Guide:** After enabling ARP scanning prevention SNMP Trap function, users will receive Trap message whenever a port is closed or recovered by ARP scanning prevention, and whenever IP t is closed or recovered by ARP scanning prevention.
- **Example:** Enable ARP scanning prevention SNMP Trap function of the switch.
- Switch(config)#anti-arpscan trap enable

## 2.10 show anti-arpscan

- **Command:** show anti-arpscan [trust [ip | port | supertrust-port] |prohibited [ip | port]]
- **Function:** Display the operation information of ARP scanning prevention function.
- **Parameters:** None.
- **Default Settings:** Display every port to tell whether it is a trusted port and whether it is closed. If the port is closed, then display how long it has been closed. Display all the trusted IP and disabled IP.
- **Command Mode:** Admin Mode

- **User Guide:** Use “**show anti-arpscan trust port**” if users only want to check trusted ports. The reset follow the same rule.
- **Example:** Check the operating state of ARP scanning prevention function after enabling it.
- Switch(config)#show anti-arpscan
- Total port: 28
- Name Port-property beShut shutTime(seconds)
- Ethernet1/0/1 untrust N 0
- Ethernet1/0/2 untrust N 0
- Ethernet1/0/3 untrust N 0
- Ethernet1/0/4 untrust N 0
- Ethernet1/0/5 untrust N 0
- Ethernet1/0/6 untrust N 0
- Ethernet1/0/7 untrust N 0
- Ethernet1/0/8 untrust N 0
- Ethernet1/0/9 untrust N 0
- Ethernet1/0/10 untrust N 0
- Ethernet1/0/11 untrust N 0
- Ethernet1/0/12 untrust N 0
- Ethernet1/0/13 untrust N 0
- Ethernet1/0/14 untrust N 0
- Ethernet1/0/15 untrust N 0
- Ethernet1/0/16 trust N 0
- Ethernet1/0/17 untrust N 0
- Ethernet1/0/18 supertrust N 0
- Ethernet1/0/19 untrust Y 30
- Ethernet1/0/20 trust N 0
- Ethernet1/0/21 untrust N 0
- Ethernet1/0/22 untrust N 0
- Ethernet1/0/23 untrust N 0
- Ethernet1/0/24 untrust N 0
- Ethernet1/0/25 untrust N 0
- Ethernet1/0/26 untrust N 0
- Ethernet1/0/27 untrust N 0
- Ethernet1/0/28 untrust N 0
  
- Prohibited IP:
- IP shutTime(seconds)
- 1.1.1.2 132
  
- Trust IP:

- 192.168.99.5 255.255.255.255
- 192.168.99.6 255.255.255.255

## 2.11 debug anti-arpscan

- **Command:** debug anti-arpscan [port | ip]
  - no debug anti-arpscan [port | ip]
- **Function:** Enable the debug switch of ARP scanning prevention; “no debug anti-arpscan [port | ip]” command disables the switch.
- **Parameters:** None.
- **Default Settings:** Disable the debug switch of ARP scanning prevention
- **Command Mode:** Admin Mode
- **User Guide:** After enabling debug switch of ARP scanning prevention users can check corresponding debug information or enable the port-based or IP-based debug switch separately whenever a port is closed by ARP scanning prevention or recovered automatically, and whenever IP t is closed or recovered .
- **Example:** Enable the debug function for ARP scanning prevention of the switch.
- Switch(config)#debug anti-arpscan

## Chapter 3 COMMANDS FOR PREVENTING ARP, ND SPOOFING

### 3.1 ip arp-security updateprotect

- **Command:** ip arp-security updateprotect
  - no ip arp-security updateprotect
- **Function:** Forbid ARP table automatic update. The "no ip arp-security updateprotect" command re-enables ARP table automatic update.
- **Parameter:** None.
- **Default:** ARP table automatic update.
- **Command Mode:** Global Mode/ Interface configuration.
- **User Guide:** Forbid ARP table automatic update, the ARP packets conflicting with current ARP item (e.g. with same IP but different MAC or port) will be dropped, the others will be received to update aging timer or create a new item; so, the current ARP item keep unchanged and the new item can still be learned.
- **Example:**
  - Switch(Config-if-Vlan1)#ip arp-security updateprotect.
  - Switch(config)#ip arp-security updateprotect

### 3.2 ipv6 nd-security updateprotect

- **Command:** ipv6 nd-security updateprotect
  - no ipv6 nd-security updateprotect
- **Function:** Forbid ND automatic update function of IPv6 Version, the no command resets ND automatic update function.
- **Parameter:** None
- **Default:** ND update normally.
- **Command Mode:** Global Mode/ Interface configuration
- **User Guide:** Forbid ND table automatic update, the ND packets conflicting with current ND item (e.g. with same IP but different MAC or port) will be dropped, the others will be received to update aging timer or create a new item; so, the current ND item keep unchanged and the new item can still be learned.
- **Example:**
  - Switch(Config-if-Vlan1)#ipv6 nd -security updateprotect
  - Switch(config)#ipv6 nd -security updateprotect

### 3.3 ip arp-security learnprotect

- **Command:** ip arp-security learnprotect
  - no ip arp-security learnprotect

- **Function:** Forbid ARP learning function of IPv4 Version, the “no ip arp-security learnprotect” command re-enables ARP learning function.
- **Parameter:** None.
- **Default:** ARP learning enabled.
- **Command Mode:** Global Mode/ Interface Configuration.
- **Usage Guide:** This command is for preventing the automatic learning and updating of ARP. Unlike ip arp-security updateprotect, once this command implemented, there will still be timeout even if the switch keeps sending Request/Reply messages.
- **Example:**
  - Switch(Config-if-Vlan1)# ip arp-security learnprotect
  - Switch(config)# ip arp-security learnprotect

### 3.4 ipv6 nd-security learnprotect

- **Command:** ipv6 nd-security learnprotect
- **no ipv6 nd-security learnprotect**
- **Function:** Forbid ND learning function of IPv6 Version, the no command re-enables ND learning function.
- **Parameter:** None.
- **Default:** ND learning enabled.
- **Command Mode:** Global Mode/ Interface Configuration.
- **Usage Guide:** This command is for preventing the automatic learning and updating of ND. Unlike ip nd-security updateprotect, once this command implemented, there will still be timeout even if the switch keeps sending Request/Reply messages.
- **Example:**
  - Switch(Config-if-Vlan1)#ipv6 nd -security learnprotect
  - Switch(config)#ipv6 nd -security learnprotect

### 3.5 ip arp-security convert

- **Command:** ip arp-security convert
- **Function:** Change all of dynamic ARP to static ARP.
- **Parameter:** None
- **Command Mode:** Global Mode/ Interface configuration
- **Usage Guide:** This command will convert the dynamic ARP entries to static ones, which, in combination with disabling automatic learning, can prevent ARP binding. Once implemented, this command will lose its effect.
- **Example:**
  - Switch(Config-if-Vlan1)#ip arp -security convert
  - Switch(config)#ip arp -security convert



### 3.6 ipv6 nd-security convert

- **Command:** `ipv6 nd-security convert`
- **Function:** Change all dynamic ND to static ND.
- **Parameter:** None
- **Command Mode:** Global Mode/ Interface Configuration
- **Usage Guide:** This command will convert the dynamic ND entries to static ones, which, in combination with disabling automatic learning, can prevent ND binding. Once implemented, this command will lose its effect.
- **Example:**
  - `Switch(Config-if-Vlan1)#ipv6 nd -security convert`
  - `Switch(config)#ipv6 nd -security convert`

### 3.7 clear ip arp dynamic

- **Command:** `clear ip arp dynamic`
- **Function:** Clear all of dynamic ARP on interface.
- **Parameter:** None
- **Command Mode:** Interface Configuration
- **Usage Guide:** This command will clear dynamic entries before binding ARP. Once implemented, this command will lose its effect.
- **Example:**
  - `Switch(Config-if-Vlan1)#clear ip arp dynamic`

### 3.8 clear ipv6 nd dynamic

- **Command:** `clear ipv6 nd dynamic`
- **Function:** Clear all dynamic ND on interface.
- **Parameter:** None
- **Command mode:** Interface Configuration
- **Usage Guide:** This command will clear dynamic entries before binding ND. Once implemented, this command will lose its effect.
- **Example:**
  - `Switch(Config-if-Vlan1)#clear ipv6 nd dynamic`

## Chapter 4 COMMAND FOR ARP GUARD

### 4.1 arp-guard ip

- **Command:** arp-guard ip <addr>
  - no arp-guard ip <addr>
- **Function:** Add an ARP GUARD address, the no command deletes ARP GUARD address.
- **Parameters:** <addr> is the protected IP address, in dotted decimal notation.
- **Default:** There is no ARP GUARD address by default.
- **Command Mode:** Port configuration mode
- **Usage Guide:** After configuring the ARP GUARD address, the ARP messages received from the ports configured ARP GUARD will be filtered. If the source IP addresses of the ARP message match the ARP GUARD address configured on this port, these messages will be judged as ARP cheating messages, which will be directly dropped instead of sending to the CPU of the switch or forwarding. 16 ARP GUARD addresses can be configured on each port.
- **Example:**
  - Configure the ARP GUARD address on port ethernet1/0/1 as 100.1.1.1.
  - switch(config)#interface ethernet1/0/1
  - switch(Config-If-Ethernet 1/0/1)#arp-guard ip 100.1.1.1
  - Delete the ARP GUARD address on port ethernet1/0/1 as 100.1.1.1.
  - switch(config)#interface ethernet1/0/1
  - switch(Config-If-Ethernet 1/0/1)#no arp-guard ip 100.1.1.1

## Chapter 5 COMMAND FOR ARP LOCAL PROXY

### 5.1 ip local proxy-arp

- **Command:** ip local proxy-arp
  - no ip local proxy-arp
- **Function:** Enable/disable the local ARP Proxy function of a specified interface.
- **Parameters:** None.
- **Default Settings:** This function is disabled on all interfaces by default.
- **Command Mode:** Interface VLAN Mode.
- **User Guide:** This function is disabled on all interfaces by default, and differs from the original proxy-arp in that this function acts as an ARP Proxy inside the same layer-3 interface and thus directs the layer-3 forwarding of the switch.
- **Example:** Enable the local ARP Proxy function of interface VLAN1.
- Switch(Config-if-Vlan1)# ip local proxy-arp

## Chapter 6 COMMANDS FOR GRATUITOUS ARP CONFIGURATION

### 6.1 ip gratuitous-arp

- **Command:** `ip gratuitous-arp [<interval-time>]`
  - `no ip gratuitous-arp`
- **Function:** To enable gratuitous ARP, and specify update interval for gratuitous ARP. The no form of this command will disable the gratuitous ARP configuration.
- **Parameters:** `<interval-time>` is the update interval for gratuitous ARP with its value limited between 5 and 1200 seconds and with default value as 300 seconds.
- **Command Mode:** Global Configuration Mode and Interface Configuration Mode.
- **Default:** Gratuitous ARP is disabled by default.
- **Usage Guide:** When configuring gratuitous ARP in global configuration mode, all the Layer 3 interfaces in the switch will be enabled to send gratuitous ARP request. If gratuitous ARP is configured in interface configuration mode, then only the specified interface is able to send gratuitous ARP requests. When configuring the gratuitous ARP, the update interval configuration from interface configuration mode has higher preference than that from the global configuration mode.
- **Example:**
  - 1) To enable gratuitous ARP in global configuration mode, and set the update interval to be 400 seconds.
    - Switch>enable
    - Switch#config
    - Switch(config)#ip gratuitous-arp 400
  - 2) To enable gratuitous ARP for interface VLAN 10 and set the update interval to be 350 seconds.
    - Switch(config)#interface vlan 10
    - Switch(Config-if-Vlan10)#ip gratuitous-arp 350

### 6.2 show ip gratuitous-arp

- **Command:** `show ip gratuitous-arp [interface vlan <vlan-id>]`
- **Function:** To display configuration information about gratuitous ARP.
- **Parameters:** `<vlan-id>` is the VLAN ID. The valid range for `<vlan-id>` is between 1 and 4094.
- **Command Mode:** All the Configuration Modes.
- **Usage Guide:** In all the configuration modes, the command `show ip gratuitous arp` will display information about the gratuitous ARP configuration in global and interface configuration mode. The command `show ip gratuitous-arp interface vlan <vlan-id>` will

display information about the gratuitous ARP configuration about the specified VLAN interface.

- **Example:**

- 1) To display information about gratuitous ARP configuration in both global and interface configuration modes.

- Switch#show ip gratuitous-arp
- Gratuitous ARP send is Global enabled, Interval-Time is 300(s)

- Gratuitous ARP send enabled interface vlan information:

- Name           Interval-Time(seconds)
- Vlan1           400
- Vlan10          350

- 2) To display gratuitous ARP configuration information about interface VLAN 10.

- Switch#show ip gratuitous-arp interface vlan 10
- Gratuitous ARP send interface Vlan10 information:
- Name           Interval-Time(seconds)
- Vlan10          350

## Chapter 7 COMMANDS FOR KEEPALIVE GATEWAY

### 7.1 keepalive gateway

- **Command:** `keepalive gateway <ip-address> [{<interval-seconds> | msec <interval-millisecond>} [retry-count]]`
  - **no keepalive gateway**
- **Function:** Enable keepalive gateway, configure the interval that ARP request packet is sent and the retry-count after detection is failing, the no command disables the function.
- **Parameters:** ip-address: IP address of the gateway
- interval-seconds: The interval (unit is second) that ARP request packet is sent, ranging between 1 and 32767. If there is no configuration, the default is 10 seconds.
  - interval-millisecond: The interval (unit is millisecond) that ARP request packet is sent, ranging between 160 and 999.
  - retry-count: Determine the retry-count after detection is failing. If there is no configuration, the default is 5 times.
- **Default:** Disable keepalive gateway.
- **Command Mode:** Interface mode.
- **Usage Guide:** This command is supported by layer 3 switch and the detection method is used to point-to-point topology mode only.
- **Example:**
- Switch(config)#interface vlan 1
- Switch(config-if-vlan1)#keealive gateway 1.1.1.1 3 10

### 7.2 show ip interface

- **Command:** `show ip interface [interface-name]`
- **Function:** Show IPv4 running status of the specified interface.
- **Parameters:** interface-name is the specified interface name. If there is no parameter, show IPv4 running status of all interfaces.
- **Default:** None.
- **Command Mode:** Admin and configuration mode.
- **Usage Guide:** Show IPv4 running status of the interface.
- **Example:**
- Switch(config)#show ip interface brief
- Index Interface IP-Address Protocol
- 3001 Vlan1 1.1.1.2 up
- 9000 Loopback 127.0.0.1 up

### 7.3 show keepalive gateway

- **Command:** show keepalive gateway [interface-name]
- **Function:** Show keepalive running status of the specified interface.
- **Parameters:** interface-name is the specified interface name. If there is no parameter, show keepalive running status of all interfaces.
- **Default:** None.
- **Command Mode:** Admin and configuration mode.
- **Usage Guide:** Show keepalive running status of the interface.
- **Example:**
  - Switch(config)#show keepalive gateway
  - interface Vlan1 gateway 1.1.1.1 time 10s retry 1 remain 4 now UP