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OpenFlow

Command Reference

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OpenFlow commands

active instance

Use **active instance** to activate an OpenFlow instance.

Use **undo active instance** to deactivate an OpenFlow instance.

Syntax

active instance

undo active instance

Default

An OpenFlow instance is not activated.

Views

OpenFlow instance view

Predefined user roles

network-admin

Usage guidelines

If the VLAN configuration or flow table configuration of an activated OpenFlow instance is changed, use this command to reactivate the instance. After the OpenFlow instance is reactivated, it re-establishes connections to controllers if the OpenFlow instance was connected to the controllers before the reactivation.

Examples

```
# Activate OpenFlow instance 1.  
<Sysname> system-view  
[Sysname] openflow instance 1  
[Sysname-of-inst-1] active instance
```

classification

Use **classification** to configure the OpenFlow instance mode.

Use **undo classification** to restore the default.

Syntax

classification vlan *vlan-id* [**mask** *vlan-mask*] [**loosen**]

undo classification

Default

The OpenFlow instance mode is not configured.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

vlan: Specifies the VLAN mode.

vlan-id: Specifies a VLAN ID in the range of 1 to 4094.

vlan-mask: Specifies a VLAN mask in the range of 0 to 4095. The default value is 4095.

loosen: Specifies the loosen mode. If the loosen mode is used, a port belongs to the OpenFlow instance when VLANs associated with the OpenFlow instance overlap with the port's allowed VLANs. If you do not specify the loosen mode, a port belongs to an OpenFlow instance only when VLANs associated with the OpenFlow instance are within the port's allowed VLAN list.

Usage guidelines

The VLANs to be associated are calculated by a bitwise AND operation on the specified VLAN ID and mask. The VLAN mask supports non-contiguous 1s and ignores all 0 bits. To view the associated VLANs, use the **display openflow instance** command.

If you execute this command multiple times, the most recent configuration takes effect.

Examples

Enable the VLAN mode for OpenFlow instance 1 and associate OpenFlow instance 1 with VLANs determined by VLAN ID 255 and VLAN mask 7.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] classification vlan 255 mask 7
```

Related commands

display openflow instance

controller address

Use **controller address** to specify a controller for an OpenFlow switch and configure the main connection to the controller.

Use **undo controller address** to delete the main connection to the specified controller.

Syntax

controller *controller-id* **address** { **ip** *ipv4-address* | **ipv6** *ipv6-address* } [**port** *port-number*] [**local address** { **ip** *local-ipv4-address* | **ipv6** *local-ipv6-address* } [**port** *local-port-number*]] [**ssl** *ssl-policy-name*] [**vrf** *vrf-name*]

undo controller *controller-id* **address**

Default

An OpenFlow instance does not have a main connection to a controller.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

controller-id: Specifies a controller by its ID in the range of 0 to 63.

ip *ipv4-address*: Specifies the IPv4 address of the controller.

ipv6 *ipv6-address*: Specifies the IPv6 address of the controller.

port *port-number*: Sets the port number used by the controller to establish TCP connections to the OpenFlow switch. The value range for the port number is 1 to 65535. The default value is 6633.

local address: Specifies the source IP address used to establish TCP connections to the controller. When multiple routes are available between a controller and a switch, you can use this keyword to configure a source IP address for the switch. When the switch restarts or an active/standby switchover occurs, the switch can use the original route to reconnect to the controller without selecting a new route.

ip *local-ipv4-address*: Specifies the source IPv4 address.

ipv6 *local-ipv6-address*: Specifies the source IPv6 address.

port *local-port-number*: Specifies the source port number in the range of 1 to 65535. If you do not specify this option, the system automatically assigns a source port number for establishing the main connection to the controller.

ssl *ssl-policy-name*: Specifies the SSL client policy that the controller uses to authenticate the OpenFlow switch. The *ssl-policy-name* argument is a case-insensitive string of 1 to 31 characters. You must configure a separate SSL client policy for the main connection to each controller.

vrf *vrf-name*: Specifies an MPLS L3VPN instance by its name, a case-sensitive string of 1 to 31 characters. If you do not specify a VRF name, the controller is in the public network.

Usage guidelines

You can specify multiple controllers for an OpenFlow switch. The OpenFlow channel between the OpenFlow switch and each controller can have only one main connection.

The OpenFlow switch uses the main connection to a controller to exchange control messages with the controller to perform the following operations:

- Receive flow table entries or data from the controller.
- Report information to the controller.

As a best practice, configure a unicast IP address for a controller. An OpenFlow switch might fail to establish a connection with the controller that does not use a unicast IP address.

As a best practice, configure a unicast source IP address that is the IP address of a port belonging to the OpenFlow instance. If the source IP address is not a unicast address of a port belonging to the OpenFlow instance, the OpenFlow switch might fail to establish a connection with the controller.

Examples

```
# Specify controller 1 for OpenFlow instance 1. The controller's IP address is 1.1.1.1 and the port number is 6666.
```

```
<Sysname> system-view
```

```
[Sysname] openflow instance 1
```

```
[Sysname-of-inst-1] controller 1 address ip 1.1.1.1 port 6666
```

controller connect interval

Use **controller connect interval** to set the interval for an OpenFlow instance to reconnect to a controller.

Use **undo controller connect interval** to restore the default.

Syntax

controller connect interval *interval*

undo controller connect interval

Default

An OpenFlow instance reconnects to a controller every 60 seconds.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

interval: Specifies the reconnection interval in the range of 10 to 120 seconds.

Examples

```
# Configure OpenFlow instance 1 to reconnect to a controller every 10 seconds.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] controller connect interval 10
```

controller echo-request interval

Use **controller echo-request interval** to set the echo request interval for an OpenFlow switch.

Use **undo controller echo-request interval** to restore the default.

Syntax

controller echo-request interval *interval*

undo controller echo-request interval

Default

The echo request interval is 5 seconds for an OpenFlow switch.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

interval: Specifies the echo request interval in the range of 1 to 10 seconds.

Examples

```
# Set the echo request interval to 10 seconds for OpenFlow instance 1.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] controller echo-request interval 10
```

controller mode

Use **controller mode** to set the controller mode for an OpenFlow instance.

Use **undo controller mode** to restore the default.

Syntax

controller mode { **multiple** | **single** }

undo controller mode

Default

The controller mode is **multiple**.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

multiple: Specifies the **multiple** mode.

single: Specifies the **single** mode.

Usage guidelines

In **single** mode, the OpenFlow switch connects to only one controller at a time. When communication with the current controller fails, the OpenFlow instance connects to the controller with the lowest ID among the rest controllers.

In **multiple** mode, the OpenFlow switch simultaneously connects to all controllers. If one or more controllers become invalid or disconnected, the OpenFlow switch continues to exchange messages with the rest of the controllers.

Examples

```
# Set all controllers of OpenFlow instance 1 to operate in single mode.
```

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] controller mode single
```

datapath-id

Use **datapath-id** to set the datapath ID for an OpenFlow instance.

Use **undo datapath-id** to restore the default.

Syntax

datapath-id *id*

undo datapath-id

Default

The datapath ID of an OpenFlow instance contains the instance ID and the bridge MAC address of the device. The lower 16 bits are the instance ID and the upper 48 bits are the bridge MAC address of the device.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

id: Specifies the datapath ID for the OpenFlow instance, in the range of 1 to ffffffff in hexadecimal format.

Examples

```
# Set the datapath ID to 123456 for OpenFlow instance 1.
```

```
<Sysname> system-view
```

```
[Sysname] openflow instance 1
[Sysname-of-inst-1] datapath-id 123456
```

description

Use **description** to configure a description for an OpenFlow instance.

Use **undo description** to restore the default.

Syntax

```
description text
undo description
```

Default

An OpenFlow instance does not have a description.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

text: Specifies a description, a case-sensitive string of 1 to 255 characters.

Examples

```
# Configure the description as test-desc for OpenFlow instance 1.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] description test-desc
```

display openflow

Use **display openflow** to display controller information for an OpenFlow instance.

Syntax

```
display openflow instance instance-id { controller [ controller-id ] | listened }
```

Views

Any view

Predefined user roles

network-admin
network-operator

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094.

controller-id: Specifies a controller by its ID in the range of 0 to 63. If you do not specify a controller ID, this command displays information about all controllers for an OpenFlow instance.

listened: Specifies the client that connects to the server that is enabled for the OpenFlow instance.

Examples

```
# Display controller information for OpenFlow instance 100.
```

```
<Sysname> display openflow instance 100 controller
```

```
Instance 1 controller information:
```

```
Reconnect interval : 60 (s)
```

```
Echo interval      : 5 (s)
```

```
Controller ID      : 1
```

```
Controller IP address : 192.168.49.49
```

```
Controller port     : 6633
```

```
Local IP address    : 192.0.0.1
```

```
Local port          : 5566
```

```
Controller role     : Equal
```

```
Connect type        : TCP
```

```
Connect state       : Established
```

```
Packets sent        : 9
```

```
Packets received    : 9
```

```
SSL policy          : --
```

```
VRF name            : --
```

Table 1 Command output

Field	Description
Reconnect interval	Reconnection interval (in seconds) for an OpenFlow instance to reconnect to all controllers.
Echo interval	Connection detection interval (in seconds) at which an OpenFlow instance sends an echo request message to all controllers.
Controller IP address	IP address of the controller.
Controller port	TCP port number of the controller.
Local IP address	Source IP address of the controller that is connected to the OpenFlow instance.
Local port	Source TCP port number of the current controller.
Controller role	Role of the controller: <ul style="list-style-type: none">• Equal—The controller has the same mode as other controllers that are specified for the OpenFlow instance.• Master—The controller is the master controller for the OpenFlow instance.• Slave—The controller is a subordinate controller for the OpenFlow instance. If the controller is not configured with any role, this field displays two hyphens (--).
Connect type	Type of the connection between the OpenFlow instance and the controller: TCP or SSL .
Connect state	State of the connection between the OpenFlow instance and the controller: Idle or Established .
Packets sent	Number of packets that have been sent to the controller.
Packets received	Number of packets that have been received from the controller.
SSL policy	Name of the SSL client policy used for SSL connections. If no SSL client policy is configured, this field displays two hyphens (--).

Field	Description
VRF name	Name of the MPLS L3VPN to which the controller belongs. If no MPLS L3VPN instance is configured, this field displays two hyphens (--).

display openflow flow-table

Use **display openflow flow-table** to display flow table information for an OpenFlow instance.

Syntax

```
display openflow instance instance-id flow-table [ table-id ]
```

Views

Any view

Predefined user roles

network-admin

network-operator

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094.

table-id: Specifies a flow table by its ID in the range of 0 to 254. If you do not specify a flow table ID, the command displays information about all flow tables for the specified OpenFlow instance.

Examples

Display information about all flow tables for OpenFlow instance 100.

```
<Sysname> display openflow instance 100 flow-table
Instance 100 flow table information:

Table 0 information:
  Table type: MAC-IP, flow entry count: 1, total flow entry count: 2

MissRule (default) flow entry information:
  cookie: 0x0, priority: 0, hard time: 0, idle time: 0, flags: reset_counts
  |no_pkt_counts|no_byte_counts, byte count: --, packet count: --
Match information: any
Instruction information:
  Write actions:
    Drop

Flow entry rule 1 information:
  cookie: 0x0, priority: 1, hard time: 0, idle time: 0, flags: none,
  byte count: --, packet count: --
Match information:
  Ethernet destination MAC address: 0000-0000-0001
  Ethernet destination MAC address mask: ffff-ffff-ffff
  VLAN ID: 100, mask: 0xfff
Instruction information:
  Write actions:
    Output interface: GE1/0/4
```

```
Write metadata/mask: 0x0000000000000001/0xffffffffffffffff
Goto table: 1
```

Table 1 information:

```
Table type: Extensibility, flow entry count: 2, total flow entry count: 2
```

MissRule (default) flow entry information:

```
cookie: 0x0, priority: 0, hard time: 0, idle time: 0, flags: none,
byte count: 300, packet count: 60
```

Match information: any

Instruction information:

```
Write actions:
```

```
Drop
```

Flow entry rule 1 information: (Not effective)

```
cookie: 0x0, priority: 0, hard time: 0, idle time: 0, flags: flow_send_rem
|check_overlap, byte count: 8, packet count: 1
```

Match information:

```
Input interface: GE1/0/3
```

```
Ethernet source MAC address: 0000-0000-0001
```

```
Ethernet source MAC address mask: ffff-ffff-ffff
```

Instruction information:

```
Set meter: 100
```

```
Apply actions:
```

```
Output interface: GE1/0/4
```

```
Write actions:
```

```
Output interface: Controller, send length: 128 bytes
```

Table 2 Command output

Field	Description
Table information	Information about the flow table.
Table type	Type of the flow table: MAC-IP or Extensibility .
flow entry count	Number of flow entries deployed by the controller.
total flow entry count	Total number of flow entries in the table.
Flow entry rule information	Information about the flow entry. If the flow entry does not take effect, this field displays Not effective .
cookie	Cookie ID of the flow entry.
priority	Priority of the flow entry. The larger the value, the higher the priority.
hard time	Hard timeout of the flow entry, in seconds. The flow entry is removed when the timer times out, whether or not the flow entry matches any data stream. If the flow entry has no hard timeout, the field displays 0 .
idle time	Idle timeout of the flow entry, in seconds. The flow entry is removed if the flow entry does not match any data stream during the idle time. If the flow entry has no idle timeout, the field displays 0 .

Field	Description
flags	<p>Flags that the flow entry includes:</p> <ul style="list-style-type: none"> • flow_send_rem—Sends a flow removed message when the flow entry is removed or expires. • check_overlap—Checks for overlapping flow entries. • reset_counts—Resets flow table counters. • no_pkt_counts—Does not count packets. • no_byte_counts—Does not count bytes. <p>If the flow entry does not include any flags, this field displays none.</p>
byte count	Number of bytes that have matched the flow entry.
packet count	Number of packets that have matched the flow entry.
Match information	Contents of the match field of the flow entry (see Table 3).
Instruction information	<p>Contents of the instruction set of the flow entry:</p> <ul style="list-style-type: none"> • Set meter—Sends the matched packet to a specific meter. • Write metadata—Writes the value into the metadata fields of the matched packet. Metadata is used for passing messages between flow tables. • Write metadata mask—Specifies which bits of the metadata should be modified. • Goto table—Sends the matched packet to the next flow table for processing. • Clear actions—Immediately clears all actions in the action set. • Apply actions—Immediately applies specified actions in the action set. • Write actions—Writes specified actions into the current action set. <p>For more information about actions, see Table 4.</p>

Table 3 Match field types

Field	Mask field	Description
Input interface	N/A	Ingress port (see Table 5).
Physical input interface	N/A	Ingress physical port.
Metadata	Metadata mask	Metadata and mask.
Ethernet destination MAC address	Ethernet destination MAC address mask	Ethernet destination MAC address and mask.
Ethernet source MAC address	Ethernet source MAC address mask	Ethernet source MAC address and mask.
Ethernet type	N/A	Ethernet type of the OpenFlow packet payload.
VLAN ID	Mask	VLAN ID and mask.
VLAN PCP	N/A	VLAN priority.
IP DSCP	N/A	Differentiated Services Code Point (DSCP) value.
IP ECN	N/A	Explicit Congestion Notification (ECN) value in the IP header.
IP protocol	N/A	IPv4 or IPv6 protocol number.
IPv4 source address	Mask	IPv4 source address and mask.
IPv4 destination address	Mask	IPv4 destination address and mask.

Field	Mask field	Description
TCP source port	Mask	TCP source port and mask.
TCP destination port	Mask	TCP destination port and mask.
UDP source port	Mask	UDP source port and mask.
UDP destination port	Mask	UDP destination port and mask.
ICMPv4 type	N/A	ICMPv4 type.
ICMPv4 code	N/A	ICMPv4 code.
ARP source IPv4 address	Mask	Sender IPv4 address and mask in the ARP payload.
ARP source MAC address	ARP source MAC address mask	Sender MAC address and mask in the ARP payload.
IPv6 source address	IPv6 source address mask	Source IPv6 address and mask.
IPv6 destination address	IPv6 destination address mask	Destination IPv6 address and mask.
IPv6 flow label	Mask	IPv6 flow label and mask.
ICMPv6 type	N/A	ICMPv6 type.
ICMPv6 code	N/A	ICMPv6 code.
Output interface	N/A	Output port.
VRF index	N/A	VPN index.
Fragment	N/A	Fragment.
Physical output interface	N/A	Output physical port.
CVLAN ID	Mask	CVLAN ID and mask.
Experimenter	N/A	Extension matching fields. Address ID represents the unique identifier of an address.

Table 4 Actions

Field	Description
Drop	Drops the matched packet. This action is not defined in the OpenFlow specifications.
Output interface	Sends the packet through a specific port. For more information about ports, see Table 5 .
Group	Specifies a group table to process the packet.
Set queue	Maps the flow entry to a queue specified by its ID.
Set field	Modifies a field of the packet.

Table 5 Ports

Port name	Ingress port	Output port	Description
Normal	Not supported.	Supported.	Processing the packet by using the normal forwarding process.
Flood	Not supported.	Supported.	Flooding the packet.
All	Not supported.	Supported.	Forwarding the packet out of all ports.

Port name	Ingress port	Output port	Description
Controller	Supported.	Supported.	Sending the packet to the controller.
Local	Supported.	Supported.	Sending the packet to the local CPU.
<i>port name</i>	Supported.	Supported.	Valid physical or logical port on the switch.

display openflow group

Use **display openflow group** to display group entry information for an OpenFlow instance.

Syntax

display openflow instance *instance-id* **group** [*group-id*]

Views

Any view

Predefined user roles

network-admin

network-operator

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094.

group-id: Specifies a group by its ID in the range of 0 to 4294967040. If you do not specify a group ID, this command displays information about all group entries for an OpenFlow instance.

Examples

Display group entry information for OpenFlow instance 100.

```
<Sysname> display openflow instance 100 group
```

```
Instance 100 group table information:
```

```
Group count: 2
```

```
Group entry 103:
```

```
Type: All, byte count: 55116, packet count: 401
```

```
Bucket 1 information:
```

```
Action count 1, watch port: any, watch group: any
```

```
Byte count 55116, packet count 401
```

```
Output interface: BAGG100
```

```
Bucket 2 information:
```

```
Action count 1, watch port: any, watch group: any
```

```
Byte count --, packet count --
```

```
Output interface: Controller, send length: 128 bytes
```

```
Referenced information:
```

```
Count: 3
```

```
Flow table 0
```

```
Flow entry: 1, 2, 3
```

```
Group entry 104:
```

```
Type: All, byte count: 0, packet count: 0
```

```
Bucket 1 information:
```

```

Action count 1, watch port: any, watch group: any
Byte count --, packet count --
Output interface: Controller, send length: 128 bytes
Referenced information:
Count: 0

```

Table 6 Command output

Field	Description
Group count	Total number of group entries included in the OpenFlow instance.
Type	Type of the group entry. The value of All indicates that the device executes all buckets in the group. This group is used for multicast or broadcast forwarding.
Bucket	Buckets included in the group table.
Action count	Number of actions included in the bucket.
Byte count	Number of bytes processed by a group or by a bucket. If this field is not supported, the field displays two hyphens (--).
packet count	Number of packets processed by a group or by a bucket. If this field is not supported, the field displays two hyphens (--).
watch port	Port whose state affects whether this bucket is live.
watch group	Group whose state affects whether this bucket is live.
Output interface	Output interface included in the group entry.
Referenced information	Information about the group entry used by flow entries.
Count	Total number of flow entries that use the group entry.
Flow table	Flow table to which the flow entries that use the group entry belong.
Flow entry	Flow entries that use the group entry.

display openflow instance

Use **display openflow instance** to display detailed information about an OpenFlow instance.

Syntax

```
display openflow instance [ instance-id ]
```

Views

Any view

Predefined user roles

network-admin

network-operator

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094. If you do not specify an instance ID, this command displays detailed information about all OpenFlow instances.

Examples

```
# Display detailed information about OpenFlow instance 100.
<Sysname> display openflow instance 100
```

Instance 100 information:

Configuration information:

Description : test-desc

Active status : Active

Inactive configuration:

None

Active configuration:

Classification: VLAN, loosen mode, total VLANs(1)

2

In-band management VLAN, total VLANs(0)

Empty VLAN

Connect mode: Multiple

MAC address learning: Disabled

TCP DSCP value: 10

Flow table:

Table ID(type): 0(MAC-IP), count: 0

Flow-entry max-limit: 65535

Datapath ID: 0x0000001234567891

Default table-miss: Drop

Forbidden port: None

Qinq Network: Disabled

TCP connection backup: Enabled

Port information:

GigabitEthernet1/0/3

Active channel information:

Controller 1 IP address: 192.168.49.49 port: 6633

Controller 2 IP address: 192.168.43.49 port: 6633

Table 7 Command output

Field	Description
Configuration information	Information about the configuration.
Description	Description of the OpenFlow instance.
Active status	OpenFlow instance status: Active or Inactive .
Inactive configuration	Inactive configuration for the OpenFlow instance.
Active configuration	Active configuration for the OpenFlow instance.
Classification: VLAN, total VLANs	VLANs that are associated with the OpenFlow instance and the total number of these VLANs.
loose mode	The loose mode is used.
In-band management VLAN, total VLANs	Inband management VLANs and the total number of them.
Connect mode	Connection mode of the controller: <ul style="list-style-type: none">• Single—The OpenFlow instance connects to only one controller at a time.• Multiple—The OpenFlow instance can simultaneously connect to multiple controllers.

Field	Description
MAC address learning	Whether MAC address learning is disabled: Enabled or Disabled .
TCP DSCP value	DSCP value for OpenFlow packets.
Flow table	Flow table information for the OpenFlow instance.
Table ID(type)	Type of the flow table: MAC-IP or Extensibility .
count	Total number of flow entries included in the current flow table.
Flow-entry max-limit	Maximum number of flow entries allowed in the extensibility flow table.
Datapath ID	Datapath ID of the OpenFlow instance.
Default table-miss	Default action of the table-miss flow entry: Permit or Drop .
Forbidden port	Type of interfaces that are forbidden to be reported to the controller: <ul style="list-style-type: none"> • L3 Physical Interface—Layer 3 Ethernet interfaces and Layer 3 aggregate interfaces. • VLAN interface.
Qinq Network	Whether the OpenFlow instance is enabled to perform QinQ tagging for double-tagged packets passing an extensibility flow table: <ul style="list-style-type: none"> • Disabled. • Enabled.
TCP connection backup	Whether OpenFlow connection backup is enabled: <ul style="list-style-type: none"> • Disabled. • Enabled.
Port information	Ports that have been added to the OpenFlow instance.
Active channel information	Information about active channels.
IP address	IP address of the controller configured for the OpenFlow instance.
Port	TCP port number that is used to connect to the controller.
Failopen mode	Connection interruption mode for the OpenFlow instance: <ul style="list-style-type: none"> • Standalone. • Smart. • Secure.

display openflow meter

Use **display openflow meter** to display meter entry information for an OpenFlow instance.

Syntax

```
display openflow instance instance-id meter [ meter-id ]
```

Views

Any view

Predefined user roles

network-admin

network-operator

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094.

meter-id: Specifies a meter by its ID in the range of 1 to 4294901760. If you do not specify a meter ID, this command displays information about all meter entries for an OpenFlow instance.

Examples

Display meter entry information for OpenFlow instance 100.

```
<Sysname> display openflow instance 100 meter
Meter flags: KBPS -- Rate value in kb/s, PKTPS -- Rate value in packet/sec
             BURST -- Do burst size,          STATS -- Collect statistics
```

```
Instance 100 meter table information:
meter entry count: 2
```

```
Meter entry 100 information:
Meter flags: KBPS
Band 1 information
Type: drop, rate: 1024, burst size: 65536
Byte count: --, packet count: --
Referenced information:
Count: 3
Flow table: 0
Flow entry: 1, 2, 3
```

```
Meter entry 200 information:
Meter flags: KBPS
Band 1 information
Type: drop, rate: 10240, burst size: 655360
Byte count: --, packet count: --
Referenced information:
Count: 0
```

Table 8 Command output

Field	Description
Group entry count	Total number of meter entries that the OpenFlow instance has.
Meter flags	Flags configured for the meter: <ul style="list-style-type: none">• KBPS—The rate value is in kbps.• PKTPS—The rate value is in pps.• BURST—The burst size field in the band is used and the length of the packet or byte burst is determined by the burst size.• STATS—Meter statistics are collected.
Band	Bands contained in the meter.
Type	Type of the band: <ul style="list-style-type: none">• drop—Discard the packet.• dscp remark—Modify the drop precedence of the DSCP field in the IP header of the packet.
Rate	Rate value above which the corresponding band applies to packets.
Burst size	Length of the packet or byte burst to consider for applying the meter.

Field	Description
Byte count	Number of bytes processed by a band. If this field is not supported, the field displays two hyphens (--).
packet count	Number of packets processed by a band. If this field is not supported, the field displays two hyphens (--).
Referenced information	Information about the meter entry used by flow entries.
Count	Total number of flow entries that use the meter entry.
Flow table	Flow table to which the flow entries that use the meter entry belong.
Flow entry	Flow entries that use the meter entry.

display openflow summary

Use **display openflow summary** to display brief OpenFlow instance information.

Syntax

display openflow summary

Views

Any view

Predefined user roles

network-admin

network-operator

Examples

Display brief OpenFlow instance information.

```
<Sysname> display openflow summary
```

Fail-open mode: Se - Secure mode, Sa - Standalone mode

ID	Status	Datapath-ID	Channel	Table-num	Port-num	Reactivate
1	Active	0x0000000100001221	Connected	2	8	N
10	Inactive	-	-	-	-	-
4094	Active	0x00000ffe00001221	Failed(Sa)	2	0	N

Table 9 Command output

Field	Description
ID	OpenFlow instance ID.
Status	Activation status of the OpenFlow instance: <ul style="list-style-type: none"> Active—The OpenFlow instance has been activated. Inactive—The OpenFlow instance has not been activated.
Datapath-ID	Datapath ID of the OpenFlow instance. If the OpenFlow instance is not activated, this field displays a hyphen (-).

Field	Description
Channel	<p>Status of the OpenFlow channel to the controller:</p> <ul style="list-style-type: none"> • Connected—An OpenFlow channel has been established. • Failed(Se)—The OpenFlow channel is disconnected from the controller, and the OpenFlow instance uses the secure connection interruption mode. • Failed(Sm)—The OpenFlow channel is disconnected from the controller, and the OpenFlow instance uses the smart connection interruption mode. • Failed(Sa)—The OpenFlow channel is disconnected from the controller, and the OpenFlow instance uses the standalone connection interruption mode. <p>If the OpenFlow instance is not activated, this field displays a hyphen (-).</p>
Table num	<p>Number of flow tables that the OpenFlow instance has.</p> <p>If the OpenFlow instance is not activated, this field displays a hyphen (-).</p>
Port num	<p>Number of ports that belong to the OpenFlow instance.</p> <p>If the OpenFlow instance is not activated, this field displays a hyphen (-).</p>
Reactivate	<p>Whether the OpenFlow instance is required to be reactivated. N indicates the configuration is unchanged and the OpenFlow instance is not required to be reactivated.</p> <p>If the OpenFlow instance is not activated, this field displays a hyphen (-).</p>

fail-open mode

Use **fail-open mode** to set the connection interruption mode for an OpenFlow switch.

Use **undo fail-open mode** to restore the default.

Syntax

fail-open mode { **secure** | **smart** | **standalone** }

undo fail-open mode

Default

The connection interruption mode is **secure**, and the controller deploys the table-miss flow entry (the action is **Drop**) to the OpenFlow instance.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

secure: Configures the OpenFlow switch to use flow tables for traffic forwarding after it is disconnected from all controllers. If the output action in a matching flow entry is to forward traffic to a controller, the traffic is discarded.

smart: Configures the OpenFlow switch to use flow tables for traffic forwarding after it is disconnected from all controllers. If the output action in a matching flow entry is to forward traffic to a controller, the traffic is forwarded in normal process.

standalone: Configures the OpenFlow switch to use the normal forwarding process after it is disconnected from all controllers.

Examples

```
# Set the connection interruption mode to standalone for OpenFlow instance 1.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] fail-open mode standalone
```

flow-entry max-limit

Use **flow-entry max-limit** to set the maximum number of entries for an extensibility flow table on an OpenFlow switch.

Use **undo flow-entry max-limit** to restore the default.

Syntax

```
flow-entry max-limit limit-value
undo flow-entry max-limit
```

Default

An extensibility flow table can have a maximum of 65535 flow entries.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

limit-value: Specifies the maximum number of flow entries. The value range for this argument is 1 to 65535.

Examples

```
# Configure OpenFlow instance 1 to have a maximum of 256 entries in each extensibility flow table.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] flow-entry max-limit 256
```

flow-log disable

Use **flow-log disable** to disable logging for successful flow table modifications.

Use **undo flow-log disable** to restore the default.

Syntax

```
flow-log disable
undo flow-log disable
```

Default

Logging for successful flow table modifications is enabled.

Views

OpenFlow instance view

Predefined user roles

network-admin

Examples

```
# Disable logging for successful flow table modifications for OpenFlow instance 1.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] flow-log disable
```

flow-table

Use **flow-table** to create a flow table for an OpenFlow instance.

Use **undo flow-table** to restore the default.

Syntax

```
flow-table { [ ingress-vlan ingress-table-id ] [ extensibility extensibility-table-id | mac-ip mac-ip-table-id ] * [ egress-vlan egress-table-id ] }
```

```
undo flow-table
```

Default

An OpenFlow instance has an extensibility flow table with ID 0.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

ingress-vlan *ingress-table-id*: Specifies a VLAN tagging flow table by its ID in the range of 0 to 254.

extensibility *extensibility-table-id*: Specifies an extensibility flow table by its ID in the range of 0 to 254.

mac-ip *mac-ip-table-id*: Specifies a MAC-IP flow table by its ID in the range of 0 to 254.

egress-vlan *egress-table-id*: Specifies a VLAN untagging flow table by its ID in the range of 0 to 254.

Usage guidelines

Create flow tables for an OpenFlow instance before you activate the OpenFlow instance.

If you execute this command multiple times, the most recent configuration takes effect.

The ID you enter for an extensibility flow table must be larger than the ID for an MAC-IP flow table.

If you specify the **ingress-vlan** *ingress-table-id* option, make sure the VLAN tagging flow table has the smallest ID among all flow tables. If you specify the **egress-vlan** *egress-table-id* option, make sure the VLAN untagging flow table has the largest ID among all flow tables. The VLAN tagging and untagging flow tables take effect only when **qinq-network enable** command is configured and the device operates in standalone mode.

Examples

```
# Create a MAC-IP flow table with ID 0 and an extensibility flow table with ID 1 for OpenFlow instance 1.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] flow-table mac-ip 0 extensibility 1
```

Related commands

qinq-network enable

in-band management vlan

Use **in-band management vlan** to configure inband management VLANs for an OpenFlow instance.

Use **undo in-band management vlan** to restore the default.

Syntax

in-band management vlan { *vlan-id* [*to* *vlan-id*] } &<1-10>

undo in-band management vlan

Default

No inband management VLANs are configured for an OpenFlow instance.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

vlan-id: Specifies a VLAN ID in the range of 1 to 4094.

Usage guidelines

By default, traffic in VLANs associated with an OpenFlow instance is forwarded in OpenFlow forwarding process. The OpenFlow instance cannot use these VLANs to connect to the controller.

You can use this command to specify inband management VLANs for an OpenFlow instance. Traffic in inband management VLANs is forwarded in the normal forwarding process instead of the OpenFlow forwarding process. Inband management VLANs are used by an OpenFlow instance to connect to controllers.

Examples

```
# Configure VLAN 10 as the inband management VLAN for OpenFlow instance 1.
```

```
<Sysname> system-view
```

```
[Sysname] openflow instance 1
```

```
[Sysname-of-inst-1] in-band management vlan 10
```

mac-ip dynamic-mac aware

Use **mac-ip dynamic-mac aware** to configure an OpenFlow instance to support dynamic MAC addresses.

Use **undo mac-ip dynamic-mac aware** to restore the default.

Syntax

mac-ip dynamic-mac aware

undo mac-ip dynamic-mac aware

Default

An OpenFlow instance does not support dynamic MAC addresses and ignores dynamic MAC address messages sent from controllers.

Views

OpenFlow instance view

Predefined user roles

network-admin

Usage guidelines

This command configures an OpenFlow instance to support querying and deleting dynamic MAC addresses in only MAC-IP flow tables. The OpenFlow instance does not send change events for the dynamic MAC addresses to controllers.

Examples

```
# Configure OpenFlow instance 1 to support dynamic MAC addresses.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] mac-ip dynamic-mac aware
```

mac-learning forbidden

Use **mac-learning forbidden** to configure OpenFlow to forbid MAC address learning in VLANs associated with an OpenFlow instance.

Use **undo mac-learning forbidden** to restore the default.

Syntax

mac-learning forbidden

undo mac-learning forbidden

Default

MAC address learning is allowed for VLANs associated with an OpenFlow instance.

Views

OpenFlow instance view

Predefined user roles

network-admin

Examples

```
# Forbid MAC address learning in VLANs associated with OpenFlow instance 1.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] mac-learning forbidden
```

openflow instance

Use **openflow instance** to create an OpenFlow instance and enter its view, or enter the view of an existing OpenFlow instance.

Use **undo openflow instance** to remove an OpenFlow instance.

Syntax

openflow instance *instance-id*

undo openflow instance *instance-id*

Default

No OpenFlow instances exist.

Views

System view

Predefined user roles

network-admin

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094.

Examples

```
# Create OpenFlow instance 1 and enter OpenFlow instance view.
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1]
```

openflow lossless enable

Use **openflow lossless enable** to enable packet loss prevention for OpenFlow forwarding.

Use **undo openflow lossless enable** to disable packet loss prevention for OpenFlow forwarding.

Syntax

openflow lossless enable

undo openflow lossless enable

Default

Packet loss prevention for OpenFlow forwarding is disabled.

Views

System view

Predefined user roles

network-admin

Usage guidelines

Packet loss prevention ensures successful OpenFlow forwarding without packet loss. In an OpenFlow network, packet loss might occur on the switch during the flow entry deployment process. Packet loss then causes OpenFlow forwarding errors. For example, traffic is mistakenly sent to controllers and the controllers deploy faulty flow entries.

When this feature is enabled, the OpenFlow matching ability is decreased. For example, packets cannot be matched by IPv6 address.

Do not enable this feature in non-OpenFlow networks. Otherwise, the forwarding efficiency and matching ability might be decreased.

After you enable or disable packet loss prevention on a switch, save the configuration and restart the switch to make the configuration take effect.

Examples

```
# Enable packet loss prevention for OpenFlow forwarding.
<Sysname> system-view
[Sysname] openflow lossless enable
  Enable lossless traffic function? [Y/N]:y
  For the setting to take effect, save the configuration, and then reboot the device.
```

qinq-network enable

Use **qinq-network enable** to enable an OpenFlow instance to perform QinQ tagging for double-tagged packets passing an extensibility flow table.

Use **undo qinq-network enable** to restore the default.

Syntax

```
qinq-network enable  
undo qinq-network enable
```

Default

A double-tagged packet becomes single-tagged after it passes an extensibility flow table.

Views

OpenFlow instance view

Predefined user roles

network-admin

Usage guidelines

Execute this command to make double-tagged packets keep double-tagged after the packets pass an extensibility flow table.

Examples

```
# Enable OpenFlow instance 1 to perform QinQ tagging for double-tagged packets passing an  
extensibility flow table.
```

```
<Sysname> system-view  
[Sysname] openflow instance 1  
[Sysname-of-inst-1] qinq-network enable
```

Related commands

flow-table

refresh ip-flow

Use **refresh ip-flow** to refresh all Layer 3 flow entries in the MAC-IP flow tables for an OpenFlow instance.

Syntax

```
refresh ip-flow
```

Views

OpenFlow instance view

Predefined user roles

network-admin

Usage guidelines

Layer 3 flow entries in the MAC-IP flow tables might be overwritten. In such cases, you can use this command to obtain all Layer 3 flow entries in the MAC-IP flow tables from the controller again.

Examples

```
# Refresh all Layer 3 flow entries in the MAC-IP flow tables for OpenFlow instance 1.
```

```
<Sysname> system-view
```

```
[Sysname] openflow instance 1
[Sysname-of-inst-1] refresh ip-flow
```

reset openflow instance statistics

Use **reset openflow instance statistics** to clear statistics on packets that a controller sends and receives for an OpenFlow instance.

Syntax

```
reset openflow instance instance-id { controller [ controller-id ] | listened } statistics
```

Views

User view

Predefined user roles

network-admin

Parameters

instance-id: Specifies an OpenFlow instance by its ID in the range of 1 to 4094.

controller-id: Specifies a controller by its ID in the range of 0 to 63. If you do not specify a controller ID, this command clears statistics on packets that all controllers send and receive for an OpenFlow instance.

listened: Specifies the client that connects to the server enabled for the OpenFlow instance.

Examples

```
# Clear statistics on packets that all controllers send and receive for OpenFlow instance 1.
```

```
<Sysname> reset openflow instance 1 controller statistics
```

tcp dscp

Use **tcp dscp** to set a DSCP value for OpenFlow packets.

Use **undo tcp dscp** to restore the default.

Syntax

```
tcp dscp dscp-value
```

```
undo tcp dscp
```

Default

The DSCP value for OpenFlow packets is not set.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

dscp-value: Specifies a DSCP value for OpenFlow packets, in the range of 0 to 63.

Examples

```
# Set the DSCP value to 63 for OpenFlow packets.
```

```
<Sysname> system-view
```

```
[Sysname] openflow instance 1
```

[Sysname-of-inst-1] tcp dscp 63

Document conventions and icons

Conventions

This section describes the conventions used in the documentation.

Command conventions

Convention	Description
Boldface	Bold text represents commands and keywords that you enter literally as shown.
<i>Italic</i>	<i>Italic</i> text represents arguments that you replace with actual values.
[]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x y ... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[x y ...]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x y ... }*	Asterisk marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[x y ...]*	Asterisk marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.

GUI conventions

Convention	Description
Boldface	Window names, button names, field names, and menu items are in Boldface. For example, the New User window opens; click OK .
>	Multi-level menus are separated by angle brackets. For example, File > Create > Folder .

Symbols

Convention	Description
 WARNING!	An alert that calls attention to important information that if not understood or followed can result in personal injury.
 CAUTION:	An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.
 IMPORTANT:	An alert that calls attention to essential information.
NOTE:	An alert that contains additional or supplementary information.
 TIP:	An alert that provides helpful information.

Network topology icons

Convention	Description
	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.
	Represents an access controller, a unified wired-WLAN module, or the access controller engine on a unified wired-WLAN switch.
	Represents an access point.
	Represents a wireless terminator unit.
	Represents a wireless terminator.
	Represents a mesh access point.
	Represents omnidirectional signals.
	Represents directional signals.
	Represents a security product, such as a firewall, UTM, multiservice security gateway, or load balancing device.
	Represents a security module, such as a firewall, load balancing, NetStream, SSL VPN, IPS, or ACG module.

Examples provided in this document

Examples in this document might use devices that differ from your device in hardware model, configuration, or software version. It is normal that the port numbers, sample output, screenshots, and other information in the examples differ from what you have on your device.

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:
www.hpe.com/assistance
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:
www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
- To download product updates, go to either of the following:
 - Hewlett Packard Enterprise Support Center **Get connected with updates** page:
www.hpe.com/support/e-updates
 - Software Depot website:
www.hpe.com/support/softwaredepot
- To view and update your entitlements, and to link your contracts, Care Packs, and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:
www.hpe.com/support/AccessToSupportMaterials

ⓘ **IMPORTANT:**

Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HP Passport set up with relevant entitlements.

Websites

Website	Link
Networking websites	
Hewlett Packard Enterprise Information Library for Networking	www.hpe.com/networking/resourcefinder
Hewlett Packard Enterprise Networking website	www.hpe.com/info/networking
Hewlett Packard Enterprise My Networking website	www.hpe.com/networking/support
Hewlett Packard Enterprise My Networking Portal	www.hpe.com/networking/mynetworking
Hewlett Packard Enterprise Networking Warranty	www.hpe.com/networking/warranty
General websites	
Hewlett Packard Enterprise Information Library	www.hpe.com/info/enterprise/docs
Hewlett Packard Enterprise Support Center	www.hpe.com/support/hpesc
Hewlett Packard Enterprise Support Services Central	ssc.hpe.com/portal/site/ssc/
Contact Hewlett Packard Enterprise Worldwide	www.hpe.com/assistance
Subscription Service/Support Alerts	www.hpe.com/support/e-updates
Software Depot	www.hpe.com/support/softwaredepot
Customer Self Repair (not applicable to all devices)	www.hpe.com/support/selfrepair
Insight Remote Support (not applicable to all devices)	www.hpe.com/info/insightremotesupport/docs

Customer self repair

Hewlett Packard Enterprise customer self repair (CSR) programs allow you to repair your product. If a CSR part needs to be replaced, it will be shipped directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your Hewlett Packard Enterprise authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or go to the CSR website:

www.hpe.com/support/selfrepair

Remote support

Remote support is available with supported devices as part of your warranty, Care Pack Service, or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which will initiate a fast and accurate resolution based on your product's service level. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

For more information and device support details, go to the following website:

www.hpe.com/info/insightremotesupport/docs

Documentation feedback

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part number, edition, and publication date located on the front cover of the document. For online help content, include the product name, product version, help edition, and publication date located on the legal notices page.

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