Hewlett Packard Enterprise

HPE FlexNetwork HSR6600 Routers

Comware 7 OpenFlow Command Reference

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Acknowledgments

Contents

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.

Reactivating an OpenFlow instance refreshes the configuration data and interrupts communication with the controllers.

Examples

Activate OpenFlow instance 1.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] active instance
```

classification global

Use **classification global** to configure the global mode for an OpenFlow instance.

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

Syntax

classification global

undo classification

Default

The global mode is not configured for an OpenFlow instance.

Views

OpenFlow instance view

Predefined user roles

network-admin

Examples

Enable the global mode for OpenFlow instance 1.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] classification global
```

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 auxiliary

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

Use **undo controller auxiliary** to delete the specified auxiliary connection to the specified controller.

Syntax

controller *controller-id* **auxiliary** *auxiliary-id* **transport** { **tcp** | **udp** | **ssl** *ssl-policy-name* } [**address** { **ip** *ipv4-address* | **ipv6** *ipv6-address* }] [**port** *port-number*]

undo controller *id* **auxiliary** *auxiliary-id*

Default

An OpenFlow instance does not have auxiliary connections 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.

auxiliary *auxiliary-id*: Specifies an auxiliary connection ID in the range of 1 to 255.

transport: Specifies the transport layer protocol.

tcp: Specifies TCP connections.

udp: Specifies UDP connections.

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.

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 to establish TCP connections to the controller. The value range for the port number is 1 to 65535. The default value is 6633.

Usage guidelines

The OpenFlow channel might have one main connection and multiple auxiliary connections. Auxiliary connections are used to improve the communication performance between the controller and OpenFlow switches.

Make sure the configuration of an auxiliary connection does not conflict with the configuration of the main connection. Otherwise, the auxiliary connection cannot be established.

An auxiliary connection can have a different destination IP address and port number than the main connection. If no destination IP address and port number are specified, the auxiliary connection uses the destination IP address and port number configured for the main connection.

Examples

Specify controller 1 for OpenFlow instance 1 and configure auxiliary connection 1 to the controller.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] controller 10 auxiliary 1 transport tcp
```

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 0xFFFFFFFFFFFFFFFF.

Examples

Set the datapath ID to **0x123456** for OpenFlow instance 1.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] datapath-id 123456
```

default table-miss permit

Use **default table-miss permit** to change the default action of table-miss flow entries to forward packets to the normal pipeline.

Use **undo default table-miss permit** to restore the default.

Syntax

default table-miss permit

undo default table-miss permit

Default

The default action of a table-miss flow entry is to drop packets.

Views

OpenFlow instance view

Predefined user roles

network-admin

Examples

Configure the default action of table-miss flow entries to forward packets to the normal pipeline.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] default table-miss permit
```

description

Use **description** to set 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

Set the description to **test-desc** for OpenFlow instance 1 .

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] description test-desc
```

display openflow auxiliary

Use **display openflow auxiliary** to display auxiliary connection information and statistics about received and sent packets for an OpenFlow instance.

Syntax

display openflow instance *instance-id* **auxiliary** [*controller-id* [**auxiliary** *auxiliary-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.

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

auxiliary *auxiliary-id*: Specifies an auxiliary connection by its ID in the range of 1 to 255.

Examples

Display auxiliary connection information for OpenFlow instance 100.

```
<Sysname> display openflow instance 100 auxiliary
Controller ID: 1    Auxiliary connection number: 2
 Auxiliary            ID : 1
  Controller IP address  : 192.168.49.48
  Controller port        : 6633
  Connect type           : TCP
  Connect state          : Established
  Packets sent           : 9
  Packets received       : 9
  SSL policy             : --

 Auxiliary            ID : 2
  Controller IP address  : 192.168.49.49
   Controller port       : 6633
   Connect type          : TCP
   Connect state         : Established
   Packets sent          : 9
   Packets received      : 9
   SSL policy            : --
```

Table 1 Command output

Field	Description
Auxiliary connection number	Total number of auxiliary connections.
Auxiliary ID	ID of an auxiliary connection.
Controller IP address	IP address of the controller.
Controller port	TCP port number of the controller.
Connect type	Type of the connection between the OpenFlow instance and the controller: **TCP** **UDP**, 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 (**--**).

display openflow controller

Use **display openflow controller** 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 100 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 2 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.

Field	Description
Controller role	Role of the controller: • **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 (**--**).
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: GE1/1/4
 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: --, packet count: 60
Match information: any
Instruction information:
 Write actions:
  Drop

Flow entry rule 1 information:
 cookie: 0x0, priority: 0, hard time: 0, idle time: 0, flags: flow_send_rem
 |check_overlap, byte count: --, packet count: 1
Match information:
 Input interface: GE1/1/3
 Ethernet source MAC address: 0000-0000-0001
 Ethernet source MAC address mask: ffff-ffff-ffff
Instruction information:
 Set meter: 100
 Apply actions:
  Output interface: GE1/1/4
 Write actions:
  Output interface: Controller, send length: 128 bytes
```

Table 3 Command output

Field	Description
Table information	Information about the flow table.

Field	Description
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.
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**.
flags	Flags that the flow entry includes: • **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. If the flow entry does not include any flags, this field displays **none**.
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 4).
Instruction information	Contents of the instruction set of the flow entry: • **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. For more information about actions, see Table 6.

Table 4 Match field types

Field	Mask field	Description
Input interface	N/A	Ingress port (see Table 7).
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.

Field	Mask field	Description
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.
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.
SCTP source port	Mask	Stream Control Transmission Protocol (SCTP) source port and mask.
SCTP destination port	Mask	SCTP destination port and mask.
ICMPv4 type	N/A	ICMPv4 type.
ICMPv4 code	N/A	ICMPv4 code.
ARP opcode	N/A	ARP opcode.
ARP source IPv4 address	Mask	Sender IPv4 address and mask in the ARP payload.
ARP target IPv4 address	Mask	Target 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.
ARP target MAC address	ARP target MAC address mask	Target 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.
IPv6 ND target address	N/A	Target IP address in an IPv6 Neighbor Discovery message.
IPv6 ND source MAC address	N/A	Source link-layer address in an IPv6 Neighbor Discovery message.
IPv6 ND target MAC address	N/A	Target link-layer address in an IPv6 Neighbor Discovery message.

Field	Mask field	Description
MPLS label	N/A	Label in the first MPLS header.
MPLS tc	N/A	Traffic Class (TC) in the first MPLS header.
Tunnel ID	Mask	Metadata and mask that are associated with a logical port.
IPv6 extension header	Mask	IPv6 extension header and mask.
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	Proprietary matching information. For more information, see Table 5.

Table 5 Proprietary match field types

Field	Mask field	Description
In-BSSID	N/A	Ingress port BSSID.
Out-BSSID	N/A	Output port BSSID.
Eapol	N/A	802.1X authentication packet type and packet offset. (not supported)

Table 6 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 7.
send length	Specifies the max length of bytes to be taken from the packet and sent to the controller. This field appears only when the reserved port of the controller type is specified as the output port.
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.
Set MPLS TTL	Sets the MPLS TTL.
Set IP TTL	Sets the IP TTL.
Push VLAN tag	Adds a VLAN tag to the packet.
Push MPLS tag	Adds an MPLS tag to the packet.
Pop MPLS tag	Removes the outermost MPLS tag from the packet.
Pop VLAN tag	Removes the outermost VLAN tag from the packet.
Decrement MPLS TTL	Decreases the MPLS TTL by 1.

Field	Description
Decrement IP TTL	Decreases the IP TTL by 1.
Copy TTL inwards	Copies the TTL from the outermost header to the second outermost header.
Copy TTL outwards	Copies the TTL from the second outermost header to the outermost header.

Table 7 Ports

Port name	Ingress port	Output port	Description
In port	Not supported.	Supported.	Forwarding the packet out of the ingress port.
Table	Not supported.	Supported.	Submitting the packet to the first flow table so that the packet can be processed through the regular OpenFlow pipeline.
Normal	Not supported.	Supported.	Processing the packet by using the normal forwarding process.
Flood	Not supported.	Supported.	Flooding the packet to all physical ports in VLANs, except the ingress port and those blocked or link-down ports.
All	Not supported.	Supported.	Forwarding the packet out of all ports except the ingress port.
Controller	Supported.	Supported.	Sending the packet to the controller.
Local	Supported.	Supported.	Sending the packet to the local CPU.
Any	Not supported.	Not supported.	Special value used in some OpenFlow commands when you do not specify a port.
port name	Supported.	Supported.	Valid physical or logical port on the switch, such as an aggregate interface.

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 0xffffff00. 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
 Referencedinformation:
  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
 Referencedinformation:
  Count: 0
```

Table 8 Command output

Field	Description
Group count	Total number of group entries included in the OpenFlow instance.
Type	Type of the group entry: • **All**—Executes all buckets in the group. This group is used for multicast or broadcast forwarding. • **Select**—Executes one bucket in the group. • **Indirect**—Executes the one defined bucket in the group. • **Fast failover**—Executes the first live bucket.
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.

Field	Description
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 all OpenFlow instances.

```
<Sysname> display openflow instance 100
Instance 100 information:

Configuration information:
 Description   : test-desc
 Active status : Active
 Inactive configuration:
  None
 Active configuration:
  Classification: Global(Standard)
  In-band management VLAN, total VLANs(0)
   Empty VLAN
  Connect mode: Multiple
  MAC address learning: Disabled
  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
Port information:
 GigabitEthernet1/1/2
```

```
Route-Aggregation1
Active channel information:
 Controller 1 IP address: 192.168.49.49  port: 6633
 Controller 2 IP address: 192.168.43.49  port: 6633

Instance 200 information:

Configuration information:
 Description   : --
 Active status : Active
 Inactive configuration:
  None
 Active configuration:
  Classification: Global(Standard)
  In-band management VLAN, total VLANs(0)
   Empty VLAN
  Connect mode: Multiple
  Mac-address learning: Enabled
  Flow table:
   Table ID(type): 0(Extensibility), count: 0
  Flow-entry max-limit: 65535
  Datapath ID: 0x0064001122000101
  Default table-miss: Drop
  Forbidden port: None
  Qinq Network: Disabled
Port information:
 GigabitEthernet1/1/2
 Route-Aggregation1
Active channel information:
 Failopen mode: secure
```

Table 9 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: Global(Standard)	The global mode is enabled.
In-band management VLAN, total VLANs	Inband management VLANs and the total number of them (not supported).
Connect mode	Connection mode of the controller: • **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**.
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 that the current flow table can include.
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: **VLAN interface** or **VXLAN VSI interface**.
Qinq Network	This field is not supported in the current software version. Whether the OpenFlow instance is enabled to perform QinQ tagging for double-tagged packets passing an extensibility flow table: • **Enabled**. • **Disabled**.
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.
Fail-open mode	Connection interruption mode for the OpenFlow instance: **Standalone** or **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 429490176. 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: --
 Referencedinformation:
  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 10 Command output

Field	Description
Group entry count	Total number of meter entries that the OpenFlow instance has.
Meter flags	Flags configured for the meter: • **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: • **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.
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 instance 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         Y
10    Inactive  -                   -          -          -         -
4094  Active    0x00000ffe00001221  Fail(Sa)   2          0         N
```

Table 11 Command output

Field	Description
ID	OpenFlow instance ID.
Status	Activation status of the OpenFlow instance: • **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 (**-**).
Channel	Status of the OpenFlow channel to the controller: • **Connected**—An OpenFlow channel has been established. • **Fail(Se)**—The OpenFlow channel is disconnected from the controller, and the OpenFlow instance is in secure mode. • **Fail(Sa)**—The OpenFlow channel is disconnected from the controller, and the OpenFlow instance is in standalone mode. If the OpenFlow instance is not activated, this field displays a hyphen (**-**).
Table num	Number of flow tables that the OpenFlow instance has. If the OpenFlow instance is not activated, this field displays a hyphen (**-**).
Port num	Number of ports that belong to the OpenFlow instance. If the OpenFlow instance is not activated, this field displays a hyphen (**-**).
Reactivate	Whether the OpenFlow instance is required to be reactivated: • **Y**—The configuration is changed, and the OpenFlow instance is required to be reactivated. • **N**—The configuration is unchanged, and the OpenFlow instance is not required to be reactivated. If the OpenFlow instance is not activated, this field displays a hyphen (**-**).

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** | **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.

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-table

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

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

Syntax

flow-table { **extensibility** *extensibility-table-id* | **mac-ip** *mac-ip-table-id* }&<1-n>

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

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.

&<1-n>: Specifies the maximum number of extensibility flow tables that can be configured. The value range for n is 0 to 254.

Usage guidelines

You can create only one MAC-IP flow table for an OpenFlow instance.

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.

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
```

forbidden port

Use **forbidden port** to forbid an OpenFlow instance from reporting ports of the specified types to controllers.

Use **undo forbidden port** to restore the default.

Syntax

forbidden port { **vlan-interface** | **vsi-interface** } *

undo forbidden port

Default

All ports that belong to an OpenFlow instance are reported to the controllers.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

vlan-interface: Forbids reporting VLAN interfaces to controllers.

vsi-interface: Forbids reporting VXLAN VSI interfaces to controllers.

Examples

Forbid OpenFlow instance 1 from reporting VLAN interfaces that belong to the OpenFlow instance to controllers.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] forbidden port vlan-interface
```

listening port

Use **listening port** to enable an SSL server for an OpenFlow instance.

Use **undo listening port** to restore the default.

Syntax

listening port *port-number* **ssl** *ssl-policy-name*

undo listening port

Default

No SSL server is enabled for an OpenFlow instance.

Views

OpenFlow instance view

Predefined user roles

network-admin

Parameters

port-number: Specifies the SSL server port number in the range of 1 to 65535.

ssl *ssl-policy-name*: Specifies the SSL server policy name, a case-insensitive string of 1 to 31 characters.

Usage guidelines

Typically, an OpenFlow instance acts as the TCP/SSL client and actively connects to the controller (SSL server).

You can configure this feature to enable an SSL server for an OpenFlow instance. After an SSL server is enabled for an OpenFlow instance, the controller acts as an SSL client and actively connects to the OpenFlow instance.

To re-configure the SSL server, first execute the **undo** form of the command to delete the existing SSL server configuration.

Examples

Enable an SSL server with the port number 20000 for OpenFlow instance 1.

```
<Sysname> system-view
[Sysname] openflow instance 1
[Sysname-of-inst-1] listening port 20000 ssl ssl_name
```

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
```

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]
```

reset openflow instance controller statistics

Use **reset openflow instance controller 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
```

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.
Italic	*Italic* 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

Hewlett Packard Enterprise is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (docsfeedback@hpe.com). When submitting your feedback, include the document title,

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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