



# VLAN Management

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## VLAN Settings

Virtual Local Area Network (VLAN) creation allows you to make separate broadcast domains on a switch. The broadcast domains can associate with one another with the help of a Layer 3 device such as a router. A VLAN is mainly used to form groups among the hosts regardless of where the hosts are physically located. Thus, a VLAN improves security with the help of group formation among the hosts. When a VLAN is created, it has no effect until that VLAN is attached to at least one port either manually or dynamically. One of the most common reasons to set up a VLAN is to set up a separate VLAN for voice, and a separate VLAN for data. This directs the packets for both types of data despite using the same network.

To create a VLAN, follow these steps:

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**Step 1** Click **VLAN Management** > **VLAN Settings**.

**Step 2** Click **Add** to add one or more new VLANs.

The page enables the creation of either a single VLAN or a range of VLANs.

**Step 3** To create a single VLAN, select the VLAN radio button, enter the VLAN ID, and optionally the VLAN Name.

**Step 4** Add the following fields for the new VLANs.

- VLAN Interface State-Select to enable the VLAN.
- Link Status SNMP Traps-Select to enable link-status generation of SNMP traps.

**Step 5** To add a range of VLANs, check **Range** and enter a VLAN Range (Range 2 - 4094) in the VLAN range field.

**Step 6** Click **Apply** to create the VLAN(s).

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# VLAN Interface Settings

The VLAN Interface Settings page displays and enables configuration of VLAN-related parameters.

To configure the VLAN settings, follow these steps:

- Step 1** Click **VLAN Management > Interface Settings**.
- Step 2** Select an interface type (Port or LAG), and click **Go**. Ports or LAGs and their VLAN parameters are displayed.
- Step 3** To configure a Port or LAG, select it and click **Edit**.
- Step 4** Enter the values for the following fields:

Interface	Select a Port/LAG.
Switchport Mode	Select either Layer 2 or Layer 3.
Interface VLAN Mode	Select the interface mode for the VLAN. The options are: <ul style="list-style-type: none"> <li>• Access—The interface is an untagged member of a single VLAN. A port configured in this mode is known as an access port.</li> <li>• Trunk—The interface is an untagged member of one VLAN at most, and is a tagged member of zero or more VLANs. A port configured in this mode is known as a trunk port.</li> <li>• General—The interface can support all functions as defined in the IEEE 802.1q specification. The interface can be a tagged or untagged member of one or more VLANs.</li> <li>• Customer—Selecting this option places the interface in QinQ mode. This enables you to use your own VLAN arrangements (PVID) across the provider network. The device is in Q-in-Q mode when it has one or more customer ports.</li> </ul>
Frame Type	(Available only in General mode) Select the type of frame that the interface can receive. Frames that aren't of the configured frame type are discarded at ingress. Possible values are: <ul style="list-style-type: none"> <li>• Admit All—The interface accepts all types of frames: untagged frames, tagged frames, and priority tagged frames.</li> <li>• Admit Tagged Only—The interface accepts only tagged frames.</li> <li>• Admit Untagged Only—The interface accepts only untagged and priority frames.</li> </ul>
Ingress Filtering	Available only in General mode) Select to enable ingress filtering. When an interface is ingress filtering enabled, the interface discards all incoming frames that are classified as VLANs of which the interface isn't a member. Ingress filtering can be disabled or enabled on general ports. It's always enabled on access ports and trunk ports.

- Step 5** Click **Apply**.

## Port to VLAN

The Port to VLAN section displays the VLAN memberships of the ports in various presentations. You can use them to add or remove memberships to or from the VLANs.

When a port is forbidden default VLAN membership, that port isn't allowed membership in any other VLAN. An internal VID of 4095 is assigned to the port.

Untagged port membership between two VLAN-aware devices with no intervening VLAN-aware devices, must be to the same VLAN. The PVID on the ports between the two devices must be the same if the ports are to send and receive untagged packets to and from the VLAN. Otherwise, traffic might leak from one VLAN to another.

Frames that are VLAN-tagged can pass through other network devices that are VLAN-aware or VLAN-unaware. If a destination end node is VLAN-unaware, but is to receive traffic from a VLAN, then the last VLAN-aware device, must send frames of the destination VLAN to the end node untagged.

Use the Port to VLAN page to display and configure the ports within a specific VLAN.

To map ports or LAGs to a VLAN, follow these steps:

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**Step 1** Click **VLAN Management** > **Port to VLAN**.

**Step 2** Select a VLAN and the interface type (Port or LAG), and click **Go** to display or to change the port characteristic with respect to the VLAN.

The port mode for each port or LAG appears with its current port mode configured from the [VLAN Interface Settings, on page 2](#).

Each port or LAG appears with its current registration to the VLAN.

The following fields are displayed:

- VLAN Mode—Displays port type of ports in the VLAN.
- Membership Type: Select one of the following options:
  - Forbidden—The interface isn't allowed to join the VLAN even from GVRP registration. When a port isn't a member of any other VLAN, enabling this option on the port makes the port part of internal VLAN 4095 (a reserved VID).
  - Excluded—The interface is currently not a member of the VLAN. This is the default for all the ports and LAGs when the VLAN is newly created.
  - Tagged—The interface is a tagged member of the VLAN.
  - Untagged—The interface is an untagged member of the VLAN. Frames of the VLAN are sent untagged to the interface VLAN.
- PVID—Select to set the PVID of the interface to the VID of the VLAN. PVID is a per-port setting.

**Step 3** Click **Apply**. The interfaces are assigned to the VLAN, and written to the Running Configuration file.

You can continue to display and/or configure port membership of another VLAN by selecting another VLAN ID.

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# Port VLAN Membership

The Port VLAN Membership page displays all ports on the device along with a list of VLANs to which each port belongs. If the port-based authentication method for an interface is 802.1x and the Administrative Port Control is Auto, then:

- Until the port is authenticated, it's excluded from all VLANs, except guest and unauthenticated ones. In the VLAN to Port page, the port is marked with an upper case P.
- When the port is authenticated, it receives membership in the VLAN in which it was configured.



**Note** VLAN IS mode is supported. This means that port VLAN membership can be configured ahead of time for various VLAN modes. When the port is put into the specific VLAN mode, the configuration becomes active.

To assign a port to one or more VLANs, follow these steps:

**Step 1** Click **VLAN Management > Port VLAN Membership**.

**Step 2** Select interface type (Port or LAG), and click **Go**. The following fields are displayed for all interfaces of the selected type:

- Interface—Port/LAG ID.
- Mode—Interface VLAN mode that was selected in the [VLAN Interface Settings, on page 2](#).
- Administrative VLANs—Drop-down list that displays all VLANs of which the interface might be a member.
- Operational VLANs—Drop-down list that displays all VLANs of which the interface is currently a member.
- LAG—If interface selected is Port, displays the LAG in which it's a member.

**Step 3** Select a port, and click **Join VLAN**.

**Step 4** Enter the values for the following fields:

- Interface—Select a Port or LAG.
- Current VLAN Mode—Displays the port VLAN mode that was selected in the [VLAN Interface Settings, on page 2](#).
- Access Mode Membership (Active)
  - Access VLAN ID—Select the VLAN from the drop-down list.
- Trunk Mode Membership
  - Native VLAN ID—When the port is in Trunk mode, it's a member of this VLAN.
  - Tagged VLANs—When the port is in Trunk mode, it's a member of these VLANs. The following options are possible:
    - All VLANs—When the port is in Trunk mode, it's a member of all VLANs.
    - User Defined—When the port is in Trunk mode, it's a member of the VLANs that are entered here.

- General Mode Membership
  - Untagged VLANs—When the port is in General mode, it's an untagged member of this VLAN.
  - Tagged VLANs—When the port is in General mode, it's a tagged member of these VLANs.
  - Forbidden VLANs—When the port is in General mode, the interface isn't allowed to join the VLAN even from GVRP registration. When a port isn't a member of any other VLAN, enabling this option on the port makes the port part of internal VLAN 4095 (a reserved VID).
  - General PVID—When the port is in General mode, it's a member of these VLANs.
- Customer Mode Membership
  - Customer VLAN ID—When the port is in Customer mode, it's a member of this VLAN.

**Step 5** Select a port and click **Details** to view the following fields:

- Administrative VLANs—Port is configured for these VLANs.
- Operational VLANs—Port is currently a member of these VLANs.

Click **Apply** (for Join VLAN). The settings are modified and written to the Running Configuration file.

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## GVRP Settings

Adjacent VLAN-aware devices can exchange VLAN information with each other by using the Generic VLAN Registration Protocol (GVRP). GVRP is based on the Generic Attribute Registration Protocol (GARP) and propagates VLAN information throughout a bridged network.

GVRP must be activated globally and on each port. When it's activated, it transmits and receives GARP Packet Data Units (GPDUs). VLANs that are defined but not active aren't propagated. To propagate the VLAN, it must be up on at least one port. By default, GVRP is disabled globally and on ports.

To define GVRP settings for an interface:

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**Step 1** Click **VLAN Management > GVRP Settings**.

**Step 2** Select **GVRP Global Status** to enable GVRP globally.

**Step 3** Click **Apply** to set the global GVRP status.

**Step 4** Select an interface type (Port or LAG), and click **Go** to display all interfaces of that type.

**Step 5** To define GVRP settings for a port, select it, and click **Edit**.

**Step 6** Enter the values for the following fields:

- Interface—Select the interface (Port or LAG) to be edited.
- GVRP State—Select to enable GVRP on this interface.
- Dynamic VLAN Creation—Select to enable Dynamic VLAN Creation on this interface.
- GVRP Registration—Select to enable VLAN Registration using GVRP on this interface.

**Step 7** Click **Apply**. GVRP settings are modified, and written to the Running Configuration file.

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## Voice VLAN

The voice VLAN feature enables access ports to carry IP voice traffic from an IP phone. When the switch is connected to an IP Phone, the phone sends voice traffic with Layer 3 IP precedence and Layer 2 class of service (CoS) values, which are both set to 5 by default. Because the sound quality of an IP phone call can deteriorate if the data is unevenly sent, the switch supports quality of service (QoS) based on IEEE 802.1p CoS. QoS uses classification and scheduling to send network traffic from the switch in a predictable manner.

Voice VLAN can propagate the CoS/802.1p and DSCP settings by using LLDP-MED Network policies. The LLDP-MED is set by default to respond with the Voice QoS setting if an appliance sends LLDP-MED packets. MED-supported devices must send their voice traffic with the same CoS/802.1p and DSCP values, as received with the LLDP-MED response. You can disable the automatic update between Voice VLAN and LLDP-MED and use your own network policies. Working with the OUI mode, the device can additionally configure the mapping and remarking (CoS/802.1p) of the voice traffic based on the OUI.

By default, all interfaces are CoS/802.1p trusted. The device applies the quality of service based on the CoS/802.1p value found in the voice stream. For Telephony OUI voice streams, you can override the quality of service and optionally remark the 802.1p of the voice streams by specifying the desired CoS/802.1p values and using the remarking option under Telephony OUI.

## Properties

Use the Voice VLAN Properties page for the following:

- View how voice VLAN is currently configured.
- Configure the VLAN ID of the Voice VLAN.
- Configure voice VLAN QoS settings.
- Configure the voice VLAN mode (Telephony OUI or Auto Voice VLAN).
- Configure how Auto Voice VLAN is triggered.

To view and configure Voice VLAN properties:

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**Step 1** Click **VLAN Management > Voice VLAN > Properties**.

- The voice VLAN settings configured on the device are displayed in the Voice VLAN Settings (Administrative Status) block.
- The voice VLAN settings that are actually being applied to the voice VLAN deployment are displayed in the Voice VLAN Settings (Operational Status) block.

**Step 2** Enter values for the following Administrative Status fields:

- Voice VLAN ID—Enter the VLAN that is to be the Voice VLAN.

**Note** Changes in the voice VLAN ID, CoS/802.1p, and/or DSCP cause the device to advertise the administrative voice VLAN as a static voice VLAN. If the option Auto Voice VLAN Activation triggered by external Voice VLAN is selected, then the default values need to be maintained.

- CoS/802.1p —Select a CoS/802.1p value for the LLDP-MED as a voice network policy. Refer to Administration > Discovery > LLDP > LLDP MED Network Policy for more details.
- DSCP—Selection of DSCP values for the LLDP-MED as a voice network policy. Refer to Administration > Discovery > LLDP > LLDP MED Network Policy for more details.

The following Operational Status fields are displayed:

- Voice VLAN ID—Voice VLAN.
- CoS/802.1p —Value being used by LLDP-MED as a voice network policy. Refer to Administration > Discovery > LLDP > LLDP MED Network Policy for more details.

- DSCP—Value used by the LLDP-MED as a voice network policy.

The following Dynamic Voice VLAN Settings fields are displayed:

- Dynamic Voice VLAN—Select this field to disable or enable voice VLAN feature in one of the following ways:
  - Enable Auto Voice VLAN—Enable Dynamic Voice VLAN in Auto Voice VLAN mode.
  - Enable Telephony OUI—Enable Dynamic Voice VLAN in Telephony OUI mode.
  - Disable-Disable Auto Voice VLAN or Telephony OUI
- Auto Voice VLAN Activation—If Auto Voice VLAN was enabled, select one of the following options to activate Auto Voice VLAN:
  - Immediate—Auto Voice VLAN on the device is to be activated and put into operation immediately if enabled.
  - By external Voice VLAN trigger—Auto Voice VLAN on the device is activated and put into operation only if the device detects a device advertising the voice VLAN.

**Note** Manually reconfiguring the voice VLAN ID, CoS/802.1p, and/or DSCP from their default values results in a static voice VLAN, which has higher priority than auto voice VLAN.

**Step 3** Click **Apply**. The VLAN properties are written to the Running Configuration file.

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## Auto Voice VLAN

If Auto Voice VLAN mode is enabled, use the Auto Voice VLAN page to view the relevant global and interface parameters.

You can also use this page to manually restart Auto Voice VLAN, by clicking Restart Auto Voice VLAN. After a short delay, this resets the voice VLAN to the default voice VLAN and restarts the Auto Voice VLAN discovery and synchronization process on all the switches in the LAN that are Auto Voice VLAN enabled.



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**Note** This only resets the voice VLAN to the default voice vlan if the Source Type is in the Inactive state.

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To view Auto Voice VLAN parameters:

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**Step 1** Click **VLAN Management > Voice VLAN > Auto Voice VLAN**.

The Operational Status block on this page shows the information about the current voice VLAN and its source:

- Auto Voice VLAN Status—Displays whether Auto Voice VLAN is enabled.
- Voice VLAN ID—The identifier of the current voice VLAN
- Source Type—Displays the type of source where the voice VLAN is discovered by the root device.
- CoS/802.1p—Displays CoS/802.1p values to be used by the LLDP-MED as a voice network policy.
- DSCP—Displays DSCP values to be used by the LLDP-MED as a voice network policy.
- Root Switch MAC Address—The MAC address of the Auto Voice VLAN root device that discovers or is configured with the voice VLAN from which the voice VLAN is learned.
- Switch MAC Address—Base MAC address of the device. If the device's Switch MAC address is the Root Switch MAC Address, the device is the Auto Voice VLAN root device.
- Voice VLAN ID Change Time—Last time that voice VLAN was updated.

**Step 2** Click **Restart Auto Voice VLAN** to reset the voice VLAN to the default voice VLAN and restart Auto Voice VLAN discovery on all the Auto-Voice-VLAN-enabled switches in the LAN.

The Voice VLAN Local Source Table displays voice VLAN configured on the device, and any voice VLAN configuration advertised by directly connected neighbor devices. It contains the following fields:

- Interface—Displays the interface on which voice VLAN configuration was received or configured. If N/A appears, the configuration was done on the device itself. If an interface appears, a voice configuration was received from a neighbor.
- Source MAC Address—MAC address of a UC from which the voice configuration was received.
- Source Type—Type of UC from which voice configuration was received. The following options are available:
  - Default—Default voice VLAN configuration on the device
  - Static—User-defined voice VLAN configuration defined on the device
  - CDP—UC that advertised voice VLAN configuration is running CDP.
  - LLDP—UC that advertised voice VLAN configuration is running LLDP.
  - Voice VLAN ID—The identifier of the advertised or configured voice VLAN
- Voice VLAN ID—The identifier of the current voice VLAN.
- CoS/802.1p—The advertised or configured CoS/802.1p values that are used by the LLDP-MED as a voice network policy.
- DSCP—The advertised or configured DSCP values that are used by the LLDP-MED as a voice network policy.



- Best Local Source—Displays whether this voice VLAN was used by the device. The following options are available:
  - Yes—The device uses this voice VLAN to synchronize with other Auto Voice VLAN-enabled switches. This voice VLAN is the voice VLAN for the network unless a voice VLAN from a higher priority source is discovered. Only one local source is the best local source.
  - No—This isn't the best local source.

**Step 3** Click **Refresh** to refresh the information on the page

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## Telephony OUI

OUIs are assigned by the Institute of Electrical and Electronics Engineers, Incorporated (IEEE) Registration Authority. Since the number of IP phone manufacturers is limited and well-known, the known OUI values cause the relevant frames, and the port on which they are seen, to be automatically assigned to a Voice VLAN. Use the Telephony OUI page to configure Telephony OUI QoS properties. In addition, the Auto Membership Aging time can be configured. If the specified time period passes with no telephony activity, the port is removed from the Voice VLAN.

To configure Telephony OUI and/or add a new Voice VLAN OUI:

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**Step 1** Click **VLAN Management > Voice VLAN > Telephony OUI**.

The Telephony OUI page contains the following fields:

- Telephony OUI Operational Status—Displays whether OUIs are used to identify voice traffic.
- CoS/802.1p—Select the CoS queue to be assigned to voice traffic.
- Remark CoS/802.1p—Select whether to remark egress traffic.
- Auto Membership Aging Time—Enter the time delay to remove a port from the voice VLAN after all of the MAC addresses of the phones detected on the ports have aged out.

**Step 2** Click **Apply** to update the Running Configuration of the device with these values.

The Telephony OUI table appears:

- Telephony OUI—First six digits of the MAC address that are reserved for OUIs.
- Description—User-assigned OUI description.

**Step 3** Click **Restore Default OUIs** to delete all of the user-created OUIs, and leave only the default OUIs in the table. The OUI information may not be accurate until the restoration is completed. This may take several seconds. After several seconds have passed, refresh the page by exiting it and reentering it.

To delete all the OUIs, select the top checkbox. All the OUIs are selected and can be deleted by clicking **Delete**. If you then click **Restore Default OUIs**, the system recovers the known OUIs.

**Step 4** To add a new OUI, click **Add**.

**Step 5** Enter the values for the following fields:

- Telephony OUI—Enter a new OUI.

- Description—Enter an OUI name.

**Step 6** Click **Apply**. The OUI is added to the Telephony OUI Table.

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## Telephone OUI Interface

The QoS attributes can be assigned per port to the voice packets in one of the following modes:

- All—Quality of Service (QoS) values configured to the Voice VLAN are applied to all of the incoming frames that are received on the interface and are classified to the Voice VLAN.
- Telephony Source MAC Address (SRC)—The QoS values configured for the Voice VLAN are applied to any incoming frame that is classified to the Voice VLAN and contains an OUI in the source MAC address that matches a configured telephony OUI.

Use the Telephony OUI Interface page to add an interface to the voice VLAN on the basis of the OUI identifier and to configure the OUI QoS mode of voice VLAN.

To configure Telephony OUI on an interface:

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**Step 1** Click **VLAN Management > Voice VLAN > Telephony OUI Interface**.

The Telephony OUI Interface page contains voice VLAN OUI parameters for all interfaces.

**Step 2** To configure an interface to be a candidate port of the telephony OUI-based voice VLAN, click **Edit**.

**Step 3** Enter the values for the following fields:

- Interface—Select an interface.
- Telephony OUI VLAN Membership—If enabled, the interface is a candidate port of the telephony OUI based voice VLAN. When packets that match one of the configured telephony OUI are received, the port is added to the voice VLAN.
- Voice VLAN QoS Mode (Telephone OUI QoS Mode in main page)—Select one of the following options:
  - All—QoS attributes are applied on all packets that are classified to the Voice VLAN.
  - Telephony Source MAC Address—QoS attributes are applied only on packets from IP phones.

**Step 4** Click **Apply**. The OUI is added.

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