VOIP Guide Using ZyXEL Switch

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Overview:

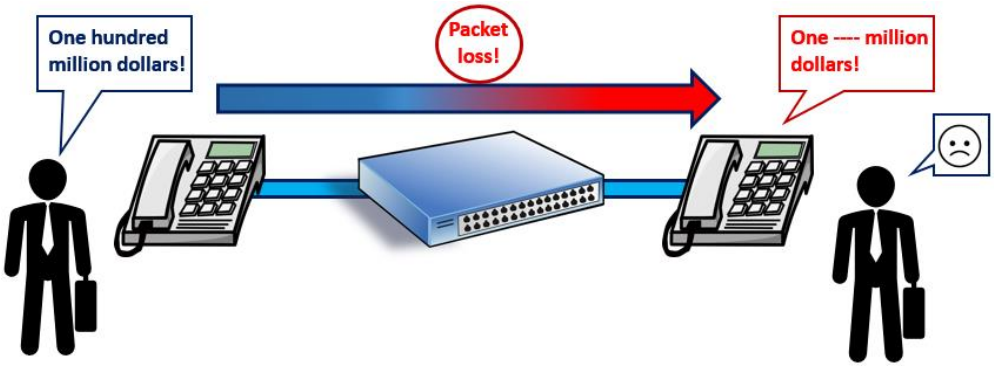
This article will contain solutions on how to configure Voice over IP (VOIP). Two methods will be discussed: Voice VLAN and LLDP-MED. Voice VLAN is a form of Quality of Service (QoS). The ZyXEL Voice VLAN configures which range of source MAC address should correspond to a VLAN with an administratively configured priority. LLDP-MED utilizes the IP Phone's LLDP packets to determine which VLAN the device's packets should belong to. Both methods are capable of performing auto-prioritization. This improves the quality of voice traffic and avoid miscommunication between two recipients. A case study will be included before the end of the article.

Objectives:

- Introduce the concept of QoS
- Explain the concept of OUI
- Present Voice VLAN in Web GUI of the GS1920 ZyXEL Switch
- Explain the function of LLDP-MED
- Present LLDP-MED in Web GUI of the GS1920 ZyXEL Switch
- Configure Voice VLAN to implement VOIP
- Configure LLDP-MED Network Policy to implement VOIP.
- Verify that Voice VLAN or LLDP-MED is functioning correctly using Web GUI

Quality of Service

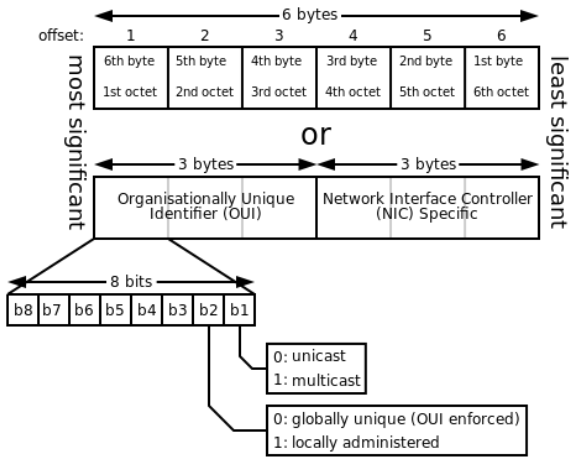
Quality of Service (QoS) is a concept that proposes that some network services deserves better bandwidth, lower latency, less errors, and stability than others. These differences in network services becomes apparent when you compare data traffic and traffic produce between two recipients using IP Telephony known as Voice IP (VoIP). When data traffic passes through the network, it either succeeds or fails. But when VoIP traffic passes through the network, it is carrying data that comes from human speech and the integrity of this speech must be preserved.



One solution for improving the quality of service of VOIP is by configuring the priority of this application. The ZyXEL switch has 8 corresponding queues for each priority. "0" being the lowest importance while "7" is the highest. Higher priorities are usually given better bandwidth.

Organizationally Unique Identifier

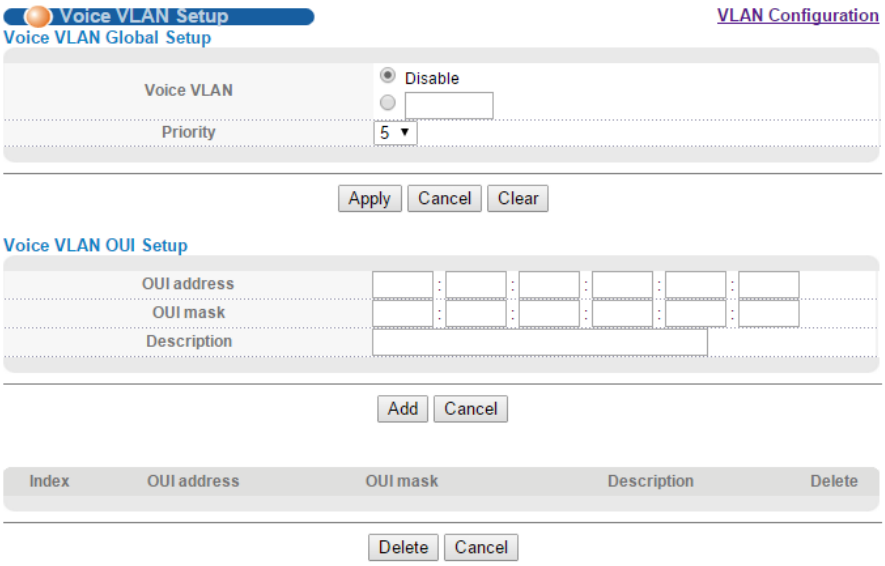
The Organizationally Unique Identifier can be commonly found in the first half of a device's MAC address. These 24-bit numbers uniquely identifies network products of a vendor, manufacturer, or other organization globally or worldwide. These must be purchased from the IEEE Registration Authority. This ensures that no network device manufacturer will create the same MAC address.



Voice VLAN takes advantage of the OUI to create a specific range for identifying devices, mainly IP Telephones. This is extremely useful when the network has over dozens of IP Telephones and plans to add more in the future.

Web GUI of Voice VLAN

Advance Application -> VLAN -> VLAN Configuration -> Voice VLAN Setup



OUI Address: This field will contain which MAC address range the OUI mask will begin with.

OUI Mask: With the same concept of subnet mask, OUI Mask uses "F" as match, while "0" as any.

Example 1:

OUI Address: 4c:93:ab:00:00:00

OUI Mask: ff:ff:ff:00:00:00

Address Range: 4c:93:ab:00:00:00 ~ 4c:93:ab:ff:ff:ff

Example 2:

OUI Address: 4c:93:ab:00:00:00

OUI Mask: ff:ff:00:00:00:00

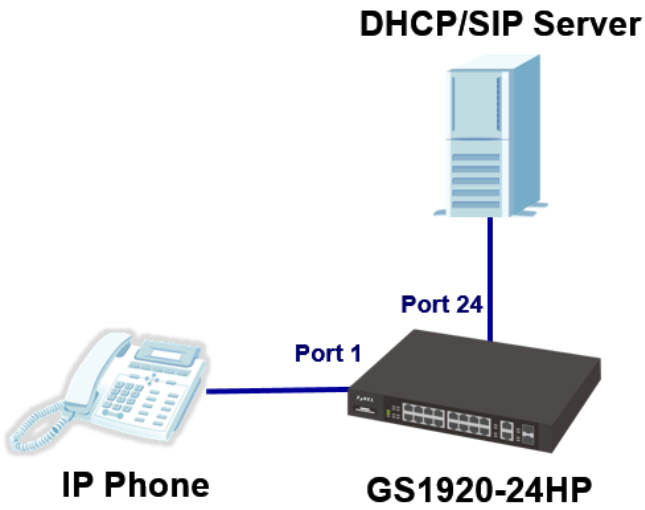
Address Range: 4c:93:ab:00:00:00 ~ 4c:94:ff:ff:ff:ff:ff

Case Study for Voice VLAN

Briefing:

The ZyXEL Voice VLAN feature uses the configured OUI as a criteria for sending packets in the Voice VLAN. This means that if configured correctly, the VOIP traffic will be processed in the Voice VLAN instead of the PVID.

Topology:



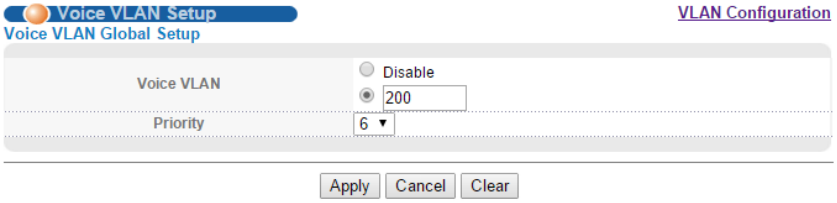
Device	IP Address	VLAN
IP Phone	DHCP	none
GS1920-24	192.168.1.1/24	1
Server	192.168.200.254/24	200

Objective:

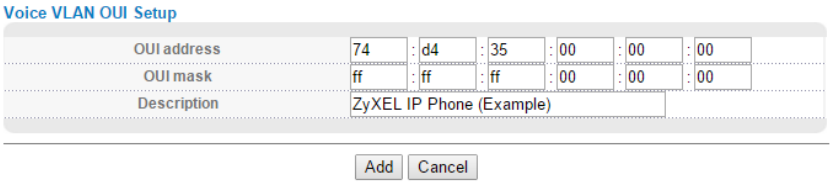
- Ensure that correct configurations were implemented.
- Ensure that packets from the device IP Phone will be tagged with the Voice VLAN.
- Ensure VOIP is processed in VLAN 200.
- Ensure that the correct priority was tagged.

Procedure:

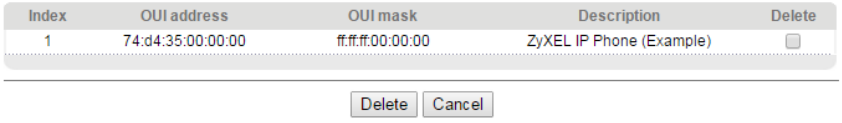
1. Create VLAN 200 for VOIP. Fix ports leading to other IP Phones and to the DHCP and SIP servers. There is no need to consider the PVID of the ports.
2. Locate the MAC address of the IP Phone. This is commonly found in the back label found under the device.
3. Configure the Voice VLAN.
   Go to Advance Application -> VLAN Configuration -> Voice VLAN Setup



4. Configure the OUI of your IP Phone. The simplest way is by inputting the first six digits of the MAC address.



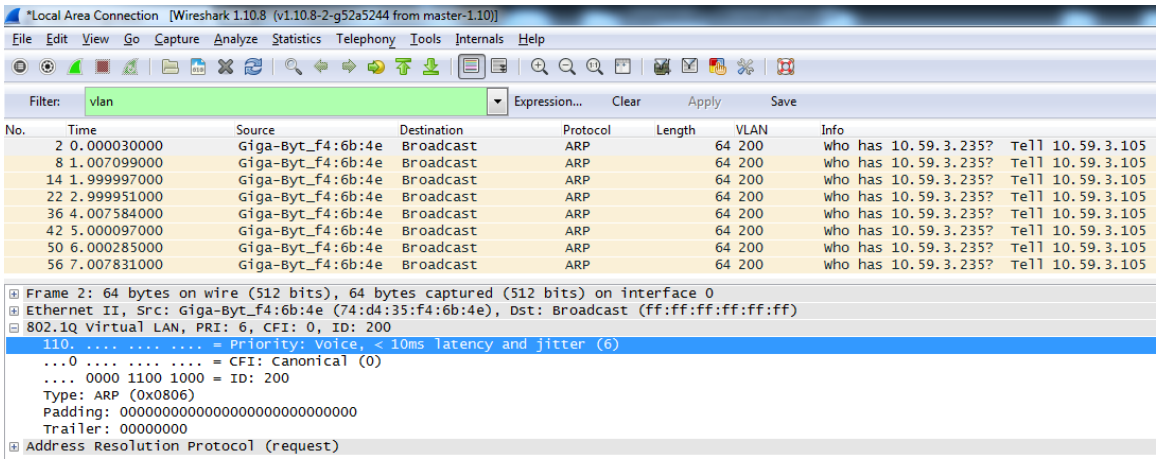
5. Once OUI has been set, an index should appear below.



Verify:

1. An entry with the IP Phone MAC address should appear with VLAN 200 in the MAC Address Table of the switch.

2. The IP Phone should be able to obtain a DHCP configuration in the VLAN 200 segment of the DHCP Server.
3. Verifying priority will be more difficult. You will need a packet analyzing software to check for the priority.



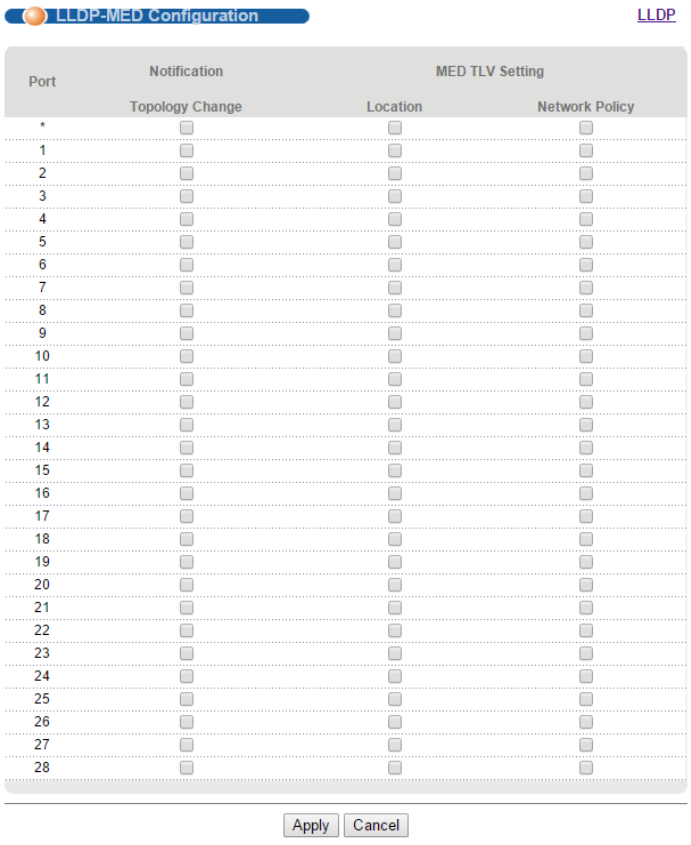
Check the 802.1Q section. Priority should be set to the configured Voice VLAN priority.

Link Layer Discovery Protocol for Media Endpoint Devices

The Link Layer Discovery Protocol for Media Endpoint Devices (LLDP-MED) is the second method for QoS. This method allows the ZyXEL switch to configure specific parameters of a directly connected LLDP-MED supported IP phone such as its VLAN and priority. Some IP phones only allows certain parameters to be configured using LLDP-MED. This is done by configuring the LLDP-MED Network Policy of the ZyXEL switch.

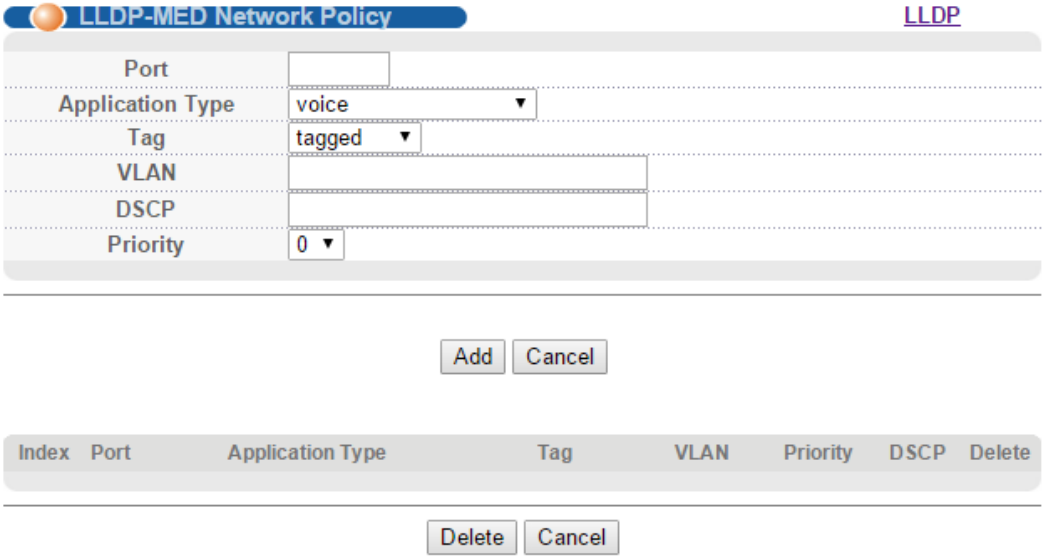
Web GUI of LLDP-MED

Advance Application -> LLDP -> LLDP-MED Configuration



Check the Network Policy box of each port that is connected to the LLDP-MED supported IP Phone.

Advance Application -> LLDP -> LLDP-MED Network Policy

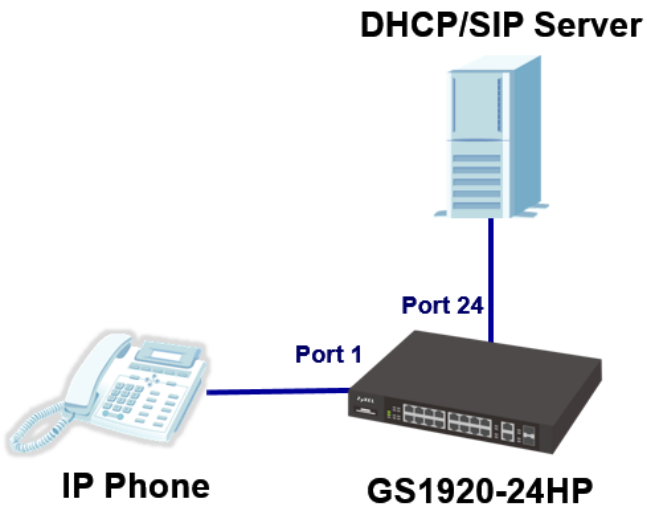


Create a Network Policy for each device connected to this switch.

Case Study for LLDP-MED

Briefing:

The ZyXEL LLDP-MED Network Policy requires an IP phone that supports LLDP-MED. To test forwarding, we will use a PC to simulate the DHCP Server. We will use port mirroring and the MAC table to confirm that the correct VLAN was tagged as well as the correct priority.



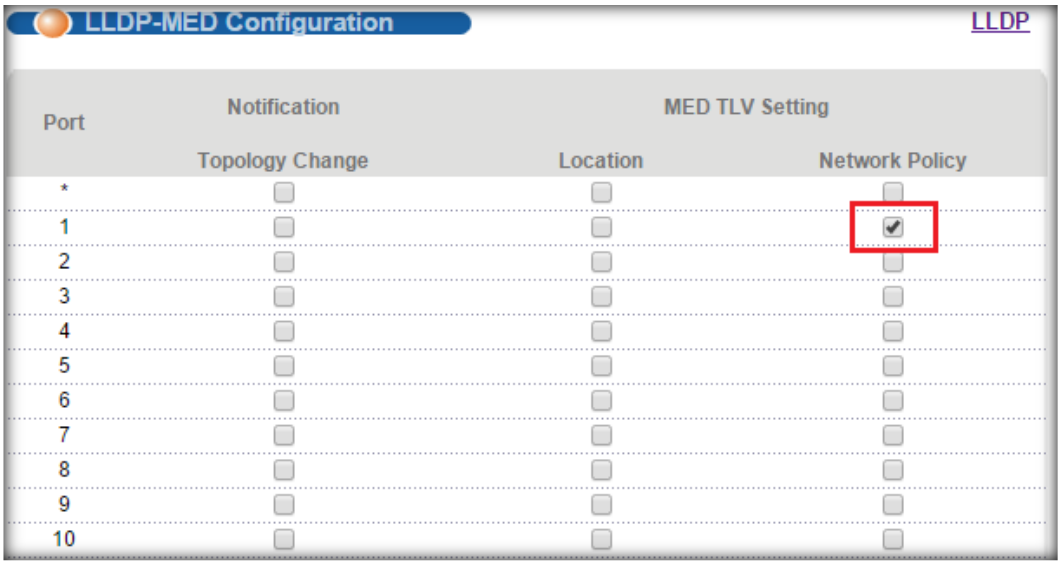
Device	IP Address	VLAN
IP Phone	DHCP	none
GS1920-24	192.168.1.1/24	1
Server	172.16.1.254	200

Objective:

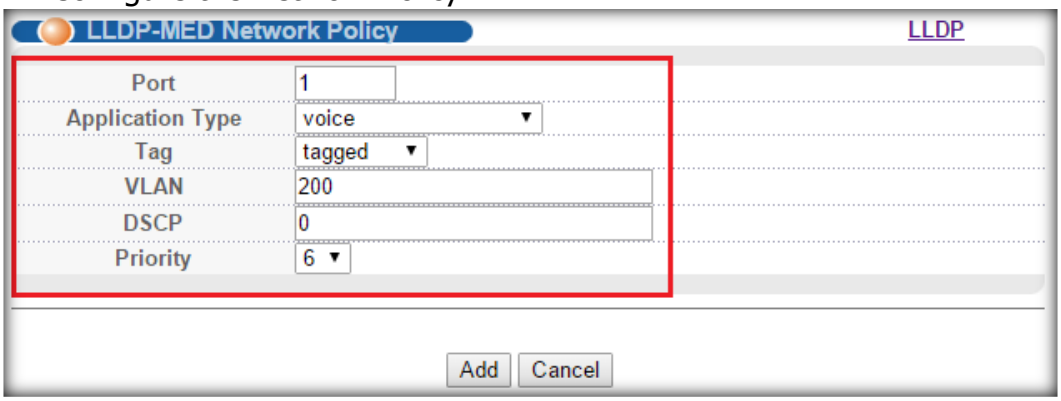
- Ensure that correct configurations were implemented.
- Ensure that the IP phone can acquire DHCP configurations on the correct VLAN.
- VOIP traffic will be processed in VLAN 200.
- Verify that LLDP-MED Network Policy has successfully allocated voice traffic in VLAN 200.

Procedure:

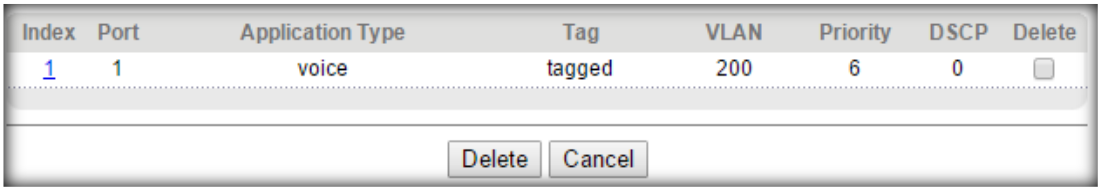
1. Create VLAN 200 for VOIP. Fix ports leading to other IP Phones and to the DHCP and SIP servers. There is no need to consider the PVID of the ports.
2. Configure the LLDP-MED Network Policy.
   2.1 Go to **Advance Application -> LLDP -> LLDP-MED Configuration**.
   2.2 Enable "Network Policy" on port to the IP phone.



2.3 Go to **Advance Application -> LLDP -> LLDP-MED Network Policy.**
2.4 Configure the Network Policy.



2.5 Once policy has been configured, an index should appear below.



Index	Port	Application Type	Tag	VLAN	Priority	DSCP	Delete
1	1	voice	tagged	200	6	0	

Delete Cancel

Verify:

1. An entry with the IP Phone MAC address should appear with VLAN 200 in the MAC Address Table of the switch.

Index	MAC Address	VID	Port	Type
5	74:d4:35:f4:6b:4e	200	1	Dynamic

2. The IP Phone should be able to obtain a DHCP configuration in the VLAN 200 segment of the DHCP Server.

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