

DrayTek Training

VLAN and its Applications

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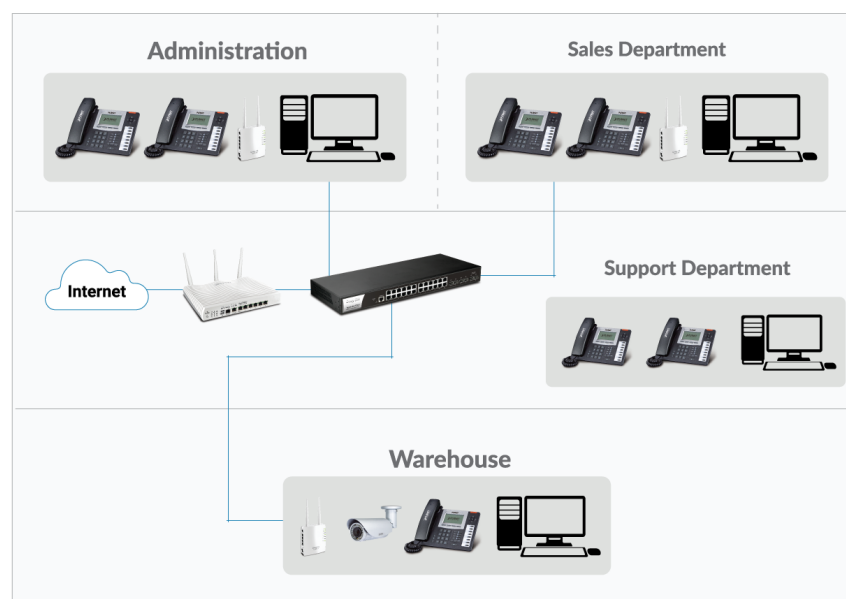
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1. VLAN – What & Why

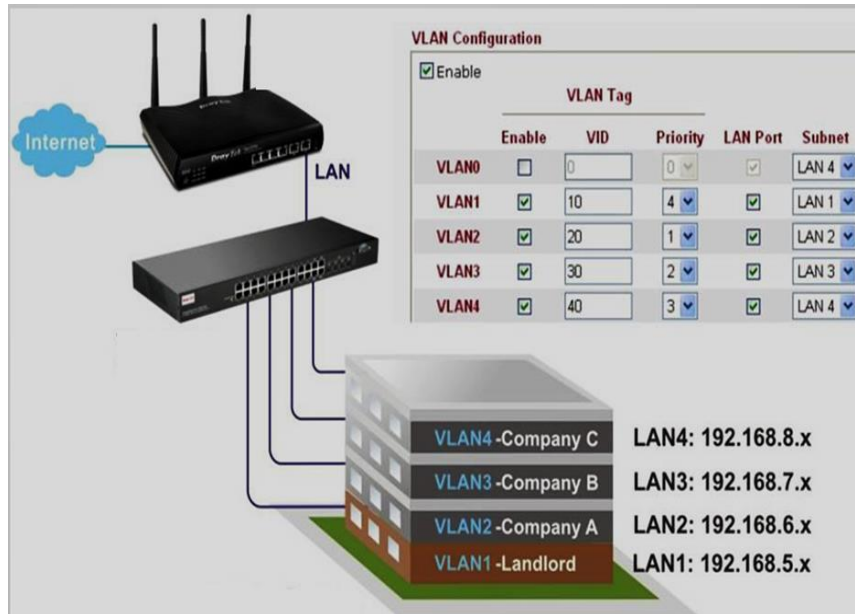
1.1 What is a VLAN

A Virtual Local Area Network (VLAN) is a logical group of workstations, servers, and network devices that appear to be on the same LAN despite their geographical dispersion. In businesses or organisations, the members of a workgroup are often located in different locations within a building or even in different buildings. VLANs allow computers or devices of member workgroups to have unified network settings such as NAT rules, Firewall rules, QoS, etc.

The diagram below shows a typical business with multi-workgroups located on various floors or physical space. In this example, with the router and the network switch located on the first floor, the Administration and Sales Departments on the 2nd floor and the Warehouse Departments on the ground floor, are connected by network cables and supported by tag-based VLANs.



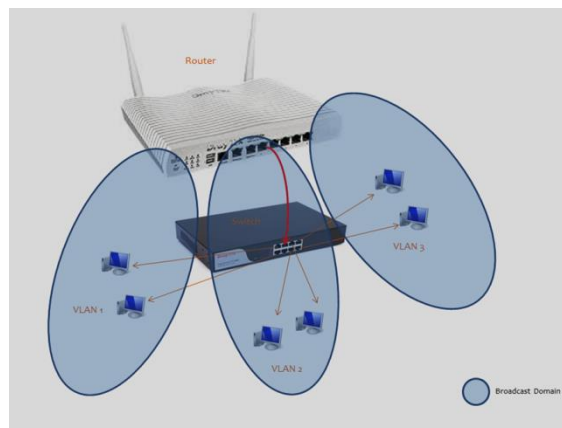
The diagram below shows another example for VLAN application. A landlord of an office building sets up VLAN groups, one for each floor. Each VLAN group has its own set of network rules and is isolated from other VLANs.



1.2 Why use VLAN

There are many benefits from using VLANs in your network, including:

1. VLANs increase the number of broadcast domains, reduces latency and traffic load on the network devices, therefore reducing congestion and improving network performance.



2. Network elements in different locations can be configured to be within the same VLAN group having the same network settings, allowing flexibility in network deployment.
3. Real-time services such as VoIP or video streaming, can be set up in separate VLANs and be isolated from network congestion due to traffic from other data types.
4. VLAN enhances network security among workgroups, so company data can only be accessed by authorized staff within the VLAN group.
5. VLAN allows easy and flexible expansion and relocation of network devices as well as workgroups.
6. VLAN allows network administrators to configure the network in a centralized environment.

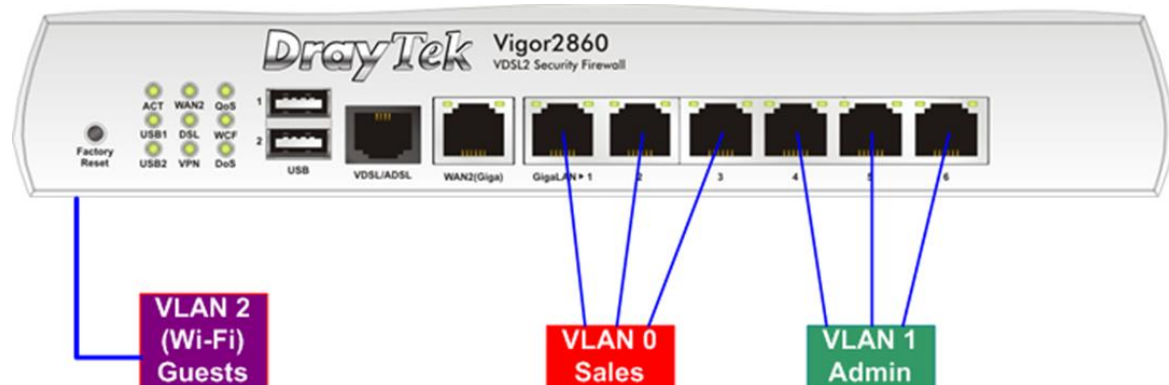
1.3 Types of VLAN

DrayTek routers support two types of VLANs: Port-based and 802.1q tag-based VLAN.

1.3.1 Port-Based VLAN (Untagged)

Port-based VLAN allows a number of physical LAN ports on a DrayTek router to be grouped into a logical group. In the example below, LAN ports 1 to 3 forms VLAN0 which is connected to staff in the Sales Department. Similarly, LAN ports 4 to 6 forms VLAN1 which is connected to staff in the Admin Department.

Note that SSID for the Wireless LAN can also be used to form VLAN groups.



VLAN (Department)	LAN Ports	LAN Subnet
VLAN0 (Sales)	1, 2, 3	LAN 1
VLAN1 (Admin)	4, 5, 6	LAN 2
VLAN2 (Guests)	SSID 1 - 4	LAN 3

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable		LAN						Wireless LAN(2.4GHz)				Wireless LAN(5GHz)				VLAN Tag			
		P1	P2	P3	P4	P5	P6	SSID1	SSID2	SSID3	SSID4	SSID1	SSID2	SSID3	SSID4	Subnet	Enable	VID	Priority
VLAN0	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN1	☐	☐	☐	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 2 ▾	☐	0	0 ▾
VLAN2	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☒	☒	☒	LAN 3 ▾	☐	0	0 ▾
VLAN3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾

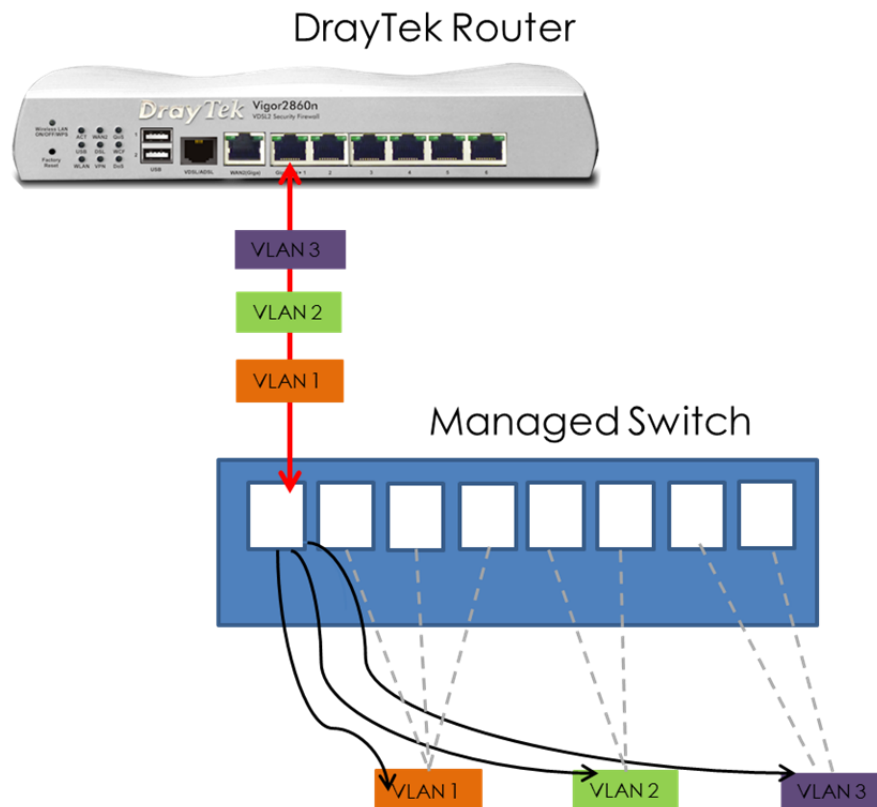
☒ Permit untagged device in P1 to access router

1. For each VLAN row, if enable is checked for the VLAN Tag then the corresponding VID will be applied to wired LAN traffic.
2. Wireless LAN traffic is always untagged, but will still be a member of the VLAN group selected.
3. Each VID must be unique.

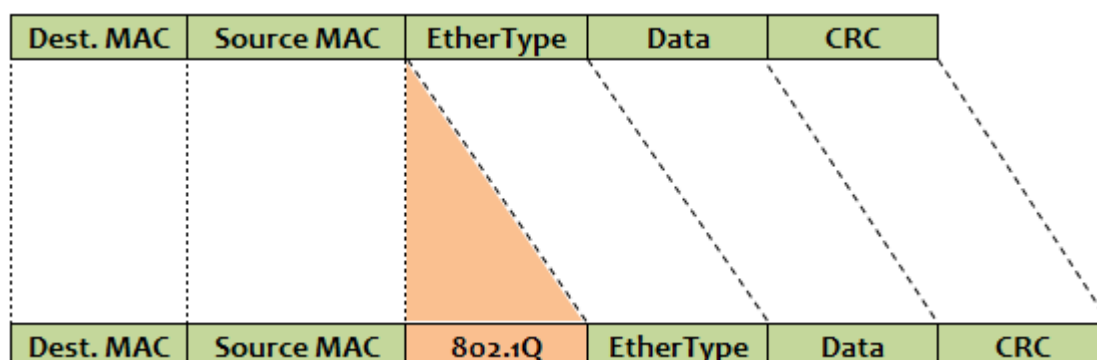
1.3.2 802.1q Tag-based VLAN

Tag-based VLANs, also called 802.1q VLAN trunks, assign a VLAN ID (VID) to network elements, even if these are connected through the same LAN ports or switch ports, and deliver data packets based on the VID, thus allowing VLAN groups to be independent of the physical LAN ports used.

The diagram below shows that through a single LAN cable to a network switch, 3 VLAN groups are set up to cater for 3 different work groups or departments.



The diagram below shows that an 802.1q VLAN tag is inserted into a data packet header.



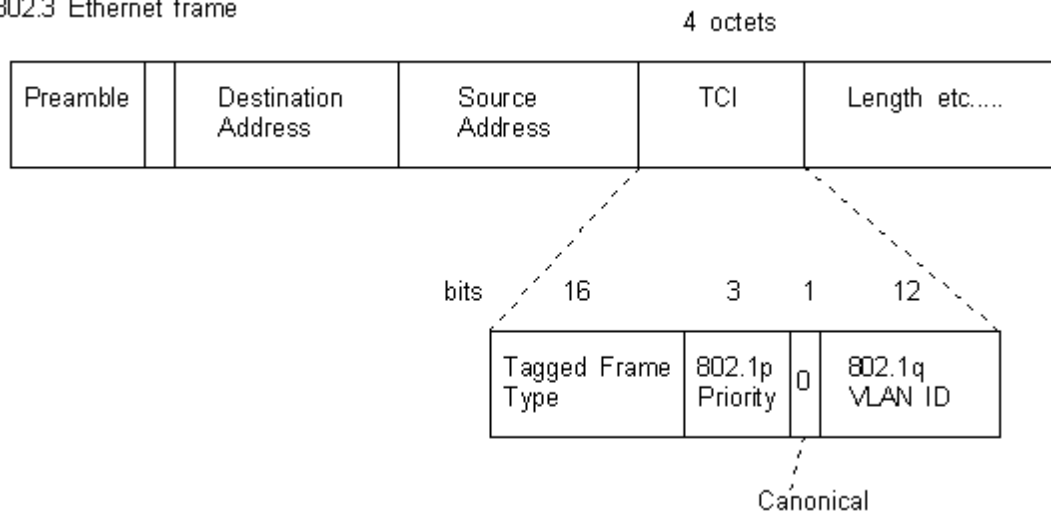
When the tagged packet arrives at a LAN port, and the port is a tagged member of the VLAN corresponding to the VID (VLAN ID) in the packet's tag, the packet will be received by that VLAN group member.

802.1p Settings

The priority option setting is used on the LAN for priority marking of frames at Layer2. This is the IEEE 802.1p standard, which specifies 8 priority levels, called **Class of Service** (CoS) levels. These are numbered 0-7, with 0 being the lowest priority and 7 the highest. The default setting is CoS level 0. These values can be used to prioritize different classes of traffic.

The CoS level is marked using 3 bits in the **Tag Control Information** (TCI) field in the 802.3 Layer 2 frame header:

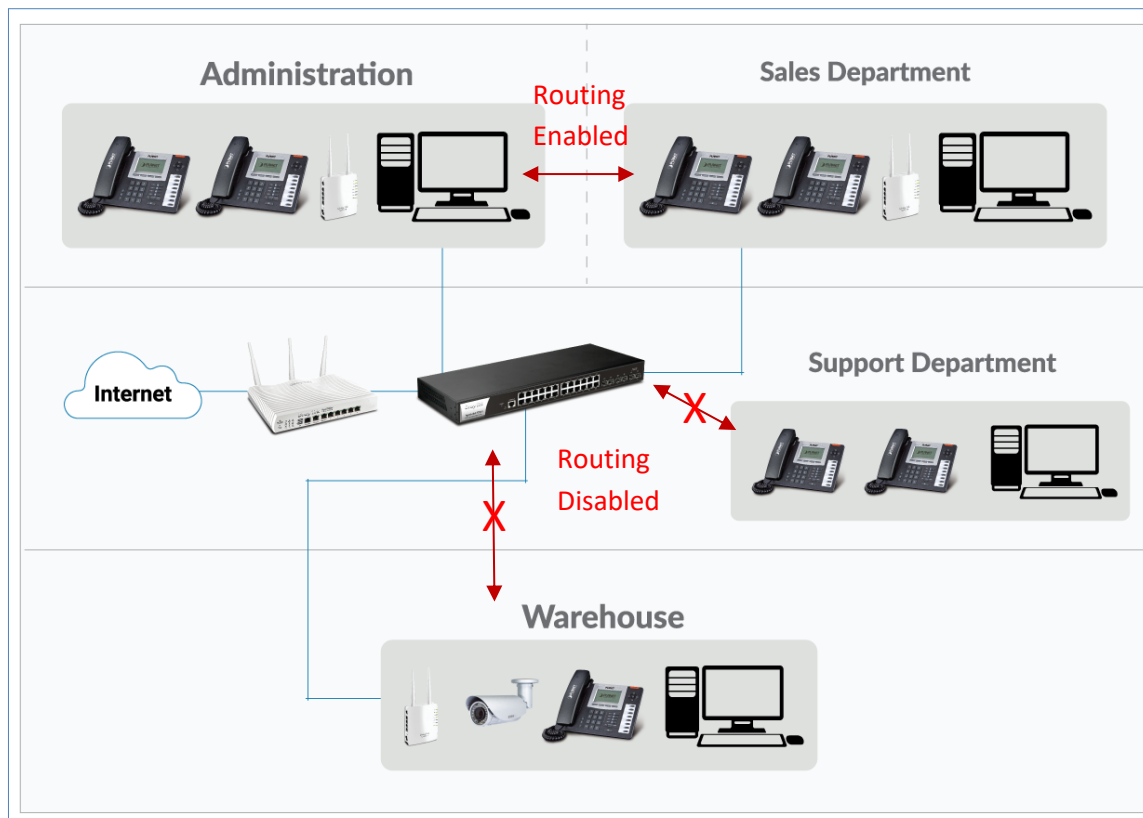
802.3 Ethernet frame



802.1p Class of Service (CoS) levels	
0	Best effort (default)
1	background
2	excellent effort
3	critical application
4	video
5	voice
6	internetwork control
7	network control

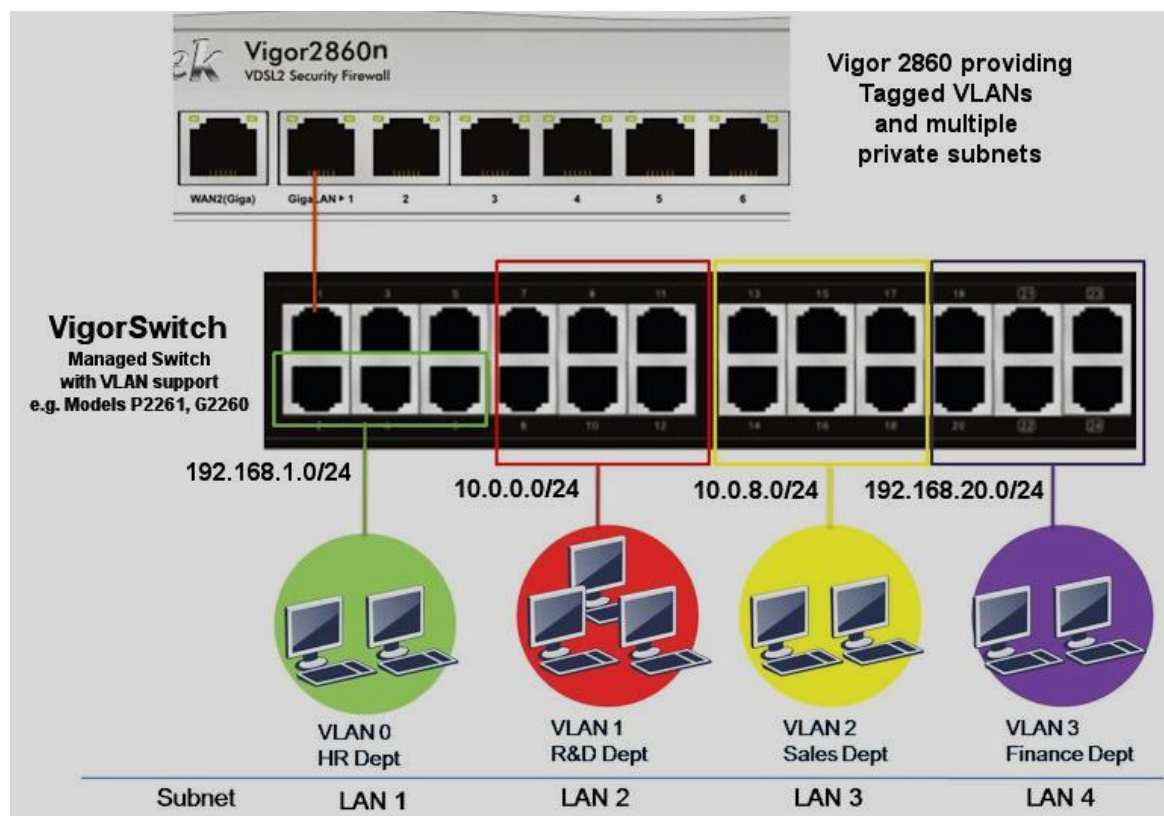
1.4 Inter-LAN Routing

Inter-LAN routing allows communication between different subnets. This feature is useful if you want to allow communication between any two LAN subnets. For example, we may have a LAN subnet for Accounts configured as VLAN1 and another LAN subnet for Payroll configured as VLAN3 and we want to allow communication between these two departments. For example you may want to allow the Administration staff to be able to access data or services in the sales department. To allow this to happen we enable inter-LAN routing between these two VLANs. Other departments such as the support department and the warehouse are not allowed access to the sales or administration networks, so we do not allow Inter-LAN routing here.



1.5 VLAN through Network Switches

DrayTek VigorSwitch series also have VLAN capability. As shown in the diagram below, we can assign groups of switch ports to be members of a VLAN. For example, devices connected to switch ports 1 to 6 will be part of the green VLAN 0 (HR Dept.) and devices connected to switch ports 7 to 12 will be part of the red VLAN 1 (R&D Dept.)



1.6 WAN VLAN Tagging

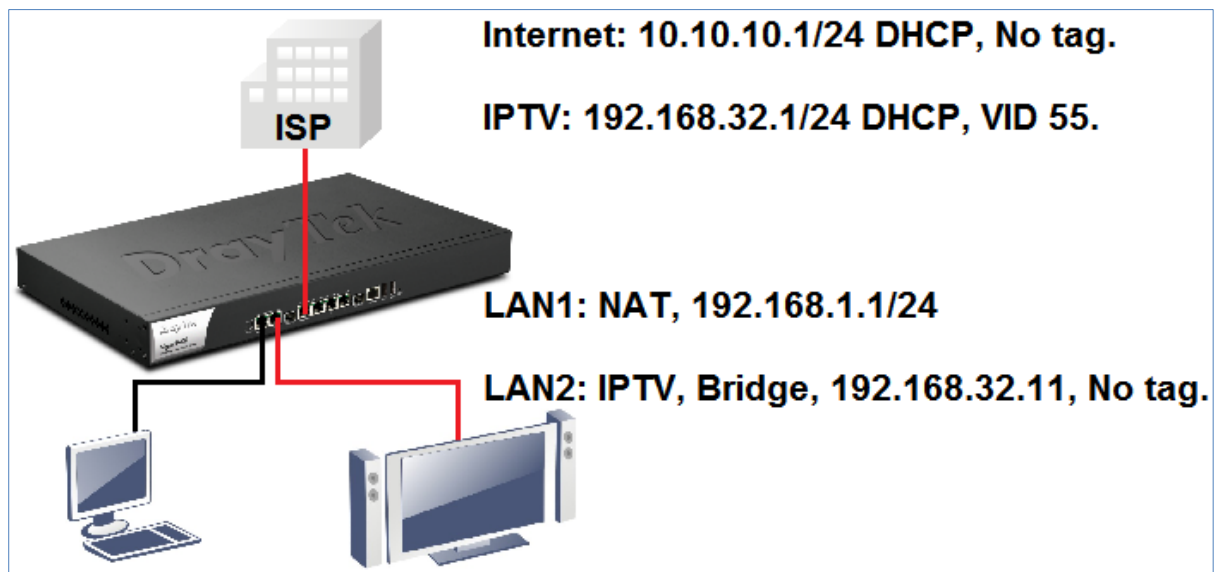
Some of the NBN service providers use VLAN tagging for WAN connections. When connecting a DrayTek router to the NBN via one of these service providers, you will need to enable the VLAN tag. Otherwise data connection will not be available. Below is a selection of some service providers and the 802.1q VLAN tags that need to be enabled.

Service Provider	Connection Type	VLAN Tag
Dodo	FTTP (Ethernet)	100
TPG	VDSL	2
Web Shield	VDSL	100
iPrimus	VDSL	100
Commander	VDSL	100

1.7 Virtual WAN

Virtual WAN is the use of VLAN concepts on the WAN side, and allows you to simulate several WAN connections through one physical WAN connection. Virtual WANs can be configured in two different ways in DrayTek routers. One is Bridge virtual WAN to LAN clients and second is for ACS management. In the diagram below we have a virtual WAN with a VLAN ID of 55 for IP TV. This will need to be supported by the Internet service provider. ACS SI management can also be enabled over a virtual WAN with a VLAN tag, but again this needs to be supported by the service provider.

Triple play deployment is possible by adding VLAN tags to differentiate the different types of traffic provided by the service provider to deliver video, voice, and data to the subscribers over a single connection. This type of service is available overseas.



2. VLAN Configuration

2.1 Port Based VLAN Configuration

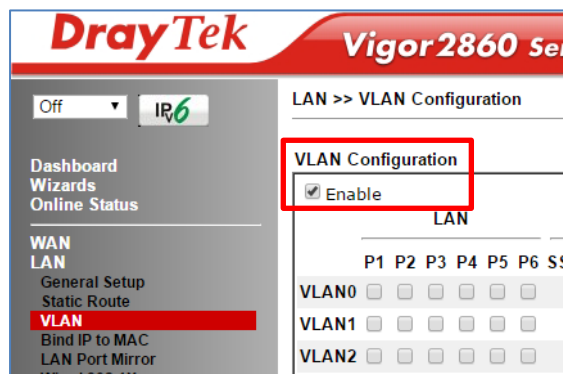
2.1.1 DrayOS Router

DrayTek DrayOS routers include the Vigor2120 series, Vigor2760 series, Vigor2860 series, Vigor2925 series, Vigor2952 and Vigor3220 routers.

Step 1: Enable VLAN

On the DrayTek Router, go to **LAN >> VLAN configuration** menu.

Enable VLAN configuration.



Step 2: Assign all the ports and SSIDs to the required VLAN and select a LAN subnet from the dropdown menu. The SSID columns will only be available in wireless router models.

In our example we are using a dual band wireless router and hence you can see 8 SSID (4 for each band) on this screen. We have assigned ports 1, 2, 3 as a member of VLAN0 and Ports 4, 5, 6 for VLAN1 and all SSIDs under VLAN2.

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable

	LAN						Wireless LAN(2.4GHz)				Wireless LAN(5GHz)				Subnet	VLAN Tag		
	P1	P2	P3	P4	P5	P6	SSID1	SSID2	SSID3	SSID4	SSID1	SSID2	SSID3	SSID4		Enable	VID	Priority
VLAN0	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN1	☐	☐	☐	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	LAN 2 ▼	☐	0	0 ▼
VLAN2	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☒	☒	☒	LAN 3 ▼	☐	0	0 ▼
VLAN3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼

☒ Permit untagged device in P1 to access router

Step 3: Configure LAN Subnets

Click on **Details Page** button to configure IP subnet details

LAN >> General Setup

General Setup

Index	Status	DHCP	IP Address	
LAN 1	V	V	192.168.1.1	Details Page
LAN 2	☒	☒	192.168.3.1	Details Page
LAN 3	☒	☒	192.168.5.1	Details Page
LAN 4	☐	☒	192.168.7.1	Details Page
IP Routed Subnet	☐	☒	192.168.2.1	Details Page

LAN >> General Setup

LAN 1 Ethernet TCP / IP and DHCP Setup

Network Configuration For NAT Usage IP Address: 192.168.1.1 Subnet Mask: 255.255.255.0 RIP Protocol Control: Disable		DHCP Server Configuration ☒ Enable Server ☐ Disable Server Relay Agent: ☐ Enable ☐ Disable Start IP Address: 192.168.1.10 IP Pool Counts: 50 Gateway IP Address: 192.168.1.1 DHCP Server IP Address for Relay Agent: DNS Server IP Address ☐ Force DNS manual setting Primary IP Address: Secondary IP Address:
--	--	---

Step 4: Enable Inter-LAN Routing if required.

Select the intersection of the two LANs that need to be routed in the matrix. In the example below we enable routing between LAN 2 and LAN 3.

Inter-LAN Routing

Subnet	LAN 1	LAN 2	LAN 3	LAN 4
LAN 1	☒	☐	☐	☐
LAN 2	☐	☒	☐	☐
LAN 3	☐	☒	☒	☐
LAN 4	☐	☐	☐	☒

2.1.2 Linux Router (Vigor3900 & Vigor2960)

Step 1: Create VLANs and Assign LAN Ports to VLANS

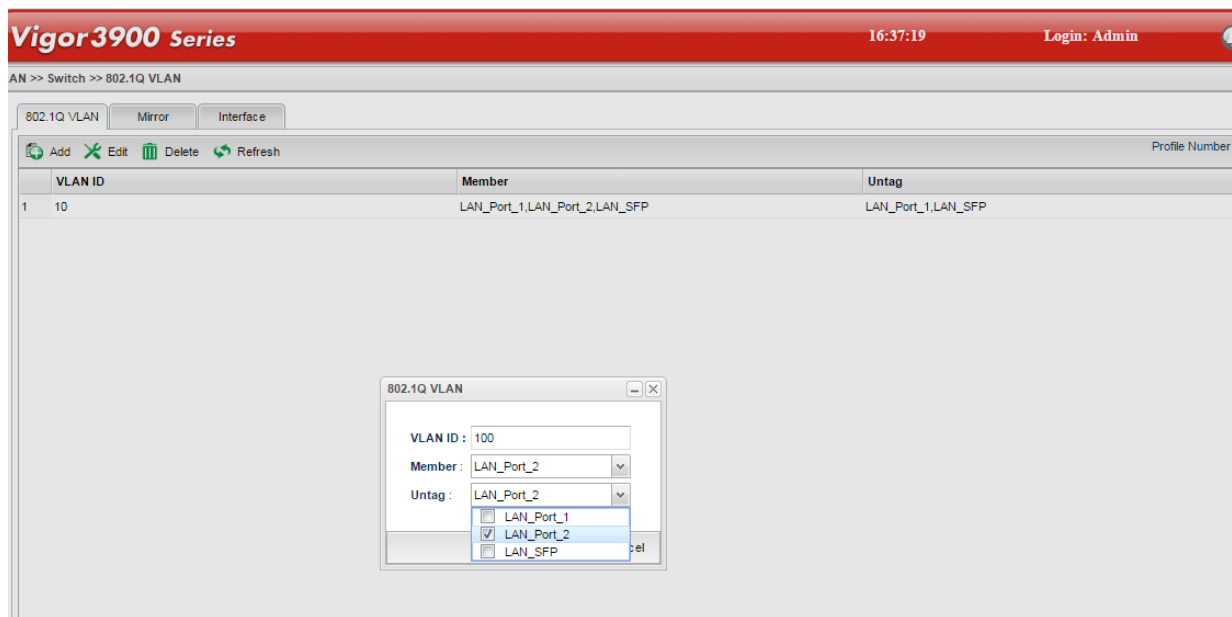
Go to **LAN>>Switch** Configuration menu in the Vigor3900 and select the 802.1q VLAN tab.

Click on **Add**

Enter the VLAN ID (100) and select LAN port 2 for Member

Select LAN Port 2 as Untagged port to be associated with this VLAN

Note: Untagged port can only belong to one VLAN ID, so need to remove if from VLAN 10 settings



Step 2: Configure LAN Subnet

Go to **LAN>>General Setup>>General Setup** Configuration menu in the Vigor3900 and select Add and modify the configuration.

1. Enter Profile name
2. Select **Enable**
3. Enter a description (Optional)
4. Change VLAN ID to 100
5. Adjust priority if required
6. Enter IP address (192.168.50.1) and Subnet Mask 255.255.255.0/24
7. Enter DHCP server Start and end IP addresses (192.168.50.10, 192.168.50.110)
8. Click Apply to save settings

Vigor3900 Series 13:36:20

General Setup

Profile (max length:7) : office

☒ Enable

Description : Office Network (Optional) enable or disable state

VLAN ID : 100

Priority(802.1p) : 0

Default MAC Address : ☒ Enable ☐ Disable

MAC Address : 00:50:7f:7f:fc:08

IPv4 Protocol : static

Mode : NAT If choose ROUTING mode, packets will not do NAT operation at any WAN sides

IP Address : 192.168.50.1

Subnet Mask : 255.255.255.0/24

Connection Detection Mode : None

DHCP Server : ☒ Enable ☐ Disable

DHCP Start IP : 192.168.50.10

DHCP End IP : 192.168.50.110

Add Save Profile Number Limit : 0

DHCP DNS

DHCP DNS : No items to show.

DHCP IP Lease Time : 86400 Seconds (min: 300, MAX: 604800)

DHCP Routers : (Optional)

DHCP Next Server : (Optional)

Add Save Profile Number Limit : 0

DHCP Option	Value
No items to show.	

Step 3: Enable Routing Between LANs

To allow devices from VLAN 10 to be able to communicate with devices on VLAN 100 you will need to enable routing between the LANs.

Go to "LAN>>General Setup>>Inter-LAN Route" Configuration menu in the Vigor3900 and select "Enable Routing between LANs"

DrayTek Vigor3900 Series

LAN >> General Setup >> Inter-LAN Route

General Setup | DHCP Relay | **Inter-LAN Route** | RADVD | DHCPv6

☒ Enable Routing Between Internal LANs

2.2 802.1q Tag-based VLAN Configuration

2.2.1 DrayOS Router

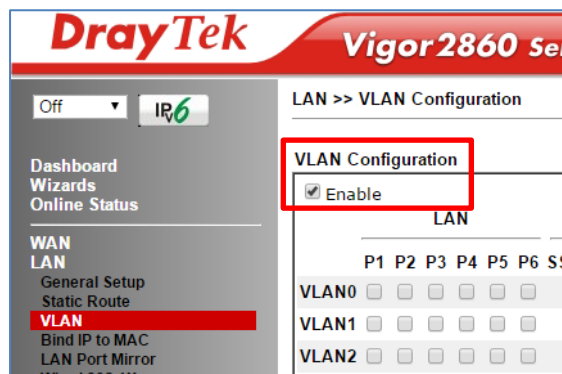
DrayTek DrayOS routers include the Vigor2120 series, Vigor2760 series, Vigor2860 series, Vigor2925 series, Vigor2952 and Vigor3220 routers.

The configuration shown below is from a DrayTek Vigor DrayOS router (Vigor2860ac).

Step 1: Enable VLAN

On the DrayTek Router, go to **LAN >> VLAN configuration** menu.

Enable VLAN configuration.



Step 2: Assign all the ports and SSIDs to the required VLAN and select a LAN subnet from the dropdown menu. The SSID columns will only be available in wireless router models.

In our example we are using a dual band wireless router and hence you can see 8 SSID (4 for each band) on this screen. We have assigned ports 1, 2, 3 as a member of VLAN0 and Ports 4, 5, 6 for VLAN1 and all SSIDs under VLAN2.

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable

	LAN						Wireless LAN(2.4GHz)				Wireless LAN(5GHz)				Subnet	VLAN Tag		
	P1	P2	P3	P4	P5	P6	SSID1	SSID2	SSID3	SSID4	SSID1	SSID2	SSID3	SSID4		Enable	VID	Priority
VLAN0	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1	☒	10	0
VLAN1	☐	☐	☐	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	LAN 2	☒	20	1
VLAN2	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☒	☒	LAN 3	☒	30	2
VLAN3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1	☐	0	3
VLAN4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1	☐	0	4
VLAN5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1	☐	0	5
VLAN6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1	☐	0	6
VLAN7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1	☐	0	7

☒ Permit untagged device in P1 to access router

1. For each VLAN row, if enable is checked for the VLAN Tag then the corresponding VID will be applied to wired LAN traffic.
 2. Wireless LAN traffic is always untagged, but will still be a member of the VLAN group selected.
 3. Each VID must be unique.

OK Clear Cancel

0 is lower, 7 is higher

Assign a VLAN ID (**VID**) for each VLAN. Enable 802.1q tagged VLANs by selecting “**Enable**” for each VLAN.

The **Priority** option setting is to configure **802.1p** for each VLAN if required. Values are from 0 to 7 with 0 being lowest up to 7 being the highest.

It is recommended to enable the option “Permit untagged device in P1 to access router” to allow a PC to be connected to the router directly for management or diagnostic purposes.

Step 3: Configure LAN Subnets

Click on **Details Page** button to configure IP subnet details

LAN >> General Setup

General Setup

Index	Status	DHCP	IP Address	
LAN 1	V	V	192.168.1.1	Details Page
LAN 2	☒	☒	192.168.3.1	Details Page
LAN 3	☒	☒	192.168.5.1	Details Page
LAN 4	☐	☒	192.168.7.1	Details Page
IP Routed Subnet	☐	☒	192.168.2.1	Details Page

LAN >> General Setup

LAN 1 Ethernet TCP / IP and DHCP Setup

Network Configuration For NAT Usage IP Address: 192.168.1.1 Subnet Mask: 255.255.255.0 RIP Protocol Control: Disable		DHCP Server Configuration ☒ Enable Server ☐ Disable Server Relay Agent: ☐ Enable ☐ Disable Start IP Address: 192.168.1.10 IP Pool Counts: 50 Gateway IP Address: 192.168.1.1 DHCP Server IP Address for Relay Agent: DNS Server IP Address ☐ Force DNS manual setting Primary IP Address: Secondary IP Address:
--	--	---

Step 4: Enable Inter-LAN Routing if required.

Select the intersection of the two LANs that need to be routed in the matrix. In the example below we enable routing between LAN 2 and LAN 3.

Inter-LAN Routing

Subnet	LAN 1	LAN 2	LAN 3	LAN 4
LAN 1	☒	☐	☐	☐
LAN 2	☐	☒	☐	☐
LAN 3	☐	☒	☒	☐
LAN 4	☐	☐	☐	☒

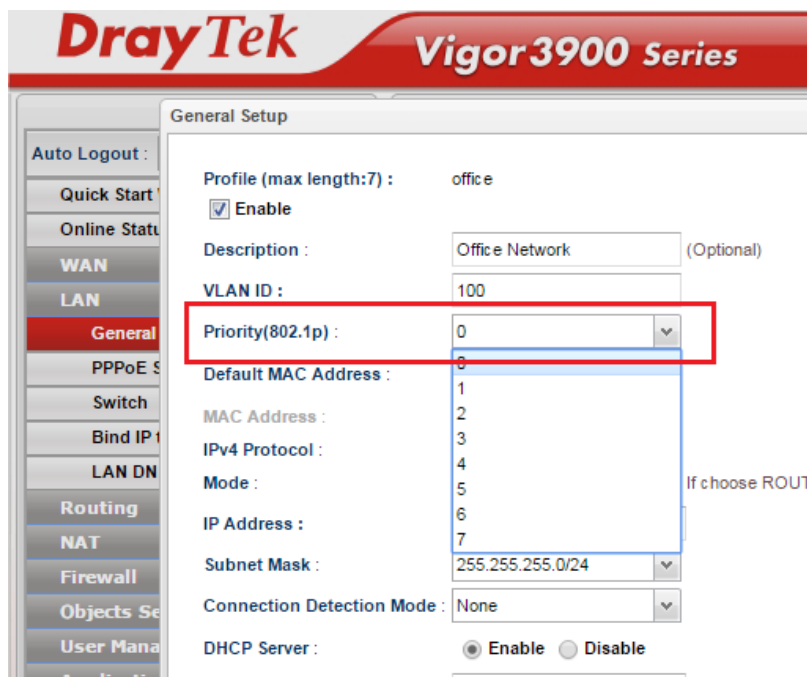
2.2.2 Linux Router (Vigor3900 & Vigor2960)

The configuration page below shows the VLAN configuration page from a DrayTek Linux based router (Vigor3900).

Create VLANs in “LAN>>Switch>>802.1q VLAN” menu. For each VLAN select a member LAN port and leave “Untag” field blank.



The Priority option (**802.1p**) can be assigned for each VLAN if required. This setting is in “LAN>>General Setup” configuration menu for each VLAN. Values are from 0 to 7 with 0 being lowest up to 7 being the highest.



2.3 Configuring 802.1q Trunk Port

2.3.1 DrayOS Routers

When connecting the router to a switch we should configure one LAN port on the router as a trunk port to carry traffic for all the VLANs to the switch. In the example shown below, we configure port 1 as trunk port by selecting all the tagged VLANs so they will be part of the VLAN trunk connected to the switch.

It is also advisable to select **“Permit untagged device in P1 to access router”** option. This allows you to connect a computer directly to router port P1 for diagnostic purposes. Usually the computer cannot send tagged packets to the router hence the router will be inaccessible.

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable

	LAN						Wireless LAN(2.4GHz)				Wireless LAN(5GHz)				Subnet	VLAN Tag		
	P1	P2	P3	P4	P5	P6	SSID1	SSID2	SSID3	SSID4	SSID1	SSID2	SSID3	SSID4		Enable	VID	Priority
VLAN0	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☒	10	0 ▾
VLAN1	☒	☐	☐	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	LAN 2 ▾	☒	20	0 ▾
VLAN2	☒	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☒	☒	LAN 3 ▾	☒	30	0 ▾
VLAN3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾
VLAN7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▾	☐	0	0 ▾

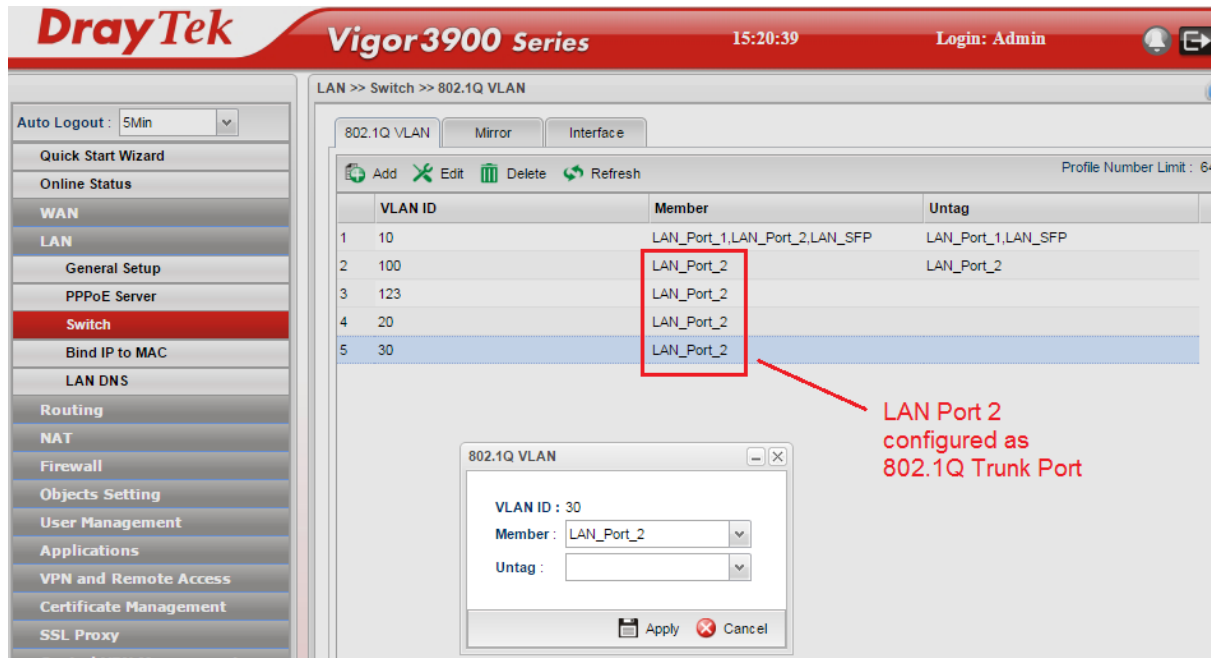
☒ Permit untagged device in P1 to access router

1. For each VLAN row, if enable is checked for the VLAN Tag then the corresponding VID will be applied to wired LAN traffic.
2. Wireless LAN traffic is always untagged, but will still be a member of the VLAN group selected.
3. Each VID must be unique.

OK Clear Cancel

2.3.2 Linux Based Routers

The screen shot below shows the VLAN configuration page from a DrayTek Linux based router (Vigor3900). Here we have configured LAN port 2 as an 802.1q trunk port by configuring a number of tagged VLANs to use port 2.



We have allowed VLAN 100 to also be untagged for port 2 to allow a computer to be connected directly to router LAN port 2 for diagnostic purposes.

2.3.3 Demonstration

Configure 802.1q Tagged VLAN in DrayOS Router (Vigor3900)

or2860ac)

Configure 802.1q Tagged VLAN in Linux based Router (Vigor3900)

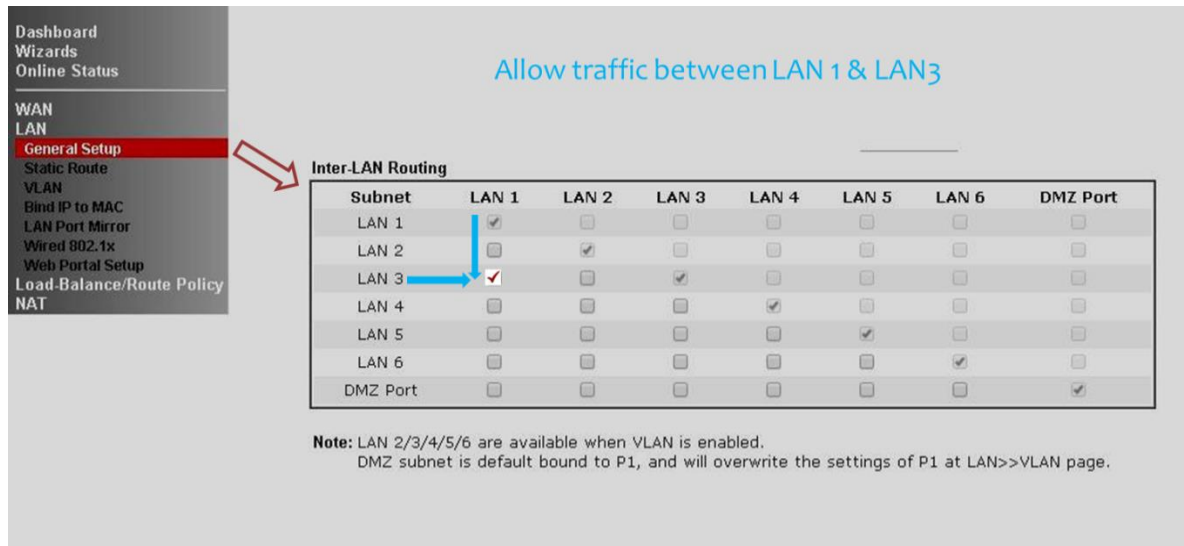
2.4 Inter LAN Routing

Below are examples of Inter-LAN routing setting through VLAN.

2.4.1 DrayOS Routers

To enable Inter LAN routing go to LAN>> General Setup configuration menu and in the Inter-LAN Routing section. For our example, look for the intersection of LAN1 and LAN3 and tick the checkbox.

Similarly you can allow communication between different subnets as required.



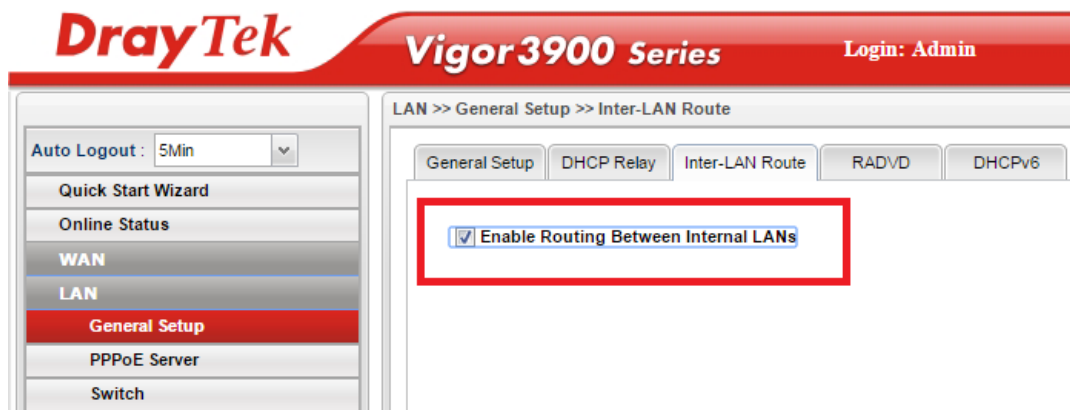
Allow traffic between LAN 1 & LAN 3

Subnet	LAN 1	LAN 2	LAN 3	LAN 4	LAN 5	LAN 6	DMZ Port
LAN 1	☒	☐	☐	☐	☐	☐	☐
LAN 2	☐	☒	☐	☐	☐	☐	☐
LAN 3	☒	☐	☒	☐	☐	☐	☐
LAN 4	☐	☐	☐	☒	☐	☐	☐
LAN 5	☐	☐	☐	☐	☒	☐	☐
LAN 6	☐	☐	☐	☐	☐	☒	☐
DMZ Port	☐	☐	☐	☐	☐	☐	☒

Note: LAN 2/3/4/5/6 are available when VLAN is enabled.
DMZ subnet is default bound to P1, and will overwrite the settings of P1 at LAN>>VLAN page.

2.4.2 Linux Routers

In Linux based routers such as the Vigor2960, Vigor300B and Vigor3900 go to LAN>>General SETUP>>Inter-LAN Route configuration menu and select the option “**Enable Routing Between Internal LANS**” as shown below. This is a global setting, so you do not have the option to select which LAN subnets to include or exclude from the selection. You will need to use firewall rules if you need to block traffic between certain IP subnets.



DrayTek Vigor3900 Series Login: Admin

LAN >> General Setup >> Inter-LAN Route

General Setup DHCP Relay Inter-LAN Route RADVD DHCPv6

☒ Enable Routing Between Internal LANS

2.5 Exercise 1

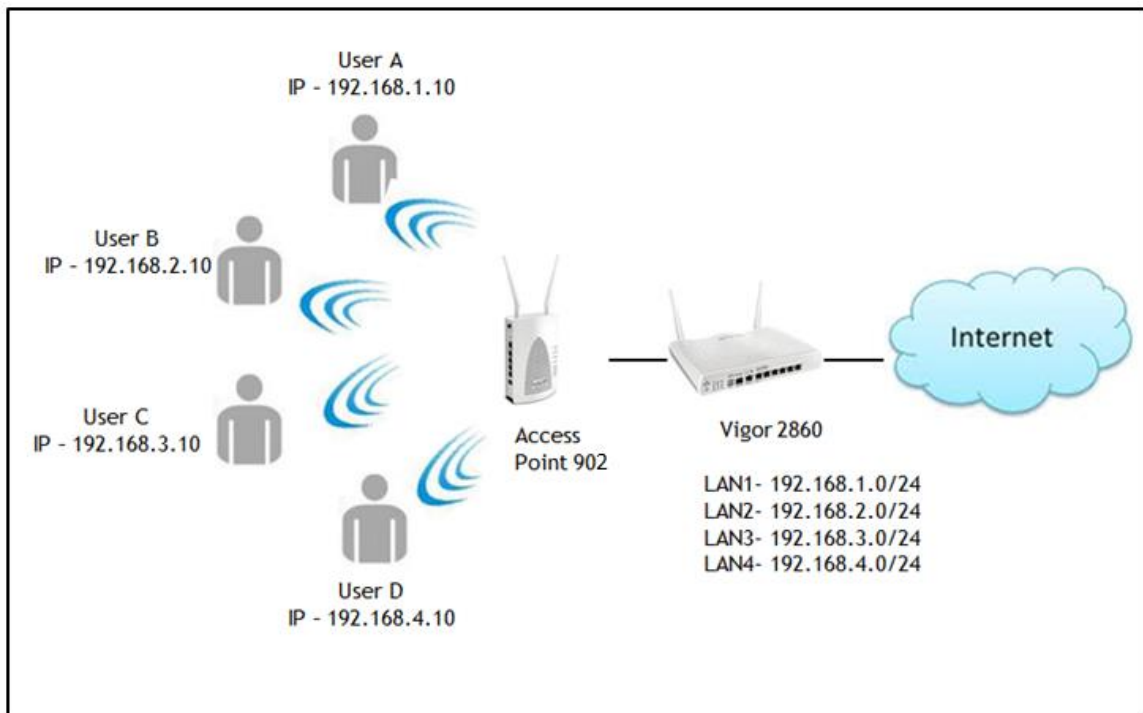
Configure Multiple SSIDs & Multiple Subnets on DrayTek Vigor Access Points

(Equipment used: Vigor2860Ln router and VigorAP 902 access point)

(YouTube demonstration: <https://youtu.be/UCLa73CUUpfo>)

For this exercise, we will configure multiple IP subnets and VLANs in the Vigor2860 router and enable the same VLANS in the VigorAP902 by setting up an 802.1q VLAN trunk between the two devices.

Each SSID in the VigorAP902 will be on a different VLAN as shown in the diagram below.



To avoid interference between each access point we will need to select a unique channel for each access point. We also need unique SSID names as indicated below to avoid confusion.

For example use LAN-10 -11-12-13 and other participant Use LAN 100 – 110- 120 -130 so that there are no two similar SSIDs being broadcasted.

Note: Before starting this exercise, reset the router and access point to factory defaults by pressing the Factory Reset button for at least 5 seconds

Step 1: Log into the Vigor2860Ln Router and Configure VLANS

Log into the router using the IP address 192.168.1.1. (**Username:** admin, **Password:** admin)

Go to **LAN >> VLAN Configuration**.

Enable the VLAN configuration in this example we configure LAN port P6 as the 802.1q VLAN trunk port. (Select all the VLANS for this port).

LAN1 will be the management LAN and will not have VLAN tag enabled for this. This will allow us to access the router.

Use the settings as shown in the diagram below.

- VLAN 0 will be untagged.

VLANs 1, 2, 3 will have VLAN tags (VID) 100, 200 & 300 respectively (Enter VLAN ID under VLAN Tag column)

Vigor2860 Series

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable

	LAN						Wireless LAN				Subnet	VLAN Tag		
	P1	P2	P3	P4	P5	P6	SSID1	SSID2	SSID3	SSID4		Enable	VID	Priority
VLAN0	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	LAN 1 ▼	☐	0	0 ▼
VLAN1	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	LAN 2 ▼	☒	100	0 ▼
VLAN2	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	LAN 3 ▼	☒	200	0 ▼
VLAN3	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	LAN 4 ▼	☒	300	0 ▼
VLAN4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼

☒ Permit untagged device in P1 to access router

Note:

1. For each VLAN row, selecting Enable VLAN Tag will apply the associated VID to the selected wired LAN port.
2. Wireless LAN traffic is always untagged, but the SSID is still a member of the selected VLAN (group).
3. Each VID must be unique.

OK Clear Cancel

Click **OK** to save the settings. (The router may restart to save the settings)

Step 2: Configure LAN Subnets

Go to **LAN >> General Setup** configuration menu and configure each LAN as shown in the diagram below.

The 4 LAN subnets to configure are 192.168.1.0/24, 192.168.2.0/24, 192.168.3.0/24 and 192.168.4.0/24. These are the default IP subnets for each LAN.

LAN >> General Setup						
General Setup						
Index	Status	DHCP	DHCPv6	IP Address		
LAN 1	V	V	V	192.168.1.1	Details Page	IPv6
LAN 2	☒	☒	☒	192.168.2.1	Details Page	IPv6
LAN 3	☒	☒	☒	192.168.3.1	Details Page	IPv6
LAN 4	☒	☒	☒	192.168.4.1	Details Page	IPv6
LAN 5	☐	☒	☒	192.168.5.1	Details Page	IPv6
LAN 6	☐	☒	☒	192.168.6.1	Details Page	IPv6
DMZ Port	☐	☐	☐	192.168.7.1	Details Page	IPv6
IP Routed Subnet	☐	☒		192.168.0.1	Details Page	

To configure LAN 1 as 192.168.1.0/24 subnet, enter the IP address, subnet mask and DHCP settings as shown below:

LAN >> General Setup	
LAN 1 Ethernet TCP / IP and DHCP Setup	LAN 1 IPv6 Setup
Network Configuration For NAT Usage IP Address: 192.168.1.1 Subnet Mask: 255.255.255.0 RIP Protocol Control: Disable	DHCP Server Configuration ☒ Enable Server ☐ Disable Server ☐ Enable Relay Agent Start IP Address: 192.168.1.10 IP Pool Counts: 200 Gateway IP Address: 192.168.1.1 Lease Time: 86400 (s) ☒ Retrieve IPs from inactive clients periodically DNS Server IP Address Primary IP Address: Secondary IP Address:
OK	

Similarly configure LAN 2, LAN 3 & LAN 4 as 192.168.2.0/24, 192.168.3.0/24 and 192.168.4.0/24 respectively.

Step 3: Log into the VigorAP 902 and Configure VLANS

Note: The default IP address for LAN A in the VigorAP902 is 192.168.1.2

Configure your PC with a static IP address 192.168.1.10 and connect the PC to LAN A port of the VigorAP 902.

Log into the VigorAP 902 using the IP address 192.168.1.2. (**Username:** admin, **Password:** admin)

Step 3.1: Configure the VigorAP 902

1). Go to **LAN >> General Setup** and Disable DHCP Client.

LAN >> General Setup

Ethernet TCP / IP and DHCP Setup

LAN-A IP Network Configuration

☒ Enable DHCP Client

IP Address: <IP>

Subnet Mask: <MASK>

Default Gateway:

☐ Enable Management VLAN

VLAN ID: 0

DHCP Server Configuration

☐ Enable Server ☒ Disable Server

☐ Relay Agent

Start IP Address:

End IP Address:

Subnet Mask:

Default Gateway:

Lease Time: 86400

DHCP Server IP:

Address for Relay Agent:

Primary DNS Server:

Secondary DNS Server:

Go to **Wireless LAN (2.4GHz) >> General Setup**. Enable Wireless LAN and Configure 4 LANS with the corresponding VLAN ID configured in the router.

DrayTek VigorAP 902

Wireless LAN (2.4GHz) >> General Setup

General Setting (IEEE 802.11)

☒ Enable Wireless LAN

☐ Enable Limit Client (3-64) 64 (default: 64)

☐ Enable Limit Client per SSID (3-64 default: 64)

Mode: Mixed(11b+11g+11n)

Channel: 2462MHz (Channel 11)

Extension Channel: 2442MHz (Channel 7)

☐ Enable 2 Subnet (Simulate 2 APs)

	Enable	Hide SSID	SSID	Subnet	Isolate Member	VLAN ID
1	☐	☐	LAN-0	LAN-A	☐	0 (Untagged)
2	☒	☐	LAN-1	LAN-A	☐	100
3	☒	☐	LAN-2	LAN-A	☐	200
4	☒	☐	LAN-3	LAN-A	☐	300

Hide SSID: Prevent SSID from being scanned.

Isolate Member: Wireless clients (stations) with the same SSID cannot access for each other.

OK Cancel

Note: Change the SSID name and channel setting to avoid interference with other access points.

For example use LAN-10 -11-12-13 and other participant Use LAN 100 – 110- 120 -130 so that there are no two similar SSID being broadcasted.

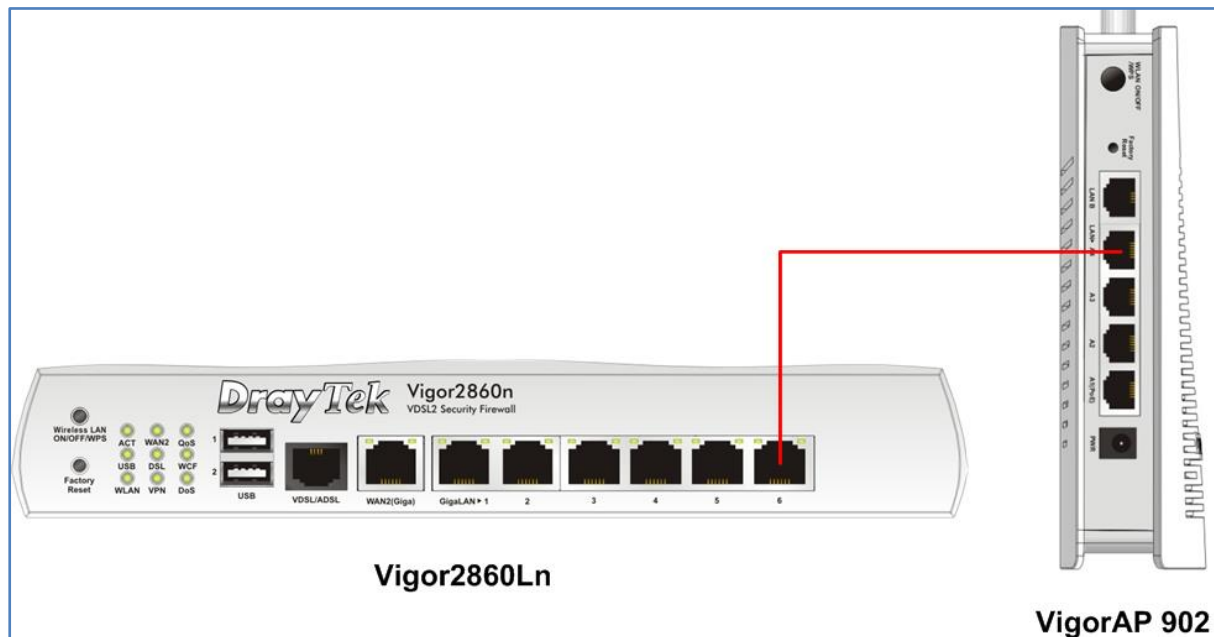
Go to **Wireless LAN (2.4GHz) >> Security** to set up authentication for each SSID

The screenshot displays a configuration window for a network device. At the top, there are four tabs labeled SSID 1, SSID 2, SSID 3, and SSID 4. The SSID 1 tab is selected and highlighted with a red box. Below the tabs, the SSID is set to LAN_0. The Mode is set to Mixed(WPA+WPA2)/PSK, which is also highlighted with a red box. A note indicates that a RADIUS Server should be set up if 802.1x is enabled. Under the WPA section, the WPA Algorithms are set to TKIP/AES, with the radio button highlighted by a red box. The Pass Phrase field is empty and highlighted with a red box. The Key Renewal Interval is set to 3600 seconds.

- Select a SSID
- Select an authentication Mode
- Select a WPA Algorithm
- Enter Pass Phrase
- Click OK to save

Step 3.2: Connect the VigorAP 902 to the Vigor2860 router

Connect router port **P6** to VigorAP 902 port LAN **A4** as shown in the diagram below:



Testing

Once this configuration is completed the wireless client for each SSID will obtain an IP address corresponding to the SSID.

On your laptop or Wi-Fi device connect to each Wi-Fi SSID and in command prompt run the command `ipconfig` to check that the PC or Wi-Fi client obtains the correct IP address for each LAN.

For example, for SSID2 which is configured for VLAN 1 and LAN 2 you should have an IP address in the 192.168.2.0 subnet.

```
C:\WINDOWS\System32>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

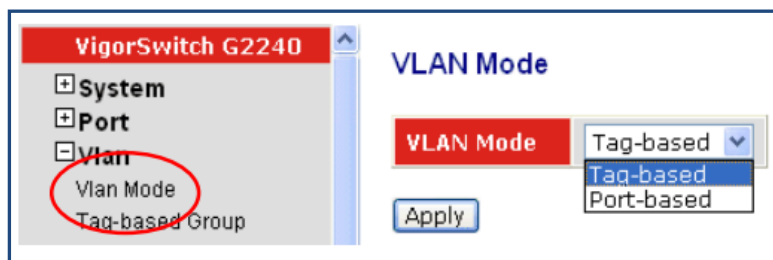
    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::d8df:c6ff:2b49:1935%14
    IPv4 Address. . . . . : 192.168.2.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.2.1
```

2.6 VLAN Configuration on DrayTek Switch

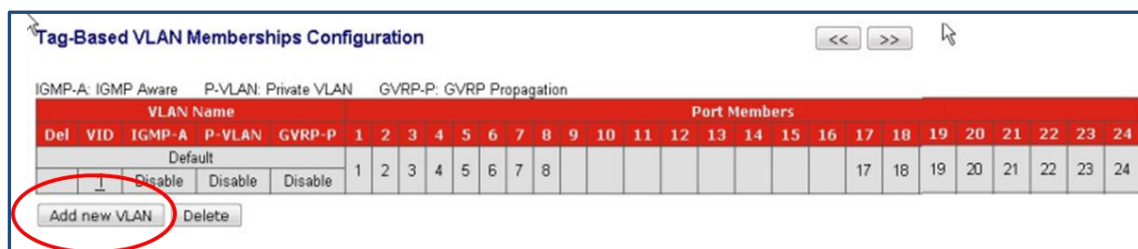
Below is an example of a VLAN configuration on the DrayTek VigorSwitch G2240. The VLAN capability also applies to the VigorSwitch G1241, VigorSwitch G2260 and VigorSwitch P2261, each of these switches support both Port-based and Tag-based VLANs. The menu interface varies for each model.



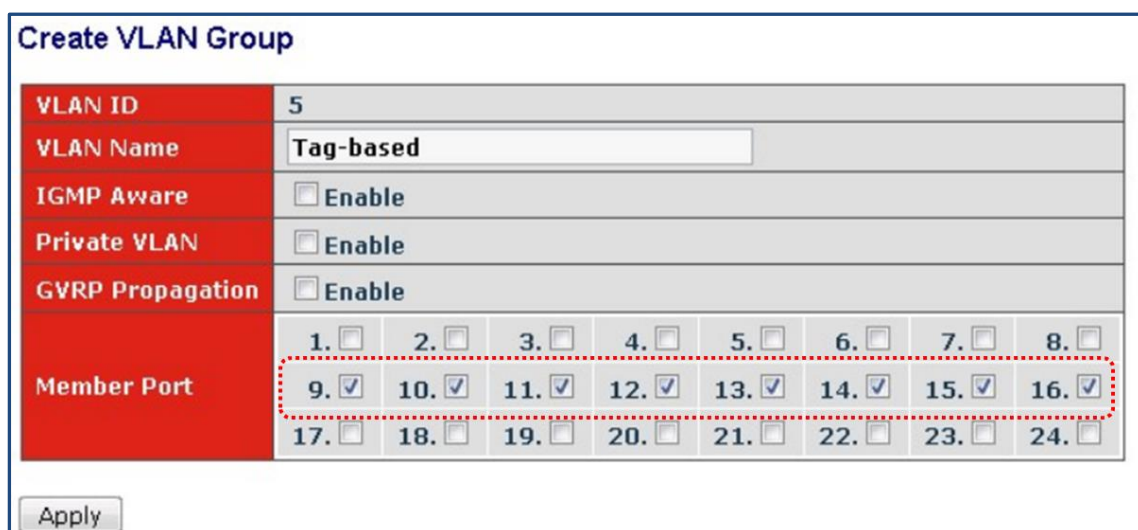
1. Select Tagged-based and click Apply to save the settings.



2. To add a new VLAN in the switch, Click on "Add new VLAN" button.



3. Enter the VLAN ID, name and select the member ports then click Apply.

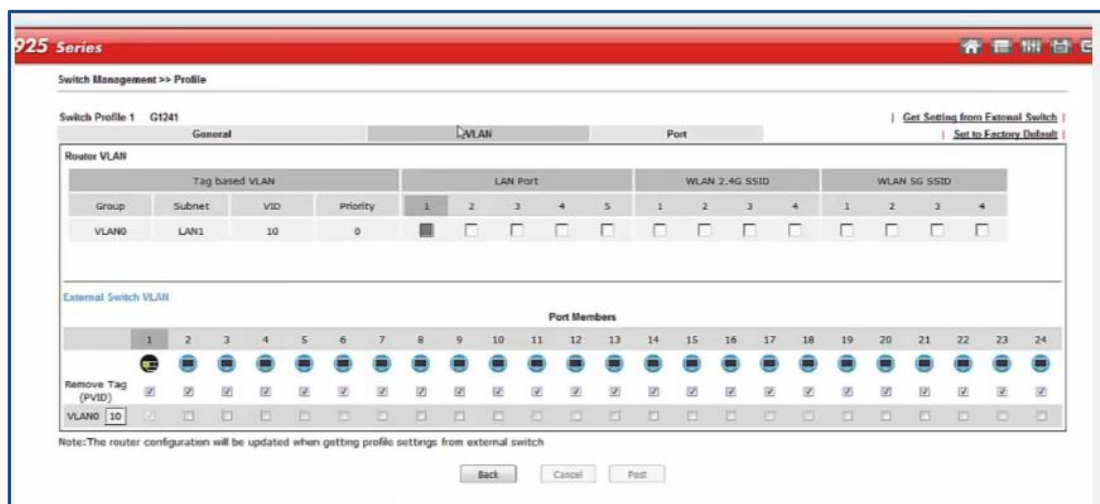


- Select one port as the trunk port. This port will need to be set as tagged as well as trunk. The remaining ports are assigned as access ports. These options may vary depending on the switch model.

Port #	VLAN Aware	Ingress Filtering	Frame Type	PVID	Role	Untag VID	Double Tag
1	☒	☐	All	1	Access	0	Disable
2	☒	☐	All	1	Access	0	Disable
3	☒	☐	All	1	Access	0	Disable
4	☒	☐	All	1	Access	0	Disable
5	☒	☐	All	1	Access	0	Disable
6	☒	☐	All	1	Access	0	Disable
7	☒	☐	All	1	Access	0	Disable
8	☒	☐	All	1	Access	0	Disable
9	☒	☒	Tagged	5	Trunk	0	Disable
10	☒	☐	All	5	Access	0	Disable
11	☒	☐	All	5	Access	0	Disable
12	☒	☐	All	5	Access	0	Disable

2.6.1 Central Switch Management

Central Switch Management (CSM) is a new feature available in DrayTek Vigor routers which simplifies the creation of VLAN on both the router and the attached switch from a central console.



The CSM features include Auto Change to Trunk port when multiple VLANs are selected and selecting the PVID from the drop-down menu.

External Switch VLAN

	1	2	3	4	5	6
Remove Tag (PVID)	0	☒	☒	☒	☒	☒
VLAN0	0	☒	☐	☐	☐	☐
VLAN1	20	☐	☒	☐	☐	☐
VLAN2	30	☐	☐	☒	☐	☐
VLAN3	40	☐	☐	☐	☒	☐
VLAN4	50	☐	☐	☐	☐	☐

0 : 0
 1 : 20
 2 : 30
 3 : 40
 4 : 50

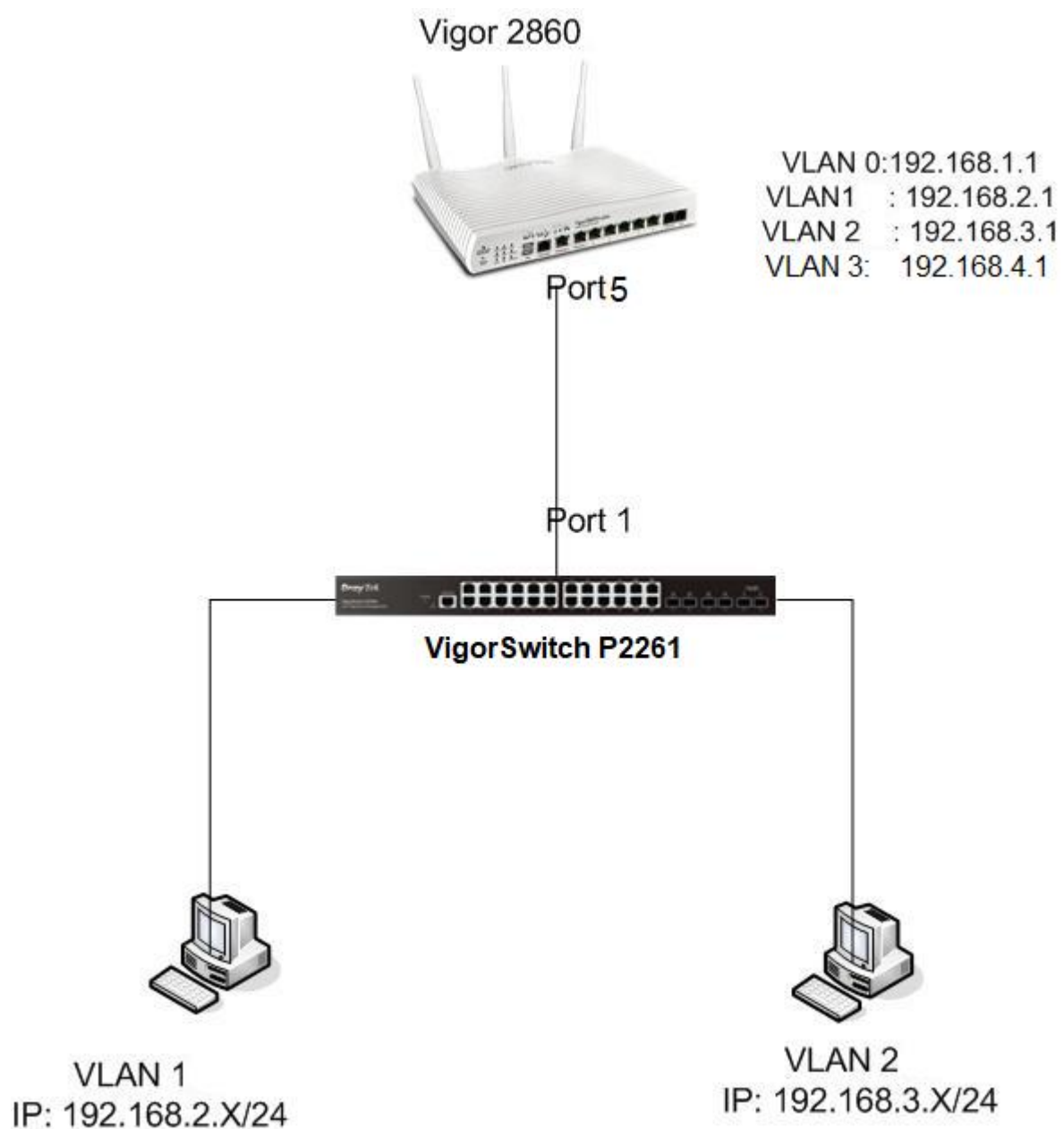
2.7 Exercises

2.7.1 Exercise 2

Creating 802.1q VLANs between DrayTek Router and VigorSwitch

In this exercise, we will create an 802.1q Trunk between a Vigor2860 and DrayTek VigorSwitch P2261 using the following network topology.

We will build upon the router configuration used in exercise 1.



Part A: Configure VLANS on Vigor2860Ln Router

Step 1: Enable VLAN

On the DrayTek Router, go to **LAN >> VLAN configuration** menu.

Add the VLANS to port P5. This will be the 892.1q VLAN Trunk port for the VigorSwitch

Router port P5 will be the Trunk port connecting to the VigorSwitch so we enable VLAN tagging for the associated VLAN ID for each VLAN.

VLAN	Ports/SSID	Subnet	VLAN ID (VID)	Tagging
VLAN0	P1 – P6/SSID1-4	LAN 1	0	No
VLAN1	P5	LAN 2	100	Enabled
VLAN2	P5	LAN 3	200	Enabled
VLAN3	P5	LAN 4	300	Enabled

Select the VLANS for Port P5 as shown in the diagram below:

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable

	LAN						Wireless LAN				Subnet	VLAN Tag		
	P1	P2	P3	P4	P5	P6	SSID1	SSID2	SSID3	SSID4		Enable	VID	Priority
VLAN0	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	LAN 1 ▼	☐	0	0 ▼
VLAN1	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	LAN 2 ▼	☒	100	0 ▼
VLAN2	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	LAN 3 ▼	☒	200	0 ▼
VLAN3	☐	☐	☐	☐	☒	☒	☐	☐	☐	☐	LAN 4 ▼	☒	300	0 ▼
VLAN4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼

☒ Permit untagged device in P1 to access router

It is recommended to enable the option “Permit untagged device in P1 to access router” to allow a PC to be connected to the router directly for management or diagnostic purposes.

☒ Permit untagged device in P1 to access router

1. For each VLAN row, if enable is checked for the VLAN Tag then the corresponding VID will be applied to wired LAN traffic.
2. Wireless LAN traffic is always untagged, but will still be a member of the VLAN group selected.
3. Each VID must be unique.

Step 2: Enable Routing between LANS

In the LAN >> **VLAN configuration** menu enable inter –lan routing between each of the LANS.

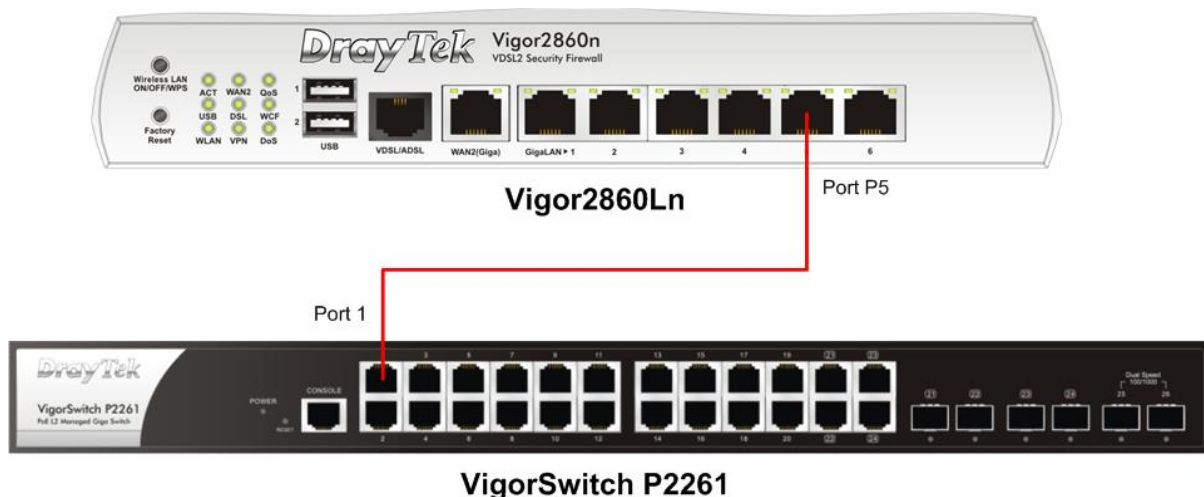
Then Go back to LAN>>VLAN Configuration and check the boxes as shown below to route between LAN1, LAN2, LAN 3 and LAN 4.

☐ Force router to use "DNS server IP address" settings specified in LAN1

Subnet	LAN 1	LAN 2	LAN 3	LAN 4	LAN 5	LAN 6	DMZ Port
LAN 1	☒	☐	☐	☐	☐	☐	☐
LAN 2	☒	☒	☐	☐	☐	☐	☐
LAN 3	☒	☒	☒	☐	☐	☐	☐
LAN 4	☒	☒	☒	☒	☐	☐	☐
LAN 5	☐	☐	☐	☐	☒	☐	☐
LAN 6	☐	☐	☐	☐	☐	☒	☐
DMZ Port	☐	☐	☐	☐	☐	☐	☒

Click **OK** to save the settings.

Step 3: Connect router port P5 to VigorSwitch Port 1 as shown in the diagram below



Part B: Configure the VigorSwitch P2261

Step 1: Log into the DrayTek VigorSwitch P2261

The default IP address for the VigorSwitch is **192.168.1.226**

The VigorSwitch also has DHCP client enabled so if the switch is connected to the router, it will be assigned an IP address from the router. To find the DHCP assigned IP address, go to the router **Diagnostics >> View ARP Cache Table** menu. In the table, you will see the IP address for the switch.

Use this IP address to connect to the VigorSwitch.(If it does not appear switch the device off/on)

Diagnostics >> View ARP Cache Table

LAN WAN

Show: ALL LANs and ALL VLANs

Ethernet ARP Cache Table [Clear](#) [Refresh](#)

IP Address	MAC Address	HOST ID	Interface	VLAN	Port
192.168.1.10	00-24-1D-C0-B6-F7	RoyPanetta-PC	LAN1	---	P1
192.168.1.11	00-50-7F-F1-27-65	p2261	LAN1	---	P1

To log in use username: **admin**

Password: **admin**



DrayTek VigorSwitch P2261

Login

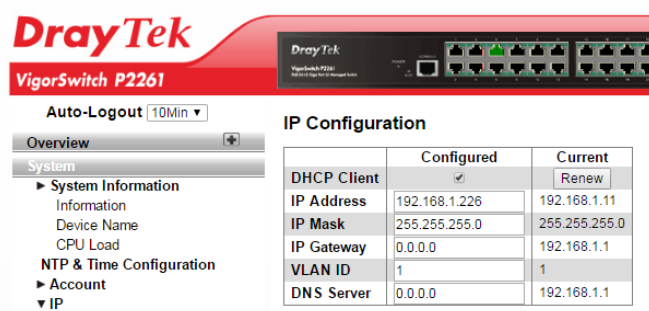
Username: admin

Password:

Note:

The switch management VLAN is **1** by default.

This can be changed to another VLAN and IP address in **IP>>IPV4>> IP Configuration** menu.



DrayTek VigorSwitch P2261

Auto-Logout 10Min

Overview System

System Information

Device Name

CPU Load

NTP & Time Configuration

Account

IP

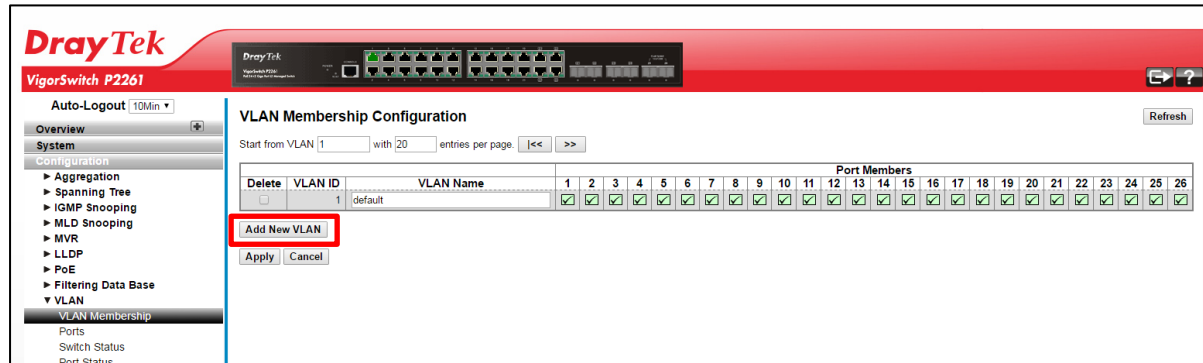
IP Configuration

	Configured	Current
DHCP Client	☒	Renew
IP Address	192.168.1.226	192.168.1.11
IP Mask	255.255.255.0	255.255.255.0
IP Gateway	0.0.0.0	192.168.1.1
VLAN ID	1	1
DNS Server	0.0.0.0	192.168.1.1

Step 2: Add VLANS to VigorSwitch P2261

Go to **Configuration>>VLAN>>VLAN Membership** configuration menu.

Click on **Add New VLAN** button.

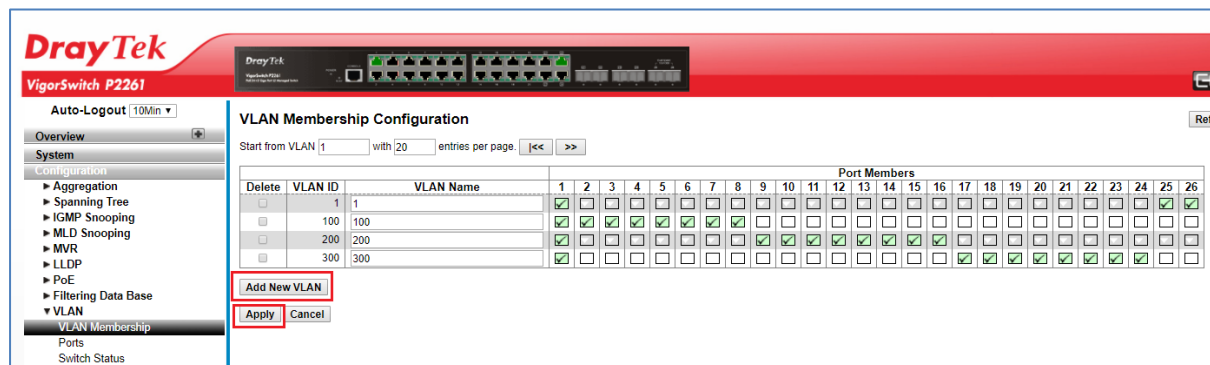


Add VLAN 100, VLAN 200 and VLAN 300 and select port members for these VLANS. Here we have selected ports 1 – 8 to have VLAN 100, ports 9 – 16 to have VLAN 200 and ports 17 - 24 to have VLAN 300

Switch port 1 will be our Trunk port so we assign all the VLANS to this port.

VLAN 1 is our management VLAN for the switch so we assign it to port 1

Click **Apply** to save the settings.



Step 3: Configure VLAN Ports

Go to **Configuration>>VLAN>>Ports** configuration menu.

Port Type Setting

- **Port 1** is our **Trunk** port so we select port type to be "C-port" (*The Unaware setting will also work but C-Port is recommended. See box below for explanation*).
- Other ports can be left as Unaware

Frame Type Setting

- Set Frame Type for all port1 to “All”
- Set Frame type for all other ports to **Untagged**

Egress Rule Setting

- For **Port 1** set Egress Rule to **Hybrid**
- For Other ports set Egress Rule to **Access**

Assign a PVID to each switch port – Leave Port 1 PVID 1 – Loss of connection if changed

- Ports 2 – 8 PVID 100
- Ports 9 – 16 PVID 200
- Ports 17 – 24 PVID 300

Click **Apply** to save settings.

Ethertype for Custom S-ports 0x8100 (Normally Ethertype)

VLAN Port Configuration

Port	Port Type	Ingress Filtering	Frame Type	Egress Rule	PVID
1	C-port	☐	All	Hybrid	1
2	Unaware	☐	All	Access	100
3	Unaware	☐	All	Access	100
4	Unaware	☐	All	Access	100
5	Unaware	☐	All	Access	100
6	Unaware	☐	All	Access	100
7	Unaware	☐	All	Access	100
8	Unaware	☐	All	Access	100
9	Unaware	☐	All	Access	200
10	Unaware	☐	All	Access	200
11	Unaware	☐	All	Access	200
12	Unaware	☐	All	Access	200
13	Unaware	☐	All	Access	200
14	Unaware	☐	All	Access	200
15	Unaware	☐	All	Access	200
16	Unaware	☐	All	Access	200
17	Unaware	☐	All	Access	300
18	Unaware	☐	All	Access	300
19	Unaware	☐	All	Access	300
20	Unaware	☐	All	Access	300
21	Unaware	☐	All	Access	300
22	Unaware	☐	All	Access	300
23	Unaware	☐	All	Access	300
24	Unaware	☐	All	Access	300
25	Unaware	☐	All	Access	1
26	Unaware	☐	All	Access	1

Apply **Cancel**

Egress Rule

Determines what device the port connects to. If the port connects to VLAN-unaware devices, such as terminal/work station, Access link should be used. If the port connects to VLAN-aware devices, for example, switch connect to switch, Trunk link should be used. Hybrid link is used for more flexible application.

Hybrid If the tag of tagged frame is as the same as PVID, the tag of the frame will be removed. The frame become an untagged frame and transmitted. Any other tagged frame whose tag value is different from PVID is transmitted directly.

Trunk All tagged frames with any tag value are transmitted.

Access The tag of any tagged frame will be removed to become an untagged frame. These untagged frames will be transmitted.

Which VLAN Port Type should I choose?

There are four port types in VigorSwitch: Unaware, C-port, S-port, and S-custom-port, each port type takes different action to the frames received according to whether the frame is tagged or not and according to the TPID of the tagged frame. Vigor Router uses tagged frames with TPID 0x8100, below we explains the behavior of different port types based on TPID 0x8100; for other TPID, please check user guide for more information.

DrayTek VigorSwitch P2261

Auto-Logout 10Min

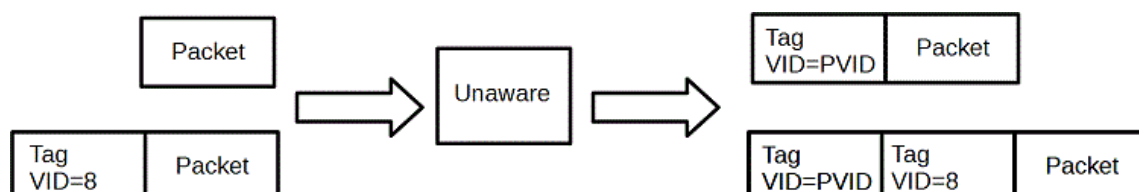
Ethertype for Custom S-ports 0x8100 (Normally Ethertype)

VLAN Port Configuration

Port	Port Type	Ingress Filtering	Frame Type	Egress Rule	PVID
1	Unaware	☐	All	Access	1
2	Unaware	☐	All	Access	1
3	C-port	☐	All	Access	1
4	S-port	☐	All	Access	1
5	S-custom-port	☐	All	Access	1
6	Unaware	☐	All	Access	1
7	Unaware	☐	All	Access	1
8	Unaware	☐	All	Access	1
9	Unaware	☐	All	Access	1

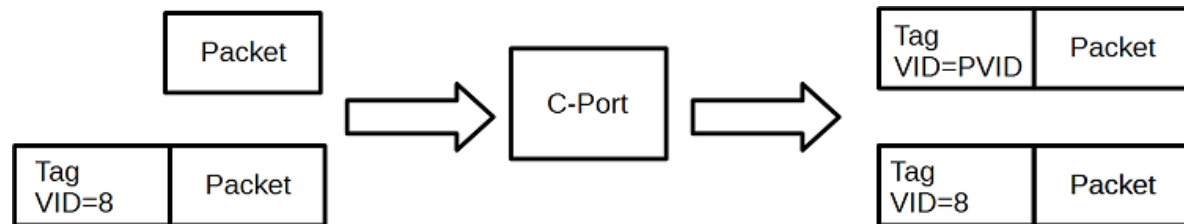
Unaware

No matter the received frame is tagged or untagged, Unaware ports add a tag (based on PVID) to the frame and then forward it.



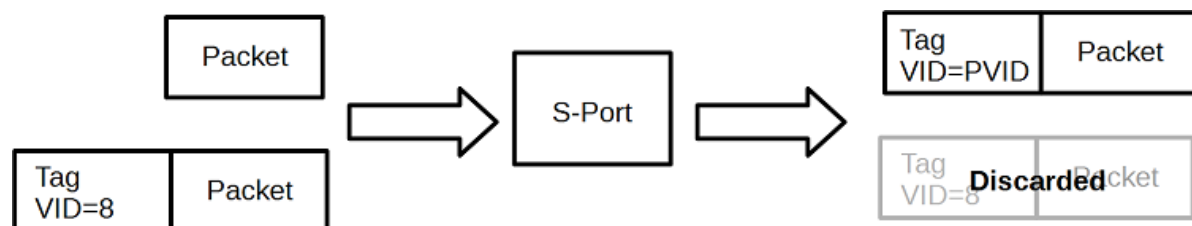
C-port

If the received frame is untagged, C-ports add a tag (based on PVID) to the frame and then forward it; If the frame is already tagged, it will be forwarded without adding a tag.



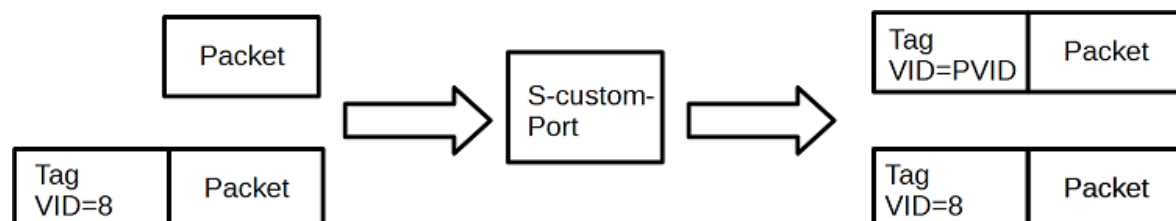
S-port

S-ports only accept untagged frames. If the received frame is untagged, S-ports add a tag (based on PVID) to the frame and then forward it; If the frame is already tagged, it will be discarded.



Custom-port

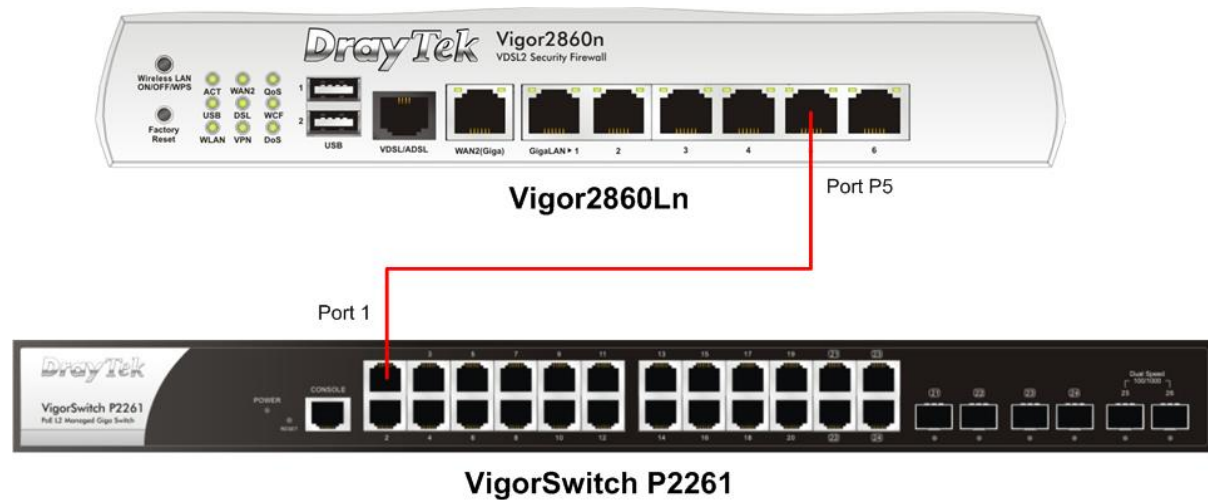
When Ethertype is set to 0x8100, S-custom ports do the same as C-ports: If the received frame is untagged, S-custom ports add a tag (based on PVID) to the frame and then forward it; If the frame is already tagged, it will be forwarded without adding a tag.



In summary, for the port that are connecting to a Vigor Router that has VLAN settings, it should be set to C-port.

Step 4: Testing

Connect Router port P5 to VigorSwitch port 1 and check that VLANs work.



Testing VLANS

The computer connected to Ports 2-8 of Switch will be assigned to VLAN 200 and will get an IP address 192.168.2.X. (note – remove the static IP address of the computer)

```
Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix  . : 
Description . . . . . : Broadcom NetXtreme Gigabit Ethernet
Physical Address. . . . . : 00-16-17-9B-EA-99
Dhcp Enabled. . . . . : Yes
Autoconfiguration Enabled . . . : Yes
IP Address. . . . . : 192.168.2.10
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.2.1
DHCP Server . . . . . : 192.168.2.1
DNS Servers . . . . . : 192.168.2.1
                        8.8.4.4
Lease Obtained. . . . . : Thursday, 20 August 2015 2:11:35 PM
Lease Expires . . . . . : Sunday, 23 August 2015 2:11:35 PM
```

The computer connected to Ports 9 - 17 of Switch will be assigned to VLAN 200 and will get an IP address 192.168.3.X

```
Connection-specific DNS Suffix  . : 
Description . . . . . : Broadcom NetXtreme Gigabit Ethernet
Physical Address. . . . . : 00-16-17-9B-EA-99
Dhcp Enabled. . . . . : Yes
Autoconfiguration Enabled . . . : Yes
IP Address. . . . . : 192.168.3.10
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.3.1
DHCP Server . . . . . : 192.168.3.1
DNS Servers . . . . . : 192.168.3.1
                        8.8.4.4
Lease Obtained. . . . . : Thursday, 20 August 2015 2:13:56 PM
Lease Expires . . . . . : Sunday, 23 August 2015 2:13:56 PM
```

The computer connected to Ports 18 - 24 of Switch will be assigned to VLAN 300 and will get an IP address 192.168.4.X

```
Ethernet adapter Ethernet 2:

Connection-specific DNS Suffix . : 
Link-local IPv6 Address . . . . . : fe80::80cc:72cc:351c:5eb8%9
IPv4 Address. . . . . : 192.168.4.10
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.4.1
```

Test connectivity across all VLANs by pinging a device on another LAN (e.g. Access point or router) with PC connected to each VLAN on the switch.

Try to ping the router LAN

192.168.1.1

192.168.2.1

192.168.3.1

192.168.4.1

```
Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . : 
IP Address. . . . . : 192.168.3.10
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.3.1

C:\Documents and Settings\Administrator>ping 192.168.1.12

Pinging 192.168.1.12 with 32 bytes of data:

Reply from 192.168.1.12: bytes=32 time=64ms TTL=63
Reply from 192.168.1.12: bytes=32 time=91ms TTL=63
Reply from 192.168.1.12: bytes=32 time=143ms TTL=63
Reply from 192.168.1.12: bytes=32 time=27ms TTL=63
```

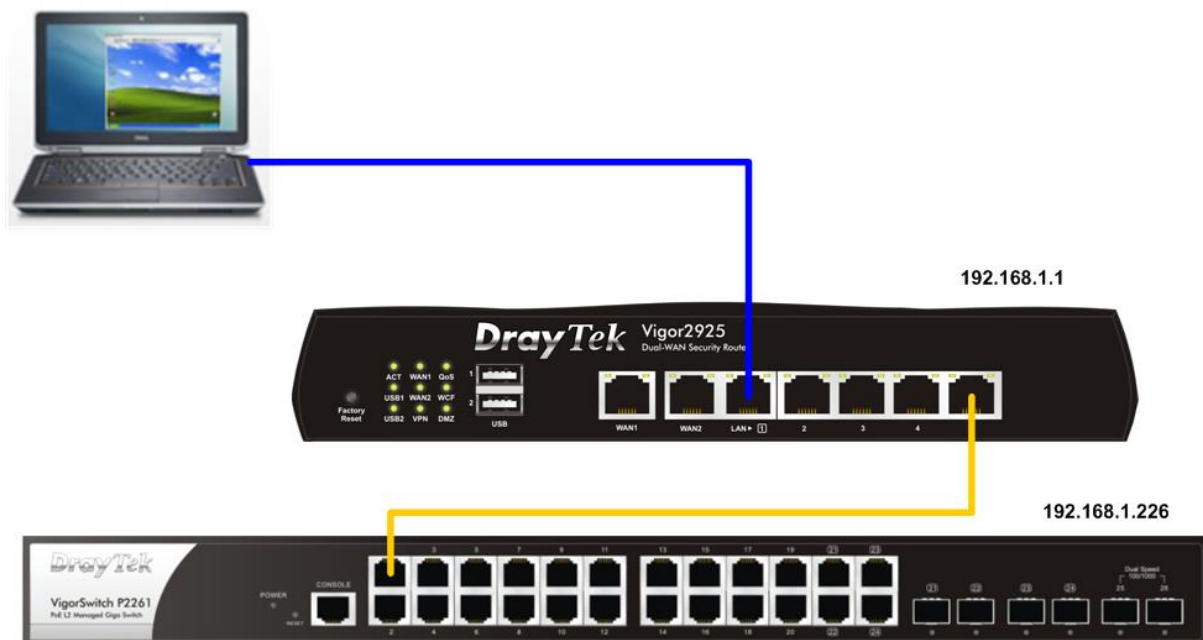
2.7.2 Exercise 3

Creating 802.1q VLANs between DrayTek Router and VigorSwitch using Central Switch Management

In this exercise, we will set up an 802.1q VLAN between a DrayTek **Vigor2925** router and a DrayTek **VigorSwitch P2261** using the central switch Management feature in the router.

Before starting this exercise, please reset the router and VigorSwitch to factory default settings. This can be done by pressing the Factory Reset button on both the router and switch for at least 5 seconds.

Connect your PC to router port P1 and connect router port P5 to switch port 1as shown in the diagram below. This will be the 802.1q VLAN trunk connection between the router and the switch. Ensure all devices are powered on.



Step 1: Log into the Router and Configure VLANS

Log into the router using the IP address 192.168.1.1.

Go to **LAN >> VLAN Configuration**.

Enable the VLAN configuration in this example we configure LAN port P5 as the 802.1q VLAN trunk port. LAN1 will be the management LAN and will not have VLAN tag enabled for this. This will allow us to access both the router and switch since they will be on LAN 1.

Use the settings shown in the diagram below.

- VLAN 0 will be untagged.
- VLANS 2, 3, 4 and 5 will have VLAN tags 100, 200, 300, 400 respectively.

DrayTek **Vigor2925 Series**

Auto Logout 

Dashboard
Wizards
Online Status

WAN
LAN
General Setup
Static Route
VLAN
Bind IP to MAC
LAN Port Mirror
Wired 802.1X
Web Portal Setup
Load-Balance/Route Policy
NAT
Hardware Acceleration
Firewall
User Management
Objects Setting
CSM
Bandwidth Management
Applications
VPN and Remote Access
Certificate Management
SSL VPN
USB Application
System Maintenance
Diagnostics

Central Management

LAN >> VLAN Configuration

VLAN Configuration

☒ Enable

	LAN					Subnet	VLAN Tag		
	P1	P2	P3	P4	P5		Enable	VID	Priority
VLAN0	☒	☐	☐	☐	☒	LAN 1 ▼	☐	0	0 ▼
VLAN1	☐	☒	☐	☐	☒	LAN 2 ▼	☒	100	0 ▼
VLAN2	☐	☐	☒	☐	☒	LAN 3 ▼	☒	200	0 ▼
VLAN3	☐	☐	☐	☒	☒	LAN 4 ▼	☒	300	0 ▼
VLAN4	☐	☐	☐	☐	☒	LAN 5 ▼	☒	400	0 ▼
VLAN5	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN6	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼
VLAN7	☐	☐	☐	☐	☐	LAN 1 ▼	☐	0	0 ▼

☒ Permit untagged device in P1 to access router

Note:

1. For each VLAN row, selecting Enable VLAN Tag will apply the associated VID to the selected wired LAN port.
2. Each VID must be unique.

OK Clear Cancel

Click **OK** to save the settings. (The router may restart to save the settings)

Step 2: Enable Routing between Subnets

- Go to **LAN>>General Setup** configuration menu.
- In **Inter-LAN Routing** section, enable inter-LAN routing by selecting the intersection of each LAN as shown in the diagram below.
- Click **OK** to save the settings

r2925 Series

LAN >> General Setup

General Setup

Index	Status	DHCP	IP Address		
LAN 1	V	V	192.168.1.1	Details Page	IPv6
LAN 2	☒	☒	192.168.2.1	Details Page	IPv6
LAN 3	☒	☒	192.168.3.1	Details Page	IPv6
LAN 4	☒	☒	192.168.4.1	Details Page	IPv6
LAN 5	☒	☒	192.168.5.1	Details Page	IPv6
DMZ Port	☐	☒	192.168.6.1	Details Page	IPv6
IP Routed Subnet	☐	☒	192.168.0.1	Details Page	

Advanced
You can configure DHCP server options here.

☐ Force router to use "DNS server IP address" settings specified in

LAN1

Inter-LAN Routing

Subnet	LAN 1	LAN 2	LAN 3	LAN 4	LAN 5	DMZ Port
LAN 1	☒	☐	☐	☐	☐	☐
LAN 2	☒	☒	☐	☐	☐	☐
LAN 3	☒	☒	☒	☐	☐	☐
LAN 4	☒	☒	☒	☒	☐	☐
LAN 5	☒	☒	☒	☒	☒	☐
DMZ Port	☐	☐	☐	☐	☐	☒

Note:
LAN 2/3/4 are available when VLAN is enabled.
DMZ subnet is default bound to P1, and will overwrite the settings of P1 at LAN>>VLAN page.

OK

Step 3: Enable External Device Discovery

3.1 Go to Central Management >> External Device configuration menu.

Enable “**External Device Auto Discovery**” so the router will discover attached devices and register them to the Central Management feature and click **OK**. (*Discovery will take a few seconds. Click on **Refresh** to update the list*)

Central Management >> External Device

☒ External Device Syslog
☒ External Device Auto Discovery

enable External Device Auto Discovery

External Devices Connected | Refresh |

Below shows available devices that connected externally:

On Line	G2260, G2260 Contact : , Connection Uptime:00:58:52	Account	Clear
	IP Address:192.168.1.226		
On Line	VigorAP902, VigorAP902, Connection Uptime:00:16:00	Account	Clear
	IP Address:192.168.1.10		

For security reason:
 If you have changed the administrator password on External Device, please click the **Account** button to retype new username and password. Otherwise, the router will be unable to monitor the External Device device properly. Click the **Clear** button to Clear the off-line information and account information.

OK

3.2 Go to Central Management >> Switch>>Status configuration menu

Add click “**Add New**”

Central Management >> Switch >> Status

Switch Status

Switch Hierarchy

| Refresh |

View Group: All ▼

Status

Group	Switch Name	IP Address	Model	System Up Time	Port in Use	Clients	Firmware Version
-------	-------------	------------	-------	----------------	-------------	---------	------------------

New Switch List

Index	Switch Name	IP Address	MAC Address	Model	Firmware Version	Add Device
1	G2261	192.168.1.226	00:50:7F:F1:08:AE	G2261	v3.35	Add New

Note:
 Supported VigorSwitch model and firmware version P2261 V3.11, G2260 V3.11.

Tick add new device

Step 4: Configuring Switch Port VLANS

Click “**Switch Name**” to access the profile of the attached VigorSwitch.

Central Management >> Switch >> Status

Switch Status | Switch Hierarchy | [Refresh](#)

View Group: All ▼

Status

Group	Switch Name	IP Address	Model	System Up Time	Port in Use	Clients	Firmware Version
Default	P2261	192.168.1.11	P2261	0:00:00	0/26	0	v3.35

Note: Supported VigorSwitch model and firmware version P2261 V3.11, G2260 V3.11, G1241 2.1.0.Beta2, P1100 2.1.0RC3a.

Click on the Switch Name

You should now see the **Central Management >> Switch >> Profile** menu page appear as shown below.

Central Management >> Switch >> Profile

Switch Profile 1 | [Get Setting from External Switch](#) | [Set to Factory Default](#)

General | VLAN | Port

Switch Name:

Comment:

☐ Copy configuration from: None ▼

Login Password:

IP Address: DHCP 192.168.1.11

Note: The router configuration will be updated when getting profile settings from external switch

Start configuration of the switch VLANS by clicking on the VLAN tab.

Now assign ports with its respective VLAN by selecting the intersection of the LAN port and VLAN ID as shown below:

Switch port VLAN assignments

VLAN 0: Ports 1 – 4 (Port 1 is 802.1q Trunk Port)

VLAN 1: Ports 5 -10

VLAN 2: Ports 11 -16

VLAN 3: Ports 17 – 22

VLAN 4: Ports 23 – 26

Central Management >> Switch >> Profile

Switch Profile 1 P2261 | Get Setting from External Switch |
| Set to Factory Default |

General				VLAN				Port			
Router VLAN											
Tag based VLAN				LAN Port							
Group	Subnet	VID	Priority	1	2	3	4	5			
VLAN0	LAN1	0	0	☒	☐	☐	☐	☒			
VLAN1	LAN2	100	0	☐	☒	☐	☐	☒			
VLAN2	LAN3	200	0	☐	☐	☒	☐	☒			
VLAN3	LAN4	300	0	☐	☐	☐	☒	☒			
VLAN4	LAN5	400	0	☐	☐	☐	☐	☒			

External Switch VLAN

		Port Members																									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Remove Tag (PVID)	0	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
VLAN0	0	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
VLAN1	100	☒	☐	☐	☐	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
VLAN2	200	☒	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
VLAN3	300	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐
VLAN4	400	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒

Note: The router configuration will be updated when getting profile settings from external switch

Click **OK** to save the settings

Click on **Send to Device** button to send the configuration to the switch.

(Wait for a few seconds for the switch to be configured by the router)

Step 5: Checking Switch Settings

To log into the switch and check the switch VLAN settings, click on the IP address appearing in the **Central Management >> Switch >> Status** router menu as shown below:

Central Management >> Switch >> Status

Switch Status

Switch Hierarchy

Refresh

View Group: All

Status

Group	Switch Name	IP Address	Model	System Up Time	Port in Use	Clients	Firmware Version
Default	P2261	192.168.1.11	P2261	0:32:07	1/26	0	v3.35

Click here to access switch

Note: Supported VigorSwitch model and firmware version P2261 V3.11, G2260 V3.11, G1241 2.1.0.Beta2, P1100 2.1.0RC3a.

This should take you to the switch login page.

Login in with Username: admin

Password: admin

In the switch, go to **VLAN Membership Configuration** page.

You should see the VLAN settings like in the diagram below. It should match the settings you enabled in the router in step 4.

DrayTek
VigorSwitch P2261

Auto-Logout 10Min

VLAN Membership Configuration

Start from VLAN 1 with 20 entries per page. << >>

Delete	VLAN ID	VLAN Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
☐	1	1	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	100	100	☒	☐	☐	☐	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	200	200	☒	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	
☐	300	300	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
☐	400	400	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	

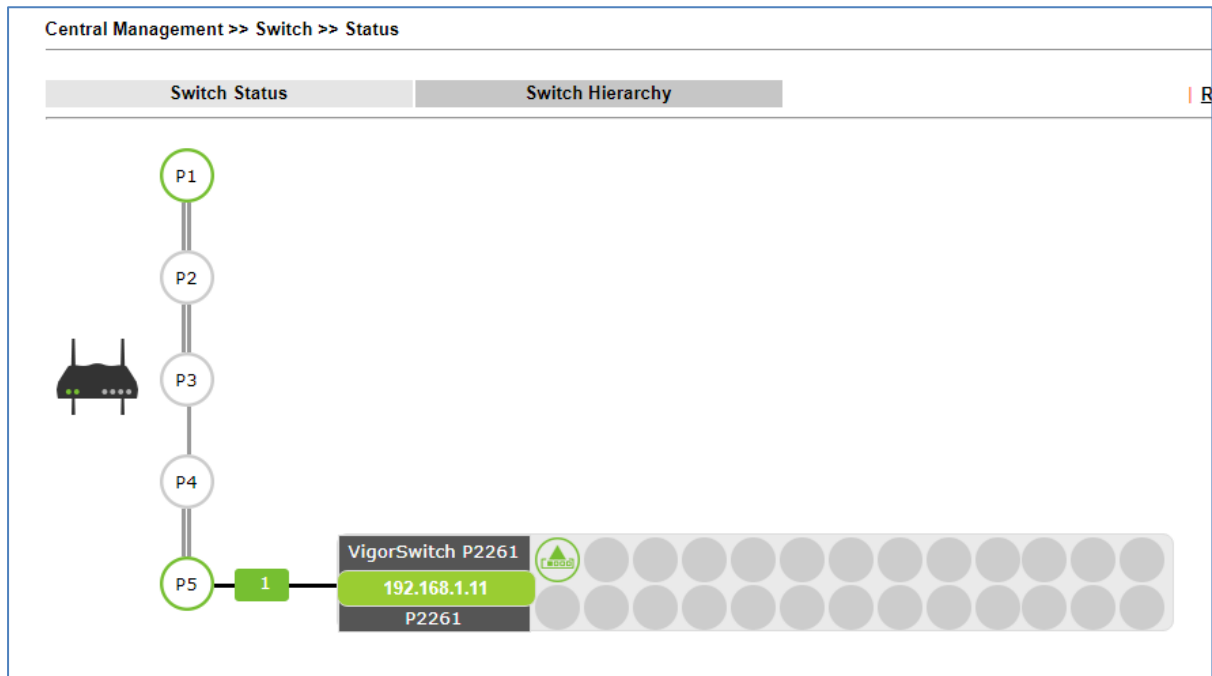
Add New VLAN

Apply Cancel

Step 6: Checking Switch Hierarchy

To check the Switch Hierarchy, go to **Central Management >> Switch >> Status** menu and click on the **Switch Hierarchy** tab.

You should see a diagram similar to that shown below. It shows that the switch is connected to port 5 on the router and port 1 is the trunk port as well as details of any other devices attached to the switch.



Testing VLANS

Connect your computer to each switch port and check that you obtain the correct IP address via DHCP for each VLAN. Test connectivity by pinging the router, another attached device or Internet host.

2.8 WAN VLAN Tagging

Some of the NBN service providers use VLAN tagging for WAN connections. Below are the steps to setup WAN VLAN Tagging in DrayOS routers.

Go to “**WAN >> General setup**”. The VLAN ID will need to match value specified by the ISP.

WAN >> General Setup

WAN 1

Enable: Yes ▾

Display Name:

Physical Mode: VDSL2

DSL Mode: VDSL2 only ▾

Physical Type: Auto negotiation ▾

DSL Modem Code: Default ▾

Line Speed(Kbps):

DownLink:

UpLink:

VLAN Tag insertion (ADSL): Disable ▾

Tag value: (0~4095)

Priority: (0~7)

VLAN Tag insertion (VDSL2): Enable ▾

Tag value: (0~4095)

Priority: (0~7)

Active Mode: Always On ▾ Load Balance: ☒

For Linux based routers such as the Vigor2960, Vigor3900 and Vigor300B, the VLAN tag is configured in WAN>>General Setup>>Global configuration menu as shown below:

DrayTek Vigor3900 Series 14:15:05

WAN >> General Setup >> General Setup

Auto Logout: 5Min ▾

General Setup | USB WAN | Bridge VLAN

Quick Start Wizard | Online Status | WAN | General Setup | Inbound Load | Switch | LAN | Routing | NAT | Firewall | Objects Setting | User Management | Applications | VPN and Remote Access | Certificate Management | SSL Proxy | Central VPN Management | Bandwidth Management | USB Application | System Maintenance | Diagnostics

Global | PPTP | Static | DHCP | PPPoE | Static V6 | DHCP V6

Profile (max length:7): wan5

☒ Enable

Description: (Optional)

Port: WAN5 ▾

Default MAC Address: ☒ Enable ☐ Disable

MAC Address:

IPv4 Protocol: None ▾

IPv4 Mode: NAT ▾ NAT operation to packet is only applied when they come from an NAT mode LAN

IPv6 Protocol: Link Local ▾

Enable Schedule Reconnect: ☐ Enable ☒ Disable

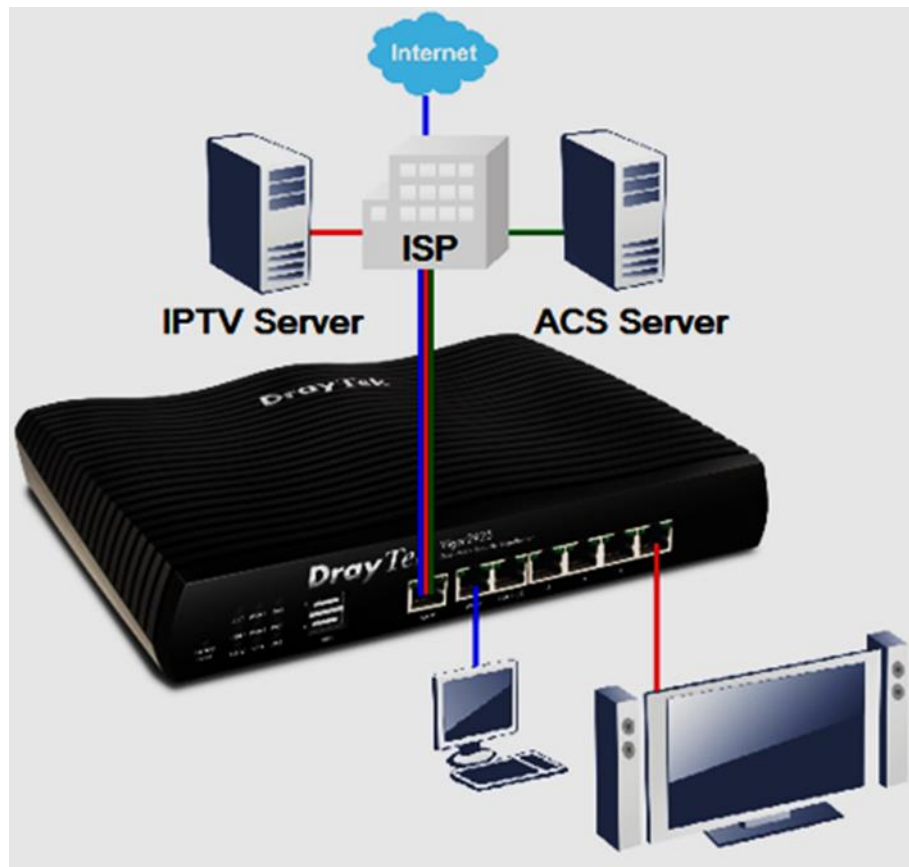
VLAN Tag: ☒ Enable ☐ Disable enable it only when your ISP requires tagged VLAN

VLAN ID:

Priority(802.1p):

2.9 Virtual WAN

Virtual WANs can be configured in two different ways in DrayTek routers. One is Bridge virtual WAN to LAN clients and second is for ACS management.



Go to “WAN >> Multi-VLAN >> Channel” configuration menu to configure. In the example below we have selected WAN5.

WAN

General Setup

Internet Access

Multi-VLAN

WAN Budget

Multi-VLAN

General

Channel	Enable	WAN Type	VLAN Tag	Port-based Bridge
1	Yes	Ethernet(WAN1)	None	
2	Yes	Ethernet(WAN2)	None	
3	No	Ethernet(WAN1)	None	
4	No	Ethernet(WAN1)	None	
5	WAN5	No	Ethernet(WAN1)	None ☐ Enable ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5
6	WAN6	No	Ethernet(WAN1)	None ☐ Enable ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5
7	WAN7	No	Ethernet(WAN1)	None ☐ Enable ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5
8		No	Ethernet(WAN1)	None ☐ Enable ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5
9		No	Ethernet(WAN1)	None ☐ Enable ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5
10		No	Ethernet(WAN1)	None ☐ Enable ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5

2.9.1 Bridge Virtual WAN to LAN clients

For “Bridge Virtual WAN to LAN clients”, select Enable and set WAN Type to Ethernet (WAN1), enter the VLAN Tag, tick Open Port-based Bridge Connection for this Channel, and select physical port (P5 in this scenario) as Physical Member and ok to save the settings

WAN >> Multi-VLAN >> Channel 5

Multi-VLAN Channel 5: ☒ Enable ☐ Disable

WAN Type :

General Settings

VLAN Header

VLAN Tag:

Priority:

Note: Tag value must be set between 1~4095 and unique for each channel.
Only one channel can be untagged (equal to 0) at a time.

☒ Open Port-based Bridge Connection for this Channel

Physical Members

☐ P1 ☐ P2 ☐ P3 ☐ P4 ☒ P5

Note: P1 is reserved for NAT use, and cannot be configured for bridge mode.

☐ Open WAN Interface for this Channel

2.9.2 Virtual WAN for ACS Management

If you want to configure “Virtual WAN for ACS management” then tick “Open WAN Interface for this Channel” option instead of Bridge option which we selected earlier, set WAN Application to Management, and set WAN Setup to Static or Dynamic IP.

WAN >> Multi-VLAN >> Channel 6

Multi-VLAN Channel 6: ☒ Enable ☐ Disable **a.**

WAN Type :

General Settings

VLAN Header

VLAN Tag: **b.**

Priority:

Note: Tag value must be set between 1~4095 and unique for each channel.
Only one channel can be untagged (equal to 0) at a time.

☐ Open Port-based Bridge Connection for this Channel

Physical Members

☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5

Note: P1 is reserved for NAT use, and cannot be configured for bridge mode.

☒ Open WAN Interface for this Channel **c.**

WAN Application:

WAN Setup:

ISP Access Setup

ISP Name:

Username:

WAN IP Network Settings

☒ Obtain an IP address automatically **d.**

Router Name:

