Port-based VLAN

Ethernet Switch

<u>ZyNOS 4.0</u>



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Port-based VLAN

Port-based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port. You must define outgoing ports allowed for each port when using port-based VLANs. Note that VLAN only governs the outgoing traffic, in other words, it is unidirectional. Therefore, if you wish to allow two subscriber ports to talk to each other, e.g., between conference rooms in a hotel, you must define the egress (outgoing port) for both ports. An egress port is an outgoing port, that is, a port through which a data packet leaves.

There are 5 hosts (Host A, B, C, D and E) connected to a 5-port layer-2 switch which supports port-based VLAN.

Case 1: Host A and Host B can talk to each other, because they are in the same VLAN group. But Host A and Host B can't talk to Host C, D, and E.



Port-based VLAN definition:

- Egress port for port 1: port 2
- Egress port for port 2: port 1

Case 2: There are 3 VLAN groups in the physical network. Host A and Host B can talk to each other; they are in the same VLAN group 1. Host B and Host C are in VLAN group 2. Host A, Host D and Host E are in VLAN group 3.

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Port-based VLAN definition:

- Egress port for port 1: port 2, port 4, port 5
- Egress port for port 2: port 1, port 3
- Egress port for port 3: port 2
- Egress port for port 4: port 1, port 5
- Egress port for port 5: port 1, port 4

Port-based VLAN across different switch

Port-based VLAN is specific only to the switch on which it was created. Definitely, Port-based VLAN can't spread across multiple switches. As the following network diagram shows, in most MTU cases, for the sake of security, subscribers are isolated from each other except from the gateway. There are two switches, Switch-2 and Switch-3, support port-based VLAN and uplink to a

non-port-based VLAN switch, Switch-1.



For Switch-2, port 1, port 2, and port 3 are allowed to communicate back and forth with uplink port 4, but not with the other ports.

- Switch-2 VLAN 1 member port: port 1 and port 4
- Switch-2 VLAN 2 member port: port 2 and port 4
- Switch-2 VLAN 3 member port: port 3 and port 4

For Switch-3, port 2, port 3, and port 4 are allowed to communicate back and forth with uplink port 1, but not with the other ports.

- Switch-3 VLAN 1 member port: port 2 and port 1
- Switch-3 VLAN 2 member port: port 3 and port 1
- Switch-2 VLAN 3 member port: port 4 and port 1

Host A can't talk to Host B due to the port-based VLAN in Switch-2, and Host C can't talk to Host D due to the port-based VLAN in Switch-3. But both Switch-2 and Switch-3 have an uplink to the non VLAN Switch-1. Host A and Host B will talk to Host C and Host D via the non VLAN switch because port-based VLAN can't spread across different switches.

To achieve the security between different switches, you must put another portbased VLAN switch for the uplink. Each port on the uplink switch also should be separated into different VLAN, except for the port to the gateway. So subscribers only can talk to the gateway for Internet access but can not communicate with each other. All contents copyright (c) 2011 ZyXEL Communications Corporation.



For Switch-1, port 1, port2, and port 3 are allowed to communicate back and forth with uplink port 4, but not with the other ports.

- Switch-1 VLAN 1 member port: port 1 and port 4
- Switch-1 VLAN 2 member port: port 2 and port 4
- Switch-1 VLAN 3 member port: port 3 and port 4

How to configure Port-Based VLAN

Port-based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port.

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Scenario



In this scenario, Port Based VLAN is used to separate one physical Switch into two smaller logical Switches. Ports 1~4 and 9, 10 are in one group and Ports

5~10 are in another group. Port-based VLANs are specific only to the switch on which they have been created.



Configuring your Switch to fulfill this scenario (GUI)

- 1. Connect a PC or Notebook to the port 1 with using the RJ45 Cable.
- 2. By default, the MGMT IP on every port is 192.168.1.1/24
- 3. Set your NIC to 192.168.1.2/24
- 4. Open an Internet browser such as IE and enter<u>http://192.168.1.1</u> in the URL.
- 5. By default, you will need to put "admin" as the username and "1234" as the password.
- 6. After you login successfully, you will see a screen similar to the one below.

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sic Setting	Port	Name	Link	State	PD:	LACP	TxPMis	RoPtets	Ecors	TA KBA:	Rik KB/s	Up Time	
	1		=0.000AVE	FORWARD NG	Of.	C satled	1116	1475	0	29.787	8 825	1117 32	
Application	2		Down	SICP	OF	Disabled	3	4	0	111	-13	11121-00	
inagement			10:0000	SIGP	CH	Desident	3	4		0.0	34	0 133 00	
	4		Down	STOP	or	C sabled	2	0	0	0.0	0.0	0.00.00	
	5		Down	STOP	or	C satled	2)	0	0.0	0.0	0:00 00:	
	2		Down	STOP	or	C sabled	Э	9	0	0.0	0.0	0:00 00	
	1		Dawa	STOP	()†	Disabled	а	4	D	0.1	40	000000	
	3		Down	SICH	01	Disabled	a.	31	0	11-11	10	41-100-00	
	4		DOMES	STOP		Desident.	819	10,499		0.1		0.00.00	
	10		Dawn	STOP	n new service	Disabled	2	0	0	0.0	0.0	0.00 00	

7. First, we need to tell the Switch to run VLAN as port based instead of 802.1q based. In order to do so, click on the "Basic Setting", then click "Switch Setup"; in the right side of the screen select the VLAN Type "Port Based" instead of "802.1Q", and click "Apply". Click "Save" to save the changes.

IP Application	VLAN Type	© 802.1Q Port Based		
Management	ARP Aging Time	Aging Time	3C0	seconds
		Join Timer	200	milliseconds
System Info	GARP Timer	Leave Timer	GCO	milliseconds
Switch Setup		Leave All Timer	10000	milliseconds
IP Detup	Priority Queue Assignment	Leve 7	7 -	
Port Setup		Lave 6	6 🔻	
PoE		Leve 5	5 -	
		Leve 4	4 🔻	
		Leve 3	3 🖛	
		Leve 2	1.5	
		Leve 1	0 -	
		Leve C	2 🔻	

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Apply Caru:el

8. Now, you need to tell the Switch how you are going to separate the physical Switch into small logical Switches. Click "Advanced Application" then "VLAN". In the right side of the screen, check the boxes as you need. In this case, we need to put ports 1~4 and ports 9, 10 in a group in order for them to communicate in both ways. We put port 5~10 in another group so that these two groups cannot talk with each other. Here we also logically define Port 9 and Port 10 as the uplink ports. Therefore, both groups can pass data to Port 9 and Port

10. In other words, these two ports belong to both groups at the same time. Check whether your setting looks like the one below.

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Advanced Application	15	Selling Wizard			Port isolation *			Ap	PY				
IP Application	• <u>s</u> 4	0.224	and the second			Dana manazanazan sa			(index self)				
Management													
	1							Incom	ng				
VLAN			1	0.2%	3	4	5	5	7	8	g	:10	
Static MAC Forwarding		1	121	T		121	m		111		17	172	1
Statle Multicast Forwarding		-	121	177	1		1001	-		1007-100	177	1271	1.1
Fitering	Outgoing	-	191	M	(W)	V	10.1			20.00	W		- 4
Spanning Tree Protocol		3	1	S.	2	1	101				3	2	3
Bandwidth Control		43	V	(V)	V	J	E1				<i>u</i>		- 4
Broadcast Sterm Control		5		西			V	17	Z	V	12	12	5
Mirroring		6				Canal Sector	V		V	1		100	6
Link Accrecation		7	177		1000	11	121		17	ক		100	- 7
Port Authentication				100			100	Intel .	100	251	Lease.	1001	
Port Security		8	1.1			- Charles	~	1	N.	<u>W</u>	(<u>w</u>)	V	8
Classifier		ų	2	V	2	J			1	(W)	2	1	ų
Policy Rule		20	2	1	32	2			V	N.	2	2	10
Dueuing Vethod		CPU	1	V	V	V	N/	1	V	W.	4	N/	C20
Multicast			1	+		4	1		101	×	10	15	
ддд			1. 1.	25	362	1997	0.0	1.41	- 10 -		523		U
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Loop Cuard							Angl		real]				
Layer 2 Protocol Tunneling							Apply	Ca	cer				

- 9. Finally, you can now verify the results. If everything works fine, PC A can ping PC B and PC Z. But it cannot ping PC C or PC D. It should work vice versa at the same time too.
- 10. For example,
 - PC A: 192.168.1.4/24 PC B: 192.168.1.5/24
 - PC C: 192.168.1.6/24
 - PC D: 192.168.1.7/24
 - PC Z: 192.168.1.99/24
- 11. PING PC B from PC A (Should work)

C: >>ping 192.168.1.5 Pinging 192.168.1.5 with 32 bytes of data: Reply from 192.168.1.5: bytes=32 time=12ms TTL=254 Reply from 192.168.1.5: bytes=32 time=6ms TTL=254 Reply from 192.168.1.5: bytes=32 time=7ms TTL=254 Reply from 192.168.1.5: bytes=32 time=6ms TTL=254 Ping statistics for 192.168.1.5: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 6ms, Maximum = 12ms, Average = 7ms

12. PING PC Z from PC A (Should work)

C:>>ping 192.168.1.99 Pinging 192.168.1.99 with 32 bytes of data: Reply from 192.168.1.99: bytes=32 time=15ms TTL=254 Reply from 192.168.1.99: bytes=32 time=6ms TTL=254 Reply from 192.168.1.99: bytes=32 time=6ms TTL=254 Reply from 192.168.1.99: bytes=32 time=7ms TTL=254 Ping statistics for 192.168.1.99: Packets: Sent = 4, Received = 4, Lost = 0 (0× loss), Approximate round trip times in milli-seconds: Minimum = 6ms, Maximum = 15ms, Average = 8ms

13. PING PC C from PC A (Should NOT work)

```
C:\>ping 192.168.1.6
Pinging 192.168.1.6 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.1.6:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

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Configuring your Switch to fulfill this scenario (CLI)

- 1. Connect your PC or Notebook to the Switch Console port.
- 2. Open your Terminal program.(e.g. Hyper Terminal in Windows System)
- 3. Make sure that your port settings are

bps:9600 Data bits:8 Parity: None Stop bits:1

- Flow control: None:
- 4. After you are connected successfully, enter the correct user name and the password.
- 5. Put "config" to go into the configuration mode.
- 6. Issue the following commands to setup Port Based VLAN on your Switch in this scenario.

```
vlan-type port-based
interface port-channel 1
  no egress set 5-8
exit
interface port-channel 2
  no egress set 5-8
exit
interface port-channel 3
  no egress set 5-8
exit
interface port-channel 4
  no egress set 5-8
exit
interface port-channel 5
  no egress set 1-4
exit
interface port-channel 6
  no egress set 1-4
exit
interface port-channel 7
  no egress set 1-4
exit
interface port-channel 8
  no egress set 1-4
exit
```

7. When all of the above is done, do not forget to put the "write memory" command under the enable mode to save your configuration.