REMOTE LAB

Practical Exercise 38

Managed Switch Configuration

Version 1.0

	Hardware List:		
Switch	Weidmuller IE-SW-M-		
	Wave		
	Software List:		
MIB Browser	ManageEngine MibBrowser		
Remote Lab PC:	RL1	Remote	A
		Lab	
		Type:	

Remote Lab Type: A - EIT PC with hardware Remote Lab Type: B - EIT PC with Simulation Software Remote Lab Type: C - Cloud PC with software Remote Lab Type: D - Student/Home PC

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1. Objectives

In this exercise we will perform basic configuration and diagnostics on a Weidmuller IE-SW-M-Wave managed switch. These include:

- Checking the IP configuration
- Setting up a trunk
- Mirroring a port
- Setting up a VLAN
- Performing basic diagnostics with SNMP

NB Whereas it is possible to follow the instructions in this document blindly without understanding the underlying theory, very little learning will take place. We therefore recommend that you first familiarize yourself with this assignment before logging into thr Remote Lab, and where necessary consult the manual (*IE-SW-M-Wave.pdf*) just as you would do in the actual workplace.

2. Background

The Weidmueller IE-SW-M-Wave is an 8-port managed switch with port trunking, VLAN, Rapid Ring and other capabilities.

You may refer to para 1.2 on p8 of the switch manual for an overview of its functionality.

The figure below shows a generic version of the switch (8x RJ-45) and comes from the front page of the manual. Note the numbering of the ports.



Exercise 39 - Managed Switch Configuration v1

For this paricular exercise we will use a version with 2 fiber ports (SC) and 6 copper ports (RJ-45) as per the following figure. The port numbering scheme remains unchanged. The Remote Lab 1 computer is connected to port 4, which will serve as our management port.



Also refer to the photograph below. This depicts the actual switch in the Remote Lab. Notice the Cat5e flylead connecting the switch with the Remote Lab computer. On one side of the switch you will see the 24V power supply (with the bright green LED), and on the other side is a Weidmuller IE-ARM industrial router, not used for this particular exercise.



3. Instructions

3.1 Logging into the switch

Log into the Electromeet and open Remote Lab 1.

Ping the switch to ensure that it is present on the lab network. Note the IP address of the switch, below. The factory default IP address is 192.168.1.110, but this has been changed to 192.168.3.110.



Unlike the Cisco router in Exercise 39 that uses Telnet for configuration via its Ethernet port, this device uses a browser (as in the case of ADSL routers and most wireless Access Points). This switch can also be configured via its USB port connected to the serial port of the configuring PC (with a suitable cable and driver software) and a utility such as PuTTY, in which case the Web interface cannot be used.

Now open the browser (Internet Explorer) and type the IP address of the switch in the search bar. No need for 'http://'.



When prompted, enter username admin and password detmold. The home page of the firmware will open. Be patient of the characters you type don't want to 'echo'.

Home		5	Weidmüller
	Name	System Configuration S IP Configuration Performance Menitor S Weidmueller IE S 28C-M-WAVE Managed Switch V6.0.1	Settings Logout
	Location	Location	
	Contact	PersonDepartment	
	MAC Address	06-15-7E-02-1E-65	
	Firmware Version	601	
	Uptime	tillititi secontis	
	Switch Temperature	Normal	

 $\operatorname{{\rm Click}}\nolimits on$ System Configuration.

System Configuration	ł.
Configure IP Address	
Configure Trunking	•
Configure Port Mirroring	
Configure VLAN	ł
Configure Filtering and Forwarding Table	1
Configure Quality of Service	
Configure Fault Relay	•
Configure Redundancy	ŀ
Configure Rate Control	Ľ
Configure Port Security	"
Configure IGMP Snooping	¢.
Configure LLDP	
A man and a marked	

3.2 Checking IP Address Configuration

Г

PLEASE DO NOT CHANGE THE IP ADDRESS OR ANY OTHER SETTINGS

We are not going to touch this setting, but there is no harm in having a quick look. Click on <u>Configure IP Address</u> (first item in the System Configuration menu). The IP configuration page will open.

In the screenshot below, note the fixed IP address of 192.168.3.110 with subnet mask 255.255.255.0

TAKE A SCREENSHOT OF THIS IMAGE ON YOUR COMPUTER SCREEN. We will refer to it as Figure 38.1.

Assign by	● Fixed ○ DHCP	
P Address	192.168.3.110	
Subnet Mask	255.255.255.0	
Default Gateway	192.168.3.1	
<u>Confi</u> Confi	Apply gure IP Addres (Configure Trunking) Configure Port Mirroring Configure gure Filtering and Portuging Table Configure Quality of Service Fault	<u>VLAN</u> Relav

From here (see the red circle above) we can go to Port Trunking. Note that you do not have to go back to the main manu to access other functions, as the menu is repeated on every page, as in the screenshot above.

3.3 Trunking

PLEASE DO NOT SAVE ANY SETTINGS

If you are not familiar with trunking, first read section 4.1 on pages 14, 15 and 16 in the switch manual to obtain a better understanding of the trunking concept. Refer to the figure on p14, reproduced here.



For the sake of simplicity we are going to assume that 'our' switch is SW2 in the figure above, hence we are only going to configure one group (Group 1) consisting of ports 3 and 4. That's it! In real life we would now click 'Apply', and also proceed to configure trunking on SW3 and SW4. The creation of a trunk from SW2 to SW3 gives us a 200 Mbps data rate between the switches in Group 1. It also creates redundancy in case one of the links fail.

Create a 'Group1' for ports 3 and 4, and set the 'enable' radio button.

TAKE A SCREENSHOT OF THIS IMAGE ON YOUR COMPUTER SCREEN. We will refer to it as Figure 38.2.



3.4 Port Mirroring

PLEASE DO NOT SAVE ANY SETTINGS

If you are not familiar with the idea of port mirroring, first read section 4.2 on pages 16 thru 19 in the switch manual to obtain a better understanding of the concept. Refer to the following figure (from p16 in the manual).



In the figure above you are logged into the 'Packet Sniffer' (RL1) running Wireshark (blue arrow), and you are connected to the managed switch (Red arrow). The other PC and the router are not connected at present, but imagine that they are connected to ports 1 and 2 as per the figure.

The problem is that Wireshark would not 'see' any traffic between the PC and the router, because of the way in which a switch operates. The solution is to mirror ports 1 and 2 to port 4. Note the following:

- We can mirror any ports we want to
- We can set various 'filters', as follows:
 - We can set rules for both traffic going into the switch (ingress) and traffic going out of it (egress)
 - We can capture all packets, or filter on source/destination MAC address (entered in hex without colons or dashes)
 - In cases of very heavy traffic we can set a 'divider' so we do ot capure all packets and overload the switch in the process.

In the following example we are mirroring ports 1 and 2 onto port 4, with no filters.

TAKE A SCREENSHOT OF THIS IMAGE ON YOUR COMPUTER SCREEN. We will refer to it as Figure 38.3.

Status	Enable O Disable
Mirror Port	Port: 0 1 0 2 0 () 0 5 0 6 0 7 0 8
Ingress (Ingoing) Mirr	or Rules:
Source Ports	
Divider	1(1-1023)
MAC Address Filter	● apture ALL ○ Capture by Source ○ Capture by Destination
MAC Address	
Egress (Outgoing) Mir	ror Rules:
Source Ports	☑ 1 ☑ 2 □ 3 □ 4 ☑ 5 □ 6 □ 7 □ 8
Divider	1(1-1023)
MAC Address Filter	● Capture ALL ○ Capture by Source ○ Capture by Destination
MAC Address	

3.5 Virtual LAN (VLAN)

PLEASE DO NOT SAVE ANY SETTINGS

First read section 4.2 on pages 19 thru 23 in the switch manual. Refer to the following figure on p21. You may want to read it several times to 'get the hang of it'.



In order to keep things simple (and make it easier for you) we are going to follow the example in the IE-SW-M-Wave manual, and set up four VLANs as follows. Port 2 is the management port. VLAN 1 allows port 1 to send packets to 3, 4, 5 and 6, and VLANs 2/3 create return paths for 3,5 and 4,6 respectively.

VID (VLAN ID)	Ports	Can send packets to
1	1	3, 4, 5, 6
2	3,5	1
3	4,6	1
4	2 (M)	None

First we have to create the VLANs.

TAKE A SCREENSHOT OF THIS IMAGE ON YOUR COMPUTER SCREEN. We will refer to it as Figure 38.4(a).

Scoup	VID	Members and Tag Filter - = Non Member MN = Member without Filter MF = Member with Filter	Status
1 Apply	1	1 MF ⊂ 2	Disable
2 Apply	2	1 MF v 2··· v 3 MF v 4··· v 5 MF v 5··· v 7··· v 8··· v	Disable
3 Apply	3	1 MF V 2 ··· V 3 ··· V 4 MF V 5 ··· V 6 MF V 7 ··· V 8 ··· V	Elabie
4 Soply	*	1	Euloie
5 Spply	5	1 v 2 v 3 v 4 v 5 v 5 v 7 v 8 v □ Management Pot	C Enable Disable

Continue to page 2 of the VLAN settings.



Then we have to set the IEEE802.1Q VLAN Tag or 'VID' for each port as per the following example, so that they match our previous allocation.

TAKE A SCREENSHOT OF THIS IMAGE ON YOUR COMPUTER SREEN. We will refer to it as Figure 38 4(b).

	Defeult Terr	
Port	Default Tag	
1	1	
2	4	
3	2	
4	3	
5	2	
6	3	
7	15	
8	15	anti
М	4	

Note that port 2 appears twice, because it is also the management port. We are not allocating ports 7 and 8 to any VLAN.

3.6 SNMP

If you want to do some background reading on the topic; here are a few links:

<u>http://en.wikipedia.org/wiki/Simple_Network_Management_Protocol</u> <u>http://oreilly.com/perl/excerpts/system-admin-with-perl/twenty-minute-snmp-tutorial.html</u> <u>http://www.manageengine.com/network-monitoring/what-is-snmp.html</u>

Unfortunately SNMP (Simple Network Management) is anything but simple (for beginners, at least) and often its implementation on a specific device is poorly documented as well. This switch is no exception. However, let's see what information we can extract from the switch.

The following is a snippet from the IE-SW-M-Wave MIB documentation.

```
ieswSwitchFaultStatus OBJECT-TYPE
SYNTAX INTEGER {
    fault(1),
    noFault(2)
    }
ACCESS read-only
STATUS mandatory
DESCRIPTION
    "A value which indicates the fault status of the switch.
    The meanings of the values are:
    fault(1) - fault has occured.
    noFault(2) - no fault has occured."
    ::= { ieswFault 1 }
```

Note that 1= fault, and 2=no fault.

The OID (Object Identifier) for Switchfault (as per p41 of the manual) status is .1.3.6.1.4.1.24029.1.1.1.1.0.

Start the ManageEngine Free MIB Browser Tool.

2		ManageEngine Mi	bilirowser h	ter To	ic)			
File Edit View Operation	a Help		192			-		-
۵ 🖻 🎂 🔄	0 (2)8		12 12		● :€	• 4		O More Free K
Coased WEMODURES	Host	192168.3.110		Port		161		4
EtherLike-Mill	Community	Community +++++		Write	Write Community			
REC1213-MB	Set Value		~	i.				
SNMPV2-MIB	ObjectID	1.3.6.1.4.1.24029.1.1	1.1.0					
	Description M	ultriar .						
	Syntax Access			81 Ri	latus etenencie			-1-1
	Object ID	1						
	Description		0353	10203	-	12000	3	-
ALVIEW	and a second		of the local division in which the local division in which the local division in the loc	-			(heards)	and the second

Enter the IP address of the switch ('Host'), as well as the Object ID ('OID') for Switchfault status.

Click on the icon for 'GET SNMP Variable' (circled in previous screenshot). Note the returned value of 2 (= no fault).

3 3 8	T 📲 🎦 🧠 🕅	. 🔤 🐞 🛒 🕻
Host	192.168.3.110	✓ Port
Community	****	Write Community
Set Value		v
Object ID	.1.3.6.1.4.1.24029.1.1.1.1.0	
Sent GET requ	iest to 192.168.3.110 : 161	
.1.3.6.1.4.1.24	029.1.1.1.1.0	2
		4
		ITE
		man 17

Now this is all fair and well, but because we do not have the appropriate MIBs loaded, hence the information we can retrieve is rather sketchy and in numerical format only.

In order to extract more user-friendly unformation from the switch, we need to load six MIBs, viz. IE-SW-M-WAVE.MIB.txt, Ildp-mib.txt, rfc1213.mib, rfc1493mib, rfc1573.mib, and 1643.mib as supplied by Weidmuller.

Click File->Load MIB and select the supplied MIBs.

en Mib Setti	nas Recent				
Look in	: 📙 mibs				¥
~		TION-MIB	HOST-RESOURCES-MIB.cmi	🛋 oracle-database.mib	🔟 rfc1213.mib
	APPLICA	TION-MIB.cds	IANAifType-MIB	ORADB-MIB	RFC1215-TRAP
Decent Items	APPLICA	TION-MIB.cmi	IANAifType-MIB.cds	ORADB-MIB.cds	RFC1215-TRAP.cds
Recent Items	BRIDGE-N	ИВ	IANAifType-MIB.cmi	📄 ORADB-MIB.cmi	RFC1215-TRAP.cmi
	BRIDGE-N	/IB.cds	IE-SW-M-WAVE-MIB.cds	Printer-MIB	RFC1315-MIB
	BRIDGE-N	/IB.cmi	IE-SW-M-WAVE-MIB.cmi	Printer-MIB.cds	RFC1315-MIB.cds
Desktop	Сізсо-м	IB	E-SW-M-WAVE-MIB.txt	Printer-MIB.cmi	RFC1315-MIB.cmi
	CISCO-RT	ITMON-MIB	IF-MIB	RDBMS-MIB	🔟 rfc1493.mib
	🛛 🎑 CISCO-RT	TTMON-TC-MIB.my	IF-MIB.cds	RDBMS-MIB.cds	🗹 rfc1573.mib
	🧃 CISCO-SN	/Il.my	📄 IF-MIB.cmi	RDBMS-MIB.cmi	🗹 rfc1643.mib
My Documents	EtherLike	-MIB	LLDP-MIB.cds	RFC1155-SMI	SNMP-FRAMEWOR
	EtherLike	-MIB.cds	LLDP-MIB.cmi	RFC1155-SMLcds	SNMP-FRAMEWORI
	EtherLike	-MIB.cmi	📔 lldp-mib.txt	RFC1155-SMI.cmi	SNMP-FRAMEWORI
	FDDI-SM	T73-MIB	MSSQL-MIB	RFC1213-MIB	🚄 SNMP-FRAMEWOR
Computer	HOST-RE	SOURCES-MIB	MSSQLSERVER-MIB.cds	RFC1213-MIB.cds	SNMP-USER-BASED
	HOST-RE	SOURCES-MIB.cds	MSSQLSERVER-MIB.cmi	📄 RFC1213-MIB.cmi	SNMP-USER-BASED
	<				ALL N
Network	File name:	"IE-SW-M-WAVE-MIB.	txt" "lldp-mib.txt" "rfc1213.mib" "rfc14	93.mib" "rfc1573.mib" "rfc1643.mib"	Open
	Files of type:	All Files			✓ Cancel

Now click 'Open'. The dialog box will indicate successful loading of the MIBs.

```
Start with RFC1213-MIB and 'drill down' as follows:
```

```
->org

->dod

->internet

->mgmt

->mib-2

->interfaces

->ifTable

->ifEntry
```



Do not forget to set the 'Host address' to the switch's IP address. It defaults to'localhost' and if you forget to change this, you will be trying to GET values from the Remote Lab computer and not the switch.

1	🔬 🔤 🛛 👹	🛚 🛫 🐵 🧼 🖳 🚺
^	Host	192.168.3.110
	Community	*****
	Set Value	
	Object ID	
~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Select 'ifSpeed' and click on 'Get SNMP Variable'. This will get the current speeds (bit rates) of the eight switch ports.



The following results are obtained. Note the description (green arrow) and the OID in numerical format as well as text (circled).

Ports 1 and 2, being fiber (100BaseFX) ports, cannot auto-negotiate and are always running at 100Mbps (red arrows). The copper ports, being able to auto-negotiate, default to 10Mbps since they are not connected. The exception is the management port (#4), connected to the Remote Lab PC, which has connected at 100 Mbps in this particular example.

TAKE A SCREENSHOT OF THIS IMAGE ON YOUR COMPUTER SCREEN. We will refer to it as Figure 38.5.

Host	192.168.3.110	Y Port		161	
Community	****	Write	Community		
Set Value		~			
Object ID 🛛 🛁	.iso.org.dod.internet.mgmt.mib-2.interf	aces.ifTable.ifEntry.ifSpeed			
Bent GET reque	st to 192.168.3.110 : 161				
fSpeed.1		10000000 🗲			
fSpeed.2		10000000 🔶			
fSpeed.3		1000000			
fSpeed.4		10000000		_	
fSpeed.5		1000000			
fSpeed.6		1000000			
fSpeed.7		1000000			
Description Mult	Var				
Description Mult	Var Gauge	Stat	us man	datory	
Description Mult Syntax Access	Var Gauge read-only	Stat	us man erence	datory	
Description Multi Syntax Access Index	War Gauge read-only	Stat	us man erence	datory	

End of Exercise

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