

Company Name	
Employee Names	
Team Lead	
Module Name	NETWORKING HARDWARE AND MANAGING HARDWARE IN SERVER 2012

Portfolio Contents

Item	Complete	Incomplete	Points Awarded
Lab reports for all labs			
Requirement	Excellent (10)	Incomplete (0)	
Lab 4-1			
Lab 4-2			
Lab 4-3			
Lab 4-4			
Lab 4-5			
Lab 4-6 (just do it)			
Lab 4-7			
Lab 4-8			
Notes			
Lab Test			

Networking Hardware

Certification Objectives

- *Identify the _____ of LAN connectivity hardware*
- *Install and configure a NIC (network interface card)*
- *Identify _____ associated with connectivity hardware*

NICs (Network Interface Cards)

- _____ devices that enable workstations, servers, printers, or other nodes to receive and transmit data over network media
- AKA _____, _____ cards
- Usually contain data _____
- Work on the _____ and _____ layers
- Apply data signals to wire
- _____ and _____ data frames
- Interpret physical _____ information
- Determine which node has right to _____ data at any given time*

Types of NICs

- *NICs come in variety of types depending on:*
 - _____ method
 - Network transmission _____
 - Connector _____
 - Type of compatible _____ or device
 - _____ *

Peripheral Bus Standards

- *Personal Computer Memory Card International Association (_____) adapter: connect external devices to most laptop computers*
 - PC Card: First PCMCIA adapter
- Specified _____ -bit interface running at 8 MHz
- _____ Bus: 32-bit interface running at 33 MHz
- _____ Card*

ExpressCard NIC

- *Speedy little devils!*
- _____ MBps (yeah BYTES) both ways
- _____ -pin interface
- Fits in _____ slot on a laptop*

Peripheral Bus Standards

- _____ NICs
- *Wired and _____*
- *10/100*
- *Gigabit limited by _____ speeds of USB*
- *Handy for temporary connections or when PCI slots and onboard aren't available.**

On-board NICs

- *Some peripheral devices connect directly to motherboard using on-
_____ ports*
- e.g., a mouse
- *Many new computers use on-board NICs*
- _____ into motherboard*

Installing NICs

- *First install _____, then _____*
- May have to configure _____
- *Always read manufacturer's documentation and follow proper safety procedures*
- *Multiple NICs may be installed, each with its own IP address*
- Useful for setting up _____
- Connecting to two _____ *

NIC Software

- *Must ensure that correct device _____ installed and configured properly for the NIC*
- *To install from Windows XP interface, need Windows XP software and NIC's device drivers*
- Can usually download NIC software from _____ Web site
- *Installing NIC drivers on UNIX or Linux depends somewhat on OS version**

Interpreting LED Indicators

- *NICs may have one or more of following lights:*
- _____ : if blinking, indicates that NIC is either transmitting or receiving data
- If solid, heavy network traffic volume
- _____ : if lit, NIC is functional
- In some models, if blinking, NIC detects network but cannot communicate with it
- _____ : if blinking, NIC is functional and transmitting frames

- _____ : if blinking, NIC is functional and receiving frames*

Repeaters and Hubs

- *Repeaters: simplest type of connectivity devices that _____ a digital signal*
- Operate in _____ layer
- Cannot _____ or _____
bad or erroneous signal
- _____ signal over entire segment
- One _____ port and one _____ port
- Suited only to _____ topology networks*

Repeaters and Hubs (continued)

- *Hub: repeater with more than one output port*
- Multiple _____ ports
- Operate at _____ layer
- _____ port: allows connection to another hub or other connectivity device
- On Ethernet networks, can serve as central connection point of _____ or _____ -based hybrid topology
- On Token Ring networks, hubs are called _____ Access Units (_____)*

Repeaters and Hubs (continued)

- *Hubs (continued):*
- Connected devices share _____ amount of bandwidth and same _____ domain
- Logically or physically distinct Ethernet network segment on which all participating devices must detect and accommodate data collisions
- *Types of hubs:*
- _____
- _____

- _____
- _____ *

Bridges

- *Connect two network segments*
- Analyze _____ frames
- Make decisions about where to direct them based on each frame's MAC address
- Operate at _____ layer
- Protocol _____
- Can move data more _____ than traditional routers
- Extend Ethernet network without extending _____ domain or segment
- Can be programmed to _____ out certain types of frames*

Bridges

- *The top image shows a bridge _____ packets from one side of a network to another.*
- *The bottom image is a Cisco Aironet bridge. It connects two _____ networks to each other.*
- *Bridges _____ used much in enterprise networking any more.**

Switches

- *Subdivide network into smaller logical pieces (segments)*
- Can operate at levels _____, or _____ of OSI model
- _____ bridges
- Most have internal _____, OS, _____, and several ports
- *Each port on switch acts like _____*
- *Each connected device effectively receives own _____ channel*
- *Helps to isolate _____ domains**

Switch Modes

- *Switches forward traffic in one of three modes*
- _____ through
- _____ and forward
- _____ free*

Cut-Through Mode

- *Switch running in cut-through mode reads frame's header and decides where to forward the data before receiving the entire packet*
- Cannot read _____ before transmission
- Cannot detect _____ packets
- Can detect runs
- Erroneously _____ packets
- Biggest advantage is _____ *

Store and Forward Mode

- *Switch reads entire data frame into memory and checks for accuracy before transmitting*
- Transmits data more _____
- _____ than cut-through mode
- Can transfer data between _____ running different transmission speeds*

Fragment Free Switching

- *Combination of cut through and store and forward*
- Fragmented frames are _____ forwarded
- Switch examines only the first _____ bytes of each frame to check for errors
- That's the part of the frame most likely to be _____ in a collision
- Not as _____ as store and forward, but _____

- Not as _____ as cut through, but a little more _____ *

Using Switches to Create VLANs

- *Virtual LANs (_____) logically separate networks within networks*
- *Use switches to group a number of ports into a _____ domain*
- *Combination of ports making up a Layer _____ segment*
- *In TCP/IP, referred to as a subnet*
- *VLANs created by properly configuring switch's software*
- *VLAN configuration requires careful _____ **

VLANs

- *VLANs are used on _____ and _____ to segment off traffic.*
- *Traffic bound for _____ will not be sent through ports 5, 3, or 2*
- *Traffic bound for engineering will not be sent through ports 7, 6, or 4**

Higher-Layer Switches

- *Layer 3 switches (_____ switch) and Layer 4 switches*
- *Ability to interpret higher-layer data enables switches to perform advanced _____, _____ keeping, and _____ functions**

Routers

- *Multiport connectivity devices that direct data between nodes on a network*
- *Can integrate _____ and _____*
- *Running at different _____ speeds*
- *Using variety of _____*
- *Reads incoming packet's _____ addressing information (_____ address)*
- *Determines where to deliver _____*
- *Determines _____ path to that network*

- Operate at _____ layer
- _____ -dependent*

Router Features and Functions

- *Typical router has internal _____, OS, _____, various input and output jacks, and _____ console interface*
- *Modular router: multiple slots to hold different _____ cards or other devices*
- *All routers can:*
 - Connect _____ networks
 - Interpret Layer ___ addressing and other information
 - Determine the _____ path for data to follow
 - _____ traffic*

Router Features and Functions (continued)

- *Other router functions:*
 - Filter out _____ transmissions
 - Prevent certain _____ of traffic from getting to a network
 - Support simultaneous _____ and _____ connectivity
 - Provide high network fault tolerance through _____ components
 - _____ network traffic and report _____
 - Diagnose _____ or other _____ problems*
- *Interior router directs data between _____ on autonomous LANs*
- *Exterior router directs data between nodes _____ to given autonomous LAN*
- *Border routers connect _____ LAN with a WAN*
- *Static routing: network administrator _____ router to use specific paths between nodes*
- *Dynamic routing automatically _____ best path between two nodes*
 - Accumulates information in _____ table*

Routing Protocols: RIP, OSPF, EIGRP and BGP

- *Best path: most _____ route between nodes*
- *Routers communicate via _____ protocols*
- Characterized according to convergence time
- Time taken to recognize _____ path
- Routing Information Protocol (_____) for IP and IPX
- Open Shortest Path First (_____) for IP
- Enhanced Interior Gateway Routing Protocol (_____) for IP, IPX, and AppleTalk
- Border Gateway Protocol (_____) for IP*

Brouters

- *Bridge routers*
- *Routers that take on some characteristics of bridges*
- Can forward _____ protocols
- Connect multiple network types through one device
- Kinda like a bridge on speed...has special capabilities that allow it to do some _____ jobs.*

Gateways

- *Connect two systems using different formatting, communications protocols, or architecture*
- _____ information to be read by another system
- Operates at multiple OSI Model layers
- _____ gateway
- _____ gateway
- _____ gateway
- _____ /data gateway
- _____ *

Cisco Layers

- *Cisco defines three layers for networking*
- _____

- _____
- _____

The access layer

- like the _____ and _____ layers
- it is where users gain _____ to the network
- _____, _____, _____, _____, NICs, and clients work here.

Distribution layer

- Switches data between _____ and the _____
- Separates users from the core layer
- _____, _____, _____, _____, and L3 _____ work here

Core layer

- Must be the _____ and most _____ layer
- _____, _____ (phone switching), High speed _____ switches, multiplexers work here
- Requires high end, high speed _____ *

Review

- _____ come in a variety of types depending on access method, network transmission speed, connector interfaces, type of compatible motherboard, and manufacturer
- Desktops or tower PCs may use an expansion card _____, which must match the system's bus
- _____ combines hardware and software
- _____ are the connectivity devices that perform the regeneration of a digital signal

Re-Review

- A _____ contains multiple data ports into which the patch cables for network nodes are connected
- _____ resemble repeaters in that they have a single input and a single output port, but they can interpret the data they retransmit

- *As nodes transmit data through a bridge, the bridge establishes a _____ database*
- *_____ subdivide a network into smaller, logical pieces*

Re-Re-Review

- *A ___ is a multiport device that can connect dissimilar LANs and WANs running at different transmission speeds, using a variety of protocols*
- *Routers are protocol-_____*
- *Routing _____ provide rules for communication between routers and help them determine the best path between two nodes*
- *_____ are combinations of networking hardware and software that connect two dissimilar kinds of networks*

Re-Re-Re-Review

- *What are the three layers defined by cisco?*
- *Which layer must be the most responsive and reliable?*
- *Which layer is where users gain access to the network?*
- *What is the purpose of the distribution layer?*

Windows Server 2012 Supporting Hardware

- *Hardware support is really important on a Server*
- *Your OS MUST support the _____ it works with*
- *You should meet the suggested requirements of the operating system*
- *Microsoft gives minimum and suggested requirements*
- *Minimum is only for simple servers with few users*
- *Hardware installed must be compatible*
- *_____ checker*
- *HCL**

The HCL

- *Microsoft has a website dedicated to hardware and software that has been tested and works*

with their operating systems.

- *Designed for Windows*
- Vendor has worked with MS using their toolbox to ensure the drivers work
- Microsoft has tested the drivers and digitally signed them

The HCL

- _____
- Works with the OS, may not be digitally signed
- _____
- Either doesn't work, or hasn't been tested
- *If it is not on the HCL*
- Check vendor website
- Buy different hardware*

Driver Signing

- *If a driver has not been tested by Microsoft and found to work with the hardware, it is an unsigned driver.*
- *You may not want unsigned drivers in your network, since they can cause problems.*
- *You can configure driver signing.*

- _____
- _____
- _____ *

Windows File Protection

- *Windows has a new file _____ scheme built into it.*
- *When activated it keeps important system files from being _____, even intentionally.*
- *WFP can be activated to _____ any file on your server.*

Lab 4-1 Router Interfaces Using a Simulator

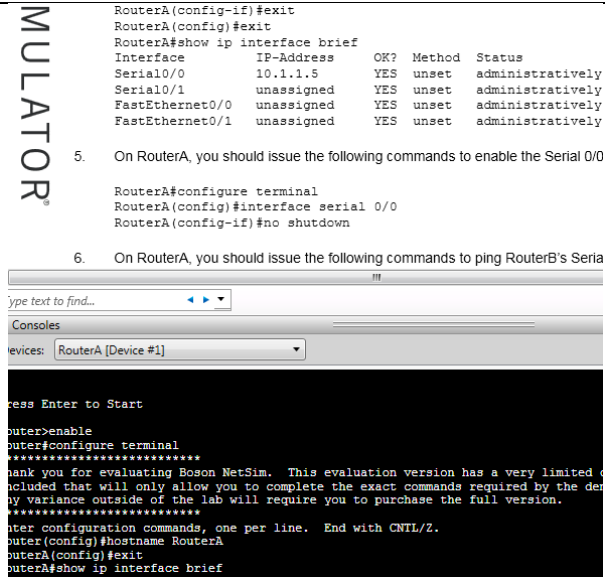
Learning Targets

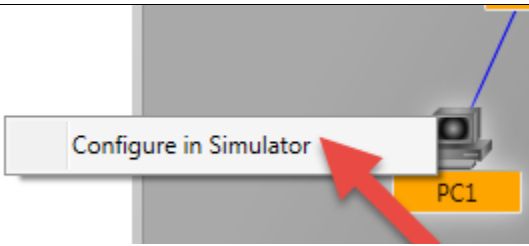
- Understand NetSim
- Recognize CIDR
-

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	Add PowerShell
		Answer questions

Directions

<ol style="list-style-type: none"> Go to www.boson.com and download the demo version of Network Simulator. We're going to play with that. You will need to sign up for an account. Don't worry, you can unsubscribe when you're done with this lab. Install the software. Once the software is installed you will see some options in the right pane. Click on Try the Demo Lab. The lab will load and will give you the deets. 	<p>Note: 10.1.1.4/30 means that there are 30 1s in the subnet mask and the rest are all 0s. OR, that the first 30 bits of the IP address are the network and the last bits are the host. This is CIDR notation or Classes Interdomain Routing Notation.</p> <p>When an IP address is converted to binary it will have four octets of 1s and 0s (so a total of 32 characters) so the IP address 10.12.132.45 would be: 00001010.00001110.10000100.00101101 and the first 30 of those digits would represent the NETWORK and the last two (in this case) are the hosts...wow, that's a small network! Oh wait, that's for the WAN. That's okay then. You only need three addresses and you can get three out of those hosts 01 11 and 10 (you can't use 00 because that's against the rules).</p> <p>00001010.00001110.10000100.00101101 00001010.00001110.10000100.00101110 00001010.00001110.10000100.00101111</p>
<ol style="list-style-type: none"> Not in your CourseSites go to the first video and watch it. It will take you through all of the different windows in the software you're going to be using and show you how to navigate around it. If you want to look at how the network is laid out, you would click on the _____ button. The black area down below lets you type on the _____ interface of the router or the interface for the _____ prompt if you're working in one of the PCs. 	<p>5. On RouterA, you should issue the following commands to enable the Serial 0/0</p> <pre>RouterA#configure terminal RouterA(config)#interface serial 0/0 RouterA(config-if)#no shutdown</pre> <p>6. On RouterA, you should issue the following commands to ping RouterB's Serial 0/0</p>  <p>The screenshot shows the NetSim interface with a terminal window open for RouterA. The terminal output includes the command 'RouterA#show ip interface brief' which shows the status of interfaces Serial0/0, Serial0/1, FastEthernet0/0, and FastEthernet0/1. Below this, the configuration commands for enabling Serial0/0 are shown. At the bottom, the start of a ping command is visible.</p>

<p>8. When you are finished watching video one, start video two and start the demo lab 1. Follow along in the lab and the video.</p>	
<p>9. The first thing you do is you're going to set it up so that you've got your tabs ready to access the interfaces you'll be using. You can see that RouterA is already there. You want to also open RouterB and PC1.</p> <p>10. Click on NetMap.</p> <p>11. Right click on PC1 and select Configure in Simulator.</p> <p>12. Do the same for RouterB.</p>	
<p>13. Go back to Lab Instructions and make sure you're in the interface of RouterA and note that RouterA is not configured at all. This is like RouterA just was fresh out of the box.</p> <p>14. First you're going to login to RouterA by typing <code>enable</code> which is the command that says "Hey, enable me to log into the router". If there was a password, you'd type "enable secret" and then type the password, but there isn't so we just type <code>enable</code>.</p> <p>15. Hit return.</p> <p>16. Next we're going to configure the router by typing <code>configure terminal</code></p> <p>17. That's going to change the prompt from just Router# to Router {config} and as long as you're in the configuration interface you can config your heart out. When you're done type <code>exit</code>.</p>	<pre>Press Enter to Start Router>enable Router#configure terminal</pre> <p>When it says router {config} you are in the _____ interface.</p> <p>What is the name of this router? _____</p> <p>How do you get out of configuration? _____</p>
<p>18. Now you're going from configuring the router as a whole to configuring an interface ON the router. Router interfaces are places where the router plugs into either a switch or another router.</p> <p>19. Type <code>Show IP Interface Brief</code> to show the IP addresses that have been assigned to the interfaces and also show if the interfaces are "up" (on) or "down" (off).</p> <p>20. We want to turn 0/0 which is a serial interface (not an Ethernet), on. So, we need to configure it, but it's not the router, but part of the router so we type <code>configure terminal</code>. That gets us into the area where we can configure the terminal inputs/outputs.</p>	<pre>RouterA#show ip interface brief Interface IP-Address OK? Method Status Protocol Serial0/0 unassigned YES unset administratively down down Serial0/1 unassigned YES unset administratively down down FastEthernet0/0 unassigned YES unset administratively down down FastEthernet0/1 unassigned YES unset administratively down down</pre>
<p>21. Now type the terminal we want to configure which is the serial 0/0 so type <code>Interface serial 0/0</code> and hit return. That sends us to that interface to work on it.</p> <p>22. Now give it an IP address and subnet mask by typing <code>ip address 10.1.1.5 255.255.255.252</code> (If you convert 255.255.255.252 to binary it is 11111111.11111111.11111111.11111100 which is 30 1s and 2 0s. Remember the notation 10.1.1.45/30? That's where those numbers come from!)</p> <p>23. To turn it on type <code>no shutdown</code>.</p>	<pre>RouterA(config-if)#no shutdown 00:22:29: %LINK-3-UPDOWN: Interface Serial0/0, changed to line protocol up</pre>
<p>24. You'll then change the clock rate. Since this is a serial port, you have to set a specific speed or clock rate. You only have to set them on serial ports.</p> <p>25. Type <code>exit</code> and hit return. Do that again. That gets you back to your main prompt.</p> <p>26. Now you can show <code>ip interface brief</code> again either by typing it, or using the up arrow to recall it and tada, your 0/0 interface is up and doing its thing!</p>	<pre>RouterA#show ip interface brief Interface IP-Address OK? Method Status Protocol Serial0/0 10.1.1.5 YES unset up up Serial0/1 unassigned YES unset administratively down down FastEthernet0/0 unassigned YES unset administratively down down FastEthernet0/1 unassigned YES unset administratively down down</pre>

27. Now continue on with the rest of the lab until you get to task 3. Stop there.	
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Questions

1. In CIDR (Classless Interdomain Routing) if you see 192.168.1.0/24 that means there are _____ 1s and _____ 0s in the subnet when it is written in binary.
2. In CIDR if you see 10.1.0.0/15 there are 15 1s that identify the _____ part of the address and 17 0s that represent the _____ part of the address.
3. What is the one word logon command if there is no password, on a router? _____
4. What is the command to configure the router? _____
5. How do you show the IP Addresses that have been assigned to the different interfaces on a router?

6. An interface is a place where the router plugs into a _____ or another _____.
7. What is the command to turn ON an interface? _____

Take Router Quiz 1

Lab 4-2 Creating Routes in a Router

Learning Targets


- Understand how to show IP route
- Understand what a route discover protocol is
- Understand how to verify network connectivity

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Finish lab tasks 2 and 3
		Watch videos
		Run EIGRP route discovery
		Verify network connectivity
		Answer questions
		Pass quiz
		Clean up

Directions

<p>28. Continue on to task three.</p> <p>29. What EIGRP does once you enable it is it tells the interfaces to “announce” everything they are attached to. In doing so they can work together to map network routes.</p> <p>30. If you have opened up your saved lab in Boson, log back in by using the command enable.</p> <p>31. Be sure to set up your lab so that you have RouterA, RouterB, and PC1 in your devices tables</p>	<p>Enhanced Interior Gateway Routing Protocol (EIGRP) is an advanced distance-vector routing protocol that is used on a computer network to help automate routing decisions and configuration. The protocol was designed by Cisco Systems as a proprietary protocol, available only on Cisco routers. The router simulation is a Cisco 2811 router.</p>
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<p>32. Start at PC1 try to ping 192.168.200.2</p> <p>33. Try to ping 192.168.200.3</p> <p>34. What happens?</p> <hr/> <p>35. Type Show ip route. If you look at the routes, you can see that there is no connection between your PC1 and those IP addresses. Fortunately there is an easy way to fix that. Back in the olden days you used to have to type those routes in statically (that meant that once they were in, they didn't change unless you changed them). Now you can use EIGRP to "discover" them. EIGRP is a route discovery protocol.</p>	<pre>RouterA#show ip route Codes: C - connected, S - static, I - IGRP, R - RIP D - EIGRP, EX - EIGRP external, O - OSPF, IA E1 - OSPF external type 1, E2 - OSPF external i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2 U - per-user static route Gateway of last resort is not set 10.0.0.0/30 is subnetted, 1 subnets C 10.1.1.4 is directly connected, Serial0/0 C 192.168.100.0 is directly connected, FastEthernet0/0</pre>
<p>36. Type in at RouterA# configure terminal</p> <p>37. The prompt will change to RouterA{config}# so now type router eigrp 100</p> <p>38. That configures the EIGRP process.</p>	
<p>39. Now you're going to tell EIGRP to announce all directly connected networks by typing network 10.0.0.0</p> <p>40. And then network 192.168.100.0</p> <p>41. Now go see if it works!</p> <p>42. Go to PC1 and ping 192.168.200.3</p> <p>43. Ping 192.168.200.2</p>	<pre>C:>ping 192.168.200.2 Pinging 192.168.200.2 with 32 bytes of data: Reply from 192.168.200.2: bytes=32 time=4ms TTL=241 Reply from 192.168.200.2: bytes=32 time=6ms TTL=241 Reply from 192.168.200.2: bytes=32 time=5ms TTL=241 Reply from 192.168.200.2: bytes=32 time=72ms TTL=241 Reply from 192.168.200.2: bytes=32 time=68ms TTL=241</pre> 

Questions

1. What is the purpose of EIGRP?	
2. Why couldn't you ping 192.168.200.2 before you updated?	
3. Before EIGRP, how did network administrators have to update routes?	
4. What is a route discovery protocol?	
5. Who designed EIGRP?	

Take Router Quiz 2

Lab 4-3 Creating a Network Topology

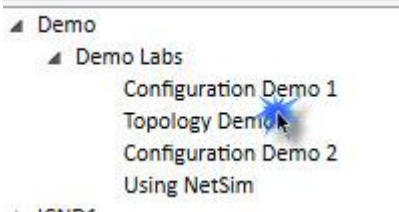
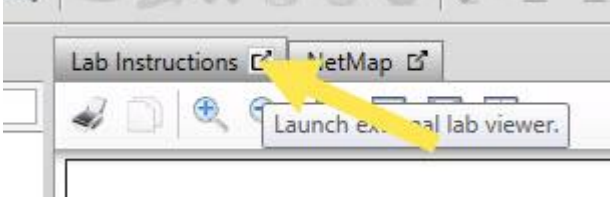

Learning Targets

- Understand how place hardware in a network topology
- Understand how to activate ports using a network simulator
- Understand what a Frame Relay is
- Understand the relationship between a router and switch
- Understand the relationship between a router and frame relay

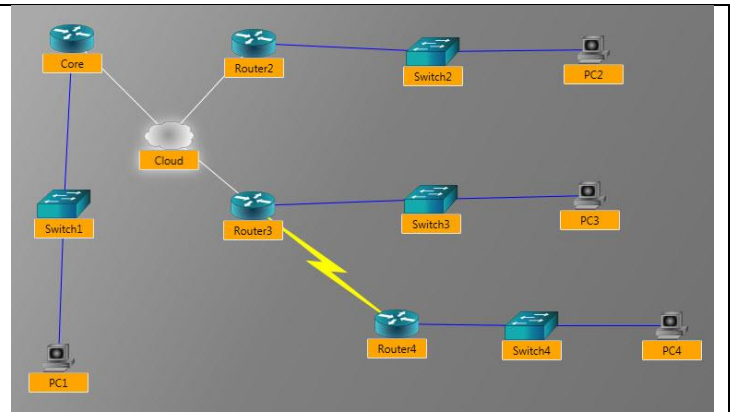
Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Create a new network topology
		Connect FastEthernet Ports
		Connect Serial Ports
		Connect a FrameRelay
		Answer questions
		Clean up

Directions

<p>44. Open up your NetSim software.</p> <p>45. On the left hand pane expand demo and select the Topology demo.</p>	
<p>46. This demo is going to have you set up a network with four switches and four routers that use a frame relay. The PCs are going to actually represent different networks.</p> <p>47. The demo itself is pretty self-explanatory.</p> <p>48. The first thing you want to do is break out the instructions to make it easier. You can print them or just put them in an area on the screen that is easier to see.</p> <p>49. Click the break out icon on the lab instructions tab.</p>	
<p>50. Down at the bottom you will see (on the right, no left...do) four bars. Click on the one that says Network Designer.</p> <p>51. You will get a blank grey screen. This is where you do your designing!</p>	

52. On the left (left? Yes. Left.) you now see a section that says **available devices**. That's where your devices are.
53. You are going to create a network that looks like the image (that's mine). It doesn't look *exactly* like the one in the lab, but close enough!



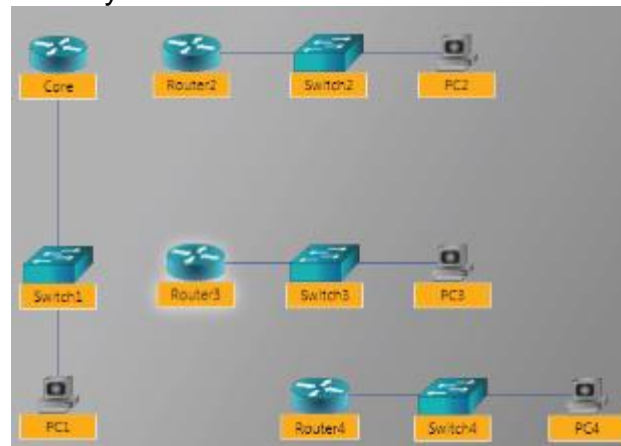
54. In the full version of the software you can run the network when you're done to see if the network will work.

55. In task one you add the devices to the topology.
56. Be sure to add the PROPER devices (Cisco 2811 routers and Cisco 3500 switches).
57. Be sure your routers each have four serial inputs.
58. Finally add your four PCs, which are going to actually represent four networks.

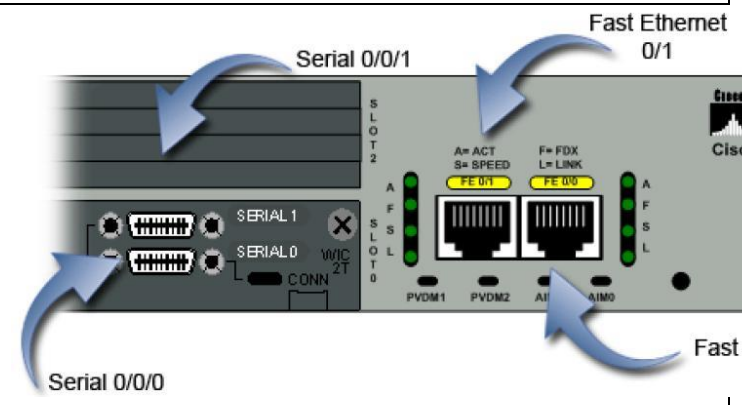
It should look like the image above when done, but without any connections, so organize them so that they look like that.

59. In **task two** you're going to connect your devices to your Ethernet connections.
60. This represents connecting Cat5 or Cat6 cables to the back on the routers to the switches and the back of the switches to the computers.
61. Picture that in your mind how that would happen. In a real life setup it always goes computer → switch → router (or to another switch then to a router). I know at home you may connect a computer directly to a router but those are home router and are more like combination router/switches/wireless routers that you get from Frontier or Comcast. These are Enterprise switches and routers.
62. Be sure to select the **correct** connections when you set these up.

When you're done it'll look like this:



63. Task three you will set up serial connections. On the back of a router you have RJ45 (FastEthernet) and you have Serial ports. The picture to the right shows you what a serial port looks like on a router.
64. These are mainly used to connect to other routers.
65. Serial ports, as you remember from the first labs, often need to have specific speeds programmed to them. We're not doing that in this lab, but remember that they have



<p>different “baud rates” or speeds just like network ports do only you don’t have to manually assign speeds to network ports.</p> <p>66. First we connect two routers together via their serial ports.</p> <p>67. For the other three we are actually connecting these routers to each other through a device called a Frame Relay. A frame relay allows many routers to connect to each other using virtual circuits. If these routers are in different areas in the country, for example, it’s much cheaper to have this setup then to use leased lines from the phone company. (If you’re confused, don’t worry. It’s all somewhat confusing because we can’t really see it working, we just have to trust it works.)</p> <p>68. The frame relay will allow packet switching to occur so that all of the packets can get to each of the networks without issue, using alternate routes if one of the routers goes down. Note that when you set this up, the image that comes up is a cloud. Why? Because no one really knows what goes on in the cloud...it’s a secret.</p> <p>69. Once you are done, save your work. We’ll use it again in the last lab from this software.</p>	
--	--

Questions

<p>6. In an enterprise network, what do you connect a computer to?</p>	
<p>7. What do you connect a switch to? (Two devices.)</p>	
<p>8. How come at home you can connect a computer directly to your “router”?</p>	
<p>9. What are the two kinds of ports you will find on a router? Note, you will also find those on switches (the older ones, at least.)</p>	
<p>10. What is a frame relay?</p>	

Lab 4-4 Connecting Your New Topology

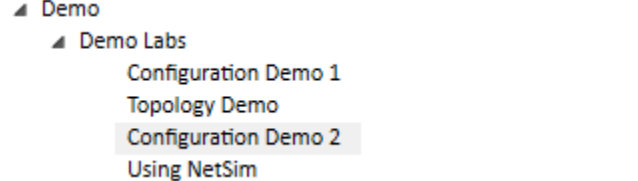
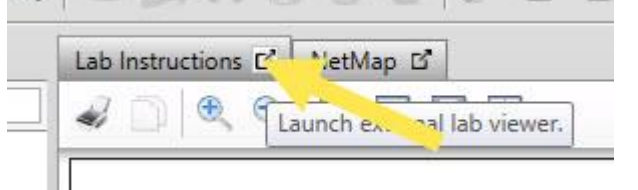

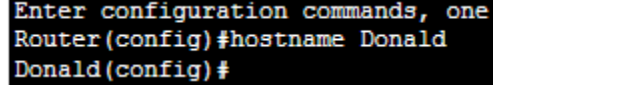
Learning Targets

- Understand how to create sub interfaces
- Understand the concept of a frame relay
- Understand the difference between a LAN and a WAN port on a piece of networking hardware

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Rename your routers
		Set up your IP addresses on your FastEthernet ports
		Set up your IP addresses on your WAN ports
		Set up your sub interfaces
		Test your connectivity
		Answer questions
		Breathe a sigh of relief because that was a challenging lab, even for me! Good job!

Directions

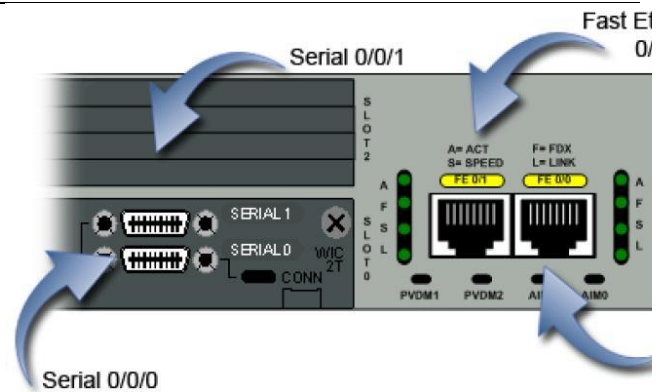
<p>70. Open NetSim and load your saved lab from Lab 4-3.</p> <p>71. Watch the video BEFORE you start this lab, or you can watch the video and do the lab alongside it.</p> <p>72. Click on Try the Demo Lab.</p> <p>73. Click Configuration Demo 2.</p>	 <p>The screenshot shows a 'Demo' menu with sub-items: 'Demo Labs', 'Configuration Demo 1', 'Topology Demo', 'Configuration Demo 2', and 'Using NetSim'. 'Configuration Demo 2' is highlighted with a grey background.</p>
<p>74. Pop out your lab instructions like you did last time.</p> <p>75. Your goal is to be able to logon to one of the PCs and be able to ping the other three PCs.</p> <p>76. Go ahead and try that now.</p> <p>77. Click on PC2</p> <p>78. Press Enter in the command prompt at the bottom of the screen.</p> <p>79. Try to ping PC1 by typing its IP Address (look for the list of IP addresses in the lab instructions). Did it work? _____</p> <p>80. Why did it work or not work? _____</p>	 <p>The screenshot shows the NetSim interface with a toolbar containing 'Lab Instructions' and 'NetMap' buttons. A yellow arrow points to the 'NetMap' button. Below the toolbar is a button labeled 'Launch external lab viewer.'</p>
<p>81. Let's start with your Core router.</p> <p>82. Right click on him and select Configure in Simulator.</p> <p>83. What is the command you use to log into a router? _____</p> <p>84. After you have logged in, you want to enter the command configure terminal to change the name.</p> <p>85. Change the name to Core by typing hostname core.</p>	 <p>The terminal shows the following commands and output:</p> <pre>Router>enable Router# Core [X] PC2 [X] Enter configuration commands, one Router(config)#hostname core core(config)#</pre>
<p>86. Now do the same to the other routers naming them Router2, Router3, Router4.</p> <p>87. Or you can be creative and give them other names.</p>	 <p>The terminal shows the following commands and output:</p> <pre>Enter configuration commands, one Router(config)#hostname Donald Donald(config)#</pre>

<p>I'm totally cool with that.</p>	
<p>88. Now we're going to enable Frame Relay on the interfaces between Core, Router2, and Router3.</p> <p>89. At Core(config-if)# interface serial 0/0</p> <p>90. Core(config-if)# encapsulation frame-relay</p> <p>91. Core(config-if)# no shutdown</p> <p>92. Do the same at Router2 and Router3</p>	
<p>93. Now assign IP addresses to all the Ethernet interfaces on the routers. Remember what they are called in the IOS interface? They are called what?</p> <p>94. When you enter an ip address, you have to enter what else with it? _____</p> <p>95. How do you turn on the port to make it active? _____</p>	<pre>KyloRen(config)#interface fastethernet 0/0 KyloRen(config-if)#ip address 192.168.40.1 255.255.255.0 KyloRen(config-if)#no shutdown 00:23:31: %LINK-3-UPDOWN: Interface FastEthernet0/0, change state to up 00:23:33: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up KyloRen(config-if)#</pre>
<p>96. Now you're going to enter IP addresses into the PCs. You have done this a number of times, but this time you're doing it in the command prompt which is new!</p> <p>97. Go to PC1, enter the command prompt by right clicking, and select Configure in Simulator.</p> <p>98. You're going to type ipconfig /ip 192.168.10.2 255.255.255.0 (return)</p> <p>99. Ipconfig /dg 192.168.10.1 (return)</p> <p>100. Ip=ip address</p> <p>101. Dg=default gateway or router</p> <p>102. Using the table in the lab instructions, do the same for the other three PCs. You're so smart! You're learning all this new stuff!</p> <p>103. Pat yourself on the back, but don't break your arm doing it.</p>	<pre>Press Enter to begin C:>ipconfig /ip 192.168.10.2 255.255.255.0 C:>ipconfig /dg 192.168.10.1 C:> C:>ipconfig /ip 192.168.20.2 255.255.255.0 C:>ipconfig /dg 192.168.20.1 C:> C:>ipconfig /ip 192.168.30.2 255.255.255.0 C:>ipconfig /dg 192.168.30.1 C:>ipconfig /ip 192.168.40.2 255.255.255.0 C:>ipconfig /dg 192.168.40.1</pre>
<p>104. Test that each computer can reach its default gateway by pinging it.</p> <p>105. Go to PC1 and ping 192.168.10.1. Did it work? _____</p> <p>106. If not, fix it by re-doing the steps above or going back and redoing that fastethernet port on the connected router.</p>	<pre>Pinging 192.168.40.1 with 32 bytes of data: Reply from 192.168.40.1: bytes=32 time=59ms TTL=241 Reply from 192.168.40.1: bytes=32 time=66ms TTL=241 Reply from 192.168.40.1: bytes=32 time=71ms TTL=241 Reply from 192.168.40.1: bytes=32 time=62ms TTL=241 Reply from 192.168.40.1: bytes=32 time=62ms TTL=241 Ping statistics for 192.168.40.1: Packets: Sent = 5, Received = 5, Lost = 0 (0% loss) Approximate round trip times in milli-seconds: Minimum = 59ms, Maximum = 71ms, Average = 64ms</pre> <p>Worked for me! Yay!</p>

107. Now you're going to configure the WAN interfaces on your routers. For review, what does WAN mean?

108. Which interfaces do you think are WAN interfaces???

(hint....look at the picture over there to the, ummm...right)



109. Go into the simulator on your Core router. You're going to set up your Frame Relay. Remember how I mentioned that it said it was somewhat confusing. Where here is where it gets a little less confusing. We're going to set up virtual circuits on one serial port. Very funky. At this point, don't worry if you don't fully "get it" just do it.

110. If you're not logged in be sure to log in, get into the terminal interface.

111. Now type **interface serial 0/0.2 point-to-point**

112. Wow that's new! We've never done a **2** before! That's one of those virtual circuits I talked about in frame relays! Notice that the prompt turns to subif which means sub-interface!

113. Now assign the IP address by typing the same old command **ip address 20.1.1.1 255.255.255.252**

114. We're making this subinterface a frame relay so type **frame-relay interface-dlci 102**

115. That's the first sub interface we're putting on this port. Now for another one.

116. **Interface serial 0/0.3 point-to-point**

117. **Ip address 20.1.1.5 255.255.255.252**

118. **Frame-relay interface-dlci 103**

119. Follow the lab and complete the other WAN connections on Router2 and Router3.

```
core(config-if)#interface serial 0/0.2 point-to-point
core(config-subif)#ip address 20.1.1.1 255.255.255.252
core(config-subif)#frame-relay interface-dlci 102
core(config-subif)#interface serial 0/0.3 point-to-point
core(config-subif)#20.1.1.5 255.255.255.252
^
% Invalid input detected at '^' marker.

core(config-subif)#ip address 20.1.1.5 255.255.255.252
core(config-subif)#frame-relay interface-dlci 103
Mickey(config-if)#interface serial 0/0.1 point-to-point
Mickey(config-subif)#ip address 20.1.1.2 255.255.255.252
Mickey(config-subif)#frame-relay interface-dlci 201
Mickey(config-subif)#interface serial 0/0.3 point-to-point
Mickey(config-subif)#ip address 20.1.1.13 255.255.255.252
Mickey(config-subif)#frame-relay interface-dlci 203
Mickey(config-subif)#
```

```
Donald(config-if)#interface serial 0/0.1 point-to-point
Donald(config-subif)#ip address 20.1.1.6 255.255.255.252
Donald(config-subif)#frame-relay interface-dlci 301
Donald(config-subif)#interface serial 0/0.2 point-to-point
Donald(config-subif)#ip address 20.1.1.14 255.255.255.252
Donald(config-subif)#frame-relay interface-dlci 302
```

```
Donald#show controllers serial 0/1
HD unit 0, idb = 0x1AE828, driver structure at 0x1B4BA0
buffer size 1524 HD unit 0,V.36 DTE cable
cpb = 0x7, eda = 0x58DC, cda = 0x58F0
RX ring with 16 entries at 0x4075800
00 bd_ptr=0x5800 pak=0x1B5E24 ds=0x4079108 status=80
pak_size=13
01 bd_ptr=0x5814 pak=0x1B85B8 ds=0x4080384 status=80
pak_size=13
```

On Router3 (which I named Donald). Good, I wanted Router3 to be my DTE cable. DTE is kind of the end point or the ultimate destination for my Frame Relay. It's where I want all my packets to ultimately go. Imagine that is a cable from my Frame Relay going into my network. That's the end that goes into the router.

So what did we just do? We set up a virtual Frame Relay:
Point-to-point means we set up a connection that was directly from one point to another.
DLCI=a unique local address used between the router and the Frame Relay (stands for Data-Link Connection Identifier because Frame Relay works at the physical and data link layers)
We created some **virtual circuits** to route the packets from one place to another in our wide area

network we created. Wow! We got a LOT done just sitting there not really sure what we were doing!

120. We want to see which device in our virtual Frame Relay is the DTE (Data Terminal Equipment) and which is the DCE (Data Communications Equipment). If we set it up right, Router3 should be DTE and Router4 should be DCE

121. On Router 3 type **end** then type **show controllers serial 0/1** a bunch of stuff is going to scroll down your screen showing a bunch of stuff. We only care about the very beginning. We're looking for the text DCE cable. Did you find it?

122. Now on Router4 do the same, this time you're looking for DCE cable. Did you find it?

```
KyloRen#show controllers serial 0/1
HD unit 0, idb = 0x1AE928, driver structure at 0x1B4BA0
buffer size 1524 HD unit 0,V.35 DCE cable
cpb = 0x7, eda = 0x58DC, cda = 0x58ru
RX ring with 16 entries at 0x4075800
00 bd_ptr=0x5800 pak=0x1B5E24 ds=0x4079108 status=80
pak_size=13
01 bd_ptr=0x5814 pak=0x1B85B8 ds=0x4080384 status=80
```

All good on Router4 which I named KyloRen! The DCE cable refers to a virtual cable plugged into the Frame Relay modem (so to speak).

We are living in a virtual world!

123. Let's configure the Serial Interfaces on Router3 and Router4 so they are passing things into the Frame Relay.

124. You should be able to do this without me telling you the commands at this point. On Router3 since we've gone all the way back to the main prompt, you do have to **configure terminal** to get back to your interface, but from there you are going to configure **interface serial 0/1** and give it the ip address 10.1.1.5 with subnet mask 255.255.255.252 and then make sure it is turned on.

125. What are the commands you will use?

Type the commands here:
Assign ip address:

Turn on port:

126. Now on Router4 you're going to do the same thing, only because this is a DCE cable you need to set a clock rate of 1,000,000.

127. What command do you need to get to the correct prompt: _____

128. You're changing serial port 0/1 on Router4

129. The command to set your clock rate is **clock rate 1000000**

What commands did you type:

130. Now test the connections by pinging.

131. Go to Router3.

132. Type **end**

133. Type **ping 20.1.1.5** (Remember this is one of those virtual interfaces we set...how exciting! Okay, it is for me!)

134. Ping 20.1.1.3

135. Ping 10.1.1.6

136. Did they work??? _____

137. Whew!!

```
core(config)#router eigrp 100
core(config-router)#network 20.1.1.0 0.0.0.3
core(config-router)#network 20.1.1.4 0.0.0.3
core(config-router)#network 192.168.10.0 0.0.0.255
```

138. Now finally we're going to set up EIGRP to discover the rest of the routes! It's about time we made a protocol do some of the work for us!

139. If you were to try to ping from one PC to another they'd still fail because the routers still don't know the full routes. You could go in and statically write the routing tables, but what fun is that? None fun. That's what fun. None fun.
140. Log into your Core router and configure terminal.
141. Type the command **router eigrp 100**
142. This will give the routers an autonomous system number of 100 and configure EIGRP to announce all networks that are directly connected to the routers and tell them about each subnet. Kind of like the Whos in Horton Hears a Who.
143. Now type in the networks:
144. **Network 20.1.1.0 0.0.0.3**
145. **Network 20.1.1.4 0.0.0.3**
146. **Network 192.168.10.0 0.0.0.255**
147. On Router2 you're going to do the same thing except the networks you're going to announce are:
- 20.1.1.0 0.0.0.3
 - 20.1.1.12 0.0.0.3
 - 192.168.20.0 0.0.0.255
148. On Router3 same dealio, except the networks are:
- 20.1.1.4 0.0.0.3
 - 20.1.1.12 0.0.0.3
 - 10.1.1.4 0.0.0.3
 - 192.168.30.0 0.0.0.255
149. On Router4, again same set of commands, only these networks
- 10.1.1.4 0.0.0.3
 - 192.168.40.0 0.0.0.255
150. NOTE: the second set of numbers with each network is like a reverse subnet mask, if you hadn't put that together.
151. We did it!!!!!!!

```
Enter configuration commands, one per line. End with CNTL/Z.
KyloRen(config)#router eigrp 100
KyloRen(config-router)#network 10.1.1.4 0.0.0.3
02:37:27: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 100: Neighbor 10.1.1.5
(Serial0/1) is up: new adjacency
KyloRen(config-router)#network 192.168.40.0 0.0.0.255
```

Once you are done, EIGRP is fast!

Go to PC1 and PING PC2:

```
Pinging 192.168.20.2 with 32 bytes of data:
Reply from 192.168.20.2: bytes=32 time=57ms TTL=241
Reply from 192.168.20.2: bytes=32 time=48ms TTL=241
Reply from 192.168.20.2: bytes=32 time=56ms TTL=241
Reply from 192.168.20.2: bytes=32 time=49ms TTL=241
Reply from 192.168.20.2: bytes=32 time=51ms TTL=241

Ping statistics for 192.168.20.2:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 48ms, Maximum = 57ms, Average = 52ms
```

Yay!!!!!!

Now from PC2 Ping PC3

```
Pinging 192.168.30.2 with 32 bytes of data:
Reply from 192.168.30.2: bytes=32 time=53ms TTL=241
Reply from 192.168.30.2: bytes=32 time=72ms
Reply from 192.168.30.2: bytes=32 time=71ms
Reply from 192.168.30.2: bytes=32 time=68ms
Reply from 192.168.30.2: bytes=32 time=52ms

Ping statistics for 192.168.30.2:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 52ms, Maximum = 72ms, Average = 63ms
```



Super Yay!!

Now from PC3 Ping PC4

Devices:

```
Pinging 192.168.40.2 with 32 bytes of data:
Reply from 192.168.40.2: bytes=32 time=58ms TTL=241
Reply from 192.168.40.2: bytes=32 time=69ms
Reply from 192.168.40.2: bytes=32 time=54ms
Reply from 192.168.40.2: bytes=32 time=66ms
Reply from 192.168.40.2: bytes=32 time=69ms

Ping statistics for 192.168.40.2:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 54ms, Maximum = 69ms, Average = 63ms
```



Astounding Yay!!!!!!

Questions

11. What is a Frame Relay?	
12. What is a DTE?	
13. What is a DCE?	
14. What is a DLCI?	
15. How do you set up a sub interface (what is the command)?	
16. How do you set the clock rate on a port?	

17. What is a WAN?	
18. What is a LAN?	
19. Remind me again what EIGRP is?	
20. What is a subnet?	

That was a challenging lab! Good job!

Lab 4-5 Driver Signing Options

Purpose of Lab: *To understand driver signing options and be able to disable driver signing to install an older driver.*

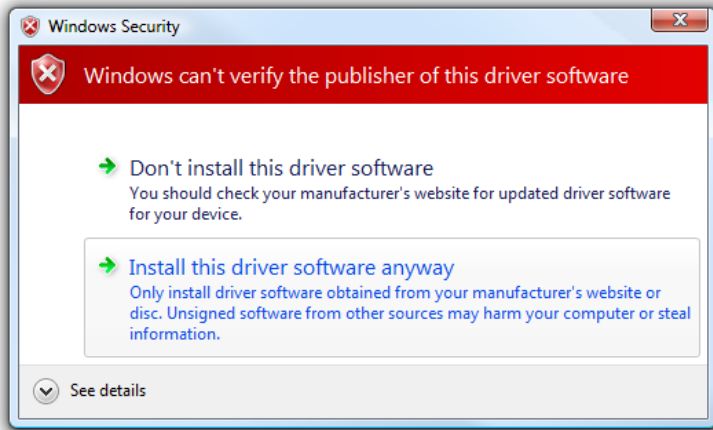
Learning Targets

- Understand driver signing
- Understand how to turn driver signing on and off

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Configure your server to warn if someone tries to install a driver that is not signed
		Fill out table
		Use BCDedit to change the driver signing
		Show me the command
		Attach screenshot
		Answer questions

Windows security requirements want you to install only signed drivers. A signed driver contains a confirmed piece of code and verifies that the driver has been tested and is safe. If the driver has been modified since the testing, or has not been tested you will see a warning box that looks like this:



Supposedly in Windows 8 and Server 2012 you can't install unsigned drivers at all. Best practices are that you set your network to block ALL unsigned drivers so your users do not install unsigned drivers. However, in case you want to go ahead and live on the edge...here's how you can disable driver signing in Server 2008 R2.

<p>Directions</p> <ol style="list-style-type: none"> 1. Boot into your Server 2008 as an administrator. 2. Configure it to warn if someone tries to install a driver that is not magically signed by Microsoft. 3. Right click on Command Prompt and Run As Administrator 	
<ol style="list-style-type: none"> 4. Type the following command: 5. bcdedit -set loadoptions DISABLE_INTEGRITY_CHECKS 6. Hit enter. Now type 7. bcdedit -set TESTSIGNING ON 8. Hit enter 9. Take a screenshot. 	<p>You have just used a program called BCDEDIT. Boot Configuration Data (BCD) files provide a store that is used to describe boot applications and boot application settings. The objects and elements in the store effectively replace Boot.ini. BCDEdit is a command-line tool for managing BCD stores. It can be used for a variety of purposes, including creating new stores, modifying existing stores, adding boot menu options, and so on. BCDEdit serves essentially the same purpose as Bootcfg.exe on earlier versions of Windows.</p>
<ol style="list-style-type: none"> 10. Now if you attempt to install a driver that is not digitally signed, it will allow you. NOTE: this is a risky venture on a server and a good network administrator probably would not do this. However, there you go. 	

Now let's try the same thing in Windows 8 and see if it works.

According to Microsoft if you want to disable driver signing in Server 2012 or Windows 8 you can just suck it, but this guy here <http://thephuck.com/end-user-computing/how-to-disable-driver-signing-requirement-in-windows-8/> has figured out a way how to do it, so let's give it a whirl! Unfortunately his directions are dated, so I had to go figure out the new way to do

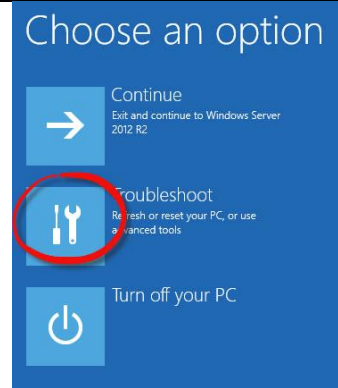
it so what WAS going to take me three minutes (fixing this lab) took me a few hours when it didn't work. It's all good now! I tested it on Windows 8.1 and on Server 2012.

1. When might you need to do this?
Well let's say you have an old piece of hardware and it works but the company hasn't created a driver that works with Windows 8.1 so you're out of luck due to no updates. You can try to install the old one using this trick.

2. Shut down all programs and everything.
3. In Server 2012 R 2 or Windows 8.1 type the following at the command prompt.
4. Open the Run command and type **shutdown /r /o /t 0**
5. Hit return
6. This will force a reboot with options (that's what the -o does).



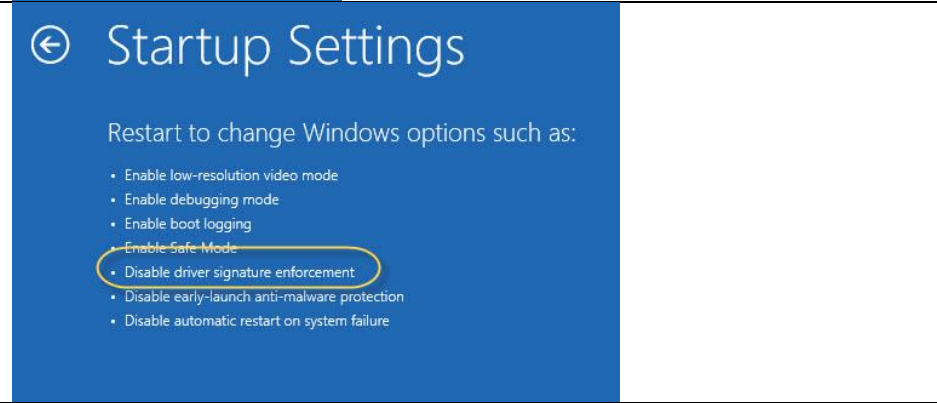
7. It's going to ask you what you want to do. On the first screen click **Troubleshoot**.



8. Now click **Startup Settings**.



9. On the next screen it lists the things you'll be able to do when you restart. Notice one is to be able to disable driver signing.
10. Go ahead and click restart.



<ol style="list-style-type: none"> 11. When you restart you're going to get a black screen with white lettering. 12. Read the screen until you find Disable Driver Signature Enforcement. 13. Hit your down arrow until you get to it, hit return to start Windows, 14. Now Driver Signing will be disabled. 15. Now go answer questions. 	<p>Advanced Boot Options</p> <p>Choose Advanced Options for: Windows Server 2012 R2 (Use the arrow keys to highlight your choice.)</p> <p>Repair Your Computer</p> <p>Safe Mode Safe Mode with Networking Safe Mode with Command Prompt</p> <p>Enable Boot Logging Enable low-resolution video Last Known Good Configuration (advanced) Directory Services Repair Mode Debugging Mode Disable automatic restart on system failure Disable Driver Signature Enforcement Disable Early Launch Anti-Malware Driver</p> <p>Start Windows Normally</p>
--	--

Questions (Answer online)

1. When might you want to disable driver signing?
2. What is Microsoft's "Best Practice" for driver signing?
3. What is the benefit to the network security of having the driver signed?
4. Why can this be a hassle for you, the administrator?
5. When you are an administrator someday, how do you think you'll handle driver signing in a real world situation? Will you require all drivers to be signed or will you allow non-signed drivers?
6. Clarify your answer from the question above in two paragraphs.

Lab 4-6 Using the File Signature Verification Utility

Purpose of Lab: To understand how to verify the device driver signatures.

Learning Targets

- Understand file signature verification
- Learn how to look up system files

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Run Sigverif
		Look up nvmpu401.sys
		Answer questions

Directions

1. Log into your server as an administrator. Use either your host server or one of your ADDCs, but choose one which you have NOT turned off driver signing on, or turn it back on. Just go through the same steps to turn it back on.
2. Open the run command.
3. Type **sigverif** and hit return.
4. The File Signature Verification tool will start. It is going to test all the drivers in your system to make sure they signed. This is often used after upgrading a system, where drivers have not been tested for signing.
5. Click start.

6. When it is done you get a list of unsigned drivers. Mine had ONE unsigned driver. To see the log, click the advanced button.
 7. What did it save the log as?
 8. Open that file. Print it out. Attach to your logs.
 9. My unsigned file is **nvmpu401.sys**. Go online and look up that file. Where does it come from?
-
10. Should I be concerned?
-
11. If I do not want any drivers unsigned on my system, what should I do?

Turn in the following:

- ☞ Printout of the SIGVERIF.TXT (just page one, please).

Lab 4-7 Running System File Checker and Windows Resource Protection

Learning Targets

- Understand the purpose of the system file checker
- Understand how to run System File Checker and Windows Resource Protection

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Start the System File Checker
		Run CMD elevated
		Answer the questions

Directions

1. Log into your server
2. Open the command prompt.
3. Type sfc /?
4. What is sfc?
5. Uh oh, it won't allow you to run it. Why?
6. Close the command prompt. Huh. This is getting more like Linux every day.
7. Go to start→accessories→command prompt and right click.
8. How can you run as an admin?
9. Do dat.
10. Now do 3 and answer 4.
11. Run a scan. What is the command to do this?

Go online to <http://support.microsoft.com/?kbid=310747> and read and answer the following while sfc is running.

1. What does sfc.exe do if it finds a file has been overwritten?

2. What if you want to set up a scan, but don't want to do it now. Rather, you'd like to do it when the computer restarts.
3. How can you set sfc to scan files on every single reboot?

Go to [http://msdn.microsoft.com/en-us/library/aa382503\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/aa382503(VS.85).aspx) and read up on Windows Resource Protection

4. How is SFC related to WRP?
5. What did WRP used to be called?
6. Name two resources that are protected by these two features?

Lab 4-8 Using Windows Powershell

Learning Targets

- Understand Powershell
- Understand cmdlets
- Understand how to navigate around in PowerShell

Checkoff Success Criteria—have you met your mark?

Tory Check	You check	
		Add Powershell
		Test commands and demonstrate moving through directories.
		Locate a command and get help on it
		Write a simple script in Notepad.
		Set a restore point
		Open as an administrator
		Change execution policy
		Run script
		Answer questions

Directions

1. Boot into your server 2012 R2
2. Open Server Manager
3. Expand Features
4. Add a Feature
5. Select Windows Powershell and install.
6. Read this:

PowerShell is a very power command line interface (shell) that allows you to perform activities in Server. It is the strongest tool you have to manage server quickly and adeptly. We are going to just touch the surface on things you can do with with. Powershell uses both **cmdlets** (command-lets) and **scripts** to perform a variety of functions. It seems to be particularly useful for remote administrating other servers and applying the same script to perform different actions. For

example, you may set up an application server and use a PowerShell script to control the installation of a number of applications.

Test using the Console. Try the following commands.

To	Do this
List the contents of the current directory	Type the command dir , or ls , and press Enter .
Move to a different directory	Type the command cd followed by a space, specify the path name of the directory to change to, and press Enter .
Make a new directory	Type the command md followed by a space, and then type the name of the directory to be created. Then press Enter .
Delete a file or directory	Type the command del followed by a space, and then type the name of the file/directory to be deleted. Then press Enter .
Display a line of text in the console	Type the command echo followed by a space, and then type the message surrounded by quotation marks. Then press Enter .
Clear the console	Type the command cls and then press Enter .

Cmdlets are specialized commands for performing different tasks in PowerShell. If you type **get-command** in the PowerShell prompt, you'll get a list of all the cmdlets available. You can even write your own cmdlets if Microsoft doesn't have what you need built into it.

One thing I noticed when I was writing this lab is that PowerShell uses many commands you can find in both DOS and Linux commands (UNIX). I went to perform a few typical tasks such as listing a directory, and accidentally typed the Linux command **LS** instead of **DIR**. Both worked identically.

Test it out.

1. Go into the Metro Interface and start typing PowerShell. Open it up. You'll notice PowerShell. It looks much like the CMD prompt. It is, but it's not. CMD is a shell environment, and so is PowerShell only cmd.exe can't do the CMDLETS.
2. Type **dir** and hit return.
3. Type **ls** and hit return.
4. Type **help dir** and hit return.
5. Type **man dir** and hit return
6. What do you get with the last two? Yeah, I don't know why that is either. I think it's a bug.

7. Type **get-process**.
8. What do you see?

9. Type **get-process | more** and hit return to show just a pageview at a time.

10. What does **| more** do? Note that the **|** is known as a "pipe".

11. Now let's say that you have a server running really slowly and you think it's RAM. You want to kill all processes taking over 500 MB RAM. Type **get-process | where { \$_.WS -gt 500MB } | stop-process**.
12. To see a list of services running, type **get-service**.
13. To get a list of all the cmdlets available, type **get-help about_core_command** and press enter.
14. Whoa! What was that?
15. Hit the up arrow to bring the command back onto your prompt. Now add to the end | **more** (the | is called a pipe and is usually on the top of the \ key) to pause it.
16. Choose one of the commands in the list and type **get-help** followed by the name of the command.

Command	What it does

PowerShell is extremely powerful. It is much more than the cmd prompt on steroids. There are entire books written on PowerShell and its applications.

Let's write a simple script in PowerShell that is completely pointless, but will let you see if you can write a program.

1. Open Notepad and save it as helloworld.PS1 (PS1 is the extension for PowerShell). Save this right in the C:\ drive to find it easily.
2. Type the following commands in Notepad and save.
 - a. **\$strString = "Hello World"**
 - b. **write-host \$strString**
3. Save.
4. Open PowerShell.
5. Type c:\helloworld.PS1
6. If you get an error that says the execution of scripts is disabled, you can change that policy by changing a registry key. NOTE: CHANGING REGISTRY KEYS IS DANGEROUS SO YOU HAVE TO REALLY CAREFUL!!
7. Set a restore point first.
8. You may have to close PowerShell and reopen as Administrator. (Right click—Run as Administrator)
9. Now type **PS C:\Users\shriganesh> Set-ExecutionPolicy unrestricted**
10. Then type **Set-ExecutionPolicy RemoteSigned**
11. Now run the command in step two.

Go to this website and practice with the commands shown. <http://www.howtogeek.com/114344/5-cmdlets-to-get-you-started-with-powershell/> or use <http://bit.ly/Powershell1>

Questions

1. Which is more powerful, CMD or PowerShell?	
2. What command would you use to clear your screen?	

3. What is a cmdlet?	
4. Why do you have to type a – between a command and a modifier? (Read the website if you don't know.)	
5. What command turns off the signed execution policy?	
6. If I wanted to get help on ipconfig, what do you think I would type??	