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Cisco CCNA/ICND2 Lab Guide

Covers all topics for the ICND2 exam

Version 0.2

Written by

Marc Bouchard

www.subnet192.com

CISCO CERTIFIED CCENT NETWORK

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Contents

Introduction

Studying for the CCENT/CCNA exams is challenging. There are a lot of resources out there, lots of material but there was nothing I could find to meet my objective: provide me with a challenge, and then show a step by step explanation to validate the tasks.

This guide is in no way endorsed by Cisco Systems. I created this document out of personal need and to help myself memorize and learn the various commands and configurations. I thought I should share this with others to assist in actually learning hands-on skills with Cisco equipment. Also, note that I didn't reinvent the wheel here. Most of this is inspired from personal experience in my own lab, from information gathered on the internet, from some of the simulators, etc.

This guide is provided FREE of charge. If you paid for this guide, you got ripped off. I do however accept donations of any amount via Paypal at marc@subnet192.com if you find this guide of use and want to thank me for my efforts. Visit my site at www.subnet192.com for more information and the latest guides!

Recommended training material

The following are what I personally used to pass the certification. I find that going through a CBT before hitting the books helps a lot to make the book easier to understand.

- CBT Nuggets ICND2 training by Jeremy Cioara.
- Cisco Press ICND2 by Wendell Odom.

Recommended lab equipment

Finding the right gear to build a lab is quite a daunting task. There is a multitude of models and versions, as well as modules to customize each device. While you can get by with simulators, (I have tried them all), nothing compares to working with the real deal.

My recommendations, for a reasonably priced lab that would get you through the CCENT and CCNA curriculum would be the following. Note that not all of them are used for the CCENT, but will be useful at the CCNA level.

3 Cisco 2950 series switches

3 Cisco 2620XM 128/45 series routers

3 WIC-2T serial interfaces

3 DCE/DTE Smart Serial cables (for the WIC-2T to WIC-2T connections)

1 NM-4A/S serial interface

3 Serial to Smart Serial cables (for the NM-4A/S to WIC-2T connections)

How this guide works…

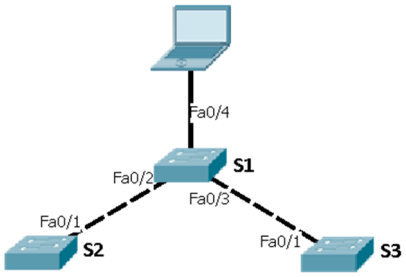
First off, this is not intended to explain any of the concepts. There are fantastic books out there for that job. This guide attempts to make you think about what you need to do, which commands are required to complete each step and so on.

In this guide, there is no goal topology as it will change depending on the objectives of each lab. The various topologies are all based on my recommendations for hardware above. You can also perform most of the steps using Cisco's Packet Tracer software if you are part of the Cisco Learning Academy, but be aware that some commands may not be fully implemented.

Also, by now you should be familiar with the familiar prompts of the IOS (the exec mode #, the config mode (config)#, etc.) so steps to get you into these modes will not be identified in the walkthrough.

Lab 1 – VLAN Trunking Protocol (VTP)

Material required: 3 switches, 1 PC, rollover cable, crossover and standard Ethernet cables.



Configuring VTP

Objectives

This lab will guide you in configuring VTP in the lab environment.

Preparation

- Configure all three switches using the scripts in appendix 1.
- DISCONNECT all crossover cables from S1.

Tasks

- Open a terminal emulator session to S1 (console)
  - Display VLAN configuration.
  - Display switch ports information from the running-configuration using output modifiers to begin the display at interface FastEthernet0/1.
  - Display the default VTP configuration information.
  - Configure all switch ports to access mode.
  - Set the VTP mode to Transparent.
  - Save the configuration.
- Open a terminal emulator session to S2 (console)
  - Configure all switch ports to access mode.
  - Configure VTP
    - Set the VTP mode to Server.
    - Set the VTP domain to CCNALAB.
    - Set the VTP version to 2.
  - Save the configuration.
- Open a terminal emulator session to S3 (console)
  - Configure all switch ports to access mode.
  - Set the VTP mode to Client.
  - Save the configuration.
- Experimentation
  - Display and compare the VTP configuration information on all 3 switches.

- Connect the topology together using the diagram at the beginning of the lab.
- Telnet to S3.
- Display the VTP configuration information.
  - Is the domain name set? Why?
    - No trunks exist between the switches so VTP doesn't do anything.
- Configure all the links between switches to trunk mode.
- Display the interface status to confirm trunk is enabled.
- Display the VTP configuration information on S1 and S3.
  - Is the domain name set? Why?
    - Trunks are enabled and all server and clients receive VTP updates. Transparent mode switches ignore VTP broadcasts.
- Create VLAN 100 on S1.
  - What happens? Is it propagated to other switches?
    - VLAN is created but remains local to this switch.
- Create VLAN 300 on S3.
  - What happens?
    - Unable to create a VLAN, client mode doesn't allow creation.
- Create VLAN 200 on S2.
  - Is it propagated to other switches? Which ones?
    - Yes it is. S3 receives the update as it is in client mode.
- Display the VLAN and VTP configuration on S3 and observe what has changed.
- Enable debugging of VTP events on S3.

Attempt to perform all the tasks listed above before going through the walkthrough.

- Switchport trunk allowed vlan except 100-200
- Spanning tree portfast on access ports

Walkthrough

On S1:

Display VLAN configuration

```
S1#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                Fa0/21, Fa0/22, Fa0/23, Fa0/24
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0

Remote SPAN VLANs
------------------------------------------------------------------------------


Primary Secondary Type              Ports
------- --------- ----------------- ------------------------------------------
```

Display switch ports information from the running-configuration using output modifiers to begin the display at interface FastEthernet0/1

```
S1#show running-config | begin interface FastEthernet0/1
interface FastEthernet0/1
 switchport mode access
 speed 100
 duplex full
!
interface FastEthernet0/2
 switchport mode access
 speed 100
 duplex full
…
```

Display the default VTP configuration information

```
S1#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 128
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 192.168.1.5 on interface Vl1 (lowest numbered VLAN interface found)
```

Set all switch ports to Access mode

```
S1(config)#interface range fa0/1 - 24
S1(config-if-range)#switchport mode access
```

Set the VTP mode to Transparent

```
S1(config)#vtp mode transparent
Setting device to VTP TRANSPARENT mode.
```

On S2:

Set all switch ports to Access mode

```
Same steps as S1.
```

Configure VTP

```
S2(config)#vtp mode server
Setting device to VTP SERVER mode.

S2(config)#vtp domain CCNALAB
S2(config)#vtp version 2
```

On S3:

Set all switch ports to Access mode

```
Same steps as S1.
```

Set the VTP mode to Client

```
S3(config)#vtp mode client
Setting device to VTP CLIENT mode.
```

Experimentation:

Display and compare the VTP configuration information on all 3 switches

```
S1#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 128
Number of existing VLANs        : 5
VTP Operating Mode              : Transparent
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

S2#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 250
Number of existing VLANs        : 5
VTP Operating Mode              : Server
VTP Domain Name                 : CCNALAB
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Enabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x88 0x1F 0x98 0xBF 0xFF 0xB8 0x36 0x9B
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00

S3#show vtp status
VTP Version                     : 2
Configuration Revision          : 0
Maximum VLANs supported locally : 250
Number of existing VLANs        : 5
VTP Operating Mode              : Client
VTP Domain Name                 :
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Disabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
```

Configure all the links between switches to trunk mode

```
S1(config)#interface range fa0/2 - 3
S1(config-if-range)#switchport mode trunk

S2(config)#interface fa0/1
S2(config-if)#switchport mode trunk

S3(config)#interface fa0/1
S3(config-if)#switchport mode trunk
```

Display the interface status to confirm trunk is enabled

```
S1#show interface status

Port      Name               Status       Vlan       Duplex  Speed Type
Fa0/1                        notconnect   1            full    100 10/100BaseTX
Fa0/2                        connected    trunk        full    100 10/100BaseTX
Fa0/3                        connected    trunk        full    100 10/100BaseTX
Fa0/4                        notconnect   1            full    100 10/100BaseTX
Fa0/5                        notconnect   1            full    100 10/100BaseTX
Fa0/6                        notconnect   1            full    100 10/100BaseTX
Fa0/7                        notconnect   1            full    100 10/100BaseTX
Fa0/8                        notconnect   1            full    100 10/100BaseTX
Fa0/9                        notconnect   1            full    100 10/100BaseTX
Fa0/10                       notconnect   1            full    100 10/100BaseTX
Fa0/11                       notconnect   1            full    100 10/100BaseTX
Fa0/12                       notconnect   1            full    100 10/100BaseTX
…
```

Create VLAN 100 on S1

```
S1(config)#VLAN 100
```

Create VLAN 300 on S3

```
S3(config)#VLAN 300
VTP VLAN configuration not allowed when device is in CLIENT mode. ← Unable to create!
```

Create VLAN 200 on S2

```
S2(config)#vlan 200
```

Display the VLAN and VTP configuration on S3 and observe what has changed

```
S3#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/2, Fa0/3, Fa0/4, Fa0/5
                                                Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                Fa0/22, Fa0/23, Fa0/24, Gi0/1
                                                Gi0/2
200  VLAN0200                         active ← Propagated to S3 via VTP.
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup
```

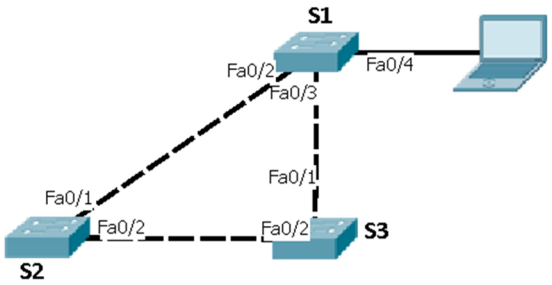
```
S3#show vtp status
VTP Version                     : 2
Configuration Revision          : 1 ← 1 VLAN configuration update received
Maximum VLANs supported locally : 250
Number of existing VLANs        : 6
VTP Operating Mode              : Client
VTP Domain Name                 : CCNALAB
VTP Pruning Mode                : Disabled
VTP V2 Mode                     : Enabled
VTP Traps Generation            : Disabled
MD5 digest                      : 0x66 0x92 0xDF 0xDD 0xBD 0x35 0x2A 0xAE
Configuration last modified by 192.168.1.6 at 3-1-93 00:29:10 ← From this switch
```

Enable debugging of VTP events on S3

```
S3#debug sw-vlan vtp events
vtp events debugging is on

Observe a few events, then disable it using:

S3#no debug all
All possible debugging has been turned off
```

Lab 2 – Spanning Tree Protocol (STP)

Material required: 3 switches, 1 PC, crossover and standard Ethernet cables.



Configuring Spanning Tree Protocol

Objectives

This lab will guide you in configuring STP in the lab environment.

Preparation

- Connect a crossover cables on FastEthernet ports 02 on between S2 and S3.
- Remove VLAN 100 from S1.
- Remove VLAN 200 from S2.

Tasks

- Configure ports FastEthernet 0/2 on S2 and S3 to trunk mode using the dynamic modes.
- Display the trunk interfaces information.
- Display the spanning tree information summary on all switches to identify the root.
- Display the spanning tree information details on the root bridge and the blocking switch.
- On the blocking switch, force a path change by changing the cost of the uplink to the root.
- Disconnect one of the cables going to your root bridge. Observe the spanning tree on the switch at the other end of that cable (switching between ports, going into listening mode etc.)
- Reconnect the cable.
- Force another switch to become your primary root bridge.
- Disable spanning tree on all switches and cause a broadcast storm. Observe what happens.
- Re-enable spanning tree.
- Enable Rapid STP on all switches and verify STP summary.
- On the blocking switch, enable Spanning Tree events debugging and…
    - Disable the root port interface.
    - Observe STP events.
    - Re-enable the root port interface.
    - Observe STP events.
- ***Portfast, Rootguard, BPDUguard***

Walkthrough

Remove VLAN 100 from S1

```
S1(config)#no vlan 100
```

Remove VLAN 200 from S2

```
S2(config)#no vlan 200
```

Configure ports Fa0/2 on both switches to trunk mode using the dynamic modes

```
S2(config)#interface fastEthernet 0/2
S2(config)#switchport mode dynamic desirable

S3(config)#interface fastEthernet 0/2
S3(config)#switchport mode dynamic auto
```

Display the trunk interfaces information

```
S2#show interface trunk

Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/2       desirable    802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-4094
Fa0/2       1-4094

Port        Vlans allowed and active in management domain
Fa0/1       1
Fa0/2       1

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       1
Fa0/2       none


S3#show interface trunk

Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1
Fa0/2       auto         802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/1       1-4094
Fa0/2       1-4094

Port        Vlans allowed and active in management domain
Fa0/1       1
Fa0/2       1

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       1
Fa0/2       1
```

Display the spanning tree information summary on all switches

```
S1#show spanning-tree

VLAN0001 ← Note that a spanning-tree has been defined for each VLAN (PVST)
  Spanning tree enabled protocol ieee
  Root ID     Priority    32769
              Address     000a.4117.5300
              This bridge is the root ← This is the root bridge in my lab.
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769  (priority 32768 sys-id-ext 1) ← Bridge ID/priority
              Address     000a.4117.5300
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time 15

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/2            Desg FWD 19        128.2    P2p ← Both ports are designated ports.
Fa0/3            Desg FWD 19        128.3    P2p ← No Root ports on the bridge.


S2#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    32769
              Address     000a.4117.5300
              Cost        19
              Port        1 (FastEthernet0/1) ← I can reach the root through this port.
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769  (priority 32768 sys-id-ext 1)
              Address     0015.2b1c.9a40
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/1            Root FWD 19        128.1    P2p ← Current port to reach the root.
Fa0/2            Altn BLK 19        128.2    P2p ← Blocked alternate path.


S3#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    32769
              Address     000a.4117.5300
              Cost        19
              Port        1 (FastEthernet0/1)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769  (priority 32768 sys-id-ext 1)
              Address     0013.1a2c.2700
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/1            Root FWD 19        128.1    P2p ← Current port to reach the root.
Fa0/2            Desg FWD 19        128.2    P2p ← Alternate path to reach the root.
```

Display the spanning tree information details on the root bridge and the blocking switch

On root bridge:

```
S1#show spanning-tree detail

 VLAN0001 is executing the ieee compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, sysid 1, address 000a.4117.5300
  Configured hello time 2, max age 20, forward delay 15
  We are the root of the spanning tree
  Topology change flag not set, detected flag not set
  Number of topology changes 2 last change occurred 00:14:00 ago
          from FastEthernet0/3
  Times:  hold 1, topology change 35, notification 2
          hello 2, max age 20, forward delay 15
  Timers: hello 1, topology change 0, notification 0, aging 300

 Port 2 (FastEthernet0/2) of VLAN0001 is forwarding
   Port path cost 19, Port priority 128, Port Identifier 128.2.
   Designated root has priority 32769, address 000a.4117.5300
   Designated bridge has priority 32769, address 000a.4117.5300
   Designated port id is 128.2, designated path cost 0
   Timers: message age 0, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   Link type is point-to-point by default
   BPDU: sent 1635, received 1

 Port 3 (FastEthernet0/2) of VLAN0001 is forwarding
   Port path cost 19, Port priority 128, Port Identifier 128.3.
   Designated root has priority 32769, address 000a.4117.5300
   Designated bridge has priority 32769, address 000a.4117.5300
   Designated port id is 128.3, designated path cost 0
   Timers: message age 0, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   Link type is point-to-point by default
   BPDU: sent 1635, received 1
```

On blocking switch:

```
S2#show spanning-tree detail

 VLAN0001 is executing the ieee compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, sysid 1, address 0015.2b1c.9a40
  Configured hello time 2, max age 20, forward delay 15
  Current root has priority 32769, address 000a.4117.5300
  Root port is 1 (FastEthernet0/1), cost of root path is 19
  Topology change flag not set, detected flag not set
  Number of topology changes 4 last change occurred 00:00:45 ago
          from FastEthernet0/2
  Times:  hold 1, topology change 35, notification 2
          hello 2, max age 20, forward delay 15
  Timers: hello 0, topology change 0, notification 0, aging 300

 Port 1 (FastEthernet0/1) of VLAN0001 is forwarding
    Port path cost 19, Port priority 128, Port Identifier 128.1.
    Designated root has priority 32769, address 000a.4117.5300
    Designated bridge has priority 32769, address 000a.4117.5300
    Designated port id is 128.2, designated path cost 0 ← Lower cost
    Timers: message age 2, forward delay 0, hold 0
    Number of transitions to forwarding state: 2
    Link type is point-to-point by default
    BPDU: sent 2, received 4223

 Port 2 (FastEthernet0/2) of VLAN0001 is blocking
    Port path cost 19, Port priority 128, Port Identifier 128.2.
    Designated root has priority 32769, address 000a.4117.5300
    Designated bridge has priority 32769, address 0013.1a2c.2700
    Designated port id is 128.2, designated path cost 19 ← Higher cost
    Timers: message age 2, forward delay 0, hold 0
    Number of transitions to forwarding state: 2
    Link type is point-to-point by default
    BPDU: sent 4, received 4921
```

On the blocking switch, force a path change by changing the cost…

```
S2(config)#interface fastEthernet 0/1
S2(config-if)#spanning-tree vlan 1 cost 100
```

Disconnect one of the cables going to your root bridge. Observe…

```
S2#ping
Protocol [ip]:
Target IP address: 192.168.1.5
Repeat count [5]: 20000
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 20000, 100-byte ICMP Echos to 192.168.1.5, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!.

01:52:07: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state
to down
01:52:08: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to
down...............!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 99 percent (1840/1856), round-trip min/avg/max = 1/3/16 ms
```

You can repeat the following command to see the various status of the interface:

```
S2#show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     000a.4117.5300
             Cost        38
             Port        2 (FastEthernet0/2)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     0015.2b1c.9a40
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 15

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/2            Root LIS 19        128.2    P2p

…

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/2            Root LRN 19        128.2    P2p

…

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/2            Root FWD 19        128.2    P2p
```

Force another switch to become your primary root bridge

```
S2(config)#spanning-tree vlan 1 root primary
```

You can then perform a show spanning-tree command to view the changes.

Disable spanning tree on all switches and cause a broadcast storm

Repeat the following steps on all switches:

```
S1(config)#no spanning-tree vlan 1

S1#show spanning-tree detail
No spanning tree instance exists.
```

To cause the broadcast storm, a simple ping can do…

```
S1#ping 4.2.2.2
```

Then watch the port lights on your switch. They should start blinking madly. The CLI will probably be slower to respond while this is happening. To restore everything back to normal, repeat the following steps on all switches:

```
S1(config)#spanning-tree vlan 1
```

Enable Rapid STP on all switches and verify STP summary

Repeat on all switches…

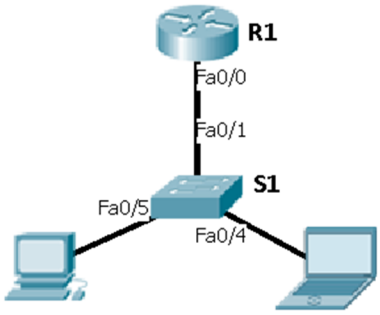
```
S1(config)#spanning-tree mode rapid-pvst

S1#show spanning-tree summary
Switch is in rapid-pvst mode ← Confirm Rapid PVST mode is enabled
Root bridge for: VLAN0001
EtherChannel misconfig guard is enabled
Extended system ID           is enabled
Portfast Default             is disabled
PortFast BPDU Guard Default  is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default            is disabled
UplinkFast                   is disabled
BackboneFast                 is disabled
Pathcost method used         is short

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN0001                    0         0        0          2          2
---------------------- -------- --------- -------- ---------- ----------
1 vlan                      0         0        0          2          2
```

On the blocking switch, enable Spanning Tree events debugging and…

```
S2#debug spanning-tree events
Spanning Tree event debugging is on

S2(config)#interface fa0/1
S2(config-if)#shutdown

12:09:04: RSTP(1): updt roles, root port Fa0/1 is going down
12:09:04: RSTP(1): Fa0/2 is now root port
12:09:06: %LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively
down
12:09:07: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state
to down

S2(config-if)#no shutdown
S2(config-if)#
12:09:20: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
S2(config-if)#
12:09:22: RSTP(1): initializing port Fa0/1
12:09:22: RSTP(1): Fa0/1 is now designated
12:09:22: RSTP(1): transmitting a proposal on Fa0/1
12:09:22: RSTP(1): updt roles, superior bpdu on Fa0/1 (synced=0)
12:09:22: RSTP(1): Fa0/1 is now root port
12:09:22: RSTP(1): Fa0/2 blocked by re-root
12:09:22: RSTP(1): Fa0/2 not in sync
12:09:22: RSTP(1): Fa0/2 is now alternate
12:09:22: RSTP(1): synced Fa0/1
12:09:22: RSTP(1): synced Fa0/1
12:09:22: RSTP(1): transmitting an agreement on Fa0/1 as a response to a proposal
12:09:23: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state
to up

S2#no debug spanning-tree events
Spanning Tree event debugging is off
```

Lab 3 – VLAN Routing (Router on-a-stick)

Material required: 1 switch, 1 router, 2 PC, 3 standard Ethernet cables.



Configuring Inter-VLAN routing

Objectives

Configuring and understanding inter-VLAN routing.

Preparation

- Disconnect all Ethernet cables from S1.
- Connect R1 to port Fa0/1 on S1.
- Connect PC1 to port Fa0/4 on S1.
- Connect PC2 to port Fa0/5 on S1.
- Configure R1 and S1 using the scripts in appendix 2.
- Prepare two computers using the following configurations.
    - Both: 100mbps/full duplex
    - PC1: IP address: 10.1.0.5/24, Gateway: 10.1.0.1
    - PC2: IP address: 10.2.0.5/24, Gateway: 10.2.0.1

Tasks

- On S1, perform the following tasks
    - Create VLAN 10, with a description of “Students” and assign port Fa0/4 to it.
    - Create VLAN 20, with a description of “Faculty” and assign port Fa0/5 to it.
    - Configure port Fa0/1 to forward VLAN information to the router.
- On R1, perform the following tasks
    - Create a sub-interface named Fa0/0.10, that is part of VLAN 10.
    - Set the sub-interface IP address to 10.1.0.1/24
    - Create a sub-interface named Fa0/0.20, that is part of VLAN 20.
    - Set the sub-interface IP address to 10.2.0.1/24
    - Verify the VLAN configurations summary
    - Enable RIPv2 as the routing protocol
    - Enable the route
- On either PC, test the connectivity using Ping and Tracert.

Walkthrough

On S1, perform the following tasks…

```
S1(config)#vlan 10
S1(config-vlan)#name Students
S1(config-vlan)#vlan 20
S1(config-vlan)#name Faculty
S1(config-vlan)#exit
S1(config)#interface fastEthernet 0/4
S1(config-if)#switchport access vlan 10
S1(config-if)#interface fastEthernet 0/5
S1(config-if)#switchport access vlan 20
S1(config-if)#exit
S1(config)#interface fastEthernet 0/1
S1(config-if)#switchport mode trunk
S1(config-if)#^Z


S1#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/6
                                                 Fa0/7, Fa0/8, Fa0/9, Fa0/10
                                                 Fa0/11, Fa0/12, Fa0/13, Fa0/14
                                                 Fa0/15, Fa0/16, Fa0/17, Fa0/18
                                                 Fa0/19, Fa0/20, Fa0/21, Fa0/22
                                                 Fa0/23, Fa0/24
10   Students                          active    Fa0/4
20   Faculty                           active    Fa0/5
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup
```

On R1, perform the following tasks

```
R1(config)#interface fastEthernet 0/0.10
R1(config-subif)#encapsulation dot1Q 10
R1(config-subif)#ip address 10.1.0.1 255.255.255.0
R1(config-subif)#interface fastEthernet 0/0.20
R1(config-subif)#encapsulation dot1Q 20
R1(config-subif)#ip address 10.2.0.1 255.255.255.0

R1#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.1.1     YES manual up                    up
FastEthernet0/0.10         10.1.0.1        YES manual up                    up
FastEthernet0/0.20         10.2.0.1        YES manual up                    up
Serial0/0                  unassigned      YES unset  administratively down down
Serial0/1                  unassigned      YES unset  administratively down down

R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 10.0.0.0
R1(config-router)#^Z
```

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 2 subnets
C       10.2.0.0 is directly connected, FastEthernet0/0.20
C       10.1.0.0 is directly connected, FastEthernet0/0.10
C    192.168.1.0/24 is directly connected, FastEthernet0/0
```

You are now able to ping from any VLAN to any device on the network (VLAN1, 10 or 20).

From PC1 (VLAN 10) to PC2 (VLAN 20)

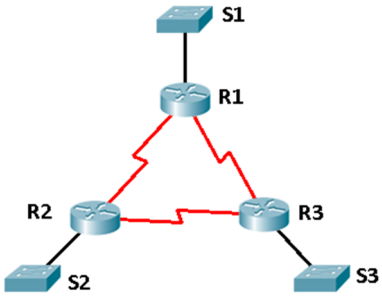
```
PC>ping 10.2.0.5

Pinging 10.2.0.5 with 32 bytes of data:

Reply from 10.2.0.5: bytes=32 time=33ms TTL=127
Reply from 10.2.0.5: bytes=32 time=8ms TTL=127
Reply from 10.2.0.5: bytes=32 time=9ms TTL=127
Reply from 10.2.0.5: bytes=32 time=7ms TTL=127

Ping statistics for 10.2.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 7ms, Maximum = 33ms, Average = 14ms
```

From PC1 (VLAN 10) to S1 (VLAN 1)

```
PC>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:

Reply from 192.168.1.5: bytes=32 time=10ms TTL=254
Reply from 192.168.1.5: bytes=32 time=15ms TTL=254
Reply from 192.168.1.5: bytes=32 time=5ms TTL=254
Reply from 192.168.1.5: bytes=32 time=5ms 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 = 5ms, Maximum = 15ms, Average = 8ms
```

Lab 4 – Routing Protocols

Material required: 3 switches, 3 routers, 3 DCE-DTE Smart Serial cables, 3 standard Ethernet cables.



OSPF

Objectives

This lab simulates the connection of three different sites with different subnets using OSPF.

Preparation

- Connect the DCE end of each cable to the Serial0 interface, and the DTE end to Serial1 of the neighbor router.
- Connect a standard Ethernet cable from Ethernet0 on each router to Port Fa0/1 on each switch.
- Configure the switches and routers using the scripts in Appendix 3.

Tasks

- Complete the following table:

	R1 Fa0/0	R2 Fa0/0	R3 Fa0/0	R1-R2 Serial Link	R2-R3 Serial Link	R3-R1 Serial Link	S1 VLAN1	S2 VLAN1	S3 VLAN1
Subnet	10.0.0.0	172.16.5.0	192.168.0.0	10.50.0.0	10.50.0.0	10.50.0.0	10.0.0.0	172.16.0.0	192.168.0.0
Number of hosts	450	75	35	2	2	2	-	-	-
Subnet Mask bits									
IP Address									

  - Use the first address in each subnet for the router and the last for the switch.
  - For the serial links, use the first subnet for R1-R2, the 2nd for R2-R3 and the 3rd for R3-R1.
- Configure the addresses on all interfaces and enable all links, set the clock rates to 64000.
- Verify all links to ensure connectivity between all components.
- Enable OSPF routing using the router number as process ID and enable all routes (summarize if possible).
- From each router, ping all VLAN interface IPs to verify connectivity.
- Display the protocol information on R3 to confirm published routes and routing protocol used.
- Display the routing table for R2.
- Display the OSPF neighbor list on R2.
- Display the OSPF database on R2.

Walkthrough

Complete the following table…

	R1 Fa0/0	R2 Fa0/0	R3 Fa0/0	R1-R2 Serial Link	R2-R3 Serial Link	R3-R1 Serial Link	S1 VLAN1	S2 VLAN1	S3 VLAN1
Subnet	10.0.0.0	172.16.5.0	192.168.0.0	10.50.0.0	10.50.0.0	10.50.0.0	10.0.0.0	172.16.0.0	192.168.0.0
Number of hosts	450	75	35	2	2	2	-	-	-
Subnet Mask bits	23	25	26	30	30	30	23	25	26
IP Address	10.0.0.1	172.16.5.1	192.168.0.1	10.50.0.1 10.50.0.2	10.50.0.5 10.50.0.6	10.50.0.9 10.50.0.10	10.0.1.254	172.16.5.126	192.168.0.62

Configure the addresses on all interfaces and enable all links

```
S1(config)#interface vlan 1
S1(config-if)#ip address 10.0.1.254 255.255.254.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 10.0.0.1

S2(config)#interface vlan 1
S2(config-if)#ip address 172.16.5.126 255.255.255.128
S2(config-if)#no shutdown
S2(config-if)#exit
S2(config)#ip default-gateway 172.16.5.1

S3(config)#interface vlan 1
S3(config-if)#ip address 192.168.0.62 255.255.255.192
S3(config-if)#no shutdown
S3(config-if)#exit
S3(config)#ip default-gateway 192.168.0.1

R1(config)#interface fastEthernet 0/0
R1(config-if)#ip address 10.0.0.1 255.255.254.0
R1(config-if)#no shutdown

R2(config)#interface fastEthernet 0/0
R2(config-if)#ip address 172.16.5.1 255.255.254.128
R2(config-if)#no shutdown

R3(config)#interface fastEthernet 0/0
R3(config-if)#ip address 192.168.0.1 255.255.255.192
R3(config-if)#no shutdown

R1(config)#interface serial 0/0
R1(config-if)#ip address 10.50.0.1 255.255.255.252
R1(config-if)#clock rate 64000
R1(config-if)#no shutdown

R1(config-if)#interface serial 0/1
R1(config-if)#ip address 10.50.0.10 255.255.255.252
R1(config-if)#no shutdown

R2(config)#interface serial 0/0
R2(config-if)#ip address 10.50.0.5 255.255.255.252
R2(config-if)#clock rate 64000
R2(config-if)#no shutdown

R2(config-if)#interface serial 0/1
R2(config-if)#ip address 10.50.0.2 255.255.255.252
R2(config-if)#no shutdown

R3(config)#interface serial 0/0
R3(config-if)#ip address 10.50.0.9 255.255.255.252
R3(config-if)#clock rate 64000
```

```
R3(config-if)#no shutdown

R3(config-if)#interface serial 0/1
R3(config-if)#ip address 10.50.0.6 255.255.255.252
R3(config-if)#no shutdown
```

Verify all links to ensure connectivity between all components

To do so, you can either ping from each end, or use CDP to ensure devices are seen.

```
R3#ping 192.168.0.62

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.62, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R1#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater

Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
R2.subnet192.com Ser 0/0            151         R S I      Cisco 2620Ser 0/1
R3.subnet192.com Ser 0/1            132         R S I      Cisco 2620Ser 0/0
S1.subnet192.com Fas 0/0            127          S I       WS-C2950-2Fas 0/1
```

Enable OSPF routing using the router number as process ID and enable all routes…

```
R1(config-router)#network 10.0.0.0 0.255.255.255 area 0

R2(config-router)#network 10.50.0.0 0.0.255.255 area 0
R2(config-router)#network 172.16.0.0 0.0.255.255 area 0

R3(config-router)#network 10.50.0.0 0.0.255.255 area 0
R3(config-router)#network 192.168.0.0 0.0.255.255 area 0
```

From each router, ping all VLAN interface IPs to verify connectivity

From each router, ping the 3 IP addresses that were configured on the switches. Successful pings will confirm that all sub networks are accessible from everywhere.

```
R3#ping 192.168.0.62

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.62, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

R3#ping 10.0.1.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.1.254, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/30/32 ms
```

```
R3#ping 172.16.5.126

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.5.126, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/28/32 ms
```

Display the protocol information on R3 to confirm published routes…

```
R3#show ip protocols
Routing Protocol is "ospf 3"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.0.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.50.0.0 0.0.255.255 area 0
    192.168.0.0 0.0.255.255 area 0
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.50.0.10           110      00:07:43
    172.16.5.1           110      00:07:43
  Distance: (default is 110)
```

Display the routing table on R2

```
R2#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/25 is subnetted, 1 subnets
C       172.16.5.0 is directly connected, FastEthernet0/0
     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
O       10.0.0.0/23 [110/65] via 10.50.0.1, 00:10:25, Serial0/1 ← OSPF learned route
O       10.50.0.8/30 [110/128] via 10.50.0.6, 00:10:25, Serial0/0 ← OSPF learned route
                     [110/128] via 10.50.0.1, 00:10:25, Serial0/1
C       10.50.0.0/30 is directly connected, Serial0/1
C       10.50.0.4/30 is directly connected, Serial0/0
     192.168.0.0/26 is subnetted, 1 subnets
O       192.168.0.0 [110/65] via 10.50.0.6, 00:10:26, Serial0/0 ← OSPF learned route
```

Display the OSPF neighbor list on R2

```
R2#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
10.50.0.10        0   FULL/  -        00:00:34    10.50.0.1       Serial0/1
192.168.0.1       0   FULL/  -        00:00:35    10.50.0.6       Serial0/0
```

Display the OSPF database on R2

```
R2#show ip ospf database

            OSPF Router with ID (172.16.5.1) (Process ID 1)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link count
10.50.0.10      10.50.0.10      77          0x80000001 0x00F241 5
172.16.5.1      172.16.5.1      76          0x80000003 0x0087FC 5
192.168.0.1     192.168.0.1     77          0x80000005 0x001FC3 5
```

EIGRP

Objectives

This lab simulates the connection of three different sites with different subnets using EIGRP.

Preparation

- The topology configured for the OSPF section will be used. No changes required.

Tasks

- Disable OSPF on all routers.
- Enable EIGRP using ASN 1.
- Enable all routes.
- Display the routing table on R2.
- Display the protocol information on R3.
- Display the neighbors list on R2.

Walkthrough

Disable OSPF on all routers

```
R1(config)#no router ospf 1
R2(config)#no router ospf 2
R3(config)#no router ospf 3
```

Enable EIGRP using ASN 1

```
R1(config)#router eigrp 1
R2(config)#router eigrp 1
R3(config)#router eigrp 1
```

Enable all routes

```
R1(config-router)#network 10.50.0.0

R2(config-router)#network 10.50.0.0
R2(config-router)#network 172.16.0.0

R3(config-router)#network 10.50.0.0
R3(config-router)#network 192.168.0.0
```

Display the routing table on R2

```
R2#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.5.0/25 is directly connected, FastEthernet0/0
D       172.16.0.0/16 is a summary, 00:00:42, Null0 ← EIGRP learned route
     10.0.0.0/8 is variably subnetted, 5 subnets, 3 masks
D       10.0.0.0/23 [90/2172416] via 10.50.0.1, 00:00:40, Serial0/1← EIGRP learned route
D       10.0.0.0/8 is a summary, 00:00:42, Null0 ← Auto summarized route
D       10.50.0.8/30 [90/2681856] via 10.50.0.6, 00:00:40, Serial0/0← EIGRP learned route
                     [90/2681856] via 10.50.0.1, 00:00:40, Serial0/1
C       10.50.0.0/30 is directly connected, Serial0/1
C       10.50.0.4/30 is directly connected, Serial0/0
D    192.168.0.0/24 [90/2172416] via 10.50.0.6, 00:00:41, Serial0/0← EIGRP learned route
```

Display the protocol information on R3

```
R3#show ip protocols
Routing Protocol is "eigrp 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Redistributing: eigrp 1
  EIGRP NSF-aware route hold timer is 240s
  Automatic network summarization is in effect
  Automatic address summarization:
    192.168.0.0/24 for Serial0/0, Serial0/1
      Summarizing with metric 28160
    10.0.0.0/8 for FastEthernet0/0
      Summarizing with metric 2169856
  Maximum path: 4
  Routing for Networks:
    10.0.0.0
    192.168.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    (this router)         90      00:29:36
    Gateway         Distance      Last Update
    10.50.0.10            90      00:01:40
    10.50.0.5             90      00:01:40
  Distance: internal 90 external 170
```

Display the neighbors list on R2

```
R2#show ip eigrp neighbors
IP-EIGRP neighbors for process 1
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
1   10.50.0.1               Se0/1             14 00:00:24   26   200  0  5
0   10.50.0.6               Se0/0             12 00:00:35   25   200  0  9
```

Lab 5 – WAN

Material required: To be determined…

TOPOLOGY DIAGRAM

Configuring a hub and spoke topology using Frame Relay

Objectives

…

Preparation

- …

Tasks

- …

Lab 6 – Access Lists

Material required: To be determined…

TOPOLOGY DIAGRAM

Configuring and assigning Access Lists

Objectives

…

Preparation

- …

Tasks

- …

Lab 7 – Network Address Translation (NAT/PAT)

Material required: To be determined…

TOPOLOGY DIAGRAM

Configuring NAT

Objectives

…

Preparation

- …

Tasks

- …

Lab 8 – IPv6

Material required: 3 routers, 1 PC, crossover and regular Ethernet cables.

TOPOLOGY DIAGRAM

IPv6 to IPv4 Tunneling

Objectives

…

Preparation

- …

Tasks

- …

Appendix 1

Lab 1 Switch configurations

Using a rollover cable, connect to the console port and perform a factory default reset on all switches. Disconnect all Ethernet cables until all resets have been completed to prevent propagation of certain parameters.

```
Switch>enable
Switch#write erase
Switch#delete flash:vlan.dat
Switch#reload
```

Paste the following script in the CLI on each switch to configure it. Edit to fit your specifications (# of ports etc.)

Switch 1 (S1)	Switch 2 (S2)	Switch 3 (S3)
enable configure terminal hostname S1 service password-encryption alias exec save copy run start ip default-gateway 192.168.1.1 enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 24 speed 100 duplex full exit interface vlan 1 ip address 192.168.1.5 255.255.255.0 no shutdown exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname S2 service password-encryption alias exec save copy run start ip default-gateway 192.168.1.1 enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 12 speed 100 duplex full exit interface vlan 1 ip address 192.168.1.6 255.255.255.0 no shutdown exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname S3 service password-encryption alias exec save copy run start ip default-gateway 192.168.1.1 enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 24 speed 100 duplex full exit interface vlan 1 ip address 192.168.1.7 255.255.255.0 no shutdown exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>

Appendix 2

Lab 3 Router and switch configurations

Using a rollover cable, connect to the console port and perform a factory default reset on each device.

```
Router>enable
Router#write erase
Router#reload

Switch>enable
Switch#write erase
Switch#delete flash:vlan.dat
Switch#reload
```

Paste the following scripts in the CLI on the router and switch to reconfigure them.

Router 1 (R1)	Switch 1 (S1)
enable configure terminal hostname R1 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface fa0/0 ip address 192.168.1.1 255.255.255.0 speed 100 duplex full no shutdown exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname S1 service password-encryption alias exec save copy run start ip default-gateway 192.168.1.1 enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 24 speed 100 duplex full exit interface vlan 1 ip address 192.168.1.5 255.255.255.0 no shutdown exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>

Appendix 3

Lab 4 Device configurations

Using a rollover cable, connect to the console port and perform a factory default reset on each device.

```
Router>enable
Router#write erase
Router#reload

Switch>enable
Switch#write erase
Switch#delete flash:vlan.dat
Switch#reload
```

Paste the following scripts in the CLI on the router and switch to reconfigure them.

Switch 1 (S1)	Switch 2 (S2)	Switch 3 (S3)
enable configure terminal hostname S1 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 24 speed 100 duplex full exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname S2 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 12 speed 100 duplex full exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname S3 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface range fa0/1 - 24 speed 100 duplex full exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>

Router 1 (R1)	Router 2 (R2)	Router 3 (R3)
enable configure terminal hostname R1 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface fa0/0 speed 100 duplex full exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname R2 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface fa0/0 speed 100 duplex full exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>	enable configure terminal hostname R3 service password-encryption alias exec save copy run start enable secret ciscosecret ip domain-name subnet192.com interface fa0/0 speed 100 duplex full exit line con 0 no exec-timeout password cisco logging synchronous line vty 0 4 no exec-timeout password remote login transport input telnet line vty 5 15 no exec-timeout password remote transport input telnet end save <press enter to save>

References & Resources

Cisco official certification information
http://www.cisco.com/web/learning/le3/learning_career_certifications_and_learning_paths_home.html

The Cisco Learning Network
https://learningnetwork.cisco.com/index.jspa?ciscoHome=true

Cisco Feature Navigator
http://tools.cisco.com/ITDIT/CFN/jsp/index.jsp

Wendell Odom's CertSkills
http://www.certskills.com/

Software

Dynagen/Dynamips Cisco emulator
http://dynagen.org/

Tera Term terminal emulator
http://en.sourceforge.jp/projects/ttssh2/

TFTPD32 TFTP server
http://tftpd32.jounin.net/

Special thanks…

To my wife Luz and my son Ian, for understanding my passion for technology; and to all of you who went through this whole guide and thought…

"Wow! What a great guide, I can pass this exam easily now! This guy rocks!" ☺

… and then went to Paypal and sent in a donation to marc@subnet192.com to thank me for all my hard work.

Good luck with the exam!

Marc Bouchard

http://www.subnet192.com