

# Layer 2 Network Design Lab

April 3, 2017

# Part 1

## Introduction

The purpose of these exercises is to build Layer 2 (switched) networks utilizing the concepts explained in today's design presentations. Students will see how star topology, aggregation, Spanning Tree Protocol, etc. are put to work.

There will be 5 groups of students, with 4 switches per group. The distribution of IP address space for the building (Layer 2) networks will be as follows:

- Group 1: 10.1.64.0/24
- Group 2: 10.2.64.0/24
- Group 3: 10.3.64.0/24
- Group 4: 10.4.64.0/24
- Group 5: 10.5.64.0/24

## Switch types used in the lab

Cisco 3750

## Lab access instructions

Refer to the file called [lab-access-dynamips.htm](#)

## Hierarchical, redundant network

Our building network consists of two redundant backbone switches and two edge switches. The backbone switches connect to the core of our campus network and serve as aggregation points for all the edge switches. Edge switches serve the end users. Each edge switch has a connection to both backbone switches, so that if one of the backbone switches fails, the switch has an alternative connection.

## Basic Switch Configuration

Follow these instructions to configure each switch:

NOTE: Clear all configurations on the switches as follows;

```
write erase
reload
```

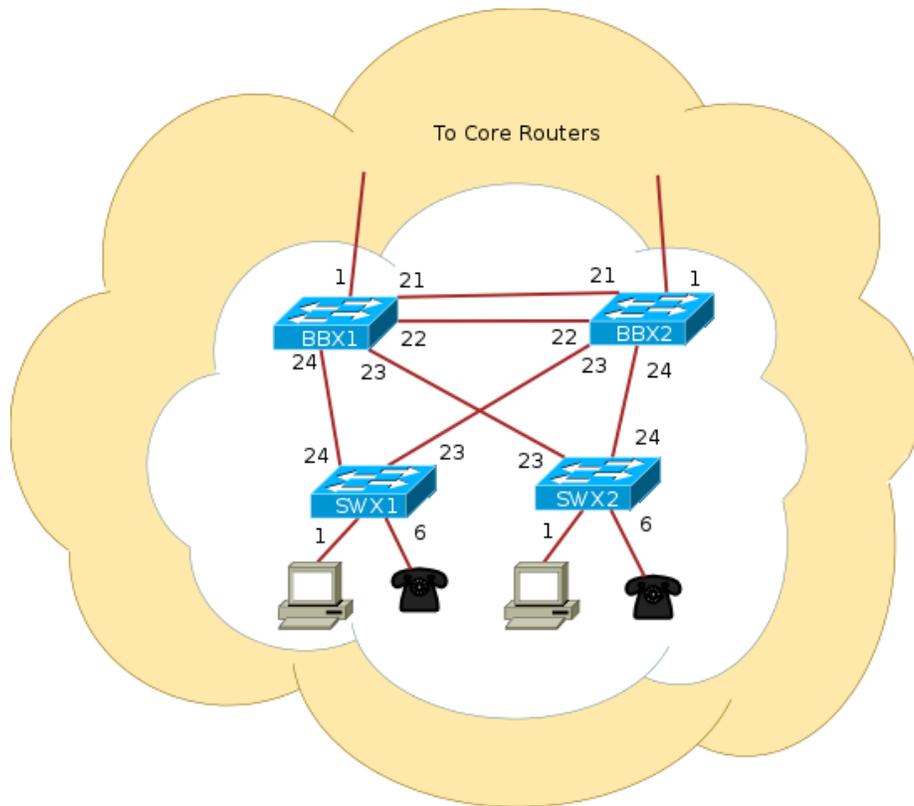


Figure 1: Lab topology

1. Name the switch

```
enable
config terminal
hostname <NAME>
```

2. Configure Authentication

```
aaa new-model
aaa authentication login default local
aaa authentication enable default enable
username nsrc secret nsrc
enable secret nsrc
service password-encryption
line vty 0 4
  transport preferred none
line console 0
  transport preferred none
```

3. Configure logging

```
no logging console
logging buffered 8192 debugging
```

4. Disable DNS resolution

```
no ip domain-lookup
```

5. Exit configuration mode and save

```
end
write memory
```

## **IP Address Configuration**

1. Assign each switch a different IP address as follows:

```
int vlan 1
ip address 10.X.64.Y 255.255.255.0
no shut
end
```

Replace the “X” with your group number, and replace “Y” like this:

1. BBX1: 10.X.64.4
1. BBX2: 10.X.64.5
1. SWX1: 10.X.64.6
1. SWX2: 10.X.64.7

Verify connectivity by pinging each switch. Do not continue until you can ping each switch from every other switch.

HINT: If ping fails, but the configuration seems OK, try doing the following:

```
int vlan 1
 shutdown
 no shutdown
end
```

(this is not normal, but most likely a bug in the IOS code somewhere)

## Spanning Tree Protocol

### STP Status

Run the following commands and pay close attention to the output:

```
show spanning-tree bridge
show spanning-tree blockedports
show spanning-tree
```

- a. What is the priority on each switch?
- b. Which switch is the root? Why?
- c. Which ports are blocked? Why?

### STP Configuration

1. Configure the STP priorities explicitly for each switch, according to the plan in Appendix A.

For example, on BB11:

```
BB11(config)#spanning-tree vlan 1 priority 12288
```

2. Verify:

```
show spanning-tree bridge
```

Why is it so important to set the priorities explicitly?

## Disabling STP

We are now going to disable spanning tree to see what effect it has.

**ASK THE INSTRUCTOR BEFORE DISABLING STP!!!**

**THE INSTRUCTOR MAY DEMO A BROADCAST STORM INSTEAD**

When you get the go-ahead from the instructor, execute the following on each switch:

```
no spanning-tree vlan 1
```

Can the switches ping each other reliably now? Why?

Watch the port counters on the inter-switch links.

```
show interfaces stats
```

What happens with the counters of the connected interfaces? What is going on?

Very quickly enable STP again on all switches:

```
spanning-tree vlan 1
```

If this still doesn't recover, it may be necessary to get the instructor to restart the simulator.

## Simulate a backbone failure

1. Disconnect BBX1 from the rest of the network:

```
interface range fastEthernet 1/21 - 24
shutdown
```

While it is cut off from the rest, verify spanning tree status on the other switches.

- a. Who is the root now?
- b. Verify port roles and status. Verify connectivity with ping.

2. Reconnect BBX1:

```
interface range fastEthernet 1/21 - 24
no shutdown
```

What happens to the spanning tree when the switch comes back online?

## Reference

### Appendix A - Spanning Tree Configuration

Refer to this priority table below for the appropriate priorities on each switch.

Priority	Description	Notes
0	Core Node	The core switches/routers will not be participating in STP... reserved in case they ever are
4096	Redundant Core Node	Ditto
8192	Reserved	
12288	<b>Building Backbone</b> (BBX1)	
16384	<b>Redundant Backbones</b> (BBX2)	
20480	Secondary Backbone	This is for building complexes, where there are separate building (secondary) backbones that terminate at the complex backbone.
24576	<b>Access Switches</b> (SWX1, SWX2)	This is the normal edge-device priority
28672	Access Switches	Used for access switches that are daisy-chained from another access switch. We're using this terminology instead of "aggregation switch" because it's hard to define when a switch stops being an access switch and becomes an aggregation switch.
32768	Default	No managed network devices should have this priority.

Table 1: Priority Table