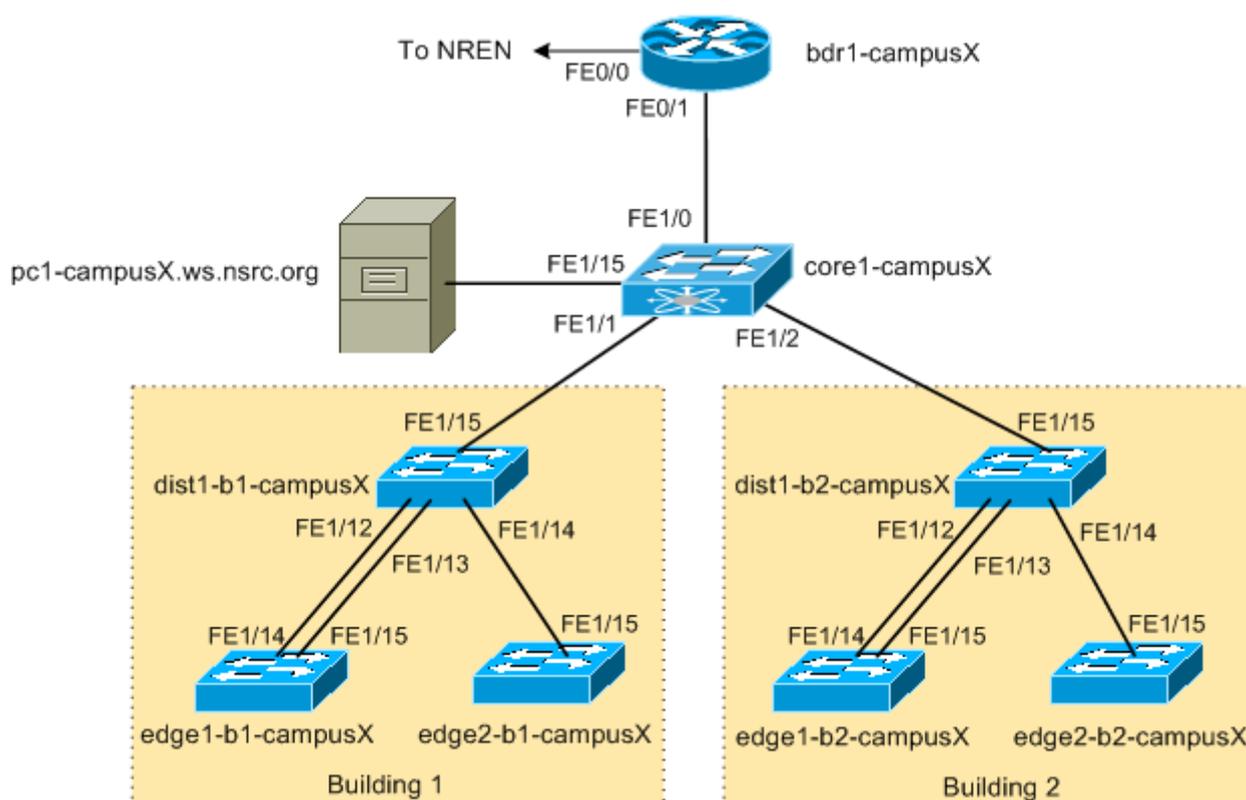


Layer 2 Network Design Lab - Spanning Tree Protocol

Introduction

The purpose of this lab is to introduce the Spanning Tree Protocol and how to configure priorities of core, distribution and access switches appropriately.

This lab is a continuation from the earlier set up exercise, and the lab layout is identical:



Initial STP Status

Before we begin configuring spanning tree we will take a look at the current situation on the network.

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

```
show spanning-tree brief
show spanning-tree blockedports
show spanning-tree
```

- What is the priority on each switch?
- Which switch is the root? Why?
- Which ports are blocked? Why?

Make a note of the answers to the above questions, as we will compare those with the answers once we do the next step. If the instructors ask you, please write them up on the classroom whiteboard too.

STP Configuration

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

For example, on dist1-b1-campus1:

```
dist1-b1-campus1(config)#spanning-tree vlan 1 priority 12288
```

Verify:

```
show spanning-tree brief
```

Why is it so important to set the priorities explicitly?

Check the output of the spanning-tree status command. What is happening on edge1-bY-campusX? Here is an example taken from one of the past Campus Network Design Workshops (your interface numbers and MAC addresses might be different):

```
edge1-b1-campus6#show spanning-tree brief

VLAN1
  Spanning tree enabled protocol ieee
  Root ID    Priority    0
            Address    c42b.5c43.0000
            Cost      38
            Port      55 (FastEthernet1/14)
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    24576
            Address    c42d.5c43.0000
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15 sec
            Aging Time 300

Interface                               Designated
Name                                     Port ID Prio Cost  Sts Cost  Bridge ID           Port
ID
-----
--
FastEthernet1/14                         128.55  128   19 FWD   19 12288 c42c.5c43.0000
128.53
FastEthernet1/15                         128.56  128   19 BLK   19 12288 c42c.5c43.0000
128.54
```

There are actually two links from edge1 to dist1 in each Building. We will use these two links later on in this lab exercise.

Notice how one link is in Forwarding Mode, and the other link is in Blocking Mode. This is so we do not have a loop between the edge1 and dist1 switches. If spanning tree is turned off between these two switches, we end up with a loop, traffic would not be forwarded, and the CPU load on the switches would go to 100%.

Disabling STP

We could disable spanning tree to see what effect it has.

WARNING: Disabling spanning tree has a significant effect on the Dynamips server's CPU load. For this reason, we cannot safely demonstrate this in our virtual environment.

START OF DEMO ONLY SECTION

We'll try to set up a demo with real hardware in class - here's what we'll try on the test setup.

On a network of real switches we could type:

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

Can the switches ping each other reliably now? Why?

Watch the port counters on the inter-switch links.

```
show interface 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
```

This is known as a **Broadcast Storm**

WARNING: Don't try this on a production network!

END OF DEMO ONLY SECTION

Simulate a backbone failure

Disconnect core1-campusX from the rest of the network:

```
interface range FastEthernet 1/1 - 2  
shutdown
```

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

- Which switch is the root now?
- Verify port roles and status. Verify connectivity with ping.

Reconnect core1-campusX:

```
interface range FastEthernet 1/1 - 2
no shutdown
```

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

Appendix A - Spanning Tree Configuration

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

Priority	Description	Notes
0	Core Switch	For the core switch (core1-campusX)
4096	Redundant Core Switch	For cases where we have a second core switch (building redundancy into the core)
8192	Reserved	
12288	Building Distribution	(dist1-b1-campusX; dist1-b2-campusX)
16384	Redundant Building Distribution	For cases where we have a redundant building distribution switch
20480	Secondary Backbone	This is for building complexes, where there are separate building (secondary) backbones that terminate at the complex backbone.
24576	Access Switches	This is the normal edge-device priority (edge1-b1-campusX; edge2-b1-campusX; edge1-b2-campusX; edge2-b2-campusX)
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.

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