

POLITECNICO DI TORINO

PROGETTO DI RETI LOCALI

Lab 2: Spanning Tree Protocol

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April 18, 2017

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Acknowledgments

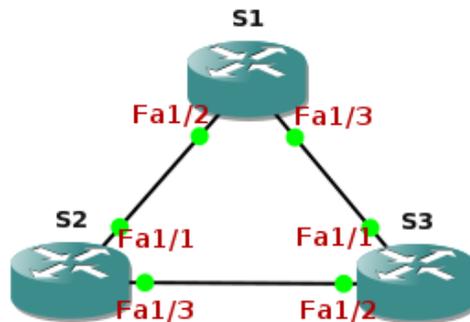
The author would like to thank all the persons that contributed to those exercises. Particularly, special thanks go to Guido Marchetto.

1 Introduction

In this lab assignment we are going to use three switches connected to create a physical loop in order to analyze how the Spanning Tree Protocol works.

2 Topology

The topology used in this assignment is represented in the following picture:



S1, S2 and S3 are *Cisco 2691* routers equipped with the optional *NM-16ESW Etherswitch module* that provides switched interfaces, transforming a router into a switch (on those interfaces, while the native interfaces of the router are still *routed* interfaces).

3 Preparing the lab configuration

Log-in in the network emulation system, create the network topology as depicted in the figure above and start the devices. Finally, open all the configuration consoles of the network devices involved in the lab and be ready to interact with them.

For this lab no additional configuration steps are required, as the switched ports are already configured by default to use the Spanning Tree Protocol.

4 Analysis of the Spanning Tree Protocol

First, we verify the Spanning Tree configuration. On each switch, type the command:

```
show spanning-tree
```

Now, answer to the following questions:

1. Which is the device elected as *ROOT*? Why?
2. What is the *Bridge Priority* of each device?
3. Which are the interfaces elected as *ROOT PORT* and which as *DESIGNATED PORT*?
4. What is the status of the interfaces on each device?
5. Which is the path that a packet follows in order to go from S1 to S2? From S1 to S3? And from S2 to S3?

5 Configuring the Spanning Tree Protocol

In this step, we will change the *bridge priority* of one device in order to force the Spanning Tree Protocol to elect it as new *ROOT*. For this, enter the global configuration mode and type:

```
spanning-tree vlan 1 priority <value>
```

Carefully choose the priority value.

Now, check the new Spanning Tree configuration and answer to the following questions:

1. Report and motivate the *Bridge Priority* value that you configured at previous point.
2. Which are the interfaces elected as *ROOT PORT* and which as *DESIGNATED PORT*?
3. What is the status of the interfaces on each device?
4. Which is the path that a packet follows in order to go from S1 to S2? From S1 to S3? And from S2 to S3?

6 Spanning Tree and topology changes

In this step, we would like to analyze the behavior of the Spanning Tree Protocol when stimulated by a topology change.

Start the capture on each link in the topology. On the *ROOT* switch, shutdown one of the two interfaces that connect it to the other switches. After about a minute, stop the capture.

Now, answer to the following questions:

1. Save and open the capture files.
2. Analyze the Spanning Tree packets captured, listing the fields (and the packets they belong to) that can be used to infer the new configuration of the spanning tree and motivate your answer.
3. Analyze the timestamp of the captured packets and correlate them to the timers of the STP.

4. How many *Topology Change Notification* packets do you expect to find in the capture file and why? Now count the number of TCN packets actually sent. Are these the number and the position in the capture file that you expected? Notice how precisely predicting the behavior of advanced network protocols such as the STP is often quite difficult, due to both the complexity of the standard and possible vendor customizations.