Local and Metropolitan Area Network Design (LMAND)

Progettazione di Reti Locali e Comprensorio (PRLC)

Exercises: Spanning Tree

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Sommario

Legend ......................................................................................................................... 4
Methodology ................................................................................................................ 5
Exercise n. 1 ................................................................................................................... 6
Exercise n. 2 ................................................................................................................... 7
Exercise n. 3 ................................................................................................................... 8
Exercise n. 4 ................................................................................................................... 9
Exercise n. 5 ................................................................................................................... 10
Exercise n. 6 ................................................................................................................... 11
Exercise n. 7 ................................................................................................................... 12
Exercise n. 8 ................................................................................................................... 13
Exercise n. 9 ................................................................................................................... 14
Exercise n. 10 ............................................................................................................... 15
Exercise n. 11 ............................................................................................................... 16
Exercise n. 12 ............................................................................................................... 17
Exercise n. 13 ............................................................................................................... 18
Exercise n. 14 ............................................................................................................... 19
Exercise n. 15 ............................................................................................................... 20
Solution for exercise n. 1 ............................................................................................ 22
Solution for exercise n. 2 ............................................................................................ 23
Solution for exercise n. 3 ............................................................................................ 24
Solution for exercise n. 4 ............................................................................................ 25
Solution for exercise n. 5 ............................................................................................ 26
Solution for exercise n. 6 ............................................................................................ 27
Solution for exercise n. 7 ............................................................................................ 28
Solution for exercise n. 8 ............................................................................................ 29
Spanning Tree Protocol ................................................................................................. 29
Solution for exercise n. 9 ............................................................................................ 30
Solution for exercise n. 10 .......................................................................................... 31
Solution for exercise n. 11 ........................................................................................................32
Solution for exercise n. 12 ........................................................................................................33
Solution for exercise n. 13 ........................................................................................................34
Solution for exercise n. 14 ........................................................................................................35
Solution for exercise n. 15 ........................................................................................................36
Legend

Spanning Tree Port Roles

- Root port
- Designated port
- Blocked port

Rapid Spanning Tree Port Roles

- Root port
- Designated port
- Edge port
- Alternate port
- Backup port
- Disabled port
Methodology

The outcome of the Spanning Tree can be easily obtained through the following steps:

1. Determine the root bridge (i.e. the bridge that has the best Bridge ID)
2. Determine the spanning tree across the entire network, selecting the best paths in the network toward each bridge
3. For each bridge, select the root port
   a. In case the bridge has only one path toward the root bridge, that port will be the root port
   b. In case the bridge has multiple equivalent paths toward the root bridge, use the selection criteria in order to determine which is the best root port
4. For each LAN, select the designated port (among the ports that are not root)
5. Put the remaining ports in blocking state.

The outcome of the RSTP is definitely similar to the STP one, the difference being the criteria used to select a status to the ports and the multiple states available.
Exercise n. 1

Referring to the network topology depicted below, determine the final outcome of the Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 2

Referring to the network topology depicted below, determine the final outcome of the Spanning Tree Protocol, assuming that:

- the MAC address of the switch $S_{xx}$ is 00-00-00-AA-AA-$xx$;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 3

Referring to the network topology depicted below, determine the final outcome of the Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.

![Network Topology Diagram]
Exercise n. 4

Referring to the network topology depicted below, determine the final outcome of the Spanning Tree Protocol, assuming that:

- the MAC address of the switch $S_{xx}$ is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 5

Referring to the network topology depicted below, determine the final outcome of the Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 6

Referring to the network topology depicted below, determine the final outcome of the Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 7

Given the network topology in the figure below, configure the proper parameters in the switches so that switches on the left side of the building will send frames to the left switch in the basement, while switches on the right side of the building will send frames to the right switch in the basement. No VLANs are configured in the network.
Exercise n. 8

Due to a configuration error, both sides of a cable are connected to the same switch, as shown in the figure below. Explain what happens and motivate the answer. Consider both the STP and the RSTP protocols.
Exercise n. 9

Referring to the network topology depicted below, determine the final outcome of the Rapid Spanning Tree Protocol, assuming that:

- the MAC address of the switch $S_{xx}$ is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 10

Referring to the network topology depicted below, determine the final outcome of the Rapid Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.

![Network Topology Diagram]
Exercise n. 11

Referring to the network topology depicted below, determine the final outcome of the Rapid Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 12

Referring to the network topology depicted below, determine the final outcome of the Rapid Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 13

Referring to the network topology depicted below, which resembles to a network for a four-floors building, determine the final outcome of the Rapid Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Exercise n. 14

Referring to the network topology depicted below, determine the final outcome of the Rapid Spanning Tree Protocol, assuming that:

- the MAC address of the switch Sxx is 00-00-00-AA-AA-xx;
- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified;
- the Link Aggregation function is used to interconnect one switch to another when multiple links are available.
Exercise n. 15 (optional)

Referring to the network topology depicted below, determine the final outcome of the Common and Internal Spanning Tree (CIST), assuming that:

- the Bridge Priority of each bridge is set to the default value, unless differently specified;
- the Port Path Cost is equal to 10 on each link, unless differently specified.
Solution for exercise n. 1

Considering that all the switches have the same Bridge Priority, S00 is elected as root because it has the lowest MAC ADDRESS (00-00-00-AA-AA-00).

S01 and S02 elect respectively Fe1 and Fe0 as root ports because directly connected with the root bridge (they feature the lowest cost towards the root bridge).

Fe0 is elected as root port on S03 as it is directly connected with the switch that has the lowest bridge identifier, since Fe1, which features the same cost towards the root bridge, receives a BPDU with a lower bridge identifier. Port Fe1 will then enter in the blocking state.

Fe3 on S01 is elected as designated port for Ethernet C as it features the lowest cost towards the root bridge. Consequently Fe2 on S03 enters the blocking state.