Communication networks – theoretical exercise 2

1. The root of the network is bridge 6 (because it has the smallest ID).

|  |  |  |
| --- | --- | --- |
| Bridge | Root port | Designated ports |
| 6 | - | 1 |
| 11 | 1\* | - |
| 19 | 1 | 2, 3 |
| 23 | 2 | 1 |
| 35 | 2 | 1 |
| 42 | 2 | 1 |

\* since bridge 11 has no designated ports, its root port is blocked and therefore this bridge should be removed from the network

1. Yes we can!

In the current configuration, the path of the message is:

C 🡪 19 🡪 A 🡪 23 🡪 F 🡪 42 🡪 E

By changing bridge 11 ID to 4 (for example; any ID smaller than 6 would work), the new SP root would be 4. In that case, when sending a message from C to E we can get a shorter message path:

C 🡪 35 🡪 D 🡪 4 (originally 11) 🡪 E

Namely, the message goes through 2 bridges instead of 3, so indeed we got an improvement. Great success!

1. **Claim**: after the STP protocol converges a bridge does not have a root port iff this bridge is the root.

**Proof:**

* Let B be the ID of the root bridge in the network. Let us assume that B is connected to N neighbors (bridges) with IDs B1, … , BN. According to the protocol, each bridge of B1, … , BN will get the following message from B: **B.0.B**. This message will "beat" any of the other messages gotten from its neighbors (according to the lexicographic order we defined in class). For example: if some (neighbor) bridge Bi sends the following message: **root\_id.len.Bi** then B ≤ *root\_id* because B is the root, and therefore it holds the smallest ID in the network (this is why it was chosen to be the root in the first place…). If B = root\_id then it must hold that 0 < *len*, because in that case Biconsiders B as the root port, and therefore it knows that the length from it is at least 1 (len = 0 only if Bi thinks it is the root, and that is not the case anymore). All in all we get that B sent the a better message than its neighbors, and therefore (as we saw in class) it has no root port.
* Let B be the ID of a bridge in the network which is not the root bridge. Let B\* be the ID of a bridge that is a neighbor of B and has the shortest distance to the root bride among B's neighbors. W.L.G we will also assume that if there are more neighbors of B with the same distance from the root, their IDs are larger than B\*. When the algorithm converges, the last message sent from B\* would be **root\_id.len.B\*** where *root\_id* and *len* are the **real** root ID and the optimal distance from B\* to it, respectively. Since B\* has the lowest ID among B's neighbors with the minimal distance from the root, then B will choose to send its data through B' (namely, the message B gets from B\* beats the other messages, including its own message), which will make B' its root port. Notice that this proof still holds in the case where B\* is the root. □

**שאלת בונוס**

שיטות תקשורת בתקופת המכבים:

1. איתותי עשן (ע"י מדורות למשל)
2. שליחים