ASSIGNMENT 3

CSCI 6704 – Advanced Topics in Networks
Exercise 2

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Exercise 2: Consider the bridge configuration shown in the figure below. Bridges B1 and B2 connect two LANs, and A and B are hosts on one LAN. This is one of the configurations that results in a classic problem in bridges called the bridge loop problem that results in a race condition. One of the solutions to this problem is then bridge spanning tree protocol. Conduct an online search to understand this problem, and how it is fixed. Write a short report (approximately one page, 12-point, single font including citations) on your study of the problem and its solution.

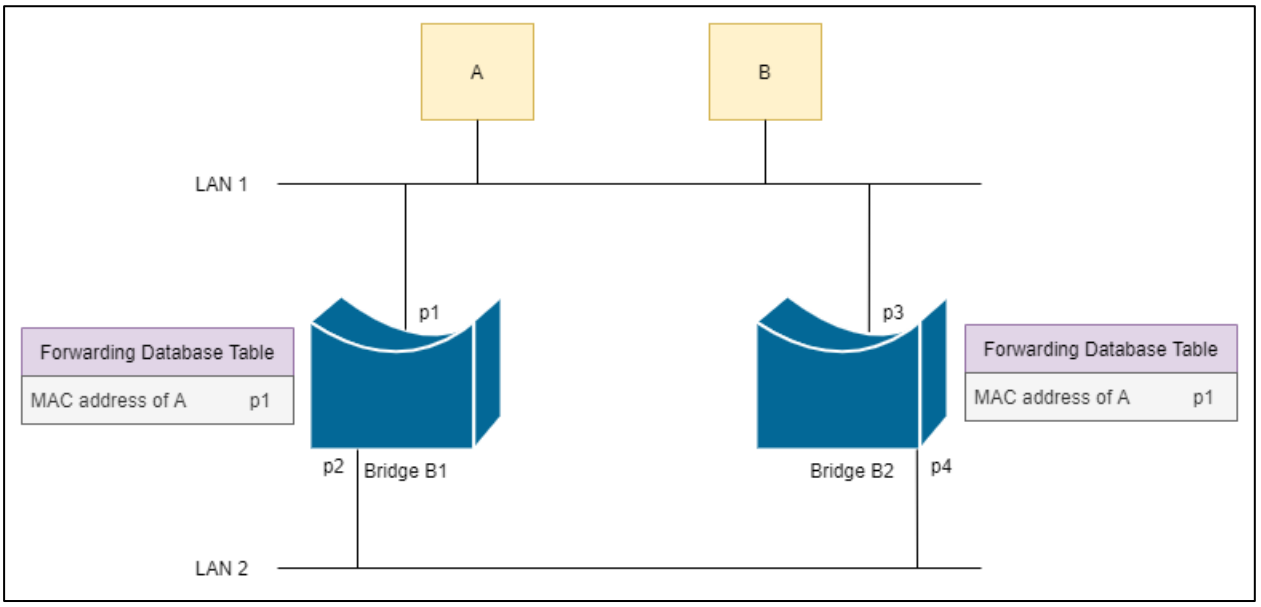

Figure 1 - Bridge configuration that creates bridge loop problem [1]

The given configuration consists of two bridges(i.e., Bridge B1 and Bridge B2), each connected to two LANs (i.e., LAN 1 and LAN 2). Also, LAN 1 connects two hosts (i.e., Host A and Host B) and is connected to bridges B1 and B2 at ports p1 and p3 respectively. Also, LAN 2 is connected to bridges B1 and B2 at ports p2 and p4 respectively. This configuration consists of redundant bridges as multiple bridges connect LAN 1 and LAN 2. Thus, if a single bridge fails, another one takes its' place. However, having such a configuration creates loops in the network. To understand the bridge loop problem, consider the following scenario.

Bridge Loop Problem Example:

Assume Host A want to transmit a frame to Host B. Initially, the Forwarding Database (FDB) table for both the bridges are empty. The frame transmitted by Host A is received by bridges B1 and B2 at ports p1 and p3 respectively. Since the tables of both the bridges are empty, they broadcast the frames and update their tables with entry [MAC address of A | p1]. The frames are further transmitted by the bridges B1 and B2 over LAN 2 from ports p2 and p4 respectively. This results in LAN 2 having two copies of a single frame. The frames are then redirected to the other end via B2 and B1 bridges this time. LAN 1 now has two copies of a single frame which are received by Host B. Since there is no entry of Host B in the Forwarding Database (FDB) table, the process

keeps repeating endlessly, resulting in a loop. However, this process would not stop because of the inherent property of bridges which states along with filtering it also strengthens the signal. Thus, after each loop, the frames are again regenerated. [2]

Bridge Spanning Tree Protocol:

One solution to bridge loop problem is bridge spanning tree protocol. When there are more than one links (i.e., alternative links) to a destination, at a time only one link (i.e., primary link) will be used to transfer data. All alternative links are disabled. The bridges are aware of the network topology; however, the alternative paths remain disabled till the primary link fails. This process is achieved using spanning tree algorithm. The algorithm looks for all the alternative paths in the network by treating one host as a reference point. When it finds alternative paths to that reference point, it decides as to which path will remain enabled for data transfer and which alternative paths will be disabled. This solves the problem of bridge loop control and thereby offers network reliability and availability. [3]

References

[1] diagrams.net, "Flowchart Maker & Online Diagram Software," diagrams.net, [Online]. Available: https://app.diagrams.net/. [Accessed 25 October 2021].

[2] My Reading Room, "Loop problem in Transparent Bridges," My Reading Room, [Online]. Available: http://www.myreadingroom.co.in/notes-and-studymaterial/68-dcn/843-loop-problem-in-transparent-bridges.html. [Accessed 25 October 2021].

[3] Cicso, "Cisco Certified Expert," Cicso, [Online]. Available: https://www.ccexpert.us/switched-networks/preventing-bridge-loops.html. [Accessed 25 October 2021].