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Implementation of the meshed tree algorithm on a switched network

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Implementation of the meshed tree algorithm on a switched network

by

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1. Abstract

Loop avoidance is a critical component of switched networks. Protocols like STP, RSTP, TRILL, etc solve this problem in different ways, but there is room for improvement. The Meshed Tree Protocol aims to improve the performance of switched networks while avoiding loops. In this research, a working model of the Meshed Tree Protocol (MTP) using OPNET was created. The performance of RSTP, the current industry standard, was examined and performance metrics like link failure convergence time and root failure convergence time were documented to create a baseline for further development of MTP.

2. Introduction

Switched networks introduce link redundancy in order to improve network reliability. However, this results in loops in the networks which can result in broadcast storms that render the network unusable. For this reason, protocols like Spanning Tree Protocol (STP) were developed to ensure loop free forwarding. Loop-avoidance protocols create loop-free forwarding paths by creating logical trees in the network in such a way that every node is included but there is only one way to get to each node from every other node. This is done by logically blocking some of the redundant paths. While this method creates a usable tree topology, it has some inherent problems like suboptimal path for frame forwarding and convergence times upon link and node failure. RSTP, the current industry standard for loop resolution, was designed as an improvement to STP, in order to decrease convergence times on link/node failure. While it was a great improvement over STP, it does not meet the needs of today's networks. Hence, complex implementations based on Link State routing are being considered in Shortest Path Bridging [1] and TRILL [2].

The Meshed Tree Algorithm (MTA) [4-8] uses the concept of multiple logical trees from a single root meshing on a single physical topology. Frames traversing the network can use any available

tree. This will result in a more optimal path selection, especially for unicast frame forwarding. Also, since backup paths are readily available, convergence times can be reduced.

3. Purpose

This research is aimed at applying the concept of Meshed Tree Algorithm (MTA) to the switched network to develop a protocol for loop avoidance, in order to decrease convergence time, failover time and improve path selection, which will result in an increase in overall reliability and performance of the network. This protocol is called the Meshed Tree Protocol (MTP).

4. Background

Switched networks are frequently built with redundant links for increased reliability of data transfer, especially in the case of link failures. This kind of topology creates loops in the networks and when a broadcast frame is sent out, it can circulate in the network for ever, consuming the bandwidth and eventually causing the devices to crash. This condition is referred to as a broadcast storm. To avoid such an occurrence, protocols are implemented which create a loop-free logical topology over a physical topology with redundant links. This section gives an overview of the existing solutions to this problem and our proposed solution. Section 3.1 covers Spanning Tree Protocol (STP), which is based on the Spanning Tree Algorithm. Section 3.2 introduces Rapid Spanning Tree Protocol (RSTP), an enhancement to STP, which also uses STA. Section 3.3 covers TRILL, a protocol that is based on linked state routing. Section 3.4 discusses the Meshed Tree Algorithm and the Meshed Tree Protocol, which is the basis of this research.

4.1 Spanning Tree Protocol

Spanning Tree Protocol (STP) was one of the first protocols designed to create a logical loop-free topology over a network with redundant physical links. It was first proposed by Radia Perlman and was based on the Spanning Tree Algorithm (STA) [3]. STP causes devices to block certain

ports on switches in the network, such that there is only one logical path between any two switches at a given time. This is accomplished by creating a logical tree that spans every switch on the network.

First a root switch is elected and then STP uses the STA algorithm to compute best paths from every switch to the root switch. Ports that do not lead to the best path (to the root) are blocked. This creates a single logical path between any two switches. FIGURE 1 shows a topology with a single loop and FIGURE 2 illustrates two possible ways to construct a logical topology with STP.

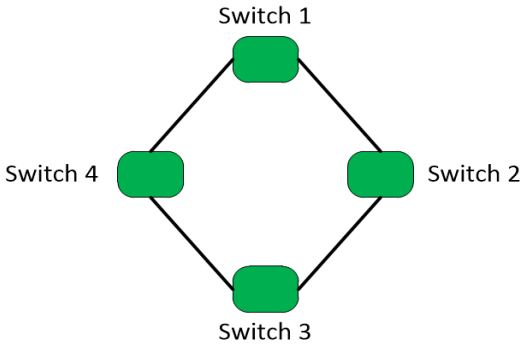

FIGURE 1: Topology with one physical loop

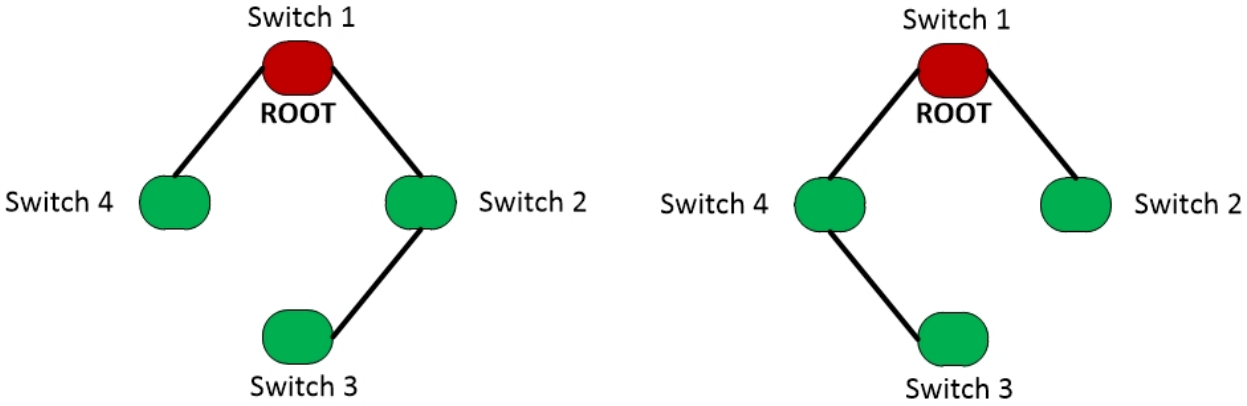

FIGURE 2: Two possible ways to create a loop-free logical topology with STP

If any active link fails, the tree is recomputed and the redundant link becomes the active link (a blocked port becomes a forwarding port). This activity is governed by several timers. Switches running STP exchange control messages called BPDUs (Bridge Protocol Data Units) as a keep-alive mechanism. These messages are exchanged every 2 seconds (hello time). Topology Change Notifications (TCNs) are sent if a link failure is detected. TCNs force the MAC address table entries to age out faster so that the switches can learn them again and make any necessary topology changes. Once a TCN is received, a blocked port may go through listening and learning stages before it is ready to forward traffic. Each stage has a timer associated with it, called the forward delay. By default, this value is 15 seconds. Thus, once link failure is detected a port can move to the forwarding state in 30 seconds. However, some network failures can only be detected by the absence of BPDUs. BPDUs have a maximum age time 20 seconds, which means the overall process will now take about 50 seconds. This is a significant delay for today's networks. FIGURE 3 shows the STP port states and FIGURE 4 shows the transition sequence with timers.

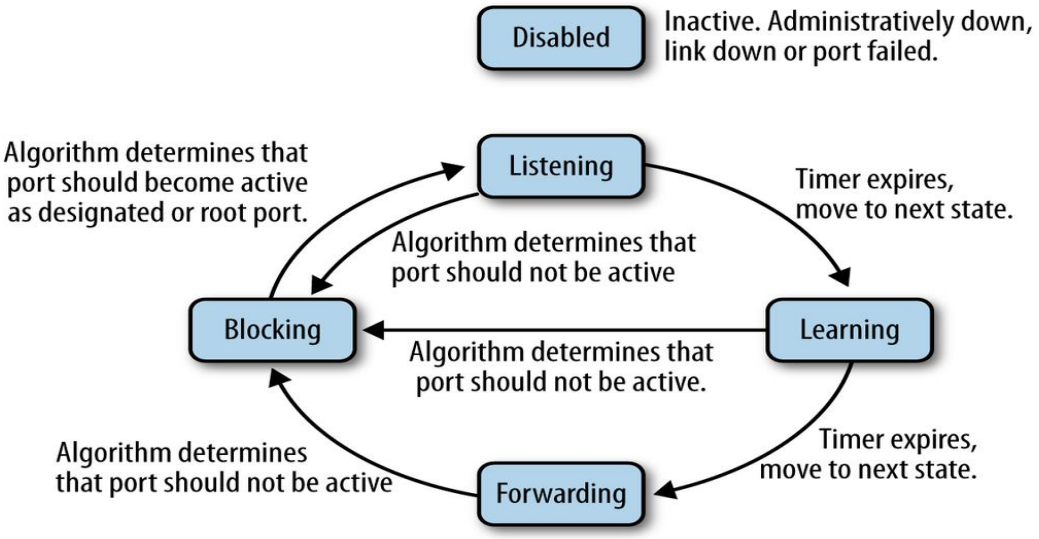

FIGURE 3: STP port states [9]

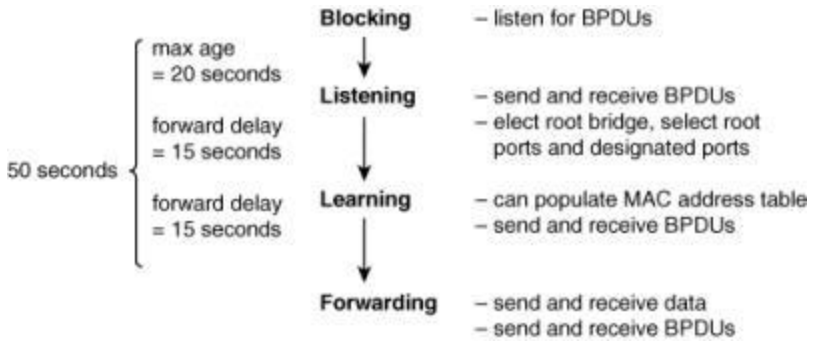

FIGURE 4: Port Transition Sequence [11]

4.2 Rapid Spanning Tree Protocol

STP was designed at the time when a minute or so of network downtime was considered acceptable. However, network uptime expectations changed rapidly as more critical and time sensitive information traversed through LANs. STP's network convergence after link failure/recovery was no longer acceptable. While it was possible to make small improvements in the performance of STP by manipulating some of the default STP parameters, it became obvious that significant changes to the way the protocol works would be needed to get major performance improvements.

The motivation behind RSTP was to make these changes to the way STP worked while keeping the same plug and play functionality offered by STP. RSTP uses most of the same terminology and is also designed to be backwards compatible with STP.

In RSTP, port states and port roles have been decoupled. Port states are discarding, learning, forwarding.

Port roles are root, designated, backup (previously blocking) and alternate (previously blocking).

The RSTP BPDU is also different from STP BPDU. The RSTP BPDU makes use of all the flag bits as shown in FIGURE 5 below.

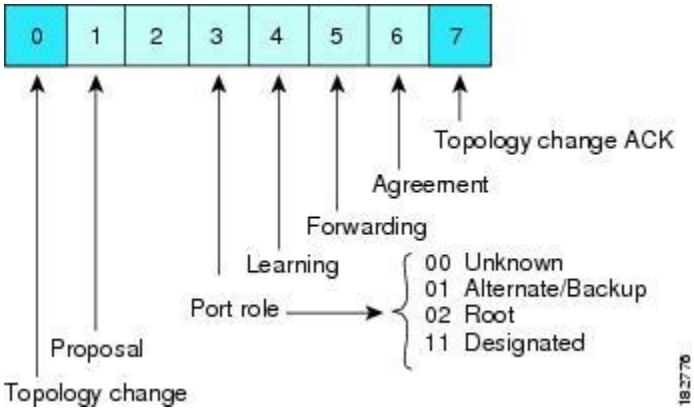

FIGURE 5: Flag bits and their use in RSTP BPDU [9]

4.2.1 Initial Convergence with RSTP

Let us consider this 4 switch topology in FIGURE 6. For initial convergence, root has to be elected. Here S1 will eventually be the root.

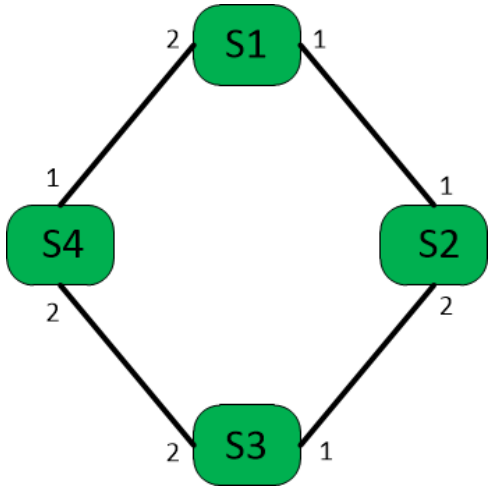

FIGURE 6: Simple 4 switch topology

RSTP uses a process call Synchronization to converge the topology. At startup, initially all ports are designated/discarding. Each switch assumes it is the root and sends out a BPDU with the

proposal flag set. Let's consider the link between S1 and S2. Both switches send a BPDU with the proposal flag set. Since the S1 sends a superior BPDU (S1 has a lower bridge ID), S2 accepts S1 as the root and sends an acknowledgement BPDU with the agreement bit set. S2 then sets port 1 to be root port (and removes root port role from any other port that may have had it, making it designated discarding). S2 also puts port 2 (and in general, all other non-edge designated ports) into discarding state. Once all the other ports (in this case port 2) are in discarding state, S2 will now move port 1 into forwarding state and send out a response BPDU with the agreement flag set. After that, port 2 on S2 reaches designated forwarding state. This completes the RSTP synchronization process between S1 and S2. FIGURE 7 illustrates this process.

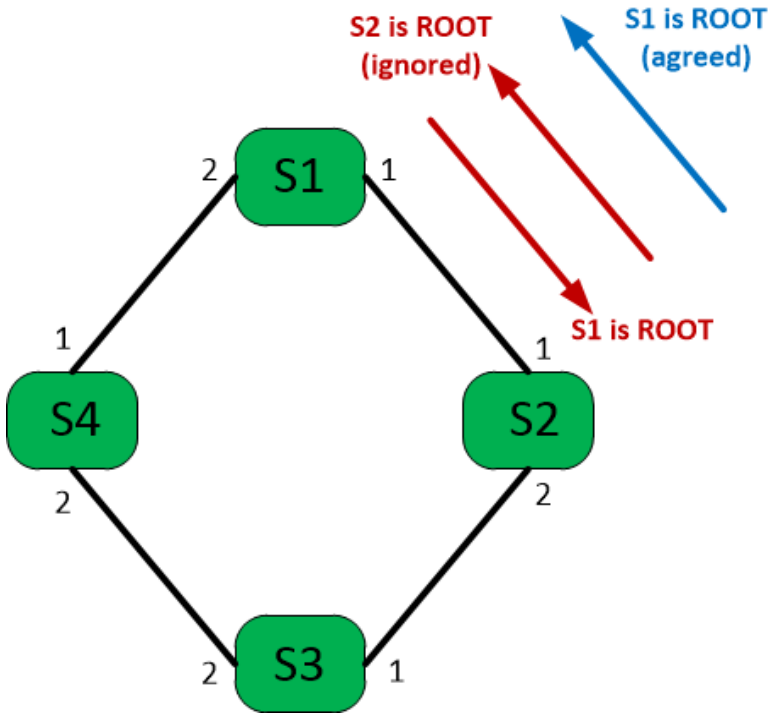

FIGURE 7: RSTP Synchronization between S1 and S2

Let us assume that S3 and S4 perform the synchronization next and S4 sends a superior BPDU. This will cause S3 to accept S4 as the root. Now as S3 proceeds to synchronize with S2, S2 sends

a superior BPDU (where S1 is the root). This causes S3 to change its root port to port 1. At the same time S4 also learns that S1 is the root through the same synchronization process. Thus the topology can converge much faster than it did with STP, where ports had to cycle through the listening-learning-forwarding states, with each transition adding a delay of 15 seconds.

Although this is a huge improvement over STP, for larger topologies time to converge will go up because a lot of potential roots will be established during the synchronization process, that have to be renegotiated before the final convergence. MTP aims to remove this trial and error process.

Topology change is detected faster in RSTP than in STP, due to the keep-alive mechanism. Hello BPDUs are sent every 2 seconds by default. 3 missed hellos are considered a failure in the topology. Physical link failures are detected instantly, i.e. 3 missed hellos are not required.

For ports that are not part of the active topology, RSTP uses the concepts of alternate ports and backup ports. An alternate port is the next best way to get to the root, if the root becomes unavailable through the root port. A backup port acts as a backup for the designated port on the same segment (not very common in today's networks). FIGURE 8 shows the final resolution of the above topology.

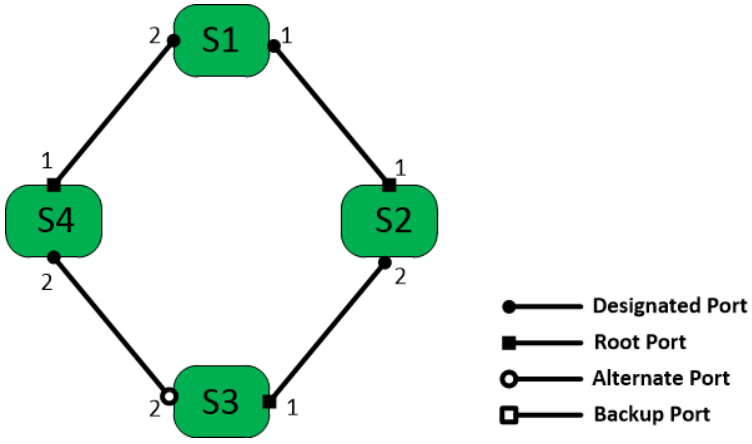

FIGURE 8: Resolved Topology

4.2.2 Link failure with RSTP

Now let us assume that the link between S2 and S3 fails. S3 has now lost its root port but it has an alternate port which can be quickly transitioned to forwarding state to reconverge the topology.

The alternate port allows the alternate path to be established quickly. However, this is only true for S3. If S2 or S4 were to lose their root port, the topology must reconverge, as seen in FIGURE 9. Also, the alternate path will only come into play when the primary path is disabled. This is suboptimal because all the links are not used effectively. With MTP, all paths are in use and frames will simply choose the best path.

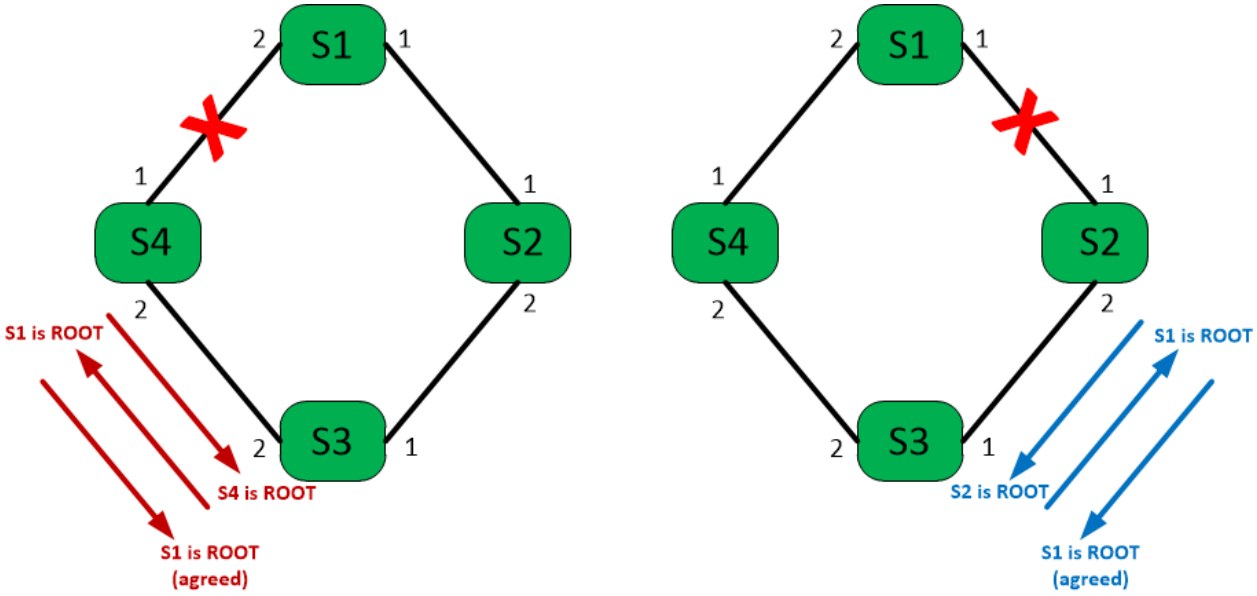

FIGURE 9: Convergence process when S2 or S4 lose the root port

4.2.3 Root failure with RSTP

Let us consider the root failure process with the topology in FIGURE 8. Once the root (S1) fails, S2 and S4 stop getting hello BPDUs. Since neither switch has an alternate port (and therefore no other way to get to the root), both assume root status. Now let us assume that S2 has a superior

BPDU but S3 gets the proposal from S4 first. At this point S3 still thinks that S1 is the root and sends this information to S4. S4 will accept this information. After this S2 and S3 will negotiate root and S2 will be accepted as root by S3. S3 will then relay this information to S4. This process is illustrated in FIGURE 10 below.

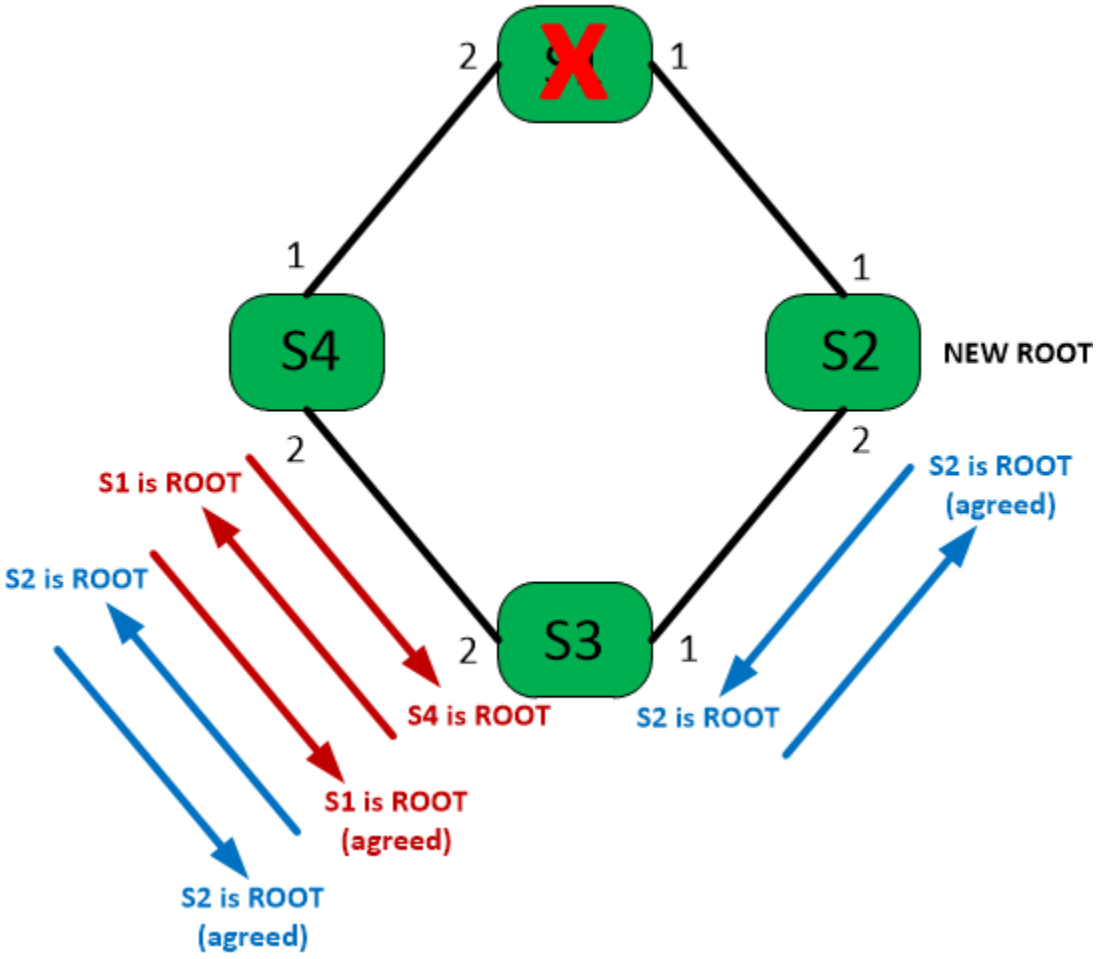

FIGURE 10: RSTP root failure resolution

The drawback here is that the topology goes through another trial and error process before the new root is elected. This causes a delay in network convergence.

4.3 TRansparent Interconnection of Lots of Links (TRILL)

TRansparent Interconnection of Lots of Links or TRILL [2] uses the concepts of layer 3 routing to create a loop free network. This is achieved by encapsulating Ethernet frames in a TRILL header, which consists of ingress nickname, egress nickname, hop count and multi-destination flag. This encapsulated frame is then routed using IS-IS to achieve loop avoidance. TRILL reduces convergence times and avoids packet looping by relying on hop count while the network transitions. However, this process of using a layer 3 protocol causes more control overhead in the network.

4.4 Meshed Tree Protocol and Meshed Tree Algorithm

To achieve the performance requirements of today's networks a faster more robust method of loop resolution is needed. The Meshed Tree Protocol (MTP) researched here overcomes the performance challenges of the options discussed above. MTP can achieve much shorter failover times once the failure has been discovered, with very little control overhead. At the crux of this protocol is the Meshed Tree Algorithm (MTA).

MTA creates multiple logical trees on a physically redundant topology, which are referred to as Meshed Trees (MT) [4-8]. Here it is assumed that a root has already been elected (a process similar to STA may be used to elect the root). For the purpose of this research we assume a designated root. MTA defines the use of Meshed Tree Virtual Identifiers (MT_VIDs) which identify a path between a switch and a root switch in a topology. A switch can have more than one MT_VID and each MT_VID contains information about the path to the root. A MT_VID contains a combination of the BridgeID (a unique switch identifier that may be defined from the mac address) and ports numbers that lead away from the root. This allows each switch to maintain information about the

multiple paths to the root, use the best possible path for data transfer, and quickly resolve to the next available path in case of failure in the network.

4.4.1 Protocol operation

Let us look at the same 4 switch topology from FIGURE 6. We consider a single root scenario at this time. Here, for the sake of simplicity and without loss of generality, we will consider the BridgeID of S1 to be 1. Since S1 is the administratively selected root, it sends out VID advertisements to S2 and S4. A VID advertisement is a frame the contains information about one of the meshed trees. When a VID advertisement is accepted by a switch, an MT_VID is added to the VID table of the switch. The VID advertisement from the root is a combination of the BridgeID and port that this advertisement was sent out on. Thus S2 receives [1.1] and S4 receives [1.2]. These advertisements are accepted into the VID tables of switches S2 and S4 (see FIGURE 11). Note that the VID table also records the incoming port of the MT_VID.

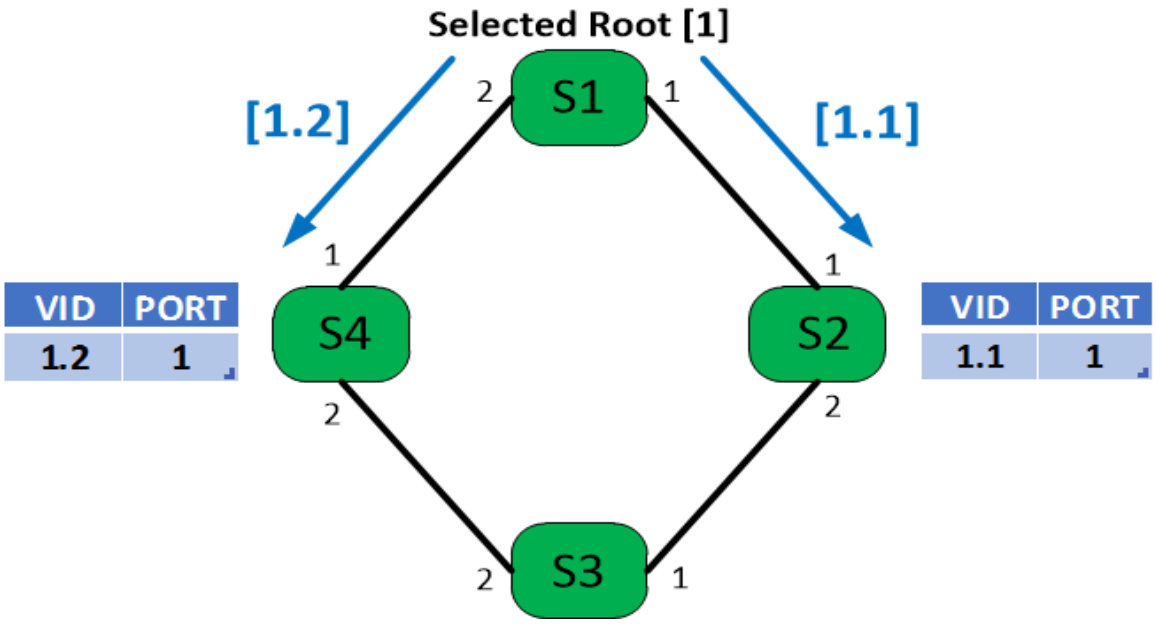

FIGURE 11: MTP Resolution - VID advertisements sent by Root

S2 and S4 now send VID advertisements to S3, appending the exit port number in the VID advertisement. Thus, S4 sends [1.2.2] and S2 sends [1.1.2]. The key point here is that S3 accepts both these VIDs as alternate paths to the root and becomes the first node to become part of multiple trees in the same physical topology. The VID table of S3 can be seen in FIGURE 12 below.

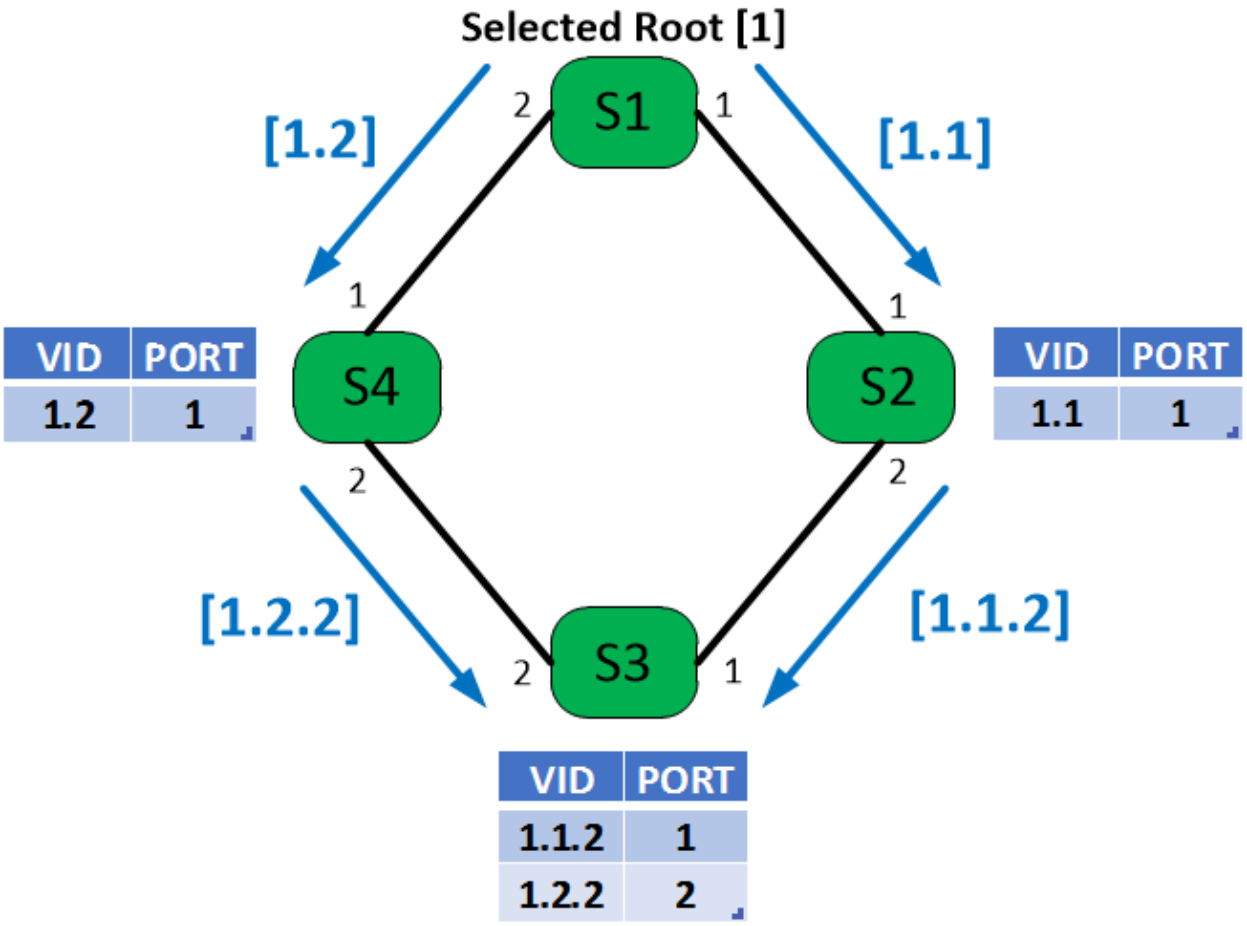

FIGURE 12: MTP Resolution- VID table of S3

The final step in this topology resolution occurs when S3 sends its own VID advertisements to S2 and S4, informing these nodes of the alternate path to the root. Thus, S3 sends [1.1.2.2] to S4 and [1.2.2.1] to S2. FIGURE 13 shows the resolved VIDs with MTP.

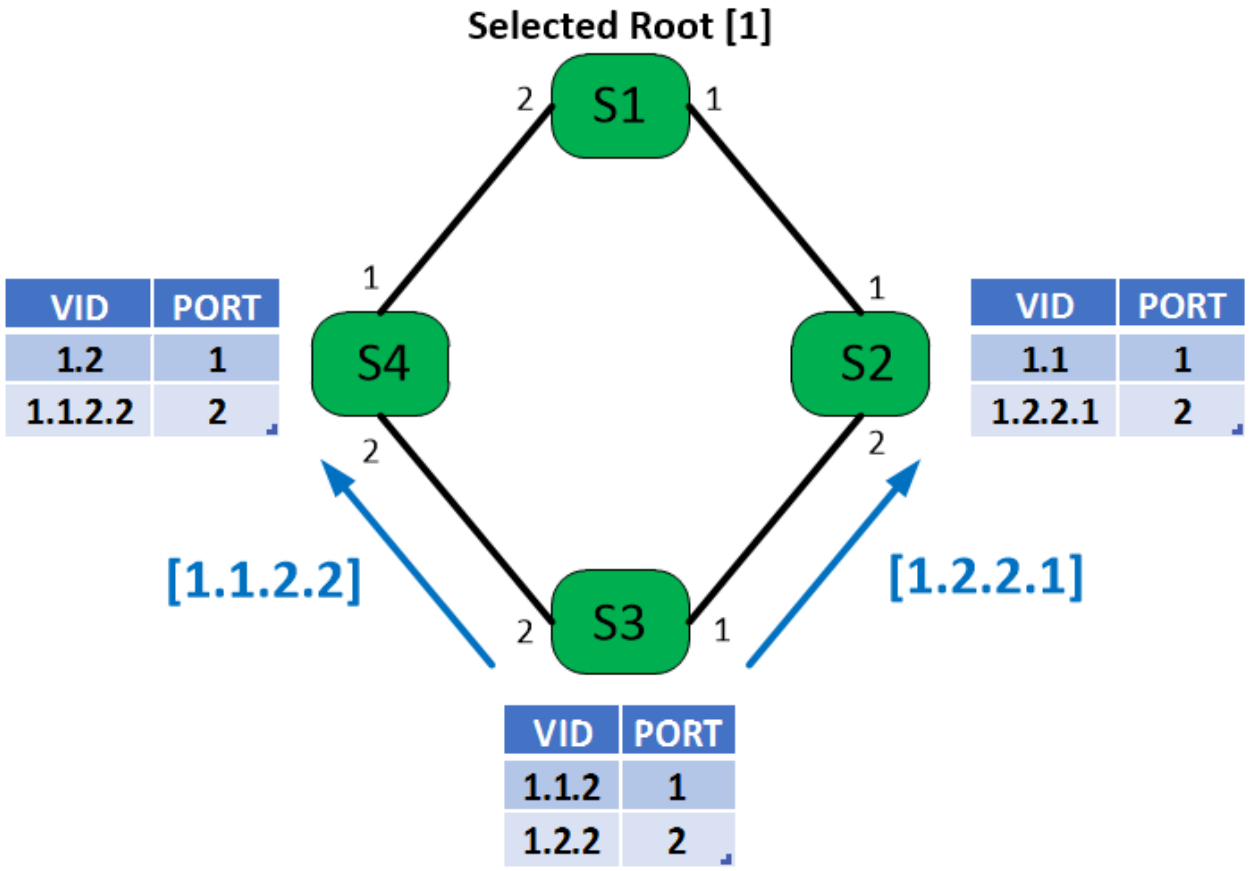

FIGURE 13: MT_VIDs for each switch in the topology

Thus we can see that each switch has well established alternate paths which can be used to optimise transmission of frames. Another important piece of the operation is that the SAT is not populated in the traditional way, by looking at the source of incoming traffic. Switches in MTP share information about hosts that are directly connected and this information is saved in Virtual SAT or a VSAT. This piece is critical to path optimization, because each switch is aware of the switch MT_VIDs that map to a host and can choose the best possible path to reach the host.

MTP defines two types of ports- host ports where a host is directly connected, and a Meshed Tree port or MT port, which is connected to another switch participating in MTP and thus is part of the

active topology. Tha MAC address of a host directly connected to a switch is learned using the source address of the frame- much like in 802.1D. Once a host is recorded by the switch it is directly connected to, the switch adds this information into its VSAT table and sends a VSAT update to its neighbors. the VSAT update contains the host MAC address and the MT_VIDs of the switch that this host is on. This information is further propagated until all switches know about all hosts.

5. Research work and Methodology

In this thesis I have researched the operational specifications of RSTP, the current industry standard, and modeled the behavior of MTP discussed above, using OPNET. OPNET is a suite of protocols and technologies to design. model and analyse networks.

5.1 RSTP model

I have studied the inbuilt OPNET model demonstrating RSTP and derived important metrics from this model. OPNET models are developed in consultation with equipment vendors and model the switch/protocol operation to specification.

5.1.1 RSTP Metrics

The following metrics have been collected:

Initial convergence time – When all ports are characterized as root/designated/alternate ports and have reached steady state. Initial convergence time represents the time taken for RSTP to converge the network before frame forwarding can begin, without loops. In OPNET, this is recorded as the time-stamp at which the last port state change takes place after the simulation starts.

Link failure and Recovery

1. **Link Failure Convergence Time** – The time at which all ports have reached steady state again, after failover. The link failure convergence time represents the disruption in the

network and network downtime as a result of a failed link. In OPNET, we recorded this as the difference between the time at which the last port state change took place after failover and the time at which link failure occurred.

2. **Link Recovery Convergence Time** – The time at which all ports reach steady state after the failed link has recovered. When a failed link recovers, the topology must reconverge to account for this new link. This event would result in a network downtime, which is recorded by the link recovery convergence time. This metric can also be considered as the time to converge after the addition of a new link in the network. In OPNET, we recorded this as the difference between the time at which the last port state change takes place after recovery and the time at which link recovery took place..

Root failure

1. **Root failure detection time -** The time at which the topology detects a root failure. Root failure is expected to result in a significant network downtime since a new root must be calculated. In OPNET this metric is recorded as the difference between time at which the first state change of a port occurs after root failure and the time at which the root failure occurs.
2. **Root failure convergence time -** The time at which all ports have reached steady state again, after root failure (this includes root failure detection time). In OPNET, this is recorded as the difference between the time at which the last port state change takes place after root failure and the time at which root failure occurs.

5.1.2 RSTP Topologies

The topologies shown in the following sections have been used for this analysis. In this research all path costs are assumed to be equal and have been kept constant.

Topology 1: 3 node - 1 loop topology

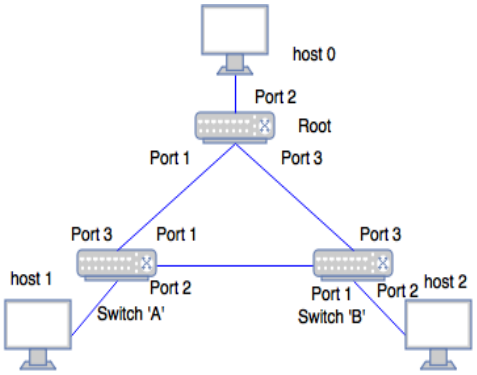

FIGURE 14: 3 node - 1 loop topology

Topology 2: 5 node - 2 loop topology

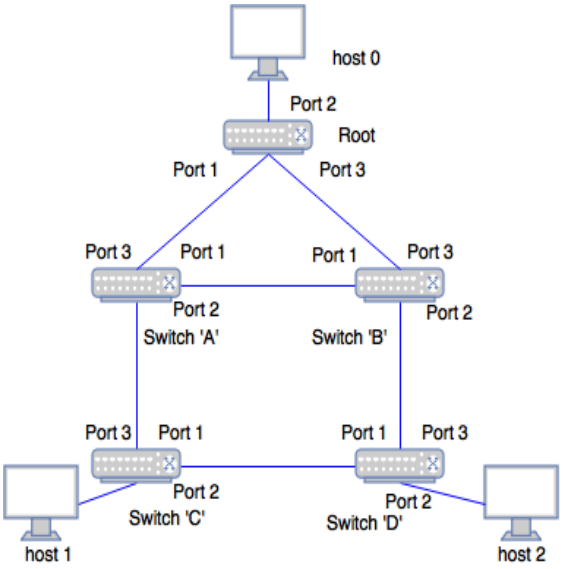

FIGURE 15: 5 node - 2 loop topology

Topology 3: 7 node - 3 loop topology

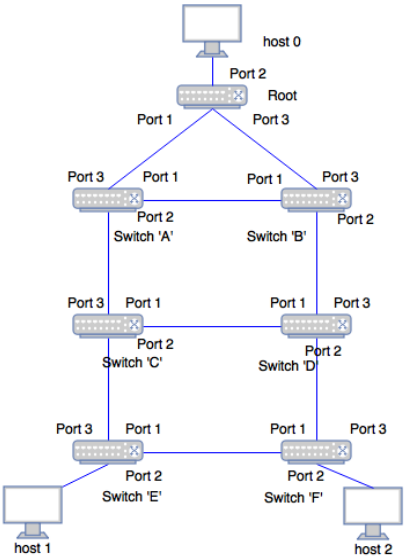

FIGURE 16: 7 node - 3 loop topology

Topology 4: 15 node - multiple loop topology

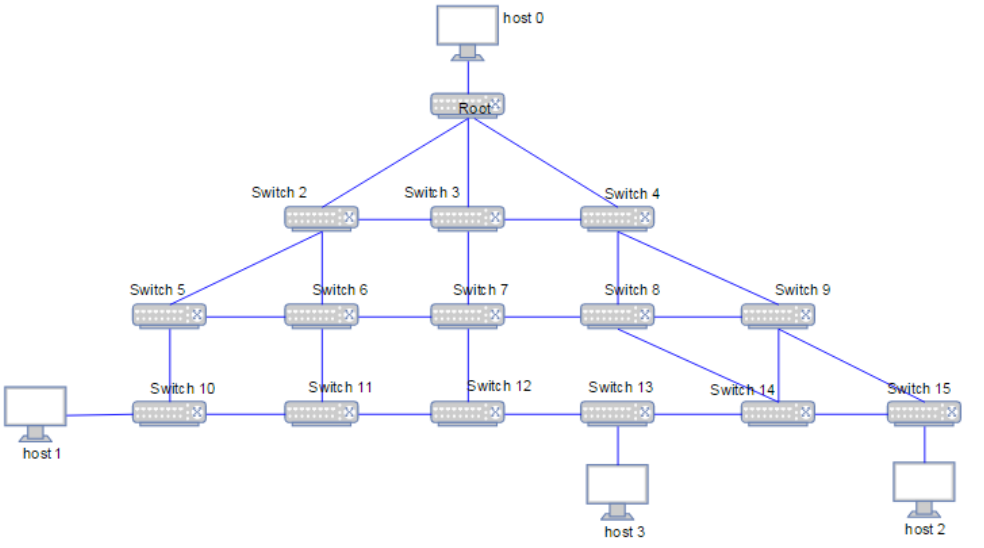

FIGURE 17: 15 node - multiple loop topology

5.1.3 RSTP results

Parameters

All links are of equal cost- 100BaseT links.

All links are full duplex.

Bridge priority has been set to 0 for all bridges. Thus, Bridge ID depends on the mac address.

Results were calculated for the following seed values- 97, 101, 103, 107, 109.

5.1.3.1 Topology 1

3 node - 1 loop topology

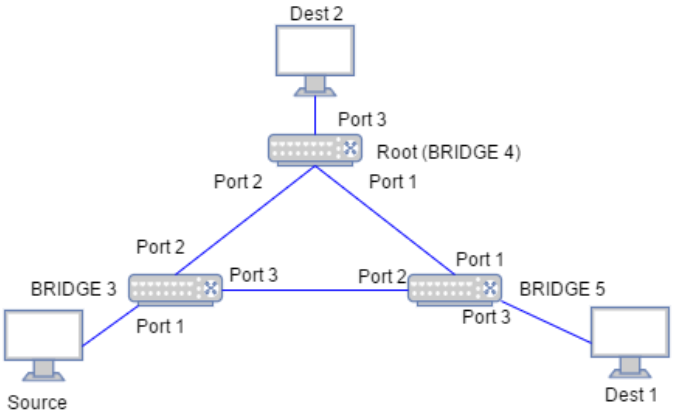

FIGURE 18: 3 node - 1 loop topology

Here we consider the simplest possible topology with 3 nodes and 1 loop, as shown in FIGURE 18. In the OPNET topology below in FIGURE 19, Bridge 4 is the root with initial loop resolution depicted. The port on Bridge 3 for the link between Bridge 3 and Bridge 5 is blocked.

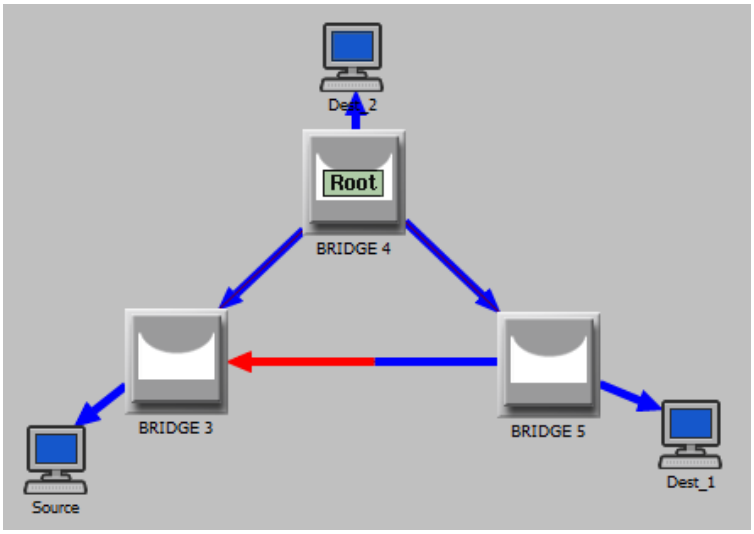

FIGURE 19: 3 node- 1 loop topology in OPNET- Initial loop resolution

Link between Root and Bridge 5 fails at 100 sec and recovers at 200 sec. Bridge 4 (Initial Root) fails at 300 sec. FIGURE 20 and FIGURE 21 below show topology resolution in each case.

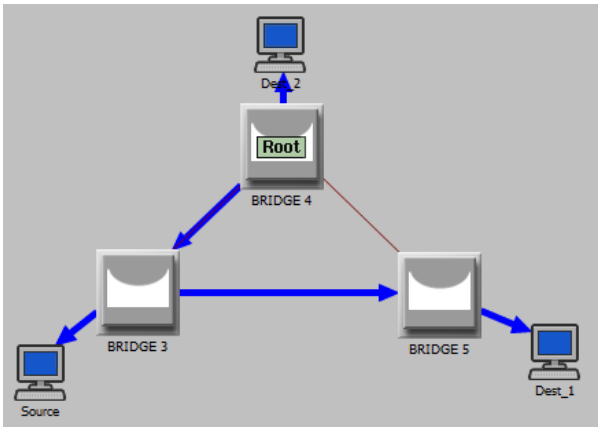

FIGURE 20: Topology resolution after link between BRIDGE 4 and BRIDGE 5 fails

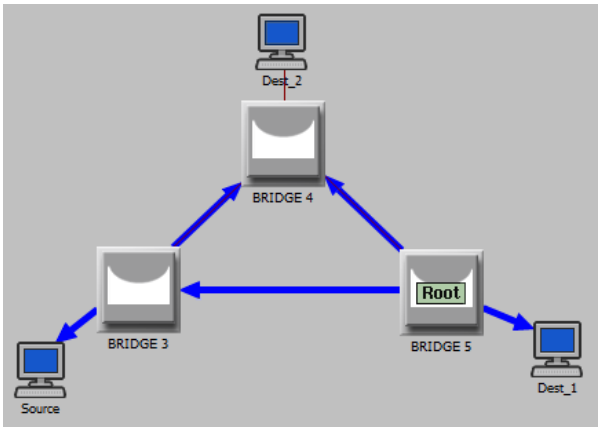

FIGURE 21: Topology resolution after root (BRIDGE 4) fails

Results

Process for collecting results: The OPNET simulation is run for 500 sec for different seed values. Every time a port changes state, a time-stamped statement is written to the output file. We take note of the time stamp for the last state change in the topology, following the events of link failure at 100 sec, link recovery at 200 sec and root failure at 300 sec. The complete output for each simulation can be found in Appendix (A).

The following output snippet shows Initial Convergence Time:

|---|

State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000036

State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000046

State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000046

State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000026

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000026

[Link Failure at 100 sec]

State of Port number 1 for BRIDGE 4 being set to DISABLED at 100.000000

State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000

|---|

Here we can see that after the simulation started, the last state change was at 30.000026 sec. After this, there are no further changes to the port states until the next disruptive event. Thus we are recording 30.000026 sec as the initial convergence time.

Note here that Port 3 on Bridge 3 is the Alternate Port and was moved to BLOCKING at 0.000046 sec. Thus, this port did not participate in the RSTP Synchronization process and port 2 on Bridge 5 followed the STP process of moving through the learning and forwarding states. Since the link

between Bridge 3 and Bridge 5 is not part of the active topology, actual traffic is not impacted by the slow resolution of port 2 on Bridge 5. Thus we can say that practical convergence time is 0.000046 sec, since frame forwarding can begin at this time.

The following output snippet shows Link Failure Convergence Time:

|----------|

State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000

State of Port number 3 for BRIDGE 3 being set to LISTENING at 104.000026

State of Port number 3 for BRIDGE 3 being set to FORWARDING at 104.000058

[Link recovers at 200 sec]

State of Port number 1 for BRIDGE 4 being set to LISTENING at 200.000000

|----------|

Here we can see that after the link was failed at 100 sec, the last state change was at 104.000058 sec. After this, there are no further changes to the port states until the next disruptive event. Thus we are recording 4.000058 sec as the Link Failure Convergence Time.

The following output snippet shows Link Recovery Convergence Time:

|----------|

State of Port number 1 for BRIDGE 4 being set to LISTENING at 200.000000

State of Port number 1 for BRIDGE 5 being set to LISTENING at 200.000000

State of Port number 2 for BRIDGE 5 being set to LISTENING at 200.000016

State of Port number 1 for BRIDGE 5 being set to FORWARDING at 200.000016

State of Port number 3 for BRIDGE 3 being set to BLOCKING at 200.000032

State of Port number 1 for BRIDGE 4 being set to FORWARDING at 200.000036

State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016

[Root fails at 300 sec]

State of Port number 2 for BRIDGE 3 being set to LISTENING at 304.000016

|---|

Here we can see that after the link recovers at 200 sec, the last state change was at 230.000016 sec. After this, there are no further changes to the port states until the next disruptive event. Thus we are recording 30.000016 sec as the Link Recovery Convergence Time.

as the link recovers, there is now, once again, a loop in the network. Thus port 3 on BRIDGE 3 goes into blocking state and does not participate in RSTP synchronization. This causes port 2 on BRIDGE 5 to go through the listening-learning-forwarding process. However, this does not impact actual traffic and frame forwarding can begin at 200.000036 seconds. Hence practical convergence time is 0.000036 sec.

The following output snippet shows Root Failure Detection Time:

|---|

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016

[Root fails at 300 sec]

State of Port number 2 for BRIDGE 3 being set to LISTENING at 304.000016

State of Port number 3 for BRIDGE 3 being set to FORWARDING at 304.000016

State of Port number 2 for BRIDGE 3 being set to LEARNING at 319.000016

State of Port number 2 for BRIDGE 3 being set to FORWARDING at 334.000016

|---|

Here we can see that after the root fails at 300 sec, the first state change was at 304.000016 sec. Thus we are recording 4.000016 sec as the Root Failure Detection Time.

The following output snippet shows Root Failure Convergence Time:

|---|

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016

[Root fails at 300 sec]

State of Port number 2 for BRIDGE 3 being set to LISTENING at 304.000016

State of Port number 3 for BRIDGE 3 being set to FORWARDING at 304.000016

State of Port number 2 for BRIDGE 3 being set to LEARNING at 319.000016

State of Port number 2 for BRIDGE 3 being set to FORWARDING at 334.000016

|---|

Here we can see that after the root fails at 300 sec, the last state change was at 334.000016 sec. After this, there are no further changes to the port states for the rest of the simulation. Thus we are recording 34.000016 sec as the Root Failure Convergence Time.

However, port 2 on BRIDGE 3 is facing the root that is now disabled. So it cannot complete the RSTP synchronization and must cycle through the listening-learning-forwarding process. this delay does not impact actual traffic and frame forwarding can resume at 304.000016 seconds. Thus, practical convergence time is 4.000016 sec.

Results

S. No	SEED	Initial Convergence Time
1	97	30.000026
2	101	30.000026
3	103	30.000026
4	107	30.000026
5	109	30.000026

TABLE 1: Initial Convergence - 3 nodes

S. No	SEED	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergence Time
1	97	4.000058	30.000016	4.000016	34.000016
2	101	4.000058	30.000016	**4.000016**	34.000016
3	103	4.000058	30.000016	4.000016	34.000016
4	107	4.000058	30.000016	4.000016	34.000016
5	109	4.000058	30.000016	4.000016	34.000016

TABLE 2: Link and Root Failure- 3 nodes

5.1.3.2 Topology 2

5 node - 2 loop topology

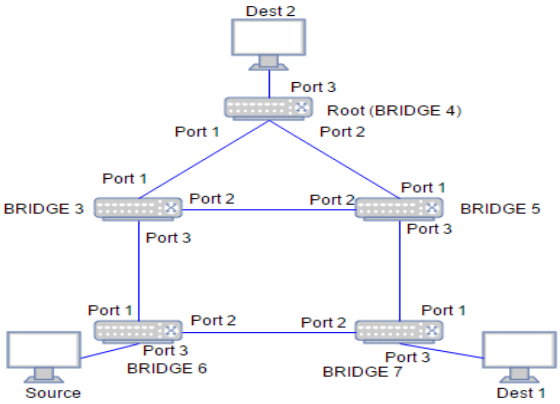

FIGURE 22: 5 node - 2 loop topology

In FIGURE 22 we consider a slightly more complex topology, with 5 nodes and 2 loops. In the OPNET topology below (FIGURE 23), Bridge 4 is the root with initial loop resolution depicted. The ports in red are the blocked ports.

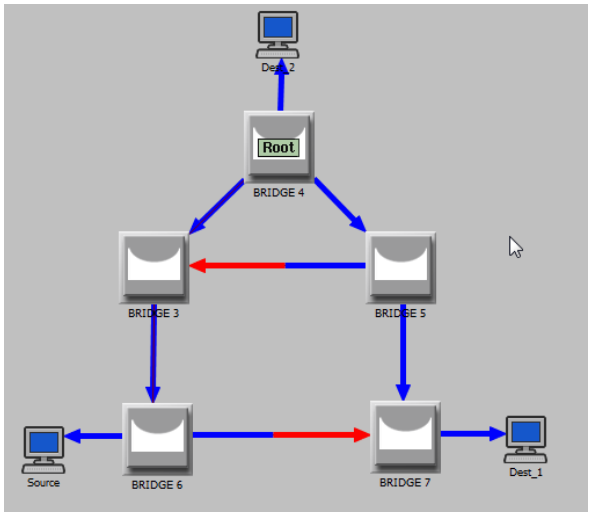

FIGURE 23: 5 node - 2 loop topology in OPNET- Initial loop resolution

Link between Root and Bridge 5 fails at 100 sec and recovers at 200 sec. Bridge 4 (Initial Root) fails at 300 sec. FIGURE 24 and FIGURE 25 below show topology resolution in each case.

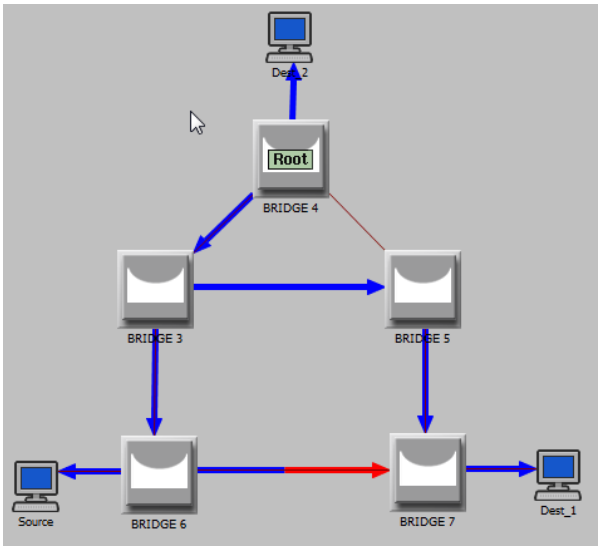

FIGURE 24: Topology resolution after link between BRIDGE 4 and BRIDGE 5 fails

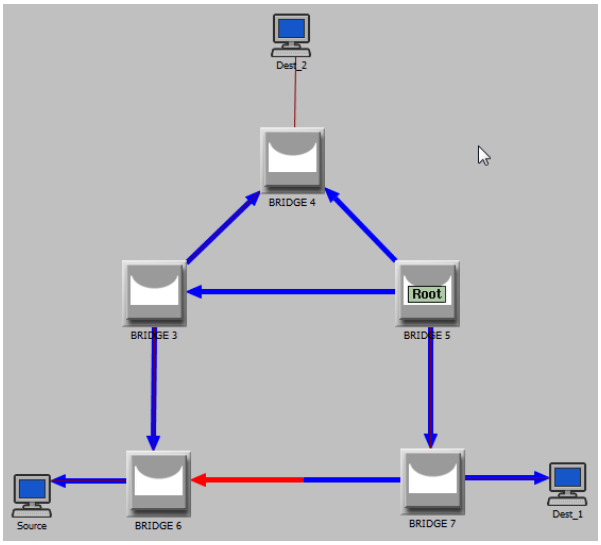

FIGURE 25: Topology resolution after root (BRIDGE 4) fails

Results

S. No	SEED	Initial Convergence Time
1	97	30.000056
2	101	30.000056
3	103	30.000056
4	107	30.000056
5	109	30.000056

TABLE 3: Initial Convergence

S. No	SEED	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergence Time
1	97	4.000074	30.000016	4.000016	48.000016
2	101	4.000074	30.000016	4.000016	48.000016
3	103	4.000074	30.000016	4.000016	48.000016
4	107	4.000074	30.000016	4.000016	48.000016
5	109	4.000074	30.000016	4.000016	48.000016

TABLE 4: Link and Root Failure

5.1.3.3 Topology 3

7 node - 3 loop topology

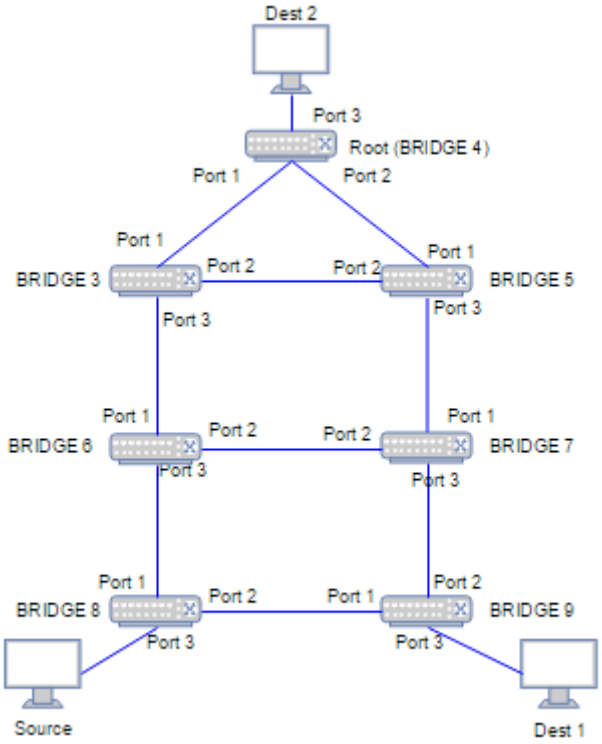

FIGURE 26: 7 node - 3 loop topology

A 7 node - 3 loop topology is considered here. In the OPNET topology below, Bridge 4 is the root with initial loop resolution depicted. The ports in red are the blocked ports.

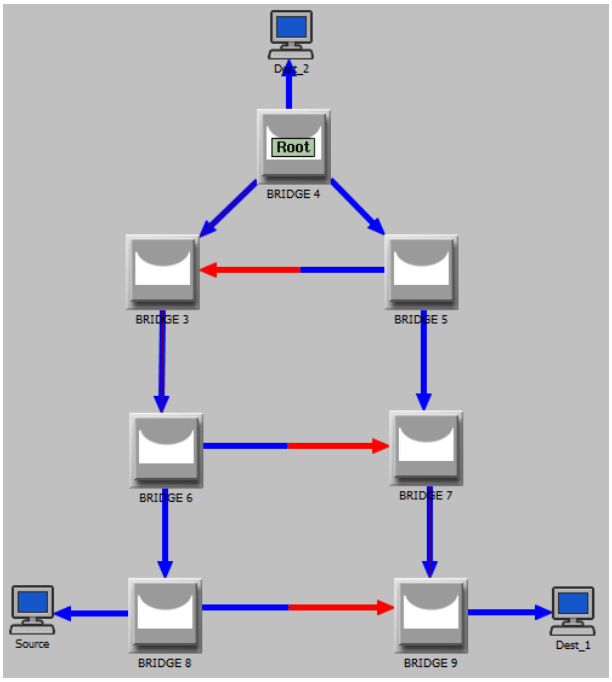

FIGURE 27: 7 node - 3 loop topology in OPNET- Initial loop resolution

Link between Root and Bridge 5 fails at 100 sec and recovers at 200 sec. Bridge 4 (Initial Root) fails at 300 sec. The figures below show topology resolution in each case.

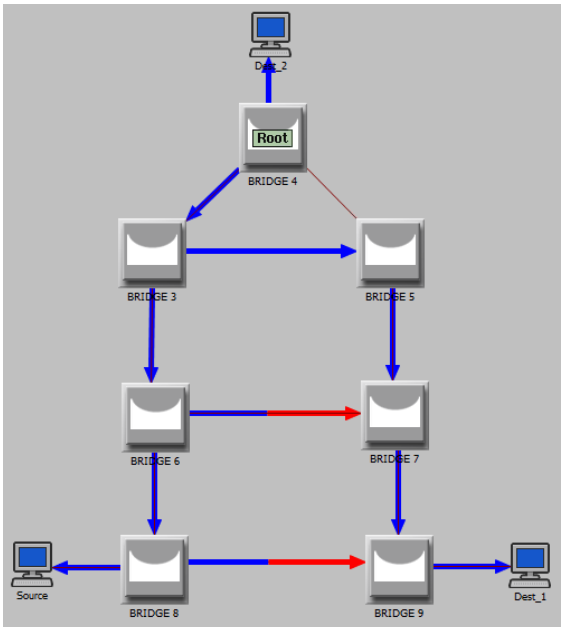

FIGURE 28: Topology resolution after link between BRIDGE 4 and BRIDGE 5 fails

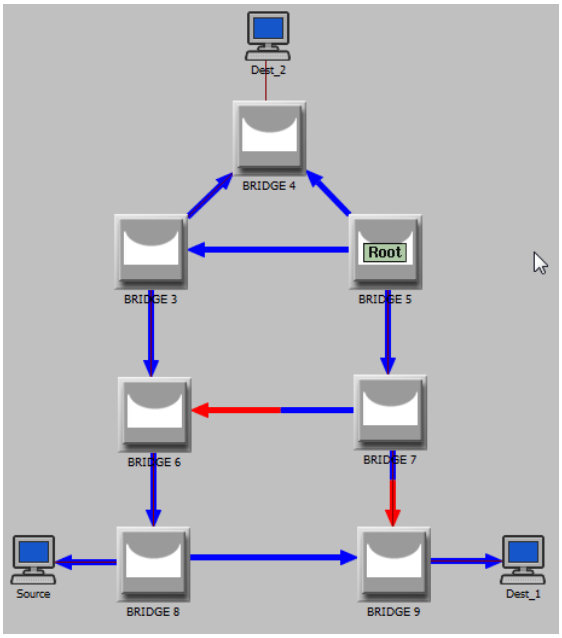

FIGURE 29: Topology resolution after root (BRIDGE 4) fails

Results

S. No	SEED	Initial Convergence Time
1	97	30.000036
2	101	30.000036
3	103	30.000036
4	107	30.000036
5	109	30.000036

TABLE 5: Initial Convergence

S. No	SEED	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergence Time
1	97	10.000046	30.000016	4.000016	49.000016
2	101	10.000046	30.000016	4.000016	49.000016
3	103	10.000046	30.000016	4.000016	49.000016
4	107	10.000046	30.000016	4.000016	49.000016
5	109	10.000046	30.000016	4.000016	49.000016

TABLE 6: Link and Root Failure

5.1.3.4 Topology 4

15 node - multiple loop topology

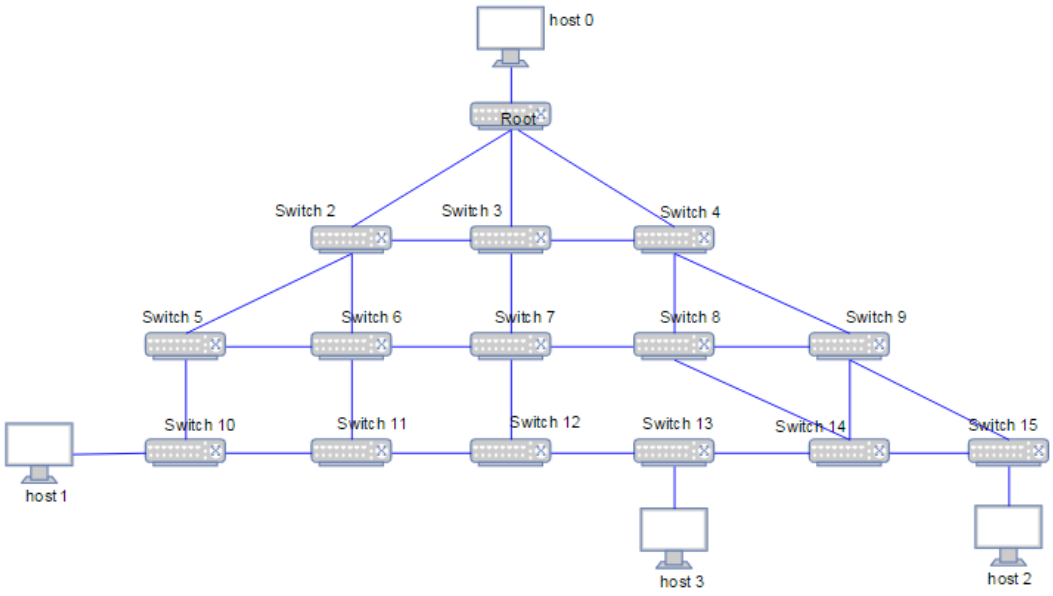

FIGURE 30: 15 node - multiple loop topology

Here we consider a large and complex topology with multiple loops to be resolved. In the OPNET topology below, Bridge 4 is the root with initial loop resolution depicted. The ports in red are the blocked ports.

For this topology 2 scenarios are considered.

Scenario 1: Bridge 5 is the next root

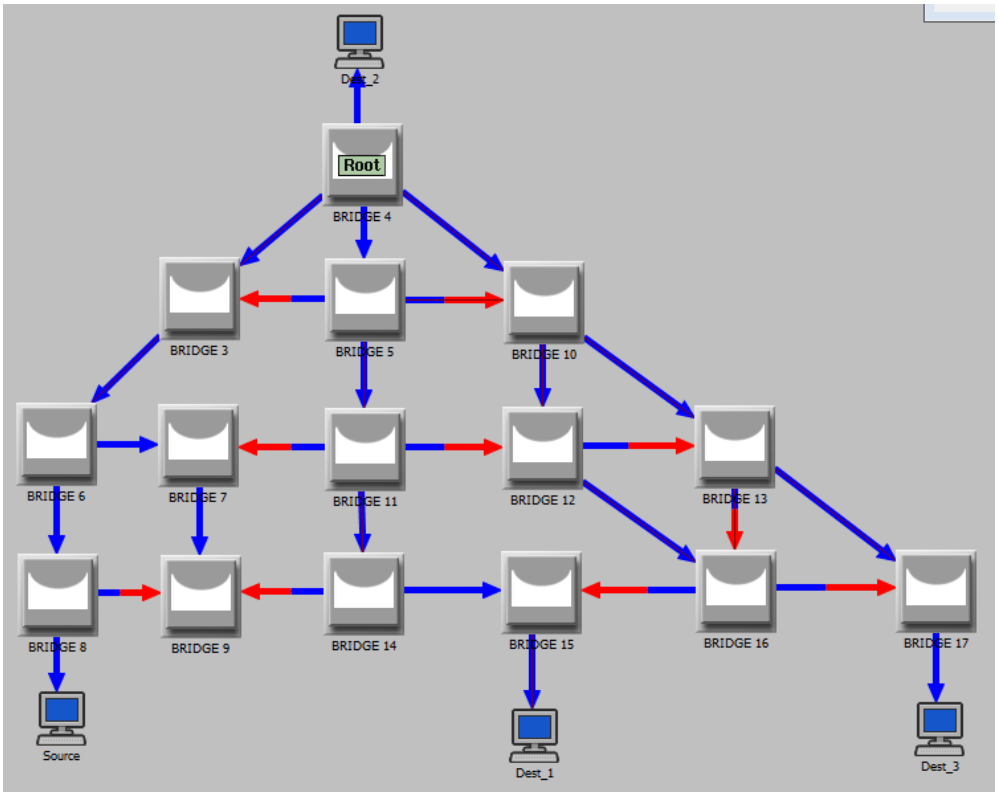

FIGURE 31: 15 node- mulitple loop topology in OPNET- Initial loop resolution- Scenario 1

Link between Root and Bridge 5 fails at 100 sec and recovers at 200 sec. Bridge 4 (Initial Root) fails at 300 sec. The figures below show topology resolution in each case.

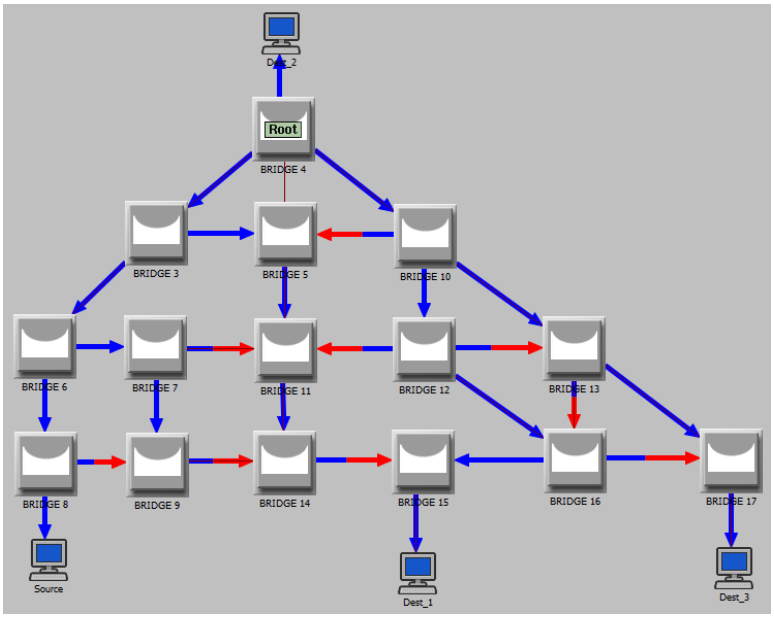

FIGURE 32: Topology resolution after link failure- Scenario 1

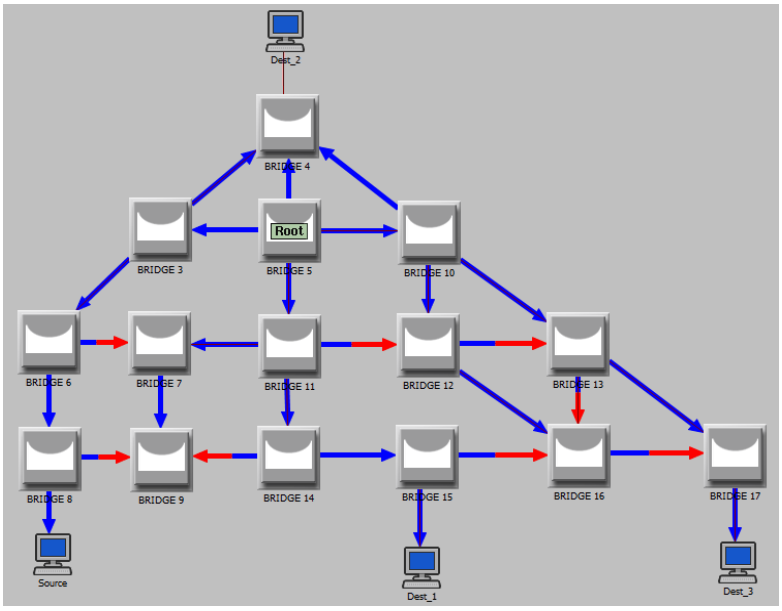

FIGURE 33: Topology resolution after root failure- Scenario 1

Results: Scenario 1

S. No	SEED	Initial Convergence Time
1	97	32.000026
2	101	32.000026
3	103	32.000026
4	107	32.000026
5	109	32.000026

TABLE 7: Initial Convergence

S. No	SEED	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergence Time
1	97	43.000036	30.000062	4.000026	47.000036
2	101	43.000036	30.000062	4.000026	47.000036
3	103	43.000036	30.000062	4.000026	47.000036
4	107	43.000036	30.000062	4.000026	47.000036
5	109	43.000036	30.000062	4.000026	47.000036

TABLE 8: Link and Root Failure

Scenario 2: Bridge 15 is the next root

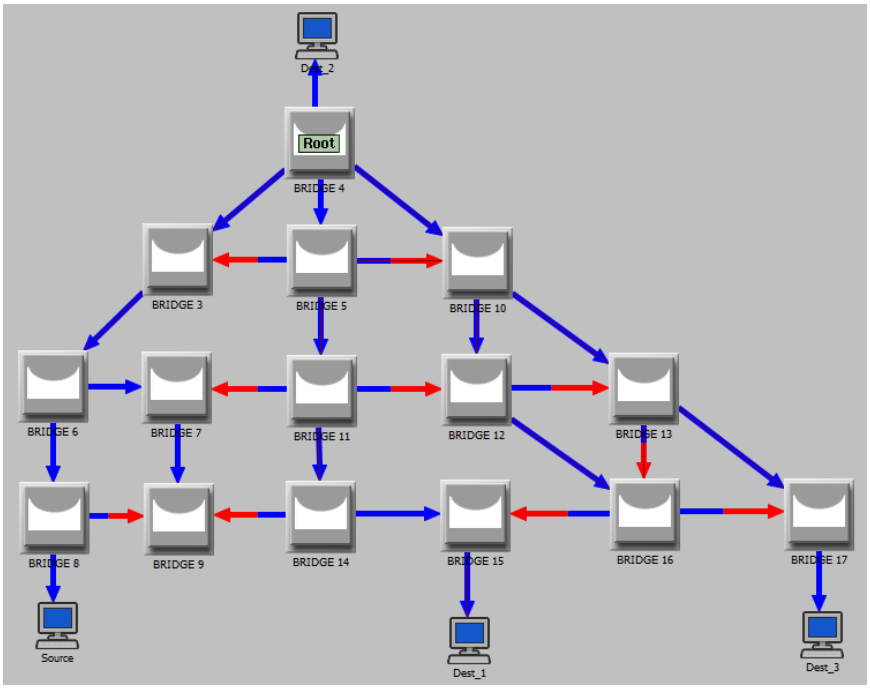

FIGURE 34: 15 node- multiple loop topology in OPNET- Initial loop resolution- Scenario 2

Link between Root and Bridge 5 fails at 100 sec and recovers at 200 sec. Bridge 4 (Initial Root) fails at 300 sec. The figures below show topology resolution in each case.

Link between bridge 4 and bridge 5 fails at 100 sec and recovers at 200 sec

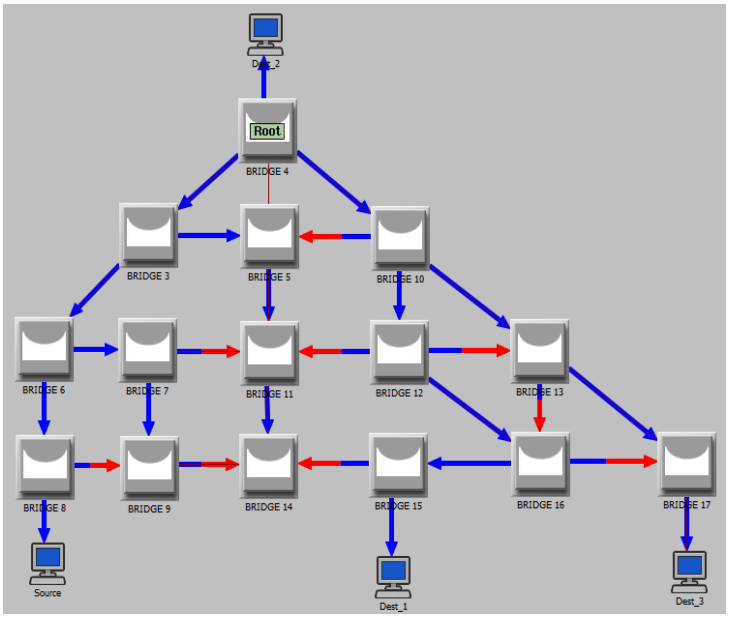

FIGURE 35: Topology resolution after link failure- Scenario 2

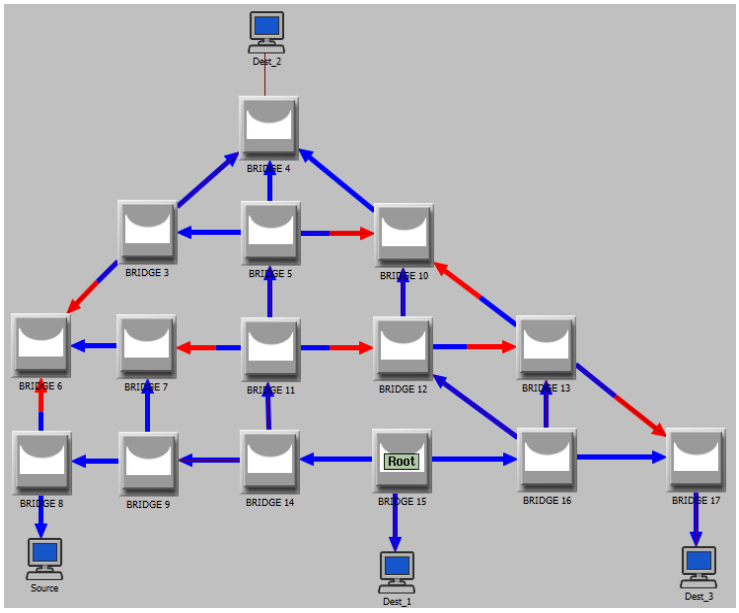

FIGURE 36: Topology resolution after root failure- Scenario 2

Results: Scenario 2

Output snippet for Initial Convergence Time:

State of Port number 3 for BRIDGE 14 being set to FORWARDING at 3.000026

State of Port number 4 for BRIDGE 12 being set to FORWARDING at 3.000036

State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000036

State of Port number 3 for BRIDGE 16 being set to LEARNING at 15.000036

State of Port number 3 for BRIDGE 12 being set to LEARNING at 15.000036

State of Port number 3 for BRIDGE 5 being set to LEARNING at 15.000046

State of Port number 3 for BRIDGE 11 being set to LEARNING at 15.000046

State of Port number 2 for BRIDGE 8 being set to LEARNING at 17.000026

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000036

State of Port number 3 for BRIDGE 16 being set to FORWARDING at 30.000036

State of Port number 3 for BRIDGE 12 being set to FORWARDING at 30.000036

State of Port number 3 for BRIDGE 5 being set to FORWARDING at 30.000046

State of Port number 3 for BRIDGE 11 being set to FORWARDING at 30.000046

State of Port number 2 for BRIDGE 8 being set to FORWARDING at 32.000026

[Link failed at 100 sec]

State of Port number 2 for BRIDGE 4 being set to DISABLED at 100.000000

Thus, Initial Convergence Time is 32.000026 seconds. However some ports go through the listening-learning-forwarding process since they cannot complete synchronization with blocked

ports. This does not impact traffic, because frame forwarding is possible at this time. Thus practical convergence time is 3.000036 sec.

Output snippet for Link Failure Convergence Time:

State of Port number 3 for BRIDGE 9 being set to LISTENING at 113.000036

State of Port number 1 for BRIDGE 14 being set to BLOCKING at 113.000052

State of Port number 1 for BRIDGE 10 being set to LEARNING at 119.000016

State of Port number 1 for BRIDGE 7 being set to LEARNING at 125.000026

State of Port number 2 for BRIDGE 12 being set to LEARNING at 125.000026

State of Port number 1 for BRIDGE 15 being set to LEARNING at 128.000016

State of Port number 3 for BRIDGE 9 being set to LEARNING at 128.000036

State of Port number 1 for BRIDGE 10 being set to FORWARDING at 134.000016

State of Port number 1 for BRIDGE 7 being set to FORWARDING at 140.000026

State of Port number 2 for BRIDGE 12 being set to FORWARDING at 140.000026

State of Port number 1 for BRIDGE 15 being set to FORWARDING at 143.000016

State of Port number 3 for BRIDGE 9 being set to FORWARDING at 143.000036

[Link recovered at 200 sec]

State of Port number 2 for BRIDGE 4 being set to LISTENING at 200.000000

Since the link failed at 100 sec, Link Failure Convergence Time is 43.000036. However, for the same reasons mentioned for Initial convergence, actual traffic is affected for 13.000052 sec.

Output snippet for Link Recovery Convergence Time and Root Failure Detection Time:

State of Port number 2 for BRIDGE 15 being set to BLOCKING at 200.000078

State of Port number 3 for BRIDGE 14 being set to FORWARDING at 200.000103

State of Port number 3 for BRIDGE 5 being set to LEARNING at 215.000016

State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016

State of Port number 1 for BRIDGE 11 being set to LEARNING at 215.000046

State of Port number 3 for BRIDGE 11 being set to LEARNING at 215.000046

State of Port number 1 for BRIDGE 14 being set to LEARNING at 215.000062

State of Port number 3 for BRIDGE 5 being set to FORWARDING at 230.000016

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016

State of Port number 1 for BRIDGE 11 being set to FORWARDING at 230.000046

State of Port number 3 for BRIDGE 11 being set to FORWARDING at 230.000046

State of Port number 1 for BRIDGE 14 being set to FORWARDING at 230.000062

State of Port number 1 for BRIDGE 3 being set to LISTENING at 304.000026

State of Port number 2 for BRIDGE 3 being set to FORWARDING at 304.000026

Link recovers at 200 sec. Here we can see that the last port changes state a 230.000062 sec. Thus, Link Recovery Convergence Time is 30.000062 sec. However, traffic is affected for 0.000103 sec.

Root was failed at 300 sec. The first state change is detected at 304.000026 sec. Thus, Root Failure Detection time is 4.000026 sec.

Output snippet for Root Failure Convergence Time:

State of Port number 2 for BRIDGE 13 being set to FORWARDING at 319.000036

State of Port number 1 for BRIDGE 12 being set to FORWARDING at 320.000016

State of Port number 1 for BRIDGE 5 being set to LEARNING at 325.000062

State of Port number 3 for BRIDGE 12 being set to LEARNING at 331.000026

State of Port number 1 for BRIDGE 11 being set to LEARNING at 332.000016

State of Port number 1 for BRIDGE 8 being set to LEARNING at 333.000016

State of Port number 3 for BRIDGE 13 being set to LEARNING at 333.000016

State of Port number 1 for BRIDGE 3 being set to FORWARDING at 334.000026

State of Port number 2 for BRIDGE 10 being set to FORWARDING at 334.000026

State of Port number 1 for BRIDGE 5 being set to FORWARDING at 340.000062

State of Port number 3 for BRIDGE 12 being set to FORWARDING at 346.000026

State of Port number 1 for BRIDGE 11 being set to FORWARDING at 347.000016

State of Port number 1 for BRIDGE 8 being set to FORWARDING at 348.000016

State of Port number 3 for BRIDGE 13 being set to FORWARDING at 348.000016

|---|

Root was failed at 300 sec. The last state change is detected at 348.000016 sec. Thus, Root Failure Convergence time is 48.000016 sec but traffic is affected for only 20.000016 sec.

Results

S. No	SEED	Initial Convergence Time
1	97	32.000026
2	101	32.000026
3	103	32.000026
4	107	32.000026
5	109	32.000026

TABLE 9: Initial Convergence

S. No	SEED	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergence Time
1	97	43.000036	30.000062	4.000026	48.000016
2	101	43.000036	30.000062	4.000026	48.000016
3	103	43.000036	30.000062	4.000026	48.000016
4	107	43.000036	30.000062	4.000026	48.000016
5	109	43.000036	30.000062	4.000026	48.000016

TABLE 10: Link and Root Failure

5.1.4.5 Consolidated results

S.No	No of Nodes	Initial Convergence Time	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergence Time
1	3	30.000026	4.000058	30.000016	4.000016	34.000016
2	5	30.000056	4.000074	30.000016	4.000016	48.000016
3	7	30.000036	10.000046	30.000016	4.000016	49.000016
4	15	32.000026	43.000036	30.000062	4.000026	47.000036
5	15	32.000026	43.000036	30.000062	4.000026	48.000016

TABLE 11: Metrics from all the RSTP topologies

S.No	No of Nodes	Initial Convergence Time	Link Failure Convergence Time	Link Recovery Convergence Time	Root Failure Detection Time	Root Failure Convergenc e Time
1	3	0.000046	4.000058	0.000036	4.000016	4.000016
2	5	1.000016	4.000074	0.000052	4.000016	18.000036
3	7	2.000026	10.000046	0.000068	4.000016	19.000032
4	15	3.000032	14.000016	0.000103	4.000026	18.000036
5	15	3.000036	13.000052	0.000103	4.000026	20.000016

TABLE 12: Practical Convergence from all the RSTP topologies

5.1.4.6 Analysis

The above tables summarize the results for all the topologies.

Some observations:

1) As the number of nodes increase, we can see that all convergence values trend up as well. A change in the topology forces neighboring bridges to go through the RSTP

synchronization process once again, which forces other neighbors to do the same, until the sync cascades through the topology. This trial and error process causes a delay that increases significantly in larger topologies.

2) The values for 7 node and 15 node topologies are in the same range. This is because the 15 node topology is only about 5 nodes "deep". The depth or radius of a topology is the number of hops it takes to get from the farthest node to the root node after the topology has resolved.
3) We defined all convergence parameters as time taken for all the ports to reach steady state. With the RSTP synchronization process, once a port reaches alternate/discarding state, the port opposite to it is not able to complete synchronization. Thus, it cycles through listening-learning-forwarding. While this process adds to the total time taken for all ports to reach steady state, the time taken is not reflective of traffic impact (since that link was not going to be used anyway). Accounting for this behavior, the second table shows practical convergence values.

5.2 MTP implementation

This section describes the specifics of the MTP model created in OPNET.

5.2.1 Assumptions

All bridges in the topology are using MTP. All bridges by default are not the root and the root is administratively determined. Hence, the flow of VID packets begins with the root and as each bridge receives a VID it processes the VID and subsequently generates its own VID advertisements. It is also assumed that all link costs are equal.

5.2.2 Frame formats

The following frame formats have been used.

1) Basic frame

Sender Address (8 bits)	Destination Address(8 bits)	ID (4 bits)	Hops (8 bits)

This frame is the placeholder for data frames sent from one host to another. Simulated hosts on the network generate this frame, add their own address (Sender address), and select a destination address (randomly). The ID value is used to track frames to see which ones reached their destination and which ones were lost. The Hops field is used as an indicator of the path taken, to gauge whether the frame took the most optimal path to the destination.

2) VID Advertisement

Mode (8 bits)	Path Cost (8 bits)	Next Child VID (32 bits)	Switch ID (32 bits)

This is the VID advertisement sent by each switch to its neighbors. Mode and Path cost are not being used at this time. The Next Child VID field contains the VID being offered to the child switch. Switch ID is the ID of the sender.

At start of simulation, once the root is determined, the root sends out initial VID advertisements. As a child switch receives a VID advertisement, it populates its VID table and generates advertisements for its neighbors.

3) VSAT update

Host Add (32 bits)	VID list (32 bits)	Neighbor flag (1 bit)	Switch ID (32 bits)	Seq No (32 bits)

VSAT updates are sent as a result of new information seen in the VSAT table. A data frame whose Source Address was never seen before causes a new entry in the VSAT table, which in turn causes a VSAT update to be sent.

When a data frame is sent by a host to its connected switch, the switch records an entry in the VSAT table for the source address in the data frame. A VSAT update is sent out with Neighbor Flag set to 1 for this host address. As other switches receive the VSAT update, they check to see if they have an existing entry for that host address. Sequence number is used to determine if this is a new update. If the update is new, the VSAT table is updated and the VSAT update s forwarded after resetting the neighbor flag.

4) Hello

Type (8 bits)	VID list (32 bits)	Switch ID (32 bits)

Hello Frames have various functions depending on the Type. There are 3 types of Hellos.

Type_null: This is used when a switch joins the network but is not a root. A null hello alerts neighboring switches about presence of a new switch. Upon receiving a null hello, a switch will send out a VID Advertisement and VSAT updates to the new switch. The VID list field will contain a dummy value in a null hello.

Type_periodic: All switches send a periodic hello message to adjacent switches. This indicates that links are up and the topology did not change.

Type_change: An expired timer for a neighboring switch triggers this type of hello. If a neighbor is deemed lost, VIDs received from that neighbor are removed. The new list of VIDs is sent to child switches, which in turn update their own VID tables. The new VID tables result in recomputation of forwarding port for the VSAT table. New VSAT updates are also sent.

5.2.3 State diagram and state definitions

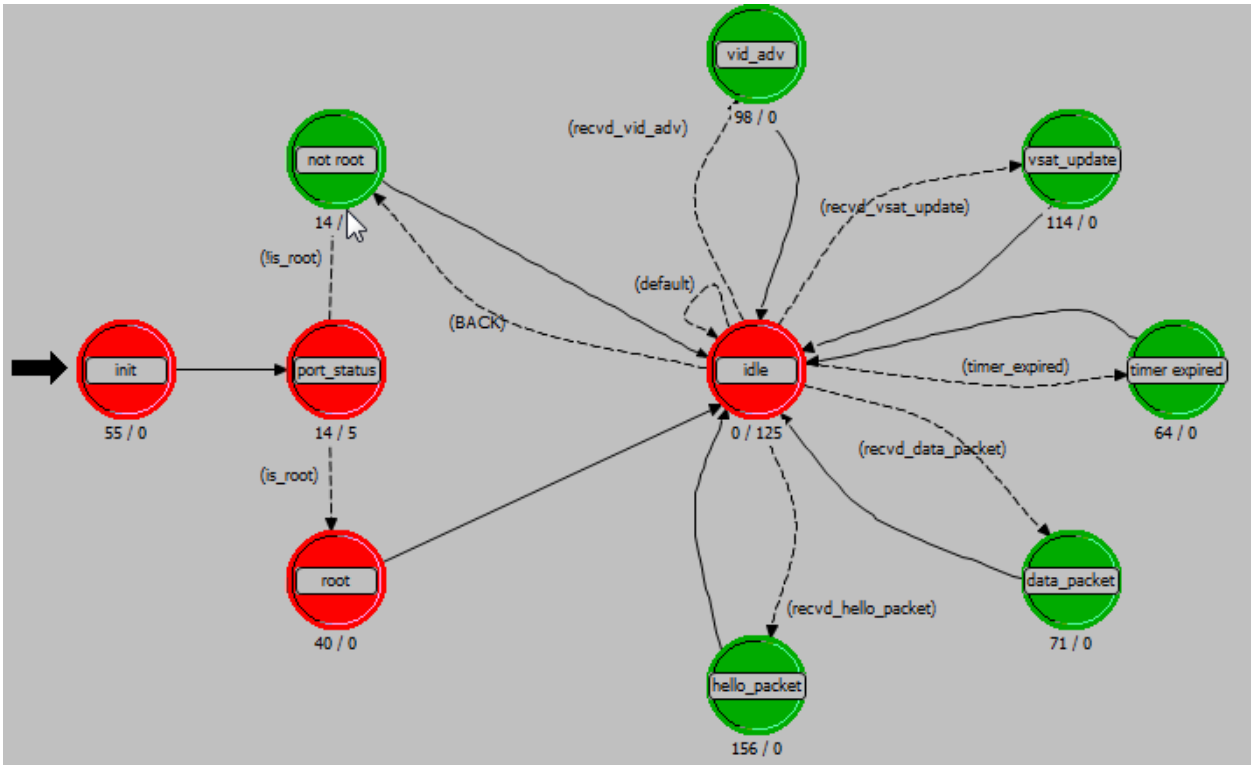

FIGURE 37: State machine for MTP

Init state

This state Initializes all the lists, tables and variables.

Port_status state

In this state the node determines which ports are connected. This state also checks tos ee of the node was administratively selected as root.

Root state

We enter this state if the node is Root. The root makes the initial VID advertisement and sends on all active ports. The root also creates its own VID table.

Not_Root state

We reach this state if the node was not selected to be root. In this state, the node sends out a NULL hello. This will trigger VID and VSAT updates from nodes that receive it in case a new node joins the mix. We come back to this state every 2 seconds (by default) as long as a null interrupt is received- this means it got no VID.

Idle state

This is the resting state for a node when all actions related to an interrupt have been performed. The following events will trigger further action:

1) VID advertisement is received
2) VSAT update is received
3) Data Packet is received
4) Hello Packet is received
5) A timer expires

This state also handles timer based internal events like sending periodic hellos.

VID_adv state

We enter this state when a VID advertisement is received. The VID advertisement is processed to see if it will be accepted or discarded. If accepted, VID advertisements and VSAT updates are generated and sent to all neighbors.

VSAT_update state

We enter this state when a VSAT update is received. The update is either accepted and added to the VSAT table, or discarded as being stale information.

Timer_expired state

This state deals with the timers on the entries of the VID table. If a timer expires, that entry is aged out and corresponding updates are sent to neighbors.

Data_packet process

This state deals with a received data packet. If the destination address is known ,the packet is forwarded, else it is dropped. MTP does not flood the network with data packets when the destination si unknown. This is reasonable because there are no silent nodes these days.

If the source is not known and it is a locally connected host, it is added to the vsat table and vsat updates are sent.

Hello_packet state

This state deals with all received hello packets. There are 3 types of hello packets- Null Hello, Periodic Hello and Change Hello.

1. Null Hello is used to signify a new non-root node in the network. VID advertisements and VSAT updates are sent to this node.
2. Periodic Hello is a keep-alive for neighbors. All necessary timers are restarted when this packet is received.
3. Change Hello means a topology change has occurred somewhere. The Change Hello packet carries the change information with it. This information is evaluated to see if it can be accepted. If accepted, further Change Hellos are generated and sent out.

5.2.4 Results

Here we compare RSTP and MTP results for root failure [15]. While root failure in RSTP takes about 20 sec to resolve (we are considering practical convergence here), in MTP the time to converge is negligible by comparison. This is because a redundant root is being calculated in the beginning, so that if the primary root fails, the backup root can take over immediately. Thus we are able to eliminate the time taken to calculate a new root. RSTP has no such provision for a redundant root.

The times for root failure in MTP do not include root failure detection time. Thus, we will subtract the detection time from the total root failure convergence time in RSTP for a fair comparison in TABLE 13:

No. of nodes in Topology	RSTP (sec)	MTP (usec)
5	14	1
7	15	1
15	16	2

TABLE 13: RSTP vs MTP for Root failure[15]

5.2.5 Analysis

The implementation for MTP root failure is triggered by 1 missing hello, which takes about 2 seconds with default timers. This is different in RSTP, which considers 3 missing hello packets to indicate true failure. In the case of RSTP, this is required, because electing a new root takes time and results in other links being blocked in the topology. In MTP, only one hello packet is missed before the new root takes over. This is acceptable because a) MTP does not require a lot of time

for second root to take over and b) no links are being blocked so even if the topology flips to the new root without a true failure, it does not cost any significant network downtime.

6. Conclusion

MTP reduces convergence times in switched networks from the order of seconds to the order of milliseconds, as demonstrated by the root failure metrics. The down time is so little that no frames are lost in the process. However, convergence values for MTP only take into account VID convergence. In order to make a true comparison with RSTP, this value should also include the convergence time for VSAT tables. Only then can we say that frame forwarding is taking place correctly. Another approach could be to include information about VIDs generated from backup root in the original VID table. If this is done, then the new VSAT table can simply be calculated at each node. This would eliminate any time required for synchronizing the VSAT stables across the topology.

Since all paths are active, MTP allows networks to make the most of every possible link while avoiding loops. Since MTP relies on all path and host information being synched across the network, this will increase computation and storage requirements for switches. Given the advancements seen in storage and computation, this is not likely to be a real challenge.

7. Directions for further research

In this research I have created the core functionality of MTP. As next steps, path cost may be introduced as a decision maker. Root redundancy has already been worked on, but as in this research, the roots were predetermined. Further work may focus on optimizing the actual root election process. MTP makes multiple paths to a host available at the same time and the best path is chosen for frame forwarding. In the future, load balancing across these multiple paths may be considered.

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[14]http://www.cisco.com/c/en/us/td/docs/switches/datacenter/nexus5000/sw/configuration/guide/cli/CLIConfigurationGuide/RPVSpanningTree.html

[15] Implementing Multiple Meshed Trees to Support Root Redundancy in Meshed Tree Protocol by Tanwee Atul Gandhi

9. Appendix

Transcripts from RSTP output

Transcript from Opnet output for Seed 97 - 3 node topology

_____ OPNET Simulation Debugger _____

Type 'help' for Command Summary

ODB> continue
State of Port number 1 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to LISTENING at 0.000016
State of Port number 1 for BRIDGE 4 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 3 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 5 being set to LISTENING at 0.000026

State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000036
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000046
State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000046
State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000026
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000026
State of Port number 1 for BRIDGE 4 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000
State of Port number 3 for BRIDGE 3 being set to LISTENING at 104.000026
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 104.000058
State of Port number 1 for BRIDGE 4 being set to LISTENING at 200.000000
State of Port number 1 for BRIDGE 5 being set to LISTENING at 200.000000
State of Port number 2 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 200.000016
State of Port number 3 for BRIDGE 3 being set to BLOCKING at 200.000032
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 200.000036
State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 2 for BRIDGE 3 being set to LISTENING at 304.000016
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 304.000016
State of Port number 2 for BRIDGE 3 being set to LEARNING at 319.000016
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 334.000016
|---|
| Simulation Completed - Collating Results. |
| Events: Total (3,034,902); Average Speed (491,402 events/sec.) |
| Time : Elapsed (6.2 sec.); Simulated (8 min. 20 sec.) |
DES Log: 1 entry

Transcript from Opnet output for Seed 97 - 5 node topology

_____ OPNET Simulation Debugger _____

Type 'help' for Command Summary

ODB> continue
State of Port number 1 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 0.000000

State of Port number 3 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 5 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 4 being set to LISTENING at 0.000016
State of Port number 3 for BRIDGE 3 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 7 being set to LISTENING at 0.000026
State of Port number 1 for BRIDGE 4 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 6 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 5 being set to LISTENING at 0.000036
State of Port number 2 for BRIDGE 3 being set to LISTENING at 0.000036
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000042
State of Port number 1 for BRIDGE 6 being set to LISTENING at 0.000046
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 0.000046
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000052
State of Port number 2 for BRIDGE 6 being set to LISTENING at 0.000056
State of Port number 1 for BRIDGE 6 being set to FORWARDING at 0.000056
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000066
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 1.000016
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 1.000016
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 1.000016
State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000036
State of Port number 2 for BRIDGE 6 being set to LEARNING at 15.000056
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000036
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 30.000056
State of Port number 2 for BRIDGE 4 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 7 being set to LISTENING at 104.000016
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 104.000016
State of Port number 2 for BRIDGE 3 being set to LISTENING at 104.000026
State of Port number 2 for BRIDGE 5 being set to LISTENING at 104.000032
State of Port number 3 for BRIDGE 5 being set to LISTENING at 104.000042
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 104.000042

State of Port number 1 for BRIDGE 7 being set to FORWARDING at 104.000048
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 104.000058
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 104.000058
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 104.000074
State of Port number 2 for BRIDGE 4 being set to LISTENING at 200.000000
State of Port number 1 for BRIDGE 5 being set to LISTENING at 200.000000
State of Port number 2 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 3 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 200.000016
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 200.000032
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 200.000036
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 200.000052
State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 1 for BRIDGE 3 being set to LISTENING at 304.000016
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 304.000016
State of Port number 1 for BRIDGE 7 being set to LISTENING at 310.000016
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 310.000016
State of Port number 1 for BRIDGE 5 being set to LISTENING at 310.000032
State of Port number 2 for BRIDGE 5 being set to LISTENING at 310.000032
State of Port number 3 for BRIDGE 3 being set to LISTENING at 310.000048
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 310.000056
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 310.000064
State of Port number 2 for BRIDGE 6 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 316.000042
State of Port number 1 for BRIDGE 7 being set to LISTENING at 316.000042
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 316.000058
State of Port number 2 for BRIDGE 7 being set to LISTENING at 318.000016
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 318.000016
State of Port number 2 for BRIDGE 6 being set to BLOCKING at 318.000036
State of Port number 1 for BRIDGE 3 being set to LEARNING at 319.000016
State of Port number 1 for BRIDGE 5 being set to LEARNING at 325.000032
State of Port number 2 for BRIDGE 7 being set to LEARNING at 333.000016
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 334.000016

State of Port number 1 for BRIDGE 5 being set to FORWARDING at 340.000032
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 348.000016
|--|
| Simulation Completed - Collating Results. |
| Events: Total (4,731,856); Average Speed (471,347 events/sec.) |
| Time : Elapsed (10 sec.); Simulated (8 min. 20 sec.) |
DES Log: 1 entry

Transcript from Opnet output for Seed 97 - 7 node topology

_____ OPNET Simulation Debugger _____

Type 'help' for Command Summary

ODB> continue
State of Port number 1 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 5 being set to BLOCKING at 0.000000

State of Port number 2 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 6 being set to LISTENING at 0.000016
State of Port number 3 for BRIDGE 7 being set to LISTENING at 0.000016
State of Port number 3 for BRIDGE 5 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 4 being set to LISTENING at 0.000016
State of Port number 3 for BRIDGE 3 being set to LISTENING at 0.000016

State of Port number 2 for BRIDGE 8 being set to LISTENING at 0.000026
State of Port number 1 for BRIDGE 9 being set to LISTENING at 0.000026
State of Port number 1 for BRIDGE 4 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 6 being set to LISTENING at 0.000036
State of Port number 2 for BRIDGE 7 being set to LISTENING at 0.000036
State of Port number 2 for BRIDGE 5 being set to LISTENING at 0.000036
State of Port number 2 for BRIDGE 3 being set to LISTENING at 0.000036
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000042
State of Port number 2 for BRIDGE 9 being set to LISTENING at 0.000046
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 0.000046
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000052
State of Port number 1 for BRIDGE 9 being set to LISTENING at 0.000056
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 0.000056
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000066
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 1.000016
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 1.000016
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 1.000026
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 2.000016
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 2.000016
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 2.000026
State of Port number 2 for BRIDGE 8 being set to LEARNING at 15.000026
State of Port number 2 for BRIDGE 6 being set to LEARNING at 15.000036
State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000036
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 30.000026
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 30.000036
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000036
State of Port number 2 for BRIDGE 4 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 7 being set to LISTENING at 104.000016
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 104.000016
State of Port number 2 for BRIDGE 3 being set to LISTENING at 104.000026
State of Port number 2 for BRIDGE 5 being set to LISTENING at 104.000032
State of Port number 3 for BRIDGE 5 being set to LISTENING at 104.000042
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 104.000042

State of Port number 1 for BRIDGE 7 being set to FORWARDING at 104.000048
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 104.000058
State of Port number 3 for BRIDGE 7 being set to LISTENING at 104.000058
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 104.000058
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 104.000074
State of Port number 2 for BRIDGE 9 being set to LISTENING at 110.000016
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 110.000016
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 110.000016
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 110.000016
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 110.000046
State of Port number 2 for BRIDGE 4 being set to LISTENING at 200.000000
State of Port number 1 for BRIDGE 5 being set to LISTENING at 200.000000
State of Port number 2 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 3 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 200.000016
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 200.000032
State of Port number 3 for BRIDGE 7 being set to LISTENING at 200.000036
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 200.000036
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 200.000052
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 200.000068
State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 1 for BRIDGE 3 being set to LISTENING at 304.000016
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 304.000016
State of Port number 1 for BRIDGE 7 being set to LISTENING at 310.000016
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 310.000016
State of Port number 1 for BRIDGE 5 being set to LISTENING at 310.000032
State of Port number 2 for BRIDGE 5 being set to LISTENING at 310.000032
State of Port number 3 for BRIDGE 3 being set to LISTENING at 310.000048
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 310.000056
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 310.000064
State of Port number 1 for BRIDGE 9 being set to LISTENING at 315.000026
State of Port number 2 for BRIDGE 6 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 6 being set to LISTENING at 316.000016

State of Port number 2 for BRIDGE 9 being set to LISTENING at 316.000032
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 316.000032
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 316.000042
State of Port number 1 for BRIDGE 9 being set to LISTENING at 316.000042
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 316.000042
State of Port number 1 for BRIDGE 7 being set to LISTENING at 316.000052
State of Port number 3 for BRIDGE 7 being set to LISTENING at 316.000052
State of Port number 2 for BRIDGE 8 being set to LISTENING at 316.000052
State of Port number 2 for BRIDGE 9 being set to LISTENING at 316.000052
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 316.000052
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 316.000062
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 316.000062
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 316.000068
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 316.000078
State of Port number 1 for BRIDGE 9 being set to LISTENING at 317.000016
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 317.000026
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 318.000016
State of Port number 2 for BRIDGE 7 being set to LISTENING at 318.000026
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 318.000026
State of Port number 1 for BRIDGE 9 being set to LISTENING at 319.000016
State of Port number 1 for BRIDGE 3 being set to LEARNING at 319.000016
State of Port number 2 for BRIDGE 6 being set to BLOCKING at 319.000016
State of Port number 2 for BRIDGE 8 being set to BLOCKING at 319.000032
State of Port number 1 for BRIDGE 5 being set to LEARNING at 325.000032
State of Port number 2 for BRIDGE 7 being set to LEARNING at 333.000026
State of Port number 1 for BRIDGE 9 being set to LEARNING at 334.000016
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 334.000016
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 340.000032
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 348.000026
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 349.000016
|--|
| Simulation Completed - Collating Results. |
| Events: Total (6,429,990); Average Speed (465,738 events/sec.) |
| Time : Elapsed (14 sec.); Simulated (8 min. 20 sec.) |

DES Log: 1 entry

Transcript from Opnet output for Seed 97 - 15 node topology scenario 1

_____ OPNET Simulation Debugger _____

Type 'help' for Command Summary

ODB> continue
State of Port number 1 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 0.000000

State of Port number 2 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 0.000000

State of Port number 4 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 14 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 14 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 14 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 14 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 15 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 15 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 15 being set to BLOCKING at 0.000000

State of Port number 1 for BRIDGE 15 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 15 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 17 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 17 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 17 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 17 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 17 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 6 being set to LISTENING at 0.000016
State of Port number 4 for BRIDGE 13 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 8 being set to LISTENING at 0.000016
State of Port number 4 for BRIDGE 11 being set to LISTENING at 0.000016
State of Port number 3 for BRIDGE 10 being set to LISTENING at 0.000016
State of Port number 4 for BRIDGE 5 being set to LISTENING at 0.000026
State of Port number 1 for BRIDGE 4 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 7 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 6 being set to LISTENING at 0.000026
State of Port number 1 for BRIDGE 16 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 12 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 3 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 15 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 5 being set to LISTENING at 0.000036
State of Port number 4 for BRIDGE 4 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 7 being set to LISTENING at 0.000036

State of Port number 3 for BRIDGE 16 being set to LISTENING at 0.000036
State of Port number 3 for BRIDGE 9 being set to LISTENING at 0.000036
State of Port number 3 for BRIDGE 14 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 11 being set to LISTENING at 0.000036
State of Port number 3 for BRIDGE 12 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 0.000036
State of Port number 3 for BRIDGE 5 being set to LISTENING at 0.000046
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000046
State of Port number 3 for BRIDGE 13 being set to LISTENING at 0.000046
State of Port number 3 for BRIDGE 11 being set to LISTENING at 0.000046
State of Port number 4 for BRIDGE 12 being set to LISTENING at 0.000046
State of Port number 4 for BRIDGE 10 being set to LISTENING at 0.000046
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000046
State of Port number 1 for BRIDGE 17 being set to LISTENING at 0.000046
State of Port number 2 for BRIDGE 7 being set to LISTENING at 0.000066
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 0.000066
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 0.000066
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 0.000066
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000076
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 0.000076
State of Port number 1 for BRIDGE 14 being set to LISTENING at 0.000076
State of Port number 1 for BRIDGE 13 being set to LISTENING at 0.000086
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 0.000086
State of Port number 4 for BRIDGE 4 being set to FORWARDING at 0.000096
State of Port number 1 for BRIDGE 9 being set to LISTENING at 0.000096
State of Port number 2 for BRIDGE 9 being set to LISTENING at 0.000096
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 0.000096
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 0.000126
State of Port number 4 for BRIDGE 16 being set to LISTENING at 0.000126
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 1.000016
State of Port number 2 for BRIDGE 16 being set to LISTENING at 1.000016
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 1.000016
State of Port number 1 for BRIDGE 8 being set to LISTENING at 1.000016
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 1.000016

State of Port number 2 for BRIDGE 12 being set to LISTENING at 1.000016
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 1.000016
State of Port number 2 for BRIDGE 8 being set to LISTENING at 1.000026
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 1.000026
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 1.000026
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 1.000026
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 1.000026
State of Port number 1 for BRIDGE 17 being set to LISTENING at 1.000026
State of Port number 2 for BRIDGE 7 being set to LISTENING at 1.000036
State of Port number 2 for BRIDGE 9 being set to LISTENING at 1.000036
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 1.000036
State of Port number 4 for BRIDGE 10 being set to FORWARDING at 1.000036
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 1.000046
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 2.000016
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 2.000016
State of Port number 4 for BRIDGE 13 being set to FORWARDING at 2.000016
State of Port number 1 for BRIDGE 8 being set to LISTENING at 2.000016
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 2.000016
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 2.000016
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 2.000016
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 2.000026
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 2.000026
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 2.000026
State of Port number 2 for BRIDGE 8 being set to LISTENING at 2.000026
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 2.000026
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 2.000026
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 2.000026
State of Port number 2 for BRIDGE 15 being set to BLOCKING at 2.000026
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 2.000036
State of Port number 4 for BRIDGE 16 being set to BLOCKING at 2.000046
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 2.000046
State of Port number 3 for BRIDGE 13 being set to FORWARDING at 2.000046
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 3.000016
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 3.000016

State of Port number 3 for BRIDGE 7 being set to FORWARDING at 3.000016
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 3.000026
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 3.000026
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 3.000032
State of Port number 1 for BRIDGE 16 being set to LEARNING at 15.000026
State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000036
State of Port number 3 for BRIDGE 16 being set to LEARNING at 15.000036
State of Port number 3 for BRIDGE 12 being set to LEARNING at 15.000036
State of Port number 3 for BRIDGE 5 being set to LEARNING at 15.000046
State of Port number 3 for BRIDGE 11 being set to LEARNING at 15.000046
State of Port number 2 for BRIDGE 8 being set to LEARNING at 17.000026
State of Port number 1 for BRIDGE 16 being set to FORWARDING at 30.000026
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000036
State of Port number 3 for BRIDGE 16 being set to FORWARDING at 30.000036
State of Port number 3 for BRIDGE 12 being set to FORWARDING at 30.000036
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 30.000046
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 30.000046
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 32.000026
State of Port number 2 for BRIDGE 4 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000
State of Port number 2 for BRIDGE 3 being set to LISTENING at 104.000016
State of Port number 1 for BRIDGE 10 being set to LISTENING at 104.000016
State of Port number 3 for BRIDGE 5 being set to LISTENING at 104.000042
State of Port number 4 for BRIDGE 5 being set to LISTENING at 104.000042
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 104.000052
State of Port number 1 for BRIDGE 11 being set to LISTENING at 104.000058
State of Port number 3 for BRIDGE 11 being set to LISTENING at 104.000058
State of Port number 4 for BRIDGE 11 being set to LISTENING at 104.000058
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 104.000058
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 104.000073
State of Port number 1 for BRIDGE 14 being set to LISTENING at 110.000016
State of Port number 3 for BRIDGE 14 being set to LISTENING at 110.000016
State of Port number 1 for BRIDGE 7 being set to LISTENING at 110.000026
State of Port number 2 for BRIDGE 12 being set to LISTENING at 110.000026

State of Port number 4 for BRIDGE 11 being set to FORWARDING at 110.000042
State of Port number 1 for BRIDGE 11 being set to BLOCKING at 110.000052
State of Port number 3 for BRIDGE 11 being set to BLOCKING at 110.000062
State of Port number 1 for BRIDGE 15 being set to LISTENING at 113.000016
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 113.000016
State of Port number 3 for BRIDGE 9 being set to LISTENING at 113.000036
State of Port number 1 for BRIDGE 14 being set to BLOCKING at 113.000052
State of Port number 1 for BRIDGE 15 being set to BLOCKING at 114.000016
State of Port number 1 for BRIDGE 10 being set to LEARNING at 119.000016
State of Port number 3 for BRIDGE 14 being set to LEARNING at 125.000016
State of Port number 1 for BRIDGE 7 being set to LEARNING at 125.000026
State of Port number 2 for BRIDGE 12 being set to LEARNING at 125.000026
State of Port number 3 for BRIDGE 9 being set to LEARNING at 128.000036
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 134.000016
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 140.000016
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 140.000026
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 140.000026
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 143.000036
State of Port number 2 for BRIDGE 4 being set to LISTENING at 200.000000
State of Port number 1 for BRIDGE 5 being set to LISTENING at 200.000000
State of Port number 3 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 2 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 4 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 200.000016
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 200.000032
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 200.000032
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 200.000036
State of Port number 1 for BRIDGE 11 being set to LISTENING at 200.000046
State of Port number 3 for BRIDGE 11 being set to LISTENING at 200.000046
State of Port number 4 for BRIDGE 11 being set to LISTENING at 200.000046
State of Port number 1 for BRIDGE 14 being set to LISTENING at 200.000062
State of Port number 3 for BRIDGE 14 being set to LISTENING at 200.000062
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 200.000062
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 200.000062

State of Port number 4 for BRIDGE 5 being set to FORWARDING at 200.000066
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 200.000078
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 200.000078
State of Port number 2 for BRIDGE 15 being set to BLOCKING at 200.000078
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 200.000078
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 200.000103
State of Port number 3 for BRIDGE 5 being set to LEARNING at 215.000016
State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016
State of Port number 1 for BRIDGE 11 being set to LEARNING at 215.000046
State of Port number 3 for BRIDGE 11 being set to LEARNING at 215.000046
State of Port number 1 for BRIDGE 14 being set to LEARNING at 215.000062
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 230.000046
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 230.000046
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 230.000062
State of Port number 1 for BRIDGE 3 being set to LISTENING at 304.000026
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 304.000026
State of Port number 2 for BRIDGE 10 being set to LISTENING at 304.000026
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 304.000026
State of Port number 1 for BRIDGE 12 being set to LISTENING at 310.000016
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 310.000016
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 310.000016
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 310.000016
State of Port number 2 for BRIDGE 13 being set to LISTENING at 310.000026
State of Port number 1 for BRIDGE 13 being set to FORWARDING at 310.000026
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 310.000026
State of Port number 2 for BRIDGE 13 being set to FORWARDING at 310.000026
State of Port number 1 for BRIDGE 10 being set to LISTENING at 310.000032
State of Port number 4 for BRIDGE 10 being set to LISTENING at 310.000032
State of Port number 4 for BRIDGE 10 being set to BLOCKING at 310.000052
State of Port number 1 for BRIDGE 5 being set to LISTENING at 310.000062
State of Port number 2 for BRIDGE 5 being set to LISTENING at 310.000062
State of Port number 4 for BRIDGE 5 being set to LISTENING at 310.000062

State of Port number 1 for BRIDGE 11 being set to LISTENING at 310.000078
State of Port number 3 for BRIDGE 11 being set to LISTENING at 310.000078
State of Port number 4 for BRIDGE 11 being set to LISTENING at 310.000078
State of Port number 3 for BRIDGE 3 being set to LISTENING at 310.000078
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 310.000078
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 310.000093
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 310.000103
State of Port number 1 for BRIDGE 9 being set to LISTENING at 315.000016
State of Port number 1 for BRIDGE 15 being set to LISTENING at 315.000016
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 315.000016
State of Port number 1 for BRIDGE 17 being set to LISTENING at 315.000016
State of Port number 2 for BRIDGE 9 being set to LISTENING at 315.000026
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 315.000026
State of Port number 3 for BRIDGE 10 being set to LISTENING at 315.000032
State of Port number 4 for BRIDGE 10 being set to FORWARDING at 315.000032
State of Port number 2 for BRIDGE 7 being set to LISTENING at 316.000016
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 316.000016
State of Port number 4 for BRIDGE 16 being set to LISTENING at 316.000016
State of Port number 1 for BRIDGE 14 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 14 being set to LISTENING at 316.000016
State of Port number 1 for BRIDGE 12 being set to LISTENING at 316.000016
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 316.000016
State of Port number 1 for BRIDGE 13 being set to LISTENING at 316.000016
State of Port number 2 for BRIDGE 6 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 6 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 12 being set to LISTENING at 316.000026
State of Port number 4 for BRIDGE 12 being set to LISTENING at 316.000026
State of Port number 3 for BRIDGE 7 being set to LISTENING at 316.000026
State of Port number 3 for BRIDGE 9 being set to LISTENING at 316.000032
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 316.000032
State of Port number 2 for BRIDGE 15 being set to LISTENING at 316.000032
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 316.000032
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 16 being set to LISTENING at 316.000042

State of Port number 4 for BRIDGE 16 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 17 being set to LISTENING at 316.000042
State of Port number 1 for BRIDGE 17 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 8 being set to LISTENING at 316.000042
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 316.000046
State of Port number 1 for BRIDGE 9 being set to LISTENING at 316.000052
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 316.000052
State of Port number 4 for BRIDGE 16 being set to LISTENING at 316.000052
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 316.000052
State of Port number 1 for BRIDGE 17 being set to LISTENING at 316.000052
State of Port number 2 for BRIDGE 17 being set to FORWARDING at 316.000052
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 316.000058
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 316.000072
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 316.000082
State of Port number 2 for BRIDGE 16 being set to LISTENING at 316.000082
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 316.000082
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 317.000016
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 317.000016
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 317.000016
State of Port number 1 for BRIDGE 16 being set to BLOCKING at 317.000016
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 317.000016
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 317.000026
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 317.000026
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 317.000026
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 317.000026
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 317.000032
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 317.000036
State of Port number 4 for BRIDGE 16 being set to BLOCKING at 317.000036
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 317.000036
State of Port number 3 for BRIDGE 16 being set to LISTENING at 317.000036
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 318.000026
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 318.000036
State of Port number 1 for BRIDGE 3 being set to LEARNING at 319.000026

State of Port number 2 for BRIDGE 10 being set to LEARNING at 319.000026
State of Port number 1 for BRIDGE 5 being set to LEARNING at 325.000062
State of Port number 2 for BRIDGE 6 being set to LEARNING at 331.000016
State of Port number 3 for BRIDGE 12 being set to LEARNING at 331.000026
State of Port number 2 for BRIDGE 15 being set to LEARNING at 331.000032
State of Port number 2 for BRIDGE 8 being set to LEARNING at 331.000042
State of Port number 3 for BRIDGE 16 being set to LEARNING at 332.000036
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 334.000026
State of Port number 2 for BRIDGE 10 being set to FORWARDING at 334.000026
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 340.000062
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 346.000016
State of Port number 3 for BRIDGE 12 being set to FORWARDING at 346.000026
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 346.000032
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 346.000042
State of Port number 3 for BRIDGE 16 being set to FORWARDING at 347.000036
|--|
| Simulation Completed - Collating Results. |
| Events: Total (15,017,476); Average Speed (460,814 events/sec.) |
| Time : Elapsed (33 sec.); Simulated (8 min. 20 sec.) |
DES Log: 1 entry

Transcript from Opnet output for Seed 97 - 15 node topology scenario 2

_____ OPNET Simulation Debugger _____

Type 'help' for Command Summary

ODB> continue
State of Port number 1 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000000

State of Port number 3 for BRIDGE 3 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 4 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 4 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 5 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 6 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 7 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 8 being set to BLOCKING at 0.000000

State of Port number 3 for BRIDGE 8 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 8 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 10 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 10 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 11 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 12 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 12 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 0.000000

State of Port number 1 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 13 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 13 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 14 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 14 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 14 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 14 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 15 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 15 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 15 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 15 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 4 for BRIDGE 16 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 0.000000
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 0.000000
State of Port number 2 for BRIDGE 17 being set to BLOCKING at 0.000000
State of Port number 3 for BRIDGE 17 being set to BLOCKING at 0.000000
State of Port number 1 for BRIDGE 17 being set to FORWARDING at 0.000000
State of Port number 2 for BRIDGE 17 being set to FORWARDING at 0.000000
State of Port number 3 for BRIDGE 17 being set to FORWARDING at 0.000000

State of Port number 2 for BRIDGE 4 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 6 being set to LISTENING at 0.000016
State of Port number 4 for BRIDGE 13 being set to LISTENING at 0.000016
State of Port number 2 for BRIDGE 8 being set to LISTENING at 0.000016
State of Port number 4 for BRIDGE 11 being set to LISTENING at 0.000016
State of Port number 3 for BRIDGE 10 being set to LISTENING at 0.000016
State of Port number 1 for BRIDGE 15 being set to LISTENING at 0.000016
State of Port number 4 for BRIDGE 5 being set to LISTENING at 0.000026
State of Port number 1 for BRIDGE 4 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 7 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 6 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 12 being set to LISTENING at 0.000026
State of Port number 3 for BRIDGE 3 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 15 being set to LISTENING at 0.000026
State of Port number 2 for BRIDGE 5 being set to LISTENING at 0.000036
State of Port number 4 for BRIDGE 4 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 7 being set to LISTENING at 0.000036
State of Port number 3 for BRIDGE 16 being set to LISTENING at 0.000036
State of Port number 3 for BRIDGE 9 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 14 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 11 being set to LISTENING at 0.000036
State of Port number 3 for BRIDGE 12 being set to LISTENING at 0.000036
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 0.000036
State of Port number 3 for BRIDGE 5 being set to LISTENING at 0.000046
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 0.000046
State of Port number 2 for BRIDGE 16 being set to LISTENING at 0.000046
State of Port number 3 for BRIDGE 13 being set to LISTENING at 0.000046
State of Port number 3 for BRIDGE 11 being set to LISTENING at 0.000046
State of Port number 4 for BRIDGE 12 being set to LISTENING at 0.000046
State of Port number 4 for BRIDGE 10 being set to LISTENING at 0.000046
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 0.000046
State of Port number 2 for BRIDGE 17 being set to LISTENING at 0.000046
State of Port number 1 for BRIDGE 17 being set to FORWARDING at 0.000046
State of Port number 2 for BRIDGE 7 being set to LISTENING at 0.000066

State of Port number 1 for BRIDGE 7 being set to FORWARDING at 0.000066
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 0.000066
State of Port number 2 for BRIDGE 14 being set to LISTENING at 0.000066
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 0.000066
State of Port number 1 for BRIDGE 4 being set to FORWARDING at 0.000076
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 0.000076
State of Port number 1 for BRIDGE 13 being set to LISTENING at 0.000086
State of Port number 2 for BRIDGE 13 being set to LISTENING at 0.000086
State of Port number 4 for BRIDGE 13 being set to FORWARDING at 0.000086
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 0.000086
State of Port number 4 for BRIDGE 4 being set to FORWARDING at 0.000096
State of Port number 4 for BRIDGE 16 being set to LISTENING at 0.000096
State of Port number 1 for BRIDGE 9 being set to LISTENING at 0.000096
State of Port number 2 for BRIDGE 9 being set to LISTENING at 0.000096
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 0.000096
State of Port number 2 for BRIDGE 12 being set to LISTENING at 0.000106
State of Port number 1 for BRIDGE 12 being set to LISTENING at 0.000106
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 0.000106
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 0.000112
State of Port number 4 for BRIDGE 13 being set to LISTENING at 0.000116
State of Port number 2 for BRIDGE 13 being set to FORWARDING at 0.000116
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 0.000126
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 1.000016
State of Port number 1 for BRIDGE 16 being set to LISTENING at 1.000016
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 1.000016
State of Port number 1 for BRIDGE 8 being set to LISTENING at 1.000016
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 1.000016
State of Port number 3 for BRIDGE 14 being set to LISTENING at 1.000016
State of Port number 2 for BRIDGE 14 being set to FORWARDING at 1.000016
State of Port number 4 for BRIDGE 12 being set to LISTENING at 1.000016
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 1.000016
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 1.000016
State of Port number 2 for BRIDGE 7 being set to LISTENING at 1.000026
State of Port number 1 for BRIDGE 7 being set to LISTENING at 1.000026

State of Port number 3 for BRIDGE 7 being set to FORWARDING at 1.000026
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 1.000026
State of Port number 1 for BRIDGE 17 being set to LISTENING at 1.000026
State of Port number 2 for BRIDGE 17 being set to FORWARDING at 1.000026
State of Port number 1 for BRIDGE 15 being set to LISTENING at 1.000032
State of Port number 3 for BRIDGE 7 being set to LISTENING at 1.000036
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 1.000036
State of Port number 4 for BRIDGE 10 being set to FORWARDING at 1.000046
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 2.000016
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 2.000016
State of Port number 4 for BRIDGE 13 being set to FORWARDING at 2.000016
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 2.000016
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 2.000016
State of Port number 2 for BRIDGE 15 being set to BLOCKING at 2.000016
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 2.000016
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 2.000016
State of Port number 1 for BRIDGE 16 being set to FORWARDING at 2.000026
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 2.000026
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 2.000026
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 2.000026
State of Port number 2 for BRIDGE 8 being set to LISTENING at 2.000026
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 2.000026
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 2.000026
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 2.000026
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 2.000036
State of Port number 4 for BRIDGE 16 being set to BLOCKING at 2.000046
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 2.000046
State of Port number 3 for BRIDGE 13 being set to FORWARDING at 2.000046
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 3.000016
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 3.000016
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 3.000016
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 3.000026
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 3.000026
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 3.000036

State of Port number 2 for BRIDGE 5 being set to LEARNING at 15.000036
State of Port number 3 for BRIDGE 16 being set to LEARNING at 15.000036
State of Port number 3 for BRIDGE 12 being set to LEARNING at 15.000036
State of Port number 3 for BRIDGE 5 being set to LEARNING at 15.000046
State of Port number 3 for BRIDGE 11 being set to LEARNING at 15.000046
State of Port number 2 for BRIDGE 8 being set to LEARNING at 17.000026
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 30.000036
State of Port number 3 for BRIDGE 16 being set to FORWARDING at 30.000036
State of Port number 3 for BRIDGE 12 being set to FORWARDING at 30.000036
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 30.000046
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 30.000046
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 32.000026
State of Port number 2 for BRIDGE 4 being set to DISABLED at 100.000000
State of Port number 1 for BRIDGE 5 being set to DISABLED at 100.000000
State of Port number 2 for BRIDGE 3 being set to LISTENING at 104.000016
State of Port number 1 for BRIDGE 10 being set to LISTENING at 104.000016
State of Port number 3 for BRIDGE 5 being set to LISTENING at 104.000042
State of Port number 4 for BRIDGE 5 being set to LISTENING at 104.000042
State of Port number 3 for BRIDGE 5 being set to BLOCKING at 104.000052
State of Port number 1 for BRIDGE 11 being set to LISTENING at 104.000058
State of Port number 3 for BRIDGE 11 being set to LISTENING at 104.000058
State of Port number 4 for BRIDGE 11 being set to LISTENING at 104.000058
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 104.000058
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 104.000073
State of Port number 1 for BRIDGE 14 being set to LISTENING at 110.000016
State of Port number 3 for BRIDGE 14 being set to LISTENING at 110.000016
State of Port number 1 for BRIDGE 7 being set to LISTENING at 110.000026
State of Port number 2 for BRIDGE 12 being set to LISTENING at 110.000026
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 110.000042
State of Port number 1 for BRIDGE 11 being set to BLOCKING at 110.000052
State of Port number 3 for BRIDGE 11 being set to BLOCKING at 110.000062
State of Port number 1 for BRIDGE 15 being set to LISTENING at 113.000016
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 113.000016
State of Port number 3 for BRIDGE 14 being set to BLOCKING at 113.000032

State of Port number 3 for BRIDGE 9 being set to LISTENING at 113.000036
State of Port number 1 for BRIDGE 14 being set to BLOCKING at 113.000052
State of Port number 1 for BRIDGE 10 being set to LEARNING at 119.000016
State of Port number 1 for BRIDGE 7 being set to LEARNING at 125.000026
State of Port number 2 for BRIDGE 12 being set to LEARNING at 125.000026
State of Port number 1 for BRIDGE 15 being set to LEARNING at 128.000016
State of Port number 3 for BRIDGE 9 being set to LEARNING at 128.000036
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 134.000016
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 140.000026
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 140.000026
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 143.000016
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 143.000036
State of Port number 2 for BRIDGE 4 being set to LISTENING at 200.000000
State of Port number 1 for BRIDGE 5 being set to LISTENING at 200.000000
State of Port number 3 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 2 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 4 for BRIDGE 5 being set to LISTENING at 200.000016
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 200.000016
State of Port number 2 for BRIDGE 3 being set to BLOCKING at 200.000032
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 200.000032
State of Port number 2 for BRIDGE 4 being set to FORWARDING at 200.000036
State of Port number 1 for BRIDGE 11 being set to LISTENING at 200.000046
State of Port number 3 for BRIDGE 11 being set to LISTENING at 200.000046
State of Port number 4 for BRIDGE 11 being set to LISTENING at 200.000046
State of Port number 1 for BRIDGE 14 being set to LISTENING at 200.000062
State of Port number 3 for BRIDGE 14 being set to LISTENING at 200.000062
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 200.000062
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 200.000062
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 200.000066
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 200.000078
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 200.000078
State of Port number 2 for BRIDGE 15 being set to BLOCKING at 200.000078
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 200.000103
State of Port number 3 for BRIDGE 5 being set to LEARNING at 215.000016

State of Port number 2 for BRIDGE 5 being set to LEARNING at 215.000016
State of Port number 1 for BRIDGE 11 being set to LEARNING at 215.000046
State of Port number 3 for BRIDGE 11 being set to LEARNING at 215.000046
State of Port number 1 for BRIDGE 14 being set to LEARNING at 215.000062
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 230.000016
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 230.000046
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 230.000046
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 230.000062
State of Port number 1 for BRIDGE 3 being set to LISTENING at 304.000026
State of Port number 2 for BRIDGE 3 being set to FORWARDING at 304.000026
State of Port number 2 for BRIDGE 10 being set to LISTENING at 304.000026
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 304.000026
State of Port number 1 for BRIDGE 12 being set to LISTENING at 310.000016
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 310.000016
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 310.000016
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 310.000016
State of Port number 2 for BRIDGE 13 being set to LISTENING at 310.000026
State of Port number 1 for BRIDGE 13 being set to FORWARDING at 310.000026
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 310.000026
State of Port number 2 for BRIDGE 13 being set to FORWARDING at 310.000026
State of Port number 1 for BRIDGE 10 being set to LISTENING at 310.000032
State of Port number 4 for BRIDGE 10 being set to LISTENING at 310.000032
State of Port number 4 for BRIDGE 10 being set to BLOCKING at 310.000052
State of Port number 1 for BRIDGE 5 being set to LISTENING at 310.000062
State of Port number 2 for BRIDGE 5 being set to LISTENING at 310.000062
State of Port number 4 for BRIDGE 5 being set to LISTENING at 310.000062
State of Port number 1 for BRIDGE 11 being set to LISTENING at 310.000078
State of Port number 3 for BRIDGE 11 being set to LISTENING at 310.000078
State of Port number 4 for BRIDGE 11 being set to LISTENING at 310.000078
State of Port number 3 for BRIDGE 3 being set to LISTENING at 310.000078
State of Port number 1 for BRIDGE 10 being set to FORWARDING at 310.000078
State of Port number 4 for BRIDGE 5 being set to FORWARDING at 310.000093
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 310.000103

State of Port number 1 for BRIDGE 9 being set to LISTENING at 315.000016
State of Port number 1 for BRIDGE 15 being set to LISTENING at 315.000016
State of Port number 2 for BRIDGE 15 being set to FORWARDING at 315.000016
State of Port number 1 for BRIDGE 17 being set to LISTENING at 315.000016
State of Port number 2 for BRIDGE 9 being set to LISTENING at 315.000026
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 315.000026
State of Port number 3 for BRIDGE 10 being set to LISTENING at 315.000032
State of Port number 4 for BRIDGE 10 being set to FORWARDING at 315.000032
State of Port number 2 for BRIDGE 7 being set to LISTENING at 316.000016
State of Port number 1 for BRIDGE 7 being set to FORWARDING at 316.000016
State of Port number 4 for BRIDGE 16 being set to LISTENING at 316.000016
State of Port number 1 for BRIDGE 14 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 14 being set to LISTENING at 316.000016
State of Port number 1 for BRIDGE 12 being set to LISTENING at 316.000016
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 316.000016
State of Port number 1 for BRIDGE 13 being set to LISTENING at 316.000016
State of Port number 2 for BRIDGE 6 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 6 being set to LISTENING at 316.000016
State of Port number 3 for BRIDGE 12 being set to LISTENING at 316.000026
State of Port number 4 for BRIDGE 12 being set to LISTENING at 316.000026
State of Port number 3 for BRIDGE 7 being set to LISTENING at 316.000026
State of Port number 3 for BRIDGE 9 being set to LISTENING at 316.000032
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 316.000032
State of Port number 2 for BRIDGE 14 being set to LISTENING at 316.000036
State of Port number 3 for BRIDGE 14 being set to FORWARDING at 316.000036
State of Port number 4 for BRIDGE 11 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 16 being set to LISTENING at 316.000042
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 17 being set to LISTENING at 316.000042
State of Port number 1 for BRIDGE 17 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 8 being set to LISTENING at 316.000042
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 316.000042
State of Port number 2 for BRIDGE 7 being set to BLOCKING at 316.000046
State of Port number 1 for BRIDGE 9 being set to LISTENING at 316.000052

State of Port number 3 for BRIDGE 9 being set to FORWARDING at 316.000052
State of Port number 4 for BRIDGE 16 being set to LISTENING at 316.000052
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 316.000052
State of Port number 1 for BRIDGE 17 being set to LISTENING at 316.000052
State of Port number 2 for BRIDGE 17 being set to FORWARDING at 316.000052
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 316.000058
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 316.000072
State of Port number 2 for BRIDGE 16 being set to LISTENING at 316.000072
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 316.000072
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 316.000082
State of Port number 1 for BRIDGE 9 being set to BLOCKING at 317.000016
State of Port number 1 for BRIDGE 11 being set to LISTENING at 317.000016
State of Port number 2 for BRIDGE 11 being set to LISTENING at 317.000016
State of Port number 3 for BRIDGE 11 being set to LISTENING at 317.000016
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 317.000016
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 317.000016
State of Port number 1 for BRIDGE 15 being set to FORWARDING at 317.000016
State of Port number 1 for BRIDGE 17 being set to BLOCKING at 317.000016
State of Port number 3 for BRIDGE 9 being set to BLOCKING at 317.000026
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 317.000026
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 317.000026
State of Port number 4 for BRIDGE 16 being set to BLOCKING at 317.000026
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 317.000026
State of Port number 1 for BRIDGE 16 being set to LISTENING at 317.000026
State of Port number 3 for BRIDGE 16 being set to LISTENING at 317.000026
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 317.000032
State of Port number 2 for BRIDGE 5 being set to LISTENING at 317.000032
State of Port number 3 for BRIDGE 5 being set to LISTENING at 317.000032
State of Port number 1 for BRIDGE 9 being set to LISTENING at 317.000036
State of Port number 2 for BRIDGE 9 being set to LISTENING at 317.000036
State of Port number 3 for BRIDGE 9 being set to FORWARDING at 317.000036
State of Port number 4 for BRIDGE 16 being set to LISTENING at 317.000036
State of Port number 2 for BRIDGE 16 being set to LISTENING at 317.000036
State of Port number 1 for BRIDGE 16 being set to FORWARDING at 317.000036

State of Port number 2 for BRIDGE 11 being set to FORWARDING at 317.000048
State of Port number 3 for BRIDGE 3 being set to LISTENING at 317.000048
State of Port number 3 for BRIDGE 10 being set to LISTENING at 317.000048
State of Port number 4 for BRIDGE 10 being set to LISTENING at 317.000048
State of Port number 2 for BRIDGE 5 being set to FORWARDING at 317.000063
State of Port number 3 for BRIDGE 5 being set to FORWARDING at 317.000073
State of Port number 1 for BRIDGE 8 being set to LISTENING at 318.000016
State of Port number 2 for BRIDGE 8 being set to FORWARDING at 318.000016
State of Port number 1 for BRIDGE 13 being set to LISTENING at 318.000016
State of Port number 2 for BRIDGE 13 being set to LISTENING at 318.000016
State of Port number 3 for BRIDGE 13 being set to LISTENING at 318.000016
State of Port number 2 for BRIDGE 14 being set to FORWARDING at 318.000016
State of Port number 2 for BRIDGE 12 being set to LISTENING at 318.000016
State of Port number 2 for BRIDGE 17 being set to LISTENING at 318.000016
State of Port number 1 for BRIDGE 17 being set to FORWARDING at 318.000016
State of Port number 2 for BRIDGE 7 being set to LISTENING at 318.000026
State of Port number 1 for BRIDGE 7 being set to LISTENING at 318.000026
State of Port number 3 for BRIDGE 7 being set to FORWARDING at 318.000026
State of Port number 1 for BRIDGE 14 being set to FORWARDING at 318.000026
State of Port number 1 for BRIDGE 12 being set to LISTENING at 318.000026
State of Port number 2 for BRIDGE 12 being set to FORWARDING at 318.000026
State of Port number 3 for BRIDGE 6 being set to LISTENING at 318.000026
State of Port number 1 for BRIDGE 7 being set to BLOCKING at 318.000036
State of Port number 2 for BRIDGE 12 being set to BLOCKING at 318.000036
State of Port number 4 for BRIDGE 12 being set to FORWARDING at 318.000036
State of Port number 1 for BRIDGE 6 being set to BLOCKING at 318.000036
State of Port number 3 for BRIDGE 6 being set to FORWARDING at 318.000036
State of Port number 2 for BRIDGE 17 being set to BLOCKING at 318.000036
State of Port number 3 for BRIDGE 3 being set to FORWARDING at 318.000042
State of Port number 4 for BRIDGE 16 being set to FORWARDING at 318.000046
State of Port number 1 for BRIDGE 10 being set to BLOCKING at 318.000046
State of Port number 4 for BRIDGE 10 being set to FORWARDING at 318.000046
State of Port number 3 for BRIDGE 6 being set to BLOCKING at 318.000046
State of Port number 2 for BRIDGE 6 being set to FORWARDING at 318.000046

State of Port number 3 for BRIDGE 16 being set to FORWARDING at 318.000056
State of Port number 3 for BRIDGE 11 being set to FORWARDING at 318.000066
State of Port number 2 for BRIDGE 7 being set to FORWARDING at 319.000016
State of Port number 1 for BRIDGE 9 being set to FORWARDING at 319.000016
State of Port number 4 for BRIDGE 10 being set to BLOCKING at 319.000016
State of Port number 3 for BRIDGE 10 being set to FORWARDING at 319.000016
State of Port number 2 for BRIDGE 16 being set to FORWARDING at 319.000016
State of Port number 1 for BRIDGE 13 being set to BLOCKING at 319.000026
State of Port number 1 for BRIDGE 3 being set to LEARNING at 319.000026
State of Port number 2 for BRIDGE 10 being set to LEARNING at 319.000026
State of Port number 2 for BRIDGE 9 being set to FORWARDING at 319.000036
State of Port number 2 for BRIDGE 13 being set to FORWARDING at 319.000036
State of Port number 1 for BRIDGE 12 being set to FORWARDING at 320.000016
State of Port number 1 for BRIDGE 5 being set to LEARNING at 325.000062
State of Port number 3 for BRIDGE 12 being set to LEARNING at 331.000026
State of Port number 1 for BRIDGE 11 being set to LEARNING at 332.000016
State of Port number 1 for BRIDGE 8 being set to LEARNING at 333.000016
State of Port number 3 for BRIDGE 13 being set to LEARNING at 333.000016
State of Port number 1 for BRIDGE 3 being set to FORWARDING at 334.000026
State of Port number 2 for BRIDGE 10 being set to FORWARDING at 334.000026
State of Port number 1 for BRIDGE 5 being set to FORWARDING at 340.000062
State of Port number 3 for BRIDGE 12 being set to FORWARDING at 346.000026
State of Port number 1 for BRIDGE 11 being set to FORWARDING at 347.000016
State of Port number 1 for BRIDGE 8 being set to FORWARDING at 348.000016
State of Port number 3 for BRIDGE 13 being set to FORWARDING at 348.000016
|--|
| Simulation Completed - Collating Results. |
| Events: Total (15,037,840); Average Speed (459,900 events/sec.) |
| Time : Elapsed (33 sec.); Simulated (8 min. 20 sec.) |
DES Log: 1 entry