Assignment-1

COMPUTER NETWORKS

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B-Tech CSE (AI&ML)

SOET

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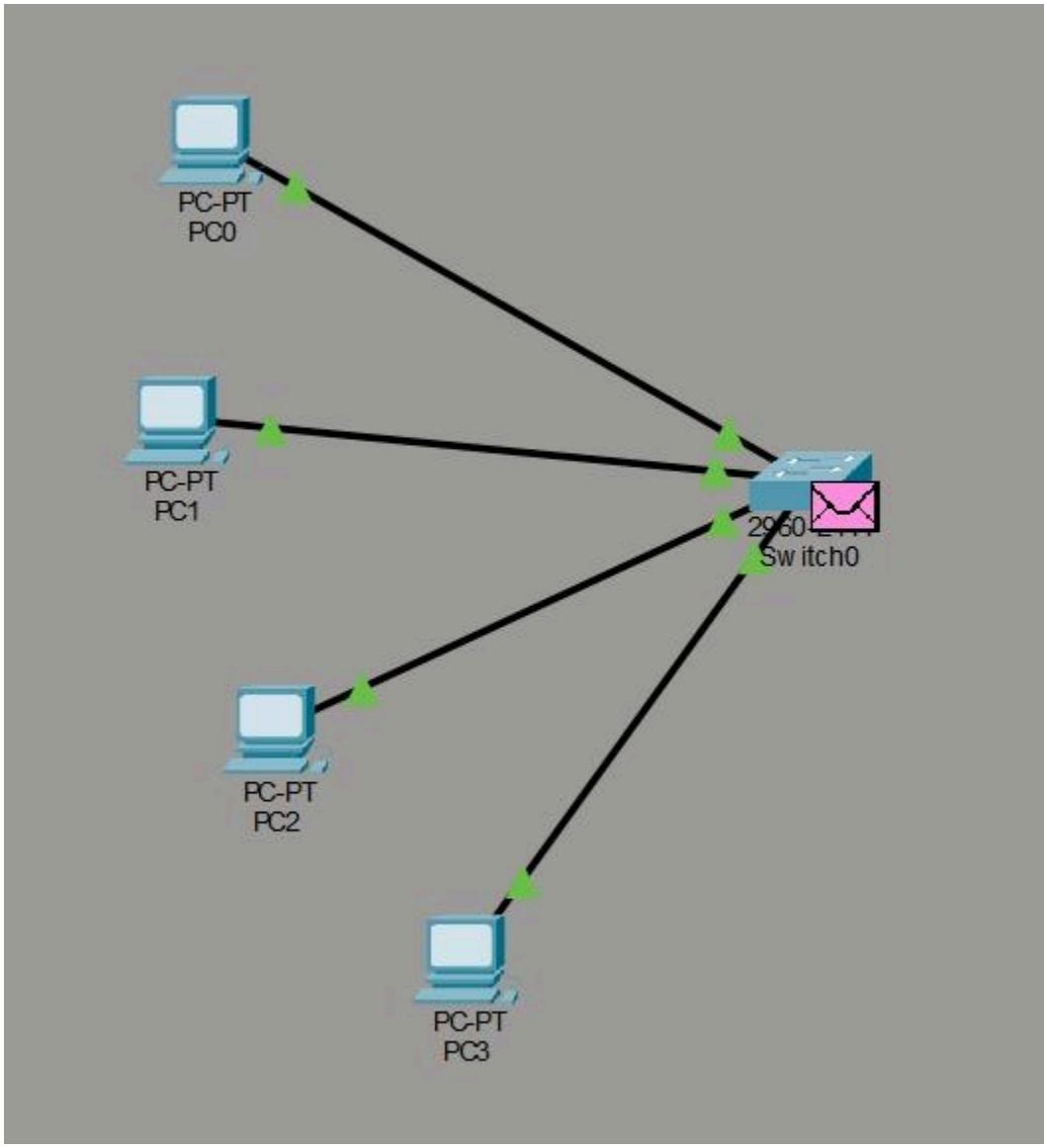
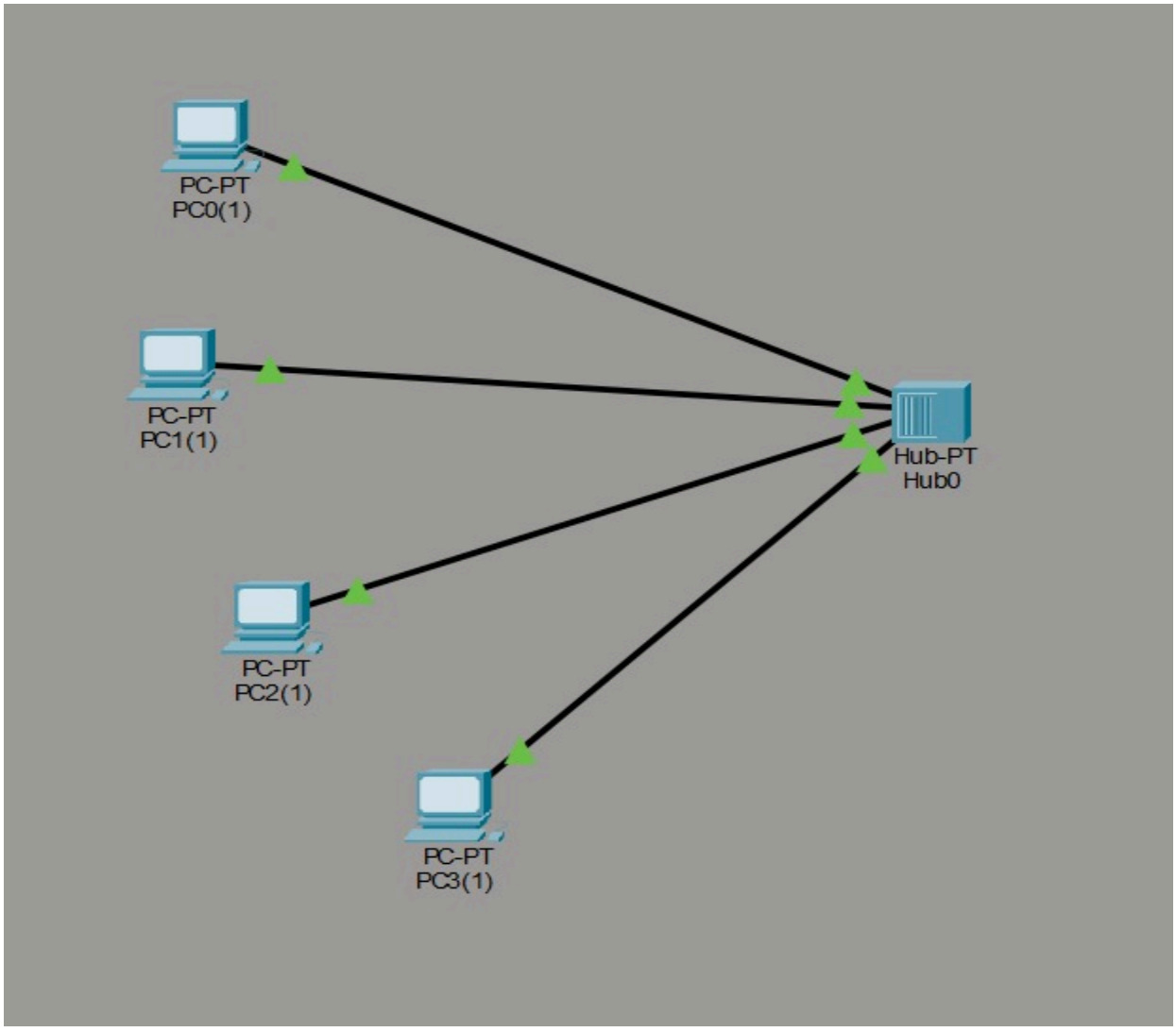
Star Topology

Observation: When PC0 pings PC1, the switch learns their locations. The ICMP packet goes directly from PC0 -> Switch -> PC1. Other PCs (PC2, PC3) do not see the traffic.



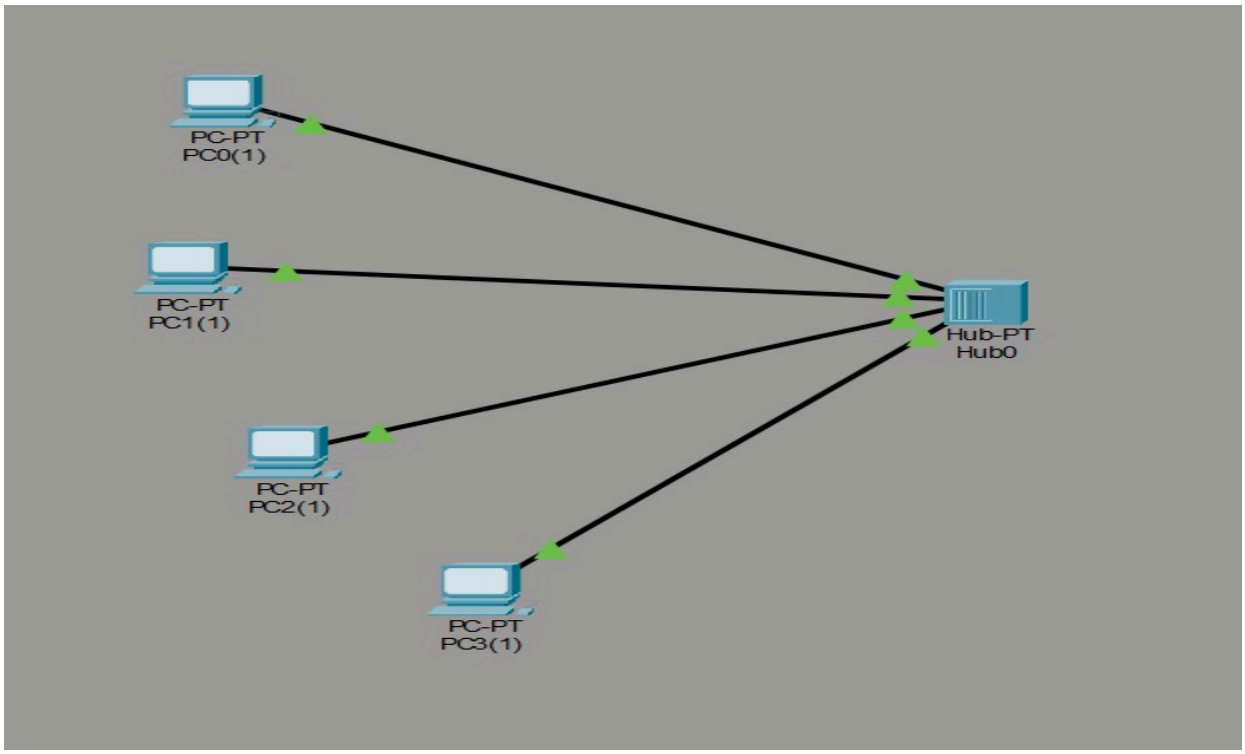
Bus Topology

Observation: You will likely see Collisions (indicated by a small fire/explosion icon in Packet Tracer). Because hubs create a single Collision Domain, only one device can successfully "talk" at a time.



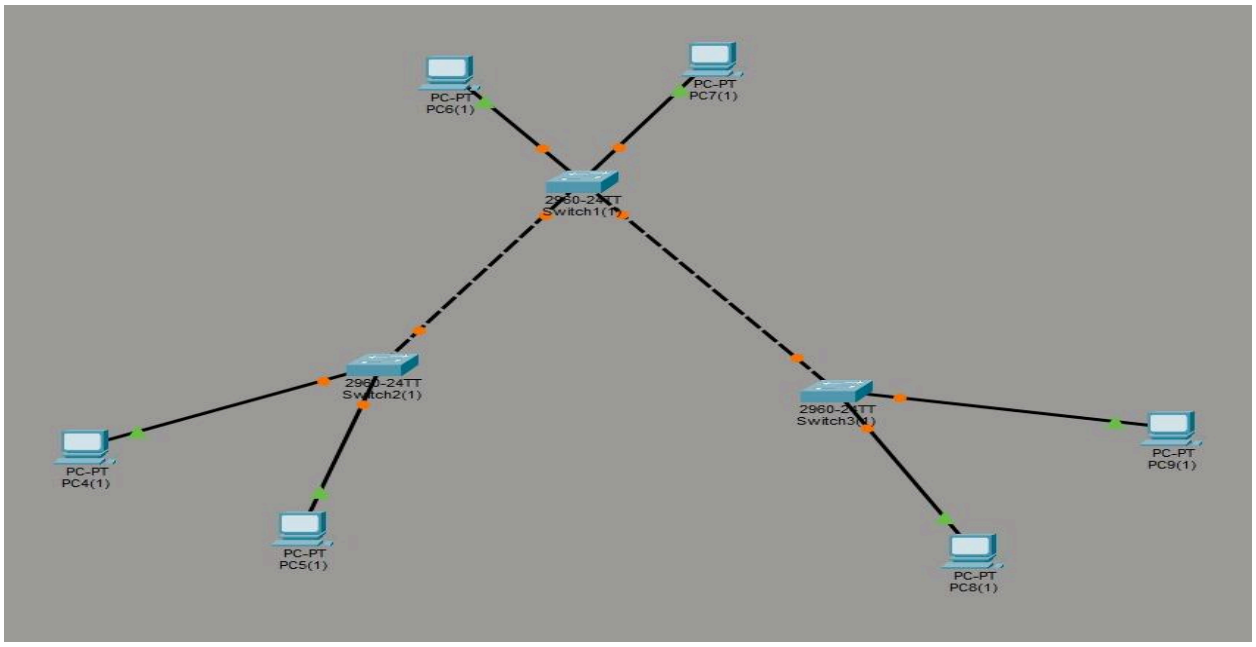
Ring Topology

Observation: The Ring-like topology demonstrates redundancy; while all switches are physically connected, Spanning Tree Protocol (STP) will initially block one port (turning it orange) to prevent a logical loop. In Task 4, disconnecting an active link causes a momentary ping failure until the blocked port "heals" and turns green. This proves that while a Star topology has a single point of failure, a Ring layout provides fault tolerance by automatically rerouting traffic through an alternate path.



Failure test

Observation: We simulate a network failure by deleting a direct link between two switches in the ring. Initially, the ICMP ping will fail as the primary path is broken, but Spanning Tree Protocol (STP) will detect the outage and transition the previously "blocked" (orange) port to a "forwarding" (green) state. This transition demonstrates fault tolerance, as the network automatically "heals" by rerouting traffic through the remaining switches. Consequently, communication is restored without manual reconfiguration, proving that redundant topologies prevent total network collapse during hardware or cable failures.



Conclusion: This experiment demonstrates that while Star topologies provide efficient, collision-free communication using switches, they lack the fault tolerance found in Ring-like layouts. By observing the Spanning Tree Protocol (STP) in Task 4, it becomes clear that redundant links allow a network to "self-heal" by rerouting traffic when a primary cable fails. Ultimately, choosing the right topology requires balancing hardware costs against the need for high availability and performance.