

## Computer Networking: Concepts

### Lab Experiment 3

#### **Procedure:**

Perform the tasks below; capture screenshots and record observations. Consider the following IP addresses: PC0: 192.168.1.10 /24, PC1: 192.168.1.11 /24, PC2: 192.168.1.12 /24, PC3: 192.168.1.13 /24, PC4: 192.168.1.14 /24.

#### 1. *Star topology* (core switch)

- Place one switch (Switch0) and connect each of the 5 PCs to Switch0 using copper straight-through cables.
  - Connect PC0 → Switch0 (FastEthernet0/1)
  - Connect PC1 → Switch0 (FastEthernet0/2)
  - Repeat for all PCs.
- Configure IPs (if not done).
- Tasks:
  - *Test connectivity*: ping between all PC pairs; record success/failure and average RTTs.
  - *Scalability test*: add 3 more PCs and repeat ping tests; note any issues.
  - *Fault tolerance test*: disconnect the cable to PC2 (simulate single-host link failure) and record which communications fail and which remain unaffected.
- Measurements/Observations:
  - Which communications break when a single PC link fails? (expected: only that PC loses connectivity)
  - Does the star show single point of failure at the central switch? Simulate switch failure by deleting Switch0 and observe results.

#### 2. *Bus topology* (emulated)

- Packet Tracer has no “single coax bus” device; emulate bus by connecting all PCs to a single hub (or chain switches/hubs) using straight cables.
- Tasks:
  - *Test connectivity*: ping across PCs.
  - *Observe collisions* (use Simulation mode and low-level frames): generate simultaneous traffic (Advanced PDU or multiple simple PDUs) and inspect frame propagation and collisions.
  - *Fault tolerance*: disconnect one segment/cable and observe effect.
- Measurements/Observations:
  - How does an intermediate cable failure affect communication?
  - Note advantages/disadvantages (e.g., simple wiring vs. collisions and poor scalability).

#### 3. *Ring topology*

- Connect PCs in a logical ring: PC0 → SwitchA → PC1 → SwitchB → PC2 → ... → back to PC0. Alternatively, use switches connected in a ring with PCs on each switch.
- Tasks:
  - Test end-to-end communication (ping all pairs).
  - *Simulation*: trace frame path in Simulation mode and observe how a frame traverses the ring.

- *Fault tolerance*: remove one link and observe if alternative path exists (in simple ring without redundancy, ring should break).
- Measurements/Observations:
  - Does ring provide resilience? (without extra protocols, a single break partitions the ring).
- 4. *Mesh topology*
  - For 5 devices, create full-mesh: connect every PC to every other PC (calculate and use correct number of links).
  - Tasks:
    - *Test connectivity* between all pairs.
    - *Fault tolerance*: remove one or two links and test if all nodes still communicate.
    - *Scalability*: estimate cable/port requirements for adding N<sup>th</sup> node; discuss practicality.
  - Measurements/Observations:
    - Note redundancy and fault tolerance vs cabling complexity.

**Observation Table**

Topology	Devices Used	No. of Links	Successful Communication (Y/N)	Collision Observed (Y/N)	Fault Tolerance (High/Low)	Remarks
Star						
Bus						
Ring						
Mesh						