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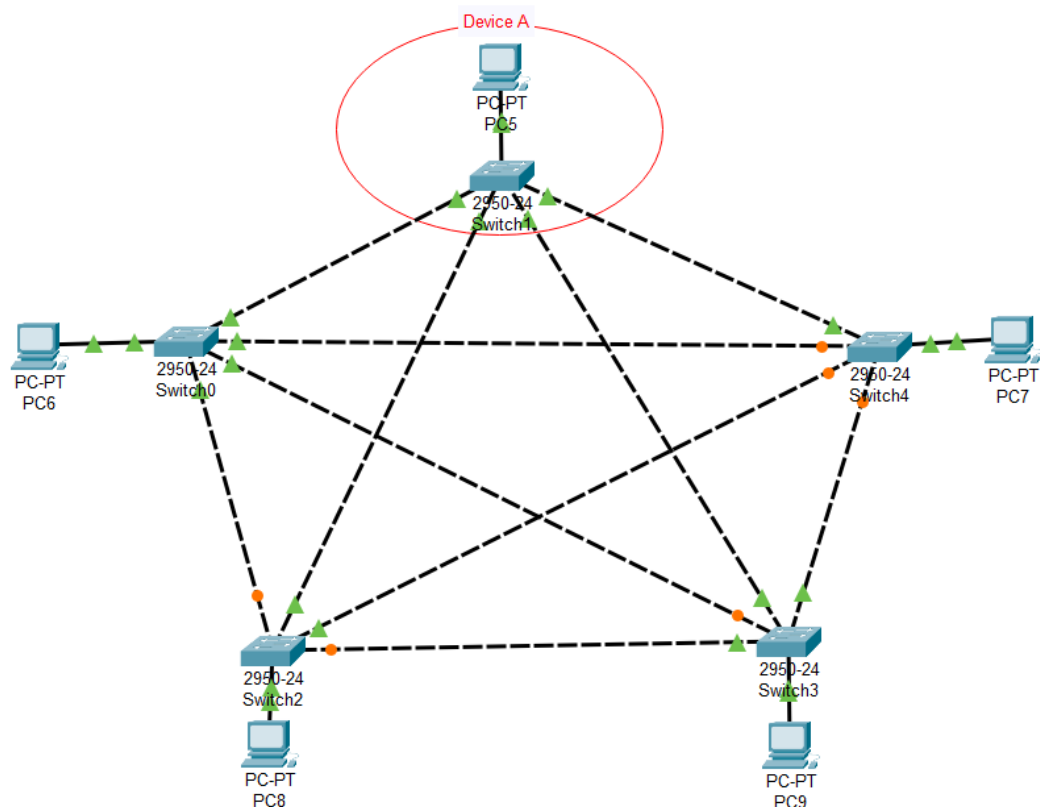
Date: 17-Jan-2023

### Computer Networks Assignment 1

#### Question 1

1 a)

The Diagram below shows 5 devices connected in mesh topology:



if Device A fails,

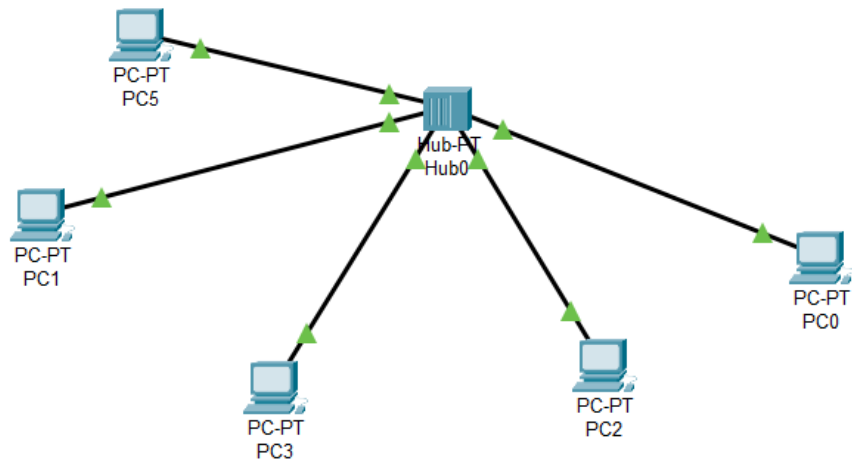
- Device A loses all connections to all the other devices.
- The other devices will still be able to send packets to each other, since there is still a one to one connection between them.
- Therefore, the whole network is not affected.

If a single wire fails for example between device A and PC 6,

- Then the direct connection is only affected. Device A can still send a packet to PC 6 through alternatives routes since each pc in mesh is connected to each other.
- Therefore, fault indentification is easy i.e. it is easy to find the faulty euipment in the network since it is nearly impossible to take down the whole network.

**1 b)**

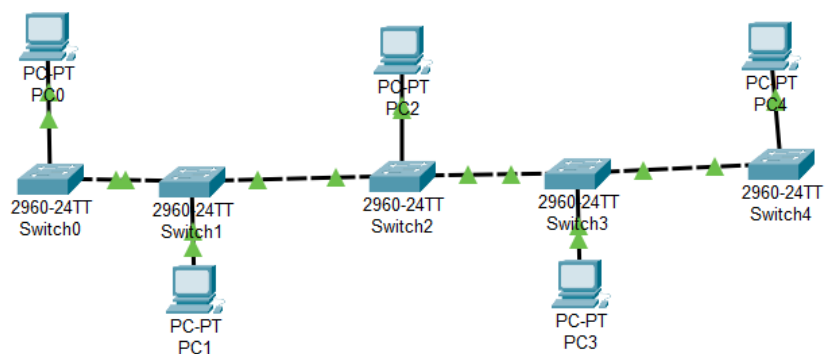
The Diagram below shows 5 devices connected in star topology:



In this case too, if a PC fails the whole network remains unaffected. Other PC's are still able to communicate to each other through the hub and the faulty PC is isolated from the network and there will be no data transmission between the hub.

**1 c)**

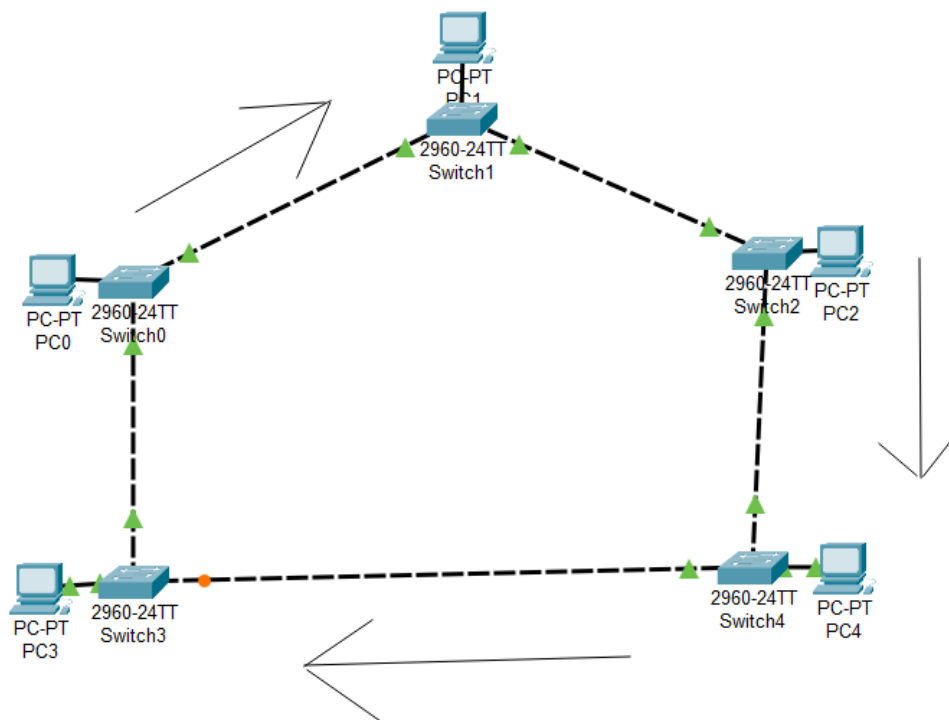
The Diagram below shows 5 devices connected in bus topology:



A device fails	In this case, only the faulty device is isolated from the network that means data transmission between the other devices still continuous via the main cable
The main cable fails	This causes the whole network to fail, none of the devices will be able to transmit data to each other.

**1 d)**

The Diagram below shows 5 devices connected in ring topology:



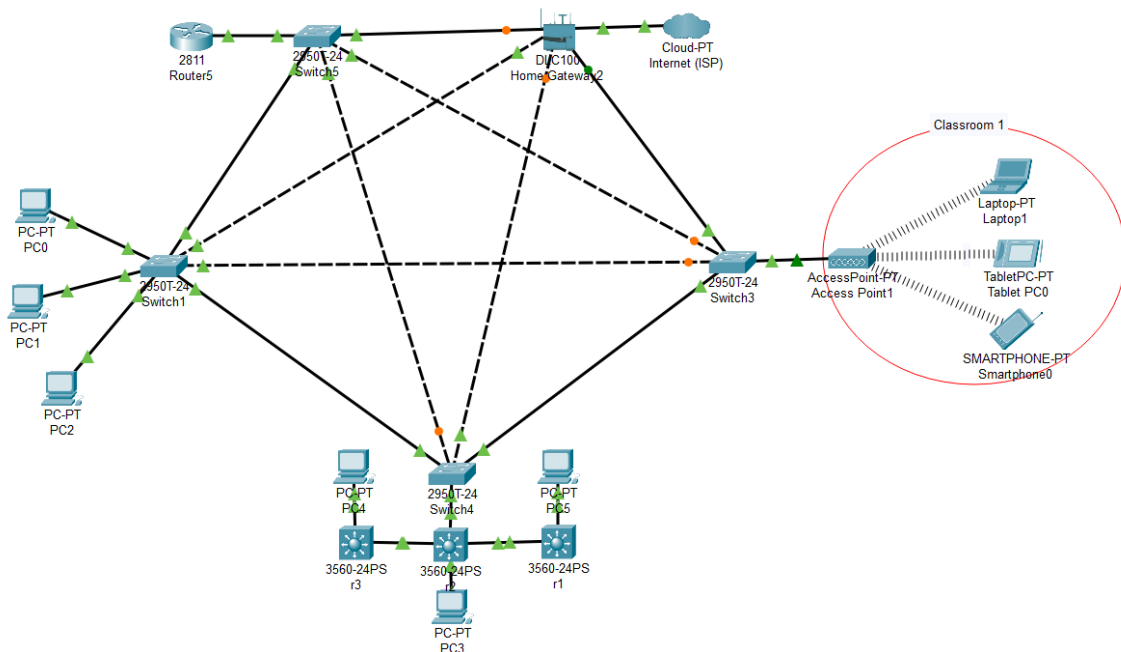
Note : This ring is unidirectional, the arrows show the movement of traffic

- If a device or the wire fails then the whole network is down because it affects the flow of traffic between the devices since it prevents breaks the loop.
- Large amounts of traffic can also cause network slowdown and data loss leading to network failure.
- It is more prone to collisions if many devices send data together.

#### General solutions to the above problems:

- Implement dual bus and dual ring topologies, this is where there are 2 rings or buses are used therefore, incase one ring or bus goes down, the network is maintained via the other ring or bus.
- Hardware and software regular updates to the network.
- Use of network troubleshooting tools to monitor and identify a fault in the network easily.

Below is a network arrangement with other problems and reasons for network failure are given:



#### Switch

Switching loop – This may occur due to multiple connections between 2 switches, or 2 ports connected to each other on the same switch.

This loop creates broadcast radiation- is the accumulation of large amounts of traffic that can use enough network resources to overload the network. For example, Chernobyl packet – a data packet with heavy data.

Solution- to prevent this looping forever, TTL (time to live) can be used – packets will circulate in the loop until their TTL value expires. Therefore, after a certain time packets will be dropped, and this will prevent resource exhaustion.

## Software configurations

For example, IP configurations – not setting the Ipv4 address and subnet mask of the router properly can cause network failure. Other configurations like port status should be on, with bandwidth properly set and duplex settings should be properly tested before establishing the connection.

## Question 2

### Similarities between telephone network and Internet

- Both carry out node to node transmission
- Both use a transmission media either wired or wireless.
- Each end node has a unique address or number
- Both are public networks.
- Both use protocols for data transmission.
- Both can be used for real time communication.

### Differences between the telephone network and Internet

Differential factor	Telephone Network	Internet
Services Offered	<ul style="list-style-type: none"><li>• Real time voice communication by using mobile phones or telephones</li><li>• Voicemails</li><li>• Conference calls</li><li>• MMS</li></ul>	<ul style="list-style-type: none"><li>• Email</li><li>• Video calling like zoom or skype</li><li>• E-commerce</li><li>• Entertainment like Youtube</li><li>• For Education</li><li>• Research</li></ul>
Major use	Voice communication	Surfing
Network structure	Circuit switched – end to end connection between 2 devices.	Packet switched – data is transmitted over the network in small packets.
Users	Limited number of users since it is paid service by each user	It is almost free since internet can be accessed by large number of users for free.
Cost	High cost- usually divided in plans.	Public internet is free

### Question 3

- If the logical destination address is corrupted that means the packet will be not able to reach its destination and will be sent back to the source or sent to the wrong address.
- The Network layer uses IP protocol to transmit packet and can be used for error checking by ICMP protocol – Internet Control Message protocol.
- ICMP is used for troubleshooting. It provides error messages to the source destination. Error detection can be done by mechanisms like Checksum or CRC (cyclic redundancy control).
- Other ways the source can be informed of the error is through TTL- Time to live for example, if the packet is unable to reach its destination and is circulating around the network then a timer can be set and once the packet expires then it will be sent back to the source.
- Using NAK (negative Acknowledgement) – Destination device can send a message to the source stating the packet was not received.

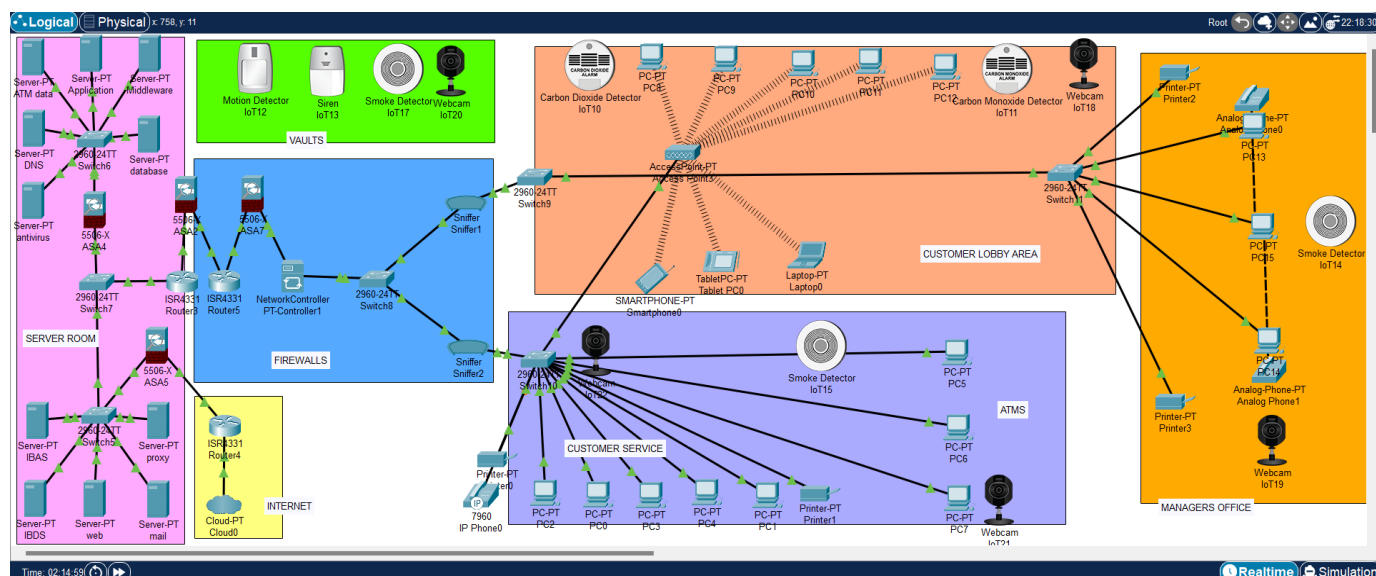
### Question 4

Suppose Scotia Bank wants to amalgamate/merge with an existing small bank in Kamloops to increase their customer base, therefore Scotia banks has set some terms and conditions so that the small bank can level up to meet Scotia's Standards.

Assuming some of the conditions are:

- Increase network speed
- Improved Security
- More Wireless terminals
- More end user devices – ATM, employee and customer stations
- Connection to scotia database and server.

### High cost Representation



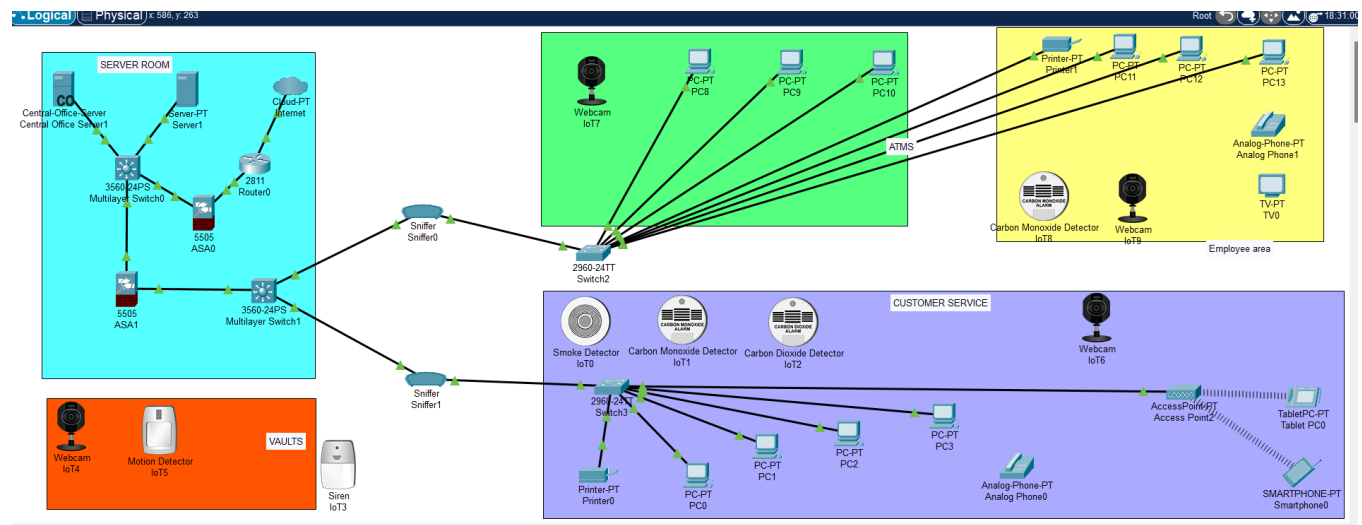
Total cost for the above is:

Hardware cost – 78,000

Cable cost – 12,500 ( based  $1.25\$ * 10,000\text{m}$ )

**Total – 90,500**

## low cost Representation



**Total – 40,540**

## References

<https://bangaloreicai.org/images/icons/ITT/4.%20Core%20Banking%20Solution.pdf>

[https://skillsforall.com/learningcollections/cisco-packet-tracer?utm\\_source=packet-tracer&utm\\_medium=app&utm\\_campaign=packet-tracer-app-link](https://skillsforall.com/learningcollections/cisco-packet-tracer?utm_source=packet-tracer&utm_medium=app&utm_campaign=packet-tracer-app-link)