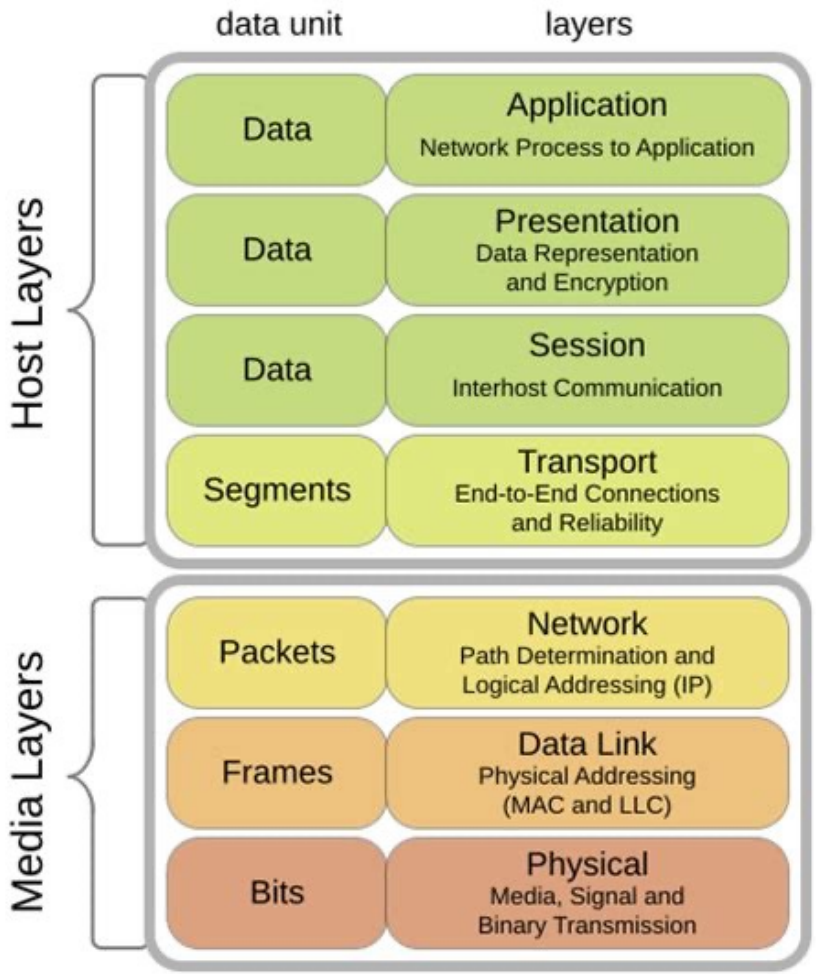



# Campus Networks: Design & concepts

Author:
Sami Ait Ali Oulahcen

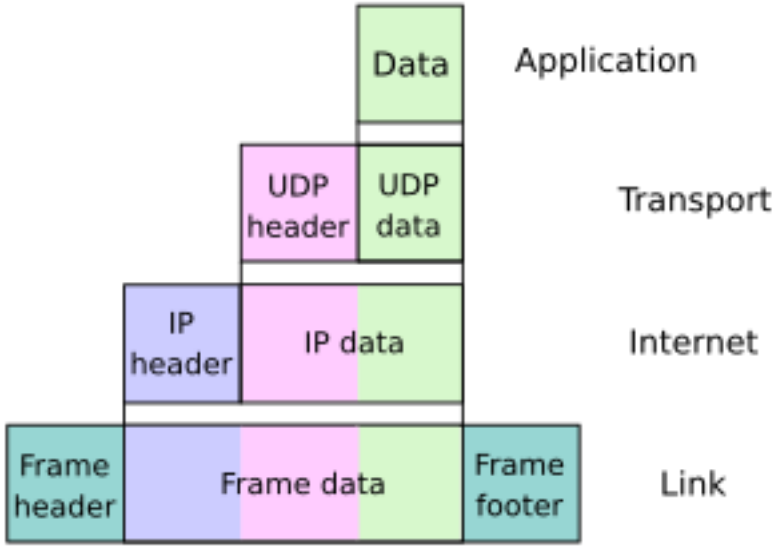
Nouakchott, Mauritania
17-22 February 2025

# OSI network model



# Encapsulation

- L4 segment contains part of stream of application protocol
- L3 datagram contains L4 segment
- L2 frame has L3 datagram in data portion



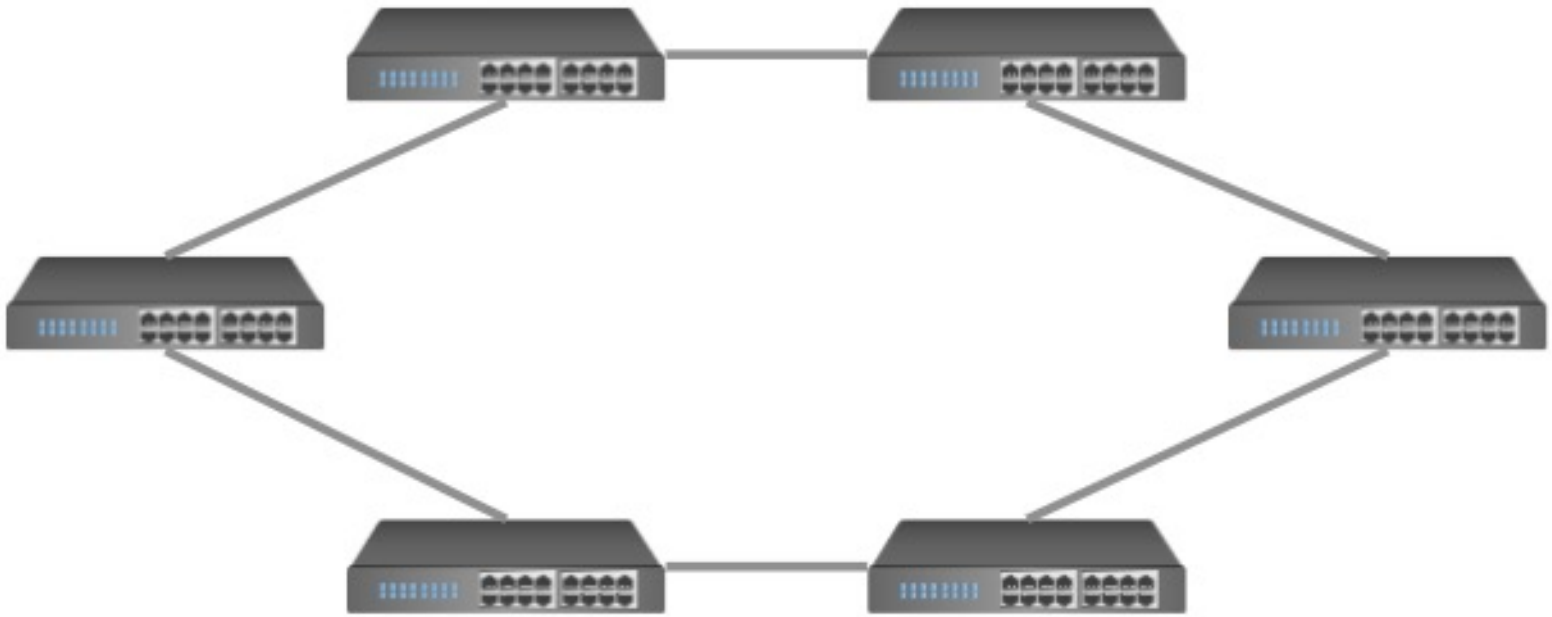
# Network topologies (quick review)

1. **Bus topology**: ex. hubs



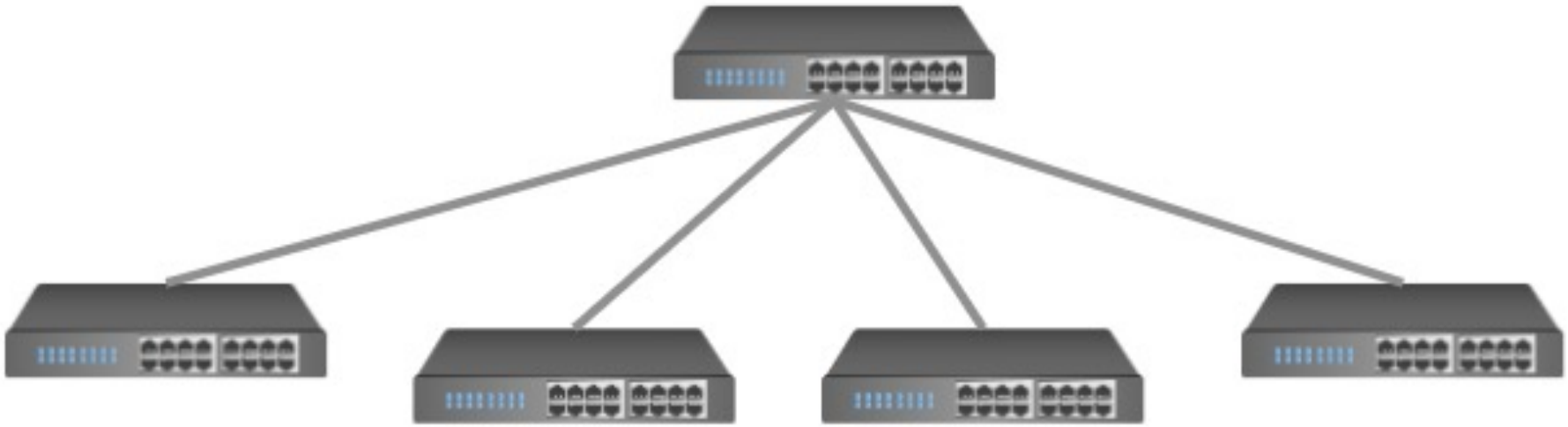
# Network topologies (quick review)

2. **Ring topology**: ex. token ring, optical fiber rings



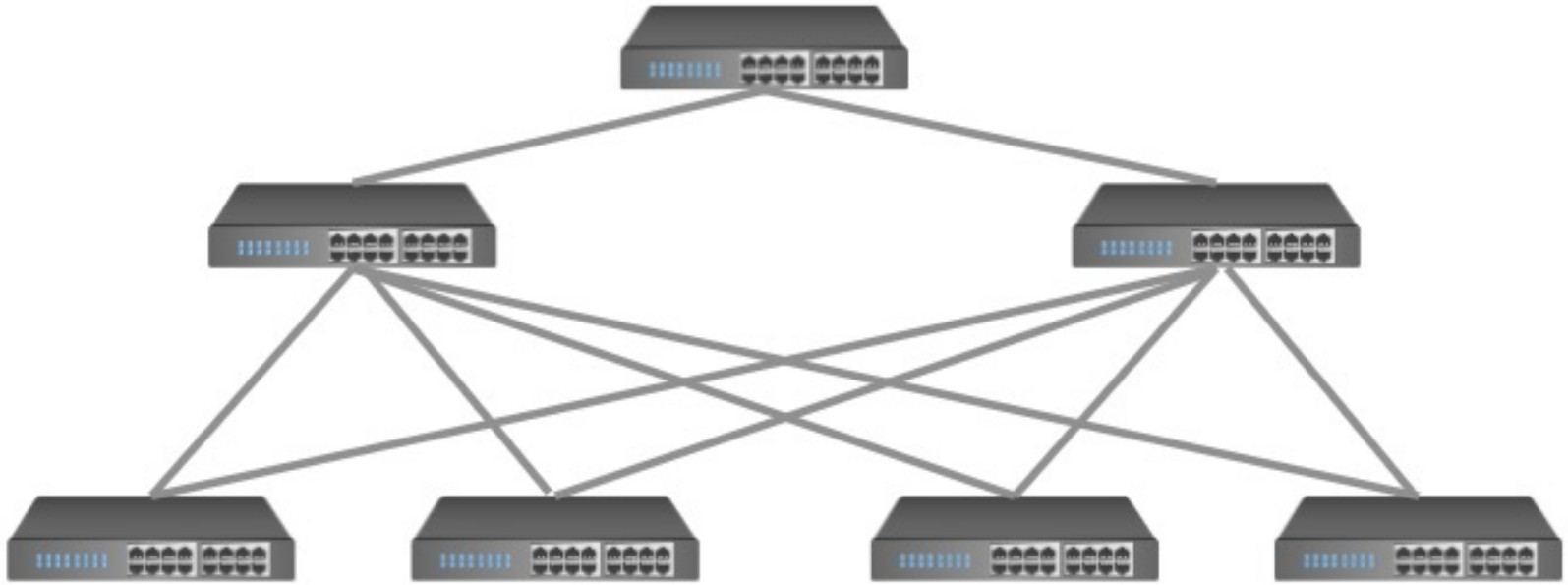
# Network topologies (quick review)

3. **Star topology**: ex. Hub and spoke (used in campus networks design)



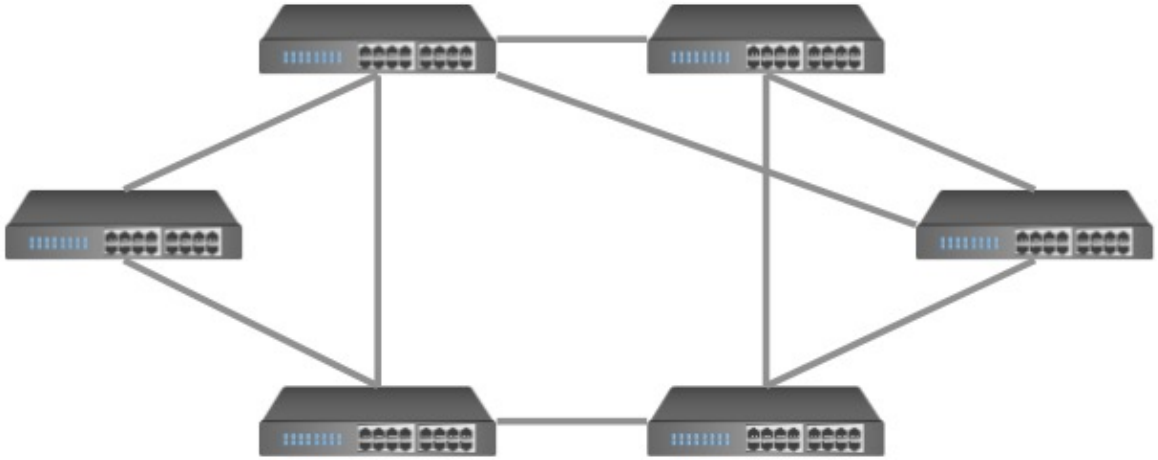
# Network topologies (quick review)

4. **Tree topology**: ex. Spine Leaf architecture (used in data center designs)

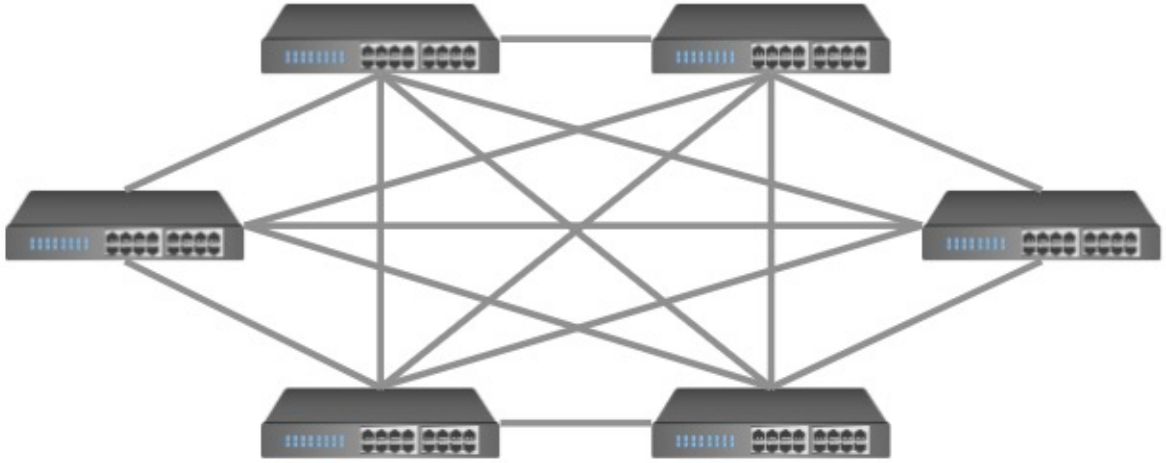


# Network topologies (quick review)

5. **Mech topology**: All equipment connected to each other (Wi-Fi community networks for example)



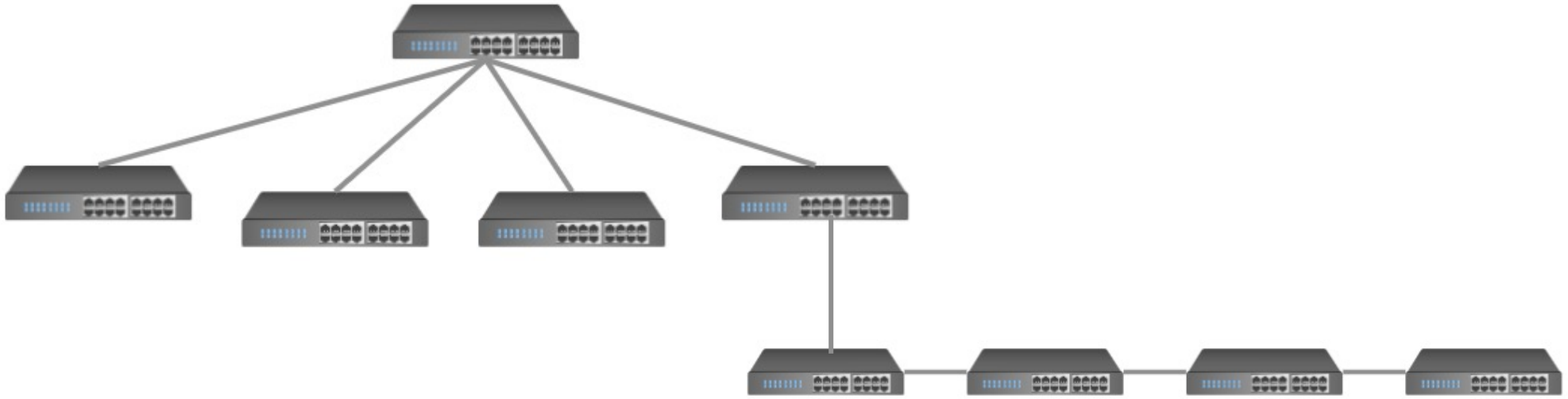
Mech



Full Mech

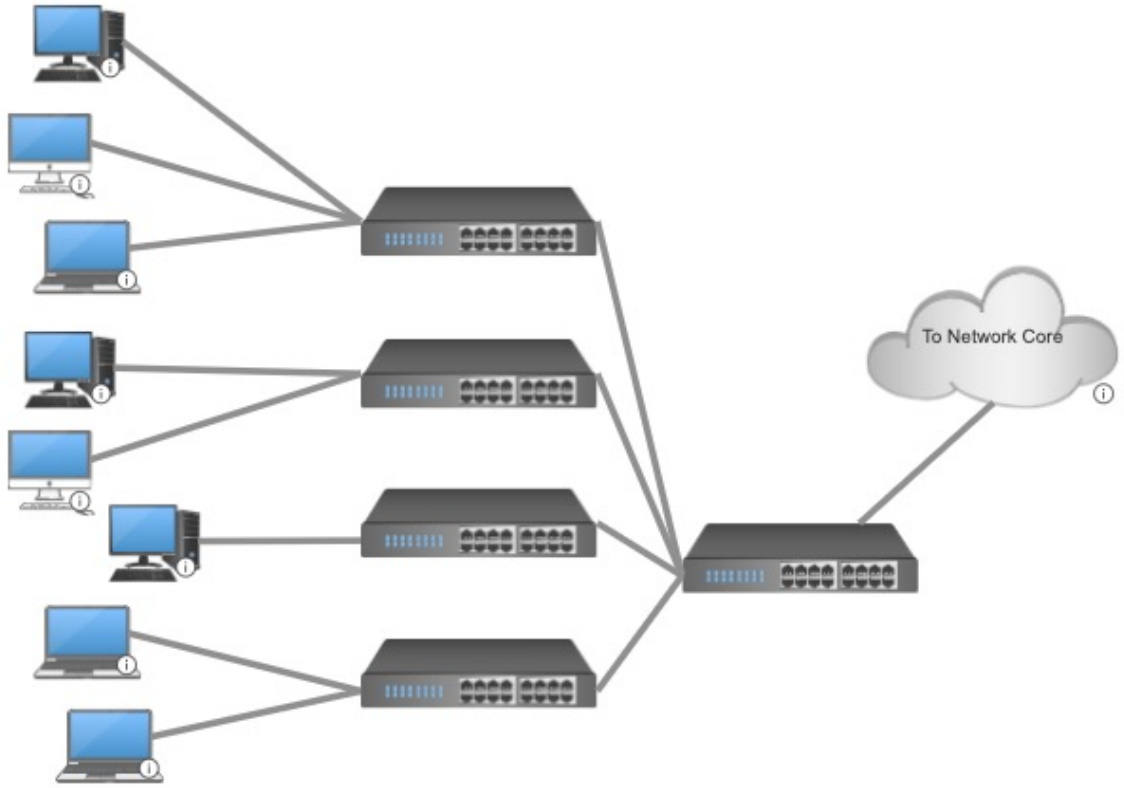
# Network topologies (quick review)

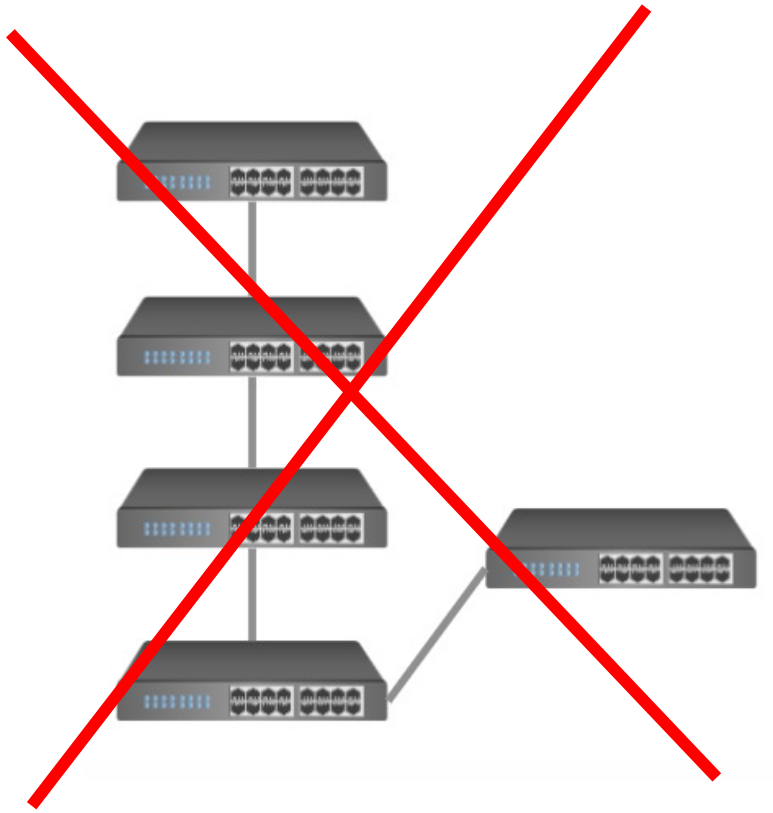
6. **Hybrid topology**: A combination of multiple topologies (for example star topology with daisy chaining for remote buildings or wireless mesh for Wi-Fi)



# Campus networks design

- Hub and spoke from core to buildings
- Hub and spoke inside buildings



No Daisy Chain (bus topology)

# VLANS

- Using VLANs (1 subnet per VLAN) per floor/per building : better isolation, useful for identifying exact location of devices (case of security incidents for example), easier management
- Per VLAN routing done at the core (router/layer3 switch/firewall)
- Separate your networks (labs, offices, Wi-Fi, management, servers…)

# Core and edge

- The Core of the network is the closest to the upstream
- The Edge of the network is the closest to the end-user equipment
- We do routing at the core and switching at the edge
- Switching: limits collision domain (old)
- Routing: limits broadcast domain

# Campus networks design principles

- Allow optimal utilization of high speed bandwidth (no bottlenecks, minimize number of equipment between core and end users)
- Be an enabler for innovation (avoid blocking things unnecessarily)
- Have a good visibility of the network infrastructure (inventory, documentation, monitoring) to find issues/troubleshoot easily
- Have a policy for security incidents (even a very simple one)