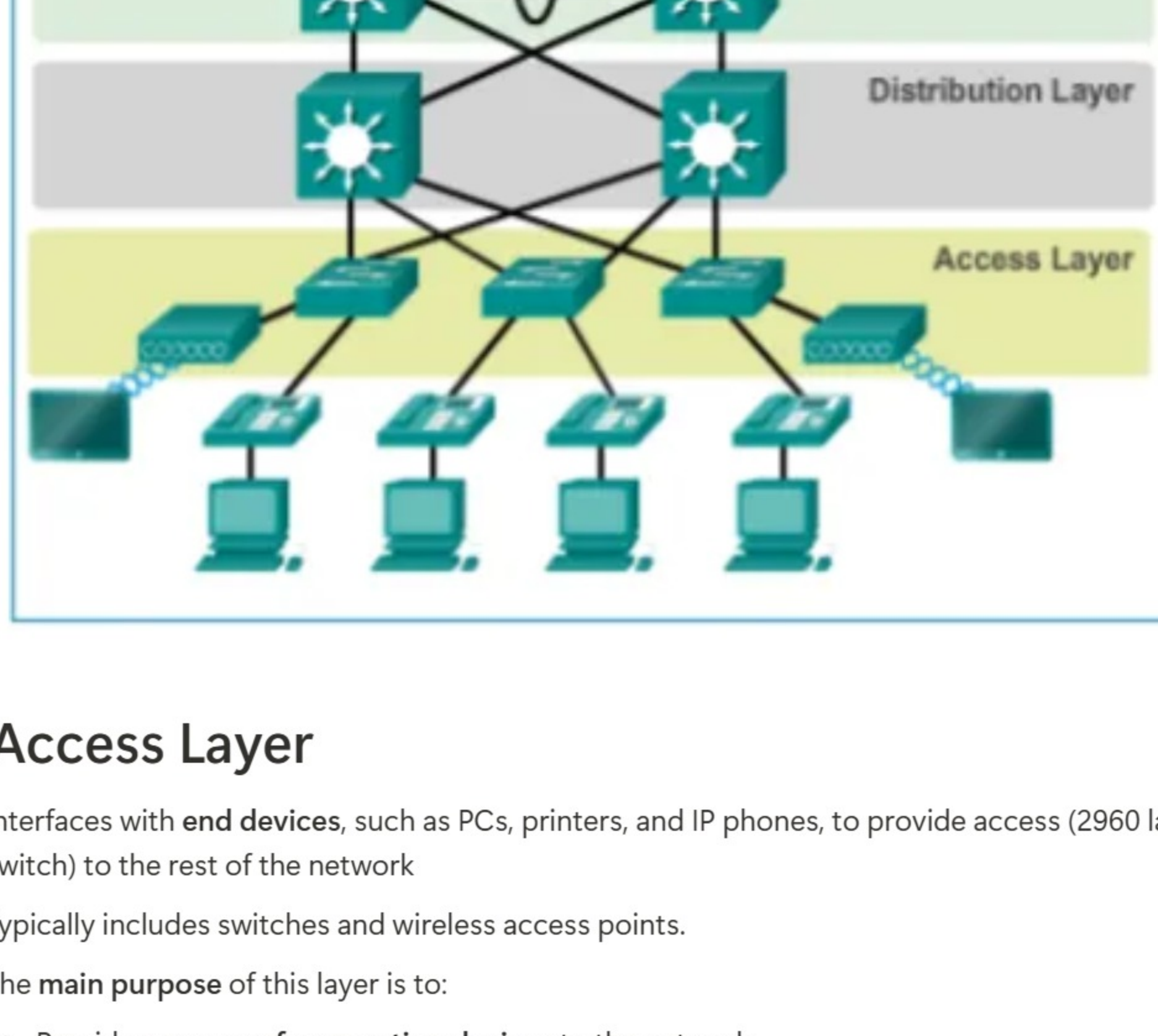


Lecture 7b - LAN Design

3. Distribution Layer
 4. Core Layer
 5. Logical Layout
 6. Physical Layout
 7. Benefits
 8. Design Principles
 - 8.1. Network Diameter
 - 8.2. Bandwidth Aggregation
 - 8.3. Redundancy
 9. Separate vs Converged Networks
 10. Switch Performance Characteristics
 10. Switch Features
- ## 1. Hierarchical Network Design
- To satisfy the **needs** of a **small** successful if a **hierarchical** design
 - This involves **dividing** the

modular, which facilitates **scalability and performance**.

- Access
 - Distribution
 - Core
-
- The diagram illustrates a network architecture. At the top, two clouds labeled 'Internet' are connected to two routers. These routers are part of the 'Core Layer', which is represented by a green background. The routers are interconnected in a mesh topology, with lines connecting them both horizontally and vertically. Below the routers, there are two server icons, each with a sun-like symbol, representing the edge of the network.




- Control which device
- Access layer connectivity

- ### 3. Distribution Layer
- Aggregates the data received from the access layer switches before it is transmitted to the core layer for routing to its final destination
 - Controls the flow of network traffic using policies (ACLs) and delineates broadcast domains by performing routing functions (3560 layer 3 switch) between virtual LANs (VLANs) defined at the access layer

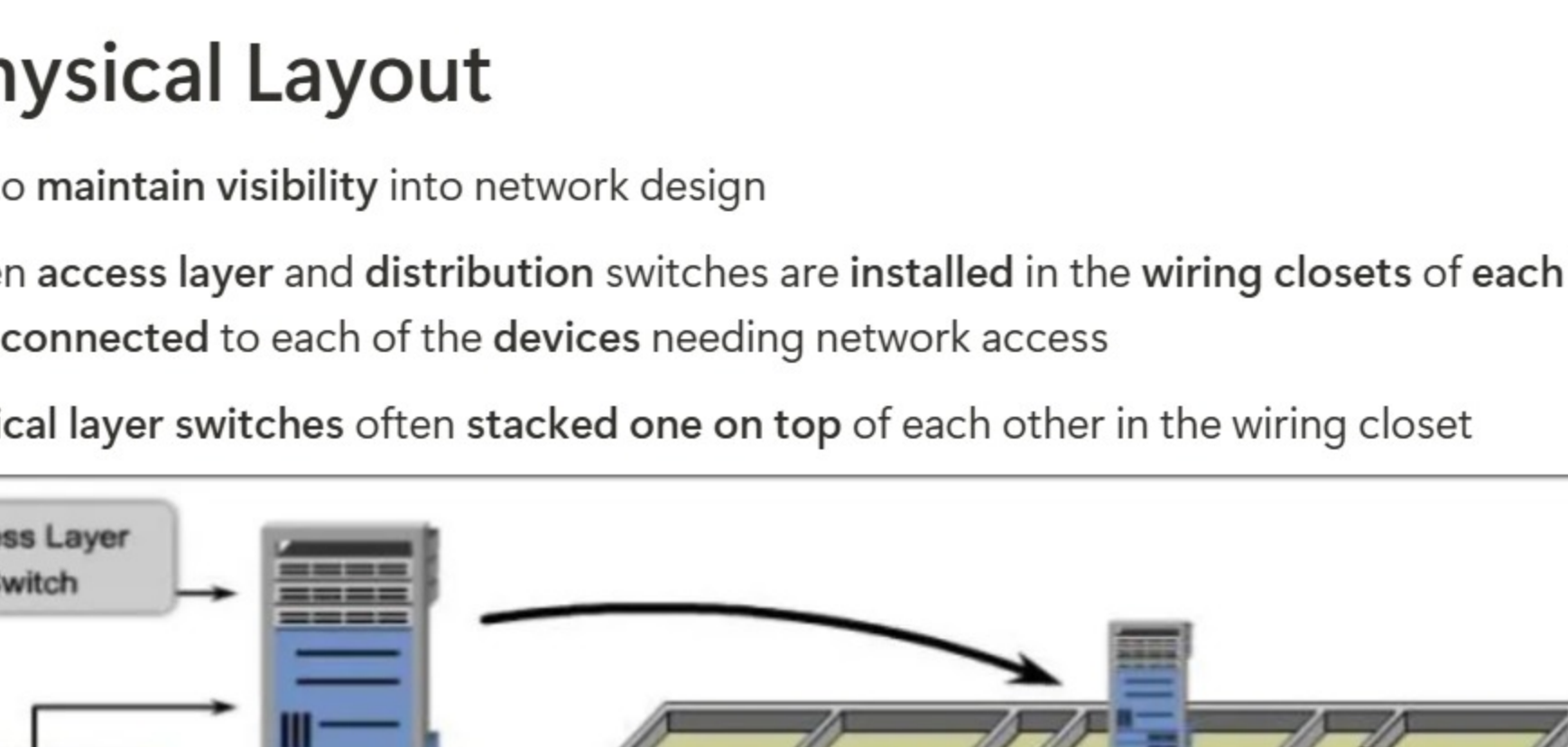
- VLANs allow you to segment the tr
- Distribution layer switches are typi

- **High-speed backbone** of the internet work
- Critical for **interconnectivity** between **distribution layer** devices, so it is **important** for the core to be **highly available** and **redundant**
- The **core layer** can also **connect** to **Internet resources**
- Aggregates the traffic from all the **distribution layer** devices, so it must be **capable of forwarding large amounts of data** quickly

layer and core layer a

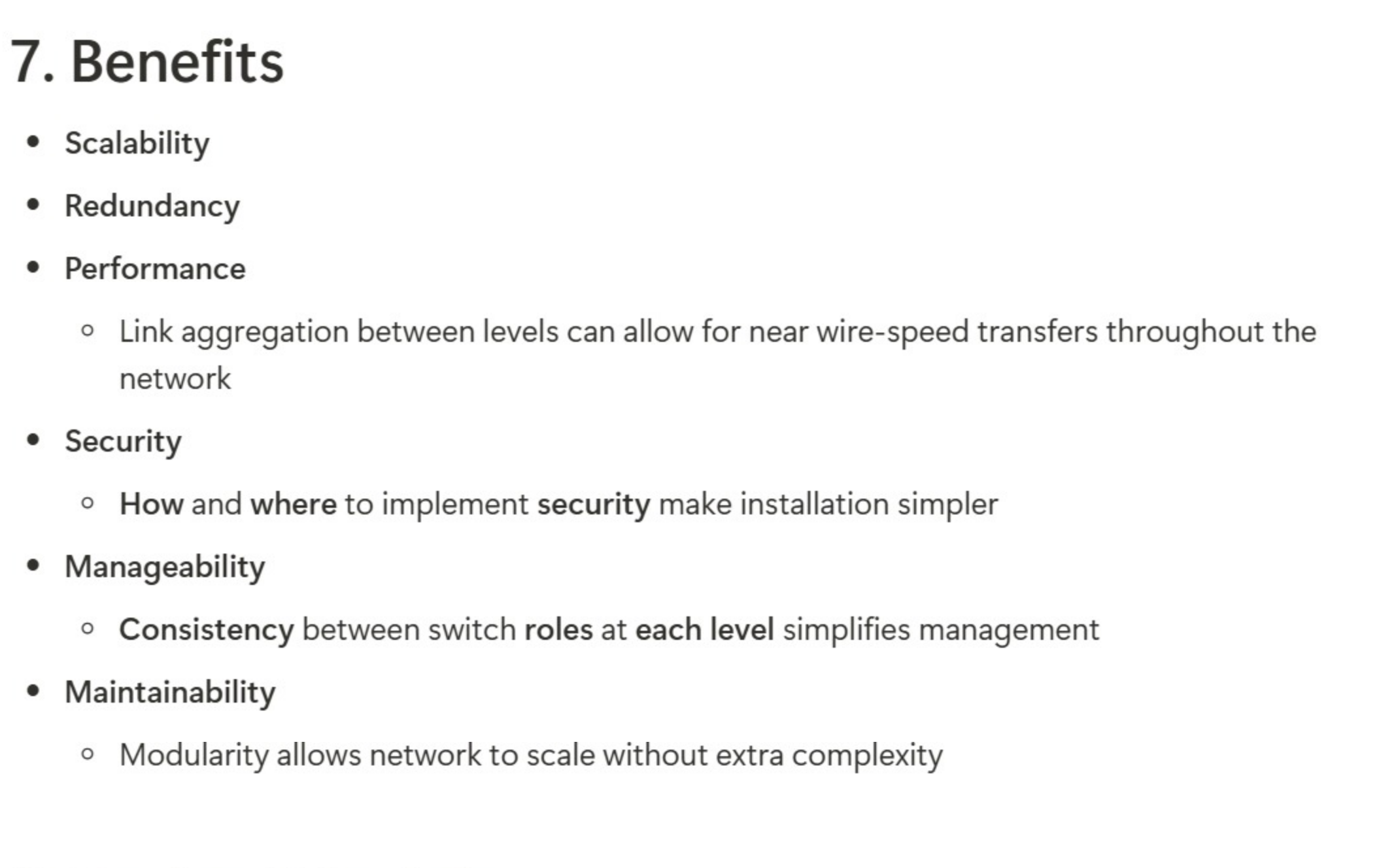
- ## 5. Logical Layout
- Layers separated into **well-defined hierarchy**
 - **Easy to see** which switches perform which function
 - **More difficult to see** in a **physical/installed** hierarchy
 - **NO** Intra-Layer connections
- 
- The diagram illustrates a logical network layout with a clear hierarchy. It shows three distinct layers of switches, each represented by a green switch icon. The top layer has two switches, the middle layer has two switches, and the bottom layer has two switches. Lines connect the switches between layers, showing a clear flow of traffic from top to bottom. There are no connections within the same layer, which is highlighted by the text 'NO Intra-Layer connections'.

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Switch

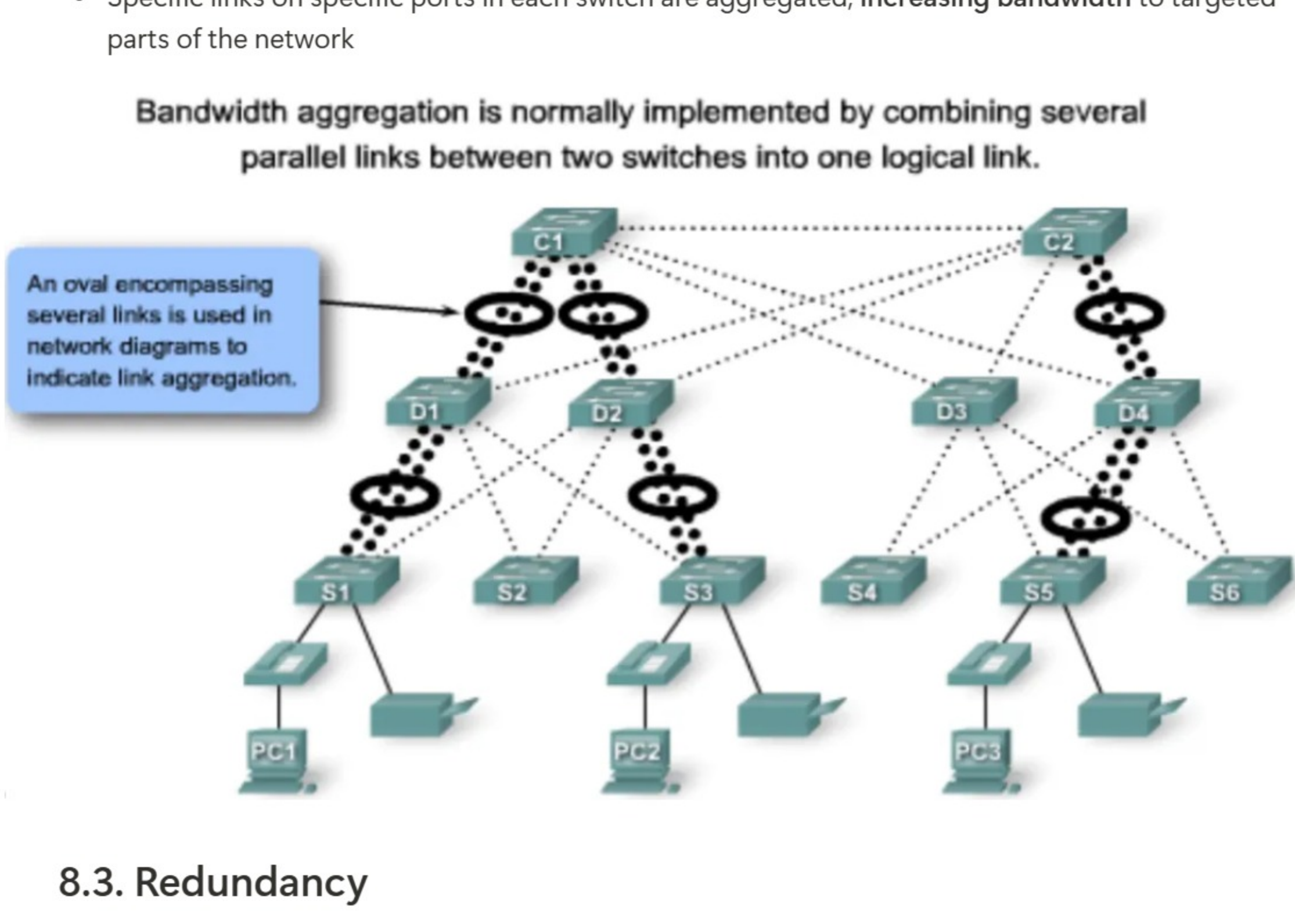
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of Design I

- ### 5.1. Network Diameter
- Number of devices a packet has to cross before reaching its destination
 - A low diameter ensures low and predictable latency between devices
 - In the figure, PC1 communicates with PC3. There could be up to six interconnected switch between PC1 and PC3. In this case, the network diameter is 6
 - In a hierarchical network, network diameter is always going to be a predictable number
-

- 
- The diagram illustrates a network topology where three separate switches, labeled PC1, PC2, and PC3, are connected to a central switch. Each switch has its own dedicated link to the central switch, representing a scenario where bandwidth is not aggregated.
- ## 8.2. Bandwidth Aggregation
- Cisco EtherChannel allows multiple Ethernet links to be aggregated
 - Specific links on specific ports in each switch are aggregated, increasing bandwidth to target




- Double the network

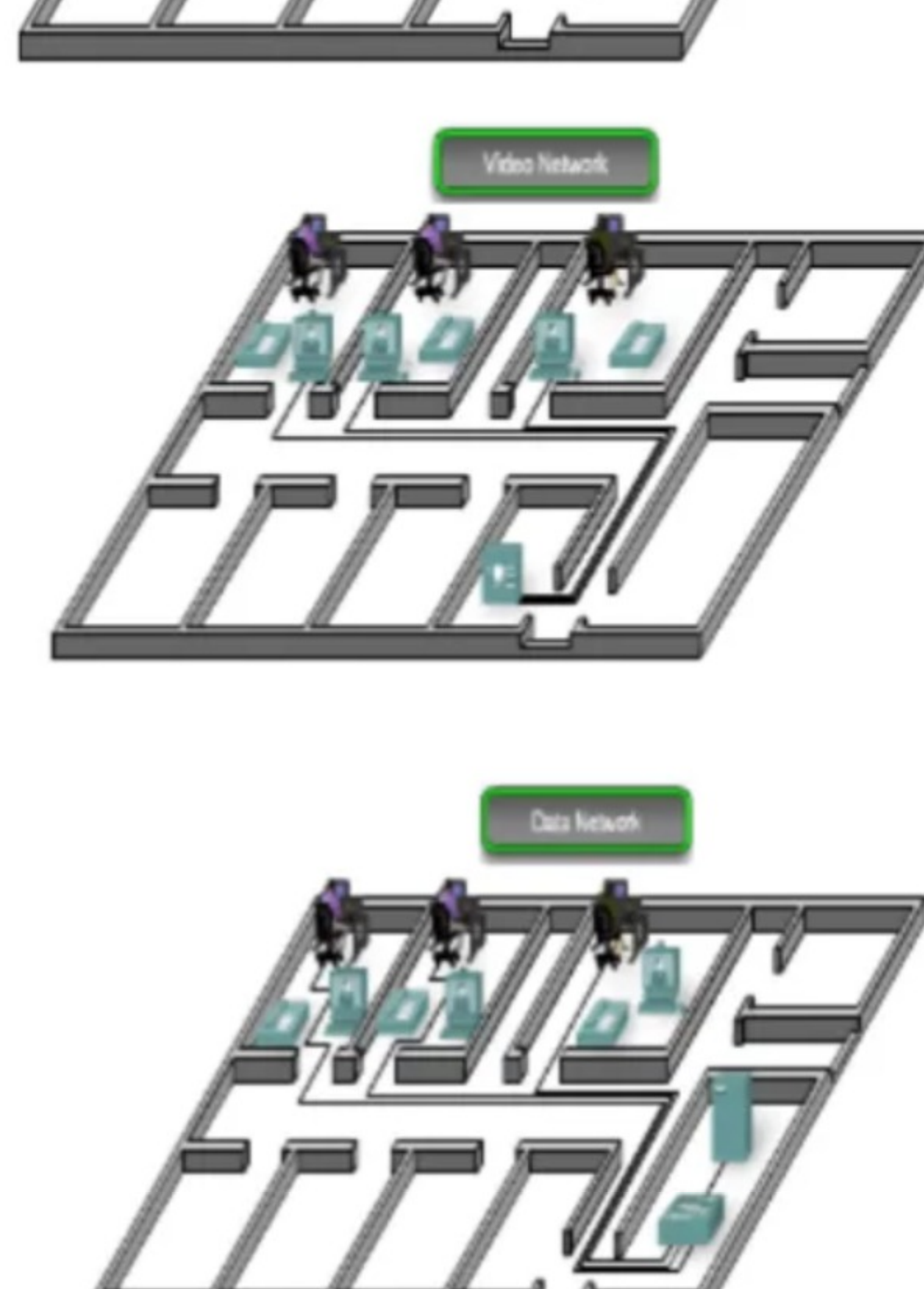
- Implementing redundant links can be expensive
 - Unlikely to implement redundancy at the access layer

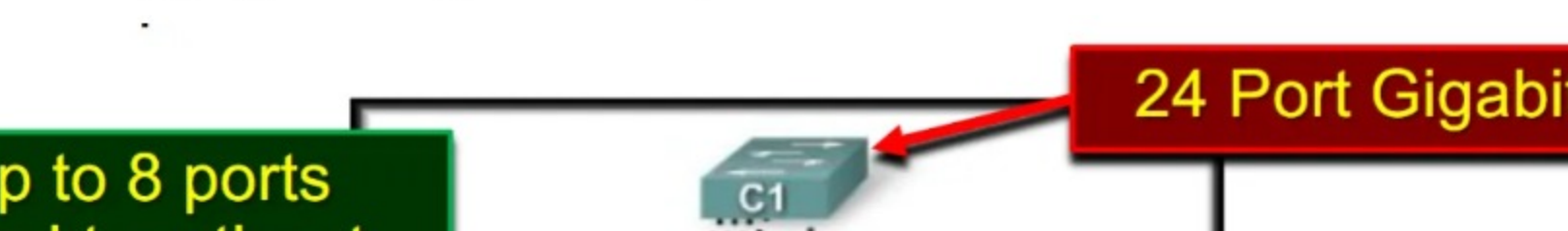
- A voice network contains isolated phone lines running to a PBX, which provides connectivity to the PSTN

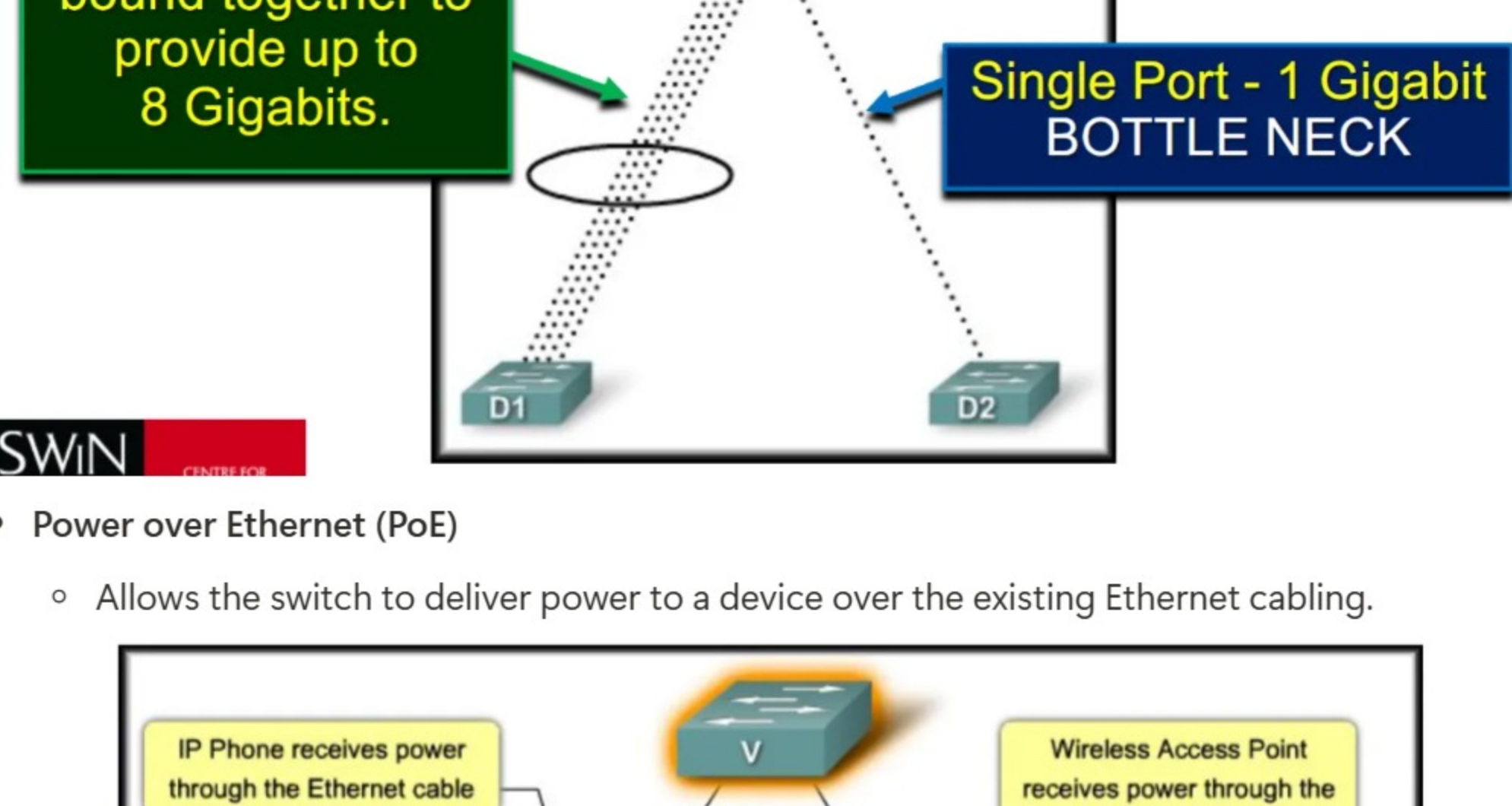
- For each new phone, a new line has

- Video conferencing data can consume significant bandwidth
 - Video networks maintained separately to allow operation without bandwidth competition
 - **Data network**
 - Interconnects the workstations and servers on a network
- Converged Network:**
- Using a properly **designed hierarchical network**, and implementing QoS (Quality of Service) policies that can **prioritize the audio and video**, means they be **converged** onto the **data network** with little to no impact on quality of service.
- 
- The diagram illustrates a converged network architecture. It features a central green rounded rectangle labeled "Voice Network". Below this rectangle is a horizontal line representing a network backbone. On this backbone, there are three blue rounded rectangles labeled "Data Network". The "Voice Network" is connected to the central "Data Network" node, while the other two "Data Network" nodes are connected to the backbone but not directly to the "Voice Network".

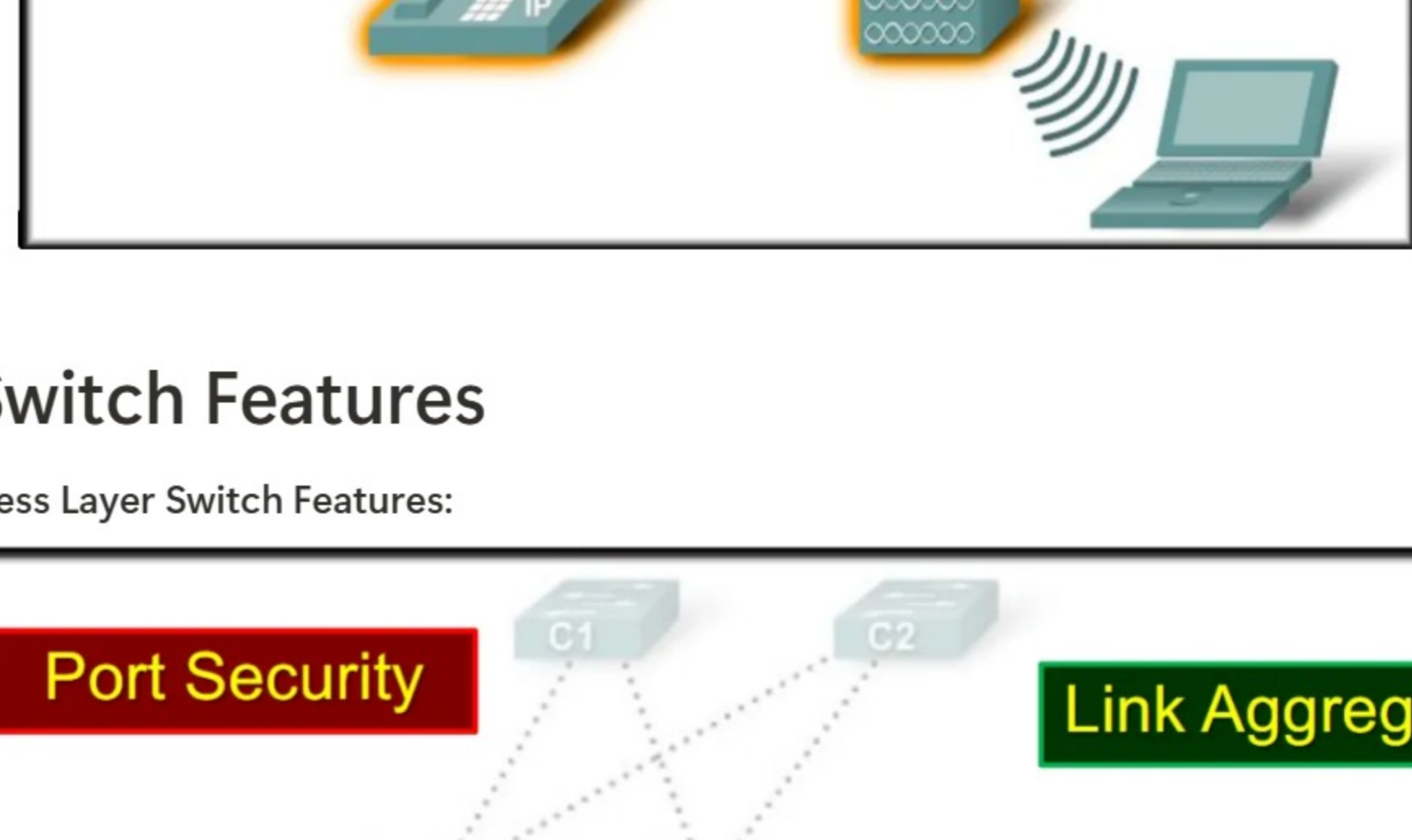
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- # 10. Switch Performance Characteristics
- **Port density:** the number of ports available on a single switch
 - **Forwarding Rate**
 - Defines the **processing capabilities** of a switch by **rating** how much **data** the switch can **process per second**.
 - If the switch forwarding rate is **too low**, it **cannot accommodate full wire-speed** communication across all of its switch ports
 - **Access layer switches** typically do **not need** to operate at **full wire speed**
 - Allows the use of:
 - **Less expensive, lower-performing** switches at the **access layer**
 - **More expensive, higher-performing** switches at the **distribution and core layers**, where the forwarding rate makes a **bigger difference**
 - **Link Aggregation:**
 - As part of bandwidth aggregation, you should determine if there are enough ports on a switch to aggregate to support the required bandwidth.
- 
- Up to 8 ports bound together to
- G1
- 24 Port Gigabit



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VLANs

- ...

