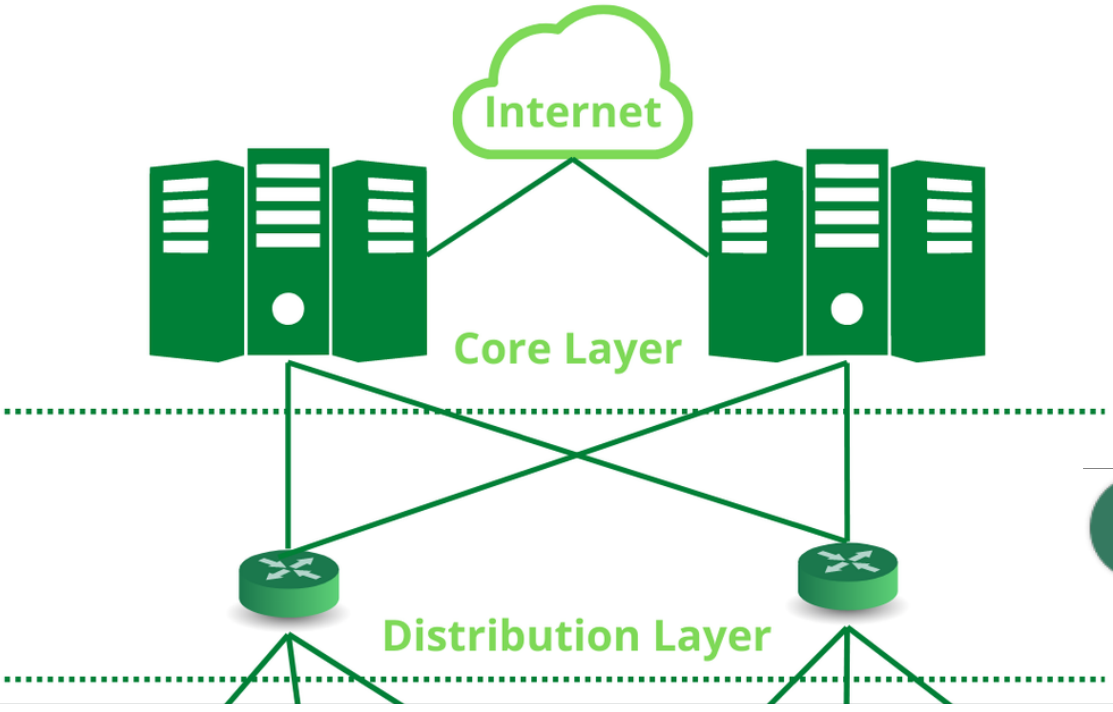
Three-Layer Hierarchical Model in Cisco

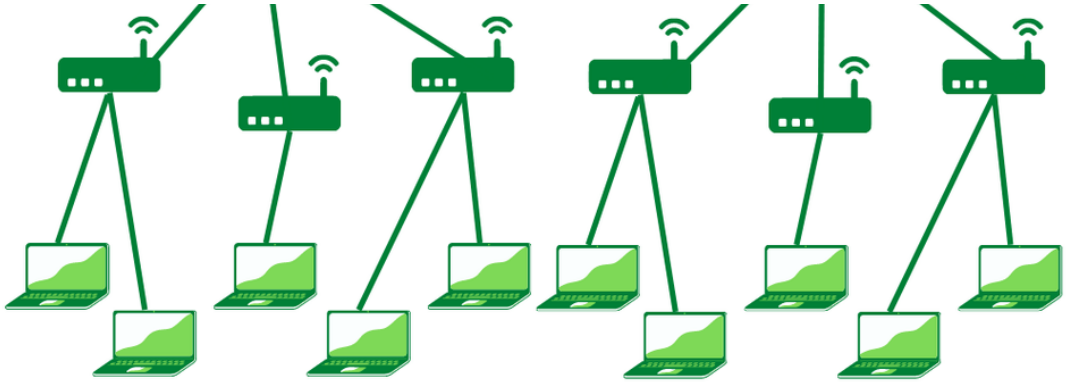
Read

In a three-layer hierarchical model for Cisco routers, The first layer is the local area network (LAN) that uses IEEE 802.3 Ethernet technology to connect devices on the same physical segment (or subnet). This low level of networking provides easy sharing of media and files between individual workstations and printers connected to the LAN, as well as providing security against unauthorized access by outsiders. The next layer is the wide area network (WAN), which offers faster data transfer rates than LANs but can be more expensive due to its reliance on leased lines or satellite links. WANs typically use TCP/IP protocols at this higher level, allowing them to communicate with other networks across corporate boundaries or over long distances.

This model consists of three layers:

1. The Access Layer
2. The Distribution Layer
3. The Core Layer





Access Layer

For more details, you can also refer to the article TCP/IP Model.

Access Layer:

The Access Layer is the part of the network which enables the users to connect to the wired Ethernet Network. It enables the users to share data and resources on the local network. The devices used in this layer include Ethernet Switches and Hubs.

Hubs are basically multiport repeaters. They are devices that cannot decode the data packets received by them because they lack circuitry and logic to decode the data packets. Hubs cannot determine which host must receive the data packet. They simply repeat the electronic signals received on one interface to all other interfaces on the hub, thus all the hosts connected to the hub receive the data packet. Hubs have a fatal issue collision. if two hosts transmit data packets at the same time, they would "collide" and be rendered useless. The hosts must retransmit the packets

again.

Another device used in the Access Layer is the Ethernet Switch. An Ethernet Switch is far more capable than hubs. They can decode the data packets and determine the interface to which the data packet must be forwarded. they use the MAC address, also known as the Physical Address, assigned to the host to forward the data packets. This reduces the issue of collision faced while using hubs. The development of Switches has rendered Hubs obsolete. Devices like *Cisco 2390XR* are used at this layer.

Distribution Layer:

When a network grows beyond a certain size, it must be divided into multiple local (Access Layer) networks. the distribution layer connects these networks together. It ensures that local traffic remains confined to local networks and governs traffic control between these networks.

This layer uses Routers to connect multiple networks together. Routers and other devices on this layer are meant to connect multiple networks together, and not individual hosts. In order to navigate traffic between hosts on different networks, IP Address, also known as Logical Address, is used. The Router maintains a Routing Table to determine the interface on which to forward the received data packet.

This layer also acts as an intermediary between the Access Layer and the Core Layer. Devices like the *Cisco C9300* are used at this layer.

Core Layer:

This layer is considered the backbone of a network, as it is used to connect multiple Distribution Layer devices together. This layer uses the most powerful devices to manage the traffic between the networks. The speed at which data flows in this layer is upwards of 10 Gigabit Ethernet. This layer has the maximum number of redundant connections (*Redundancy is the process of introducing extra connections between the same netw points to ensure reliable data transfer even if one of the connections is down*) in order to ensure reliable connectivity.

Devices like *Cisco Catalyst 9600* are used at this layer with high-speed and high-bandwidth transmission media like optical fiber cable.

Advantages:

- Larger, more complex networks are divided into smaller, manageable subnetworks.
- Local traffic remains local, which increases network efficiency.
- Makes the network scalable. The addition of new networks does not affect the performance of existing ones.

Conclusion:

The Three-Layered Hierarchical Model in Cisco divides a network into the following three layers:

1. The Access Layer: Provides access points for hosts to connect to the network.
2. The Distribution Layer: Acts as an intermediary between the Core Layer and the Access Layer, and keeps local traffic confined to local networks.
3. The Core Layer: Handles and transports huge amounts of data quickly and reliably, and connects multiple end networks together.

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4

Previous

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Next

2 - Tier And 3 - Tier Architecture in Networking