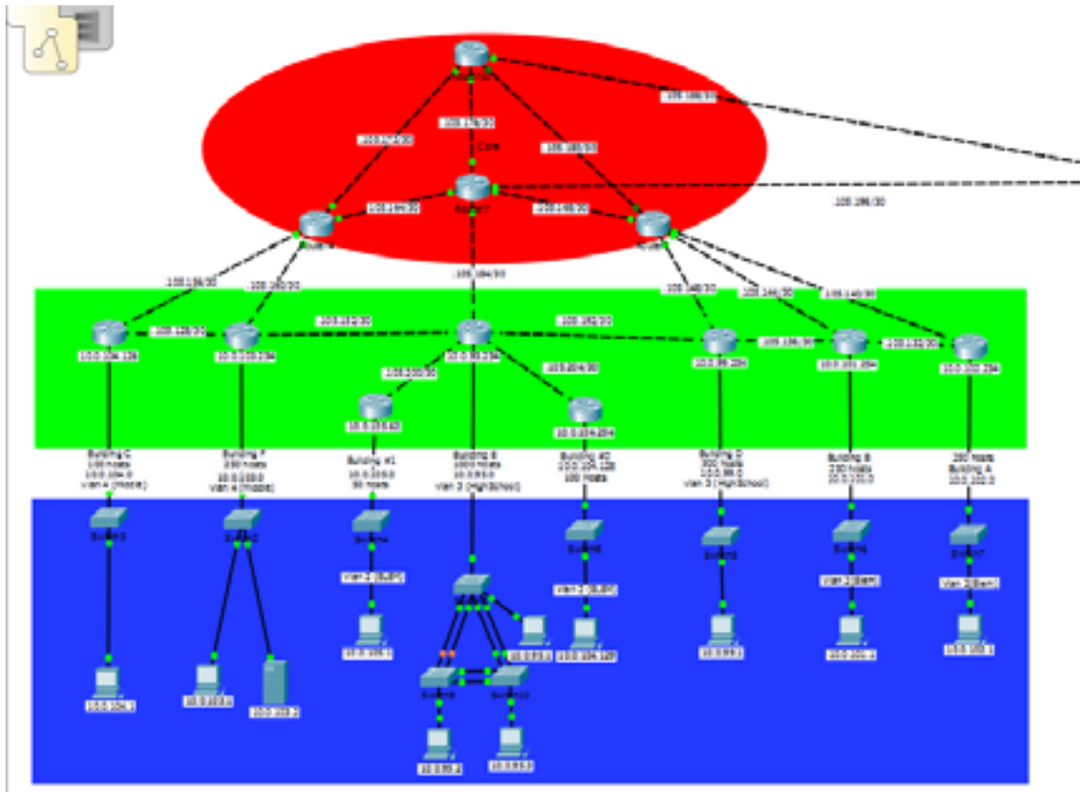
Core, Distribution, and Access layers



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Introduction

Network design is an expanding area and requires a great deal of knowledge and experience. At the base of network design, is the model defined by Cisco. Cisco has defined a hierarchial model known as the hierarchical internetworking model. This model simplifies the task of building a reliable, scalable, and less expensive hierarchical internetwork because rather than focusing on packet construction, it focuses on the three functional areas, or layers, of your network. There are several reasons to follow this model when building your own network. These reasons include: High Performance, Efficient Management and Troubleshooting, Policy Creation, Scalability, and Behavior Prediction. This will help give you a better understanding of each layer, and how they work together.

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Structured Engineering Principles

Regardless of network size or requirements, a critical factor for the successful implementation of any network design is to follow good structured engineering principles. These principles include:

- Hierarchy: A hierarchial network model is a useful high-level tool for designing a reliable network infrastructure. It breaks the complex problem of network design into smaller and more manageable areas.
- Modularity: By separating the various functions that exist on a network into modules, the network is easier to design. Cisco has identified several modules, including the enterprise campus, services block, data center, and Internet edge.
- Resiliency: The network must remain available for use under both normal and abnormal conditions. Normal conditions include normal or expected traffic flows and traffic patterns, as well as scheduled events such as maintenance windows. Abnormal conditions include hardware or software failures, extreme traffic loads, unusual traffic patterns, denial-of-service (DoS) events, whether intentional or unintentional, and other unplanned events.
- Flexibility: The ability to modify portions of the network, add new services, or increase capacity without going through a major forklift upgrade (i.e., replacing major hardware devices).

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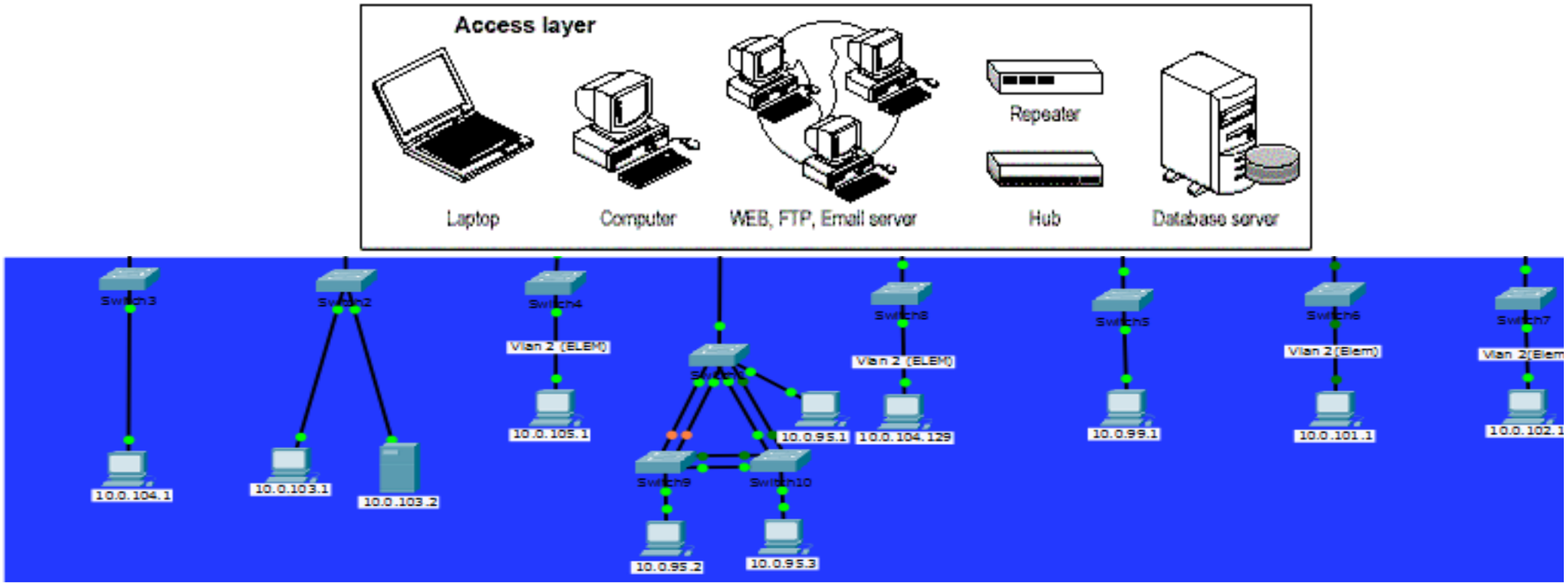
Access



The most vulnerable point of the network is the access layer. The access layer is where end users connect to the network. In the past, network administrators have largely relied on physical security to protect this part of the network. Unauthorized users were not allowed to enter a secure building where they could plug into the network, and students didn't carry computers with them. Today, contractors and consultants regularly have access to secure areas, and a student carrying a laptop is unsurprising. Once inside, there is nothing to prevent a contractor or student from plugging into a wall jack and gaining access to the corporate network.

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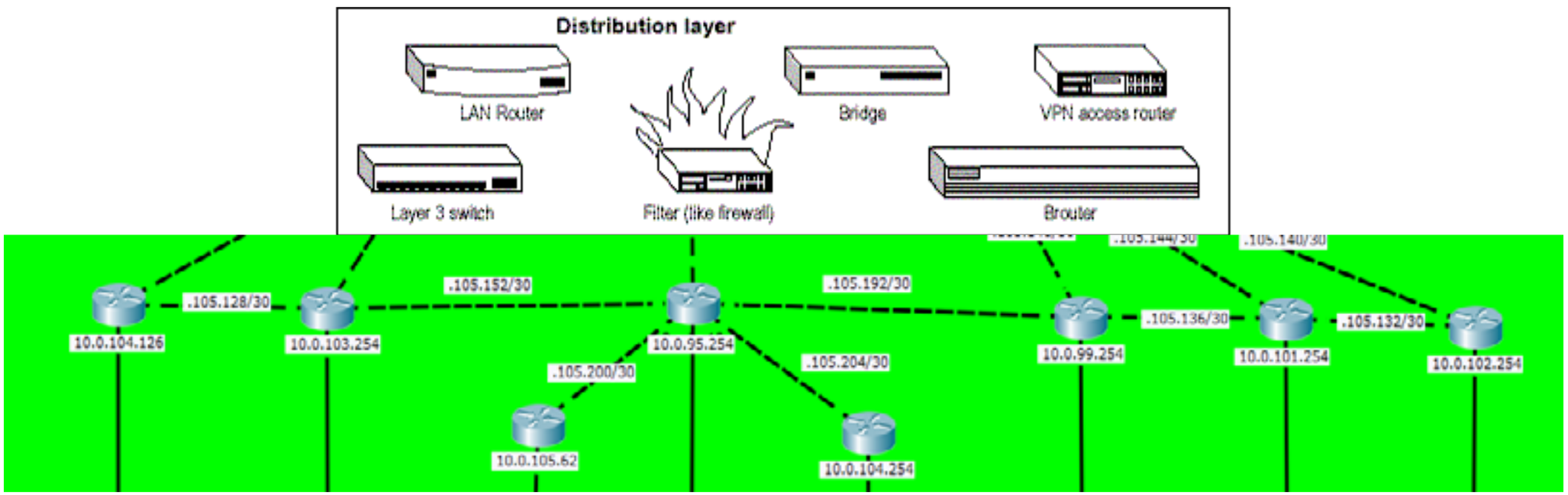
Distribution



The distribution layer is the focal point of the wiring closet. It aggregates the data received from the access layer switches before it is transmitted to the core layer for routing to its final destination. It also provides policy-based network connectivity. The distribution layer provides: Packet Filtering(firewall), Access Control List (ACL) security, Routing services between LANs and VLANs and between routing domains (e.g., EIGRP to OSPF), and Broadcast domain control, because routers or multilayer switches do not forward broadcasts. The device acts as the demarcation point between broadcast domains.

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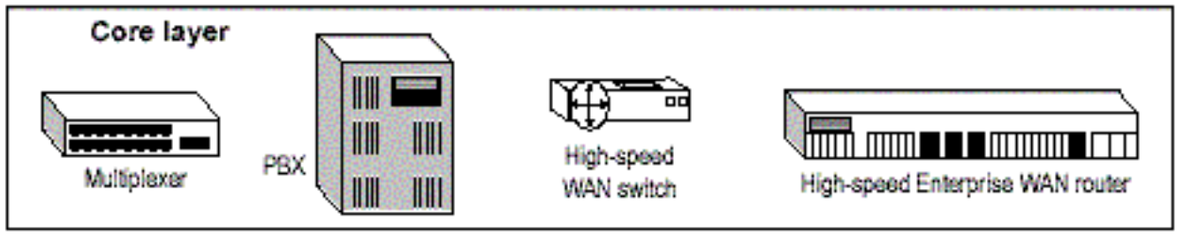
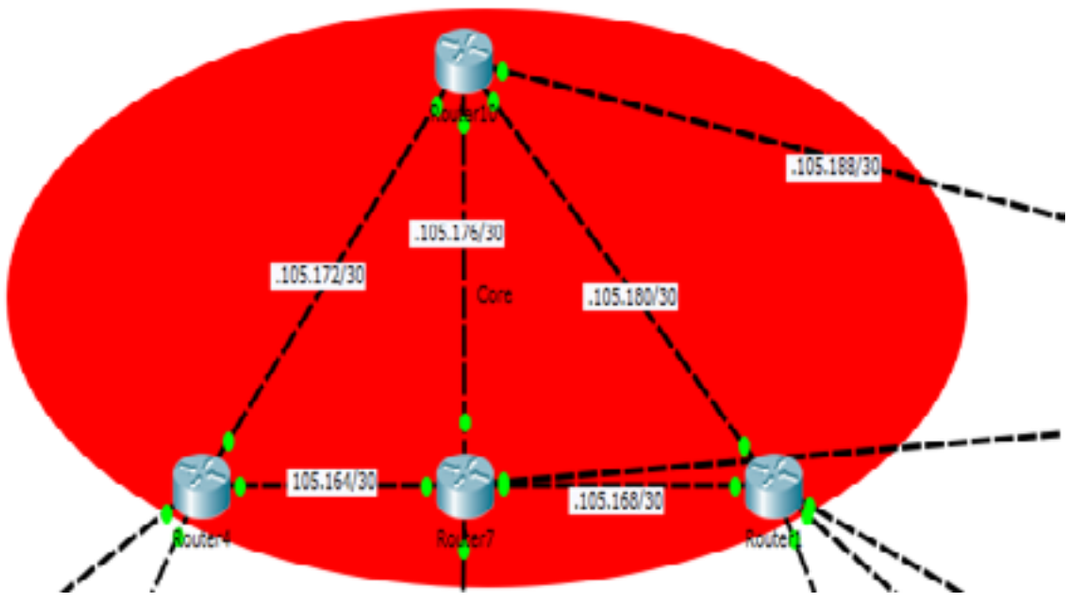
Core





The core layer is responsible for fast and reliable transportation of data across a network. The core layer is often known as the backbone or foundation network because all other layers rely upon it. Its purpose is to reduce the latency time in the delivery of packets. It is of the utmost importance to have redundancy at the core layer, if not, your whole network could go down. The main difference between a router in the core layer, from a router in the distribution layer is that it's only job is high speed routing.

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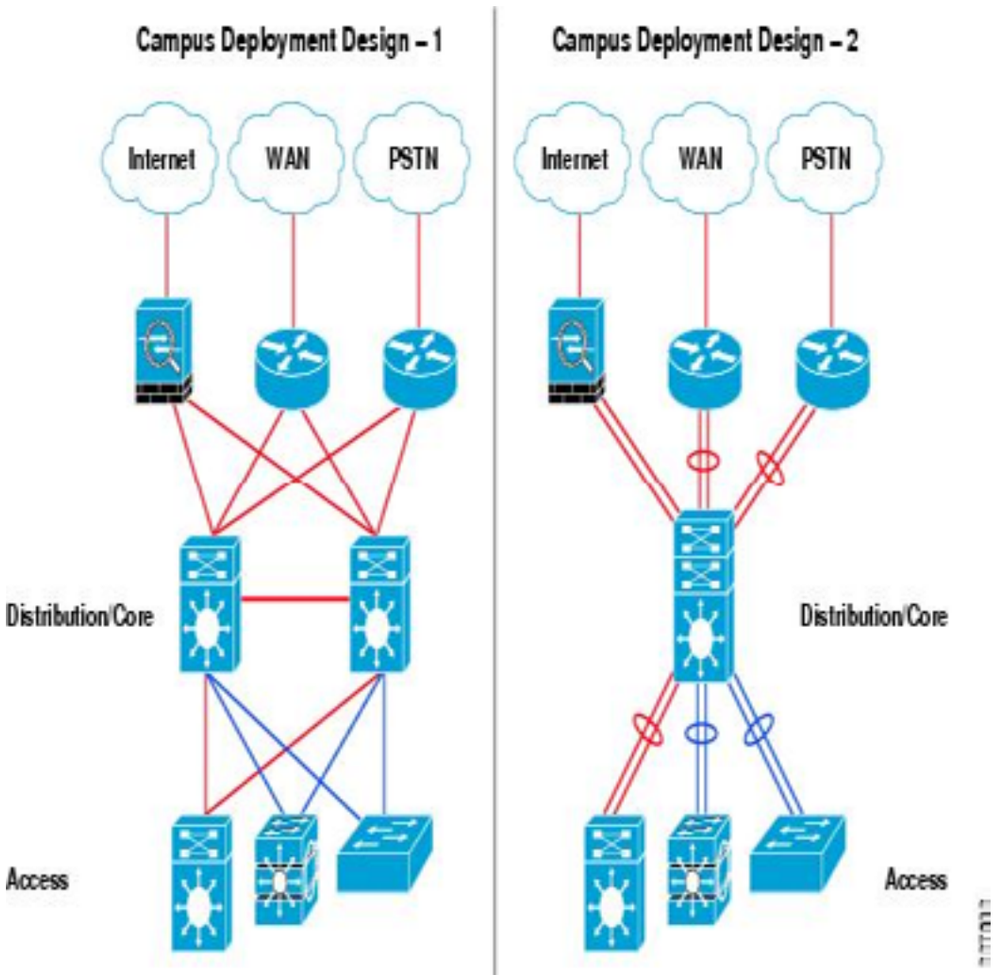
Collapsed Core Network Design



The three-tier hierarchical design maximizes performance, network availability, and the ability to scale the network design. Most small enterprise campus' do not grow significantly larger over time, and most small enterprise campus are small enough to be well served by a two-tier hierarchical design, where the core and distribution layers are collapsed into one layer. The primary motivation for the collapsed core design is reducing network cost, while maintaining most of the benefits of the three-tier hierarchical model. Deploying a collapsed core network results in the distribution layer and core layer functions being implemented in a single device.

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