

Post 1

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CCNA3 SCALING NETWORKS

Enterprise network: Network used to support business | Businesses grow/new employees/new divisions

- Must support exchange of traffic types [data/email/IP telephony/video/etc...]

All enterprise networks must:

- Support critical apps
- Support converged network traffic
- Support diverse business needs
- Provide centralized administrative control (NOC: Network Operations Center)

Enterprise Business Devices: Outages affect performance/revenue/customers/data/opportunities

- High-end enterprise equipment: Higher standards than low-end devices
- Reliability

Failover capability: Ability of device to switch from non-functioning service/device to functioning 1 w/little to no break in service

Hierarchical Network Design: To optimize BW, network must be organized so traffic stays local/not propagated unnecessarily

3-Layer Hierarchical Design Model:

1. **Access:** Connectivity for users
2. **Distribution:** Fwds traffic from 1 local network to another
3. **Core:** High-speed backbone

Traffic: Initiated at access: Passes through other layers: If required

- Smaller enterprises may utilize a **2-tier design**
- Core/Distribution are collapsed
- Reduces cost/complexity

Primary Architecture Modules:

Enterprise Campus	Enterprise Edge	Service Provider Edge	Remote
Enterprise Campus	Consists of entire campus infrastructure Distribution: <ul style="list-style-type: none">• L2 or L3 switches for port density• VLAN/trunk link implementation• Aggregates building access using L3 devices• Routing/access control/QoS Core: <ul style="list-style-type: none">• High-speed interconnectivity bet distribution/data center server farms/enterprise edge• Redundancy/fast convergence/fault tolerance Submodules: Server Farm/Data Center Module: <ul style="list-style-type: none">• High-speed connectivity/server protection• Security/redundancy/fault tolerance Services Module: Access to all services: IP Telephony/wireless controllers/etc...		
Enterprise Edge	Internet/VPN/WAN modules connecting enterprise w/service provider's network <ul style="list-style-type: none">• Extends services to remote sites/enables Internet use/partner resources• QoS/Policy/Service/Security		
Service Provider Edge	Internet/PSTN: Public Switched Telephone Network/WAN <ul style="list-style-type: none">• Data enters/exits ECNM: Enterprise Composite Network Model passes through edge device• All packets examined• IDS: Intrusion Detection Systems• IPS: Intrusion Prevention Systems		

Failure Domains: Area of a network impacted when a critical device/service experiences problems

Limiting Size of Failure Domains: Least expensive to control size of a FD in distribution

- Errors can be contained in smaller area | Less people affected

Switch Block Deployment: Routers/Multilayer switches: Deployed in pairs: Access layer switches evenly divided between

- Acts independently of others
- Failure of a single device doesn't cause network to go down

Design for Scalability

- Expandable/modular equipment: Modules can be added w/out major upgrades
- Routers/multilayer switches to limit broadcasts/filter traffic
- L3 devices to filter/reduce core traffic
- Link aggregation [EtherChannel]: Equal cost load balancing
- Multiple Ethernet links into single, load-balanced EtherChannel config
- Scalable routing protocol/implementing features w/in to isolate updates/min the table

Implementing Redundancy: Minimizing possibility of a single point of failure

- Installing duplicate equipment/providing failover services for critical devices
- Redundant paths: Offer alternate physical paths for data to traverse network.
 - May cause L2 loops: **STP: Spanning Tree Protocol required**

STP: Eliminates L2 loops when redundant links used between switches.

- Provides a mechanism for disabling redundant paths in a switched network until path is necessary
- open standard protocol: used in switched environment to create loop-free logical topology

EtherChannel: A form of link aggregation used in switched networks

- Some links between access/distribution switches may need to process greater traffic
- Traffic from multiple links can create a bottleneck by converging onto a single, outgoing link

Link aggregation: Increases BW bet devices by creating 1 logical link made up of 7 physical links.

EtherChannel	Uses existing switch ports/Seen as 1 logical link using EtherChannel int <ul style="list-style-type: none">• Config tasks done on int, instead of each port• Helps ensure consistency throughout links• Config takes advantage of load balancing between links part of same EtherChannel
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Managing the Routed Network

OSPF	Open Shortest Path First: Good for larger hierarchical networks <ul style="list-style-type: none">• Establish/maintain neighbor adjacency w/other connected OSPF routers• When routers initiate adjacency exchange of link-state updates begins• Link state updates sent when network changes occur• Supports 2-layer hierarchical design/multiarea OSPF• Begins w/Area 0 [backbone]: Expands• Non-backbone areas must be directly connected to area 0
EIGRP	Enhanced Interior Gateway Routing Protocol <ul style="list-style-type: none">• Distance vector/Multiple tables to manage routing process

5 categories of switches for enterprise:

• Campus LAN	Core/distribution/access/compact switches <ul style="list-style-type: none">• Vary from fanless switches w/8 fixed ports – 13-blade switches supporting 100's of them• Cisco 2960/3560/3750/3850/4500/6500/6800 Series
• Cloud-Managed	Cisco Meraki: Cloud-managed access switches enable virtual stacking <ul style="list-style-type: none">• Monitor/config 1000's of switch ports over web, w/out onsite IT staff
• Data Center	Data center: Switch infrastructure scalability/operational continuity/transport flexibility <ul style="list-style-type: none">• Cisco Nexus Series/Cisco Catalyst 6500 Series
• Service Provider	Fall under two categories: <ol style="list-style-type: none">1. Aggregation: Carrier-grade Ethernet switches that aggregate traffic at the edge of network2. Ethernet access: App intelligence/unified services/virtualization/integrated security/simplified management

• Virtual Networking	Cisco Nexus virtual networking switch platforms: <ul style="list-style-type: none"> • Secure multi-tenant services • Adds virtualization intelligence technology to data center network
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Form factors: Modular/Stackable/Fixed || Rack units: Thickness of switch

Port density: Number of ports available on a single switch

Fixed switches	Typically support up to 48 ports on a single device <ul style="list-style-type: none"> • Options for up to 4 additional ports for small form-factor pluggable (SFP) devices
Modular switches	Can support very high-port densities through the addition of multiple switch port line cards

Forwarding Rates: Define the processing capabilities of a switch by rating how much data it can process per second

- Entry-level switches have lower fwding rates
- If rate too low: Can't accommodate full wire-speed communication across all its switch ports

Wire speed: Data rate each Ethernet port on switch is capable of attaining | 100Mb/1Gb/10Gb/100Gb

Power over Ethernet: Allows switch to deliver power to device over existing Eth0 cabling

- Catalyst 2960-C/3560-C: Support PoE pass-through

Pass-through: Allows PoE devices connected to the switch/and the switch itself/by drawing power from certain upstream switches

Multilayer Switching: Ability to build r-table/support a few r-protocols/fwd packets at a rate close to that of L2 forwarding

Routers serve beneficial functions: Broadcast containment | Connect remote locations | Group users logically | Enhanced sec

Cisco: 3 Categories of Routers:

Branch	Optimize branch services on single platform: Deliver optimal app experience across branch/WANs <ul style="list-style-type: none"> • Branch networks must ensure fast recovery from faults • Min/eliminating impact on service: Provide simple network config/mgmt
Network Edge	Enable the network edge to deliver high-performance/highly secure/reliable services <ul style="list-style-type: none"> • Unite campus/data center/branch networks • Customers expect high-quality media • QoS/nonstop video/mobile
Service Provider	Increase revenues: Delivering end-to-end scalable solutions/subscriber-aware services <ul style="list-style-type: none"> • Optimize operations/reduce expenses/improve scalability/flexibility • Simplify/enhance operation/deployment of service-delivery networks

Managing IOS Files/Licensing: Choose proper IOS img w/correct feature set/version

2 methods for connecting PC to network device for config/monitoring tasks

1. **Out-of-band management:** Used for initial config/network connection unavailable

Config requires:

- Direct connection to console/AUX
- Terminal

1. **In-band management:** Used to monitor/make config changes to a network device over a network connection

Config requires:

- At least 1 network int on device to be connected
- Telnet/SSH/HTTP to access a Cisco device