Post 1

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HIERARCHICAL NETWORK DESIGN CH. 1

3 layers of design: Access/Distribution/Core
Network size: Small: Up to 200 || Medium: 200 – 1,000 || Large: 1000+
Structured engineering principles:

Hierarchy	Reliable infrastructure/more manageable areas
Modularity	Separates various functions into modules/makes design easier
Resiliency	Avail under normal/abnormal conditions
Flexibility	Mod/add new services/increase capacity w/out fork-lift upgrade (replace major HW)

Hierarchy: Divide network into discrete layers: Each layer/tier: Functions define role
- Both LAN/WAN's

Typical:
1. **Access:** Workgroup/usr access
2. **Distribution:** Boundary bet access/core
3. **Core:** Transport between distribution switches

Benefits:
- Smaller/local traffic remains local
- Traffic destined for other networks moved to higher layer
- L2 devices: Flat network: Little control broadcasts/filter traffic: Not scalable

Collapsed core: 2 tiers: Core/distribution combined in 1 switch

Access	**Grants end device access:** WAN: May provide access to corporate network across WAN's **Functions:** • L2 switching • Availability • Port sec • QoS/marking/trust boundaries • ARP (Address Resolution Protocol) inspection • **VACL:** VLAN Access Control List • STP: Spanning tree • PoE: Power over Ethernet/Aux VLANs for VoIP
Distribution	**Aggregates data received** from access switches before transmitted to core for routing • Rtr/multilayer switch segment workgroups/isolate problems **Can provide:** • Aggregation: LAN/WAN links • Policy-based sec: ACL's/filtering • Routing bet LANs/VLANs/bet domains (EIGRP to OSPF) • Redundancy/load balancing • Boundary route for aggregation/summarization config on ints toward core • Broadcast domain control (rtrs/multilayer switches don't fwd broadcasts) ○ Point bet broadcast domains
Core	**AKA Backbone:** High-speed devices switch packets/interconnect multiple components Example: Distribution/service modules, data center, WAN edge **Considerations:** • High-speed switching • Reliable/fault tolerance • Scaling: Faster equip

	• Avoids CPU-intensive packet manip caused by sec/inspection/QoS/etc…

Modular Design: Separates network into functional modules: Each target specific place/purpose
- Represent areas that have diff physical/logical connectivity
- Designate where functions occur

Benefits:
- Failures isolated: Easier problem detection/sys avail
- Changes/new services made in controlled fashion: Flexibility
- Modules can be updated/replaced: Same structure as hierarchical
- Sec can be implemented on modular basis

Modules in Enterprise Arch: Further divides 3-layer design: Pulls specific blocks/modular areas
- Connected via core

Basic modules include:

Access-distribution	**AKA: Distribution block:** Most familiar/fundamental component
Services	**Generic block used to ID services such as:** • LWAPP: Lightweight Access Point Protocol wireless controllers • Unified comm services • Policy gateways/etc…
Data center	AKA Server farm: Responsible for data systems vital to operations
Enterprise Edge	Internet Edge/WAN Edge: Connectivity to voice/video/data services outside enterprise

Cisco Enterprise Arch Model: Separates network into functional areas AKA modules
- Modularity built into arch: Flexibility in design/facilitates implementation/troubleshooting

Primary modules: Campus/Edge/Service Provider Edge
Addl. modules: Enterprise Data Center/Branch/Teleworker/Cisco Campus
- **Campus:** Building/group of connected into 1 enterprise that consists of many LANs
- Typically limited to fixed area
- **Submodules:** Building access/distribution, Campus core, Data center

Together these submods:
- IP comm/mobility/sec
- Utilize multicast traffic/QoS
- Increased flexibility using access mgmt/VLANs/IPSec VPNs

Cisco Enterprise Edge: Connectivity for voice/video/data services outside enterprise
- Functions as liaison bet enterprise campus/other modules

Submods:

E-commerce/Servers	Web/app/db servers/firewall/rtrs/IPS
Connectivity/Demilitarized zone (DMZ)	Internal usrs get connectivity: Public servers/email/DNS/ISP Components: Firewall/rtrs/edge rtrs/FTP/HTTP/SMTP relay/DNS servers
Remote Access/VPN	Remote-access termination/auth for usrs/sites Components: Dial-in access concentrators/Cisco ASA/IPS
WAN	Various WAN tech for routing traffic bet remote/central site Includes: • **MPLS:** Multiprotocol Label Switching (MPLS) • Metro Ethernet/leased lines • **SONET:** Synchronous Optical Network (SONET) • **SDH**: Synchronous Digital Hierarchy (SDH) • PPP/Frame Relay/ATM/DSL/wireless

Service Provider Edge: Enterprises use SPs to link to other sites
Module can include: ISPs/WAN services (Frame Relay/ATM/MAN)/PTSN: Public Switched Phone Network

SP Edge Module:
- Spans across large geographic areas/cost effective
- Converges voice/video/data over single IP comm
- QoS/SLA's/Sec using VPNs (IPsec/MPLS) over L2/L3 WANs
- Redundancy/failover should be considered

Redundant connections to ISP include:

Single-homed	Single connection to ISP

Dual-homed	2/more connections to single ISP
Multihomed	Connections to 2/more ISPs
Dual-multihomed	Multiple connections to 2/more ISPs

Remote Functional Area: Remote connectivity options
7 modules:

Branch	Remote branches allow employees to work at non-campus loc • Providing sec/telephony/mobility • Connectivity into campus/diff components inside • Mod allows enterprises to extend head-office apps/services to remote branches • Edge device connecting remote to central site varies depending on needs/size
Teleworker	Provides connectivity for workers who operate out of diff locations (home/hotels/sites) • Integrated security/ID: Enable to extend campus policies to teleworker • Staff can log into network over VPN/gain access to apps/services from cost-effective platform
Data Center	Same functional options as campus data center: Exists at remote location • Added layer of sec as offsite data center (disaster recovery/continuance services) • Redundant data centers: Backup using synchronous/asynchronous data • Network/devices offer server/app load balancing • Scale w/out major changes to infrastructure

Emerging Enterprise Architectures: Cisco introduced the following 3 arch's:

1. Cisco Borderless Network
2. Collaboration
3. Data Center/Virtualization

Cisco Borderless Networks	Allows orgs/ppl to connect to corporate network in BYOD env: Not static

Arch delivers 2 sets of services:

Borderless end-point/usr services	Connects various devices to provide access to network services [PCs/tablets/smart phones] • Removes location/device borders: Unified access to wired/wireless
Borderless network services	Deliver apps to usrs: Connects internal/remote usrs: Provides access to resources

Collaboration Architecture: Comprises portfolio of products/apps/SDK's [SW dev kits]/APIs: Individual components work together
Composed of 3 layers:

App/Devices	Unified comms/conf apps [Cisco WebEx Meetings, WebEx Social, Cisco Jabber, TelePresence] • Apps w/in layer help usrs stay connected • Voice/video/web conf/msging/mobile apps/enterprise social SW
Collaboration Services	Collaboration apps including services: • Presence/loc/session mgmt/contact mgmt/client frameworks/tagging/policy/sec mgmt
Network/Comp Infrastructure	Collaboration anytime/anywhere/any device: VM's

Data Center/Virtualization: Built on Cisco Data Center 3.0: Comprehensive virtualization tech/services

- Brings network/computing/storage/virtualization platforms together

Consists of 3 components:

Cisco Unified Mgmt Solutions	Simplify/automate process of deploying infrastructure/services w/speed/reliability • Operate transparently across physical/virtual resources in cloud envs
Unified Fabric Solutions	Network services to servers/storage/apps: Provides transparent convergence/scalability/intelligence
Unified Computing Solutions	Next-generation data center sys unites computing/network/storage access/virtualization • A cohesive system designed to reduce total cost of ownership (TCO) • Cisco UCS: Built w/blade/rack-mount servers/fabric interconnects/virtual int cards (VICs)