

Classical Ethernet Switching on Nexus NX-0S



<https://t.me/learningnets>

In This Section

- ▶ Classical Ethernet Design Overview
- ▶ Implementing Classical Ethernet on NX-OS

<https://t.me/learningnets>

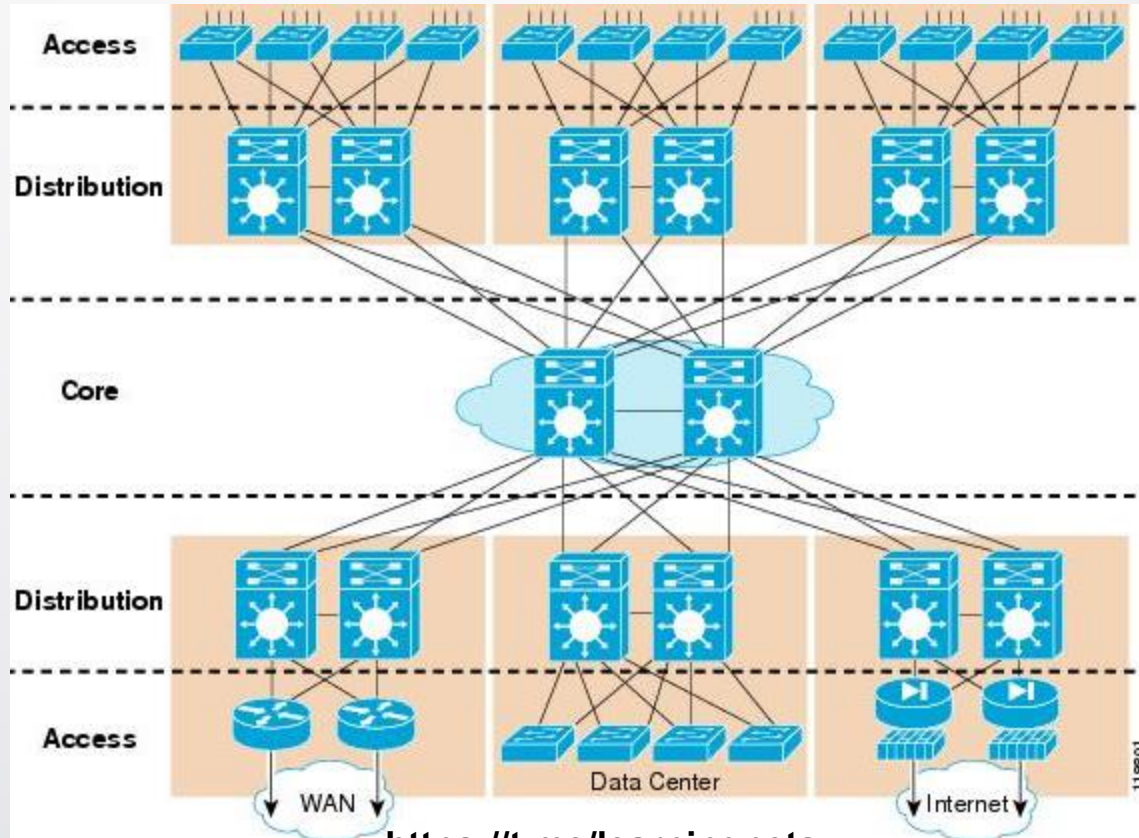
Traditional Classical Ethernet Design

▶ Three modular “building blocks”

- Access layer
- Aggregation / Distribution layer
- Core layer

▶ [Enterprise Campus 3.0 Architecture: Overview and Framework](#)

Campus Network Example



<https://t.me/learningnets>

Access Layer

- ▶ Provides physical connectivity to end hosts
 - PCs, phones, printers, WAPs, etc.
- ▶ Typically no southbound redundancy
 - E.g. end stations are single attached
 - Result is a single point of failure

Access Layer (cont.)

- ▶ Typically redundant northbound Layer 2 to distribution
 - Spanning-Tree Protocol (STP) only allows for Active / Standby
 - Includes all other STP variations
 - PVST+, RSTP, MST, etc.
- ▶ Link level redundancy can be achieved with Link Aggregation (LAG)
 - E.g. EtherChannels, Port Channels, etc.
 - Dual LAGs still means Active / Standby for STP
- ▶ Crude load balancing with STP traffic engineering
 - E.g. VLAN 10 uses uplink 1, VLAN 20 uses uplink 2

Access Layer (cont.)

▷ Uplinks to distribution could be layer 3 routed

- [High Availability Campus Network Design— Routed Access Layer using EIGRP or OSPF](#)
- [High Availability Campus Network Design - Routed Access Layer using EIGRP or OSPF System Assurance Guide](#)

▷ Limitation is the application

- Do we need direct layer 2 connectivity or not?
- E.g. vMotion

Aggregation / Distribution Layer

- ▶ Aggregates physical connectivity to access layer switches
- ▶ Adds link layer redundancy to both access and core layers
 - STP for layer 2 redundancy to access
 - ECMP (e.g. EIGRP/OSPF) for layer 3 redundancy to core
 - Active / Active northbound but still Active / Standby southbound
- ▶ Ideally adds node level redundancy
 - Redundant modules, supervisors, PSUs, etc.
 - Further potential for node redundancy via MLAGs
 - E.g. VSS, StackWise

Aggregation / Distribution Layer (cont.)

- ▶ Typically the layer 2 / layer 3 demarcation point
 - Distribution switches are the default gateways for endpoints
 - Terminates the layer 2 broadcast domains
 - Is this a good thing?
- ▶ Layer 2 redundancy with FHRPs
 - HSRP, VRRP, & GLBP
 - Generally only supports Active / Standby
- ▶ Crude load balancing with FHRP split
 - E.g. Agg1 HSRP active for VLAN10, Agg2 active for VLAN20

Core / Backbone Layer

- ▶ Typically layer 3 only
 - Goal is simply to route packets between distribution blocks
- ▶ Same node and link level redundancy considerations
 - ECMP for layer 3 load balancing and link level HA
 - Redundant chassis, modules, supervisors, & PSUs for node HA

3 Tier Design Issues

- ▶ Access layer is a single points of failure
 - Typically for both links and nodes
- ▶ Layer 2 multipath isn't supported
 - Result is wasted links and link bandwidth
- ▶ Scaling CE is a function of the MAC table
 - All switches must learn all MACs
 - Access layer switches typically have small TCAM
 - I.e. Catalyst 2960 can hold only 8000 MAC addresses
- ▶ Routed access layer breaks layer 2 adjacencies
 - Are apps like vMotion a requirement?

Classical Ethernet on Nexus

- ▶ Nexus at its core is a Layer 2 Switch
- ▶ Similar in many aspects to Catalyst IOS
 - VLANs, Trunking, VTP, Rapid PVST, MST, EtherChannel, PVLANS, UDLD, etc.
- ▶ Key new features beyond Catalyst IOS
 - FEX, vPC, FabricPath, VXLAN, OTV, etc.

Nexus NX-OS vs. Catalyst IOS

- ▶ NX-OS has key Layer 2 behavioral differences vs. Catalyst IOS
 - Default Port Modes
 - STP Port Types
 - STP Bridge Assurance
 - Port Profiles

Default Port Modes

- ▶ NX-OS default port modes can be changed as follows...
 - [no] system default switchport
 - Is the port routed or switched?
 - no system default switchport shutdown
 - Is the port up or down?
 - Only applies if no other changes on the interface have been made

Spanning-Tree Port Types

- ▷ NX-OS runs Rapid PVST by default
- ▷ Layer 2 links have three STP port types
 - spanning-tree port-type normal
 - spanning-tree port-type edge
 - spanning-tree port-type network
- ▷ Normal ports act like Catalyst IOS ports
 - Default STP port type
- ▷ Edge ports are STP PortFast ports
- ▷ Network ports run STP Bridge Assurance

STP Bridge Assurance

- ▶ All STP Network Ports send BPDUs regardless of STP port state
 - Legacy 802.1d only sends BPDUs from Root Bridge downstream
- ▶ Primary goal is to protect against unidirectional links
 - BPDU becomes a bidirectional keepalive
 - Replaces LoopGuard functionality
- ▶ Secondary result is same functional effect as VTP Pruning
 - VLANs stop forwarding on links that you do not receive BPDUs for that VLAN
- ▶ Enabled globally by default
- ▶ Enabled only on interfaces with **spanning-tree port type network**

Port Profiles

- ▶ Similar to interface macros in Catalyst IOS
 - Allows a template of config to apply to a group of ports
- ▶ Main difference is that changes to port profiles are event driven
 - Catalyst IOS macros apply only once at initial application
 - Port profiles immediately re-apply any time a change is made to the profile
- ▶ Port Profile types
 - Ethernet
 - Port-Channel
 - Interface VLAN
- ▶ Verifying Port Profiles
 - `show port-profile expand-interface name [profile_name]`

Implementing CE on NX-OS

▷ Classical Ethernet Workflow

- Create VLANs
- Create Trunks
- Optionally create Port-Channels
- Optionally modify STP modes & features

Creating VLANs Considerations

- ▶ Nexus typically doesn't run VTP
 - Implies all VLAN creations are locally significant
 - You must create VLANs on all hops
 - 7K, 5K, UCS, FabricPath Leaf & Spine, etc.
- ▶ VLAN assignment doesn't imply creation
 - NX-OS allows you assign a VLAN that doesn't exist
 - Result is that port is inactive
 - Catalyst IOS creates the VLAN when you assign it

Trunking Considerations

- ▷ Nexus default switchport mode is access
 - No DTP support like in Catalyst
 - Implies **switchport mode trunk** is always required

STP Considerations

- ▷ Nexus runs Rapid PVST by default
 - Implies short pathcost
 - Implies trunk allowed list is 1:1 with STP allowed list
- ▷ Ports run STP Port Type Normal by default
 - Implies no bridge assurance
 - Implies convergence problems with UCS
- ▷ Root Bridge placement
 - Root recommended to be vPC Primary
 - Root required to be FabricPath Leaf

Classical Ethernet Verifications

▷ Common verifications

- show interface status
- show interface brief
- show vlan [brief]
- show interface trunk
- show port-channel summary
- show spanning-tree [vlan|mst]
- show mac address-table

Q&A