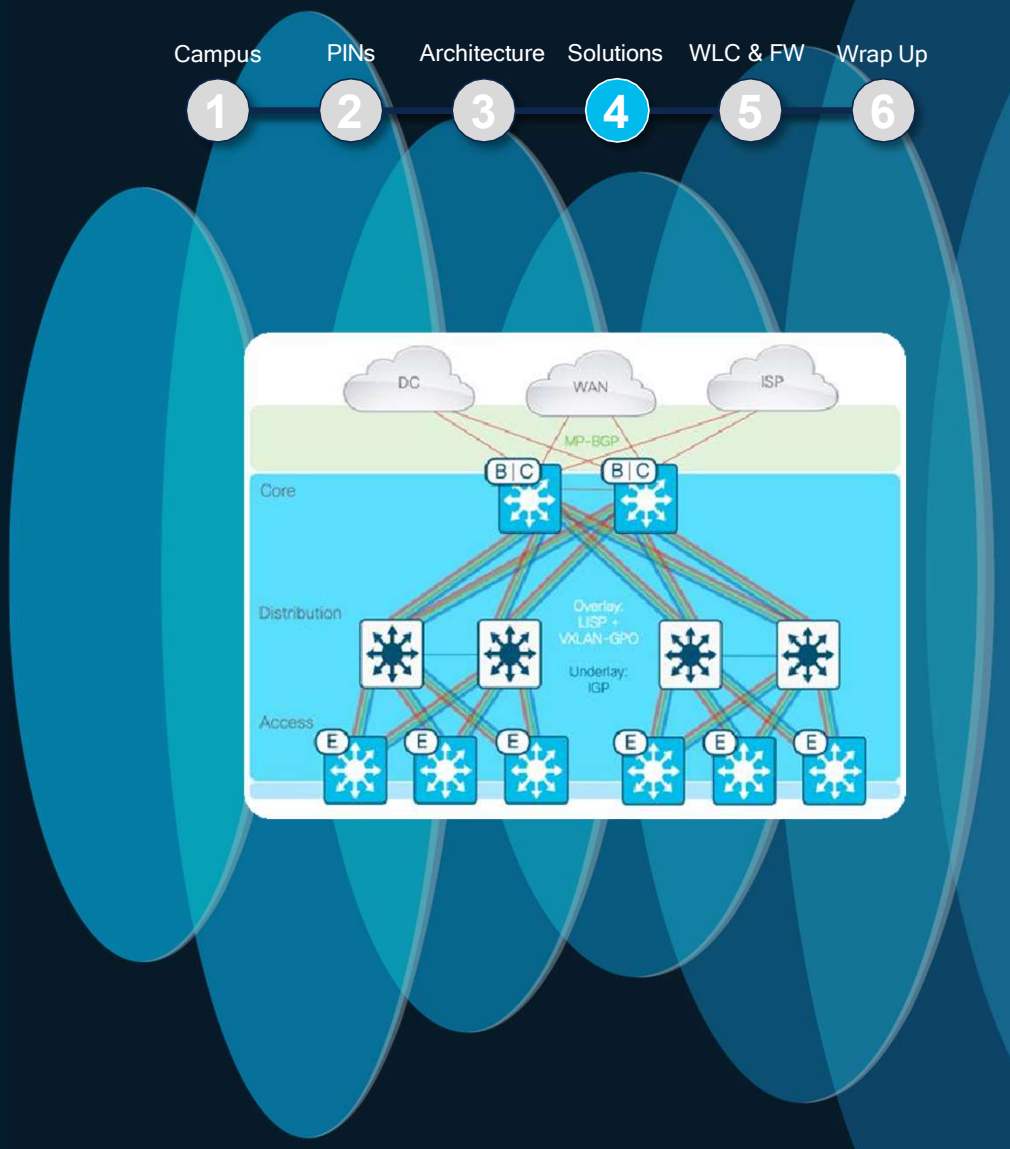
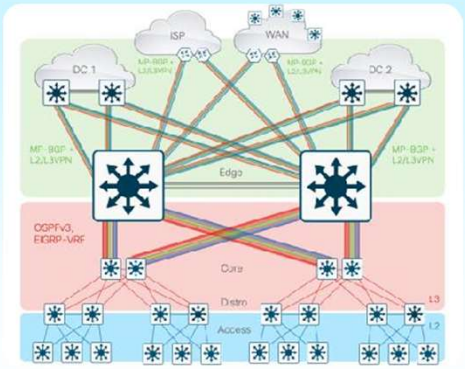
Campus Solutions

- **MPLS / VPLS**
  (L2/L3VPN)
- **EVPN + VXLAN**
  (L2/L3VNI)
- **LISP + VXLAN**
  (L2/L3VNI)



Campus Solutions & Designs

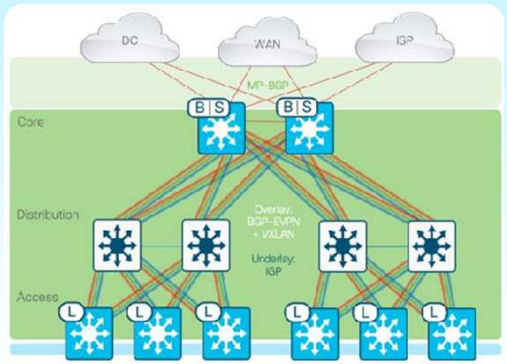
1 MPLS (L2/L3VPN)



- L3 Underlay + L2/L3 VPN Overlay
- Virtual Private Networks
- L3 VRF-based Segmentation
- WAN/Edge + VPN Services

MPLS/VPLS, LDP, SR, MP-BGP, PIC
MVPN, LSM, Extranet, MSR
SSO, NSF/NSR, ECMP, GIR
VPN-FNF, Uniform/Pipe QoS, PBR, IPACL

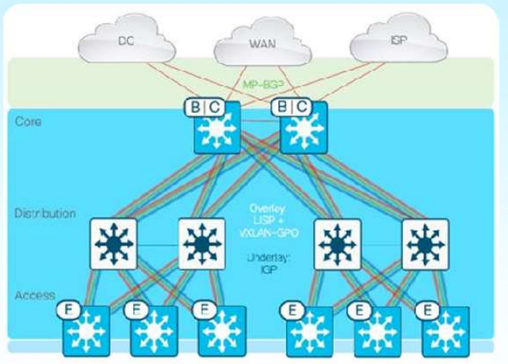
2 EVPN (L2/L3VNI)



- L3 Underlay + L2/L3 VNI Overlay
- Virtual Network Instances
- L2/L3 VNI-based Segments
- Common WAN/LAN Services

MP-BGP/EVPN, VXLAN, VRF-Lite
L2 TRM, L3 TRM, L2 BUM
SSO, NSF/NSR, ECMP, GIR
Fabric-FNF, Uniform QoS, IPACL/OGACL

3 SDA (L2/L3VNI + SGT)



- L3 Underlay + L2/L3 VNI Overlay
- VNIs + Scalable Group Tagging
- L2/L3 VNI + SGT Segments
- LAN Services + Group-Based Policy

LISP, VXLAN, MP-BGP, VRF-Lite
LISP HER, Native, L2 BUM
SSO, NSF/NSR, ECMP, GIR
Fabric-FNF, App QoS, SGACL

MPLS-VPN Provider Edge

The **Provider-Edge PIN** (Tier 3-4) focuses on connecting multiple Campus areas to remote domains (SP/WAN) using MPLS-VPN.

Main goal is to connect EVPN fabric to other networks

Uses a **L3 Underlay + L3 Hand-off**

- North (outside): L3 MP-BGP + Inter-AS, PIM + MSDP
- South (inside): L3 IGP, PIM + MSDP

Uses a **Virtualized L2/L3 Overlay**

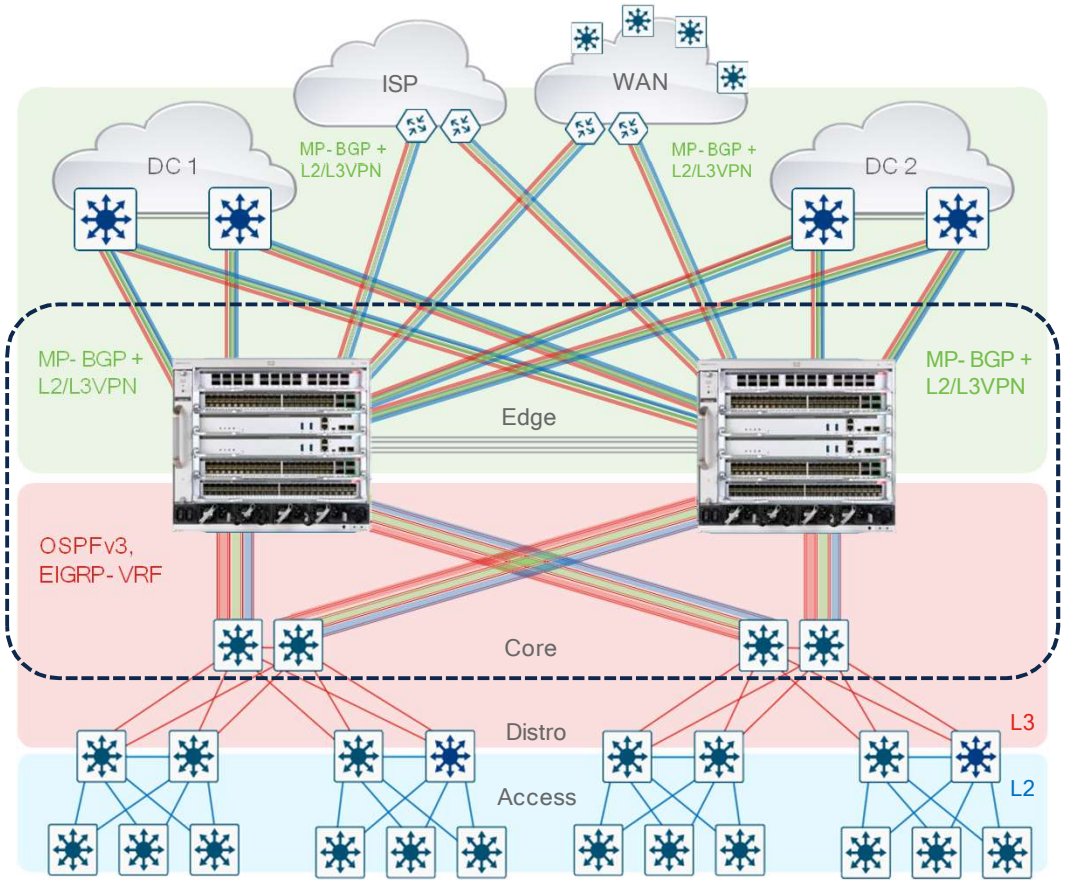
- Control-Plane: MPLS, EoMPLS/VPLS, MVPN
- Data-Plane: LDP, mLDP
- Policy- Plane: VPN ID

Tends to use Overlay-aware Features

- IP or OG ACLs (e.g. destined Outside)
- Uniform/Pipe QoS (e.g. separate Inner vs. Outer)
- Inter-VRF Routing (e.g. VRF-Lite, Leaking)
- MPLS-aware NetFlow (e.g. VPN ID in FNF)

May require multiple encapsulation(s)

Tends to require high L2/L3 & feature scale



EVPN Border & Spine

The **EVPN Border & Spine** PIN focuses on connecting an EVPN Fabric and/or other network domains.

- Typically, the same layer as Core or Edge (Tier 3-4)

Main goal is to connect EVPN fabric to other networks

Uses a **L3 Underlay + L3 Hand-off**

- North (outside): L3 MP-BGP + Inter-AS, PIM + MSDP
- South (inside): L3 IGP, PIM + MSDP

Uses a **Virtualized L2/L3 Overlay**

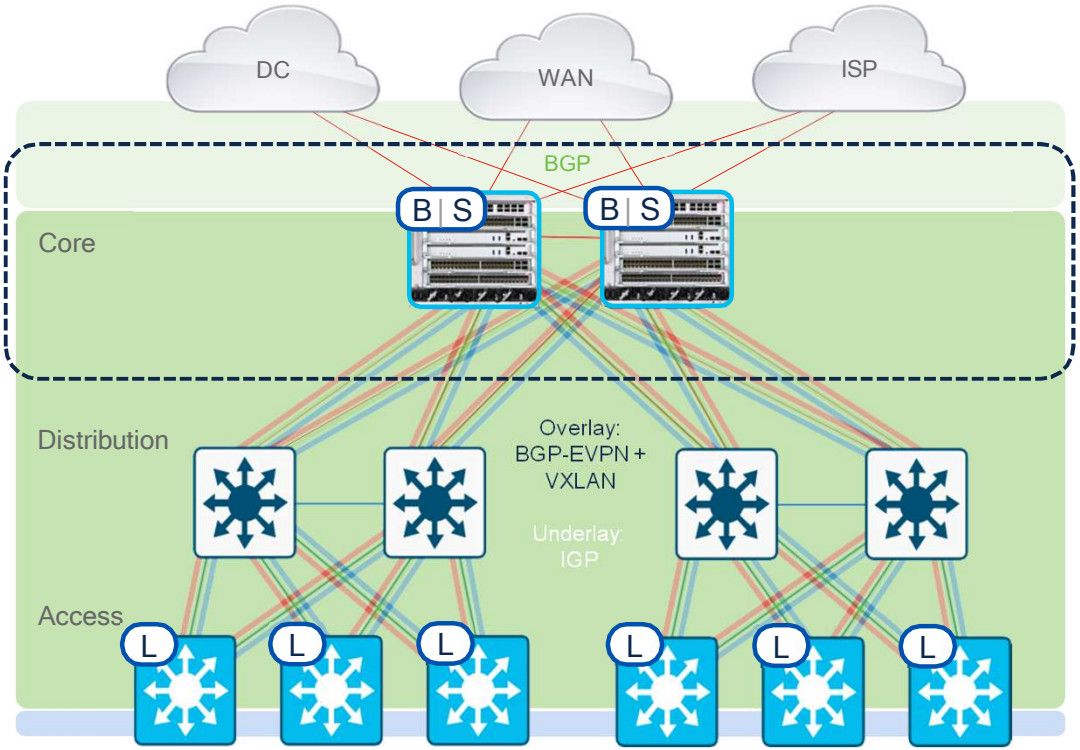
- Control-Plane: BGP- EVPN (RR), TRM
- Data-Plane: VXLAN
- Policy-Plane: L2/L3 VNID

Tends to use Overlay-aware Features

- IP/OG ACLs (e.g. destined Outside)
- (e.g. copy Inner, queue Outer)
- Uniform QoS (e.g. VRF-Lite, Leaking)
- Inter-VRF Routing (e.g. VRF/VNID in FNF)
- Fabric Telemetry

May require multiple encapsulation(s)

Tends to require high L2/L3 & feature scale



EVPN Leaf

The **EVPN Leaf** PIN focuses on connecting Wired endpoints to an EVPN Fabric domain.

- Typically, the same layer as Access or Extended (Tier 1)

Main goal is to connect Endpoints to EVPN network

Uses a **L3 Underlay + L2 Hand-off**

- North (inside): L3 IGP, PIM + MSDP
- South (outside): L2 VLAN (L3 SVI), STP, IGMP

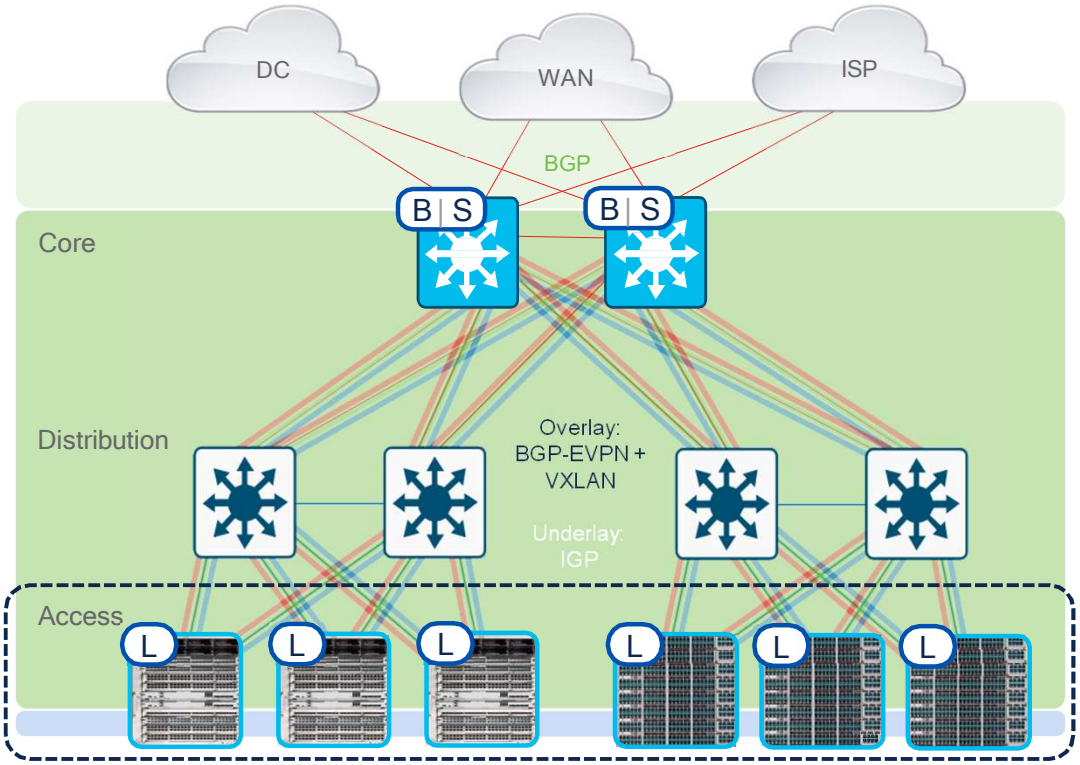
Uses a **Virtualized L2/L3 Overlay**

- Control-Plane: BGP- EVPN, TRM
- Data-Plane: VXLAN
- Policy-Plane: L2/L3 VNI

Tends to use Overlay-aware features

- IP/OG ACLs (e.g. destined outside)
- Uniform QoS (e.g. copy inner, queue outer)
- Inter- VRF Routing (e.g. VRF Leaking)
- Fabric NetFlow (e.g. FNF + VNID)

Tends to require med-high L2/L3 & feature scale



SD-Access Border & CP

The **SDA Border & CP** PIN focuses on connecting an SDA Fabric and/or other network domains.

- Typically, the same layer as Core or Core/Edge (Tier 3-4)

Main goal is to connect SDA fabric to other networks

Uses a **L3 Underlay + L3 Hand-off**

- North (outside): L3 MP-BGP + Inter-AS, PIM + MSDP
- South (inside): L3 IGP, PIM + MSDP

Uses a **Virtualized L2/L3 Overlay**

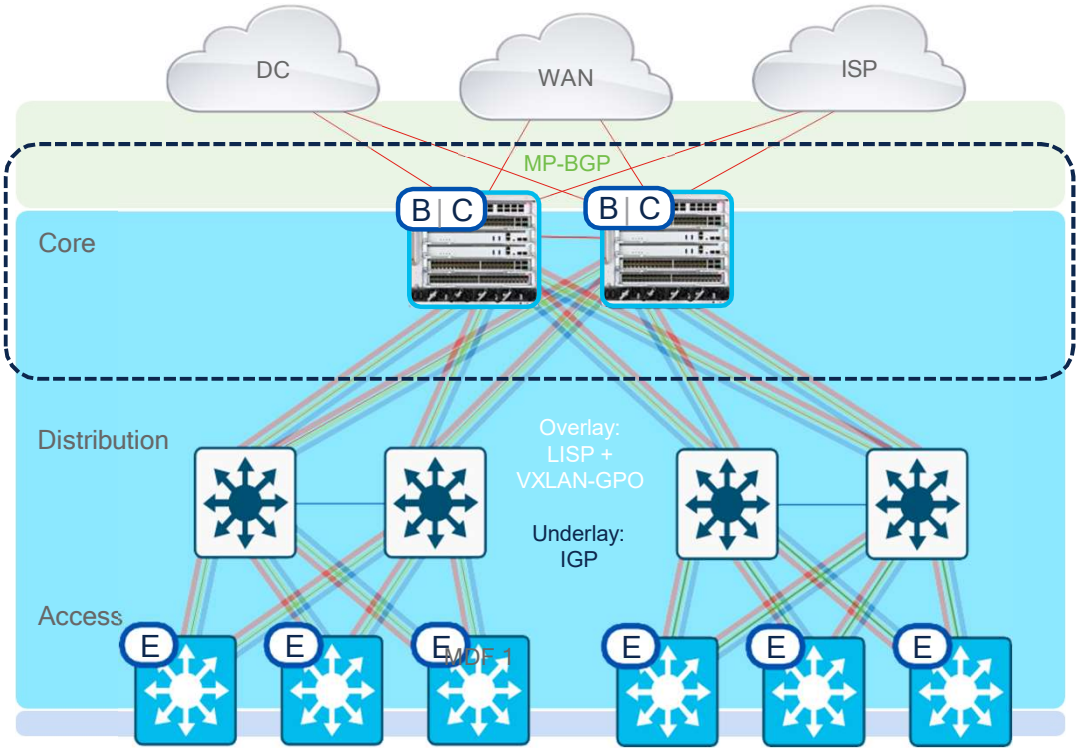
- Control-Plane: LISP (XTR, MS/MR), PIM
- Data-Plane: VXLAN- GPO
- Policy- Plane: L2/L3 VNI + SGT

Tends to use Overlay-aware features

- Security Group ACLs (e.g. destined outside)
- Uniform Pipe QoS (e.g. copy inner, queue outer)
- Inter-VRF Routing (e.g. VRF Extranet, or VRF-Lite)
- Fabric NetFlow (e.g. VRF/VNID + SGT FNF, NaaS/ETA)

May require multiple encapsulation(s)

Tends to require higher L3 & feature scale



SD-Access Edge

The **SDA Edge** PIN focuses on connecting Wired/Wireless endpoints to an SDA Fabric domain.

- Typically, the same layer as Access or Extended (Tier 1)

Main goal is to connect Endpoints to SDA network

Uses a **L3 Underlay + L2 Hand-off**

- North (inside): L3 IGP, PIM + MSDP
- South (outside): L2 VLAN (L3 SVI), STP, IGMP

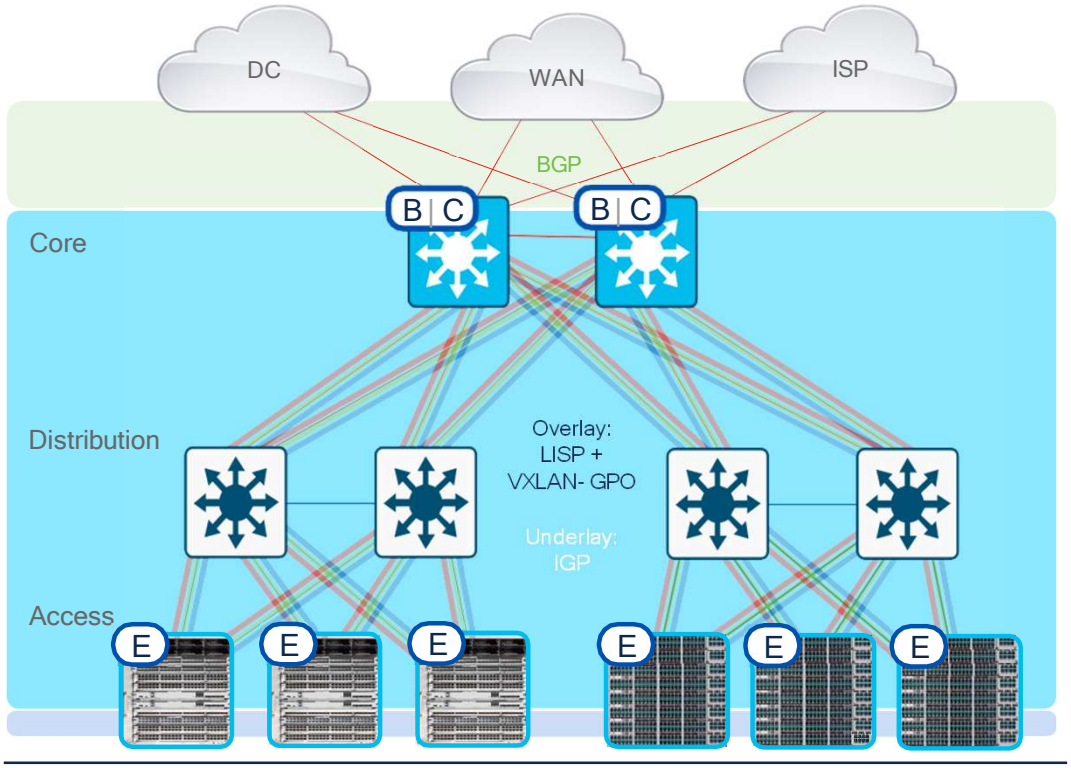
Uses a **Virtualized L2/L3 Overlay**

- Control-Plane: LISP (XTR), PIM
- Data-Plane: VXLAN- GPO
- Policy-Plane: VN + SGT

Tends to use Overlay-aware features

- Security Group ACLs (e.g. destined outside)
- Uniform Pipe QoS (e.g. copy inner, queue outer)
- Inter-VRF Routing (e.g. VN Extranet)
- Fabric NetFlow (e.g. FNF, NaaS)

Tends to require higher L3 & feature scale



Firewalls, VRFs & ACLs

The **Firewall (DMZ)** PIN focuses on controlling access into or out of different network areas.

- Typically connected to Core, Edge or DC (Tier 3+)
- Complex designs may use Distro or Access (Tier 1-2)

Main goal is to prevent unauthorized access to different network domains (segments).

- Evolved from "Edge" Access-Control Lists (ACLs)
- Can be either L2, L3 or VRF-aware
- Tends to focus on L4-L7 flows (with or w/o DPI)

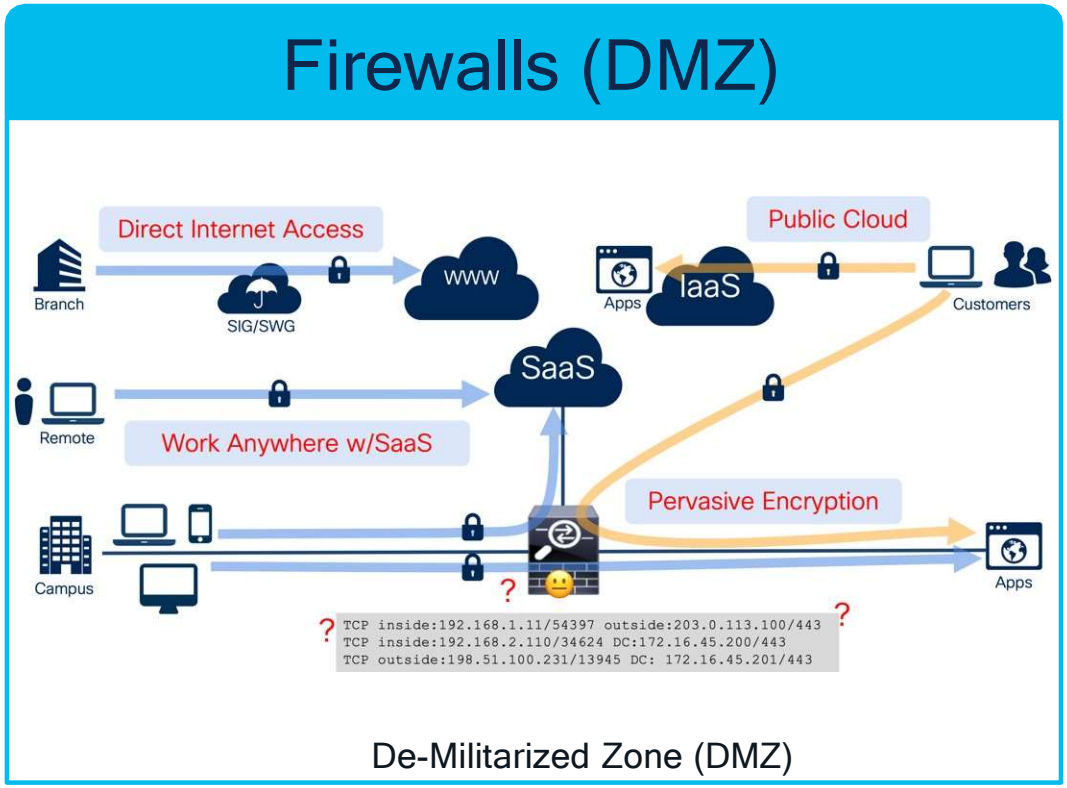
Uses a **L2 or L3/VRF + ACLs**

- North (outside): L2 802.1Q, L3 (SVI, Sub-Ints), IGP, BGP
- South (inside): L2 802.1Q, L3 (SVI, Sub-Ints), IGP, BGP

Tends to use L2 & L3/VRF + DPI & ACL features

- L4/App ACLs (e.g. VACL, MAC ACL)
- L4/App QoS (e.g. VLAN QoS)
- L4/App NetFlow (e.g. FNF, AVC, EPA & ETA)

Tends to require med-high L2/L3 & feature scale



Wireless LAN

The **Central Wireless** PIN focuses on connecting Wireless APs centrally to one or multiple WLCs.

- WLC is typically connected to Core, Edge or DC (Tier 3+)
- APs are typically connected to Access (Tier 1)

Main goal is to connect Wireless Endpoints (via APs) to a Wireless LAN (WLAN) - centrally in the network

Uses a **L2/L3 Underlay + L2 Hand-off**

- North (to WLC): L2 VLAN + 802.1Q, L3 SVI, IGP
- South (to AP): L2 VLAN + 802.1Q, STP, IGMP

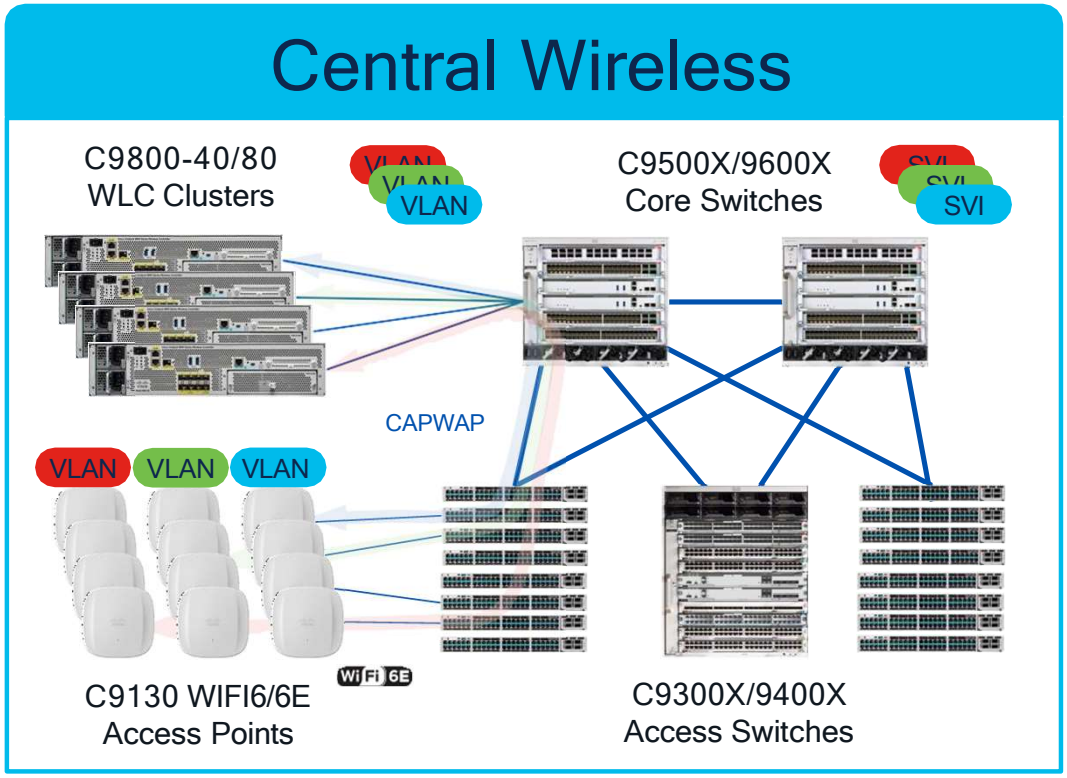
Uses a Tunneled L2 Overlay

- Control-Plane: CAPWAP, DTLS, LWAPP
- Data-Plane: CAPWAP, DTLS

Tends to require L2 (WLAN) features

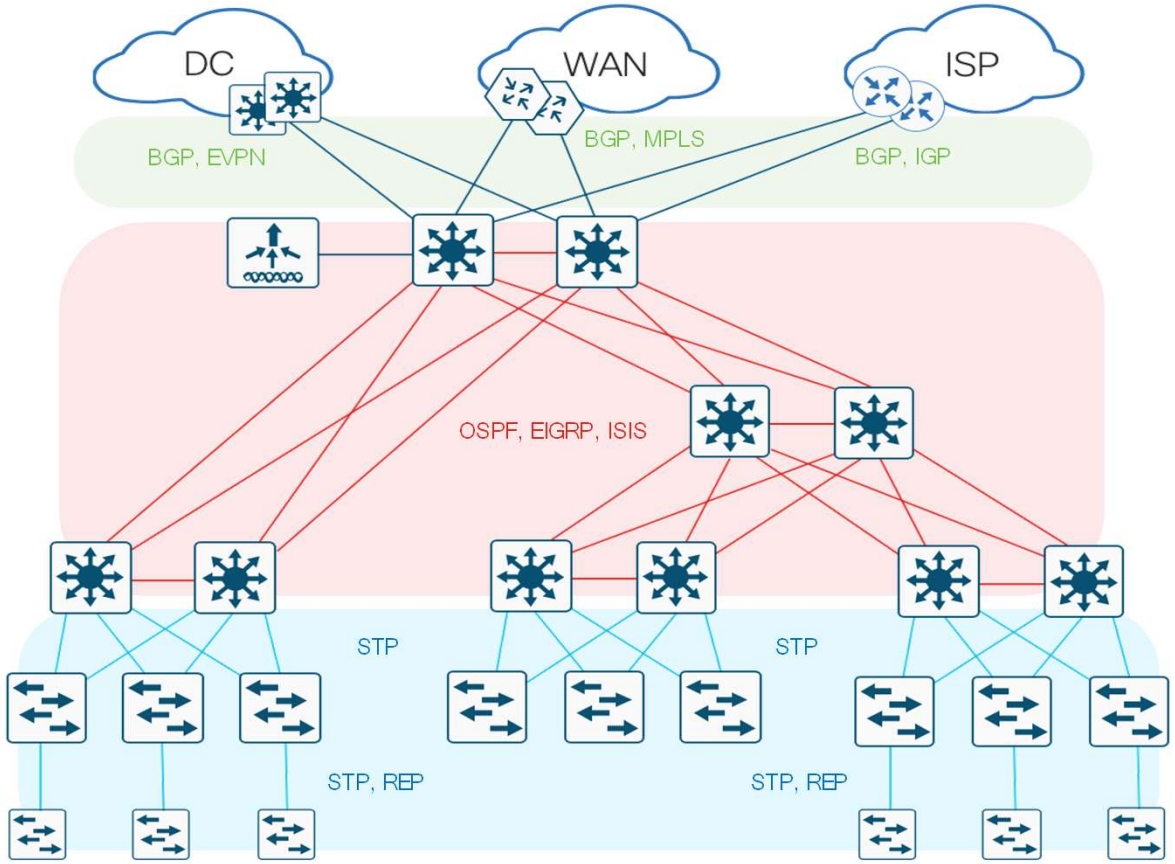
- L2 ACLs (e.g. VACL, MAC ACL)
- L2 QoS (e.g. VLAN QoS)
- L2 NetFlow (e.g. FNF, AVC, EPA & ETA)

Tends to require higher L2/L3 + feature scale



Remember: Campus PINs & Topology

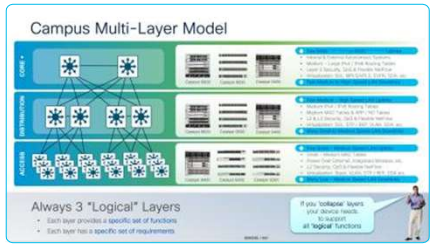
RECAP



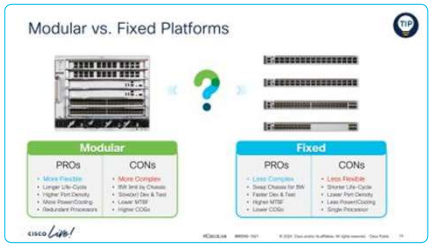
Remember: Campus Design Fundamentals

RECAP

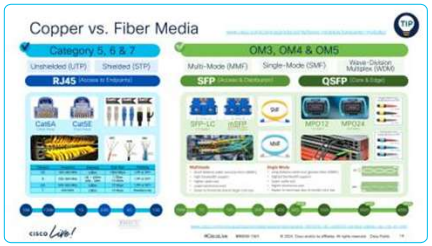
Collapse or Expand Layers?



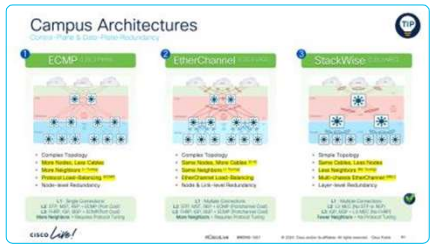
Modular or Fixed Platforms?



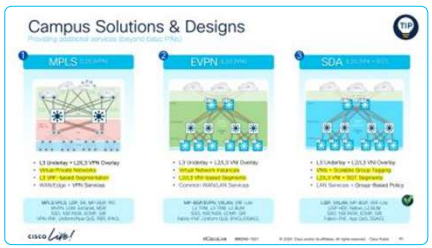
Fiber or Copper Links?



ECMP, EtherChannel or Stacking?



L2/L3 or MPLS or VXLAN?



Wireless or Security Included?