EVPN VXLAN

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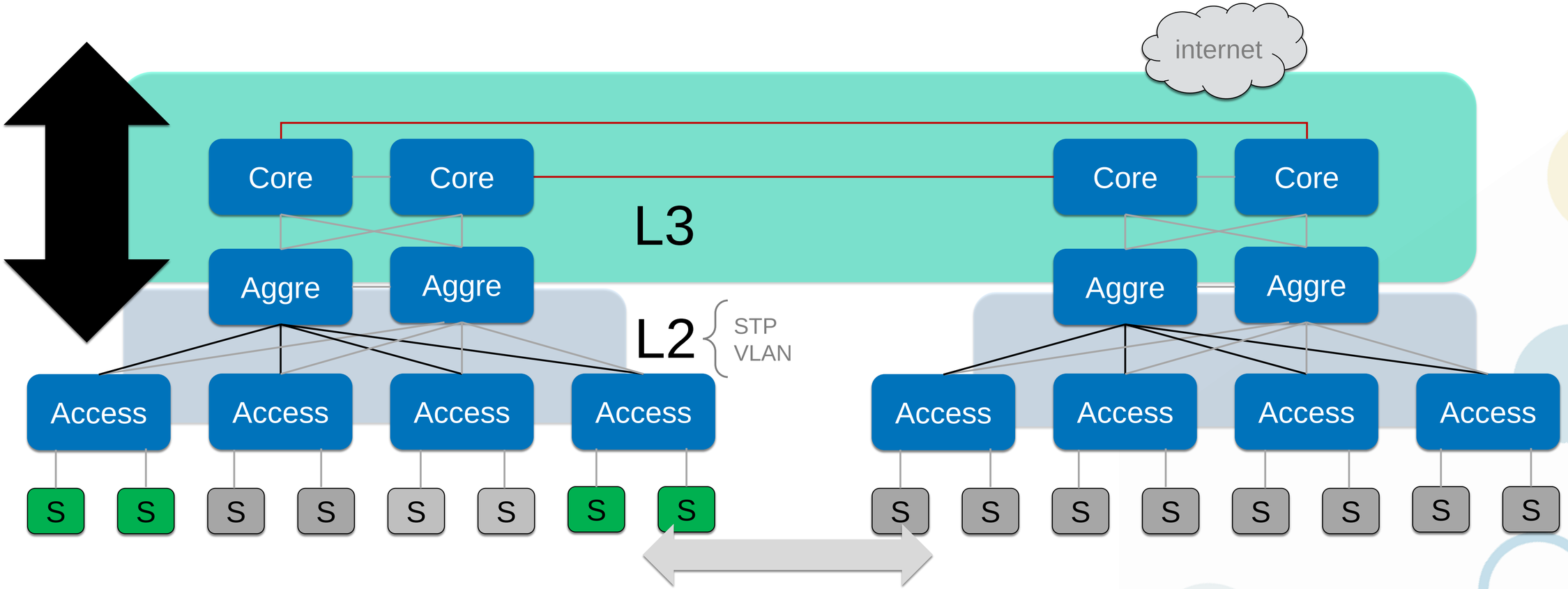
Agenda

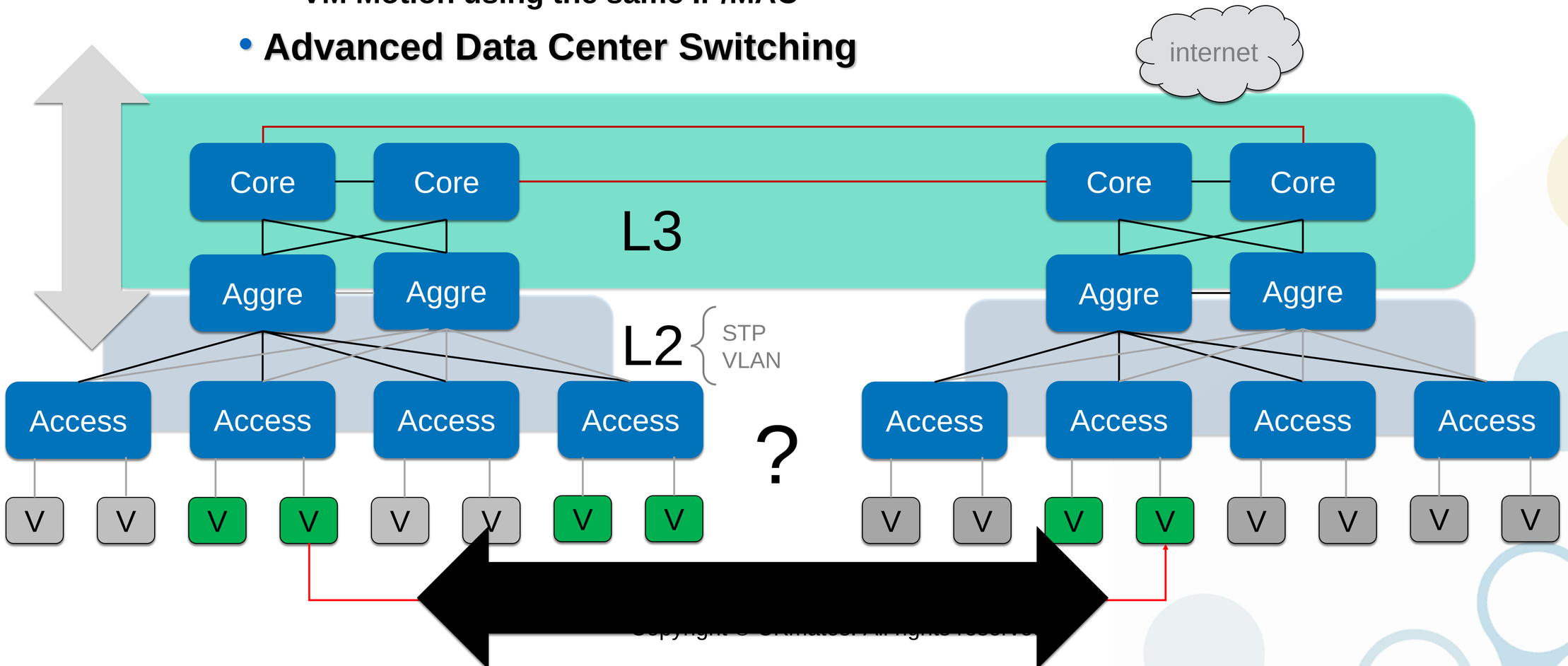
- Modern Data Center Architecture
- VXLAN Fundamentals
- VXLAN with EVPN Control
- Summary

Tranditional Data Center Architecture



Tranditional Data Center Chanllenge

- **Limited STP or xSTP**
- **Meet Virtualization Request**
  - **VM Motion using the same IP/MAC**
- **Advanced Data Center Switching**

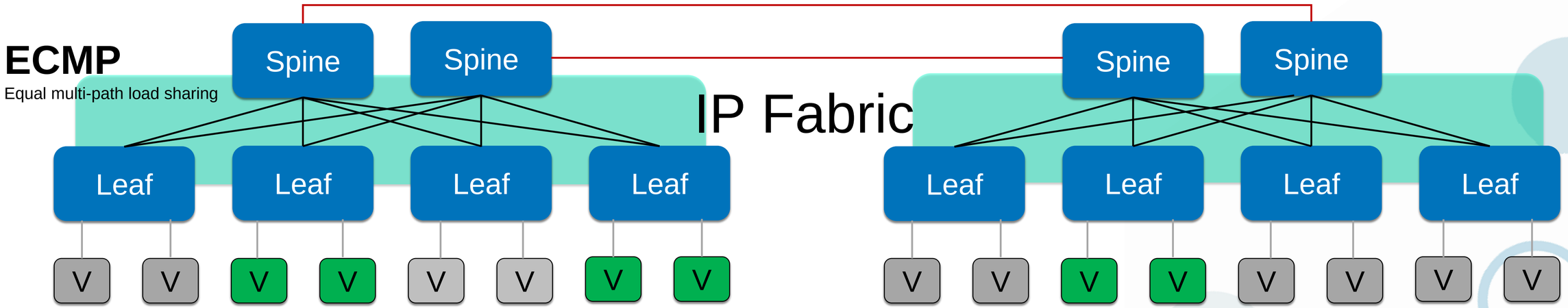


What does Modern DC Change?

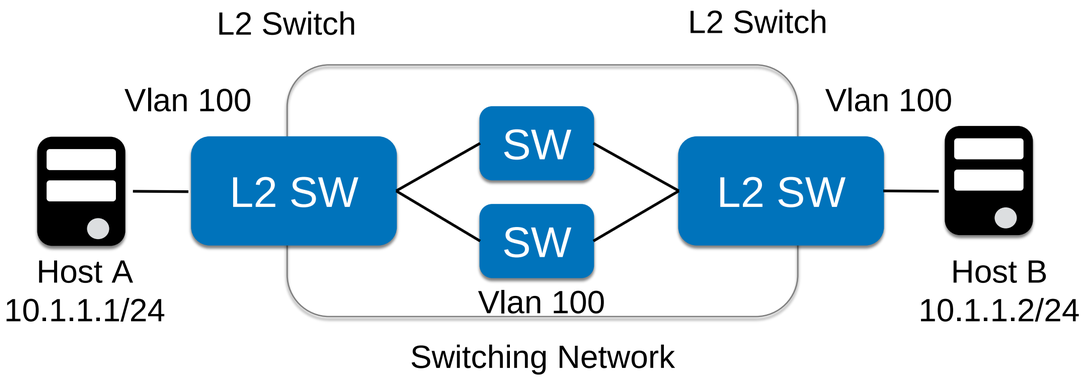
- **Spine-Leaf Architecture**
- **Overlay Networking**
  - **Underlay Network**
  - **Overlay Network**

Clos (Spine & Leaf) Architecture

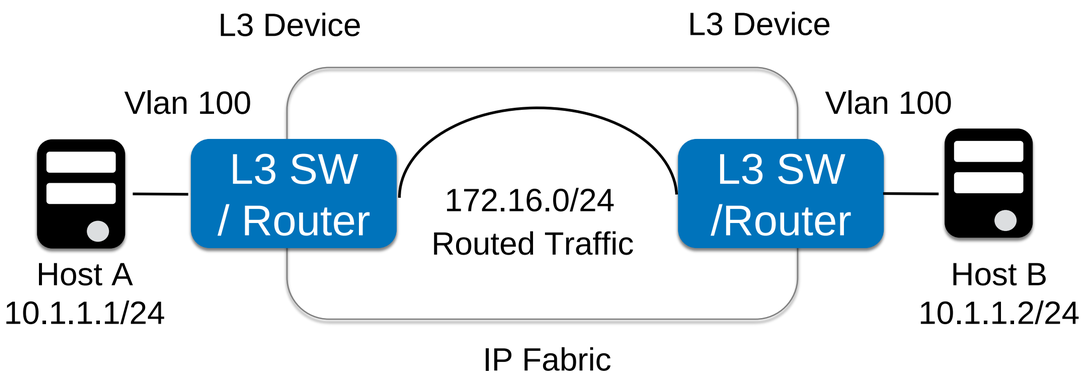
- **Spine and Leaf Architecture**
  - **Each Leaf has a physical connection on each Spine**
  - **No physical connectivity between Spines or between Leafs**
  - **The mathematical theory of this architecture was initially created by Charles Clos in 1953, hence the reason it is called Clos.**
- **All IP infrastructure**
  - **No Layer 2 switching or xSTP protocols**
  - **Traffic should be load shared over the multiple paths**

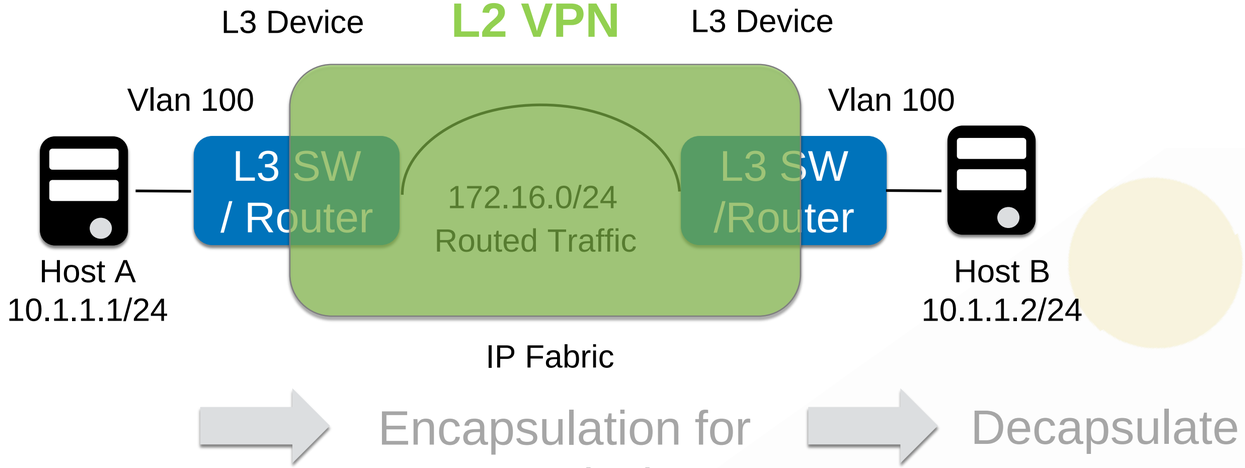


Traditional Applications

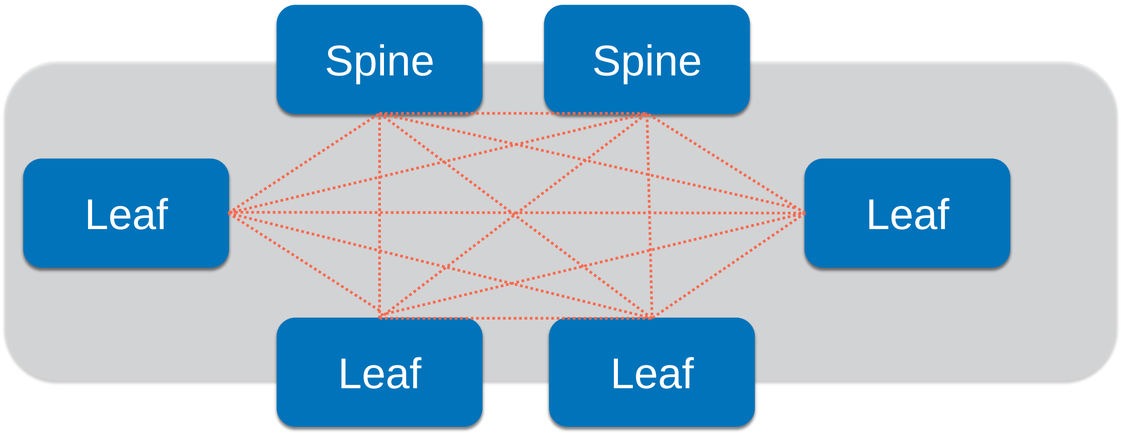


Traditional Applications / A Layer 2 VPN



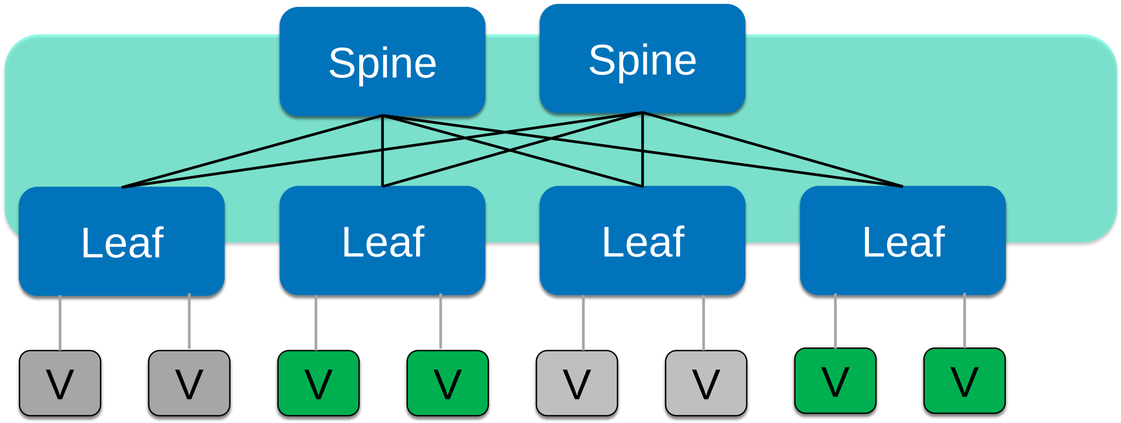


Underlay & Overlay Network



Overlay

- Layer 2 tunnel to stretch layer 2/3 connectivity intra/inter data centers
- Establishing Logical neighbor/tunnel Relationship



Underlay

- IP Service such as OSPF、ISIS、EIGRP and BGP that provides the transport for VXLAN
- Learning loopback addresses

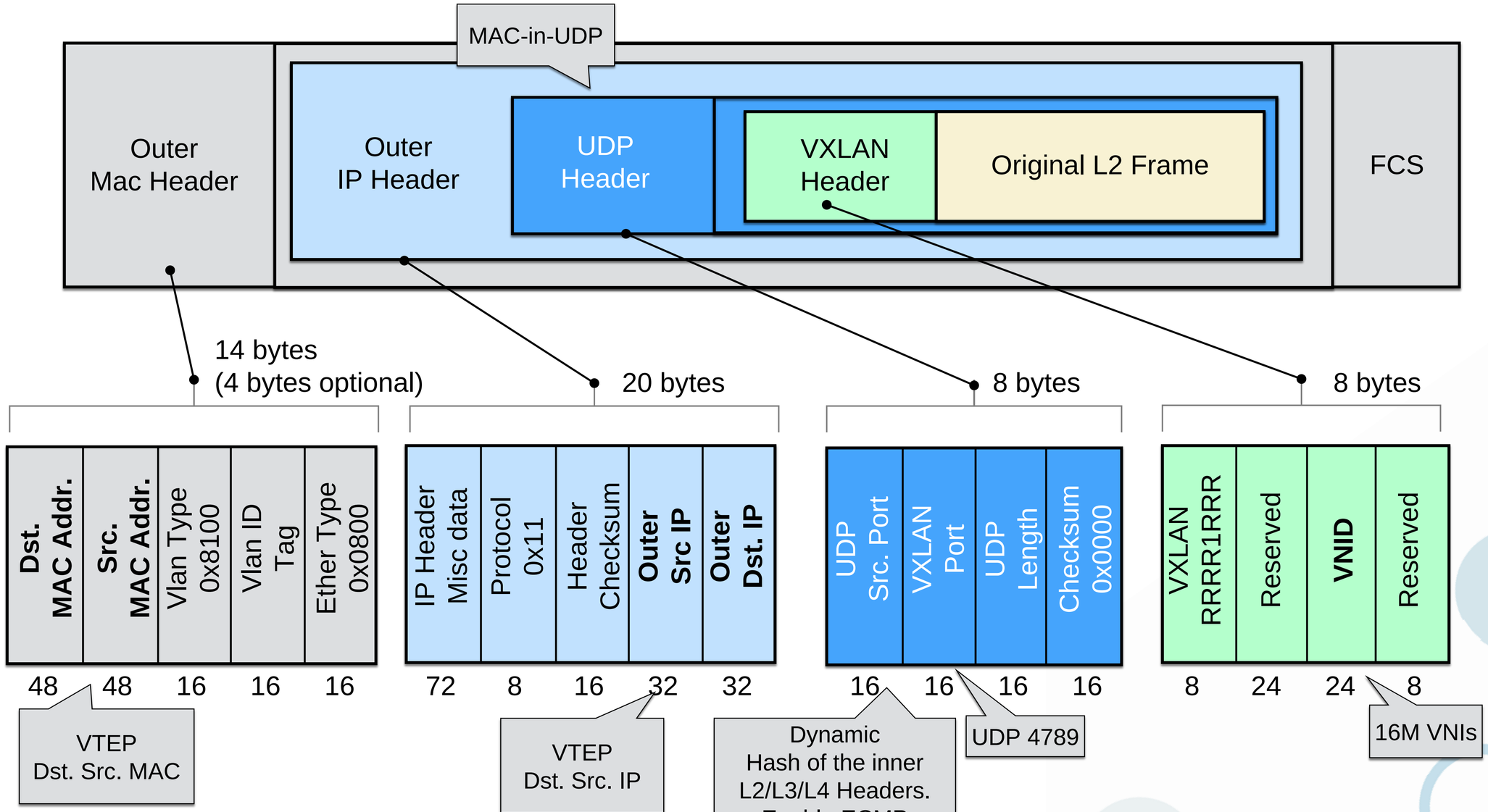
VXLAN Fundamentals

- **VXLAN : Virtual eXtensible Local Area Network**
- **VXLAN is a Layer 2 VPN**
  - **Defined in RFC 7348 (Aug 2014)**
  - **Encapsulations Ethernet Frames within IP Packets**
  - **Originally created by VMware, Arista Networks and Cisco etc.**
- **Data Plane Component**
  - **Encapsulation: Including adding an outer Ethernet header, outer IP header, out UDP header, and VXLAN header to the original Ethernet Frame**
  - **Decapsulation : Including removing all of the above outer header and forwarding the original Ethernet frame to its destination**
- **Control Plane Component**
  - **RFC7348 discusses static configuration and multicast using PIM**
  - **Other methods using EVPN**

VXLAN Key Terminology

- **VNI/VNID**
  - **VXLAN Segment identified by 24-bit Segment ID**
  - **Same VNI are allowed to communicate to each other**
  - **VNI are Globally Significant**
- **VTEP (VXLAN Tunnel End Point)**
  - **VXLAN encapsulation and decapsulation**
  - **Handle VNI / VLAN Mapping**
  - **Software-based Virtual Network Switch**

VXLAN Encapsulation

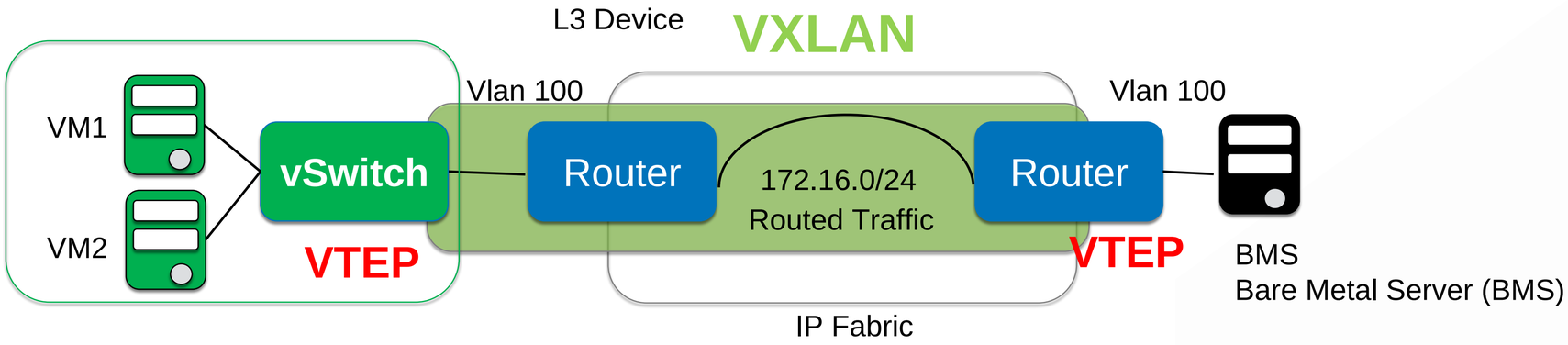


VXLAN Benefits

- **Higher Scalability**
  - 12-bit VLAN ID only identify 4094 Layer2 segments
  - 24-bit VNI identify up to 16 million VXLAN segments
- **Higher Flexibility**
  - VXLAN carries Layer 2 frames over Layer 3 Network.
  - Extend L2 segments over the underlying shared network
- **Better Utilization**
  - No STP for loop prevention by blocking redundant paths
  - Complete advantage of L3 equal-cost multipath (ECMP)

VXLAN Benefits (cont.)

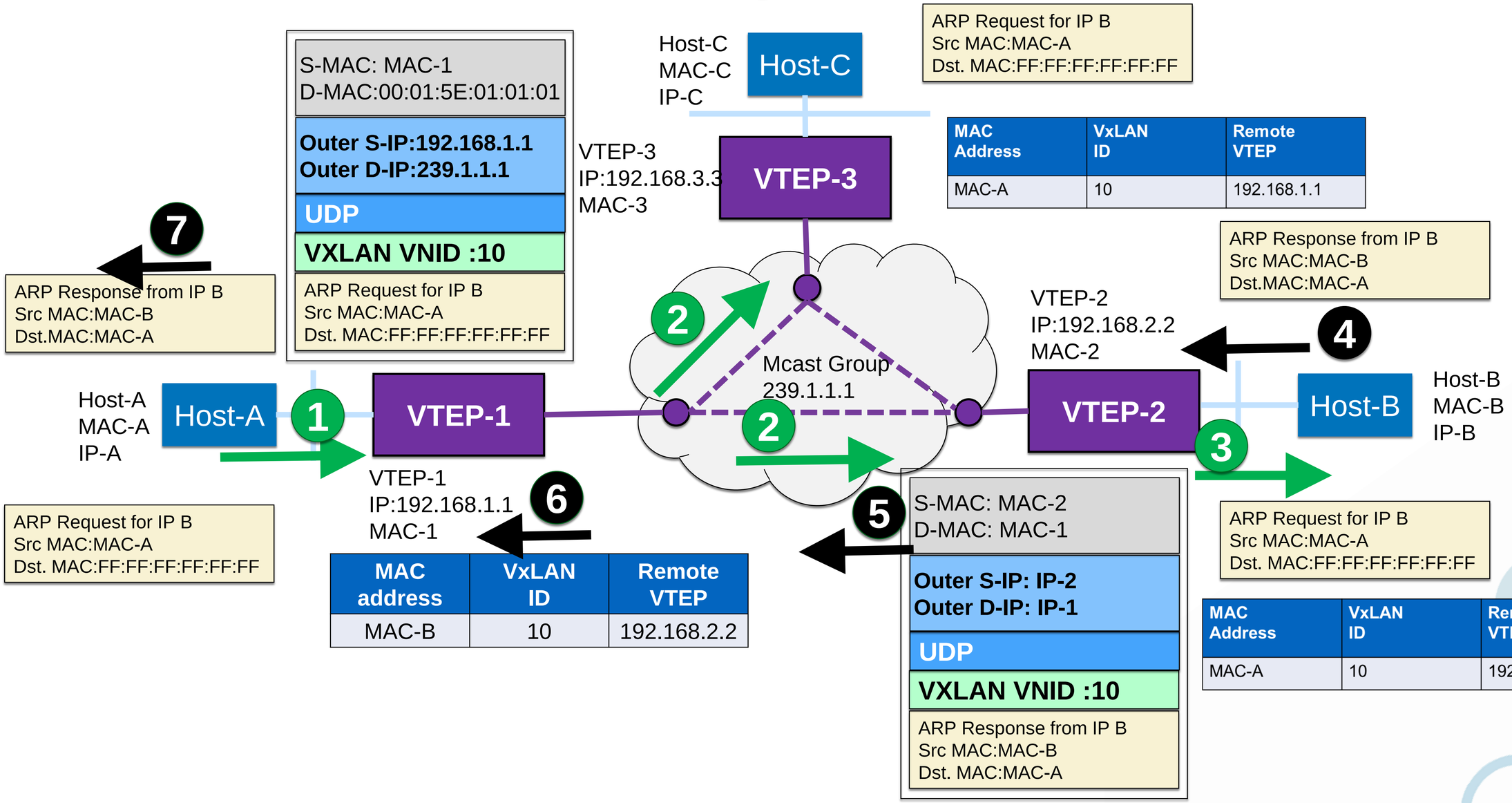
- **Embraced by major vendors and supporters of virtualization**
  - **Standardized protocol**
- **Support in many virtual switch software implementations**
  - **VTEP support the physical network environment**
  - **VTEP also support in the virtual switch environment**



VXLAN MAC Address Learning

- **Local MAC Address**
  - **Local attached servers/VM MACs are learned from locally received packets**
- **Remote MAC addresses can be learned in two ways:**
  - **Data plane**
    - Using multicast forwarding of BUM traffic
  - **Control plane (recommended)**
    - Using EVPN signaling to advertise locally learned MACs to remote VTEPs

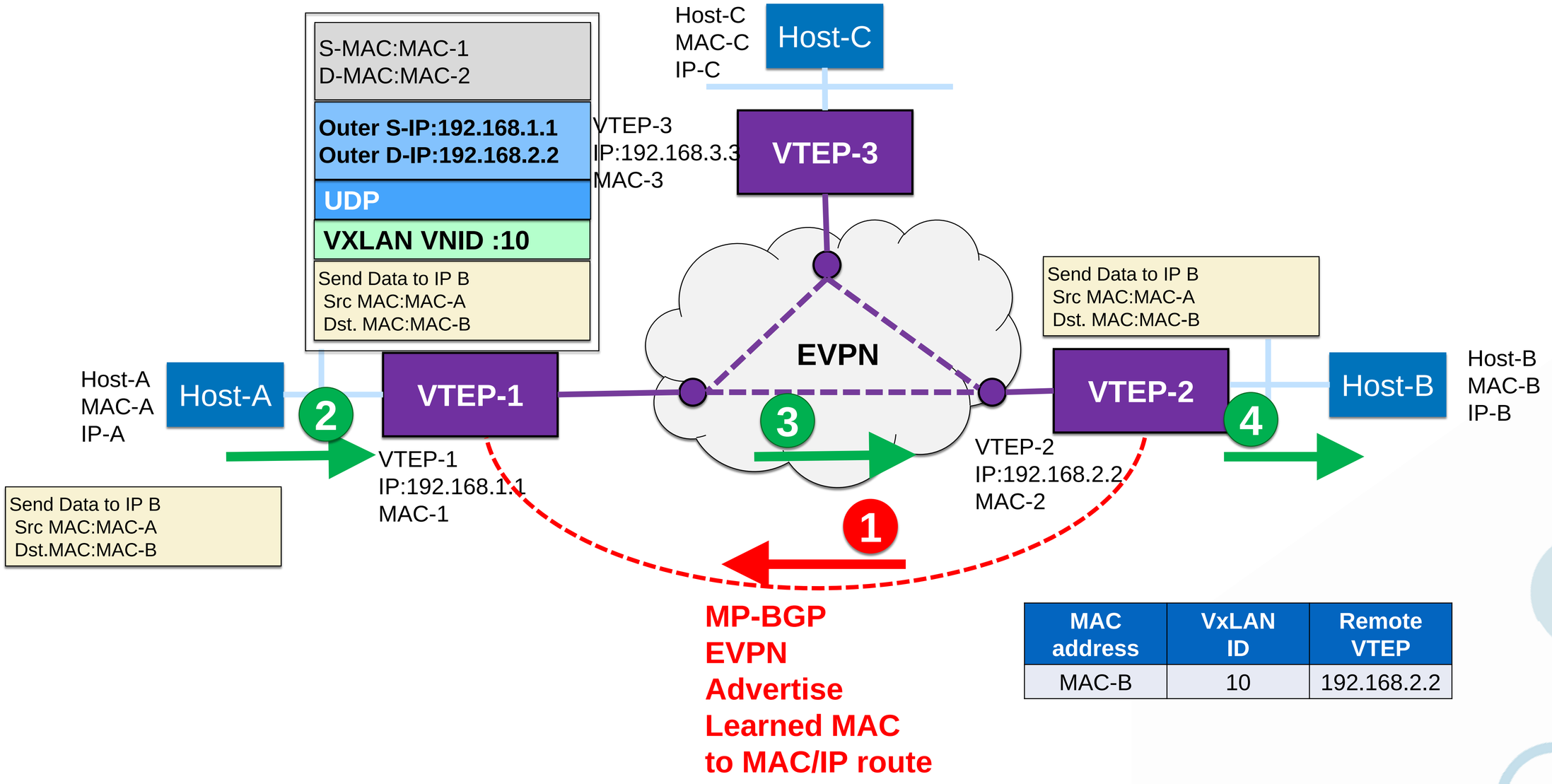
MAC Address Learning via Data Plane



VXLAN with EVPN Control

- **VXLAN is a Layer 2 VPN**
  - **Defined in RFC 7348/RFC8365**
- **EVPN is a Control Plane**
  - **Based on BGP**
  - **Highly Scalable**
  - **Auto Discovery**
- **Control plane MAC learning**
  - **Reduced unknown unicast flooding**
  - **Reduced ARP flooding**

MAC Address Learning via EVPN



MAC address	VxLAN ID	Remote VTEP
MAC-B	10	192.168.2.2

VXLAN Control Plane Evolution

- **VXLAN Control Plane**
  - **Locally learned MAC addresses are advertised to remote VXALN gateways via MAC/IP route**
  - **MAC learning through BGP signaling**
  - **Scalable**
  - **Fast convergence and updates**
  - **Automated Virtual Tunnel Endpoint (VTEP)/VNI discovery through BGP**

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EVPN VXLAN LAB concept

- **Underlay Network Configuration**
  - **Target : Routing Protocol to learn loopback**
- **Overlay Network Configuration**
  - **Establish iBGP neighbors to All other Spine/Leaf (recommend RR)**
  - **Enable address family EPVN**
  - **VTEP configuration**
  - **Target : Tunnels relationships between VTEPs are established.**
- **VXLAN Configuration**
  - **VNI/VLAN Mapping**

Summary

- **IP Fabric Spine / Leaf Architecture**
  - **All IP Fabric and xSTP**
- **VXLAN feature and benefits**
  - **Layer 2 “Overlay Networks” on top of a Layer 3 Underlay network.**
  - **MAC-in-UDP Encapsulation > Load Balance**
  - **16M VNI > multi-tenancy**
  - **Embraced by major vendors and supporters of virtualization**
- **EVPN VXLAN benefits**
  - **Separate Data Plane and Control Plane**
  - **Reduced unknown unicast flooding**
  - **Advertise MAC/IP using MP-BGP**
  - **Automated VTEP/VNI discovery through BGP**

Thanks

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