

Virtualization

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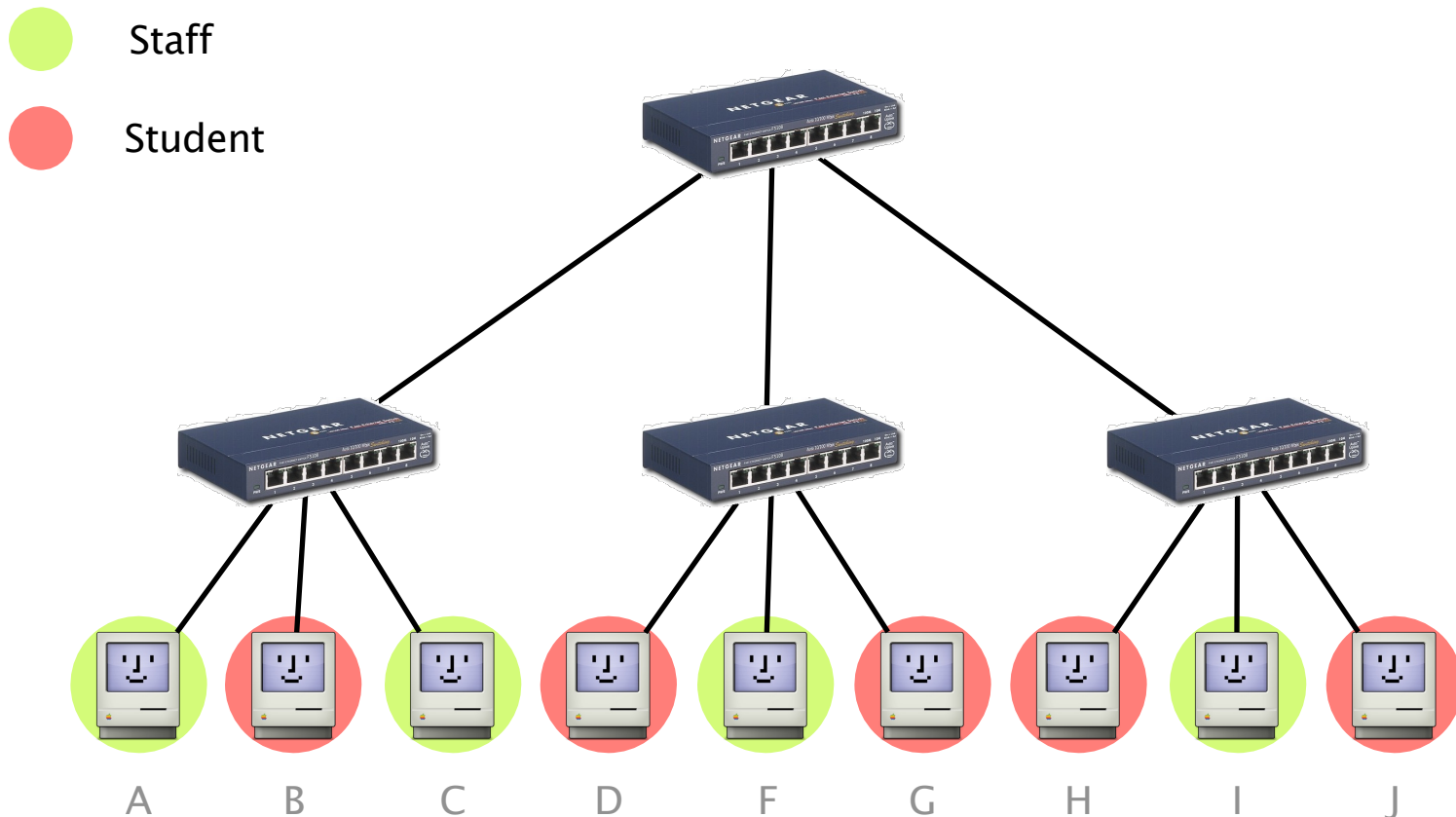
Xi'an Jiaotong University

Spring 2024

Why Virtualization?

Campus Network

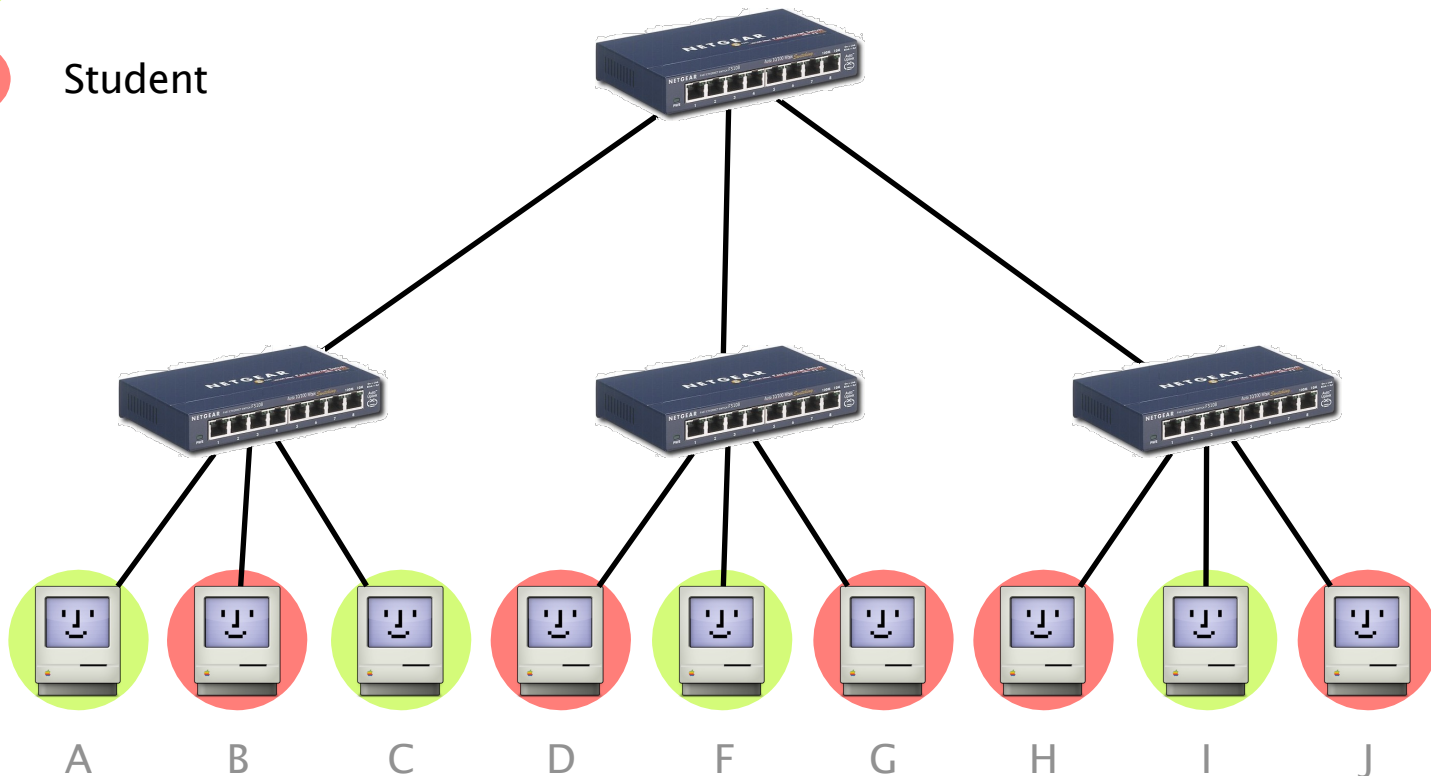
- Divide a single broadcast domain into multiple broadcast domains



Solution: Virtual LAN

A VLAN logically identifies a set of ports attached to one (or more) Ethernet switches, forming one broadcast domain

- Staff
- Student

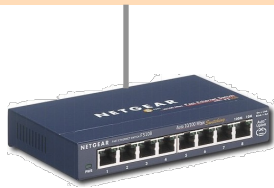


Virtual LAN

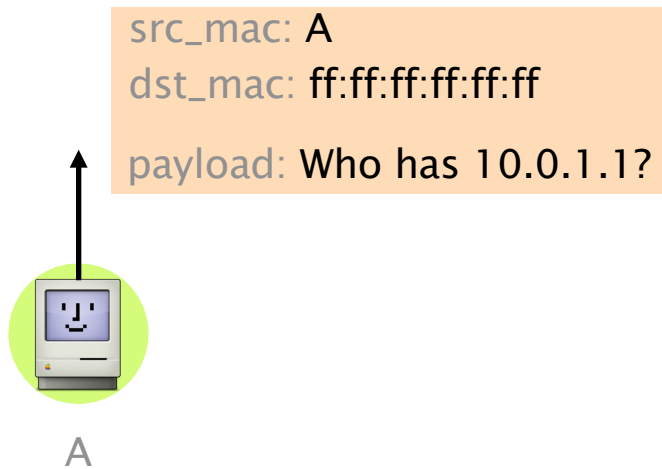
Switches need configuration tables telling them which VLANs are accessible via which interfaces

VLAN Staff: port A, port C

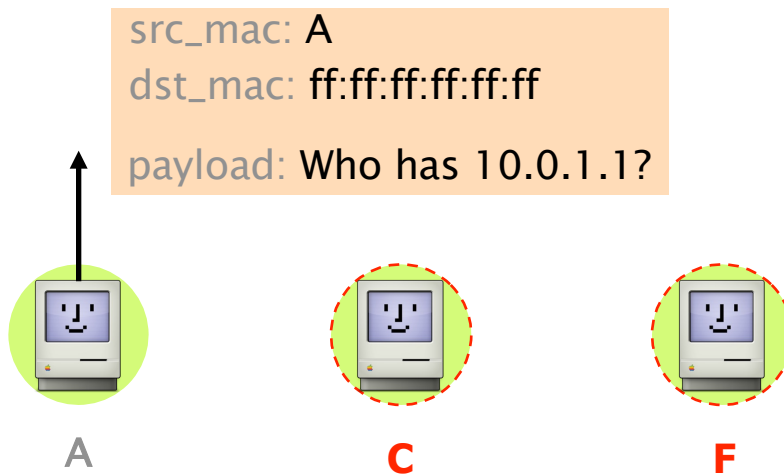
VLAN Student: port B



Virtual LAN



Virtual LAN



Virtual LAN

src_mac: A

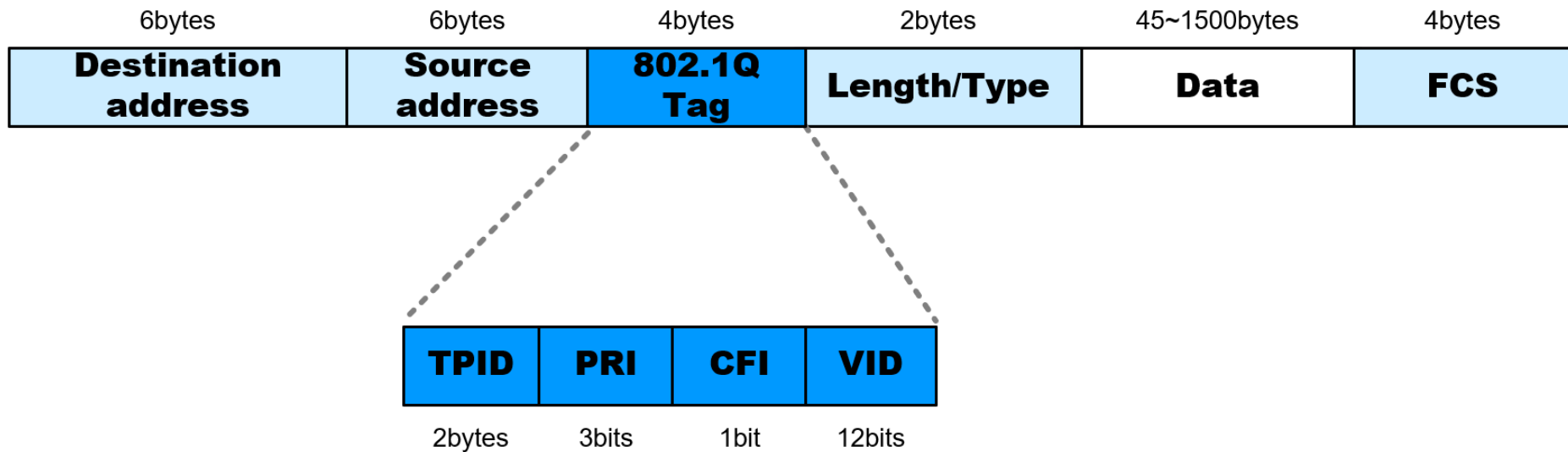
dst_mac: ff:ff:ff:ff:ff:ff

payload: Who has 10.0.1.1?



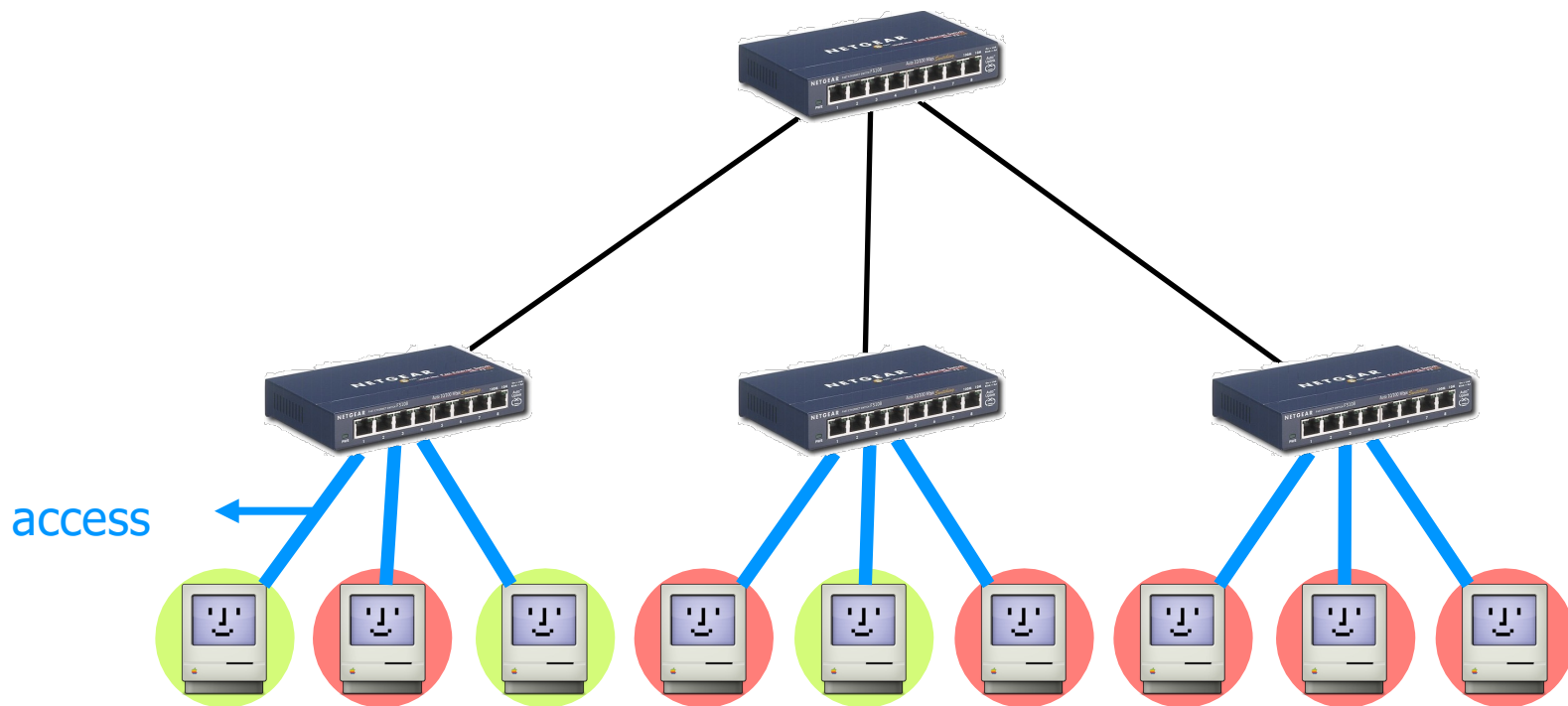
How does this switch know
where to flood it next?
e.g. pointless to send it right

Virtual LAN

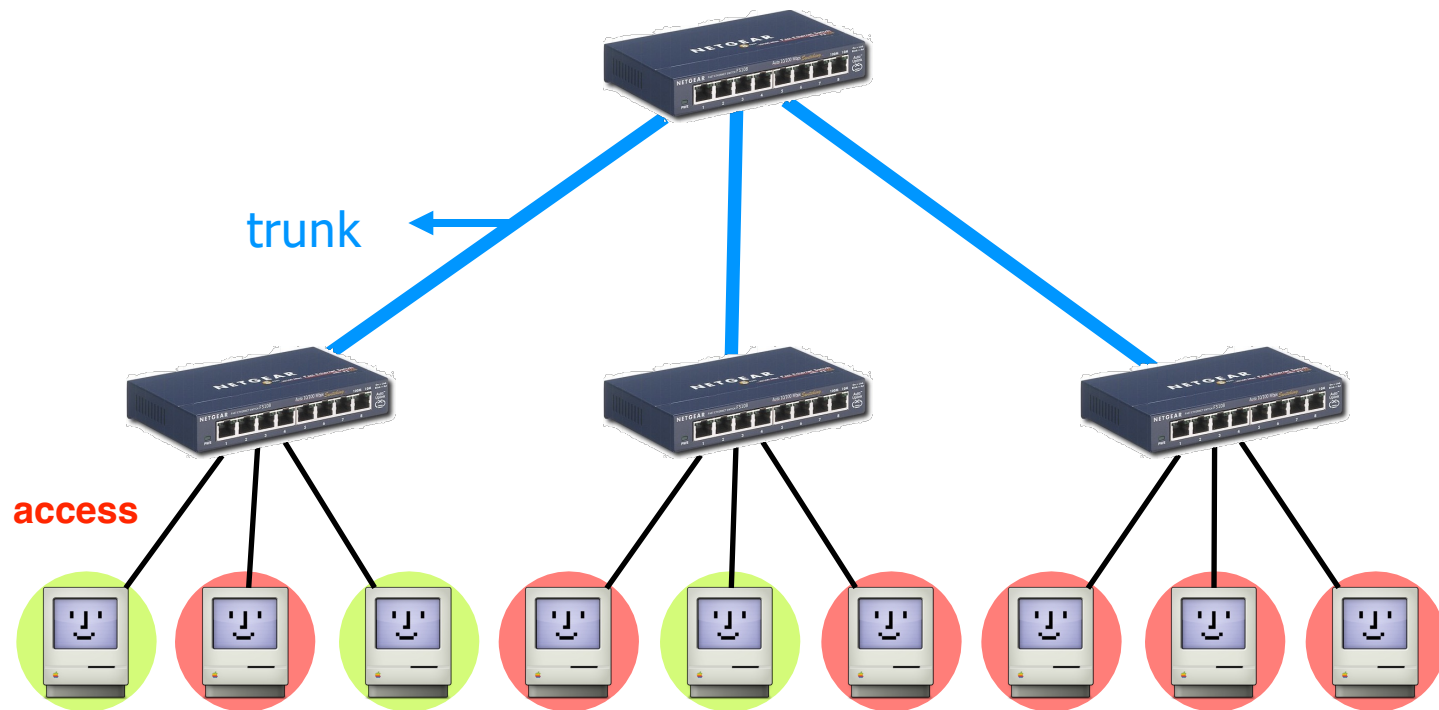


VLAN ID: from 0-4095, with 0 and 4095 being reserved

Virtual LAN



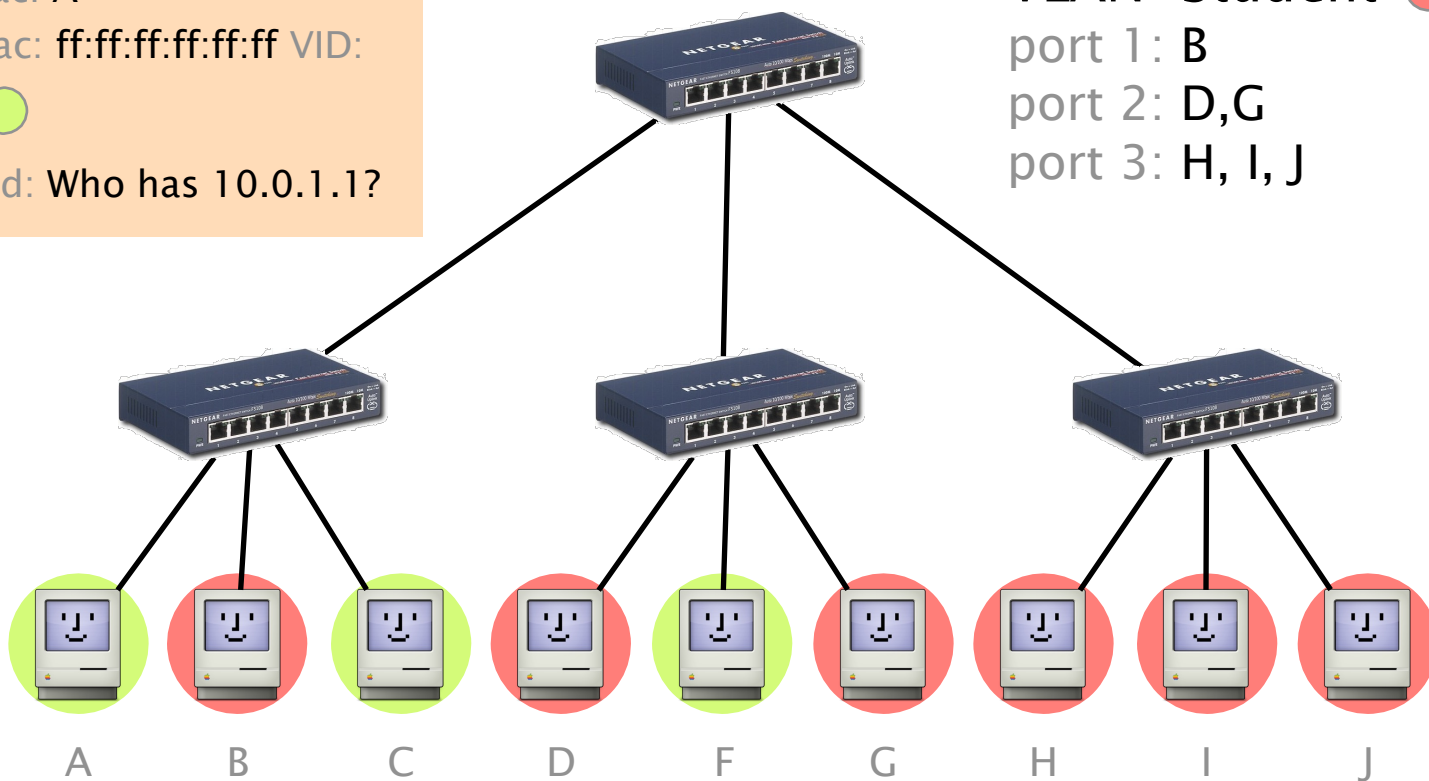
Virtual LAN



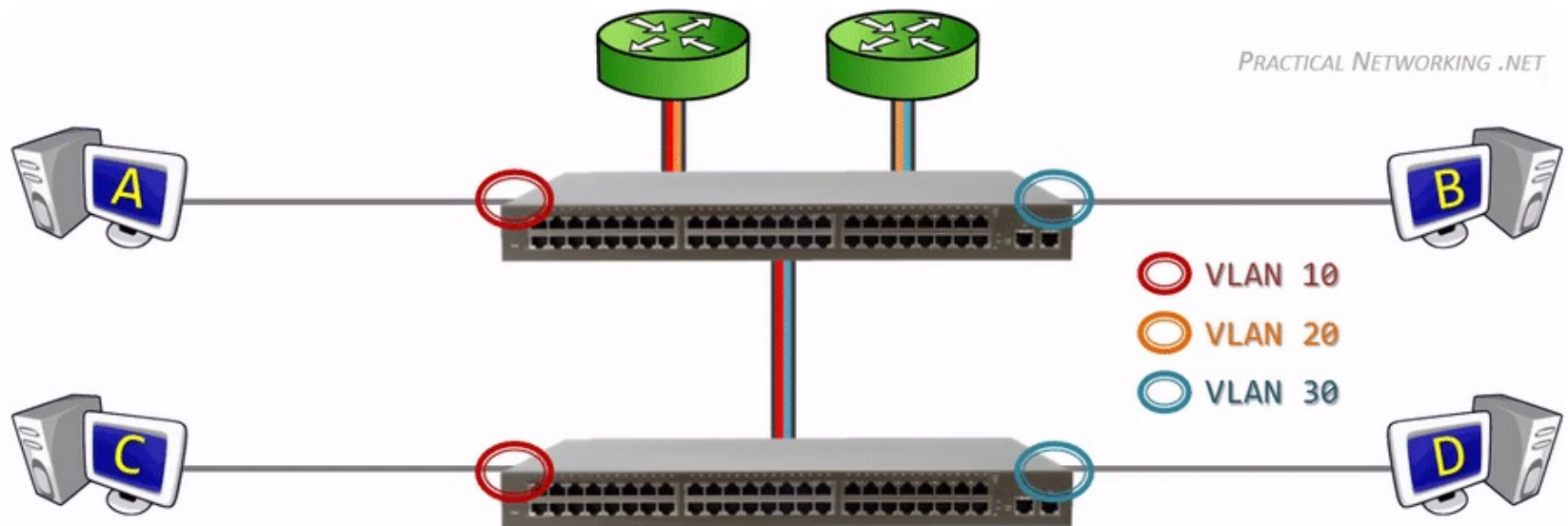
src_mac: A
dst_mac: ff:ff:ff:ff:ff:ff VID:
●
payload: Who has 10.0.1.1?

VLAN "Staff" ●
port 1: A, C
port 2: F

VLAN "Student" ●
port 1: B
port 2: D, G
port 3: H, I, J

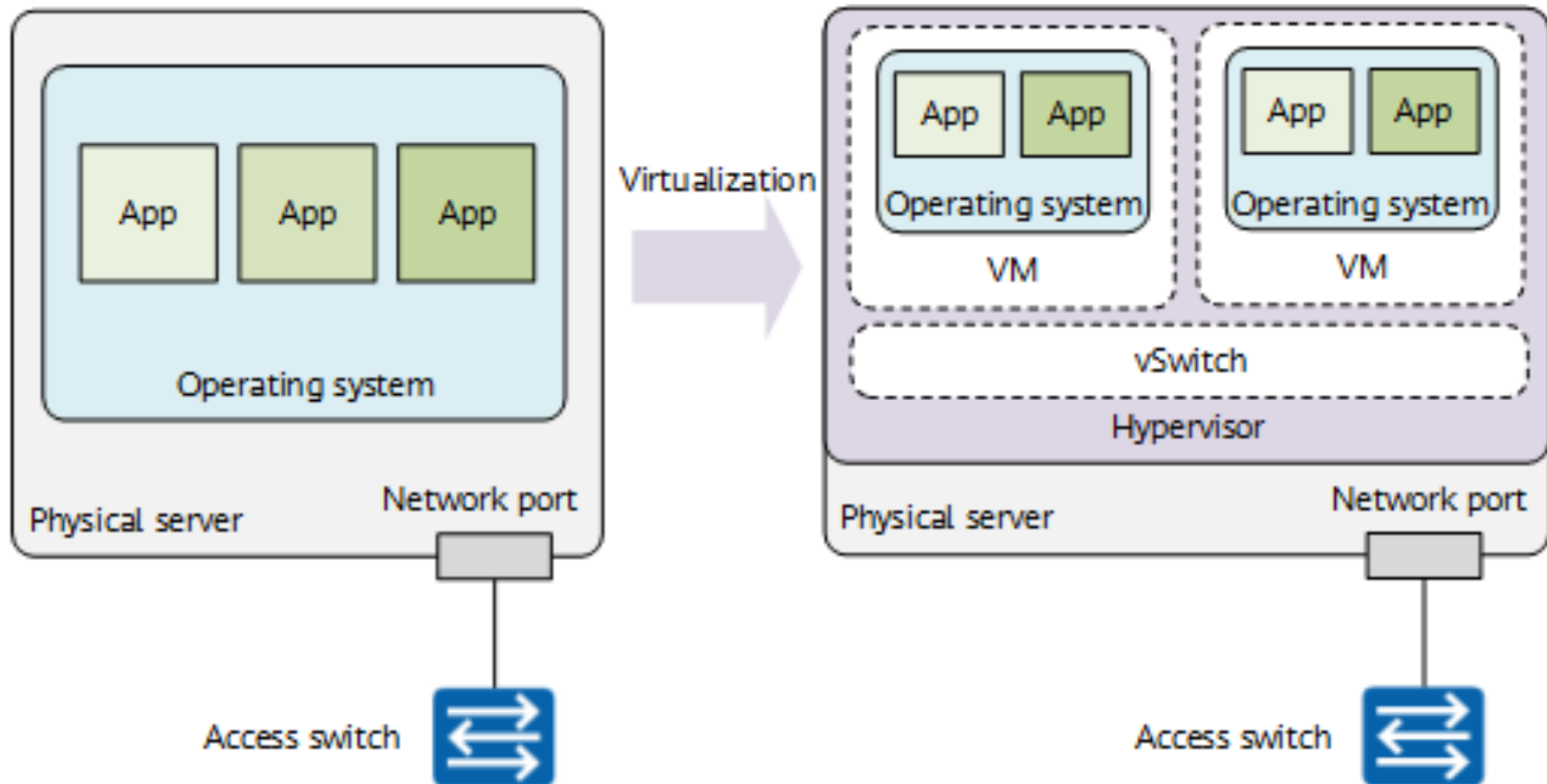


Forwarding Across VLANs

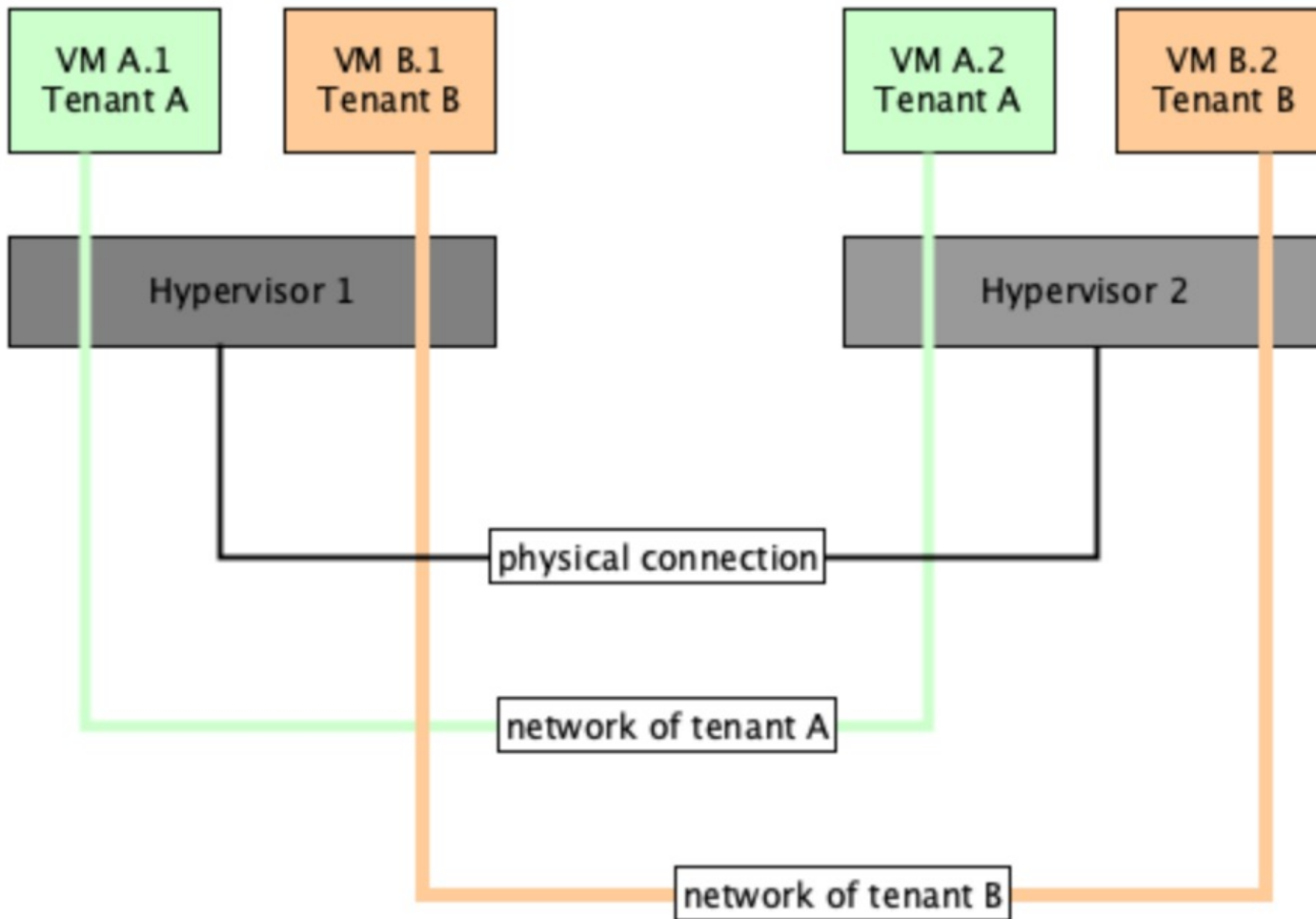


Datacenter Network

Compute Virtualization



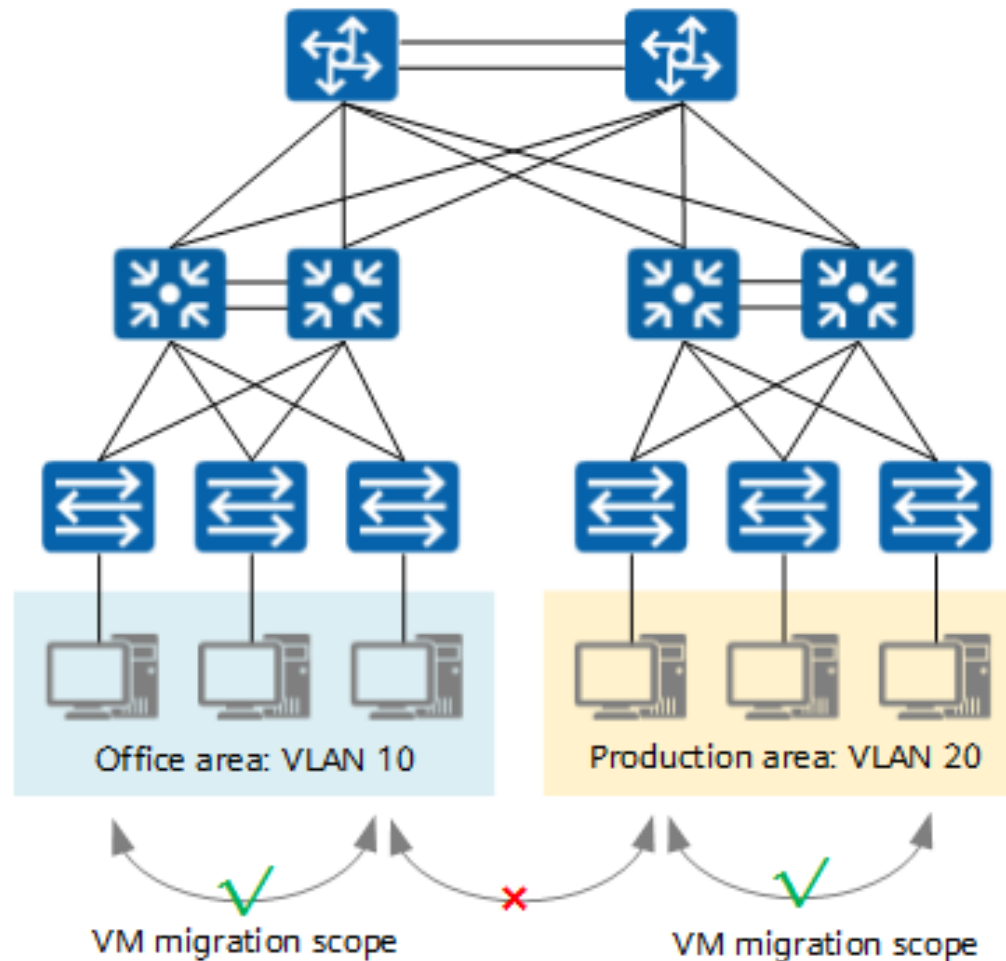
Compute Virtualization



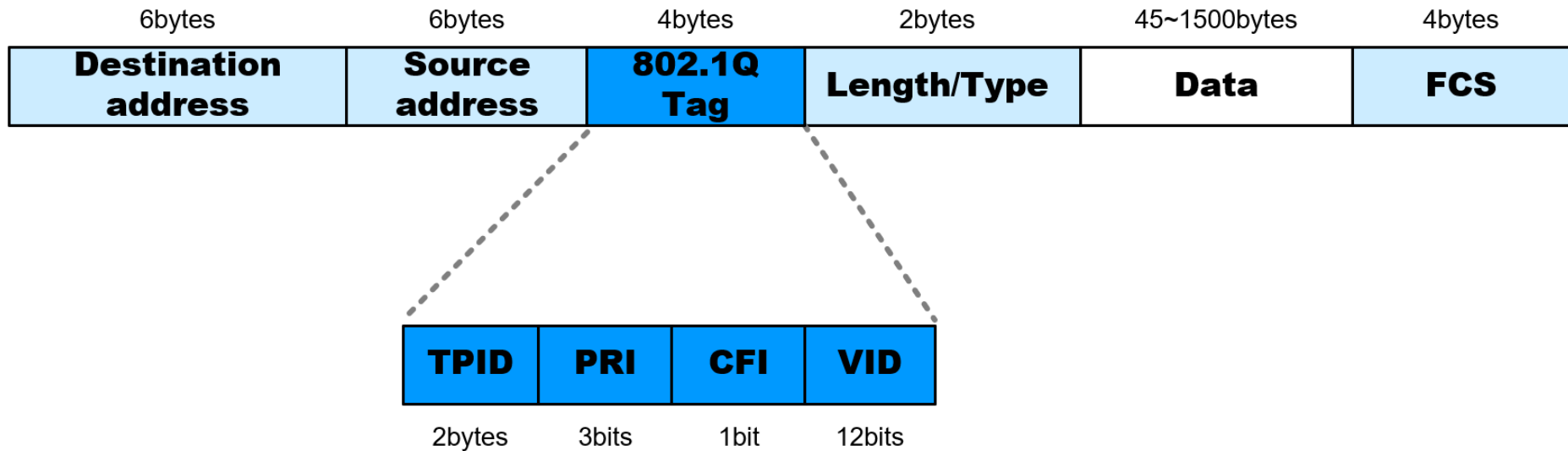
We can still use VLAN, but...

Limited VM Migration Scope

- VLAN limits the VM migration scope



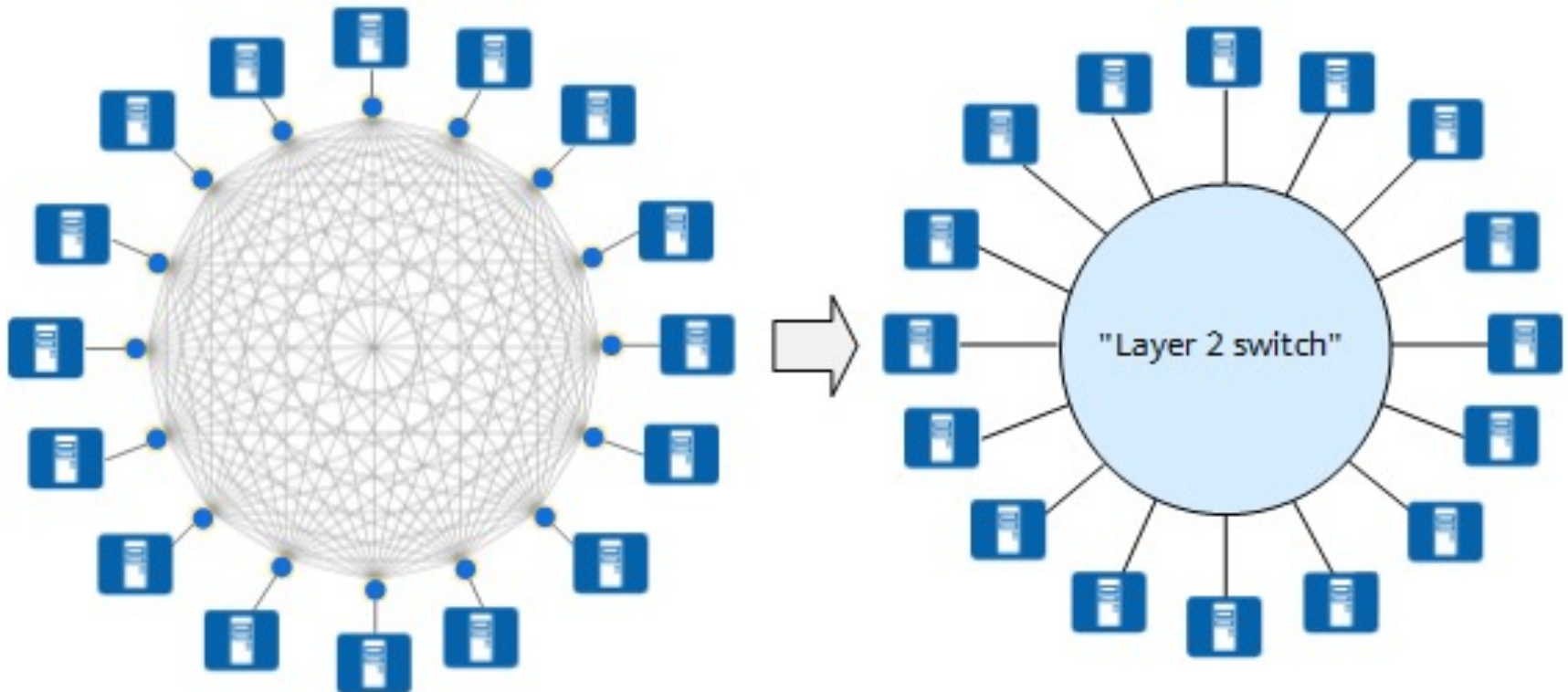
Small Number of VLANs



VLAN ID: from 0-4095, with 0 and 4095 being reserved

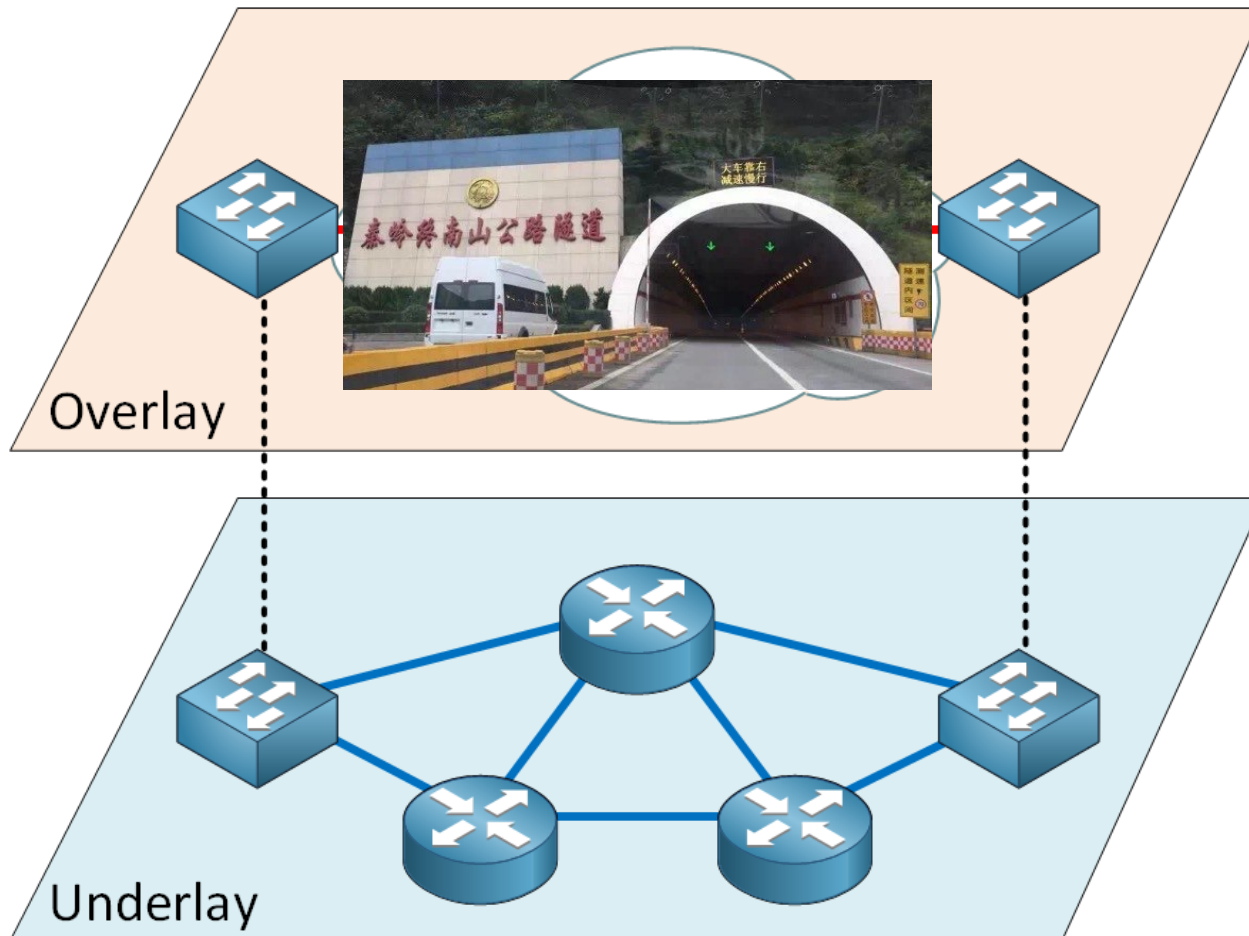
Build a Large Layer 2 switch!

- When a server is migrated from one port of a Layer 2 switch to another port, its IP address can remain unchanged



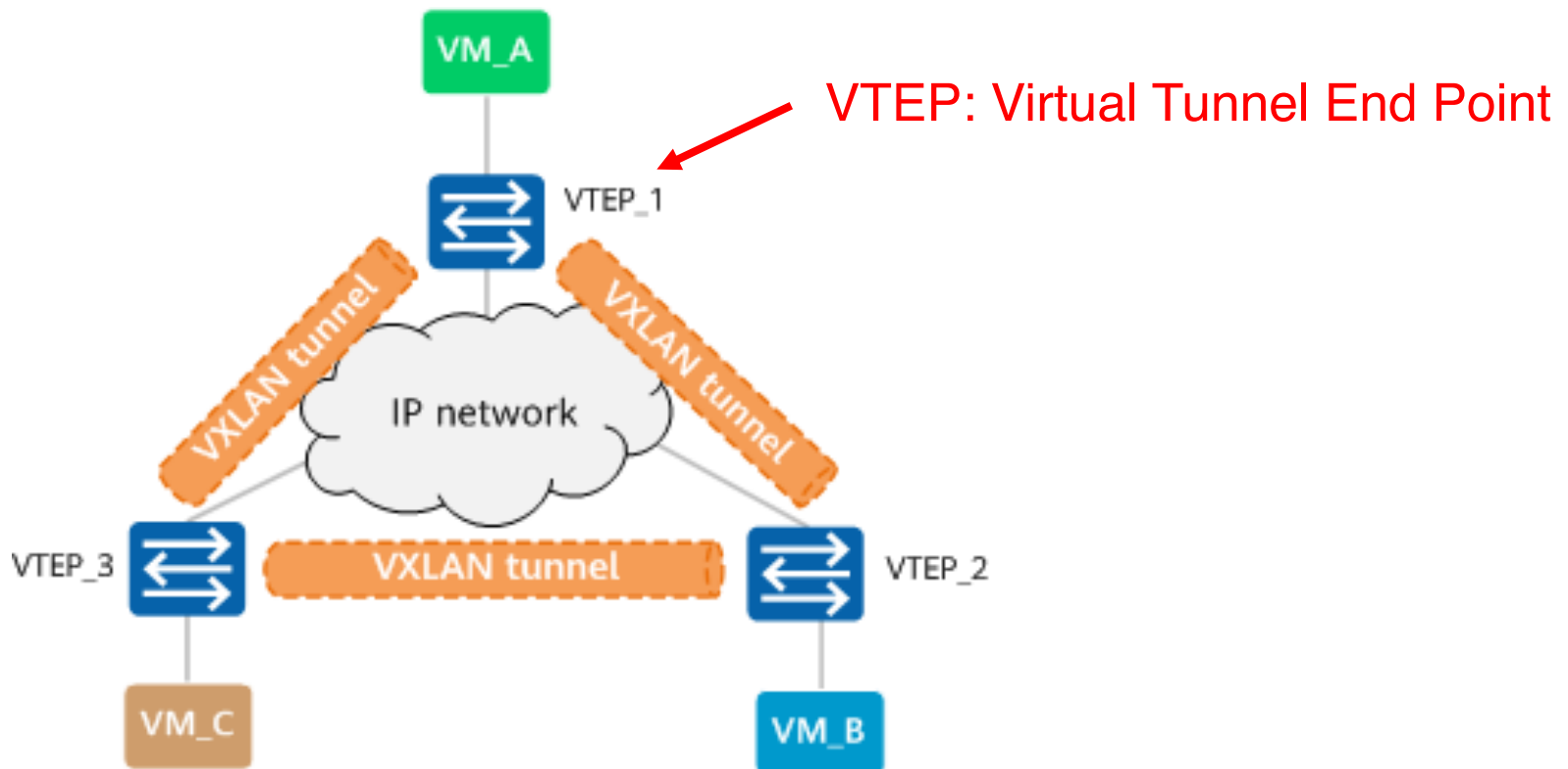
Build Overlay

- Build an overlay network with tunnels



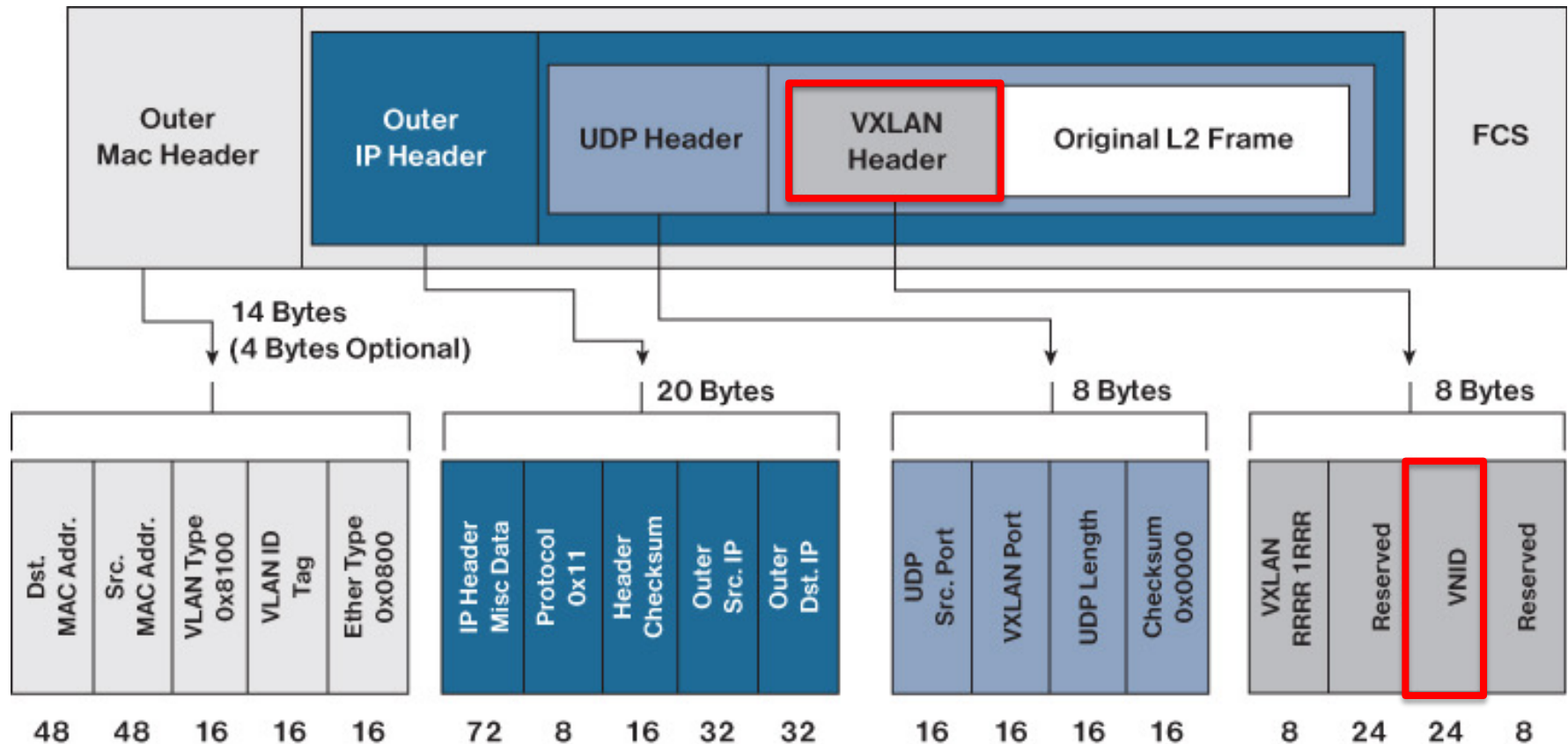
Solution: VXLAN

- **VXLAN: Virtual Extensible LAN (VXLAN)**
 - network virtualization over Layer 3 (NVO3)



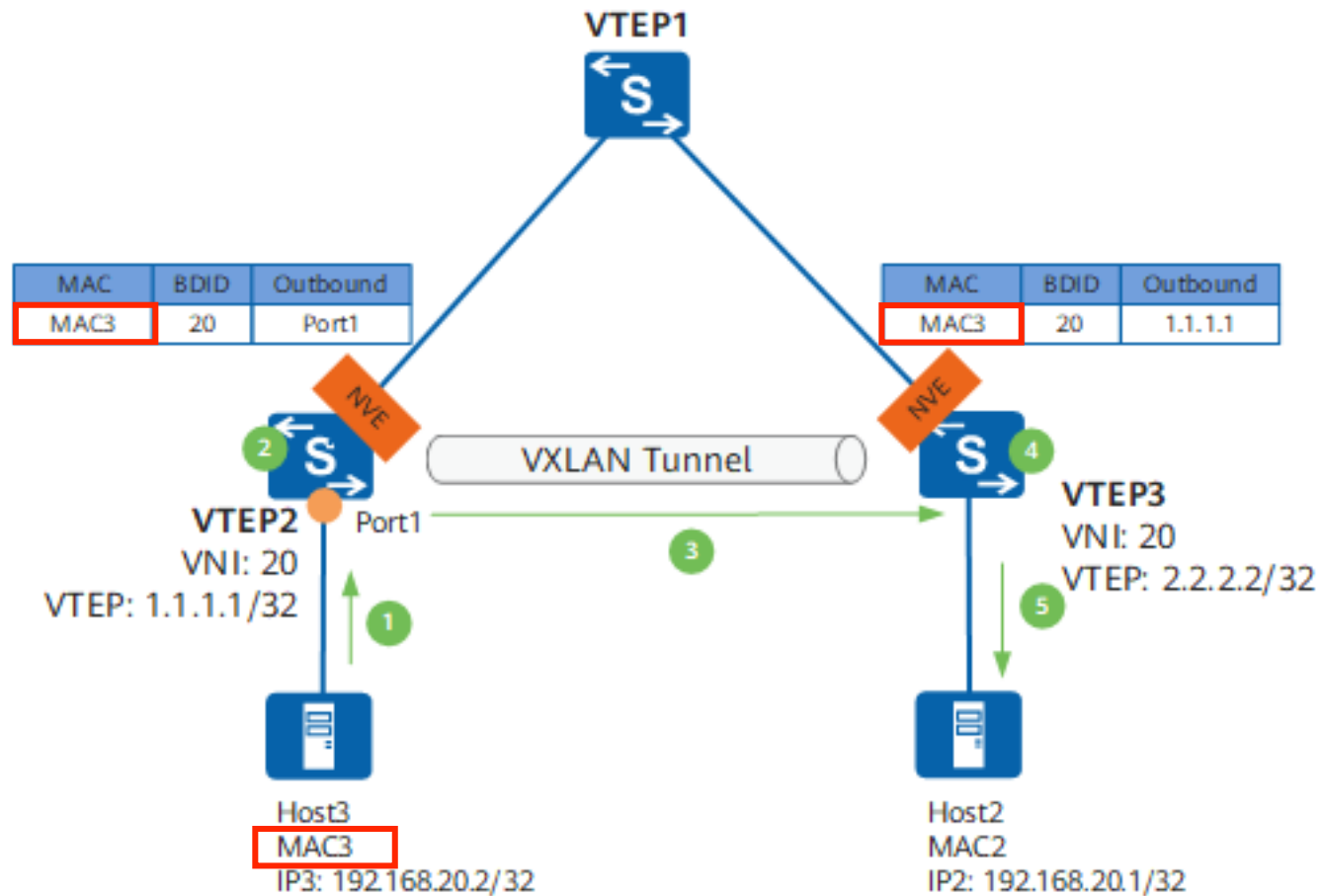
VXLAN Encapsulation

- MAC in UDP Encapsulation

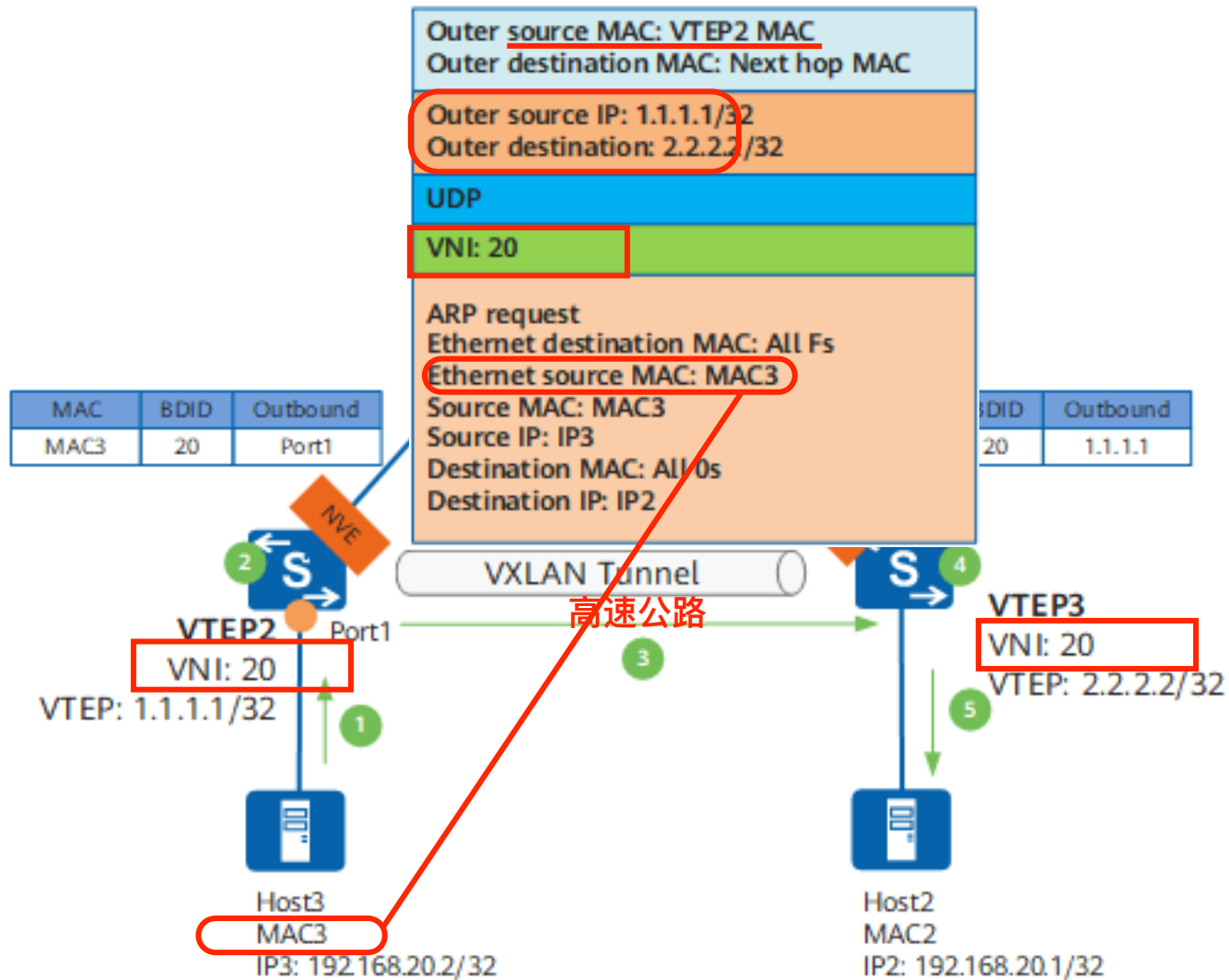


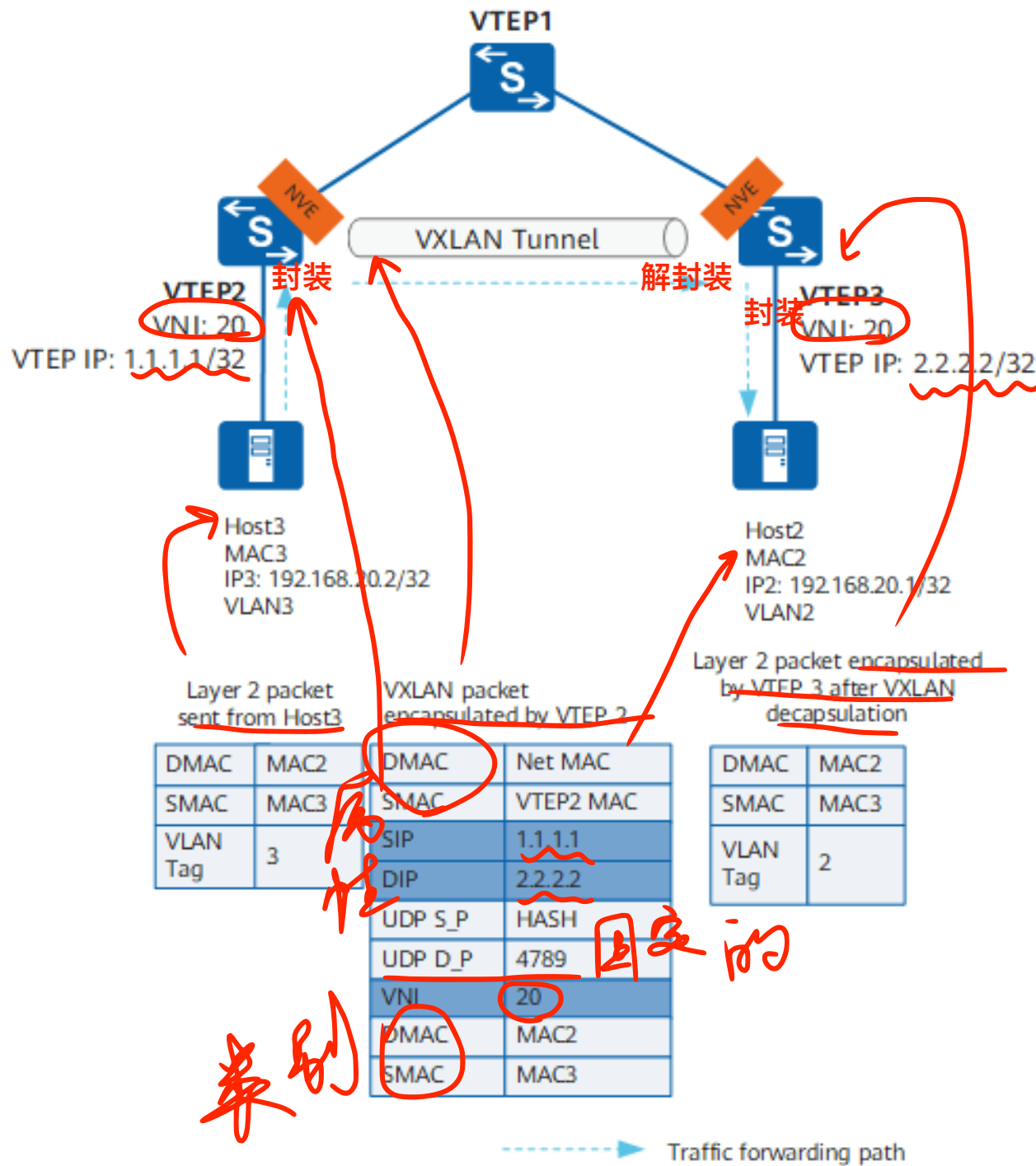
24-bit VNID: 16 million VNs

How it Works



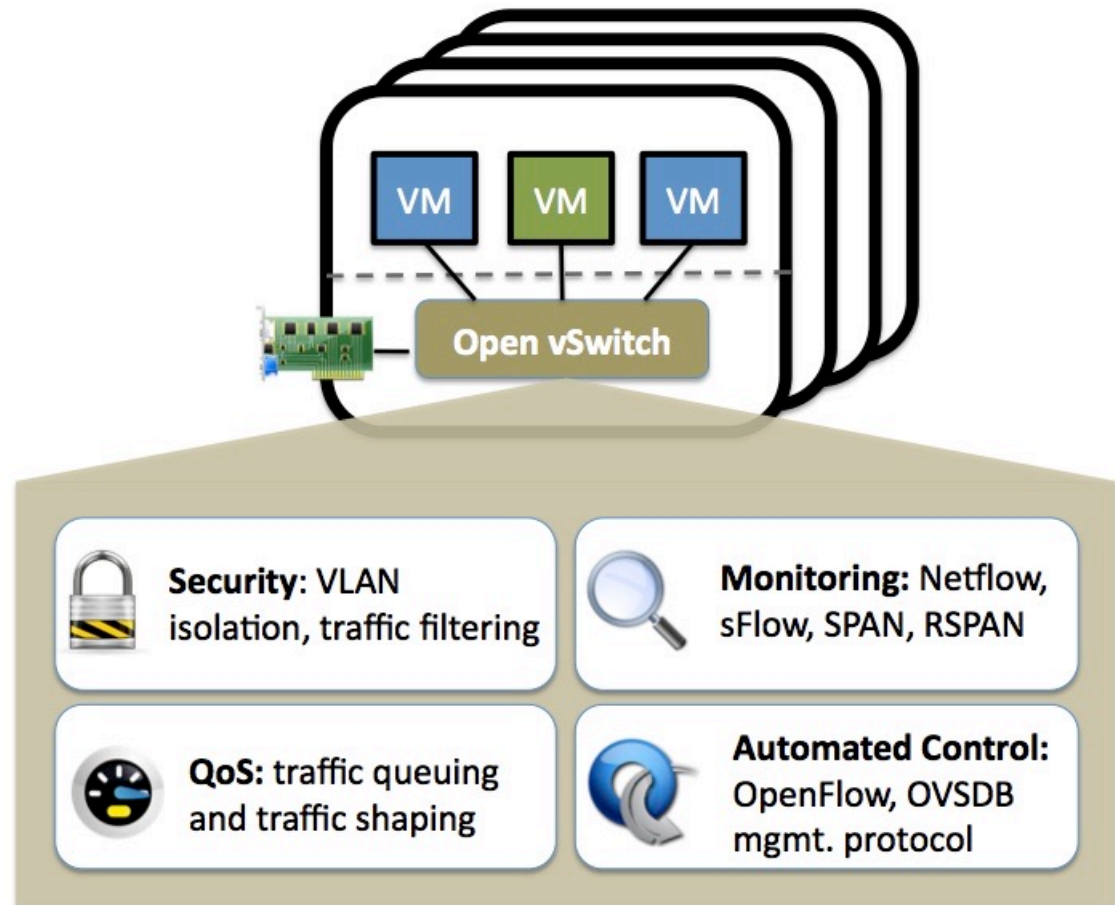
How it Works



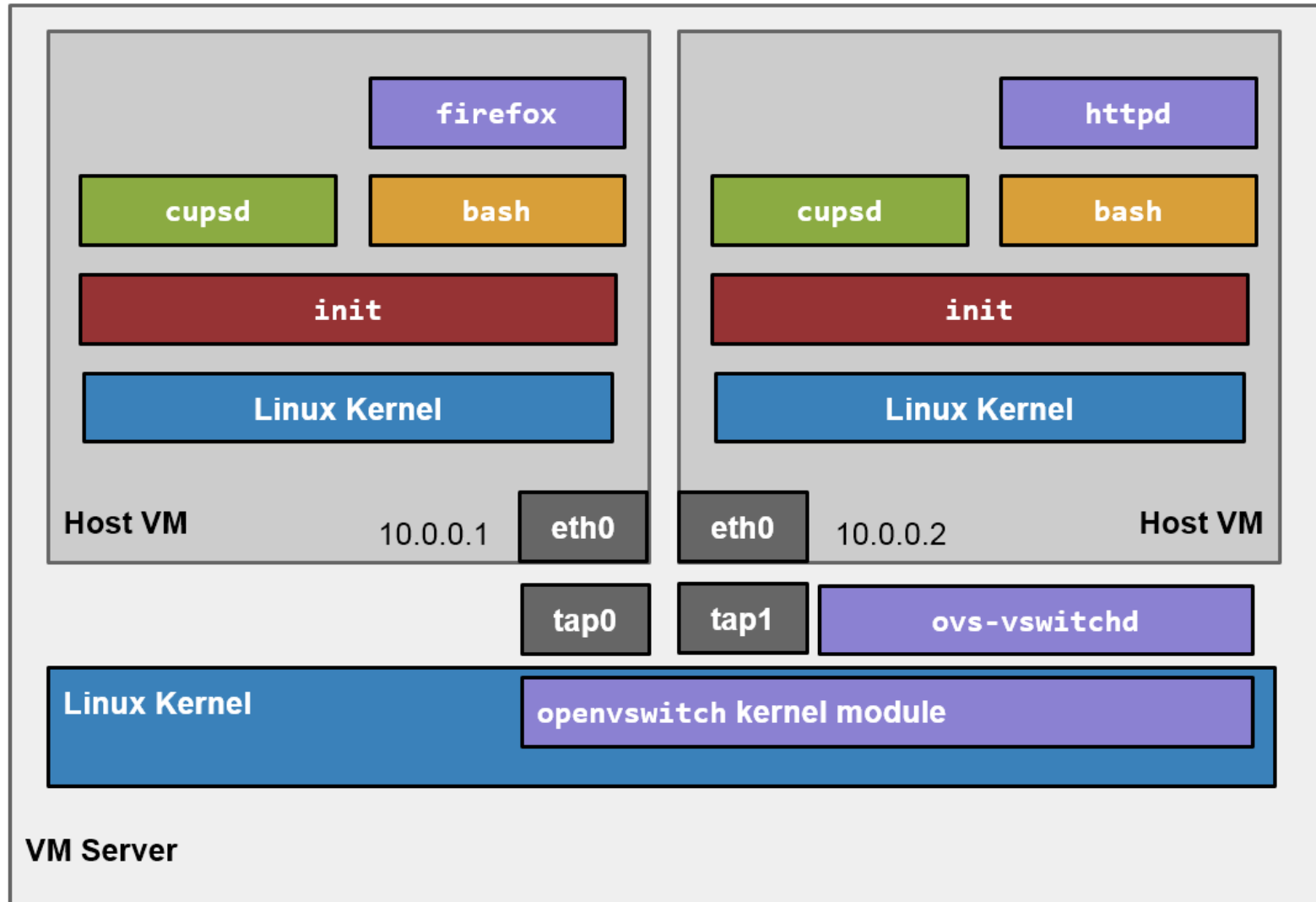


Virtual Switch

- A virtual switch (vSwitch) is a software application that allows communication between virtual machines
 - Linux bridge
 - Open vSwitch



Full Virtualization



Lightweight Virtualization

