



Routing and switching (TI40122)

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Pengenalan Software Define Network



DON'T
BE AFRAID
TO FAIL.

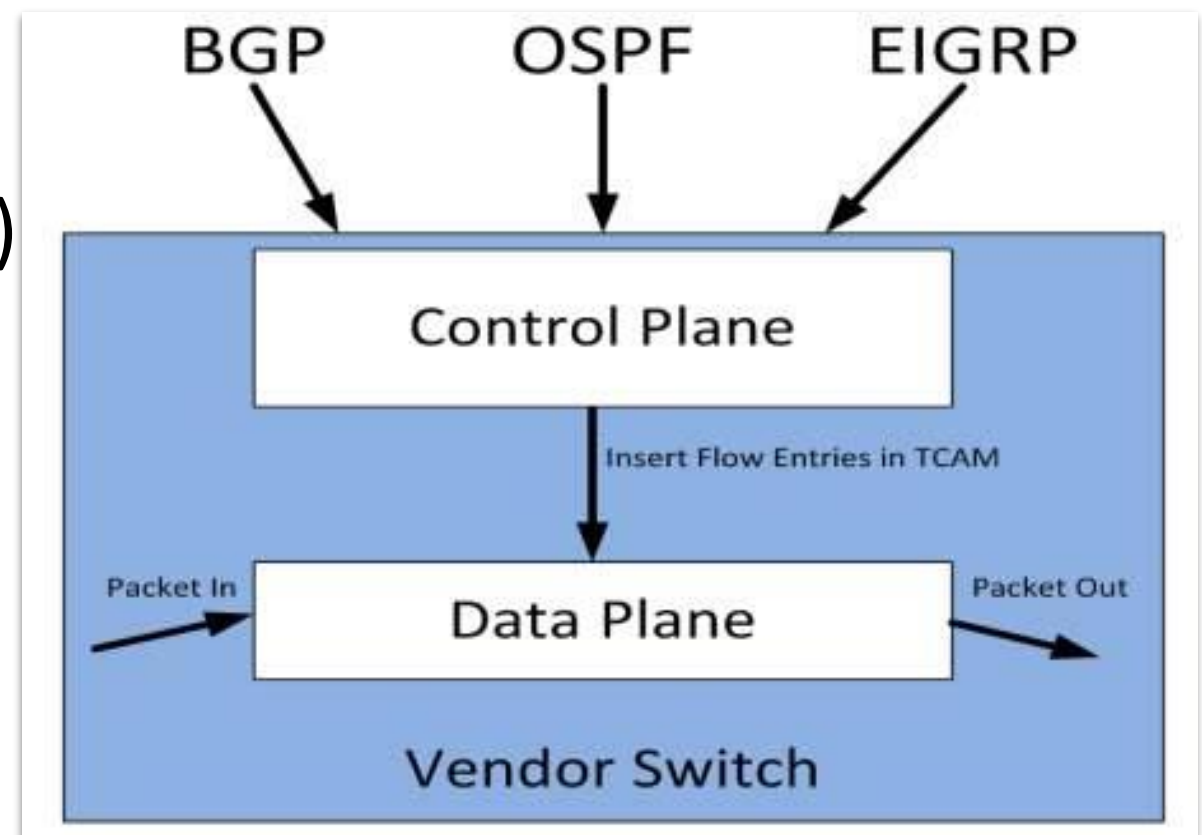
**BE AFRAID
NOT TO TRY.**



Network Device Architecture

Key concept

- Most of network device have minimal two component (control plane and data plane)
- Control plane is the part of the router architecture that is concerned with drawing the network topology, or the information in a routing table that defines what to do with incoming packets

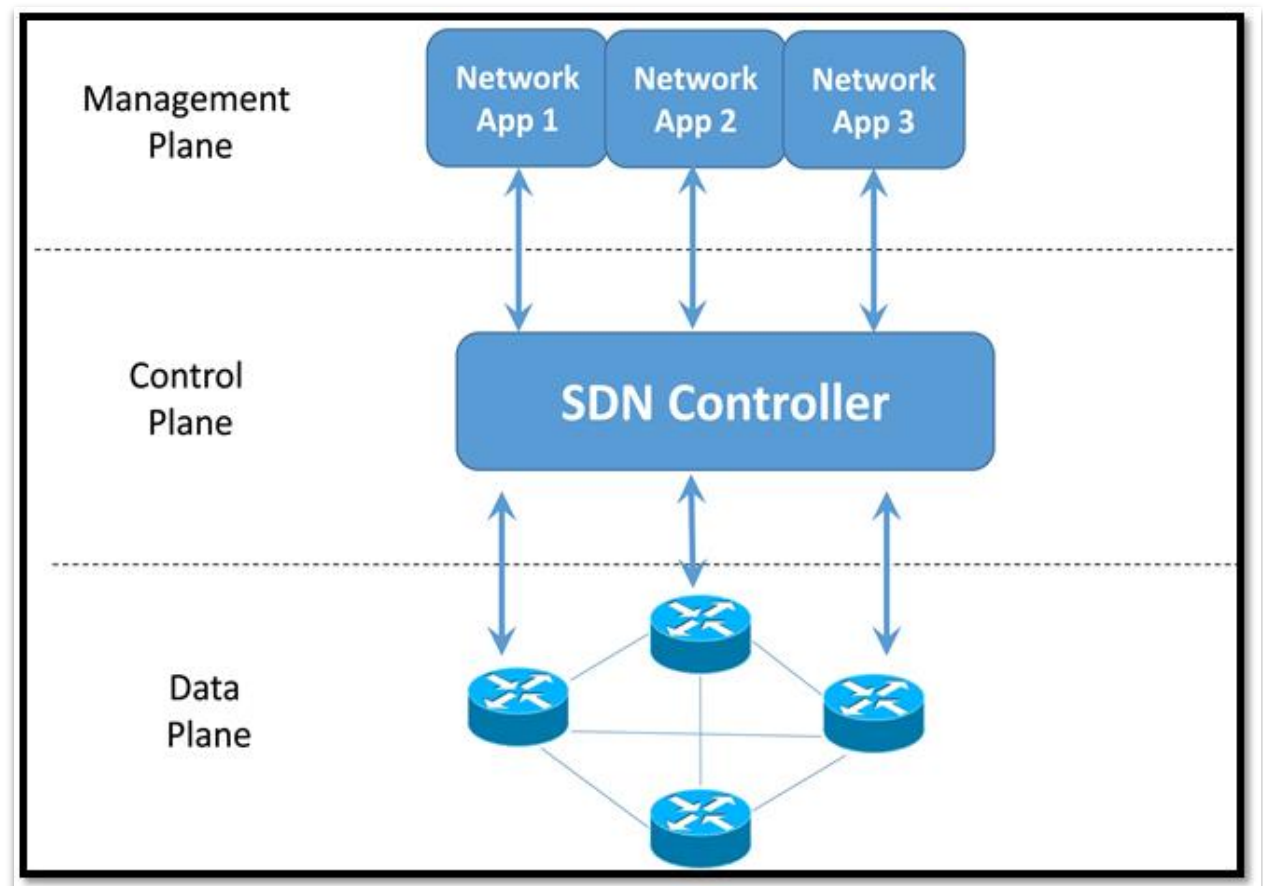




Software Define Network

Key concept

- SDN architectures decouple **network control** and **forwarding functions**
- Another concept, SDN are technology approach that enable dynamic, programmatically efficient network configuration
- Software controlling the hardware

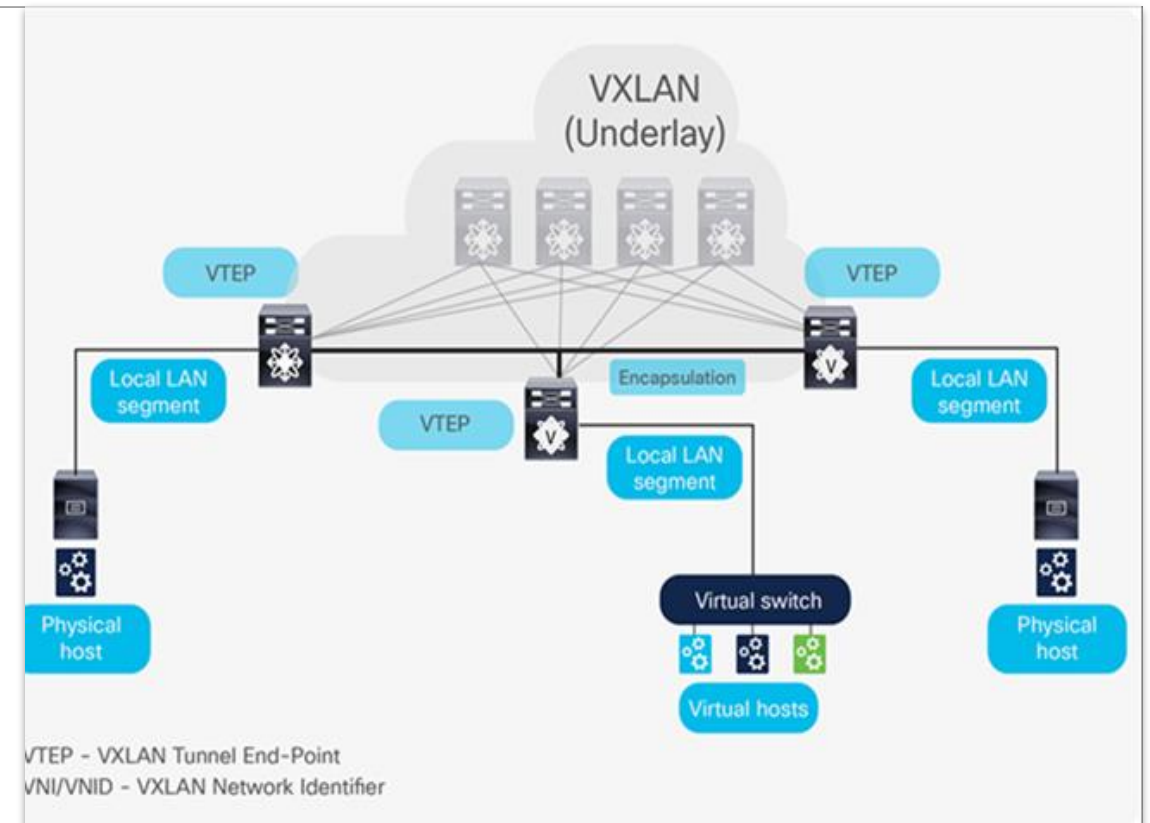




Type of SDN Application

There is several Software Defined Networking application on industry:

- **SDDC** (Software Defined Data Center)
 1. SDDC **extends virtualization** concepts such as abstraction, pooling, and automation to all data center resources and services
 2. SDDC typically have dedicated controller and create overlay network to communicate between endpoint

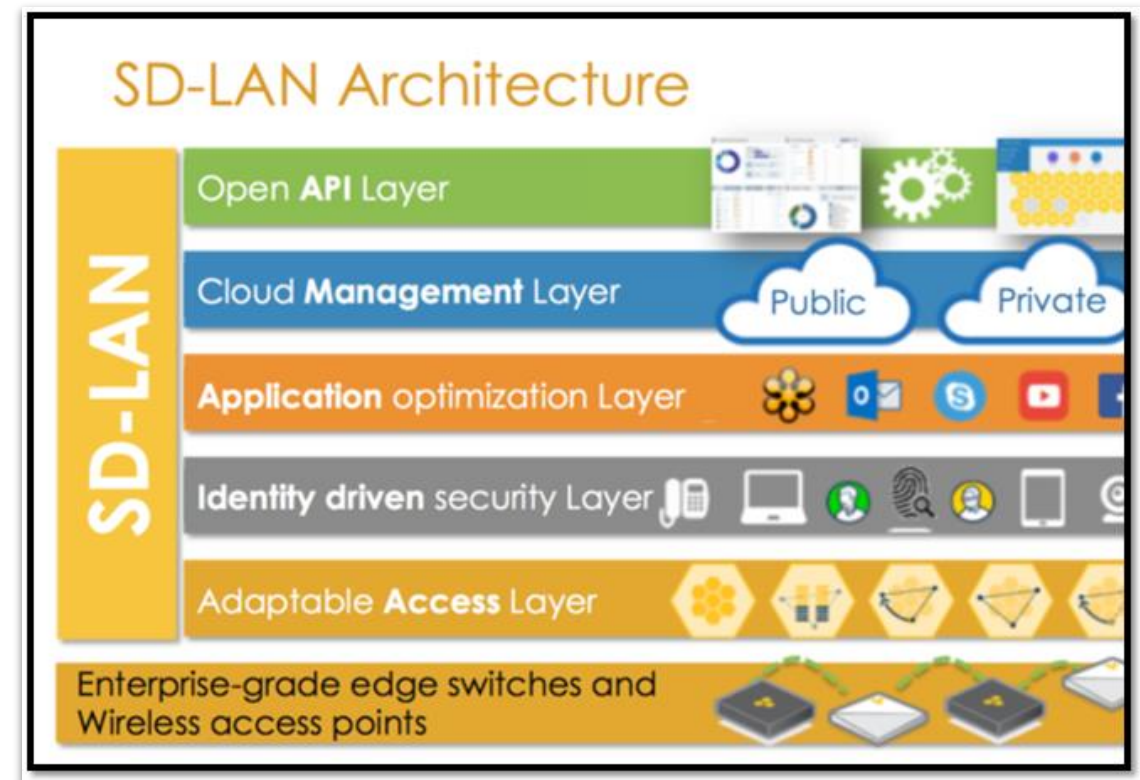




Type of SDN Application Continue

- **SD-LAN / SD-Access** (Software Defined LAN / Access)

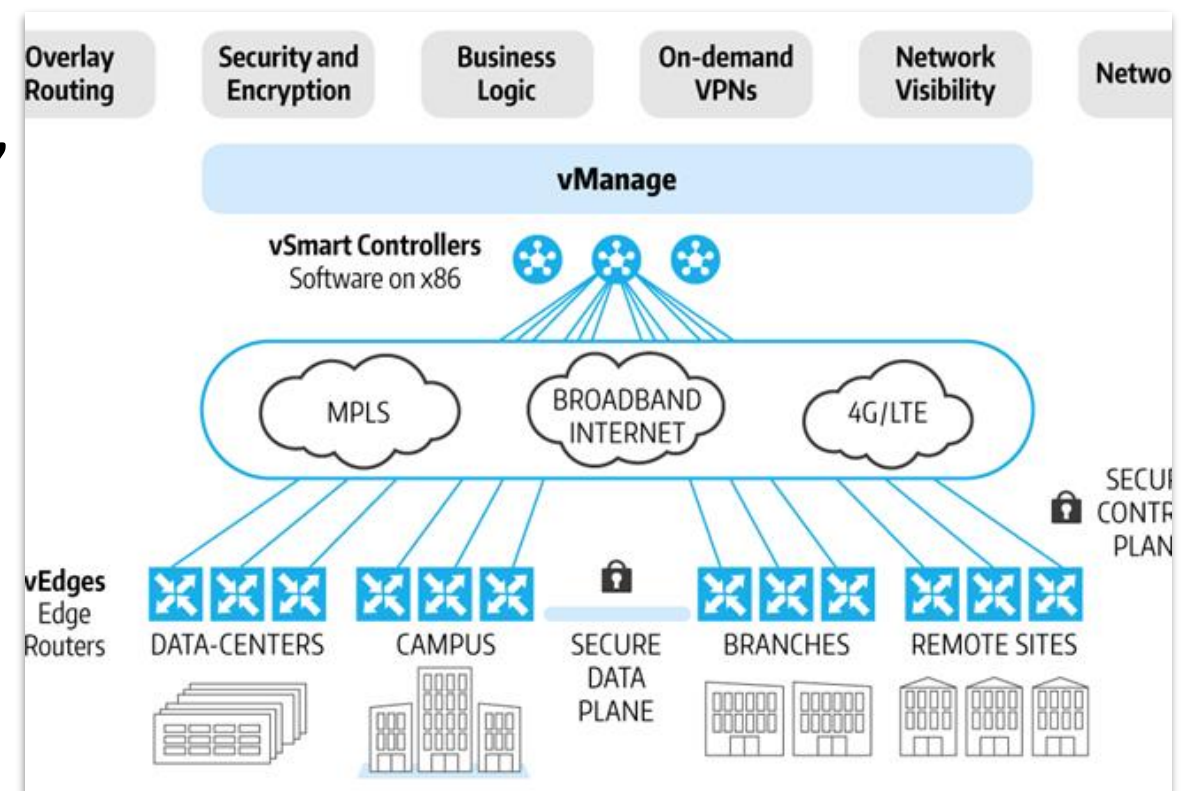
1. SD-LAN decouples control management, and data planes to enable a policy driven architecture for **wired** and **wireless** LANs
2. Access can be granted or revoked at a granular level for collections of users, devices and things, or just one of those, on corporate, guest and IoT networks





Type of SDN Application Continue

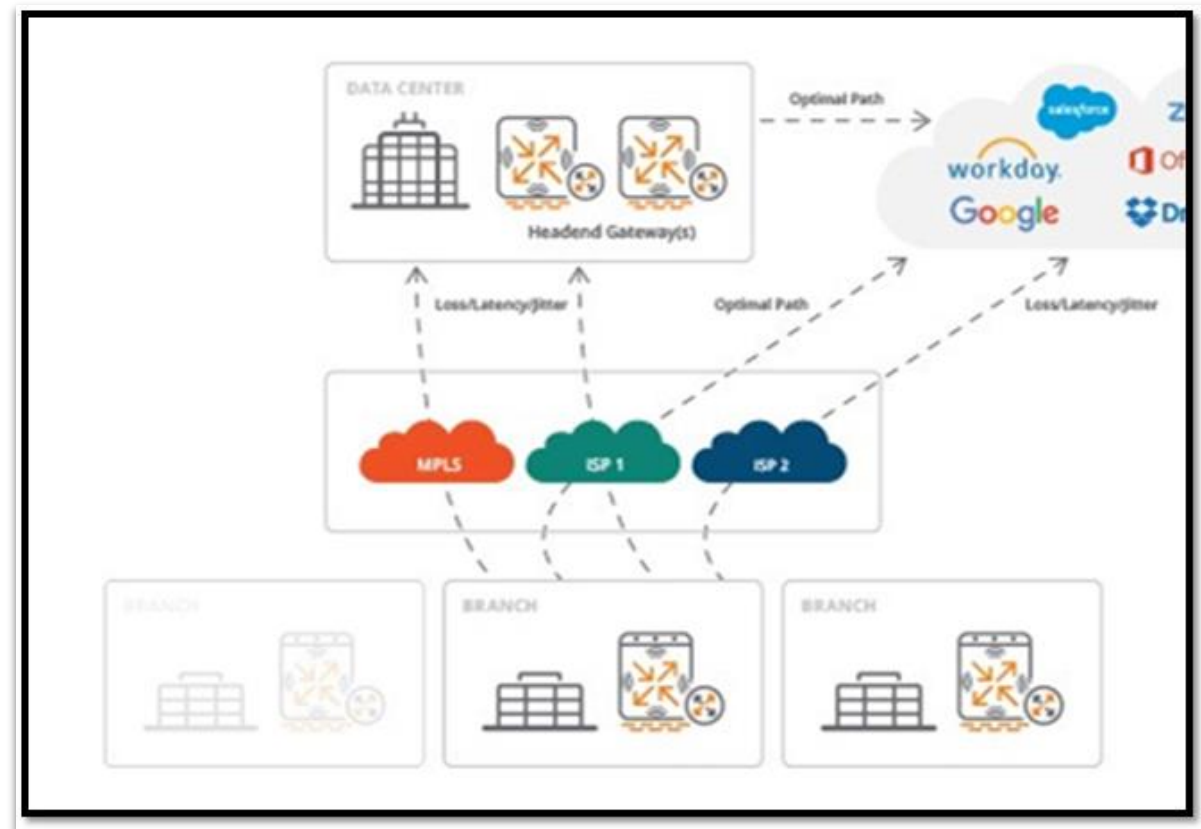
- **SD-WAN** (Software Defined WAN)
 1. SD-WAN is a virtual WAN architecture that allows enterprises to **leverage any combination of transport services** – including MPLS, LTE and broadband internet services – to securely connect users to applications
 2. SD-WAN leverage VPN connection to create secure transport





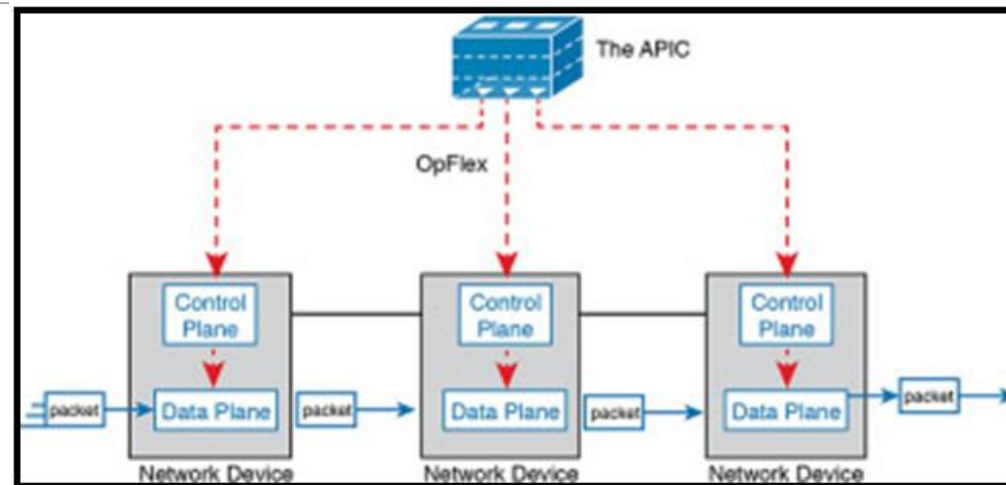
Type of SDN Application Continue

- **SD-Branch** (Software Defined Branch)
 1. SD-Branch is a way of **extending software-defined** principles to a branch location
 2. SD-branch is an evolution of SD-WAN technology
 3. An SD-branch network is centrally controlled through a single dashboard





SD-DC Implementation



Several principles/vendor has different implementation type of SDDC.

- Cisco

1. Cisco implement SDDC (ACI) with hybrid SDN approach.

Where control plane also installed on network device as agent

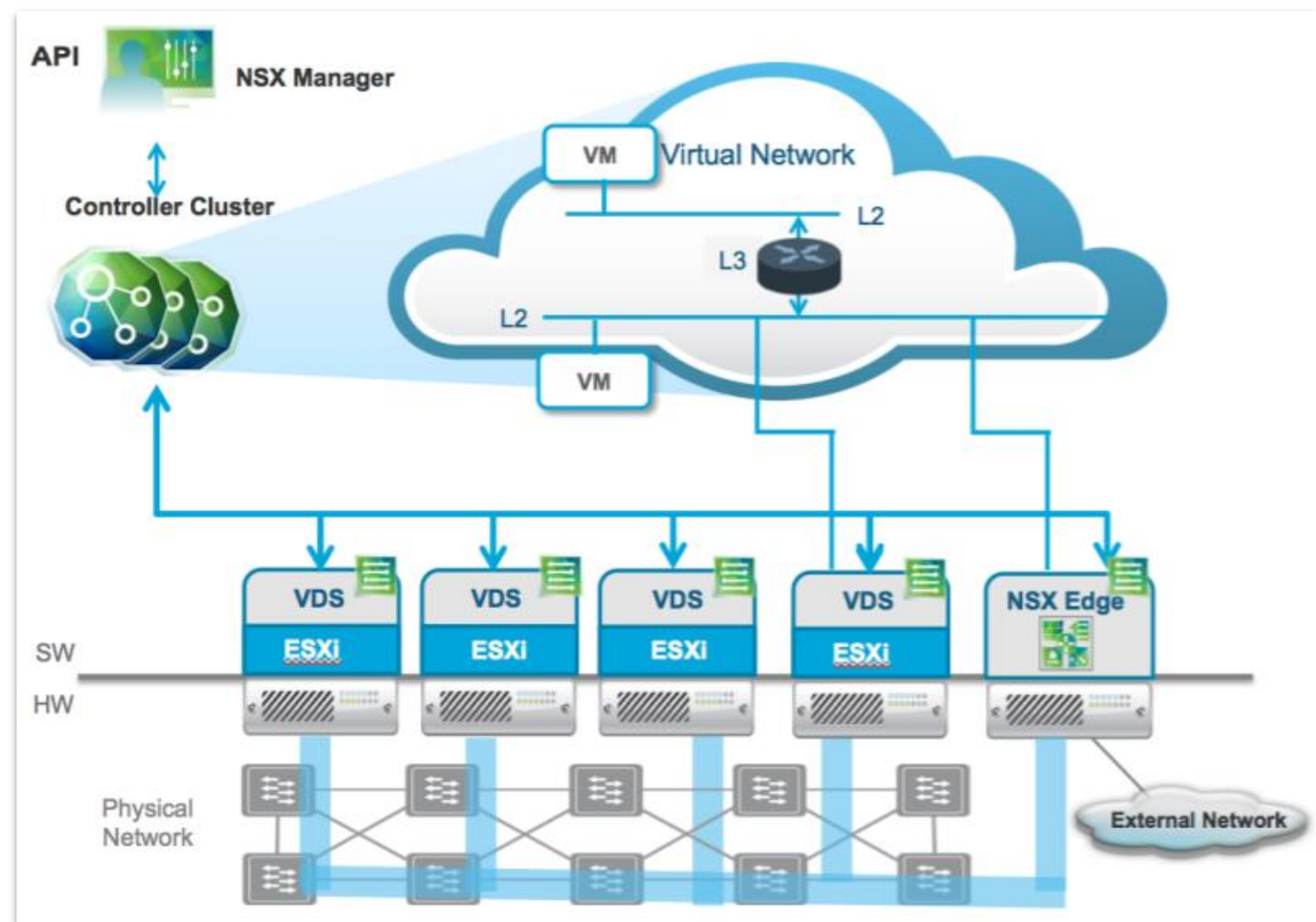
2. All configuration are push centrally by APIC (application policy infrastructure controller)

3. If APIC down the traffic not interrupt because APIC are only required to change policy



SD-DC Implementation

- VMWare
 1. VMWare implement SDDC called with NSX
 2. NSX is a network hypervisor that provides a platform to manage virtualized network deployments
 3. NSX create virtual network on top of the real device

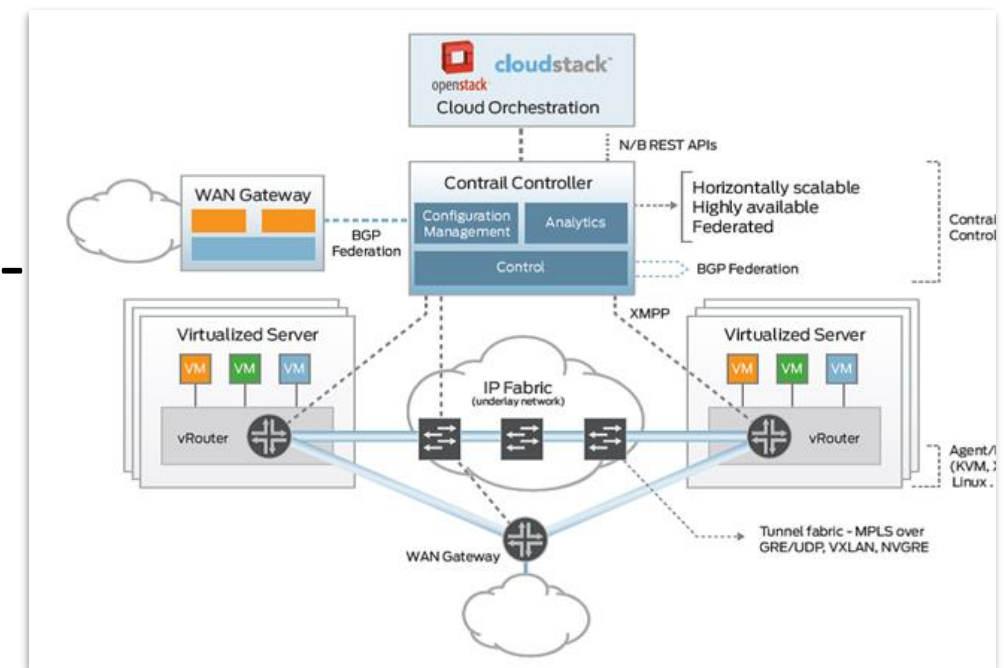




SD-DC Implementation

● Juniper

1. Juniper implement SDDC called Contrail The controller is software-based and can run in a virtual machine
2. It offers continuous overlay connectivity to any workload, running on any compute technologies from traditional bare-metal servers, virtual machines, to containers
3. Traffic loss happened when contrail controller down





SD-DC Comparison (ACI vs NSX)

Features	Cisco ACI	VMWare NSX
Virtual Network Automation	Yes, it can automate virtual network	Yes, it can automate virtual network
Legacy network	Legacy network can be directly connected to the fabric, you can use standard multi-chassis LACP	L2 based software gateways running on ESXi must be used
Convergence	With the use of standard multi-chassis LACP, convergence is sub-second	It can provide you the slow convergence
Routing implementation	Routing is implemented as East-West and North-South regardless of workload connected to fabric	East-West routing can be done on Hypervisor with extra distributed logical control VM per IP domain
Redundancy	Yes, it is possible	Yes, it is possible
Network availability	For link and node failure, sub-second convergence is there	Routing and bridging services implemented on VMs and have slow convergence and network availability



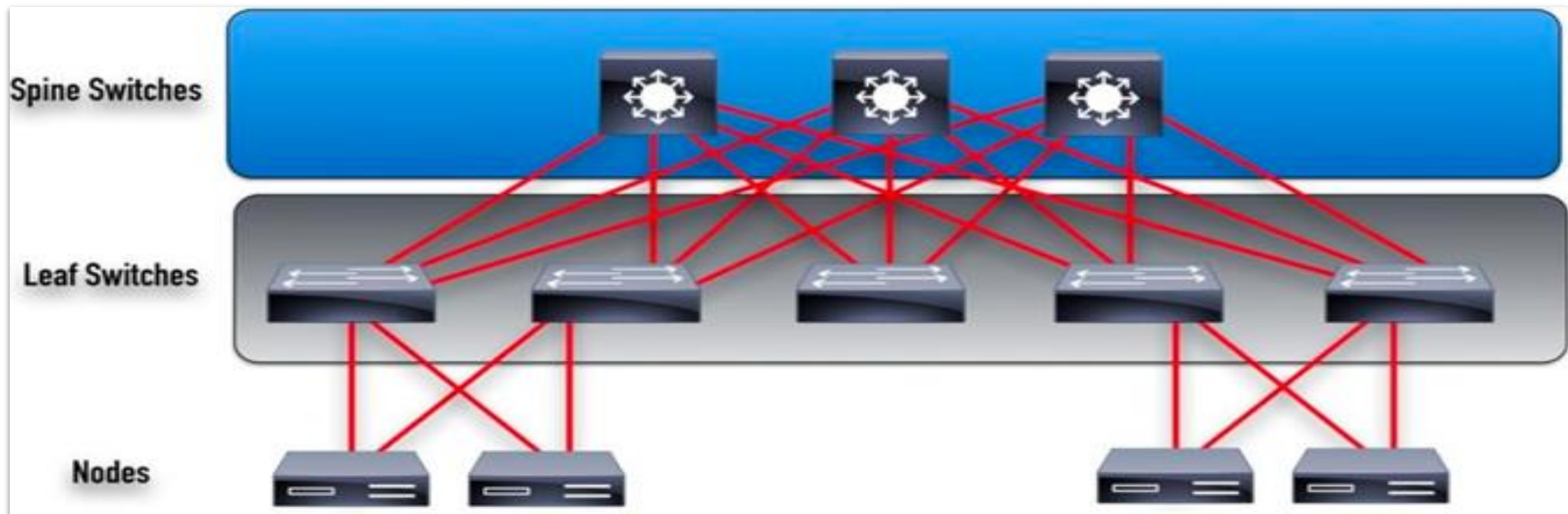
SD-DC Comparison (ACI vs Contrail)

Vendors	Cisco ACI	Juniper Contrail
Architecture	Hardware and Software	Hardware
Solution	Policy Driven	Open Source
Platform	Cisco Nexus Device	Juniper Devices
Interoperability	Cisco Only	Any Vendor
Management	APIC Controller	Juniper Contrail
Protocols	VXLAN, ISIS, COOP, BGP, OSPF	VXLAN, MPLSL3, L2VPNS, GRE, BGP
Communication	Opflex	NetConf
Feature	Routing, Switching, Security, L4-L7	Routing, Switching, Security, L4-L7



SD-DC Implementation Continue

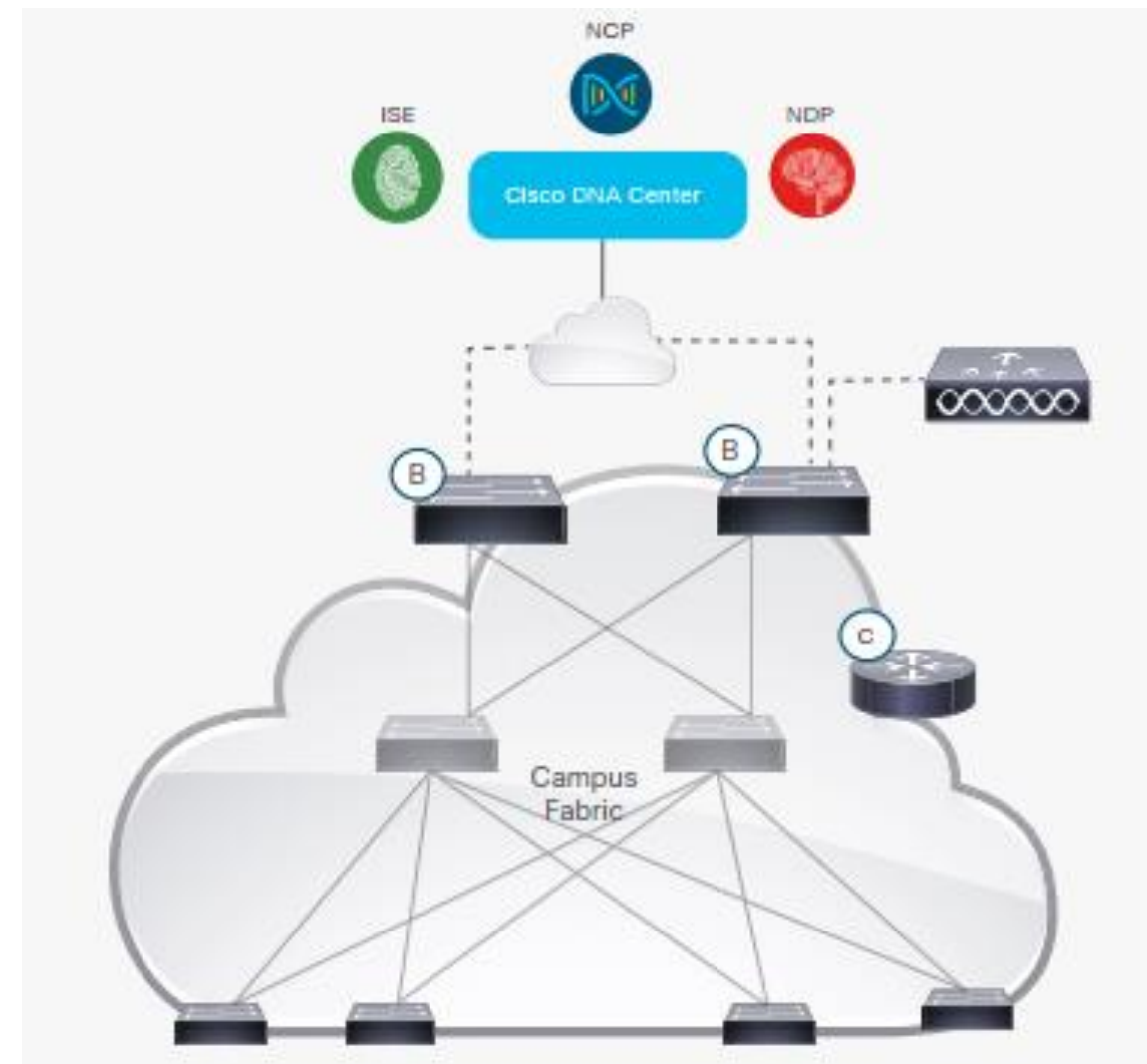
- SDDC implementation by vendor / principle usually using Spine and leaf topology
- Spine and leaf are data center topology evolution from three tier that cut one hop on three tier topology to accommodate high east – west traffic





Cisco SD-Access Implementation

- Cisco SD-Access merupakan salah satu solusi terbaru dari Cisco yang digunakan untuk jaringan wired dan wireless LAN
- Cisco SD-Access membuat user segmentation experience pada wired dan wireless LAN sama
- Cisco SD-Access memiliki dua komponen utama, yaitu DNA Center dan Campus Fabric





Cisco SD-Access Component

- Campus fabric terdiri dari beberapa perangkat, yaitu:
 - Fabric Edge
 - Fabric Border
 - Fabric Control
 - Fabric WLAN Controller
 - Fabric Access point
- DNA-Center sendiri memiliki beberapa komponen, yaitu:
 - Cisco ISE → digunakan untuk membuat user segmentation dan push policy ke campus fabric
 - APIC-EM → digunakan untuk push konfigurasi dari DNA-Center
 - NDP → digunakan untuk telemetry campus fabric sehingga apa yang terjadi di dalam DNA-Center bisa di ketahui

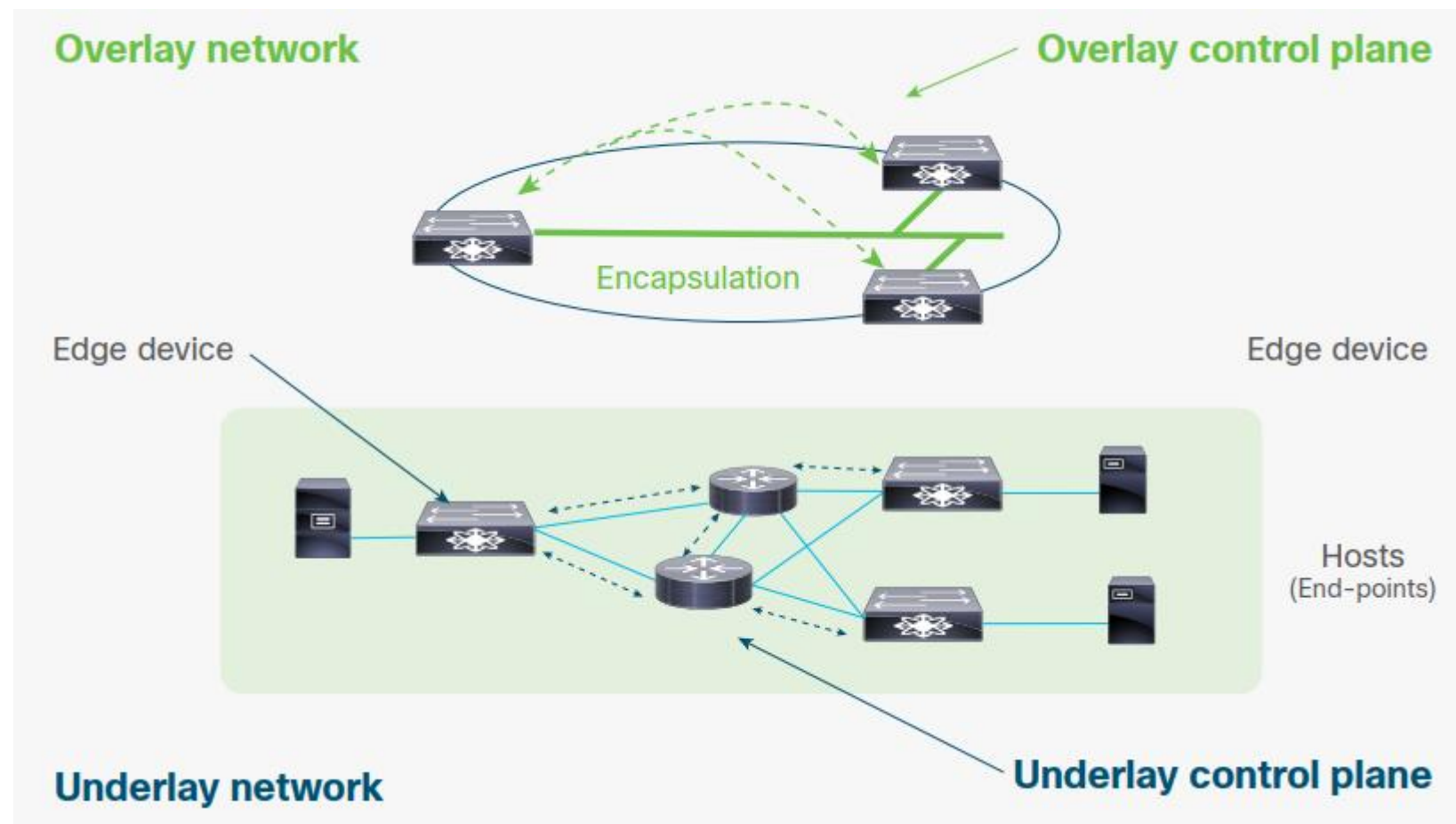


Cisco SD-Access Component

- Fungsi dari perangkat Campus fabric sebagai berikut:
 - Fabric Edge
Merupakan perangkat yang terkoneksi langsung dengan end point. Fabric edge juga berfungsi melakukan enforcement policy untuk end point
 - Fabric Border
Merupakan perangkat yang menghubungkan antara SD-access campus fabric dengan network lain
 - Fabric Control
Merupakan perangkat yang memiliki mapping end point beserta posisinya.
 - Fabric WLAN Controller
Merupakan perangkat yang digunakan untuk mengontrol AP pada campus fabric



Cisco SD-Access Arsitektur



- Cisco SD-Access menggunakan arsitektur underlay dan overlay. Dengan adanya overlay network segmentasi user bisa lebih granular

