



Partner VT ND(Nexus Dashboard)

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Cisco Nexus Dashboard

Simple to Automate, Simple to Consume

Powering automation
Unified agile platform



Insights
- FT / FT Event / MicroBurst 탐지 / 상관관계
- Operation 지원(운영권고, 변경관리)



SAN SDN Controller(FC-SAN 기반)
- FC 기반의 SAN Switch Controller
- Flow 성능 수집 / 표준기반 스토리지 연동



Multi-Site Orchestration
- Between On-Prem ACI Site
- Cloud ACI와 On-Prem ACI Site/NDFC Site



NX-OS 기반 SDN Controller
- Configuration 자동화(VXLAN EVPN 등)
- Image, Performance, Topology 관리



Nexus as Brokering Network Switch
- TAB Network Controller
- Packet Modify / GRE Termination



Fabric Discovery(이기종 장비 관리)
- Catalyst / 타사 Switch(제약)

Cisco Data Center 솔루션의 Hypervisor



Private cloud



servicenow



Public cloud



Google Cloud



NDFC

-Nexus Dashboard Fabric Controller

Cisco Nexus Dashboard Fabric Controller (NDFC)

12.X 버전 출시와 함께 NDFC로 변경

- Feature upgrade
- UI Upgrade
- ND 플랫폼 사용



Cisco Data Center
Network Manager

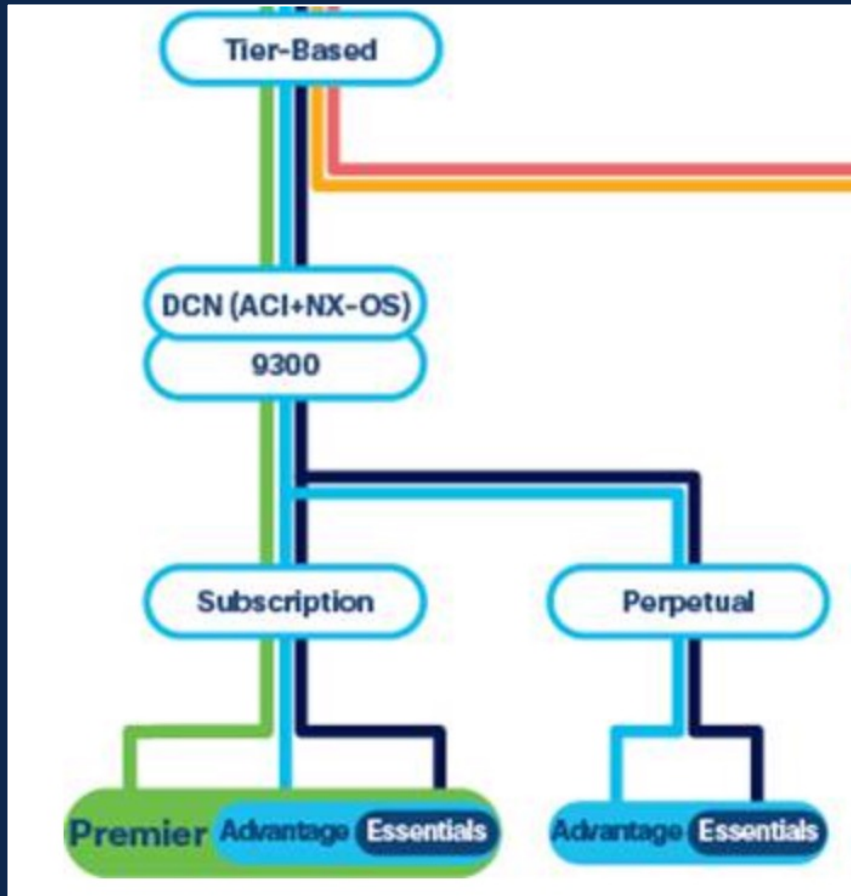
~11.X Version



Cisco Nexus Dashboard
Fabric Controller

12.X Version~

NDFC Enablement & 제안을 위한 가장 중요한 정보



Tiered License Model

NDFC – LAN 라이선스는 별도로 존재하지 않습니다.

- ✓ Tiered License라면 무료입니다.
- ✓ Essential License 에 포함되어 있습니다.
- ✓ Perpetual / Subscription 모두 마찬가지 입니다.

SDN Deal이 아닌 Legacy 장비 제안이나,
기존에 고객이 Nexus를 사용한다면 사용해보게 하세요.

CLI를 선호하는 고객이라면 SDN제안도 OK

DCNM 11 to NDFC 12 Form Factors

Managed Mode: <=80 Switches



3-Node Cluster

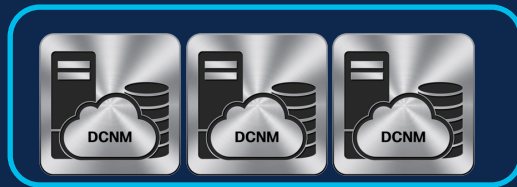
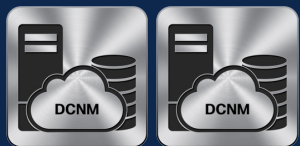
DCNM*2	OVA/ISO	16 vCPUs	32G	500G HDD	3 x NIC
--------	---------	----------	-----	----------	---------

vND*3 App node	OVA	16 vCPUs	64G	550G SSD	2 x NIC
-------------------	-----	----------	-----	----------	---------

OR

pND*3	SE Appliance
-------	--------------

Managed Mode: 350 Switches



Compute nodes



5-Node Cluster

DCNM*2	OVA/ISO	16 vCPUs	32G	500G HDD	3 x NIC
Compute*3	OVA/ISO	16 vCPUs	64G	500G HDD	3 x NIC

vND*5 App node	OVA	16 vCPUs	64G	550G SSD	2 x NIC
-------------------	-----	----------	-----	----------	---------

OR

pND*3	SE Appliance
-------	--------------

Cisco NDFC modes



Fabric discovery for
LAN Deployments



Fabric controller for LAN and
IPFM Deployments



SAN controller

데이터센터 네트워크 패브릭 구축 모델 간 차이점

두 가지 형태의 데이터센터 패브릭 구축 모델 제공

- NDFC-LAN Controller(구 DCNM)
- ACI

NDFC-LAN Controller(DCNM)



Kit

ACI



Car

주요 특징 - Template 기반의 설정 배포 (개별 장비의 관리/설정)

- 주요 설정에 대해 Built-In *Template을 보유하고 있으며, 이외의 설정에 대해서는 신규 Template을 직접 생성 후 배포
- Ex) Template : 사전에 설정을 위한 코드나 스크립트의 정의본

주요 특징 - Object-Modeling 기반의 설정 배포 (개별 장비의 관리/설정)

- 모든 설정에 대해 *Object-modeling화 하여, 별도의 정의가 필요하지 않음.
- Ex) 설정에 필요한 모든 object를 모델링화 하여 컨트롤러에 완전히 Built-In

ACI의 Modeling화 된 Configuration

ACI는 모든 Configuration이 Modeling

- 모든 설정에 대해 명확한 계위와 단계적 Hierarchy를 가짐 → Configuration Miss 또는 Fault시 동작하지 않음 → Human Error에 대한 이슈 감소

ACI GUI

cisco APIC (DC1-APIC)

System
Tenants
Fabric
Virtual Networking

ALL TENANTS
|
Add Tenant
|
Tenant Search:

i This has been created from Orchestrator. It is recommen

CISKOLAB

- > Quick Start
- > CISKOLAB
 - > Application Profiles
 - > Networking
 - > Bridge Domains
 - > aci-containers-K8S_Cluster1--node-bd
 - > aci-containers-K8S_Cluster1-pod-bd
 - > CISKOLAB
 - > DHCP Relay Labels
 - > ND Proxy Subnets
 - > Subnets
 - > 192.168.241.1/24
 - > 192.168.242.1/24
 - > CLIENT
 - > DCNM
 - > FTD-Inside
 - > FTD-Inside_VPX-Outside
 - > FTD-Outside
 - > HX-Storage
 - > L2Only
 - > VPX-Inside

Create Bridge Domain

Name:

Alias:

Description: optional

Annotations: + Click to add a new annotation

Type: fc regular

Advertise Host Routes:

VRF:

Forwarding:

Endpoint Retention Policy:
This policy only applies to local L2 L3 and remote L3 entries

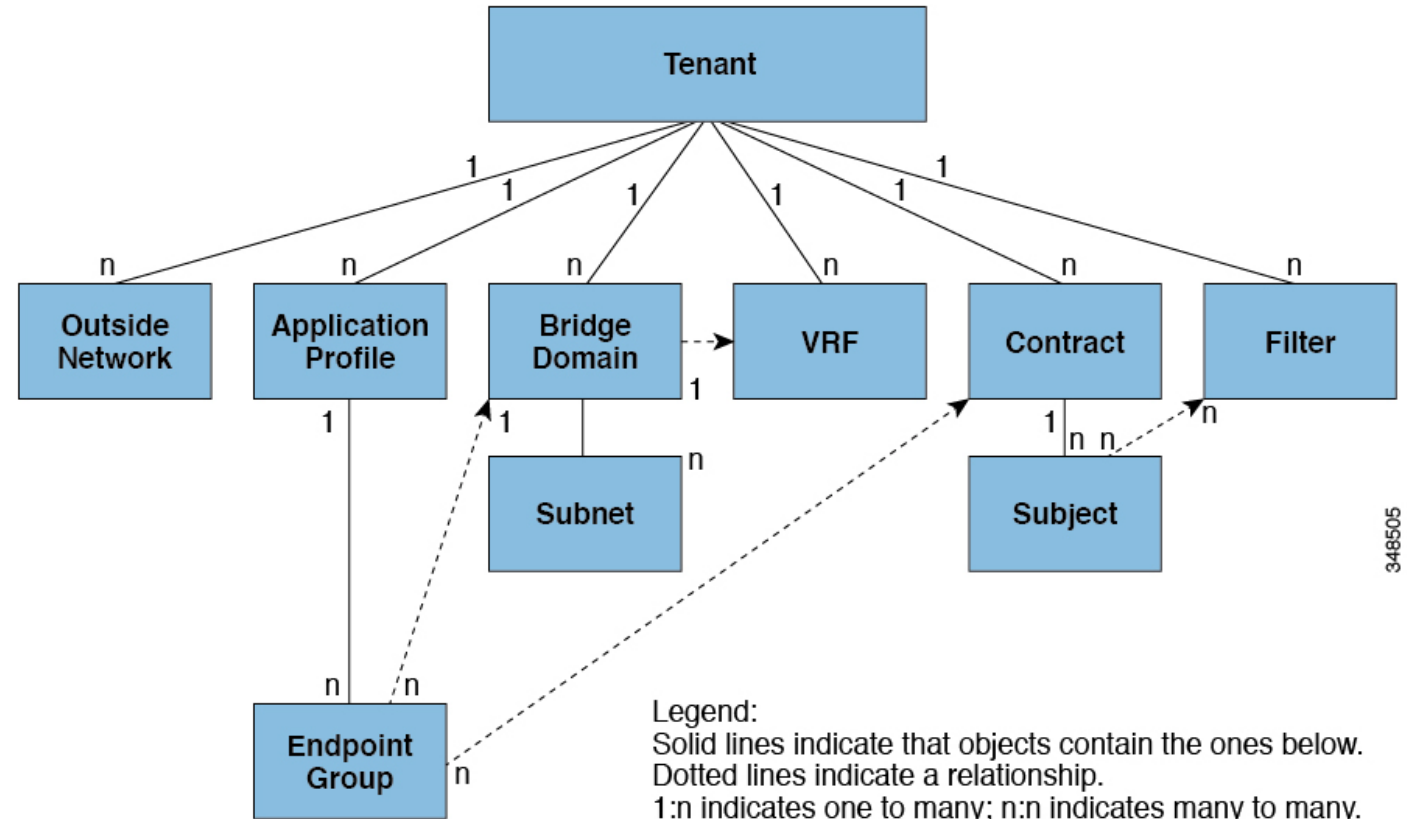
IGMP Snoop Policy:

MLD Snoop Policy:

ACI

ACI Logical Hierarchy

Figure 3. Tenants



NDFC의 Template 기반 Deployment

DCNM은 Template 기반의 장비 설정과 Automation 제공

- Template은 Controller에서 일관된 Configuration을 위한 하나의 개발 도구
- 단, 명확한 Modeling Configuration이 없기 때문에, 없는 Configuration이 다수 존재 – Arista CVP와 유사
 - Built-In Template – VXLAN Data-Plane w/ MP-BGP Control-Plane 구성
 - Customizing Template – Allowed VLAN add

Built-In Template

Control / Template Library

Templates

Templates

<input type="checkbox"/>	Name	Template Sub Type
<input type="checkbox"/>	exec_freeform	NA
<input type="checkbox"/>	ext_base_border_multisite	DEVICE
<input type="checkbox"/>	ext_base_border_vrflite_11_1	DEVICE
<input type="checkbox"/>	ext_bgp_neighbor	DEVICE
<input type="checkbox"/>	ext_bgp_neighbor_rf	DEVICE
<input type="checkbox"/>	External_Fabric_11_1	NA
<input type="checkbox"/>	External_Fabric_Extn	NA
<input type="checkbox"/>	External_Fabric_Extn_ptp	NA
<input type="checkbox"/>	external_fabric_freeform	NA
<input type="checkbox"/>	External_VRF_Lite_eBGP	DEVICE
<input type="checkbox"/>	ext_evpn_multisite_overlay_setup	INTER_FABRIC_LINK
<input type="checkbox"/>	ext_fabric_intf	VXLAN
<input type="checkbox"/>	ext_fabric_multisite_intf_11_1	VXLAN
<input type="checkbox"/>	ext_fabric_setup_11_1	INTER_FABRIC_LINK
<input type="checkbox"/>	ext_int_fabric_mpls_uplink	INTERFACE_ETHERNET
<input type="checkbox"/>	ext_int_fabric_mpls_uplink_po	INTERFACE_PORT_CHANNEL
<input type="checkbox"/>	ext_int_routed_host_11_1	INTERFACE_ETHERNET
<input type="checkbox"/>	ext_mpls_overlay	VXLAN
<input type="checkbox"/>	ext_multisite_overlay_setup_11_1	VXLAN

Template 사용의 예시

주요 특징 – CLI 기반의 설정 배포 (개별 장비의 관리/설정)

- 800개 이상의 Template Library 제공
- Cisco 에서 제공하는 *CVD 기반의 표준 Configuration Template 제공

* CVD : Cisco Verified Design

NDFC의 Template 기반 Deployment

DCNM은 Template 기반의 장비 설정과 Automation 제공

- Template은 Controller에서 일관된 Configuration을 위한 하나의 개발 도구
- 단, 명확한 Modeling Configuration이 없기 때문에, 없는 Configuration이 다수 존재 – Arista CVP와 유사
 - Built-In Template
 - Customizing Template

실제 작성하는 Template의 구성

##template variables >>>시작 (값을 입력 받는 GUI와 변수 정의)

```
# Copyright (c) 2018 by Cisco Systems, Inc.  
# All rights reserved.
```

```
@(DisplayName="Access Interface", Description="Access host port")  
interface INTF_NAME;
```

```
@(DisplayName="Adding Allowed Vlan", Description="Adding VLAN for this Trunk port")  
string Trunk_VLAN;
```

>>> 끝

##template content >>> 시작 (값을 장비에 Push)

```
conf t  
interface $$INTF_NAME$$  
  switchport trunk allowed vlan add $$Trunk_VLAN$$  
exit
```

>>> 끝

Template 사용의 예시

Execute Switch CLIs on Devices: Leaf-1

Template: add_allowed_VLAN

(값을 입력 받는 GUI와 변수 정의)

General

* Access Interface Access host port

* Adding Allowed Vlan Adding VLAN for this Trunk port

Deploy

Cancel

(값을 장비에 Push)

자동화 적용 시 고려사항

자동화 적용 시 고려사항

- ACI Terraform 적용
- NDFC 자동화 적용은 검증 후 권고

ACI w/ Terraform



Terraform

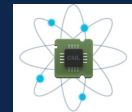
```
##VLAN_Pool
resource "aci_vlan_pool" "cicd_vlan_pool" {
  name = "cicd_vlan_pool"
  description = "From Terraform for PoC CICD"
  alloc_mode = "static"
  annotation = "example"
  name_alias = "example"
}

#VLAN_Range
resource "aci_ranges" "range_1" {
  vlan_pool_dn = aci_vlan_pool.cicd_vlan_pool.id
  description = "From Terraform"
  from = "vlan-501"
  to = "vlan-600"
  alloc_mode = "inherit"
  annotation = "example"
  name_alias = "name_alias"
  role = "external"
}
```

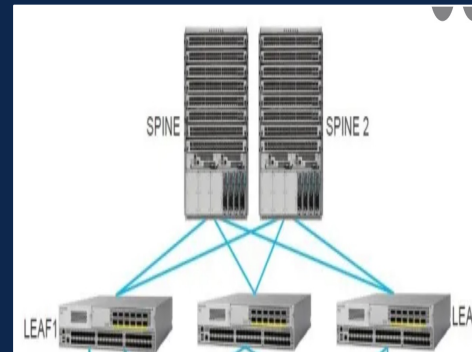
Code 기반의 자동화에 적합하며, 최근 화두가 되는 IaC(Infra as a Code)에 용이

- Config Miss 또는 Fault와 같은 휴먼에러 검증에 용이
- Code 기반의 Infra 관리 용이 - 신속한 생성과 파기가 가능

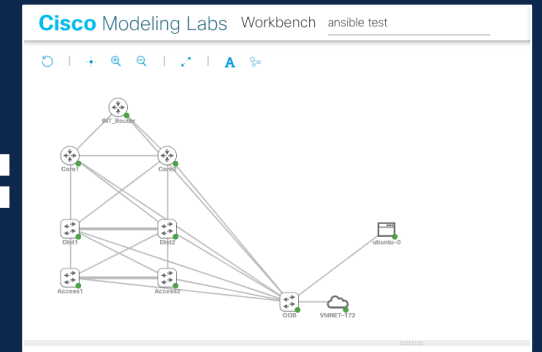
NDFC-LAN Controller(DCNM) 자동화 적용은 검증 후 권고



CML을 통한 Digital Twin Network 구현



실제 Production 장비



가상 Cisco Modeling Labs

자동화를 위해 Customizing Template을 생성하는 경우, 검증 Tool 필요

- 가상 Lab의 9300v 와 NDFC 연동가능
- 신규 설정, 자동화 적용을 위한 Template을 생성하고 검증

참고) CML

For Single user



Personal

- Single user only
- Ships with 20 Cisco nodes and cannot expand
- Community support only
- Available via the Cisco Learning Network Store for \$199 or 2 Cisco Learning Credits

Buy now

Download At-a-glance



Personal Plus

- Single user only
- Ships with 40 Cisco nodes and cannot expand
- Community support only
- Available via the Cisco Learning Network Store only for \$349 or 4 Cisco Learning Credits

Buy now

Download At-a-glance

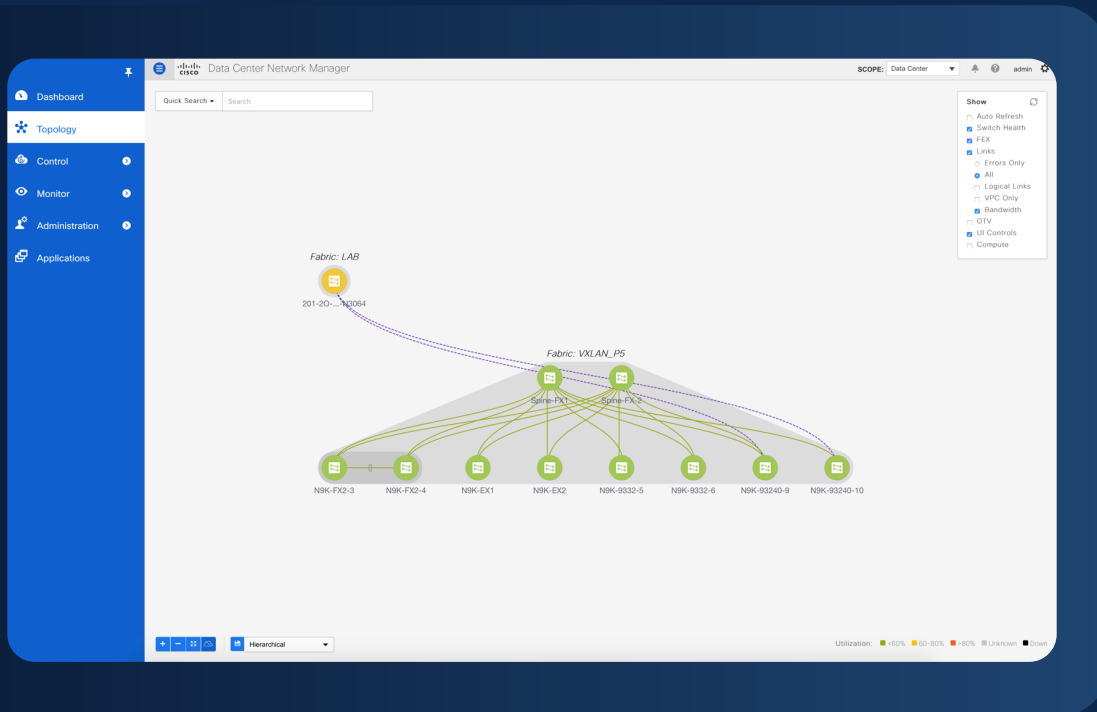
NDFC 12.0

Key features and benefits

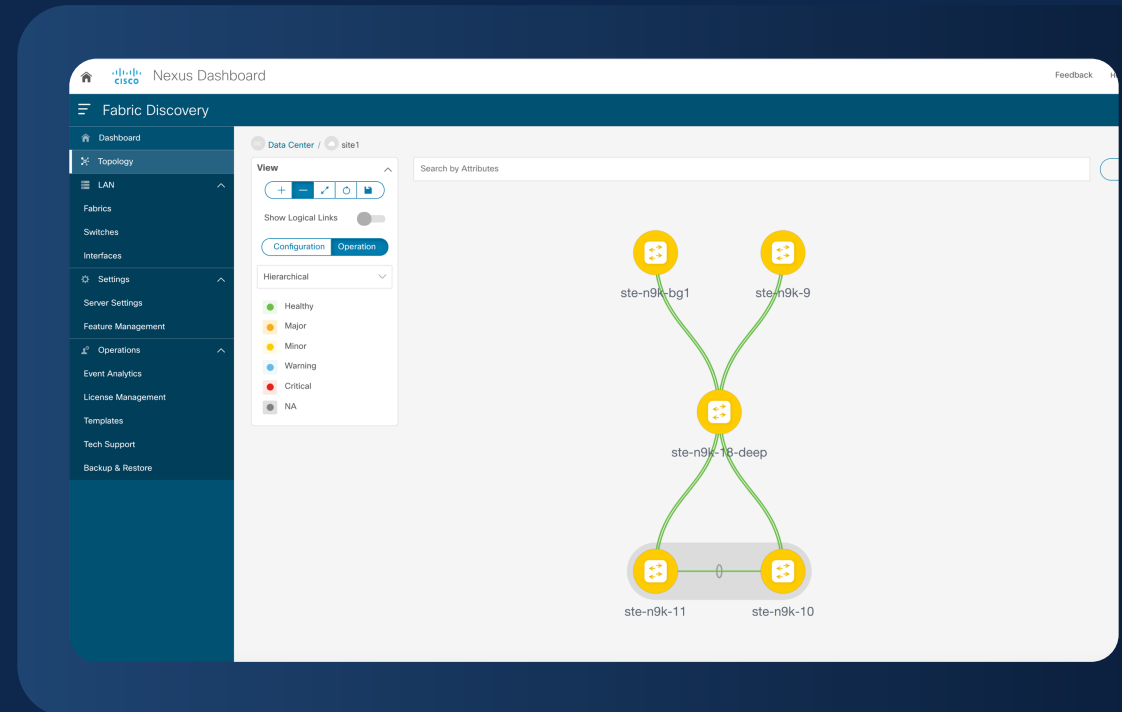


NDFC new look and feel

Old

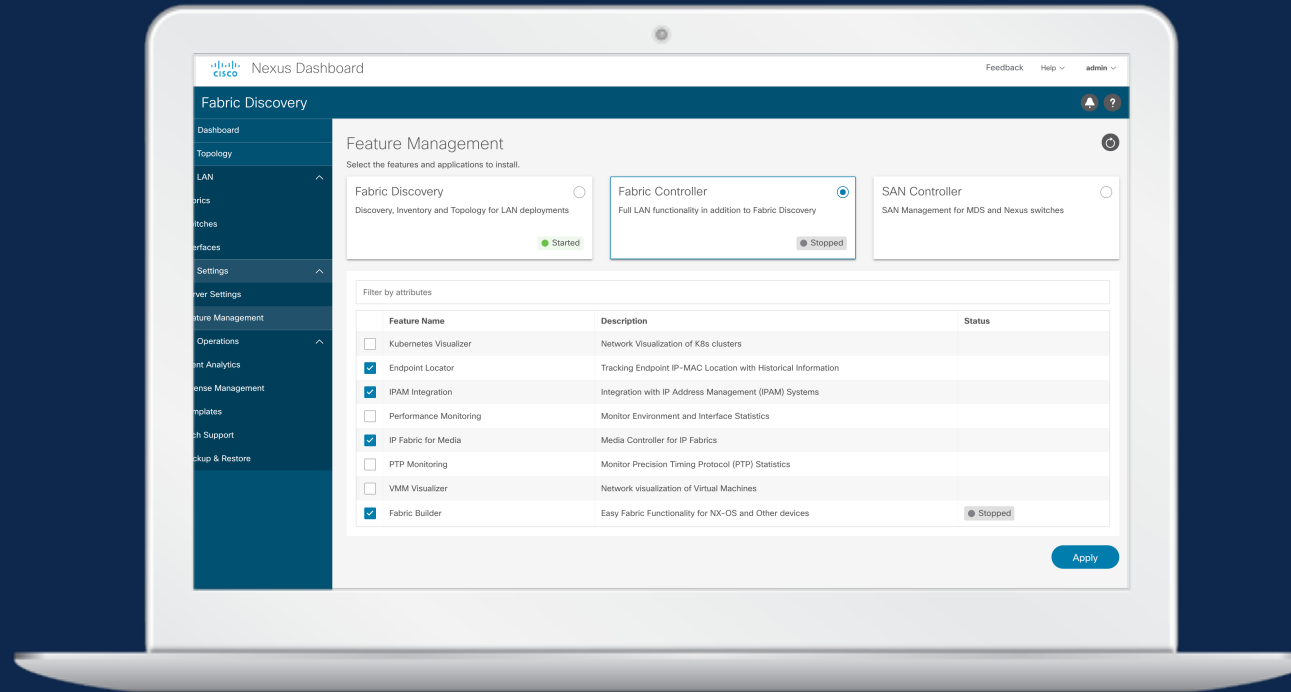


New



React JS based UI | Aligns with ND user interface | More intuitive to enhance user experience

Feature manager



No need for mode selection at installation time



ND fabric discovery selection for monitoring capabilities



Selectively enable and disable features such as fabric discovery, LAN, IPFM, and SAN and more

Implementation of smart licensing policy



Increased ease of use
and efficient consumption



Less restrictions with flexible
reporting



Reduced overall licensing
friction for users

NDFC 12.0 is transitioning to a Smart Licensing only release

What's new in 12.0(1)

Features

IOS-XR / IOS-XE 지원

퍼포먼스 모니터링
리포트 생성

RBAC 지원

IPFM: Multitenancy VRF

방송/증권을 위한
Multicast 망 용 VXLAN 지원



Increased functionality for
non-Nexus platforms

Enhanced reporting

Orchestrated via ND
Increased granularity
for current roles

Shared Resources

Ease IPFM network
provisioning

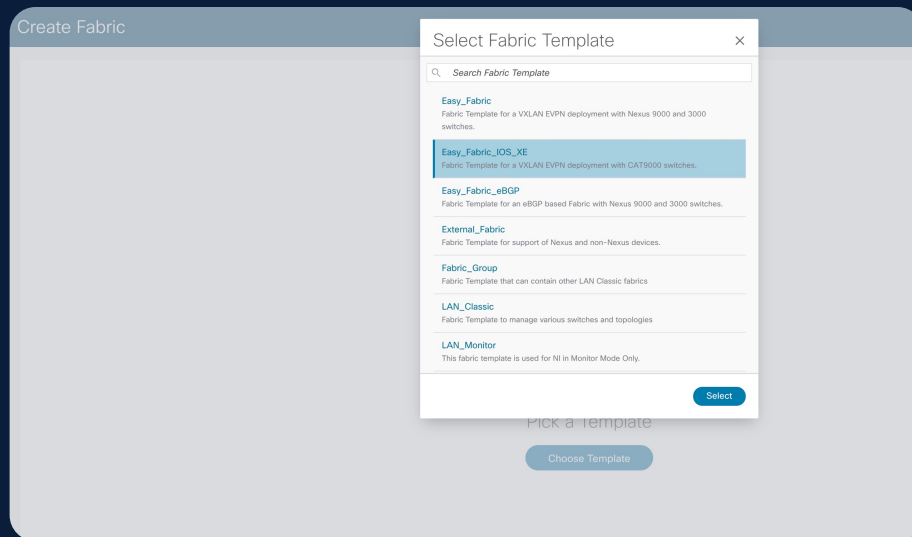
Benefits

Non-Nexus platform support

IOS-XE

Cat9k VXLAN EVPN Automation

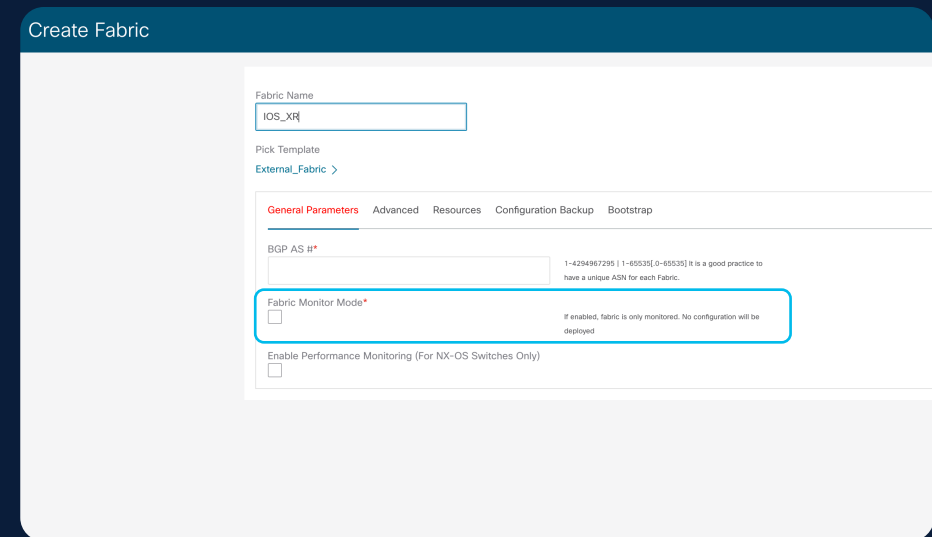
NDFC 12 will support Fabric Builder template for Cisco IOS-XE: Catalyst 9k VXLAN EVPN automation.



IOS-XR

ASR 9000/NCS5500 managed mode

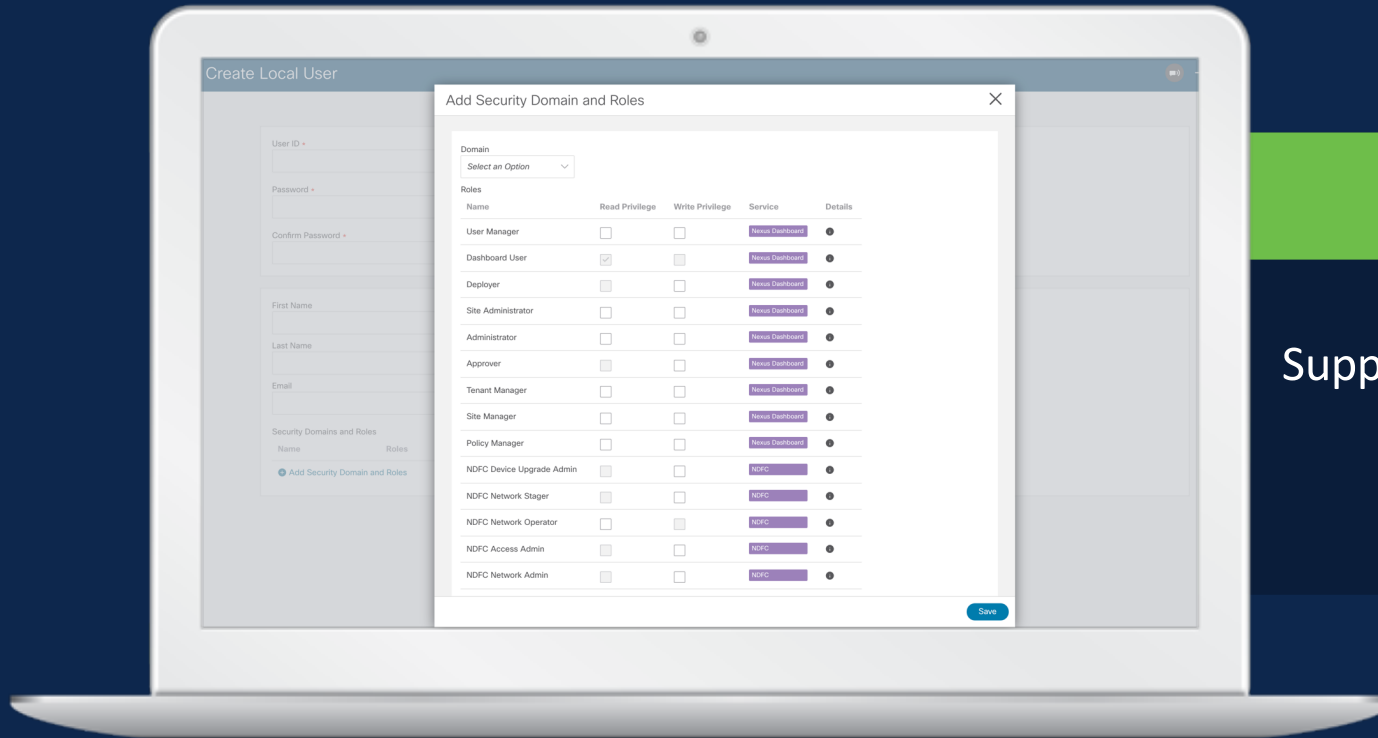
NDFC 12 will support config management for IOS-XR devices in External fabrics. Configuration compliance will also be enabled.



Benefit

Increased functionality and support in NDFC for customers deploying non-Nexus switches

Granular RBAC model



Orchestrated from ND

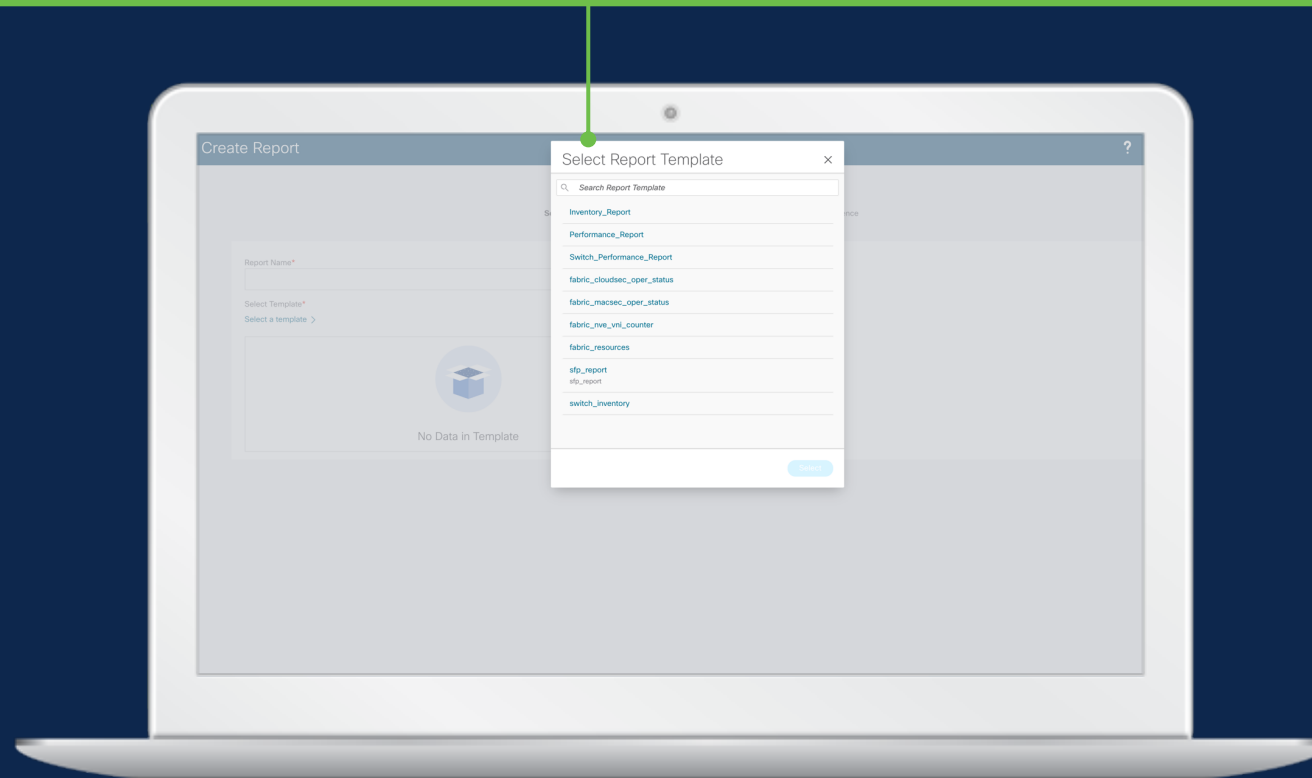
Supports same user to have different roles for different fabrics

Benefit

Increases efficiency and further reduces administrative workflows

Programmable reports for performance monitoring

Provide programmable reports for performance monitoring,
and can email generated reports to users

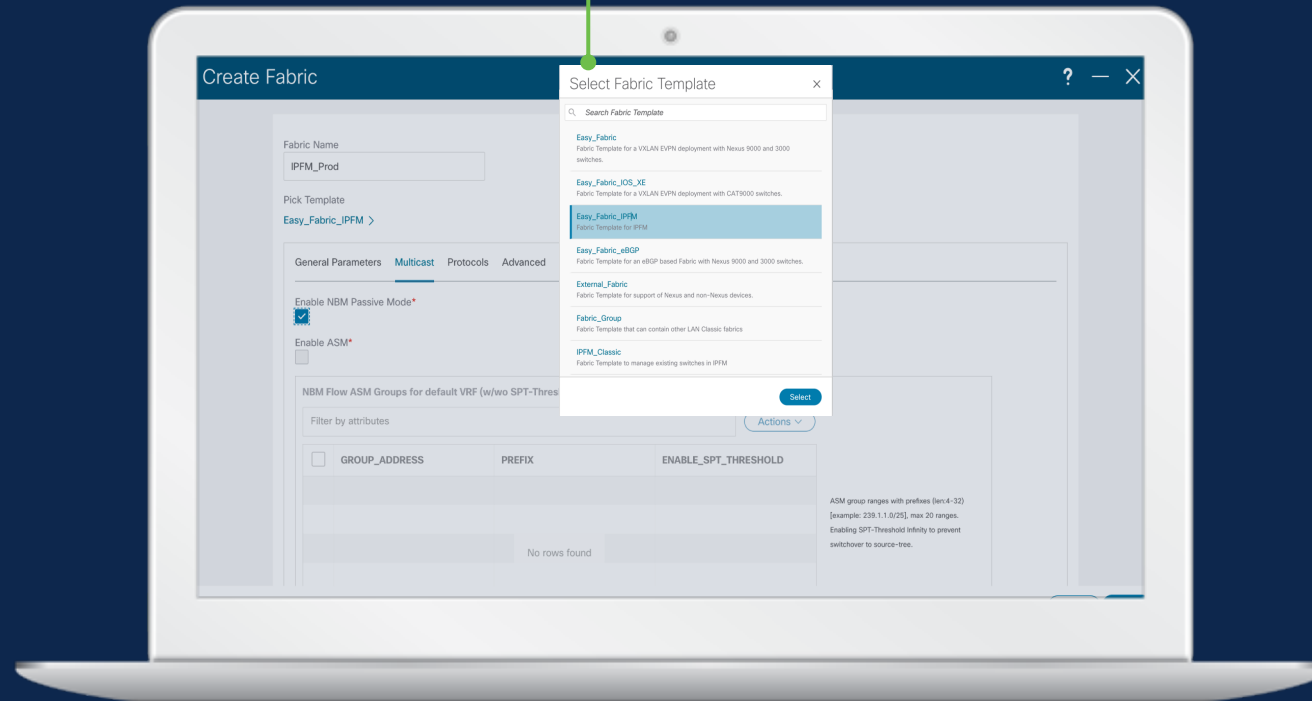


Benefit

Leverage these templates for LAN, SAN and IPFM deployments

Fabric Builder for IPFM

NDFC will support Pre-configured best practice policy templates to build your IPFM underlay in minutes



NDFC Roadmap

Shipping
(Q4CY21)



Committed
Q2CY22



Planning
(Q3CY22 – Q4CY22)



Planning
(Q1CY23)

NDFC 12.0 (2)

Modular Architecture
Update

NDFC app on Nexus
Dashboard

GUI New Look and Feel –
align with ND

Smart Licensing
Enhancements with SLP

Fabric Discovery with
inventory/discovery

Expansion of IOS-XR and
IOS-XE support

IPFM: Easy Fabric and
Dashboard Enhancements

SAN: Java Client Parity

NDFC 12.1(1)

L3 reachability among
cluster nodes

Cohosting of NDFC with
NDI on the same pND

Scale: 400 Managed
1000 Monitored

L2TOR visibility and
management in Easy fabric

IPv6 VXLAN OAM

eBGP Routed fabrics
support with IPv6 underlay

Inband management and
POAP for Easy_Fabrics

NDFC 12.1(2)

Multi Cloud Integration with
NDO – AWS, Azure, GCP

Multi Domain Integration
SDWAN

NDFC/ND SPOG

Change control management

Task granularity & Rollback
capability

Scale: 500 Managed
1500 Monitored

Increased VNI scale (Parity
with NXOS scale)

EPBR Automation

NDFC 12.1(x)

Multi Domain Integration
SDA, ACI

NDFCaaS

Fabric Discovery:
Image & License Management

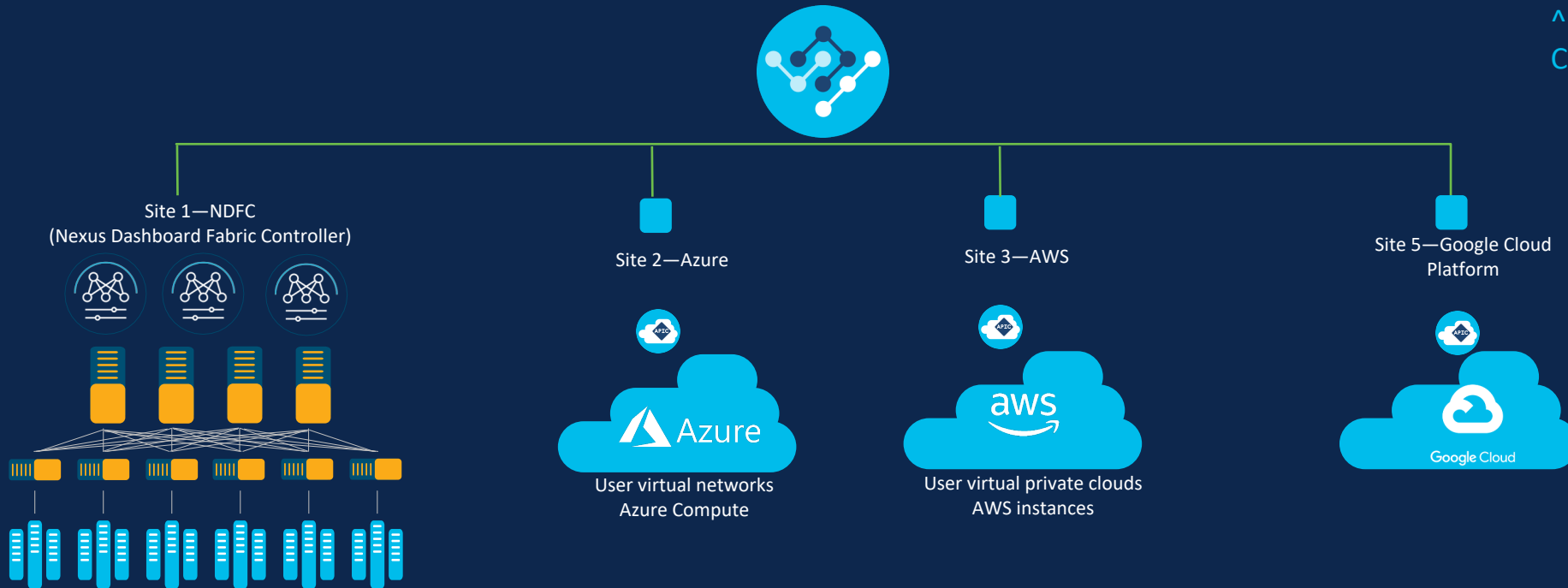
Easy Fabric
for Classic 3 tier

VXLAN OAM: Multisite

Monitoring
3rd party Devices

NDFC Site connectivity to Cloud with NDO

Planning



^DCNM direct to Azure using CSR1000V is Shipping

Public Cloud Integration for NDFC Sites

Leveraging Native Public Cloud Capabilities

Secure Connectivity to Public Cloud

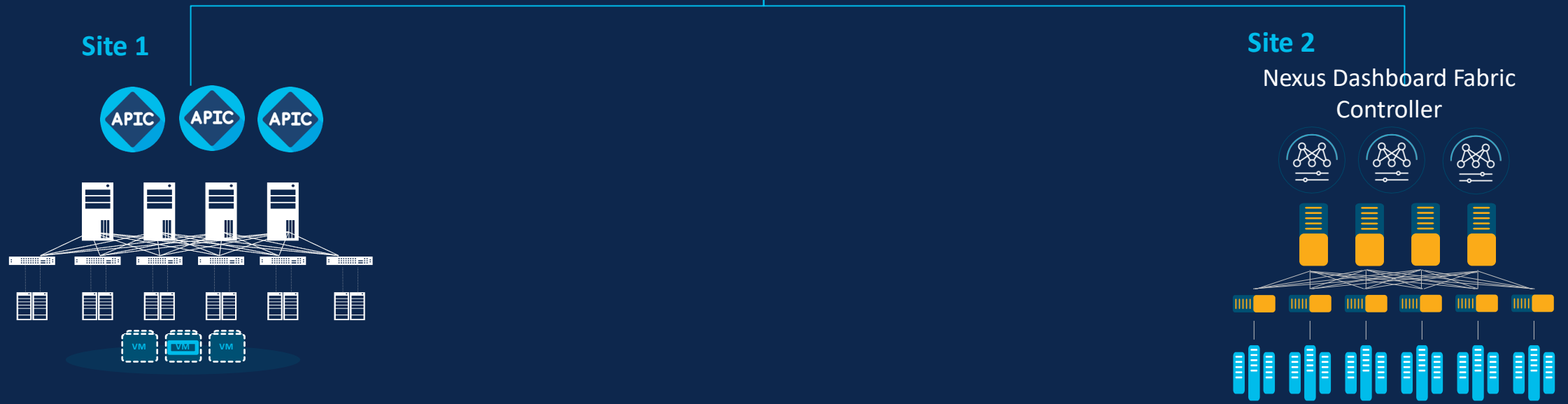
Connectivity Health, Tunnel Path & Statistics

NDFC Site to ACI Site

Planning



Cisco Nexus Dashboard Orchestrator



Demonstrating Open ACI

Leveraging Standards-based Protocol

Layer-3 Connectivity using VXLAN BGP EVPN

Connectivity Health, Tunnel Path & Statistics

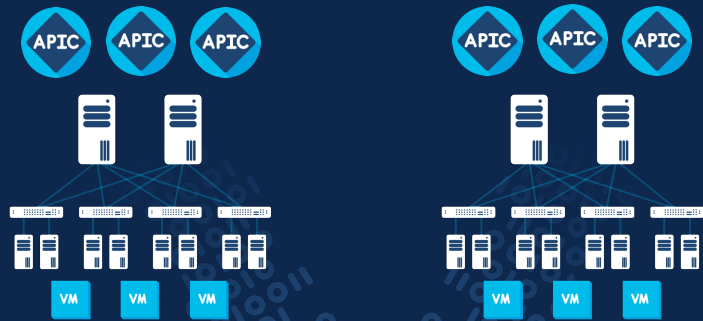


Cisco Nexus Dashboard

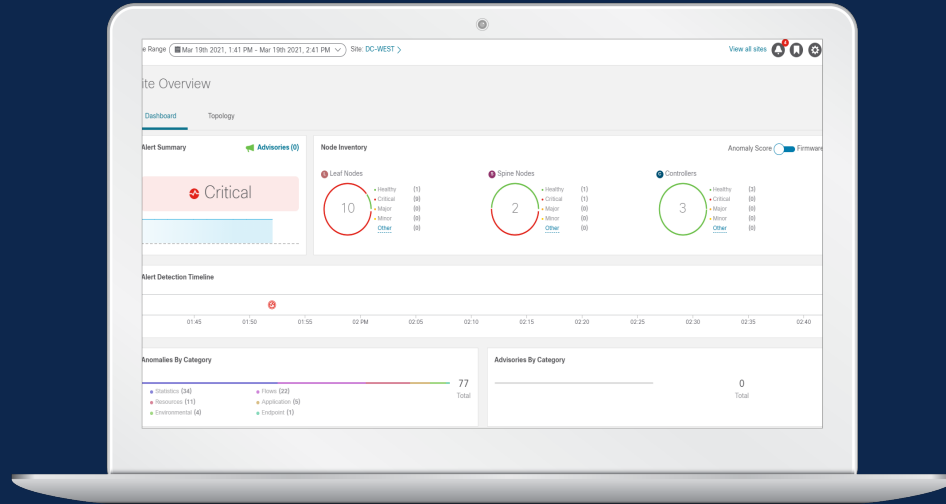
ND 2.1.2 and NDI 6.0.2 recap

Nexus Dashboard

One view



Nexus Dashboard



One View



Nexus Dashboard


Nexus Dashboard

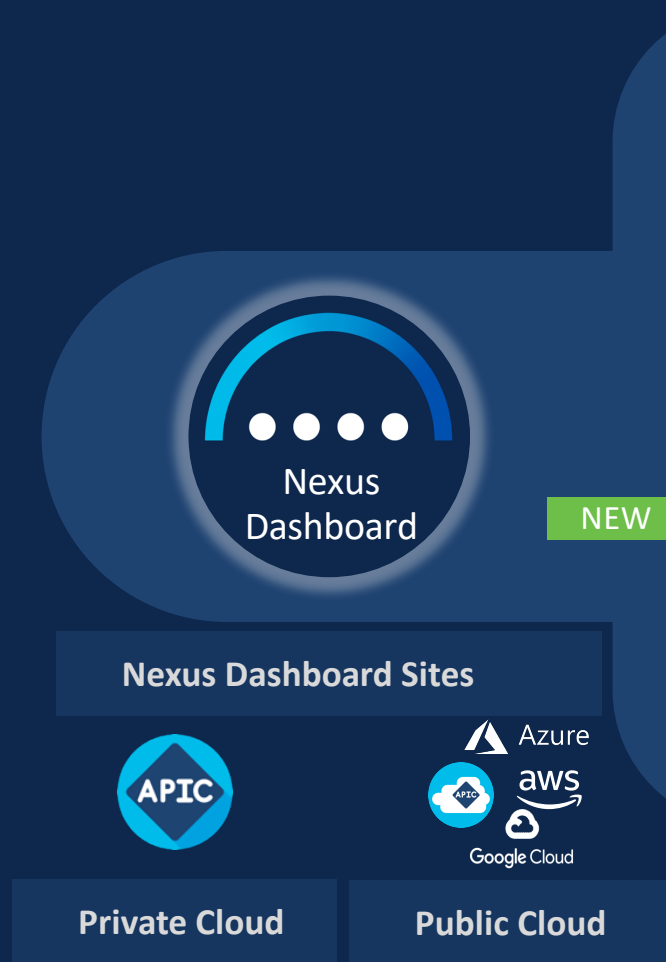
Consolidated applications

Multiple Fabric Specific Services

- Multi-Site Orchestrator (MSO)
- Network Insights Resource (NIR)
- Network Insights Advisor (NIA)
- Network Assurance Engine (NAE)

Simplified Fabric Agnostic Services

-  **Nexus Dashboard Orchestrator**
(Formerly Multi-Site Orchestrator)
-  **Nexus Dashboard Insights**
(Formerly NIR, NIA, NAE)
-  **Nexus Dashboard Data Broker**
(Formerly Nexus Data Broker)
-  **Nexus Dashboard Fabric Controller**
(Formerly DCNM)
-  **Third-party apps**



Nexus Dashboard Insights

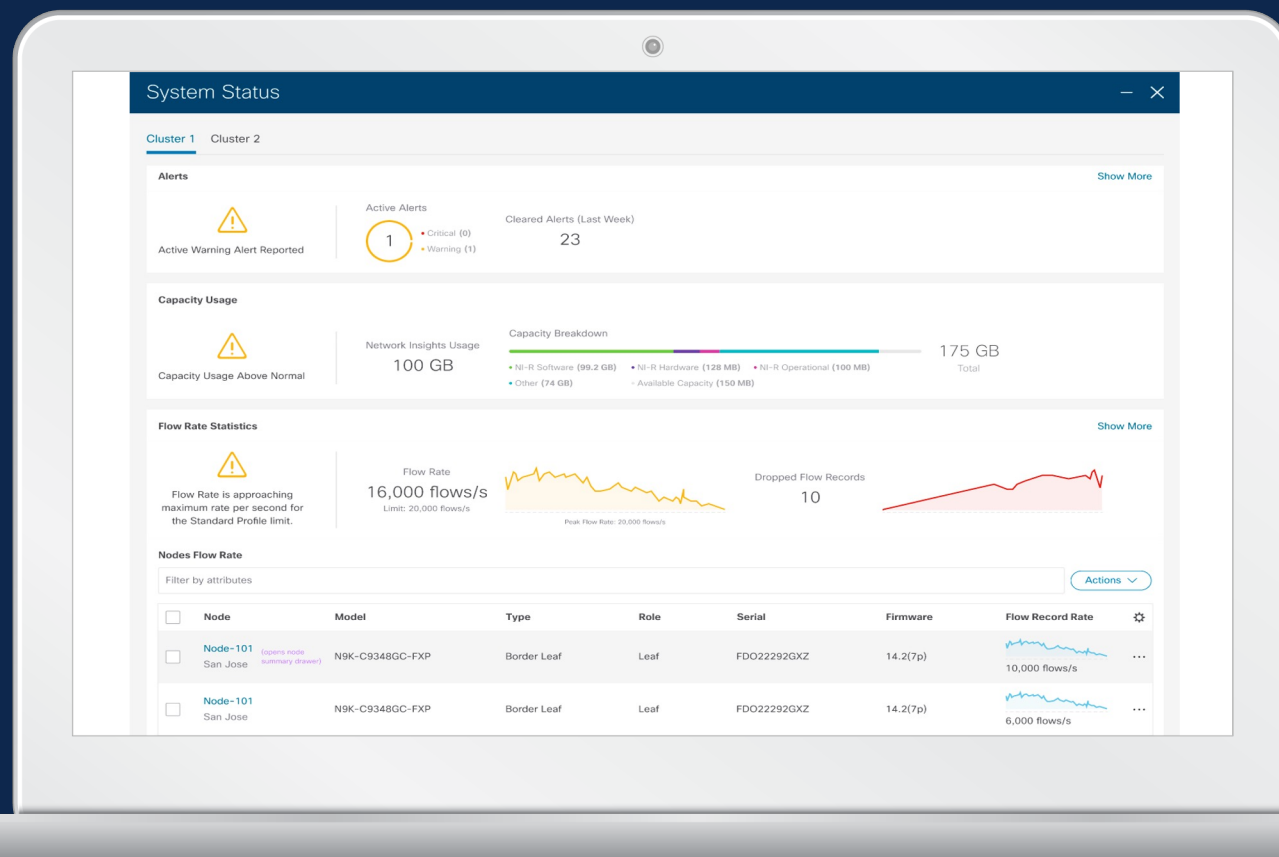
Config template compliance



Proactive intent assurance: Compliance checks run on pre-change analysis

Nexus Dashboard Insights

Flow rate statistics



Overall system flow rate*

Real-time flow rate limit

Per switch flow record rate

Number of dropped flows

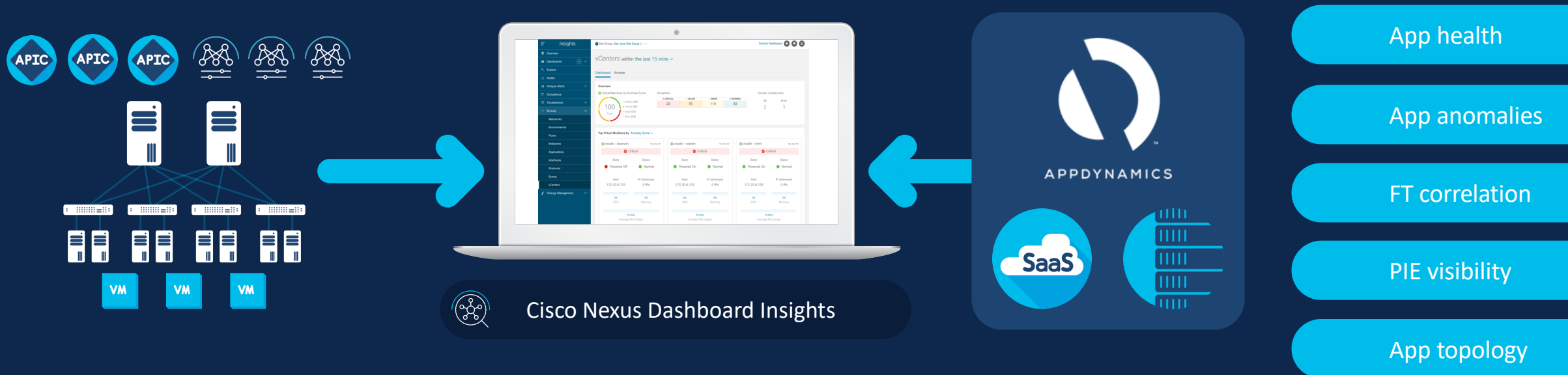
Rolling 2-hour timeline

*assume 20K flow/sec for 60K flow records/sec

Optimize flow collection to achieve best network monitoring

Nexus Dashboard Insights

AppD SaaS integration





Cisco Nexus Dashboard

What's new with ND 2.2 and NDI 6.1

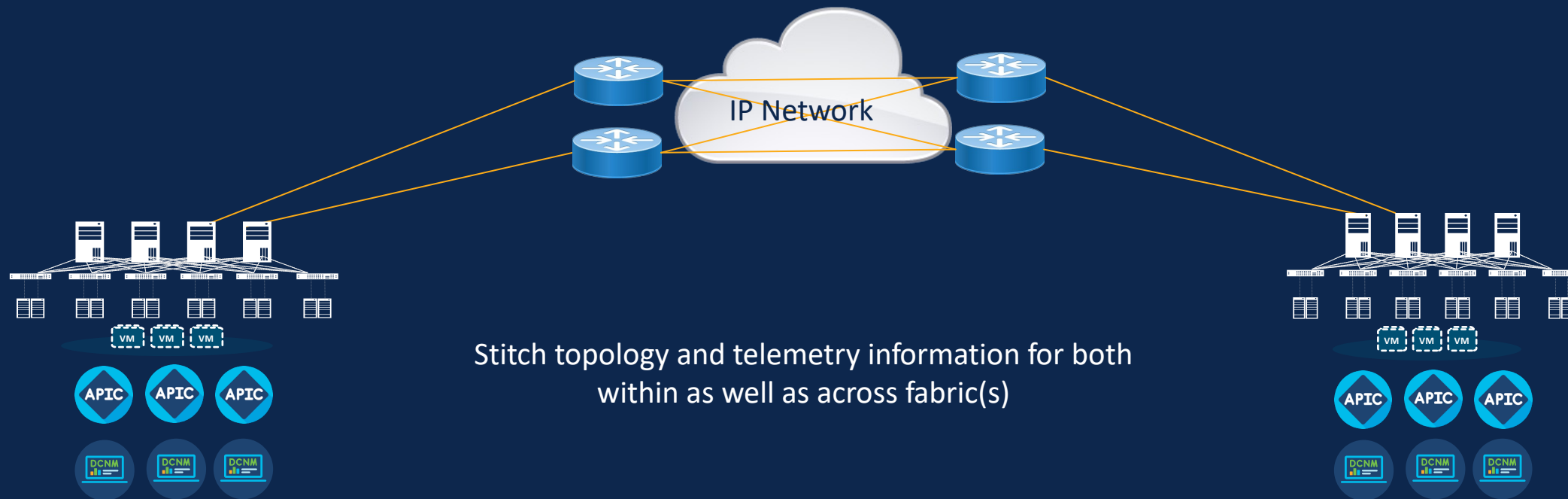
Nexus Dashboard

High level release cadence

Shipped	Shipped	Q1 CY22	Future
<h3>Cisco Nexus Dashboard 2.1</h3> <hr/> <p>Cisco Nexus Dashboard Insights 6.0</p> <p>Cisco Nexus Dashboard Orchestrator 3.4</p>	<h3>Cisco Nexus Dashboard 2.1.2</h3> <hr/> <p>Cisco Nexus Dashboard Insights 6.0.2</p> <p>Cisco Nexus Dashboard Orchestrator 3.6</p>	<h3>Cisco Nexus Dashboard 2.2</h3> <hr/> <p>Cisco Nexus Dashboard Insights 6.1</p> <p>Cisco Nexus Dashboard Orchestrator 4.0</p>	<h3>Cisco Nexus Dashboard</h3> <hr/> <p>Cisco Nexus Dashboard Insights</p> <p>Cisco Nexus Dashboard Orchestrator</p>
<p>Virtual Cisco Nexus Dashboard</p> <ul style="list-style-type: none">ESXi and KVM supportNexus Data Broker 3.1DCNM sites onboardOne View	<p>Pre-packaged services</p> <ul style="list-style-type: none">DUO multi-factor authenticationGoogle Cloud Site onboarding	<p>Profile Simplification</p> <ul style="list-style-type: none">Linux & Ubuntu SupportDual Stack IPv4 & IPv6Azure Stack Onboarding	<p>Nexus Dashboard As a Service</p> <ul style="list-style-type: none">Enhanced RBACCampus Integrations (SDA)SD-WAN Integrations

Nexus Dashboard Insights

Cross fabric path stitching



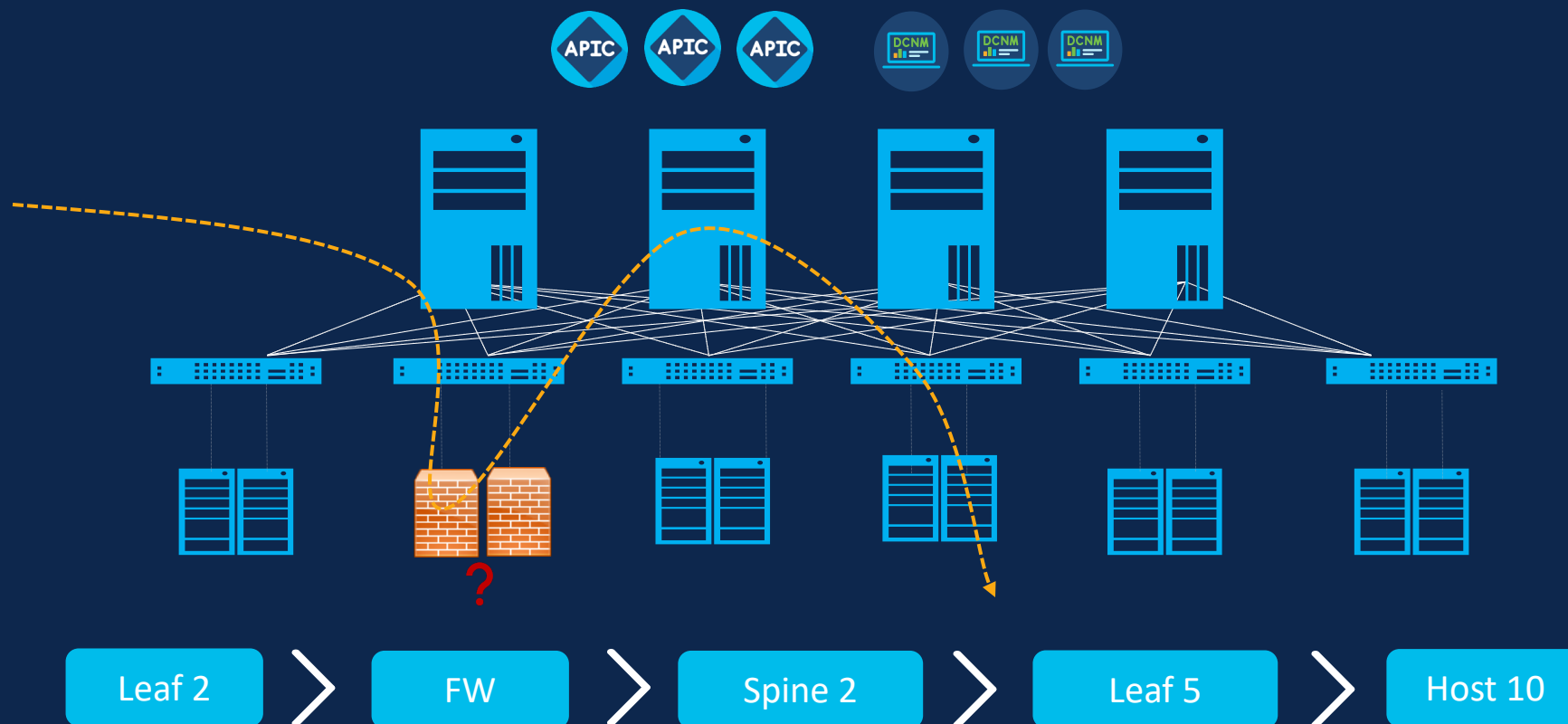
Stitch topology and telemetry information for both within as well as across fabric(s)



*Demo only for Q1 release, GA targeted Q2 CY22

Nexus Dashboard Insights

L4-L7 services path visibility



*NAT support for Cisco ASA/FTD targeted Q2'22

Nexus Dashboard Insights

Support for air-gapped networks

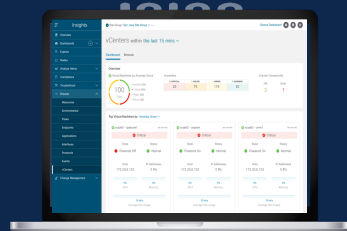
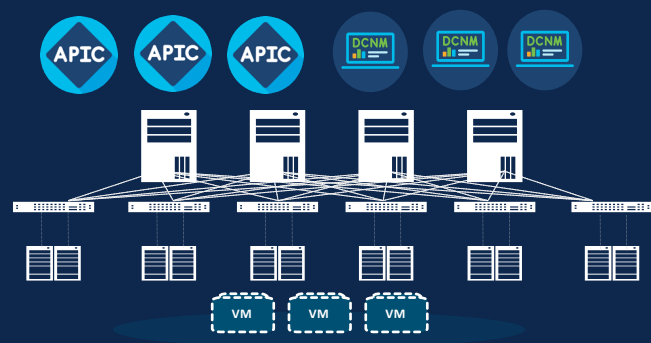
PSIRT scan

Defect scan

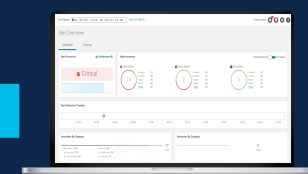
EoS/EoL notices

Field Notices

TAC assist



Nexus Dashboard Insights



Preventive maintenance

Proactive advisory

Productivity

Nexus Dashboard Insights

NDO and PBR assurance support



Orchestrator

- Explore site to site connectivity
- Existing assurance anomalies aggregated across sites
- Raises anomalies for NDO infra inconsistencies
 - End Point (EP) database out of sync
 - BGP & Ospf session down
 - VXLAN Unicast & Multicast tunnel down



Policy Based Redirect (PBR)

- Raises anomaly for config inconsistencies with Device clusters
- Device selection policy
- Deployment of vPC nodes
- Compliance for traffic redirect**
- Explore connectivity via redirect**

Nexus Dashboard Insights

Anomalies as Syslog messages



Nexus Dashboard Insights

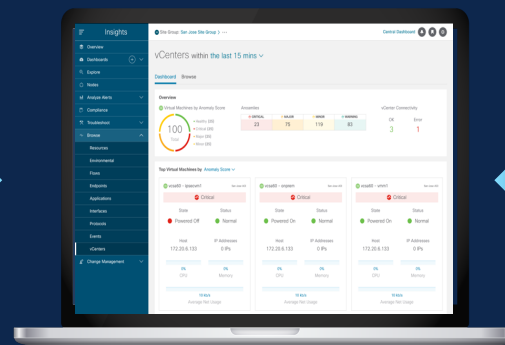
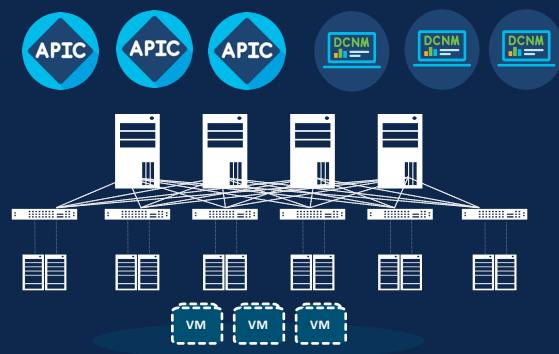


Anomalies as Syslog

Syslog collector

Nexus Dashboard Insights

VMware vCenter integration



Nexus Dashboard Insights



VMware vCenter

Hypervisor
(Name, Host, Version)

Virtual Machine
(Name, Health, Status, Resource, IP)

Port-group
(Status, NIC, Neighbor, DVS etc.)

DVS
(Status, Name, # of VMs, VMOids)

Connectivity & Stats

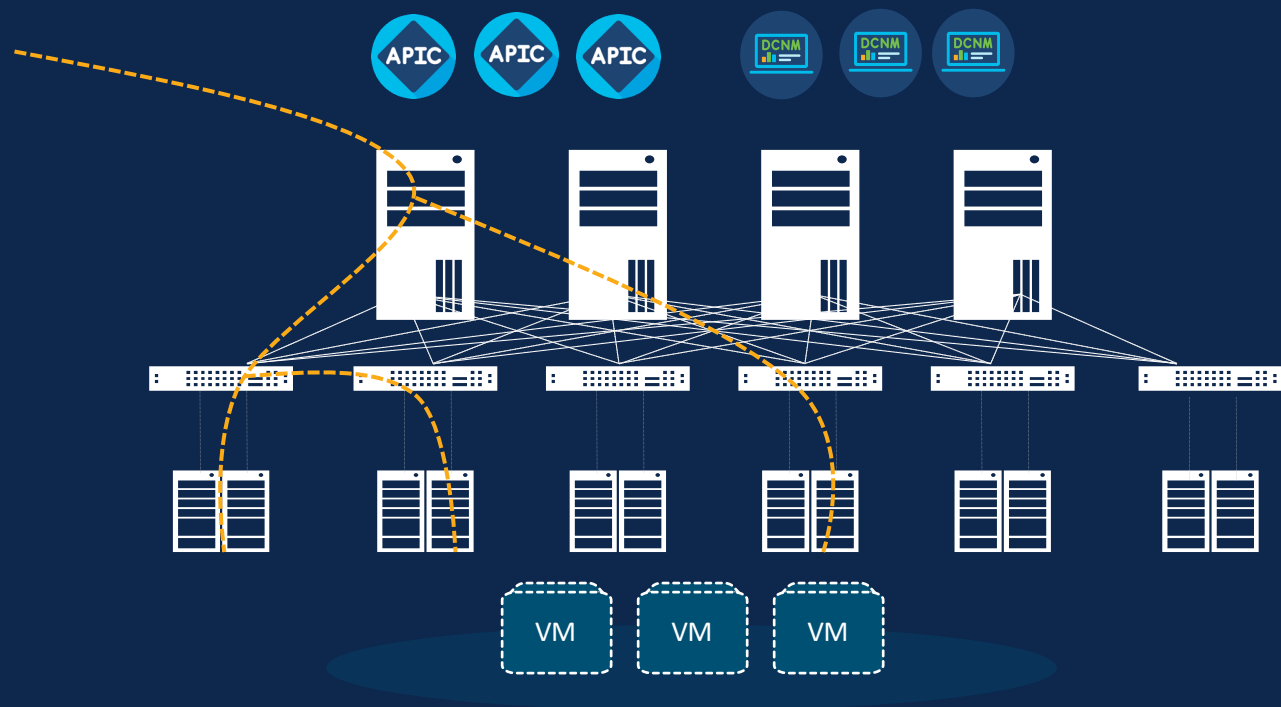


Cisco Nexus Dashboard

Future roadmap

Nexus Dashboard Insights

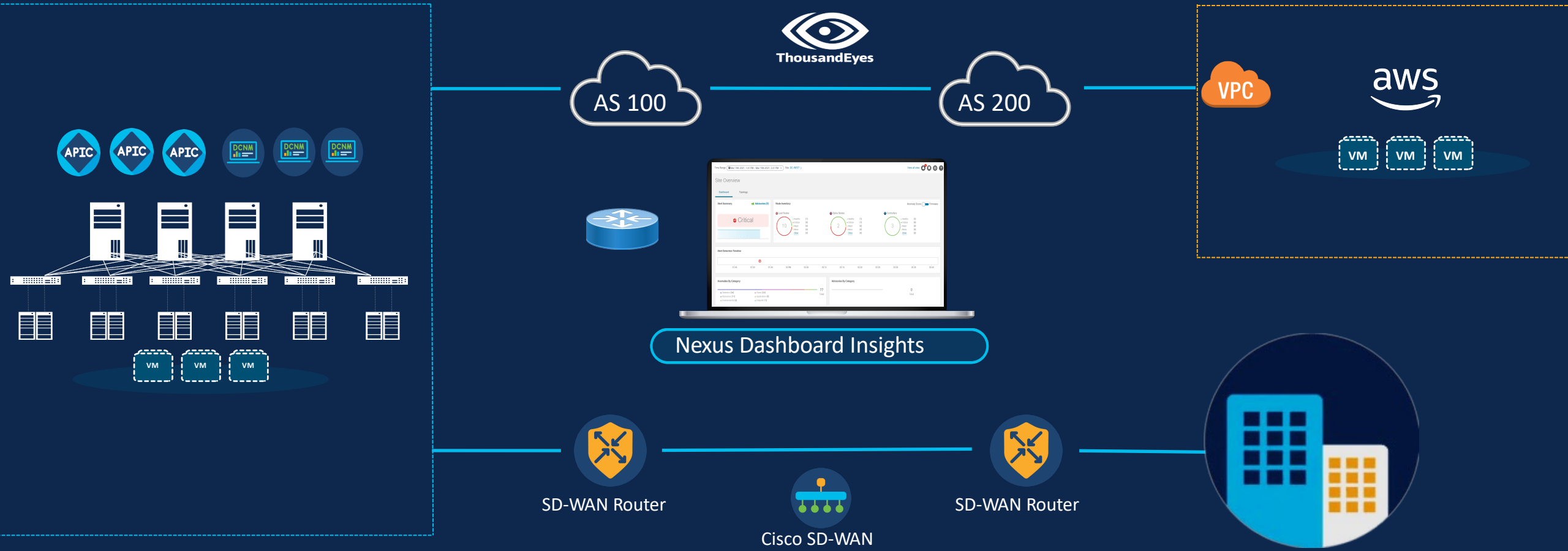
Multicast path visibility



- Microburst
- Packet drops
- Latency
- RPF checks
- Statistics and top talkers

Nexus Dashboard Insights

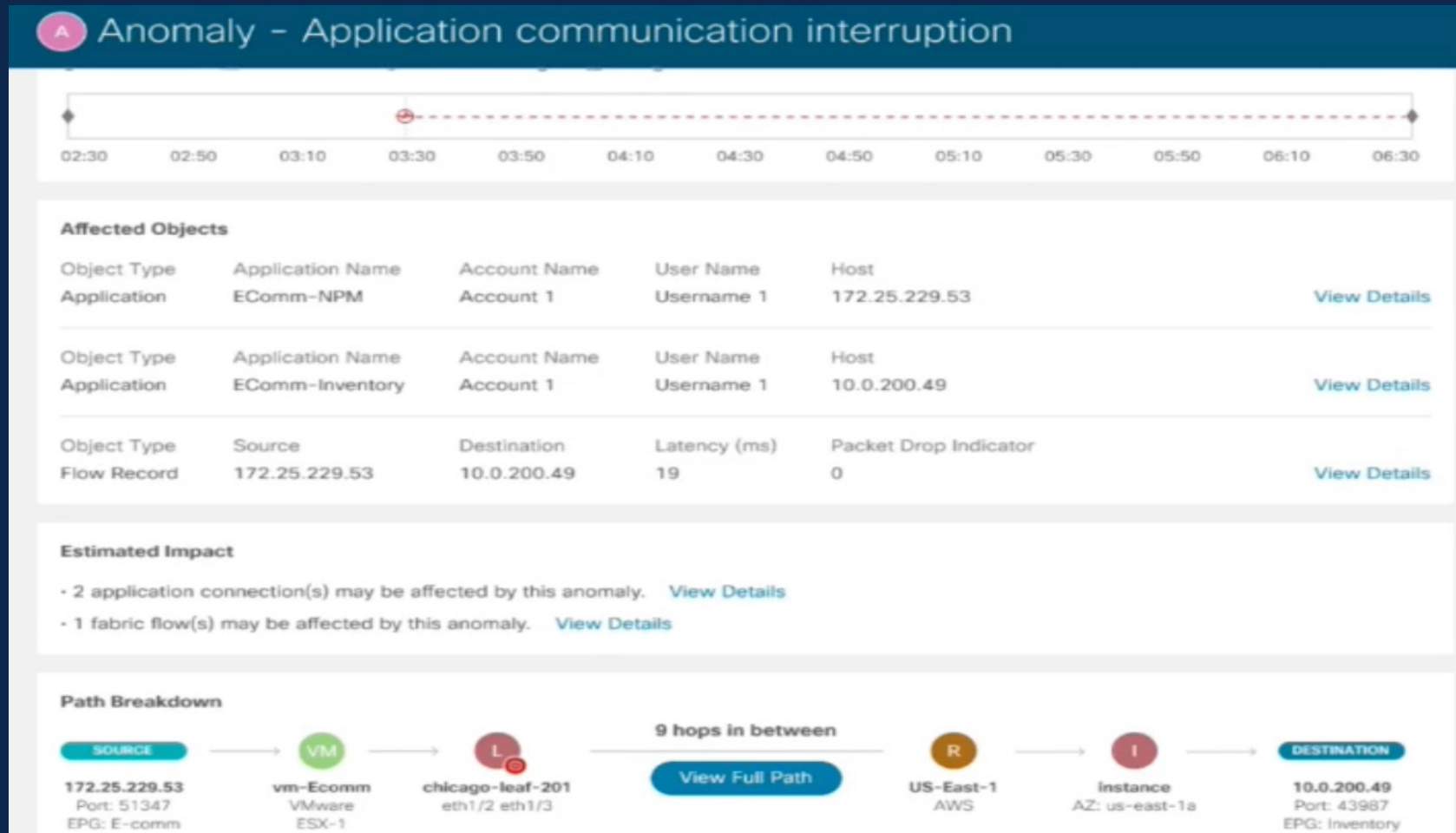
SD-WAN and Thousand Eyes integration



Full stack visibility | Single point of control

Nexus Dashboard Insights

SD-WAN and Thousand Eyes integration

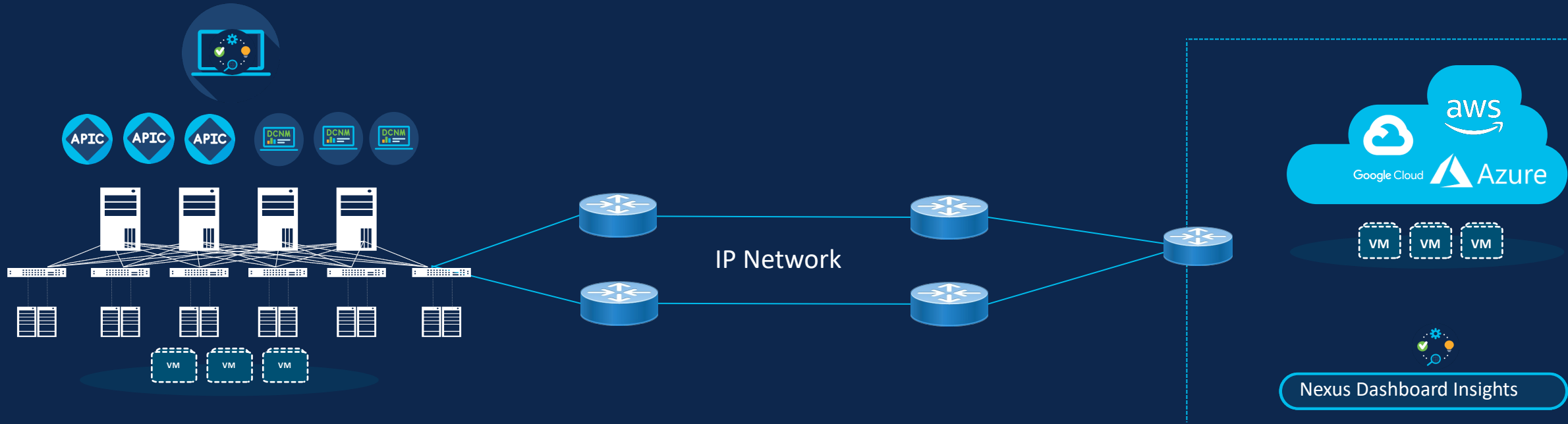


Full stack visibility | Single point of control

Nexus Dashboard Insights

Cloud integration

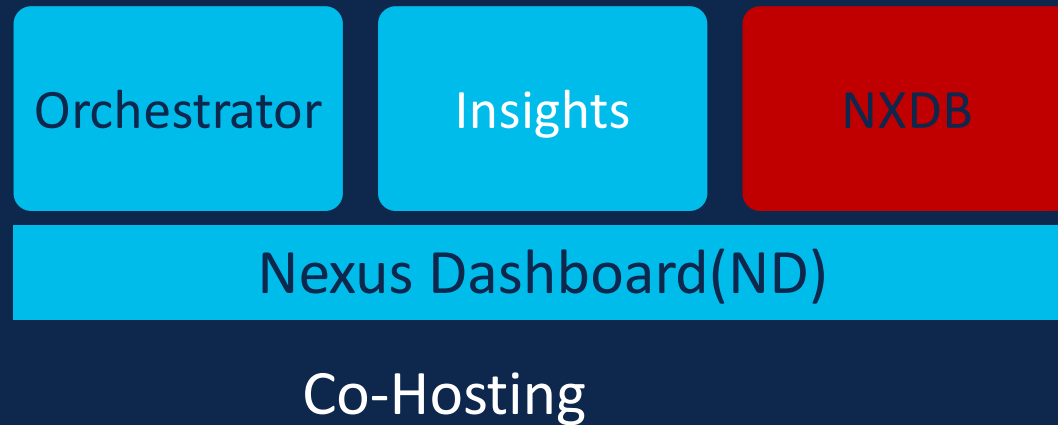
Nexus Dashboard Insights



End to end visibility | Single point of control

Nexus Dashboard Data Broker (NDDB)

Nexus Dashboard = To be ready for your network ops



시스코 넥서스 데이터 브로커

목표: 운영하기 쉽고 확장 가능한 패킷 브로커 네트워크 구축

정의 : Nexus Switch를 Tap Switch로 구현 가능

9200 Series*

9300 Series

EX/FX/FX2/GX/FX3*

9500 Series

3000 Series

3500 Series



Cisco Nexus Switches



Cisco NDB Controller
Software

TAP and SPAN Aggregation

Inline monitoring

패킷 모니터링 및 운영자의 사용 예



네트워크 운영자



Performance Monitoring
(Network / Application)
Trouble-shooting

시큐리티 운영자



Intrusion detection
Intrusion prevention
Security Threats

컴플라이언스



EU MiFID II
HIPAA, PCI etc.

Packet 브로커(Brokering)와 Packet 모니터링(Monitoring)



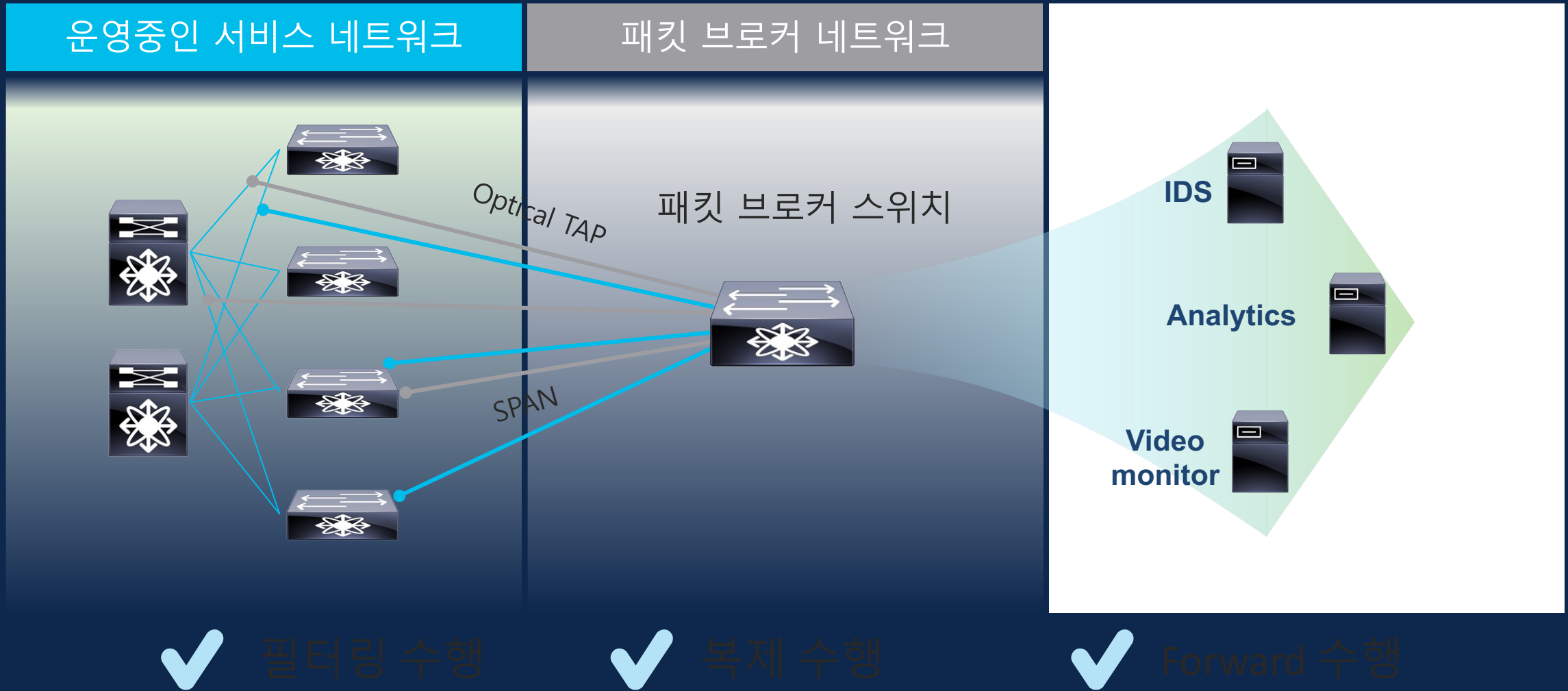
패킷 브로커

다양한 모니터링 도구에게 패킷 중계
(Aggregate, Filter, Replicate, Forward packets to multiple tools)

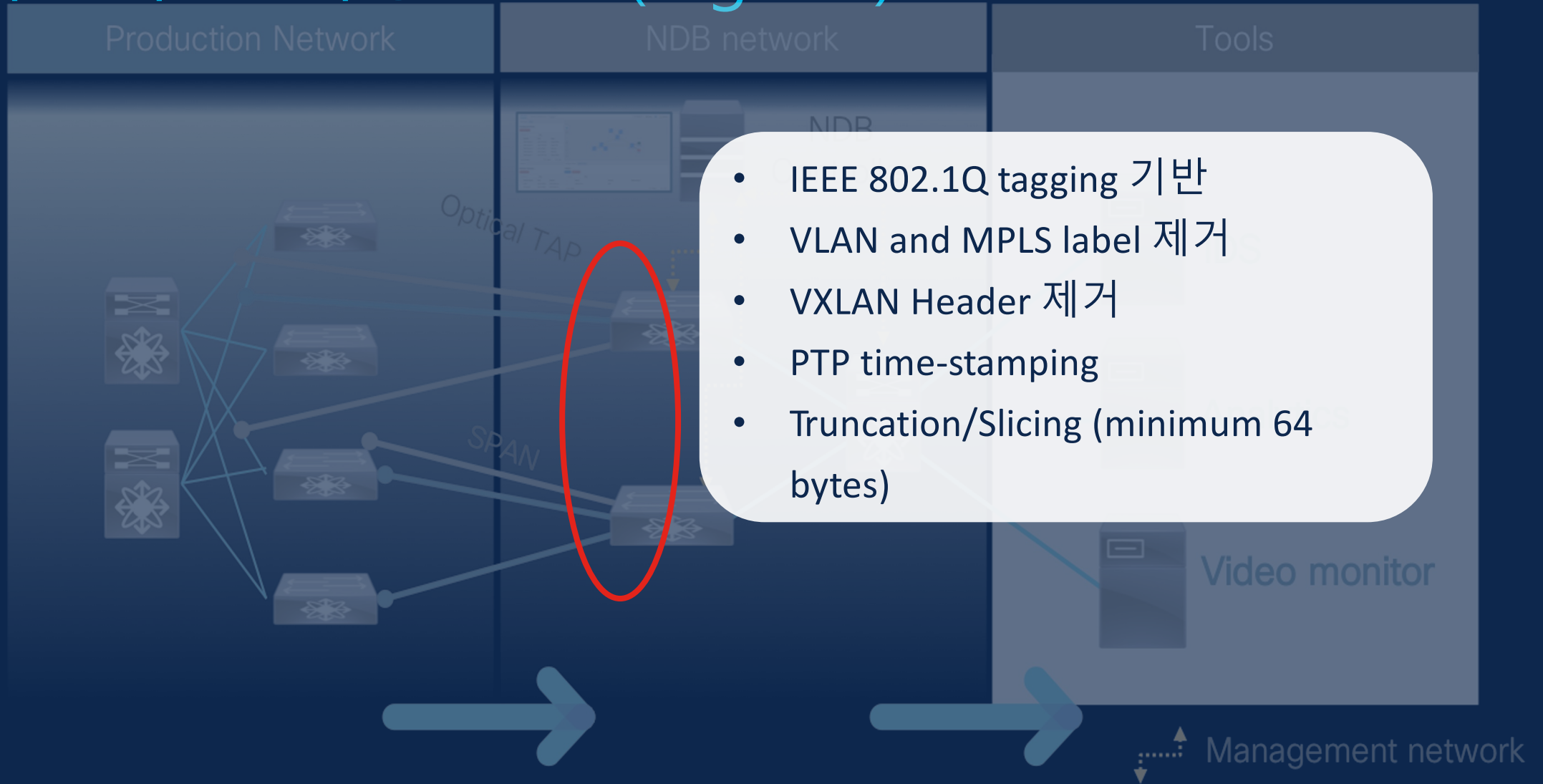
패킷 모니터

페이로드를 포함한 전체 패킷 전송
(Header 뿐만 아니라 Flow Tuple 포함)

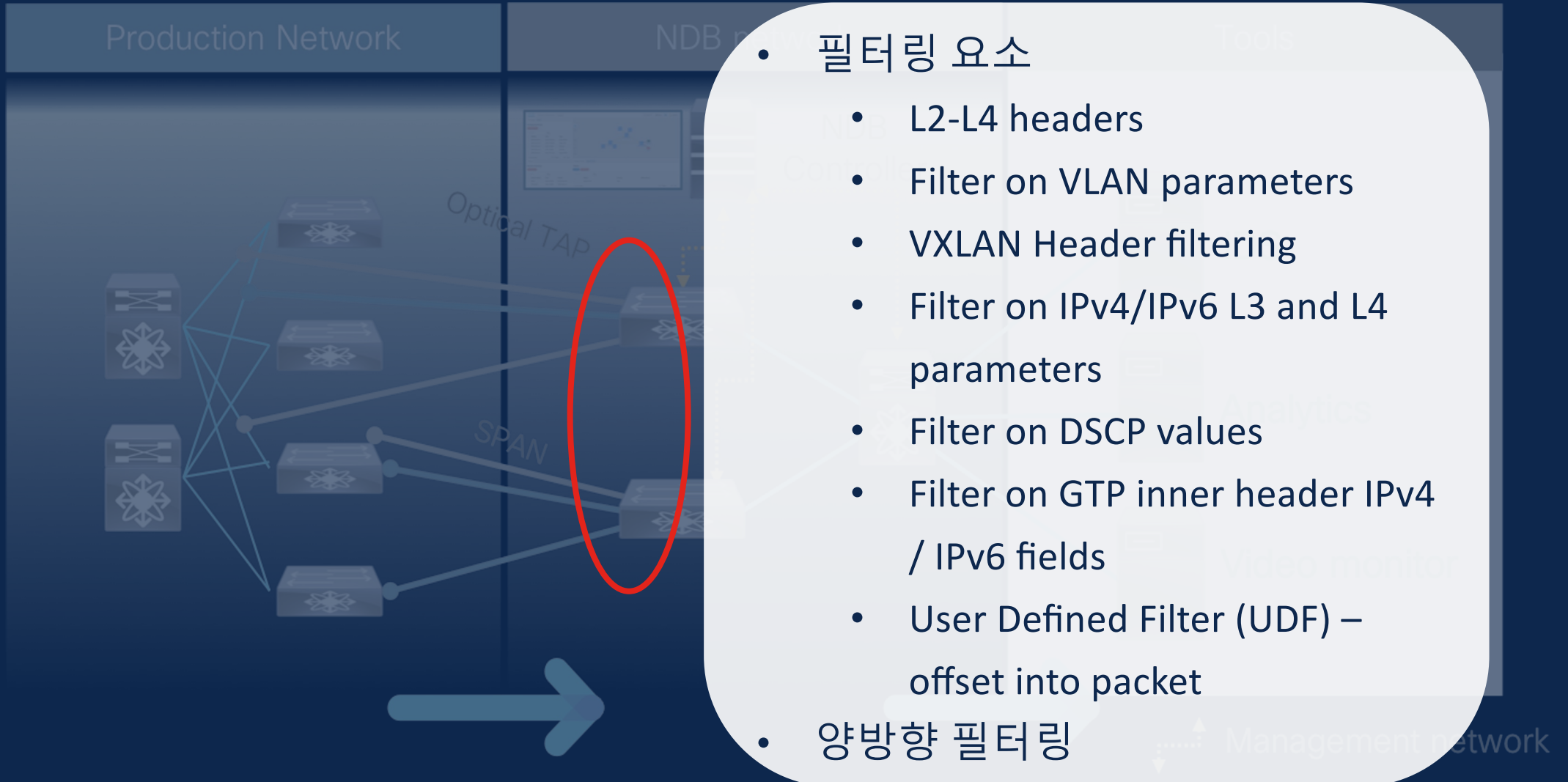
Out-of-band 모니터링 / SPAN & TAP 어그리게이션



패킷 수정 가능 Rule (Ingress)

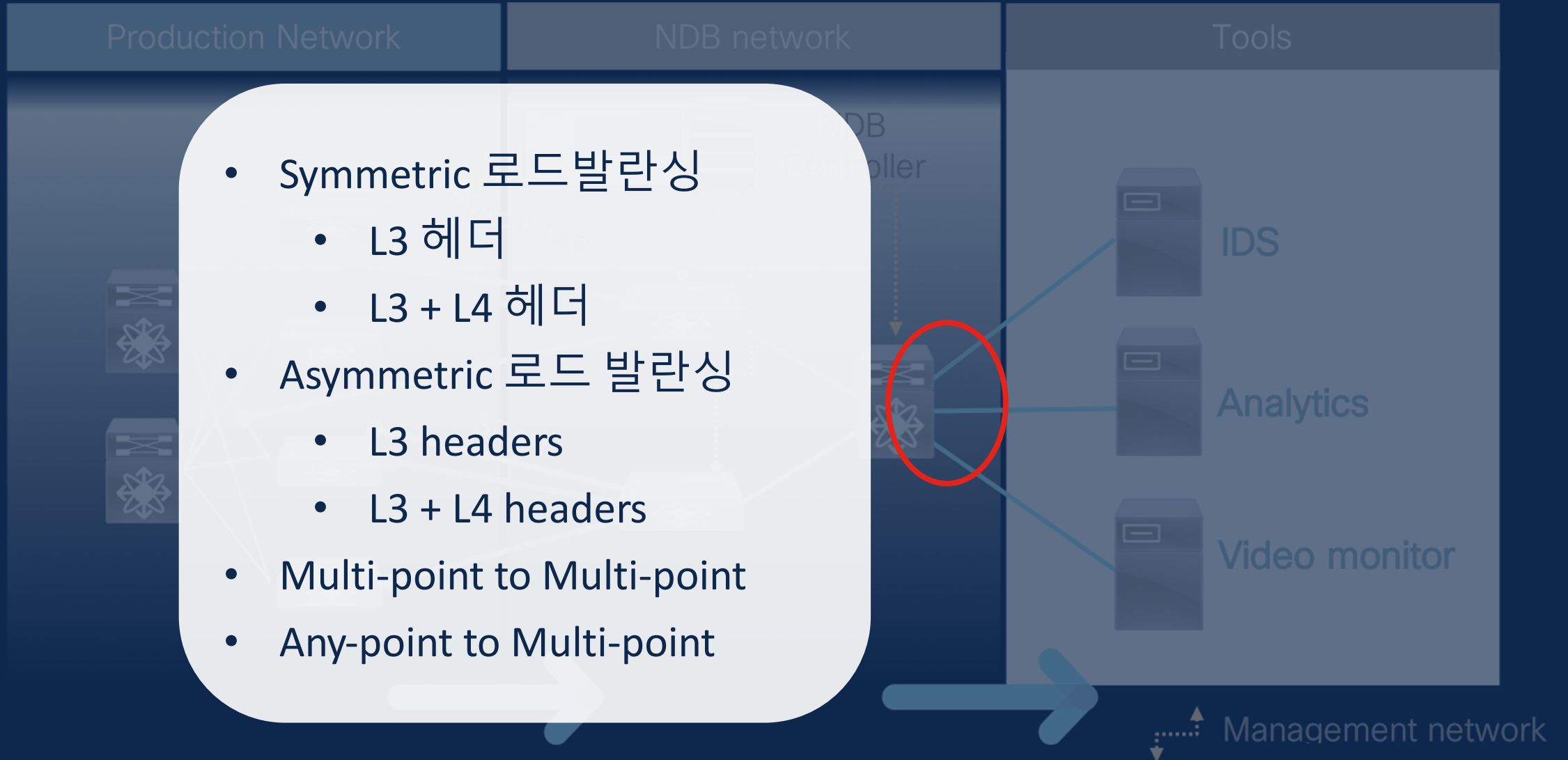


패킷 수정 가능 Rule (Ingress)



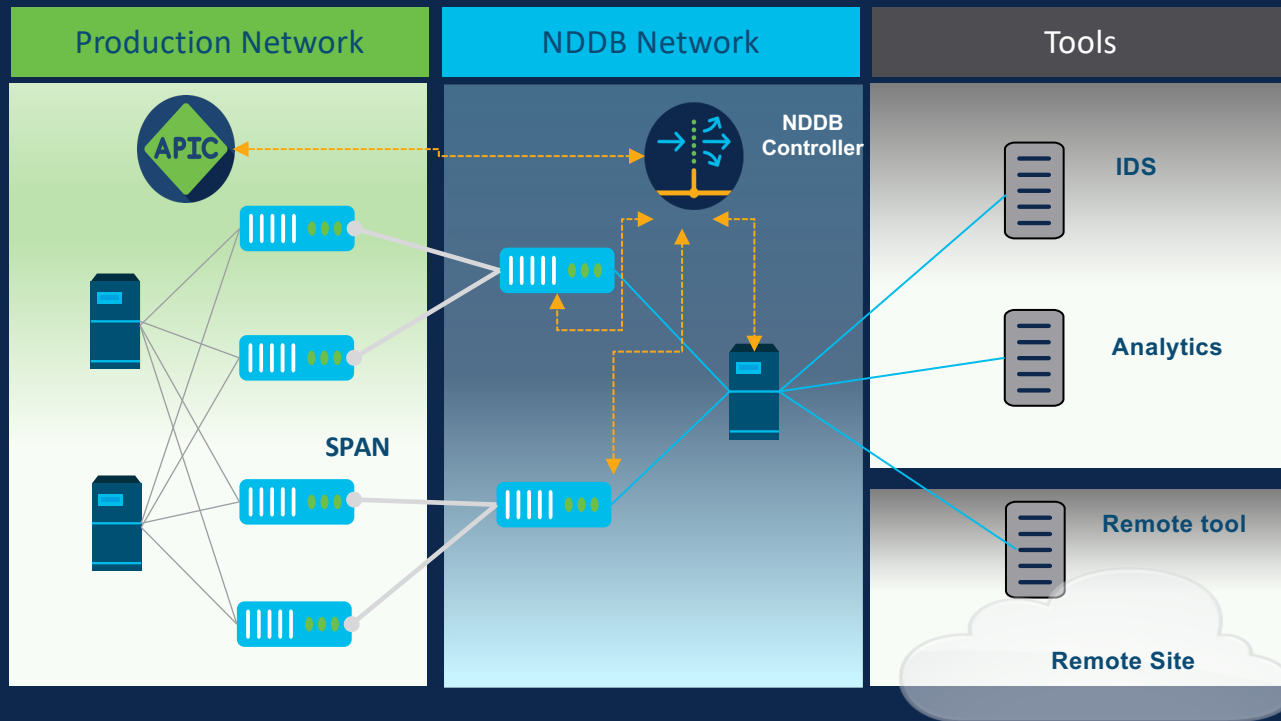
- 필터링 요소
 - L2-L4 headers
 - Filter on VLAN parameters
 - VXLAN Header filtering
 - Filter on IPv4/IPv6 L3 and L4 parameters
 - Filter on DSCP values
 - Filter on GTP inner header IPv4 / IPv6 fields
 - User Defined Filter (UDF) – offset into packet
- 양방향 필터링

패킷 포워딩 Rule (Egress)



Nexus Dashboard Data Broker – Update

Shipping



Delivered

- ACI ERSPAN automation
- NDDB App for ND & ACI
- Support for Enterprise network
- Support N3550 as TAP
- GRE Header stripping
- VXLAN Header stripping
- ERSPAN Header stripping

Futures

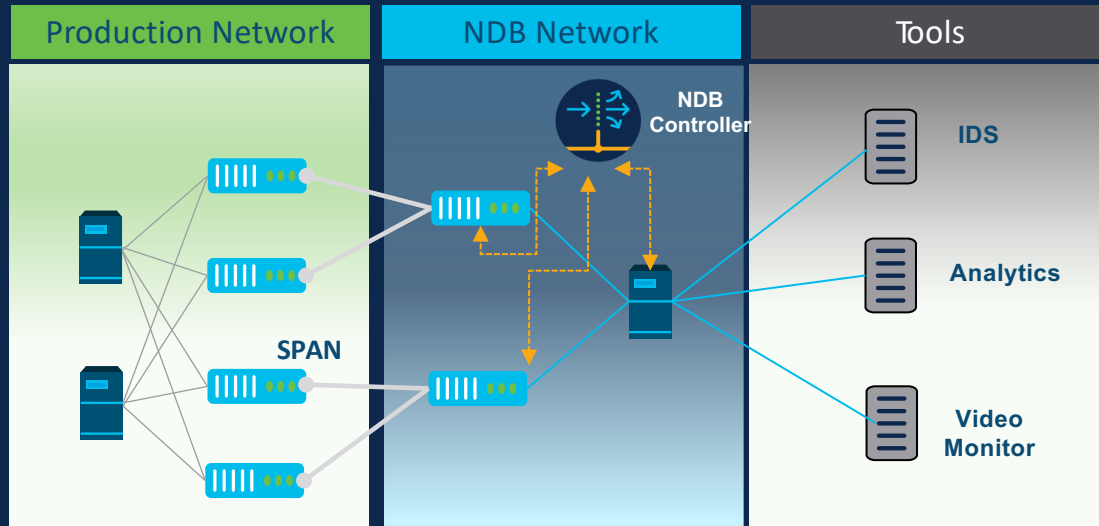
- Co-Hosting support on ND
- New topology rendering in GUI
- Packet de-duplication

TAP/SPAN aggregation

In-band / Inline monitoring

NDB – Co-existence of header stripping features

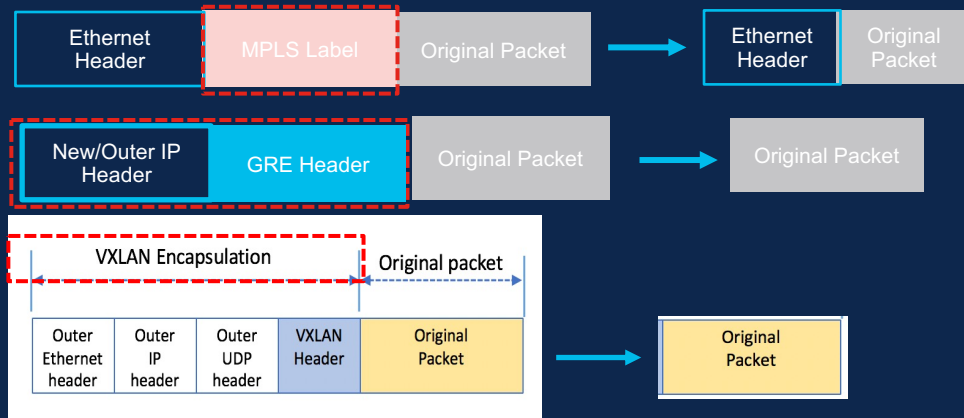
Committed



Feature

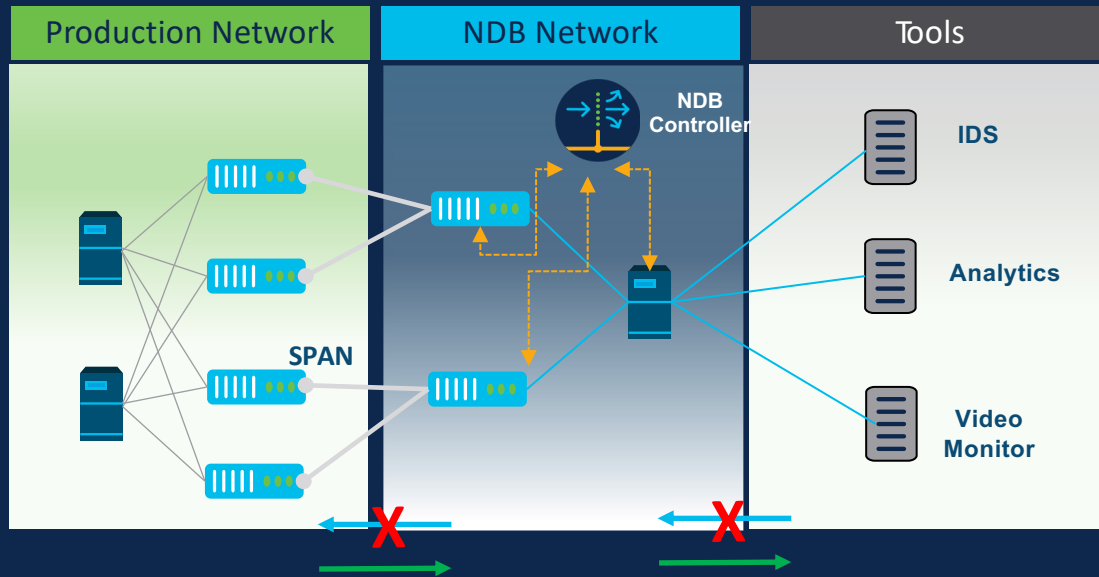
- Co-existence of MPLS Stripping along with ERSPAN, VXLAN and GRE header stripping features

- ★ Enable customers to send data to monitor nodes in the right format
- ★ Facilitate monitor nodes to efficiently process packets
- ★ Enable customers get right analysis



NDB – Unidirectional Ethernet (UDE)

Planning



Feature

- Totally blocks traffic entering into Production Network from NDB network
- Totally blocks traffic entering into NDB network from tools or monitoring devices

★ Increased security and reliability

★ Maintains sanctity of data

감사합니다.

Miyoung Shin

Miyoung Shin



Kyuhyun Lim

Soo Yung Choi

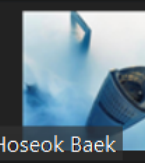
Soo Yung Choi

JoonKyu Lee

JoonKyu Lee



jesung park



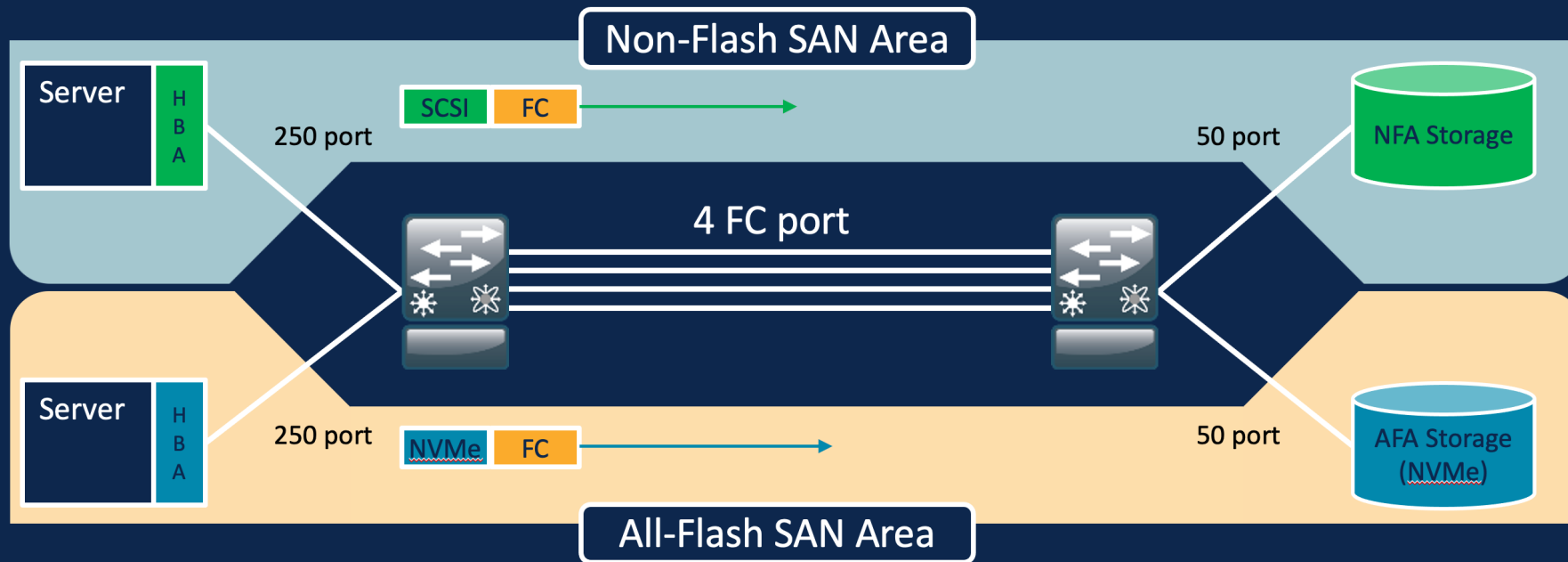
Hoseok Baek

보기



기록 중

NVMe oF(FC) Design Guide – 구성 예시



- Host가 사용하는 Array 영역이 명확하게 구분
- ISL을 Shared로 사용하는 경우 NVMe, SCSI간 성능차이로 Slow-Drain 발생 가능성 있음
- 영역별로 Dedicated 한 ISL이 필요