



Cisco ACI - 정책 기반의 데이터 센터

문병철 부장

Cisco Systems Korea

December 2015

Agenda

- 시스코 SDN 전략
- Back to the Basic : SDN?
- 시스코 ACI – 정책 기반의 데이터 센터
- Summary



Cisco SDN 전략

Programmable Network/Fabric 그리고 ACI (Application Centric Infrastructure)

데이터 센터 환경의 변화

전통적인 애플리케이션

단일체(Monolithic) 모델
다 계층 앱(Multi-tier Apps)

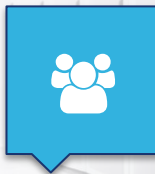


클라우드 태생(Cloud-native) 애플리케이션

비즈니스 민첩성을 위한 클라우드 모델
Micro-services / Bi-Modal IT / DevOps

수동적 상호작용 (Manual Interaction)

IT 사일로(Silos) 기반의 접근 방법
설정 기반(Configuration driven)



정책(Policy)과 자동화(Automation)

Enterprise-wide policy, hyper-convergence and cross-domain automation
Consumption driven with analytics and programmability

제품 중심 (Focus on Products)

Disjoint approaches to solve technical demands
Cohesiveness as "after thought"



비즈니스 솔루션 중심

Data Center is the foundation for business agility
Delivered as a solution and / or as a service,

네트워크에 부는 바람

- Control Plane과 Data Plane 분리하여, 빠르고 효율적인 네트워크 자원 관리



- 물리적 네트워크에 종속되지 않는 가상 서버 네트워크 구성



- 특정 관리 그룹에 종속되지 않는 네트워크 자원 관리



Cisco SDN



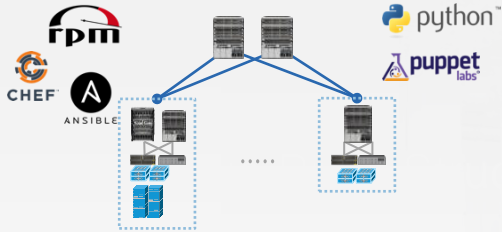
Programmable Network

Programmable Fabric

Cisco ACI

Cisco SDN: Providing Choice in Automation and Programmability

Programmable Network

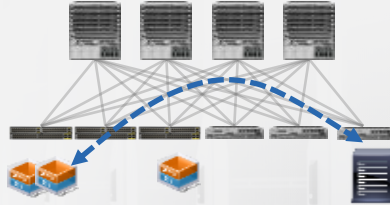


NX-API/ OpenNX-OS

자동화 에코 시스템
(Puppet, Chef, Ansible, etc.)

Mega Scale Datacenters

Programmable Fabric



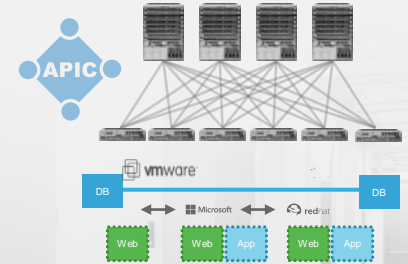
표준 기반의 VxLAN-BGP EVPN

타 사 컨트롤러 지원

VTS를 통한 오버레이 프로비저닝

Service Providers

Cisco ACI



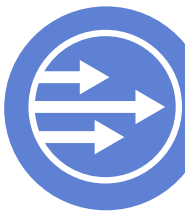
통합 솔루션

임베디드 보안, 중앙 관리, 확장성

자동화된 애플리케이션 중심의
정책 모델

깊이 있게 통합된 다양한 에코시스템

**Enterprise/Public Sector/
Commercial/Service Provider**



Programmable Network

POAP ONIE
PXE

부트스트랩 및
프로비저닝

B

RPM
Chef
puppet labs

패키지 및
애플리케이션
관리

표준 오픈
인터페이스

Linux/Python
Daemon

NXOS

python
NXAPI
XMPP

자동화 및
가시성

puppet labs
Chef
openstack

서버 관리 툴

쉬운 운영

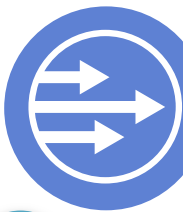
모듈러

오픈

3rd Party Apps

Programmable

DevOps에
대한 준비



Programmable Network : Open NXOS



패키지 및 애플리케이션 관리

- Yocto 기반 커널
- RPM/YUM 워크플로우를 통한 패칭 또는 업그레이드
- 호스팅 패키지를 위한 시스코 외부 저장소(Repository)



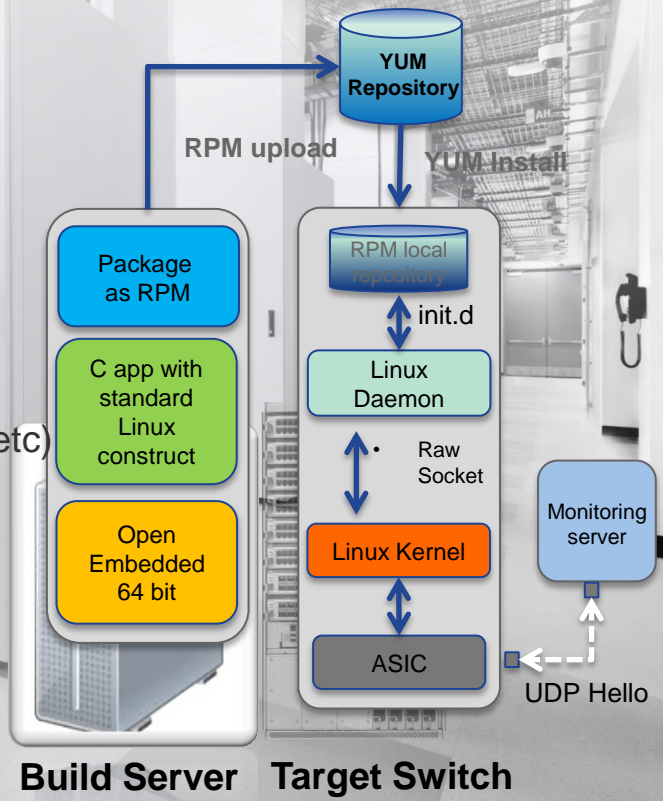
오픈 인터페이스

- 리눅스 Bash 셸(Shell) 접속 (Root and Role-based)
- 리눅스 Netdevs로서 NXOS 인터페이스(ifconfig, tcpdump etc)
- NXOS 커널 스택 인터페이스 (inject routes, install routing protocols)



ADAPTABLE NXOS

- 설정 관리(Chef/Puppet/Ansible)
- Secure LXC 컨테이너/Guest 셸





Programmable Fabric

Infrastructure Domain Administrators

Orchestrators
openstack

Hypervisor Managers
vCenter

REST API

VTS



Extensible Element Drivers

NX-API

3rd Party

Open BGP-EVPN VXLAN Fabric

Physical

Virtual

DCI/WAN

Bare Metal

Virtualized

Automated DCI / WAN

CHEF

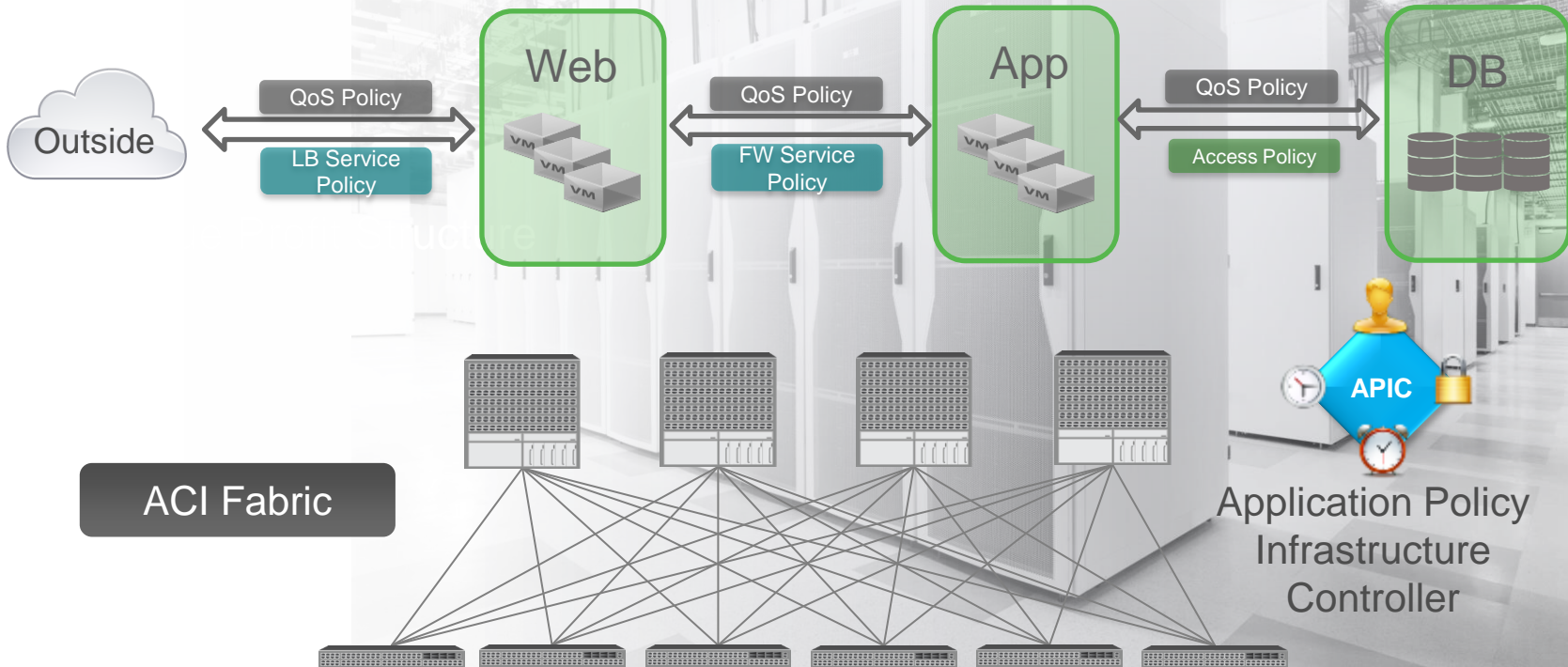
ANSIBLE

puppet labs

DevOps Style Operations / Programmability & Automation



시스코 ACI





Back to the Basic : SDN?

SDN의 성공 요소

Back to the Basic : SDN?

*“Software-defined networking (SDN) is an approach to computer networking that allows network administrators to manage network services through **abstraction** of higher-level functionality. This is done by **decoupling the system** that makes decisions about where traffic is sent (the control plane) from the underlying systems that forward traffic to the selected destination (the data plane). The inventors and vendors of these systems claim that **this simplifies networking.**”*

What is SDN? Per Wikipedia definition



SDN 개념



Directly Programmable

- Network control is directly **programmable** because it is decoupled from forwarding functions.



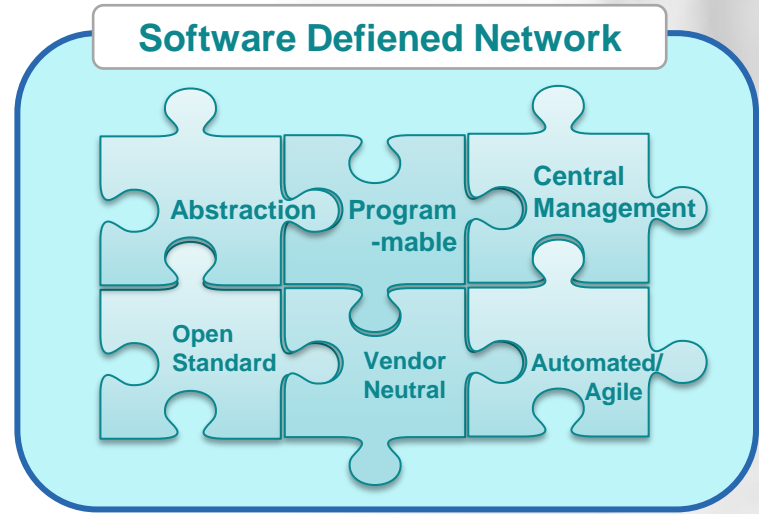
Programmatically Configured



- SDN lets network managers configure, manage, secure, and optimize network resources very quickly via dynamic, **automated** SDN programs, which they can write themselves because the programs do not depend on proprietary software.

Central Managed

- Network intelligence is (logically) centralized in software-based SDN **controllers** that maintain a global view of the network, which appears to applications and policy engines as a single, logical switch



Agile

- **Abstracting** control from forwarding lets administrators dynamically adjust network-wide traffic flow to meet changing needs.

Open Standard-based/ Vendor-neutral

- When implemented through **open standards**, SDN simplifies network design and operation because instructions are provided by SDN controllers instead of multiple, vendor-specific devices and protocols.



SDN 구성 요소

현재의 네트워크를 대체할 수 있는 **Software Defined Network**



오픈 / 표준 기반의 완벽한 프로토콜

쉬운 네트워크 구성

자동화/단순화/추상화된
프로세스 정립

표준화된 Open API

벤더 중립적이고 다양한
벤더에서 지원 가능한 **API**

DevOps/개발자 확보

네트워크 운영 방식의 변화를
이해하고, 개발할 수 있는
인력을 포용할 수 있는 조직

SDN 적용 현황 및 한계 사항

국내 SDN 적용 현황

Open Flow

제한적
기능 지원



개발자
부족



제한적
제품지원



~ 현재
2012

Open API



개발/지원
인력부족



작은
시장규모

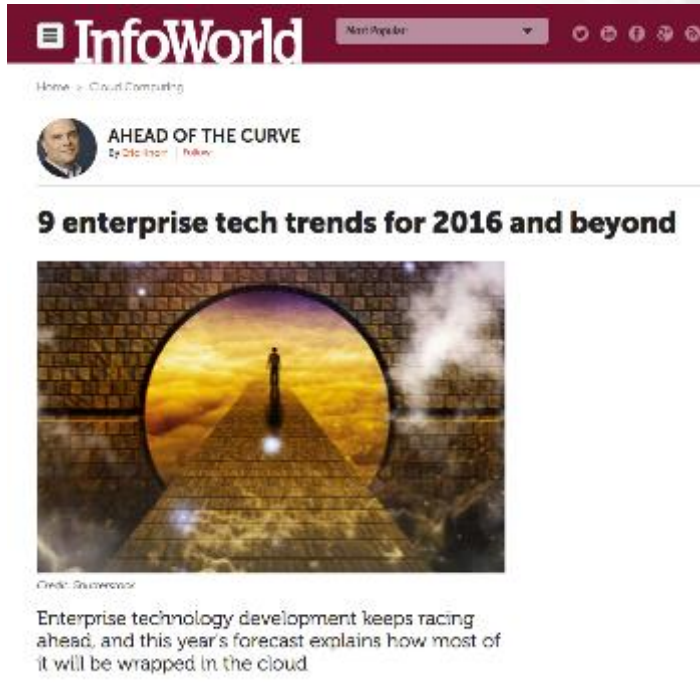


API 표준화/
제조사 지원

SDN 적용



2016 엔터프라이즈 9대 기술 트렌드



The screenshot shows the top portion of an InfoWorld article. The header includes the InfoWorld logo and a 'Next Article' dropdown menu. Below the header, there is a 'Home » Cloud Computing' breadcrumb. The article is titled 'AHEAD OF THE CURVE' by Eric Lipton and follows. The main headline is '9 enterprise tech trends for 2016 and beyond'. Below the headline is a large image of a person standing on a glowing path leading to a circular opening in a stone wall, with a bright light emanating from the opening. The text below the image reads: 'Enterprise technology development keeps racing ahead, and this year's forecast explains how most of it will be wrapped in the cloud.'

1. 'Cloud native' shapes the future
2. Spark 'streaming' accelerates
3. Developers tap into machine learning
4. Cisco's ACI reinvigorates SDN (시스코 ACI가 SDN에 활력을 불어넣다)
5. PaaS gets a second chance

<http://www.infoworld.com/article/3007057/cloud-computing/9-enterprise-tech-trends-for-2016-and-beyond.html>

지난 1년여간의 성과 : ACI

4,100+

Nexus 9K and ACI Customers Globally

1000+

ACI Customers

45+

Ecosystem Partners





Cisco ACI(Application Centric Infrastructure)

정책 기반의 데이터 센터 네트워크 구축

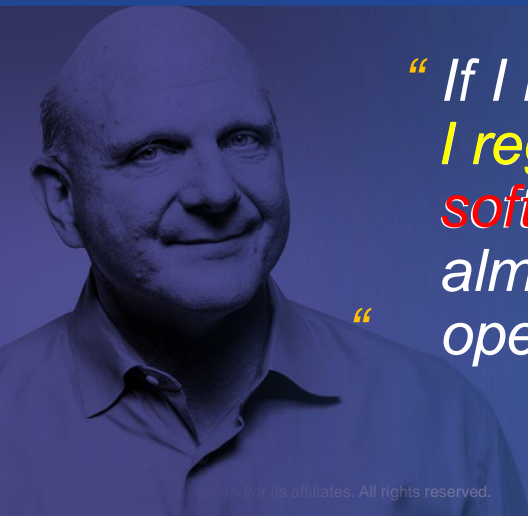
*“ If you care about the software, **you should care about the hardware**. [...and the data center, ...and the network, ...and the back office...] ”*

~ Steve Jobs



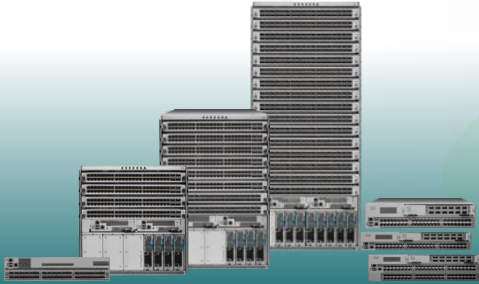
*“ If I look back with 20-20 hindsight, the thing I regret is that we didn't put the **hardware and software together soon enough**,” he said. “It was almost magical the way the PC came about with an operating system from us and hardware from IBM...”*

~ Steve Balmer, Forbes, 3/4/14

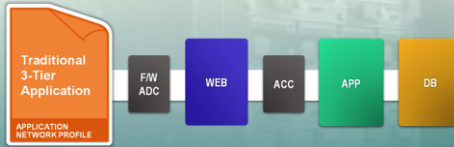


Cisco ACI 구성 요소

스케일, 보안, 완벽한 가시성에 기반한
애플리케이션의 빠른 적용



NEXUS 9500 및 9300



**APPLICATION CENTRIC
POLICY**



CONTROLLER

ACI

Cisco ACI 주요 특징

Best of
INTEROP[®]
2015 Awards



Application Centric
Infrastructure



▶ 정책 기반의 자동화된 프로비저닝



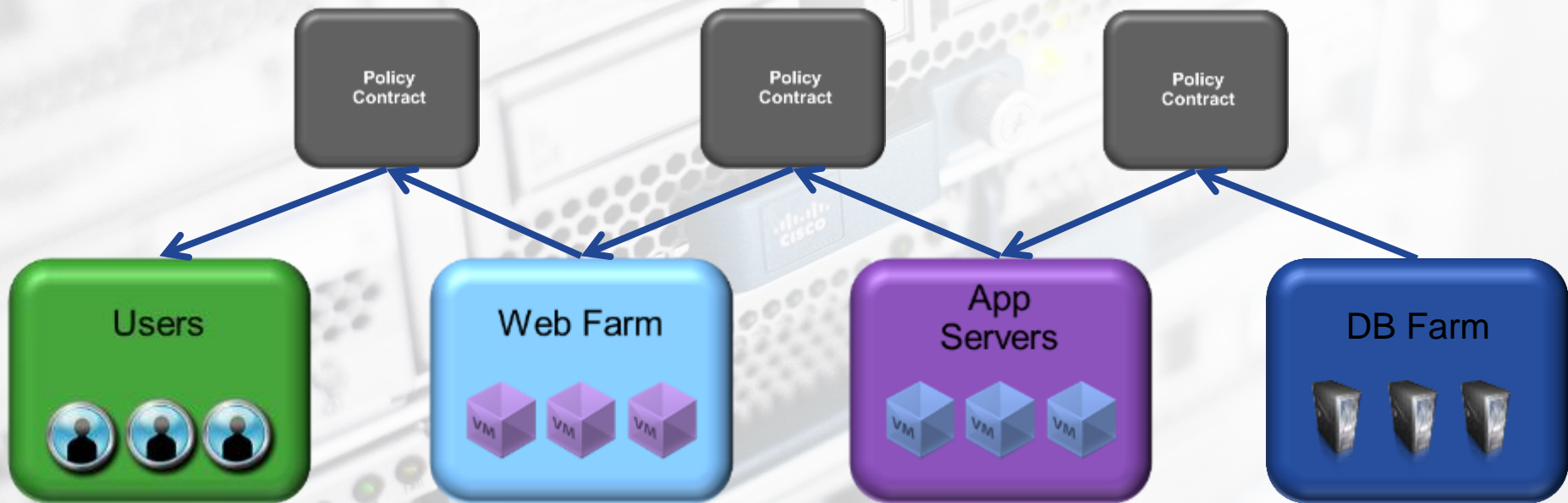
▶ 물리적/가상 서버 및 컨테이너 통합



▶ 오픈/표준 기반 솔루션



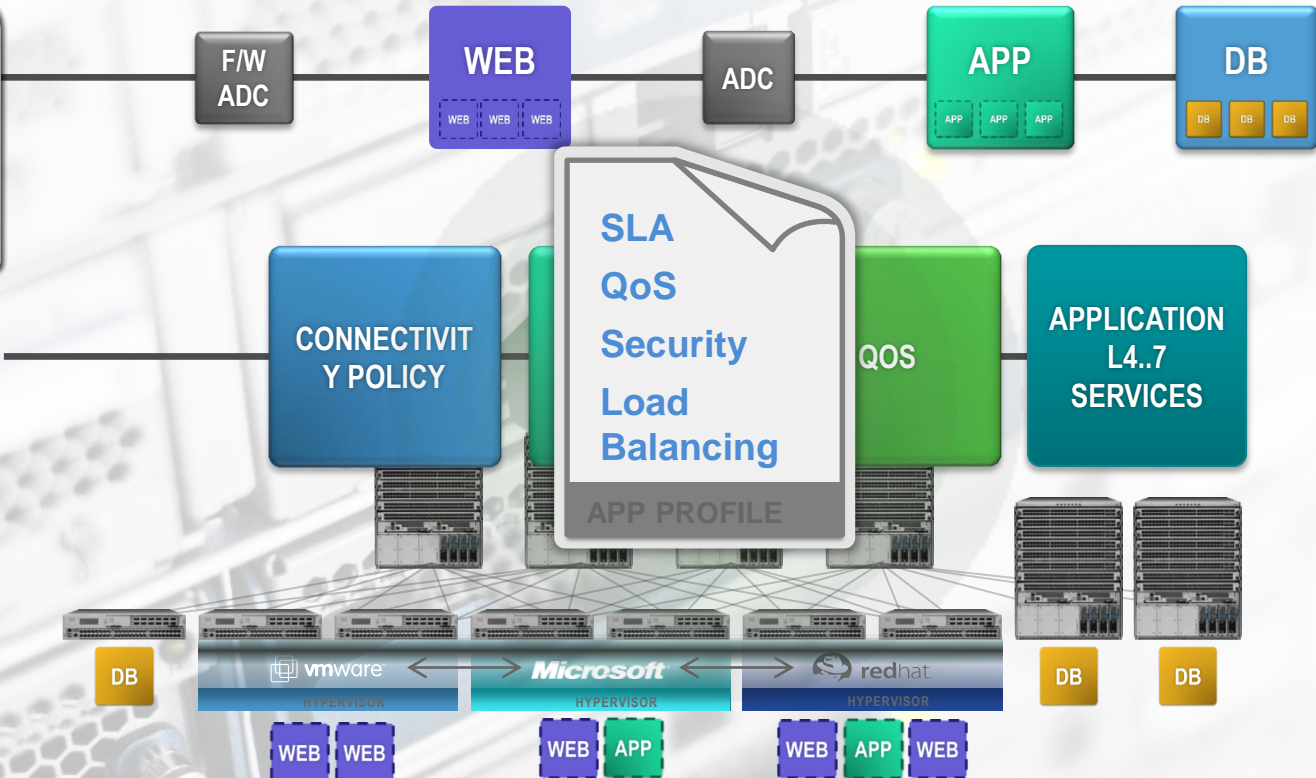
정책 기반의 애플리케이션 및 관계 정의





정책 기반의 자동화된 프로비저닝

Traditional 3-Tier Application
APP PROFILE



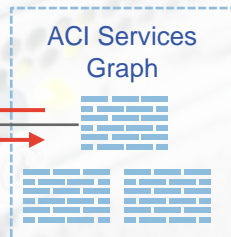


L4-L7 서비스 통합 정의 : NFV

L4-7 Service Automation



L4-7 Services



Available Now

Q4 CY 2015



L4- L7 Device Package

완벽한 L4-L7 중앙집중형 서비스 자동화 (디바이스 패키지 사용)
큰 규모의 에코시스템 및 투자 보호



No Device Package



Service Cluster Manager

중앙 집중형 네트워크 자동화 (디바이스 패키지 미사용)
다양한 L4-L7 서비스(NFV) 기능 지원

Cisco ACI 주요 특징

Best of
INTEROP[®]
2015 Awards



Application Centric
Infrastructure



정책 기반의 자동화된 프로비저닝



물리적/가상 서버 및 컨테이너 통합



오픈/표준 기반 솔루션



물리적/가상 서버(하이퍼바이저) 및 컨테이너



Server



Virtual Machines & Containers



Storage



Client

- ▶ 네트워크에 직/간접적으로 연결된 장비
- ▶ 주소(Address), 위치(location), 속성 값(Attribute - version, patch level)
- ▶ 물리적(Physical)/가상(Virtual)/컨테이너(Container)

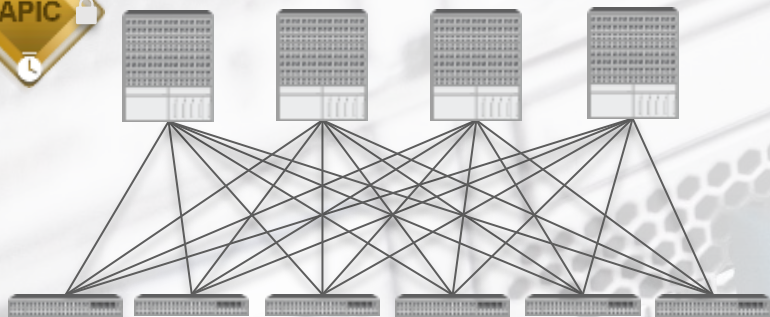
• 예:

• End Point Group (EPG) 멤버 정의:

- Ingress physical port (leaf or FEX)
- Ingress logical port (VM port group)
- VLAN ID
- VXLAN (VNID)
- IP Prefix/Subnet
- IP address (so far only applicable to external/border leaf connectivity)
- NVGRE (VSID) (future)
- VM-based attributes (future)
- Layer 4 ports (future)



하이퍼바이저 통합 : VMM Domain



vCenter DVS



VMM Domain 1

SCVMM



VMM Domain 2

OpenStack

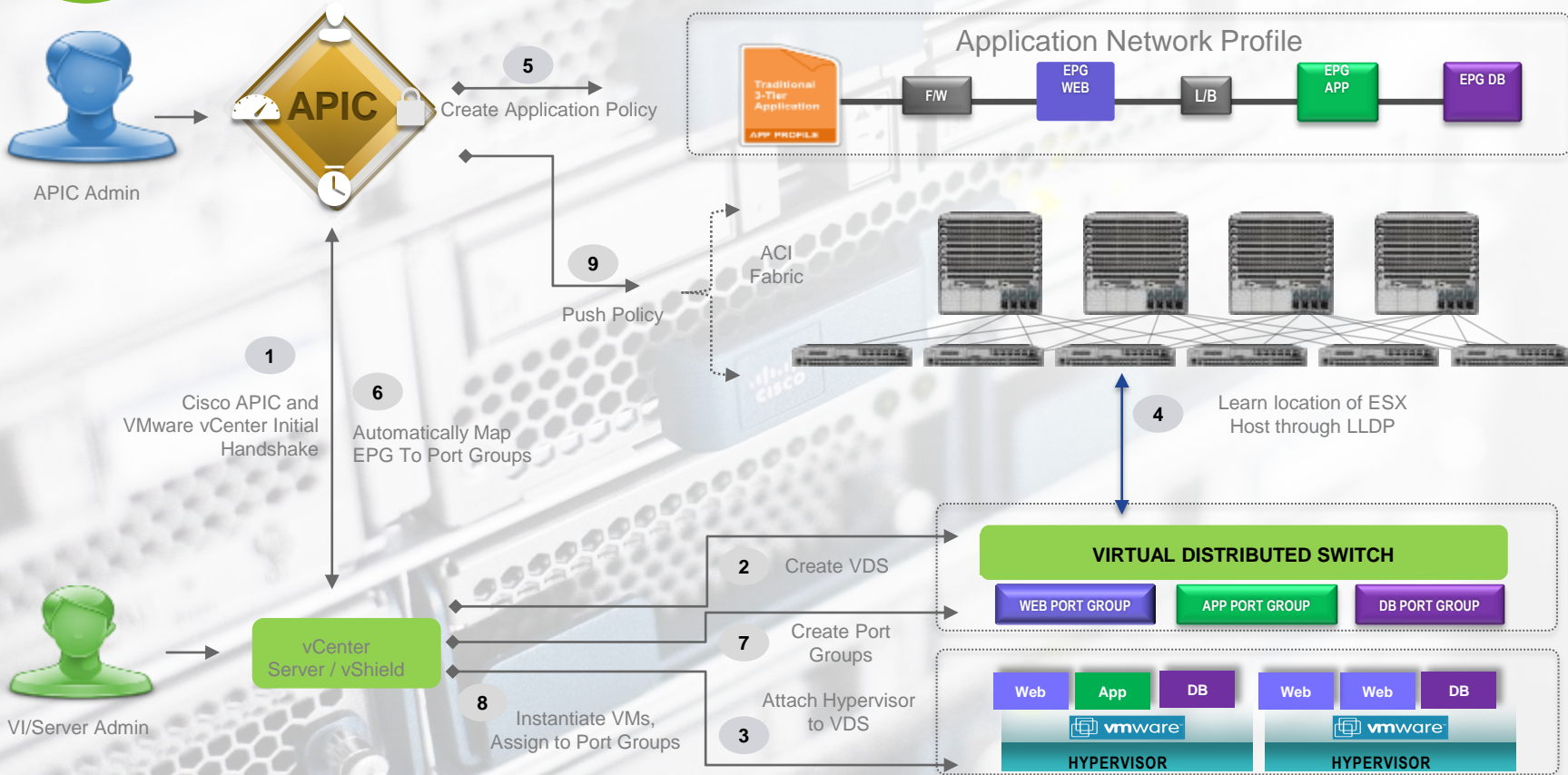


VMM Domain 3

- Relationship is formed between APIC and Virtual Machine Manager (VMM)
- Multiple VMMs likely on a single ACI Fabric
- Each VMM and associated Virtual hosts are grouped within APIC
- Called VMM Domain
- There is 1:1 relationship between a Virtual Switch and VMM Domain



하이퍼바이저 통합 : VMware dVS





하이퍼바이저 통합 : VMware dVS

Domain - vmware-dvs

PROPERTIES

Name: **vmware-dvs**

CONTROLLERS	NAME	STATE	MODEL	SERIAL	REVISION	HYPERVISORS	VIRTUAL MACHINES
	vCenter	Online	VMware vCenter Server 5.1.0 bu...	C974564D-08...	5.1.0	3	6

1 OF 1

ITEMS PER PAGE: 15

DISPLAYING OBJECTS 1 - 1 OF 1

What is a vSphere Distributed Switch?

A vSphere Distributed Switch acts as a single virtual switch across all associated hosts. This allows virtual machines to maintain consistent network configuration as they migrate across hosts.

Distributed virtual networking configuration consists of three parts. The first part takes place at the datacenter level, where vSphere Distributed Switches are created, and hosts and distributed port groups are added to vSphere Distributed Switches. The second part takes place at the host level, where host ports and networking services are associated with vSphere Distributed Switches either through individual host networking configuration or using host profiles. The third part takes place at the virtual machine level, where virtual machine NICs are connected to distributed port groups either through individual virtual machine NIC configuration or by migrating virtual machine networking from the vSphere Distributed Switch itself.

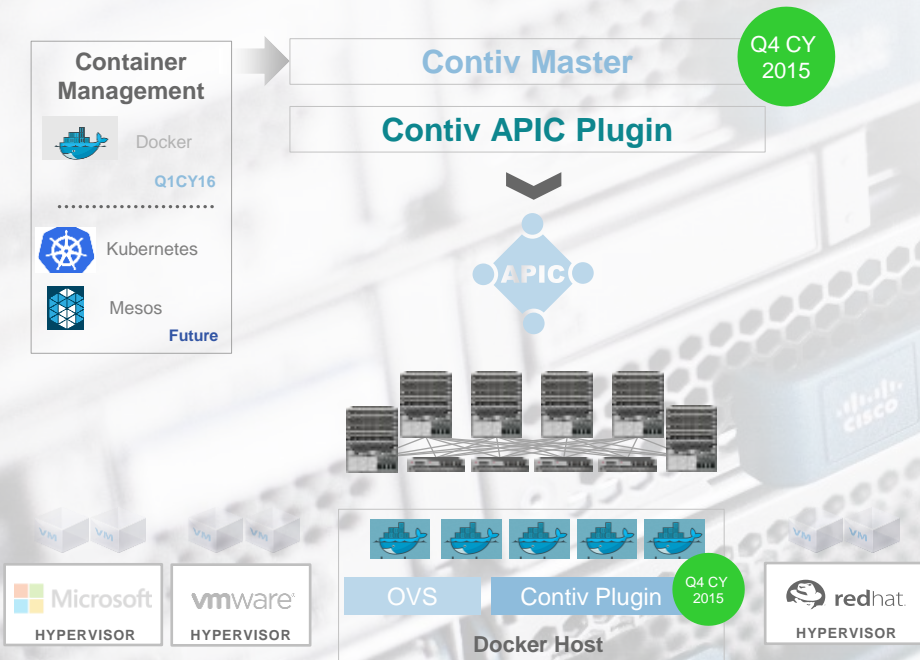
Explore Further

<ACI 컨트롤러>

<vCenter>



Open Source Docker Container 통합



프로젝트 Contiv

- 컨테이너 설치 정책을 정의하기 위한 운영 정책을 정의하기 위한 오픈 소스 프로젝트
- Docker 네트워킹 플러그인과 ACI 컨트롤러 (APIC) 통합

솔루션 하이라이트

- ACI 정책은 물리적 서버, 가상 머신, Docker 컨테이너에 상관없이 일관되게 적용 가능
- 오픈 소스 프로젝트 Contiv는 Docker 컨테이너와 ACI를 통합하기 위한 프로젝트

물리적/가상화 서버 및 컨테이너에 대해 일관된 통합 정책 적용 및 자동화

Cisco ACI 주요 특징

Best of
INTEROP[®]
2015 Awards



Application Centric
Infrastructure



▶ 정책 기반의 자동화된 프로비저닝



▶ 물리적/가상 서버 및 컨테이너 통합



▶ 오픈/표준 기반 솔루션



오픈/표준 기반의 플랫폼

자동화



하이퍼바이저
관리



엔터프라이즈
모니터링



시스템 관리



오케스트레이션
프레임워크



REST API

NORTHBOUND PROGRAMMABILITY LAYER



Fabric-attached Device API



L4-7 Orchestration Scripting API



SOUTHBOUND PROGRAMMABILITY LAYER

APIC SUPPORTS A RICH ECOSYSTEM BUILT AROUND OPEN NORTHBOUND AND SOUTHBOUND APIS



ACI/OpenStack 통합 : GBP, OpFlex

OpenStack Controller

Group-based Policy

Apic MI2 Driver



Q4 CY 2015

OpFlex Proxy

Q4 CY 2015

Hypervisor

OVS

OpFlex Agent

OVS와 OpFlex

- 오픈 소스 OpFlex Agent는 ACI의 정책을 리눅스 하이퍼바이저로 확장
- OpFlex Proxy exposes new open API in ACI fabric

오픈스택 기능 하이라이트

- NAT를 포함한 완벽한 분산형 Neutron 네트워크 기능
- 오버레이 및 언더레이 패브릭 통합, 중앙 집중형 관리
- 오픈스택, 리눅스, APIC의 통합 운영 정보 가시성
- 가상 네트워크 또는 Group-based Policy 기반 네트워킹 선택

Available Now!

주요 오픈스택 배포판 지원



CANONICAL





ACI/OpenStack 통합 : VMM

OpenStack VMM Domain

Per Hypervisor / Per Group View

Per EP stats, Health scores, faults

KVM Hypervisor Operational Data

VM NAME	INTERFACE NAME	IP	MAC	ENCAP	STATE	PORT
Web-Server-1	tapb371122...	192.103.0.4	FA:16:3E:C6...	vxlan-76021...	Up	admin noiro lab app BACKUP...
Web-Server-1	tapb371122...	192.103.0.4	FA:16:3E:C6...	vxlan-76021...	Up	admin noiro lab app BACKUP...
Web-Server-1	tapb322200...	1.103.1.4	FA:16:3E:E8...	vxlan-73400...	Up	common noiro lab app NAT-e...
Web-Server-1	tapb322200...	192.103.2.2	FA:16:3E:E8...	vxlan-75694...	Up	admin noiro lab app WEBPTG
Web-Server-1	tapb322200...	192.103.2.2	FA:16:3E:E8...	vxlan-75694...	Up	admin noiro lab app WEBPTG
Web-Server-1	tapb322200...	1.103.1.4	FA:16:3E:E8...	vxlan-73400...	Up	common noiro lab app NAT-e...



Open API/Programmable

Programmable Open APIs

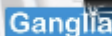
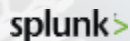
RESTful APIs

ACI Toolkit



3rd Party 에코시스템

Built by Third Party



표준 기반

OpFlex

Group-Based Policy

VXLAN

1/10G, 40G, 100G



I E T F

오픈 소스

ACI Toolkit



GitHub



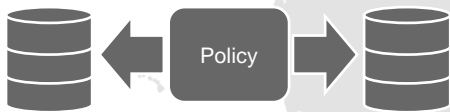
Summary

정책 기반의 데이터 센터 네트워크 구축

Summary

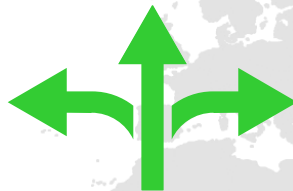
SDN의 목적은..

클라우드와
정책 기반의 데이터센터



We're on a Journey for Clouds

SDN의 3가지 전략과 선택



Programmable Network
Programmable Fabric
Application Centric Infrastructure

SDN 현황과 목적



Abstraction
Decoupling the Systems
Simplify Networking

SDN의 궁극적인 목적은 비즈니스/업무 민첩성을 위한 도구

클라우드로의 기나긴 여정

시스코 데이터 센터 및 클라우드 비전

Traditional Applications

Cloud-Native Applications

Policy-Driven
Integrated Infrastructure

Private and Hybrid
Cloud Software

Cloud Offers

Analytics

ONE

Network
Compute
Storage

UCS

SDN /
ACI

Analytics

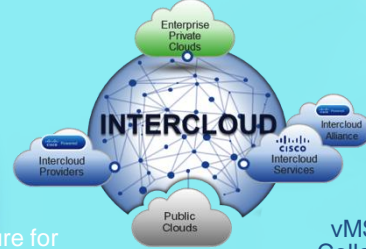
Enterprise
Cloud Suite

Metapod

Intercloud Services

Connected
Analytics

Big Data and
Analytics
Ecosystem



Architecture for
Microsoft Cloud

vMS, NFVi
Collaboration
SP Video



Security

Data Center

Cloud

Edge

Efficiency

Speed

Digitization



CISCO

TOMORROW starts here.