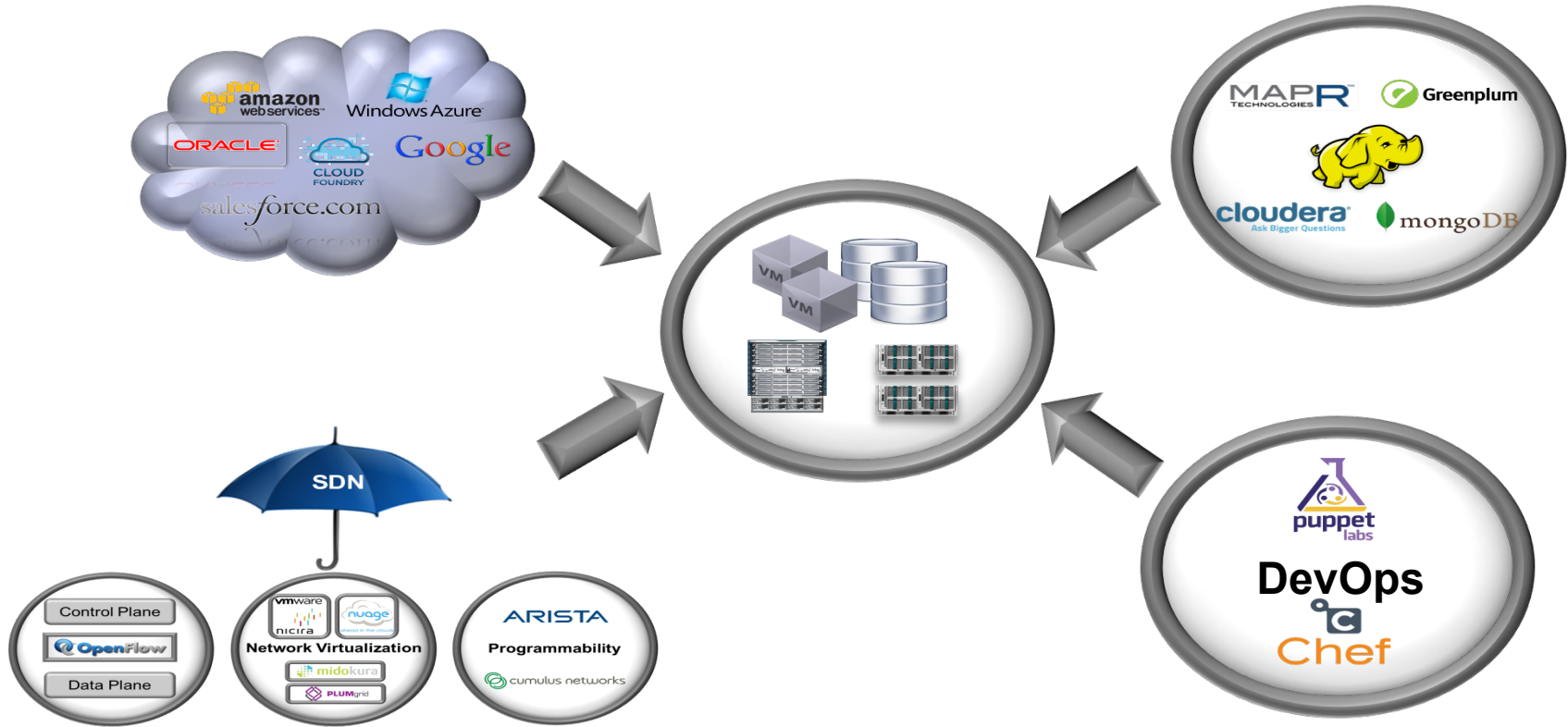# ACI-SE M02

ACI Hardware Portfolio

Agenda

- SDN and Fabric Overview

- ACI Overview

- Portfolio

- PIDs

- Pricing / Service

- Bundles

- Scalability

Industry Trends

New operational models are driving the need for infrastructure change.

Software Defined Networking

SDN

Control Plane

OpenFlow

Data Plane

vmware nicira

nuage — ahead in the clouds

Network Virtualization

midokura

PLUMgrid

ARISTA

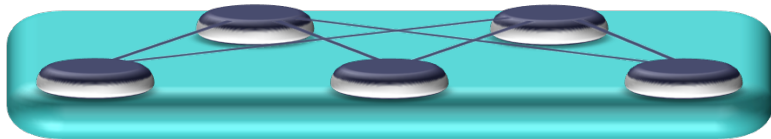**Programmability**

cumulus networks
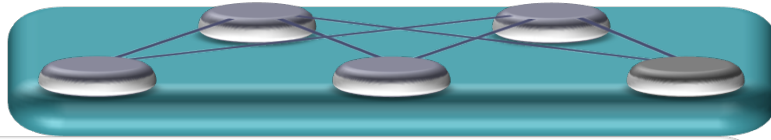
Software Overlays – Network Virtualization

Virtual Network 1

Virtual Network 2

Virtual Network 3

L3 routed non-blocking ECMP Fabric

NVGRE

Outer Ethernet	Outer IP	GRE	Inner Ethernet	Payload	New FCS

VxLAN

Outer Ethernet	Outer IP	Outer UDP	VXLAN	Inner Ethernet	Payload	New FCS
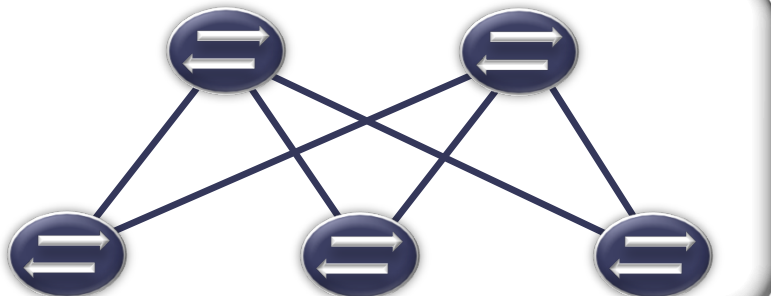
Encapsulated traffic carried over CLOS fabric

Introduction to Application Centric Infrastructure (ACI)
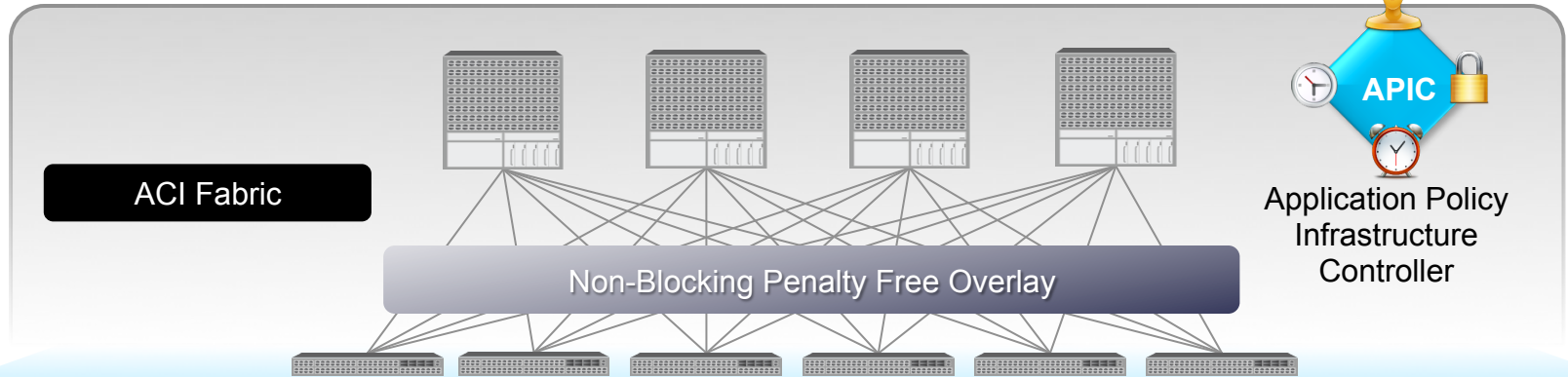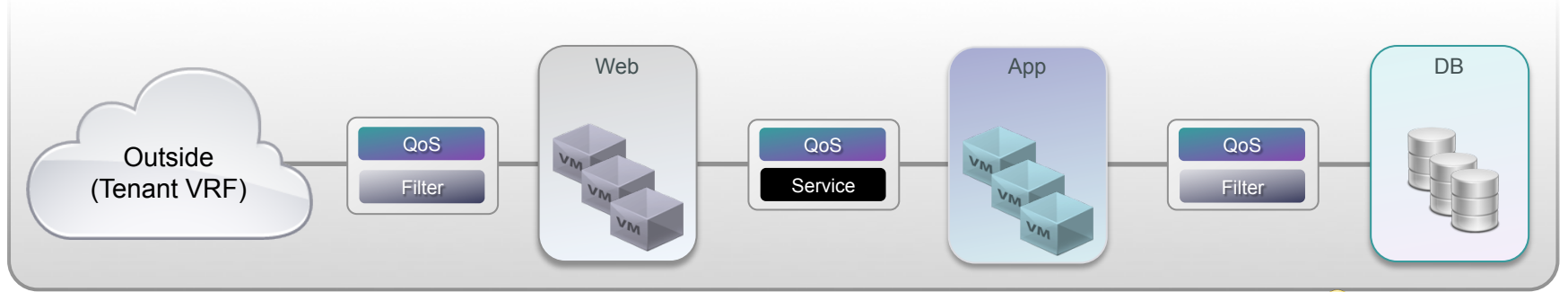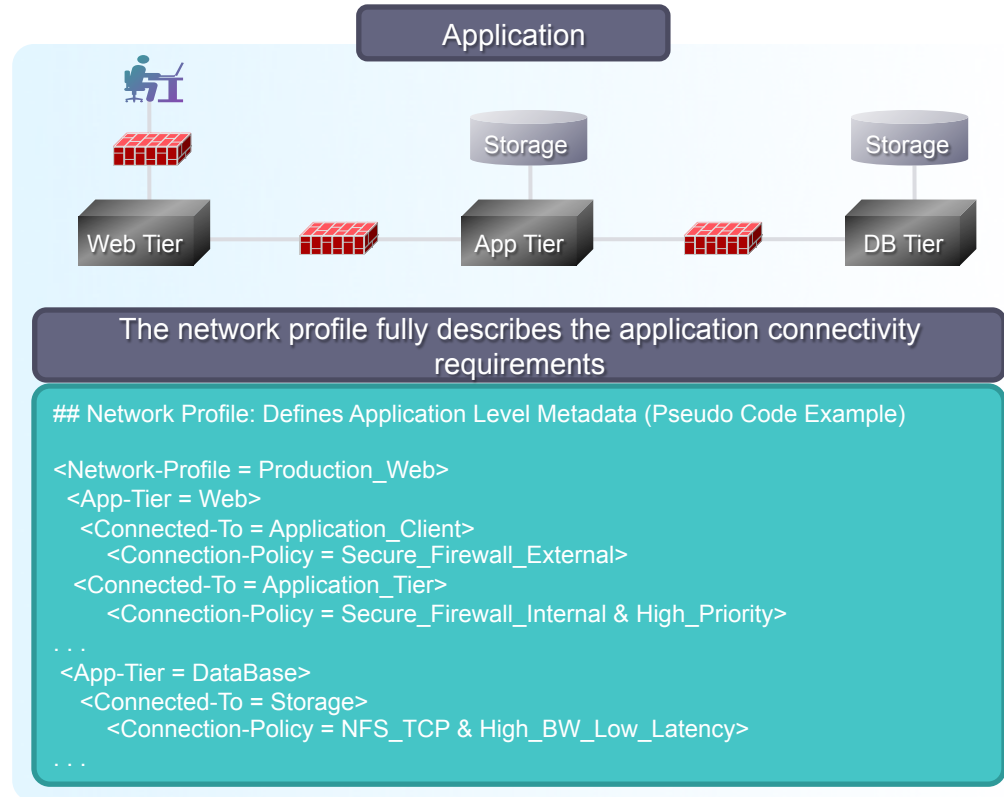
ACI Introduces Logical Network Provisioning of Stateless Hardware

ACI Network Profile
Policy-Based Fabric Management

- Extend the principle of Cisco UCS® Manager service profiles to the entire fabric
- Network profile: stateless definition of application requirements
  - Application tiers
  - Connectivity policies
  - Layer 4 – 7 services
  - XML/JSON schema
- Fully abstracted from the infrastructure implementation
  - Removes dependencies of the infrastructure
  - Portable across different data center fabrics

Application

Storage   Storage

Web Tier   App Tier   DB Tier

The network profile fully describes the application connectivity requirements

```
## Network Profile: Defines Application Level Metadata (Pseudo Code Example)

<Network-Profile = Production_Web>
  <App-Tier = Web>
    <Connected-To = Application_Client>
        <Connection-Policy = Secure_Firewall_External>
    <Connected-To = Application_Tier>
        <Connection-Policy = Secure_Firewall_Internal & High_Priority>
. . .
  <App-Tier = DataBase>
    <Connected-To = Storage>
        <Connection-Policy = NFS_TCP & High_BW_Low_Latency>
. . .
```
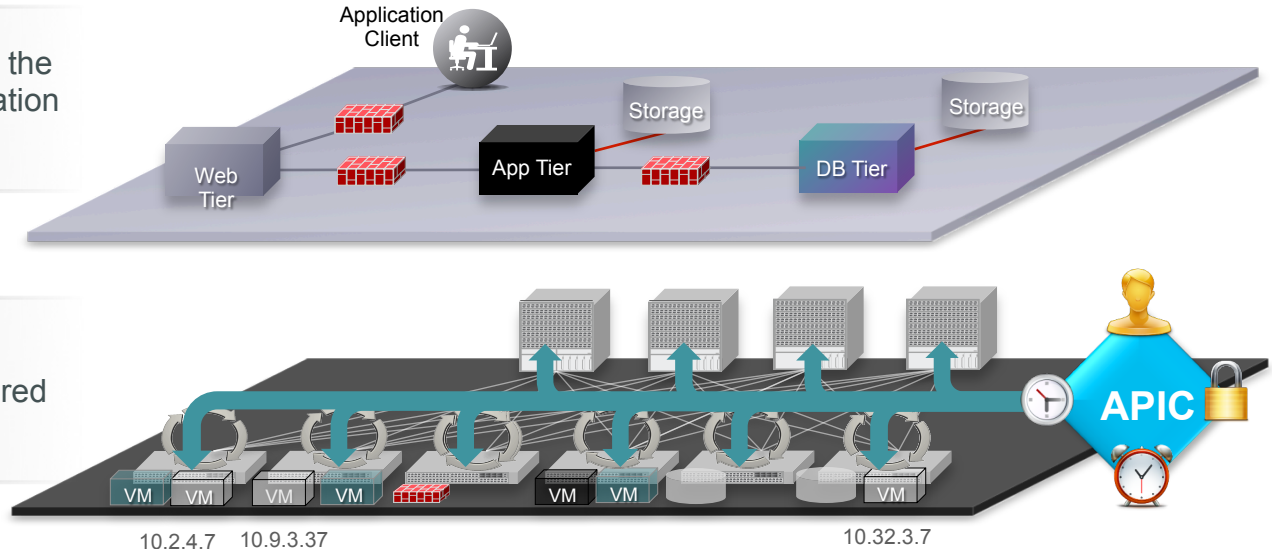
Application Policy Model and Instantiation

Application policy model: Defines the application requirements (application network profile)

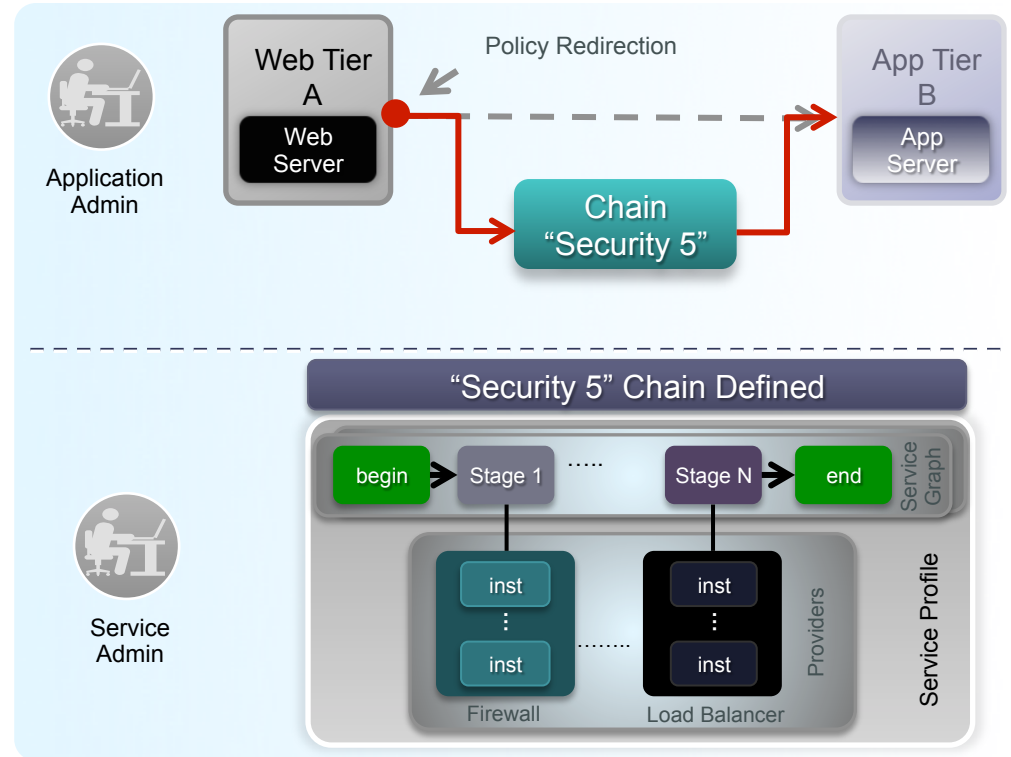**Policy instantiation**: Each device dynamically instantiates the required changes based on the policies

All forwarding in the fabric is managed through the application network profile
- IP addresses are fully portable anywhere within the fabric
- Security and forwarding are fully decoupled from any physical or virtual network attributes
- Devices autonomously update the state of the network based on configured policy requirements

ACI Layer 4 - 7 Service Integration
Centralized, Automated, and Supports Existing Model

- Elastic service insertion architecture for physical **and** virtual services

- Helps enable administrative separation between application tier policy and service definition

- APIC as central point of network control with policy coordination

- Automation of service bring-up / tear-down through programmable interface

- Supports existing operational model when integrated with existing services

- Service enforcement guaranteed, regardless of endpoint location

Application Admin

Web Tier A

Web Server

Policy Redirection

App Tier B

App Server

Chain "Security 5"

Service Admin

"Security 5" Chain Defined

begin | Stage 1 | ..... | Stage N | end

Service Graph

inst

inst

inst

inst

Providers

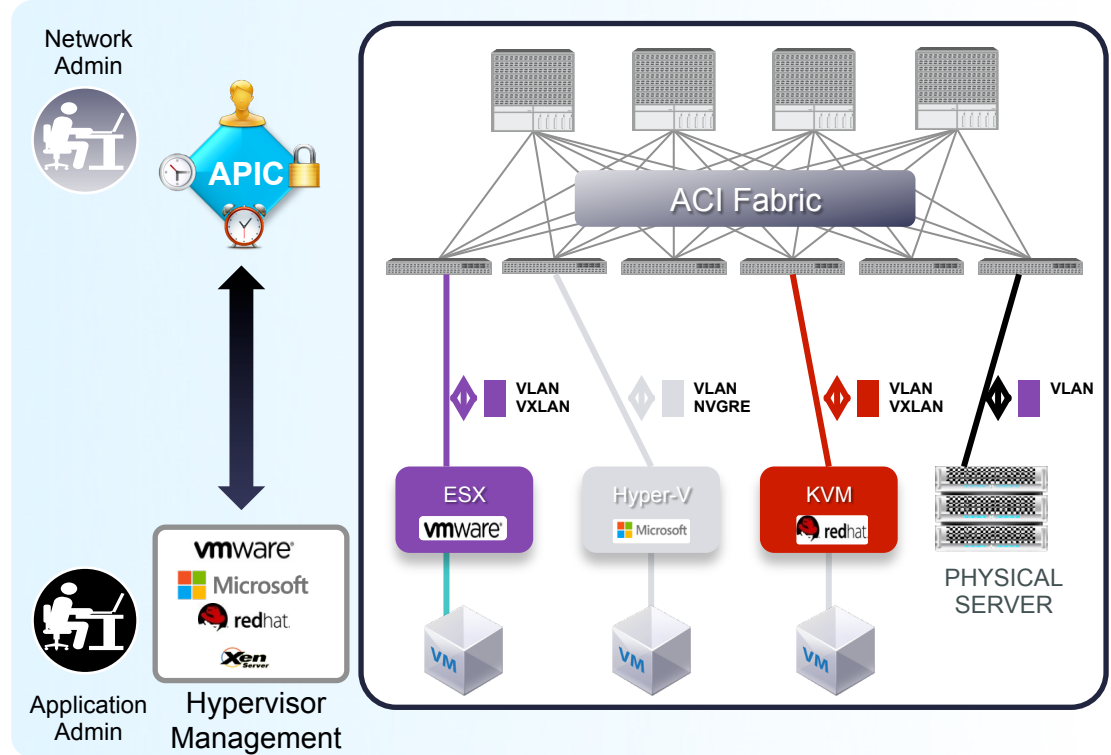Service Profile

Firewall

Load Balancer

Multi-Hypervisor-Ready Fabric

Hypervisor Integration — APIC

- Integrated gateway for VLAN, VxLAN, NVGRE networks from virtual to physical

- Normalization for NVGRE, VXLAN, and VLAN networks

- Customer not restricted by a choice of hypervisor

- Fabric is ready for multi-hypervisor

Network Admin

APIC

Application Admin

Hypervisor Management

vmware
Microsoft
redhat
Xen Server

ACI Fabric

VLAN VXLAN

VLAN NVGRE

VLAN VXLAN

VLAN

ESX
vmware

Hyper-V
Microsoft

KVM
redhat

PHYSICAL SERVER

VM

VM

VM

ACI Fabric Infrastructure

Endpoint based forwarding with Distributed Policies

All single port can support all encapsulations simultaneously

Forwarding is defined by Policy EPG 'Web' can talk to EPG 'DB' independent of IP subnet, VLAN/VXLAN, VRF is Policy says it should
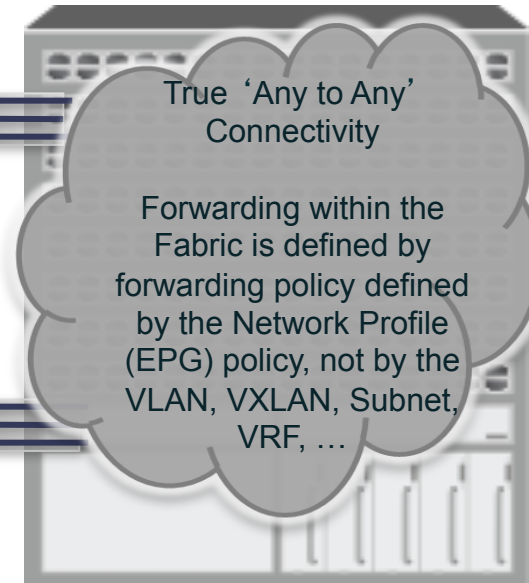
NVGRE
VSID 5165

802.1Q
VLAN 55

VXLAN
VNID 8765

10.10.11.12
VRF Shared

10.10.11.12
VRF Retail Bank

192.168.11.3
VRF Storage

True 'Any to Any' Connectivity

Forwarding within the Fabric is defined by forwarding policy defined by the Network Profile (EPG) policy, not by the VLAN, VXLAN, Subnet, VRF, …

Outside
(Tenant
VRF)

QoS
Filter

Web

QoS
Service

App

QoS
Filter
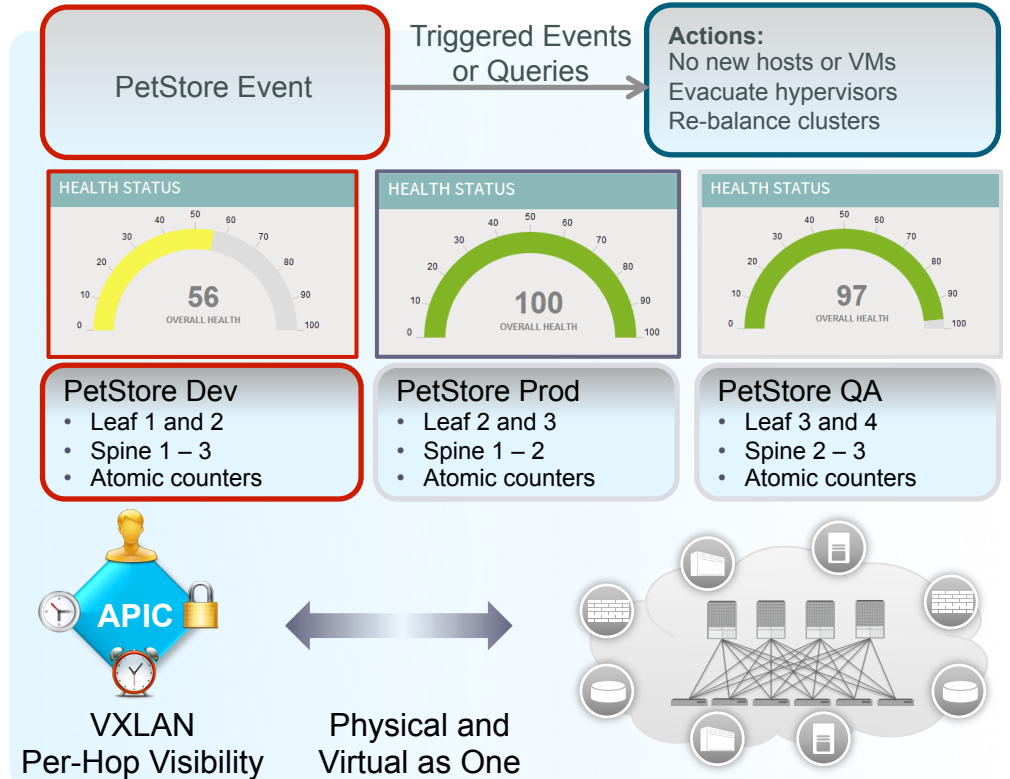
DB

Application Awareness
Application-Level Visibility

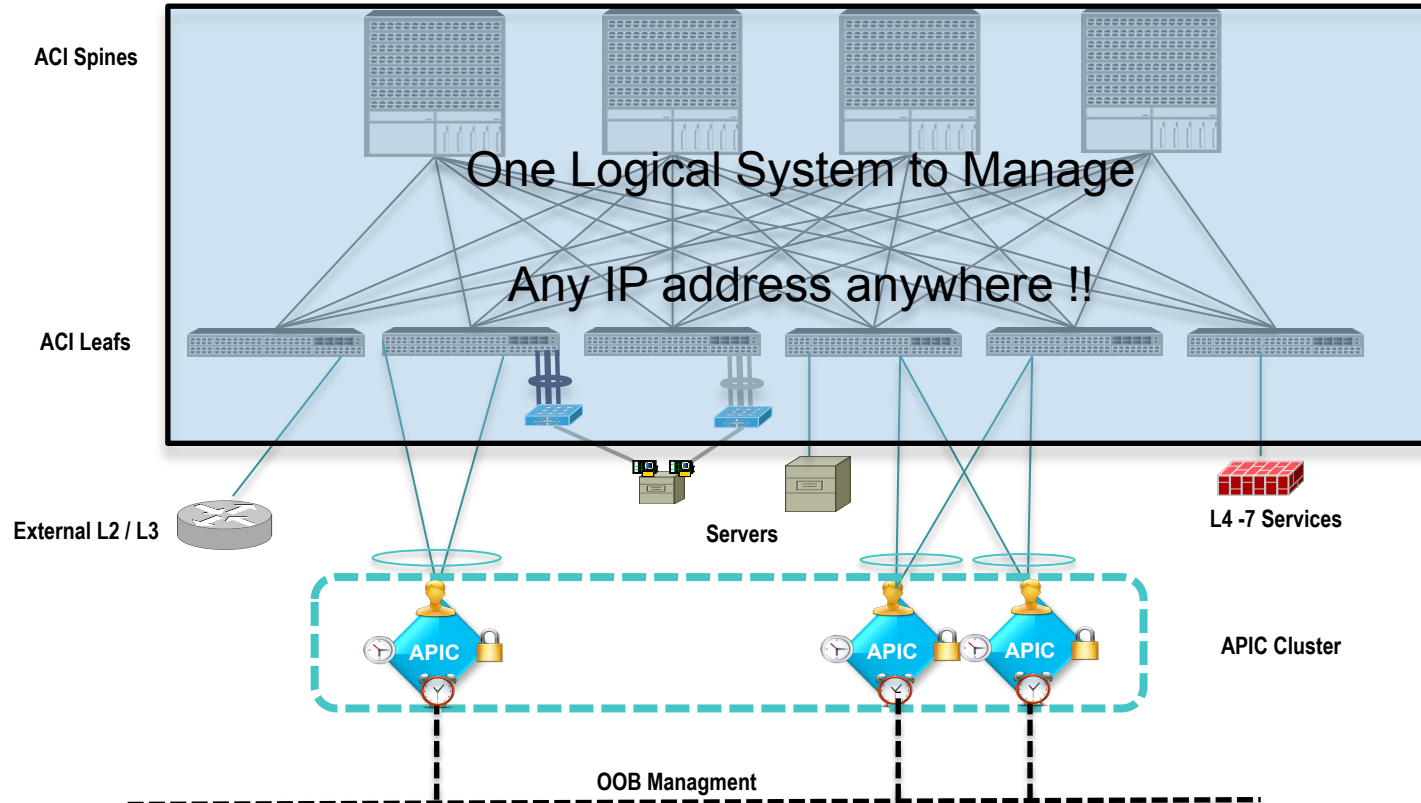ACI Fabric provides the next generation of analytic capabilities

Per application, tenants, and infrastructure:

- Health scores
- Latency
- Atomic counters
- Resource consumption

Integrate with workload placement or migration

PetStore Event

Triggered Events or Queries →

Actions:
No new hosts or VMs
Evacuate hypervisors
Re-balance clusters

HEALTH STATUS

56
OVERALL HEALTH

HEALTH STATUS

100
OVERALL HEALTH

HEALTH STATUS

97
OVERALL HEALTH

PetStore Dev
- Leaf 1 and 2
- Spine 1 – 3
- Atomic counters

PetStore Prod
- Leaf 2 and 3
- Spine 1 – 2
- Atomic counters

PetStore QA
- Leaf 3 and 4
- Spine 2 – 3
- Atomic counters

APIC

VXLAN
Per-Hop Visibility

Physical and
Virtual as One

ACI Fabric

ACI Spines

One Logical System to Manage

Any IP address anywhere !!

ACI Leafs

External L2 / L3

Servers

L4 -7 Services

APIC Cluster

APIC

APIC APIC

OOB Managment

Common Hardware Platform: Two Modes

APPLICATION CENTRIC INFRASTRUCTURE

APIC

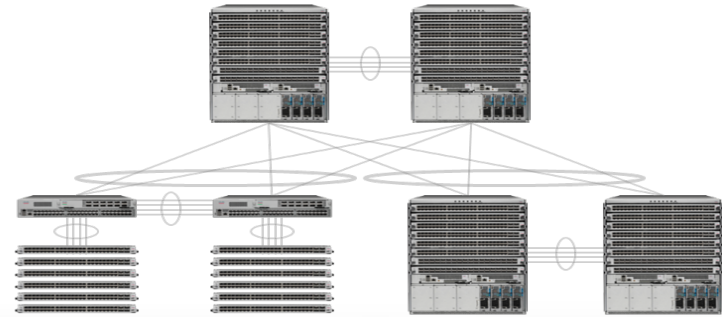Agility and Visibility | Simplicity | Automation | Open | Security | Scale and Performance

ENHANCED NX-OS

PROGRAMABILITY—40 GigE—PRICE/PERFORMANCE

Existing Network Model

Two modes of operation to support different operational models

Portfolio – ACI FCS

1. ## Spine
   - Modular Spine 8x 36p 40G
   - Fixed Spine 36p 40G

2. ## Leaf (Fixed)
   - 48p 1/10GF + 12Q
   - 48p 1/10GT + 12Q
   - 96p 1/10GT + 8Q
   - FEX

3. ## APIC Appliance
   - Small <1,000 edge ports
   - Large >1,000 edge ports

4. ## Interconnect
   - 40G links

Note:
- No modular leaf at FCS
- APIC sold as appliance, cluster of 3 required

Portfolio Additions – ACI Post FCS

1. ## Spine
   - Modular Spine Q3 CY14
        - 4x 36p 40G
        - 16x 36p 40G

2. ## Leaf
   Q3CY14
   - 48p 10G + 6Q (1RU)
   - 26p 40G + 6Q (1RU)

   Q4CY14
   - 96p 10G + 8Q (2RU)
   - 20p 40G + GEM (2RU)

   Modular Leaf (Radar)

3. ## APIC Appliance

Spine

Modular

- N9K-C9508-B2

- N9K-X9736PQ

Fixed

- N9K-C9336PQ

Leaf

FCS

- N9K-C9396PX

- N9K-C9396TX

- N9K-C93128TX

Q3CY14

- N9K-C9372TX

- N9K-C9372PX

- N9K-C9332PQ

Q4CY14

- N9K-C93128TX2

- N9K-C93128PX2

- N9K-C9332PQ2

APIC

- **Appliance**
  - APIC-S, APIC-CLUSTER-S
  - APIC-L, APIC-CLUSTER-L

- **Leaf SW License**
  - ACI-SW-48X
  - ACI-SW-96X
  - ACI-SW-26Q
  - ACI-SW-36Q
  - ACI-SW-1VS

- **Leaf SW Upgrade**
  - tbd

Modular: Nexus 9500 Line Card Types

Line Cards	Ports	ASICs on Line Card	OS	Fabric Modules	Chassis Support
X9600					
X9636PQ	36p QSFP+	3 T2	NX-OS	6	N9504, N9508
X9612PC	12p 100G (form factor TBD)	3 T2	NX-OS	6	N9504, N9508
X9500					
X9564PX	48p 1/10G SFP+ and 4p QSFP+	2 T2 & 2 ALE	NX-OS, ACI	3	N9504, N9508, N9516
X9564TX	48p 1/10G-T and 4p QSFP+	2 T2 & 2 ALE	NX-OS, ACI	3	N9504, N9508, N9516
X9536PQ	36p QSFP+ (1.5:1)	2 T2 & 2 ALE	NX-OS, ACI	3	N9504, N9508, N9516
X9700					
X9736PQ	36p QSFP+	2 ASE	ACI	6	N9504, N9508, N9516
X9400					
X9464PX	48p 1/10G SFP+ and 4p QSFP+	1 T2	NX-OS	2	N9504, N9508, N9516
X9464TX	48p 1/10G-T and 4p QSFP+	1 T2	NX-OS	2	N9504, N9508, N9516
X9432PQ	32p QSFP+	2 T2	NX-OS	4	N9504, N9508, N9516

Fixed: Nexus 9300

Line Cards	Ports	ASICs	OS	RU	Uplink Module
N9396PX	48p 1/10G SFP+ and 12p QSFP+	1 T2, 1 ALE	NX-OS, ACI	2	Y
N9396TX	48p 1/10G-T and 12p QSFP+	1 T2, 1 ALE	NX-OS, ACI	2	Y
N93128TX	96p 1/10G-T and 8p QSFP+	1 T2, 1 ALE	NX-OS, ACI	3	Y
N93128TX2	96p 1/10G-T and 8p QSFP+	1 T2, 1 ALE	NX-OS, ACI	2	N
N93128PX2	96p 1/10G SFP+ and 8p QSFP+	1 T2, 1 ALE	NX-OS, ACI	2	N
N9372PX	48p 1/10G SFP+ and 6p QSFP+	1 T2, 1 ALE	NX-OS, ACI	1	N
N9372TX	48p 1/10G-T and 6p QSFP+	1 T2, 1 ALE	NX-OS, ACI	1	N
N9332PQ	32p QSFP+	1 T2, 1 ALE	NX-OS, ACI	1	N
N9332PQ2	32p QSFP+	1 T2, 1 ALE	NX-OS, ACI	2	Y
N9336PQ	36p QSFP+	**2 ASE**, 2 T2	ACI	2	N

Pricing/ Service

- Perpetual Pricing at FCS

- Existing HW pricing for Nexus 9000 + 40G Interconnect Optics

- NEW: APIC pricing (appliance cluster + Leaf SW license) ~ 25 to 30% uplift to HW

- SmartNet Service per chassis / TOR – **same** for NX-OS and APIC mode

Note: No per end point pricing (virtual or physical)

Bundles/ Starter Kits

Existing (Mar'14)

1. **Commercial Bundle 1 - $50,000 US List**
    - 96p 1/10G SFP+ & 24p 40G uplinks
    - PID: N9K-C9396PX-B18Q
    - 2 N9396PX + 8 BiDi QSFP+
    - 31% bundle discount

2. **Commercial Bundle 2 - $50,000 US List**
    - 192p 1/10G-T & 16p 40G uplinks
    - PID: N9K-C93128TX-B18Q
    - 2 N93128TX + 8 BiDi QSFP+
    - 27% bundle discount

Fabric FCS

3   **Mini Fabric 1/10GF**
    - 72p 40G spine
    - 96p 1/10GF Leaf
    - APIC Cluster
    - 8 BiDi

4   **Mini Fabric 1/10GT**
    - 72p 40G spine
    - 192p 1/10GT Leaf
    - APIC Cluster
    - 8 BiDi

NEXUS 9500: BREAKING PERFORMANCE RECORDS

Miercom

PERFORMANCE VERIFIED

- NON-BLOCKING MODULAR SWITCH ARCHITECTURE
- LOWEST LATENCY AMONG MODULAR DC SWITCHES
- HIGHEST 40GbE DENSITY WITH LINE RATE PERFORMACNE
- 576 x 40GBE - 100% THROUGHPUT – NOT A SINGLE DROP
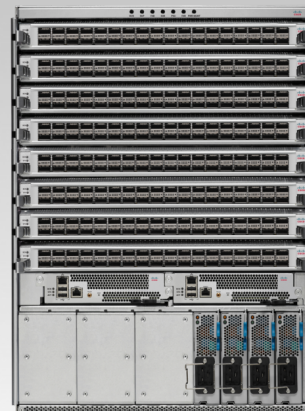- CONSISTENT UNICAST AND MULTICAST PERFORAMCE
- NO HEAD OF LINE BLOCKING
- HIGHEST POWER EFFICIENT MODULAR DC SWITCH

Nexus 9516

Nexus 9508

10.9W per 40G Port
(100% IMIX traffic load)

ELASTICITY AT SCALE / PAY AS YOU GROW

$100K
STARTING

STARTING AT 200 PORTS SCALING TO

100K+ PORTS

8K
MULTICAST GROUPS
(PER LEAF)

1M
IPV4 / IPV6 END POINTS

64K
TENANTS

576
40G PORTS WIRE-RATE
(PER SPINE)

40GB

60 TBPS
CAPACITY
(PER SPINE)

BUILT FOR THE GROWING COMMERCIAL ENTERPRISE TO THE LARGEST SERVICE PROVIDERS

Scalability (FCS)

Fabric Scale (FCS Max)

- 6 Spines

- 50 Leafs (5000 Ports)

- Single Spine Layer Design

- 128k End Points

- 8k Tenants

Initial Deployments

- Du (Saudi Arabia) – Jun'14

- Gannett (US) – Jun/Jul'14

- Cyberagent (Japan) – Jun/Jul '14

- Cisco IT – May'14

Thank you.