Cisco Data Centre Solutions for Service Providers

Edvard Haugland
Data Centre Systems Engineer

21.05.2019
Agenda

- Cisco Intent-Based Networking
- Cisco Software-Defined Computing
- Cisco Workload and Application Optimization
- Cisco Security
- Cisco OpenStack Solutions
- Cisco Services
Applications Are

Foundation for digital transformation

Key interface between businesses and their customers

Hyper-Diverse and hyper-distributed
As a Result

The data center is no longer a place or fixed location.

It’s defined as wherever the data is created, processed and used.
3 Trends Driving Data Center Modernization

Applications are Evolving
- Refactoring and cloud native need modern architectures and capabilities
- ML, AI, and Analytics placing new demands

Workloads are more Distributed
- Require flexible placement, increased performance, and enhanced monitoring
- Increased attack surfaces and blind spots

Developers Demand Multicloud Flexibility
- Unprecedented app development speed and scale
- IT complexity driven by inconsistent buying options
Cisco Data Centre: Pillars for Success

**Automation**
Automate wherever possible, and transform IT into a strategic business enabler.

**Multicloud**
Design so that location doesn’t matter, embracing Multicloud as an opportunity, not a hinderance.

**Security**
Integrate security from the ground-up, providing pervasive defense in depth.
Cisco Data Centre Automation Highlights

**Network**

“Intent-Based”
Evolving the automation lifecycle to offer assurance and predictive change control
ACI | Tetration | NAE

**Compute**

“Simplified Management”
Global policy enforcement and workflow automation from a cloud-based portal
Intersight | UCS | HyperFlex

**Workloads**

“All about the Apps”
Continuously optimize the connection between app health, user satisfaction, and business results
Cloud Center | AppD
Cisco Workload Optimization Manager

© 2018 Cisco and/or its affiliates. All rights reserved.
Cisco Intent-Based Networking
Intent-Based Networking is the Future

Translation
Capture intent, translate to policy, and check integrity

Activation
Orchestrate policies and configure systems

Assurance
Continuous verification, insights and visibility, and corrective actions

Cisco Data Center Intent-Based Networking
Cisco Tetration
Application-Centric Infrastructure
Network Assurance Engine
Zero-trust security: Cisco Tetration
Policy Compliance and Enforcement with Tetration
Enforcement of Policy Across any Floor Tile

Benefits

• Identify policy deviations in real time
• Review and update whitelist policy with one click
• Perform policy lifecycle management
Automation and change consistency: ACI
Cisco Application Centric Infrastructure

Optimizes Your Network

- Single point for configuration and troubleshooting
- Full network and security automation
- Scale within and across data centers and geographies
- Seamless integration of underlay and overlay networks optimizes management overhead
- Open APIs enable an integrated ecosystem to protect your investment
Application Centric Infrastructure Building Blocks
Built on the Nexus 9000

- Centralized Policy Model, Network Automation
- Single Open API for Entire System
- Integrated Overlay, 40/100/400G Non-Blocking Fabric, Distributed Gateway
  (Industry Leading: Price, Performance, Port-Density, Programmability, Power Efficiency)
- Flexible - Modular and Fixed Spine Options
- Non-Blocking 40/100/400G Fabric, CLOS Fabric
- Built-in Distributed Stateless Firewall, Multi-Tenant Security

Physical, Virtual and Container Workloads
WAN Interconnect
IP Storage
Network Service Appliances
Network Policy that Goes Where You Go

Consistent network and policy across clouds
Seamless workload migration
Single point of orchestration
Secure automated connectivity
ACI Multisite Orchestrator Enables Distributed Data Centers

- Single pane of management
- Consistent ACI Policy
- High Availability and Scale
- Simple fault isolation domain
- No Latency issues
Extending ACI into Virtual Environments with ACI Virtual Edge

Physical Remote Leaf
- Satellite/Remote locations deployment
- Leverage Nexus 9K hardware capabilities
- Extend ACI policy

ACI Virtual Pod
- Extend ACI Policy w/o H/W
- Virtualized Spine, Leaf and APIC
- Bare-metal providers, co-location providers, legacy networks

ACI Mini Fabric
- Small scale and cost optimized deployments
- 5RU: Ideal for space, power and cooling restrictions
- Telco DC, small to midsize business
Cloud ACI - Multicloud Extensions

Cloud Service Connectivity

- Data Center
- Compute Edge (Branch)
- Internet
- MPLS
- On Premises Cloud
- Cloud Exchange
- Public Cloud
- Public Cloud
- Public Cloud
- Bare Metal Cloud B
- Containers
- Hypervisor
- ACI Anywhere
- ACI Anywhere
- ACI Anywhere
- ACI Virtual ACI

Automation
Security
Mobility
Visibility

© 2018 Cisco and/or its affiliates. All rights reserved.
Furthering the reach with ACI integrations

Observability and Analysis
- splunk
- ScienceLogic
- zenoss
- AppDynamics
- SevOne

Automation
- SaltStack
- Ansible
- Chef
- Puppet
- Terraform

ADC
- HAProxy
- A10
- Citrix
- Avi Networks

Workload Management
- docker
- openstack
- Hyper-V
- VMware

Public Cloud
- Azure Stack
- Google Cloud Platform
- Azure
- Amazon Web Services

ITSM
- BMC
- Cherwell
- ServiceNow

Security
- Fortinet
- Check Point
- Palo Alto
- McAfee
- Symantec
- Infoblox
- Algosec
Ensuring Compliance: Network Assurance Engine
Enhanced Change Management
Epoch Delta Analysis: Correlated Ad Hoc Analysis Workflow

4 Qs, Correlated Answers
- What configurations changed?
- Who was impacted?
- Who made the changes?
- What happened as a result?

Benefits
- Reduced change management time
- Faster root-cause analysis
- Accurate migrations
- Assurance of change
- Continuous compliance
Policy Compliance and Enf. With NAE
Assure Network Security Policies and Compliance

What Can a Model Answer?
Example: Tenant Security

Benefits
• View conflicting policies
• View aliased policies
• Clear compliance view
• Identification of violations
• Automated re-mediation

Analyze millions of policies; answer questions in real-time
Adaptive computing: Cisco UCS & HyperFlex
Cisco UCS Is a Revolutionary System

Cisco UCS: It’s not a Server. It’s a System.
## Simplifying management

### 32 BLADES: TRADITIONAL

<table>
<thead>
<tr>
<th>Component</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric Interconnects</td>
<td>0</td>
</tr>
<tr>
<td>Intra Chassis Switches</td>
<td>4</td>
</tr>
<tr>
<td>Chassis Management Module</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Management Points</strong></td>
<td>8</td>
</tr>
</tbody>
</table>

![Diagram of traditional 32 blades management setup]

### 32 BLADES: CISCO UCS

<table>
<thead>
<tr>
<th>Component</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric Interconnects</td>
<td>2</td>
</tr>
<tr>
<td>Intra Chassis Switches</td>
<td>0</td>
</tr>
<tr>
<td>Chassis Management Module</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Management Points</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

![Diagram of Cisco UCS 32 blades management setup]
Embedded Automation

Policy based systems management with service profiles

Uplink port configuration, VLAN, VSAN, QoS, and EtherChannels
Server port configuration including LAN and SAN settings
Network interface card (NIC) configuration: MAC address, VLAN, and QoS settings; host bus adapter HBA configuration: worldwide names (WWNs), VSANs, and bandwidth constraints; and firmware revisions
Unique user ID (UUID), firmware revisions, and RAID controller settings
Service profile assigned to server, chassis slot, or pool

1. Subject matter expert define policies
2. Policies used to create service profile templates
3. Service profile templates create service profiles
4. Applying service profiles to bare metal configures servers automatically
Subject matter experts define policy

Automatic infrastructure configuration

Automation Tools and Cloud Platforms can control via API
Datacenter Modernization
Your bridge to the Future

Traditional Infrastructure
 Highly Manual Core Operations
 Limited Time and Budget for Future Initiatives

63% of Organizations Currently Describe Their Current Workload at “Highly Manual”

451 RESEARCH, VOICE OF THE ENTERPRISE

Modernized Hyperconverged Infrastructure
Streamlined and Modernized Core

- 75% Management Time Savings
- 90% Downtime Reduction
- 80% Savings vs. 3-tier Infrastructure

Optimized for the Distributed Datacenter

© 2018 Cisco and/or its affiliates. All rights reserved.
ROBO / Edge
Bandwidth Intensive Demands = Opportunity

Core Data Centers
Transformative Digitization for Competitive Advantage

Hybrid Cloud
Rapid Application and Business Innovation

HyperFlex Edge
Ultra-Light, Cloud Managed

HyperFlex
Any App, Any Scale

Hybrid Cloud Stacks
Consistent On-prem + Cloud Environment
Compute Infrastructure Management: Intersight
Managing your Future Datacenter
Harness the power of cloud-based management

- Proactive Guidance
- Connected Support
- Remote Deployment
- Storage Analytics

Data Center 1
Cisco HyperFlex
Cisco UCS

Remote Office/Branch Office
Cisco HyperFlex Edge
Cisco HyperFlex Edge 2-Node ROBO

Edge Computing
Cisco HyperFlex Edge

Data Center 2
Cisco UCS

- Actionable Intelligence
- Increased Agility
- Reduced Operational Costs
Multi-Cloud Deployment: CloudCenter Suite
Cisco Data Center Multi-cloud Offers

**On-Prem Cloud**

“Good Multicloud starts at home”
Develop a cloud-native operational model for the workloads that must stay at home and new demands at the edge
HyperFlex Hybrid Cloud | ACI | Azurestack Intersight | Managed Private Cloud

**Application Mobility**

“Follow business needs”
Remove IT limitations to workload placement on-prem and in the cloud
CloudCenter | Cisco Workload Optimization Manager

**Public Cloud**

“Take control”
Connect, consume and protect resources and applications as the cloud broker for your business
ACI Anywhere | Cisco Multicloud Software Portfolio
CloudCenter: multicloud management platform

One Integrated Platform

End to End Lifecycle

New and Existing Applications

Data Center

Private Cloud

Public Cloud

Container as Service

- docker
- SUGARCRM
- Jenkins
- Cassandra
- ORACLE
- splunk
- IBM WebSphere

- kubernetes
- vmware

- redhat
- openstack
- windows

- IBM Cloud
- Alibaba Cloud
- Amazon WebServices
- Google Cloud
- Azure
- Kubernetes
Kubernetes at scale: Cisco Container Platform
Cisco Container Platform

Native Kubernetes (100% Upstream)
Direct updates and best practices from open source community

Hybrid Cloud Optimized

Integrated
Networking | Management | Security | Analytics

Flexible Deployment Model
VM | Bare metal ↔ HX, ACI | Public cloud

Turnkey Solution
For Production-Grade Container Environments

Easy to acquire, deploy & manage | Open & consistent | Extensible platform | World-class advisory & support

© 2018 Cisco and/or its affiliates. All rights reserved.
Cisco Container Platform

Kubernetes Lifecycle Management
Kubernetes AuthN and AuthZ

Kubernetes

Secure Communication

K8s master 1
K8s master n

Overlay Network
Load Balancer

K8s Node

Persistent Storage
External Communication
IaaS

Storage
External Network

Technical Differentiators

- Highly automated, curated
- Runs on 100% upstream Kubernetes
- Seamless container networking
- Built in security and load balancing (L4/L7)
- Enterprise-grade persistent storage
- Integrated monitoring and logging
Cisco Hybrid Solution for Kubernetes on AWS

On-premises environment

- Cisco Container Platform
- Cisco HyperFlex / UCS
- Cisco Nexus9K / ACI

Consistent, production-grade environment

- AppDynamics
- Cisco Stealthwatch Cloud
- Cisco CloudCenter

Optional

- Cisco CSR1000v

Mandatory

- Identity and Access Management (IAM)
- Elastic Container Registry
- Amazon EKS
- EC2 / EBS
- VPC

Legend:
- Optional
- Mandatory
Cisco Hybrid Cloud Platform for Google Cloud

On-premises environment
- Existing services
- apps | data
- Cisco Container Platform
- Cisco HyperFlex
- Cisco Nexus9K / ACI

Consistent environment
- Cisco Stealthwatch Cloud
- Google Apigee
- Cisco CloudCenter
- Istio
- Cisco CSR1000v

Google Cloud
- BigQuery
- Cloud SQL
- Pub/Sub
- Big Table
- Cloud Storage
- Cloud Spanner
- Open Service Broker
- Google Kubernetes Engine
Workload and application optimization
Workload and infrastructure optimization: CWOM
Continuous Resource Optimization

Dynamic Workload Optimization
Automatically allocate resources to the workloads that need them the most

Increase infrastructure efficiency
Automatically maximize workload density and resource utilization, minimizing waste

Workload Management
Automatically place, size, and move workloads across on-prem and cloud resources
Application performance and monitoring: AppDynamics
### Process Level Data

<table>
<thead>
<tr>
<th>Class</th>
<th>Class Id</th>
<th>Current Process Co...</th>
<th>Command Line</th>
<th>State</th>
<th>Start Time</th>
<th>End Time</th>
<th>CPU (%)</th>
<th>Mem...</th>
<th>PID</th>
<th>P...</th>
</tr>
</thead>
<tbody>
<tr>
<td>acpid</td>
<td>acpid</td>
<td>1</td>
<td>/usr/sbin/acpid</td>
<td></td>
<td>05/06/18 7:58:27 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>2574</td>
<td>1</td>
</tr>
<tr>
<td>anacron</td>
<td>anacron</td>
<td>1</td>
<td>/usr/sbin/anacron -s</td>
<td></td>
<td>06/01/18 3:01:30 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>18230</td>
<td>1</td>
</tr>
<tr>
<td>bpcd</td>
<td>bpcd</td>
<td>6</td>
<td>/usr/openwinetbackup/bin/bpcd...</td>
<td>MULTIPLE</td>
<td>06/01/18 3:01:30 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>7239</td>
<td>1</td>
</tr>
<tr>
<td>envoy</td>
<td>envoy</td>
<td>2</td>
<td>/usr/bin/perl /usr/sbin/envoy</td>
<td>MULTIPLE</td>
<td>06/01/18 3:01:30 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>9416</td>
<td>9...</td>
</tr>
<tr>
<td>hald</td>
<td>hald</td>
<td>1</td>
<td>hald</td>
<td></td>
<td>05/06/18 7:58:27 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>2586</td>
<td>1</td>
</tr>
<tr>
<td>inpera_dstatPar</td>
<td>inpera_dstatPar</td>
<td>1</td>
<td>/usr/bin/python /usr/tools/inpe...</td>
<td>MULTIPLE</td>
<td>05/06/18 8:00:31 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>9243</td>
<td>9...</td>
</tr>
<tr>
<td>java</td>
<td>java</td>
<td>2</td>
<td>MULTIPLE</td>
<td></td>
<td>05/06/18 7:58:51 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>MULT...</td>
<td>1</td>
</tr>
<tr>
<td>mingetty</td>
<td>mingetty</td>
<td>6</td>
<td>MULTIPLE</td>
<td></td>
<td>05/06/18 7:58:51 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>MULT...</td>
<td>1</td>
</tr>
<tr>
<td>multipathd</td>
<td>multipathd</td>
<td>1</td>
<td>/sbin/multipathd</td>
<td>MULTIPLE</td>
<td>05/06/18 7:58:11 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>1923</td>
<td>1</td>
</tr>
<tr>
<td>nbdisco</td>
<td>nbdisco</td>
<td>1</td>
<td>/usr/openwinetbackup/bin/nbdisco...</td>
<td>MULTIPLE</td>
<td>05/06/18 7:58:46 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>7252</td>
<td>1</td>
</tr>
<tr>
<td>nsd</td>
<td>nsd</td>
<td>1</td>
<td>/usr/sbin/nsd</td>
<td>MULTIPLE</td>
<td>05/06/18 7:58:32 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>2718</td>
<td>1</td>
</tr>
<tr>
<td>perl</td>
<td>perl</td>
<td>6</td>
<td>MULTIPLE</td>
<td></td>
<td>05/06/18 7:58:32 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>MULT...</td>
<td>1</td>
</tr>
<tr>
<td>pickup</td>
<td>pickup</td>
<td>1</td>
<td>pickup -l t fifo -u</td>
<td>MULTIPLE</td>
<td>06/01/18 2:50:54 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>9573</td>
<td>7...</td>
</tr>
<tr>
<td>ps-monitor</td>
<td>ps-monitor</td>
<td>4</td>
<td>/usr/local/bin/perl /etc/monitor/...</td>
<td>MULTIPLE</td>
<td>06/01/18 2:50:54 PM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>MULT...</td>
<td>1</td>
</tr>
<tr>
<td>python</td>
<td>python</td>
<td>1</td>
<td>python /usr/bin/dstat --nohead...</td>
<td>MULTIPLE</td>
<td>05/06/18 8:00:31 AM</td>
<td>-</td>
<td>0.0</td>
<td>0.0</td>
<td>9248</td>
<td>1</td>
</tr>
</tbody>
</table>
# Code Level Drill Down

## Table

<table>
<thead>
<tr>
<th>Name</th>
<th>Time (ms)</th>
<th>Percent %</th>
<th>Thread State</th>
<th>Exit Calls / Threads...</th>
</tr>
</thead>
<tbody>
<tr>
<td>org.eclipse.jetty.server.handler.ContextHandler.doHandle</td>
<td>10 ms (self)</td>
<td>8.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTTPServlet.service:725</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>org.apache.felix.http.base.internal.dispatch.DispatcherServlet.service:49</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.adobe.granite.license.impl.LicenseCheckFilter.doFilter:308</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.adobe.granite.resourceresolverhelper.impl.ResourceResolverHelper.impl.doFilter:83</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.adobe.granite.httpcache.impl.InnerCacheFilter.doFilter:60</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.adobe.granite.httpcache.impl.InnerCacheFilter.doFilter:81</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.adobe.cq.mcm.campaign.servlets.CampaignCopyTracker.doFilter:100</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.day.cq.wcm.core.impl.WCMRequestFilter.doFilter:90</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.adobe.granite.out.impl.OptOutFilter.doFilter:76</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com.day.cq.wcm.foundation.forms.impl.FormsHandlingServlet.doFilter:138</td>
<td>0 ms (self)</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>111 ms (total)</td>
<td>91.7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
End User Telemetry Dashboard
Proactive Security
New Trend: Security is Getting Smarter

Hybrid Security

“Security via cloud"
Hybrid model architecture
Scale, diversity and function

AI in Security

Security “data lake”
Continuously context aware
Simplified monitoring and reporting

Decentralization

Digital trust requirements
Growth of hybrid IT
Distributed trust
Cisco Data Center Security Highlights

Visibility
“See Everything”
Complete visibility of users, devices, networks, applications, workloads and processes
Stealthwatch | Tetration

Segmentation
“Reduce the Attack Surface”
Prevent attackers from moving laterally east-west with application whitelisting and micro-segmentation
NGFW | ACI | Tetration

Threat Protection
“Stop the Breach”
Quickly detect, block, and respond to attacks before hackers can steal data or disrupt operations
NGFW | AMP
Stealthwatch | Tetration
Visibility: See Application Components and Their Behavior

Cisco Tetration

- Full visibility into application components including workloads, processes and application behavior in the data center
- Application dependency mapping
- Application segmentation policies (whitelist/blacklist)
- Forensic search and application anomaly detection
Segmentation: Reduce the Attack Surface

Cisco NGFW
Cisco ACI
Cisco Tetration
Segmentation: Reduce the Attack Surface

Cisco NGFW
Cisco ACI
Cisco Tetration

East-West
North-South Perimeter
Segmentation across multiple clouds
Process to Process

01 02 03
Multi-Layered Threat Sensors

Quickly detect, block, and respond dynamically when threats arise to prevent breaches from impacting the business

01

Next-Gen Firewall with AMP

Next-Gen IPS with AMP

Next-Gen Firewall with Radware DDoS

Stealthwatch

Threat Protection: Stop the Breach

By strategically deploying threat sensors north-south, east-west
Protect the Workload Everywhere
End-to-end integrated infrastructure
OpenStack Solutions
OpenStack: Industry Choice today
But it is not easy...

OpenStack can be Complex to Operate:

- Complex interactions between services, databases, messaging queues etc.
- Health and performance of a cloud is difficult to quantify, verify and monitor.
- Updates/upgrades require extensive human effort and are prone to issues.
- Best of breed sounds nice, but very hard to achieve in reality.
Private Cloud: What do you need?

- Infrastructure as a service
- Hypervisor(s)
- Baremetal Management
- Easy to Deploy
- Easy to Maintain
- Easy to Use
- Easy to Fix
- ...

© 2018 Cisco and/or its affiliates. All rights reserved.
The ETSI NFV Reference Architecture and NFVI

- **NFVI** - Network Function Virtualization Infrastructure is the **totality of all hardware and software components** that build the platform in which VNFs are deployed.

- **VIM** - Virtualized Infrastructure Manager Controls and manages the NFVI compute, storage, and network resources. **VIM is the NFVI software platform**
Cisco NFVI

Business Services
(e.g. Cisco vMS)

Mobility
(e.g. Ultra)

Other VNFS
(e.g. Media, vPE/vBNG)

3rd party VNFS
(e.g. vIMS, vLB)

Open APIs for Platform Consumption

Cisco NFVI Scope

Virtual Infrastructure
- Virtual Compute (RHEL)
- Virtual Storage (Ceph)
- Virtual Network (OVS, VTF, SR-IOV)

Cisco Physical Infrastructure
- Compute (UCS)
- Network (Nexus)
- Storage (UCS)

VIM
- Red Hat OSP
- Cisco VIM
- Lifecycle Manager

Optional Network VIM
(Cisco VTS / Cisco ACI)
The ETSI NFV Reference Architecture and NFVI

- **NFVI** - Network Function Virtualization Infrastructure is the totality of all hardware and software components that build the platform in which VNFs are deployed.
- **VIM** - Virtualized Infrastructure Manager Controls and manages the NFVI compute, storage, and network resources. VIM is the NFVI software platform.
Cisco ESC

- Agentless VNF management (Any Vendor, Any Application, Any VNF)
- VNF lifecycle management (Create, Read, Delete)
- VNF **Day0** configurations
- VM and service **monitoring**
- VNF Auto-healing, **recovery**
- Service elasticity
The ETSI NFV Reference Architecture and NFVI

- **NFVI** - Network Function Virtualization Infrastructure is the *totality of all hardware and software components* that build the platform in which VNFs are deployed.

- **VIM** - Virtualized Infrastructure Manager Controls and manages the NFVI compute, storage, and network resources. *VIM is the NFVI software platform*. 
Cisco NSO
Cisco Managed Services Accelerator (MSX)

Cisco MSX is a cloud-native, multi-tenant service creation and delivery platform that helps service providers quickly, easily, and cost-effectively develop and deliver managed services to business customers.
MSX Reduces SP Complexity and Costs

Lower cost to integrate ... lower cost to operate

One-time OSS / BSS Integration

Increased service velocity and differentiation

© 2018 Cisco and/or its affiliates. All rights reserved.
MSX Simplifies Service Creation & Delivery

One Platform; Many Services
MSX is a full-stack solution that integrates into a BSS/OSS once and enables multiple service offers.
Examples
NTT East
Managed Services for SOHO

Customer Portal

Network Services Orchestrator

Elastic Services Controller

OpenStack API

vCPE (VNF)

OSS/BSS

NFV Orchestrator

VNF Manager

Existing IP Network

Physical CPE

Physical CPE

Internet

OpenStack™

VTS

SDN Controller

Cisco NFVI

© 2018 Cisco and/or its affiliates. All rights reserved.
Deutsche Telekom Low Latency “Edge Compute Cloud”.
First customer is <MobiledgeX>

Product Launched in September 2018
- Four Edge Data Centers in production
- “order to operation” in less than 3 months
- System install and up in less than a day

Cisco NFVI solution

- 8-12ms end-to-end Round-trip-time measured from mobile devices to apps connected via 5G (20ms for 4G)
- RTT variation mainly due to radio
Services
Getting Started with Cisco Data Center Services

- Advisory: Strategy and roadmap development through expert advice
- Implementation: Technology adoption and orchestration through best practices and methodologies
- Optimization: Operational excellence through analytics and automation
- Technical: 24/7 centralized, expert-level support
- Managed: Manage, automate and optimize IT infrastructure
- Training: Virtual and Hands-on training

Plan ➔ Develop ➔ Deploy ➔ Optimize ➔ Support

© 2018 Cisco and/or its affiliates. All rights reserved.
Why Cisco?
Why Cisco

- Complete architecture provider
- Private, hybrid, and multi-cloud-ready solutions
- Embedded and add-on security
- OpenStack simplification
- Best-in-class services