What Makes Up the SP DC Architecture?

- **Servers**: Physical Hosts and Virtual Workloads
- **Storage**: Array Based as well as locally attached
- **Network**: Data Center Switching – Layer II/Layer III and FC SAN + Security
- **Software**: Control, automation, analytics, security and visibility
What is Enabling SP DC Architecture?

**Virtualization**
Services are being virtualized to optimize OPEX/CAPEX

**Disaggregation**
Distributed datacenter architecture for better speed and latency

**Automation**
Centralized automation and orchestration for operations
There is Nothing

“CENTER-ED”

About Data Anymore
There is Nothing "CENTER-ED" About Data Anymore

Public Cloud
A new operating model and growth of cloud native apps

Private Cloud

Enterprise DC
This is where we began, and it’s here to stay

Enterprise Edge
Data processing needs to be closer to the sources of demand

Colo

5G Telco Edge
New apps are creating new BW demands

IoT Edge
Significant amounts of data are being generated remotely which need to be analyzed, processed, and consumed.
The DC Needs to go Anywhere the Data is

- Enterprise DC
- Public Cloud / IaaS
- Private Cloud
- Colo / Bare Metal Cloud
- 5G Telco Edge
- Enterprise Edge
- IoT Edge
Living on the edge

The Intersection of Data and Applications

IT organizations are challenged with securing, monitoring and reliably transporting the dispersed data.

- 5G
- IoT
- Next-Gen WAN Edge
- Cloud

Cloud operational approach
No single management point
Complexity of security
DC Switching
Using DC to Transform the SP

Legacy migration to modern DC future

- Legacy gear being de-commissioned
- Moving away from hardened single purpose appliances
- Modern DC hardware and software infrastructure
- Transformed to a multi-purpose cloud
- Built for automation
Nov 2013: Cisco Announces ACI
ACI has grown up
The DC network **before**
Classic modular switching

- Supervisors (1 or 2)
- Fabric Modules (3–5)
- Linecards (Copper, Fiber, 1/10G)

Single chassis (e.g. Nexus 7000)

Up to 18 RUs Scale-up

The DC network **now**
ACI

- APICs (1, 3 or more)
- SPINE (1 to 6)
- LEAVES (1 to 200 or more*)
- Zero-touch L2 VXLAN No STP

Single VXLAN Network**
Evolution from Nexus 5000 and Nexus 7000

Scale as you need

* > 200 Leaves with MultiPod/Multi-Site
** Other topologies available (e.g. 3-tier, etc.)
Without ACI

Chaotic IT Operations

- Slower: Configurations are not standardized and changes not automated (Inconsistencies/errors/delays)
- Less Efficient: Tribal knowledge, multiple configuration templates, ad-hoc CLI changes, needle-in-a-haystack troubleshooting

With ACI

Efficient IT Operations

- Simpler: Automate repeated tasks and predictive change impact analysis
- Efficient: Software defined networking for multi-cloud environments
  
  Automate repeated tasks and predictive change impact analysis
Without ACI

New Application

App Requirements

Slow

IT administrators work in silos

Less Efficient

No shared deployment model. Resulting in spreadsheets, checklists, scripts, emails, with individual physical and logical network configurations for each app

Faster

IT administrators work at the application level

Efficient

Shared model for deployment and continuous changes through policy automation

With ACI

Simpler

Many New Applications

Faster

IT administrators work at the application level

Efficient

Shared model for deployment and continuous changes through policy automation
Application Centric Infrastructure
The Network Made Simple

Zero Touch Auto Provisioning With Policy Driven Automation
Any Hypervisor, Any Workload Physical, Virtual, Containers
Single Central Management With Integrated Overlay And Full Visibility
ACI Anywhere
ACI Anywhere: **Multi Pod**
Single APIC Cluster Extends Network Virtualization, Policy, Services to Multiple PODs

- **Data Center 1** (ACI Pod 1)
- **Data Center 2** (ACI Pod 2)

**Central Network Control Plane**

**IPN**

**Network**

- Multicast on IPN needed & Jumbo Frames (\(\leq 1550\))
- \(\leq 50\) ms RTT Required
- Up to 12 Pods, distributed gateway
- Single central management (APIC)
- Automated L2 DCI VXLAN extension
ACI Anywhere: Remote Leaf
Connect On-premises To Remote Offices With Nexus 9000 Switches

Zero Touch Auto Discovery of Remote Leaf
<= 300 ms RTT Required
Up to 20 Remote Locations
Single central management
Automated L2 VXLAN extension
ACI Anywhere: Multi Site Orchestrator
Seamlessly Connect Multiple Data Centers At Scale

No Multicast/No Jumbo Frames
Phased Changes (Zones)

<= 1s RTT Required (MSO → APIC)
Up to 12 Sites, distributed gateway

Single central management (MSO)
Automated L2 DCI VXLAN extension
ACI Anywhere: ACI Virtual Edge
Decoupled From Hypervisor Kernel APIs

Policy Consistency Across Multiple Hypervisors
Enable Migration From Legacy To ACI
Maintain Existing Operational Models
ACI Anywhere: **ACI Virtual Pod**
Extend ACI To Bare-metal Clouds, Remote Data Centers, and Legacy Infrastructure

Virtual Spine/Leaf Functionality w/ AVE integration

Up to 64 AVEs per vPod

Single central management
Automated L2 VXLAN extension

VCX Live!

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ACI Anywhere: **Public Cloud Extensions**

Seamlessly Connect Multiple Data Centers

**Discovery & Visibility**

**Policy Translation**

**CSR-1Kv/Direct-Connect integration**

**Operational Consistency**

**Single Point Of Orchestration**

**Encrypted**

---

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ACI Anywhere

Consistent Network and Policy across clouds
Seamless Workload Migration
Single Point of Orchestration
Secure Automated Connectivity
Applications

- Multi Cloud Workload Protection
- Model based Cloud Agnostic Blueprint
- APL
- APL
- APL
- Azure
- AWS
- Hypervisor-VMware
- Hypervisor-KVM
- Virtual Services and Security

Application Data Networking

- Network Assurance
- Intent based – Logical Networks
- Overlay Networking (Self Programmable)
- Underlay Networking (Self Programmable)
- Switching Hardware
1. NSX-v (vSphere)
2. NSX-T (KVM, Containers..)
3. Overlay in Software (troubleshooting)
4. Bare Metal workload Policy mgmt.?
5. Underlay Network Automation?
Application Data Networking

Applications

- Multi Cloud Workload Protection
- Model based Cloud Agnostic Blueprint
- APL
- Azure
- AWS
- Hypervisor-VMware
- Hypervisor-KVM
- Virtual Services and Security

Tetration

Cloud Center

ACI

CNAE

ACI

ACI

ACI

Cloud Scale ASIC

Next-Gen DC

Network Assurance

Intent based – Logical Networks

Overlay Networking (Self Programmable)

Underlay Networking (Self Programmable)

Switching Hardware
Hyperflex
What Is Hyperconvergence?

Traditional Approach - Converged

HCI is an Appliance that incorporates Server - Storage - **Network** And layers on SDS Software

HyperConverged

**Hyperconvergence**

NO LEGACY STORAGE CONTRACTS

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HyperFlex Product Overview

**Enterprise workloads, Validated solutions**
- Citrix VDI deployment (XenDesktop and XenApp)
- Microsoft SQL, Exchange, SharePoint etc.
- Oracle & other mission critical apps
- Backup vendor integrations

**Integrated Management**
- Manage workloads from familiar vCenter, SCVMM, and Kubernetes
- Leverage HX Connect UI (HTML5) for HX management
- Automate HX operations using HX REST API
- Extend workloads to Google Cloud Platform

**Vendor-agnostic Virtualization**
- VMware vSphere 6.X
- Windows Server 2016 Datacenter
- Cisco Container Platform

**Complete Hyperconvergence**
- Fully integrated network, compute, storage, and virtualization
- Highly scalable, resilient, scale-out file protocol
- Fully distributed data system, No data locality
The New HyperFlex Edge
The Power of Cloud-Managed Computing

- Lights out, multi-site parallel deployment
- Rapid cluster profile creation and full stack upgrades
- Flexible scalability and investment protection
- Connected TAC Support
- Connected TAC Support

Ultra-light 2-node HyperFlex Edge

Customer Leveraging Existing Branch Network

Three-node cluster quorum without physical 3rd node!
HyperFlex Data Protection

In-built 1-Click Disaster Recovery

Test Recovery
- DR Readiness
- Customize DR Test parameters

Planned Migration
- Move VMs across Data Centers / Clusters
- Re-Protect after Migration

Unplanned Failover
- Recovery VMs after Disaster
- Re-Protect after Recovery
HyperFlex Stretch Cluster
Cloud Scale Data Platform

Power Mission Critical Apps with

Disaster Avoidance | Maximum Uptime | Zero RPO | Automated DR

HX Data Platform

Synchronous Replication

Site-A  Site-B

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HyperFlex Product Differentiation

Architected to Optimize Across Hardware, Software, Networking and Management. Integrated Solution with Single Point of Support

- **High Performance & Scalable Data Platform**
  - #1 Performing HCI platform
  - Consistent, Low latency performance
  - 3X Lower TCO, 3X Higher VM Density, 64 node scale, linear scale out performance

- **Enterprise Class Data Services & Storage Optimization**
  - Integrated Dedup & Compression w/ no performance penalty

- **Seamless integration of Converged & Hyperconverged**
  - Investment protection of existing storage and compute investment

- **Independent Scaling of Compute & Capacity**
  - Cost optimization through Compute-only node support

- **Deployment Automation & Simplicity**
  - Out-of-the-box service profiles, install/upgrade automation, automated cluster scaling

- **Integrated High Performance Network Fabric**
  - 10G/40G VIC/Fabric Factory installed, integrated networking, fabric QoS

- **Data Protection, High Availability & Resiliency**
  - Native replication, backup/DR, Stretch Cluster, Availability Zones, Fault tolerant HA architecture

- **Cloud based centralized management**
  - Monitoring, Telemetry, Analytics, Policy, Orchestration, Proactive TAC, HX Cluster management

**Broad Range Of Supported Workloads**
- ROBO (Branch, IOT)
- VSI (app/web)
- VDI (Citrix, Horizon)
- Collaboration (UC, HCS)
- Databases (Oracle, SQL)
- Mission Critical & ERP (SAP)
- Analytics (Splunk)
- Cloud-Native Apps (Docker, Kubernetes)
Centralized Cloud-Based Management of the Future

- Telemetry and Analytics
- Policy Based Orchestration
- Secure and Compliant
- API Driven, DevOps Enabled
- Connected TAC

Next Generation Management

SaaS Simplicity

Actionable Intelligence

Remotely Deploy & Manage

- HyperFlex with Intersight
  - Ship to sites
  - Connect to Intersight
  - Deploy & manage remotely

Conventional Infrastructure

- Ship from Factory
- Integrate and Configure
- Stage
- Ship People and Infra to Sites
- IT Deploy On-Site

Cisco Intersight Compatibility (HCL) Check

Recommendations Engine
Cisco HyperFlex Multicloud Services

Application Visibility Engine

Cisco AppDynamics

Workload Placement
Performance
Application Monitoring

Application Modelling
Instrumentation
Hybrid Cloud Management

Cisco CloudCenter

Cisco Workload Optimization Manager

Decision Engine

Cisco HyperFlex

Deployment Engine

Multicloud Infrastructure

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Primary HyperFlex Use Cases

Virtual Desktop Infrastructure
- Low upfront costs
- Consistent performance
- Predictable scaling

Server Virtualization
- Reduce operational complexity
- Adaptive scaling
- Always-on resiliency

Test and Development
- Agile provisioning
- Frequent iterations
- Instant cloning and snapshots

ROBO & Edge
- Simple deployment
- Centralized management
- No “fly-and-fix” missions

Databases & ERP
- Consistent, low-latency
- High IOPS
- All-flash nodes

Containers
- Simple & seamless customer experience
- Enterprise grade container storage
- Cloud native development on prem
One Architecture for Operational Simplicity

Unified Computing System

- **UCS Management**
- **Intersight**
- **IMC Supervisor**

**Mainstream Computing**
- UCS Mini
- Fourth Gen. UCS

**Converged Infrastructure**
- UCS C3000
- UCS C240

**Hyperconverged Infrastructure**
- HyperFlex Systems

**Software-Defined Storage**
- HyperFlex Systems

**Scale Out**
- UCS C3000

**EDGE**

**CORE DATA CENTER**

**CLOUD**

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Tetration Analytics
Actionable Insights across Applications, Security and Infrastructure

- **Visibility**
  - Real-Time, Best in Class Visibility

- **Baselining**
  - Faster Anomaly Detection

- **Correlation**
  - Code to Customer Insights

- **Prediction**
  - Prescriptive Guidance

- **Automation**
  - Self Healing, Self Learning

---

**Application Intelligence:** AppDynamics | CWOM

**Security Intelligence:** Stealthwatch

**Infrastructure Intelligence:** Tetration

---
Policy Discovery – What talks to what and how

<table>
<thead>
<tr>
<th>Priority</th>
<th>Action</th>
<th>Consumer</th>
<th>Provider</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod06</td>
<td>haproxy</td>
<td>TCP: 3306</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod04</td>
<td>haproxy</td>
<td>TCP: 3306</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod11</td>
<td>nfs</td>
<td>TCP: 2049</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod06</td>
<td>nfs</td>
<td>TCP: 2049</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod04</td>
<td>nfs</td>
<td>TCP: 2049</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod14</td>
<td>nfs</td>
<td>TCP: 2049</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod17</td>
<td>haproxy</td>
<td>TCP: 3306</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod02</td>
<td>haproxy</td>
<td>TCP: 3306</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod02</td>
<td>nfs</td>
<td>TCP: 2049</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod02</td>
<td>percona-db</td>
<td>TCP: 4567</td>
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<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod02</td>
<td>Sensor VIP</td>
<td>TCP: 443</td>
</tr>
<tr>
<td>100</td>
<td>ALLOW</td>
<td>Default:Labs:RTP:Pod02</td>
<td>Collectors</td>
<td>TCP: 5640</td>
</tr>
</tbody>
</table>
Use Cases for Tetration

**Workload Discovery**
- Discover workload dependencies while making applications "hybrid cloud ready"
  
  "ADM"

**Network Insights**
- Gain performance insights per application in real time with historical references
  
  "NPMD"

**Workload Protection**
- Secure workloads with portable policies across any cloud, any floor tile, any OS
  
  "CWP"

Network and Operations Buying Centers

Security Buying Center
# Cisco Tetration: Deployment options

## Hardware options

<table>
<thead>
<tr>
<th>Cisco Tetration platform (large form factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Suitable for deployments of more than 5000 workloads</td>
</tr>
<tr>
<td>• Built-in redundancy</td>
</tr>
<tr>
<td>• Scales to up to 25,000 workloads</td>
</tr>
</tbody>
</table>

**Includes:**
- 36 Cisco UCS® C220
- 3 Cisco Nexus® 9300

## Cisco T tetration-M (small form factor)

<table>
<thead>
<tr>
<th>Suitable for deployments of less than 5,000 workloads</th>
</tr>
</thead>
</table>

**Includes:**
- 6 Cisco UCS C220
- 2 Cisco Nexus 9300

## Software/Service Option

<table>
<thead>
<tr>
<th>Cisco Tetration SW Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Software deployed on VMW</td>
</tr>
<tr>
<td>• Suitable for deployments of less than 1000 workloads</td>
</tr>
<tr>
<td>• Generic HW requirements</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cisco Tetration as a Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Software deployed on Cisco Cloud</td>
</tr>
<tr>
<td>• 100% Cisco managed, up to 25,000 workloads</td>
</tr>
<tr>
<td>• No VPN required</td>
</tr>
</tbody>
</table>

## Public cloud

<table>
<thead>
<tr>
<th>Cisco Tetration Cloud Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Software deployed in public cloud</td>
</tr>
<tr>
<td>• Suitable for deployments of less than 1000 workloads</td>
</tr>
<tr>
<td>• Public cloud instance owned by customer</td>
</tr>
</tbody>
</table>
Cisco Tetration software-as-a-service option

Cisco Tetration™ SaaS

- Software-as-a-service model: No need to purchase, install and manage hardware or software
- Fully managed and operated by Cisco
- Suitable for commercial customers and SaaS-first/SaaS-only customers
- Flexible pricing model; lower barrier to entry
- Quick turn up
- Scales to up to 25,000 workloads

Software subscription license based on number of workloads; available in 1-, 3- and 5-year terms