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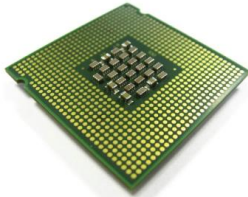https://ciscolive.ciscoevents.com/ciscolivebot/#BRKENS-1090
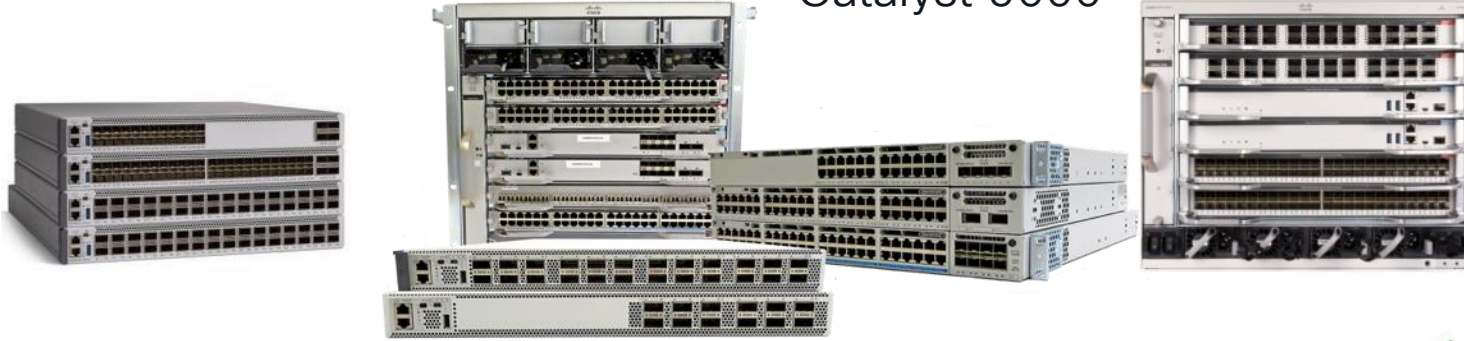
Agenda

- Introduction

- App Hosting Infra & Security

- Catalyst 9000 Containers Networking

- Application Lifecycle Management

- Application HA

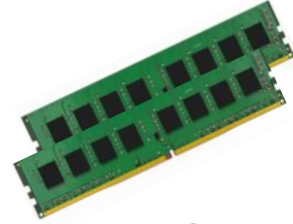- Cloud Services at the Edge

- Conclusion

Networking Today …

Catalyst 9000

x86 CPU   Linux-based OS   Memory/Storage

Enables hosting docker containers and 3rd party apps

New strategic capabilities with App Hosting on C9K Switches

Existing Hardware

Managed via CLI or DNA-C

Real Time Processing

Lower Latency

Save Bandwidth

IT Operations and Monitoring Tools

Consolidate Physical Infrastructure

ThousandEyes
kibana
WIRESHARK
perfSONAR powered

Security Agents and Functions

Enhance Visibility & Security Enforcement

Attivo NETWORKS
TRAPX SECURITY

Cloud Gateways with Serverless Edge Compute

Reduce App Latency & Optimize App Traffic

Cybervision
Cisco DNA Spaces
NS1.
Alleantia ALL <THINGS> JOINED
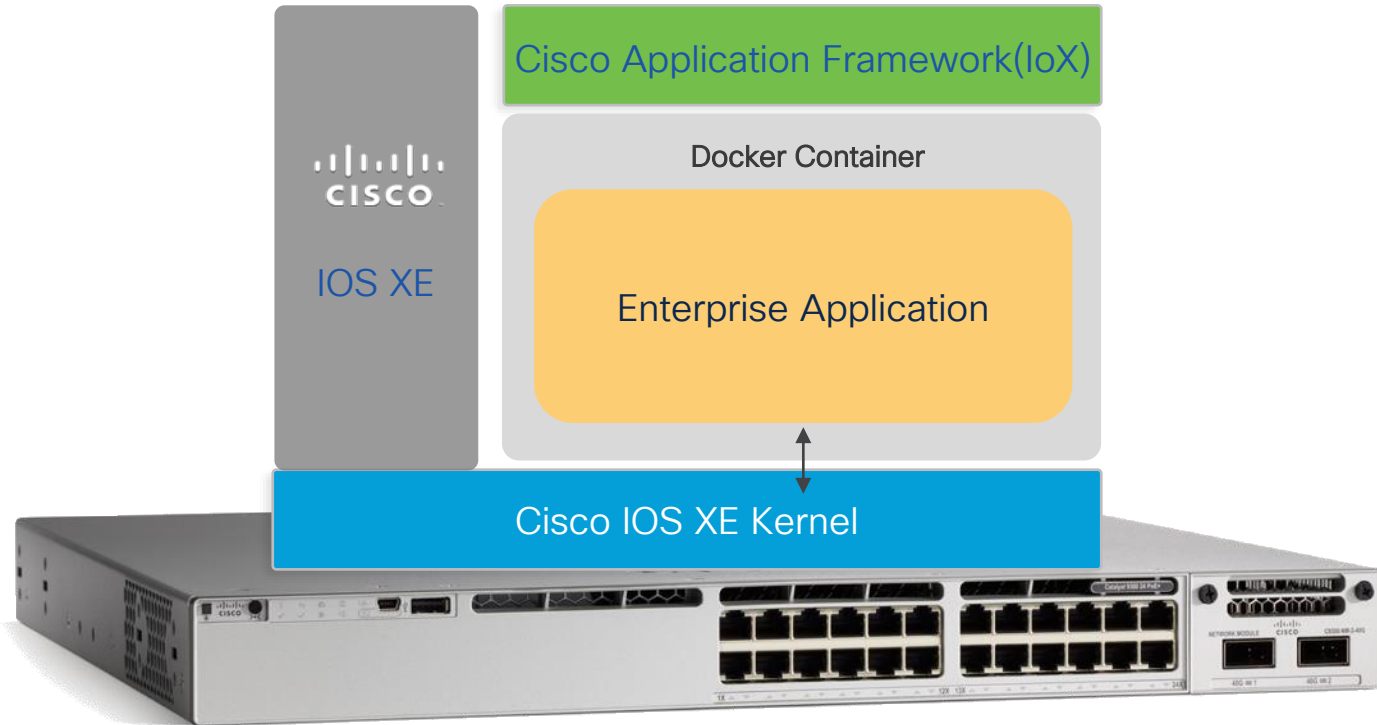
Customer Specific Applications

3rd Party App Hosting

Rich ecosystem partnership with 25+ certified apps and 200+ active customer

App Hosting
Infra & Security
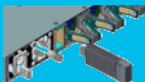
Catalyst 9000 Application Hosting Infra

Cisco Application Framework(IoX)

Docker Container

Enterprise Application

IOS XE

Cisco IOS XE Kernel

HW resources for App Hosting

	Resource type	Catalyst 9300	Catalyst 9300-X	Catalyst 9400	Catalyst 9400-X	Catalyst 9500	Catalyst 9500-X	Catalyst 9600	Catalyst 9600-X
Networking	AppGig Port	1x1G	2x10G	1x1G	2x10G	Mgmt Port*	2x10G	Mgmt Port*	Mgmt Port* (2x10G CPU ports)
Resources	Memory	2GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB
	CPU	1 core	2 core	1 core	1 core	1 core	1 core	1 core	1 core
	Storage	240GB (USB3.0/SSD)	240GB (USB3.0/SSD)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)	480-960GB (SATA)

* **Using** loopback with any external ports

Catalyst 9300-X
USB 3.0
240GB

Back panel

Catalyst 9400-X
M2 SATA
480/960GB

Plug into removable SUP

Catalyst 9500-X
M2 SATA
480/960GB

Back panel

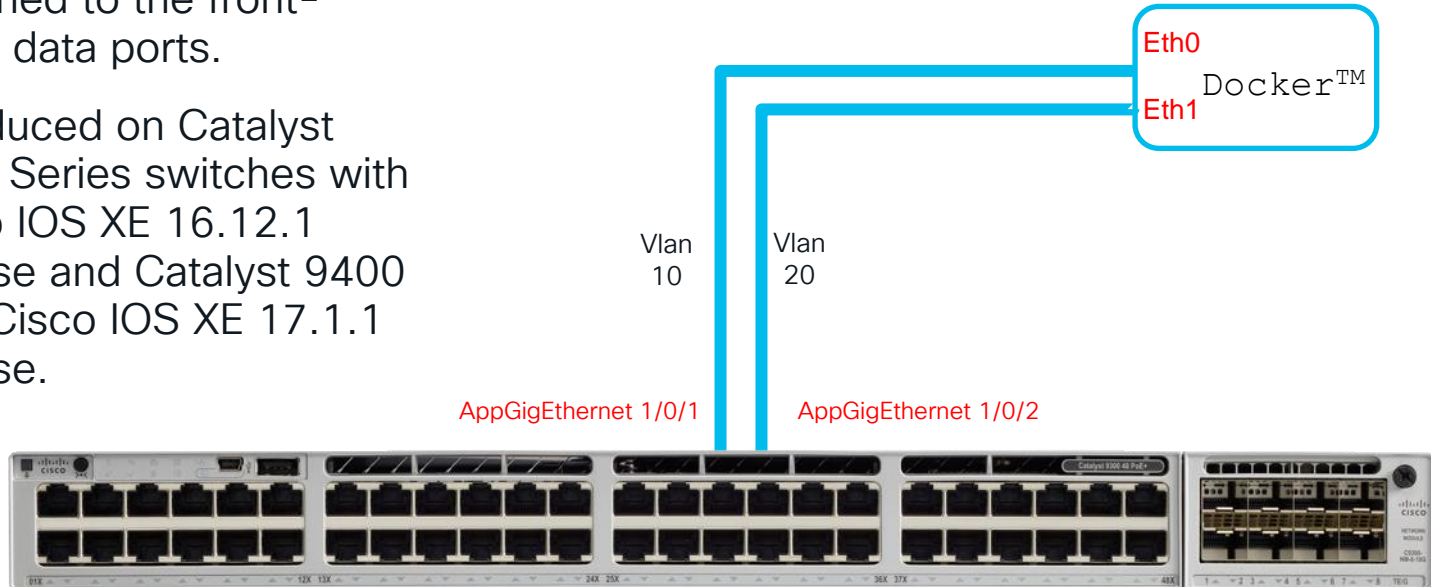## Catalyst 9600-X
M2 SATA
480/960GB

Plug into removable SUP

AppGigEthernet Port

- An internal hardware data port which is hardware-switched to the front-panel data ports.

- Introduced on Catalyst 9300 Series switches with Cisco IOS XE 16.12.1 release and Catalyst 9400 with Cisco IOS XE 17.1.1 release.

Eth0

Docker™

Eth1

Vlan
10

Vlan
20

AppGigEthernet 1/0/1   AppGigEthernet 1/0/2

Multiple Applications Support on Catalyst 9K

17.5.1

Requirements :

- **Cisco Signed Applications Only**
  (ex. ThousandEyes, IoT Gateway)

- Must use SSD Storage

- Enough HW resources should be
  available to run all applications

- AppGigabitEthernet ports config must
  not create a conflict between the apps

Shared Storage

Shared CPU   Shared RAM   Trunk

Catalyst 9000 Switch
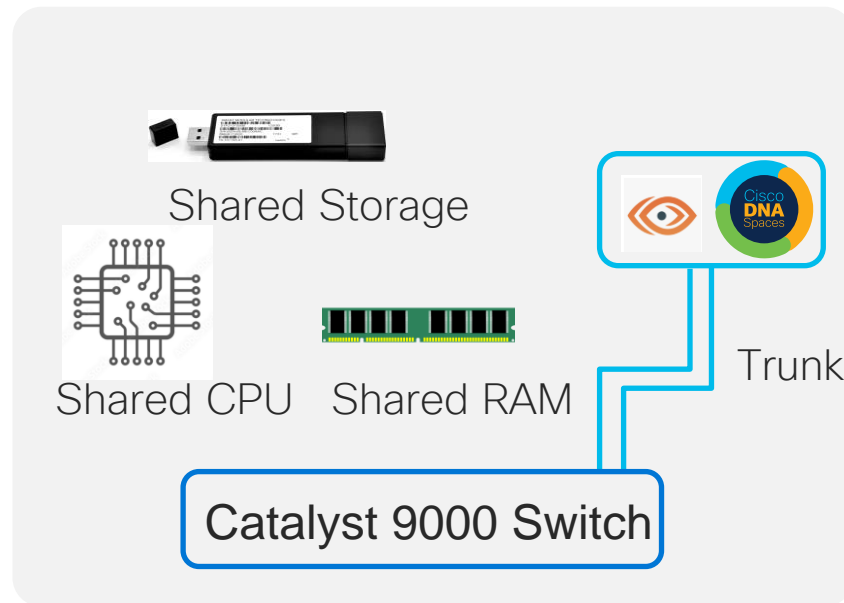
HW resource can be customized via DNA-C and CLI

IOS XE performance and security protection

- Memory and CPU usage for Apps are bounded using Control groups (cgroups).

- Process and files access for Apps are isolated and restricted (using user namespace)

- Disk usage is isolated using separate storage.

Storage security

SSD offers two layers of security:
- AES-256 Hardware encryption on SSD
- Passcode Authentication on the switch and SSD

Match
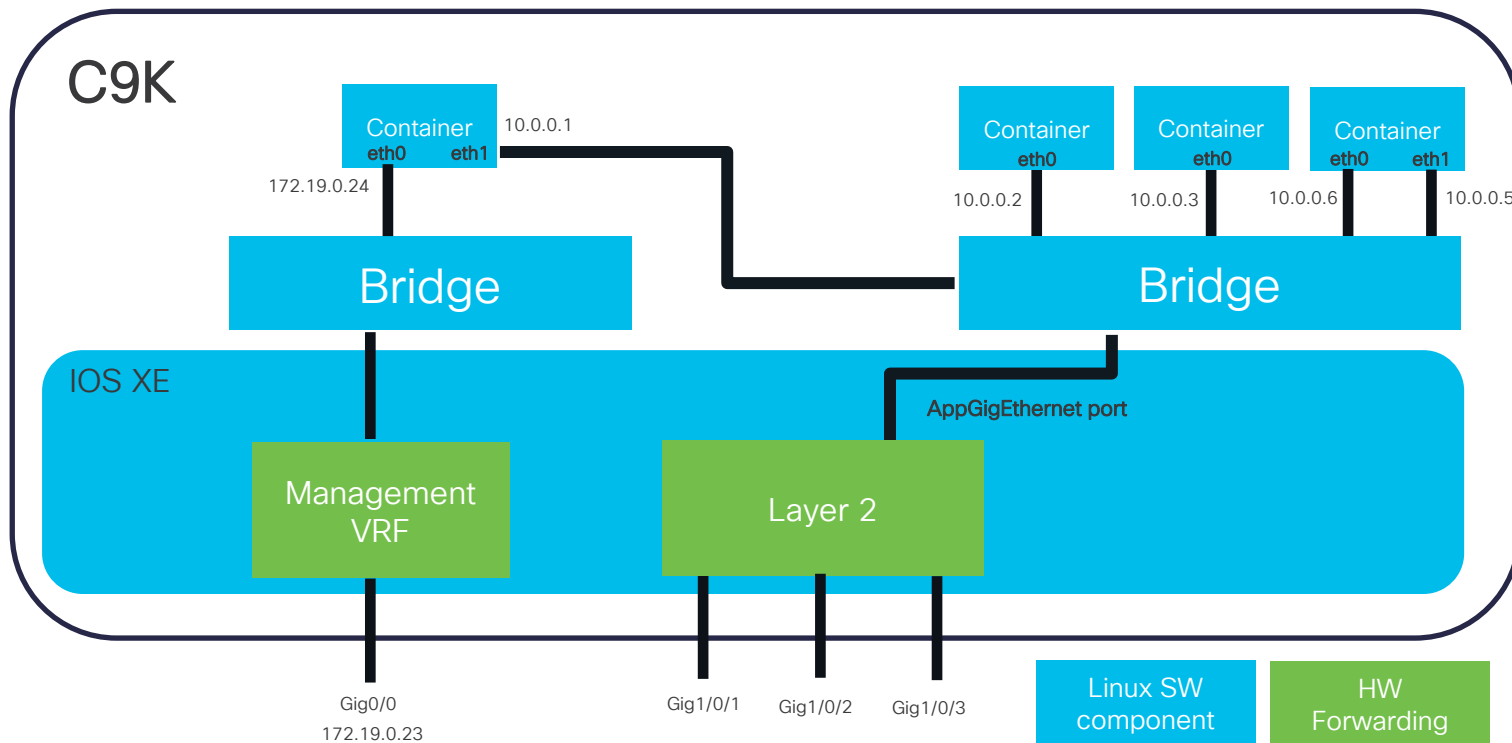
- Switch#hw-module switch 1 usbflash1 security ?
  disable disable security on USB3.0
  enable   Enable security on USB3.0
  unlock   Unlock USB3.0

Switch# conf t
Switch(config)# hw-module switch 1 usbflash1-password
Switch(config)# no hw-module switch 1 usbflash1-password

Catalyst 9000
Containers Networking

Catalyst 9000 Containers Networking

App Lifecycle Management

Application Management

Cisco DNA Center

REST

YANG | CLI | WebUI

REST | REST | REST

Cisco Application Framework

Docker	Docker	Docker	Docker	Docker
3rd Party App	3rd Party App	3rd Party App	Custom App	Custom App

Host OS (IOS XE Kernel)
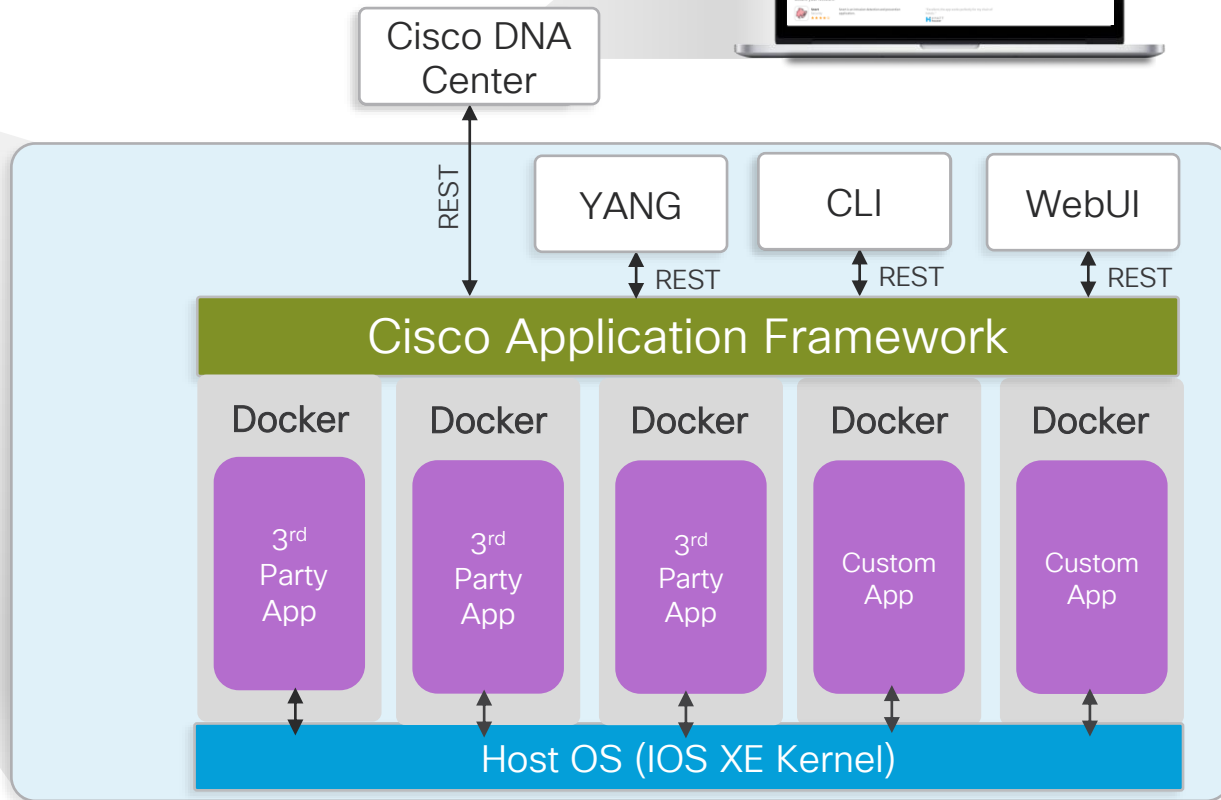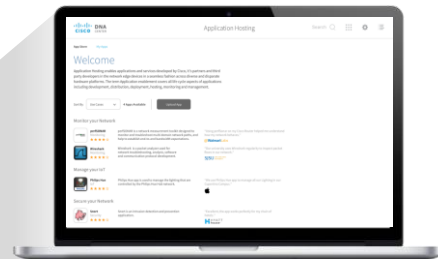
App Lifecycle Management – State Transitions

```
app-hosting install appid myapp package usbflash1:myapp.tar
```

```
app-hosting activate appid myapp
```

```
app-hosting start appid myapp
```

install → activate → start

uninstall ← deactivate ← stop

```
app-hosting stop appid myapp
```

```
app-hosting deactivate appid myapp
```

```
app-hosting uninstall appid myapp
```

CLI deployment

Cat9K

Container eth0

Bridge

IOS-XE

AppGigEthernet 1/0/1

Layer 2

Gig/0/0/1 Gig/0/0/2 Gig/0/0/3
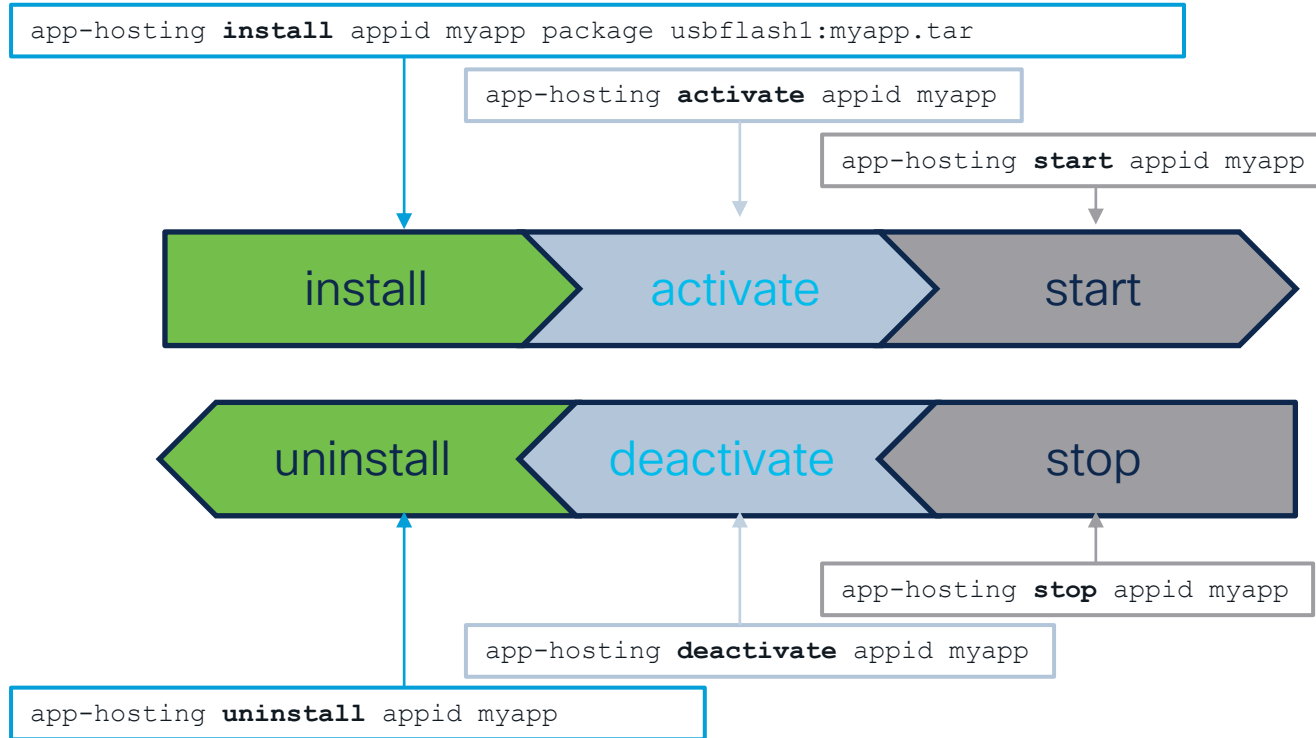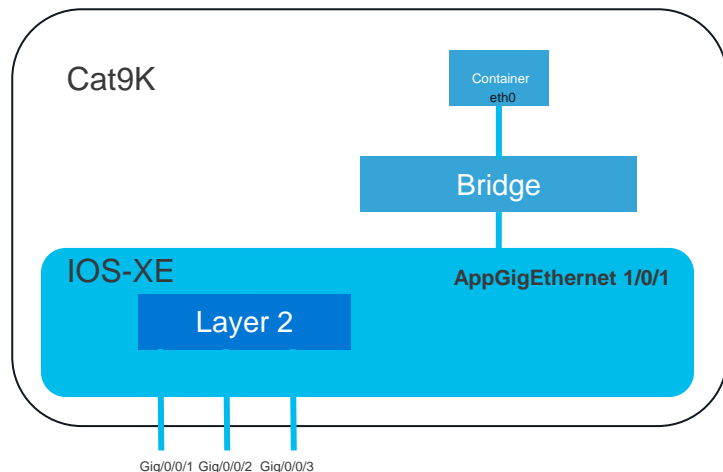
Enable IOX :

```
conf t
iox
```

AppGigEthernet Configuration :

```
interface AppGigabitEthernet1/0/1
  switchport trunk allowed vlan <vlan-id>
  switchport mode trunk
```

App Configuration :

```
app-hosting appid <app-name>
  app-vnic AppGigabitEthernet trunk
    vlan <vlan-id> guest-interface 0 ← refer to eth 0
      guest-ipaddress <app-ip> netmask <mask>
  app-default-gateway <gateway-ip> guest-interface 0

  app-resource docker
    run-opts 1 "-e xxxxxxxxxxx "
    prepend-package-opts
```

Run TE App:

```
app-hosting activate appid <app-name>

app-hosting start appid <app-name>
```

Verify TE App:

```
Show app-hosting list
```

Application HA

App Hosting High Availability with **Auto-Restart**

- Provides cold restartability of application and the underlying app hosting framework

- Retain the last configured operational state of app in the event of system switchover or restart

- 1+1 redundancy mode

- Same storage type (Flash* or SSD) required on both Active and Standby

- Enabled by default
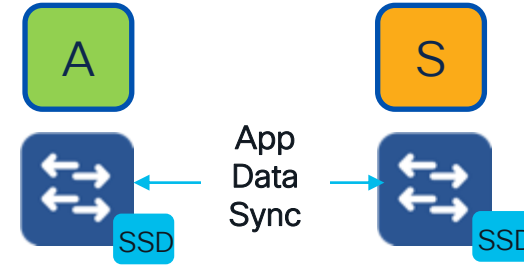
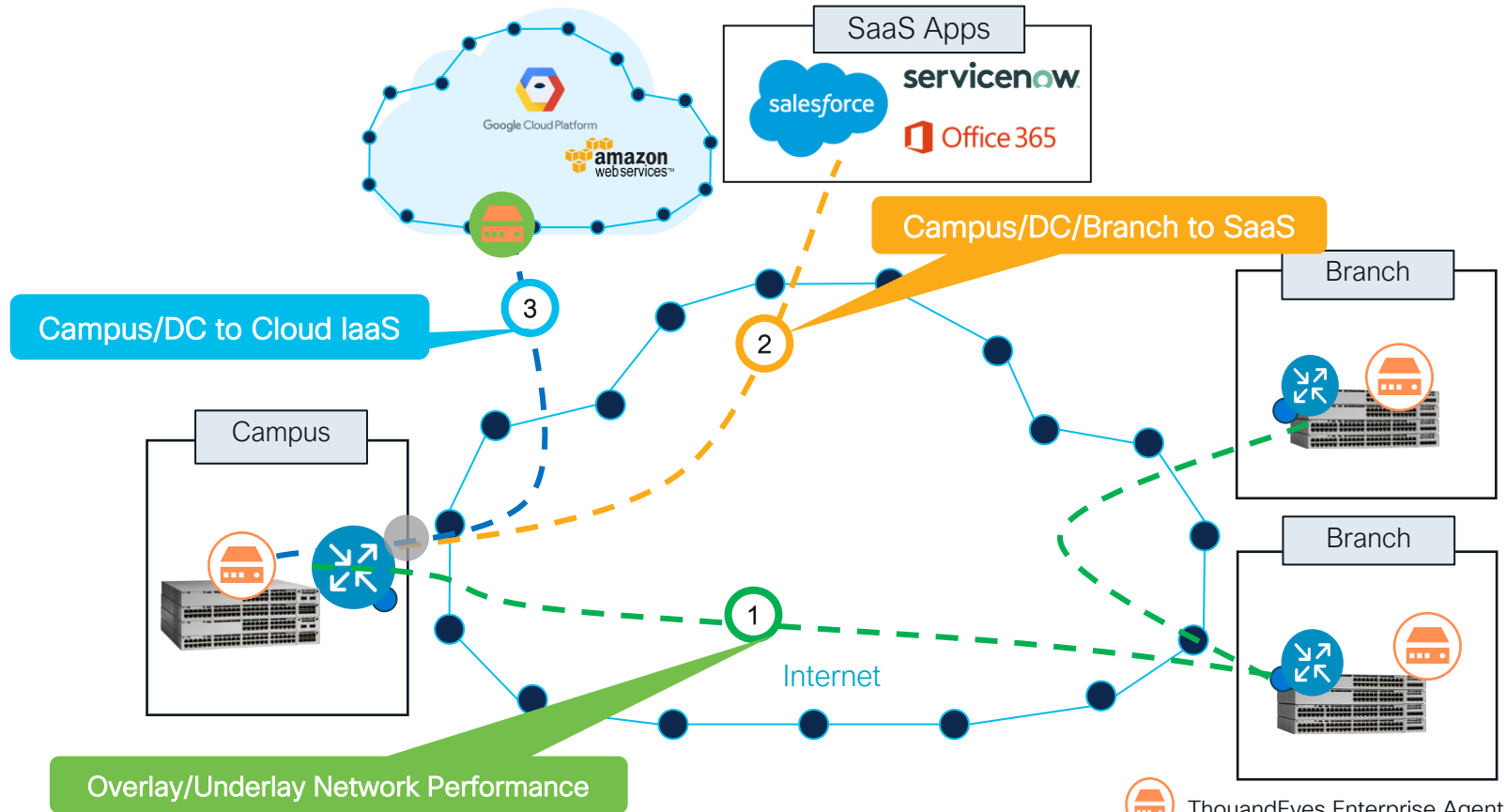| Supported Platforms	Release
9300 StackWise (1+1 mode only)	17.2.1
9400 Dual Sup (Single Chassis & StackWise Virtual)	17.5.1
9500H StackWise Virtual	17.5.1
9600 Dual Sup (Single Chassis & StackWise Virtual)	17.5.1

* Flash is only for Cisco Singed app

Cloud Services at the Edge

Service Assurance with ThousandEyes

SaaS Apps

Campus/DC/Branch to SaaS

Campus/DC to Cloud IaaS

Branch

Campus

Branch

Internet

Overlay/Underlay Network Performance

ThousandEyes Enterprise Agent

ThousandEyes now included with Cisco DNA licenses

New and existing Catalyst 9000 switches now include ThousandEyes service assurance

App hosting: no extra hardware

Enterprise

App Hosting Framework

ThousandEyes | Docker App

Docker
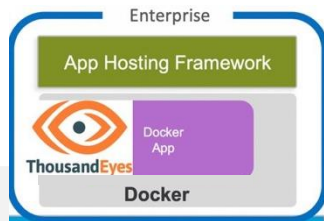
- Run ThousandEyes agent natively on flash of 9300/9400 switches
- Out of the box access to ThousandEyes for new switches

DNA subscription benefits

110 1011 010

DNA Essentials

DNA Advantage ✔

DNA Premier ✔

- Includes 22 x ThousandEyes Units for a month
- Pool entitled test capacity to deploy anywhere within your network

Data Visualization

- License to ThousandEyes SaaS-based management platform
- Access to Dashboards, alerts and reporting tools
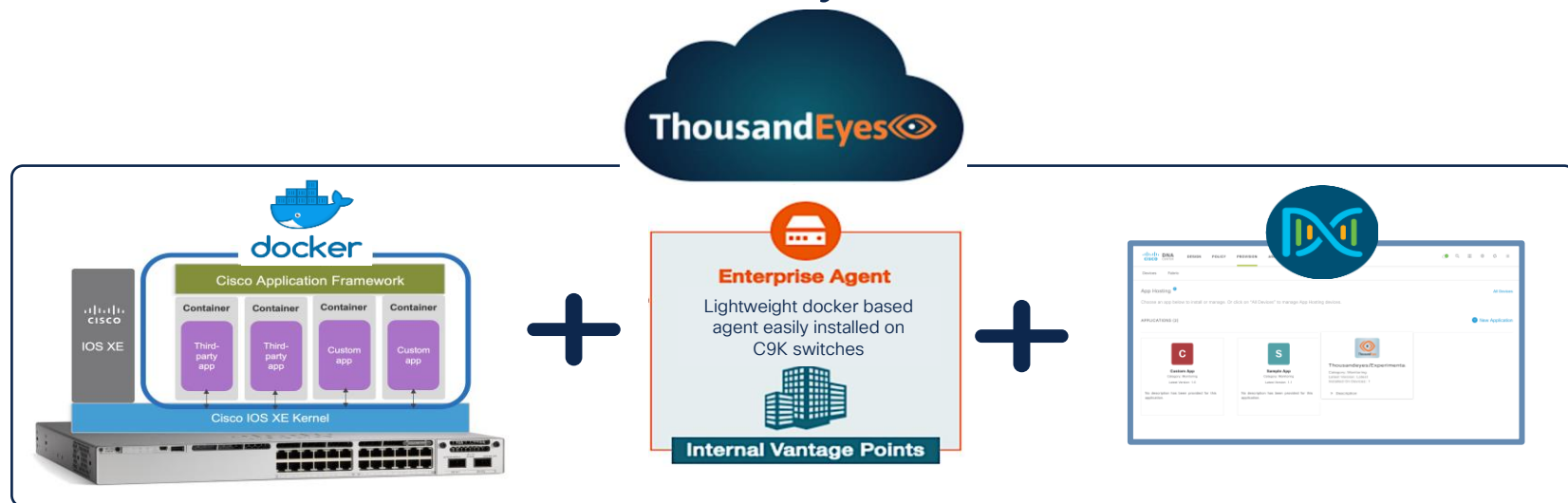
🏢 Campus connectivity   🌐 Modern WAN   ⚙ Application experience

*Choose from a menu of several networking, web and voice tests
 Browser-based tests need the use of SSD and consume more ThousandEyes units

Service Assurance from Catalyst 9000

ThousandEyes
Enterprise Agent

Agent installed in Flash
Test Included:
- **Web** – HTTP Server, FTP Server
- **DNS** - DNS Server, DNS Trace, DNSSEC
- **Network** - Agent to Agent, Agent to Server
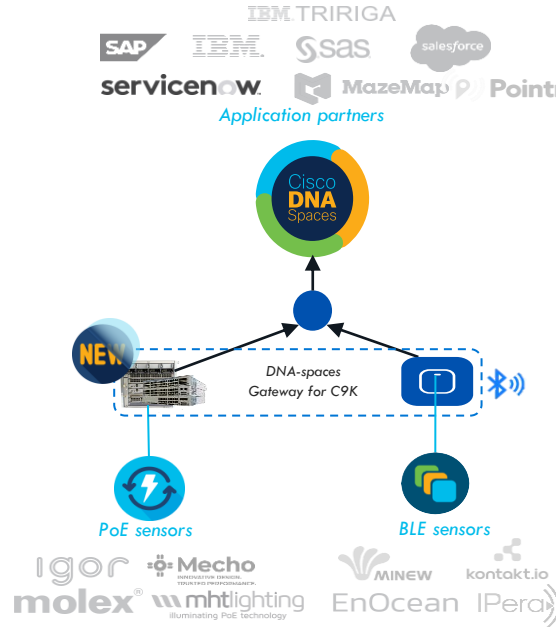- **Voice** – SIP Server, RTP Stream, Voice Call

Agent installed in SSD
Test Included:
- **Web** – HTTP Server, FTP Server
- **DNS** - DNS Server, DNS Trace, DNSSEC
- **Network** - Agent to Agent, Agent to Server
- **Voice** – SIP Server, RTP Stream, Voice Call
- **BrowserBot** – Page load & Transaction (IOS-XE 17.6.1 required)

Catalyst 9K expands value for Smart buildings

Next: DNA-spaces gateway for Catalyst 9K will expand outcomes

Catalyst 9K

+

Cisco DNA Spaces

IBM TRIRIGA
SAP IBM SAS salesforce
servicenow MazeMap Pointr

Application partners

Cisco DNA Spaces

NEW
DNA-spaces Gateway for C9K

PoE sensors

BLE sensors

igor
molex Mecho
mhtlighting
illuminating PoE Technology

MINEW kontakt.io
EnOcean IPera

New use cases

o Sustainable buildings
o Employee health & Safety
o Productivity Improvement
o Building Analytics

Unified Marketplace

o Largest choice of IoT devices
o Unmatched solution scale
o Cisco validated

Lower TCO

o Automated workflows
o No vendor lock-ins
o Cloud based as-a-service

*Source: Cisco Smart building TCO calculator

Use Cases

User Experience	Safety & Compliance	Real Estate Utilization	Automation & Optimization
Conference Room Booking	**Density Triggers**	**Device/People Counting**	**Environmental Monitoring & Asset location**

GA

Cisco Catalyst 9K

Cisco DNA Spaces

PoE lights & Sensors	Cisco Catalyst Wireless LAN Controller	Cisco Catalyst Wireless LAN Controller	POE sensors / HVAC

Indoor IoT Services – Overview

DNA Spaces cloud

- IoT Market place and Partner Apps.
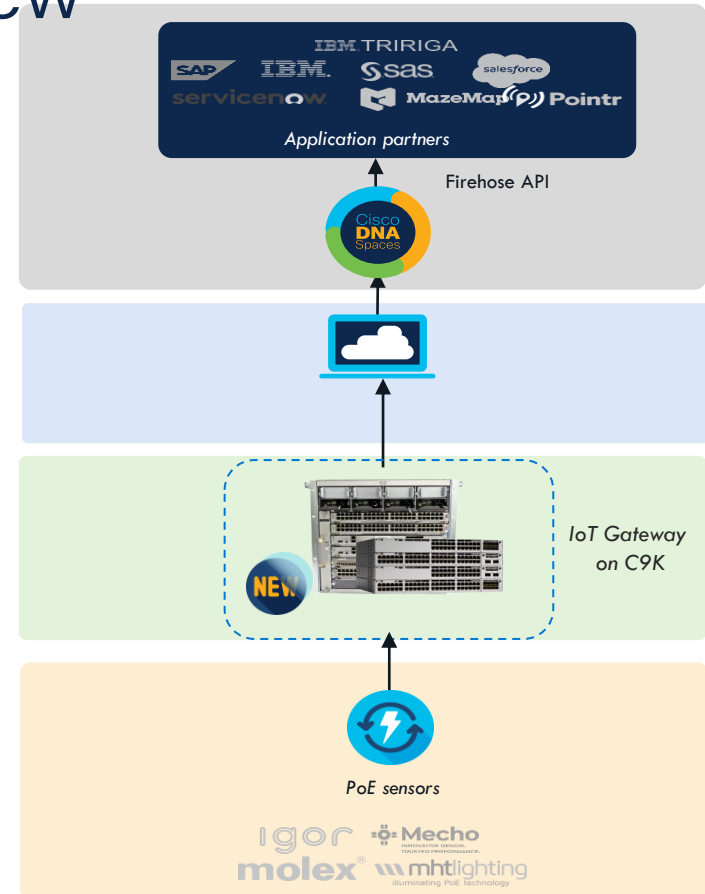- Firehose API

DNA Spaces Connector

- Interfaces between DNA Spaces Cloud & on prem devices
- Collects sensor data
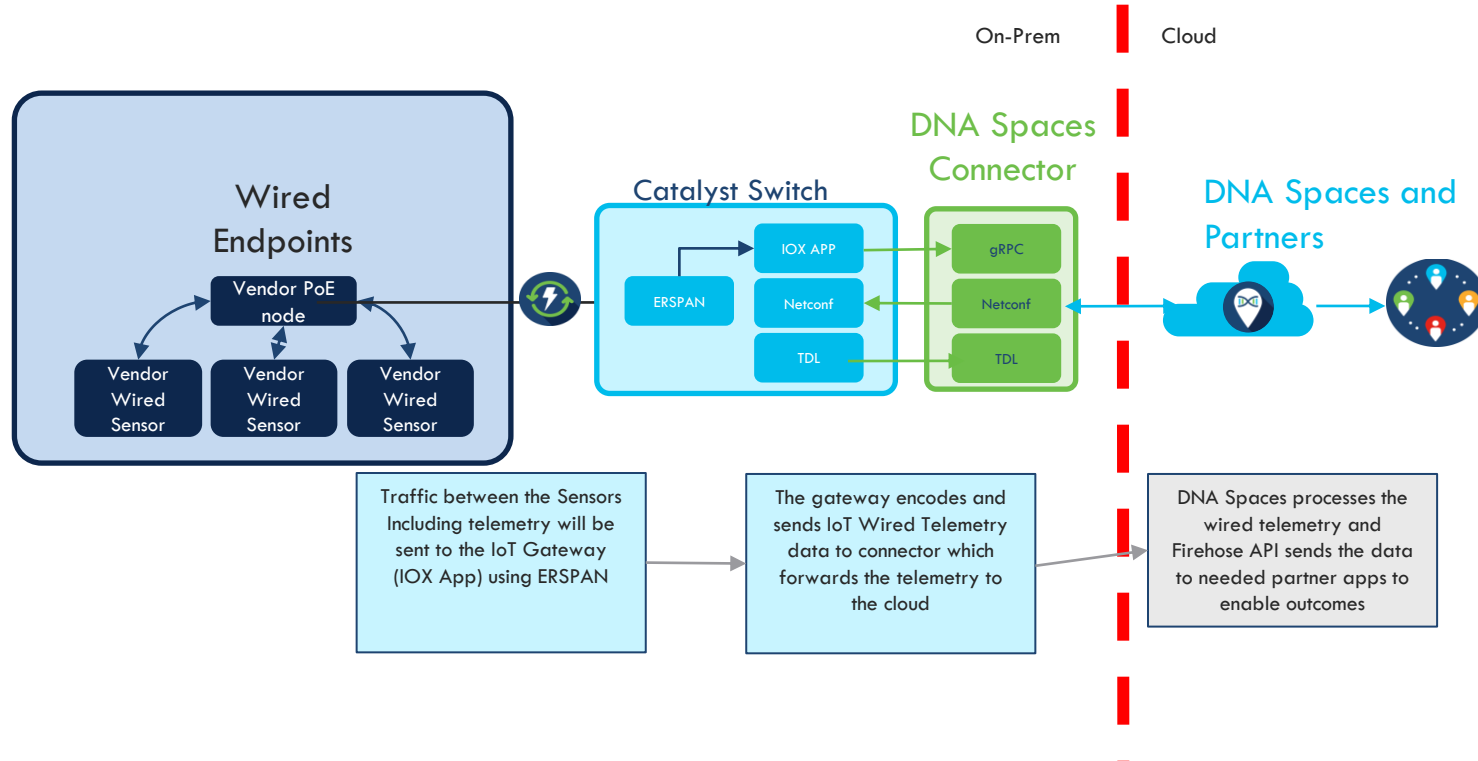
Catalyst 9300/9400

- UPOE/UPOE+ Connectivity
- IoT GW App

PoE Sensors

- Wired PoE Sensors
- Powered by UPOE/UPOE+ port on the switch

SAP IBM TRIRIGA IBM SAS salesforce servicenow MazeMap Pointr

Application partners

Firehose API

IoT Gateway on C9K

NEW

PoE sensors

igor molex Mecho mhtlighting

Indoor IoT Services with IoT Gateway App

Cisco + NS1 – Making Edge more Intelligent

Scale and reliably deliver DHCP, DNS, and IPAM (DDI) services when you need them

Business Outcomes

- Lower Cost – No new hardware

- Improved operational efficiency

- Fast application experience

- Increase ROI

Capabilities

- Distributed model with centralized cloud control
- DevOps Ready Framework

- Granular control over DDI services

- Deployment on Scale with Cisco DNA Center

DHCP DNS IP

NS1 Agent

NS1 Agent

Access devices   Users   Users   Access devices
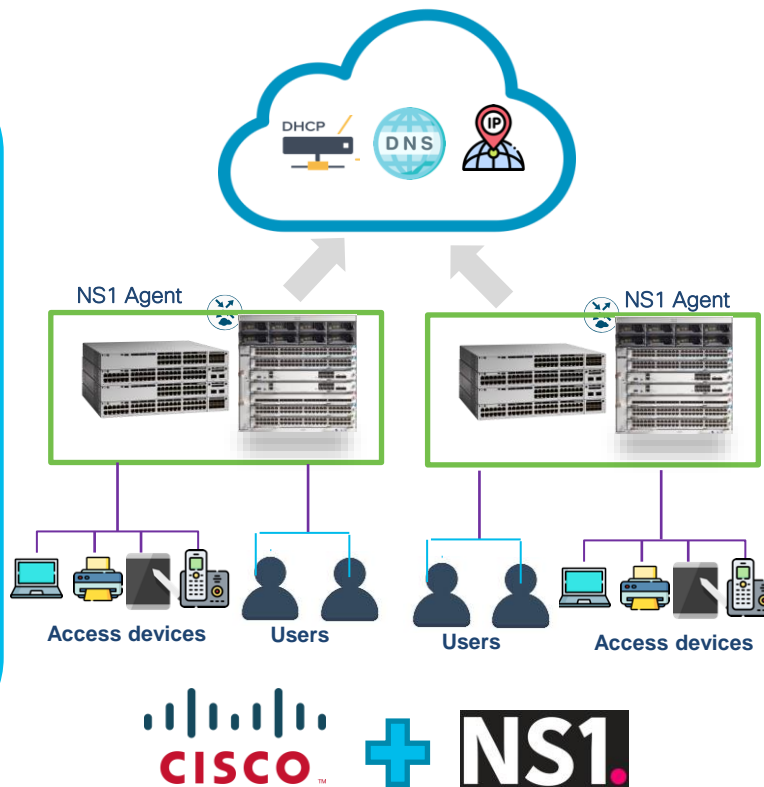
Catalyst enabled DDI aaService with NS1
Scale and reliably deliver DDI services
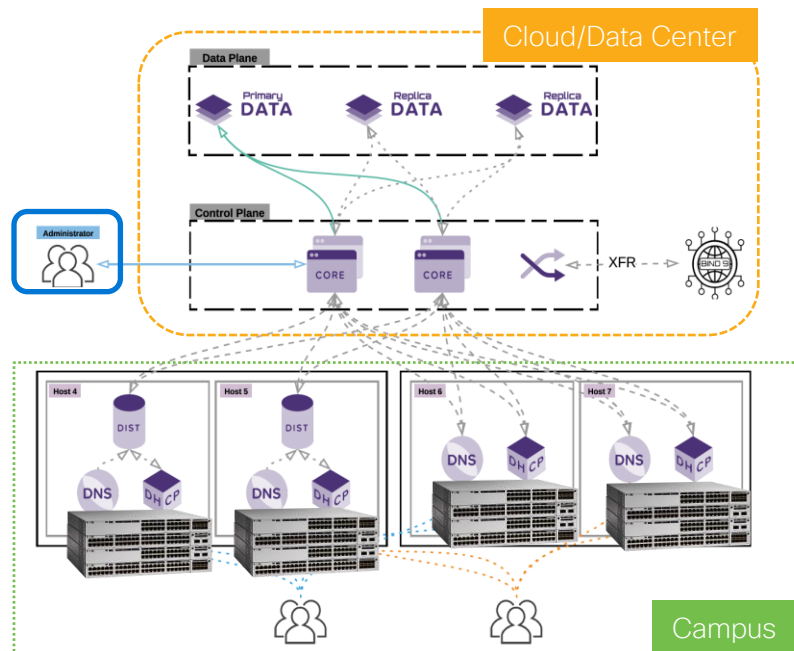
Can individually host DNS and DHCP containers in C9300 and C9400

Other DDI Containers can flexibility host on Sever or Cloud.

Resource type	Catalyst 9300/L	Catalyst 9300X	Catalyst 9400
Memory	2GB	8GB	up to 8GB
CPU	1 core (25%)	2 core (25%)	1 core (25%)
Storage	120/240 GB (USB3.0/SSD)	240GB (USB3.0/SSD)	240-960GB (SATA)

NS1 Enterprise DDI Installation Guide

Validated Apps- DevNet Eco System Exchange

[DevNet Eco System Exchange](#)

- Cisco will not provide any support to third-party apps and open source apps unless specifically called out.
- Such apps, however, will be validated for compatibility on Cisco® Catalyst® 9000 switches.
- DevNet ecosystem will indicate the partners who have worked on Cisco Catalyst 9000 switches.

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!

- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.

- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

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Cisco Learning Network
Resource community portal for certifications and learning

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Intensive team & individual automation and technology training programs

Cisco Learning Partner Program
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Accelerated curriculum of product, technology, and certification courses

Certify

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Award-winning certification program empowers students and IT Professionals to advance their technical careers
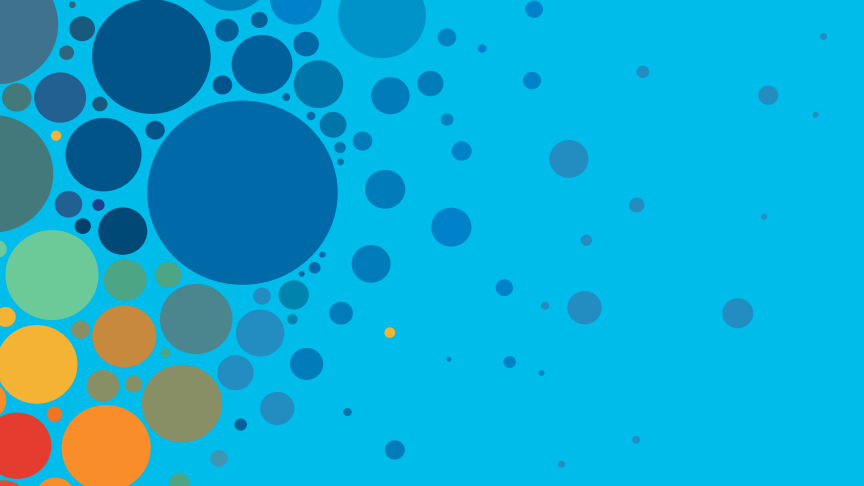
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Thank you