# Simplifying Operations and Upgrades on Nexus using Modular NXOS Software

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# Webex App

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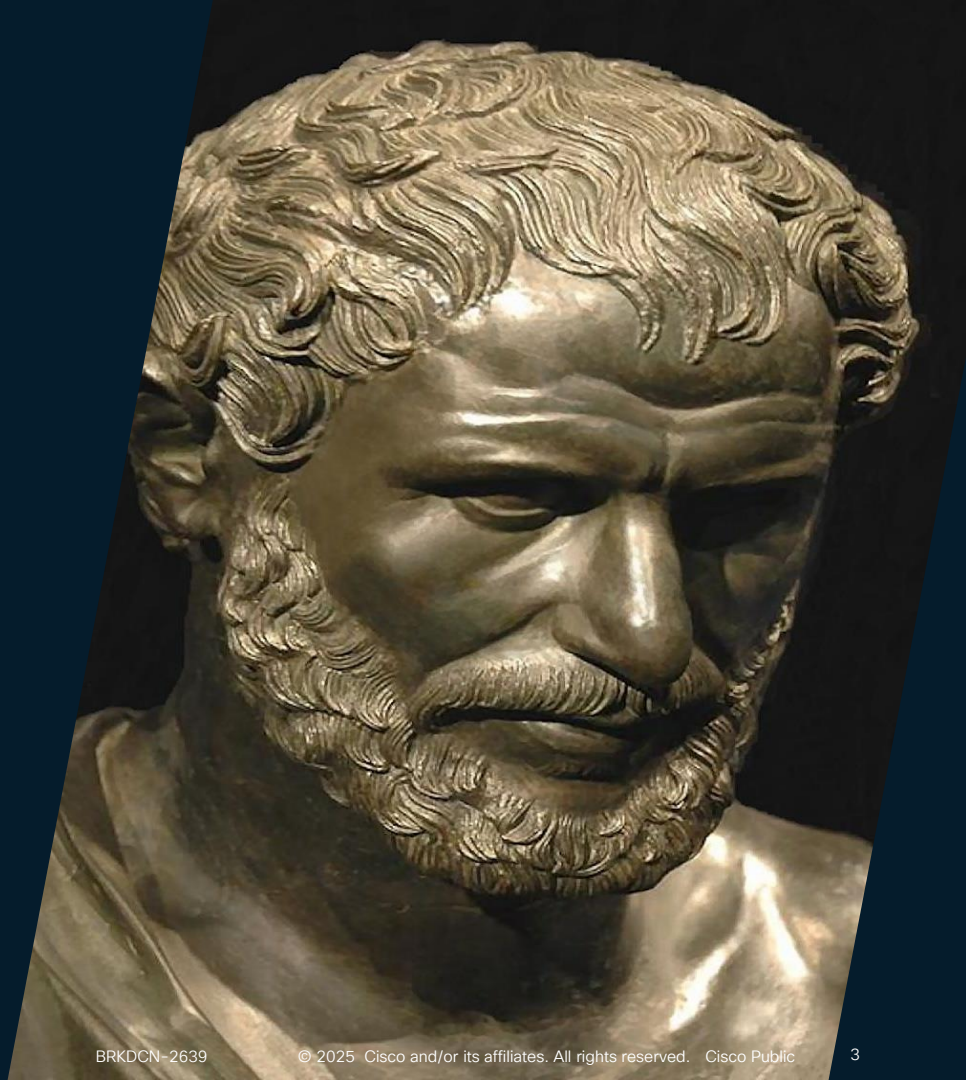
## Webex spaces will be moderated by the speaker until February 28, 2025.

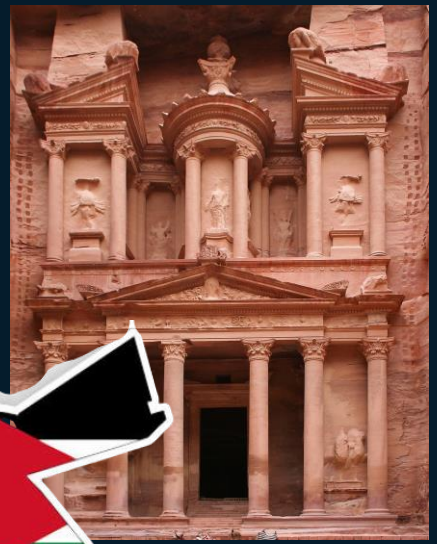
# “The Only Constant in Life Is Change”

Heraclitus



# Agenda

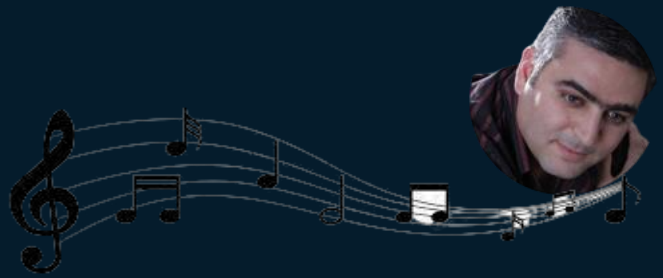
- NXOS SW Architecture
- Upgrades on the Nexus Switches
- Upgrades on ACI Switches
- Bonus: Modular Software Operations



Jordan


Bullet


CISCO 28+



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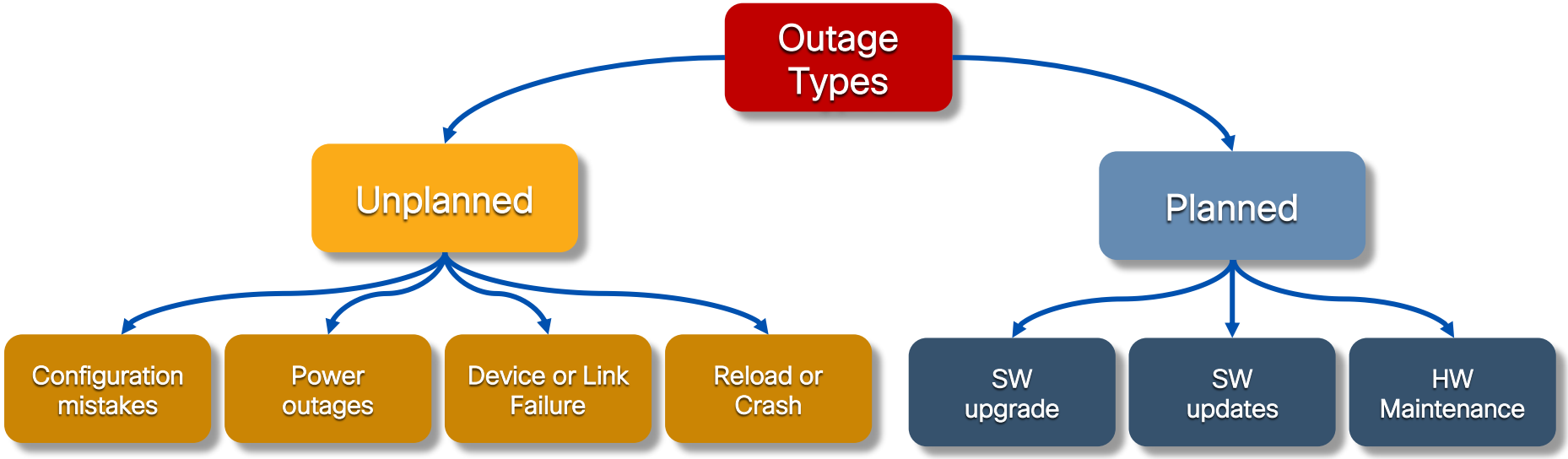
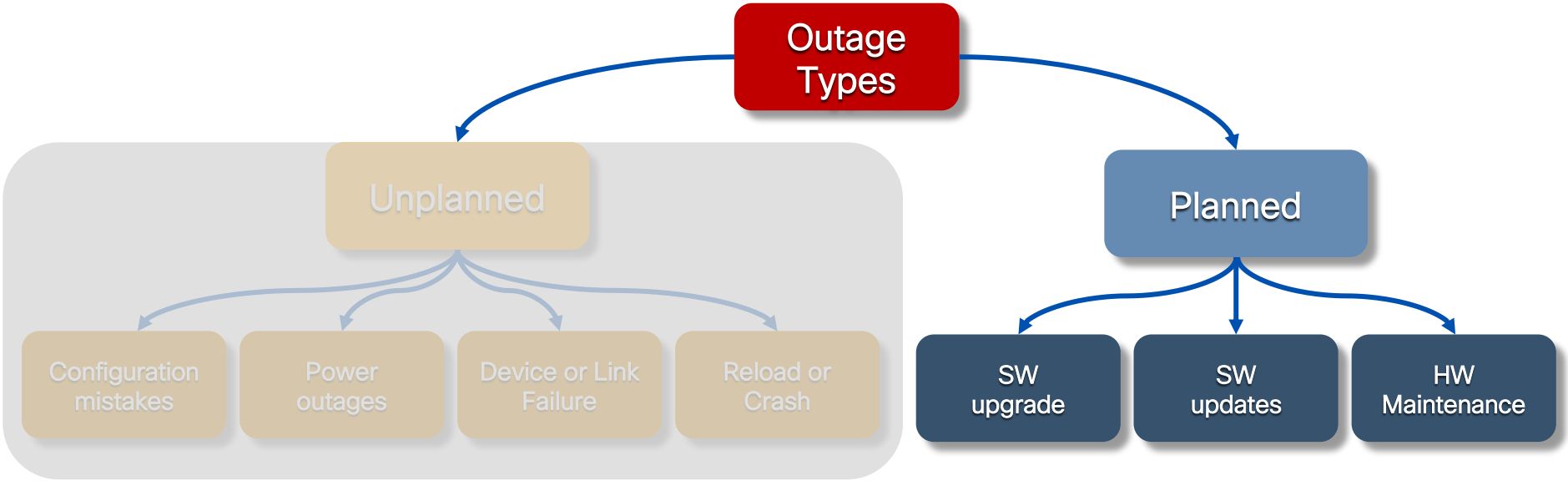
# Planned vs. Unplanned Outages




GOAL: Minimize the impact of outages on clients, network and applications

# Planned vs. Unplanned Outages

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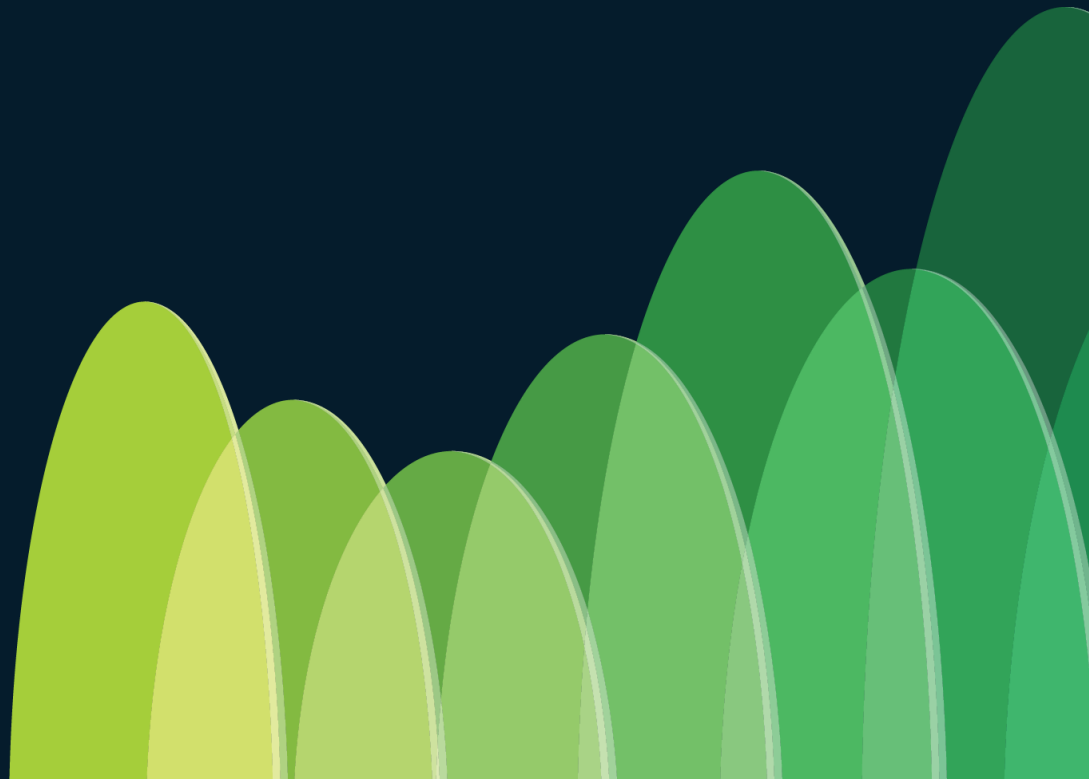
# NXOS SW Architecture



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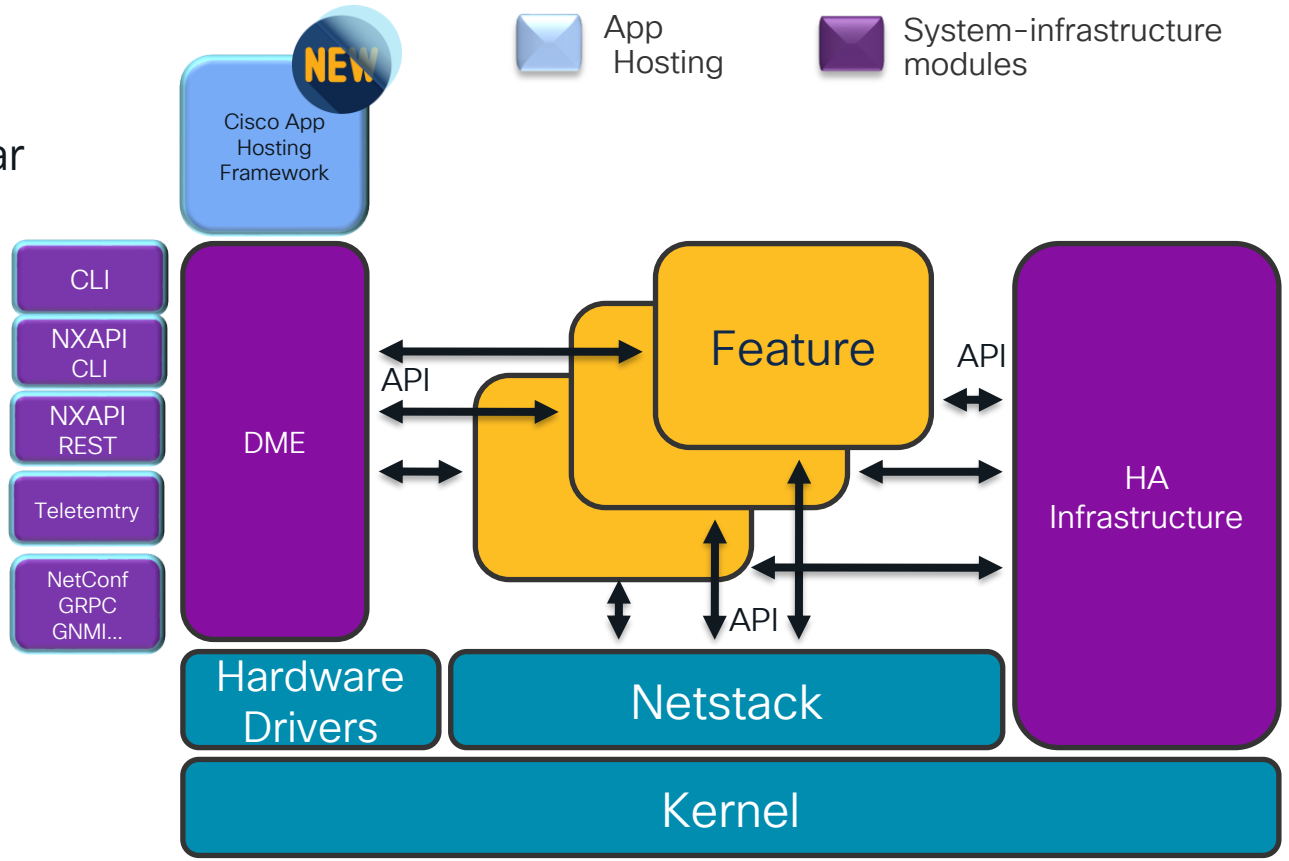
# NX-OS HA Architecture

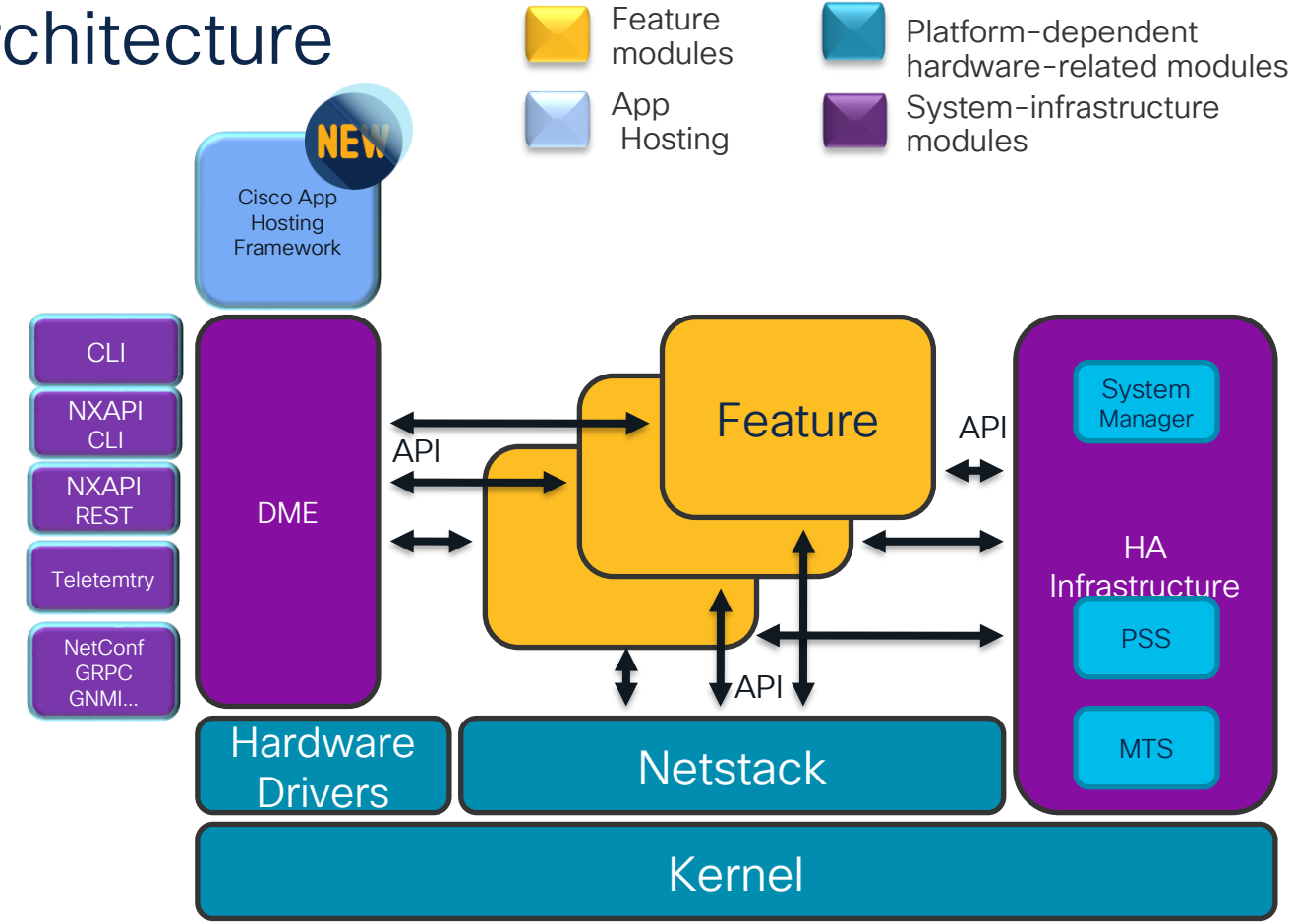
- **Fully distributed** modular design
- Control-plane & data-plane separation
- Service restart-ability
- Non-disruptive SSO* & ISSU
- Open & Model Driven
- App Hosting Capability




*SSO only available on dual-sup Nexus devices

# NX-OS HA Architecture

- 3 Major components
- System Manager
- Message & Transaction Service (MTS)
- Persistent Storage Service (PSS)



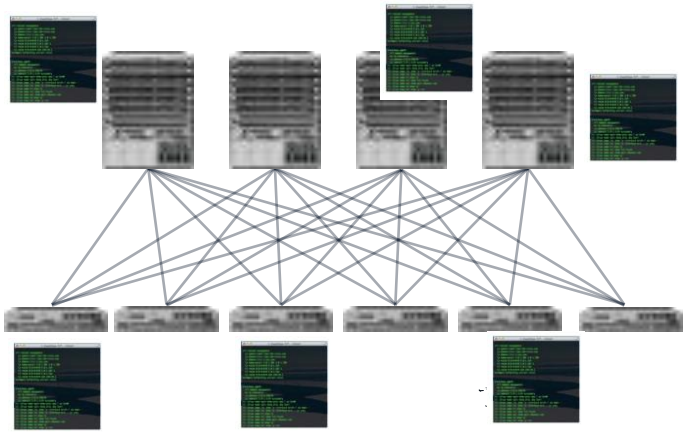
# ACI Architecture

## Controller Integration


Now let’s imagine a network switch ... at the moment, largely configured on the CLI

# ACI Architecture

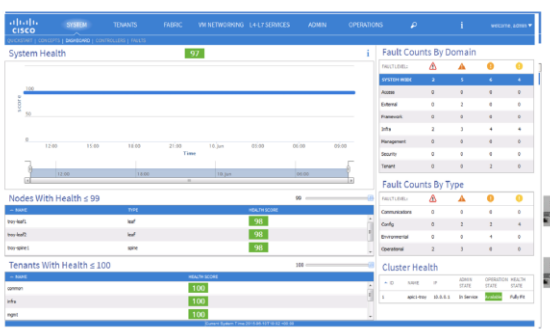
## Controller Integration

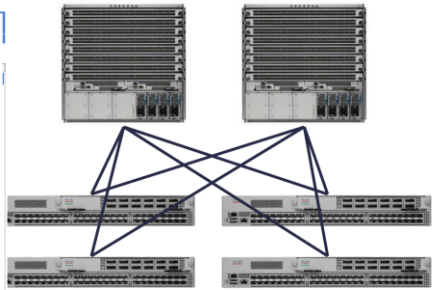


Now let's imagine a network switch ... at the moment, largely configured on the CLI

APIC becomes single point of management for the entire fabric ... with a policy-based model

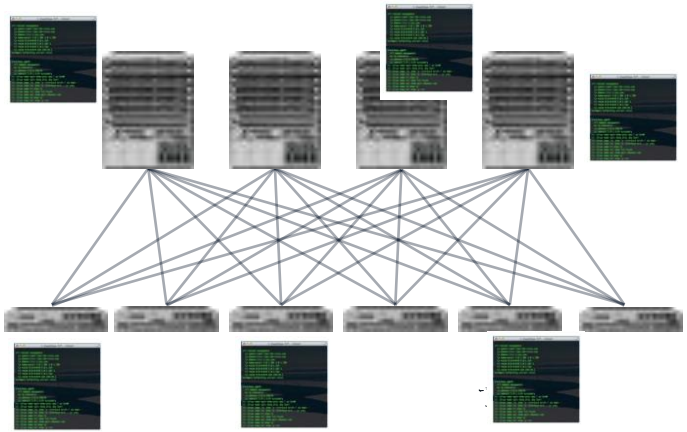
Interfaces, protocols, TCAM, etc … all represented in an object model, and ALL accessible through an XML/JSON API and CLI



# ACI Architecture

## Controller Integration



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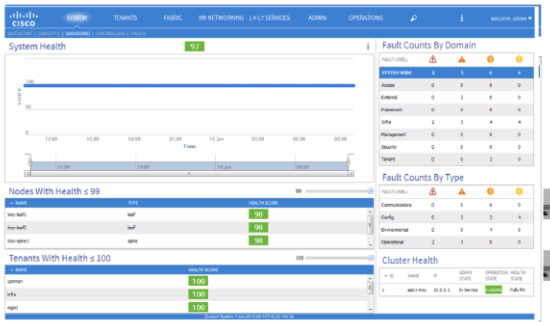
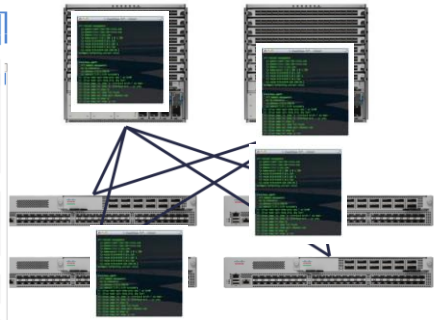


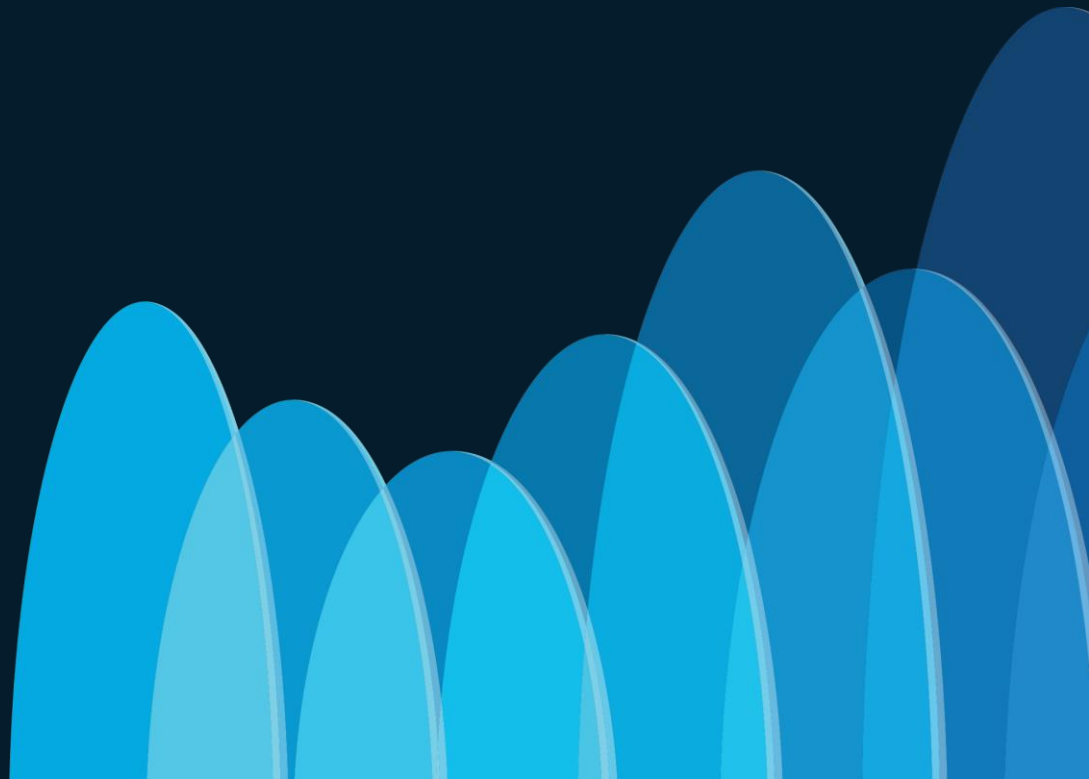



# Agenda

- NXOS SW Architecture
- Upgrades on the Nexus Switches
  - Install command
  - Enhanced  mode
  - GIR
  - Upgrades from NDFC
  - Best Practices
- Upgrades on ACI Switches
- Bonus: Modular Software Operations

Planned

# Patching & ISSU



# Validating SMU Impact

## Each SMU comes with a README file

```
##########################################################################################
#
# Readme for SMU nxos64.CSCvz98895-n9k_ALL-1.0.0-10.3.1.167.lib32_64_n9000
#
# Copyright (c) 2021 by Cisco Systems, Inc.
# All rights reserved.
#
##########################################################################################
Name:          nxos64.CSCvz98895-n9k_ALL
Version:       10.3.1.167
Compressed size:89146
DDTS:          CSCvz98895
Description:   Kr2f-122: nxpython3 core while collecting show-tech-detail > icam script is failing
Type:          non-reload
MD5 :          a64fa50587d045828421860b840cc366
```

| SMU Types | Impact |
|---|---|
| Non-Reload (Hot) | Process Restart |
| Reload (Cold) | Box Reload |

SMU Impact

# Nexus SMU install commands

Adding SMU

```
switch# install add nxos`.CSCxy68793-n9k_ALL-1.0.0-10.3.1.132.lib32_n9000.rpm)
[####################] 100%
Install operation 26 completed successfully at Sat May  4 00:27:02 2021
```

Activating SMU

```
switch# install activate nxos.CSCxy68793-n9k_ALL-1.0.0-10.3.1.132.lib32_n9000.rpm
Activating the patch (/nxos.CSCxy68793-n9k_ALL-1.0.0-10.3.1.132.lib32_n9000.rpm)
[####################] 100%
Install operation 27 completed successfully at Sat May  4 00:27:11 2021
```

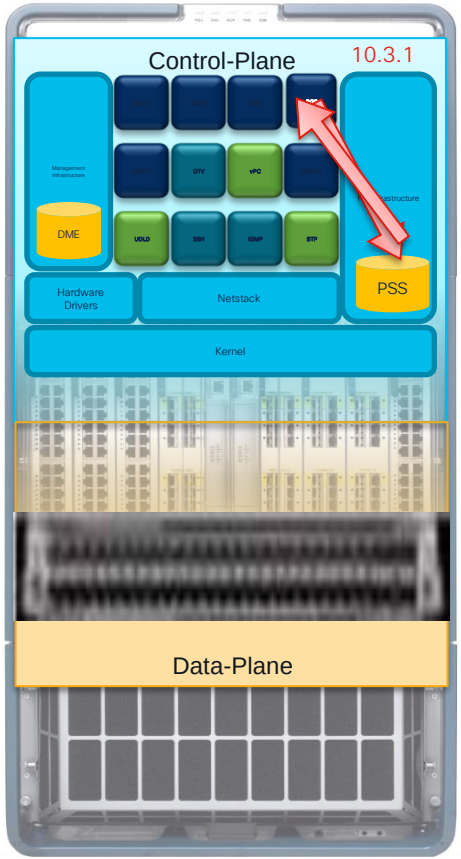
Committing SMU

```
switch# install commit
[####################] 100%
Install operation 28 completed successfully at Sat May  4 00:29:15 2024
```

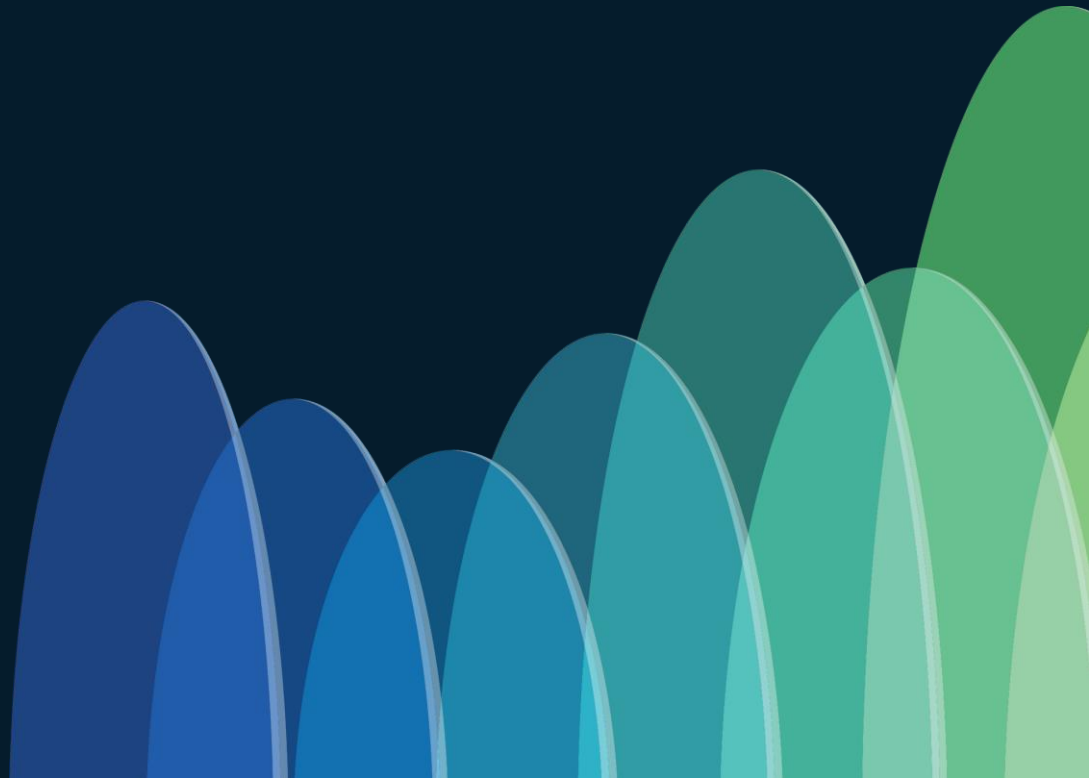
Any failures/reloads between activate and commit result in a rollback

# Non-reload(HOT)  SMU update on Nexus 9000

- Services Checkpoints their state in PSS
- Installer asks SysMgr to stop the process
- Installer updates File System with files from SMU
- Installer asks SysMgr to restart the process
- No impact on data plane
- State is recovered, operation resumes
- Total Recovery Time ~10ms



# NXOS ISSU



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# Running Manual Switch Checks (Upgrades)

- First step is downloading the image to switch

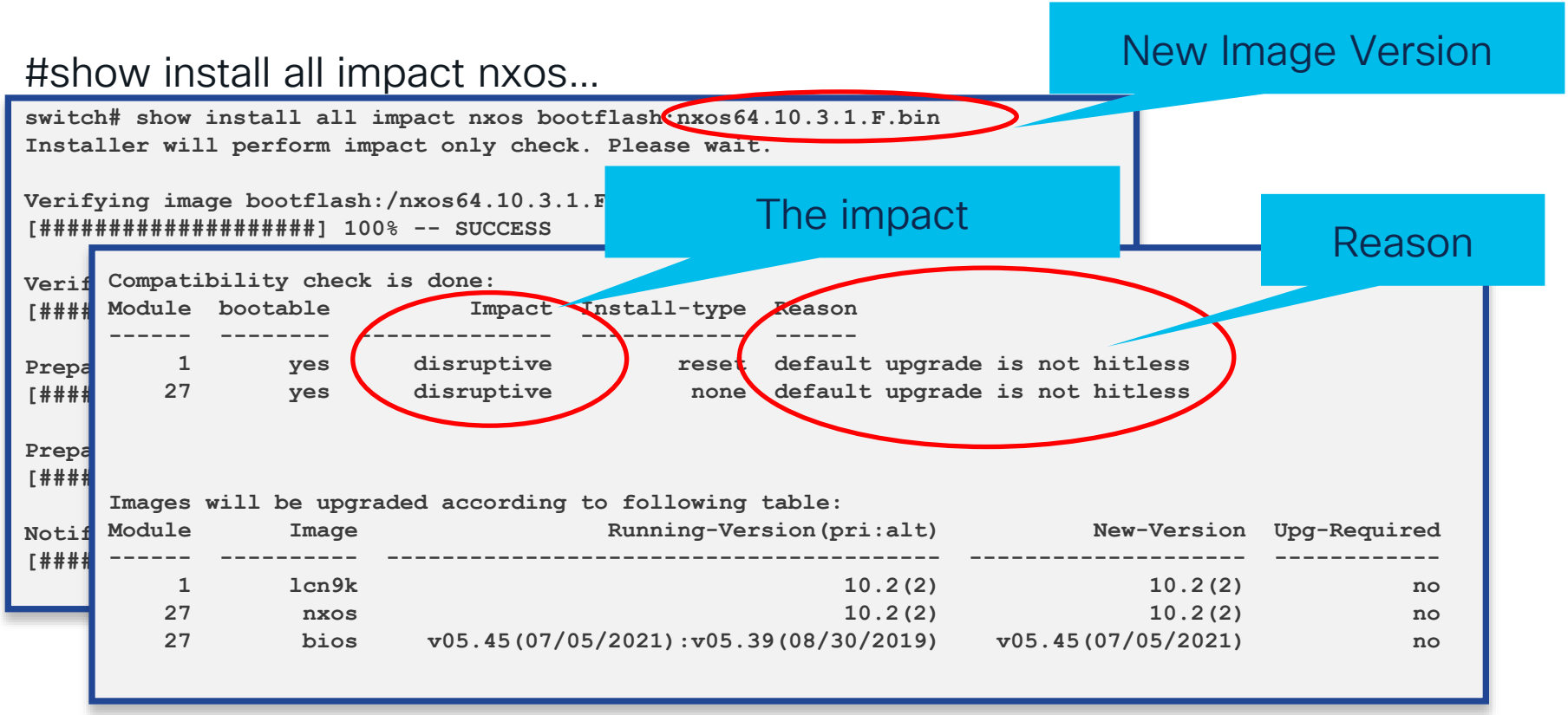
#show install all impact nxos...

New Image Version

```
switch# show install all impact nxos bootflash:nxos64.10.3.1.F.bin
Installer will perform impact only check. Please wait.

Verifying image bootflash:/nxos64.10.3.1.F.bin for boot variable "nxos".
[####################] 100% -- SUCCESS

Verifying image type.
[####################] 100% -- SUCCESS

Preparing "nxos" version info using image bootflash:/nxos64.10.3.1.F.bin.
[####################] 100% -- SUCCESS

Preparing "bios" version info using image bootflash:/nxos64.10.3.1.F.bin.
[####################] 100% -- SUCCESS

Notifying services about system upgrade.
[####################] 100% -- SUCCESS
```

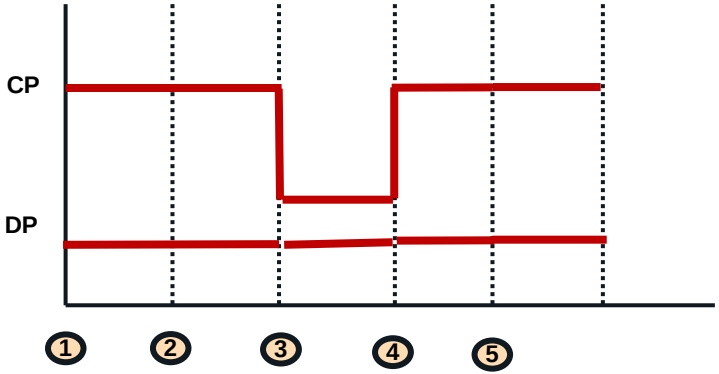
# Running Manual Switch Checks (Upgrades)

#show install all impact nxos...

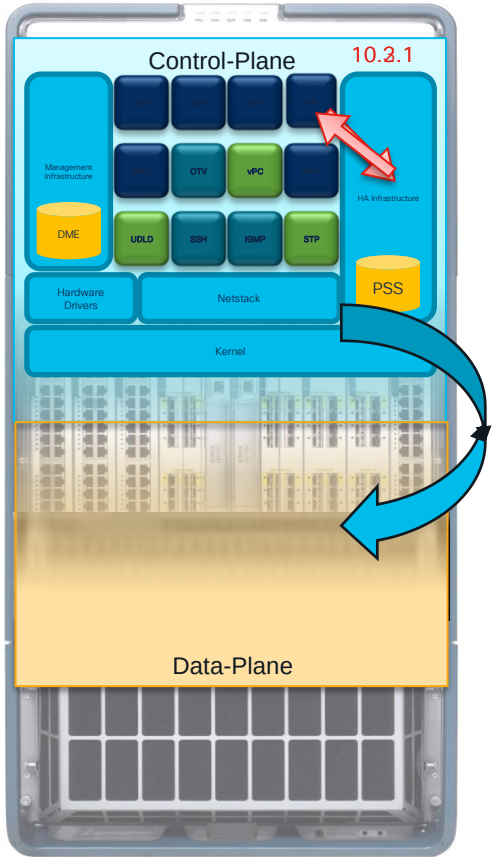


# Hitless ISSU on the Nexus TOR N9K

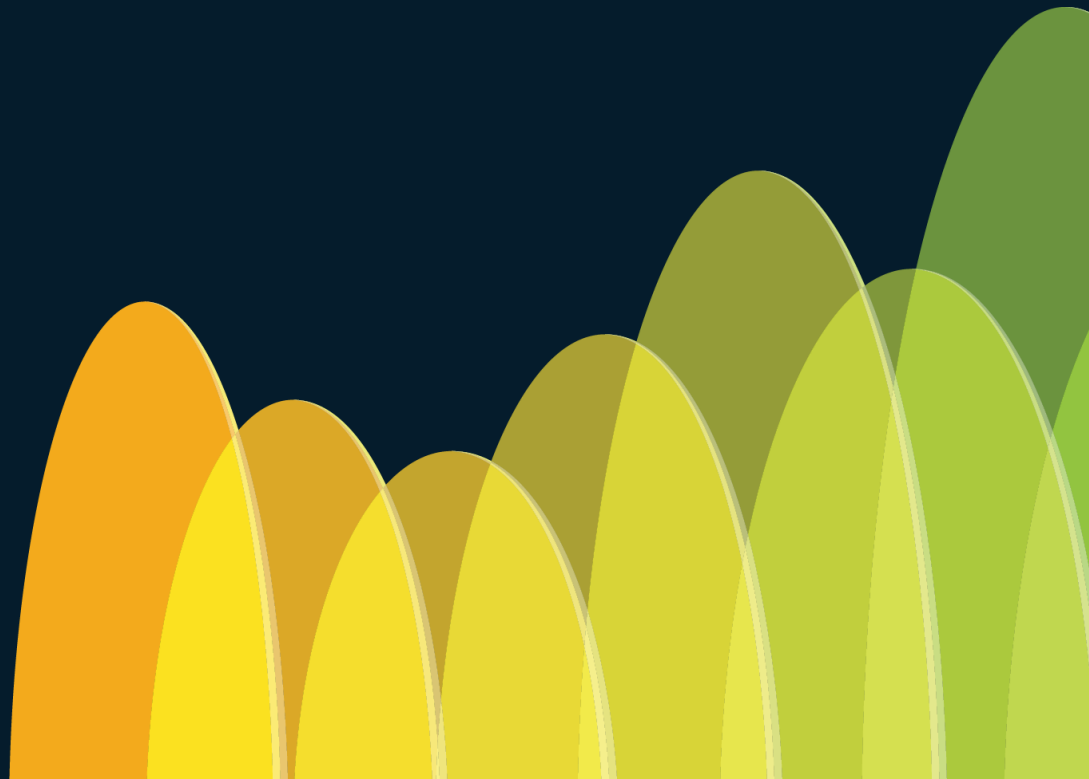
- Single supervisor
- Hitless Upgrade
  - Control plane is inactive during reload while Data plane is forwarding




1. Pre Upgrade Check
   - Config Locked
   - Stable Network
2. Save State
3. kexec to new Image
4. Restore control plane from saved State
5. Reconcile with Data Plane



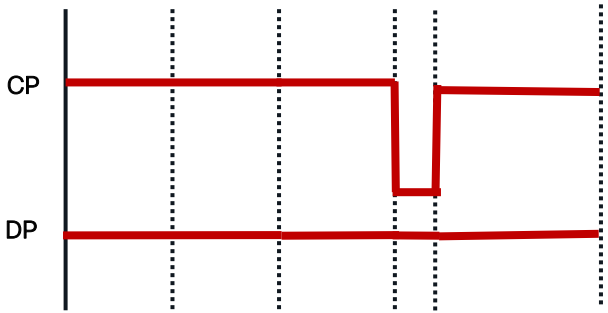
# Enhanced ISSU

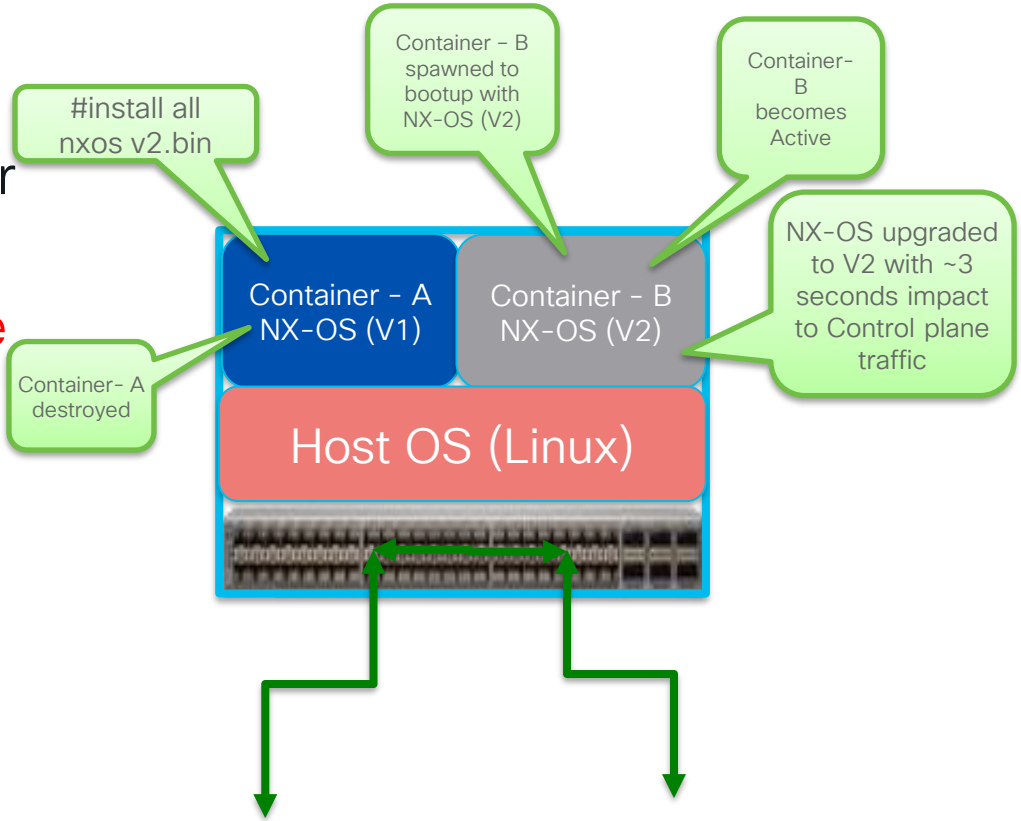


# Enhanced ISSU on the Nexus TOR N9K

- Dual Container
- Control plane is only down for ~3 sec during switchover

If Kernel uprev is detected, we auto-revert to normal ISSU

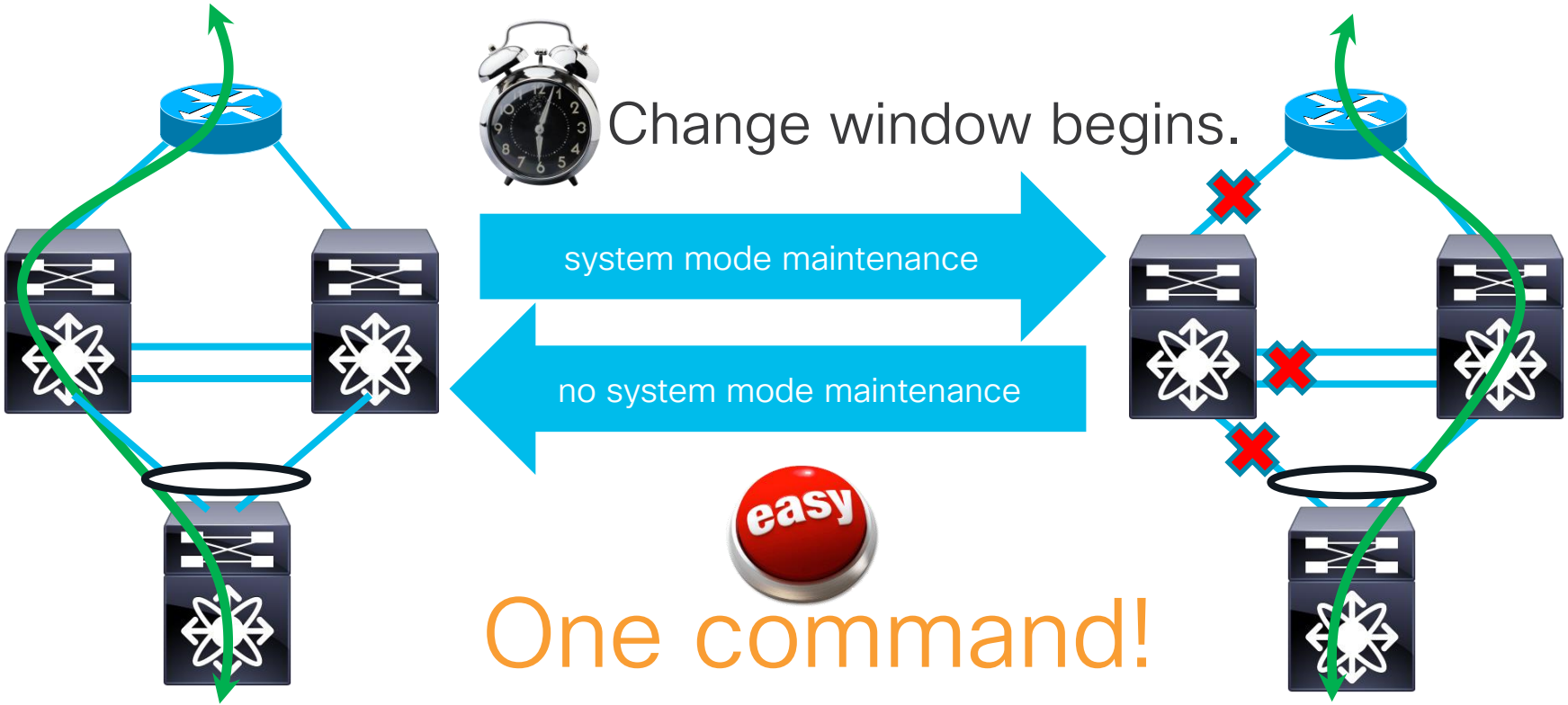


# GIR

# Graceful Insertion and Removal for NXOS

## Planned Outage – Isolation & reintroduction of Switch



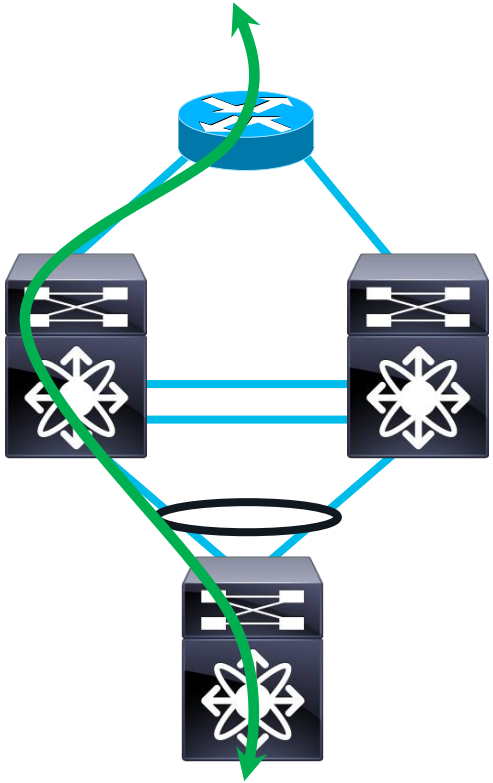

One command!

Pre-change System Snapshot

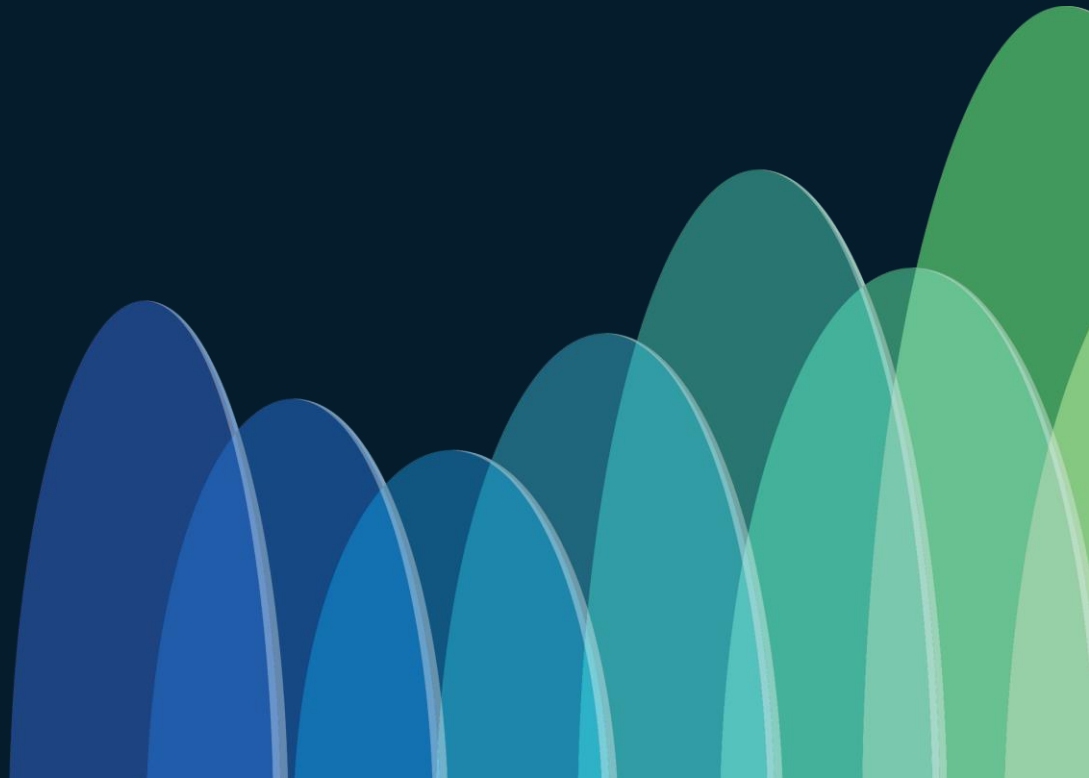
# Graceful Insertion and Removal

## Isolation of Switch from network

- Isolate a switch from the network in order to perform debugging or an upgrade.
- Shutdown Vs. Isolate Mode
  - Shutdown: All protocols are gracefully brought down and all physical ports are shut down. (7.2.1)
  - Isolate: All protocols are gracefully brought down but is not shutdown. (7.3.0)



# NDFC Switch Image Upgrades



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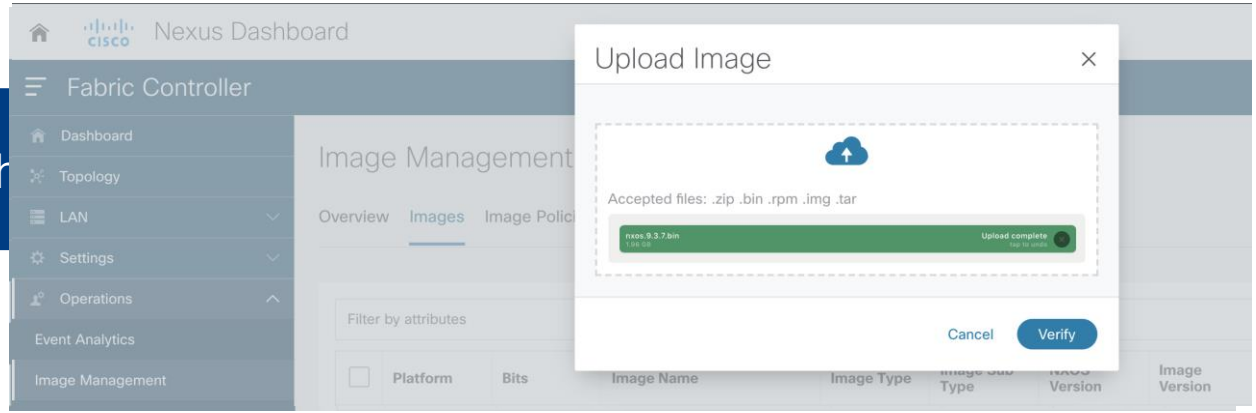
# NDFC Package Upgrade Pre-requisites

Uploading the Image to controller

Creating an Image policy

# NDFC Package Upgrade Pre-requisites

Uploading th



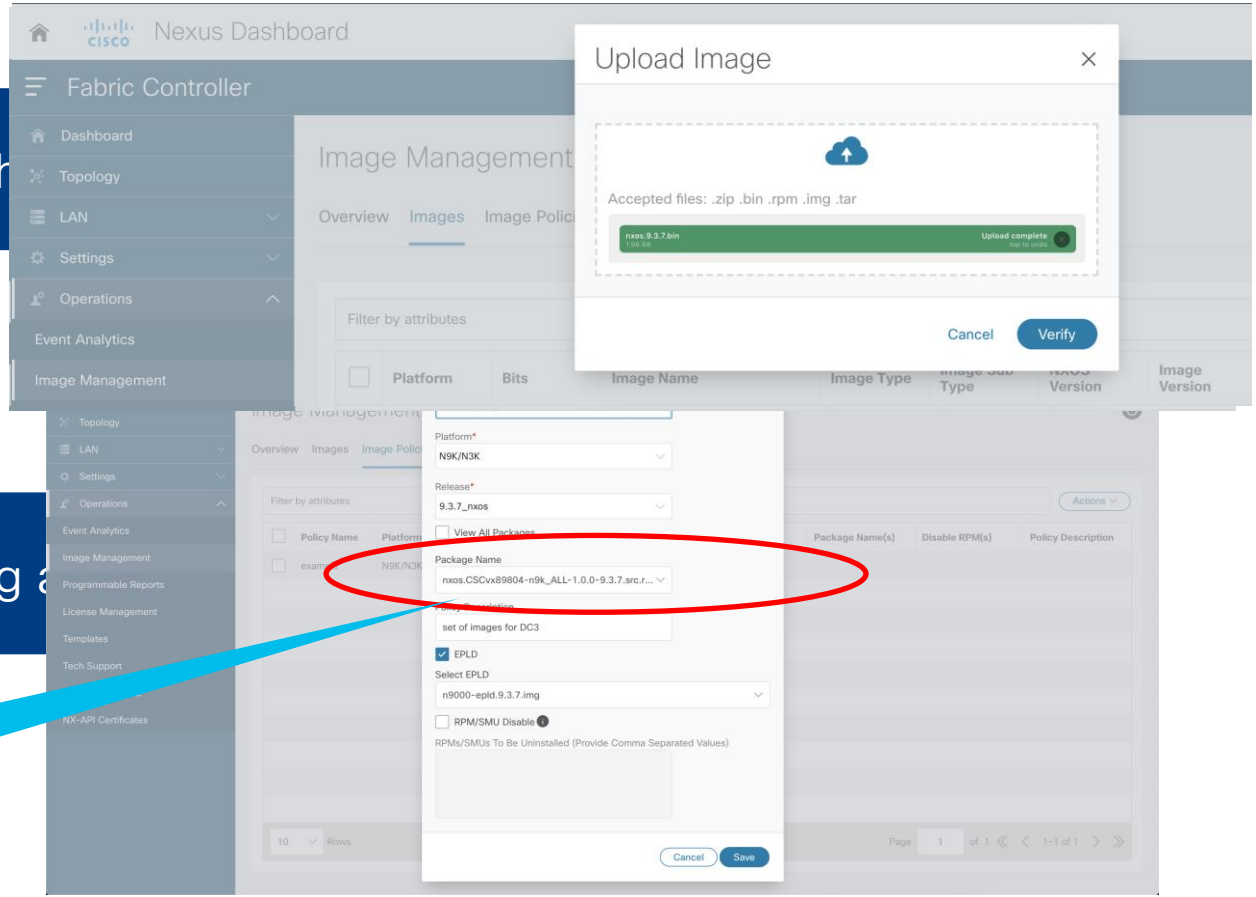

Creating an Image policy

# NDFC Package Upgrade Pre-requisites

Uploading th

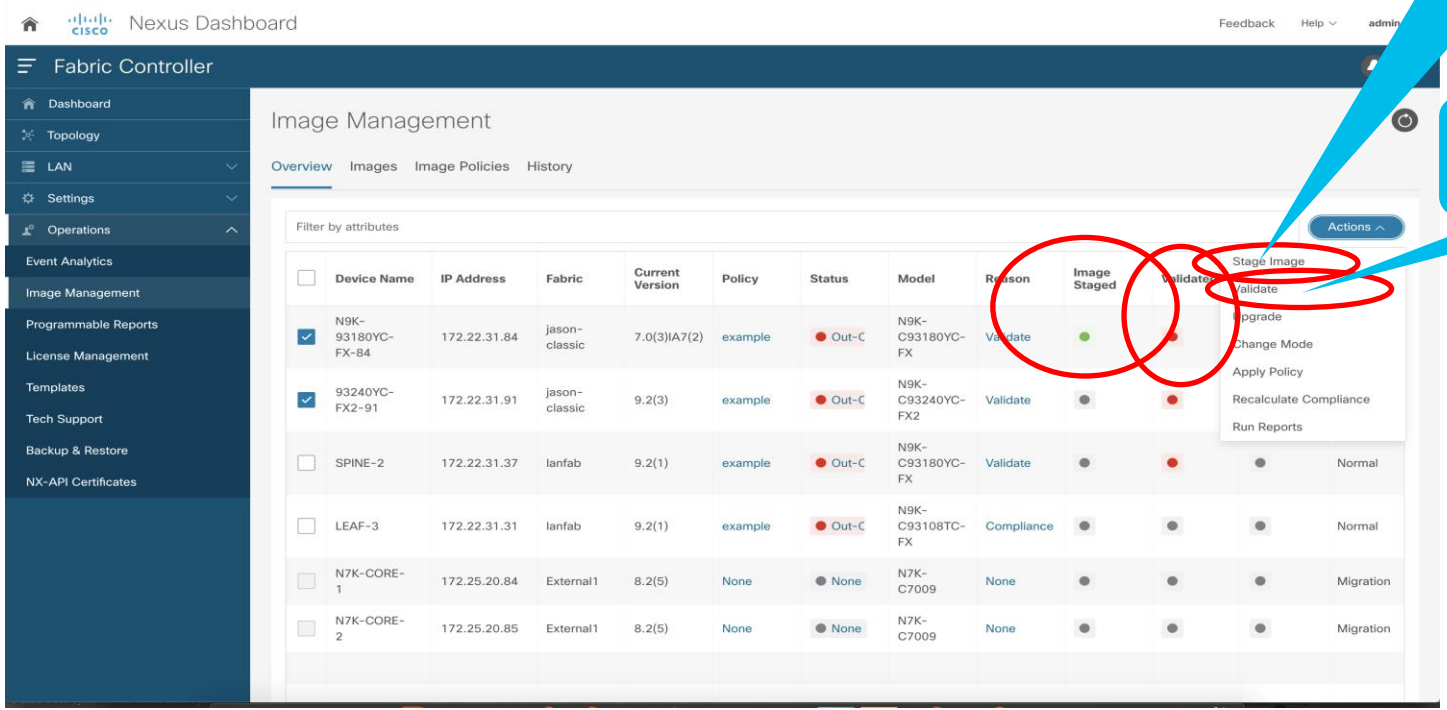
Creating a

This is where you put the image name or SMU



# Staging and Validation

## Recommended: Outside of the install window

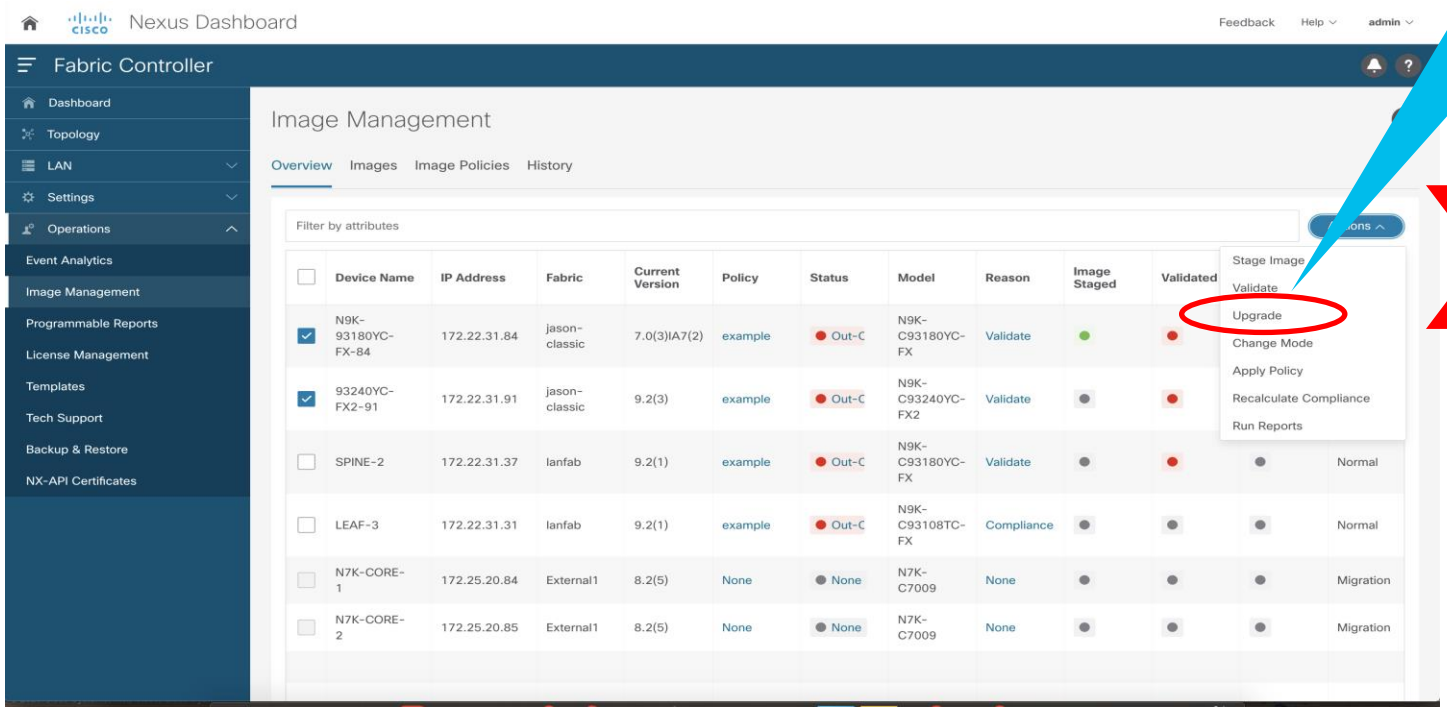



Load Image onto switches

Non-disruptive Upgrade ?

# Installing the Packages on Switch

## Within the maintenance window




Install image or images?

You may have to do this multiple times*

*10.2.1/9.3.8 support image and EPLD upgrade at the same time

# NDFC Fabric Image Upgrades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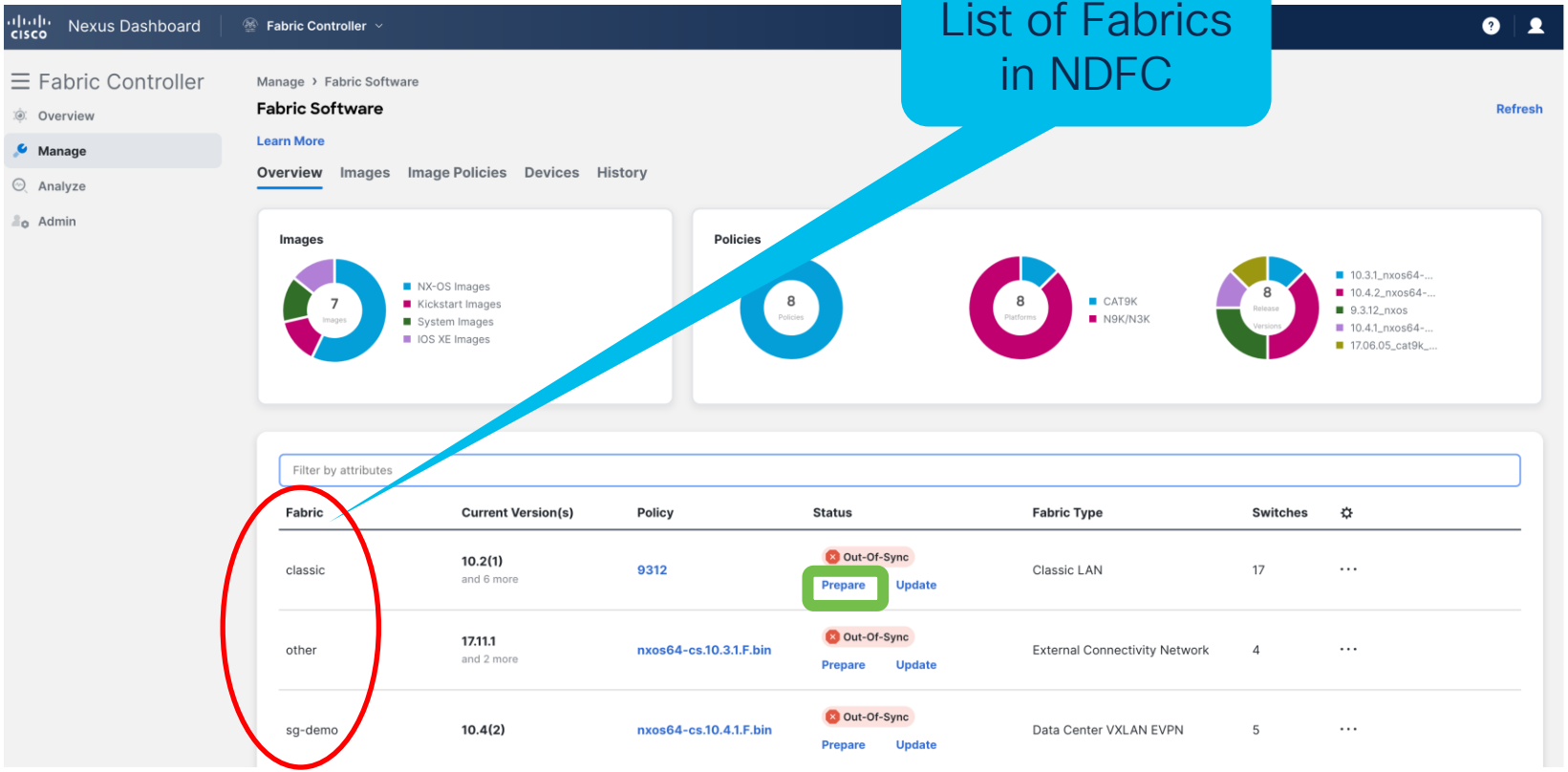
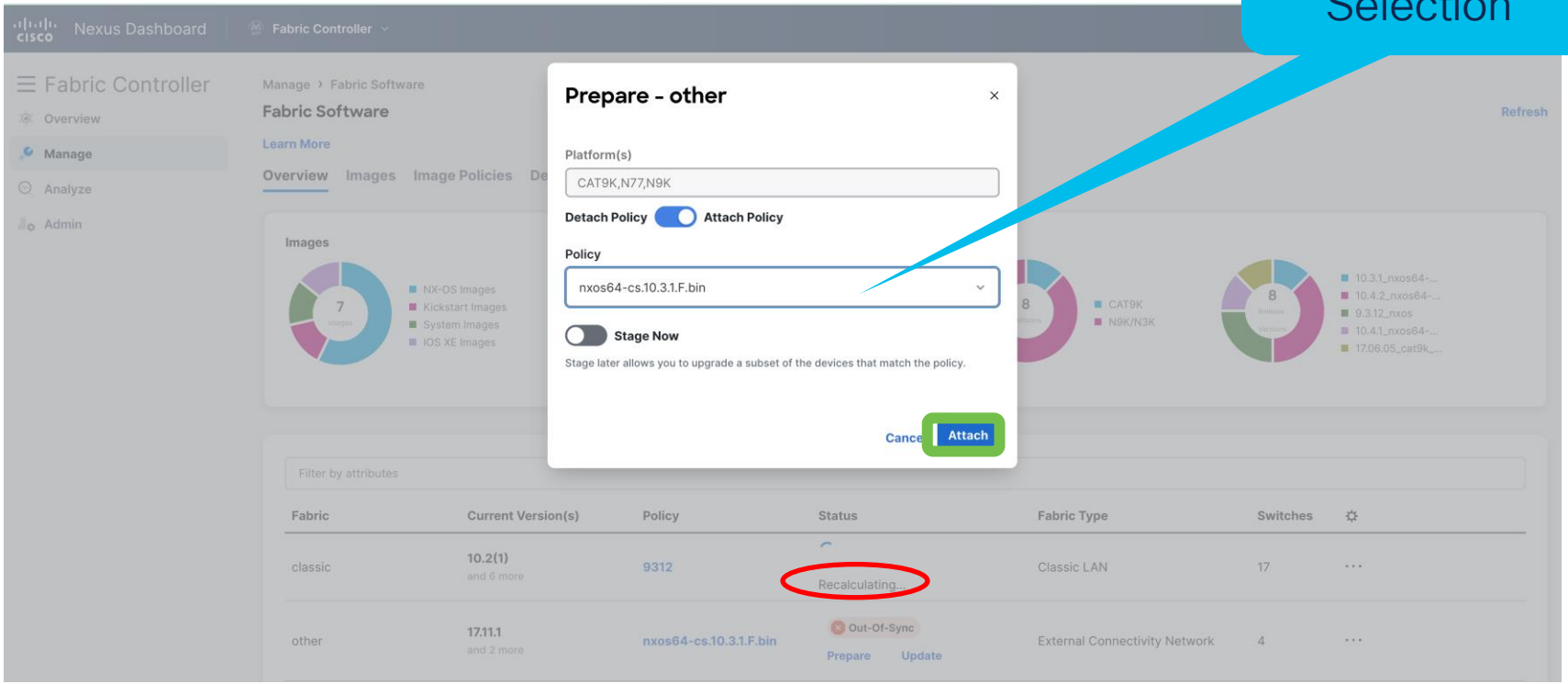
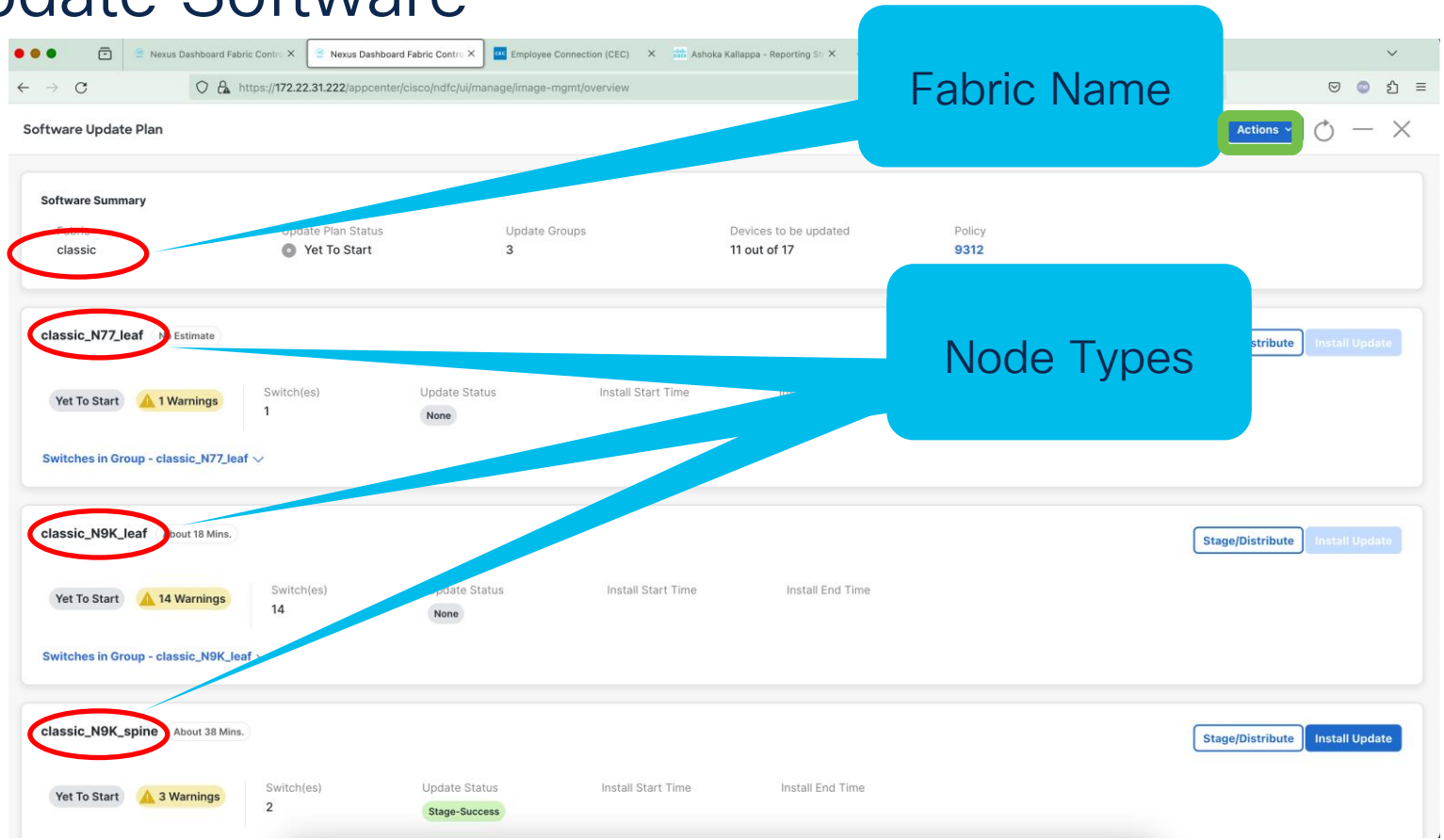
# Fabric Overview – List of Fabrics



# Prepare Fabric



# Update Software



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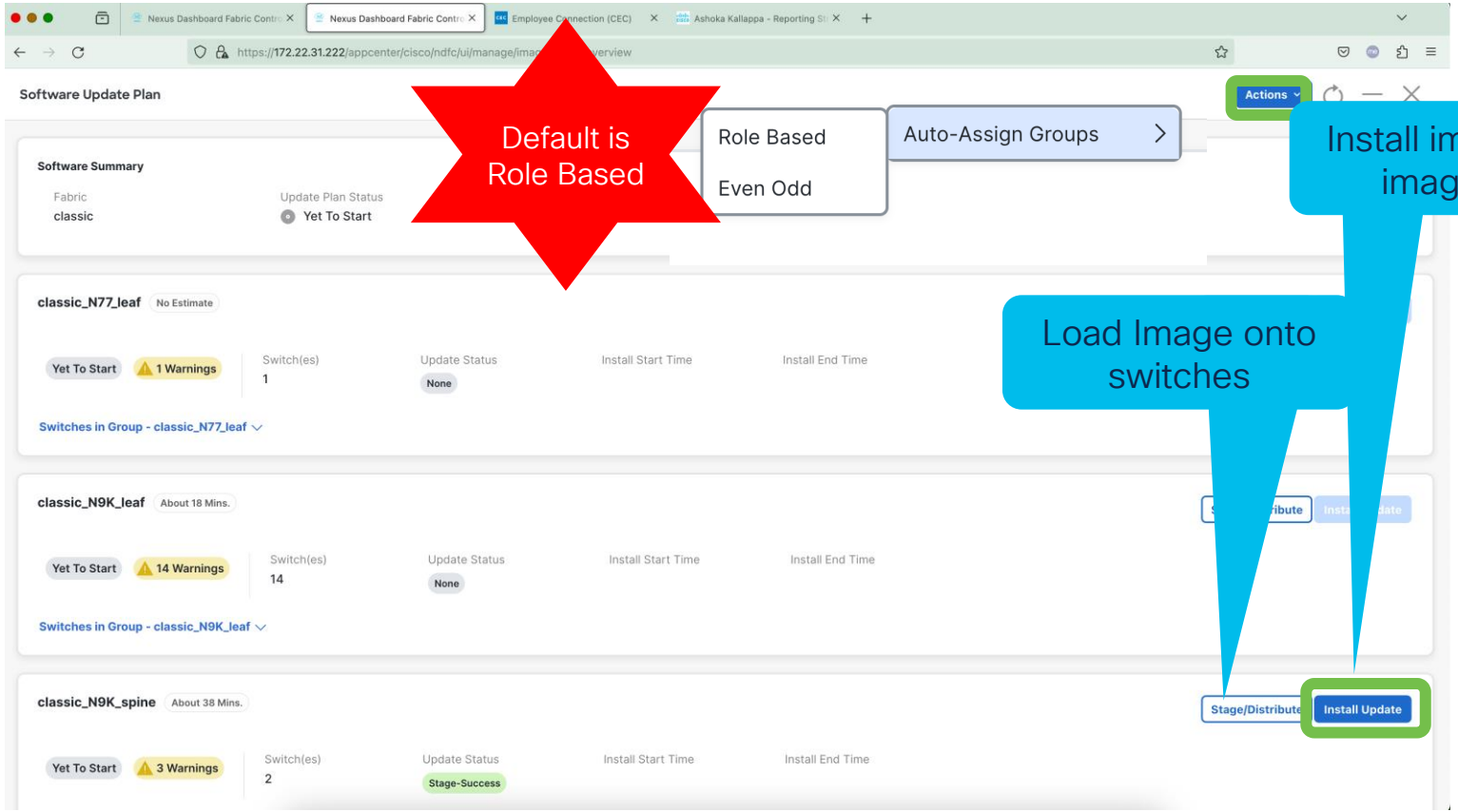
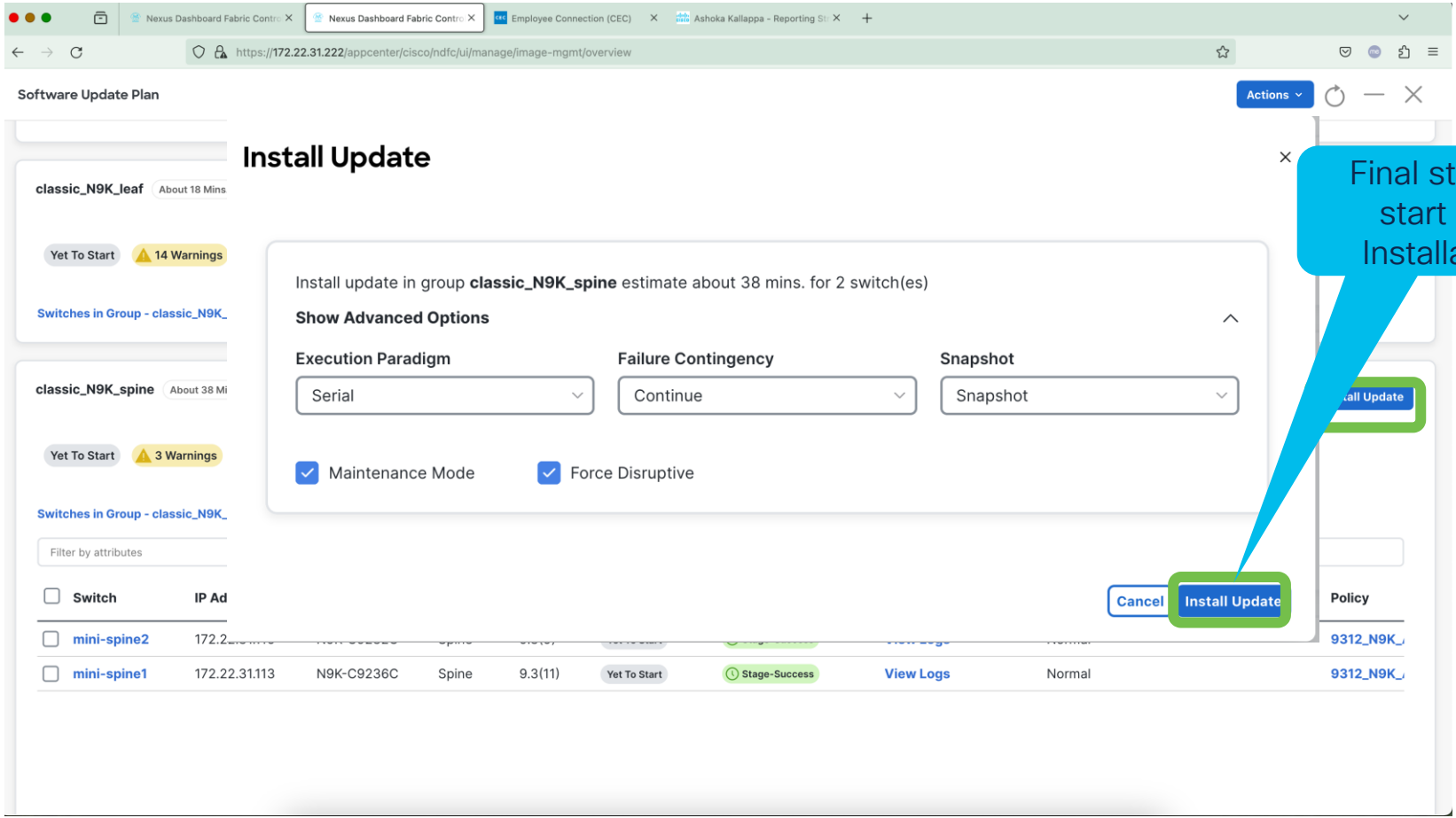




# Simplifying Upgrade Process


Non-Disruptive NXOS upgrade

Defaulting all ND ISSU to enhanced ISSU on GX2A and GX2B platforms

NEW

10.3.3 GX,FX3

Reducing Number of reloads required during upgrade

Combining NXOS and EPLD upgrade avoids additional reload in case of EPLD – 9.3(8) and 10.1(2)

Apply SMU with NXOS and EPLD upgrades - 10.2(1)

Prevent downtime for Kernel Patch

Providing the ability to perform Kernel patch without reload 10.2(2)

# Best Practices for Nexus Upgrades

Check Upgrade Path
https://www.cisco.com/c/dam/en/us/td/docs/Website/datacenter/ISSUmatrix/index.html

Download Upgrade/Patch Images prior to maintenance window

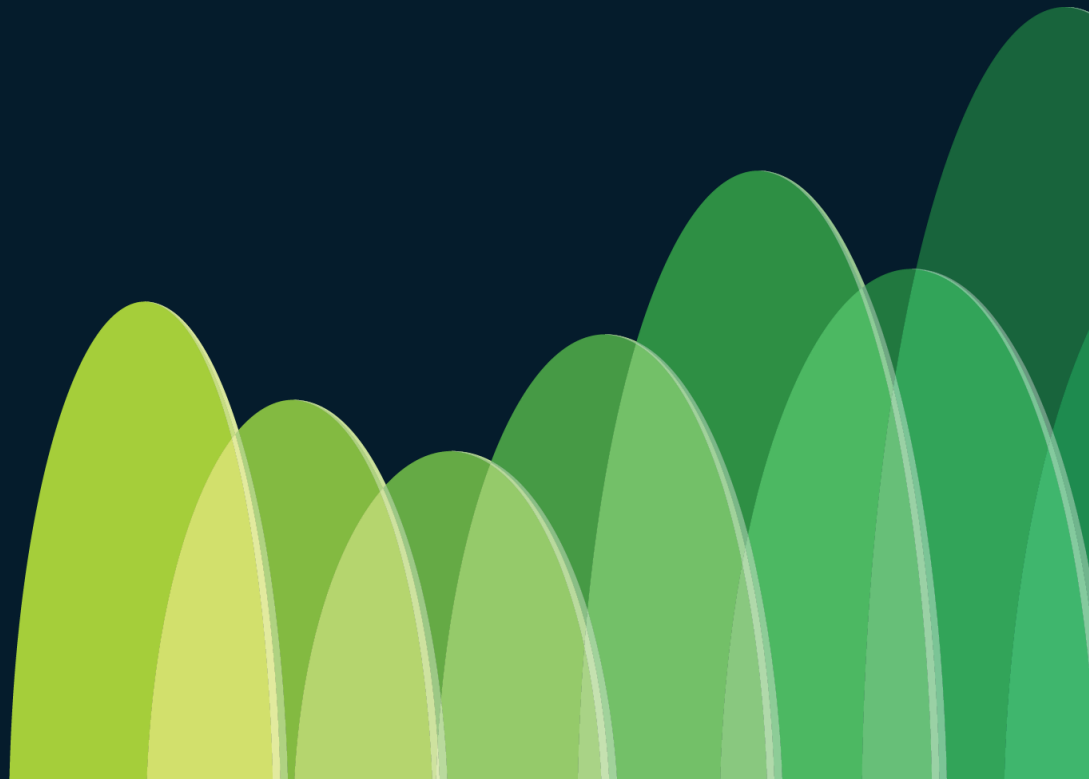
Do not make Configuration Changes during upgrades

Run Pre-Upgrade Validation Checks

# Agenda

- NXOS SW Architecture
- Upgrades on the Nexus Switches
- Upgrades on ACI Switches
  - Upgrade from APIC
  - Best Practices
- Bonus: Modular Software Operations

# Upgrades on ACI Switches



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# ACI Firmware Upgrade Types



# ACI Firmware Upgrade Types (Regular)

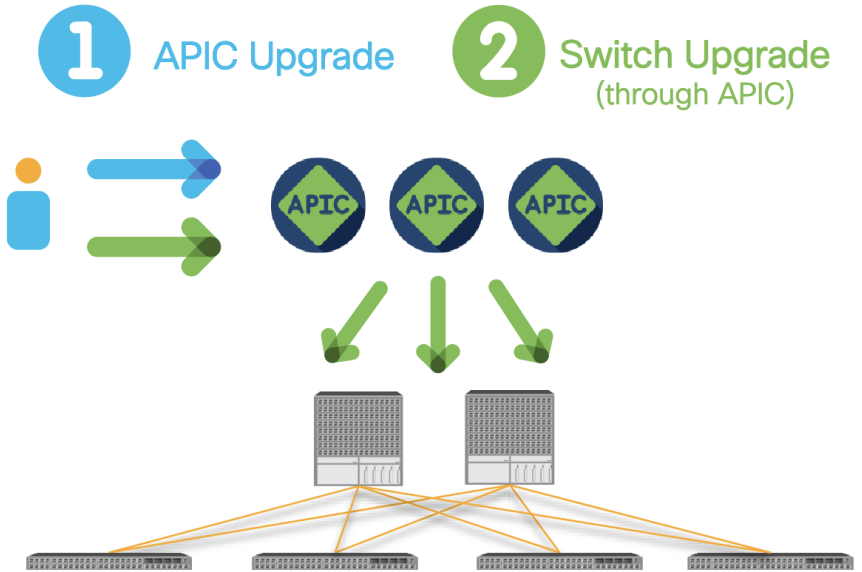
Regular Upgrade

Software Maintenance Upgrade (SMU)

EPLD/FPGA Upgrade (Only Switches)

## Base OS firmware upgrade

In principle, all APICs and switches should be on the same version



# ACI Firmware Upgrade Types (SMU)

Regular Upgrade

Software Maintenance Upgrade (SMU)

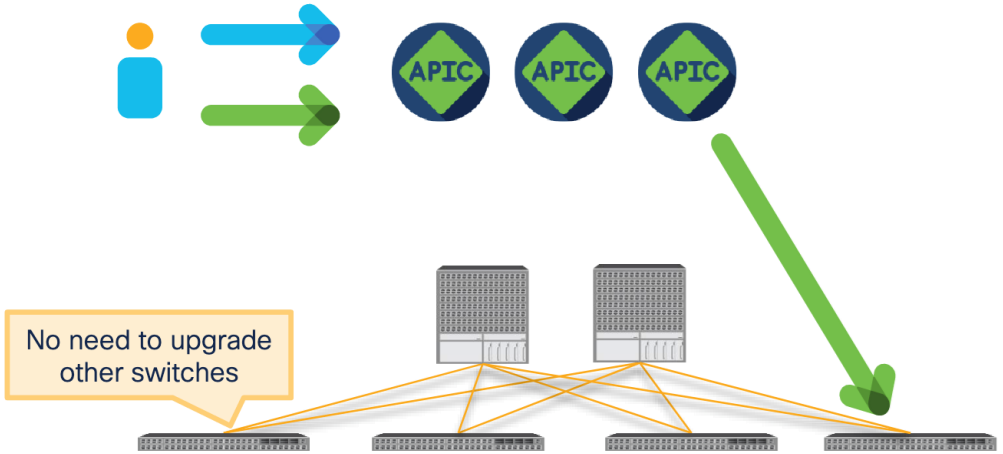
EPLD/FPGA Upgrade (Only Switches)

**A patch for a specific defect**

No need to upgrade the entire fabric. You can apply it only to APICs or affected switch nodes

1 SMU for all APICs

2 SMU for specific switches (through APIC)



# ACI Firmware Upgrade Types (EPLD/FPGA)

Regular Upgrade

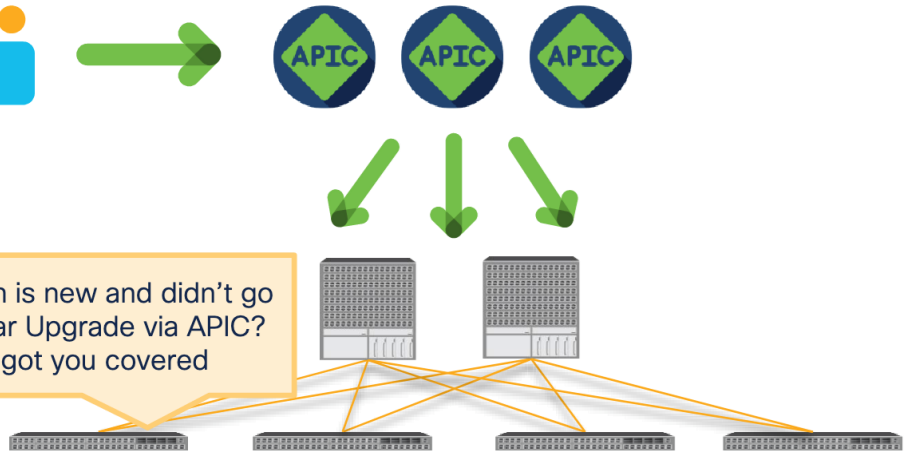
Software Maintenance Upgrade (SMU)

EPLD/FPGA Upgrade (Only Switches)

**Hardware related firmware**

Each ACI switch version has the desired EPLD/FPGA version.
Automatically upgraded via Regular Upgrade through APIC.

- No user configurations



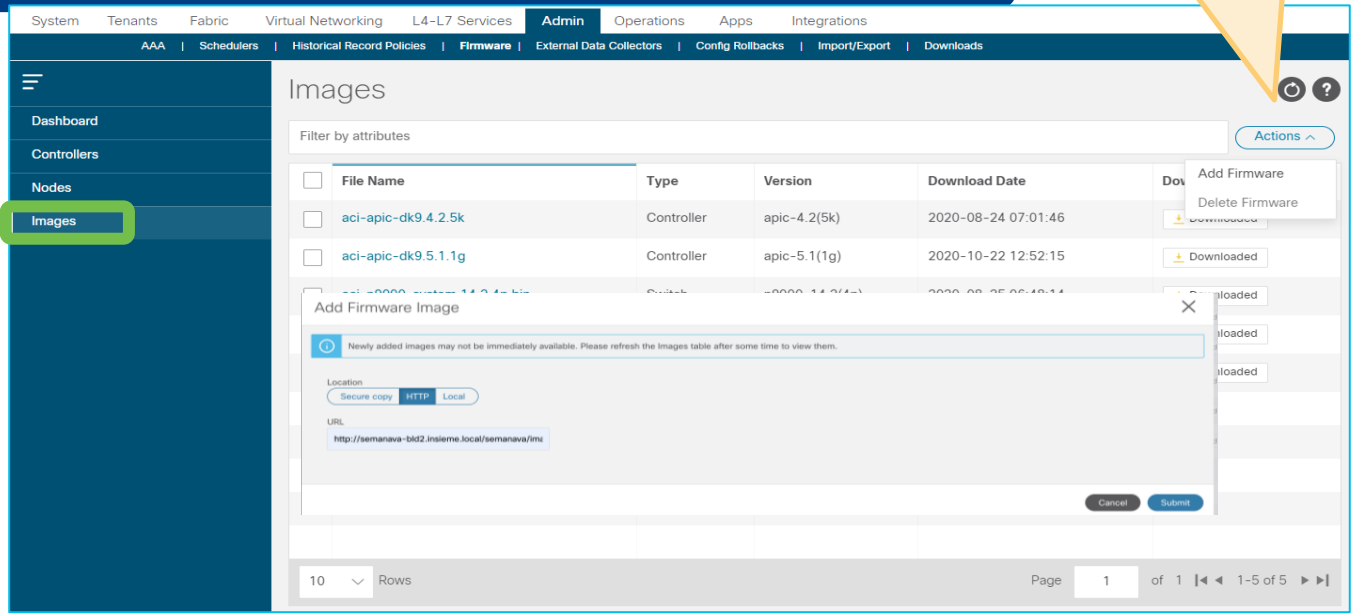

What if a switch is new and didn't go through Regular Upgrade via APIC?

- 5.2(1) got you covered

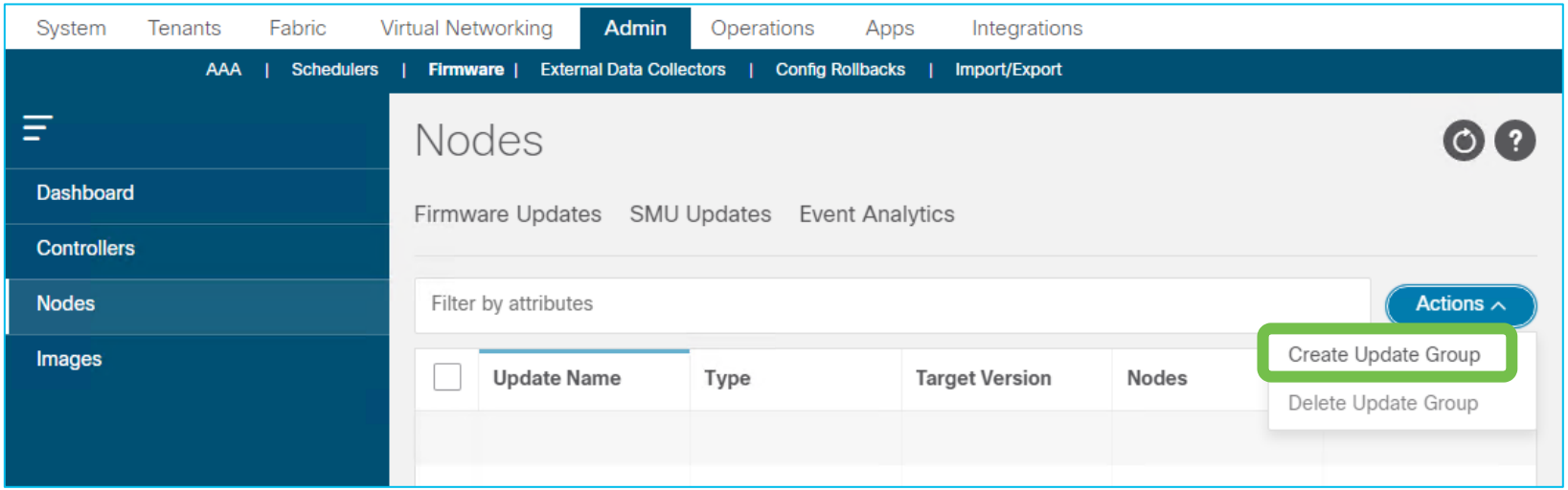
# ACI Package Upgrade Pre-requisites

loading the package(s) to APIC controller

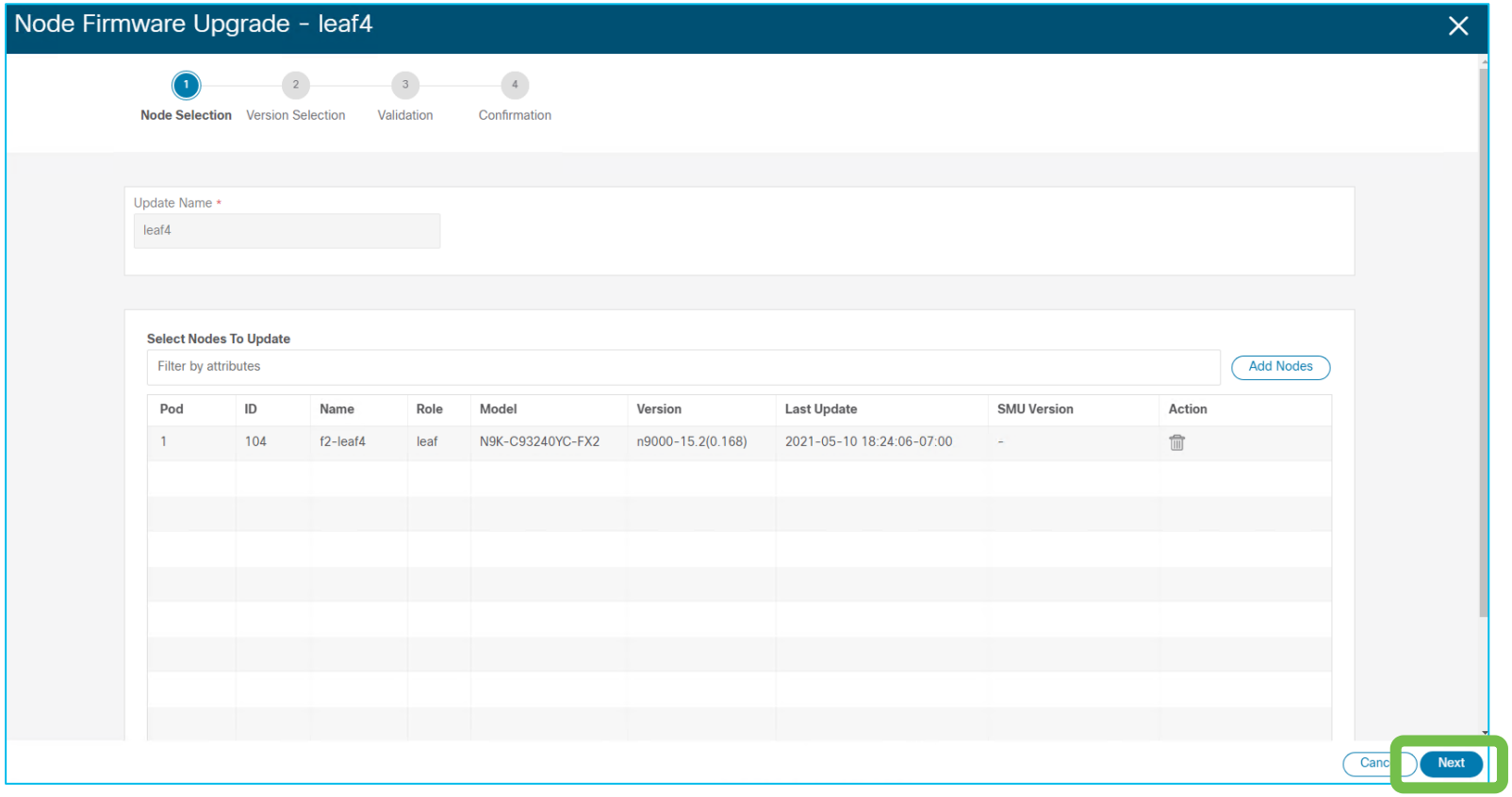
**Add Firmware** to download a new firmware image



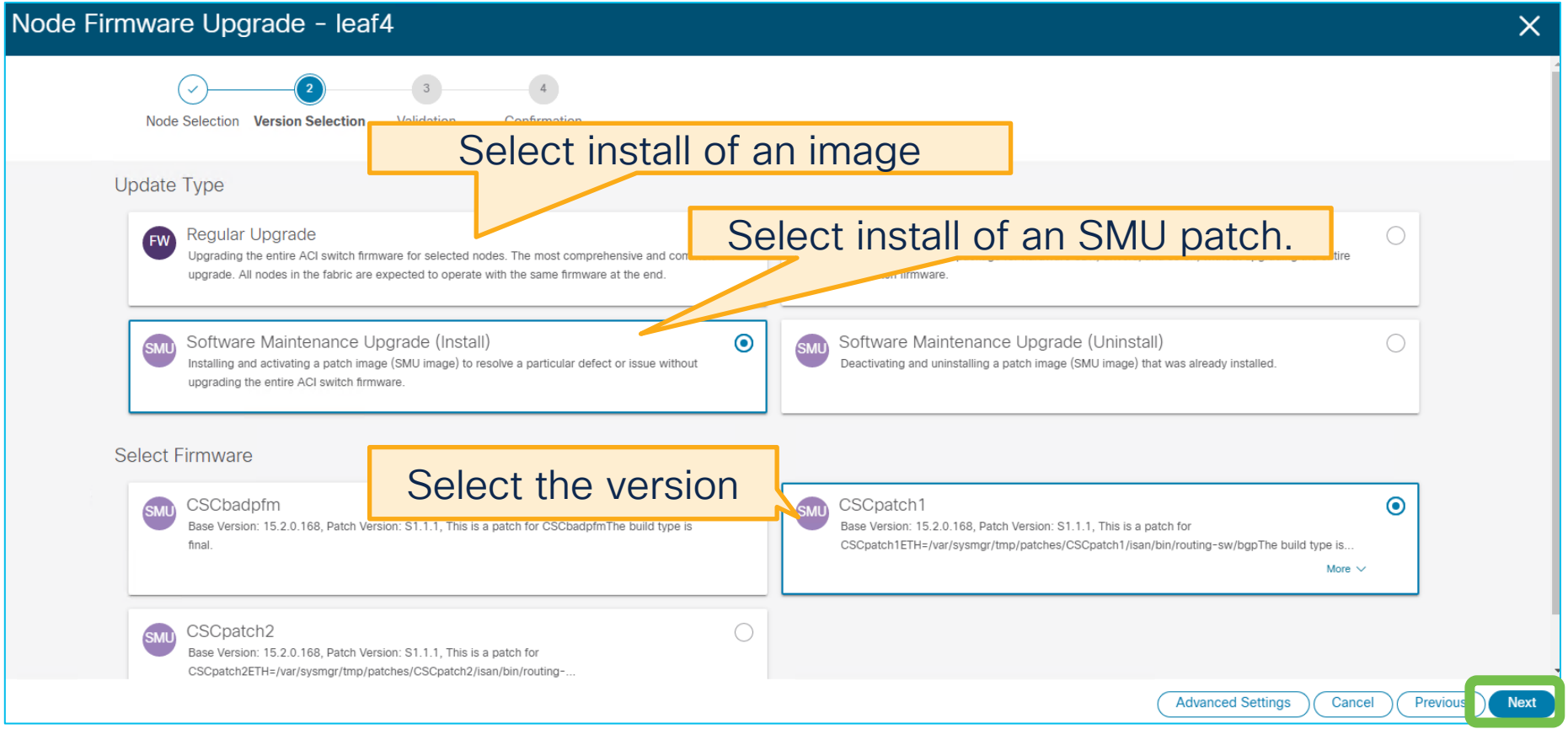
# Creating an ACI update group



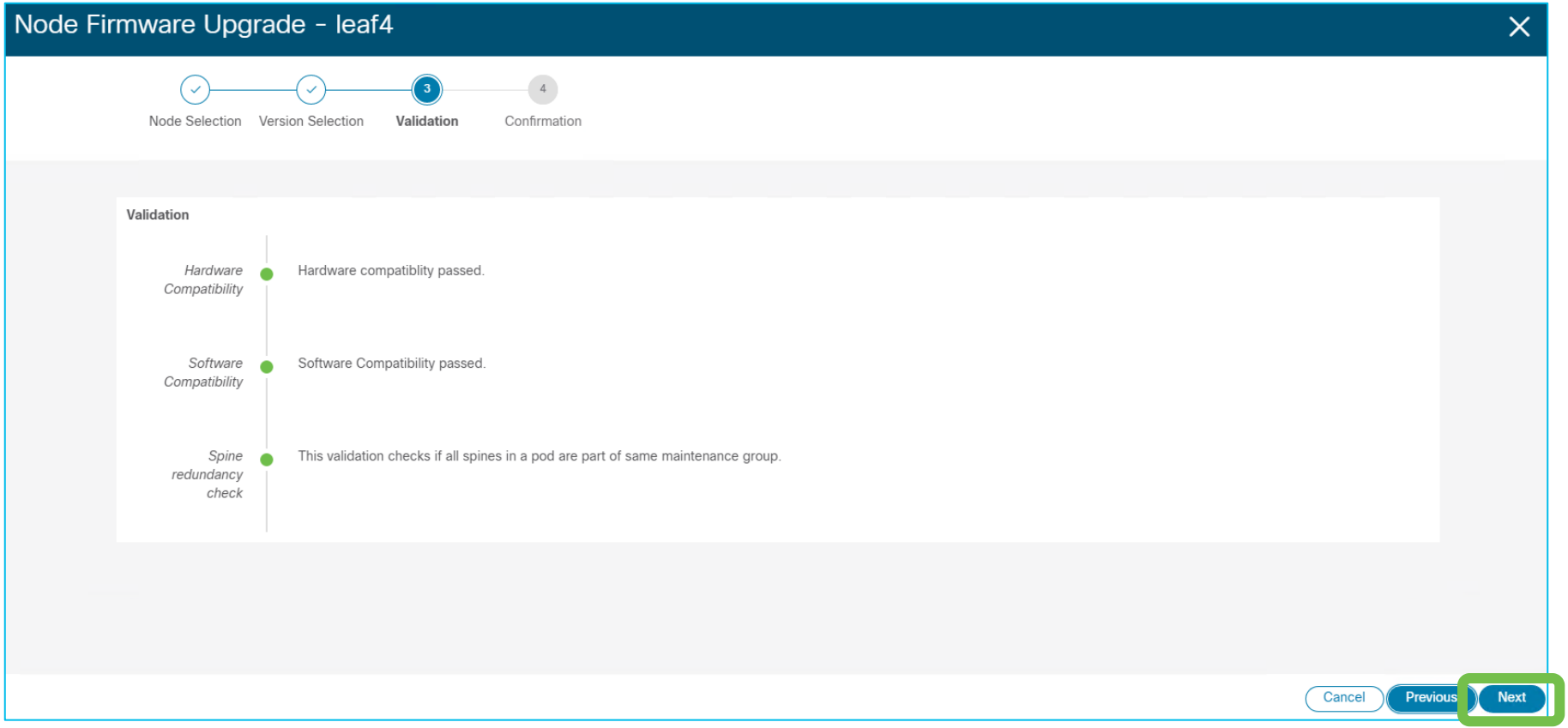
# Node Selection



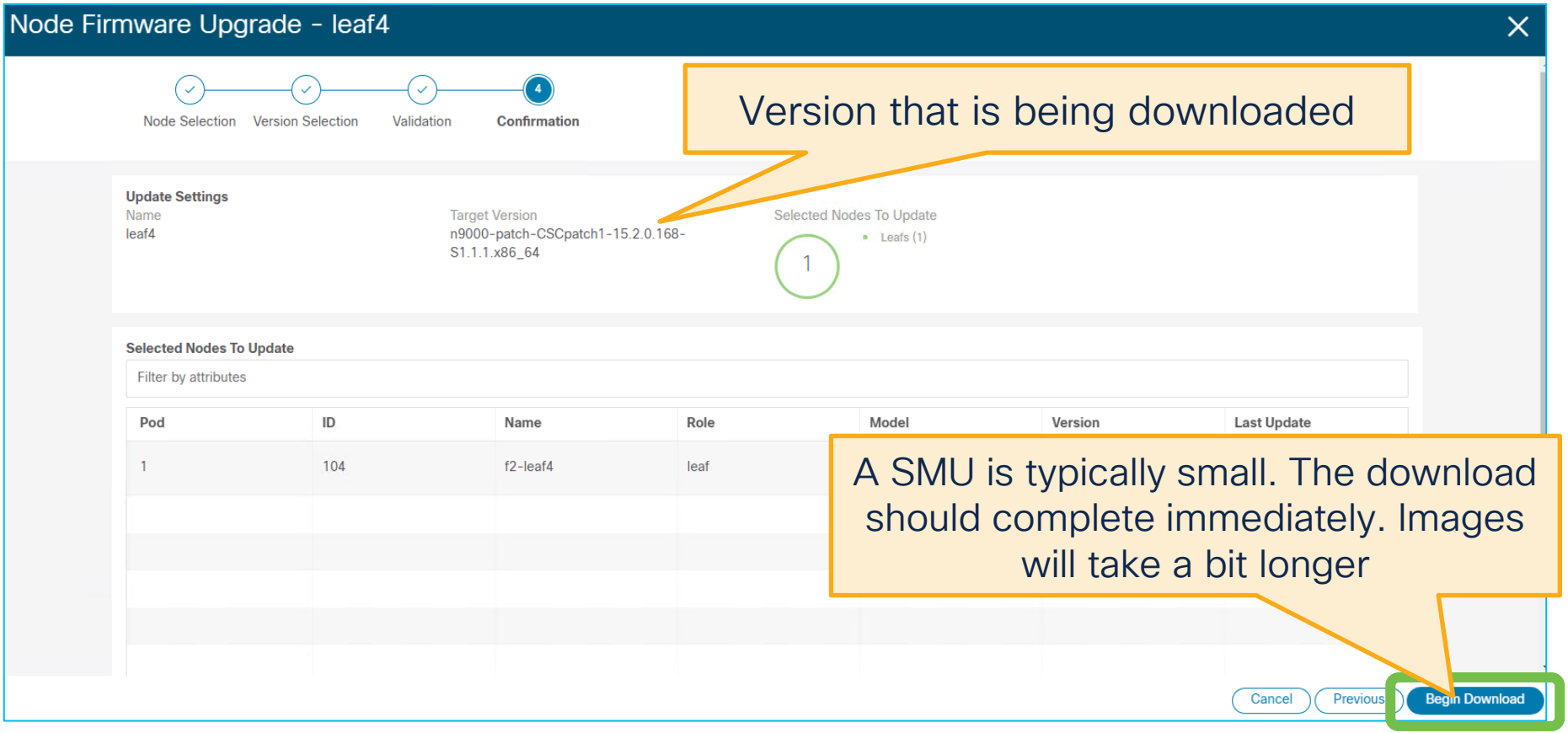
# Version Selection for either image/SMU



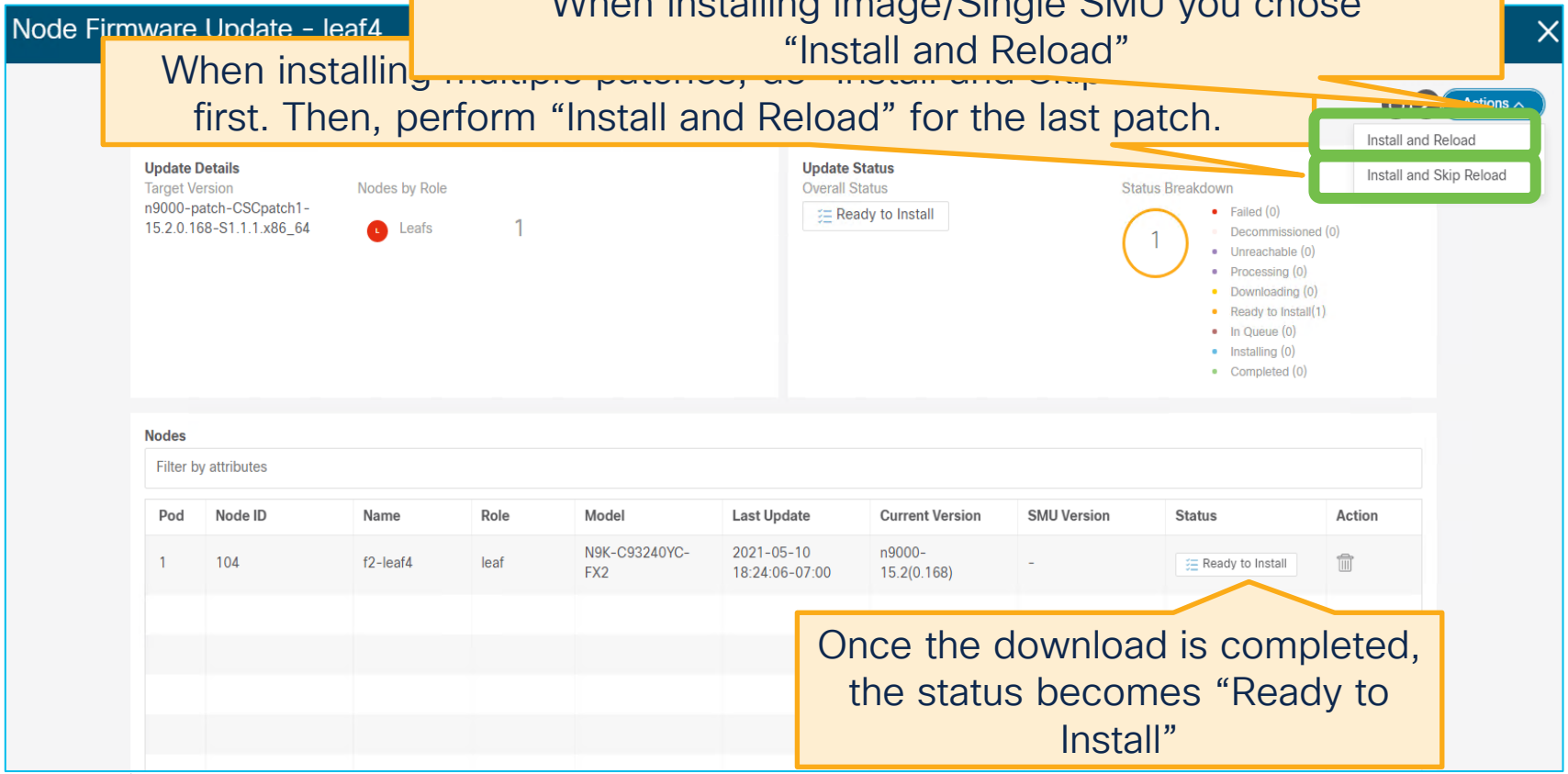
# PRE Upgrade validation



# Staging of the packages



# Installing of Package(s)



# Best Practices for ACI switch upgrades

Confirm Supported Upgrade Path
ACI Upgrade/Downgrade Support Matrix

Clear All Faults

Check APIC Cluster is Fully Fit

Run Pre-Upgrade Validation Checks

Compare state Before and After Upgrades

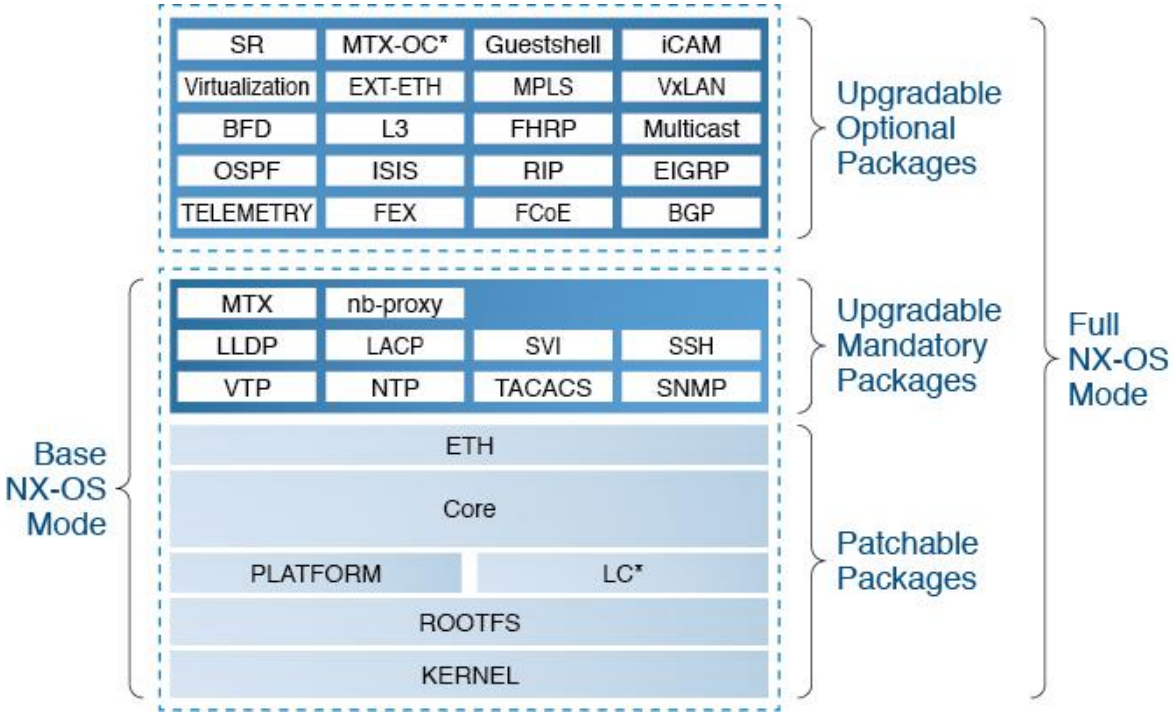
Using NAE

3rd party Apps

# Agenda

- Introduction
- Upgrades on the Nexus Switches
- Upgrades on ACI Switches
- Bonus: Modular Software Operations
  - RPM Architecture
  - Switch Boot modes

# Nexus RPM Architecture

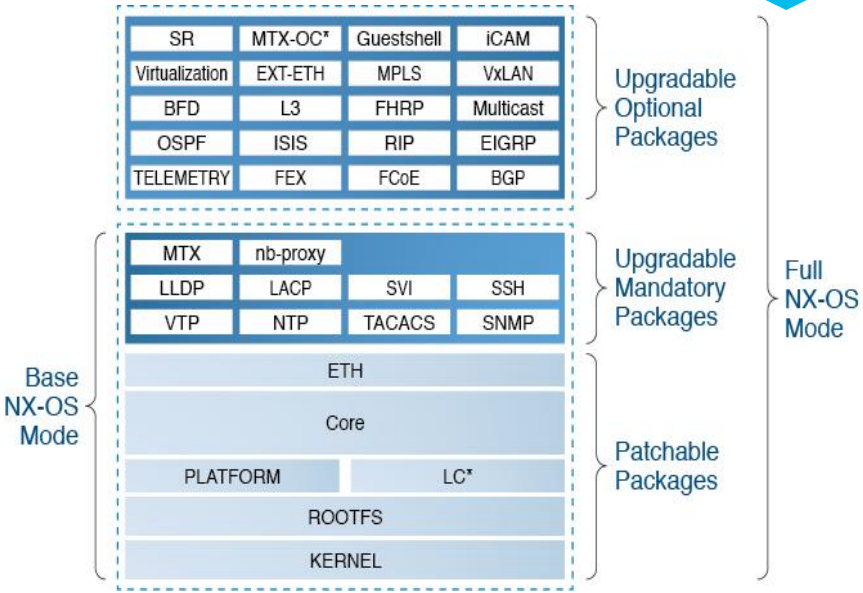


# Nexus Boot Modes

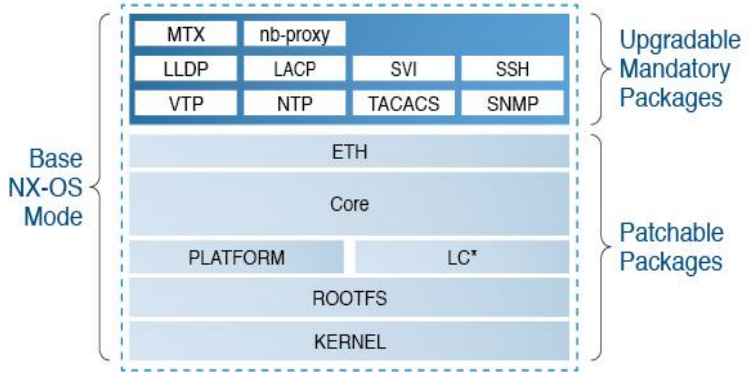
## Nexus Supports two Boot Modes

**#install reset nxos full**

Default




**#install reset nxos base**



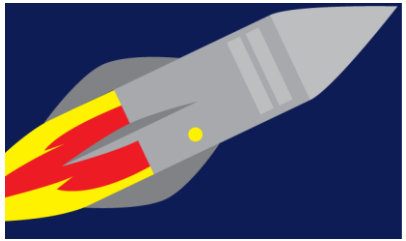
# Benefits of Modularity

Memory Usage Reduction

Security Vulnerability Impact

Qualification Cycle Time Reduction


Faster Boot up time

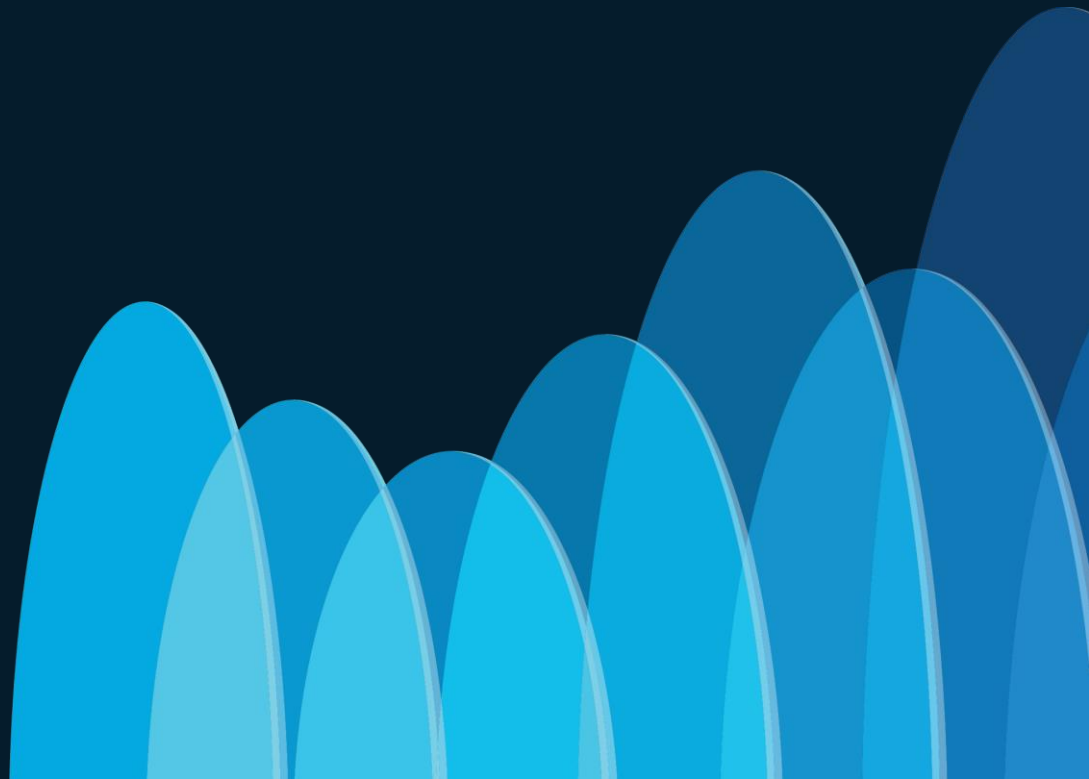


Using Open Source Tool for Managing Upgrades/Patches

puppet labs CHEF SALTSTACK ANSIBLE

# Learning Maps

https://www.ciscolive.com/emea/learn/learning-maps.html

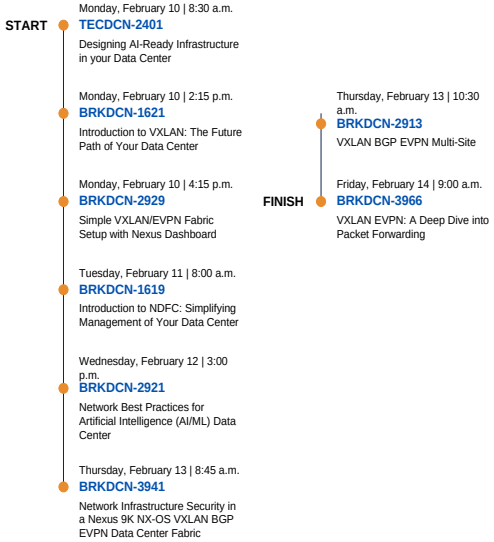


cisco Live!

# Data Center

## NXOS Technologies

This map provides the curated list of sessions for NXOS technology architecture at Cisco Live.



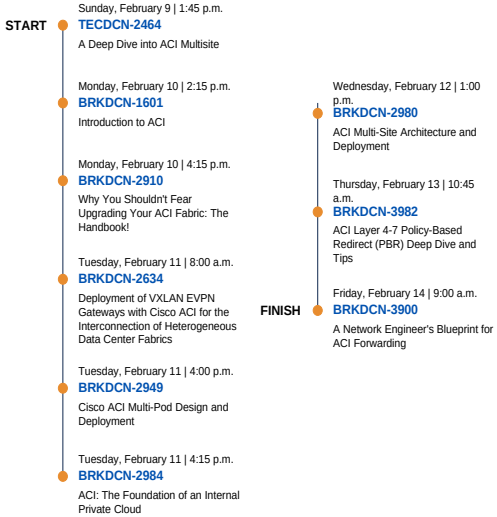

cisco Live!
Amsterdam | February 9-14, 2025

If you are unable to attend a live session, you can watch it in the On-Demand Library after the event.

# Data Center

## ACI Technologies

This map provides the curated list of sessions for ACI technology architecture at Cisco Live.




cisco Live!
Amsterdam | February 9-14, 2025

If you are unable to attend a live session, you can watch it in the On-Demand Library after the event.

# Webex App

## Questions?

Use the Webex app to chat with the speaker after the session

## How

1. Find this session in the Cisco Events mobile app
2. Click “Join the Discussion”
3. Install the Webex app or go directly to the Webex space
4. Enter messages/questions in the Webex space

**Webex spaces will be moderated by the speaker until February 28, 2025.**

# Fill Out Your Session Surveys


Participants who fill out a minimum of 4 session surveys and the overall event survey will get a unique Cisco Live t-shirt.

(from 11:30 on Thursday, while supplies last)

All surveys can be taken in the Cisco Events mobile app or by logging in to the Session Catalog and clicking the ‘Participant Dashboard’

Content Catalog

# Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at ciscolive.com/on-demand. Sessions from this event will be available from March 3.


cisco
Thank you
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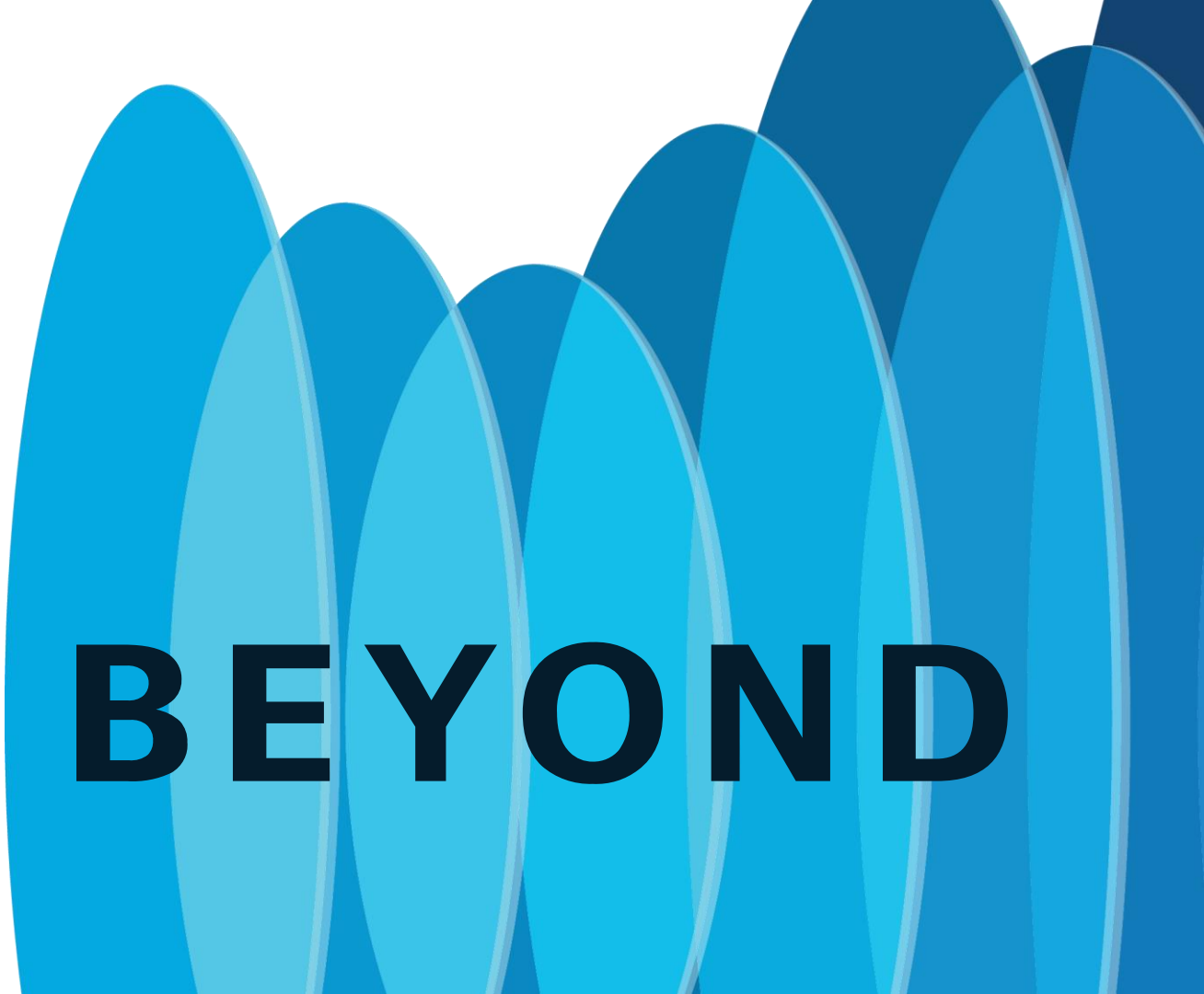

# GO BEYOND