



The bridge to possible

# Automate 5G Datacentre and Transport Components with NSO Cross-Domain Function Packs

Shambhu Nath Mishra, Technical Marketing Engineer

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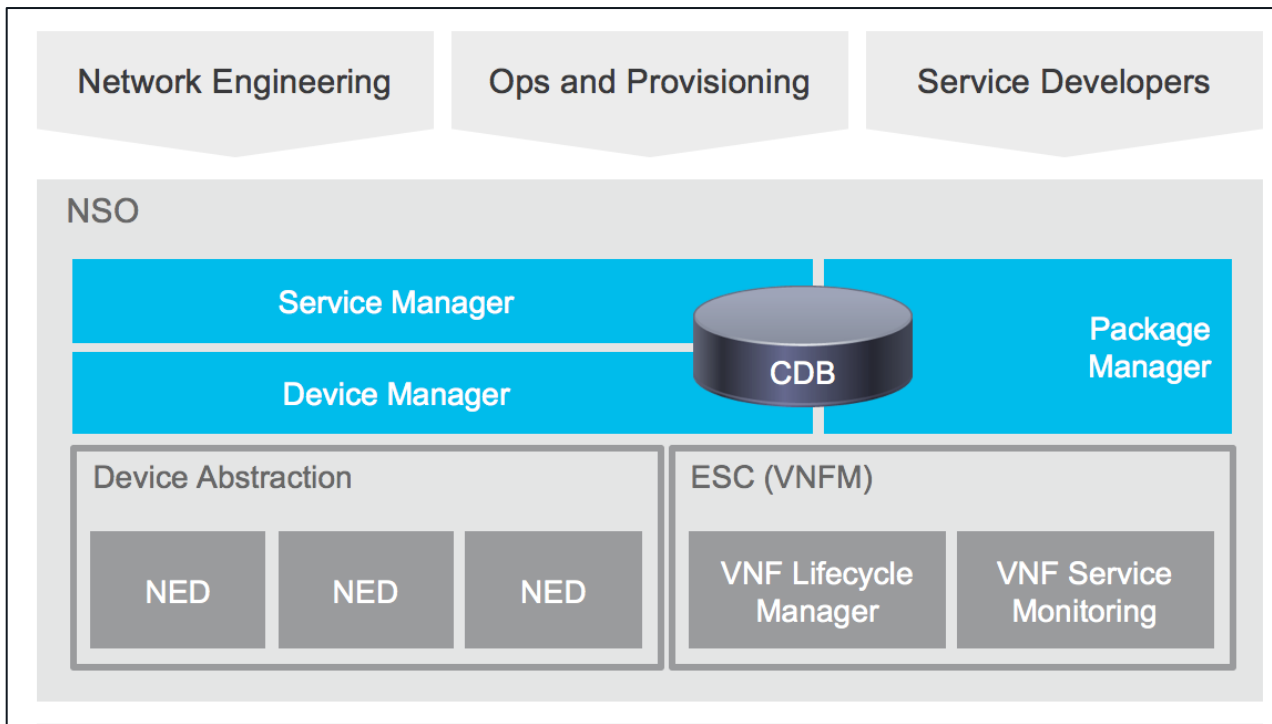




# Agenda

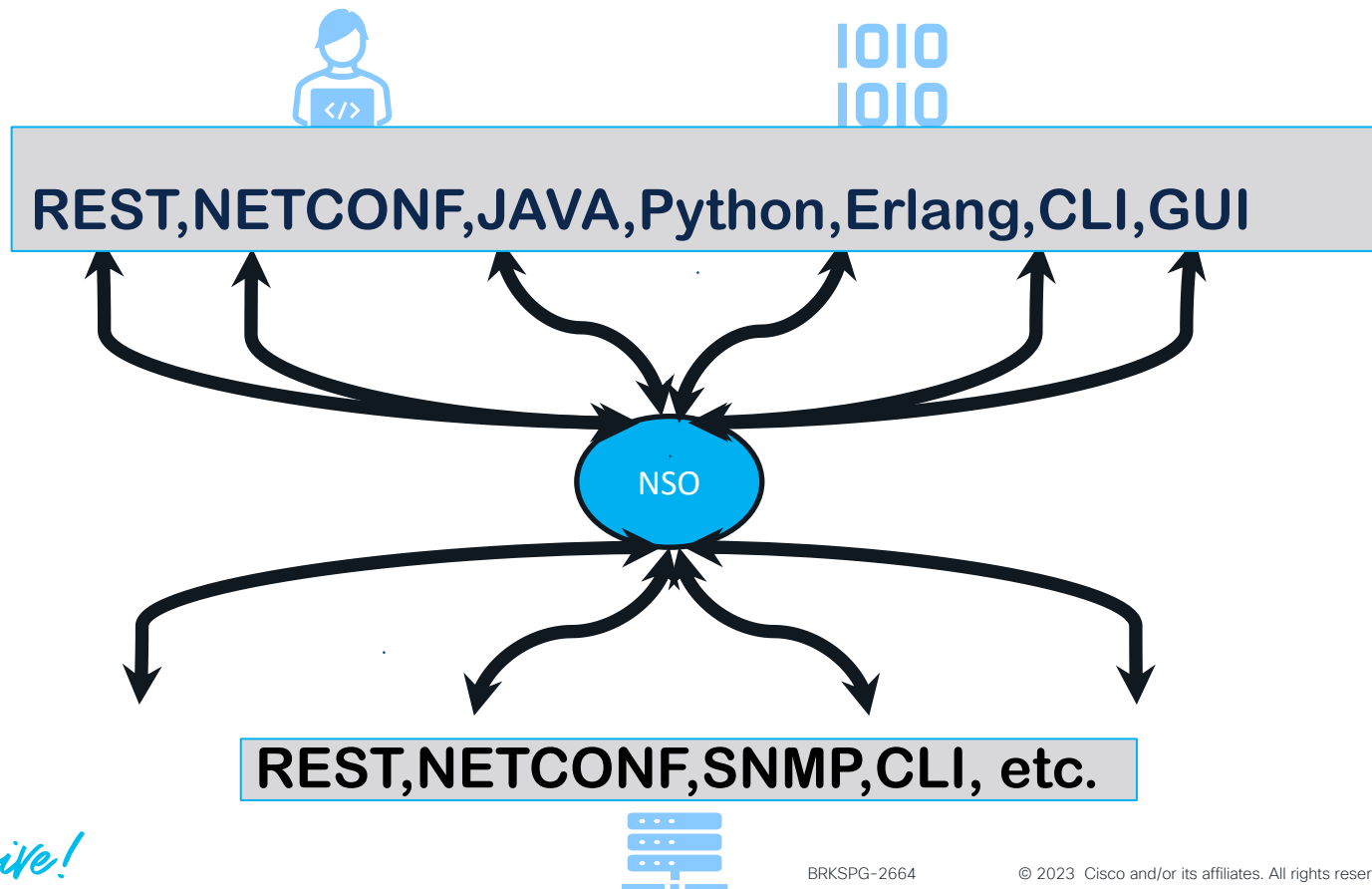
- What is NSO and Cross-domain Orchestration.
- CNF lifecycle automation using NSO CNFO
- Demo
- Scalable DC to transport handoff and network slicing using SR/MPLS
- Cross-domain automation using NSO CFP
- Demo
- Summary

# NSO Architecture and Components



Ref : <https://developer.cisco.com/docs/nso/#!nso-fundamentals>

# NSO Interfaces



# What is cross-domain orchestration?

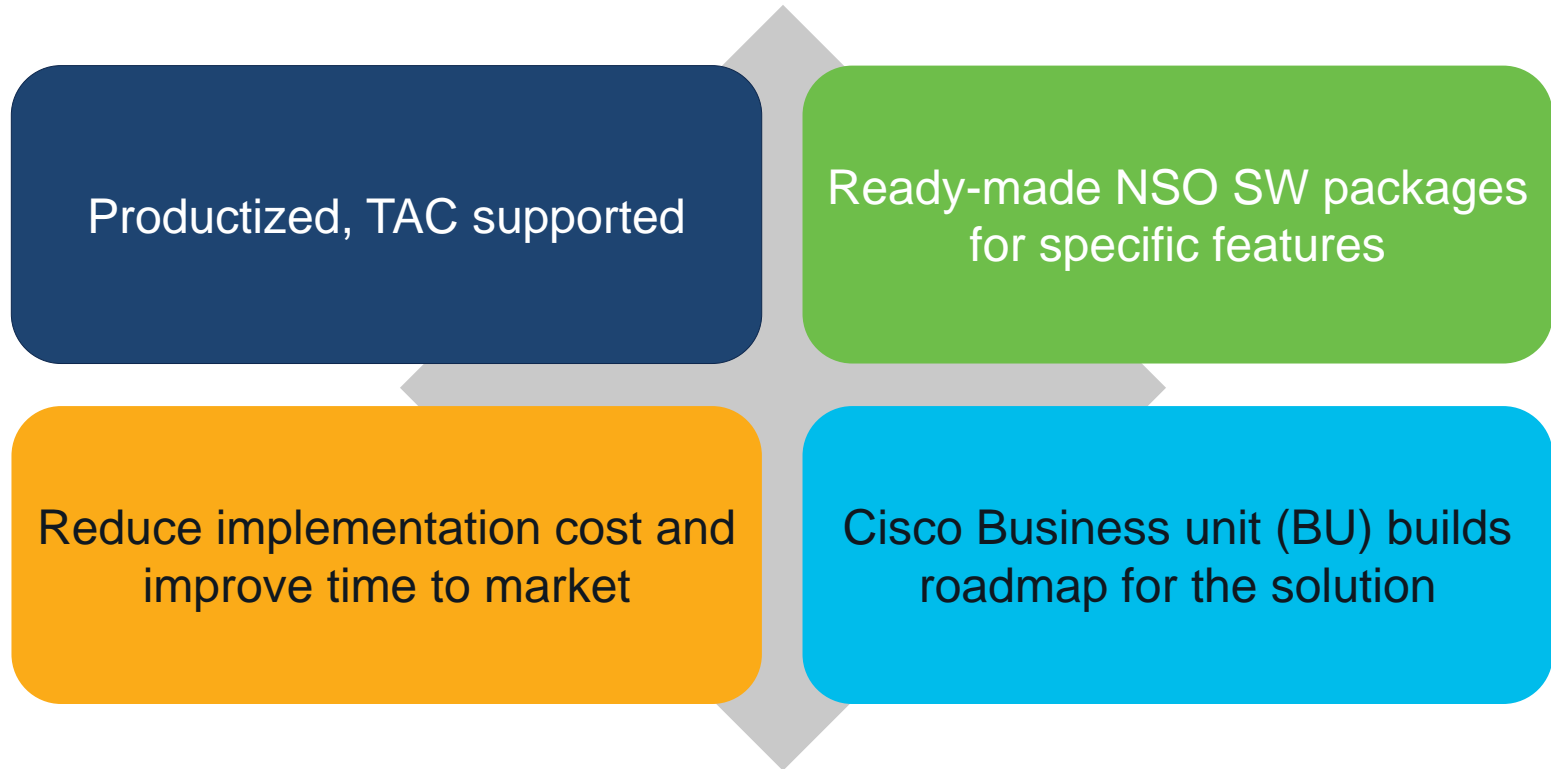


- ✓ Applications are hosted in the DC
- ✓ Application to application and user communication is through SP transport network

Cross-domain orchestration is essentially a synchronized configuration across different domains for faster time to deployment and provision/remove network resources on-demand

# NSO Core Function Packs (CFP)

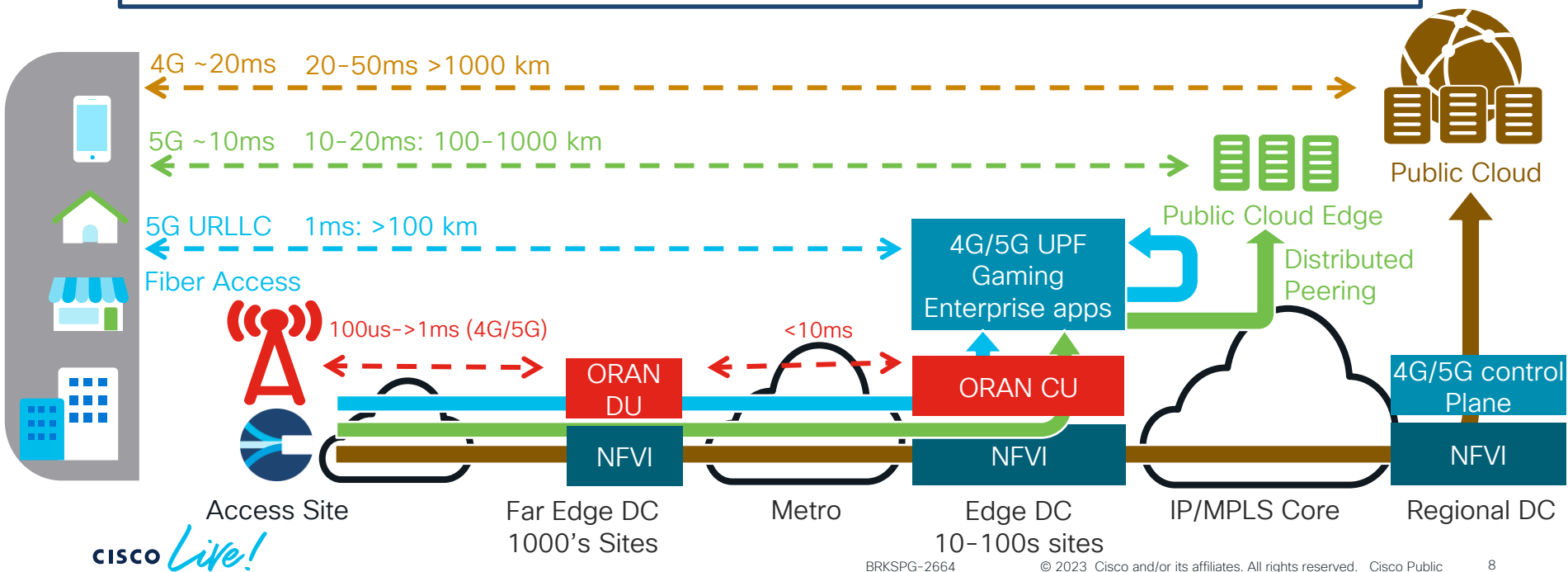
Use-case driven approach for orchestration



# Network slicing use-cases

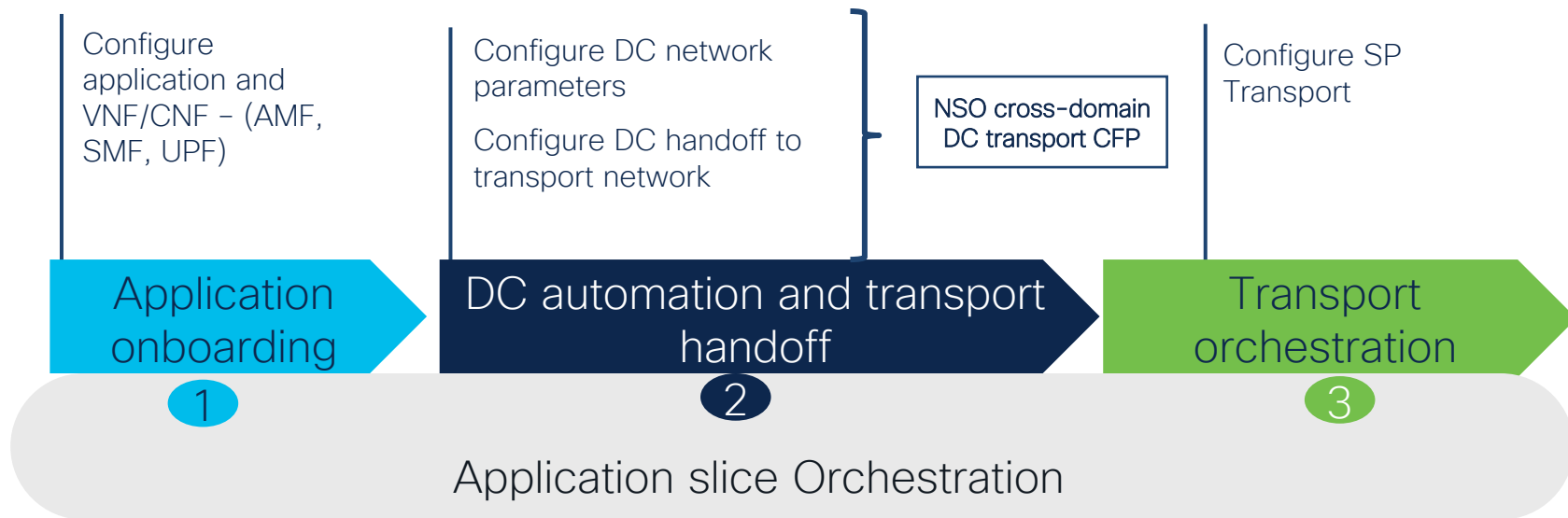
## Multiple application on same Infra

- |                        |                           |                          |
|------------------------|---------------------------|--------------------------|
| ✓ Open RAN (O-DU/O-CU) | ✓ Gaming                  | ✓ 4G/5G Data plane (UPF) |
| ✓ 4G/5G control plane  | ✓ Enterprise applications | ✓ URLLC applications     |





# How to perform cross-domain orchestration?



Application onboarding

1

DC automation and  
transport handoff

2

Transport  
orchestration

3

Application slice Orchestration

# Application Onboarding

# NSO CNFO (Container Network Function Orchestrator) for CNF orchestration

# Contents

## 1. Introduction

Diverse network landscape and Cisco's unified orchestration solution.

## 2. Design

CNF-O and CNF-M's design, architecture and communication aspects.

## 3. Features

Functions and capabilities of CNF-O and CNF-M.

## 4. Setup

Installation steps, supported versions, dependencies for CNF-O and CNF-M.

## 5. Use-Case

Cisco PNR automated using NSO-CNFO-CoreFP in Kubernetes.

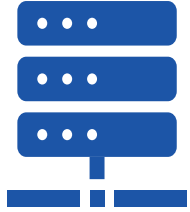
## 6. Conclusion

Value proposition, resources, next steps.

# 1. Introduction



# The Network Function Landscape



Physical Devices

Physical Network Functions  
(PNFs)



Virtual Machines

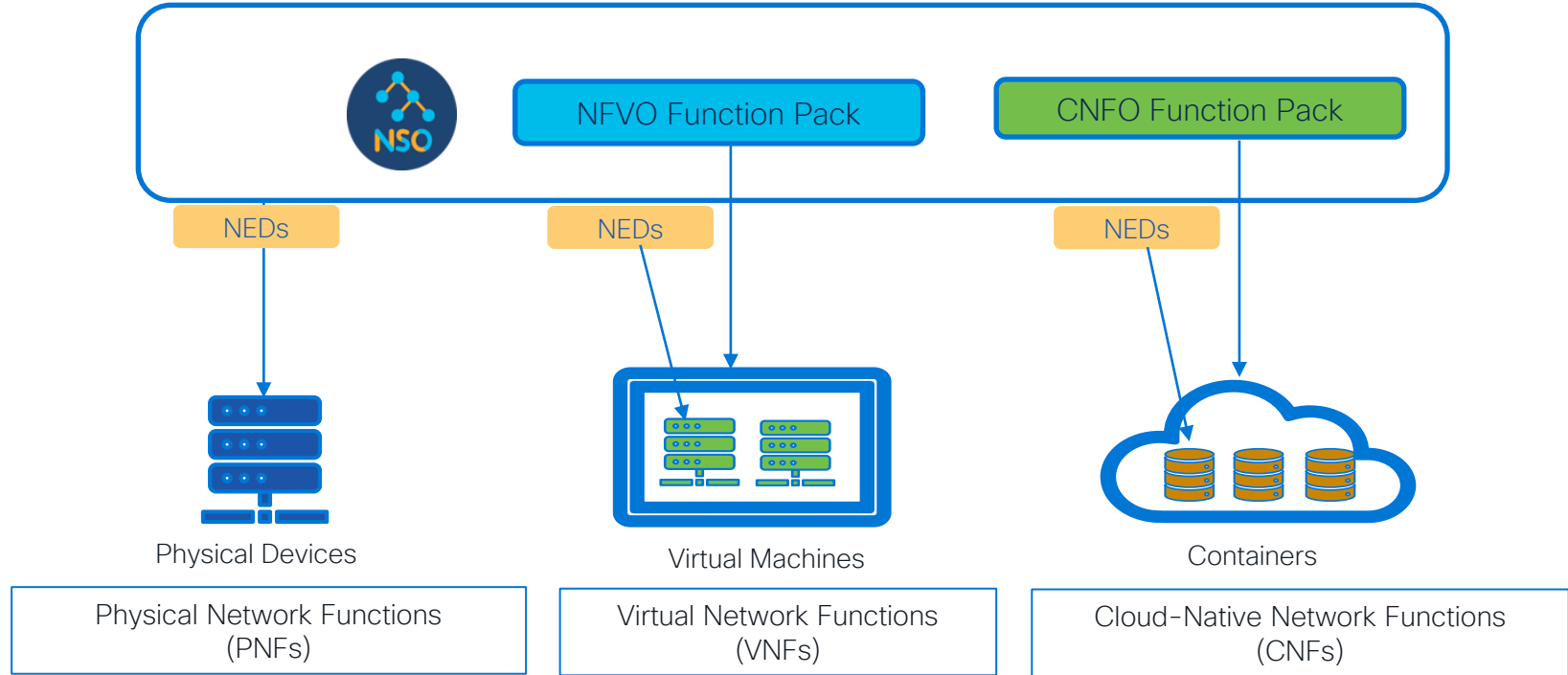
Virtual Network Functions  
(VNFs)



Containers

Cloud-Native Network Functions  
(CNFs)

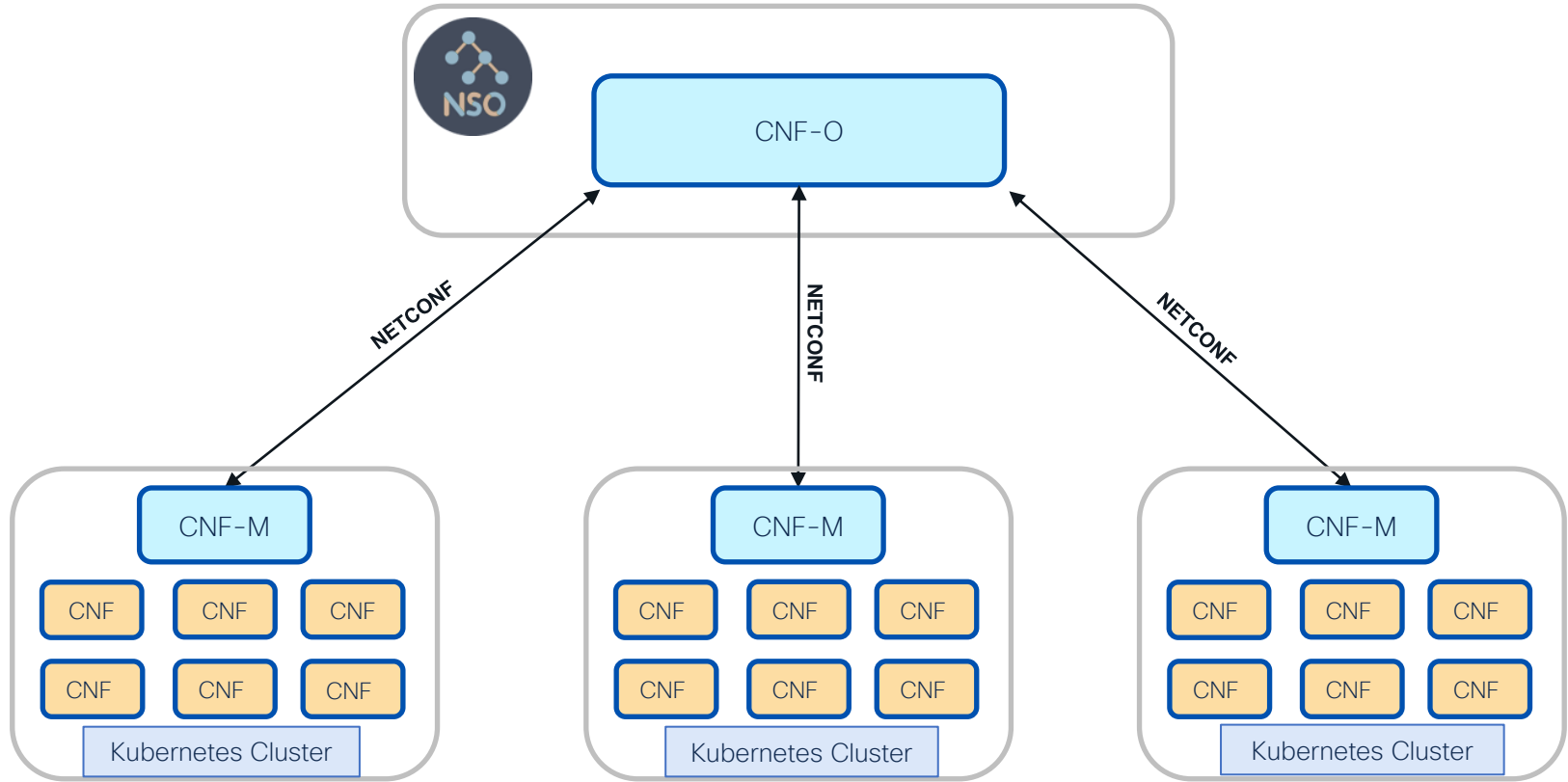
# Cisco NSO Unified Orchestration Solution



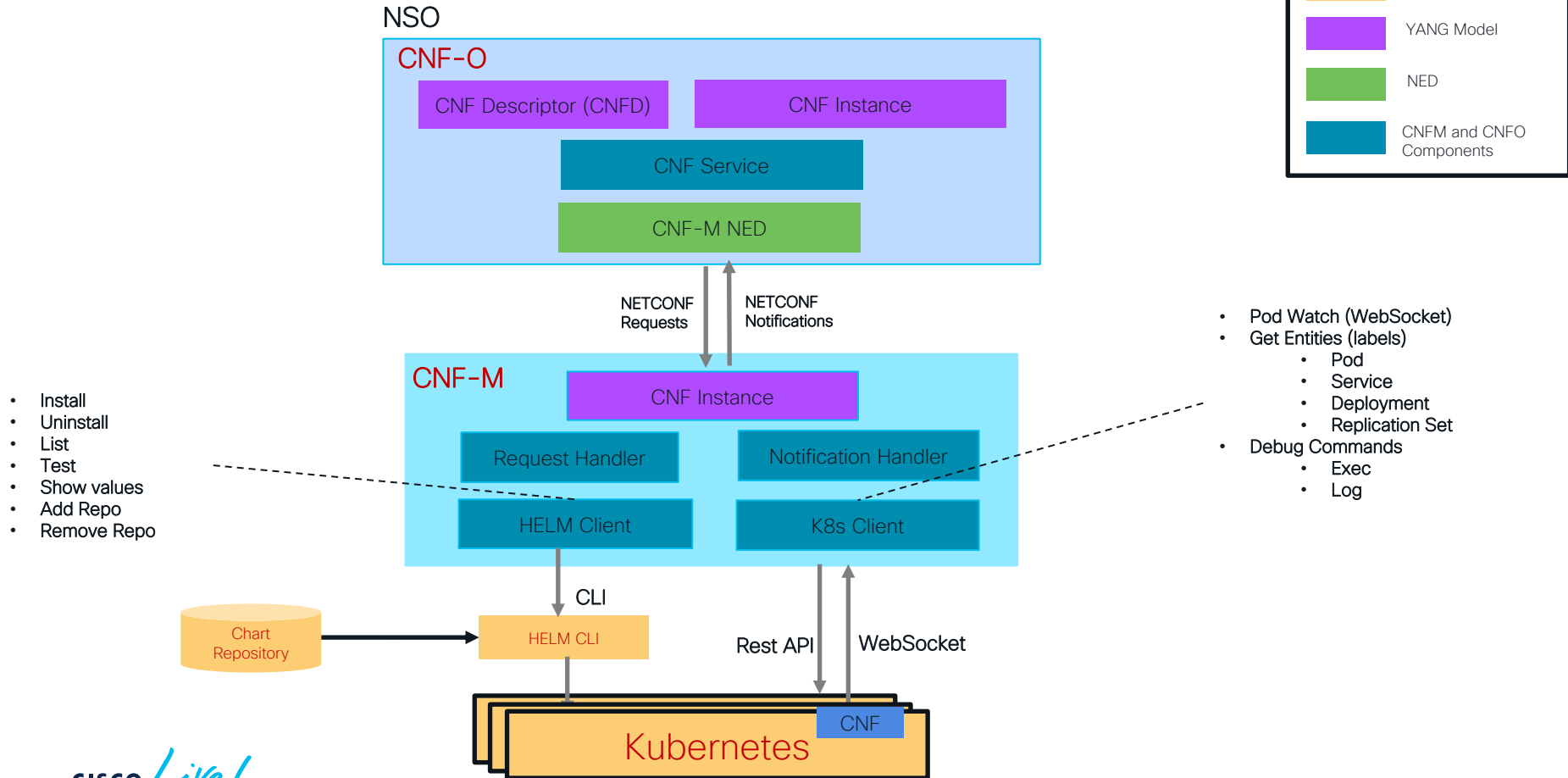
## 2. CNFO Core FP Design



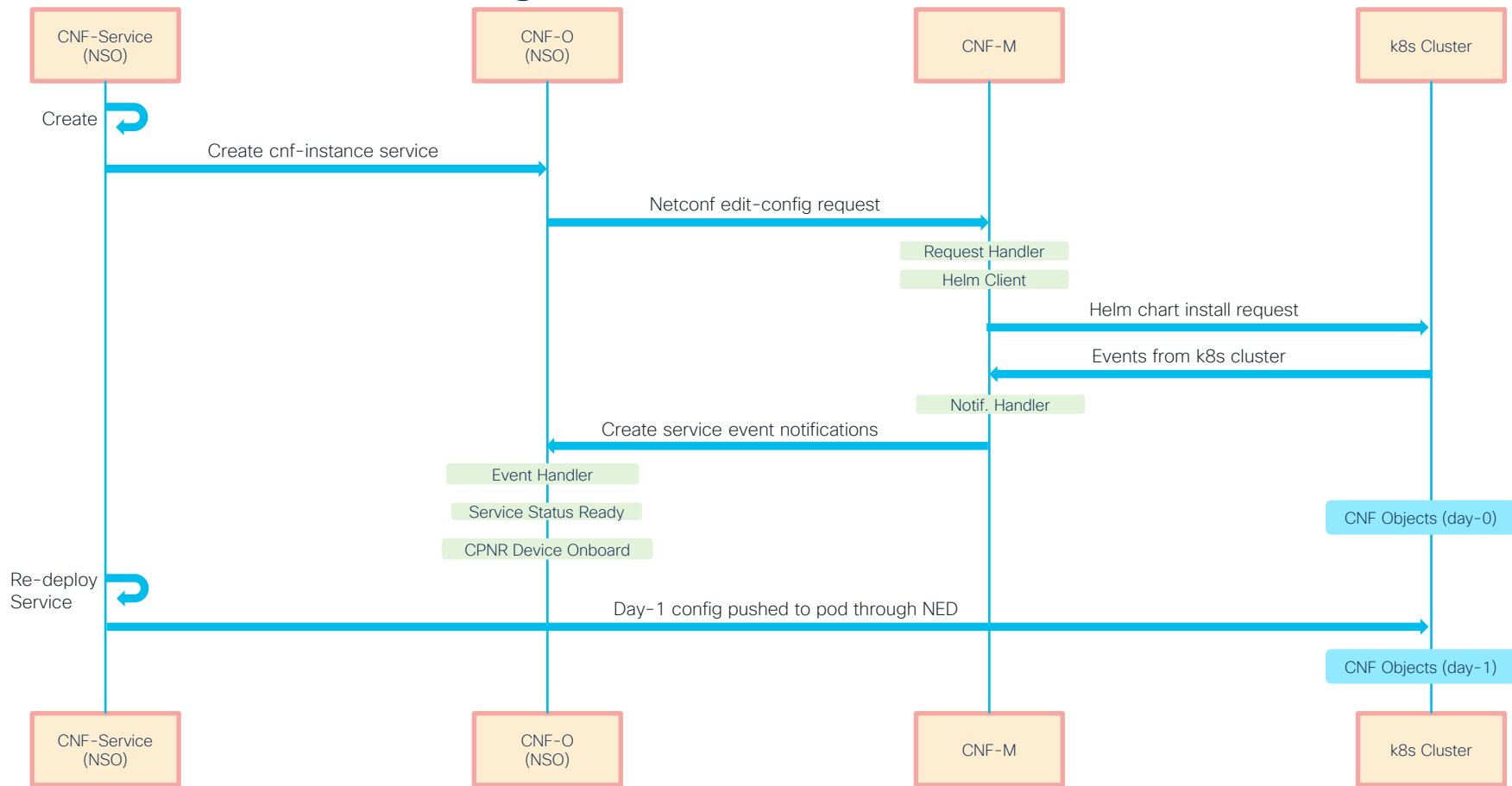
# CNF Automation Architecture



# CNF Automation Components



# CNF Onboarding Sequence



# 3. CNFO Core FP Features

# CNFO Core Function Pack – Feature Summary

Categories	Features
CNF Deployment	<ul style="list-style-type: none"><li>• CNF Life cycle Management on Kubernetes using Helm (create, upgrade, delete, scale in/out)</li><li>• CNF Service Plan to monitor the progress</li><li>• Show CNF object details using service operational data</li></ul>
CNFO Tools	<ul style="list-style-type: none"><li>• CNF Service actions (service cleanup, service retry)</li><li>• Helm actions (dry-run, history, test, get-values, diff, repo list/update/search)</li><li>• Kubectl actions (get, exec, logs)</li><li>• Cluster actions (resource details)</li><li>• Chart actions (get version)</li></ul>

## 4. CNFO Core FP Setup



# CNFO – Package Contents

CNFO CoreFP has two packages:

1)K8's service

- ncs-5.7.2.1-cisco-cnfo-1.0.0.tar.gz

2)CNFM NED

- ncs-5.7.2.1-cnfm-nc-1.0-1.0.tar.gz

Package Version

```
admin1@ncs% run show packages package package-version
```

```
PACKAGE
```

```
NAME      VERSION
```

```
-----
```

```
cisco-cnfo 1.0.0
```

```
cnfm-nc-1.0 1.0
```

Supported Kubernetes  
Platform:

Openshift 4.9 and 4.10

Tested with both Openshift Full Cluster  
and CRC (Code Ready Container)

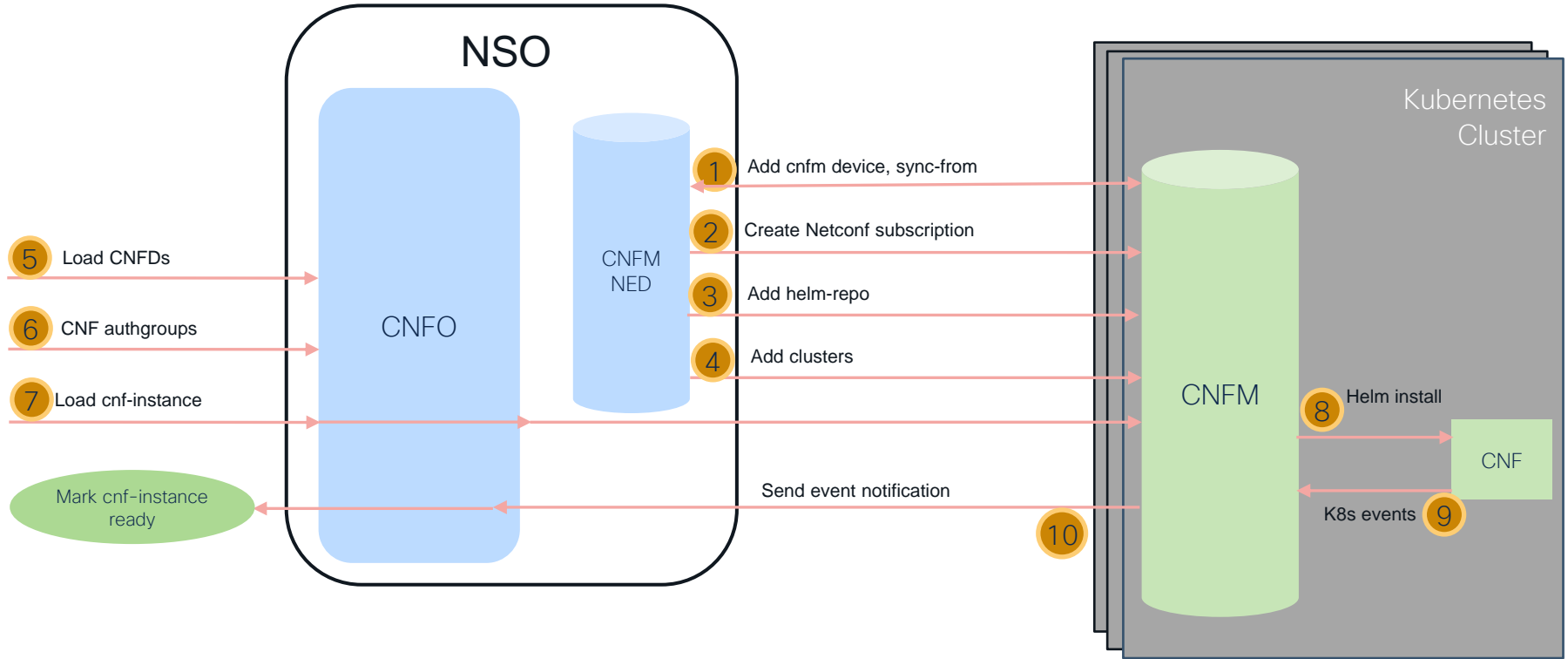


## 5. CNFO Use-Case





# CNF Use-Case



# Application Onboarding Demo



Application onboarding

DC automation and  
transport handoff

Transport  
orchestration

1

2

3

Application slice Orchestration

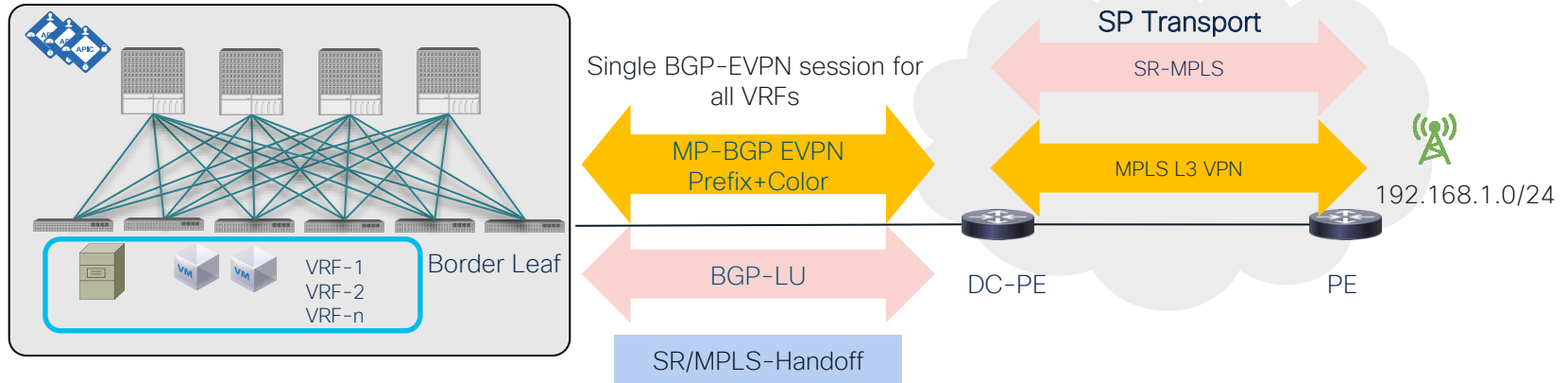
# DC and Transport Orchestration

# Scalable DC to transport handoff

- IOT, Enterprise services and 5G are driving high VRF scale requirement
- Automation and scalability is a challenge in VRF-lite solution

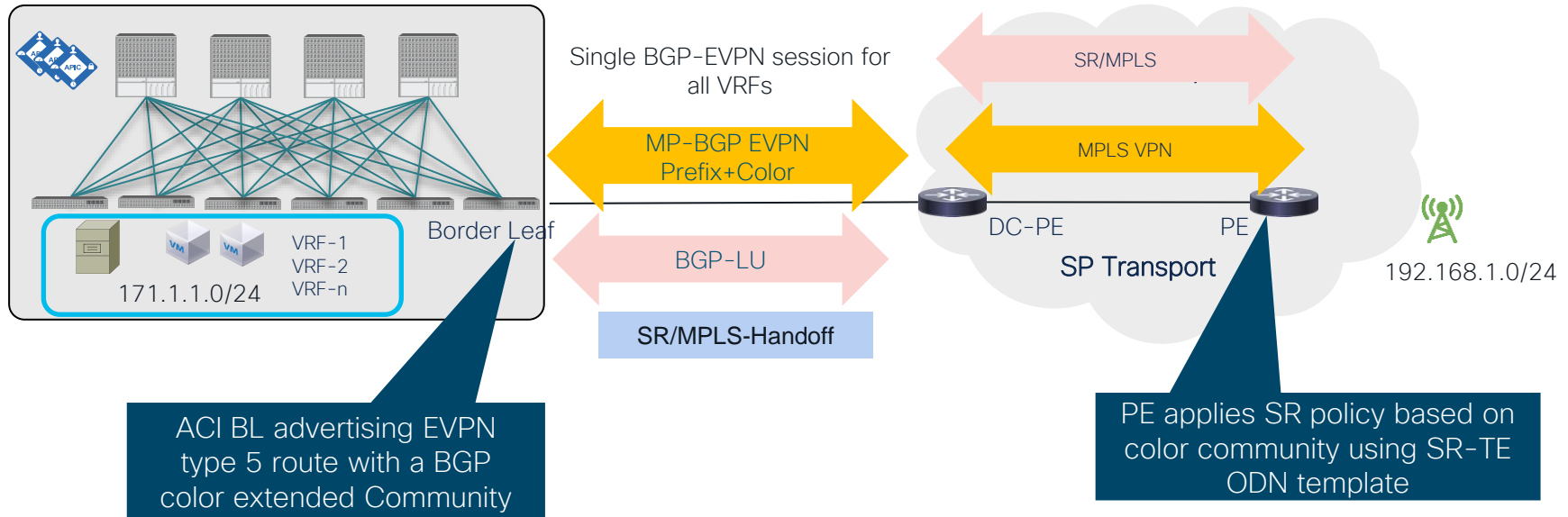
## SR MPLS handoff provides

- Single control plane and data plane session instead of per VRF control plane and data plane session
- Unified SR/MPLS transport network



# Consistent network policy across DC and transport

Advertise color community for a prefix from ACI BL, and use it on PE to define a SR policy in transport

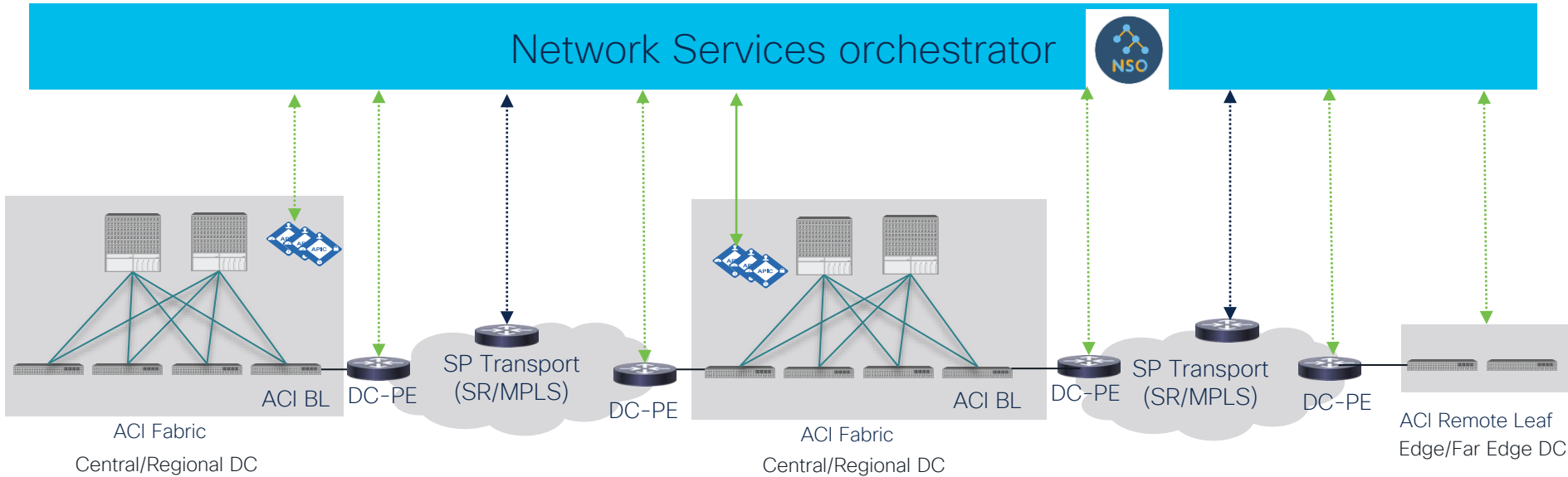


# Cross-domain automation using NSO DC SDN CFP



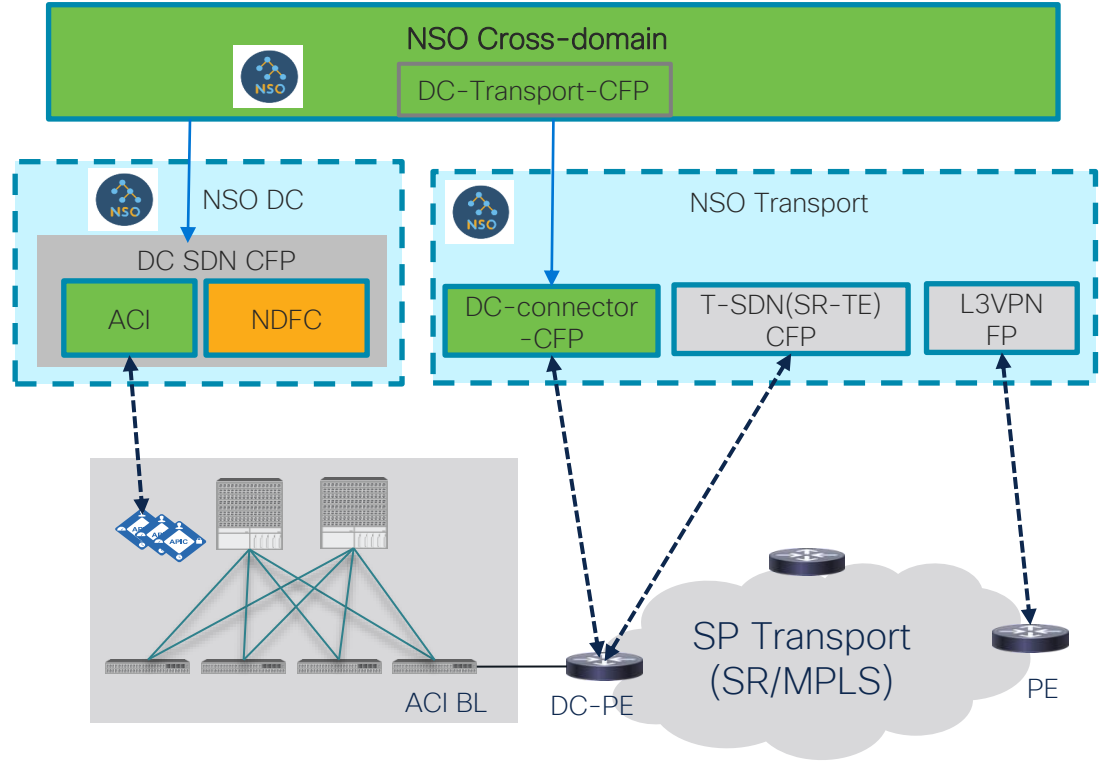
# Supported Topologies for NSO DC CFP

- Multi-Domain Orchestration across Transport and DC
- Telco DC provisioning, and DC handoff provisioning for both IP and SR handoff
- Support of multiple ACI Fabrics, ACI Multi-Pod & ACI Remote Leaf



# NSO Cross-domain core function Pack

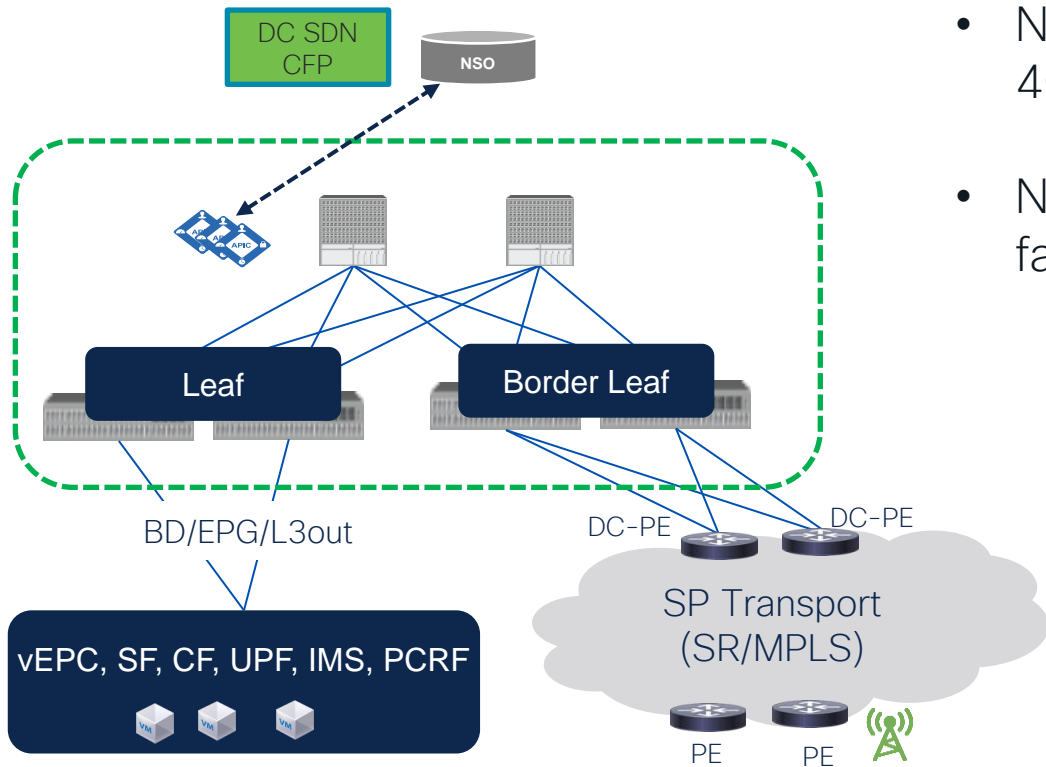
- Cross-domain CFP to provision DC to transport handoff for both IP and SR handoff using DC CFP and DC-Transport-CFP
- Multi-NSO support
- Support of Multiple ACI Fabrics from single NSO





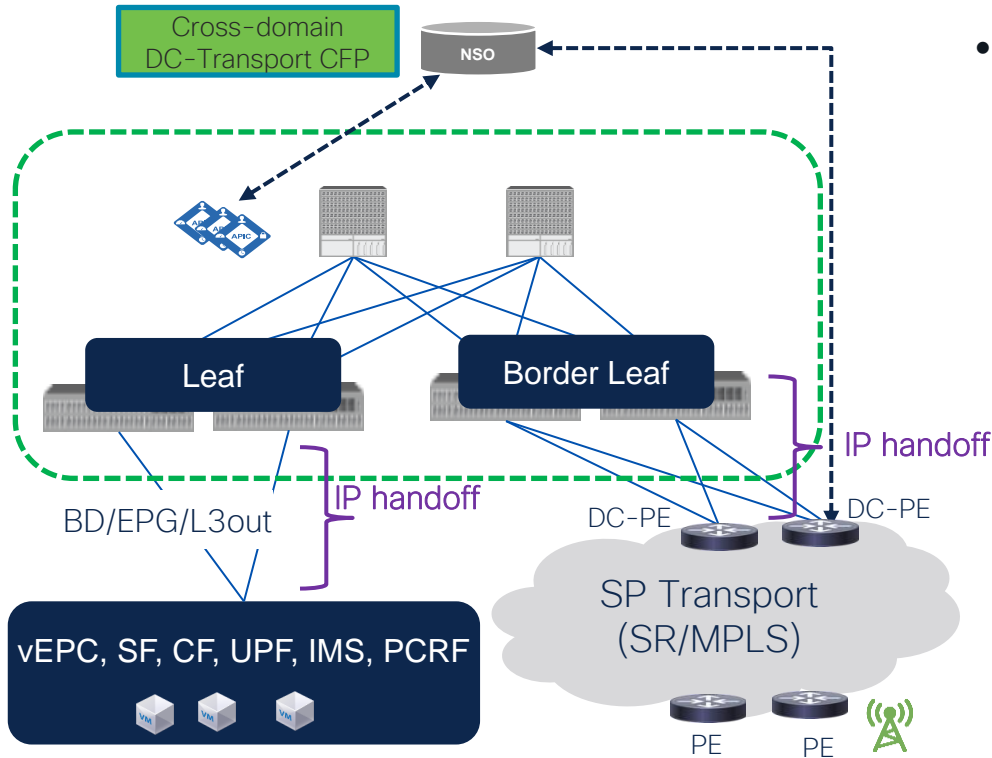
# ACI CFP use-case

## Telco cloud deployment



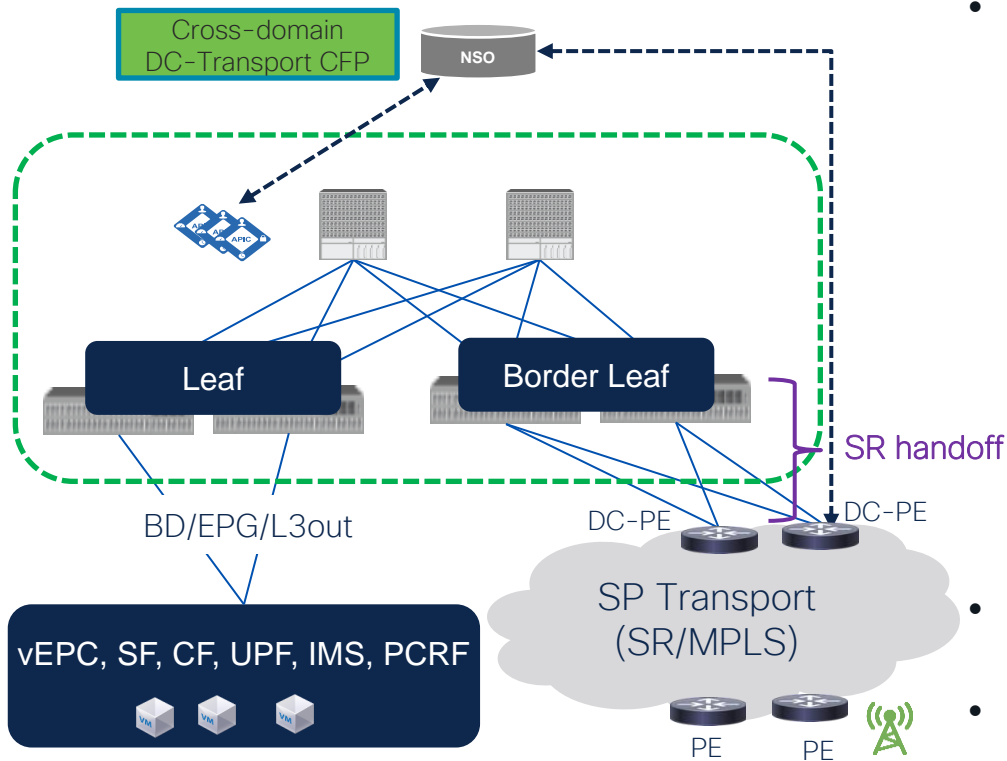
- NSO to push ACI policies to bring up 4G/5G services
- NSO will automate following in DC fabric
  - Interface, VLANs, policies
  - Tenant, EPG, BD, VRF, contracts
  - Routing (BGP, static route)
  - Route-maps
  - Service chaining (PBR)
  - QOS

# Cross-domain core function pack (IP handoff)



- NSO will automate following on ACI BL and DC-PE
  - VRF, RT, RD, VPN
  - Physical/logical interface
  - VLAN and IP address management for interfaces between DC-PE and ACI BL
  - Router-id auto-allocation
  - Routing (BGP, static route)
  - BFD
  - Routing policies

# Cross-domain core function pack (SR handoff)

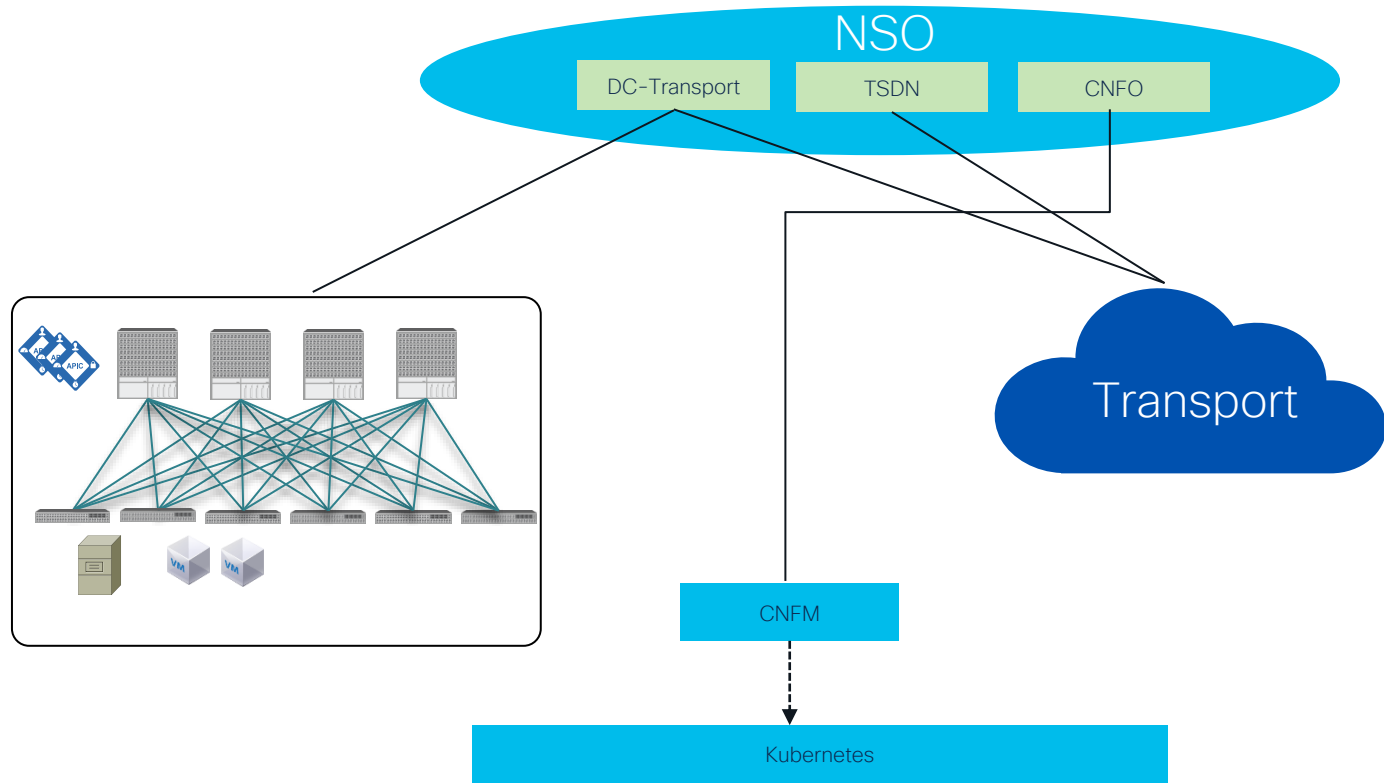


- NSO to automate following configuration on ACI BL and DC-PE
  - Configuration and management of VLAN and IP addresses for underlay BGP-LU, EVPN loopback, transport loopback, RD, RT, VLAN, SID, and Router-id
  - MPLS QOS policies
  - BGP EVPN and labeled unicast session
  - Single and Multi-hop BFD
  - Routing policies such as BGP color community
  - SR/MPLS QOS policies
- RT Translation from EVPN to L3VPN on DC-PE
- Map BGP color-community to SR policies on DC-PE

# DC and Transport Orchestration Demo



# Conclusion



# For Further Knowledge ...

## 1. CNFO Core FP Software and Documentation:

- <https://software.cisco.com/download/home/286323467/type/286330588/release/1.0.0>

## 2. Helpful Technical Inputs (how-to, sample payloads, presentations/recordings):

- <https://confluence-eng-sjc1.cisco.com/conf/display/NSOCoreFP/NSO+Core+Function+Pack+-+CNFO>

## 3. dCloud Demo:

- [QA-in-progress.](#)



# NSO Value Propositions

- ❖ End-to-end orchestration
  - ❖ PNF, VNF and CNF service lifecycle management
- ❖ Multi-vendor device support
  - ❖ More than 150 Network Element Drivers
- ❖ Orchestration at scale
  - ❖ Referenceable, Large Tier-1/2 implementations
- ❖ Based on Industry Standards
  - ❖ IETF (Netconf/Yang/Restconf), ETSI NFV, K8s, Helm

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