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5G Cloud Native Packet Core and Network Slicing Automation

Laurent DESAUNAY -TSA
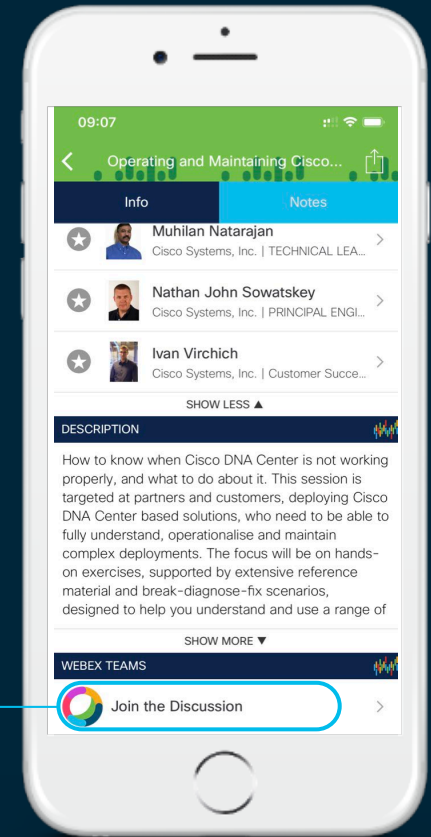
BRKSPM-2743

Barcelona | January 27-31, 2020

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Session Abstract

5G Cloud Native Packet Core and Network Slicing Automation

- 5G packet core are evolving to cloud native VNF for more better agility and Scaling. This session will focus on the new automation and operational requirements associated to the Cisco 5G Cloud Native in the context of 5G Network Slicing and we will introduce the Cisco solution to address this evolution.

- During the session the attendees will learn about:
  - The Operational impact & challenges associate to the cloud native VNF insertion.
  - The Cloud Native Packet Network Function Instantiation requirements (Container & Micro Services)
  - The Cloud Native Packet Network Function scaling requirements
  - The Cloud Native Packet Network Function Monitoring requirements
  - The Cloud Native Packet Network Function fault & Impact Analyze requirements
  - The Cisco Solution and approach to address those requirements and challenges in the context of end to end slicing automation

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Agenda

- Introduction – 5G Slicing Automation, SLA & Operation

- 5G Packet Core Slice and Cloud Native

- 5G Core Slice– Instantiation and configuration

- 5G Core Slice – Service Assurance and SLA

- Cisco 5G Core Slice– Orchestration & Service Assurance solution

- Summary

All the industry & customers are speaking about 5G e2e network slicing. Does it mean the same to each of us?
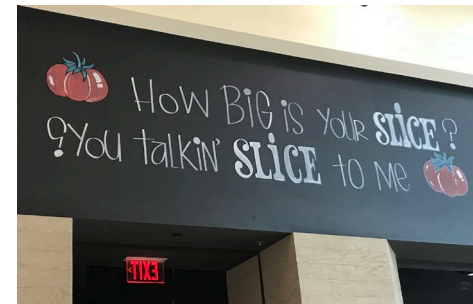
Introduction –
5G Slicing Automation, SLA & Operation

5G Slicing Automation, SLA & Operation

Standards bodies and open source projects involved in 5G

Customer 5G Perspective of Network Slicing
It's an **End-to-End** Business Service!

Network Slicing is fundamentally an end-to-end **partitioning of the network resources and network functions** so that selected applications/services/connections may **run in isolation** from each other and for a **specific business purpose**

E2E use-case
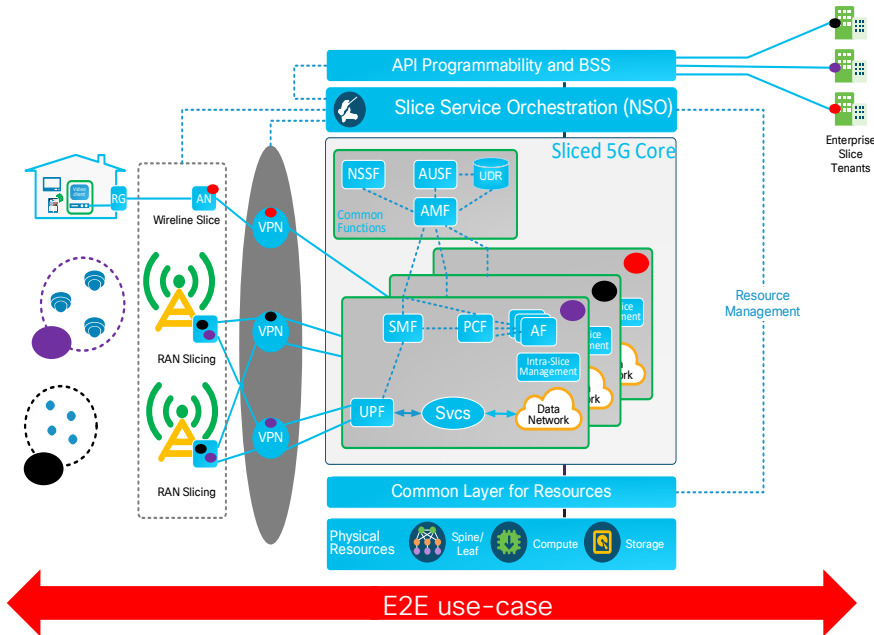
Benefits

- Each separable business operation can be efficiently and reliably run on a network slice
  - Alternate policy and charging structure
  - Unique service assurance characteristics
  - Increased service security
- Infrastructure orchestration manages the complexity driven by the requirements of each slice
  - Leverages the SP distributed DCs and Footprint
  - Each slice can have its own MANO/OSS environments
- New service introductions are quicker
  - Slicing has a significant reduction in regression testing cycles
  - Isolation eliminates effects of rogue applications (E.g. M2M)
  - Smaller failure groups imply no single "too big to fail" node

5G Slicing Automation & SLA –
Communality from the Various Standards

Fundamental Requirements :

- **Intent Based Management** *for Instantiation and SLA/OLA monitoring*

- **Closed Control Loop (CCL)** *for Dynamic/real time Slice adjustment to warranty SLA*

- **Hybrid and Multi- domain Infrastructure Management** *impose segmentation in Sub-Slice /Domain for scale and abstraction*

- **Common or compatible CFS & RFS Modelling** *for Flexibility agility and End to End Slice intent definition .*

End to end slicing – high level Requirement

It is a E2E logical constructs different network resources & functions that serves business purpose

End to End Cross Domain Orchestration and Service Assurance

Slice attributes

Functionality	• Priority, Charging, Policy control, Security, Mobility
Performance	• Latency, Mobility, Availability, Reliability, Data Rates
Users	• Users Groups, Public, Corporate, MVNO, Dev teams, tests...

Unified underlay and overlay networks with Segment Routing
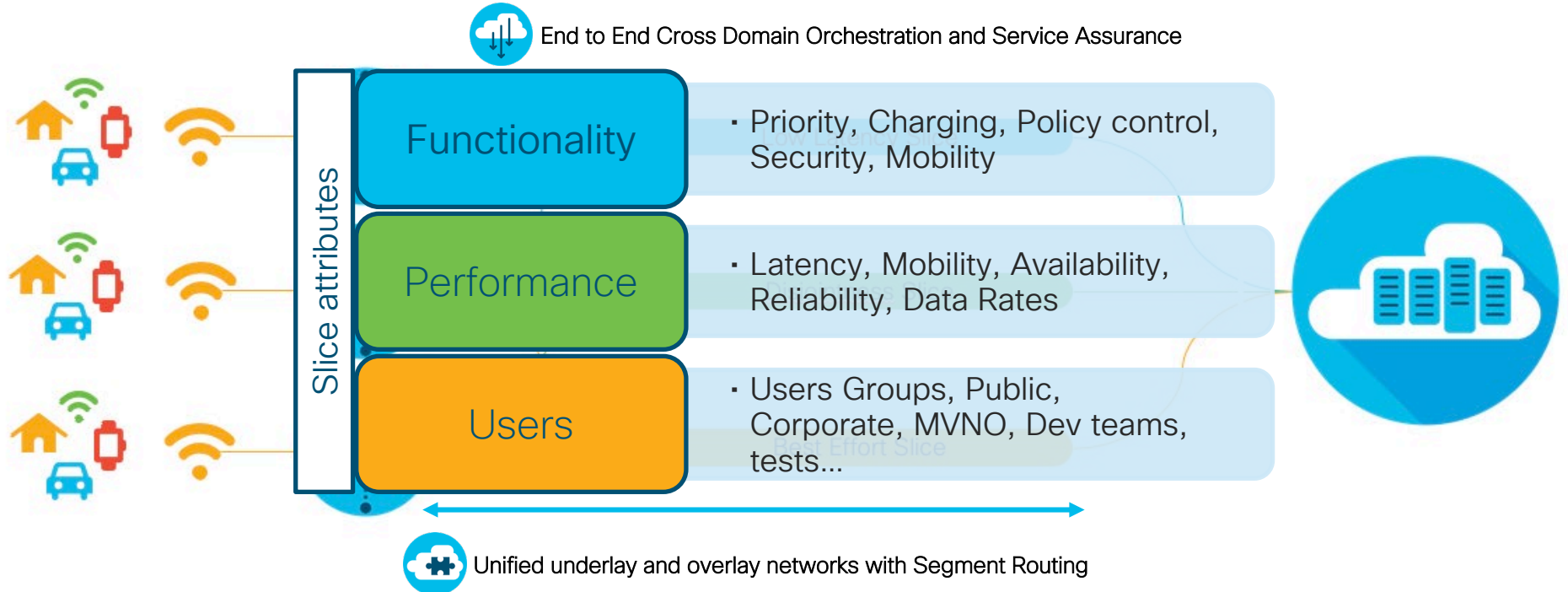
Its about offering a Service Level Agreement (SLA)
Slicing solution must be affordable to make sense

5G Slicing Automation, SLA & Operation-
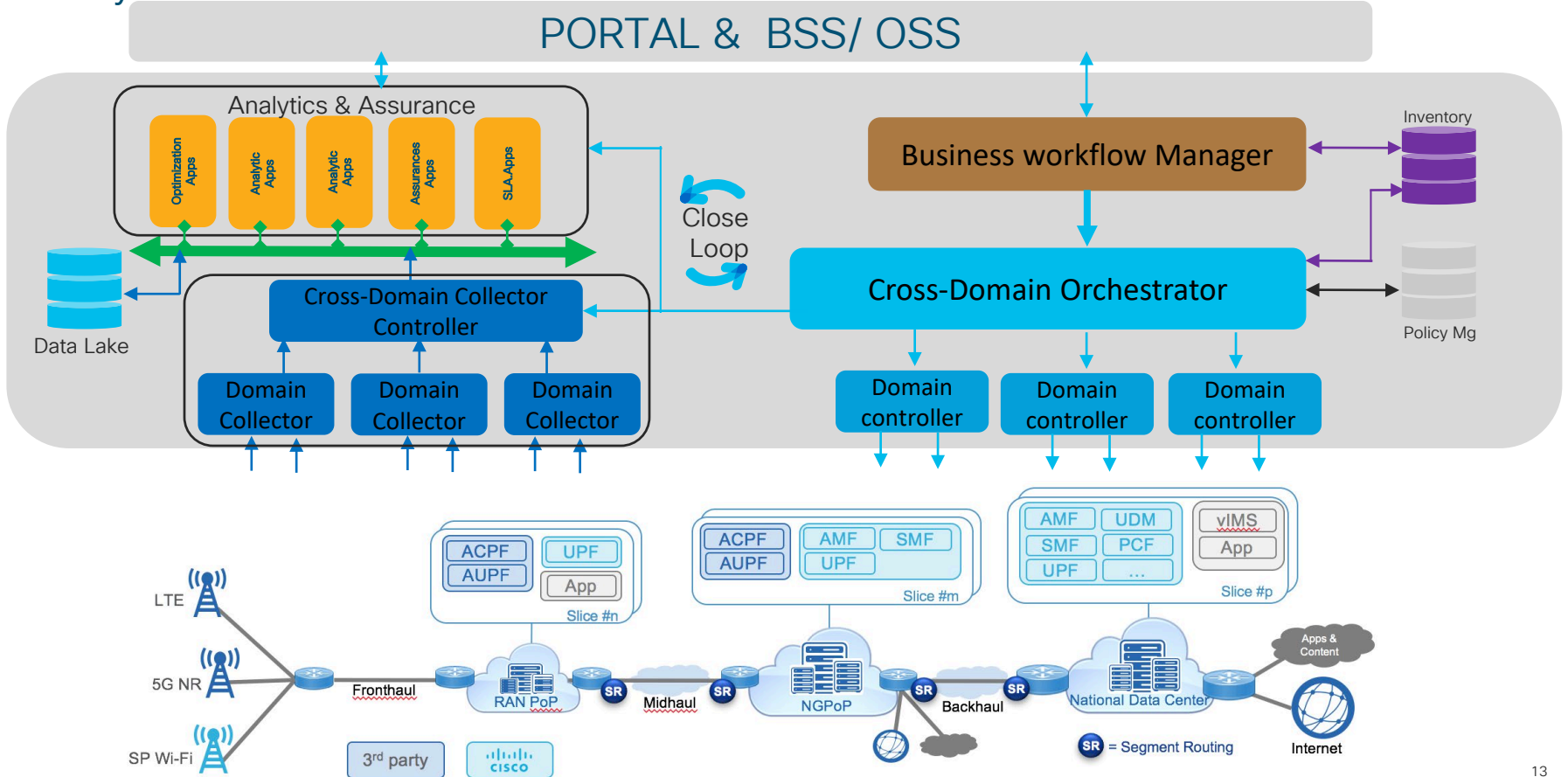## from Cisco perspective
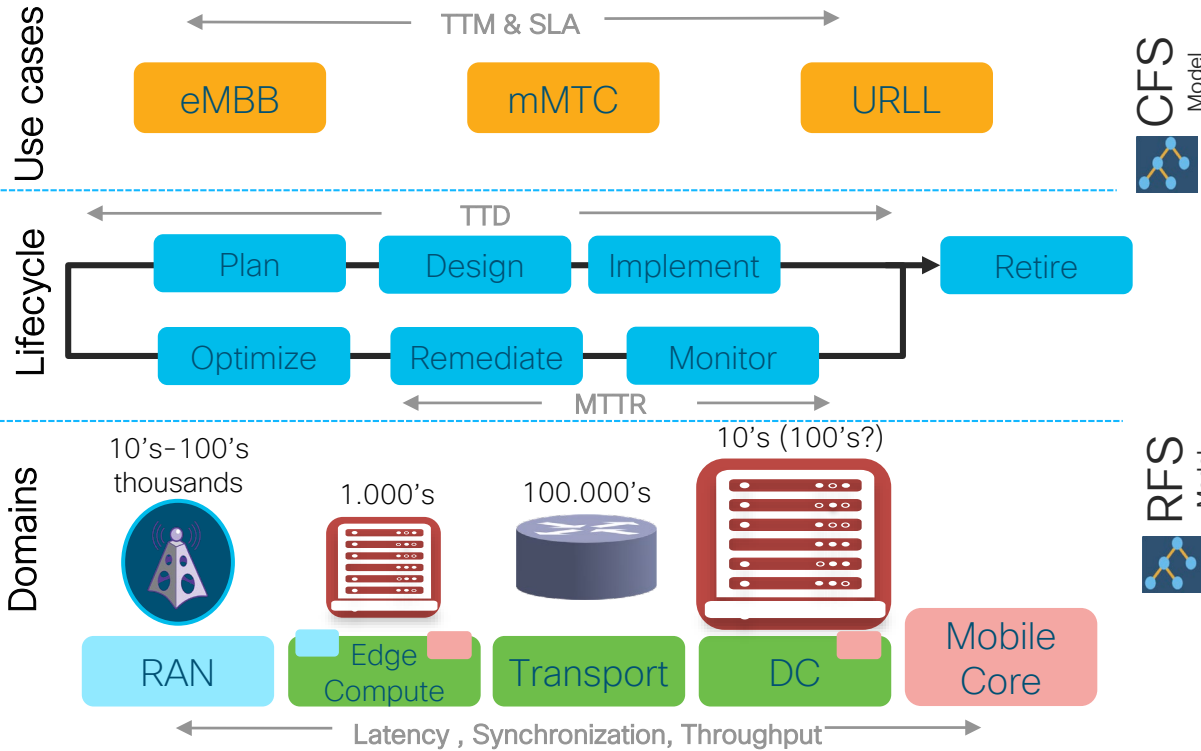
Requirements

- – Service Intent Base Orchestration
- – RFS CFS Intent based Modelling
- – Close Loop Service Assurance
- – Cross Domain Orchestration, SLA & operation

Capabilities
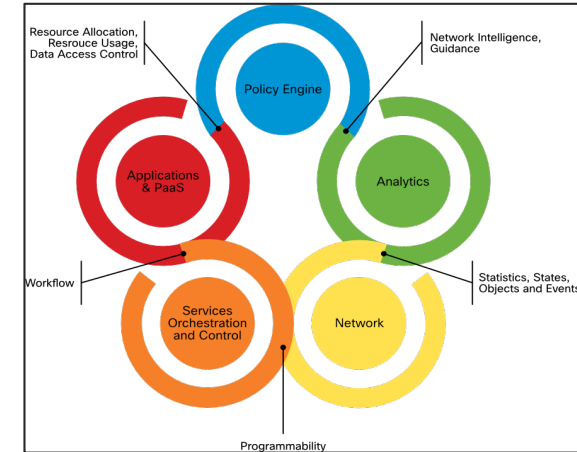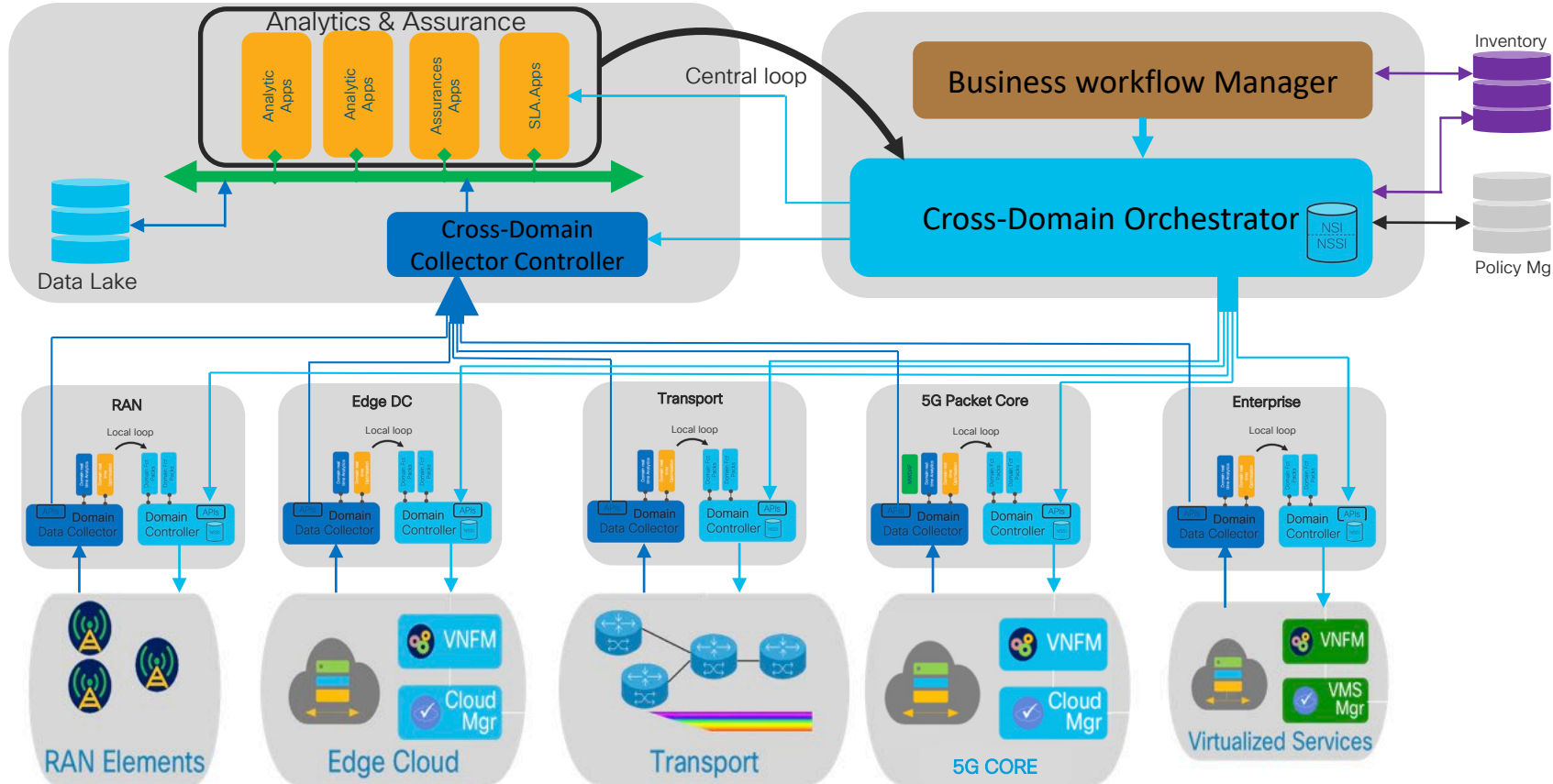
5G Slicing Automation & Operation
Key Functions Blocks

5G Slicing Automation & Operation
Cisco high level Architecture & Vision

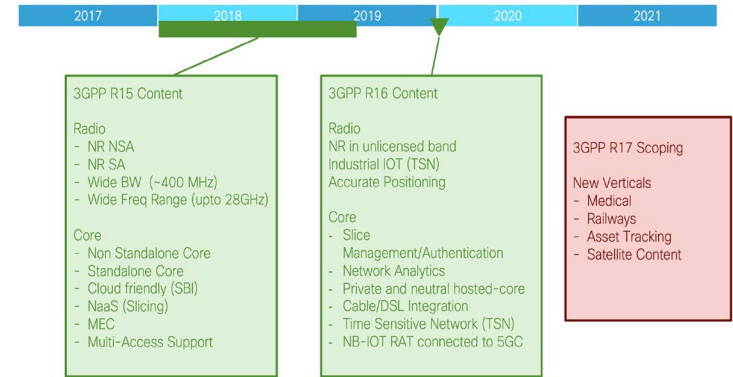# 5G Packet Core Slice and Cloud Native

5G Core slicing
Who is defining it?

3GPP : *A network slice is viewed as a logical end-to-end network that can be dynamically created. A given User Equipment (UE) may access to multiple slices over the same Access Network (e.g. over the same radio interface). Each slice may serve a particular service type with agreed upon Service-level Agreement (SLA). In this article we provide highlights of 3GPP Network Slicing as being defined in TS 23.501 in SA2. A Network Slice is defined within a Public Land Mobile Network (PLMN) and includes the Core Network Control Plane and User Plane Network Functions as well as the 5G Access Network (AN).*

Other SDOs publishing articules and studies on network slicing, such as IEEE, ITU-T, NGMN, GSMA, BBF, O-RAN

At date, 3GPP defines slicing procedures for the core network and directives for the access network and suggestions for the transport network.

3GPP 5G Timelines

| 2017 | 2018 | 2019 | 2020 | 2021 |

3GPP R15 Content

Radio
- NR NSA
- NR SA
- Wide BW (~400 MHz)
- Wide Freq Range (upto 28GHz)

Core
- Non Standalone Core
- Standalone Core
- Cloud friendly (SBI)
- NaaS (Slicing)
- MEC
- Multi-Access Support

3GPP R16 Content

Radio
NR in unlicensed band
Industrial IOT (TSN)
Accurate Positioning

Core
- Slice Management/Authentication
- Network Analytics
- Private and neutral hosted-core
- Cable/DSL Integration
- Time Sensitive Network (TSN)
- NB-IOT RAT connected to 5GC

3GPP R17 Scoping

New Verticals
- Medical
- Railways
- Asset Tracking
- Satellite Content

Normative work still ongoing

3GPP Network Slicing Model

- E2E Concept:
  - UE, RAN, 5GC
  - Transport and Datacenter
  - Multi-domain Orchestration and Automation

- Key 5GC Operations
  - Slice identifications
  - Binding Application to Slice
  - Selection of AMF, PCF, SMF
  - Use of NSSF

- Reference Standards
  - TS 23.501 Section 5.15 (Network Slicing)
  - TS 23.503 Section 6.1.2.2 (URSP, NSSP)
  - TS 38.300 Section 16.3 (Network Slicing)

3GPP deployments using network slicing
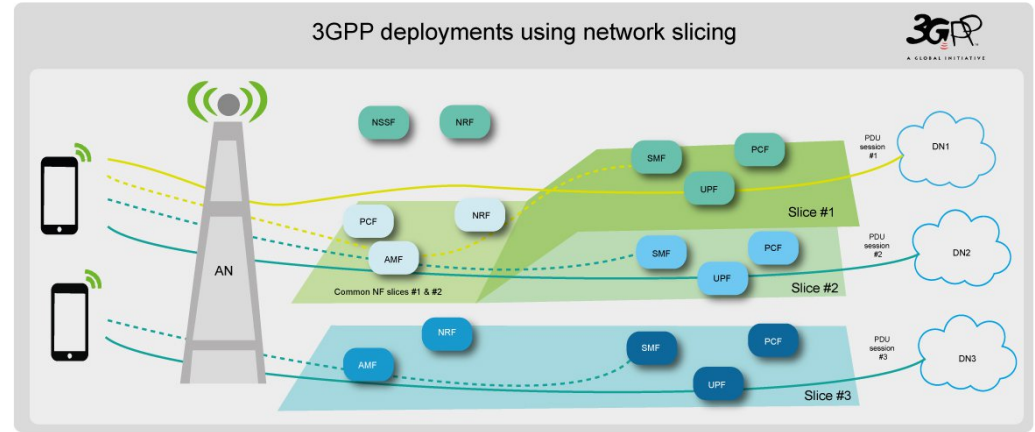
Slices are logically separated core-networks

- Dedicated networks
- Multiple slices per UE (max 8)
  - AMF/NSSF per UE
  - NF per slice (i.e.: SMF/UPF/PCF)

Key Concept & Slice Terminology defined by 3GPP
Network Slice Instance, Network Slice template, Network Slice Subnet Instance

Network Slice Instance (NSI)

A slice can be:
1:1:1 (Radio/Core/Transport)
1:n:m (Radio/Core/Transport)

CN NSSI

TN NSSI

AN NSSI
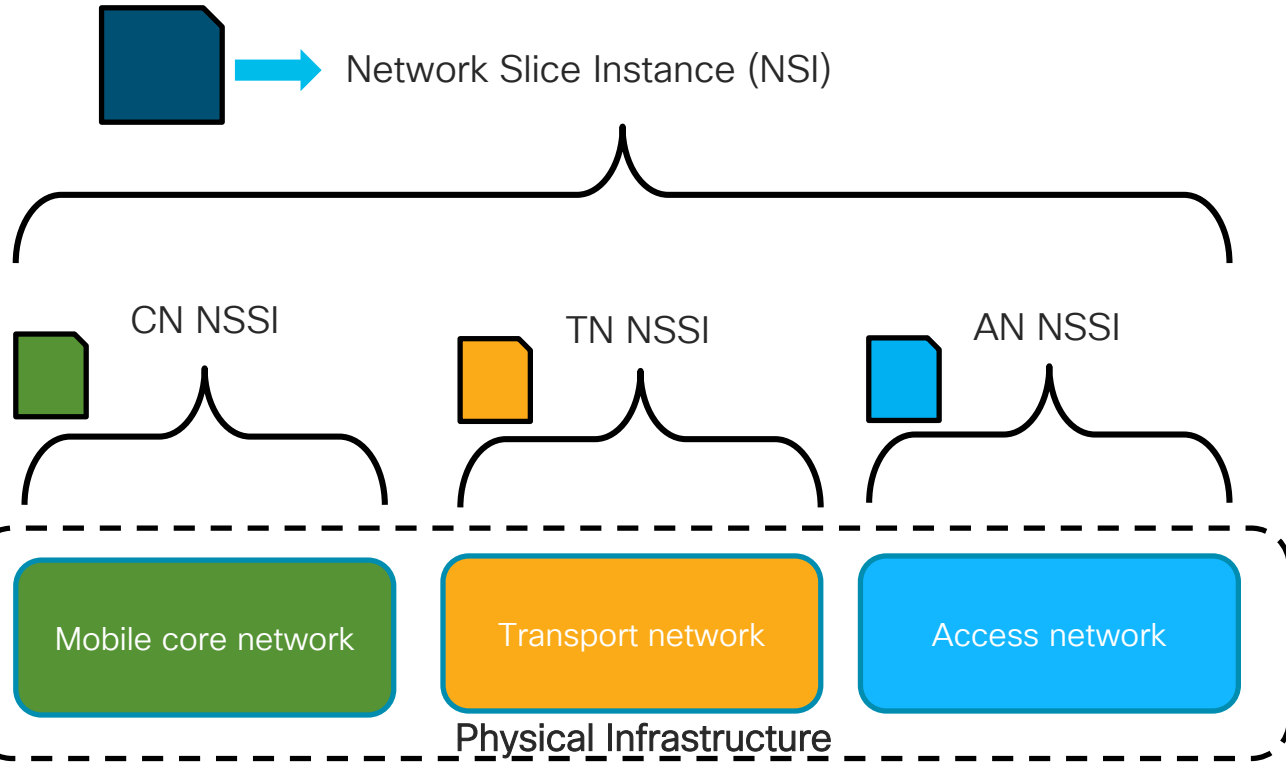
Network Slice Template (NST)

Network Subnet Slice Templates (NSST)

Mobile core network

Transport network

Access network

Physical Infrastructure

Multiple NSSIs per NSI
NSSI CAN BE CASCADED

Ref 3GPP TS 28.530 & 3GPP TS 28.531

Key Concept & Slice Terminology defined by 3GPP
Slice Topology and Slice IDs

Phone
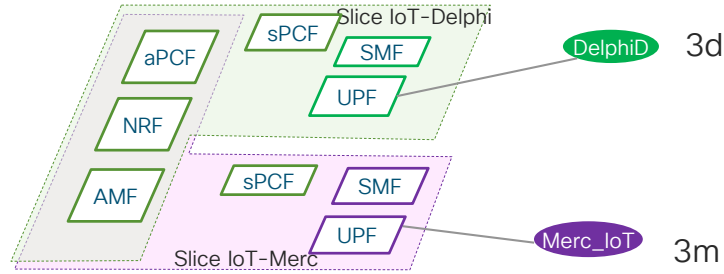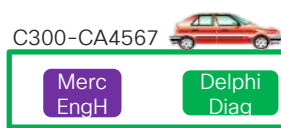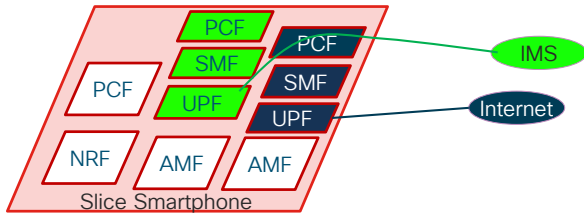
UDM

Subscribed Slice IDs		
Slice ID.		*DNN*
Mehmet		
	Slice 1	
		Internet
		IMS
		Emergency
C300-CA4567		
	Slice 3m	
		Merc_IoT
	Slice 3d	
		DelphiD

Configured Slice IDs		
Slice ID.		*DNN*
Mehmet		
	Slice 1	
		Internet
		IMS
		Emergency
Slice ID.		*DNN*
C300-CA4567		
	Slice 3m	
		Merc_IoT
	Slice 3d	
		DelphiD

3d

3m
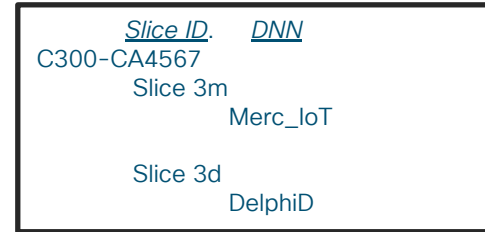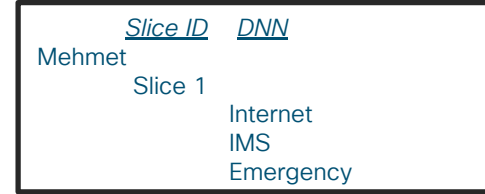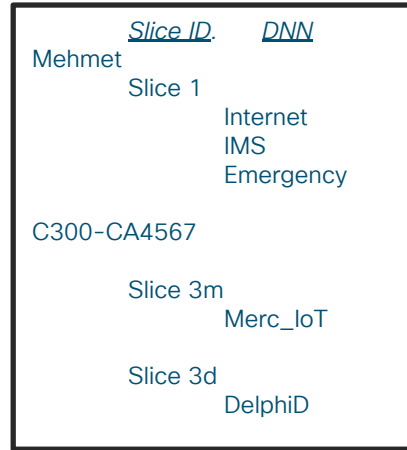
1

Slice Type	Value
eMBB	1
URLLC	2
mIoT	3

Slice ID

Slice Type	Slice Differentiator
1 byte	3 bytes

Slide ID = S-NSSAI
Slide ID Set = NSSAI
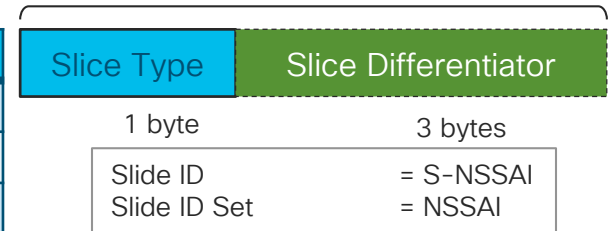
Cisco Network Slicing for 5G core Network

5G Core Orchestration

Common

AUSF UDM NSSF

Traffic

Engine

Slice #4

Traffic

Engine IoT

Slice #3, #4 Common   Slice #3

AAA PCF
UPF
SMF
PCF NRF
AMF
SMF AAA PCF
UPF

NRF SMF AAA PCF
AMF
UPF
Slice #2

Internet

App2

NRF SMF AAA PCF
AMF
UPF
Slice #1

Internet

App1

UE   Access Network   Mobile Core Network

Slices are logically separated networks
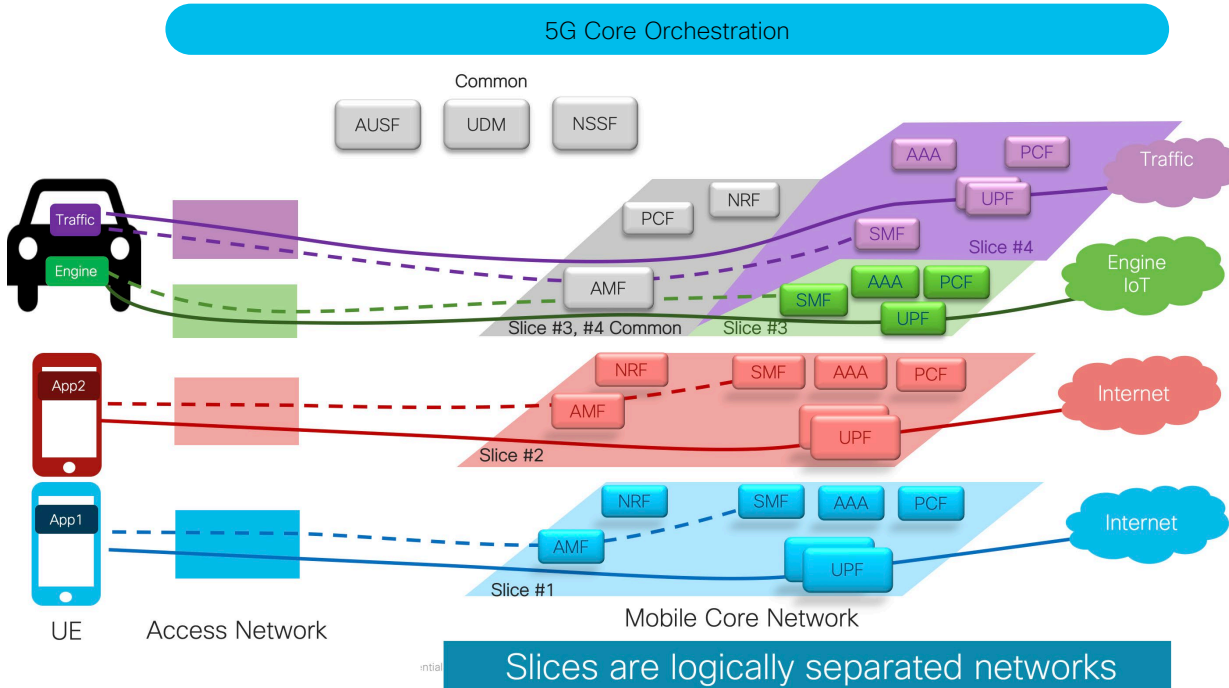
- Leverage VNF and CNF to disaggregate Control Plan from User Plan to distribute and Scale 5 Core Functions.

- Implement the NSI, NSSI for Slice isolation.

- Use the NSSAI in conjunction with the AMF and NSSF for the slice selection (8 slices per UE)

- Slice Management Authentication

- Dedicated UPFs per slice

- An Orchestration Layer to create, deploy, configure, modify, scale delete Slices

Slice – Associating Internet, Enterprise & IMS

Slice (NSI)

Internet Slice (NSSI)

Access (NSSI)

NSSF

NRF

AMF

SMF

PCF

UPF

SMF

PCF

UPF

Enterprise Slice (NSSi)

NRF
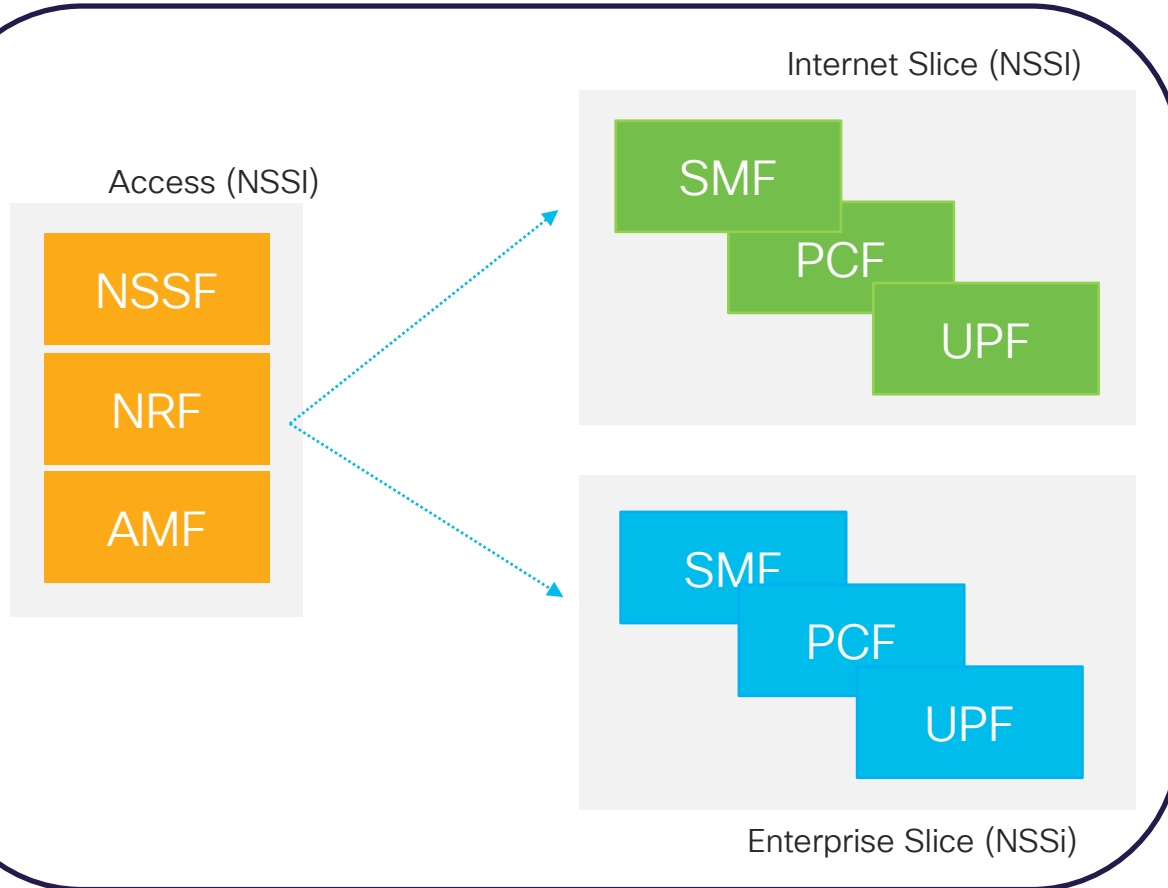
AMF	Slice-1 (1,1), Slice-2 (2,2), Slice-3 (3,3)
SMF	PCF	SST = 1, SD = 1
SMF	PCF	SST = 2, SD = 2

NRF at this point has NF's from different slices registered in its database and can route calls based on the slice type and slice differentiator

Cloud Native Applications
- deployment Models

Virtual Machines

Option-1

- Cloud Native Apps Onboarding
- K8s Installation
- VM Creation/Boot-Up
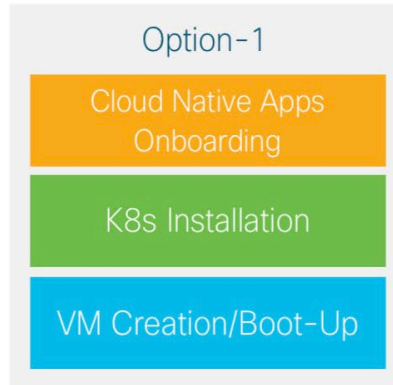
Option-1 (Virtual Machines)
- NSO can deploy VM's
- Convert them into a K8s Cluster
- Onboard Cloud Native Apps

Bare Metal

Option-2

| AMF | SMF | UPF |
| NRF | NSSF | PCF |

Bare Metal
(Ubuntu/RHEL/CentOS)

Option-2 (Bare Metal)
- Infrastructure available already
- Onboard Cloud Native Apps

Public Cloud

Option-3

| AMF | SMF | UPF |
| NRF | NSSF | PCF |

Cloud Infrastructure

Google

Amazon

Azure
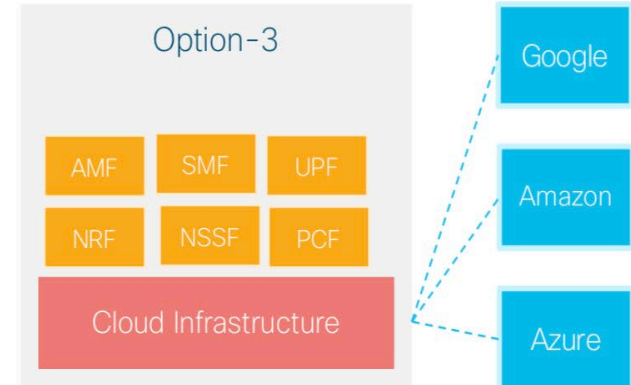
Option-3 (Cloud)
- Infrastructure available already
- Onboard Cloud Native Apps

Cisco 5G Ultra Cloud Platform
Components and Cloud Native model
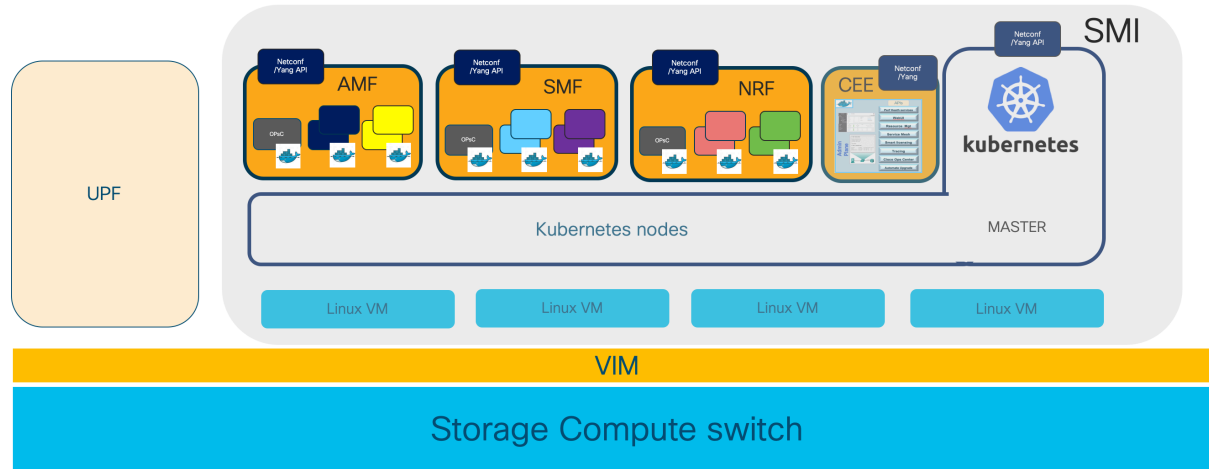
A cloud native NF is set of container define in Microservice with lifecycle Managed by K8

Cisco 5G Ultra Cloud Platform

- Run on a Vim
    (Openstack/Vmware)

- Offer a Cloud infra based o K8 name SMI with a common Execution engine to operate the cisco 5G NFs

- An optimized UPF based on VM leveraging the $G CUPs Model

Cisco 5G Ultra Cloud Platform
Slicing sample
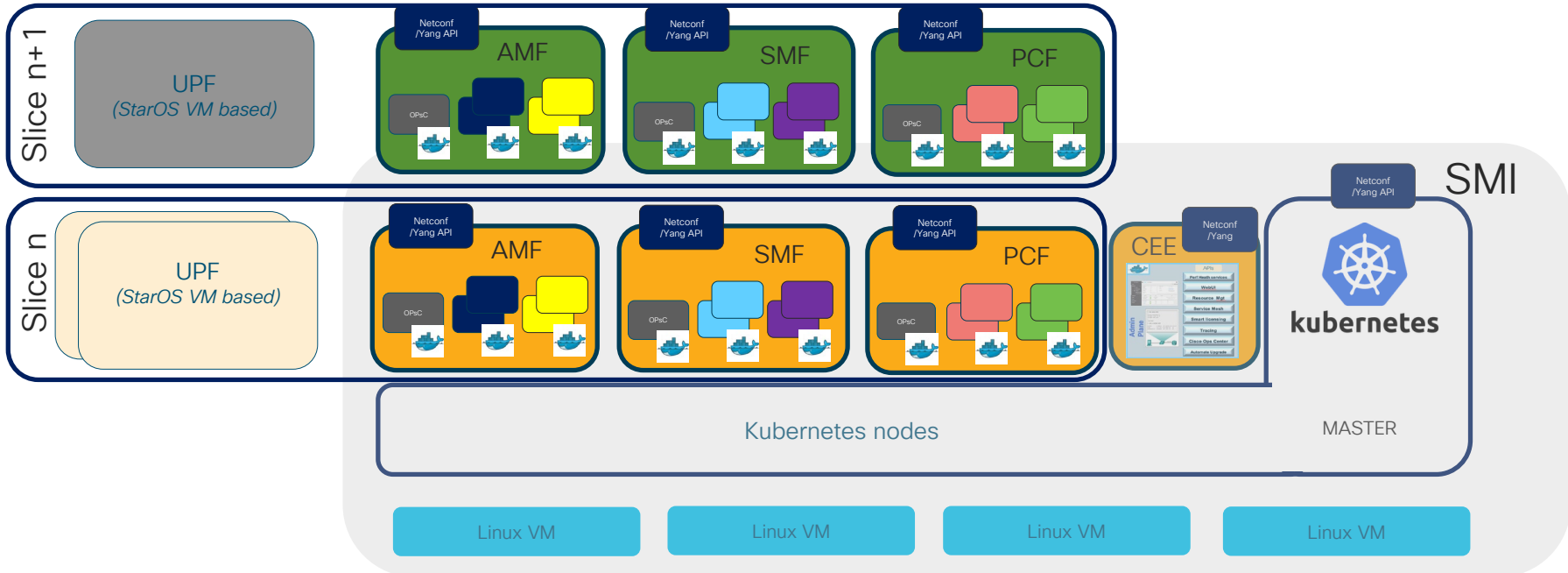
5G Core Slice– Instantiation and configuration

Cisco 5G Slicing automation
End to End Automation a Multi-Domain challenge

Efficient E2E orchestrator need to consumes:

- Abstracted models of multiple domains
- Flexible Slice & Sub-Slice definition & models
- Slice/Service Intent that can be instantiated, updated , deleted on demand

Efficient E2E orchestrator need to orchestrate multiple domain and separating the CFS from the RFS using a unique modeling language.

Slice Models

Domain Models

Service Models

BSS/OSS Environment

NaaS API Gateway

REST

Cross Domain Orchestrator

Netconf

Nfvo-Vi (Netconf)

Netconf

Netconf

REST

Netconf

Nfvo-Vi (Netconf)

Mediated Orchestration Links Exposed as APIs

RAN

eMBB

mMTC   LLC

RAN Slices

NFVI   VIM

Far Edge/RAN

Edge Cloud

NFVI   VIM

Edge Cloud

SR
PCE

Transport Automation Suite

VPN   VPN   VPN

Transport

Data Center

NFVI   VIM

Telco DCs

Slice   OSS

Slice   OSS

Slice   OSS

Customers

Direct Orchestration Links (available in some potential architectures)

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Cloud Native VNF Orchestration Model with a Mano orchestration stack

Option 1
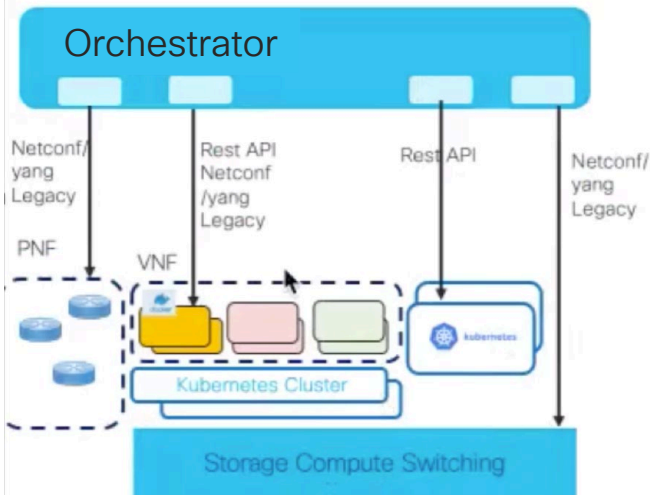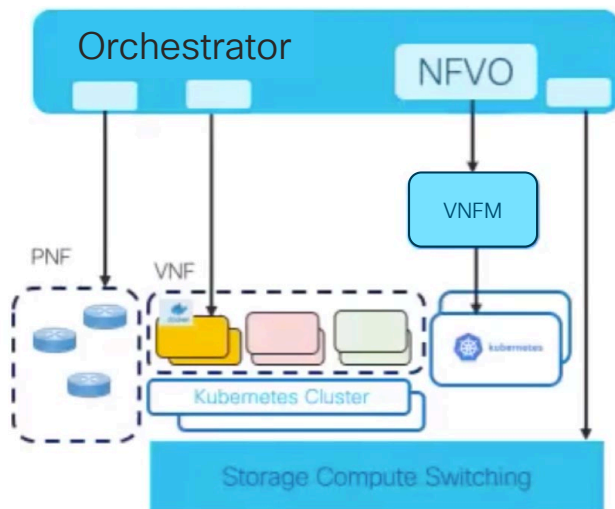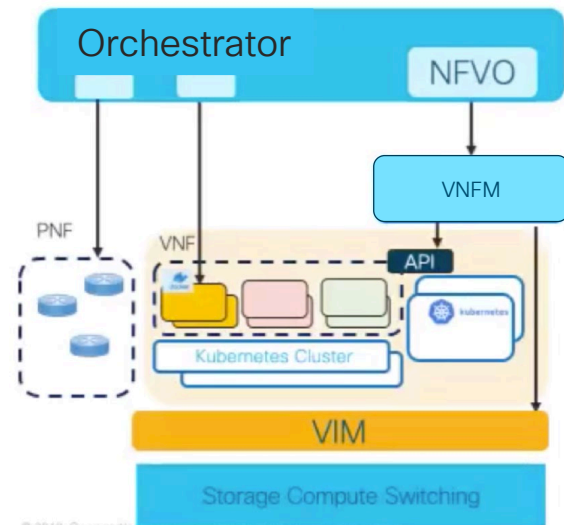
Bare Metal with direct integration between the NFVO and K8

Option 2

Bare Metal with VNFM integration with K8

Option 3

Hybrid cloud native and VM with NFVO integration to K8

Cisco 5G Core configuration & deployment
5G Cloud Native & Virtual Packet core Domain Orchestration

Orchestrator

NED NED NED NED NED

Vnf Day 1&N config

NFVO

Containers deployment & config

Netconf /Yang API

CNF CNF CNF

kubernetes MASTER

Kubernetes nodes

VNF

Linux VM   Linux VM   Linux VM

VNFM

Kubertnetes VM and NFV deployement

PNF

VIM

Storage Compute switch
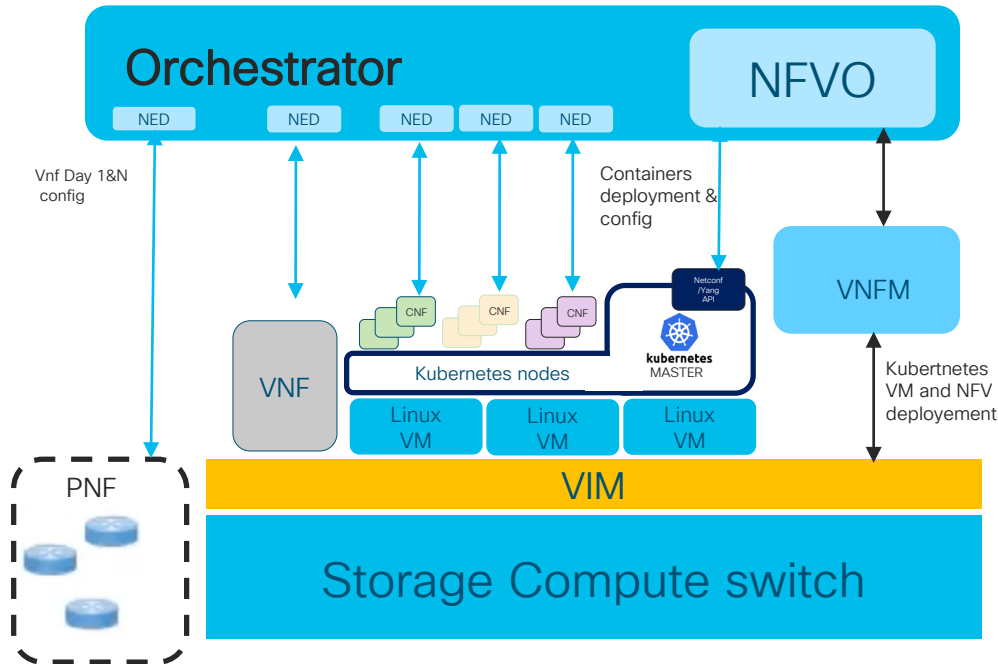
Service and VNF Design and Onboarding

- VNF Onboarding based on standard VNFD (Tosca/Yang)
- NSD Designer and Model driven SDN definition
- VNF and NSD Catalogue

VNF Instantiation & Life Cycle Management

- Create & Manage VNF a NSD info
- Generic VNF for VNF life cycle Management (Instantiate day0 config , scale in & out)

Slice / Services/ VNFs configuration

- Day1 & N VNF Configuration
- Network transport Day1 & N Config
- Network transport optimization

Automate Service Assurance

- Automate VNF Slice onboarding in the Assurance
- Enrich Assurance system with Slice and Service details
- Automate remediation based on Assurance trigger

5G Core NF and Slice Creation
– Deploy, Install, Configure and Execute

Orchestrator flow

Deploy VM's on Openstack

- VNFD Model Definition
  - VM image
  - VM Flavor
  - VM Networks
  - IP Design

Install K8s cluster

- Cluster Model Definition
  - Assign K8s Roles
  - Master and Minions

Instantiate 5G Slices/NF

Create NSI & NSSI For Each NF
 NSSI is build and instantiate base on the VNFD build NSST
- Define repository for each application in the slice
- Define key parameters for to convert into working configuration
- Inject day–1 configuration into each application

Configure 5G Slices/NF

Base on the NSD /NSI build the NF DAY 1/ DAY N config
- For each NF create Slice config and apply

Cisco 5G Ultra Cloud Core Cloud
-Infra Instantiation & onboarding

Onboarding

Instance creation

Service Assurance

FAULT Manager

Performance SLA

NSO

NED   NED   NED

NFVO

NED

NETCONF YANG

Onboarding

Instance creation

Placement

SMI

Netconf /Yang API

CEE

Netconf /Yang

Admin Plane

APIs

Perf Health services
WebUI
Resource Mgd
Service Mesh
Smart licensing
Tracing
Cisco Ops Center
Automate Upgrade

kubernetes

ESC

VNFM

Onboarding

Instance creation

Kubernetes nodes

MASTER

Linux VM   Linux VM   Linux VM   Linux VM

VIM

Storage Compute switch

Cisco 5G Ultra Cloud Core Cloud
-NF instantiation and Scaling
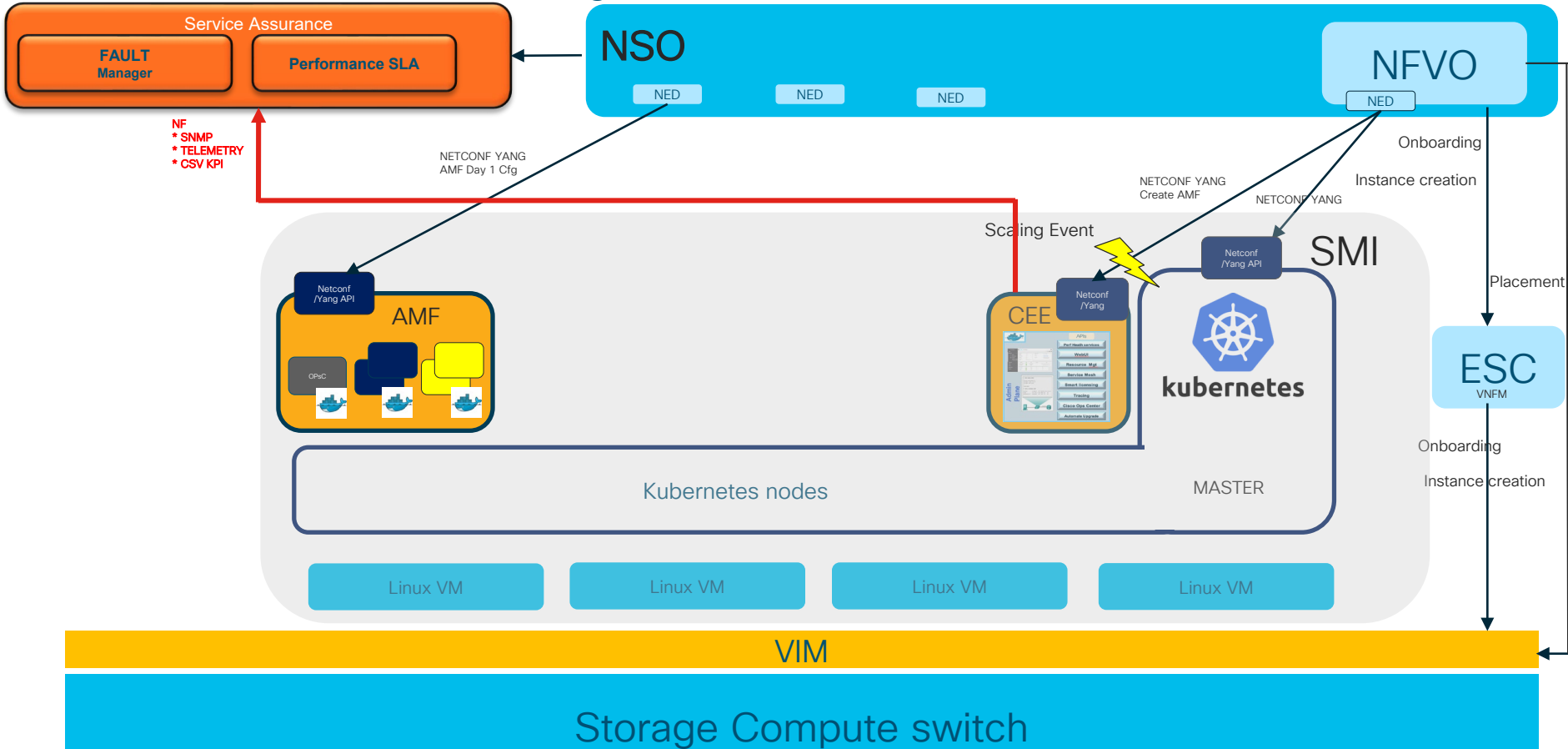
Cisco 5G Ultra Cloud Core Cloud
–5G Core Slice instantiation and Scaling
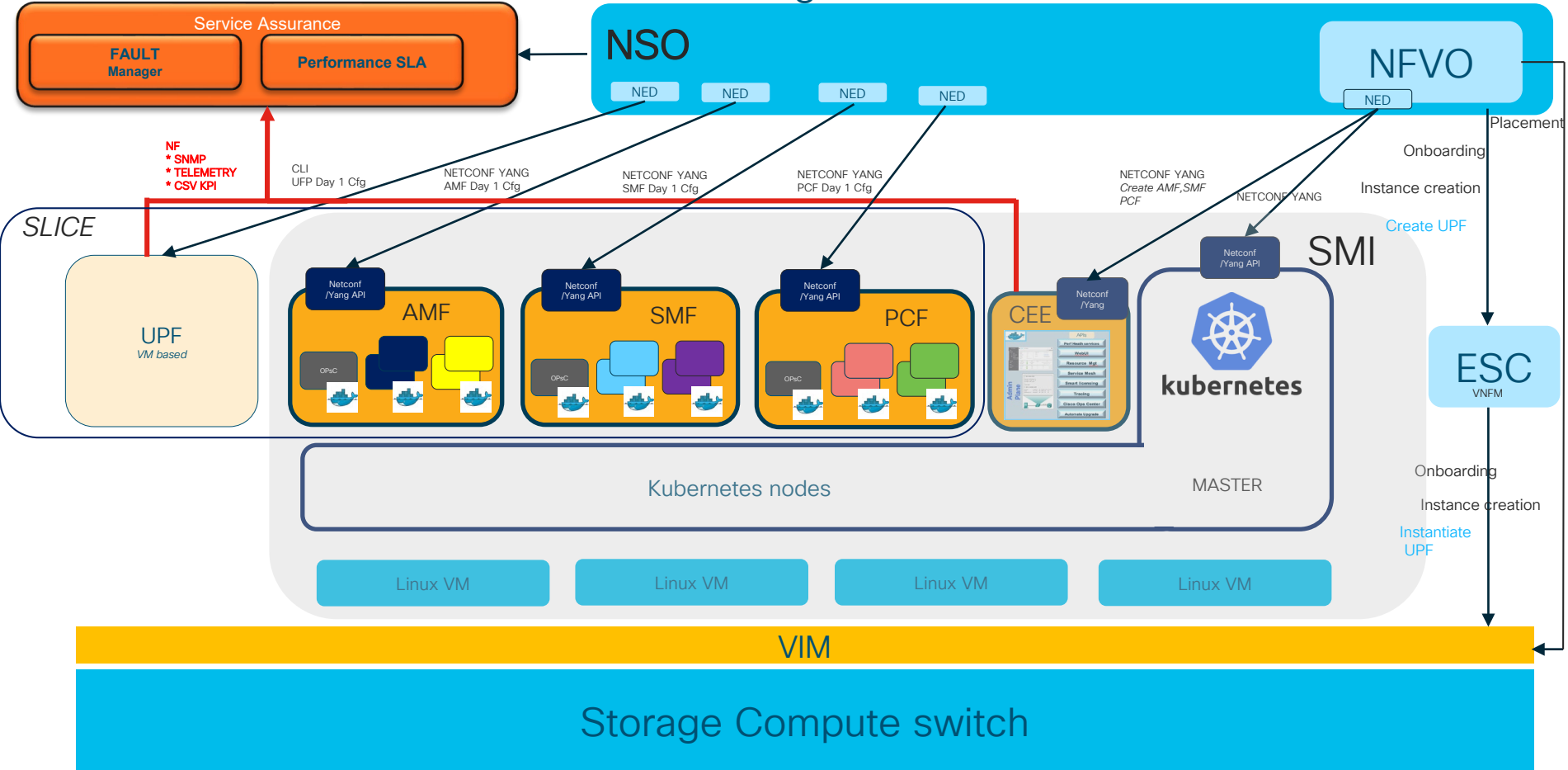
5G Core Slice - Service Assurance and SLA

Cisco 5G Slicing SLA & Operation
Service Assurance SLA Management Architecture

Real Time Analytics APPs for Dynamics Close loop

Operation & Business Analytics APPs

Controller / NWDAF

Optimization

PM SLA Trhreshold

Fault Impact

Impact Analysis/reporting

SLA Analysis/reporting

QoS/QoE Analysis/reporting

Trending Analysis/reporting

Data Lake/ Big data Platform

Data Persisted

Data Subscription Bus

Communication BUS

Programmable & Elastic Collection Layer

Collector Network Telemetry Notification

Collector SNMP

Collector Syslog

Collector Telemetry

Collector Bulk, CSV

Collector Netflow

Notifications API

RAN Elements

Edge Cloud — VNFM, Cloud Mgr

Transport

Telco DCs — VNFM, Cloud Mgr

Virtualized Services — VNFM, VMS Mgr

5G Slicing Automation & Operation
Cisco Service Assurance SLA Management BluePrint Architecture & Products

Cisco Service Assurance Solution

Quality and Capacity	Root Cause Analysis	Machine Learning	Actionable Insights	Automation

Fault Management

Threshold Crossing Alerts/ML based Anomalies

Performance Management

↑ Events ↑ Alarms ↑ SNMP ↑ Syslog ↑ Performance Counters ↑ Configuration

E2E Network in Scope

Fault, Impact Analyze & Root Cause

Cisco 5G Core – *Operation & Management*
Service Assurance

5G and Mobile Packet Core Fault Management
Challenges and Requirements

Applications and Services

Data Services · Internet Services · Enterprise

End User, Customer and Tenant Services

UPF · SMF · AMF, NRF... · DevOps · Apps

Virtualized Network Functions and Applications

Virtualized Compute (OpenStack / ESX)

Datacenter(s) and Network

Core Network

Log files, APM, SNMP, Syslog

Log files, SNMP, Syslog, Alive

SNMP, Syslog, Alive, APM

Log files, SNMP, Syslog, APM

Log files, SNMP, Syslog, APM

Log files, SNMP, Syslog, CORBA, API

Tenant Ticketing System

Tenant Ticketing System

Partner Ticketing System

Fault management Systems

Internal Ticketing System

Internal Ticketing System

Partner Ticketing System

Service Catalog

CMDB

Inventory

ESX / NOVA

CMDB / Inventory

CMDB / Inventory

5G and Mobile Packet Core Fault Management
How Cisco is addressing it ?

FILTER | DETECT | ACT | DIAGNOSE

Millions of Events get fired from your Applications, Infrastructure & Tools

Outage Occurs

Noise Reduction & Event Correlation

SITUATION
Proactive Insight

Dev · Storage · Sys Admins · Network · Service Overlay · DBA · Infra

Intelligent Notification

SITUATION ROOM
Intelligent Collaboration

servicenow
Nagios
APPDYNAMICS
splunk>

Knowledge Recycle & Decision Support

Workflow Automation

| FILTER | DETECT | ACT | DIAGNOSE | REMEDIATE |

5G and Mobile Packet Core Fault Management
Cisco Crosswork Situation Manager a way to address the challenge
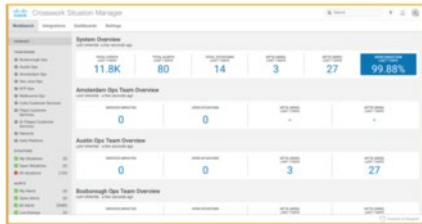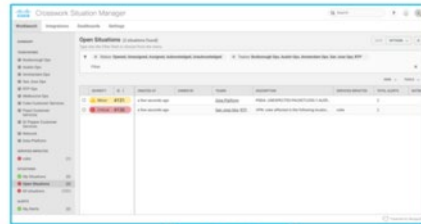
CrossWork Situation Manager is Analytic fault correlation and alarm impact Solution.

- Collect Faults form virtual Infra and Physical Network.
- Filter deduplicate alarms & define Situations/patents
- Enrichment Situation base on Operator experience & Knowledge
- Situation triggers automation or other APPs and healthcare systems

5G and Mobile Packet Core Fault Management
Crosswork Situation Manager- *Coverage & Key Function* Benefits

75%	66%	34%	43%
Reduction in Operational Noise	Reduction in Customer Reported Incidents	Reduction in Incident Tickets	Reduction in MTTR

* Source: Feedback from 4 Customers
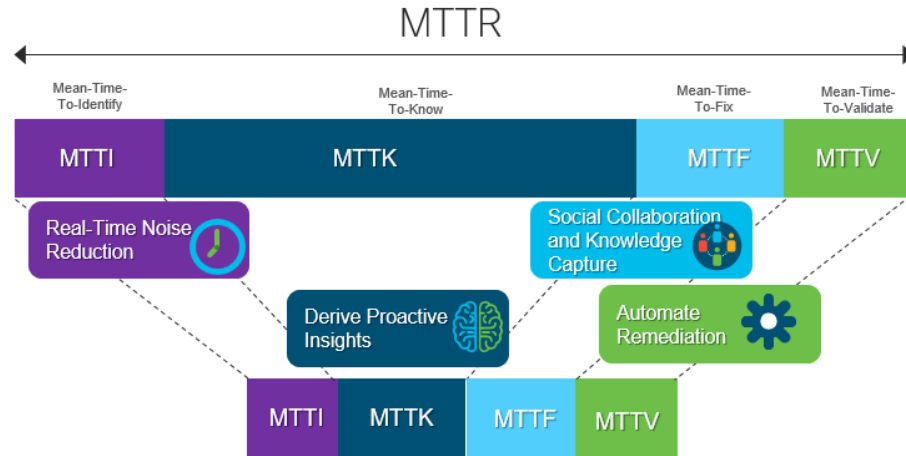
Real-Time Noise Reduction

- Compute significance rankings
- De-duplicate events from the event stream
- Identify events of interest and roll up alerts

Derive Proactive Insight

- Real-time Situation Detection
- Add critical context to the event stream: Enrichment, Labeling, Timeline

Social Collaboration & Knowledge Recycle

- Intelligent Notification
- Social Collaboration through Situation Room
- Knowledge Base Recycle for faster diagnose
- Neural Operator Feedback

Automate Remediation

- Service Desk Automation
- Monitoring Automation
- Run Book Automation

Performance and SLA

Cisco 5G Core –*Operation & Management*
Service Assurance
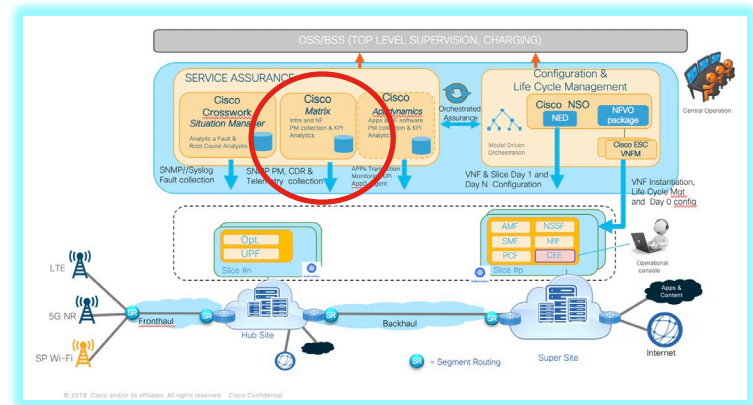
5G and Mobile Packet Core Performance Management
Challenges and Requirements

- Need Packaged and Customizable analytics to report network quality, capacity utilization across fixed-line and mobility services SLA report
- Uses Data & Decision Science, leveraging network- enhanced data telemetry

Performance Analysis	Capacity Analytics	Congestion Analysis

- Large Volume of Data and Data Source
- Telemetry streaming Bulkstats, Syslogs and SSDs from all StarOS VNFs

5G and Mobile Packet Core Performance Management – Analytics Framework

Presentation	UI Dashboards	NBI	API	Notifications	Automation

Apps

Network Performance Management	Capacity Planning	Network Audit	Compliancy Checks	Custom Apps	Data modeling

Analytics

Machine Learning Apps
- Real-time anomaly detection
- Outlier detection
- Forecasting
- Correlation
- Geo-spatial clustering analysis
- Pattern mining

Integrated ICs
- KPI Library
- Thresholds
- Knowledge Rules
- BH detection
- Correlation
- Quality Scoring

Storage

NoSQL e.g.: Hadoop, Cassandra

SQL e.g.: Postgres, MariaDB, MongoDB

Data Adapters

Core
- Bulkstats
- Syslog
- Config
- SNMP

Core
- eDR
- RTT

Routing & Switching
- Telemetry
- SNMP
- IPSLA
- Netflow

Radio (eNodeB, NodeB, RNC)
- Statistics

Generic data
- XML
- CSV, JSON,
- ODBC

DC/NFVi
- Telemetry
- SNMP
- OS, Hypervisor Logs

5G and Mobile Packet Core Performance Management –
Cisco Matrix for Mobility Network Analytics
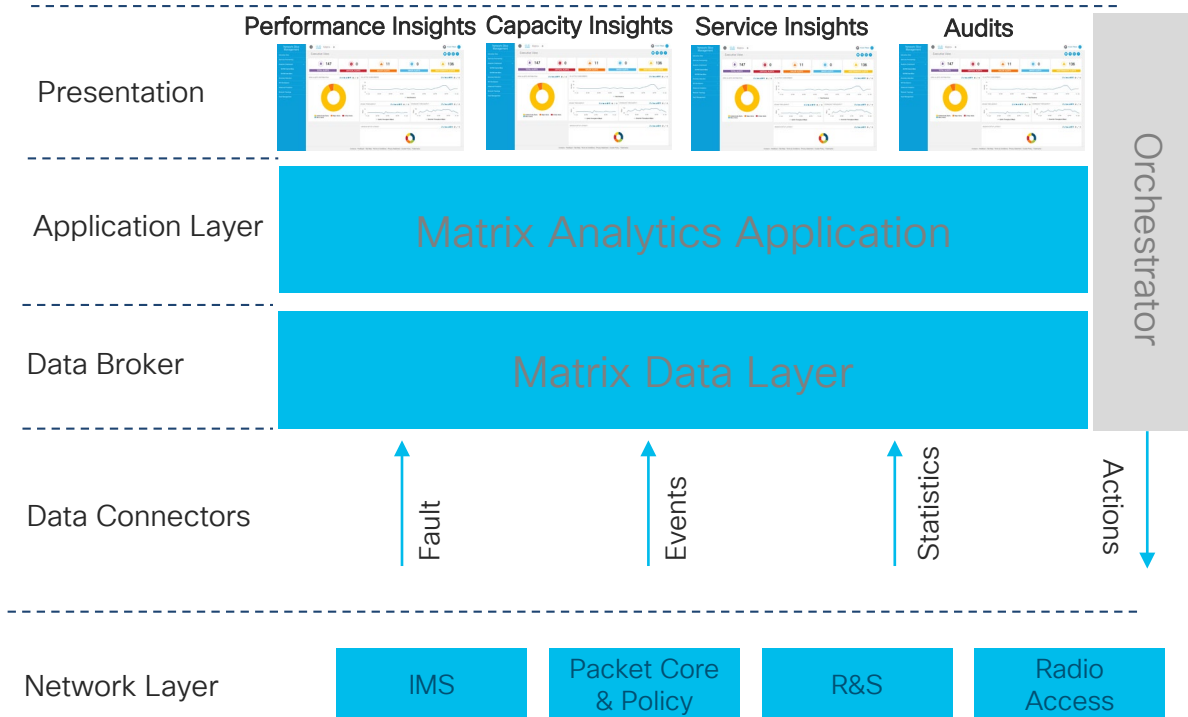
Solution

Network Insight Package
- Top offenders /performer analysis by time frame
- Accessibility, Mobility, Integrity KPIs
- Network Health Scoring
- VoLTE, Data, Service Quality indicator
- Capacity Insights
- PCRF Application health analytics
- 4G/5G

Audit Package
- Automated Network Performance Audit
- Automated Configuration Audit

Machine Learning
- Anomaly Detection, Forecasting

Automation/Orchestration integration
- Integrated with Cisco NSO .

Diagram

Presentation layer: Performance Insights, Capacity Insights, Service Insights, Audits

Application Layer: Matrix Analytics Application

Data Broker: Matrix Data Layer

Orchestrator

Data Connectors: Fault, Events, Statistics, Actions

Network Layer: IMS, Packet Core & Policy, R&S, Radio Access

5G and Mobile Packet Core Performance Management – Cisco Matrix – *Technology Coverage & Key Features*

Multi-data Source PM Collection

- Large set of Data Source: SNMP, Bulkstat, telemetry, netflow, API
- Multi-domain support; wifi, vPC, Switching, Compute, VIMs
- Vendor Agnostic and 3r party support

Software Centric KPIs

- Catalogue of Pre-package KPIs list
- Flexible KPI Editor User defined KPIs operational in minutes

Flexible GUI and Dashboard

- Real Time Monitoring
- KPIs reporting and Threshold Cross Alarming
- Network Traffic Pattern Anomaly visualization and detection
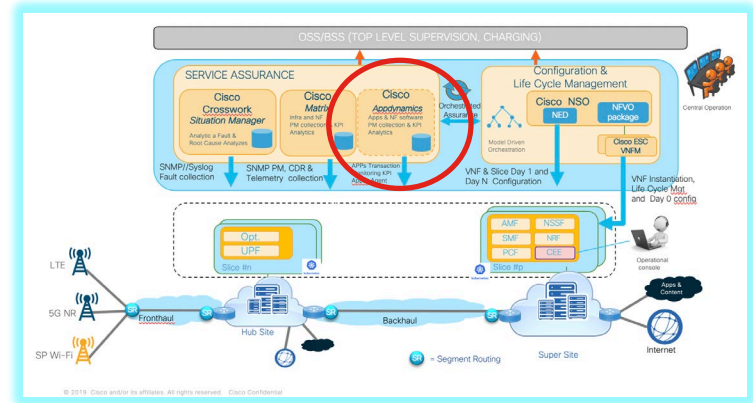- Network Traffic Forecasting visualization

Analytic & Machine Learning

- Network Traffic Pattern Anomaly modeling/definition
- Network Traffic Forecasting calculation
- Auto detect Incidents based on genuine faults.
- No false positives or duplicate faults.

Application & NF Monitoring

Cisco 5G Core –*Operation & Management*
Service Assurance

5G and Mobile Packet Core Cloud NF Monitoring
Cisco Appdynamics – *Coverage & Key Features*
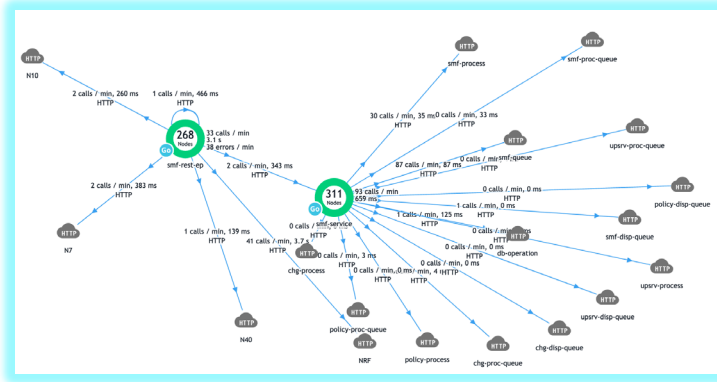
Application Transaction topology

KPIs Alarming Dashboard

Traffic Distribution Dashboard

Application & Software Centric KPIs

- Catalogue of Pre-package KPIs list
- Graph and Monitor Application transaction
- Flexible KPI Editor User defined KPIs operational in minutes

Flexible GUI and Dashboard for APPs Monitoring

- Applications , Microservice & container transaction topology view creation and PM monitoring
- Real Time Monitoring
- KPIs reporting and Threshold Cross Alarming
- Network Traffic Pattern Anomaly visualization and detection
- Network Traffic Forecasting visualization

Analytic & Machine Learning

- Network Traffic Pattern Anomaly modeling/definition
- Auto detect Incidents based on genuine faults.
- No false positives or duplicate faults.

Cisco 5G Core Slice-Orchestration & Service Assurance solution

Blueprint for 4-5G Mobile Core
Central Operation & Management

OSS/BSS (TOP LEVEL SUPERVISION, CHARGING)

SERVICE ASSURANCE

Cisco Crosswork *Situation Manager*
Analytic a Fault & Root Cause Analyzes

Cisco *Matrix*
Infra and NF PM collection & KPI Analytics

Cisco *Appdynamics*
Apps & NF software PM collection & KPI Analytics

Orchestrated Assurance

Configuration & Life Cycle Management

Model Driven Orchestration

Cisco NSO
NED
NFVO package

Cisco ESC VNFM

Central Operation

SNMP//Syslog Fault collection

SNMP PM, CDR & Telemetry collection

APPs Transaction Monitoring KPI AppD Agent

VNF & Slice Day 1 and Day N Configuration

VNF Instantiation, Life Cycle Mgt and Day 0 config

Opt.
UPF
Slice #n

AMF   NSSF
SMF   NRF
PCF   CEE
Slice #p

Operational console

LTE

5G NR

SP Wi-Fi

SR Fronthaul
SR
Hub Site

SR Backhaul
SR
Super Site

Apps & Content

Internet

SR = Segment Routing

Cisco Management & Automation for Mobile Core
deployment Architecture Blueprint
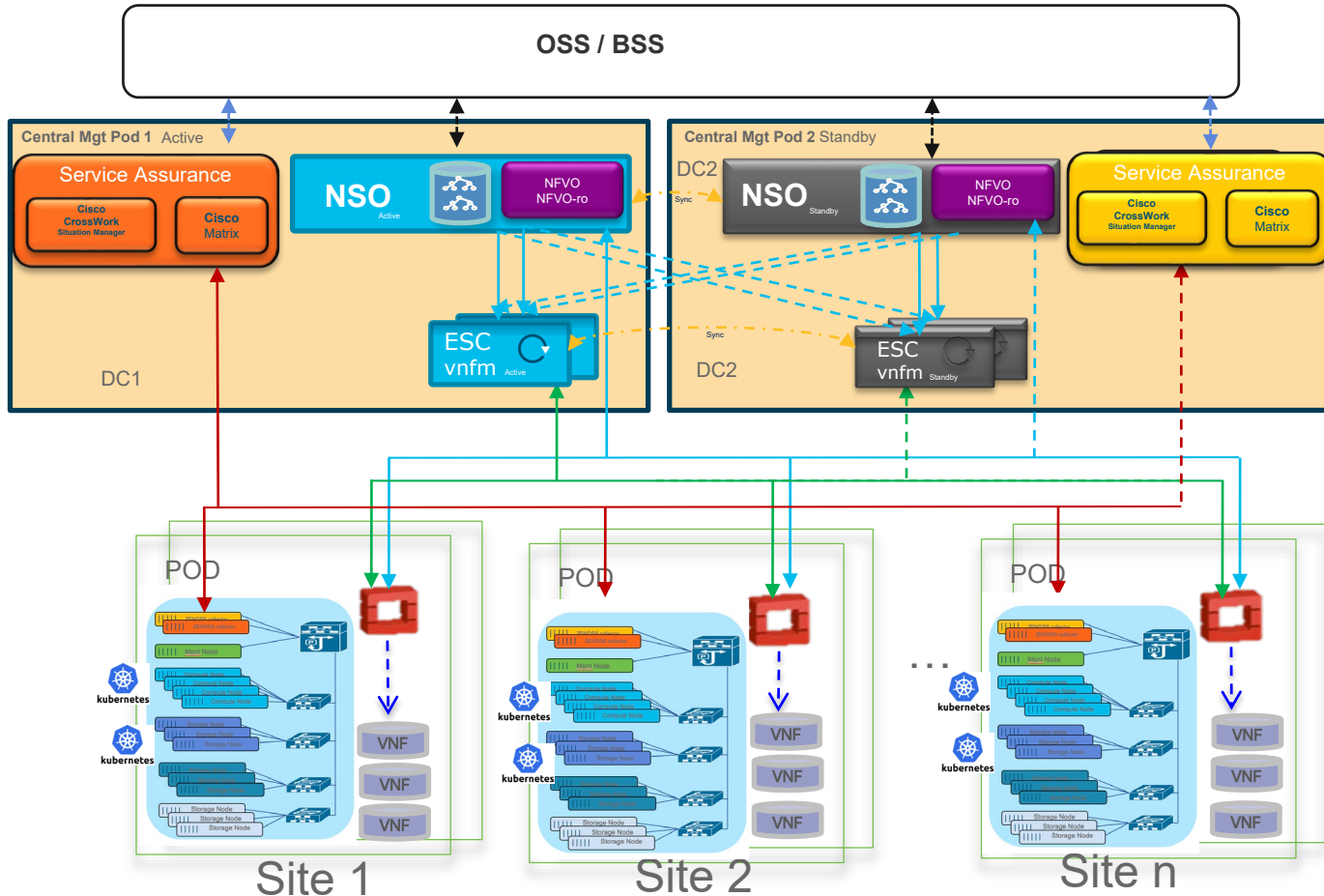
- Fully Redundant architecture for critical components
- Flexible Architecture - Can adapt Geo Deployment, Hierarchical split
- Inherent support for Massive horizontal Scale-out
- Replicable Building Blocks
- X86 based and Linux based
- Fully Virtualized Vmware Based

5G end to end Slicing Automation & Operation
Cisco BluePrint Architecture & Products

- Service Intent Base Orchestration
- RFS CFS Intent based Modelling
- Close Loop Service Assurance
- Cross Domain Orchestration, SLA & operation
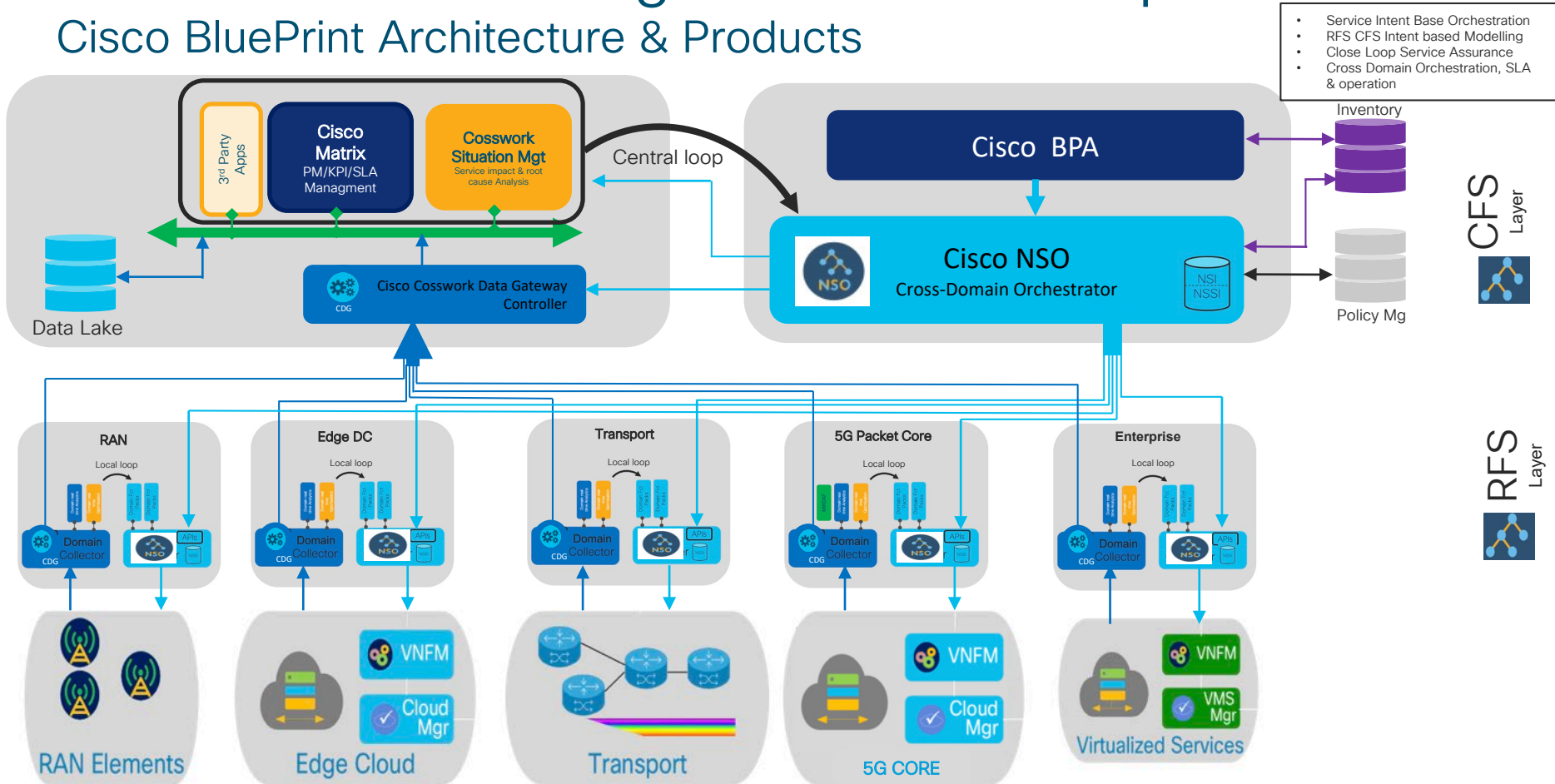
Cisco 5G Core NFV & Slice Orchestration
3GPP mapping

Legend:
- 3GPP-defined Network Slice Mgmt System
- Cisco's 5G CNFs
- Cisco's 5G VNF
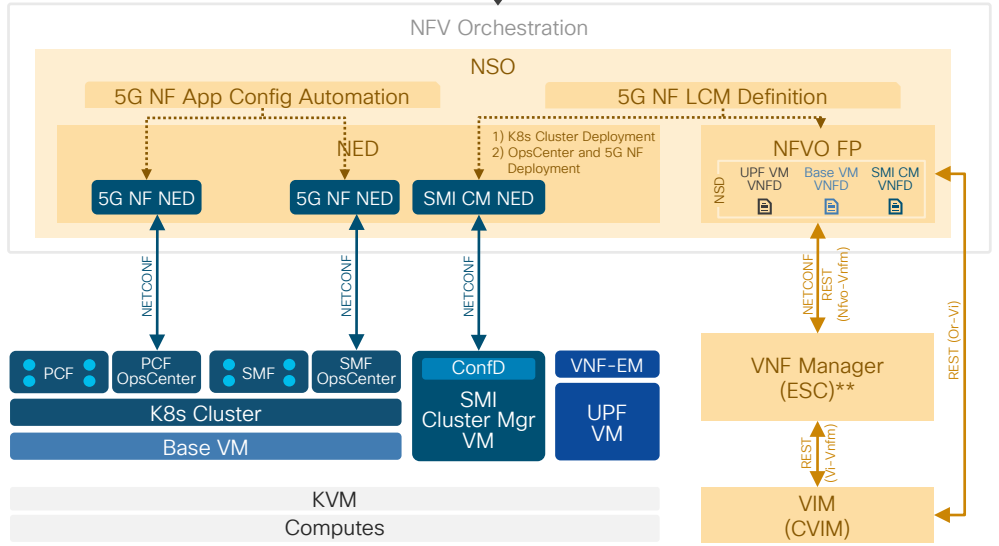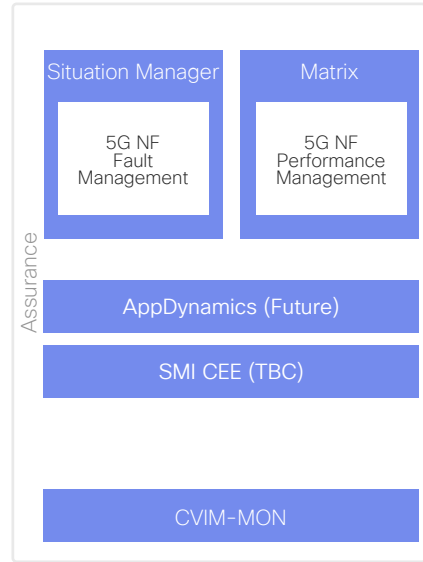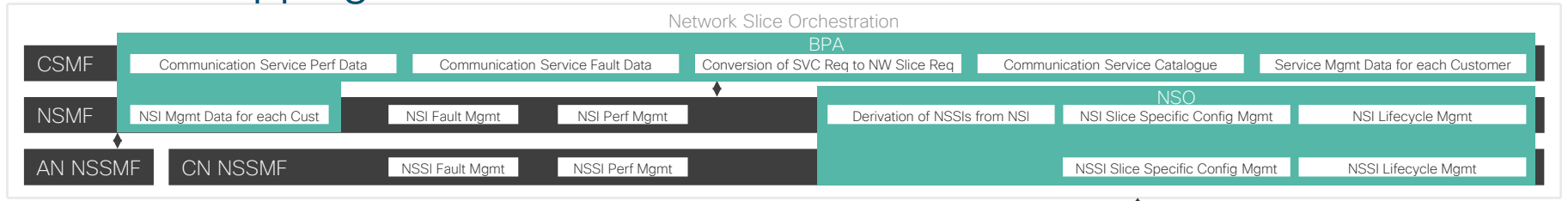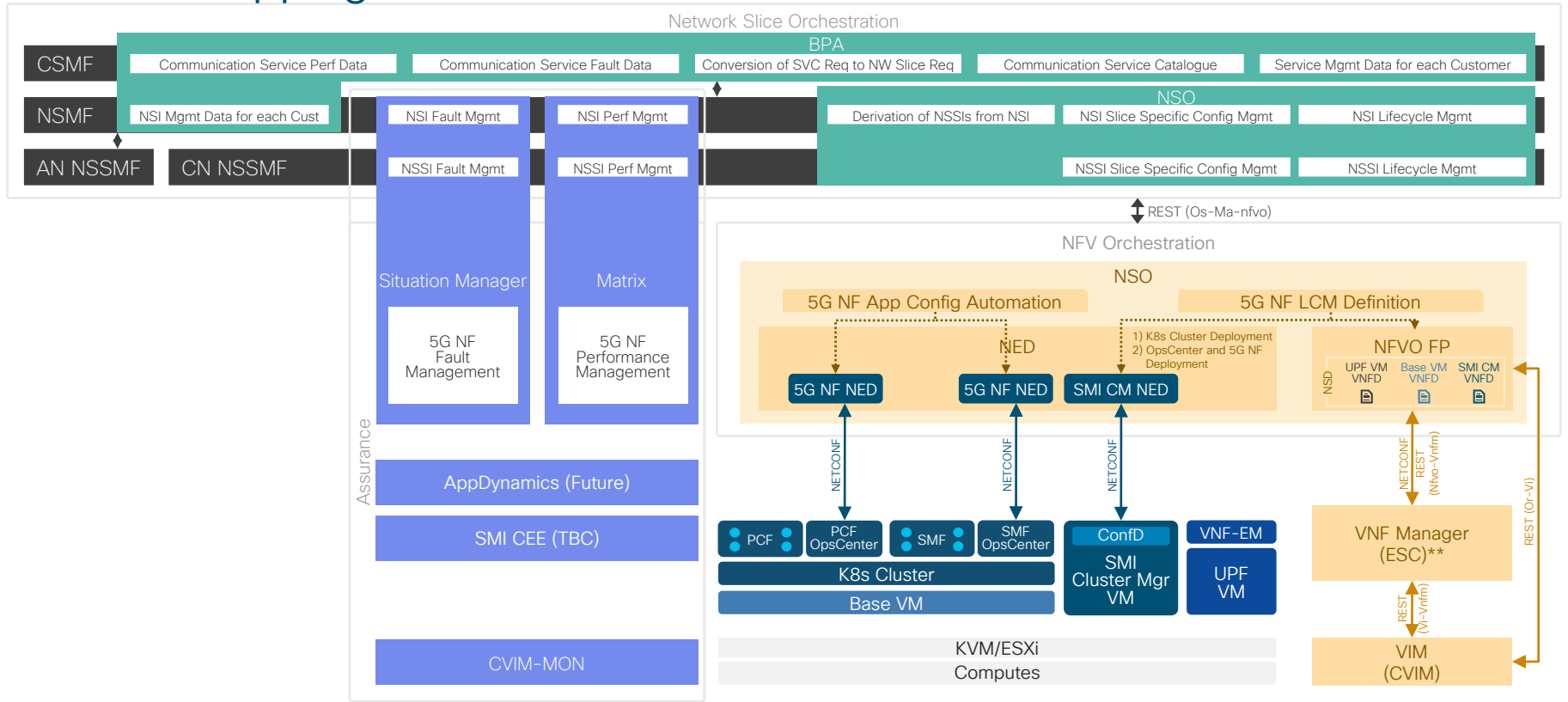- Cisco's NFV Orch
- Cisco's Assurance
- Cisco's Mgmt and Orchestration Solution

Network Slice Orchestration

BPA

CSMF	Communication Service Perf Data	Communication Service Fault Data	Conversion of SVC Req to NW Slice Req	Communication Service Catalogue	Service Mgmt Data for each Customer

NSO

NSMF	NSI Mgmt Data for each Cust	NSI Fault Mgmt	NSI Perf Mgmt	Derivation of NSSIs from NSI	NSI Slice Specific Config Mgmt	NSI Lifecycle Mgmt

AN NSSMF	CN NSSMF	NSSI Fault Mgmt	NSSI Perf Mgmt	NSSI Slice Specific Config Mgmt	NSSI Lifecycle Mgmt

REST (Os-Ma-nfvo)

NFV Orchestration

Assurance

Situation Manager
5G NF Fault Management

Matrix
5G NF Performance Management

AppDynamics (Future)

SMI CEE (TBC)

CVIM-MON

NSO

5G NF App Config Automation

5G NF LCM Definition

NIED
- 5G NF NED
- 5G NF NED
- SMI CM NED

1) K8s Cluster Deployment
2) OpsCenter and 5G NF Deployment

NFVO FP
NSD:
- UPF VM VNFD
- Base VM VNFD
- SMI CM VNFD

NETCONF

PCF — PCF OpsCenter

SMF — SMF OpsCenter

ConfD — SMI Cluster Mgr VM

VNF-EM — UPF VM

K8s Cluster

Base VM

NETCONF / REST (Nfvo-Vnfm)

VNF Manager (ESC)**

REST (Or-Vi)

REST (Vi-Vnfm)

REST (Vi-Vnfm)

VIM (CVIM)

KVM

Computes

*** ESC team is looking at ESC's abstracting CNF and VNF toward NFVO in Rakuten POC.*

Cisco 5G Core NFV & Slice Orchestration
3GPP mapping

Conclusion

5G Network end to end Slicing

Network Slicing is fundamentally an end-to-end partitioning of the network resources and network functions so that selected applications/services/connections may run in isolation from each other for a specific business purpose driven by the Orchestration capabilities
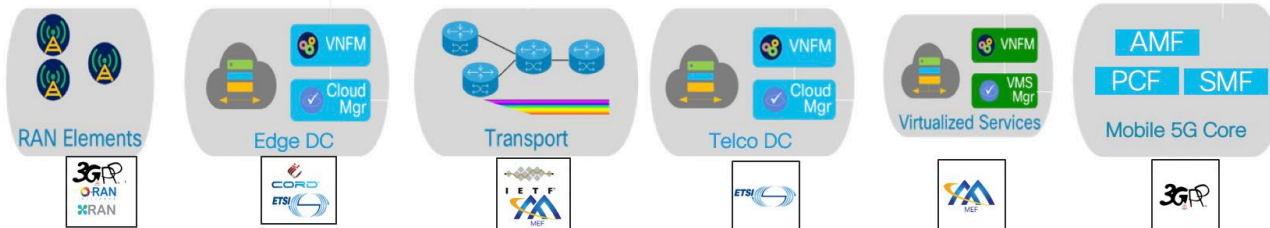

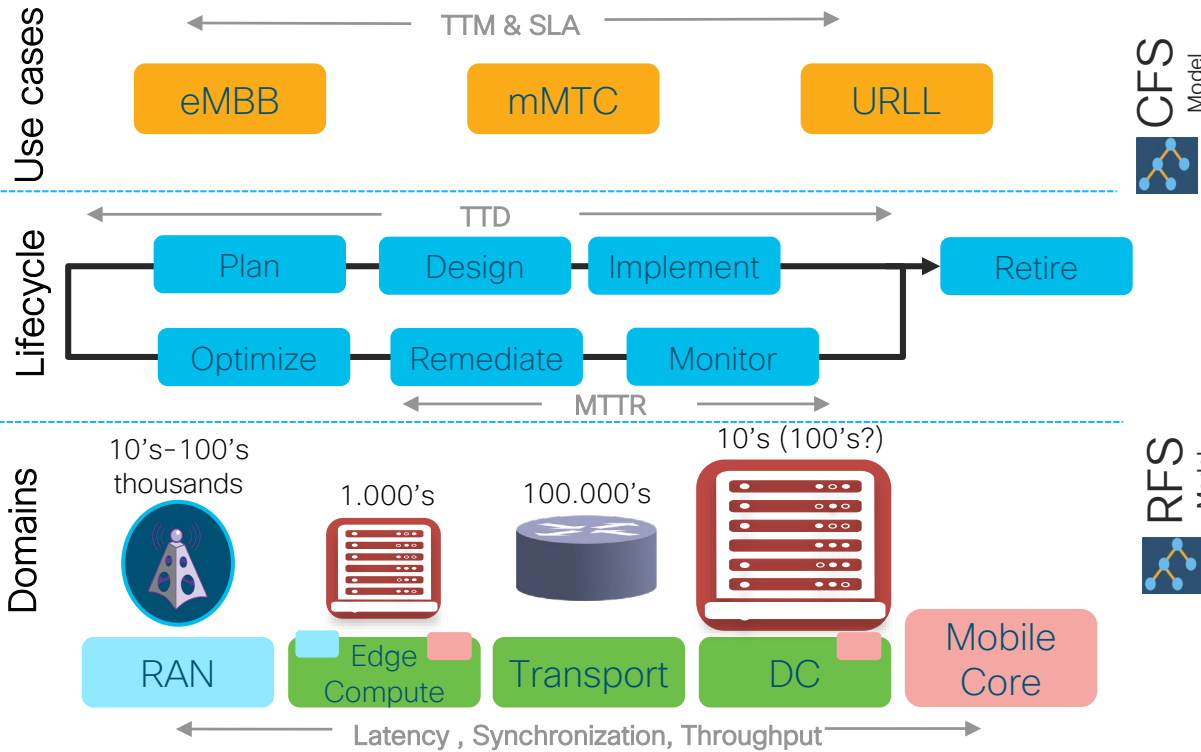Orchestration offering Network as a Service
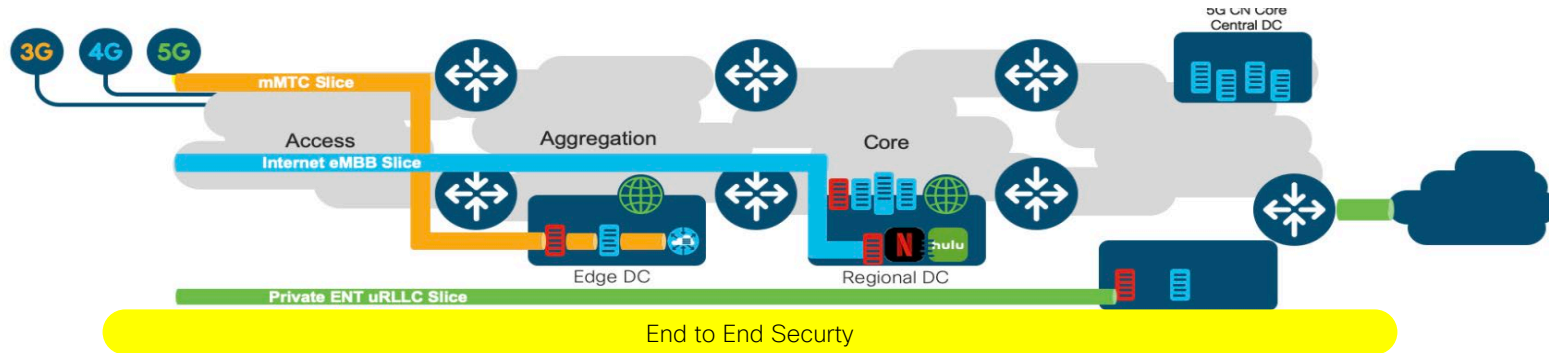
Control / User Plane Separation, Distributed physical & Virtual Fct Based on Slice attributes, Service isolation and security

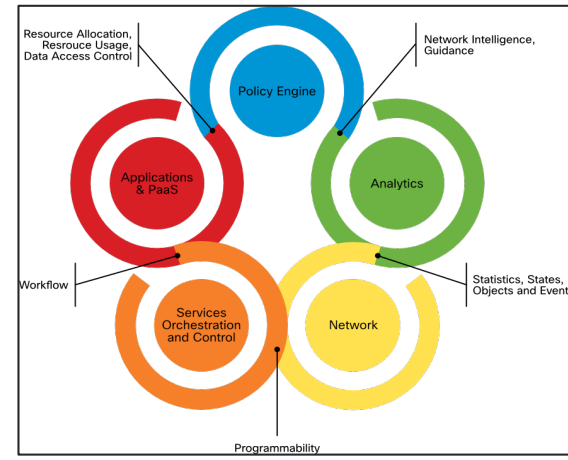Cross Domain Service based on Multiple standard

5G End to End and 5G core Slicing Orchestration
Requirements

Use cases

TTM & SLA

| eMBB | mMTC | URLL |

CFS Model

- Service Intent Base Orchestration
- RFS CFS Intent based Modelling
- Close Loop Service Assurance
- Cross Domain Orchestration, SLA & operation

Lifecycle

TTD

Plan — Design — Implement → Retire

Optimize — Remediate — Monitor

MTTR

Capabilities

Domains

10's-100's thousands

1.000's

100.000's

10's (100's?)

RFS Model

RAN | Edge Compute | Transport | DC | Mobile Core

Latency , Synchronization, Throughput

Resource Allocation, Resrouce Usage, Data Access Control

Policy Engine

Network Intelligence, Guidance

Applications & PaaS

Analytics

Workflow

Services Orchestration and Control

Network

Statistics, States, Objects and Events

Programmability

Cisco Operation & Management for Mobile Core a modular Architecture design to cover the entire lifecycle
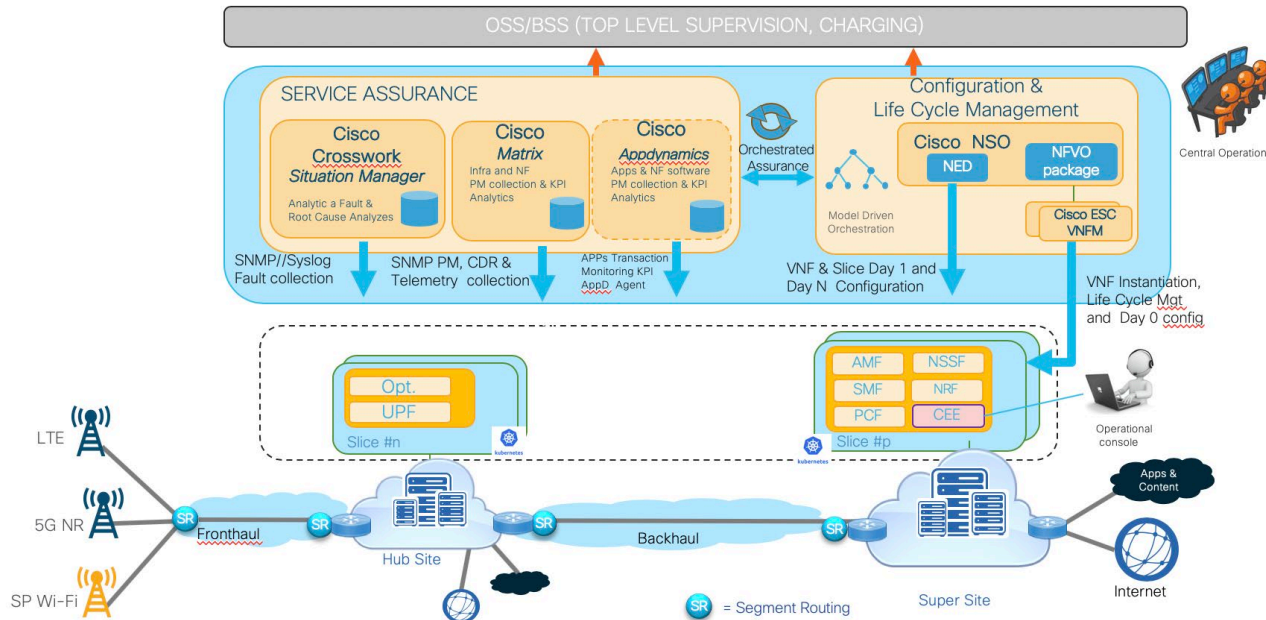
- Modular architecture for Central , local and remote operation

- Model driven design for declarative NFV orchestration

- Supports VM and Cloud Native VNFs

- Design to support the Full VNFs life cycle including Upgrade

- Supports Cisco and 3rd party VNFs

- Supports Day 1-2 & Day N VNF Configuration

- Provides Performance and KPI Analytics for Mobile Packet core, Infra and Applications

- Integrates Fault analytic for a Mobile Packet core, Infra , application fault detection & correlation for VNF/CNF and PNF

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- Complete a minimum of 4 session surveys and the Overall Conference survey (starting on Thursday) to receive your Cisco Live t-shirt.

- All surveys can be taken in the Cisco Events Mobile App or by logging in to the Content Catalog on ciscolive.com/emea.

Cisco Live sessions will be available for viewing on demand after the event at ciscolive.com.

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SP booth
 End to END 5G Slicing Demo
 5G packet Core demo

Walk-In Labs

NSO Devnet labs

Meet the Engineer 1:1 meetings

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SP breakout & techtorial
 Mobility techtorial
 5G packet Breakout

Thank you

CISCO

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