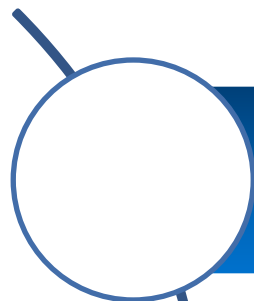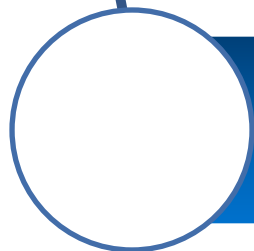# First CORD Summit – Breakout Session

Dynamic Test, Visibility -
Driving Continuous Closed Loop Automation & Optimization

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Presentation Outline

Network Slicing: Requirements

CORD (M-CORD): Focus Areas - Network Slicing

Viavi's contribution: Dynamic Test, Visibility -
Driving Continuous Closed Loop Automation & Optimization

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Network Slicing Potential Requirements (Subset..)

- Flexible compose, Configure and re-configure
- Add/Delete/Modify
- Elasticity Scaling
- Services (re-)Association
- Selection, Re-assignment
- Isolation between slices
- Multi-slices connectivity
- End to End, Hybrid (Shared/Dedicated)
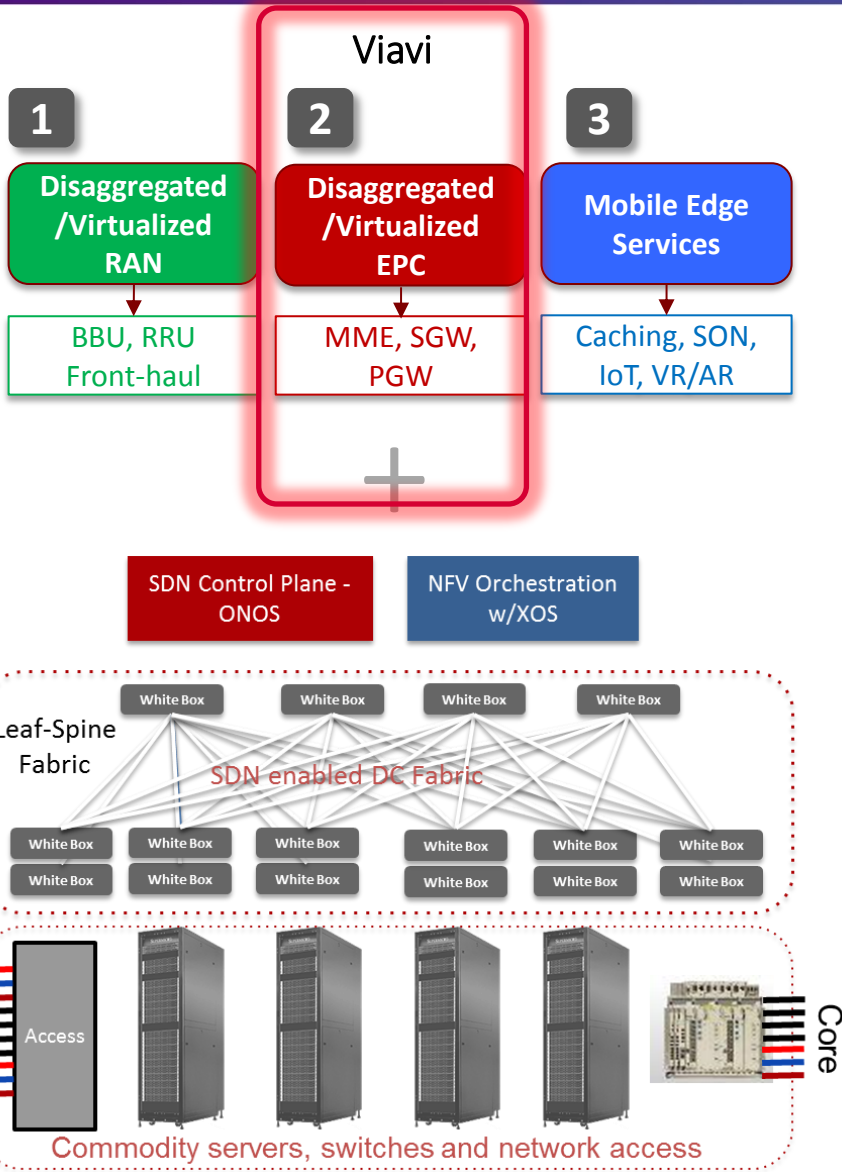- Security, others

  Reference: 3GPP TR 22.864
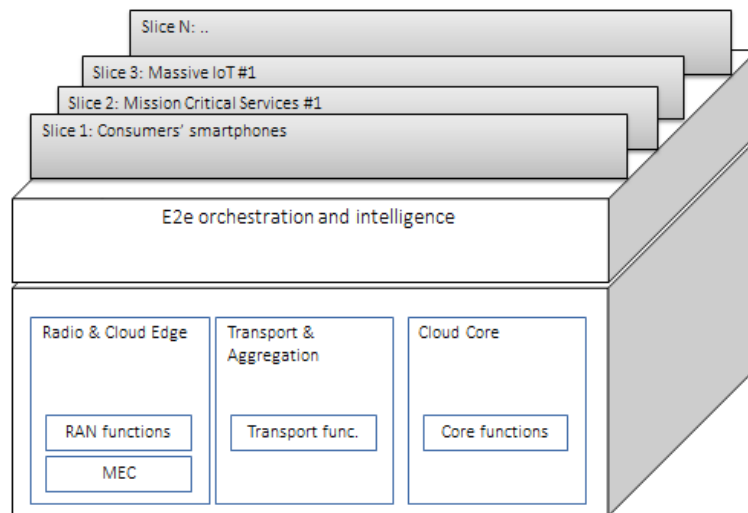
Dynamic Monitoring solutions are required to be

- **E2E Slice Integrated**: as an Integral part of the Dynamic slice management

- **E2E Slice Aware:** Verify the fulfillment of SLAs and/or properly operate the different businesses associated to different slices – in single and multi-slices operating environments
  - Aggregated per slice
  - And correlated across multiple slices

- **E2E Context Aware**: Providing Dynamic Visibility to available network resources for more efficient mobility and multipath control, and real-time monitoring of user traffic flows to enable application specific and context-aware QoE/QoS management and dynamic routing control.
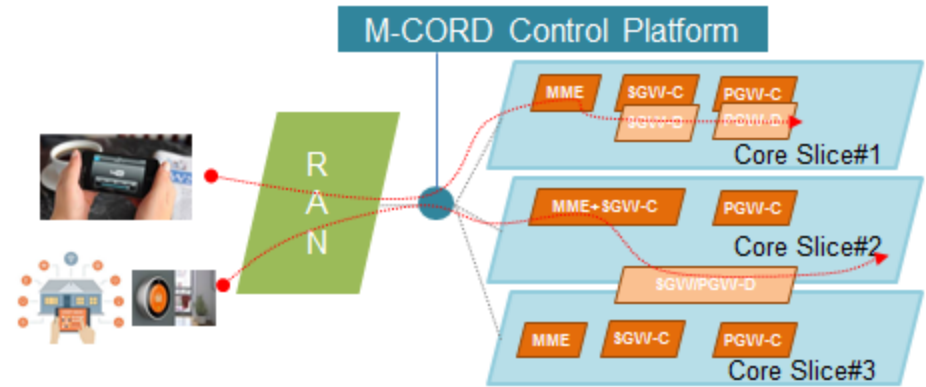
Base figure for representation of Network Slicing concept inspired by SK Telecom "5G architecture design and implementation guidelines" whitepaper, Oct 2015

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1 **Disaggregated /Virtualized RAN**

BBU, RRU Front-haul

2 **Disaggregated /Virtualized EPC**

MME, SGW, PGW

3 **Mobile Edge Services**

Caching, SON, IoT, VR/AR

SDN Control Plane - ONOS

NFV Orchestration w/XOS

Leaf-Spine Fabric

White Box | White Box | White Box | White Box

SDN enabled DC Fabric

White Box | White Box | White Box | White Box | White Box | White Box
White Box | White Box | White Box | White Box | White Box | White Box

Access

Core

Commodity servers, switches and network access

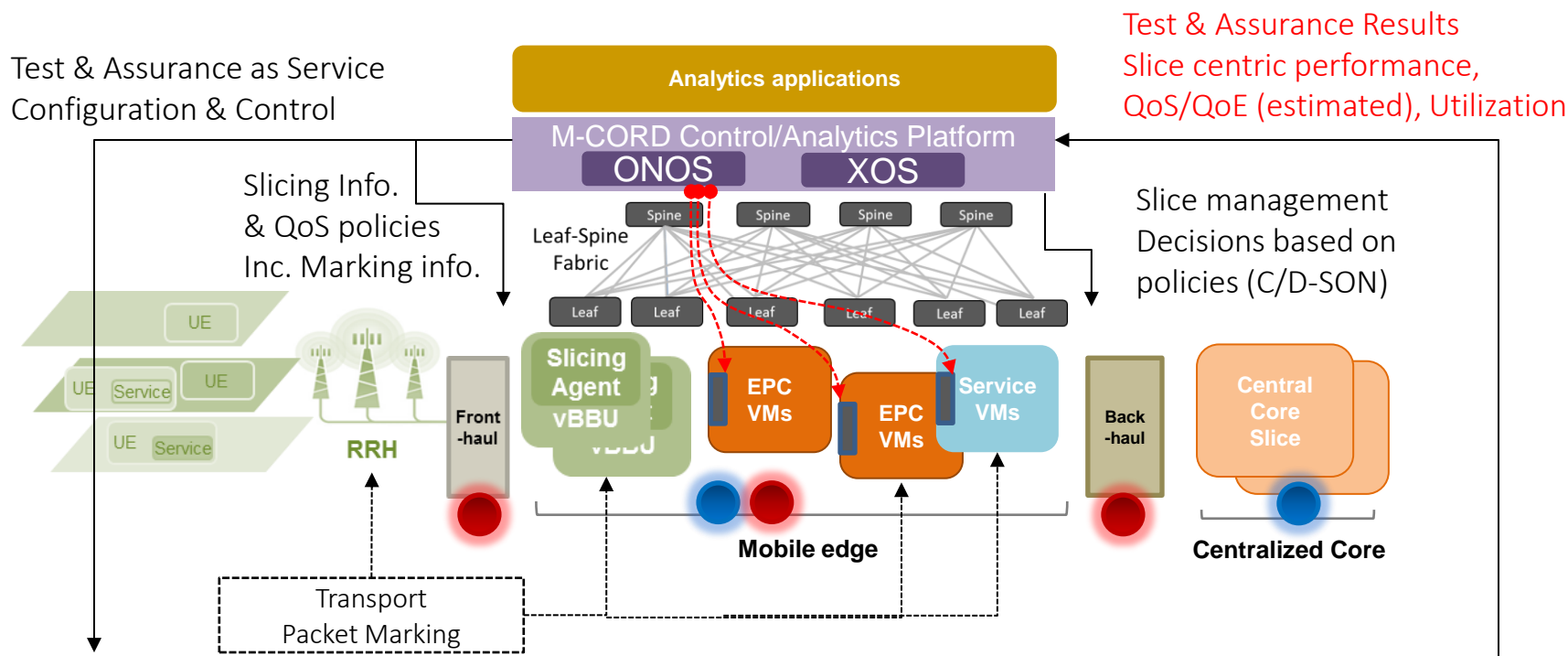## Service based Core Slicing - Observability and Analytics

- Implement programmable vProbes across multiple heterogeneous slices programmed with dedicated and shared Virtual EPC components implemented in a dis-aggregated architecture

- Enable application based slicing for services with diverse requirements, slice assignments & routing

- Monitor service QoE & QoS to enable Dynamic Network Slicing Elastic Scaling

- …

M-CORD Control Platform

RAN

MME | $GW-C | PGW-C
Core Slice#1

MME+$GW-C | PGW-C
Core Slice#2

$GW/PGW-D

MME | $GW-C | PGW-C
Core Slice#3

Reference: Mobile-CORD Plans

Viavi's contribution: Test & Assurance as a Service (TaaS, AaaS)
Dynamic Test, Visibility - Driving Continuous Closed Loop Automation & Optimization

Test & Assurance as Service Configuration & Control

Slicing Info. & QoS policies Inc. Marking info.

Test & Assurance Results Slice centric performance, QoS/QoE (estimated), Utilization

Slice management Decisions based on policies (C/D-SON)

Analytics applications

M-CORD Control/Analytics Platform

ONOS   XOS

Leaf-Spine Fabric

Spine Spine Spine Spine

Leaf Leaf Leaf Leaf Leaf Leaf

UE Service UE Service UE Service

RRH

Front-haul

Slicing Agent vBBU

EPC VMs

EPC VMs

Service VMs

Back-haul

Central Core Slice

Mobile edge

Centralized Core

Transport Packet Marking

Viavi Test & Assurance as Service – Slice Awareness

VIAVI Transport (Active) – Transport Aware

VIAVI Core (Passive) – Services Aware

Fronthaul (Ethernet based) & Backhaul Interconnects between the network elements Residing in both the edge and core clouds clusters For both sliced and non-sliced (shared) network elements

Control plane and Data plane for the vEPC (E2E capable) For each of the slices in both the dedicated and shared slices scenarios

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References

Viavi's E2E Visibility for Test, Assurance, Analytics, and Insights

Viavi provides E2E Visibility for Test, Assurance, Analytics, and Insights through its portfolio of Cross-domain, scalable physical/virtual probes, agents, and cloud-enabled instruments

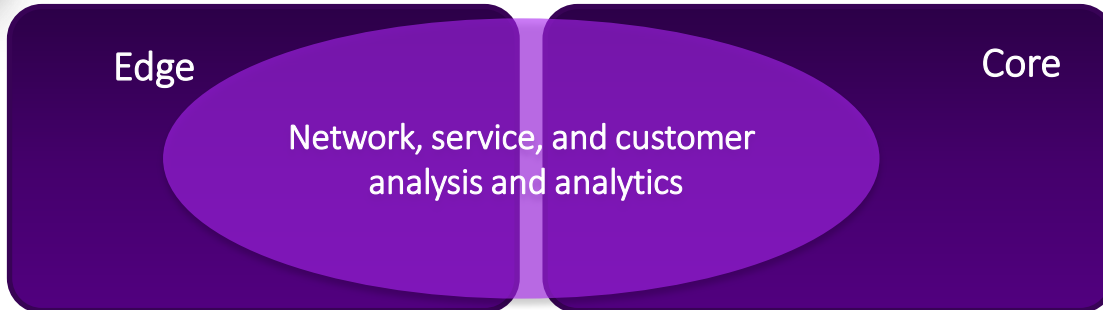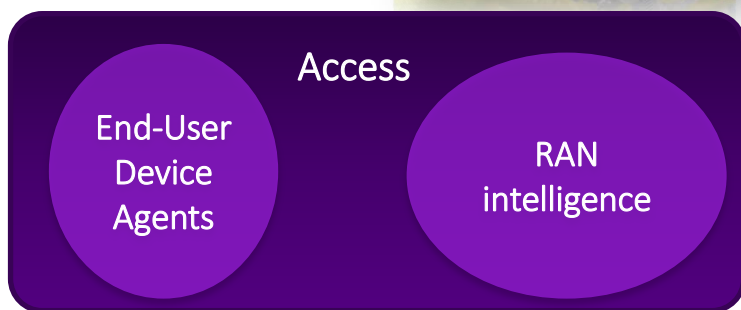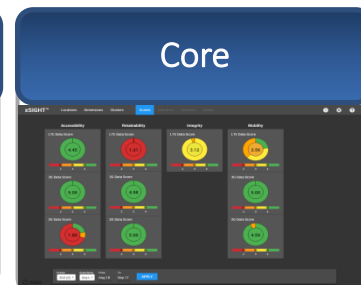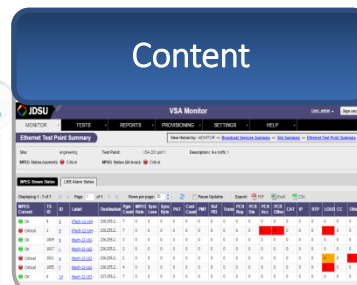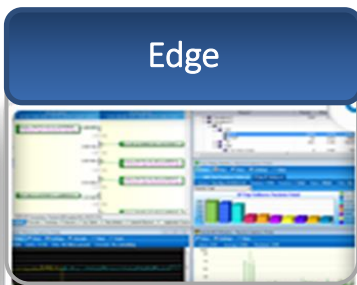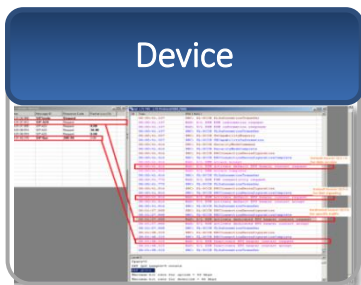**SaaS-capable E2E monitoring**   Viavi E2E QoE   **Open interfaces and shared data access**

Customer Experience

Real time, automated fault identification, correlation and isolation

Operations Analytics

Feeds to 3rd Party application ecosystems

| Device | Access Network | Edge | Content | Core |

Access
End-User Device Agents
RAN intelligence

Edge
Core
Network, service, and customer analysis and analytics

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Viavi Test & Assurance as a Service – E2E Active & Passive Test Functions

Active Testing

- Emulates and Injects synthetic traffic through the network

- Measures service quality based on Injected traffic

- End to End (based on the end points) performance measurement is usually the objective

- Example: IETF RFC 5357 - Two-Way Active Measurement Protocol (TWAMP) falls into this category

Passive Monitoring

- Monitors traffic flowing through the network

- Compute service quality based on monitored traffic

- Performance measurement is performed at the points of installation – typically used for effective fault isolation

- Example: 3GPP 4G+ EPS network monitoring over the S1 (MME, U), S11 etc interfaces falls into this category

Active Testing + Passive Monitoring provides inputs for Integrated Assurance as a Service

VIAVI Transport

VIAVI Core

Examples

vMME

vRAN (BBU)

TWAMP/Y.1731 Reflector based testing

vSGW

3GPP EPS (CP/UP) monitoring S11, S1-U etc.

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