Accelerating 5G Slicing Deployment via Open Source and Open Standards

ONAP-based 5G slice management survey and proposal

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Outline

- 5G slice mgmt architecture and related standards
- ONAP-based slice management solutions/PoCs
- Proposals for community use-case working plan

Related industry organizations

- **3GPP SA5 defines functional architecture & information model for 5G Slicing Mgmt**
  - TR28.801 and TR28.805 define the functional architecture of slice management.
  - TS28.531 is developing slice management information models and interaction workflows.
  - Not planning to further specify related interfaces.

- **TMF openAPI defines CFS/RFS management interface specifications**
  - It provides reference recommendation for slice management based on ODA.
  - It defines the openAPI standards for service management (incl. CFS and RFS).

- **GSMA NEST develops slice template and standard slice type (Overlaps with 3GPP)**
  - It is developing general slice template GST and slice type NEST.
  - It plans to develop a cross-operator standard slice template named S-NEST.

- **ETSI NFV defines partially (i.e. the NFV domain) resource mgmt interfaces**
  - It defines the MANO functional architecture and related interface specifications in virtualized network resource management domain.

- **LFN ONAP implements the support of service management and resource management functions with standard interface compliance**
  - externalAPI implements openAPI of TMF service management.
  - SDC、SO/VF-C implements cross-domain and/or NFV resource management functions with compliant ETSI MANO interfaces.
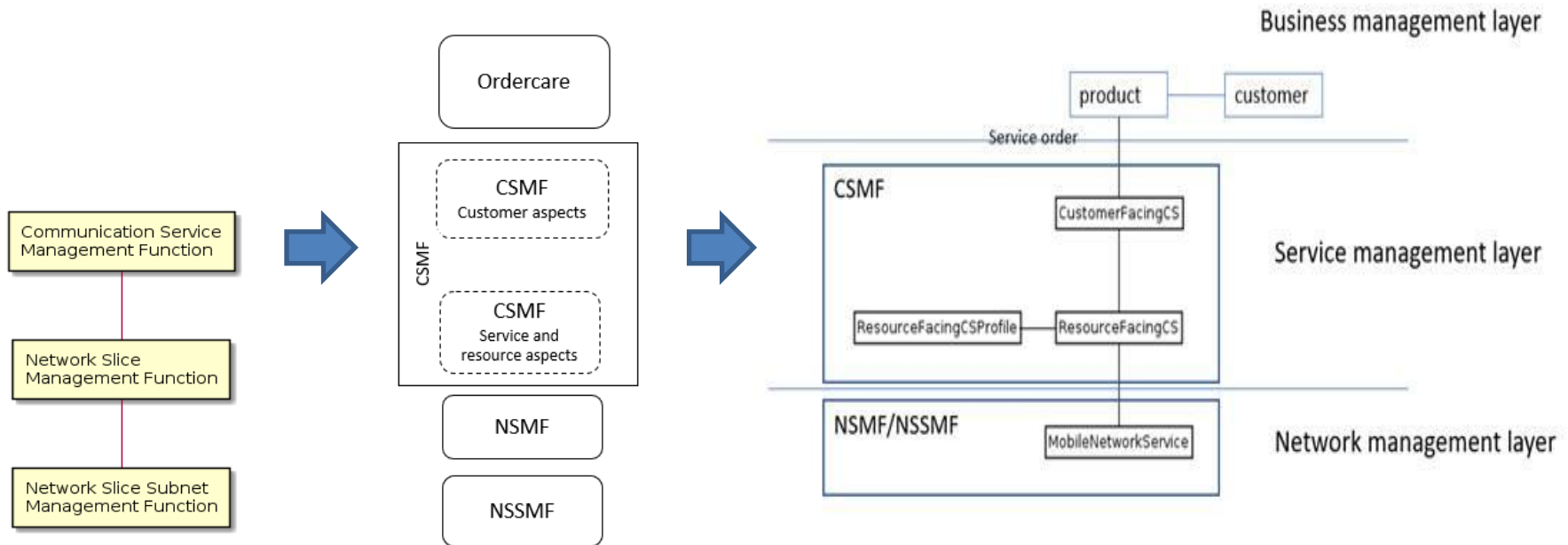 - 5G Slicing Mgmt is part of the community 5G use-case under development.

5G slice mgmt functional architecture (1/2)
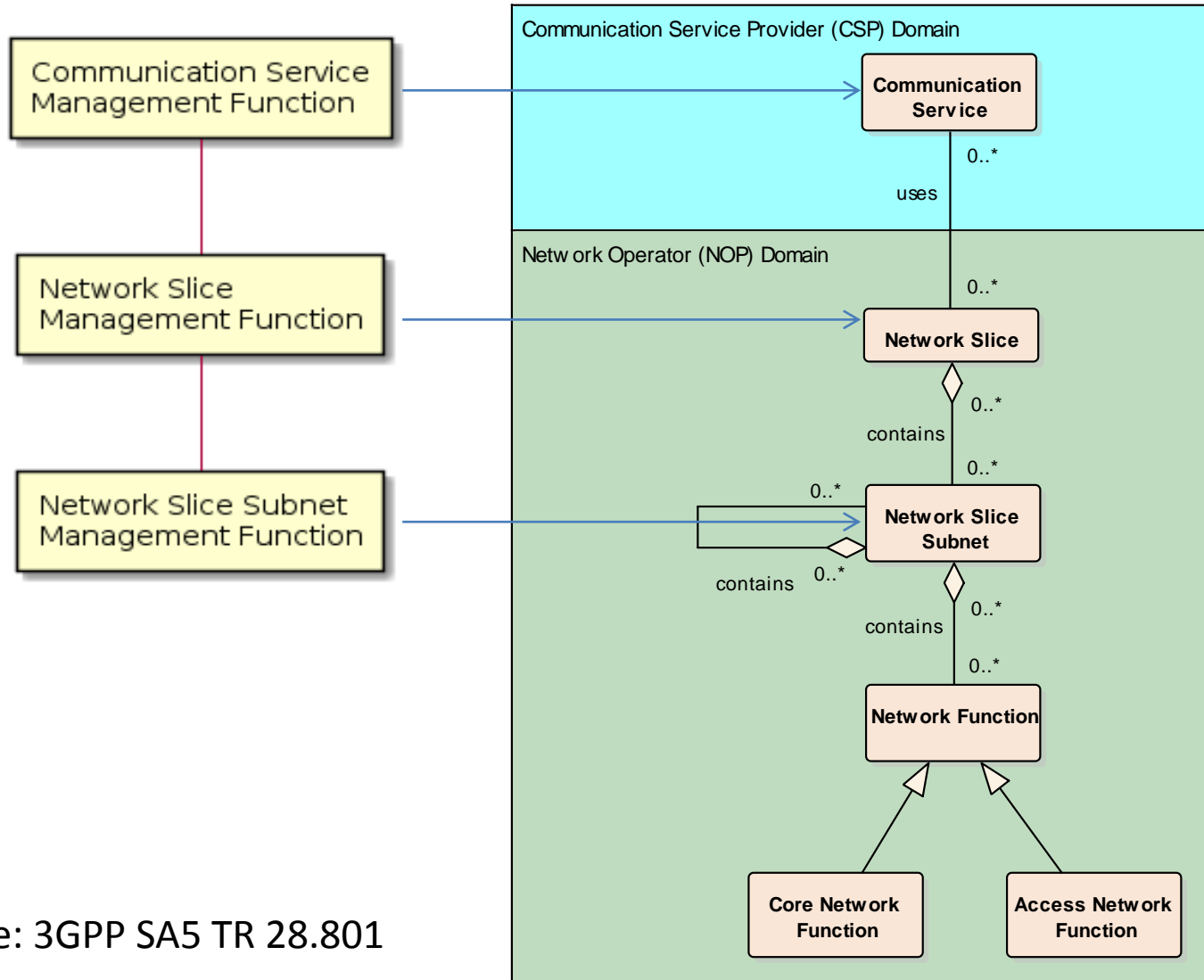
Source: 3GPP SA5 TR 28.801

5G slice mgmt functional architecture (2/2)

Taken into consideration of the two-layer service management functional division of CSMF , the slice management architecture can be further divided into four levels.
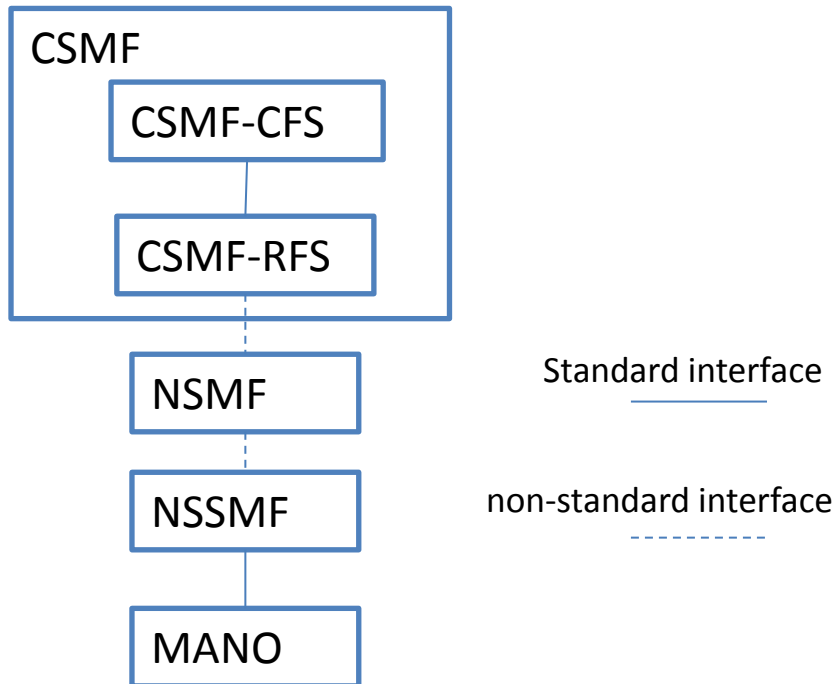

Source: 3GPP SA5 TR 28.805

Slice mgmt solution classification

Mode 1: Three-layers mode
- Provides different functional layers with different software combinations.
- There are several non-standard interfaces, hence difficult to deploy.

Mode 2: Two-layers mode
- It divides and combines CSMF functions with NSMF and NSSMF, using TMF openAPIs in between.
- It is based on standard interface, easy to deploy.
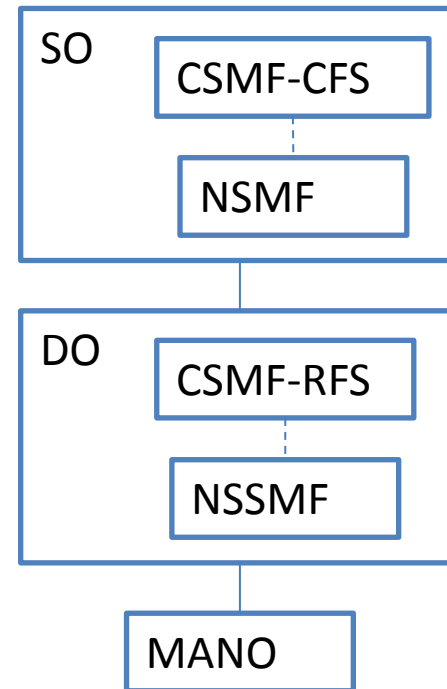
Mode 3: One-layer mode (Full stack mode)
- All functions of CSMF+NSMF+NSSMF are provided by a single piece of software.

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ONAP Based PoC #1
Mode 1: CSMF-RFS

Source: TMF DTW 2019 Catalyst - 5G Riders on the Storm

ONAP Based PoC #2
Mode 2: DO (RFS+NSSMF)

Source: TMF DTW 2019 Catalyst - Skynet

ONAP Based PoC #3
Mode 3: SO+DO/Mode 3

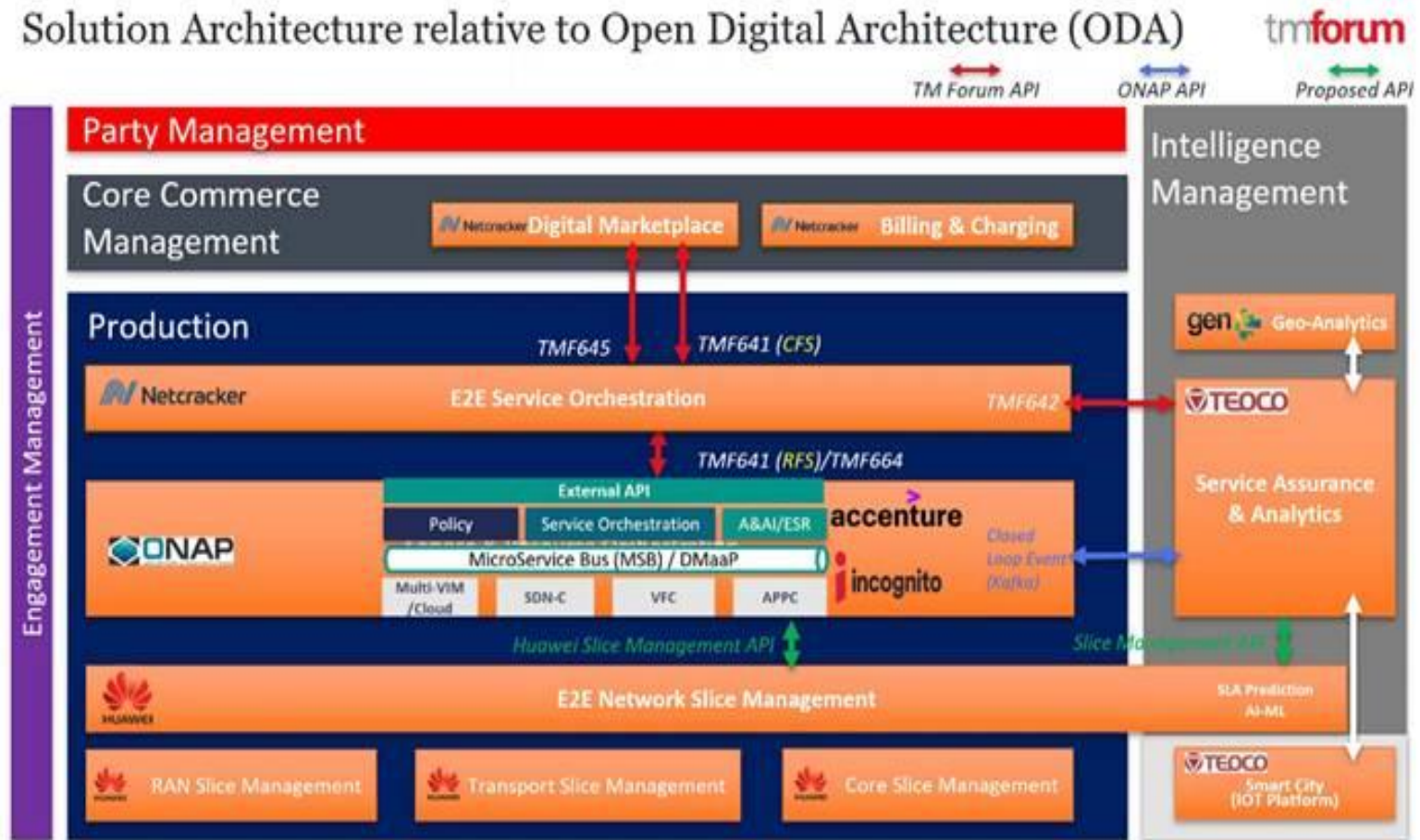Source: TMF DTW 2019 Catalyst - Skynet

Outline

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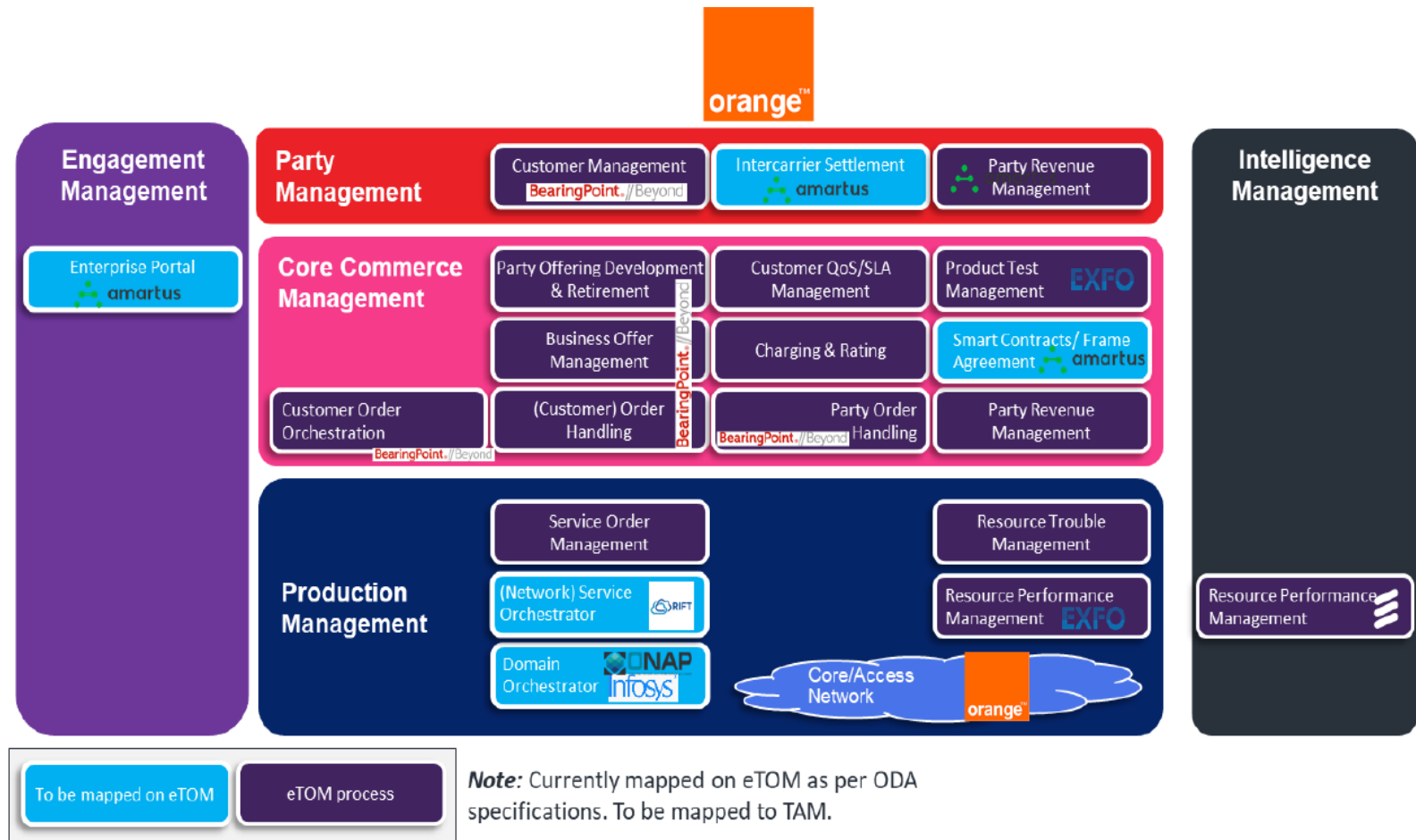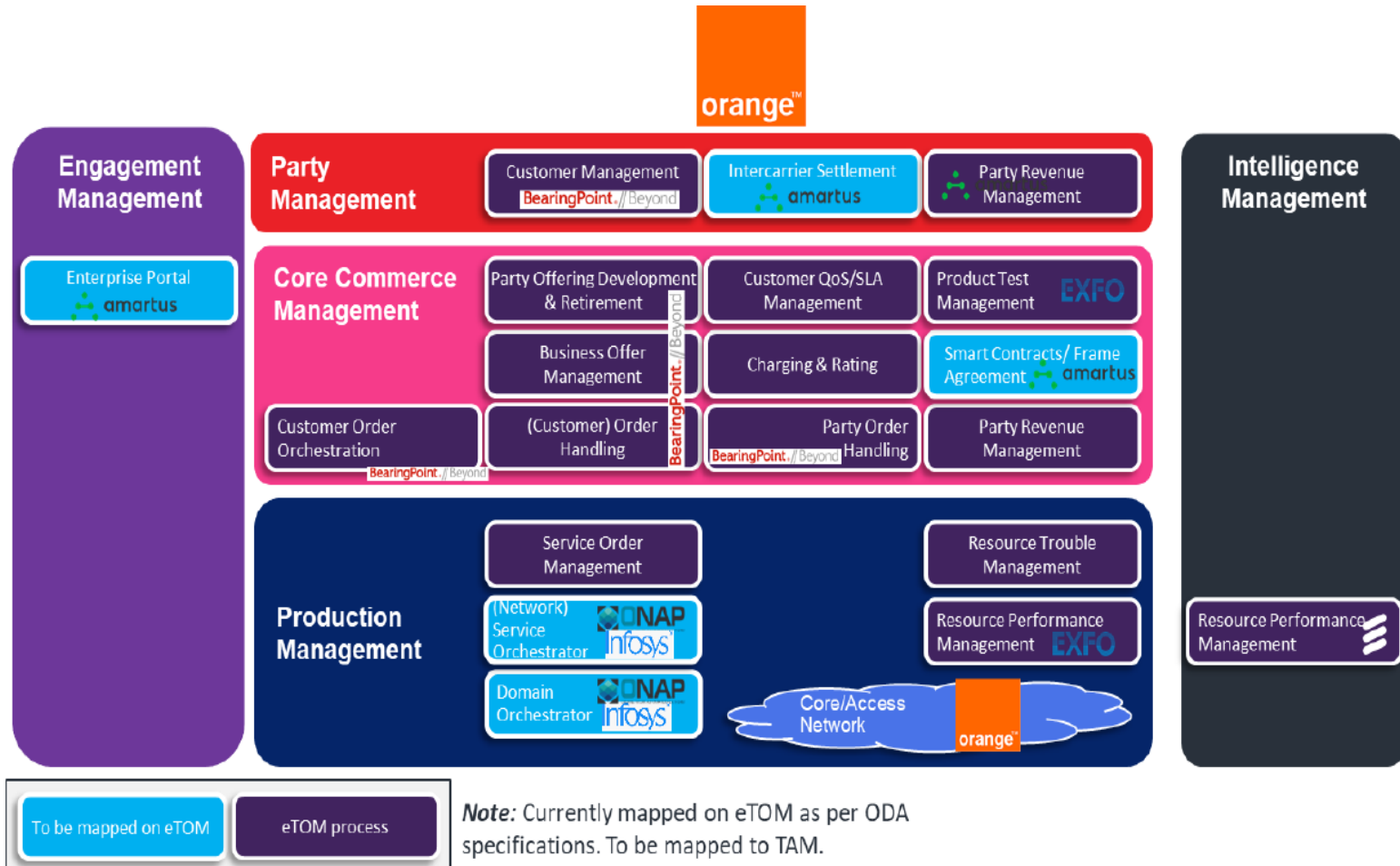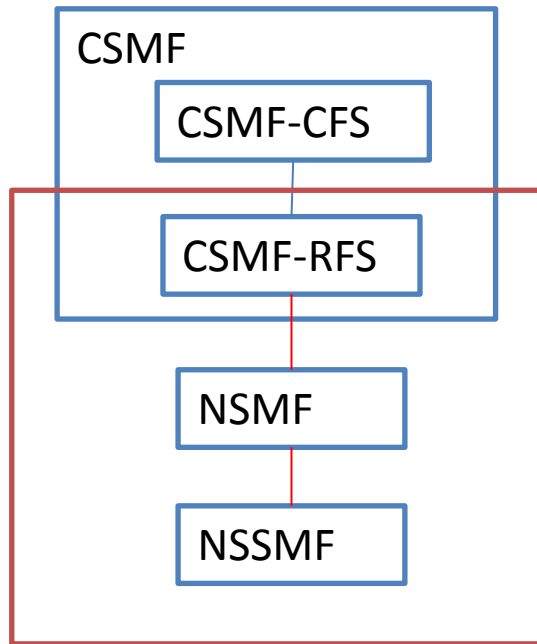- Proposals for community use-case working plan

ONAP Community PoC Proposal

Existing Track: Bottom UP
Slicing Mgmt as part of the 5G use-case

Proposed Track: Top Down
CSMF-RFS addition to the existing track

CSMF

CSMF-CFS

CSMF-RFS

NSMF

NSSMF
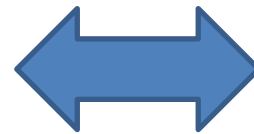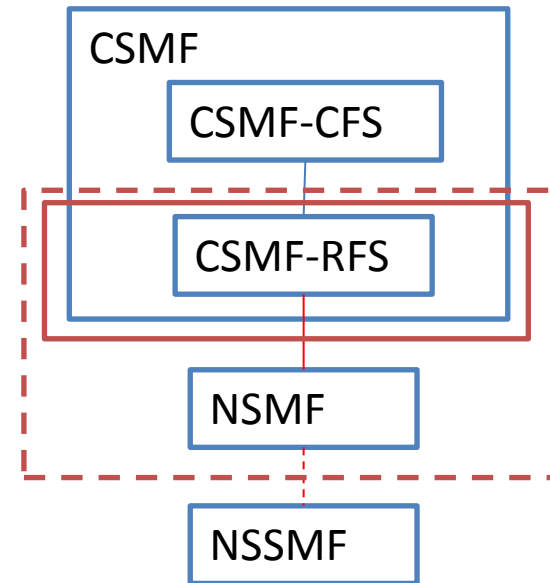
Complementary
to each other

CSMF

CSMF-CFS

CSMF-RFS

NSMF

NSSMF

- Seek to implements full stack solution using ONAP.
- Use community to decouple all layers of interfaces.
- Adopting a bottom-up working plan.
- The design is delayed by lower-level resource mgmt orchestration, i.e. Alloted resource, etc.

- The top-down push strategy is used to implement the reference implementation of each layer step by step
- Ease for quick integration and verification with existing commercial solutions on the market.

Legend:
- Enterprise spec
- Industry spec
- Community implementation

Reference Arch for CMCC
- Decouple xMFs step by step
- Specify in enterprise specification on related interfaces

Boxes: Business Exposure System, CSMF, NSMF, RAN NSSMF, TN NSSMF, CN NSSMF+NFVO, RAN OMC, TN EMS, CN OMC

① ② ③

Proposal for Frankfort
- decoupling via open interfaces
- Considerations from OTT application partners

Boxes: Tercent, VID/UUI, BES, SO, CSMF WF, OOF, NST Selection, SO/SDNC, NSMF WF, NSI Selection, RAN NSSMF, CN NSSMF+NFVO, RAN OMC, CN OMC

Existing Usecase Proposal
- Whole-stack solution with ONAP
- Not decoupled

Boxes: VID/UUI, SO, CSMF WF, NST Selection, NSMF WF, NSI Selection, NSSMF WF, NSSI Selection, SDN-R, VF-C

Follow-up suggestions

- Accelerating community PoC development for 5G Slicing Mgmt
  - Initiating the top-down slice management PoC development track.
  - Coordinated with the existing complementary work to form collaboration, not competition.
- Strengthen coordination between standards and community
  - Slice management architecture: 3GPP SA5
  - Slice management intelligent network element: (overlapping parallel threads, needs coordination)
    - 3GPP SA2 NWDAF intelligent slice management
    - 3GPP SA5 MDAF intelligent slice management
  - Slice management interface: TMF openAPI/ODA
 - Slice templates: 3GPP SA5/GSMA NEST

LFN Booth: E2E Slicing Management w. ONAP

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Goal

   Accelerate the specification development and improve interoperability between vendor solutions for 5G slicing management, via providing reference implementation in LFN community.

Scope

- Provide the prototype of CSMF and NSMF with ONAP.
- Verify commercial interoperability by interworking with vendors' NSMF/NSSFM.
- Open service creation and performance monitoring towards 3rd party service operator on the top.

On-demand 5G Slice w. ONAP
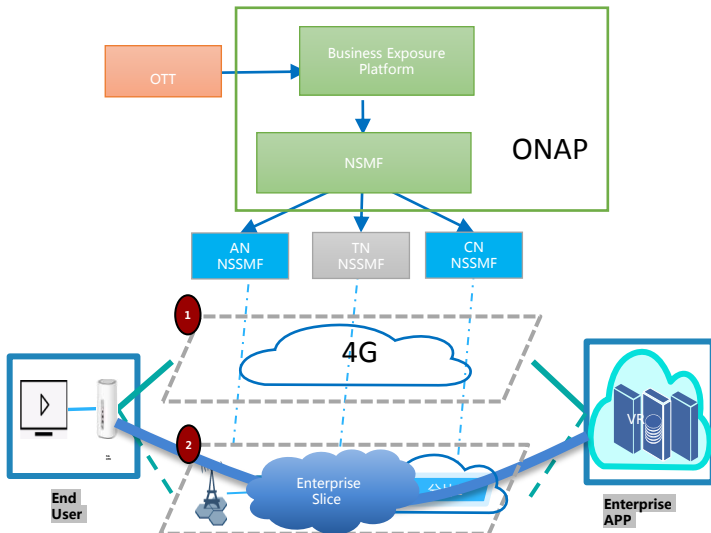
Demo

- Expose **Service Order** and **Creation Policy** interfaces to Tencent App
- Realize **partial CSMF/NSMF** with SO/SDNC
- Integrate with Vendor NSSMF and **Commercial 5G RAN/Core**

Follow-ups

- NST/NSST template specification
- Support NSST onboarding and NST design in SDC
- E2E NST orchestration in SO/SDN-C
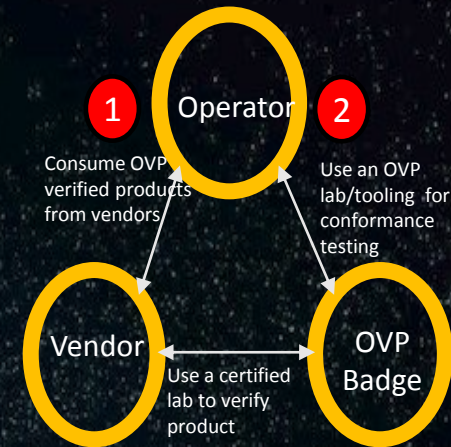- Support NST and NSI selection in OOF

LFN Booth: OVP in Action
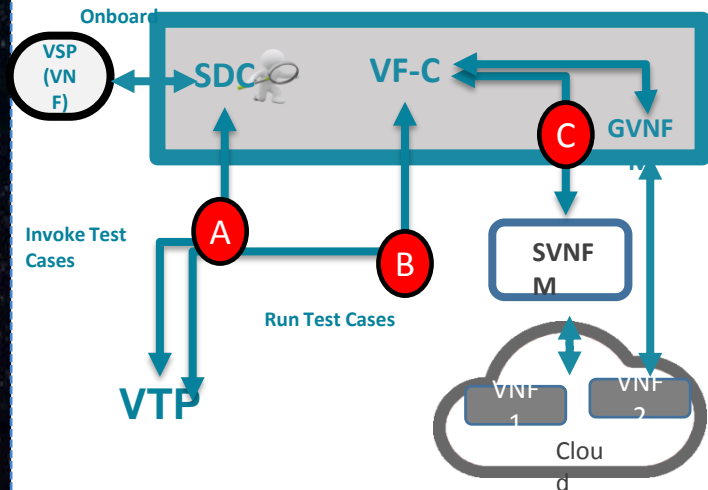
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Goal

Accelerate operators and vendors to build open ecosystems such as 5G+AI and 5G+ Edge, via providing OVP-based NFV automated testing tools and VNF certified store.

Scope

- Provide the end-to-end testing reference flow and framework based on open source component.
- Test process tracking and results feedback
- Flexible test case injection and third-party system integration capabilities

1 **Operator** **2**

Consume OVP verified products from vendors

Use an OVP lab/tooling for conformance testing

Vendor

Use a certified lab to verify product

OVP Badge

Tosca VNF Validation on ONAP

ONAP
OPEN NETWORK AUTOMATION PLATFORM

Onboard

VSP (VNF)

SDC

VF-C

C GVNF

A **B**

Invoke Test Cases

SVNF M

Run Test Cases

VTP

VNF 1 VNF 2

Cloud

Demo

- Tosca VNF Compliance testing with VNF SDK
- Tosca VNF Validation testing with VF-C
- Testing steps monitoring and tracking with VTP

Follow-ups

- Support VNF function and performance testing
- Pluggable test framework for more testing , e.g. interoperability
- Layered badging program to allow differentiated conformance

LFN Booth: ONAP DataLake & Distributed Analytics as A Service

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Goal

To enable flexible customization, on-demand deployment and capability sharing of network oriented analytic applications via a general network intelligent operation and maintenance software stack, including network data collection, persistence and analytics.

Scope

- Introduce on-demand, persistent of cross-layer network data storage to ONAP
- Extend ONAP DaaS, SDC, SO module to support analysis layer service design/sharing
- Encapsulate traffic prediction models with Acumos and integrate into ONAP

ONAP+Daas

Data Orchestration

Design Source+Infra	Auto Deploy SO/Acumos/DCAE	Ctrl. Policy Scaling/Energy/...

DaaS

Data Infrastructure

collection Collectd	storage Datalake	Analysis Traffic Prediction

Data Source

VIM PIM VNF Service

Training TensorFlow

Model Repo

Analytics
Analytics
Analysis

Demo

- Data persistence and visualization with Datalake
- Analytics model training, deployment and mgmt with DaaS
- Augmented scaling based on traffic prediction model with SO

Follow-ups

- Expand DCAE to support big data storage and DaaS docking
- Encapsulate prediction micro-service with Acumos
- Extended SDC to support design with shared AI micro-service
- Integrate with OVP program