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)

Communication Service Management Function

Network Slice Management Function

Network Slice Subnet Management Function

Communication Service Provider (CSP) Domain

Communication Service

Network Slice

Network Slice Subnet

Network Operator (NOP) Domain

Network Slice

Network Function

Core Network Function

Access Network Function

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)

Note: Currently mapped on eTOM as per ODA specifications. To be mapped to TAM.

Source: TMF DTW 2019 Catalyst - Skynet
ONAP Based PoC #3
Mode 3: SO+DO/Mode 3

Source: TMF DTW 2019 Catalyst - Skynet
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ONAP Community PoC Proposal

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

CSMF
  - CSMF-CFS
  - CSMF-RFS
  - NSMF
  - NSSMF

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

CSMF
  - CSMF-CFS
  - CSMF-RFS
  - NSMF
  - NSSMF

Complementary to each other

• Seek to implement 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. Allotted 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.
Reference Arch for CMCC
• Decouple xMFs step by step
• Specify in enterprise specification on related interfaces

Proposal for Frankfort
• Decoupling via open interfaces
• Considerations from OTT application partners

Existing Use case Proposal
• Whole-stack solution with ONAP
• Not decoupled
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
Accelerate the specification development and improve interoperability between vendor solutions for 5G slicing management, via providing reference implementation in LFN community.

**Goal**

- 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.

**Scope**

**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
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.

**Goal**

- 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

**Scope**

**Tosca VNF Validation on ONAP**

**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
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.

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