Network Slicing Management and Orchestration

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Scope of the presentation: Impact of Slice Orchestration and Management
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Key impact areas:
2, 3 and 4 of the gap analysis
Rational for Network Slicing

**What**
- Multi-tenancy: Sharing of infrastructure, sites among multiple tenants
- X as a Service: Cost reduction (TCO)

**Why**
- Vertical markets: Dedicated Resources with service assurance
- New services for Vertical markets (IoT, Automotive, etc)

**Service Optimization**
- Per-service tailored network
- Guarantee of QoS (e.g. slice for tactile internet)
Network slicing defined by NGMN, further worked by 3GPP and ETSI

- Network Slicing provides multiple logical networks on top of a partially shared network infrastructure.

- Each instance of a network slice represents an independent end-to-end network.

- A slice may include several network components, (Network Slice Subnetwork according to 3GPP terminology).

- Transport network (e.g. ACTN) is a Network Slice Subnet in the 3GPP model. Transport networks are out of the scope for 3GPP.

- Recursion can be applied to slices as well as to Network Slices Subnets.

- A slice may be deployed and/or operated by the slice provider, or by the tenant who requested the slice.

Source: 3GPP SA5
Network slice management in multi-domain context

**Ngmn definition:**
Network slicing concept consists of 3 layers:
1. Service Instance Layer,
2. Network Slice Instance Layer, and
3. Resource layer.

A Network Slice Instance may be composed of Sub-network Instances (“cross network segments”), which in turn may be shared by multiple network slice instances.
Multi-tenancy support of slicing leads to recursion

- Orchestration creates slices and associates network functions to them. It sets up connectivity between network functions. VNF and PNF live cycle managements has to be coordinated.

- Strong need for service fulfilment assurance and monitoring of SLA based Connectivity, Mobility, Capacity, Security and QoS.

- Isolation of resources and ability of the operator to support multiple tenants with varying levels of control.

New challenges:
- Brokering across domains/tenants.
- Relationship to wide area infrastructure management.
- Automated VNFs instantiation and self discovery functions.
Different levels of Network Slice Control exposure

1. Slice consumer is allowed to only monitoring selected KPIs.
   • Slice Provider offers only an API to monitor the slice KPIs as agreed in the contract.

2. Limited control to Slice Consumer to compose of network slices.
   • Slice Consumer can change configuration of deployed network functions and/or onboard own certified network functions.

3. Slice consumer operates its own Management and Orchestration stack
   • The Slice consumer has tight control over its own network functions and services

   • Need for an management entity that deals with new abstractions and offers access to lower level functions: Network Slice Management Function (NSMF).
NSMF has full visibility to and control over the end-to-end slice, its resources and performance (FCAPS)
Conclusions

• Alignment with non-IETF work on management aspects is needed to ensure painless reuse of the IETF work:

  • Abstractions and data models that support multi-domain and multi-tenant operations.
  
  • Interfaces (i.e. protocols, APIs) between the relevant functions.
  
  • Support for recursion and varying levels to exposed control for tenants with different capabilities.
  
  • Need for a functionality that consolidates the FCAPs information for the whole slice.