Extending TMF APIs into OSM MANO

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Providing Communication Services to manage Complex Vertical Markets

- Verticals have different levels of capabilities to leverage services from a CSP
- The needs and focus level can also mean different ways of consuming services
- Even within a vertical the level of communication domain capabilities can differ
- 5G has brought in newer abstractions of service
- 5G Mindset “Give customers exactly what is required”

In communication Industry “SERVICE” is heavily overloaded word and can mean many different things in different contexts

Resource

Service

Resource

An entity can be a resource in one perspective and service in another
Different types of Service Abstraction to address Vertical Markets

- Communication Services (CaaS)
- Network Sliced Service (NSaaS)
- Network Sub Slice (NSSaaS)
- Network Service (NaaS)
- Strictly Internal Resources

New Digital Markets
- Pharmaceuticals
- Power & Energy
- Entertainment
- Manufacturing
Multi-layered Closed loop Orchestration Architecture

- **Digital Market Place**
  - CaaS Orchestration
  - NSaaS Orchestration
  - NSSaaS Orchestration
  - NaaS Orchestration
  - Domain Orchestration
  - DC Orchestration (NFVO)

- **Growth**
  - Design service layers (meta data driven)
  - Efficient resource deployment
  - Fulfillment: Order, Provision, Configure

- **Optimization**
  - Actionable

- **Insights**
  - All network assurance information
  - External Influencing Info

- **Analytics**
  - Actionable

- **Information**
  - Vertical Service
  - Comm Service
  - Network Slice
  - Functional
  - Infrastructure

- **Sample Key flows across layers**
  - Logical Service Order flow
  - Policy flow
  - Unplanned constraints flow

Source: TM Forum, 3GPP Stds
Exposing Service Abstraction through TMF APIs (NaaS API)

- TMF APIs are defined at fairly abstract level and can be leveraged for different types of service abstraction
- TMF 909 gives a comprehensive view of how these different APIs come together to create different business process
- While TMF 909 focuses on NaaS, it can be applied to different service abstraction NSaaS, NSSaaS, CaaS
- Suggested order of reading Green, Blue, Grey and Purple Quick read Green and Purple
- Specifications TMF 6XX https://projects.tmforum.org/wiki/display/API/Open+API+Table--Production
- API suite for NaaS TMF 909 https://www.tmforum.org/resources/specification/tmf909-api-suite-specification-for-naas-v3-0/
#1Ref Architecture - Enabling TMF API’s into ETSI OSM MANO with Service Design & Modelling

- TMF APIs I/F enabled – 633, 641, 628, 664, 638, 642, 635, 628
- 3GPP I/F enabled – TS32.291, 23.502
- ETSI NFV ISG I/F enabled – SOL 005

Source: TM Forum, 3GPP & ETSI Stds
Orchestrating and Dynamic allocation of 5G Network Slices

• Comprehensive end to end orchestration and managing life cycle of 5G services

1. Orchestrating communication services
2. LCM of CFS and Network Slices
3. Maintaining consistencies across different management layers

Source: TM Forum, ETSI
# Reference Architecture - Enabling TMF APIs into ETSI OSM MANO with Cross Domain Manager

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**5G B2B Portal**

- Digital Services Enablement Platform
  - TMF 645
  - TMF 641

- Customer Facing Service Orchestrator
  - TMF 645
  - TMF 641

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**Distributed Ledger**

- SLA Inter-CSP Settlement
  - TMF 645

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**SLA Inter-CSP Settlement**

- CFSO
  - TMF 628, TMF 641, TMF 645

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**Active and Available Inventory**

- Service Orchestration, Operations & Cross-Domain Management
  - TMF 628, TMF 641, TMF 645

- Domain Controllers
  - RAN
  - Transport
  - Core
  - NFV MANO

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**Resource Mgt / Controllers / Orchestrators**

- Service Assurance & Analytics
  - Fault & Performance Mgmt

- SDN-C
  - Domains (eg: edge)
  - XNF-C

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**5G NW**

- ETSI OSM MANO acting as Slice, Service & Network Orchestrator

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Source: TM Forum, 3GPP & ETSI Stds
TMF Extensions supporting ETSI Frameworks

TMF 641 supporting OSM MANO Architecture and customizations introduced

Extensions support to OSM MANO

ETSI – Zero Touch Network & Service Mgmt incorporated

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Source: TM Forum, ETSI
# Extending OSM MANO - Network Layers of Abstraction & Orchestration using TMF API

<table>
<thead>
<tr>
<th>Customer Service</th>
<th>DSEP (Digital Services Enablement Platform)</th>
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<tbody>
<tr>
<td>E2E Customer service</td>
<td>In which one or more communication service are key components</td>
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<table>
<thead>
<tr>
<th>E2E Communication Service Inter-CSP</th>
<th>CFSO (Customer Facing Service Orchestrator)</th>
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<tbody>
<tr>
<td>Specific information exchange service between multiple end points</td>
<td></td>
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<tr>
<td>May span CSP boundaries</td>
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<table>
<thead>
<tr>
<th>Communication Service Intra-CSP</th>
<th>Extending OSM-Service Orchestrator roles</th>
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<tr>
<td>Service spanning across network domain between SAPs</td>
<td>SO (Service Orchestrator – for CS)</td>
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<tr>
<th>Network Slice as a Service (Sequence of NSIs)</th>
<th>SO (Service Orchestrator – NSMF*)</th>
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<tbody>
<tr>
<td>Leverage of one or more NSIs in sequence to support mobility</td>
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<thead>
<tr>
<th>Network Slice Instance</th>
<th>SLO ((Mobility) Slice Orchestrator – eCSMF*)</th>
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<tbody>
<tr>
<td>Independently manageable logical network, service guaranty between SAPs</td>
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<tr>
<th>Network Subnet Slice Instance</th>
<th>SO (Service Orchestrator – NSSMF*)</th>
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<tr>
<td>Subnet level entity to rapidly compose NSI &amp; simplify management</td>
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<tr>
<th>E2E Network service (ETSI –NFV), SDN-R, SDN-C</th>
<th>SS-LO (Subnet Slice LC Orchestrator) – NSSMF*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource layer Orchestrators, Controllers and Managers</td>
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* 3GPP CSMF – Communication Service Management Function, NSMF – Network Slice Management Function, NSSMF – Network Slice Subnet Management Function
Summary

**TMF extensions to OSM MANO have the following aspects:**

- Able to expose communication services aligned with specific vertical industry use cases
- Orchestration of specialized and guaranteed services in a timely manner & on-demand.
- Fulfillment of SLAs guaranteed through on-the-fly process monitoring at control layer and charging mechanisms
- Enforcing SLA guarantees based on Network & Service related KPIs & KQI that are collected at Network Slice Instance level
- Predicting change in demand for business critical services, and triggering dynamic & closed loop mitigating actions
Open Source MANO

Thank you