

# XGVela use of TM Forum APIs

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# TM Forum Overview

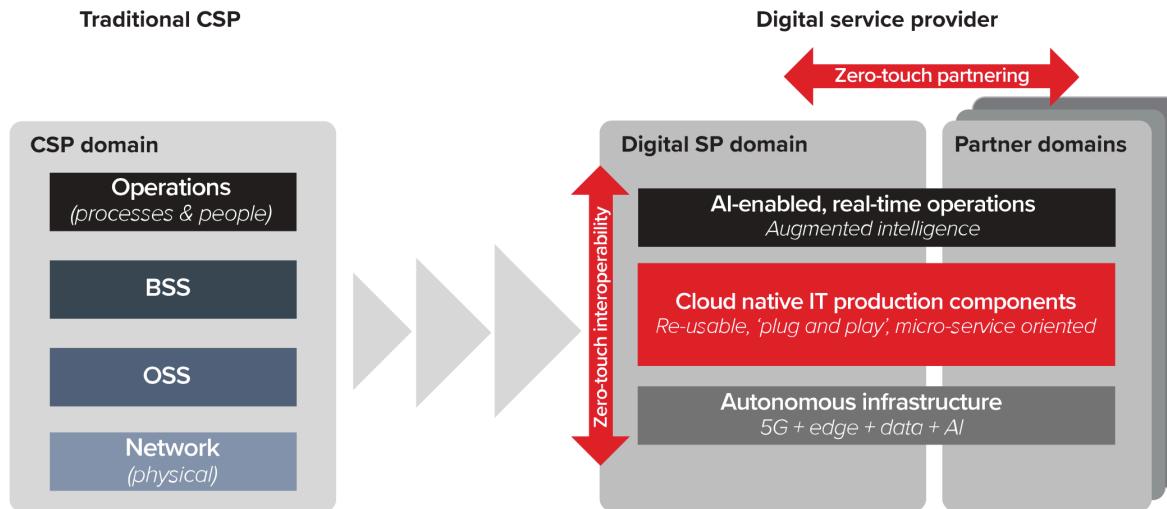
*“We are an alliance of 850+ global companies working together to break down technology and cultural barriers between **digital service providers**, technology suppliers, consultancies and systems integrators.”*



# Transition to Digital Service Provider (DSP)

The TM Forum has been known for decades as the standards development organization (**SDO**) responsible for telco operations and business support systems (**OSS/BSS**).

Today we are focused on the transition from traditional communications service providers (**CSP**) to agile digital service providers (**DSP**).



# TM Forum Frameworx

## Business Process Framework (**eTOM**)

A comprehensive, industry-agreed, multi-layered view of the key business **processes** required to run an efficient, effective and agile digital service provider.

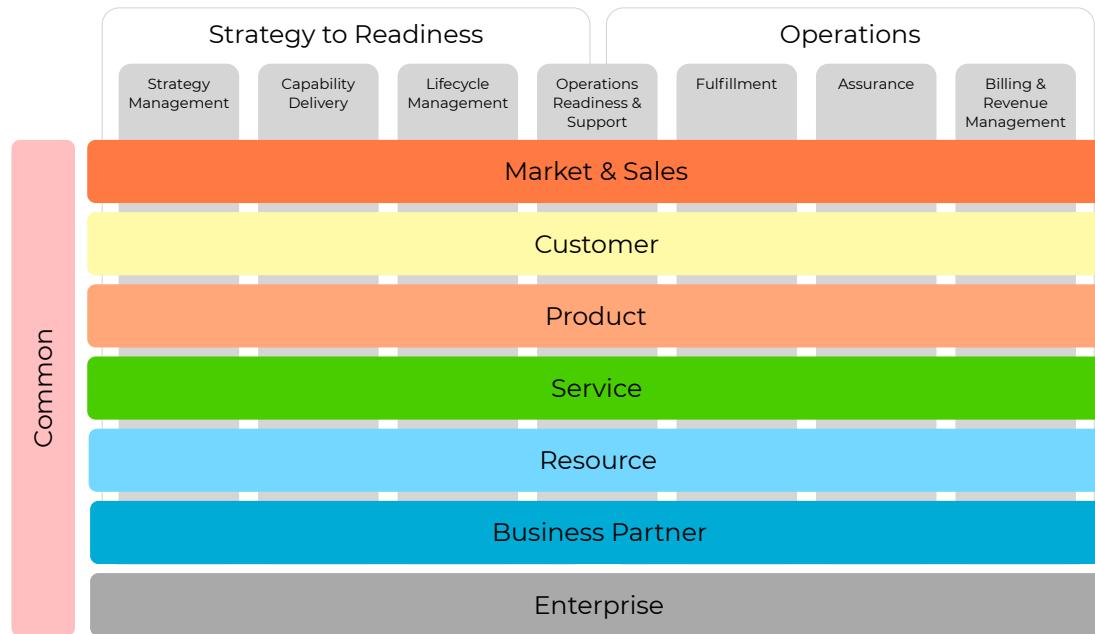
## Information Framework (**SID**)

Provides standard definitions for all the **information** that flows through the enterprise and between partners, enabling critical insights for platform economy business.

# eTOM Domains & Context Verticals

Context Verticals categorize the **processes** that are required to support customers and to manage the business.

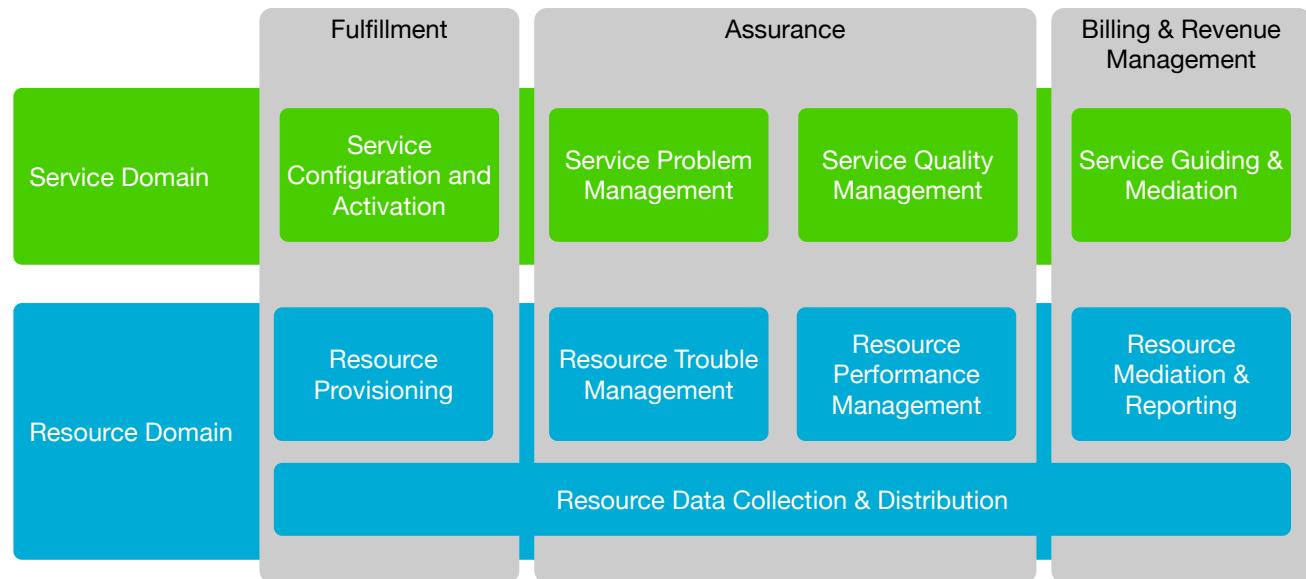
Functional process groupings (**domains**) form the apex of the process decomposition hierarchy we use to contain, find and define our processes.



# eTOM Operations

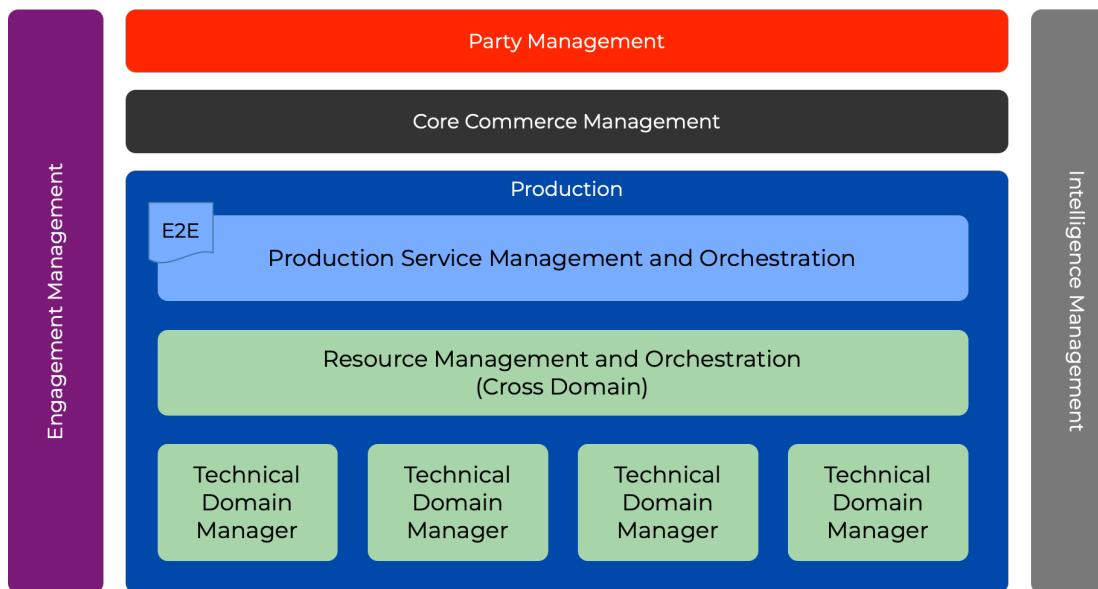
The **Operations** context vertical includes the three pillars of any service provider business:

- Fulfillment
- Assurance
- Billing



# Open Digital Architecture (ODA) (GB999)

**Production** block of ODA Functional Architecture contains **Service** and **Resource** domain functions. End-to-end service management functions provide customer facing services (**CFS**) which may go into **Products** managed by **Core Commerce** functions.



## Management & Orchestration

*“TM Forum introduces the concept of a coherent and consistent mode of operation where management and control activities are considered as one continuum.”*



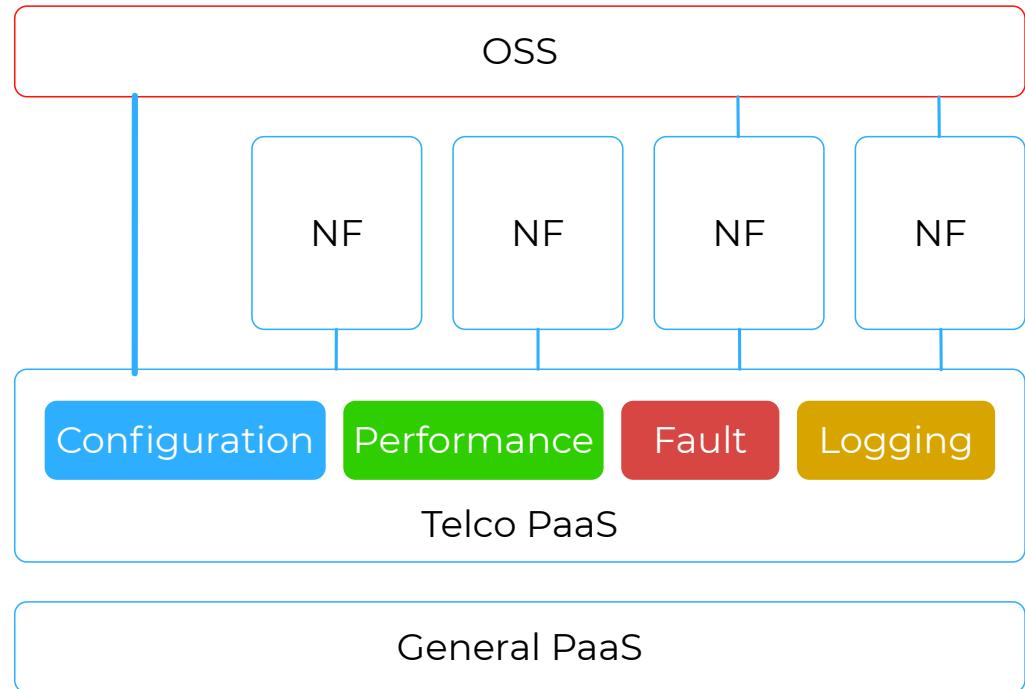
# Essential Elements of Orchestration (IG1139)

- Federated Domains
- Standardized Patterns
- Declarative Interfaces
- Autonomic Control Loops
- Security Practices and Infrastructure
- Assurance
- Culture and Governance

# XGVela Support of Operations Processes

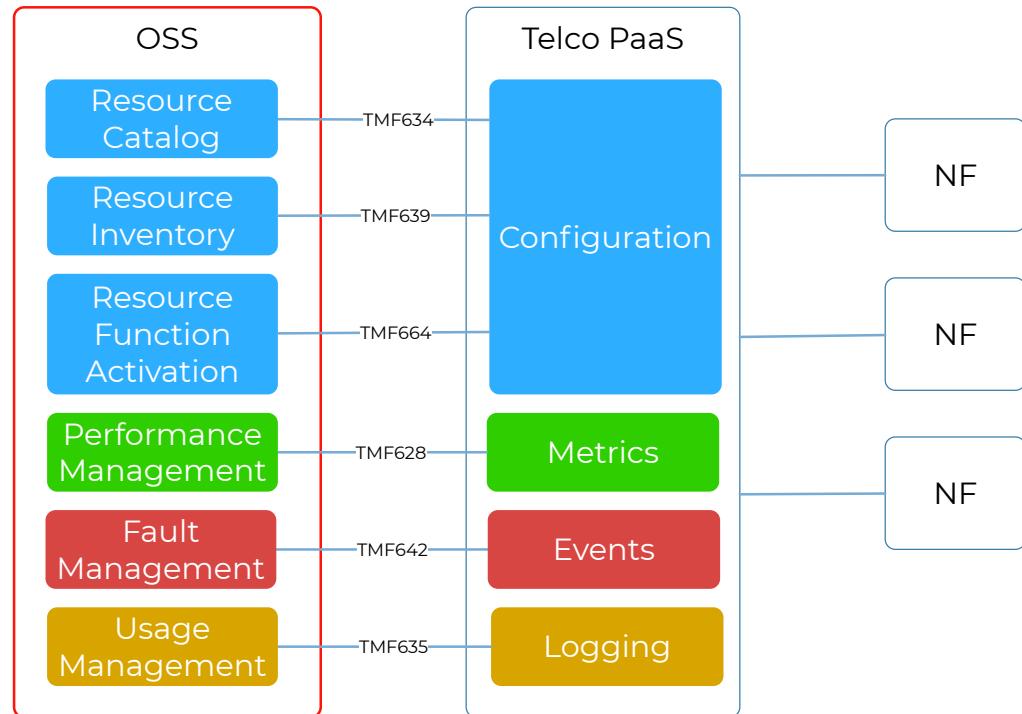
Operations Support Systems (**OSS**) may (also) manage Network Functions (**NF**) through **XGVela Telco PaaS**.

**Fulfillment, Assurance** and **Billing**, as well as aspects of **Operations Readiness & Support**, are supported by common functions of the **Telco PaaS**.



# TM Forum Open APIs with XGVelA

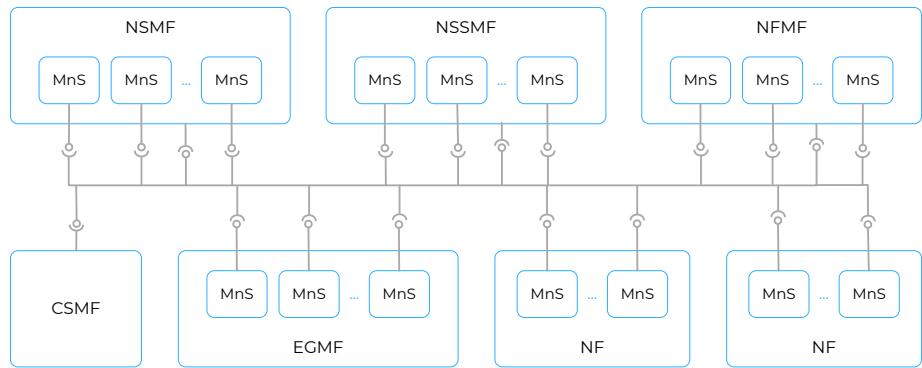
OSS may manage hosted network functions (NF) through TM Forum Open APIs providing a consistent set of interfaces widely adopted by the industry.



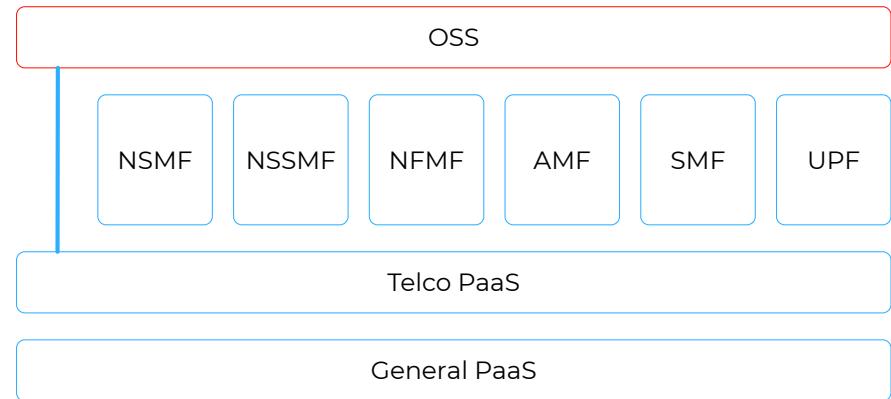
3GPP defines a **federated** service-based management architecture for 5G

Management Functions (**MnF**) may be producers or consumers of Management Services (**MnS**)

Third party access may be through an Exposure Governance Management Function (**EGMF**)



Any of the 5G MnF may  
(optionally) be hosted with  
**XGVela Telco PaaS**



Network Slice Management Function (**NSMF**)

Network Slice Subnet Management Function (**NSSMF**)

Network Function Management Function (**NFMF**)

5G Core Network Functions (NF)

Access Mobility Function (**AMF**)

Session Management Function (**SMF**)

User Plane Function (**UPF**)

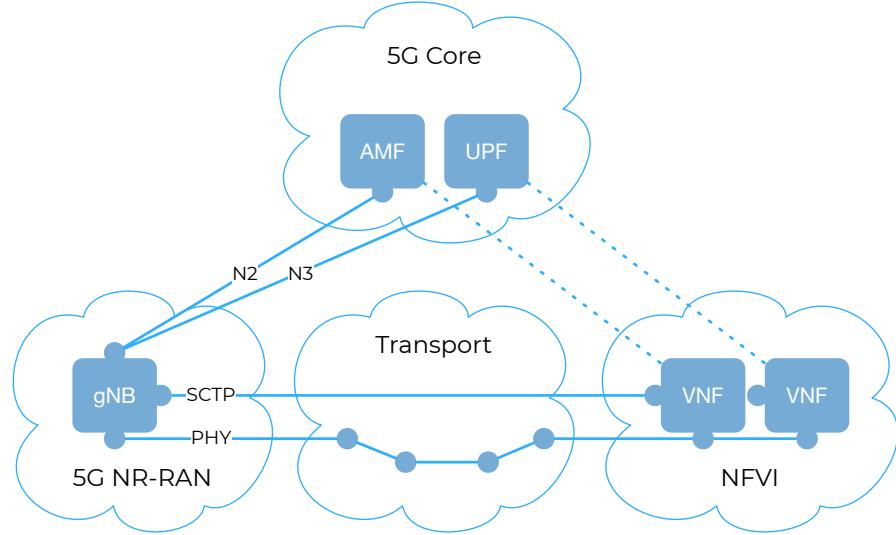
# Multi-Domain Management

In the example shown a **5G Network Slice** exists across four separately managed domains:

- Core
- NFVI
- RAN
- Transport

**Touchpoints** exist between models including:

- AMF,UPF to VNFs
- AMF N2,N3 CPs to VNFC CPs
- gNB N2,N3 Cps to AMF,UPF CPs
- gNB,VNFC Cps to Transport links

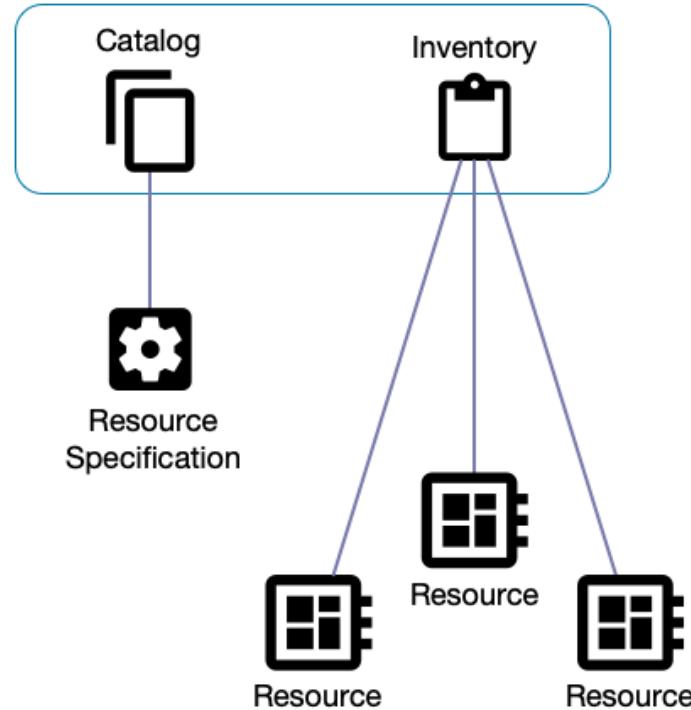


# Resource Domain



# Resource Management Domain

- **Resource Catalog**  
Contains **specifications** describing the common attributes and relationships of a set of related Resources.
- **Resource Inventory**  
Contains descriptions of specific **instances** that are based on a particular specification.

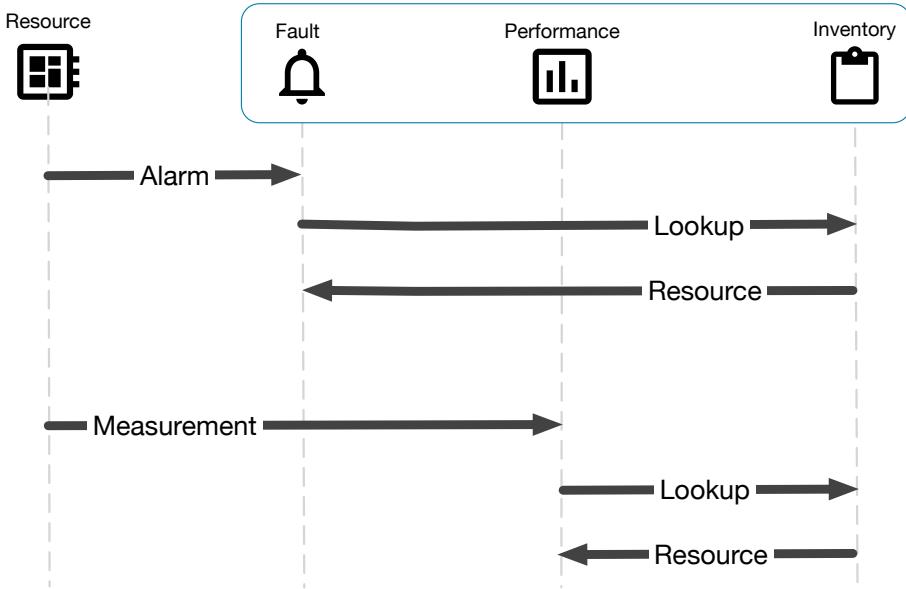


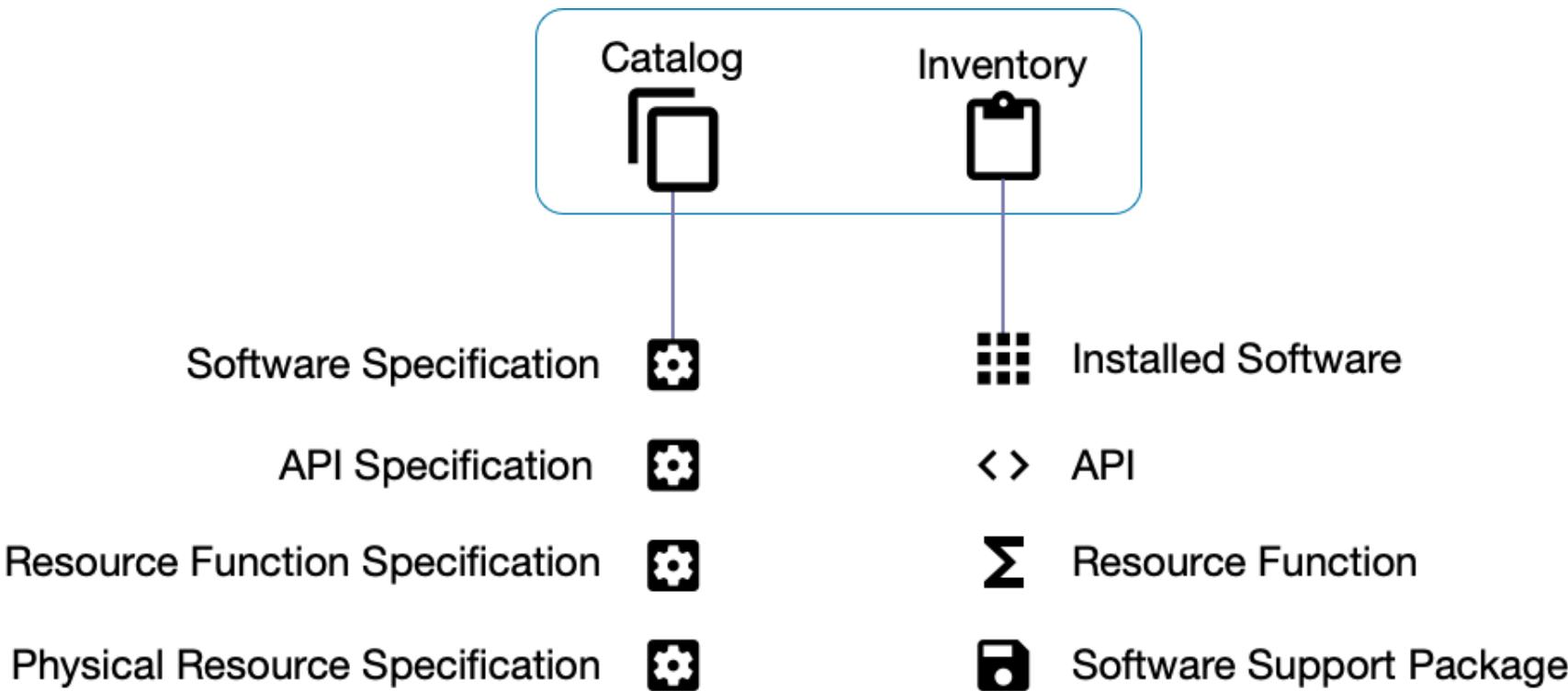
# Resource Inventory for Assurance (IG1217)

Fault Management (**FM**) and Performance Management (**PM**) processes require rich information about the Managed Objects (**MO**) for which alarms and measurements are received.

Alarms and measurements identify MO and MO Class (**MOC**) by reference.

Assurance processes require MO inventories and MOC catalogs to make sense of the FM and PM event data.





# Example: 5G Core Function in Resource Inventory

- **Installed Software**

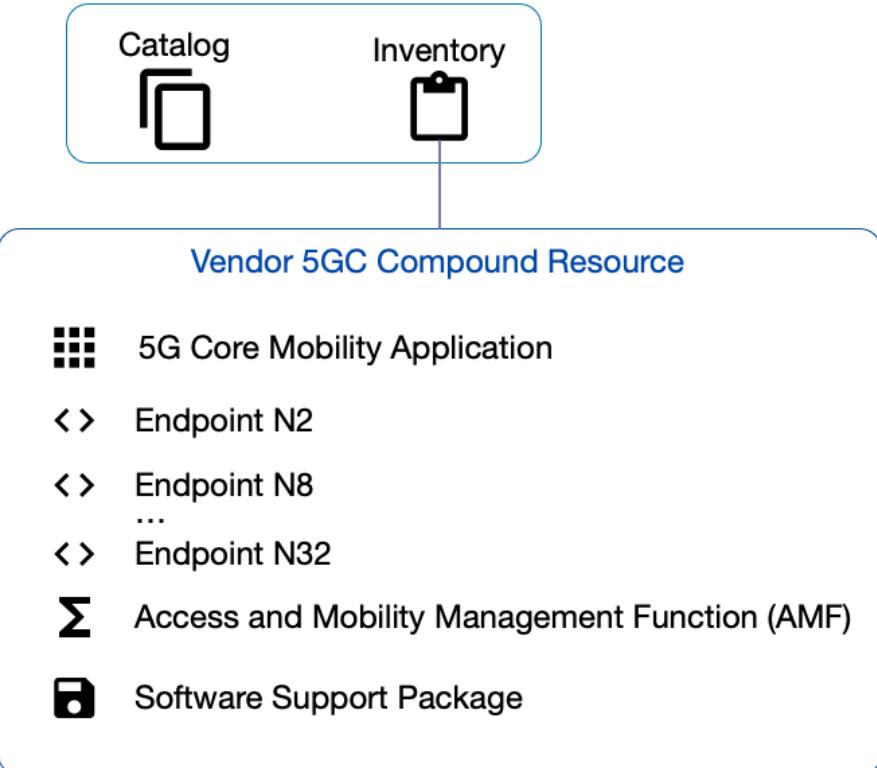
Provides a 5G Core Access and Mobility software application.

- **Endpoints N2, N8, ..., N32**

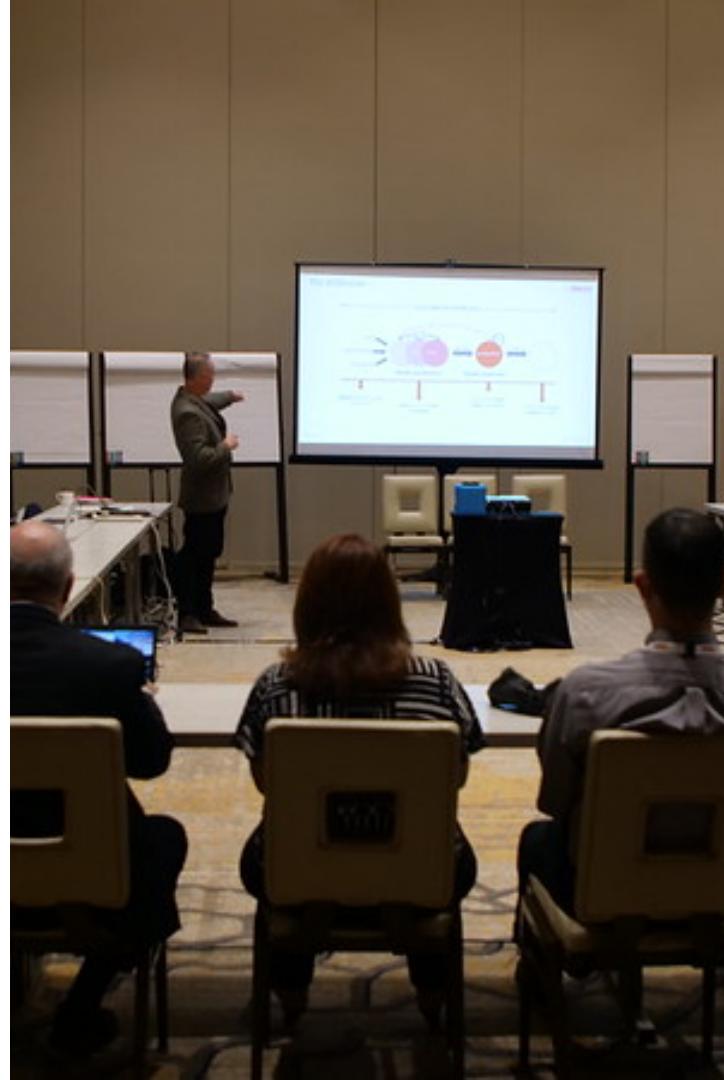
Instances of service access points of the AMF.

- **AMF**

An instance of a 5G Core AMF Resource Function.



# Information Modeling



# Metamodels in TM Forum Open APIs

## Information Model

Representation of business concepts, their characteristics and relationships, described in an implementation independent manner

## Data Model

Provides specific definition and format of values available to an instance

## JSON Schema

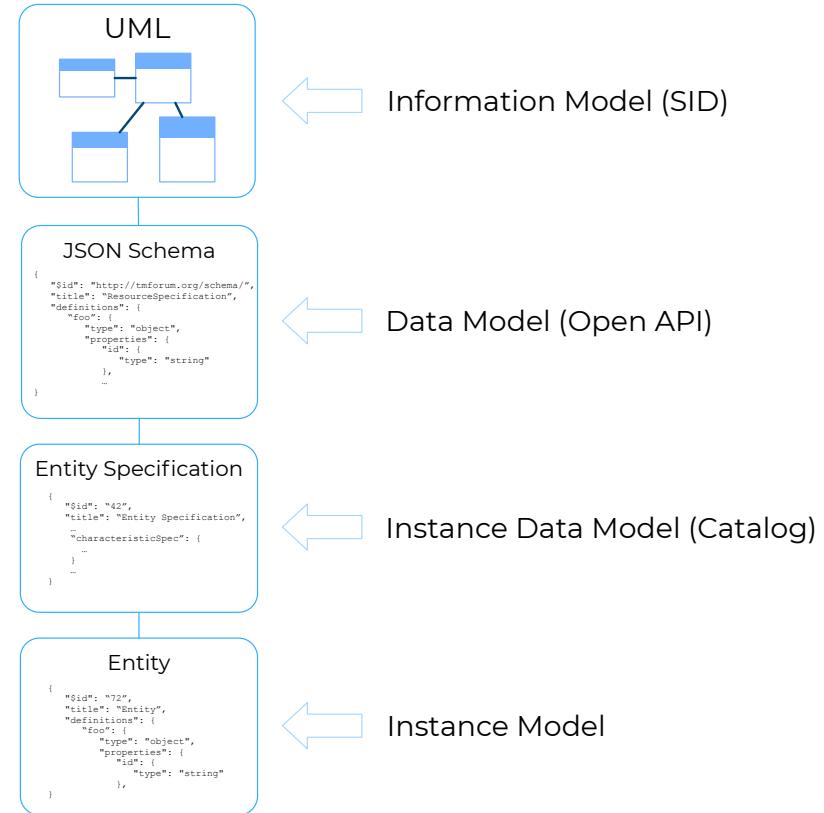
Defines JSON encoding included in Open API Specification (OAS) ("swagger")

## Specification

Provides a specific set of available characteristics and features to be included in a Catalog

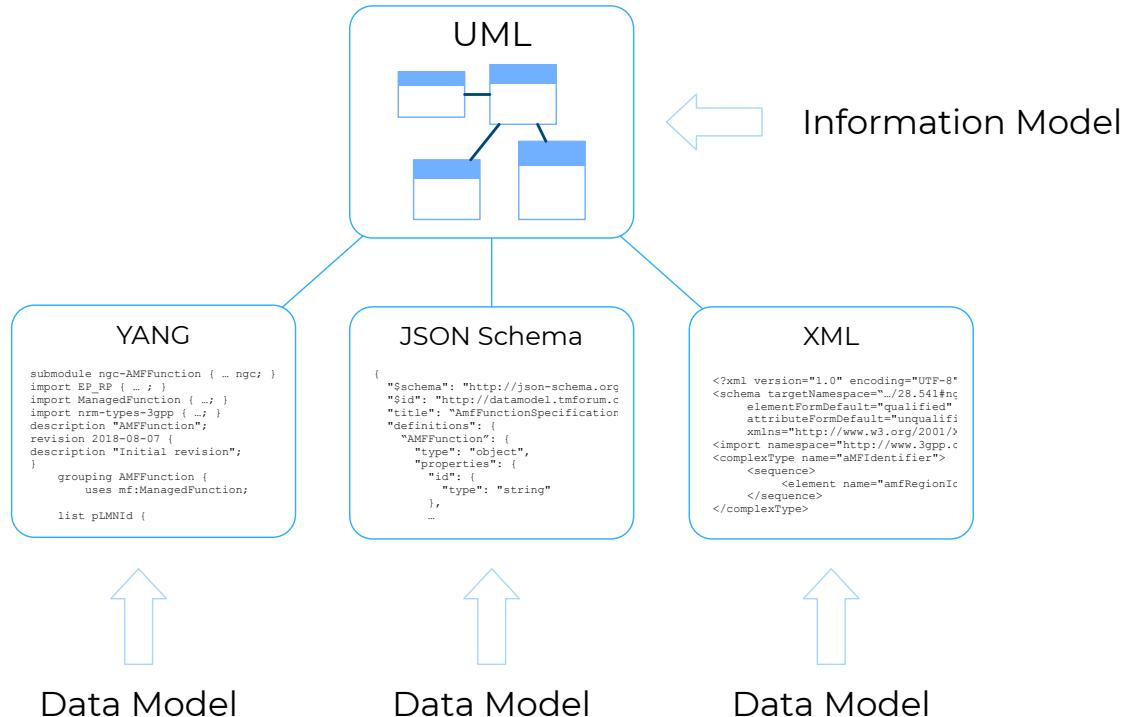
## Instance Model

Representation of an instantiated entity with values which are valid in the context of the Data Model



# Data Model Equivalency

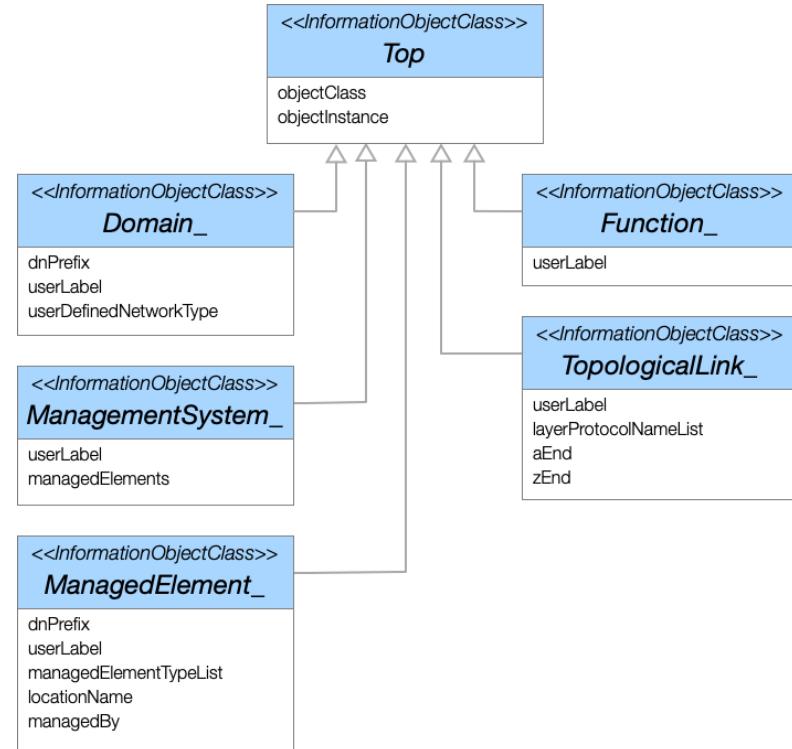
- Data Models derived from a common Information Model are equivalent
- Data values used in one encoding may be mapped to values for another encoding



# FMC FNIM Umbrella Information Model (UIM) (3GPP 32.107)

**UIM** maps simply to TM Forum Information Framework (**SID**):

FNIM (32.107)	3GPP Generic NRM (32.622)	TM Forum SID (GB922)	
		ABE	Class
<i>Top_</i>	<i>Top</i>	Common Domain::Root Business Entities ABE	<i>RootEntity</i>
<i>Domain_</i>	<i>SubNetwork</i>		<i>ManagementDomain</i>
<i>ManagedElement_</i>	<i>ManagedElement</i>		<i>ManagedEntity</i>
<i>ManagementSystem_</i>	<i>ManagementNode</i>	Resource Domain::Resource ABE::LogicalResource ABE	<i>ResourceFunction</i>
<i>Function_</i>	<i>ManagedFunction</i>		
<i>TopologicalLink_</i>	<i>Link</i>		<i>ConnectionPoint</i>
	<i>EP_RP</i>		



# Generic Network Resource Model (NRM) (3GPP 32.622)

## SubNetwork

set of managed entities

## ManagementNode

element manager (EM)

## ManagedElement

network element (NE)

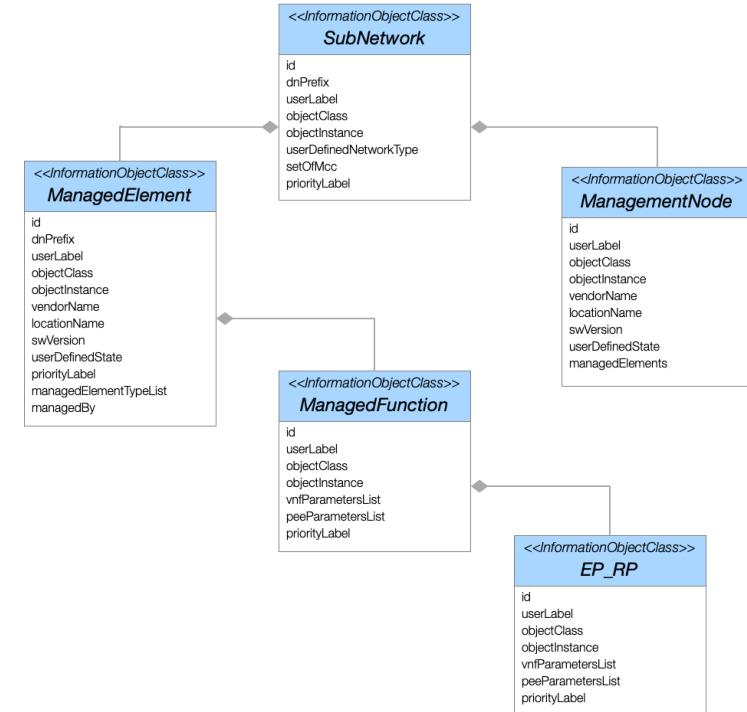
## ManagedFunction

for sub-classing only

represents a telecommunication function (e.g. NetworkSlice, AMF)

## Endpoint (EP\_RP)

represents an end point of a link across a reference point (e.g. X2, N1)



## 5G Network Slice NRM and ETSI NFV Information Model

### NetworkSlice

network slice instance

### NetworkSliceSubnet

network slice subnet instance

### ManagedFunction

5GC Function (AMF, SMF, UPF, ...)

### NetworkService

composition of Network Functions (NF) representing a group of VNFs and PNFs that are supporting the network slice subnet instance

### VNF

NF deployed on NFVI

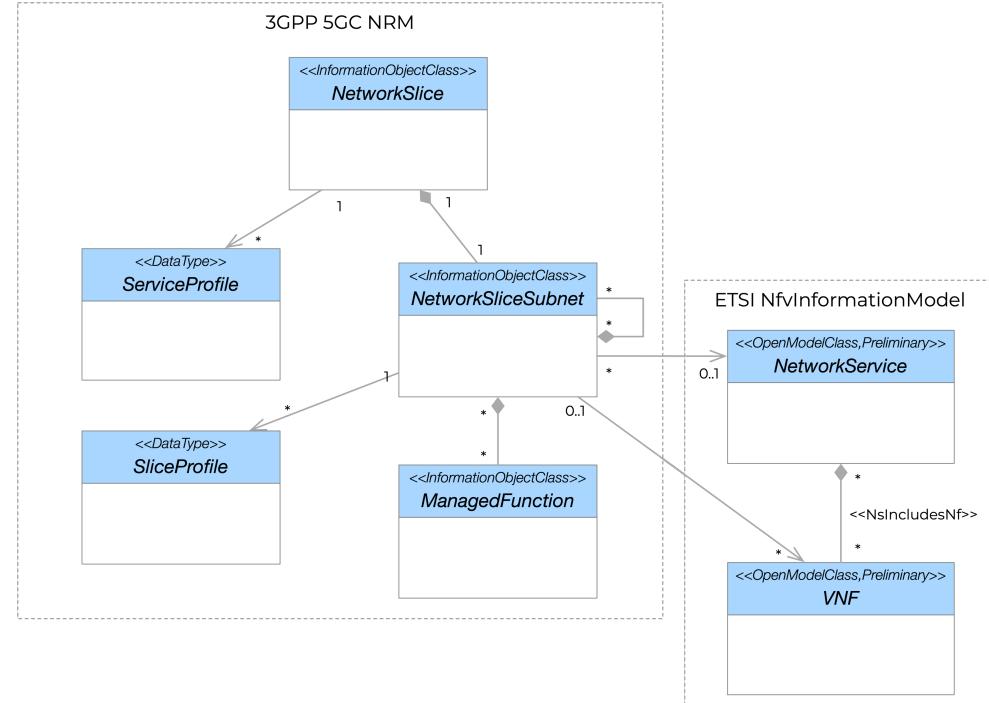


Figure 6.2.1-1: Network slice NRM fragment relationship

# Fault Management (FM) Information Model (3GPP 32.111-2, ITU X.721)

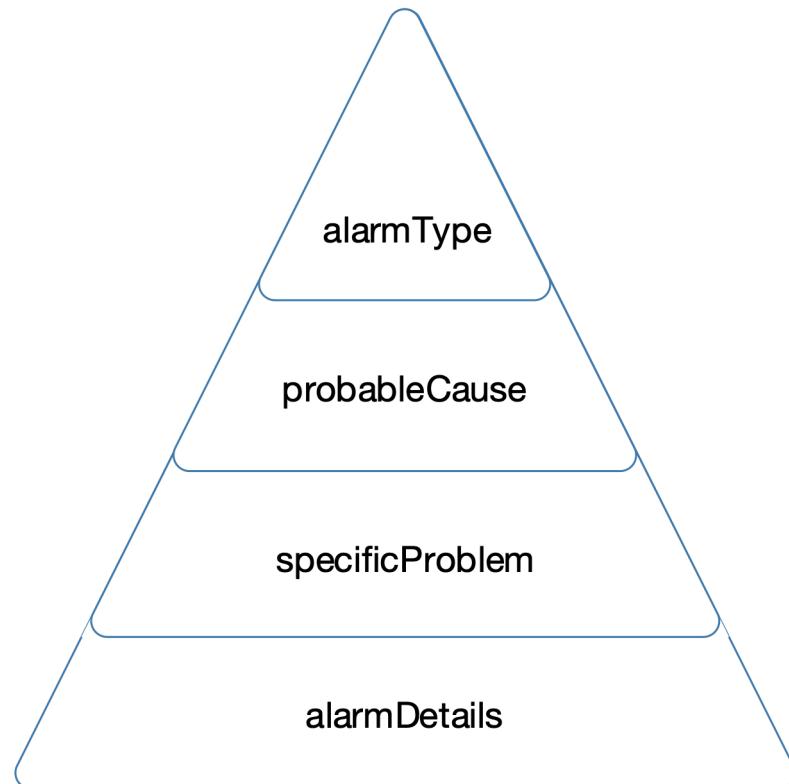
The information model for an “alarm” is more prescriptive than most implementors realize

The categorization of alarms, in increasing level of detail, requires:

**alarmType**: one of a small number of enumerated values

**probableCause**: one of a large number of enumerated values

**specificProblem**: index into context specific list



# Questions?

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