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Nephio North Bound API for OSS Integration

Analysis and Potential Approaches

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Nephio – Specifications of NorthBound API

Nephio target scope is to orchestrate Cluster Infra and Network Function deployment along with Network Service Topology provisioning which essentially covers the whole MANO Control plane.
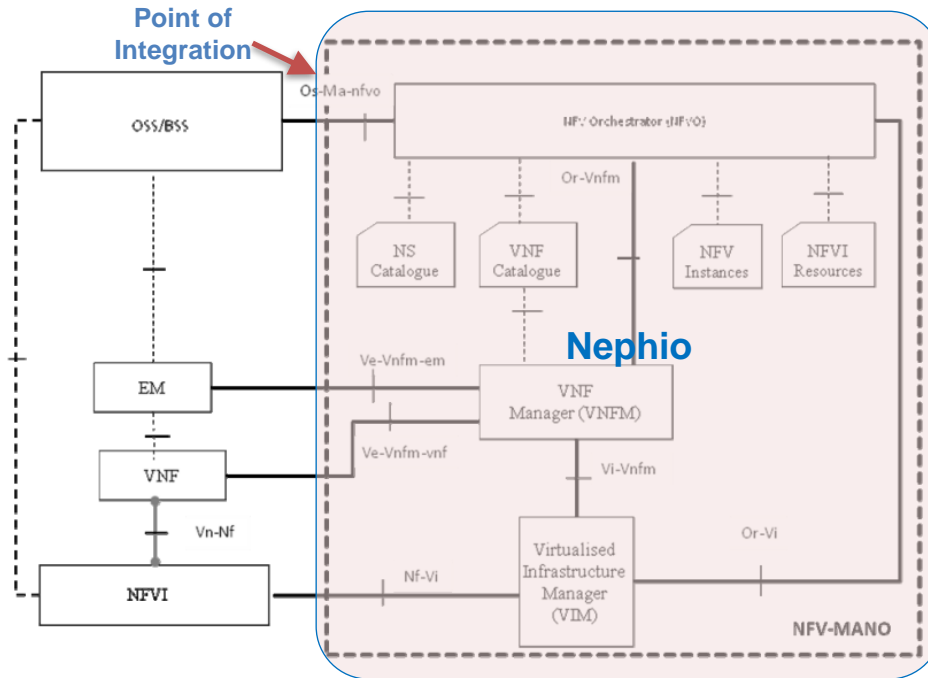
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Most Relevant, Priority 1 Operations:

- Network Service Descriptor (NSD) Management and Notifications APIs

- VNF Package Management and Notification APIs

- Network Service Lifecycle Management and Notification APIs

Not so Common, Priority 2 Operations:

- Network Service Performance Management and Notification APIs

- Network Service Fault Management and Notification APIs

- NFVI Capacity Information APIs

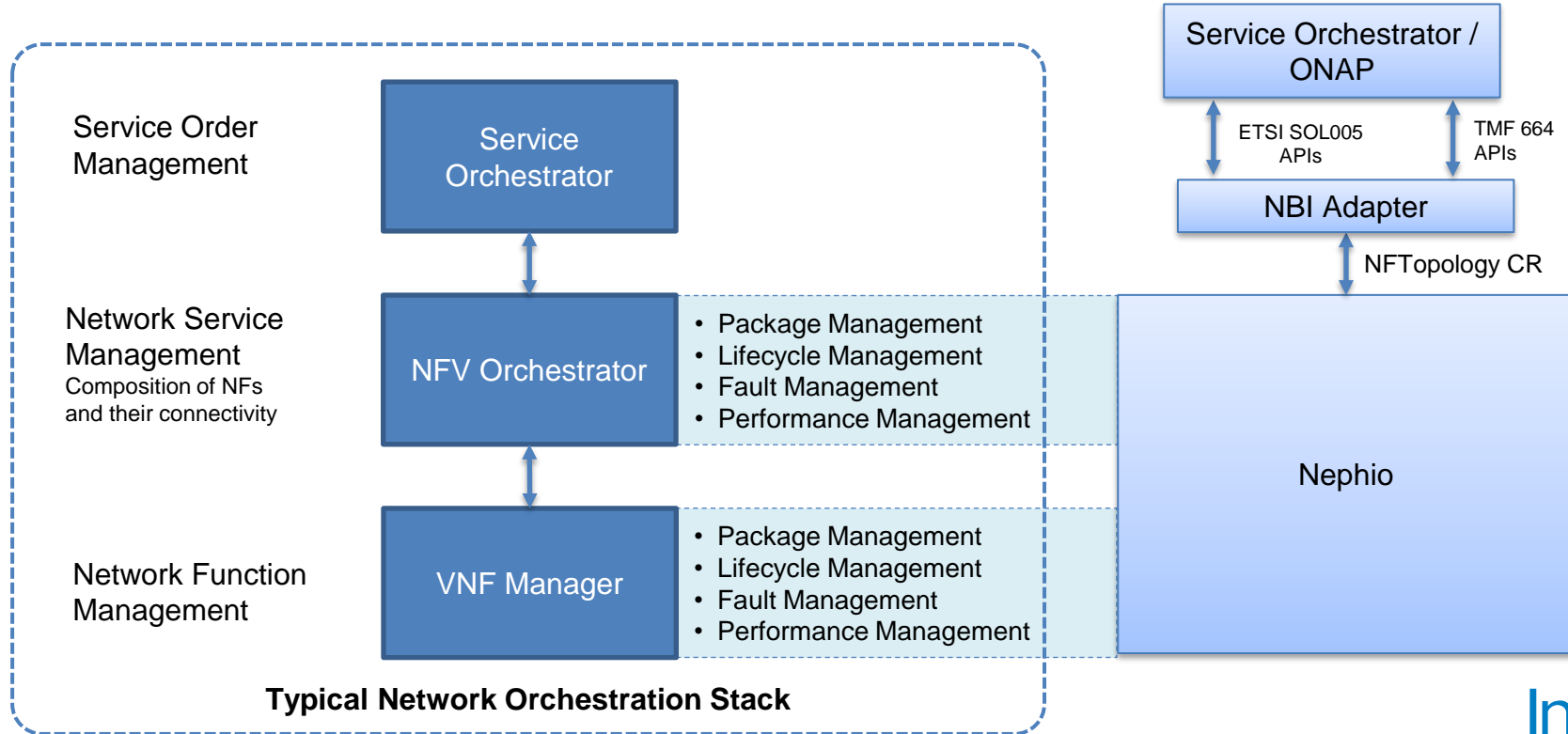- VNF Snapshot Package Management APIs

Network Function Package Management in Nephio

- Nephio is managing onboarding of NF packages from External/Vendor Repos via CLI/UI

- Lifecycle Management of packages is driven through Porch based approval workflow

- Currently Network Service package concept is missing but NFTopology* is the first steps towards the same

NFTopology Source: https://github.com/s3wong/nf-deploy-controller/blob/main/doc/r1-design.md

Network Service Lifecyle Management in Nephio

- Nephio is currently performing individual Network Function Lifecycle management in Closed-Loop mode in Edge clusters using NF specific Operators acting like VNF Managers

- NFTopology support will add elements of NS Lifecycle management to it; however NFTopology based approach has unique characteristics:

  - NFTopology schema defines modeling of Network Functions connected through Networks and Connection Points (Design Time modeling usually defined through NS Descriptor)

  - NFTopology CR triggers the Creation/Instantiation of composed Network Functions (Run Time operations usually performed via NF Lifecycle operations)

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Nephio – Current Functional Scope and Proposed NBI Integration

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Service Order Management

Service Orchestrator

Network Service Management
Composition of NFs and their connectivity

NFV Orchestrator
- Package Management
- Lifecycle Management
- Fault Management
- Performance Management

Network Function Management

VNF Manager
- Package Management
- Lifecycle Management
- Fault Management
- Performance Management

Typical Network Orchestration Stack

Service Orchestrator / ONAP

ETSI SOL005 APIs   TMF 664 APIs

NBI Adapter

NFTopology CR

Nephio

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- [TM Forum 664 Open APIs](#) are used for the provisioning and lifecycle management of Resource Function (RF) in accordance to Use Cases described in [TR255 Resource Function - Activation and Configuration](#) specifications of TM Forum.

- This API allows users to request creation of a composite RF composed of several other atomic or composite resources and connected in a topology.
  - A resource function specification describes features and characteristics of the composite RF as well as the required component resources, their roles and the adjacency relationships among the component resources.

- Both intent-based and detailed-based options are defined for configuration of resource functions

- The API supports following http operations on following resources
  - Resource Function – entity to transform inputs of any nature into outputs of any nature independently from the way it is provided.
  - Monitor – entity for monitoring of resources
  - Heal - Task Resource used to request healing of a Resource Function.
  - Scale - Task Resource used to request scaling of a Resource Function.
  - Migrate - Task Resource used to request migration of a Resource Function.

Resource Function Schema
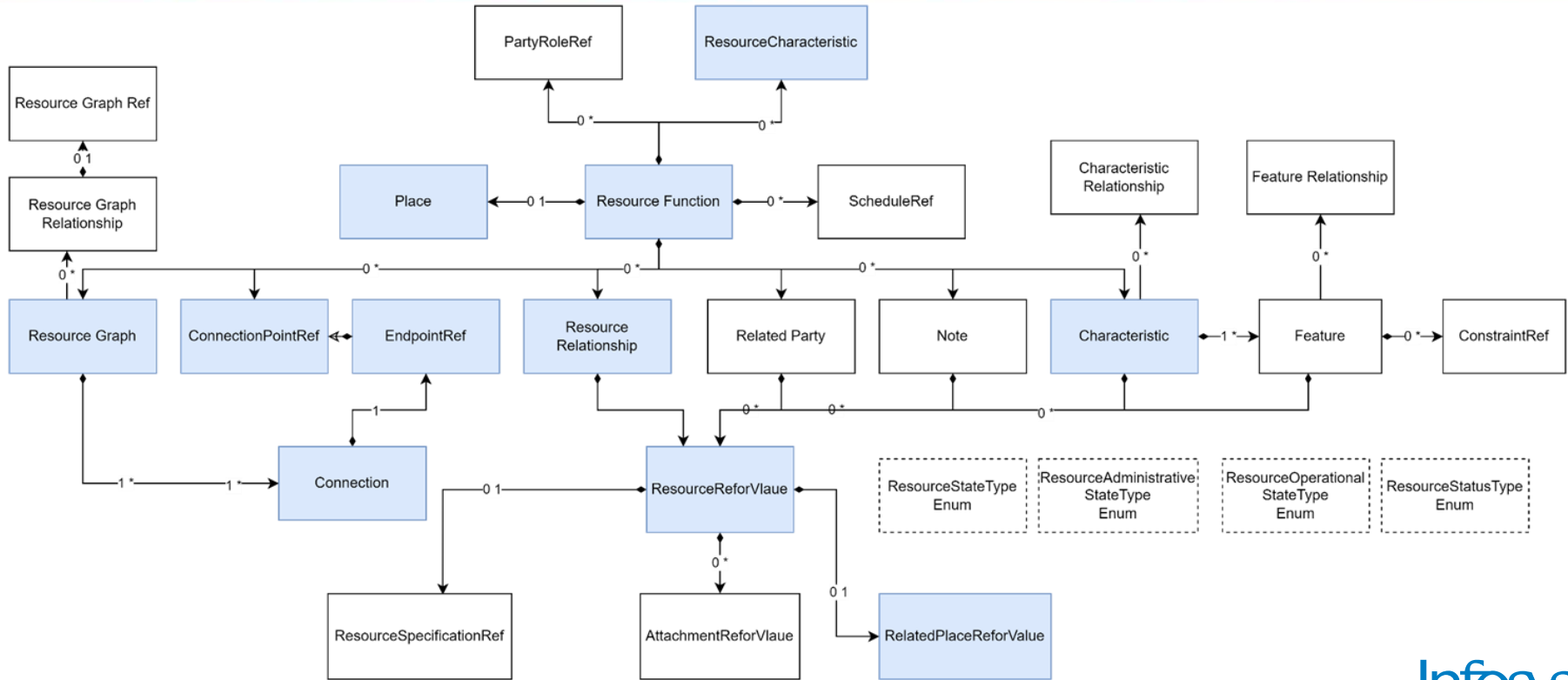
Elements suitable for NF Topology Mapping

NBI Adapter REST APIs – Implementation Options

ETSI SOL005

- Network Service is composed of Network Functions connected together

- Network Service Topology is Design-time activity, modeled using TOSCA (as per SOL001 specs)

- API groups covering all aspects of Network Service i.e. Package, Lifecycle, Fault, Perf management

- Network Service Lifecycle operations cover Create, Instantiate, Terminate, Delete, Scale etc. operations including Async Status Notifications

TMForum 664

- Resource Function can represent both Network Function and Network Service; Resource Function can have child Resource Functions

- Resource Function Topology defined Run-time, represented through the relations between RFs and Connectivity in API Payload

- API groups covering only Resource Function lifecycle management aspects

- Resource Function API group supports Create and Delete operations while Scale and Notifications are supported via other API groups

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Nephio NBI Adapter

- Will expose Rest APIs aligned to TMF 664 Open APIs specifications (Resource Function Activation)
- Will support Resource Function, Monitor, Scale and Notification API groups
- Will convert Resource Function elements in Create API into CR and allows monitoring its status
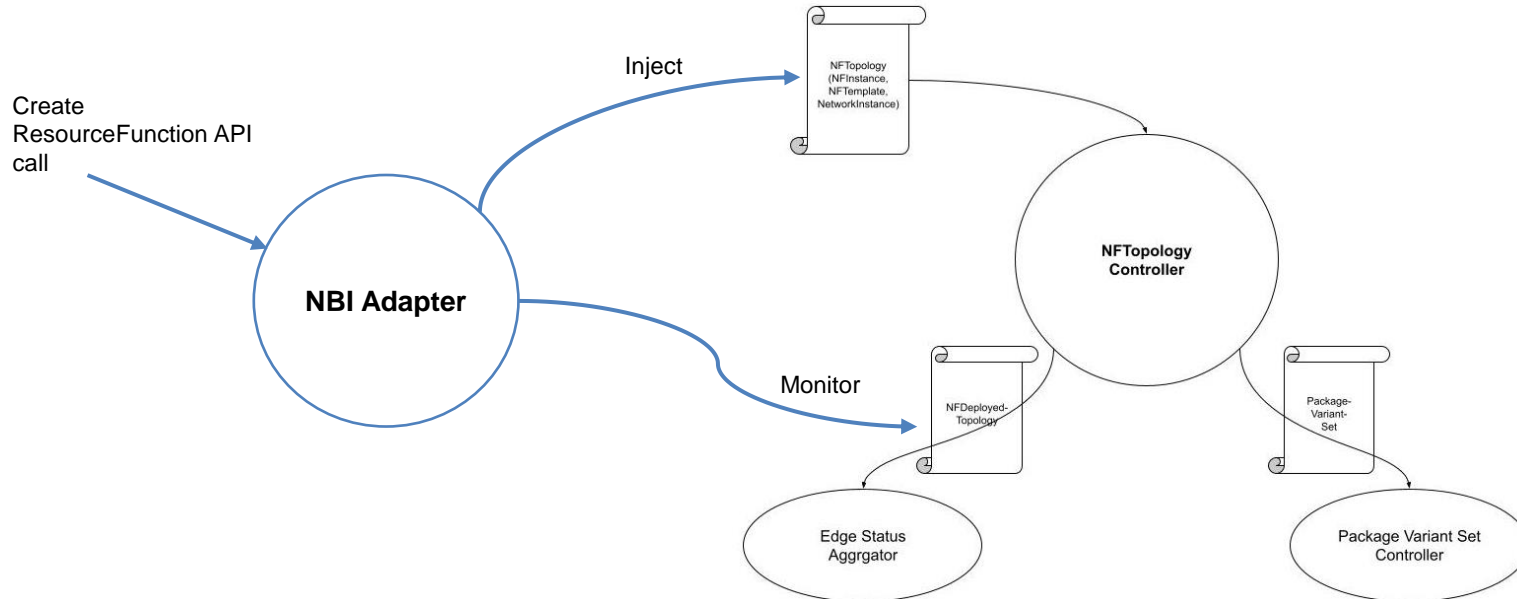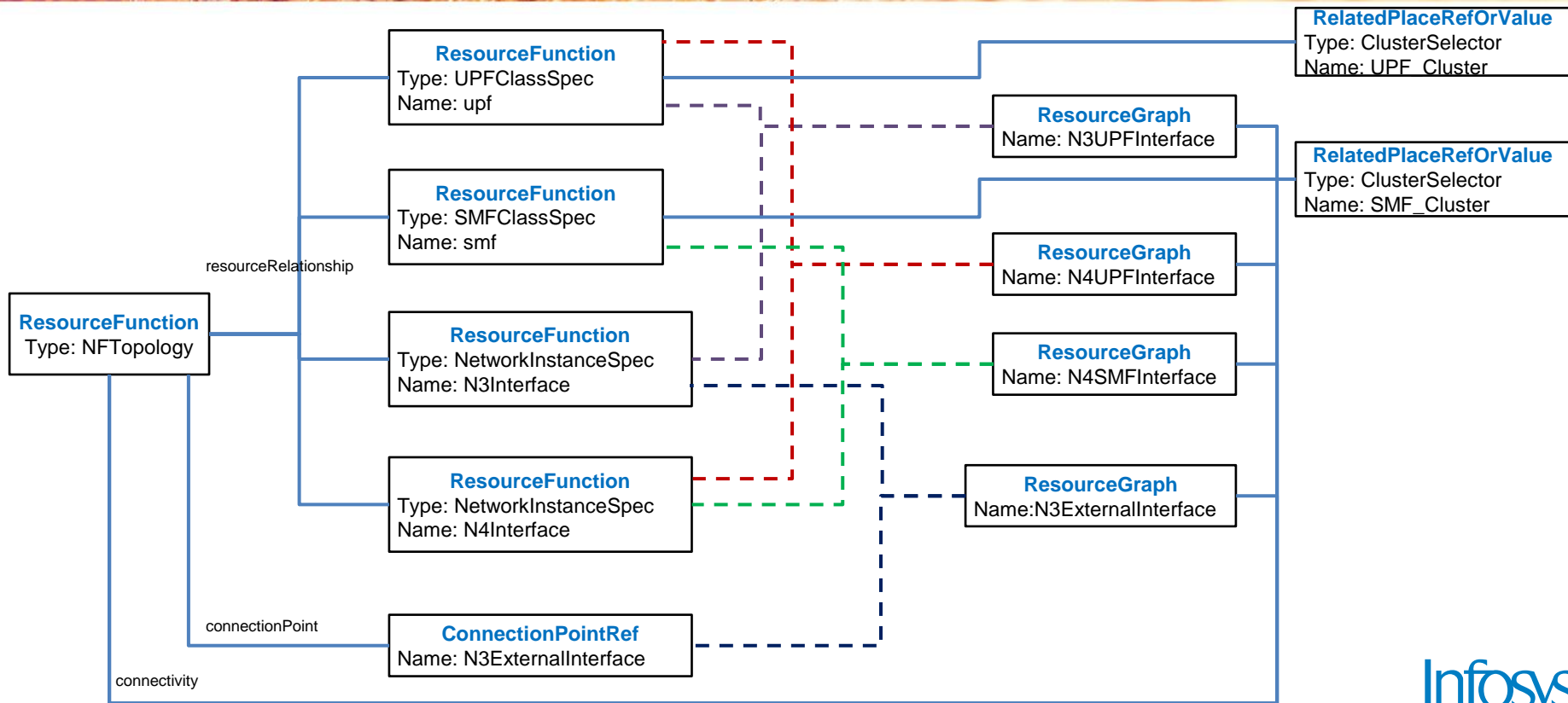
ResourceFunction Create payload for Free5GC Topology

- Basic NFTopology consisting of Free5GC with only UPF and SMF has been considered for this example payload as shown below
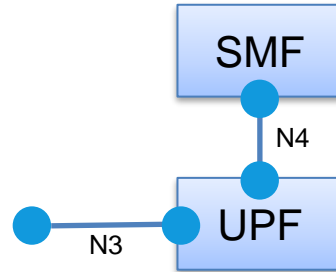
SampleCreateAPI
Payload.json

ResourceFunction Create payload – Json Elements Structure

Resource Function	GET /resourceFunction?fields=...&{filtering}
	GET /resourceFunction/{id}?fields=...&{filtering}
	POST /resourceFunction
	PATCH /resourceFunction/{id}
	DELETE /resourceFunction/{id}
Monitor	GET /monitor?fields=...&{filtering}
	GET /monitor/{id}?fields=...&{filtering}
Scale	GET /scale?fields=...&{filtering}
	GET /scale/{id}?fields=...&{filtering}
	POST /scale
Notifications	POST /hub
	DELETE /hub/{id}
	POST /client/listener

Thank you