ONF Transport API

Opening up Disaggregated Optical Transport Applications *

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Dec 3, 2018

*animated slides

ONF TAPI

Introduction & Overview

Transport API – Simple Problem Statement

APP

Network Orchestrator

Open Standard T-API

ONOS APIs

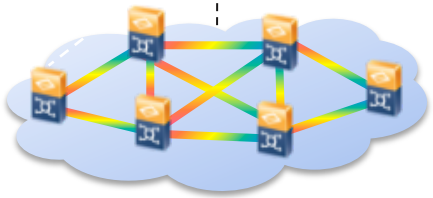
ODL APIs

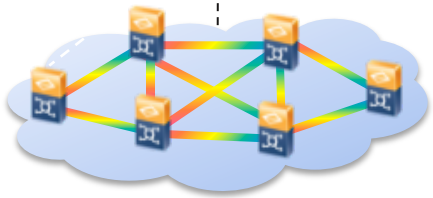
Proprietary APIs

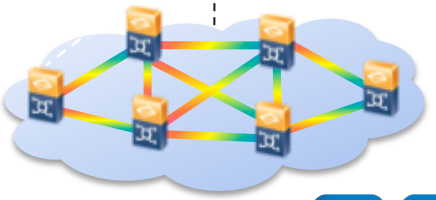
ONOS

ODL

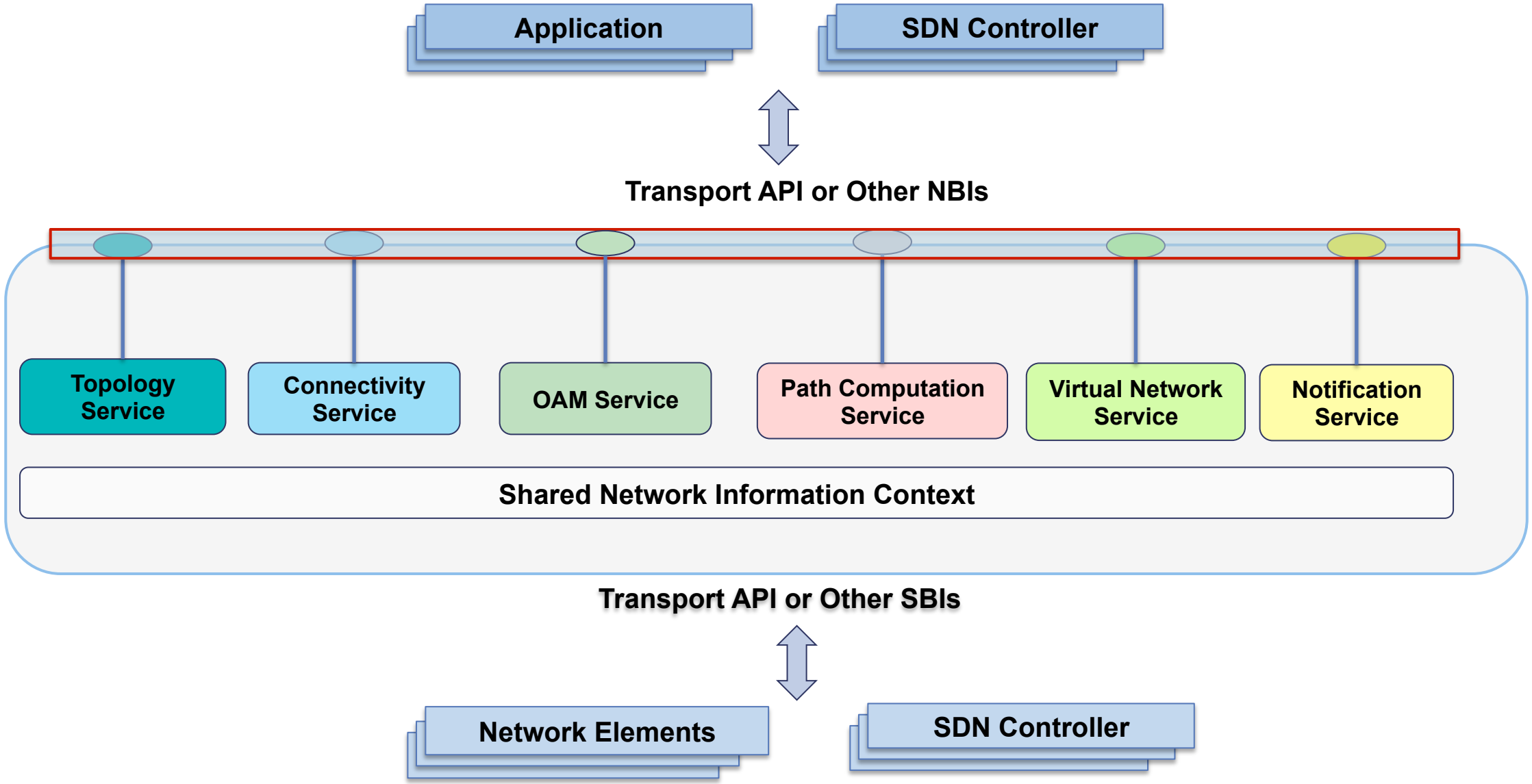
Proprietary



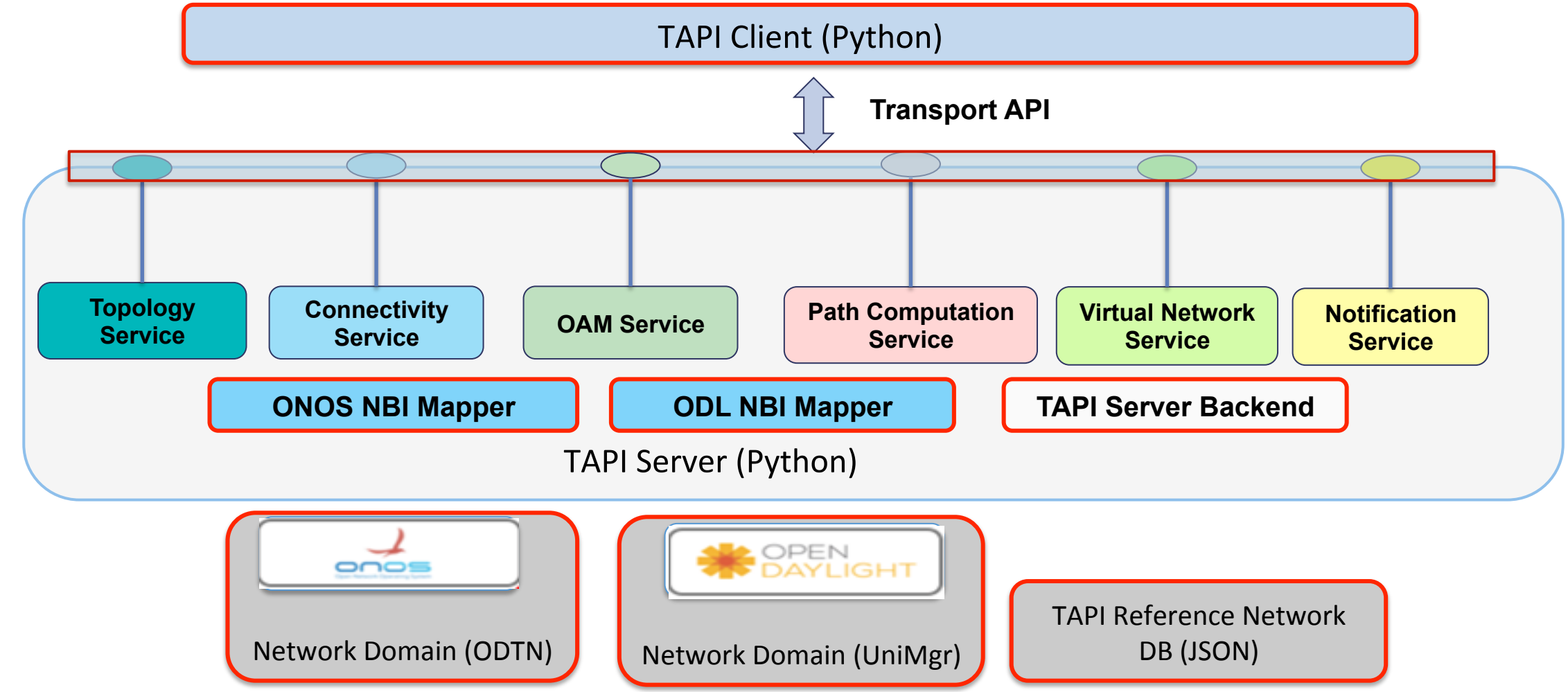




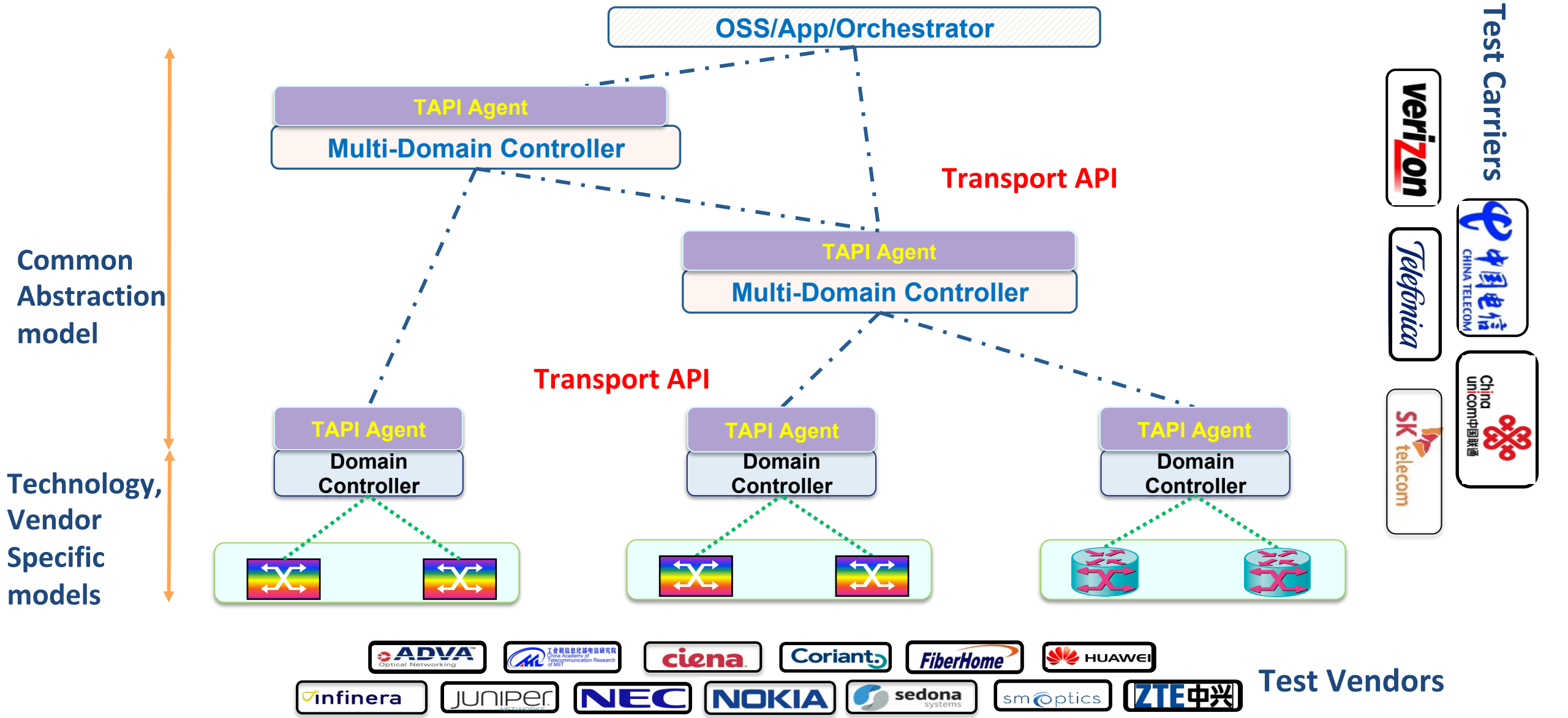
ONF Transport API (TAPI): Functional Architecture



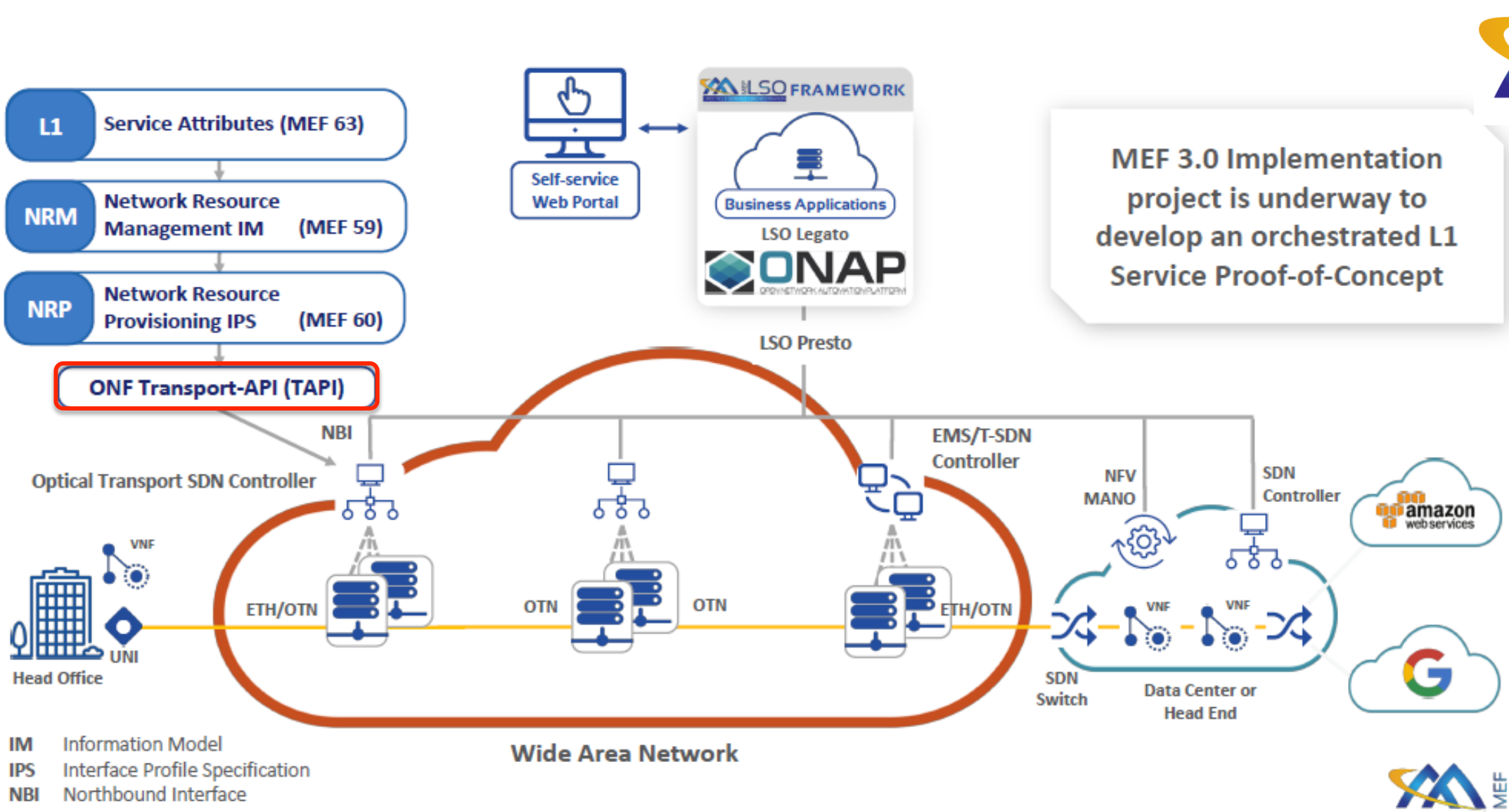
TAPI RI - Prototyping Controller-agnostic API



OIF Transport API Interop Demo (2014, 2016, 2018)

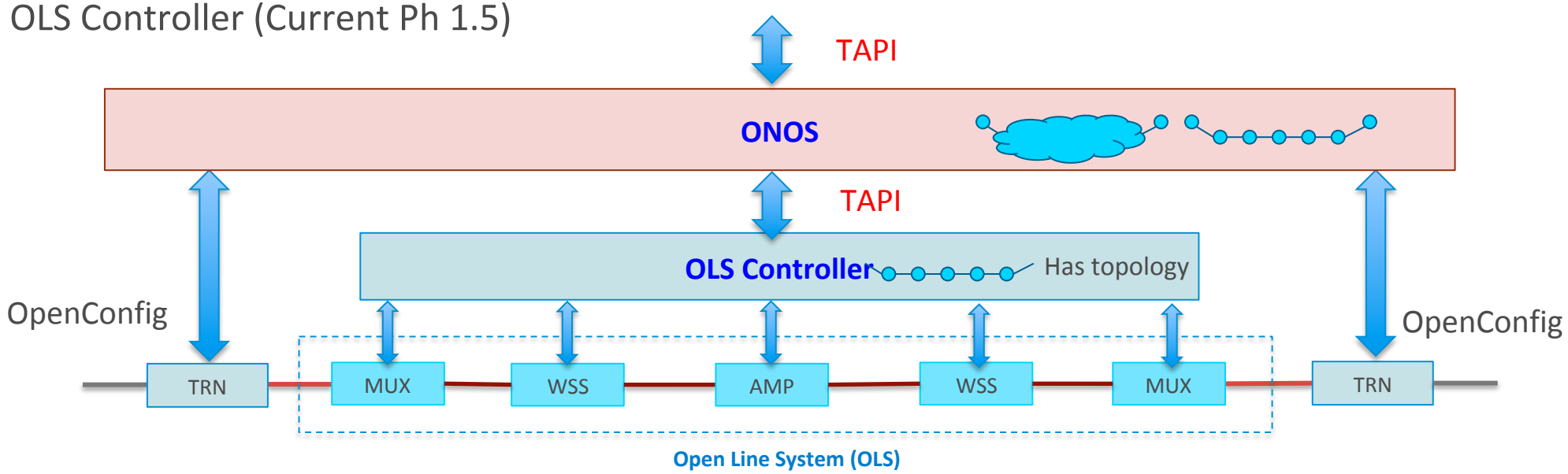


MEF 3.0 Optical Transport Implementation Project

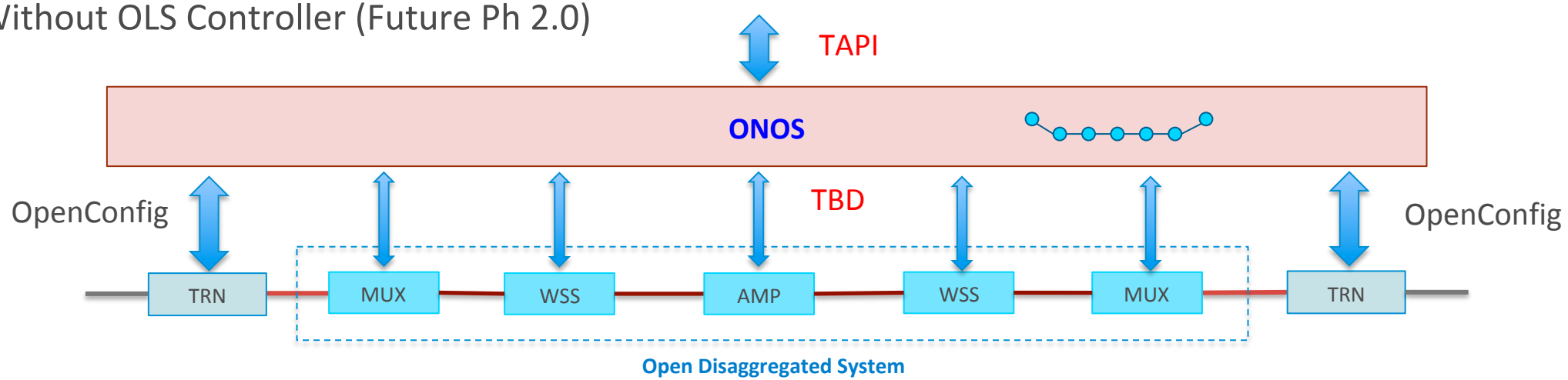


ONF ODTN (Open Disaggregated Transport) Architectures

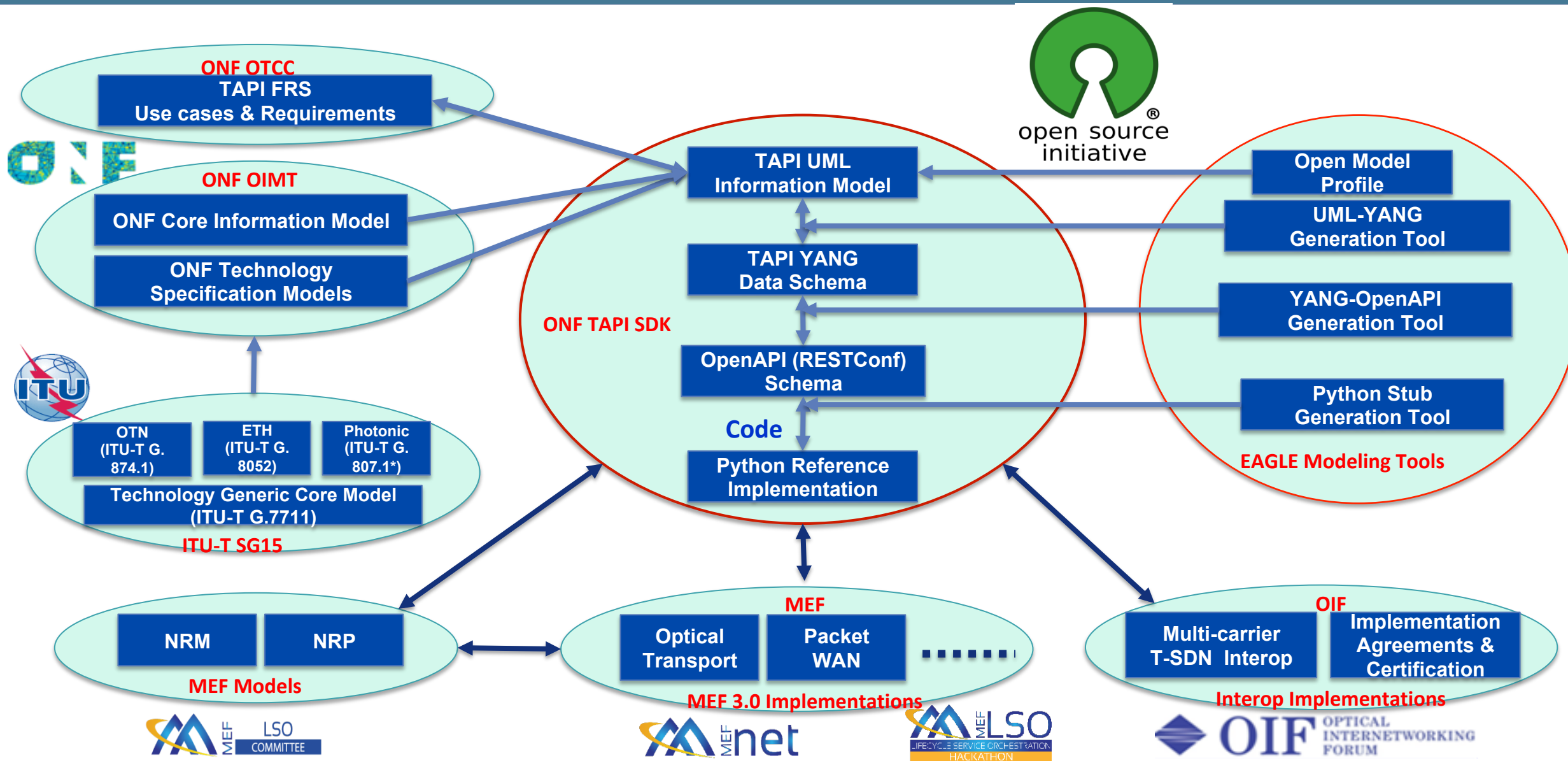
With OLS Controller (Current Ph 1.5)



Without OLS Controller (Future Ph 2.0)



Confluence of Standards and Open Source



TAPI Feature Set

TAPI SDK 1.x (H2 2016)

- **Topology Service**
  - Logical (abstract/virtual) Topology, Node, Link & Edge-Point (Across al layers)
- **Connectivity Service**
  - Retrieve & Request P2P, P2MP, MP2MP connectivity (Across all layers)
- **Path Computation Service**
  - Request for Computation & Optimization of paths
- **Virtual Network Service**
  - Create, Update, Delete Virtual Network topologies
- **Notification Framework**
  - Subscription and filtering
  - Autonomous/Push mechanism

TAPI SDK 2.x (H2 2018)

- **Node Constraints**
  - Ability to specify connectivity/blocking constraints
- **Resilience & Protection**
  - Multi-layer, Multi-Domain
  - Based on use cases under discussion
- **OAM/Monitoring/PM**
  - Consistent Multi-layer abstraction and model – L0-L2
- **Alarm/TCA/Counter**
- **Multi-Technology**
  - Photonic Media spec models
  - ETH & OTN enhancements
  - Microware TBD

Transport API Summary

General Benefits

- **Provides functions necessary for multi-domain orchestration**
  - Topology view and abstraction
  - Connectivity establishment
  - Hierarchical Abstraction
  - Migration path for legacy systems
- **Different types of topology abstraction**
  - Abstract Node (single, edge, sliced, etc)
  - Abstract Link
  - Complete (1-to-1) internal topology
- **Supports multiple transport technologies**
  - Packet Transport (Ethernet, MPLS-TP)
  - Optical Transport (OTN, DWDM)
- **Interoperability on North-South Orchestrator/Controller interface**

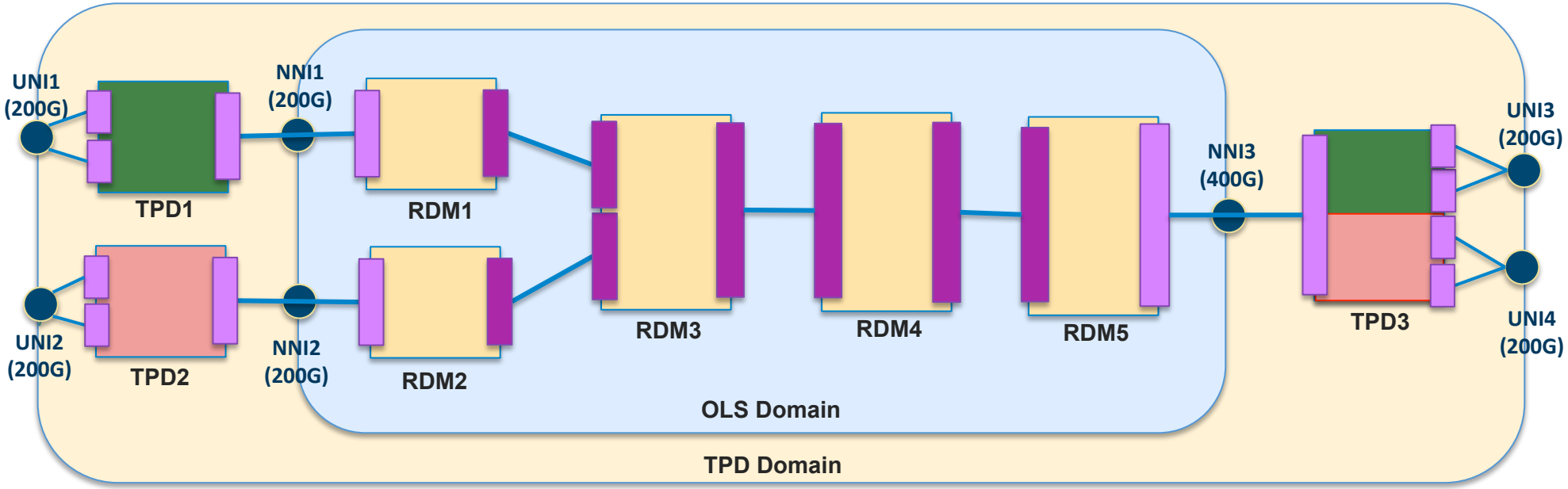
TAPI Next Steps

- **TAPI 2.x fixes & enhancements**
  - Photonic Model updates based on ODTN feedback
  - ETH, L1 & OAM alignment due to interaction with MEF (NRM-OAM/SOAM, L1) projects
  - YANG & OpenAPI/RESTConf Best Practices
    - Based on MEF-PRESTO (ODL), ODTN (ONOS) and OIF (TAPI Interop) activity feedback
- **TAPI 3.0 Items (Current)**
  - Equipment Inventory & configuration
    - Equipment, Holders (Rack/Shelf, etc), Connectors, Fiber, etc
  - Topology Pacs/Datatypes (Capacity, Cost, Latency, Risk parameters) enhancements
  - Rationalize/tune the component-system pattern for Topology & Connectivity

ONF TAPI

Logical Topology & Forwarding Concepts with Photonic Example

Simple Physical Network Example to illustrate T-API



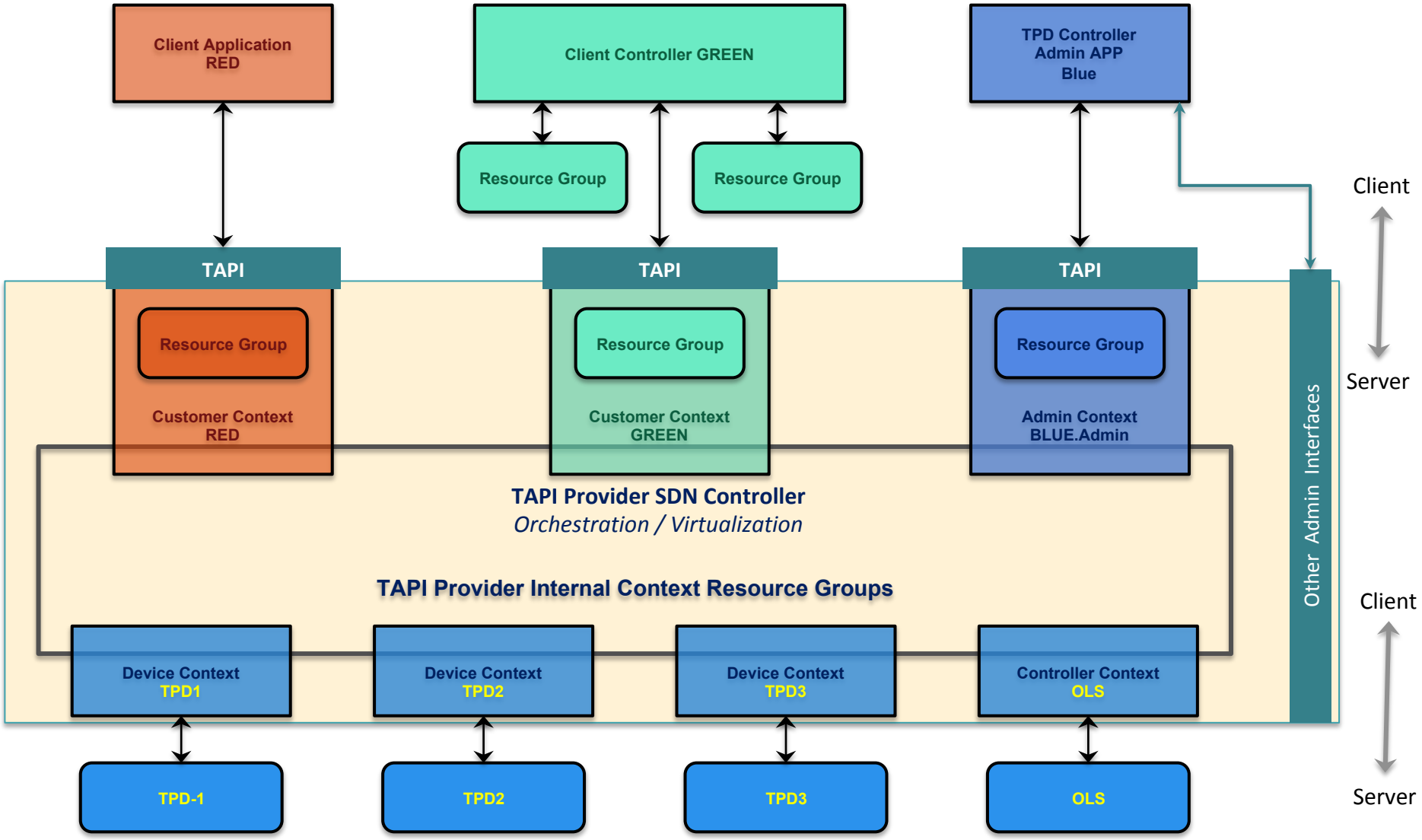
Abbreviations
TPD – Transponder Node
RDM – ROADM Node
UNI – User-Network Interface
NNI – Network-Network Interface
NMC – Network Media Channel
NMCA – NMC Assembly
OTSi – Optical Tributary Signal
OTSiA – OTSi Assembly

- A Network Provider with 2 operator domains :
  - Transponder domain
  - OLS/ROADM domain
- And with two Customers (Red and Green) connected to Transponders
- No Switching on TPD Nodes - DSRs are mapped into ODU into OTSi
- Only Photonic switching assumed on ROADMS

Logical Termination Points shown
Service Interface Point
Node Edge Point (Network Edge)
Node Edge Point (Network Internal)
Connectivity Service End Point

Example T-API Contexts

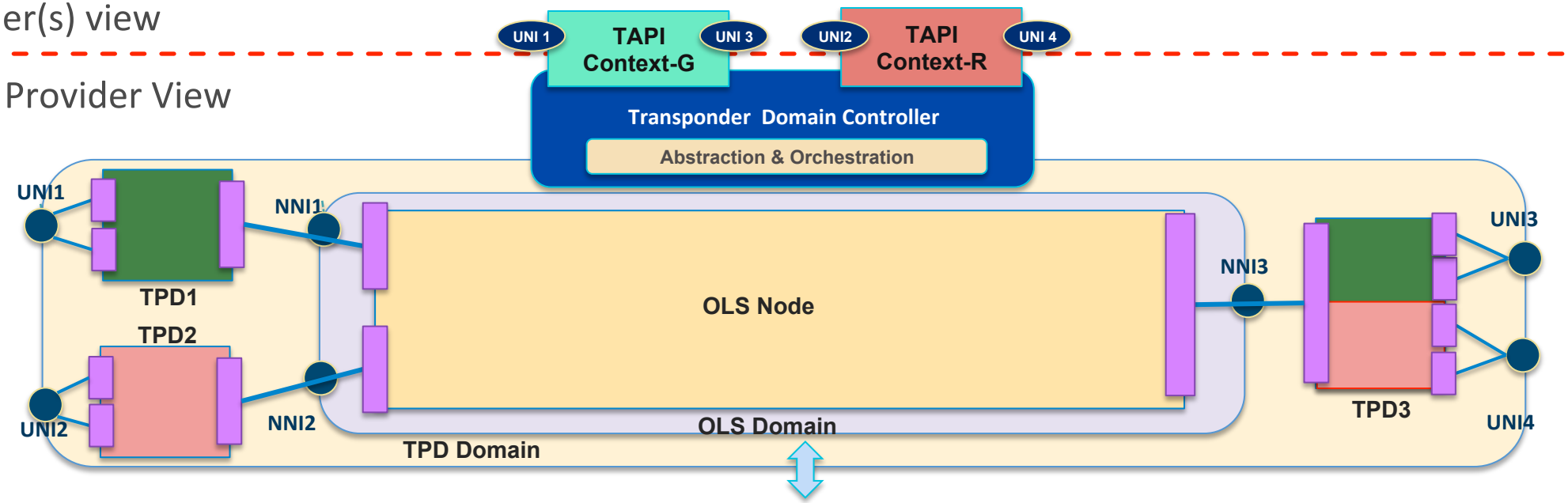
(based on ONF Architecture v1.1)



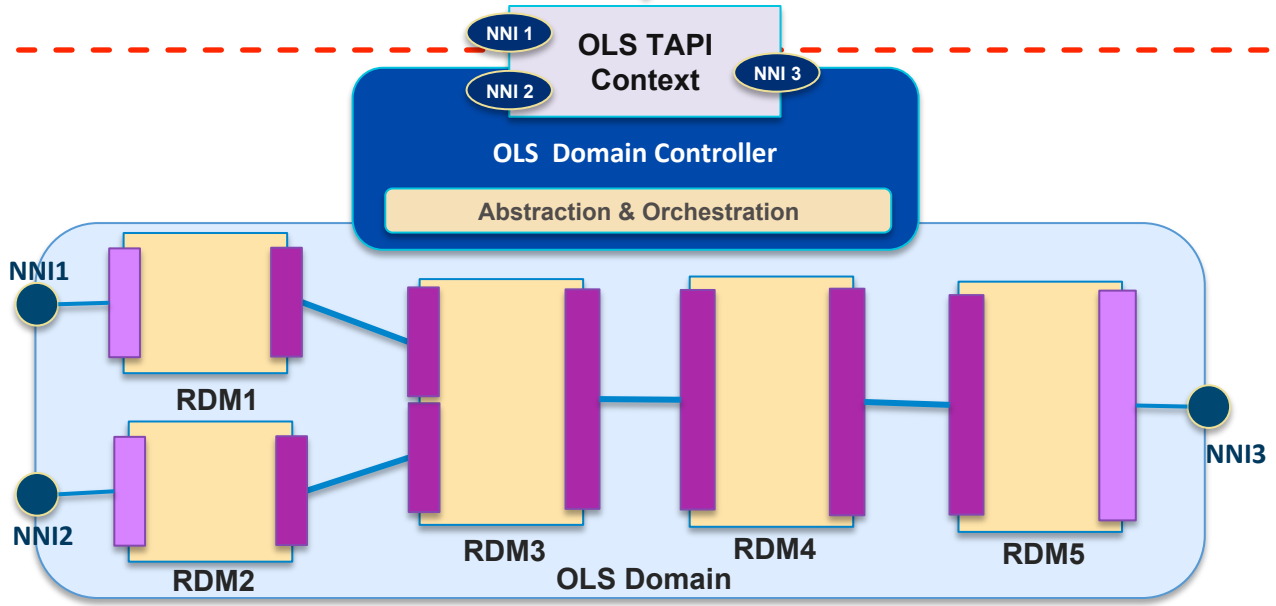
Example 1: Hierarchical TAPI Control Domains & Abstracted OLS Topology

Customer(s) view

Network Provider View



OLS Operator View



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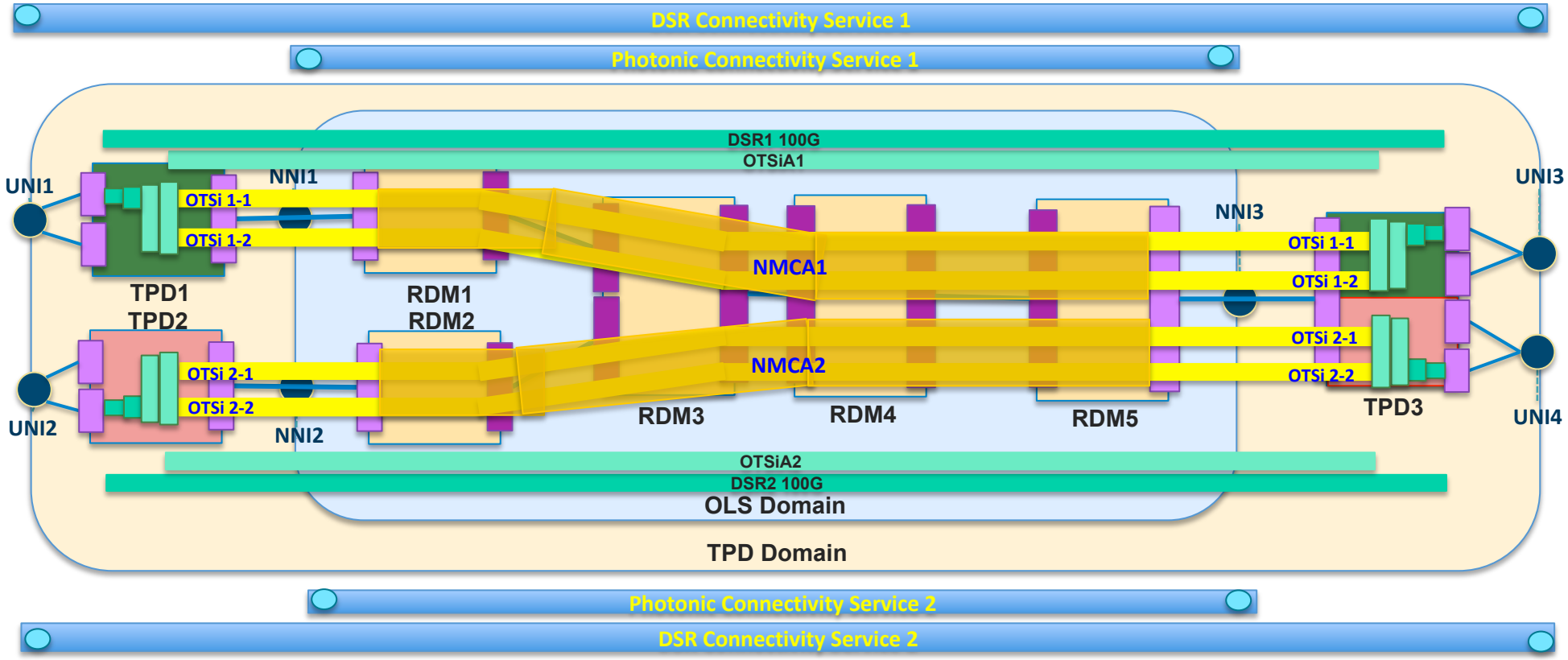
Example 1: E2E Connectivity Request Flow (Omnipotent view)



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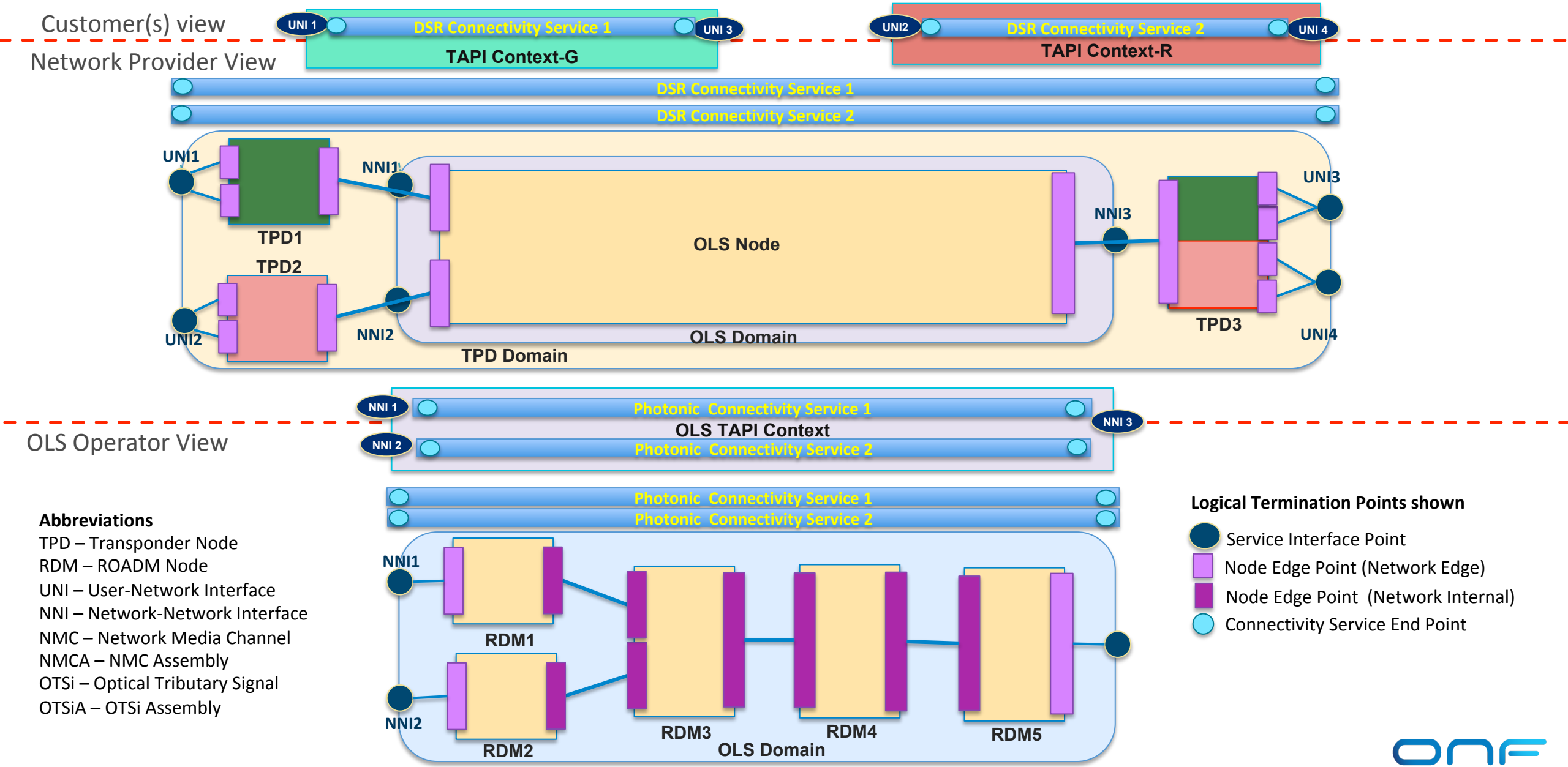
Example 1: E2E Connectivity Request Flow (actual TAPI Contexts view)



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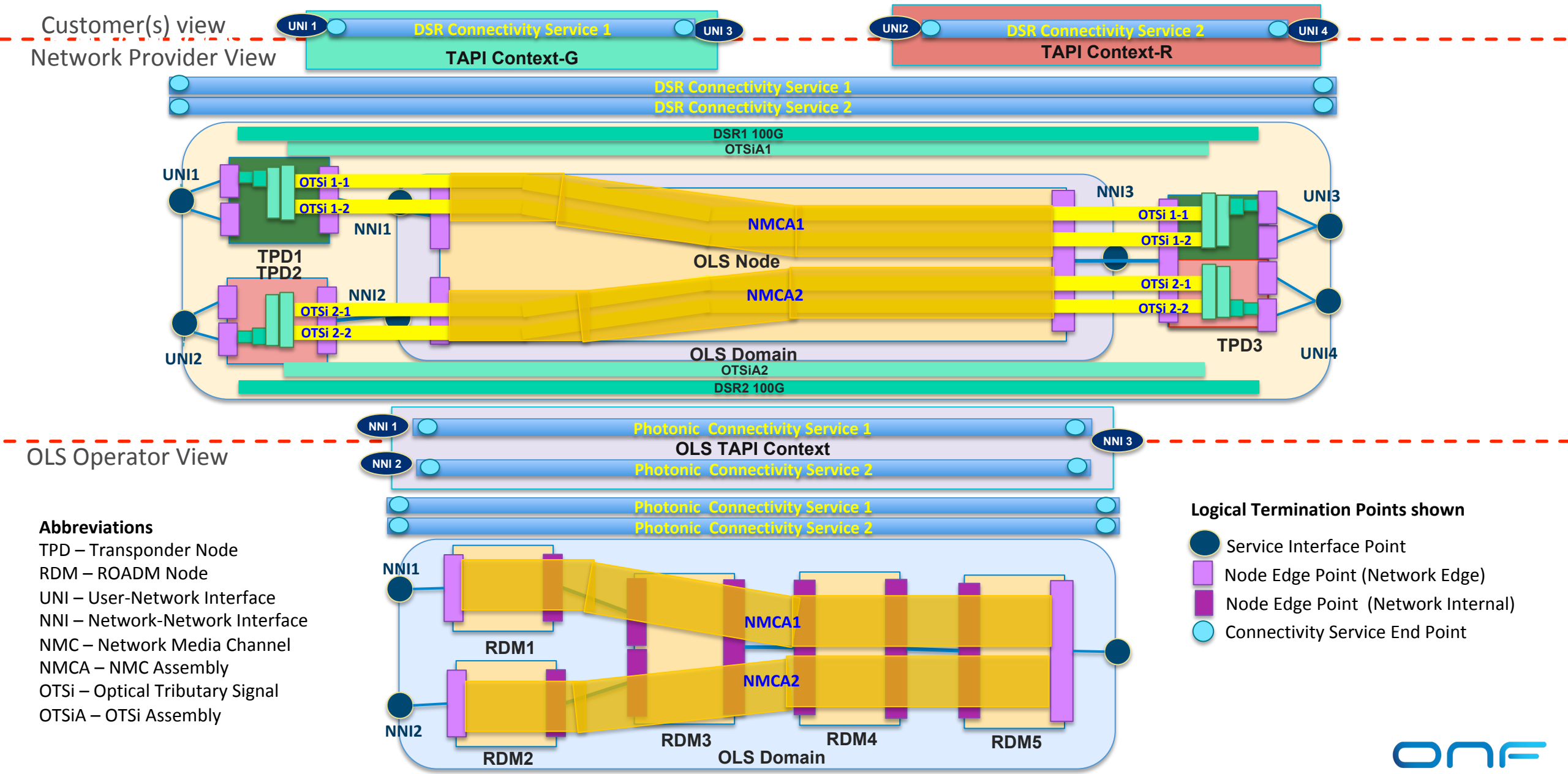
Example 1: Connectivity Request Flow /w provisioned Connectivity



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Logical Termination Points shown

- Service Interface Point
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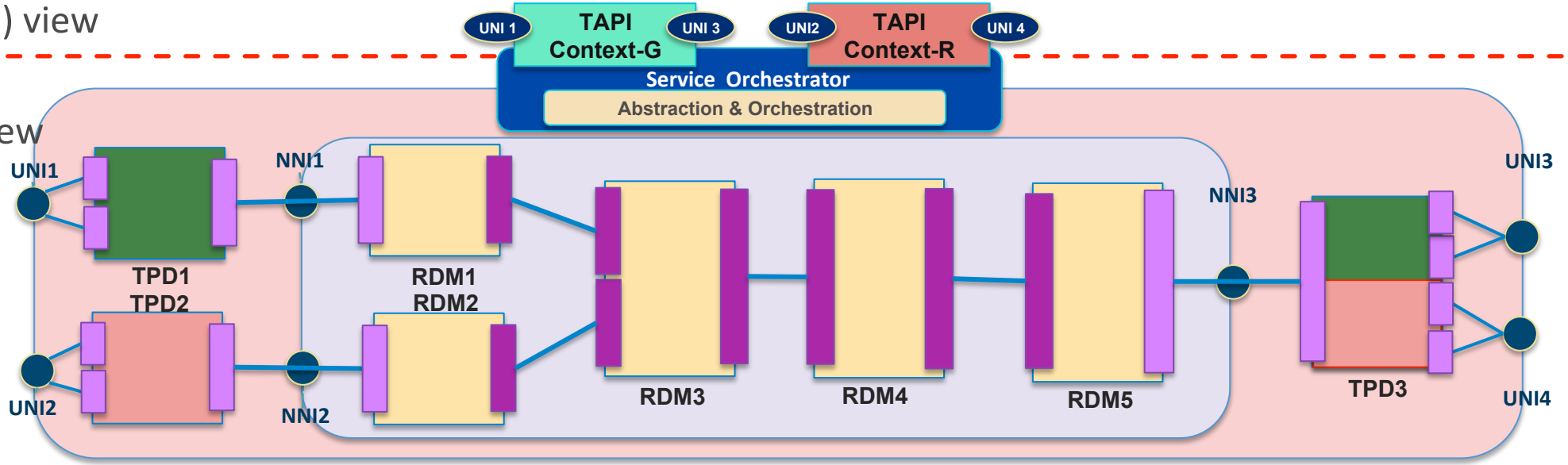
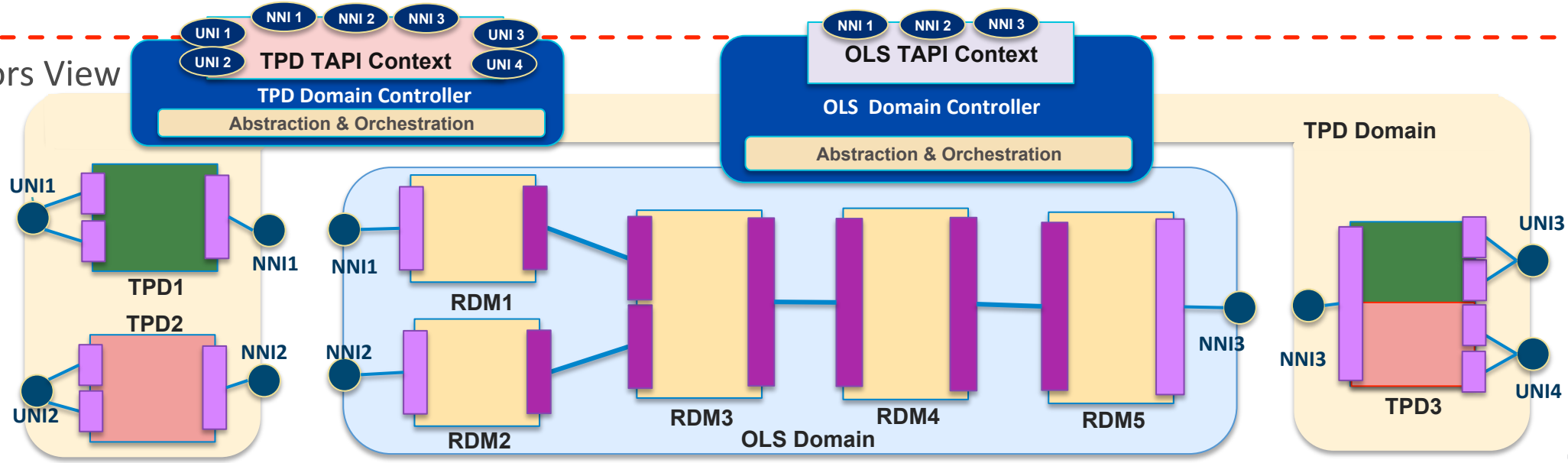
Example 2: Alternate TAPI Control Domains – Orchestration architecture

Customer(s) view

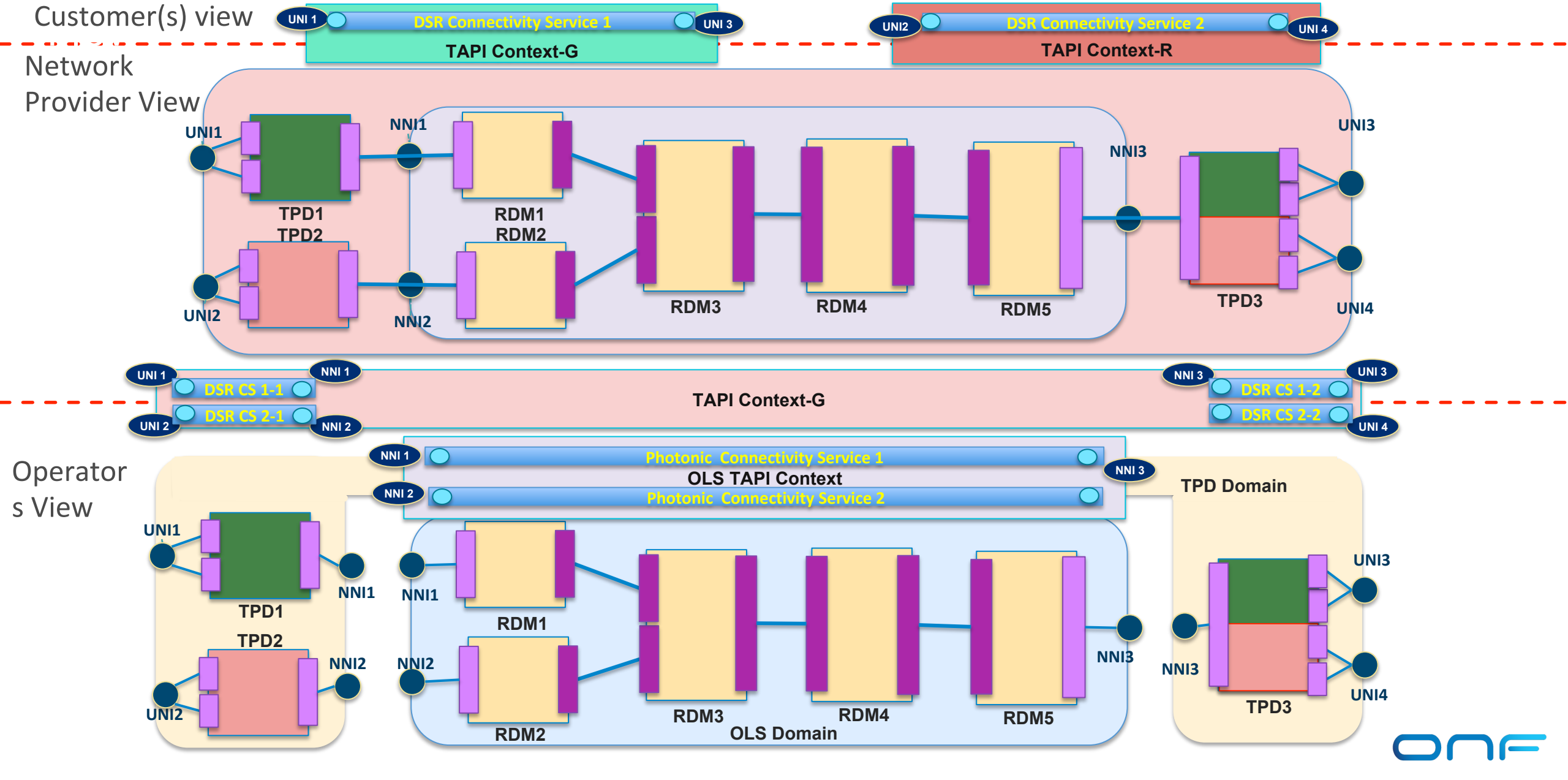
Network Provider View



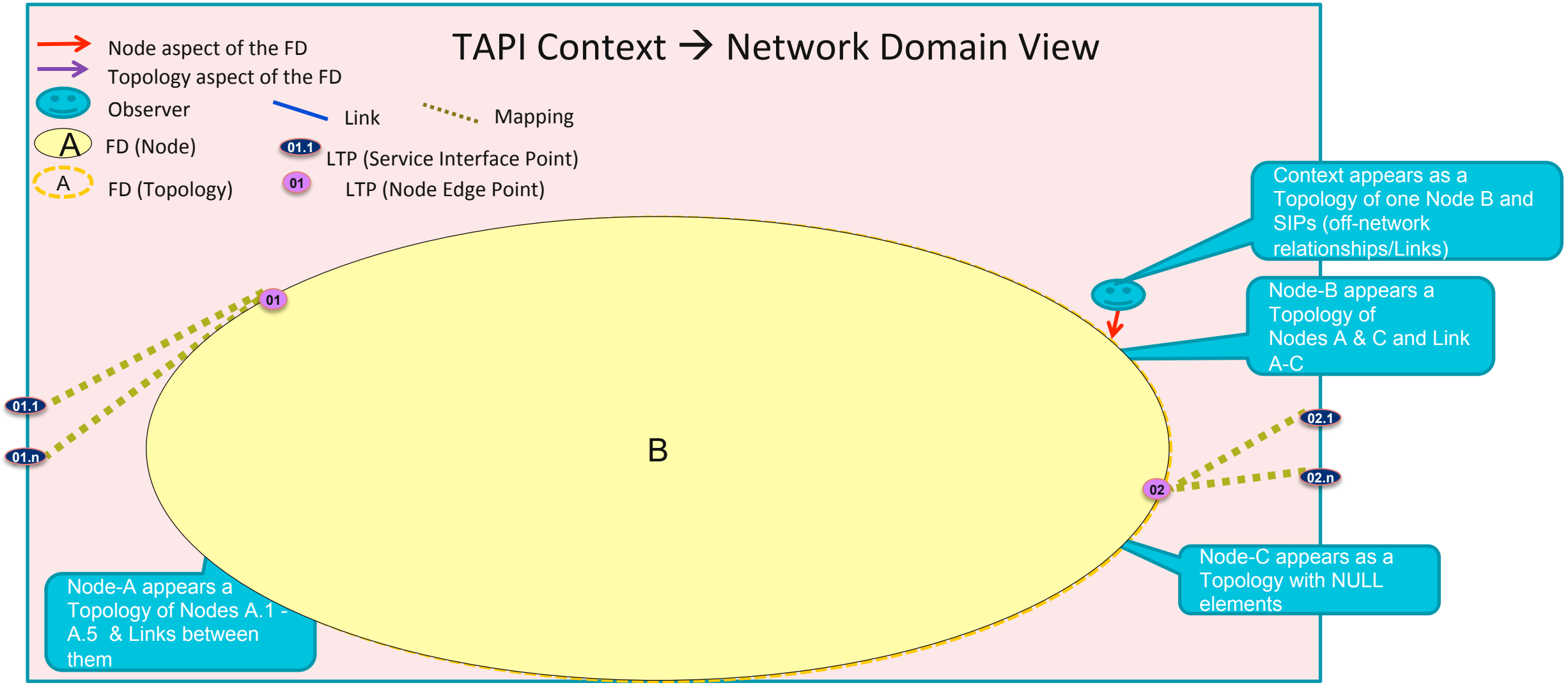
Operators View



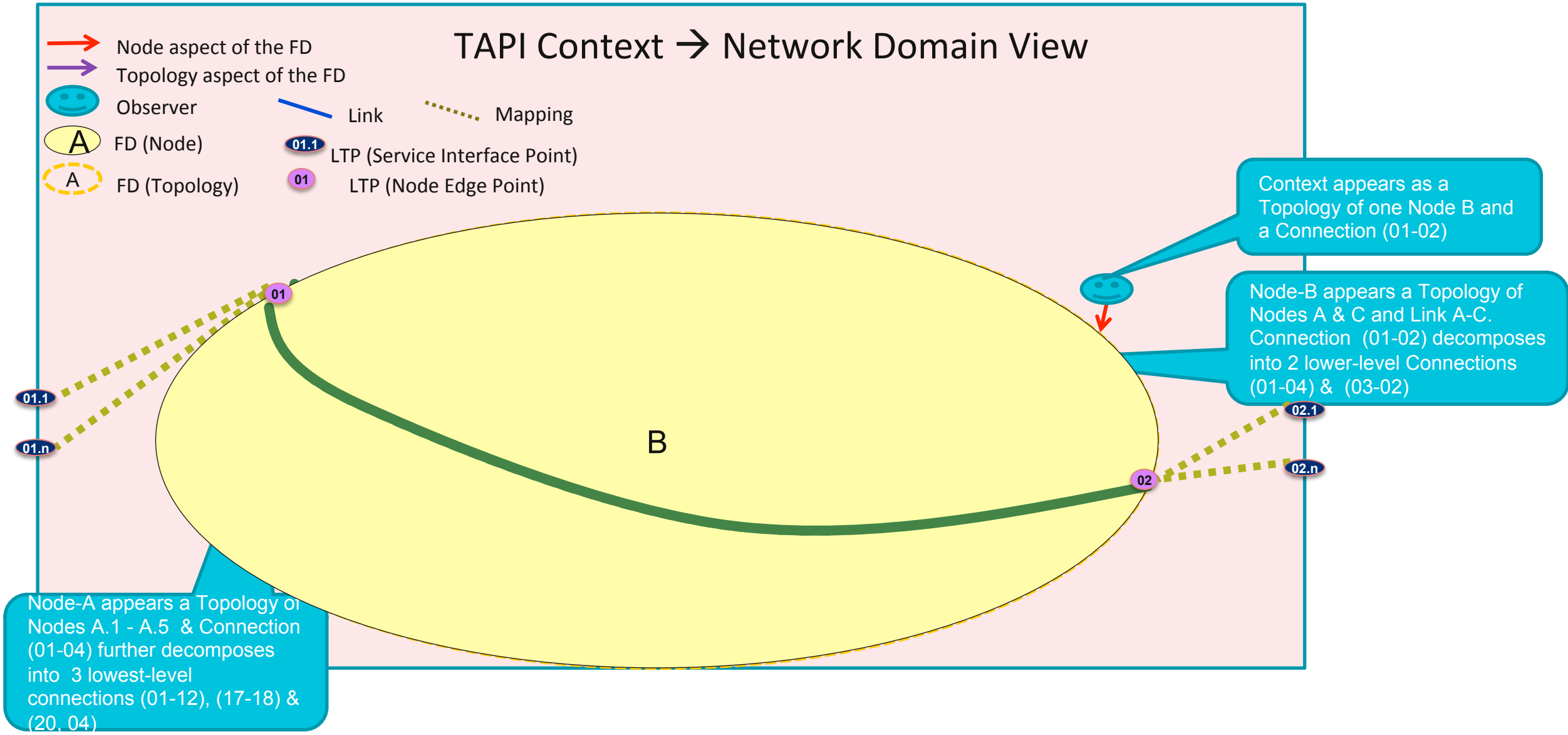
Example 2: Alternate TAPI Control Domains – E2E Connectivity Request



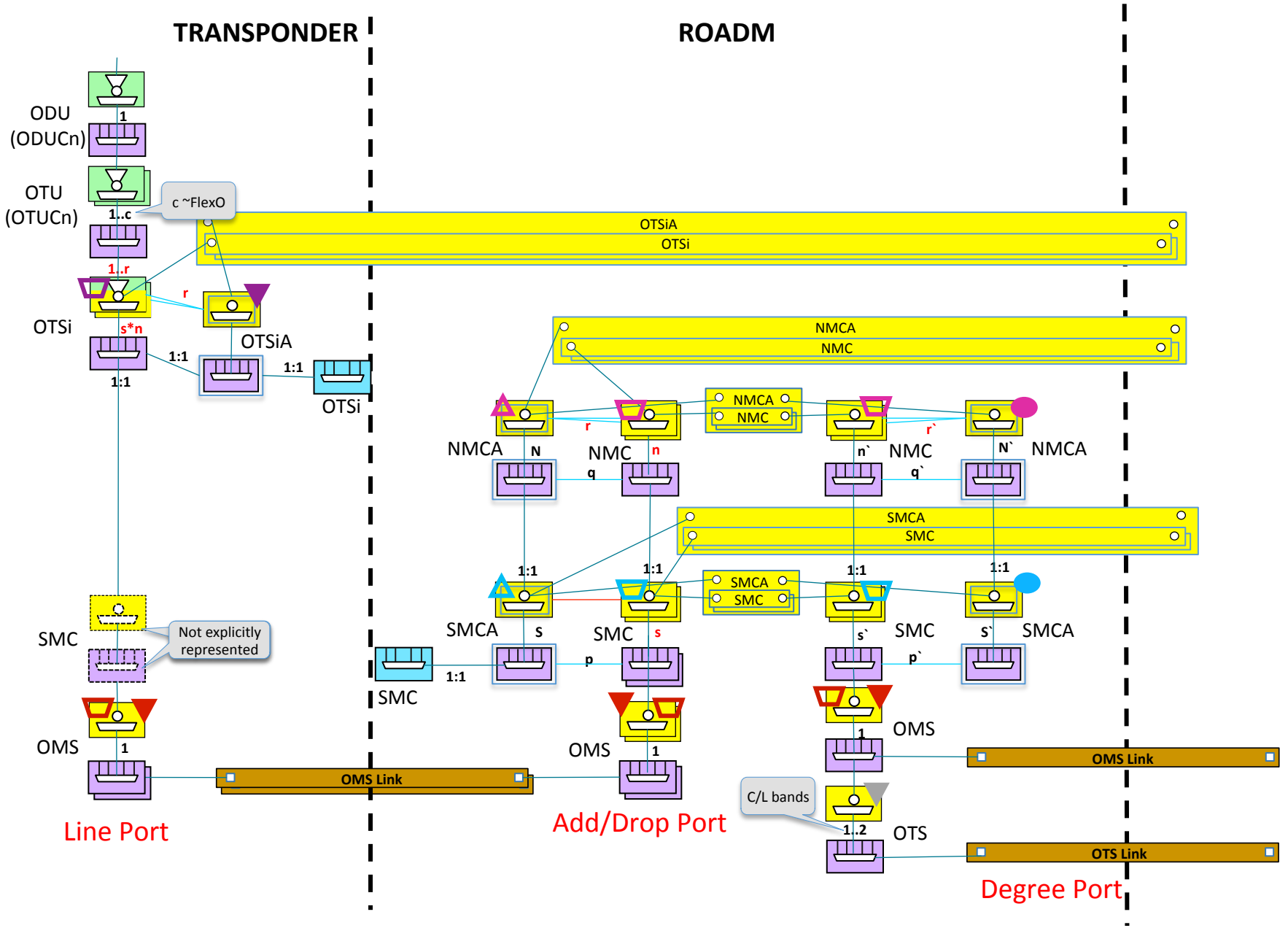
Recursive Node & Topology aspects of TAPI Forwarding Domain



Recursive Connectivity decomposition of TAPI Forwarding Construct



TAPI 2.1 Photonic LTP Model (still under review for 2.2)



- Service Interface Point
- Node Edge Point
- Node Edge Point Group
- Connection End Point (TTP only)
- Connection End Point (CTP only)
- Connection End Point (TTP + CTP)
- Connection End Point (Inverse mux CTP only)
- Media Channel CEP {lowerFreq, upperFreq}
- Media Channel Assembly [{lowerFreq, upperFreq}, {lowerFreq, upperFreq}, ..]
- Down MEP
- Up MEP
- MIP
- OPM

Non Intrusive Monitoring
No Specific OAM signaling
Optical Power Monitoring

References

Thank you ☺

Links….

- TAPI Wiki:
  - https://wiki.opennetworking.org/display/OTCC/TAPI
- TAPI SDK
  - https://github.com/OpenNetworkingFoundation/tapi
- Core model: TR-512 V1.4 (November 2018)
  - https://3vf60mmveq1g8vzn48q2o71a-wpengine.netdna-ssl.com/wp-content/uploads/2018/12/TR-512_v1.4_OnfCoreIm-info.zip
- UML, Papyrus, YANG Guidelines TR 514/515 (July 2018)
  - Last published version → https://www.opennetworking.org/software-defined-standards/models-apis/
  - Latest working draft
    - https://wiki.opennetworking.org/display/OIMT/Infrastructure+Sub-team+Guidelines
    - https://wiki.opennetworking.org/display/OIMT/UML+-+YANG+Guidelines
- UML to YANG & YAMG-OpenAPI Mapping Tools
  - Github repository: https://github.com/OpenNetworkingFoundation/EagleUmlYang
  - Github repository: https://github.com/OpenNetworkingFoundation/EagleYangOpenApi