Advancements in ONF Transport API for Orchestration of Multi-layer Connectivity Service

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ONF Transport API (TAPI): Functional Architecture

Industry Adoption: Functional Interface solution that best fulfills conflicting requirements of stability (future proof, interoperability) & flexibility/agility (technology evolution)
OIF Transport API Interop Demo (2014, 2016, 2018)
MEF: Lifecycle Service Orchestration Reference Architecture (LSO RA)
MEF: Service Provider, Operators, ICM Domains, UNI, ENNI, INNI (3)

Service Orchestration Functionality (SOF), SP Domain

Create L1 OVC

SOF, Operator Domain

Create Connectivity Service

Infrastructure Control & Mng (ICM)

Create Connectivity Service

Open Line System ICM

SOF, Partner Operator Domain

Create Connectivity Service

ICM

Create Connectivity Service

ICM

Create Connectivity Service

Node

Node

Node

UNI

OLS Node

E-NNI

I-NNI

UNI
MEF: Layer 1 Service across different Operators & Management Domains

- **Managed object classes at Service level** (appearing at Legato, Interlude Management IRPs)
- **ONF TAPI managed object classes at Resource level** (appearing at Presto for provisioning purposes)
- **ONF TAPI managed object classes at Resource level** (appearing at Presto for discovery purposes, e.g. topology)
- **MEF Resource managed object classes augmenting TAPI**

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**L1 VC (the end-to-end Layer 1 Service)**

- **L1 OVC**
  - **Connection Service**
  - **Node**
  - **UNI**
  - **L1UniNResource**
  - **L1ConnectivityEndPointResource**

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**L1ServiceLevelSpecification**
ONF ODTN (Open Disaggregated Transport) Architecture

With OLS Controller
**Operator Domain Topology**

**SOF-ICM TAPI Context (LSO Presto)**

**Operator SOF view**

**Operator ICM View**

**OLS View**

**Abbreviations**
- TPD – Transponder Node
- RDM – ROADM Node
- UNI – User-Network Interface
- NNI – Network-Network Interface
- DSR – Digital Signal Rate
- OTSi – Optical Tributary Signal
- OTSiA – OTSi Assembly
- MC – Media Channel

Logical Termination Points shown:
- Service Interface Point
- Node Edge Point (Network Edge)
- Node Edge Point (Network Internal)
- Connectivity Service End Point
- Connection / Connection End Point
- Photonic Connection
- Photonic Media Channel
Operator Domain Connectivity Service & Resources (2)

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Photonic Logical Terminations, Connectivity Service, Step 1

- MC spectrum/bandwidth only, Create **MCA ConnectivityService** with the following input parameters:
  1. MC SIPs
  2. MC CSEPs with required spectrum *(or only bandwidth, delegating spectrum allocation)*

The agent will create:
1. proper edge-to-edge MC Connection(s), MC XCs, MC CEPs and client OTSiMC NEPs, each MC CEP includes the MCA Id

This MC SIP refers to MCs NEPs, each MC NEP representing the spectrum available on an OMS.
Two MC CEPs have been created, representing disjoint portions of spectrum where the OTSiA will be routed.
**Photonic Logical Terminations, Connectivity Service, Step 2**

- Create OTSiMCA ConnectivityService with the following input parameters:
  1. MC SIPs
  2. OTSiMC CSEPs with required bandwidth (and spectrum) **in the existing MCA**

  The agent will create:
  1. proper edge-to-edge OTSiMC Connection(s), OTSiMC XC, OTSiMC CEPs, each one including the OTSiMCA Id
Two OTSi will be routed in first MC, the third OTSi in the second MC.
Photonic Logical Terminations OLS Attributes

SpectrumBand:
- upperFrequency
- lowerFrequency
- frequencyConstraint:
  - adjustmentGranularity
  - gridType

supportableSpectrum (0..n)
availableSpectrum (0..n)
occupiedSpectrum (0..n)
supportableMaximum/MinimumOutputPower
tolerableMaximum/MinimumInputPower

supportableSpectrum (0..n)
availableSpectrum (0..n)
occupiedSpectrum (0..n)

occupiedSpectrum
measuredPowerIngress
measuredPowerEgress
Photonic Logical Terminations Transponder Attributes

TRANSPONDER

- numberOfOtsi
- fecParameters
- selectedCentralFrequency
- selectedApplicationIdentifier
- selectedModulation
- selectedSpectrum
- transmittedPower
- receivedPower
- laserProperties

capacity
- centralFrequency
- spectrum
- applicationIdentifier
- Modulation
- laserControl
- transmitPower
- totalPowerWarnThresholdUpper/Lower

CentralFrequencyBand:
- lowerCentralFrequency
- upperCentralFrequency
- frequencyConstraint:
  - adjustmentGranularity
  - gridType

supportableCentralFrequencyBand (0..n)
supportableApplicationIdentifier (0..n)
supportableModulation (0..n)
totalPowerUpperWarnThresholdDefault/Min/Max
totalPowerLowerWarnThresholdDefault/Min/Max
Thank You

Follow Up Links:
https://wiki.opennetworking.org/display/OTCC/TAPI