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OPEN NETWORKING FOUNDATION

ONF Transport API (TAPI) Project

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Karthik Sethuraman, Lyndon Ong, Kam Lam, Vishnu Shukla, Yunbin Xu
ONF Open Transport Working Group

New ONF – 200+ Members Strong

Community Positioned for Success

Partner

Operators (7)

at&t, China unicom中国联通, COMCAST, Google, NTT Communications, SK telecom, verizon

Vendors (10)

ciena, CISCO, ERICSSON, FUJITSU, HUAWEI, intel, NEC, NOKIA, radisys, SAMSUNG

New ONF Board

ONF (& Stanford)	Guru Parulkar
Network Operators	
AT&T	Andre Fuetsch – CTO
Google	Urs Hölzle – SVP
NTT Comm	Dai Kashiwa – Director
SK Telecom	Alex Choi – CTO, EVP
Verizon	Srini Kalapala – VP
Research & Vendor Community	
Nick McKeown	Stanford
Jennifer Rexford	Princeton
Fabian Schneider	NEC

Innovator 110+

Including 14 Operators:

Argela/Turk Telecom	Microsoft
China Mobile	Swisscom
Deutsche Telekom	Telecom Italia
ECI Telecom	Telefonica
Facebook	TELUS
Globe Telecom	Vodafone
Goldman Sachs	Yahoo

Collaborator 70+

Volunteers

100s

What's Happening with ONF?

- **ONF**
  - 110+ member companies
  - Leader in SDN Standardization
    - OpenFlow specs
    - SDN Architecture
    - SDN NBI
  - Links to other key SDOs
  - Growing Open Source SDN program

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- 17 Partners, 70+ collaborators
- Leader in open source SDN/NFV platforms
  - ONOS
  - CORD
- Close ties to leading edge service providers
- Growing developer community

The New ONF

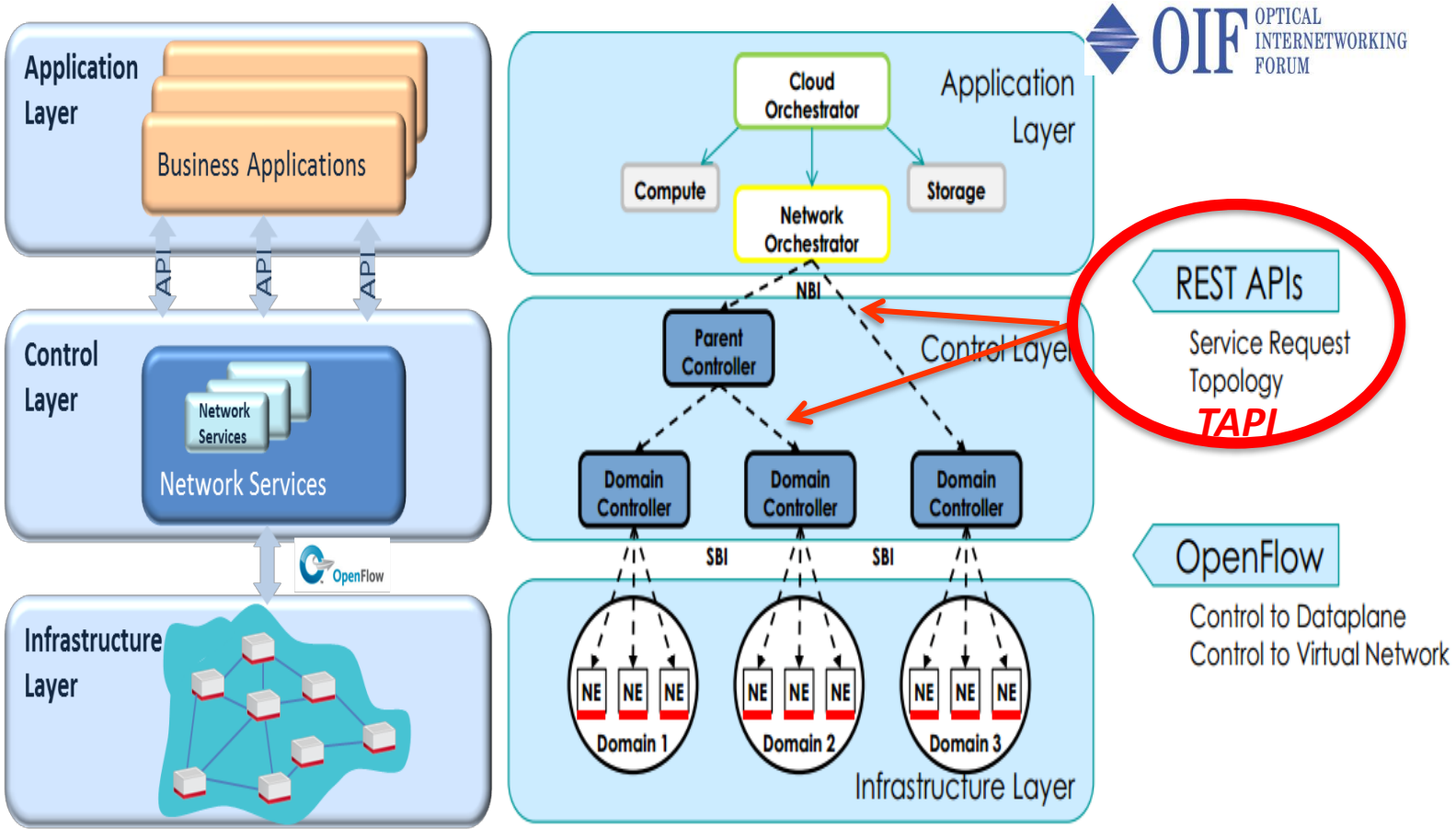
- Best of Open Source and Standards
- Software Defined Standards
  - **Collaborative process**
  - **Speed to implementation**
  - **Ready path to adoption and deployment**

ONF: The Way Forward
Thu 12pm EXPO Theater II

ONF Open Transport WG
Transport API (TAPI) Project

- Objective – realize a software-centric approach to standardization
  - Purpose-specific API to facilitate SDN control of Transport networks
  - Focus is on functional aspects of transport network control/mgmt
  - Target is YANG & JSON API libraries
  - Demonstrable code
- Use Case Driven: Activity scoped based on use case contributions and discussions. Examples include
  - Bandwidth on Demand
  - E2E Connectivity Service
  - Multi-layer Resource Optimization and Restoration
  - Multi-Domain Topology and Monitoring
  - Network Slicing and Virtualization

Where does TAPI fit in? OIF-ONF T-SDN Interop

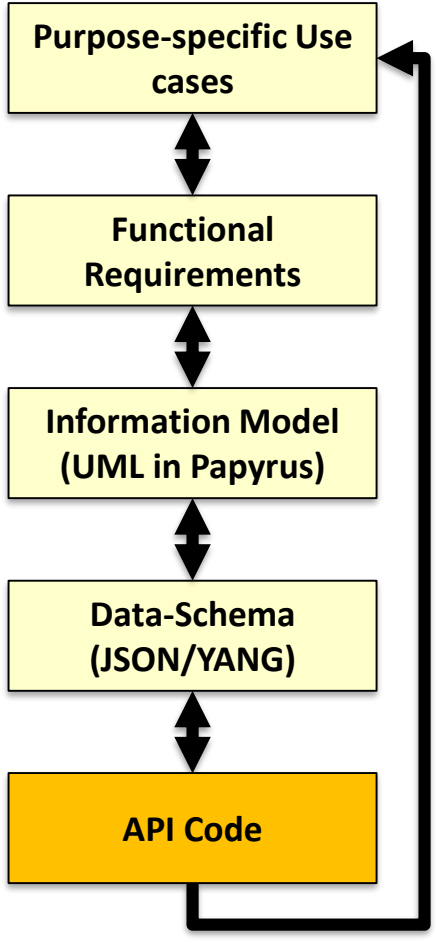


Key Features of TAPI SDK

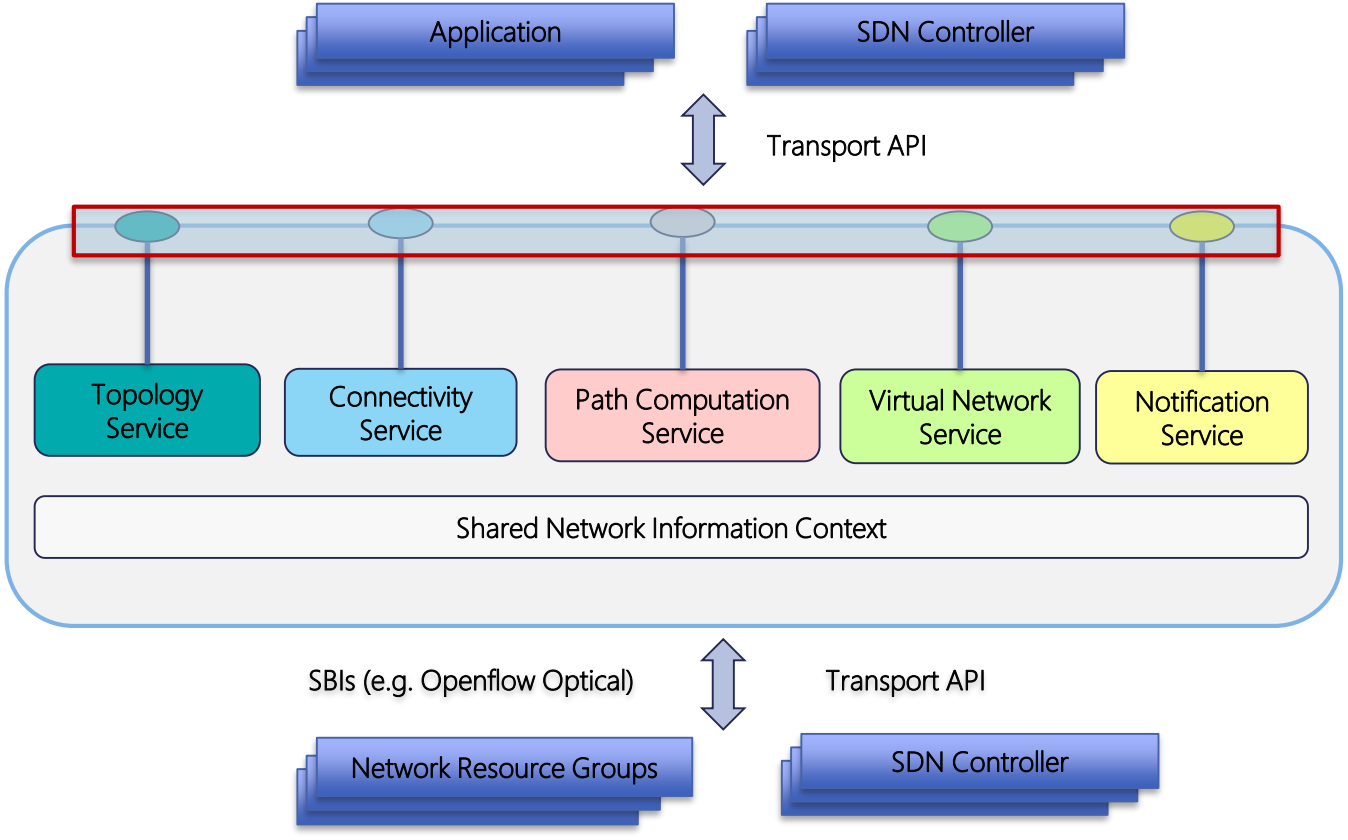
- Technology-agnostic API Framework
  - Standardizes a single core technology-agnostic specification that abstracts common transport network functions
- Modular & Extensible
  - Functional features are packaged into small self-contained largely-independent modules
  - TAPI Core Spec is designed to be fully extensible
    - *Extensions* can be Technology, SDO, Operator or Vendor specific
- Industry-wide Interoperability Objective – developed within
  - Open Source SDN SNOWMASS project under Apache 2 license
- SDK components generated using ONF tools for agile prototyping
  - YANG schema generated from UML using guidelines developed in an multi-SDO initiative (IISOMI)
  - Swagger/JSON APIs generated from YANG following RESTConf specification

TAPI SDK: Organization and Modularity

- ONF Transport API Functional Requirements – ONF TR-527, June 2016
  - ONF Open Transport WG Project
  - Input to the TAPI SDK (Software Development Kit)
- Software-wise, TAPI SDK 1.0.0 is packaged as 4 Eclipse sub-projects
  - Papyrus-UML Information Model
    - A pruned/refactored version of ONF Core IM
    - Is a technology-agnostic generic framework + technology specific extensions (OTN, ETH)
  - YANG Data Schema
    - auto-generated from UML using ONF OSSDN Eagle Tools
  - Swagger-JSON RESTConf API
    - auto-generated from YANG using ONF OSSDN Eagle tools
  - Reference Implementation (RI) in Python
- Iterative design process with code development an integral part of the cycle



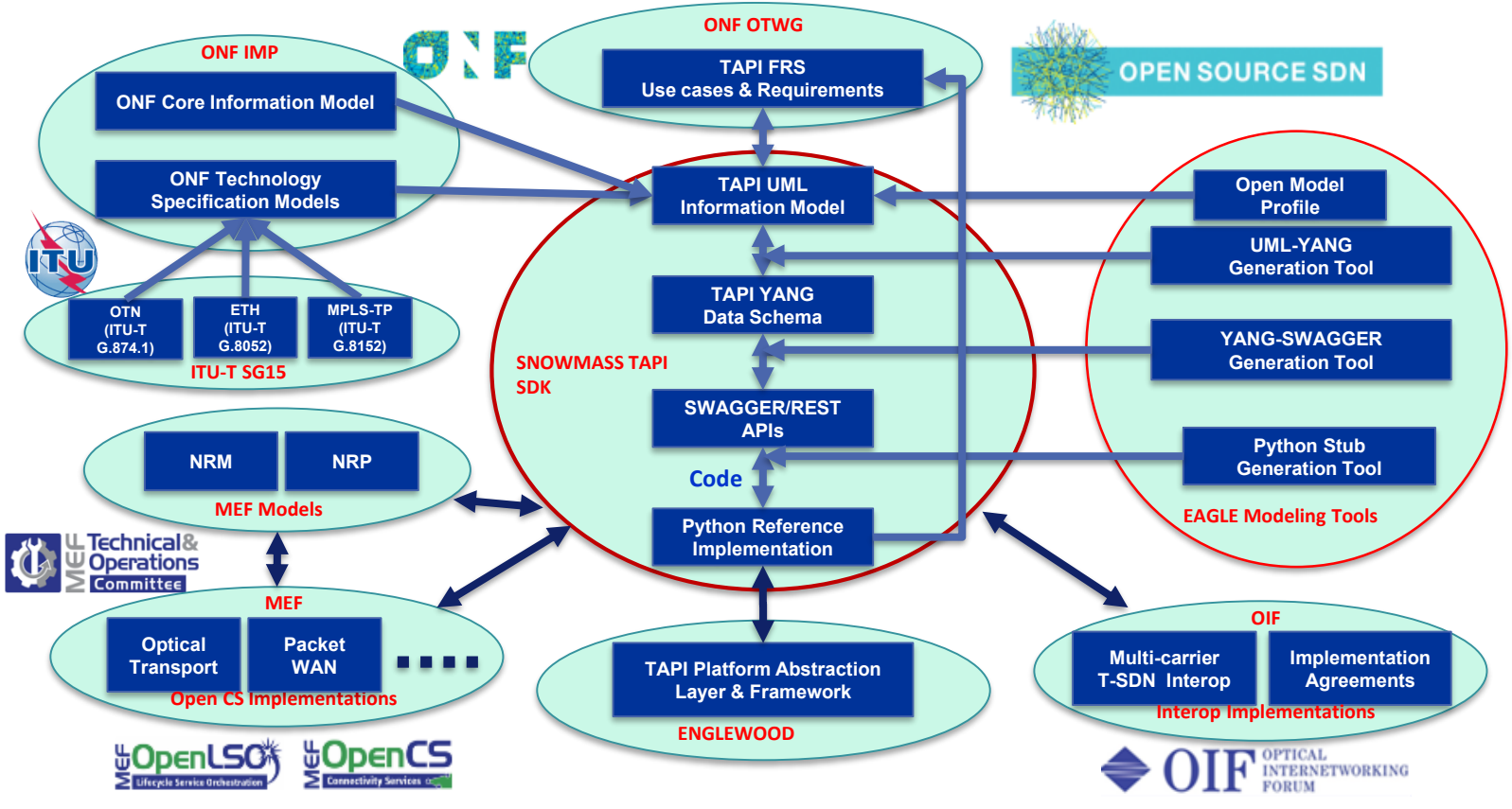
ONF Transport–API & Interfaces: Functional Architecture



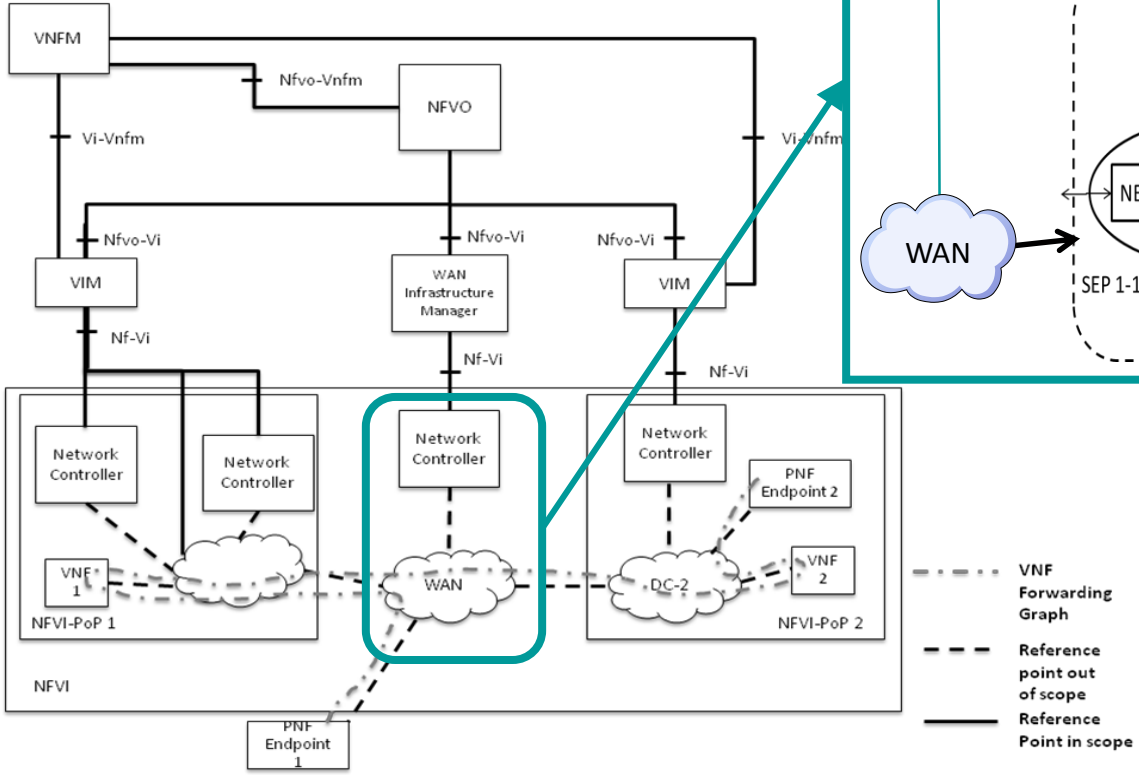
TAPI 1.0 Services

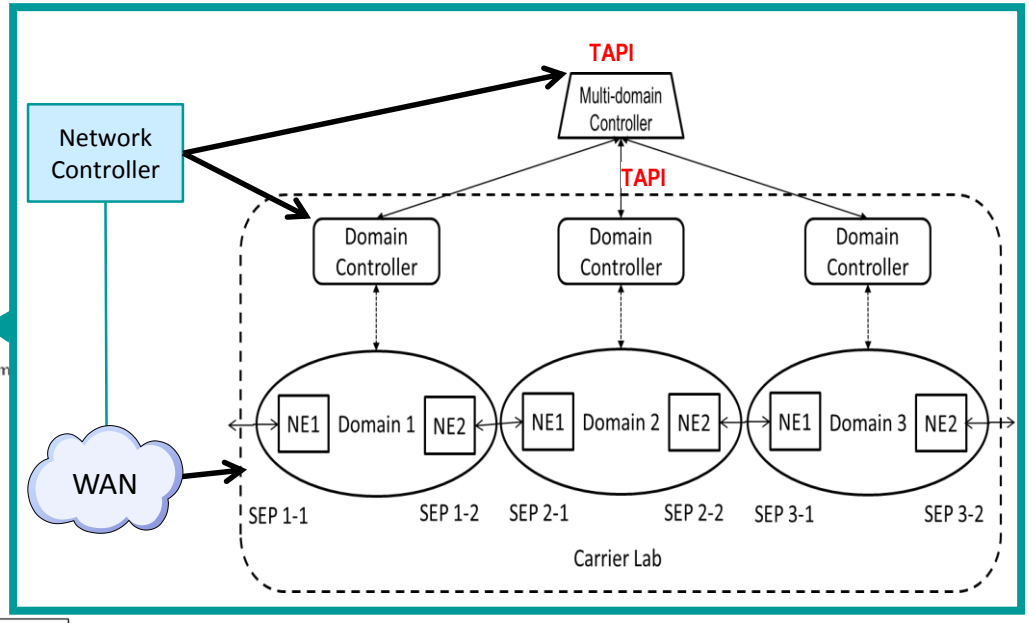
- Topology Service
  - Retrieve Topology, Node, Link & Edge-Point details (Across al layers)
- Connectivity Service
  - Retrieve & Request P2P, P2MP, MP2MP connectivity (Across all layers)
- Notification Service
  - Subscription and filtering
  - Autonomous mechanism
- Path Computation Service
  - Request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

TAPI – ONF and OSSDN Project Dependencies

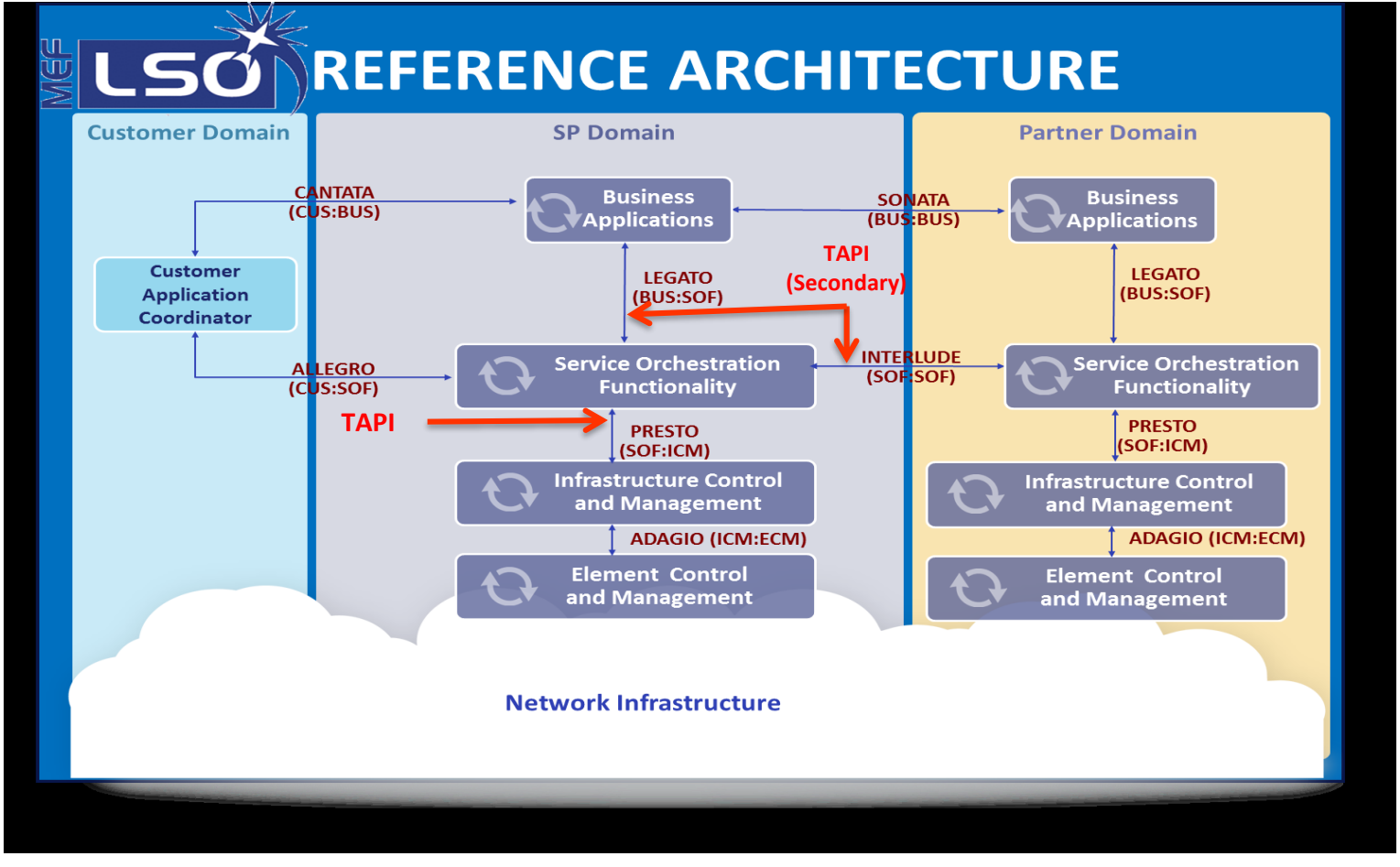


Where does TAPI fit in? ETSI-NFV Architecture





Where does TAPI fit in? MEF LSO Architecture



TAPI Next Steps – 2.0

- Node Constraints
  - Ability to specify generic connectivity/blocking constraints/relationships
- Protection
  - Multi-layer, Multi-Domain
  - Use cases under discussion
- OAM/Monitoring
  - Consistent Multi-layer abstraction and model – L0-L2
  - Alarms/TCAs/Counters
- Multi-Technology Testing
  - Microwave
  - Ethernet
- Node/Device Configuration Interface

References

- ONF SDN Architecture 1.1 - https://www.opennetworking.org/images/stories/downloads/sdn-resources/technical-reports/TR-521_SDN_Architecture_issue_1.1.pdf
- TAPI Functional Requirements 1.0 - https://www.opennetworking.org/images/stories/downloads/sdn-resources/technical-reports/TR-527_TAPI_Functional_Requirements.pdf
- TAPI SDK (SNOWMASS) - https://github.com/OpenNetworkingFoundation/Snowmass-ONFOpenTransport
- UML Tools (EAGLE) - https://github.com/OpenNetworkingFoundation/EAGLE-Open-Model-Profile-and-Tools
- TAPI 1.0 SDK Overview ONF MWD, Sept 7, 2016 https://github.com/OpenNetworkingFoundation/Snowmass-ONFOpenTransport/raw/develop/DOCS/presentations/onf2016.307_TAPI_SDK.01.pptx
- OFC 2017: OIF Interop – The Key to Unlocking the Benefits of SDN, Tuesday, 21 March; 15:00 - 16:00.
- OFC 2017: ONF Session – The Path Forward, Thursday, 23 March, 12:00 - 13:30