Enabling Key Applications for Transport SDN

OptiNetChina 2020
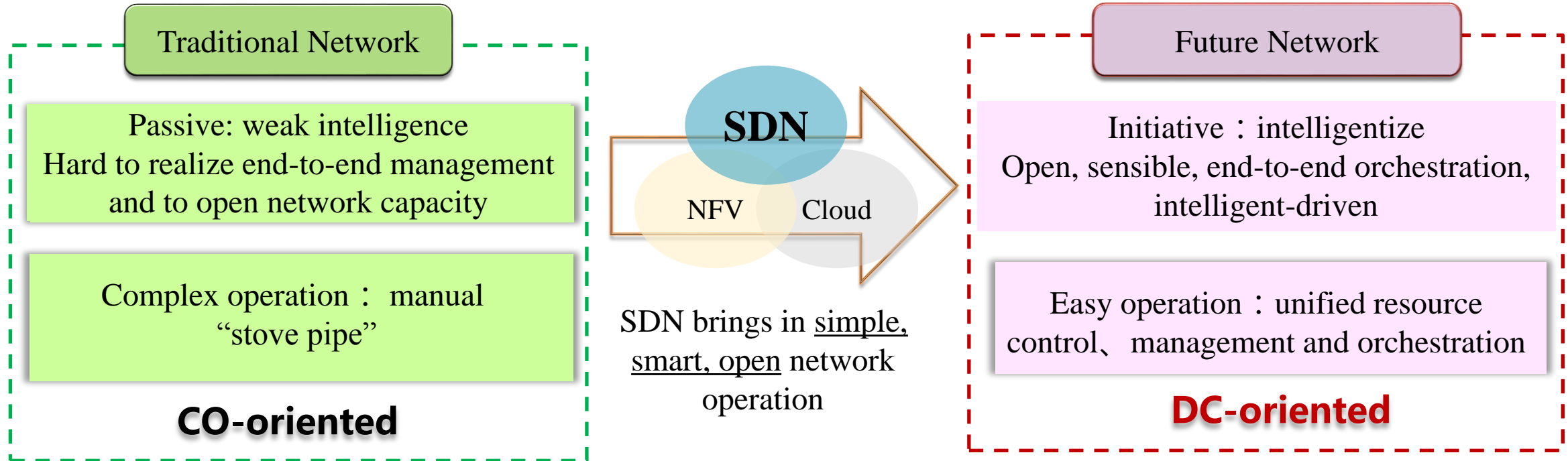
August 26, 2020

Hu Qian

Editor

OIF Integrated Packet/Optical SDN Implementation Agreement

Evolving to a New Operational Paradigm

Traditional Network

Passive: weak intelligence
Hard to realize end-to-end management
and to open network capacity

Complex operation：manual
"stove pipe"

CO-oriented

SDN

NFV　　Cloud

SDN brings in <u>simple,
smart, open</u> network
operation

Future Network

Initiative：intelligentize
Open, sensible, end-to-end orchestration,
intelligent-driven

Easy operation：unified resource
control、management and orchestration

DC-oriented

SDN's value in network reconstruction

➢ **Simple：simplify of interface /level/species/amount**

➢ **Smart：software programming , fast configuration, service-automation**

➢ **Open：open network capacity , adaptation for applications, Open interfaces**

Source: China Telecom

What is OIF

- Since 1998, OIF has brought together industry groups from the data and optical worlds

- Mission: To foster the development and deployment of interoperable products and services for data switching and routing using optical networking technologies

- OIF's 100+ member companies represent the entire industry ecosystem:
  - Network operators and network users
  - Component and systems vendors
  - Testing and software companies
  - Academia

- Products: IAs, White Papers, Certification Test Specs

- Current Work in Networking WG (Transport SDN related):
  - Requirements for Integrated Packet/Optical SDN
  - Transport SDN API Interoperability Testing

OIF's SDN Activities

- Identify architecture and requirements based on operator input

- Prototype and test SDN architecture and interfaces

- Work jointly with SDOs on addressing gaps (e.g. ONF T-API)

- Interop testing and demonstration of standards
  - Allows hands-on experience for participating operators
  - Helps drive vendor implementation

- Push findings back to SDOs (ONF Specs and Developer's Guide)

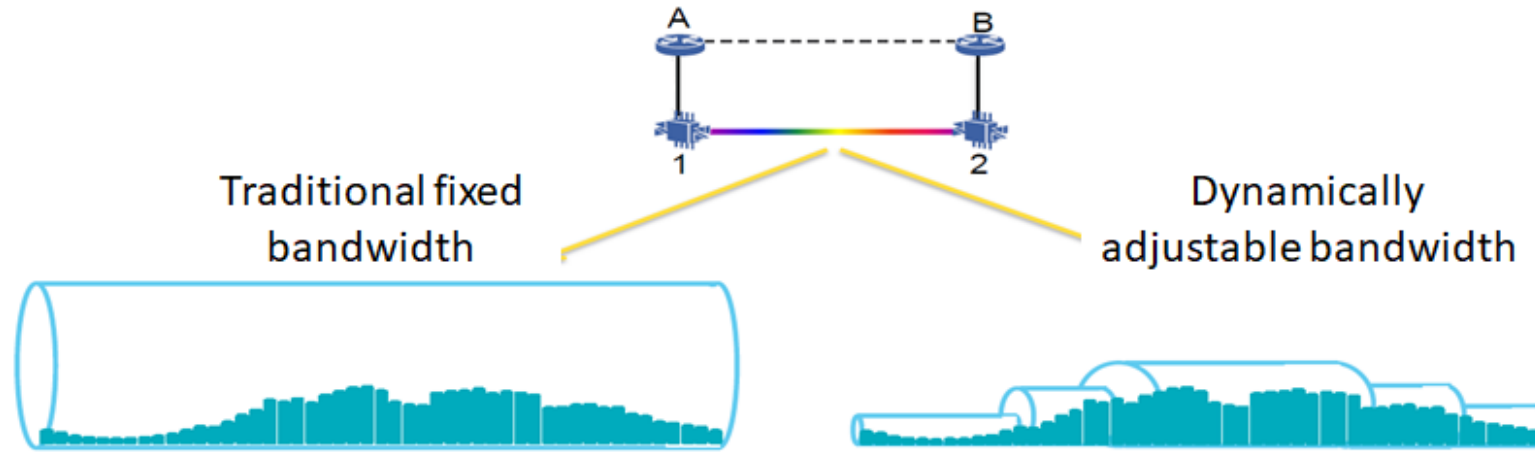- Potential certification function based on operator needs

From Transport SDN to Integrated Packet Optical SDN

IP SDN and transport SDN is ready;

Integrated packet optical SDN on the way.

- Benefits of integration
  - **Reduce CapEx:** Bypass to reduce hops; improve transport efficiency; reduce the cost for network construction.
  - **Reduce OpEx:** reduce manual process and associated configuration; fast service configuration; multi-layer unified management.
- **IA：Requirements for Integrated Packet Optical SDN （IA OIF-INT-SDN-01.0 ）**

IP Controller

•Topology info.
•Service request

Orchestrator

T-Controller
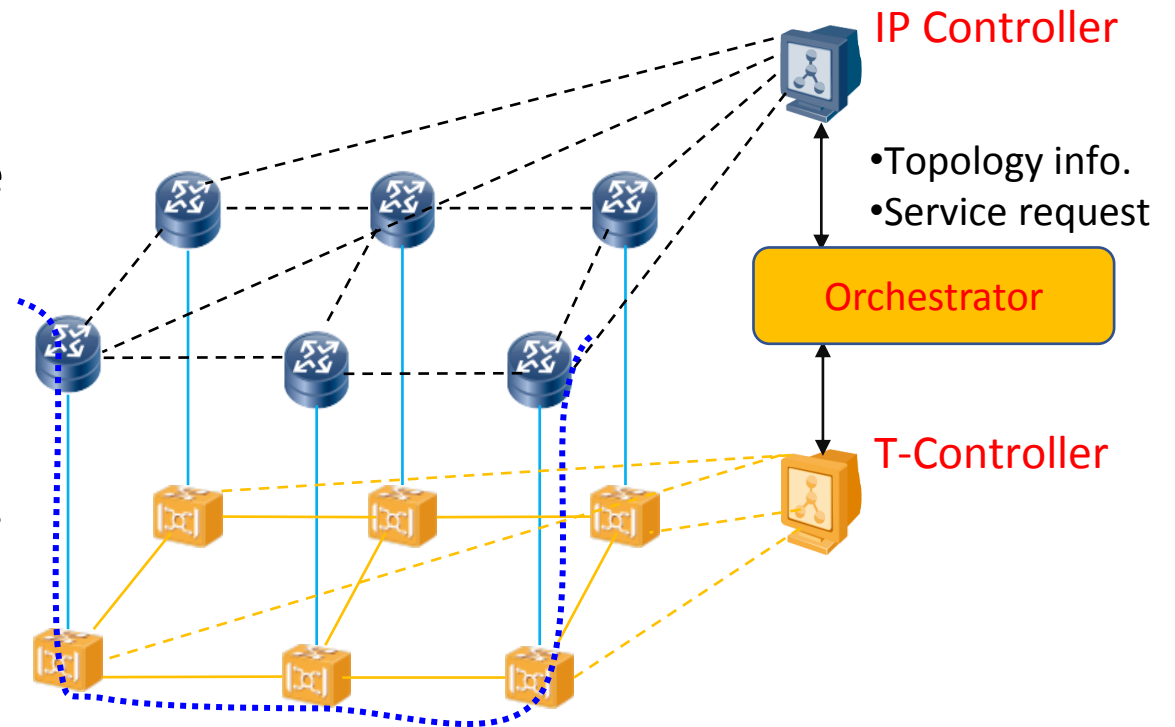
Use Cases:
Cross-layer Network Awareness and Optimization

Traditional fixed bandwidth

Dynamically adjustable bandwidth

- Operators currently handle dynamic bandwidth requirements by overprovisioning bandwidth, resulting in higher costs.

- If congestion is encountered on an IP link, The Orchestrator then requests additional capacity from the Optical Controller on the given path.

- associated optical port capacity can be upgraded

- a new path can be created using unused optical ports with higher capacity.

Use Cases:
# Fault Avoidance Using Cross Layer SRLG Information
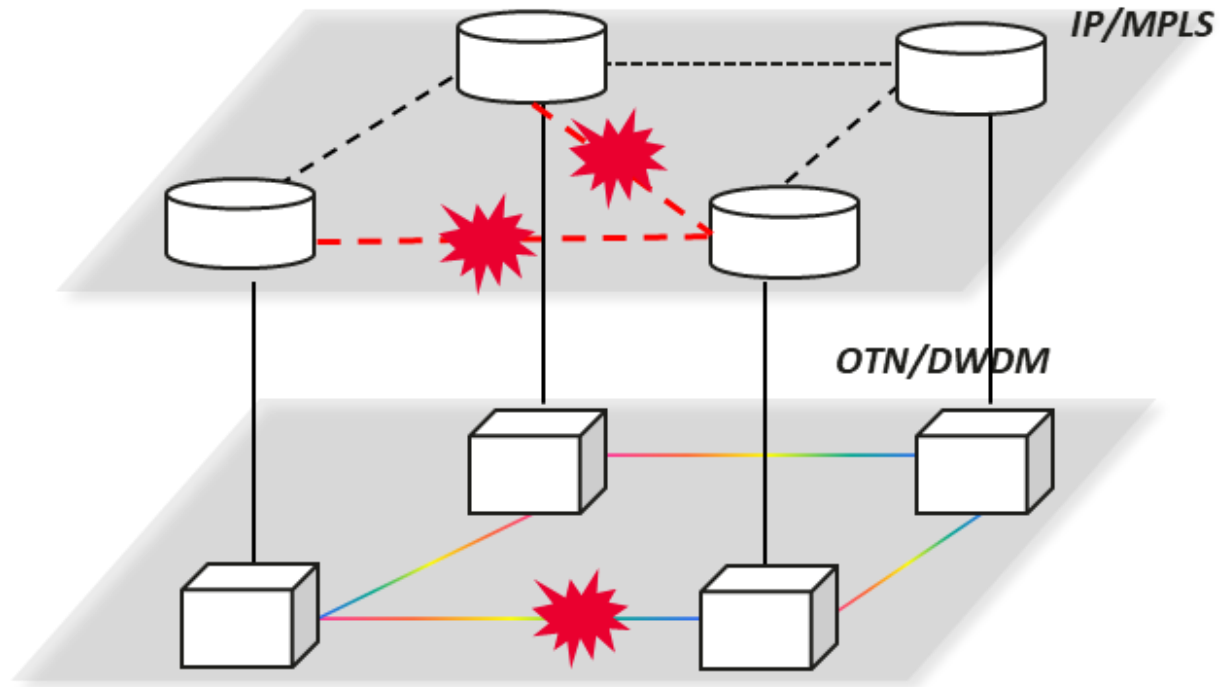
- The fault of one fiber route may lead to the fault of multiple packet links.

- With multi-layer topology information, it is easy to identify the root cause of a fault.

- path separation： working path and protection path in packet layer will not be planned in the same SRLG

# Use Cases: Cross-layer Maintenance Coordination
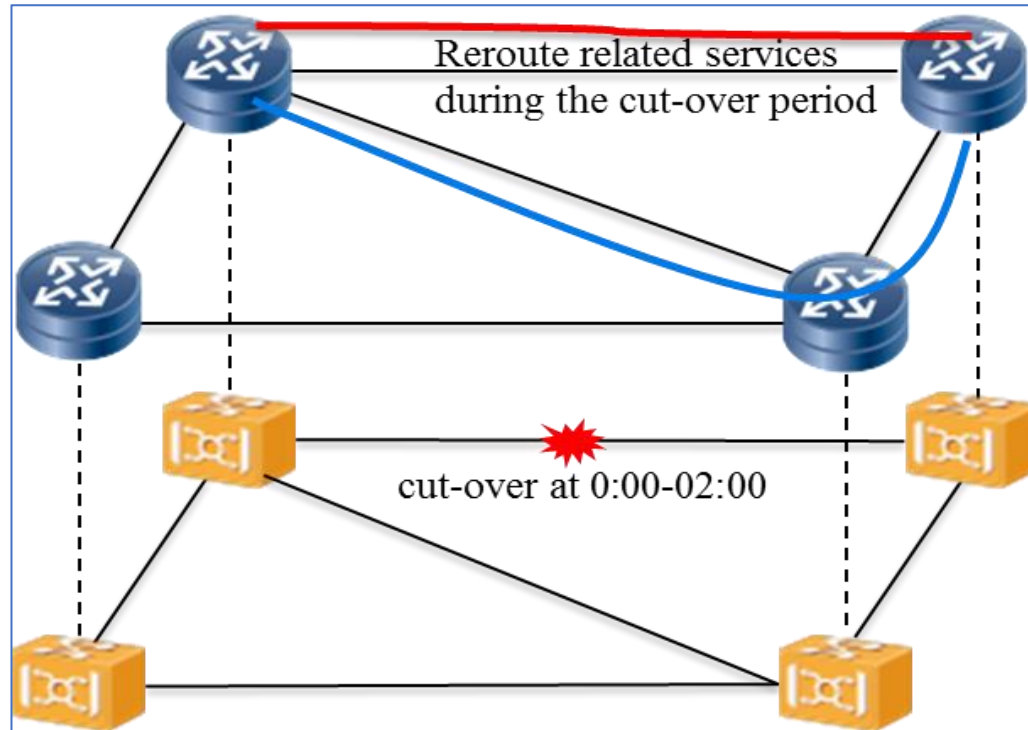
- Before cutting-over, Optical Controller set the operational state of the optical link to be "down"

- Notify Orchestrator.

- Orchestrator reroute related packet services in advance to avoid being affected.

- When cut-over maintenance is finished, related packet services can be routed back to the original working path.

Use Cases:
Cross-layer Protection Coordination
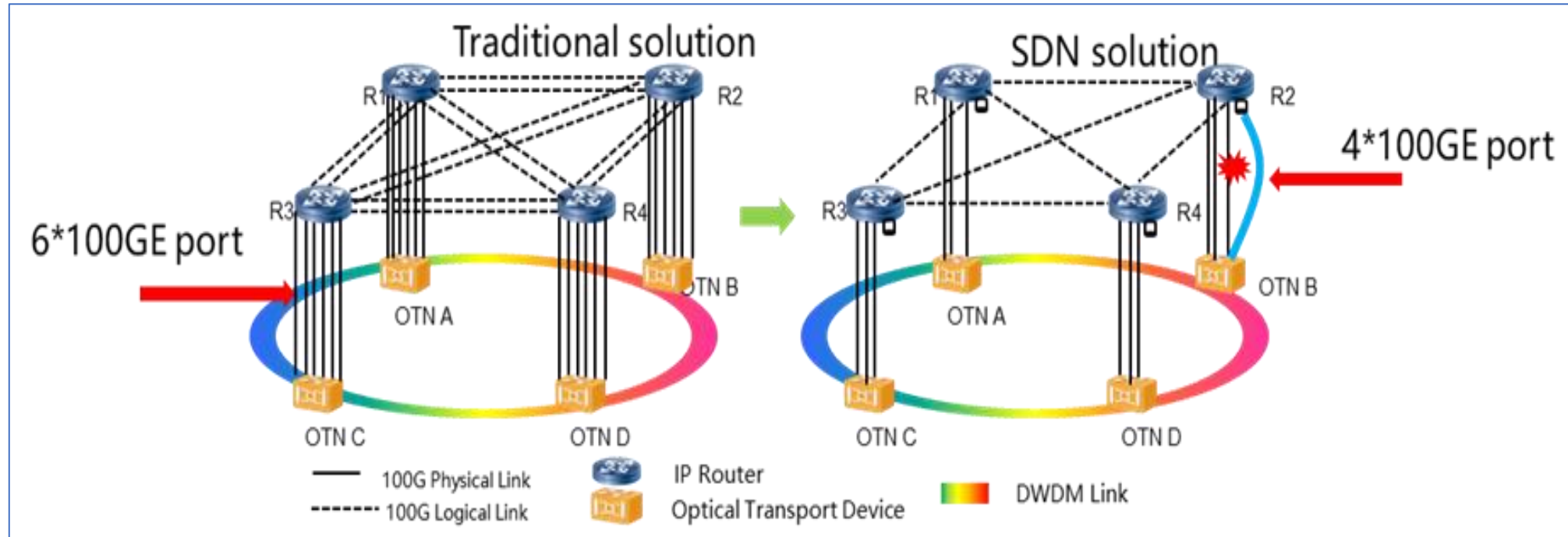
- Cross-layer N:1 protection
- alarm suppression, timers set by Orchestrator.

Integrated Packet/Optical SDN Architecture
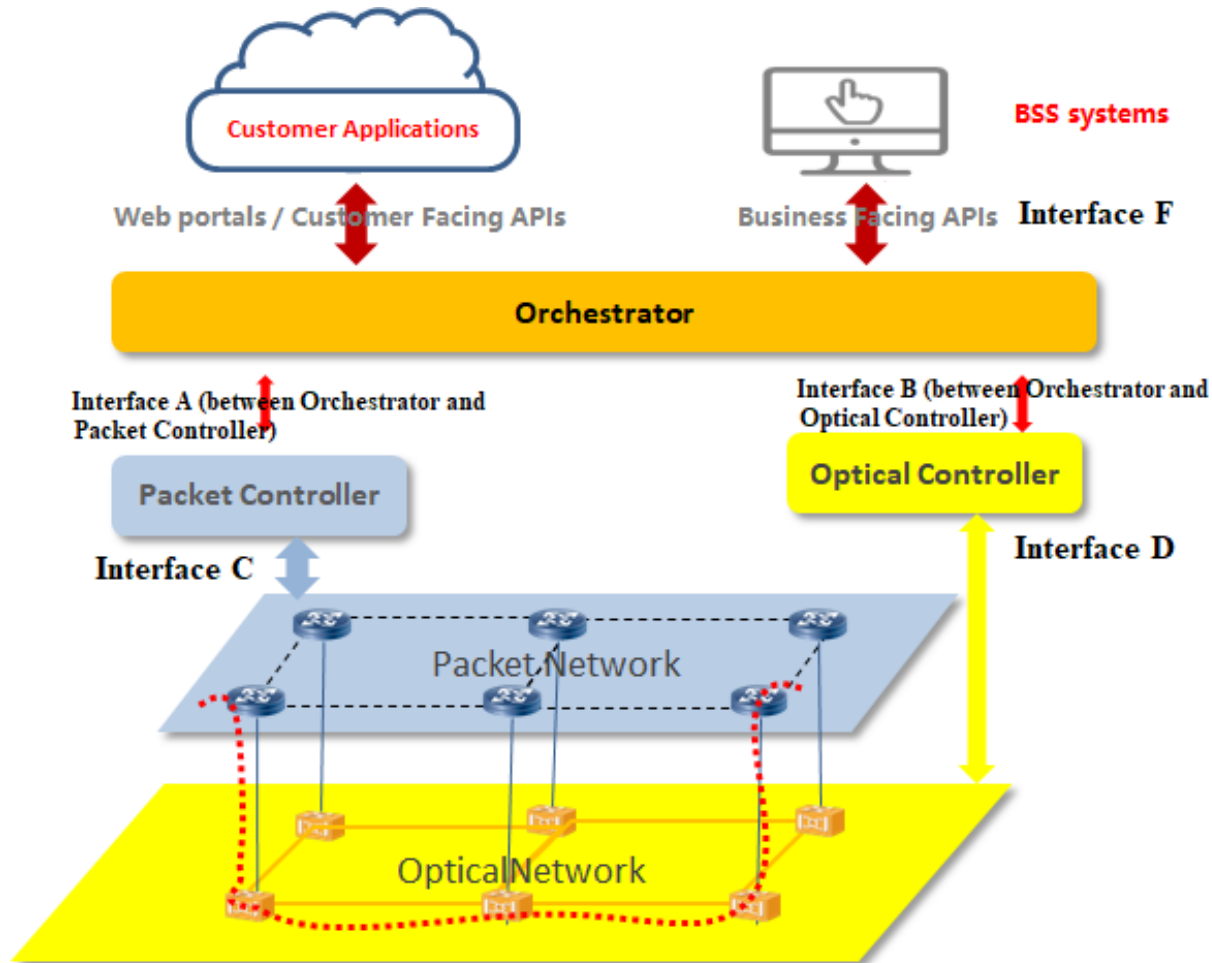
- Related Models
  - IETF ACTN (Abstraction and Control of Transport Networks)
  - ONF ODTN (Open Disaggregated Transport Network)
  - MEF LSO (LifeCycle Service Orchestration)
- APIs
  - T-API – Controller NBI to Orchestrator
  - OpenConfig – SBI to optical terminal device
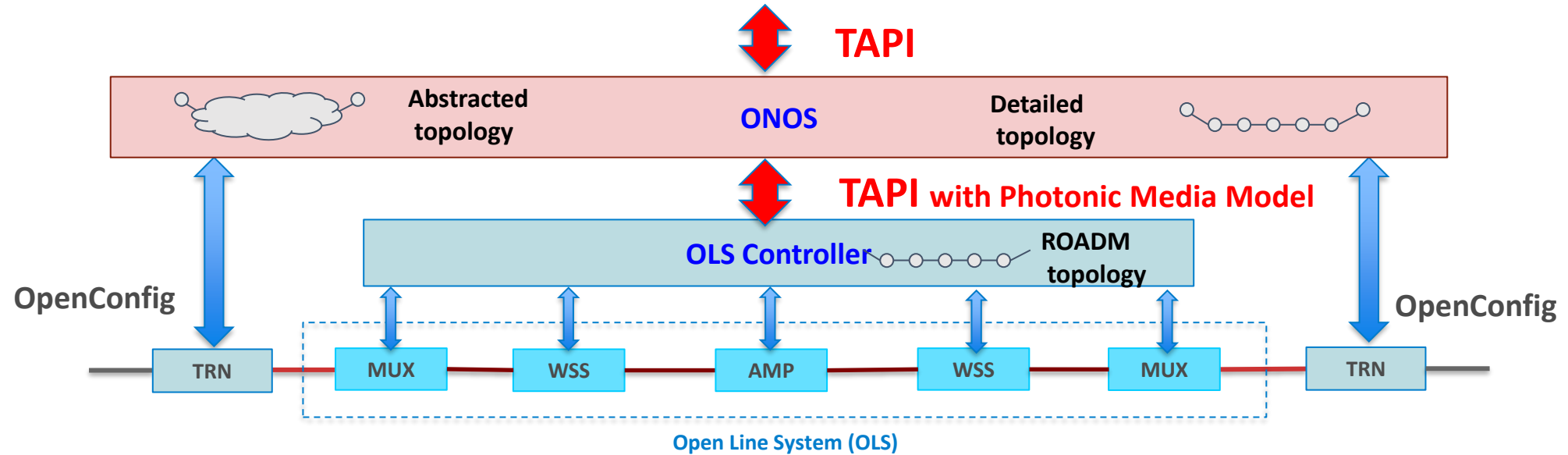 - IGP, PCEP, NETCONF/YANG – SBI to packet devices

ONF Transport API (T-API): Functional Architecture
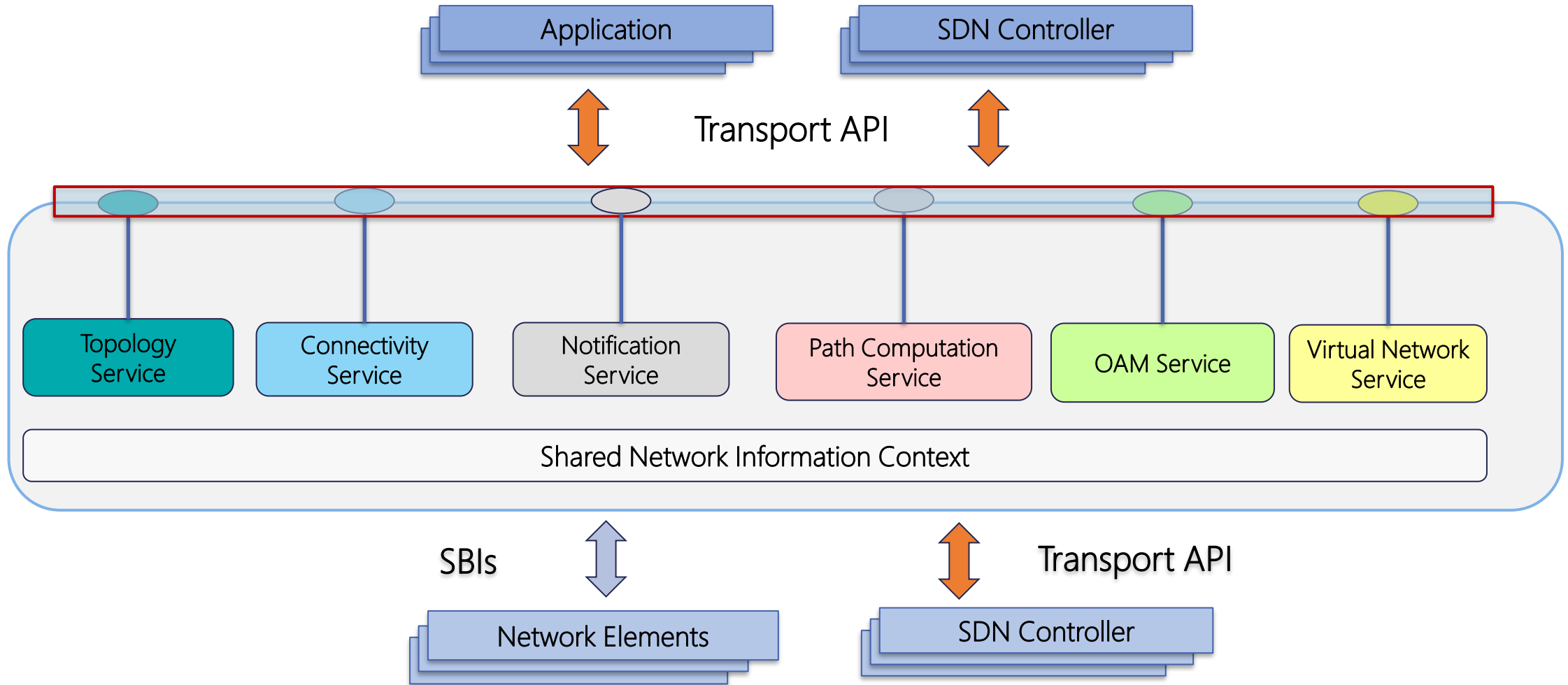
Source: ONF

ONF ODTN (Open Disaggregated Transport) Project

Partial Disaggregation With OLS Controller (ODTN Ph 1.5)
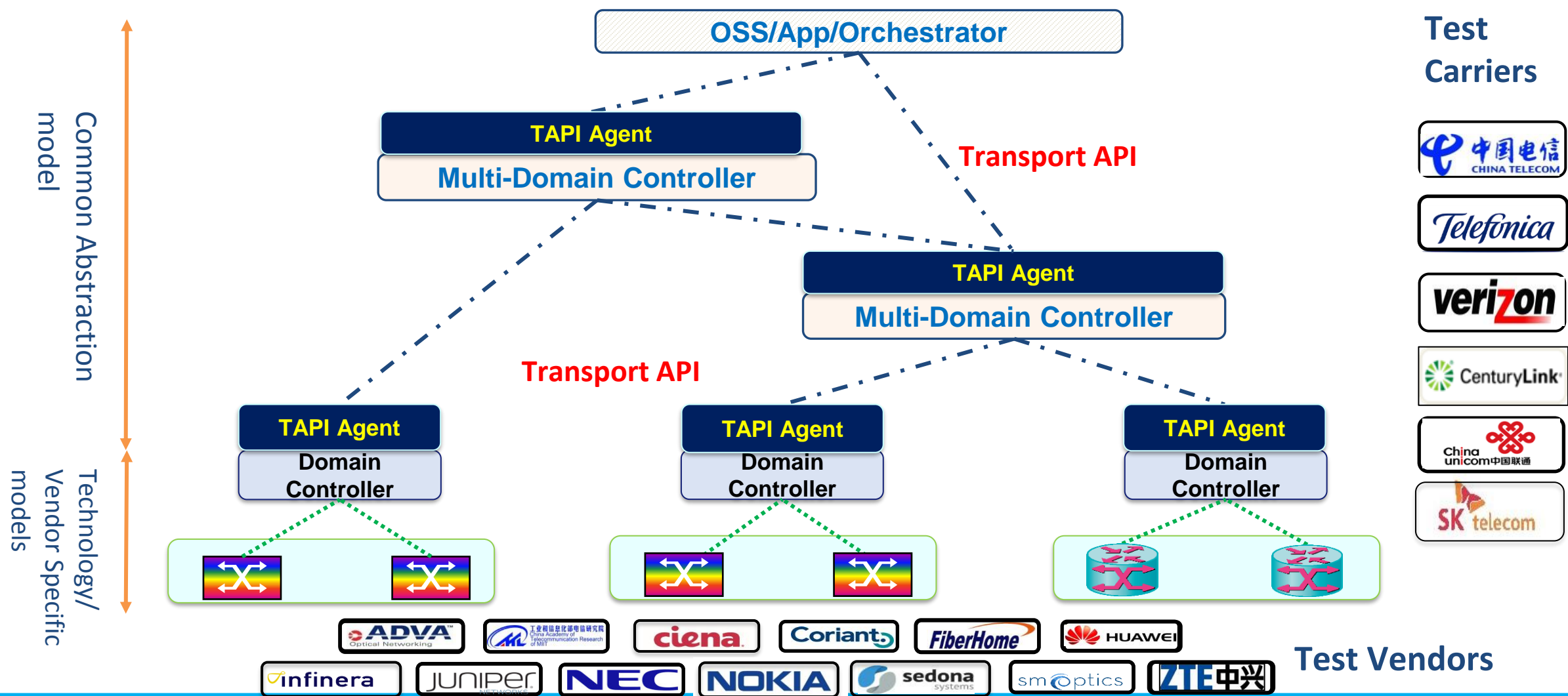

- Partial disaggregation model: OLS controller handles complex photonic aspects
- Proof of Concept using mix of open source and vendor products

Source: ONF

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

OIF 2020 Transport SDN API Interoperability Demonstration

- **Testing Focus Areas**

  - Integrated Packet Optical SDN Orchestration

  - Interoperability of Transport SDN APIs

  - Partially Disaggregated Optical Network Model
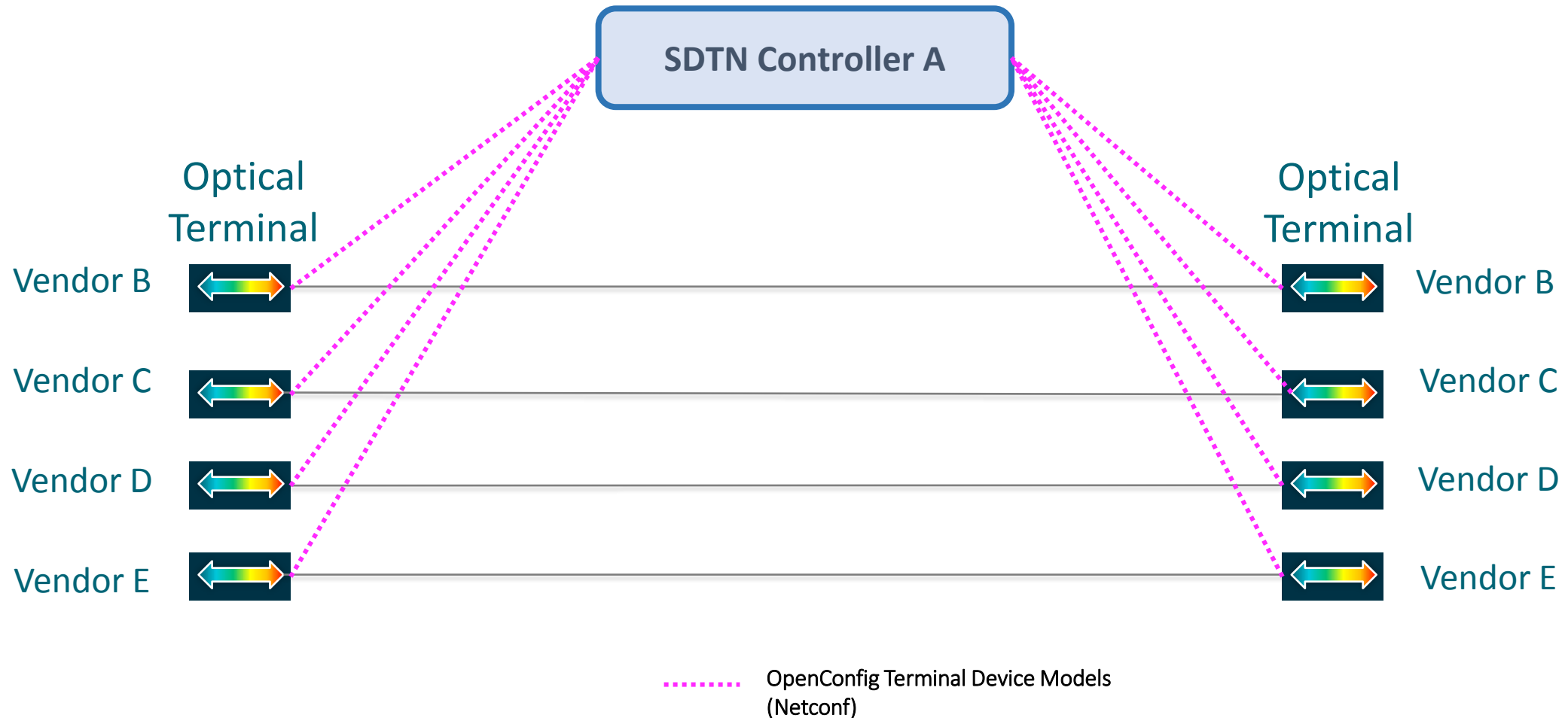
- **Interoperability Testing**

  - Multiple HW and SW Vendors, including ADVA, Ciena, Cisco, Infinera and Nokia

  - Testing hosted in Telefonica Lab with multiple consulting operators

- **CT Role**
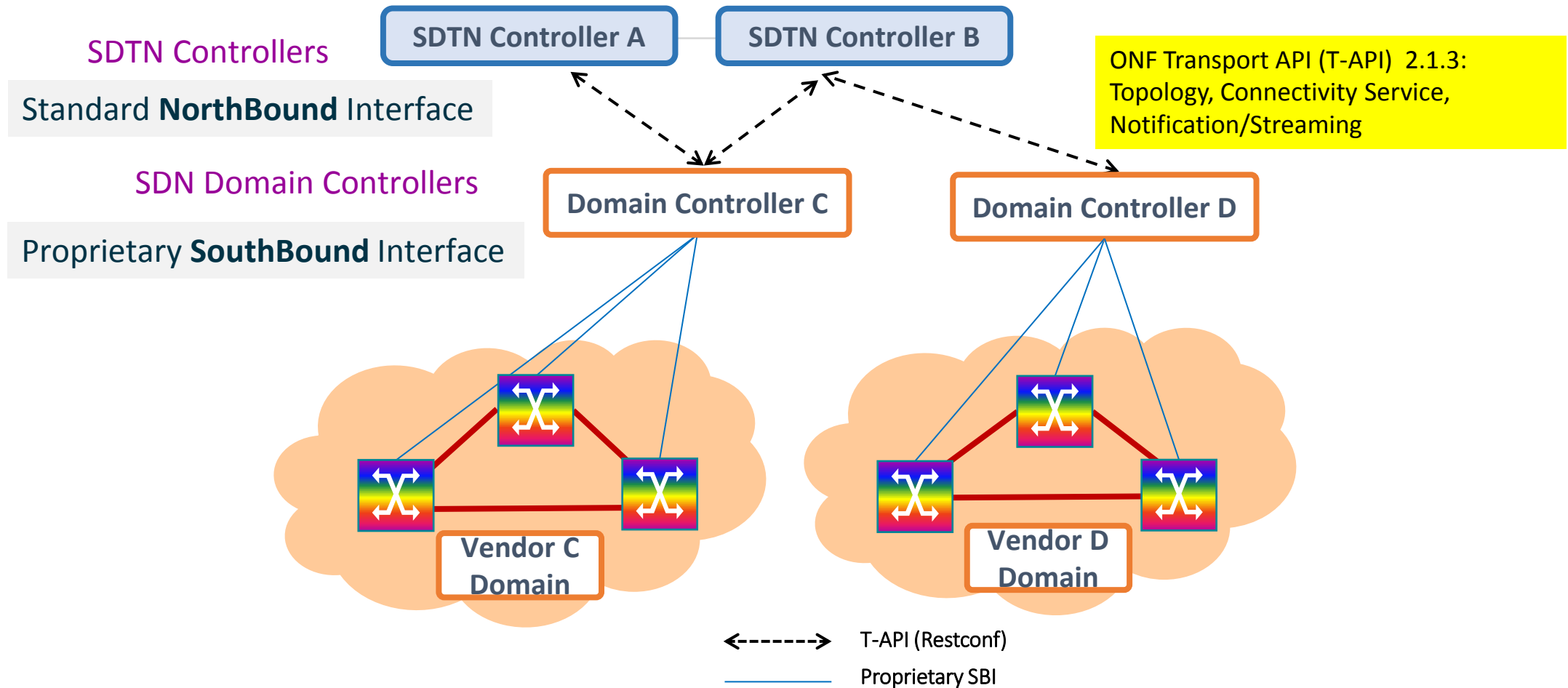
  - Consulting Operator helping with testing plan, technical specifications and evaluation
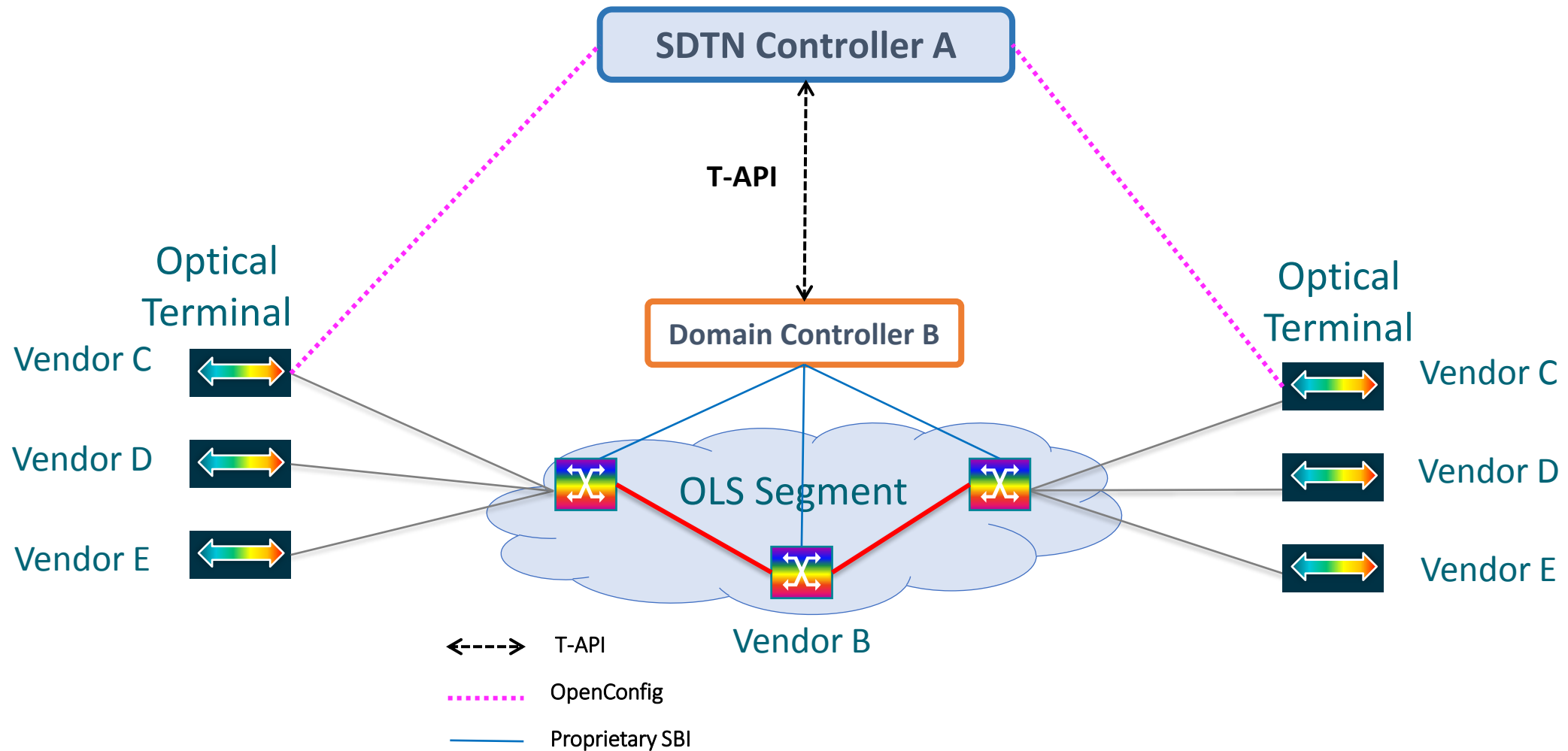
Phase 1: OT-OT Testing using OpenConfig

SDTN Controller A

Optical Terminal

Optical Terminal

Vendor B

Vendor C

Vendor D

Vendor E

Vendor B

Vendor C

Vendor D

Vendor E

OpenConfig Terminal Device Models (Netconf)

Phase 2: TAPI Domain Testing

SDTN Controller A — SDTN Controller B

SDTN Controllers
Standard **NorthBound** Interface

SDN Domain Controllers
Proprietary **SouthBound** Interface

ONF Transport API (T-API) 2.1.3:
Topology, Connectivity Service,
Notification/Streaming

Domain Controller C

Domain Controller D

Vendor C Domain

Vendor D Domain

T-API (Restconf)

Proprietary SBI

Phase 3: End-to-End Testing

Meaning and Harvest for CT

Accelerate maturity of Transport SDN standardization

Promote development of SDN industry

Solve problems of present network for CT

Realize target of network reconfiguration
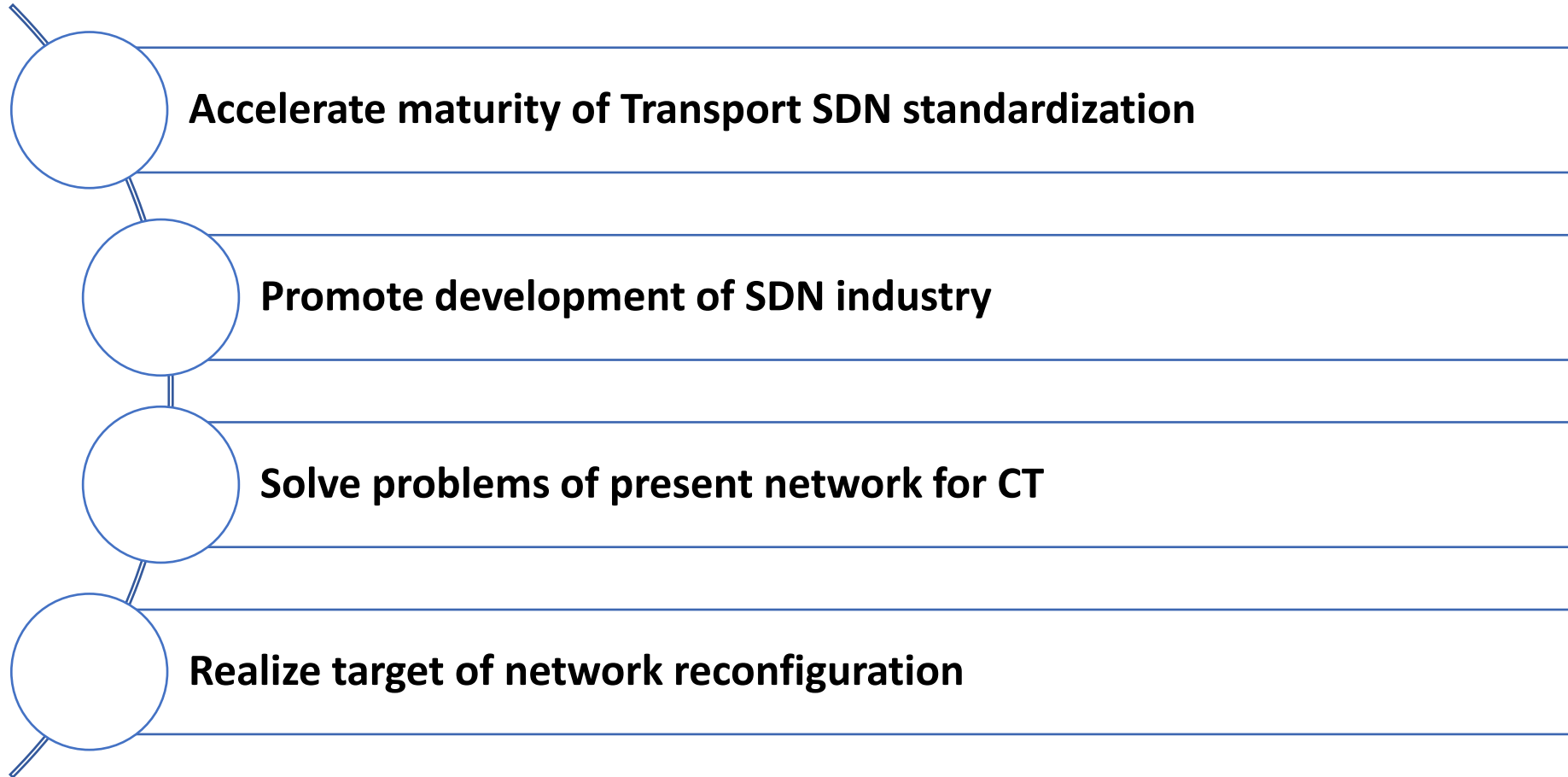
Summary: OIF Transport SDN

- **Interoperability Testing:** from 2014 to 2020, Provides early feedback to SDOs to accelerate standardization.

- **T-API/OpenConfig:** OIF has substantiated T-API as the Northbound Interface (NBI) of choice. OpenConfig realizes standardization of the management interface of the terminal devices and OLS.

- **IP+Optical:** IP SDN and transport SDN is ready; Integrated packet optical SDN on the way.

- **OIF Transport SDN:** The OIF, in collaboration with industry leaders, has helped establish a foundation for open, programmable networks that allow operators to efficiently deliver dynamic multi-domain connectivity services to the market

Thanks!

www.oiforum.com

20