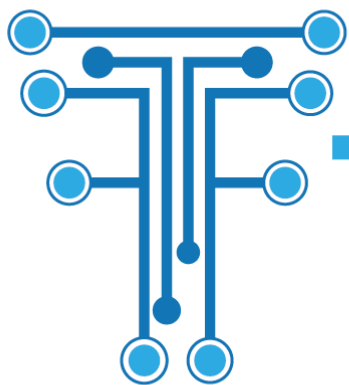# TeraFlow SDN: Where Research and Open Networking Meets Industry

Tuesday, June 21, 2022 11:30 AM to 12:30 PM

TeraFlow

Findings and next steps for industry

using open networking over optical networks
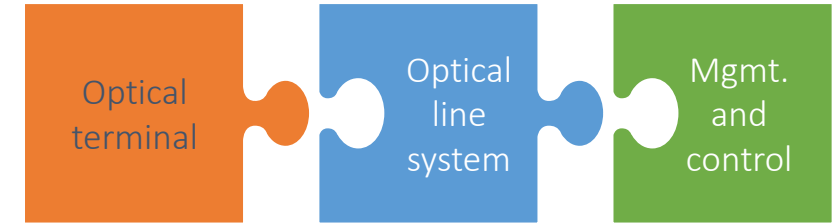
Stephan Neidlinger

ADVA

Barcelona, Spain, June 21, 2022

5G PPP

Open optical networks: benefits and challenges (1)

Disaggregation has benefits …

- Facilitates the adoption of new technology
- Increases network flexibility and agility
- Removes vendor/technology/supply chain lock-ins
- Motivates technology innovation

… and challenges

- In multi-vendor environments, who guarantees multi-vendor interoperability? Performance? …
- How can relevant information be gathered to perform network planning, management and control? …

Greater efficiency and flexibility with new complexities

Open optical networks: benefits and challenges (2)

In closed, highly coupled networks

- Coordination between OLS and transponders is provided by the same controller entity as a turn-key solution
- Interoperability between transponders and OLS is guaranteed by system vendor
- Planning data and tools are provided by system vendor
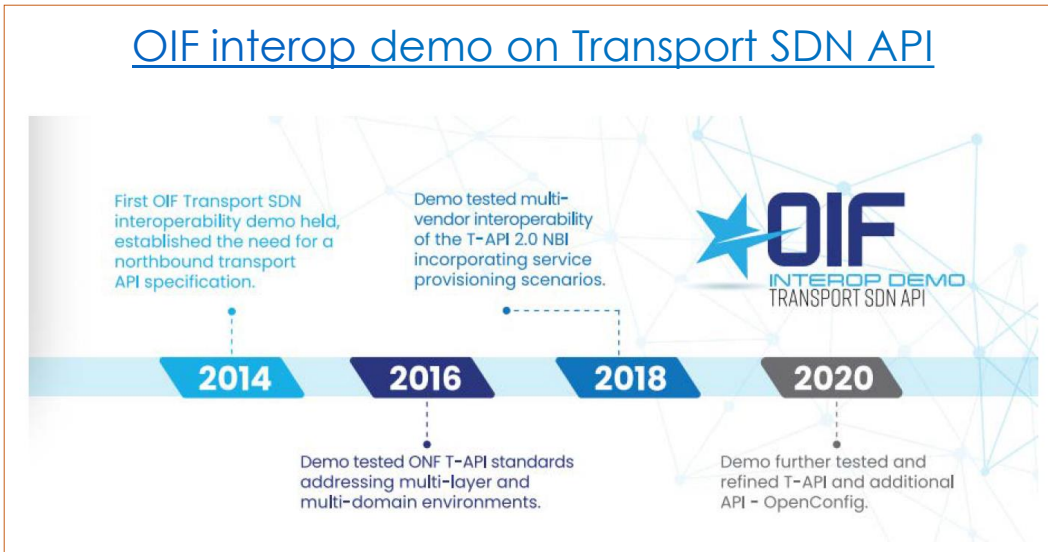
In open, disaggregated networks

How to discover relevant information on the third-party transponders for link planning?

How to do configuration and path computation?

How to extract topology and inventory across vendors?

How to make diagnosis and health assurance across vendors?

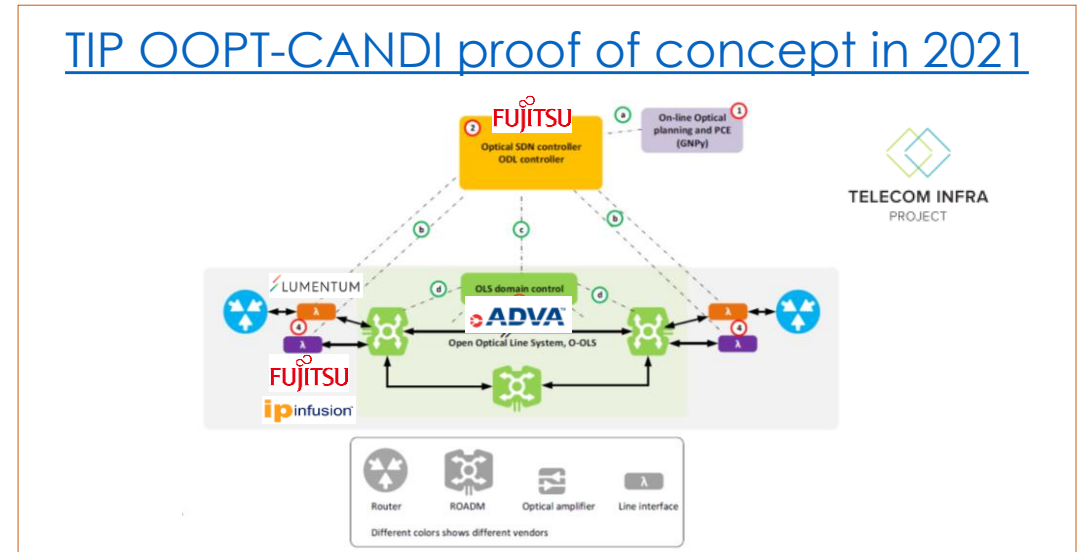## Need for standards-based models and APIs, and interoperability tests

Open optical networks achievements (1)

Numerous multi-vendor data-plane lab/field trials, many commercial deployments
Numerous multi-vendor NMS/SDN integration demos, some commercial deployments
Some multi-vendor interoperability trials including e2e optical link planning

OIF interop demo on Transport SDN API

First OIF Transport SDN interoperability demo held, established the need for a northbound transport API specification.

Demo tested multi-vendor interoperability of the T-API 2.0 NBI incorporating service provisioning scenarios.

2014 **2016** **2018** **2020**

Demo tested ONF T-API standards addressing multi-layer and multi-domain environments.

Demo further tested and refined T-API and additional API – OpenConfig.

TIP OOPT-CANDI proof of concept in 2021
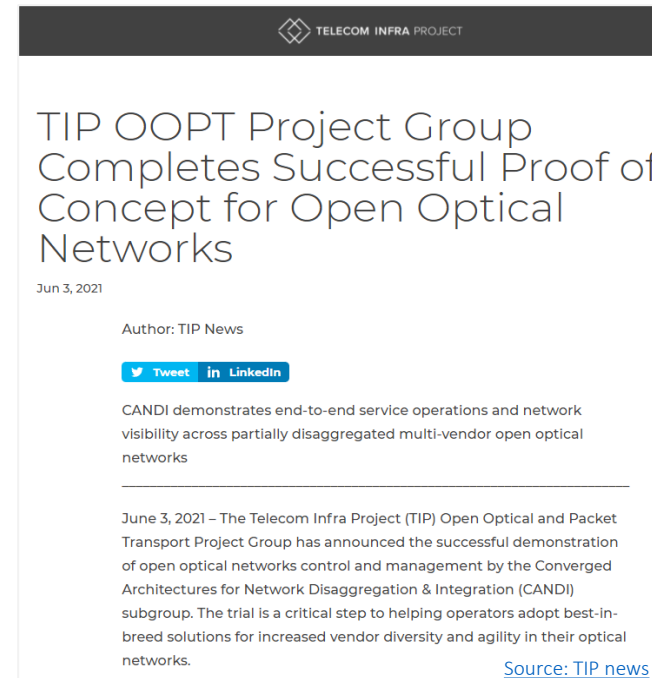

Different colors shows different vendors

Interop test results improve network architecture and API specifications
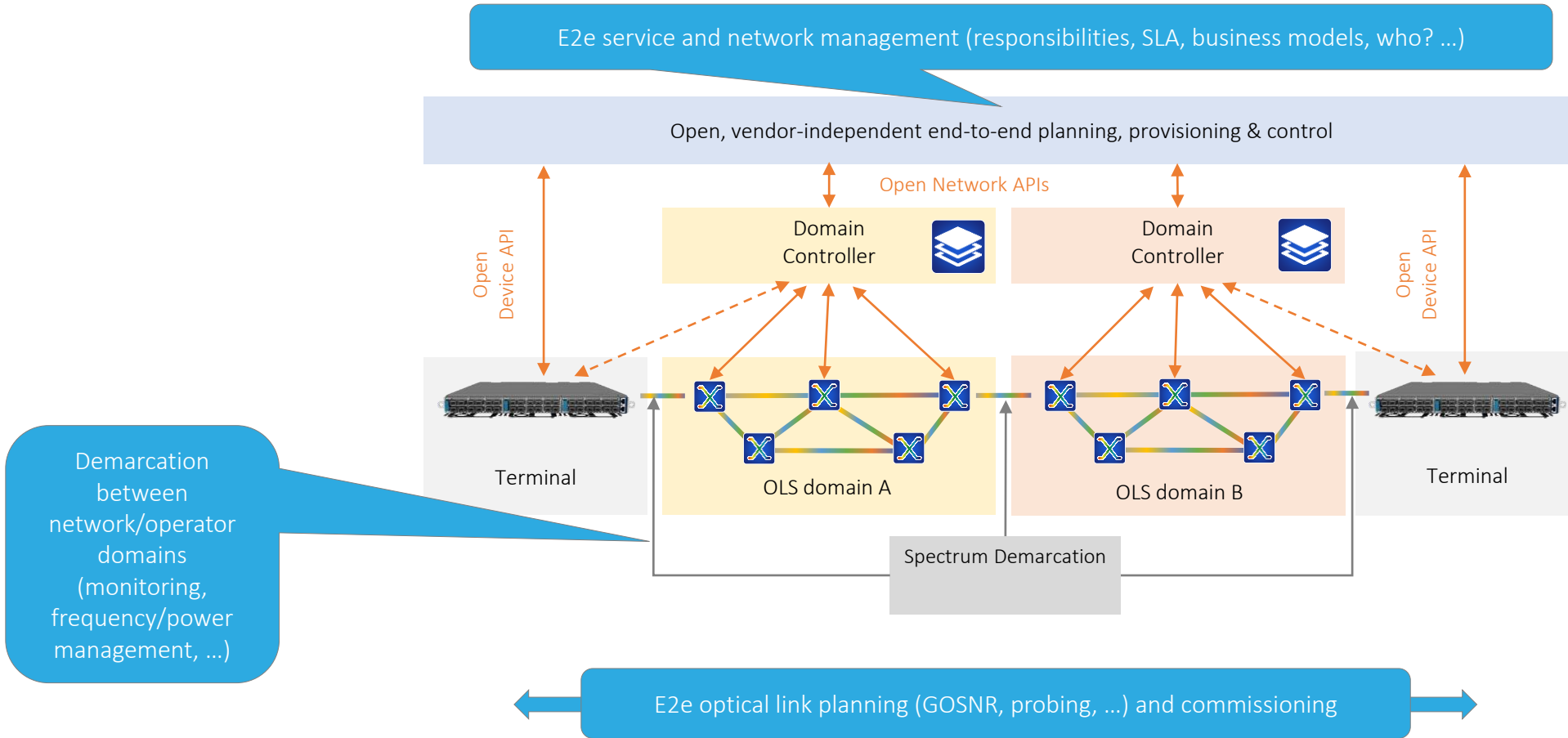
Open optical networks achievements (2)

Example: OOPT-CANDI PoC 2021 – summary and findings

- Successful demonstration of standard-based open interfaces for SDN management and control across disaggregated, multi-vendor networks

- Successful integration of optical SDN controller with optical planning tool "GNPy" for online optical provisioning and reach verification

- Experimental augmentations to ONF T-API (inclusion of span loss, fiber length, amplifier types, operational configuration settings) will be proposed to ONF T-API group via OOPT-MUST

TELECOM INFRA PROJECT

TIP OOPT Project Group Completes Successful Proof of Concept for Open Optical Networks

Jun 3, 2021

Author: TIP News

Tweet in LinkedIn

CANDI demonstrates end-to-end service operations and network visibility across partially disaggregated multi-vendor open optical networks

June 3, 2021 – The Telecom Infra Project (TIP) Open Optical and Packet Transport Project Group has announced the successful demonstration of open optical networks control and management by the Converged Architectures for Network Disaggregation & Integration (CANDI) subgroup. The trial is a critical step to helping operators adopt best-in-breed solutions for increased vendor diversity and agility in their optical networks.

Source: TIP news

Successful proof of concept for open optical networks

Open optical networks: major open topics (1)

E2e service and network management (responsibilities, SLA, business models, who? …)

Open, vendor-independent end-to-end planning, provisioning & control

Open Network APIs

Open Device API

Domain Controller

Domain Controller

Open Device API

Terminal

OLS domain A

OLS domain B

Terminal

Demarcation between network/operator domains (monitoring, frequency/power management, …)

Spectrum Demarcation

E2e optical link planning (GOSNR, probing, …) and commissioning

Key challenges: system integration and operating models

Open optical networks: major open topics (2)

Example: OOPT-CANDI PoC 2021 – summary and findings

Weaknesses in the workflow process:
Optical link planning: off- and on-line import of equipment data
Some equipment performance data for link planning was considered confidential
Manual creation of links between OTs and OLS domain in optical SDN controller
Missing commissioning step to update operational configurations

Further work to be done:
Augmentation of SDN API (OpenConfig, ONF T-API) by related industry groups
Will be driven by OOPT MUST subgroup
Will lead to updated OpenConfig and T-API specifications
Will then have to be implemented by system vendors
Define automated procedure for identifying link between OT and OLS

Further work will be driven by TIP, standardization bodies and system vendors

Further work for the community

Develop sustainable workflows and business models for …

System integration
    end-to-end optical link planning
    System ordering, delivery
    System staging (lab set up, system verification tests, …)
    Field deployment, commissioning
    Responsibilites (network operator – (system integrator –) system vendors)
    Skill set development at operators

Operating models
    end-to-end service and network management
    Life cycle management (performance/alarm monitoring, root cause analysis, maintenance, …)
    Service level agreements (network operator – (system integrator –) system vendors)
    Skill set development at operators

Further work on key challenges: system integration and operating models