ODTN, Open Disaggregated Transport Network

Status, Current work, Roadmap
Collaboration with TIP OOPT

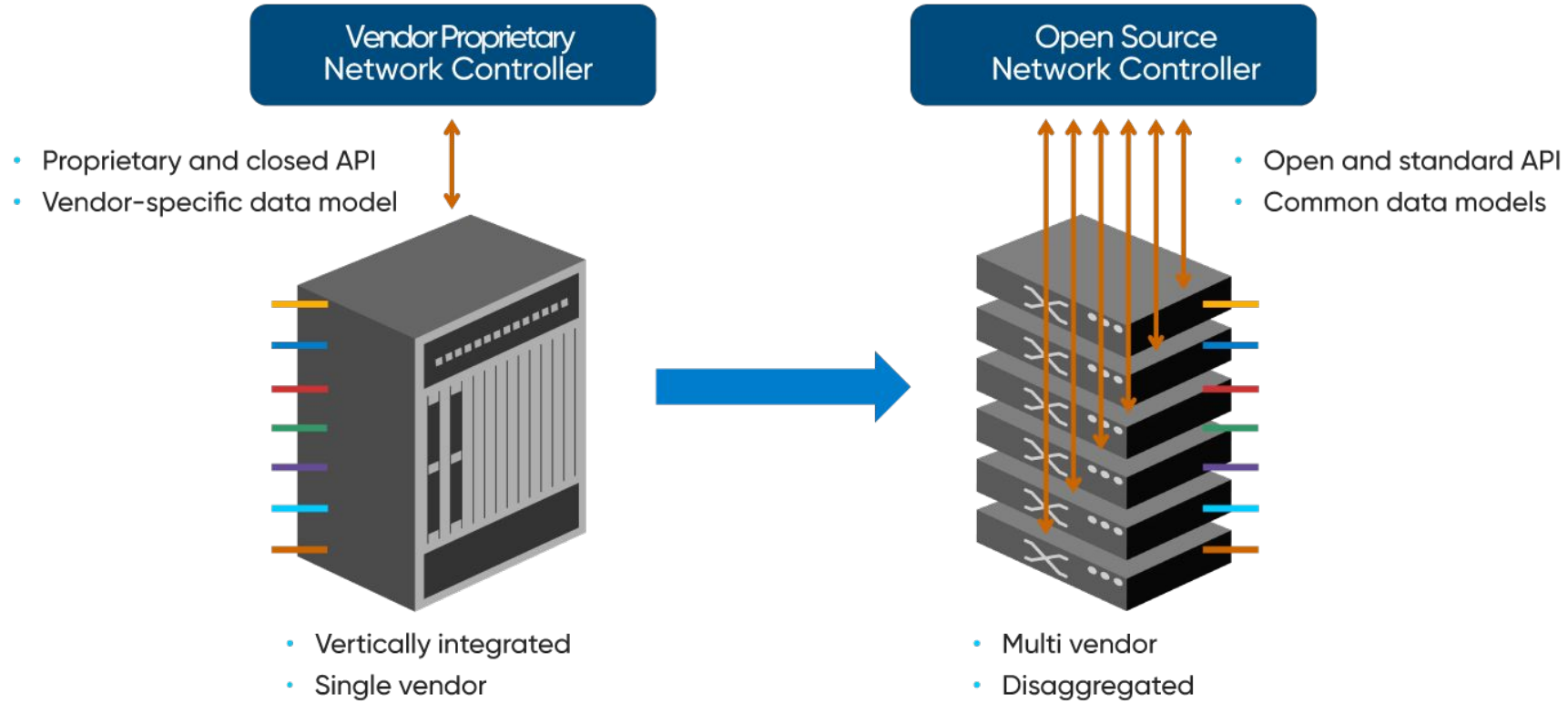
Andrea Campanella, ONF
andrea@opennetworking.org

Clear ask from operators

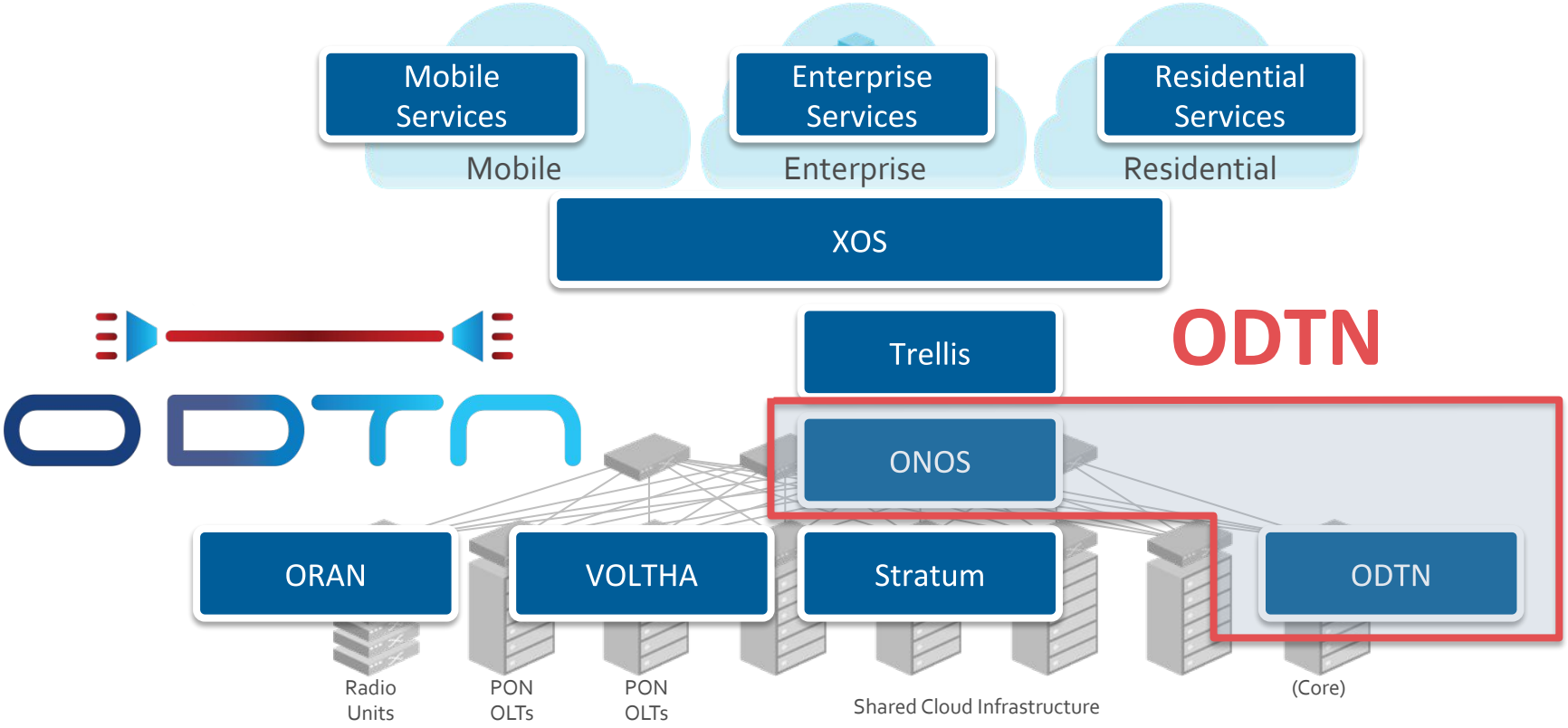
Open Source Data Center Interconnect (DCI) Solution

1. **Open and Standard APIs** to be vendor neutral and modular.
2. **Open Source Software**
3. **Rapid cycle of innovations** can happen in terminal equipment (Transponders)
4. Clear separation of the behavior of the transponder and the line system (OLS)
5. Enable **Services** to be rapidly created, prototyped, tested
6. Support OLS that transport any kind of signal (**Alien Wavelengths**)
7. Modular and **production ready platform**
8. CI/CD pipeline for DevOps environment

Disaggregated Transport Networks



ONF Projects & Platforms



Incremental Approach

ODTN gets developed one step at a time through:

- definition of use-case
- choice of common API(s) to achieve given use-case
- implementation in ONOS
- test, debug and trials

Each phase builds on top of the previous one with new and further enhancements

SDN and Disaggregation in Optical Transport Network

- Save Capex and Opex in Data Centre Interconnect deployments
- Rapid production adoption of innovations in terminal equipment
  - Enable vendors to innovate: speed, reach, QoT, …
  - Let operators reap benefits through simple bookending
- Better LCCA (Life Cycle Cost Approach) and optimize equipment life-span
- Future proof your network avoiding vendor lock-in

* Post phase 1

Open APIs

Only **Open APIs with public models** will be used.

Reach industry consensus and agreement on Open and Public APIs

Open and Standard API:

- provide **layers of abstractions**
- enable **plug and play**
- **mandate interaction** between software and hardware
- **mix and match** of components
- **multi-vendor** integration

OPENCONFIG

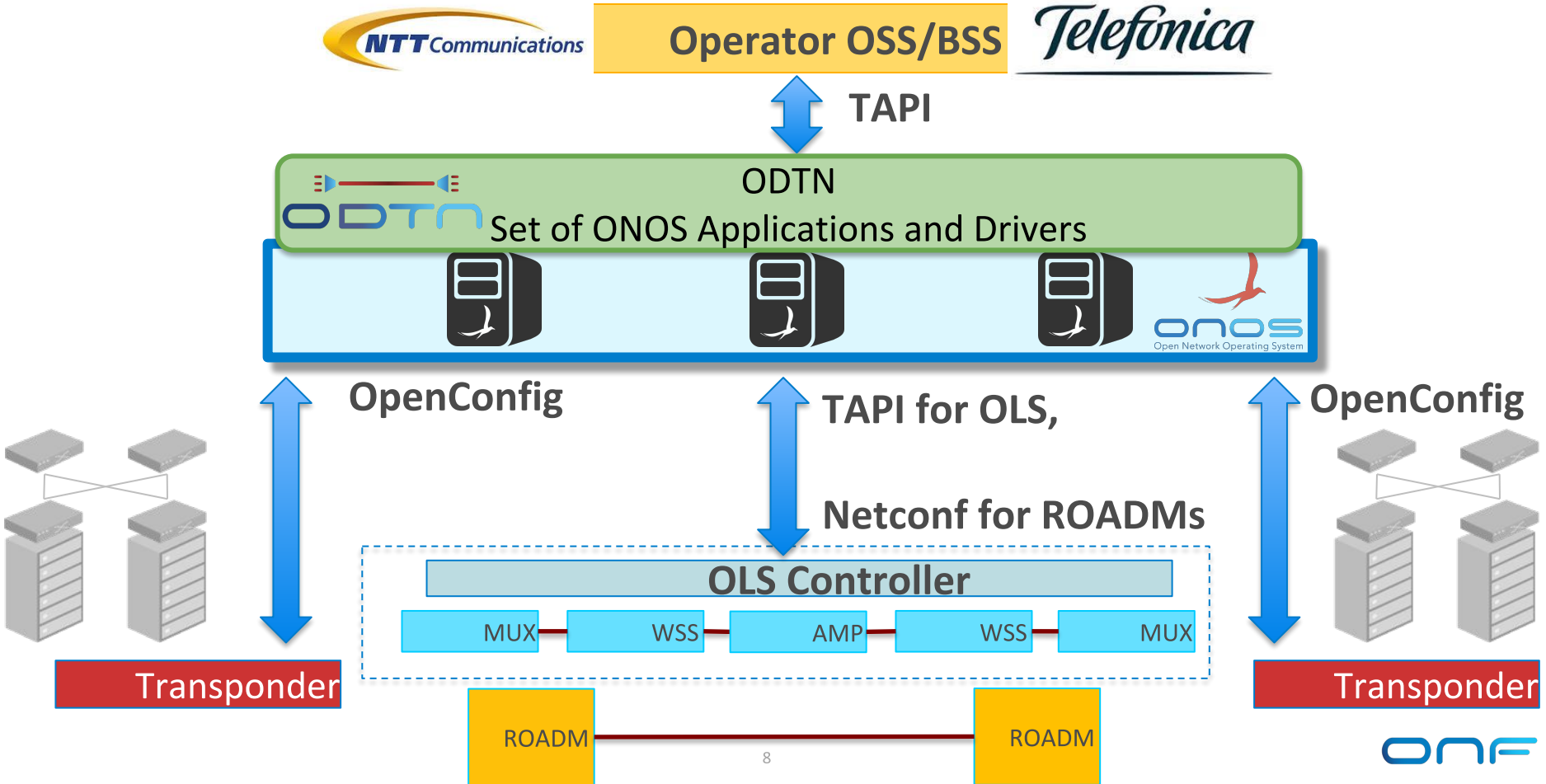
TAPI

Open ROADM

TAI
Transponder Abstraction Interface

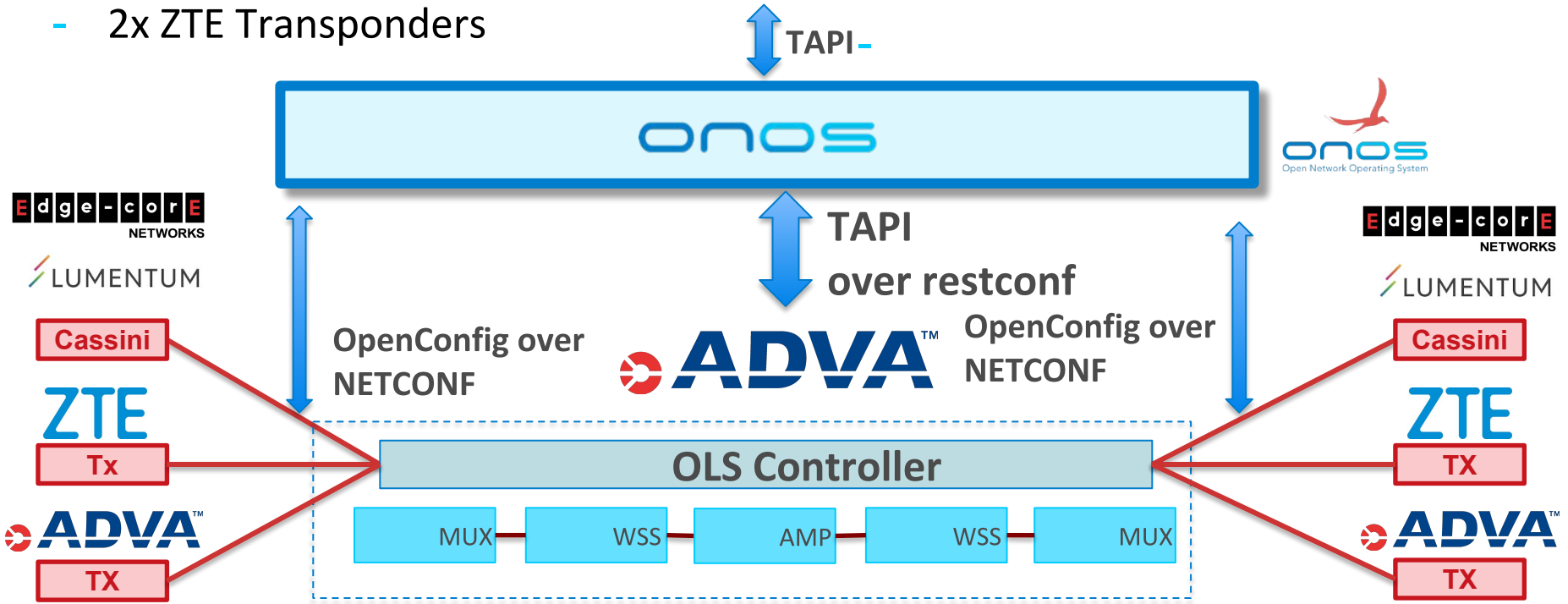
7

Data Centre Interconnect Solution



Topology at Telefonica Lab (madrid)

- 2x Edgecore Cassini TXs with Lumentum ACO Cards
- 2x ZTE Transponders
- 2 x ADVA Transponders
- 1x ADVA OLS



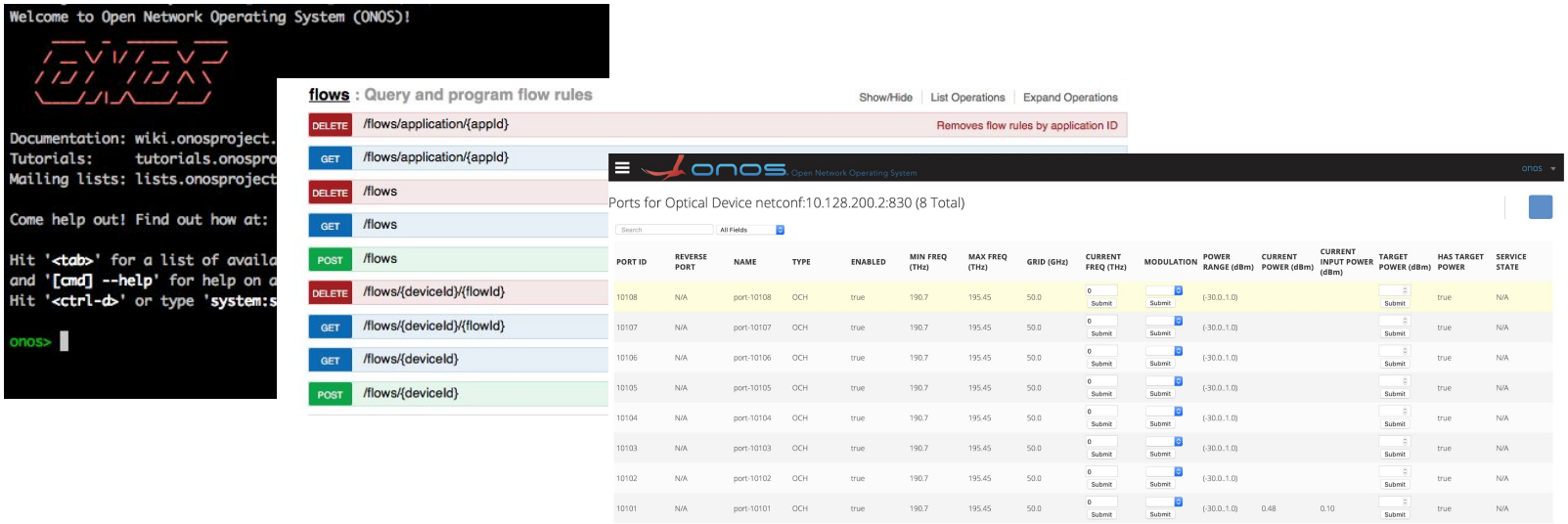
ODTN Capabilities

1. **Discover optical topology** with details (devices, ports, links)
2. Expose **topology details** on the **northbound TAPI API**
3. **Receive TAPI connectivity requests** from an OSS/BSS on NB
4. **Automated compute of end to end optical path with lambda**
5. **Install configuration for optical path to OLS controller and Transponders line side**
6. Transponder **cross connection** for client to line side connection
7. **Power** configuration on line side ports (manual)
8. **Modulation** configuration on line side ports (manual)
9. **ONOS** is deployed in a **three node instance** for resiliency and failover

Vendor independent optical configuration and management workflow(s) based on Open APIs and Open source Software

ODTN Interaction

$onos <controller_address>
REST APIs: <onos-ip>:8181/onos/v1/docs/
UI: <onos-ip>:8181/onos/ui



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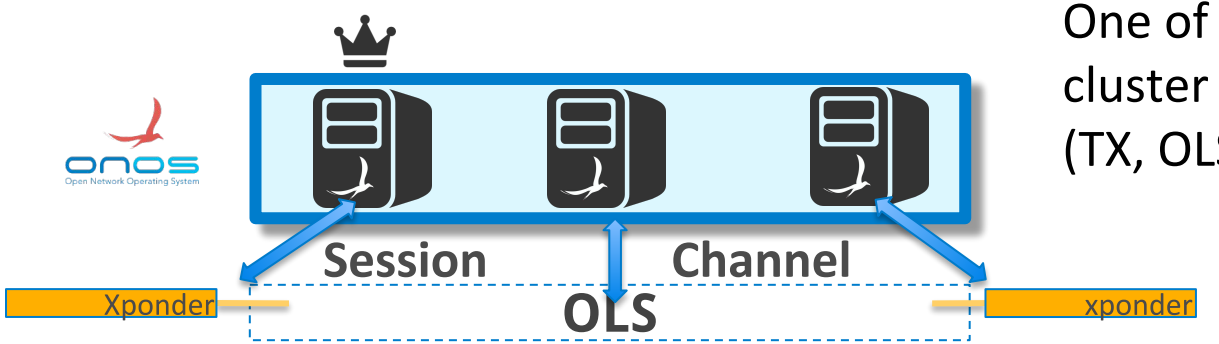
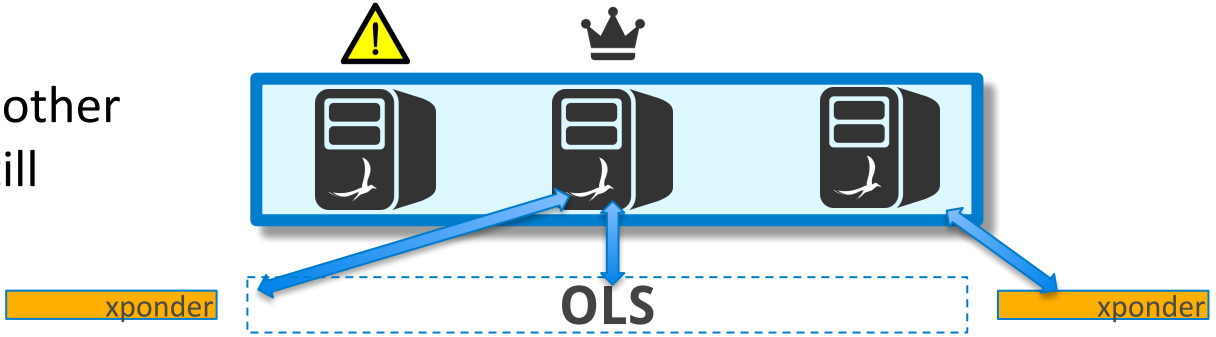
Resilience and Failover



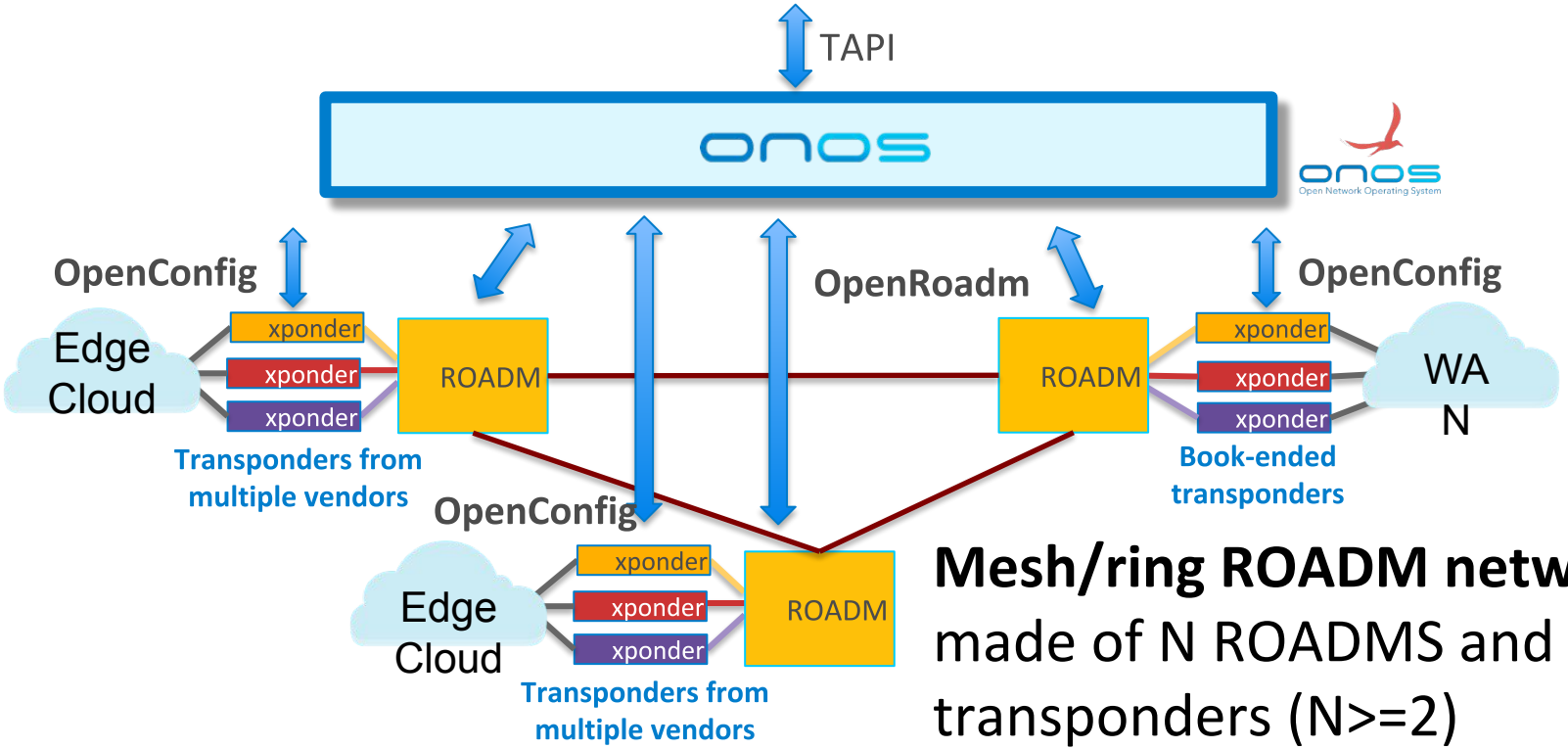
One of the onos Instance in a cluster is master of a given device (TX, OLS)

If that instance goes down another master is elected → device still managed



Current ODTN Architecture (ROADMS)

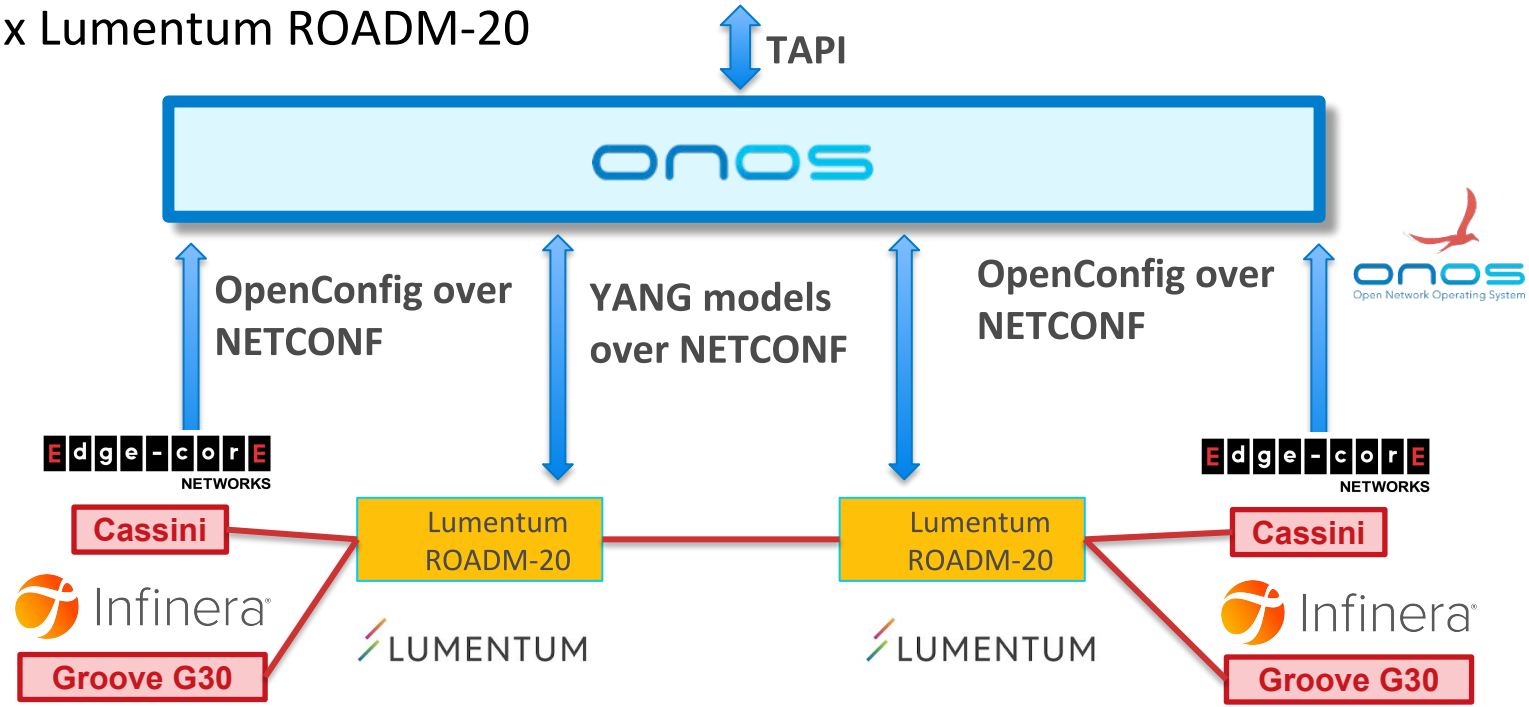
ODTN includes a complete OpenRoadm 2.2 driver



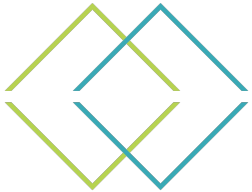
Mesh/ring ROADM network made of N ROADMS and N transponders (N>=2)

Topology at ONF Connect

- 2x Edgecore Cassini TXs with Lumentum ACO Cards
- 2x Groove G30 Infinera
- 2 x Lumentum ROADM-20



ODTN + OOPT



TELECOM INFRA
PROJECT

Joint Collaboration through Open Optical Packet Transport (OOPT) and Open Disaggregated Transport Network (ODTN)

Announced at OFC 19

https://www.opennetworking.org/news-and-events/blog/onf-and-tip-collaborating-on-open-optical-transport-solutions/

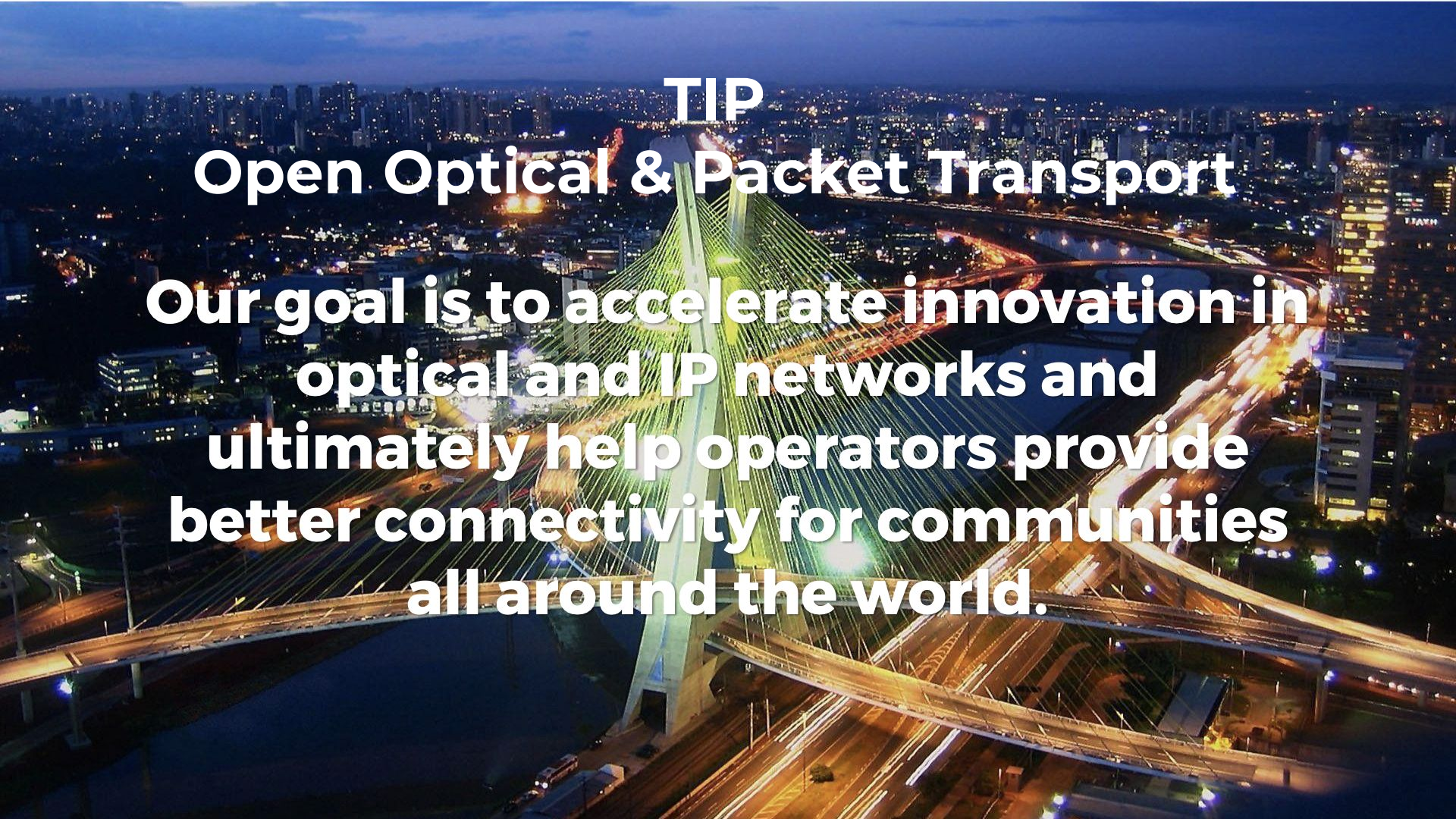
https://telecominfraproject.com/tip-at-ofc-2019-collaboration-with-onf-oopt-project-group-updates/

What is TIP?

FOUNDED IN 2016

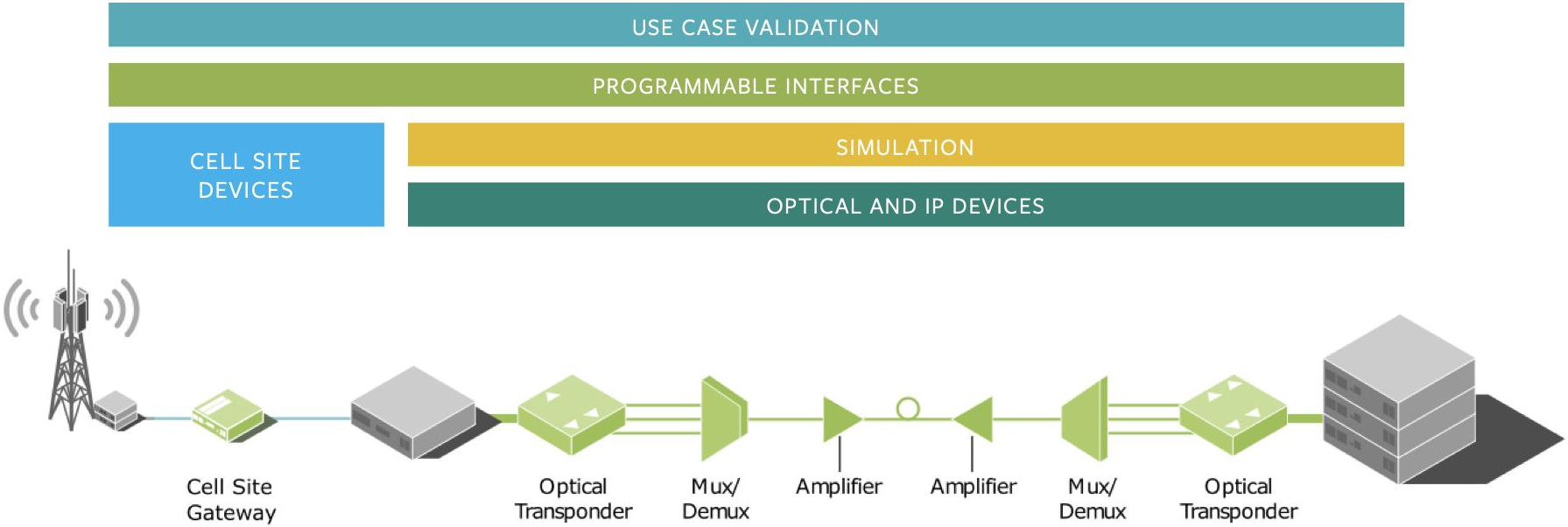
Telecom Infra Project (TIP) is a collaborative community accelerating and transforming the way telecom infrastructure is created, taken to market, and deployed.

Together We Build


TIP
Open Optical & Packet Transport
Our goal is to accelerate innovation in optical and IP networks and ultimately help operators provide better connectivity for communities all around the world.

OOPT - General Overview

Current Areas of Focus



Current OOPT Technologies

Odyssey-DCSG

Voyager

Cassini

TAI

GNPy

ONF TIP Collaboration

Collaboration **Benefits and Goals**

1. **Reduce duplicated effort** in Optical Disaggregation
2. **Share** knowledge, resources, findings and development
3. Discuss and achieve a stronger industry **consensus in APIs and solutions**
4. Stronger **impact** and accelerate **trials** and **production deployment**s of complete white box hardware and open source software in optical networks.
5. **Common test labs**

ONF ONOS Integration with TIP Cassini

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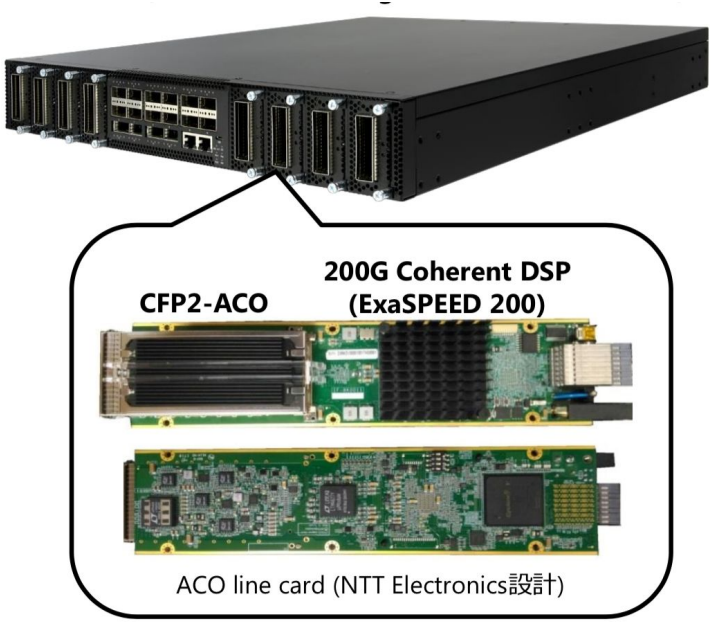
SDN Controller	ODTN / ONOS
Southbound API	OpenConfig
Network Operating System	OcNOS, TAI
Packet/Optical Hardware Platform	ASIC, ACO, DCO, CASSINI



NTT Electronics · ip infusion · Edge-corE NETWORKS · LUMENTUM · FUJITSU

Project synergies

TAPI

effort on NB apps and use cases are complementary

GNPy

TELECOM INFRA PROJECT

ONF Open Networking Foundation

ONOS Open Network Operating System

OPENCONFIG

ONF Brings network wide controller, SP requirements and API definition (tapi, Openconfig

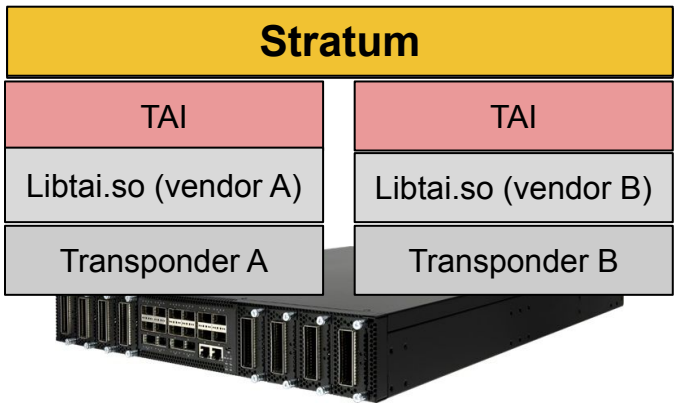
STRATUM

Transponder Abstraction Interface

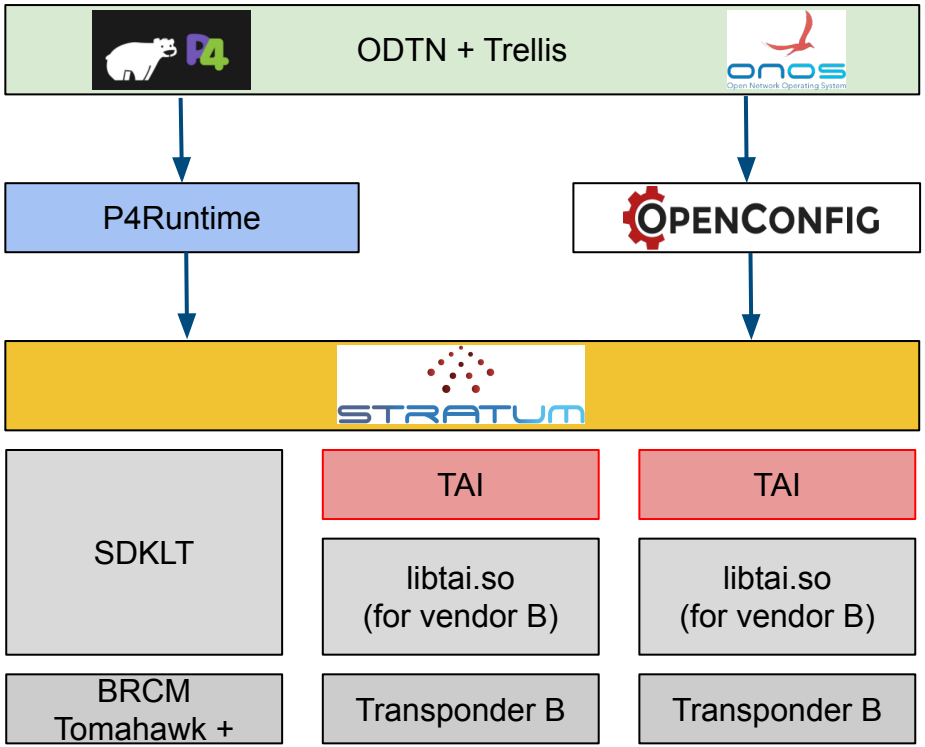
TELECOM INFRA PROJECT

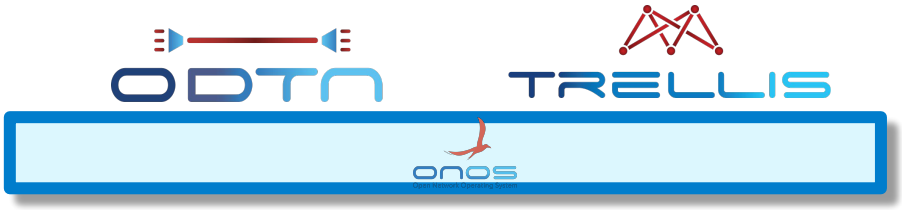
TIP brings open hardware, Optical module and component expertise, TAI, and optical network planning tool (gNPY)

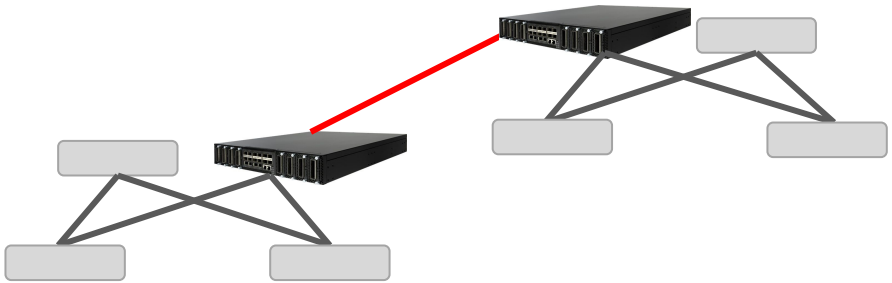
Edge-corE NETWORKS



ODTN with Stratum and Trellis







ODTN Roadmap

3 months time frame

1. **FEC**
2. **OSNR retrieval**
3. **GUI** extension with more information and parameters
4. **Testing** for an automated CI/CD with regression testing

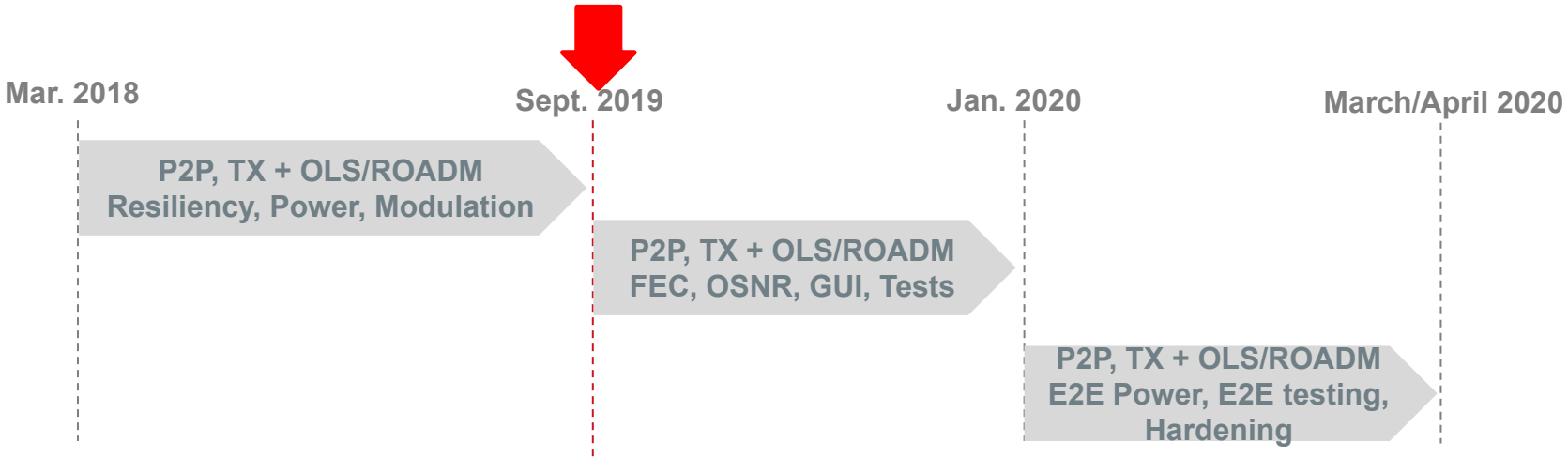
6 months time frame

1. **End to end Power configuration** workflow with OLS negotiation
2. **Platform hardening**

Current and committed ODTN Work

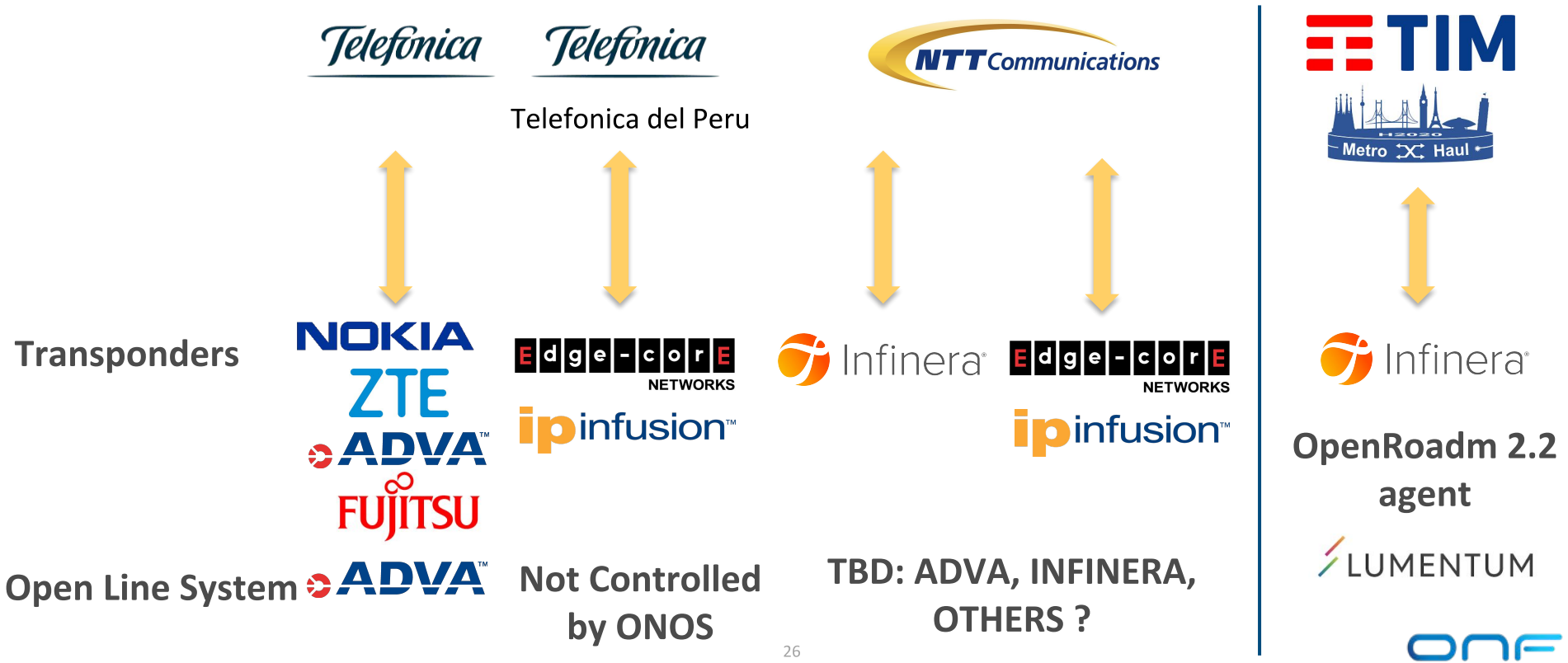
1 year (and more) time frame

1. Alarms
2. **Expanding** pool of **Transponders (Adva, Fujitsu, ZTE)**
3. **Expanding** Pools of **OLS/Roadm**
4. Integration with **Optical planning tools (gNPy)**
5. In band control



Trial Plans

ODTN is in different stages of lab/field trial with multiple operators with different vendors



Telefónica del Perú Cassini Field Trial, Sept ‘19

Telefónica

TELECOM INFRA PROJECT

ONF

Evaluation scenarios

1. Metro: Optical layer 1 interoperability with OEM O-SNCP devices.
2. Longhaul: Optical layer 0/1 reach performance in 100G and 200G mode.

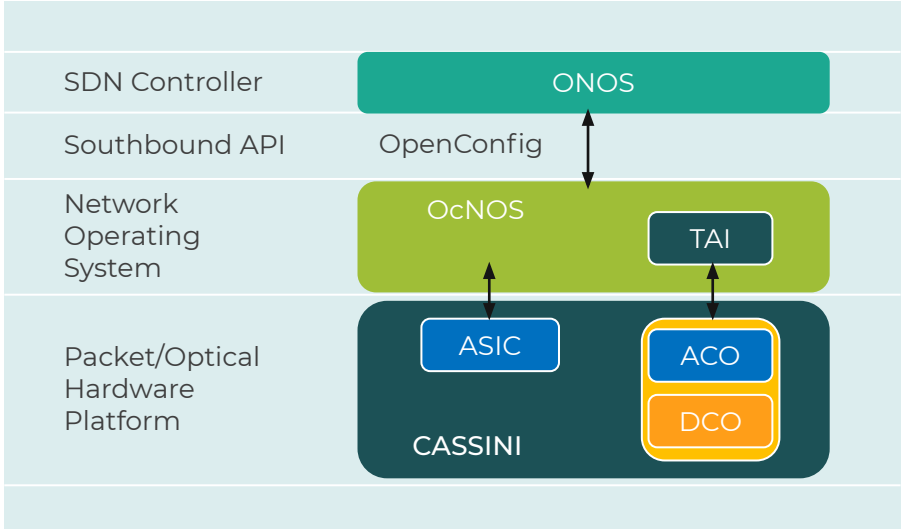
NTT Electronics

ip infusion

Edge-corE NETWORKS

LUMENTUM

FUJITSU



Possible Extension of trial with OLS (Huawei) Feb/March ‘20

Community

Great Exemplar Platform Community, Thanks you!

Still lots to do, come and join us!

odtn@opennetworking.org

Community


NTT Communications


Telefónica


TIM


NOKIA


Infinera


ADVA


Edge-corE
NETWORKS


ipinfusion


LUMENTUM


ciena


JUNIPer
NETWORKS


FUJITSU


SterliteTech


ZTE


H2020
Metro Haul

Reference Design

Informational reference Design published April 2019

Use Case, API and project milestones definition

https://www.opennetworking.org/wp-content/uploads/2019/04/ONF-Info-1002-ODTN-032919.pdf

Please do provide comments and thoughts at

odtn@opennetworking.org

or

andrea@opennetworking.org

Takeaways

- ODTN is building, with the help of partners and collaborators, an **open source software stack for optical networks**
- ODTN Uses **standard and open device APIS** (OpenConfig for Transponders, TAPI for OLS, OpenROADM 2.2 for ROADMs)
- ODTN uses **TAPI** as a standard and open API on the northbound
- ODTN leverages architecture, performance e scalability of **ONOS**
- ODTN integrates a **wide variety of vendors** for network equipment.
- **Incremental** approach towards production readiness
- **Lab trials** with major operators → **feedback loop** of requirements and enhancements
- **OOPT(TIP) and ODTN(ONF) create a common open source optical ecosystem with strong industry consensus**

ONF's 2019 Contributor Award

Designed to recognize **top ONF Community members** who are:

- Top Code Contributors (or Code Removers)
- Top Reviewers and Mentors
- Top Ambassadors or Advocates
- Contributors of Significant Components of a system
- Consistently "chopping wood and carrying water" (helping everyone be more productive)

Alessio Giorgetti

Ramon Casellas

Quan Pham Van

Konrad Mrówka

Andrea Campanella

Useful Info

ODTN Wiki: https://wiki.onosproject.org/display/ODTN/ODTN

Still lots to do, come and join us!

odtn@opennetworking.org

Questions ?

andrea@opennetworking.org

Thank You

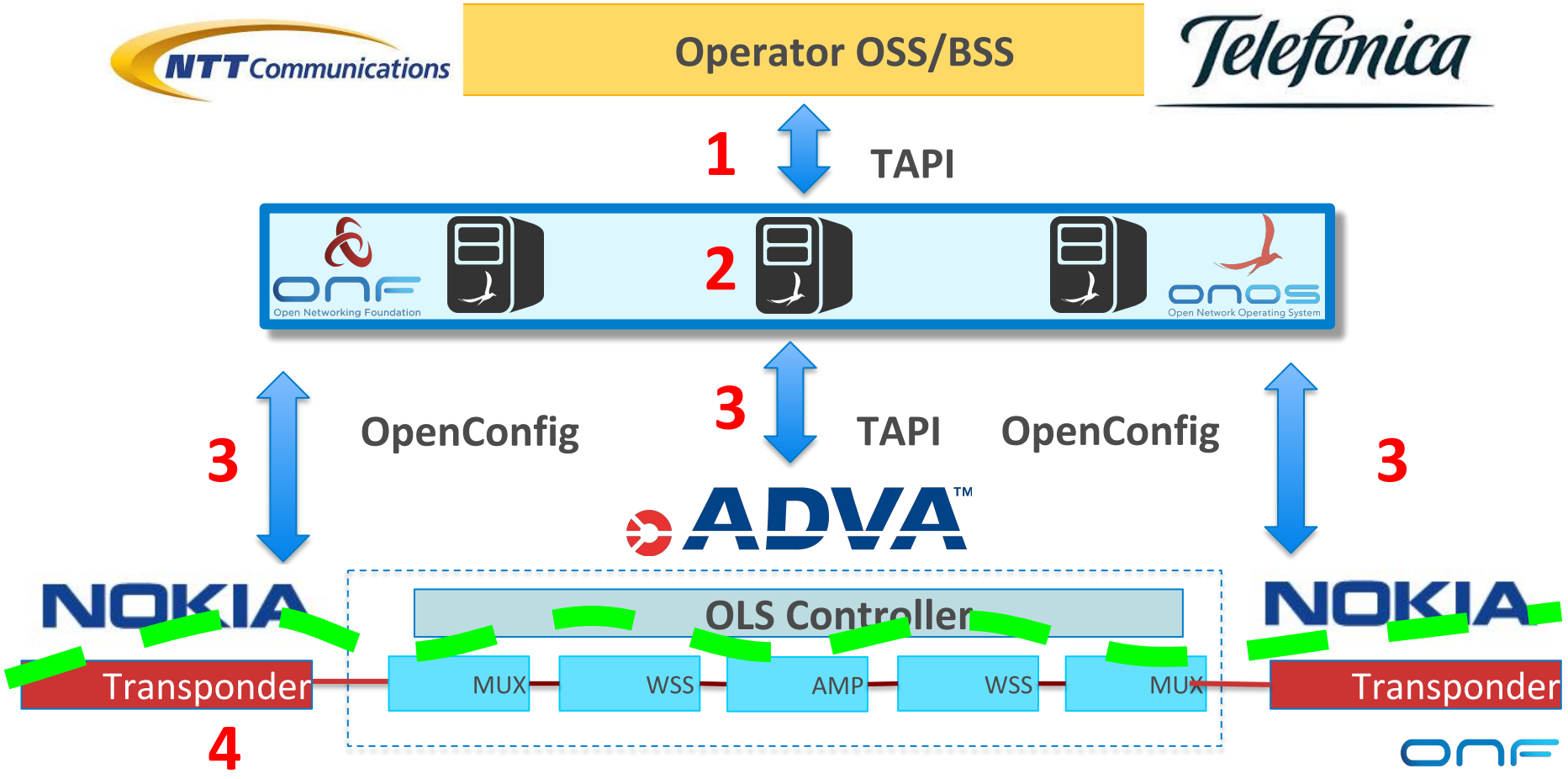
Why OpenConfig for TX

- **Well know API**
- **Supported** already by many vendors
- **Proper abstraction** model for transponder devices capabilities and information
- Defines capabilities at **correct level for programmability** but also abstraction from physical details
- Capability and Flexibility to **support vendor specific features**
- Can represent both **multi-layer** w/ and w/o OTN
- **Extensible and Open Source**

Why TAPI for ONOS Northbound and OLS ?

- **Well know API**
- **Extensible and Open Source**
- **Tested and deployed** (See Interop Testing)
- **Proper abstraction** for high level optical domain programming
- Can represent both **multi-layer** end to end provisioning with optical parameters
- Great community of vendors and Service Providers

Workflow

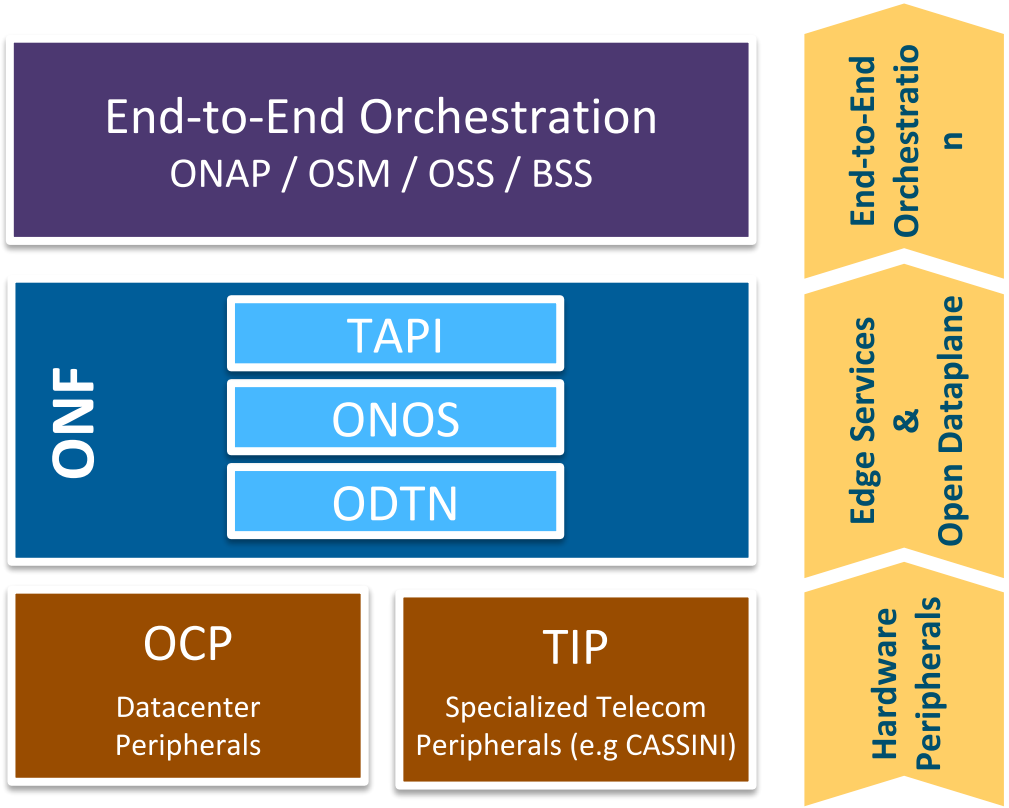

NTT Communications
Operator OSS/BSS
Telefonica
1
TAPI
ONF
Open Networking Foundation
2
ONOS
Open Network Operating System
3
OpenConfig
3
TAPI
OpenConfig
3
ADVA
NOKIA
OLS Controller
NOKIA
Transponder
MUX
WSS
AMP
WSS
MUX
Transponder
4

ODTN workflow and Capabilities

Service Provisioning

1. **OSS/BSS requests connectivity-service with TAPI**
2. Connectivity services and provisioning config is stored in distributed Maps for redundancy and failover
3. ONOS translates into **Optical Intent and TX configuration**
4. provisions a connectivity service through **TAPI** on OLS
5. Logical channel (cross-connection from client to line side) and wavelength Tuning through **Openconfig** on Transponders

Where ODTN Fits into Open Source Ecosystem



ODTN is the a carrier-grade optical transport open source project

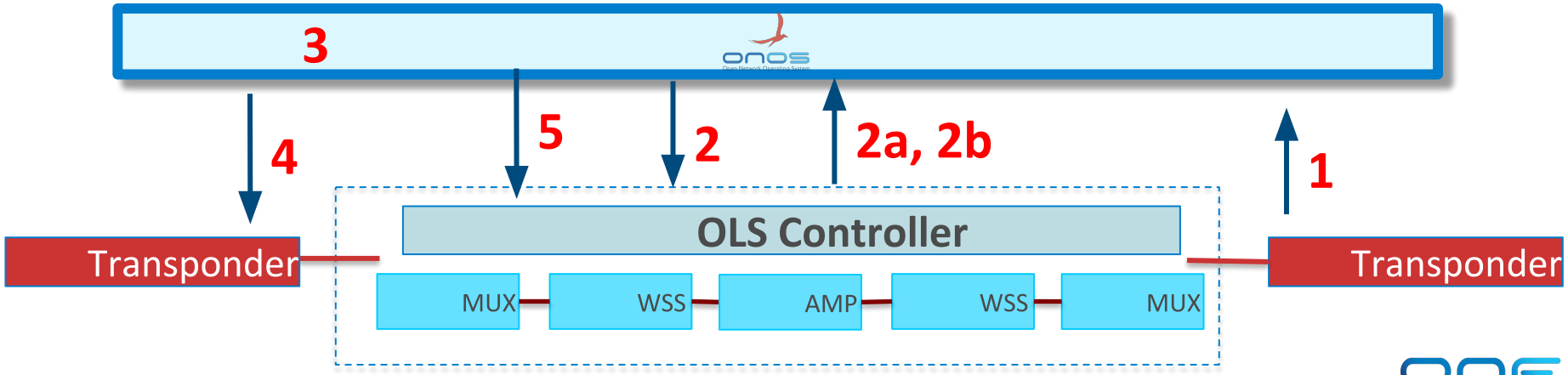
open source software stack for control and management of optical networks

This ecosystem is poised to deliver robust solutions over time, from white box peripherals to orchestrated end-to-end solutions

Power Setup workflow

1) Retrieve target-power/range from RX transponder, also transmitting capabilities on TX Transponder
2) Request path computation to OLS with Transponder RX target-power range min/max and TX range min/max (from 2.2 TAPI ⟶ range target output power on SIP)
   a) If path computation success -> 3,4 ⟶ answer need to contain a target power
   b) if path computation fail for power budget -> re-tune RX target-power transponder if possible -> 2
3) Configure wave and power on transponder TX. Power is the value returned from OLS.
4) Connectivity service establishment on OLS with constraints on min/max

PowerConfig behaviour



Physical Simulation Environment (gNPY)

Open Source Optical Simulation tool

Currently working in offline mode, with manual feedback to controller

Feedback loop with ONOS gathering information on current networks,

through open and common API (TAPI)