ONF Wireless Transport Modeling and Implementation

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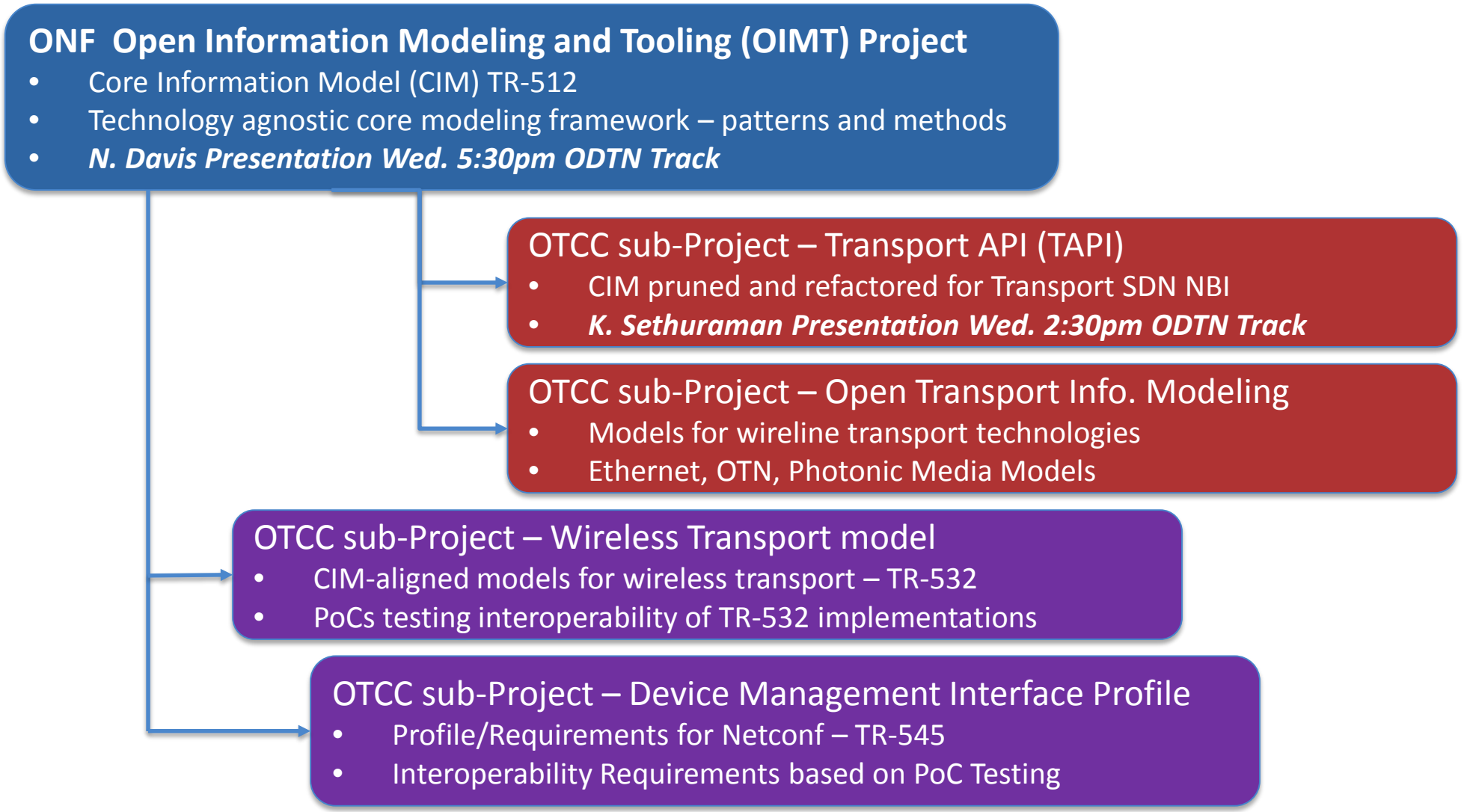
ONF Open Transport Config & Control (OTCC) Project

- Mission
  - Promote common configuration and control interfaces for transport networks in SDN, defining these interfaces with open source software and software defined standards
  - https://www.opennetworking.org/open-transport/, https://wiki.opennetworking.org/display/COM/Community+Home
- OTCC TST
  - Lyndon Ong, Ciena, OTCC project lead
  - Giorgio Cazzaniga, SIAE, Wireless Transport sub-project lead
  - Karthik Sethuraman, NEC, Transport API sub-project lead
  - Kam Lam, Fiberhome, OT Information Modeling sub-project lead
  - Thorsten Heinze, Device Management Interface Profile sub-project lead
- Products
  - OpenFlow extensions for optical
  - Transport API Functional Requirements and SDK (related OIF and MEF demonstrations)
    - https://github.com/OpenNetworkingFoundation/TAPI
  - Wireless Transport Information Model - ONF TR-532, 545 (DMIP) and related WT PoCs

ONF API Modeling

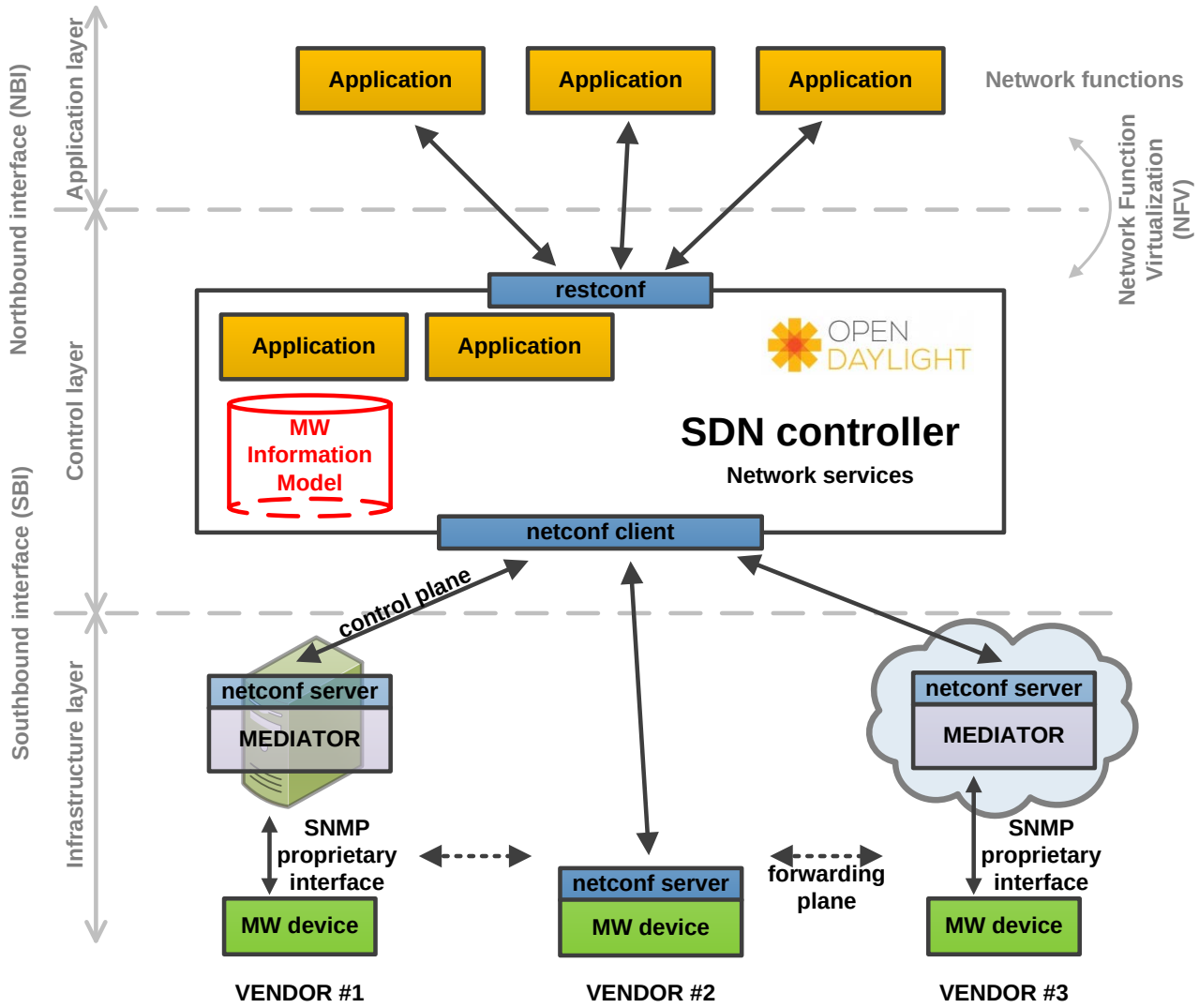


Wireless Transport Effort

Goals of the Wireless Transport Activity

- Adoption of SDN architecture and principles for wireless transport networks. Identification of and addressing of different use cases.
- Allowing non-proprietary open source SDN controller (e.g. OpenDaylight, ONOS) to manage multi-vendor wireless transport networks and coordinate them with other domains and layers of the network (e.g. RAN, Core, OTN) → multi-layer and multi-domain hierarchical SDN solely based on open source models and open interfaces.
- Definition and standardization of open interfaces and open source information models – integration of information models into the open source ecosystem. Open standardized interfaces allow connecting of multi-vendor devices to an open source SDN Controller and development of independent third-party applications (“network programming” – Network Function Virtualization (NFV)). The operators/service provides will not differentiate by the functionality, which is provided by the controller itself, but by the applications.
- Open Source SW Site: https://github.com/OpenNetworkingFoundation/CENTENNIAL

WT PoC History



	SDN controller	ONF CoreModel	SBI protocol
1st PoC 4Q2015 Spain	ONOS		OpenFlow
2nd PoC 2Q2016 Germany	ODL Lithium SR4		Netconf/YANG
3rd PoC 4Q2016 New Jersey	ODL Beryllium SR2	CM 1.1	Netconf/YANG
4th PoC 2Q2017 Germany	ODL Boron SR1	CM 1.2	Netconf/YANG
4.1th PoC 4Q2017 New Jersey	ODL Boron SR3	CM 1.2	Netconf/YANG

DMIP Effort

- Device Management Interface Profile and Requirements
  - PoC testing identified that well-defined model and protocol choice still leaves room for interoperability issues
  - Document requirements for reducing interoperability issues on a Netconf interface between controller and devices
- DMIP ONF TR-545 aims to specify requirements for interoperability
  - Joint effort by operators and vendors, approved and published in October 2018
  - Definition of generic semantic rules
  - Selection of optional components of existing standards (e.g. RFC6241)
  - Definition of minimum Performance and maximum Resource consumption
  - Assuring compatibility with Reference implementations

5th PoC INTRODUCTION

- 5th ONF PoC has been hosted by Telefonica Germany from 26 to 30 November

8 MW VENDORS

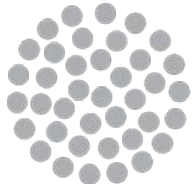
8 SW APPLICATION PROVIDERS

60+ PEOPLE ATTENDING IN THE FOUR DAYS

3 OPTICAL VENDORS

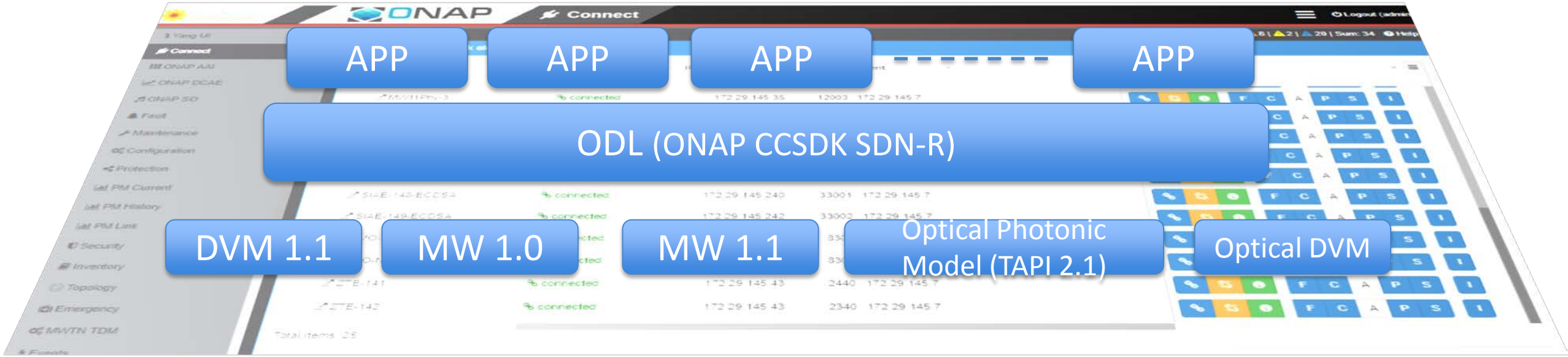
3 TELECOM OPERATORS ATTENDING

CONTRIBUTORS



SCOPE

- Demonstrate and validate the ONF TR-532 Rel.1.1 MW model.
- Demonstrate the first implementation of the TR-545 (DMIP) and ETH PHY model (TR-541)
- Demonstrate the implementation of the ONF Photonic Model extension (TAPI 2.1) in optical products.
- Run applications over REST based interface on top of ODL controller using data from real network.

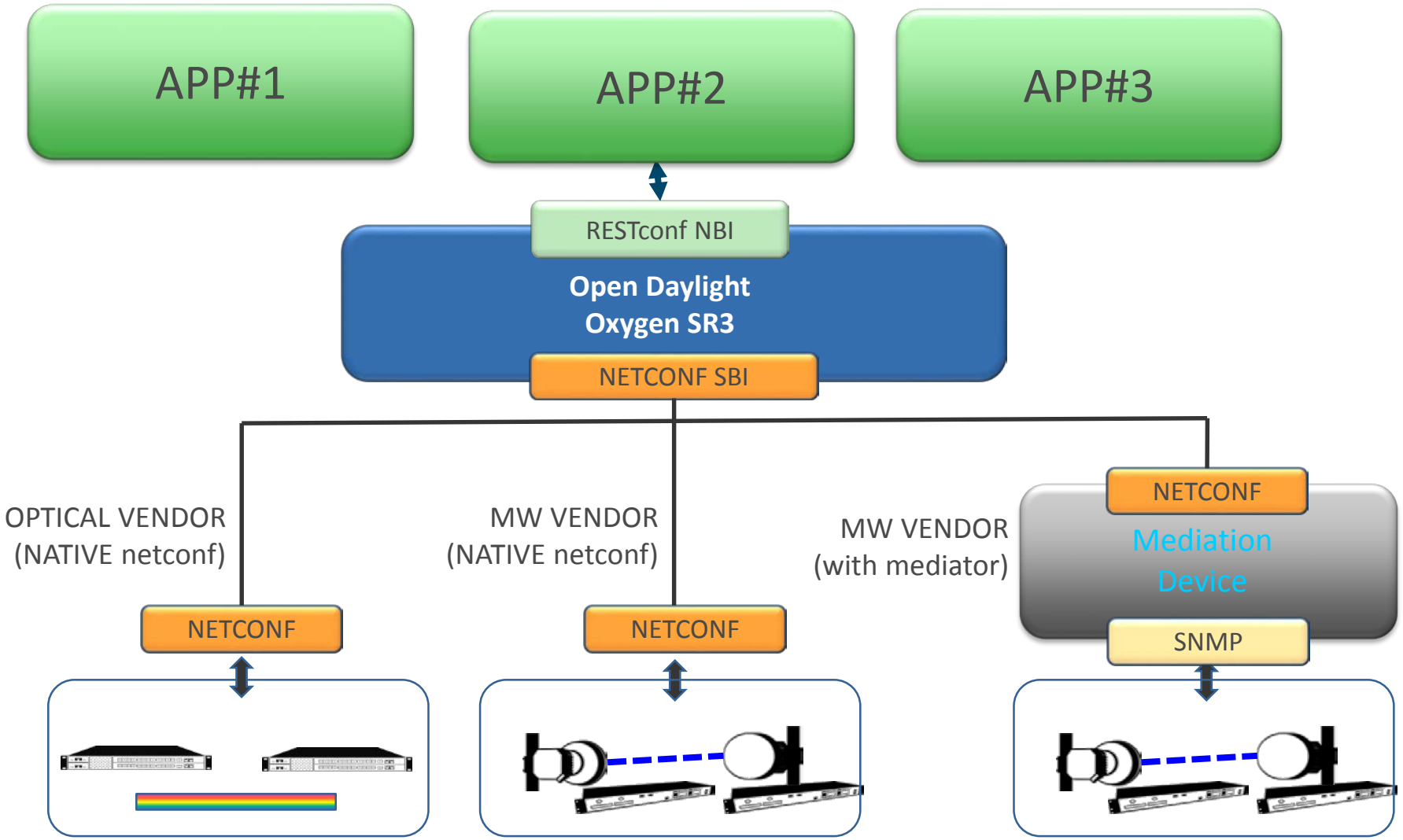


ARCHITECTURE

Applications

SDN Controller

Infrastucture



PoC ORGANIZATION

26-28 Nov 2018

TESTS ✓

29 Nov 2018
10:00-13:00

50 people in the room and more than 100 in webex

OPEN DAY FORUM ✓

29 Nov 2018
16:00-18:00

READOUT EVENT ✓

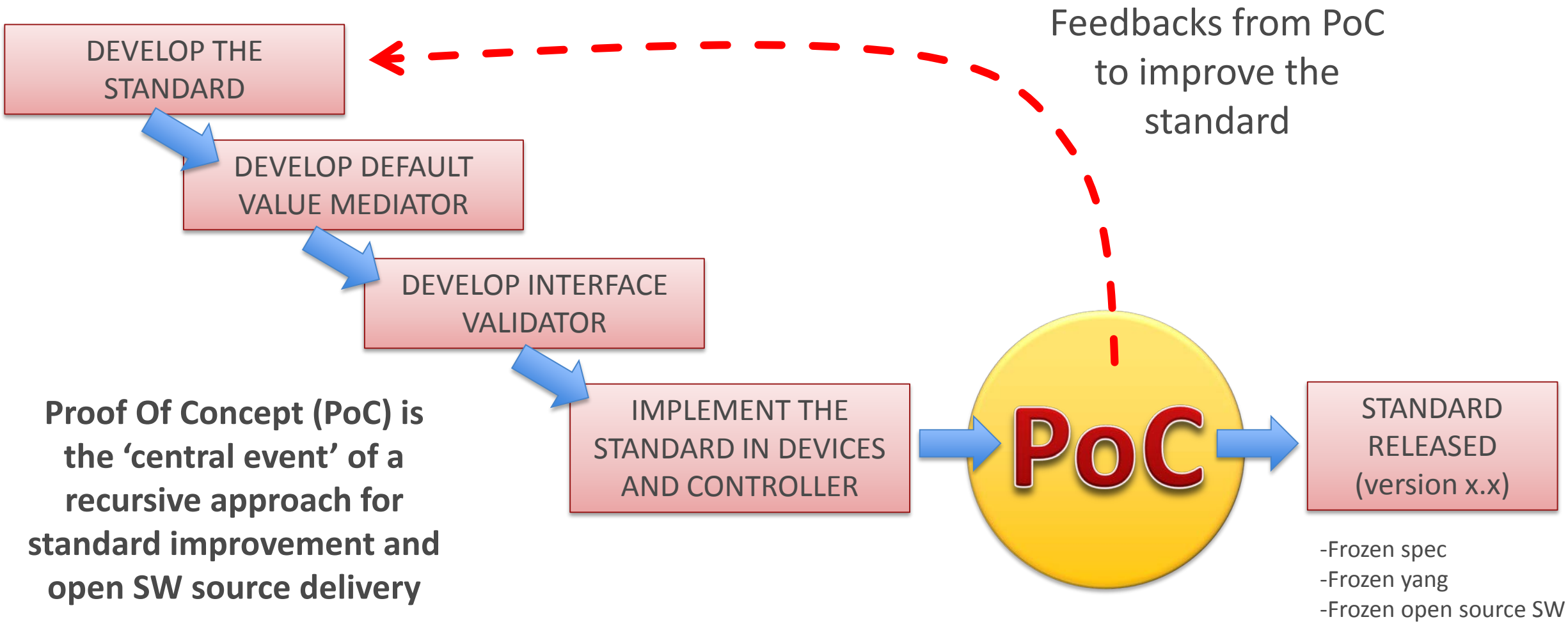
30 Nov 2018
10:00-18:00

11 expert sessions organized

EXPERT SESSIONS ✓

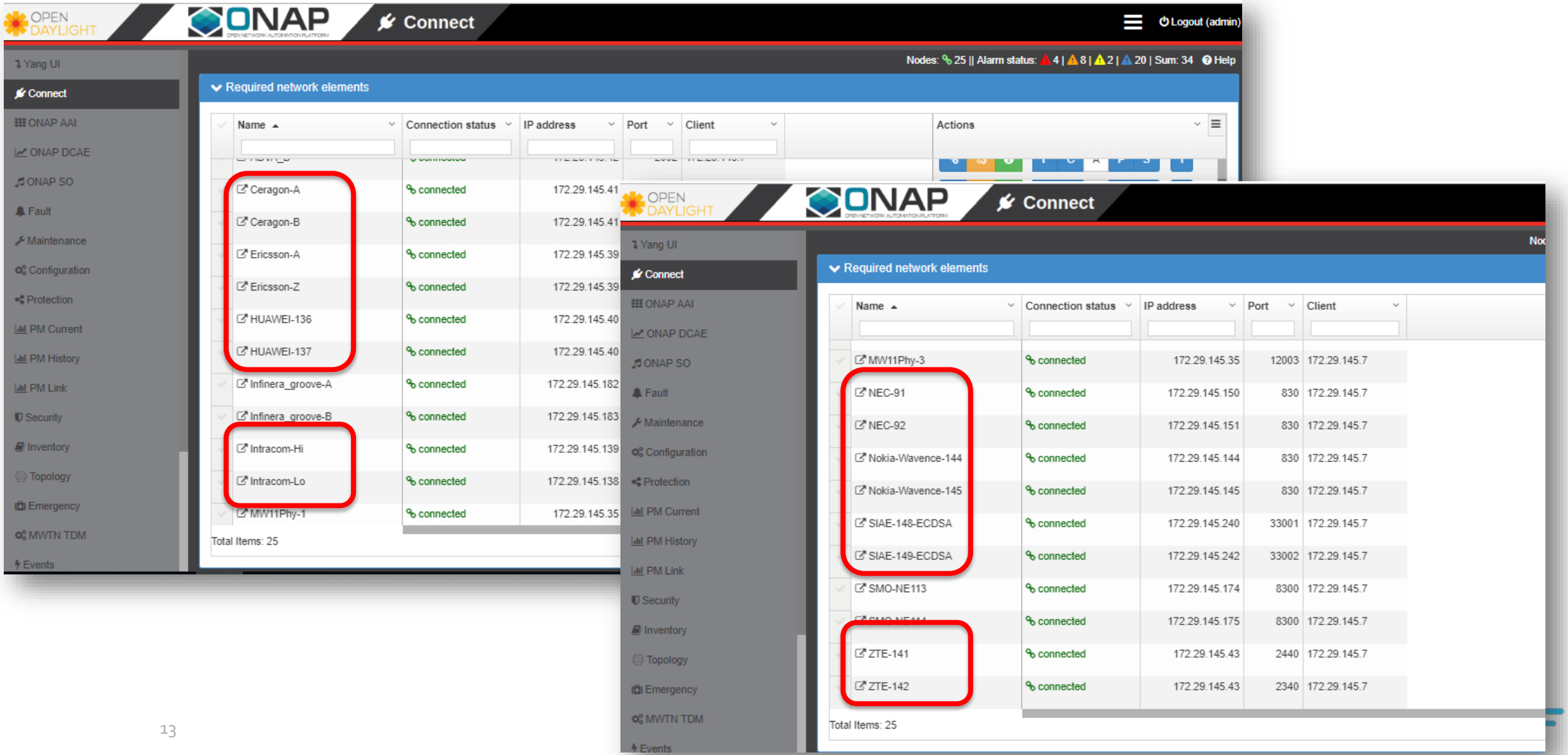
PoC CONTRIBUTION

- PoC AS FUNDAMENTAL STEP OF 'IMPLEMENTATION DRIVEN STANDARD'



Proof Of Concept (PoC) is the 'central event' of a recursive approach for standard improvement and open SW source delivery

ODL – MW CONNECTED DEVICES (AS EXAMPLE)



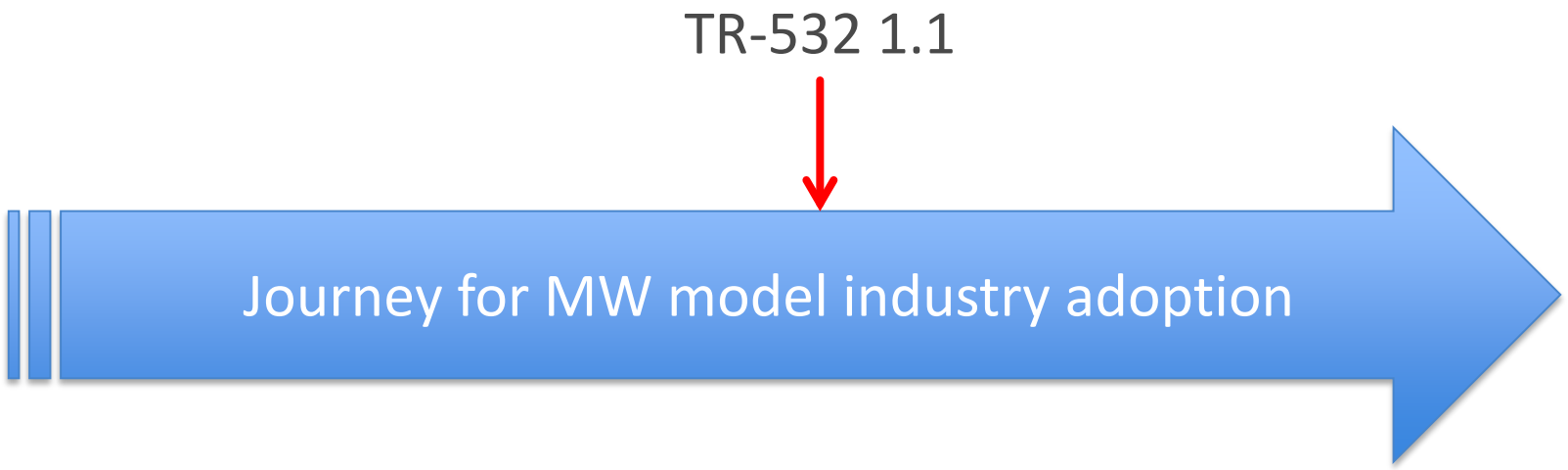
CONCLUSIONS & NEXT STEPS

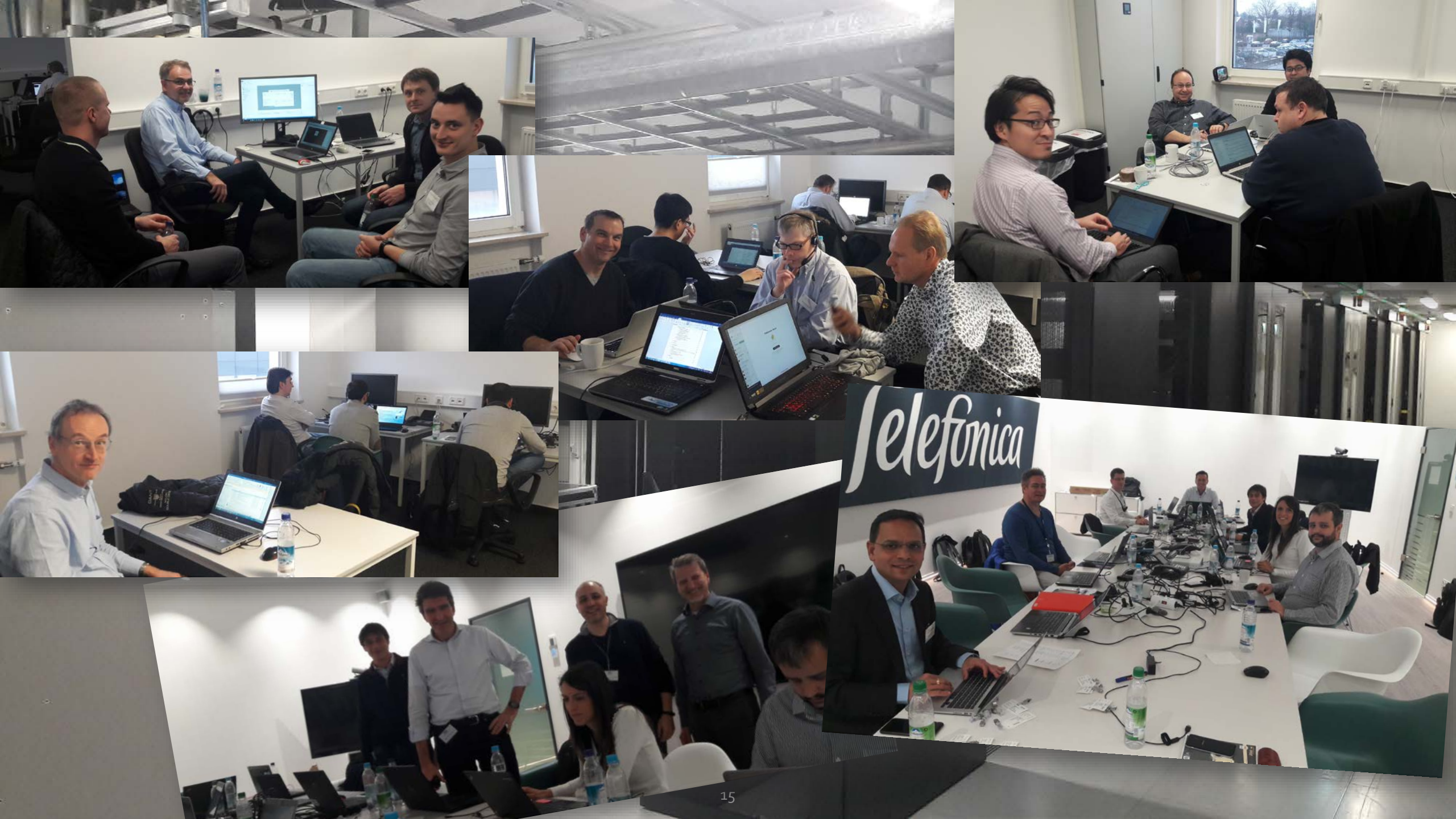
Which are the next steps for OTCC WT activities ?

1) We can consider the TR-532 Rel.1.1 MW model validated by this PoC and so available to the market for industry broad adoption.

2) In the next months we'll open a window to get requests for model extensions needed for supporting new services and collect feedbacks from the 5th PoC.

3) We'll need to continue to integrate the same model into broader architecture (ONAP & other initiatives)




Telefonica

ONF / O-RAN / ONAP release 3 (Casablanca) Proof of Concept

+ information models and open interfaces from ONF and xRAN (pending Open RAN Alliance)

“Plugfest” with wireless PNFs & emulators/simulators

+ demonstration of 5G/4G RAN use cases

Overview and background

Proofs of Concept (PoCs) have been executed by the ONF Wireless Working Group(s) every six months to demonstrate progress and to verify functionality and enhancements in a multi-vendor wireless network using real network devices, beginning with µWave/mmWave and now inclusive of eNB, RRH, DAS, IoT sensors. The work began with ONOS/OpenFlow, then ODL stand-alone, and now **ONAP SDNC/CCSDK with (evolving) controller persona approach.**

Date + Sponsor	SDN controller and platform	Open information model (IM)	SBI protocol
1st PoC; 4Q'15; Telefónica at Univ Madrid	ONOS	n/a	OpenFlow
2nd PoC; 2Q'16; Telefónica	ODL Lithium SR4	ONF CIM "rel 0"	Netconf/YANG
3rd PoC; 4Q'16; AT&T at WINLAB	ODL Beryllium SR2 (ECOMP)	ONF CIM with MW ext	Netconf/YANG
4th PoC; 2Q'17; Deutsche Telekom	ODL Boron SR1 (ONAP release 0)	ONF CIM with MW & mmW ext	Netconf/YANG
4.1 PoC; 4Q'17; AT&T at WINLAB	ODL Boron / Carbon (ONAP "pre" Amsterdam)	ONF CIM with MW, mmW, DAS	Netconf/YANG
4.5 PoC; 2Q'18; AT&T at WINLAB	ODL Nitrogen (ONAP Beijing) Wireless PNF Plug-N-Play, cSON (PCI re-assignment), Slicing, basic FCAPS	ONF CIM with MW, mmW, DAS RAN IM "release 0" eNB	Netconf/YANG
5th PoC; 4Q'18; Telefónica with AT&T, Bell Canada, CMCC, DTAG, Jio, Orange, Telstra, Verizon, Vodafone	**ODL Oxygen (ONAP Casablanca)** PNF Plug-n-Play, OOF-based PCI, Slicing (transport-centric), LCM + SW upgrade, tbd	**ONF CIM 1.x** **RAN IM "release 1" eNB, gNB** **OpenROADM 1.0**	**Netconf/YANG, Ansible, Chef, REST, VES**

ONAP (R3) 5G use cases and functional requirements

- 5G - Real Time PM and High Volume Stream Data Collection
- 5G - Real Time PM and High Volume Streaming Status
- 5G - Bulk PM
- 5G - PNF Software Upgrade*
- 5G - PNF Plug and Play*
- 5G - OOF (ONAP Optimization Framework) and PCI (Physical Cell ID) Optimization*

* synergies between Wireless <-> Wireline, Transport <-> RAN, and/or ONAP <-> ONF

ONAP (R4) 5G use cases and functional requireme

5G DUBLIN USE CASE PROPOSALS

TITLE	DESCRIPTION	WIKI
BULK PM	Performance Measurements 5G RAN Bulk Upload, Casablanca Carry-over items	5G - Bulk PM (Casablanca carry-over items)
PNF PRE-ONBOARDING & ONBOARDING Use Case	PNF Package delivery (Pre-onboarding activities) and PNF Onboarding via SDC in Dublin.	5G - PNF Pre-Onboarding & Onboarding
CONFIGURATION WITH NETCONF	Enhancement to NETCONF support in ONAP supporting 5G and other use cases.	5G - Configuration with NETCONF
FM/PM DICTIONARY	Support for handling & passing a FM & PM Dictionary	5G - FM Meta Data/5G - PM Dictionary
OOF & PCI	Optimization and PCI (SON) development. Casablanca Carry-over items	5G - OOF and PCI (Casablanca carry-over items)
PNF PnP	PNF Plug and Play support for PNF discovery, Casablanca Carry-over items, support by PRH (PNF Registration Handler)	5G - PNF Plug and Play (Casablanca carry-over items)
PNF S/W UPGRADE	PNF Software upgrade to update the software on a PNF, Casablanca Carry-over items	5G - PNF SW Upgrade (Casablanca carry-over items)
REAL-TIME PM	Real-Time Performance measurements supported by High-Volume VES Collector	5G - Real time PM (Casablanca carry-over items)
NETWORK SLICING	Advanced 5G functionality, for Network Slicing development and early steps in long-lead development.	5G - Slicing
5G NETWORK SLICING USE CASES	Outline of 5G Use Cases with Ambition levels	5G Network Slicing Dublin Release Nov 2018.pptx

Open Source First (OSF) community labs in North America

TLAB	AT&T Advanced Technologies		Rich Bennett (RB2745@att.com) John Murray (JM2932@att.com)
Multi-Geo Labs via an IPSec GRE VPN tunnel	Wind River		Stephen Gooch (stephen.gooch@windriver.com)
WINLAB / COSMOS (NSF PAWR indoor/outdoor testbed)	Rutgers University/AT&T		Ivan Seskar (seskar@winlab.rutgers.edu) Tracy Van Brakle (tv8394@att.com)

COSMOS = Cloud Enhanced Open Software Defined Mobile Wireless Testbed for City-Scale Deployment

www.cosmos-lab.org

Thank You!