



SEBA & 5G Backhaul/Fronthaul

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Denver, Colorado

Outline

- Introduction to SEBA & CORD
- SEBA Component: VOLTHA
- SEBA Component: Trellis
- SEBA & 5G

CORD – Central Office Rearchitected as a Datacenter



Residential
vOLT, vSG, vRouter, vCDN

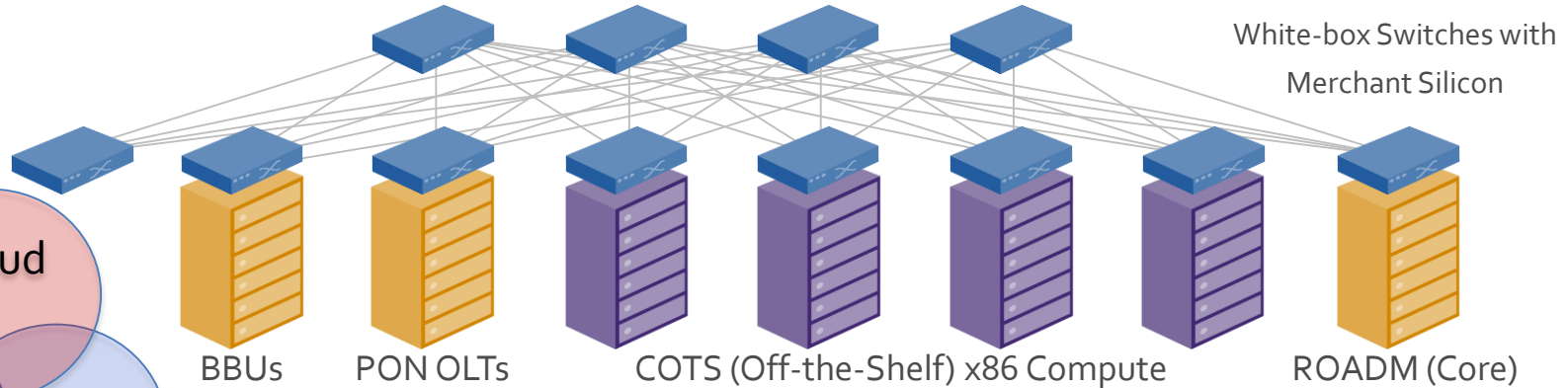


Mobile
vBBU, vMME, vSGW, vPGW, vCDN



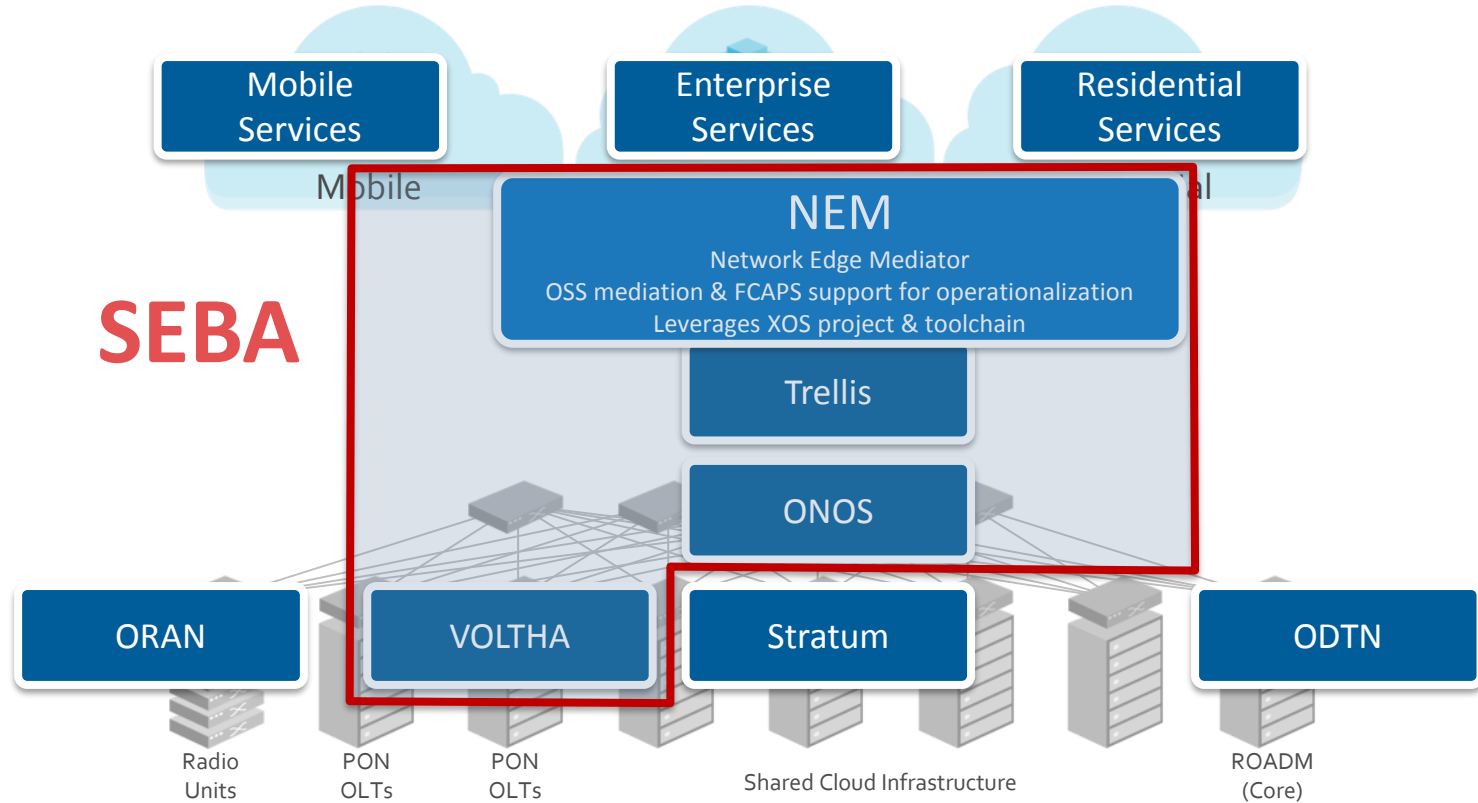
Enterprise
vCarrierEthernet, vOAM, vWanEx, vIDS

Access Service Orchestration & Control



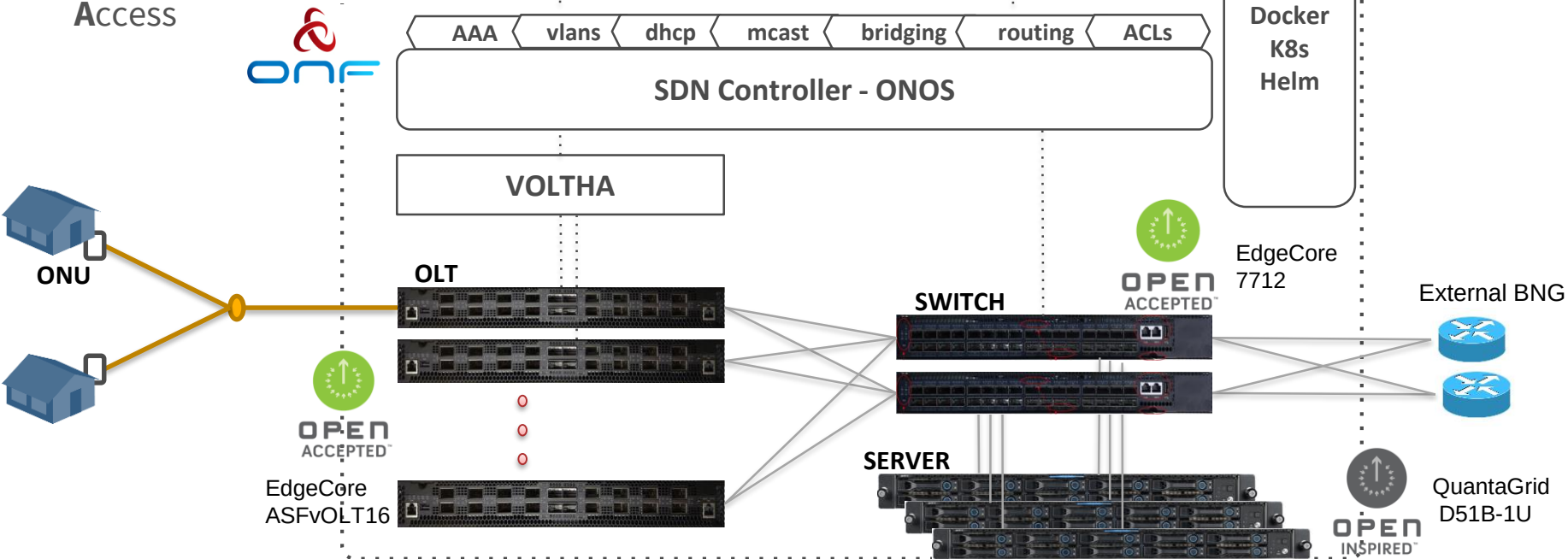
Economies of a datacenter, Agility of a cloud provider

SEBA: Built on CORD

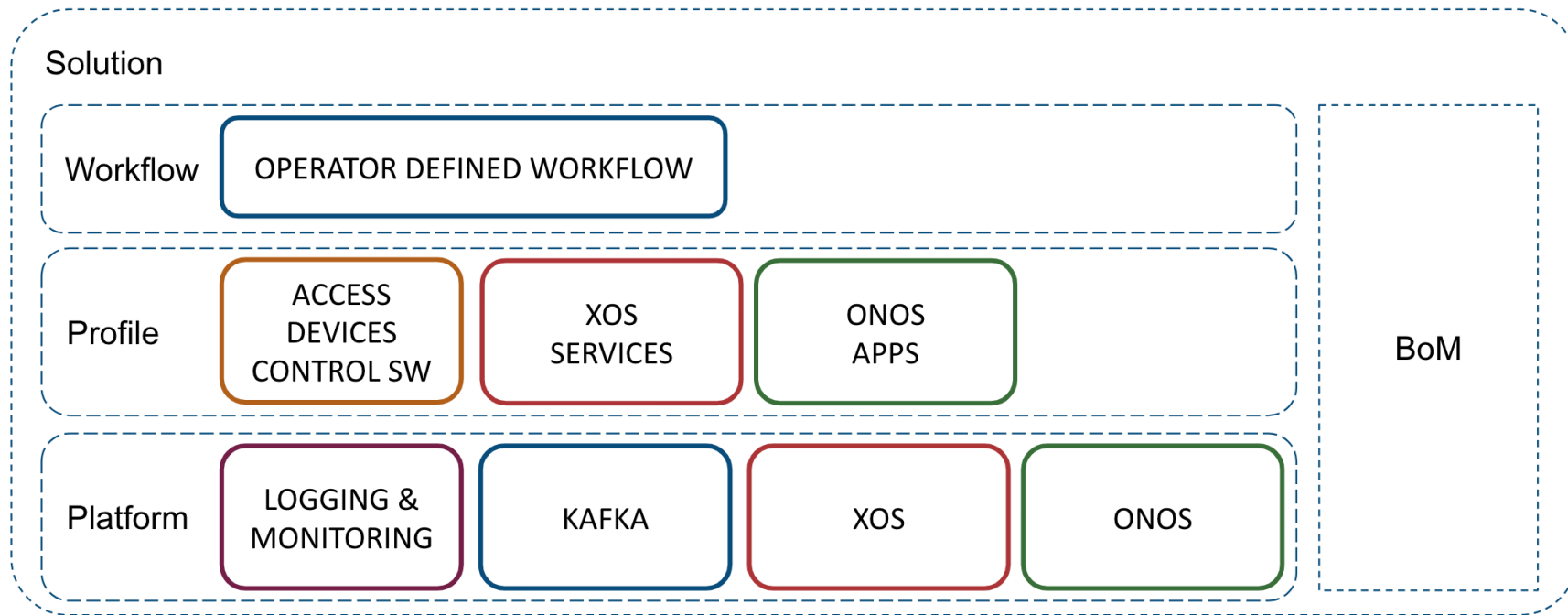


SEBA

SDN
Enabled
Broadband
Access



SEBA: Built on CORD



SEBA Community



VOLTHA: Disaggregated OLTs

OLT Disaggregation → VOLTHA

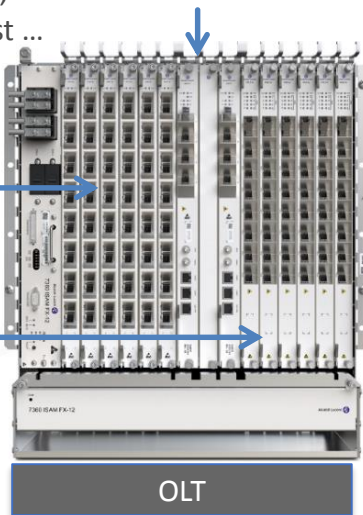
EMS

VLANs, IGMP,
802.1x, Mcast ...

Backplane

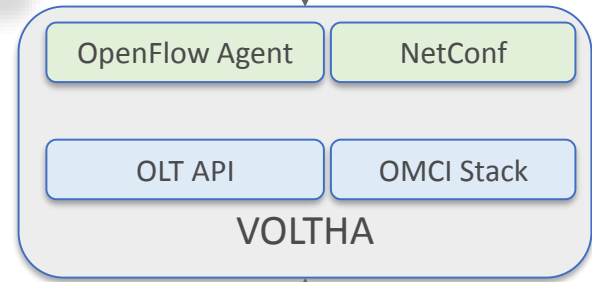
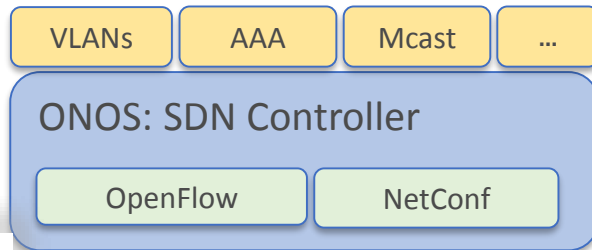
PON
MAC
blades

Compute
blades



Traditional Chassis based Vendor
OLT for PONs (Passive Optical
Networks)

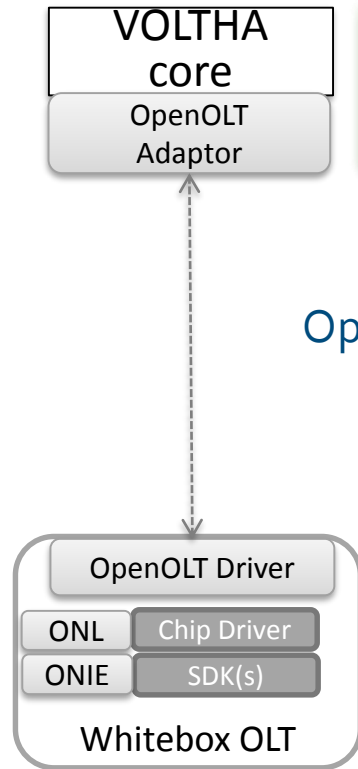
SDNize



VOLTHA: Virtual OLT Hardware
Abstraction



Industry's First White-Box XGS-PON OLT



OpenOLT

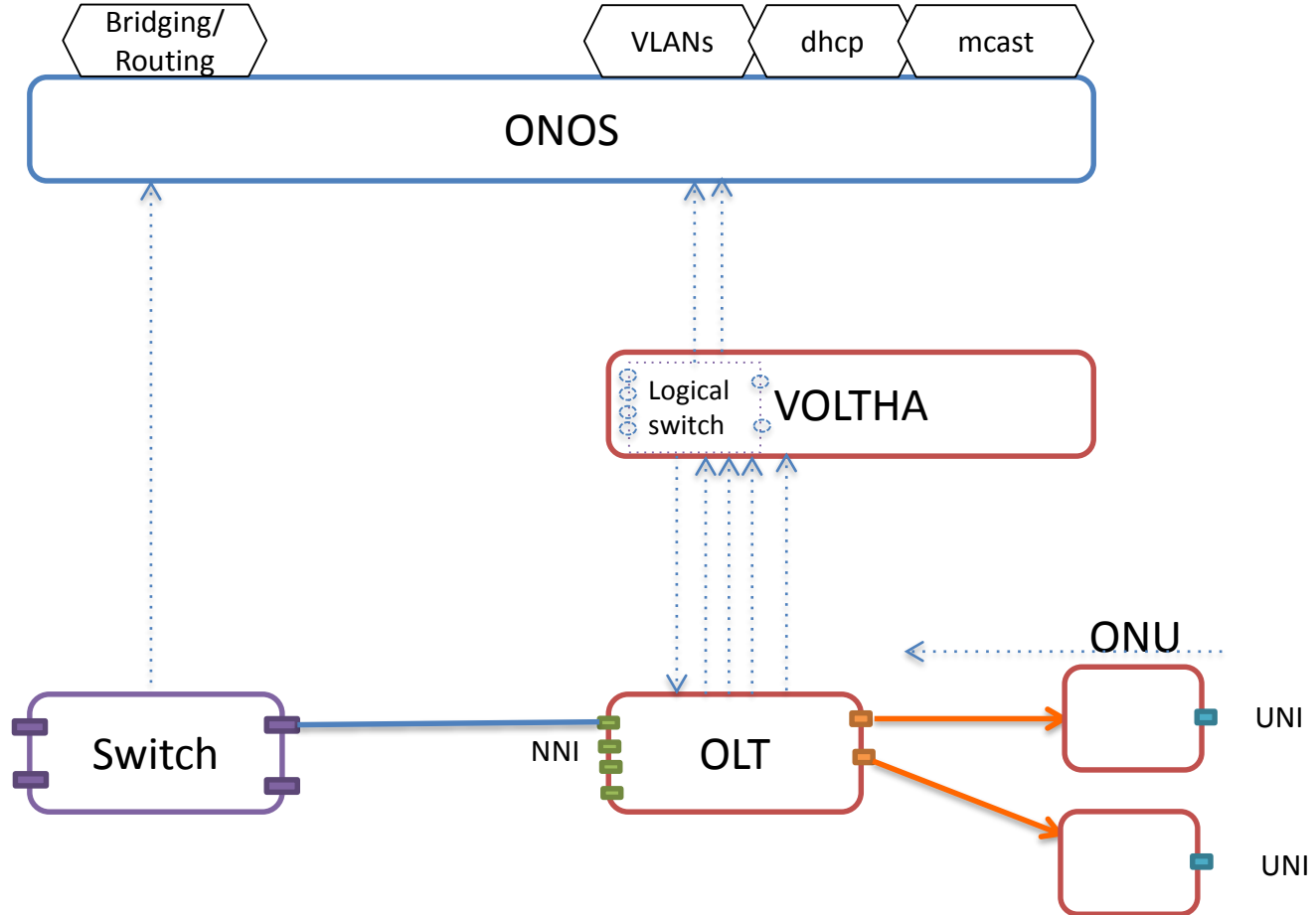


White-Box =
Open-Hardware Specs (OCP)
+ Open-Source Software (ONF & OCP)

Edgecore
ASFvOLT16
Whitebox OLT

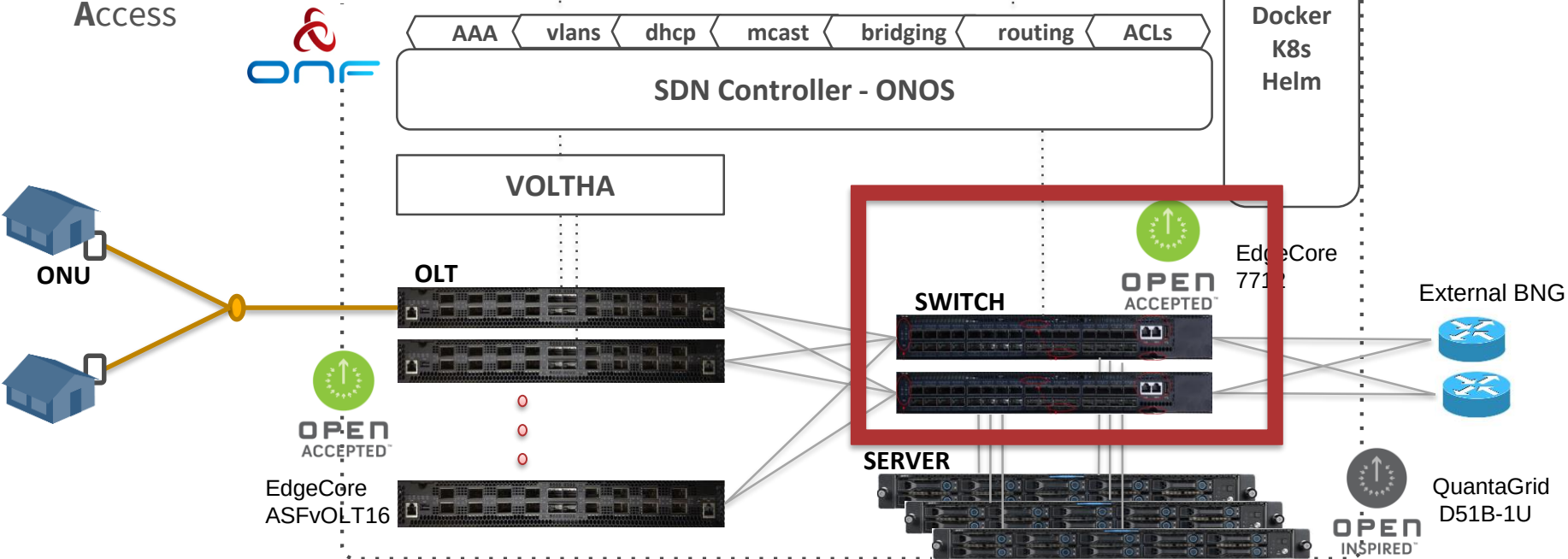


VOLTHA Operation



SEBA

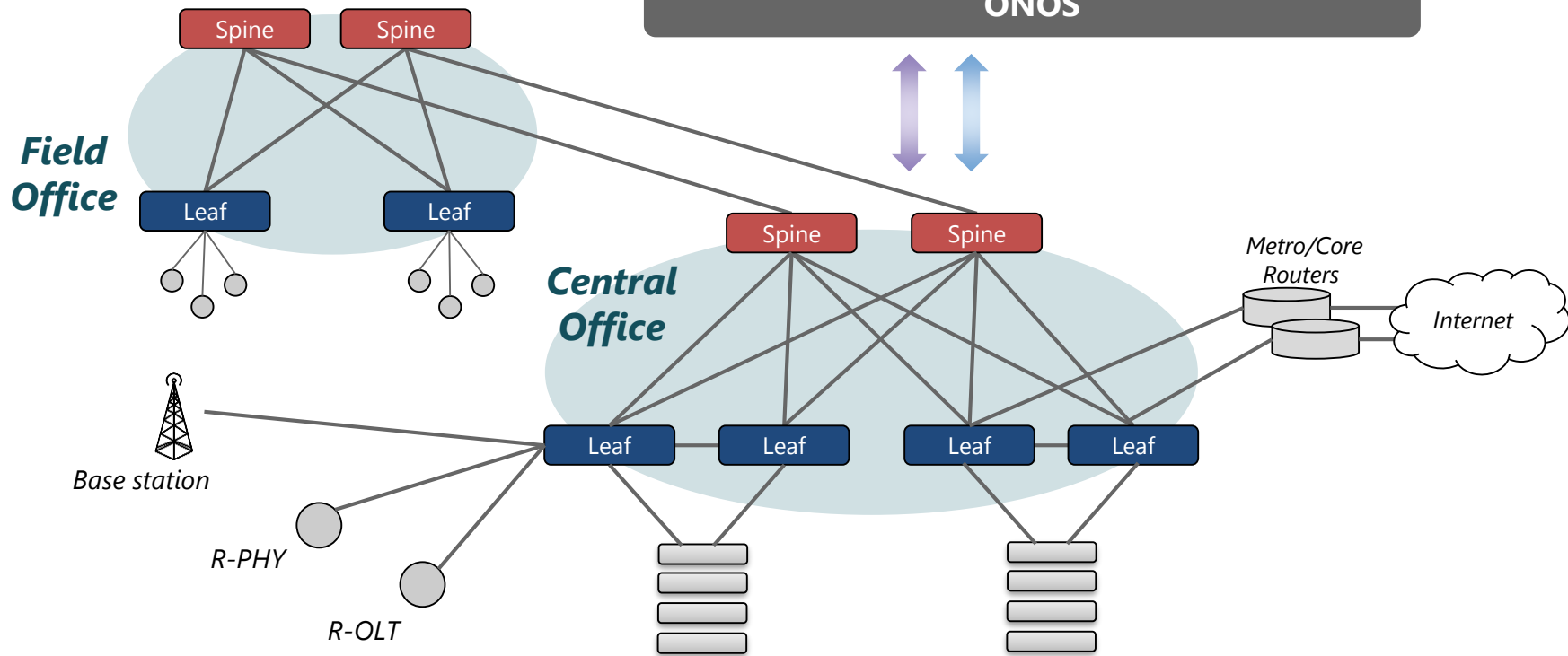
SDN
Enabled
Broadband
Access



Trellis: Multi-purpose leaf-spine fabric

Trellis

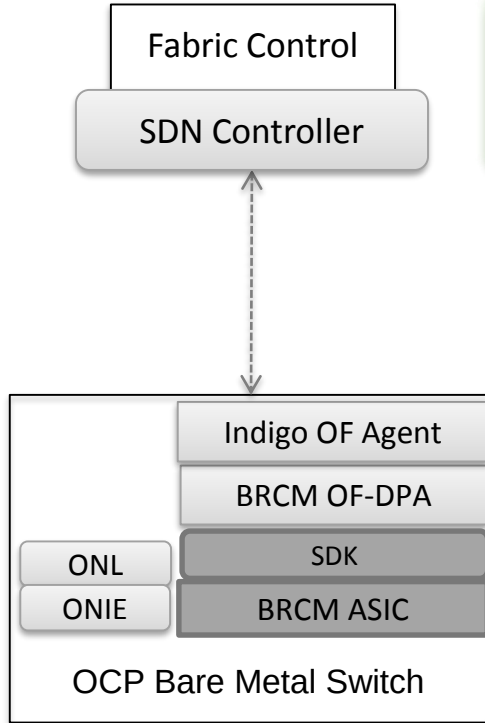
Open-Source Leaf-Spine Fabric



Trellis Community



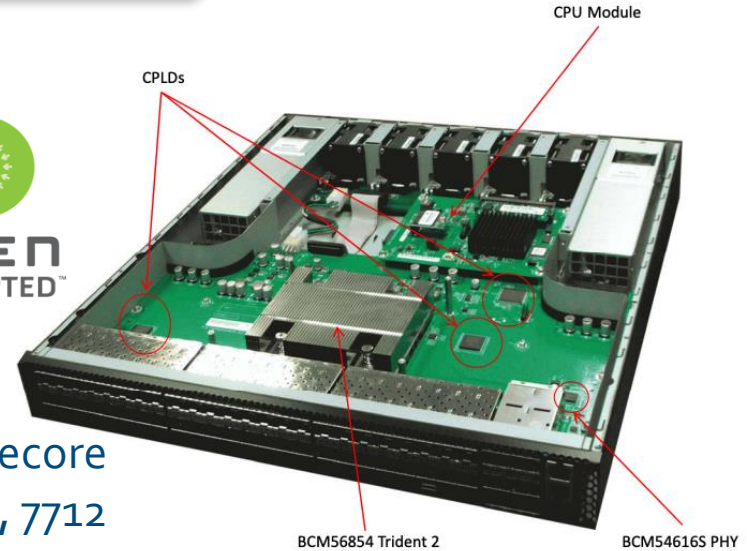
Whitebox ToR Switching



White-Box =
Open-Hardware Specs (OCP)
+ Open-Source Software (ONF & OCP)



Edgecore
5712, 6712, 7712

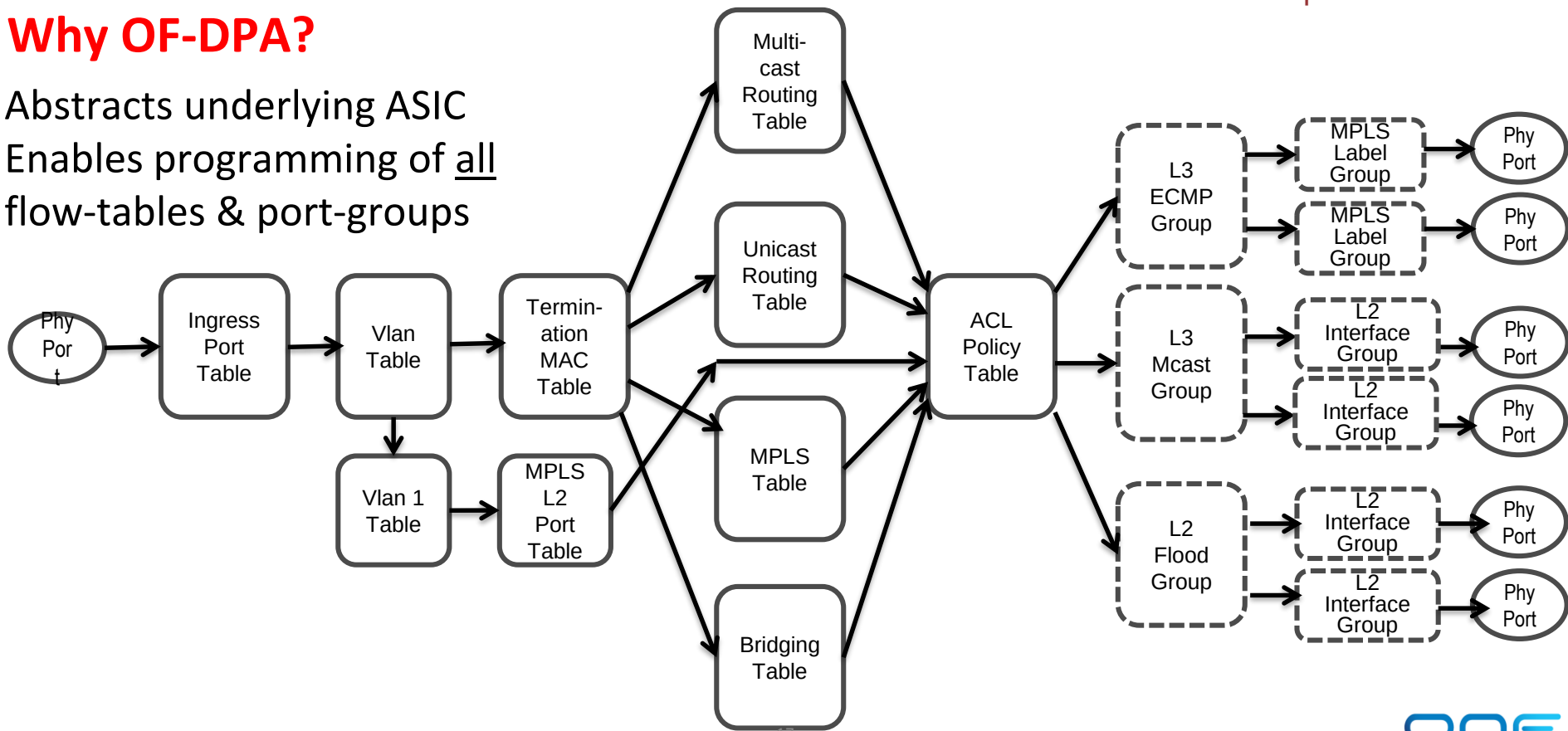


Fabric ASIC Pipeline* (BRCM's OF-DPA)

* Simplified view

Why OF-DPA?

Abstracts underlying ASIC
Enables programming of all
flow-tables & port-groups

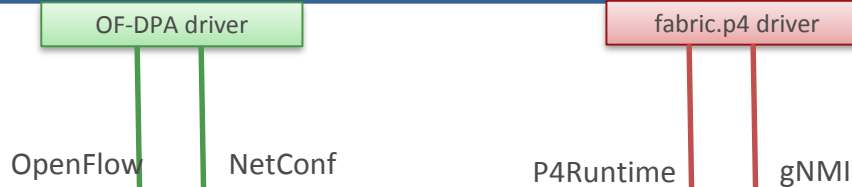


Trellis & P4

Same set of Trellis applications on ONOS



Enhanced with P4 program deployment and pipeline configuration

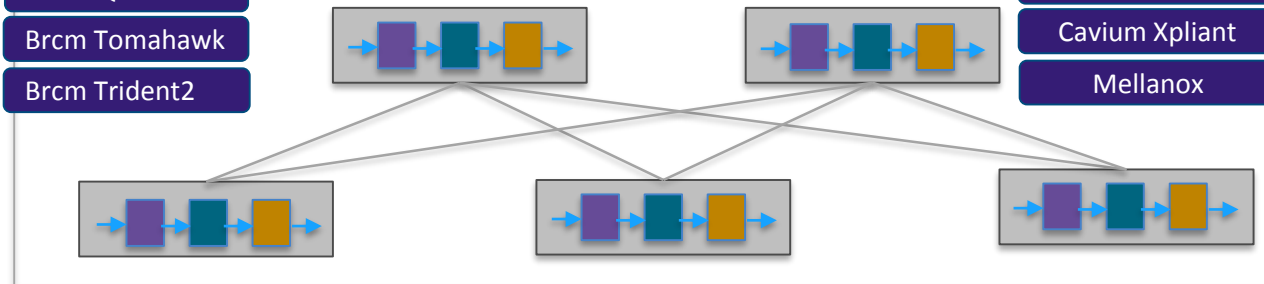


Allowing new functionality on hardware (demo at MWC '18)

Brcm Qumran
Brcm Tomahawk
Brcm Trident2

Barefoot Tofino
Cavium Xpliant
Mellanox

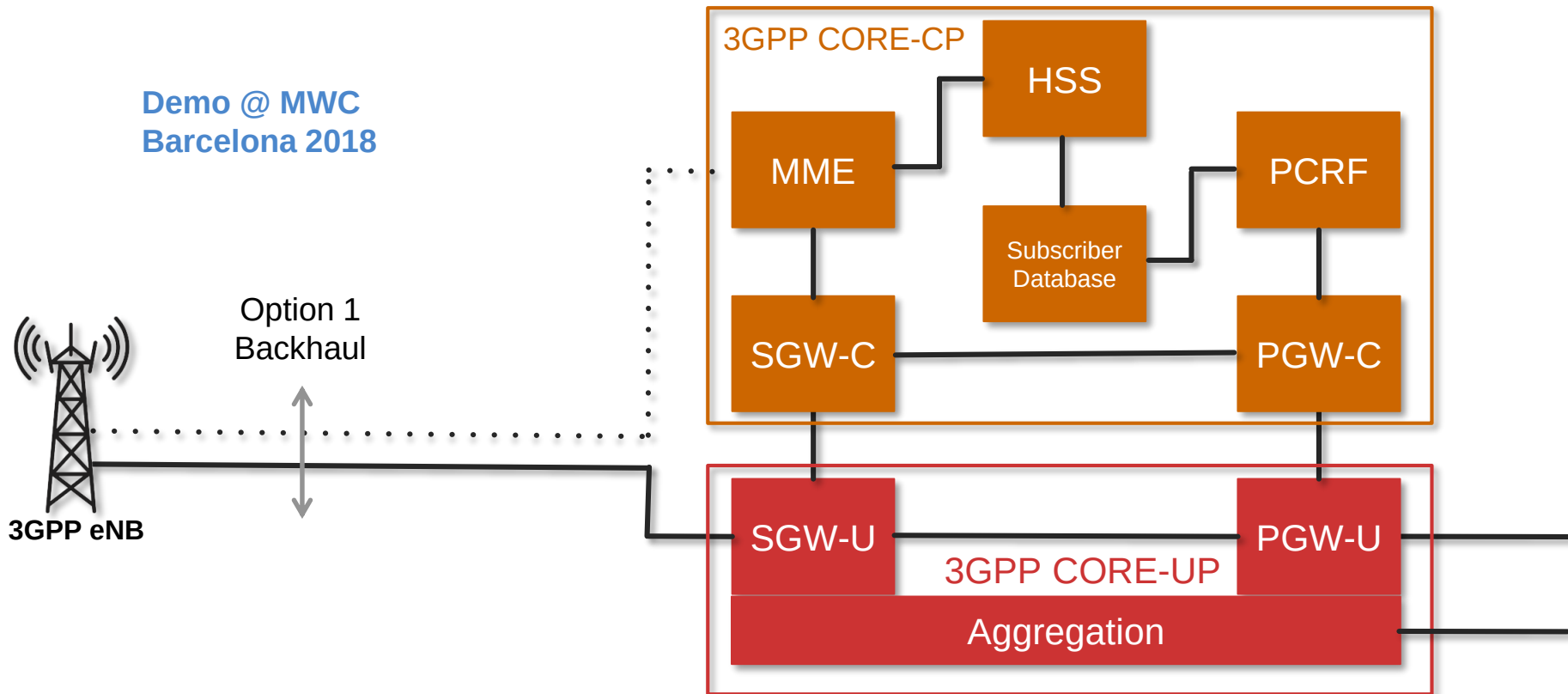
P4 capable hardware



SEBA & 5G

SPGW-U in Trellis

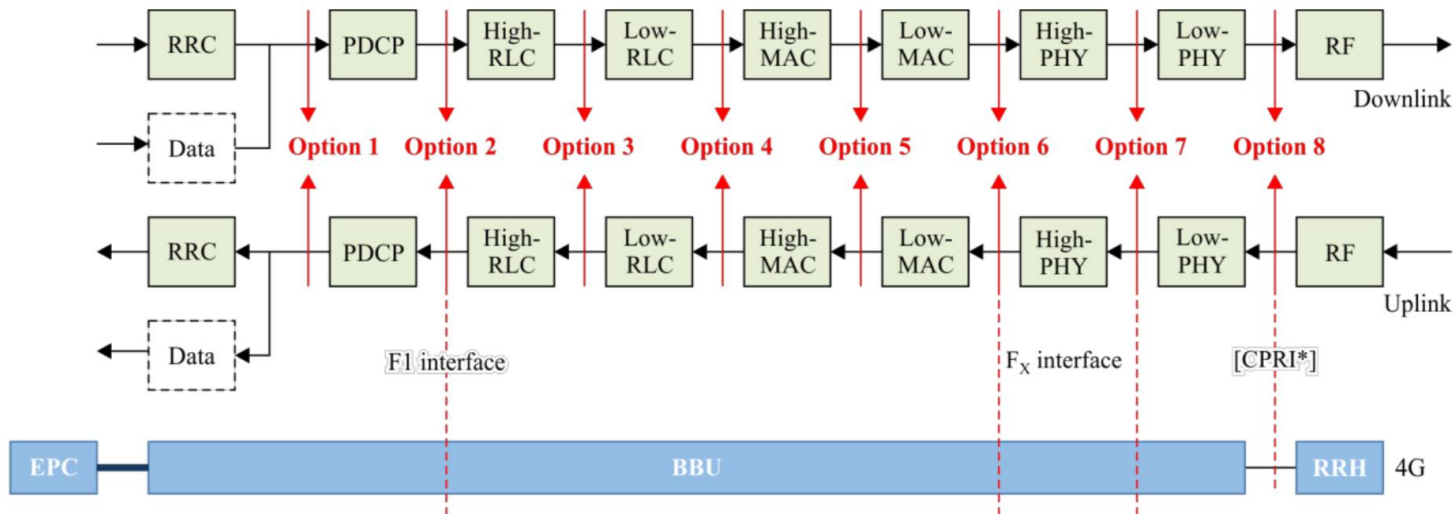
Demo @ MWC
Barcelona 2018



Trellis + P4

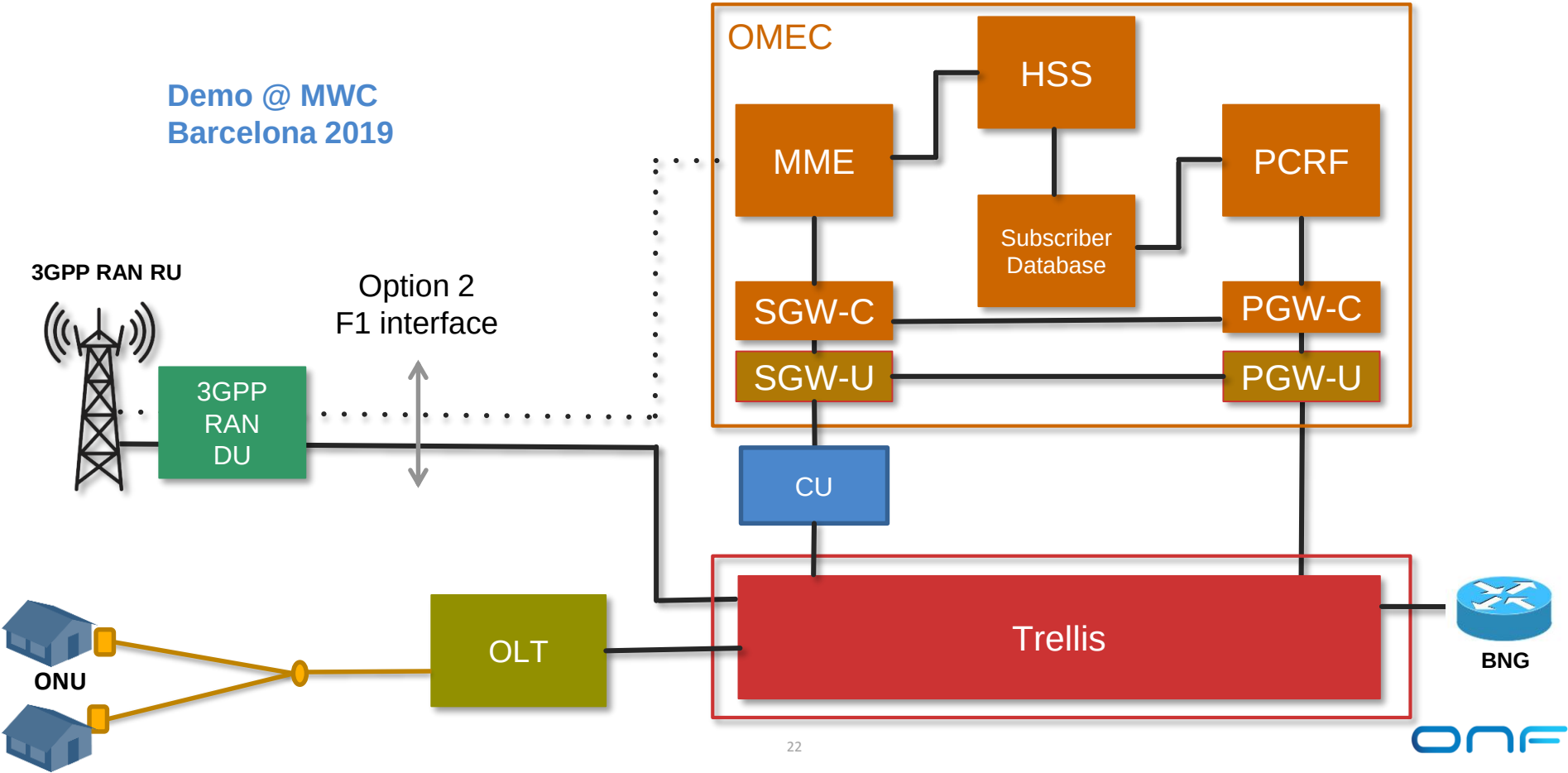
5G RAN Split Options

Source: ITU G66(18)_F6-2

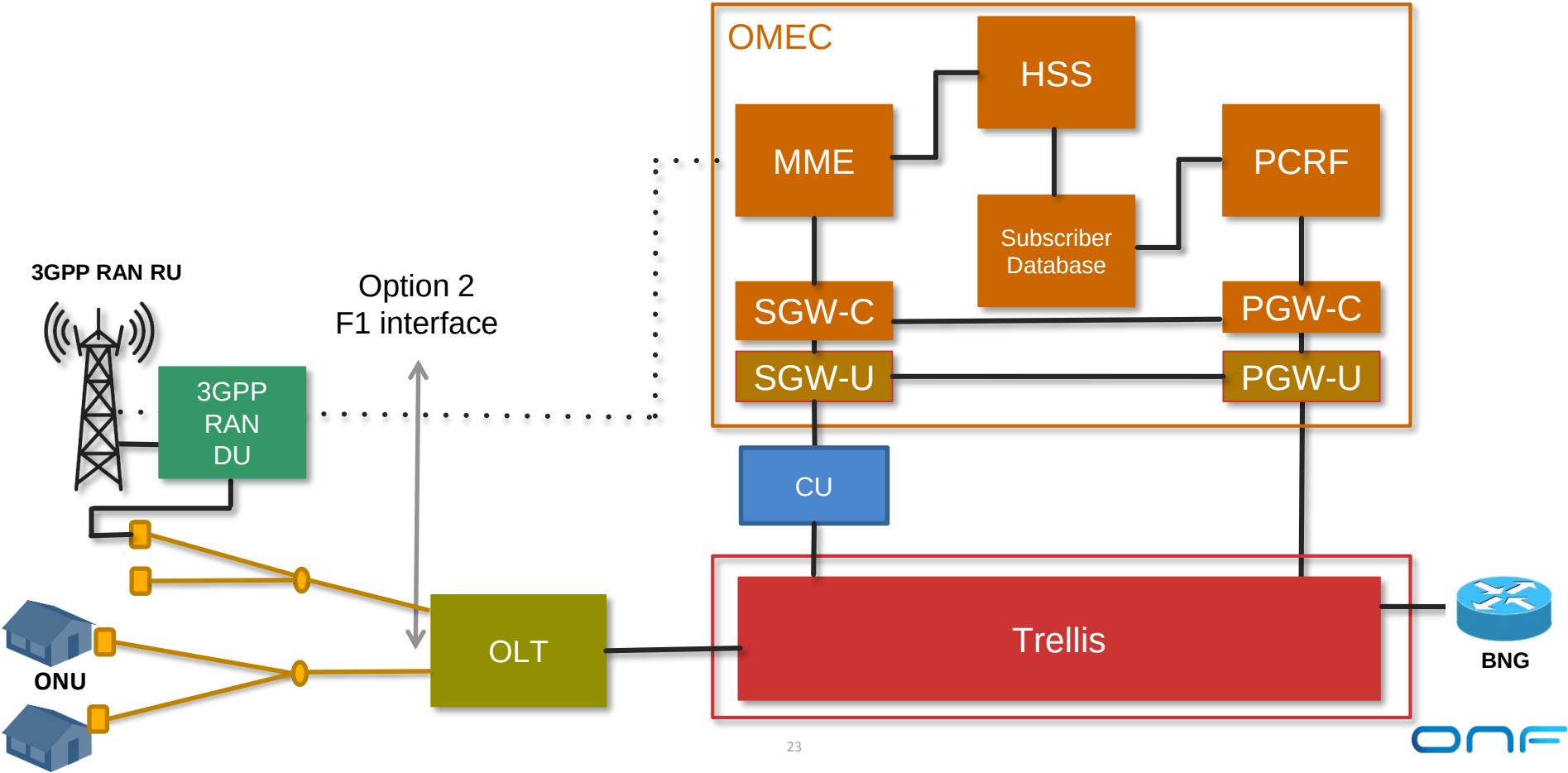


Multi-Access CORD

Demo @ MWC
Barcelona 2019

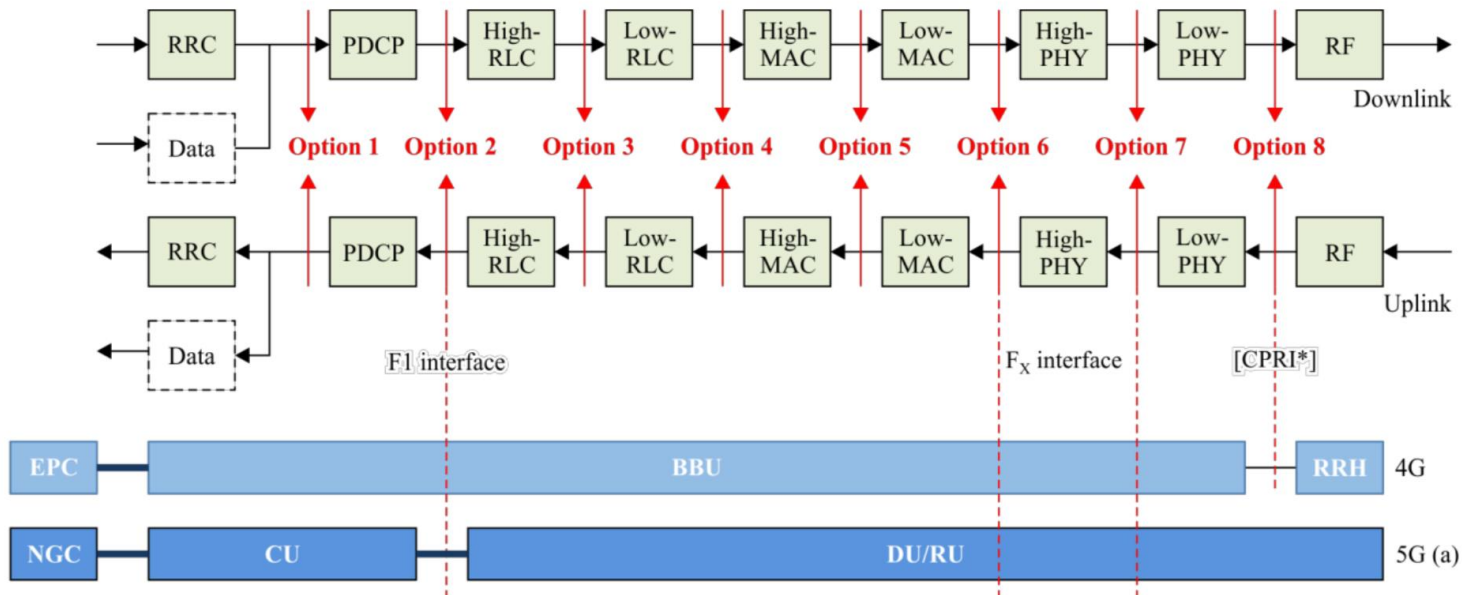


Fronthaul F1 over PON



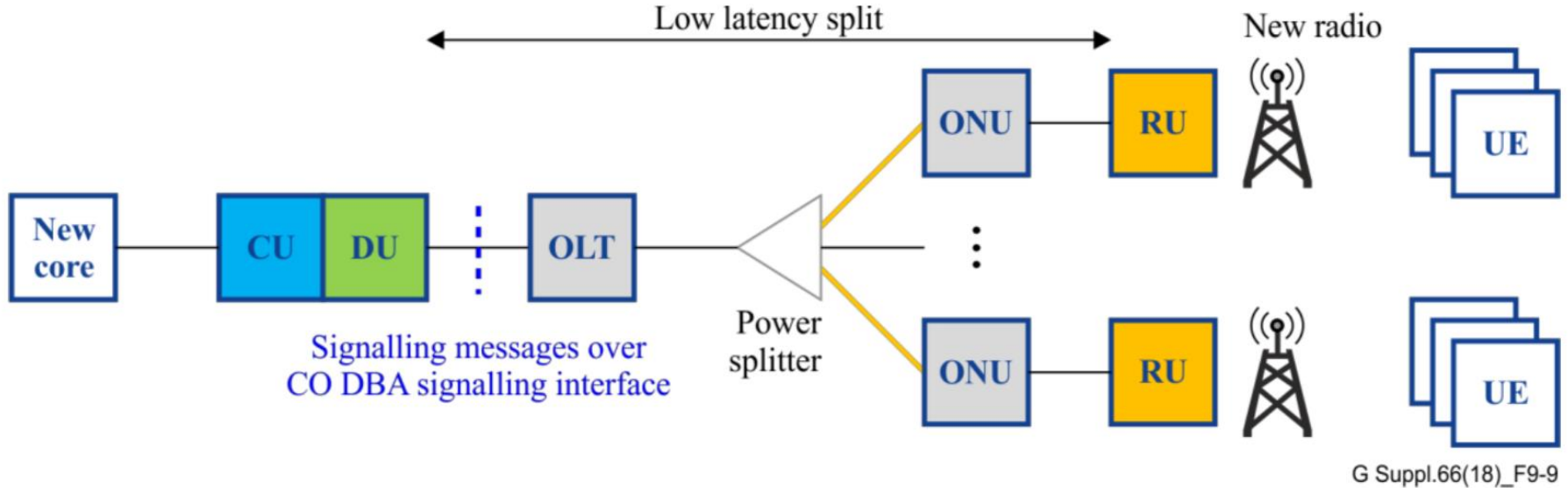
5G RAN Split Options

Source: ITU G66(18)_F6-2



CO-DBA for Fronthaul Fx over PON

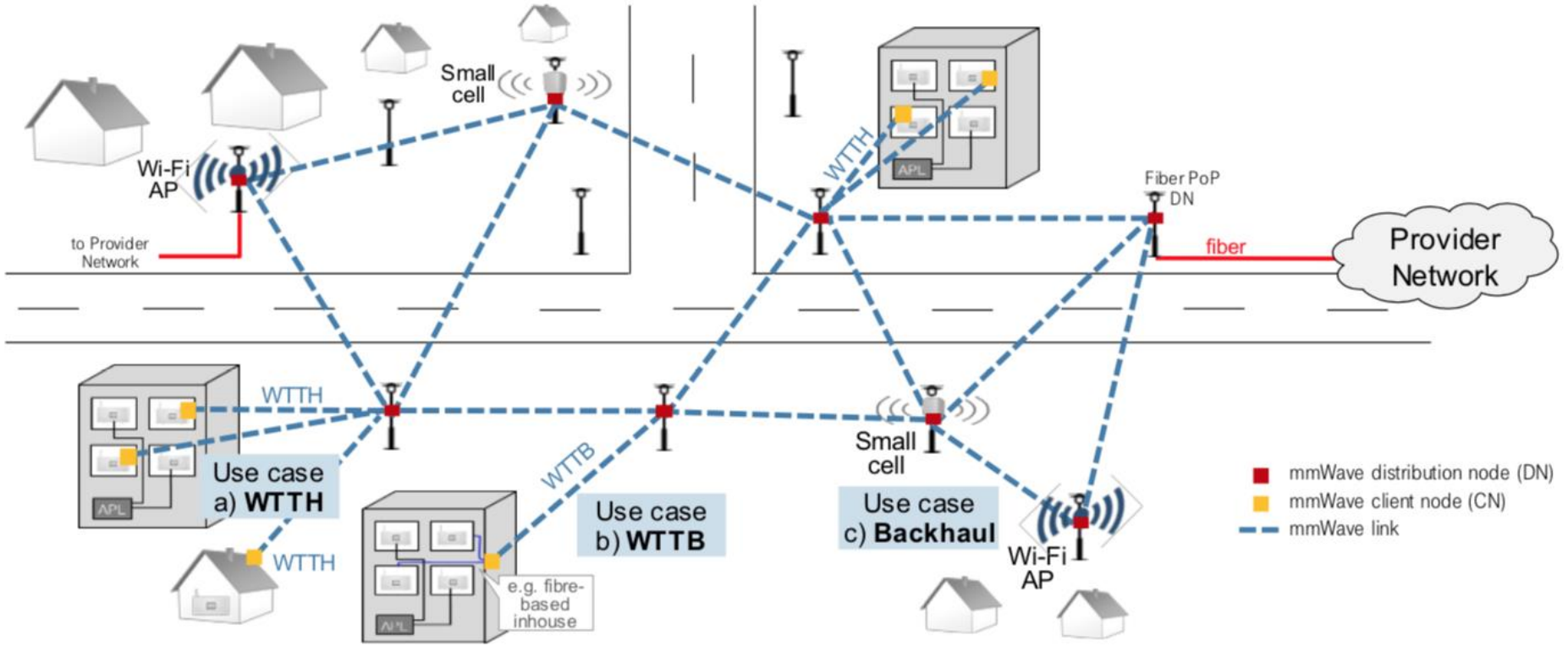
Source: ITU G66(18)_F6-2



Ongoing collaboration between ITU-T and O-RAN

Courtesy: Kent Mccammon, AT&T

mmWave Backhaul





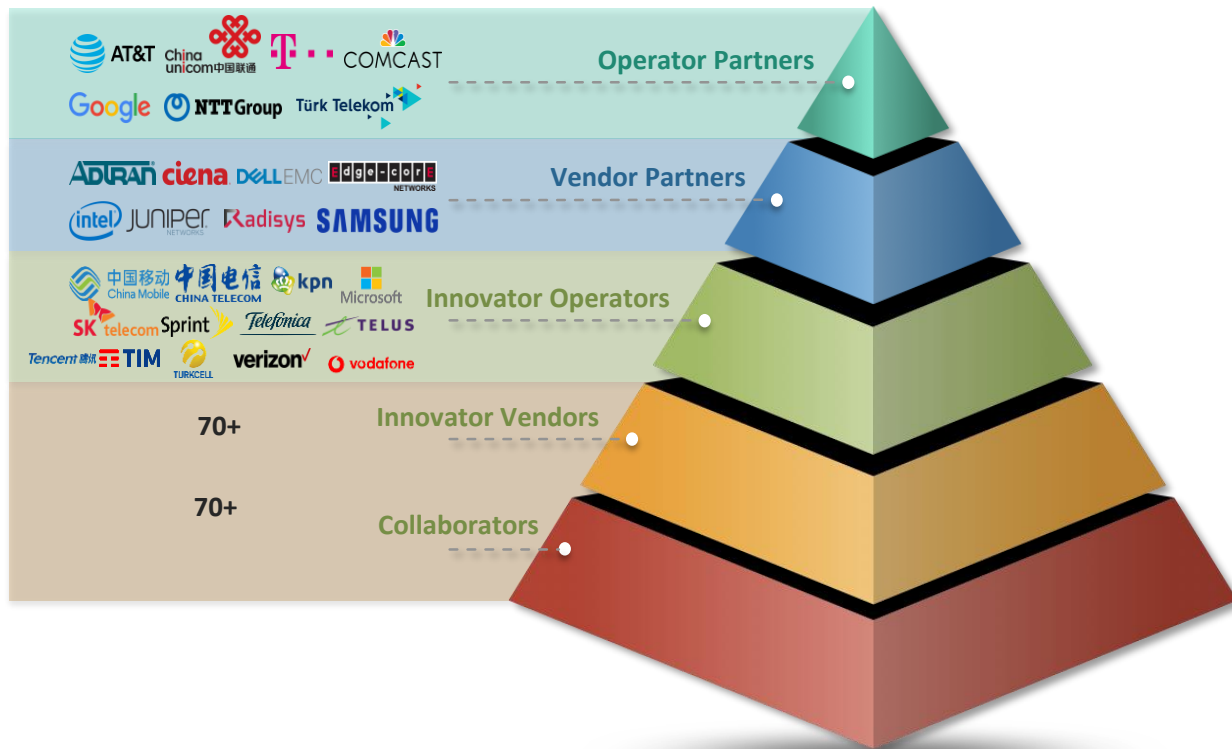
Summary

- **ONF: Operator driven curated open source**
 - *CORD is the flagship umbrella project*
 - *SEBA – SDN Enabled Broadband Access built on the CORD platform*
- **Modular Components:**
 - *VOLTHA abstracts the PON as a quasi-Ethernet switch to the SDN controller*
 - *Trellis manages a multi-purpose leaf-spine fabric*
- **SEBA & 5G**
 - *MWC Barcelona 2018: SPGW in hardware using Trellis + P4*
 - *MWC Barcelona 2019: SEBA + OMEC + 5G high-split RAN*
 - *5G low-split RAN on PON discussed by ORAN and ITU-T – a few years away*
 - *SEBA + Terragraph – mmWave backhaul – more near term*

The ONF Ecosystem

Vibrant Operator Led Consortium

160+ Members Strong



www.opennetworking.org

CORD

SEBA	Trellis
VOLTHA	ONOS
XOS	Stratum
OMEC	COMAC
ODTN	P4

How to get involved

SEBA

- Community: <https://wiki.opencord.org/display/cord/seba>
- Release: <https://guide.opencord.org/cord-6.1/>
- BOM: <https://guide.opencord.org/cord-6.1/prereqs/hardware.html>

VOLTHA

- Community: <https://wiki.opencord.org/display/cord/voltha>

Trellis

- Community:
<https://wiki.opencord.org/display/CORD/Trellis%3A+CORD+Network+Infrastructure>

OCP Telco/OpenEdge

- Wiki: <https://www.opencompute.org/wiki/Telcos/openEDGE>
- Mailing list: <https://ocp-all.groups.io/g/OCP-Open-Edge>