



Welcome!

**Guru Parulkar, Executive Director, ONF**



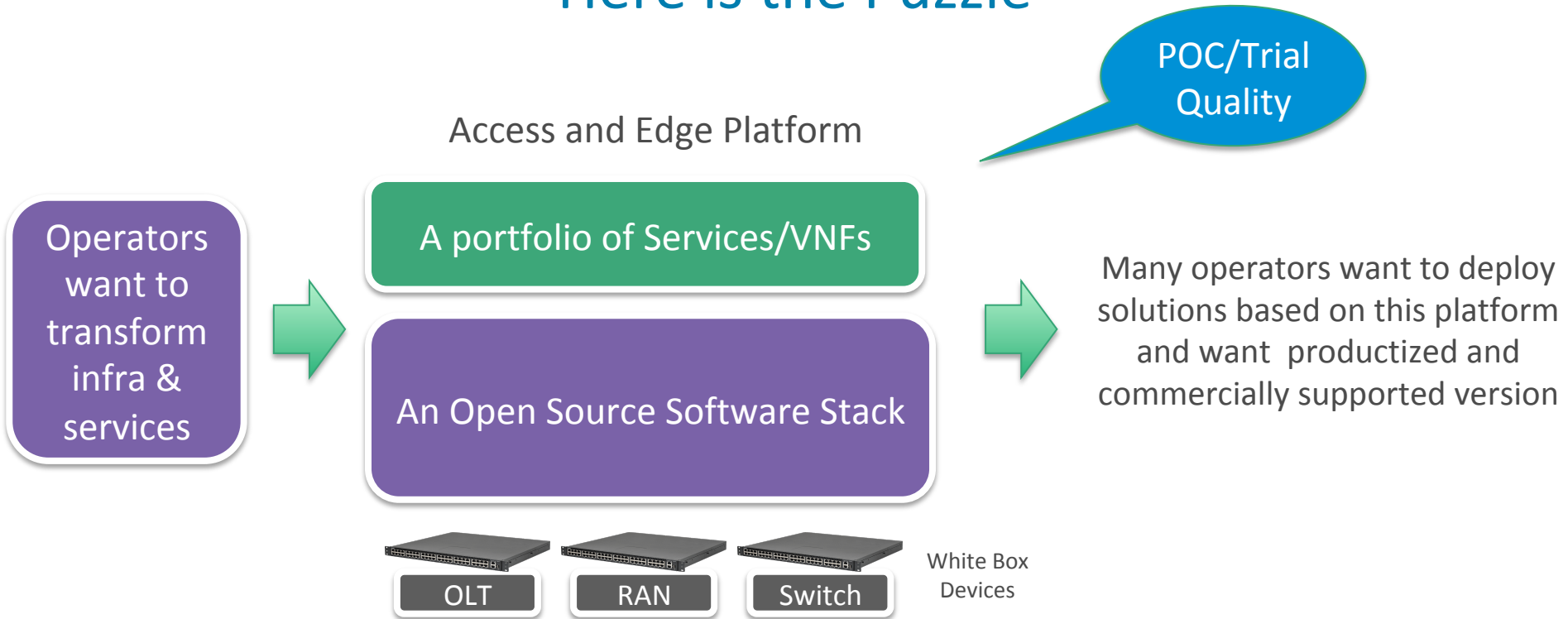


Our industry's Billion<sup>+</sup> Dollar Puzzle

ONF Connect to help you unlock this puzzle



# Here is the Puzzle



No one jumping in “with two feet” to do this!  
How can we get the supply-chain to do this?

# What we have known for 10+ years

- **Network operator realities**

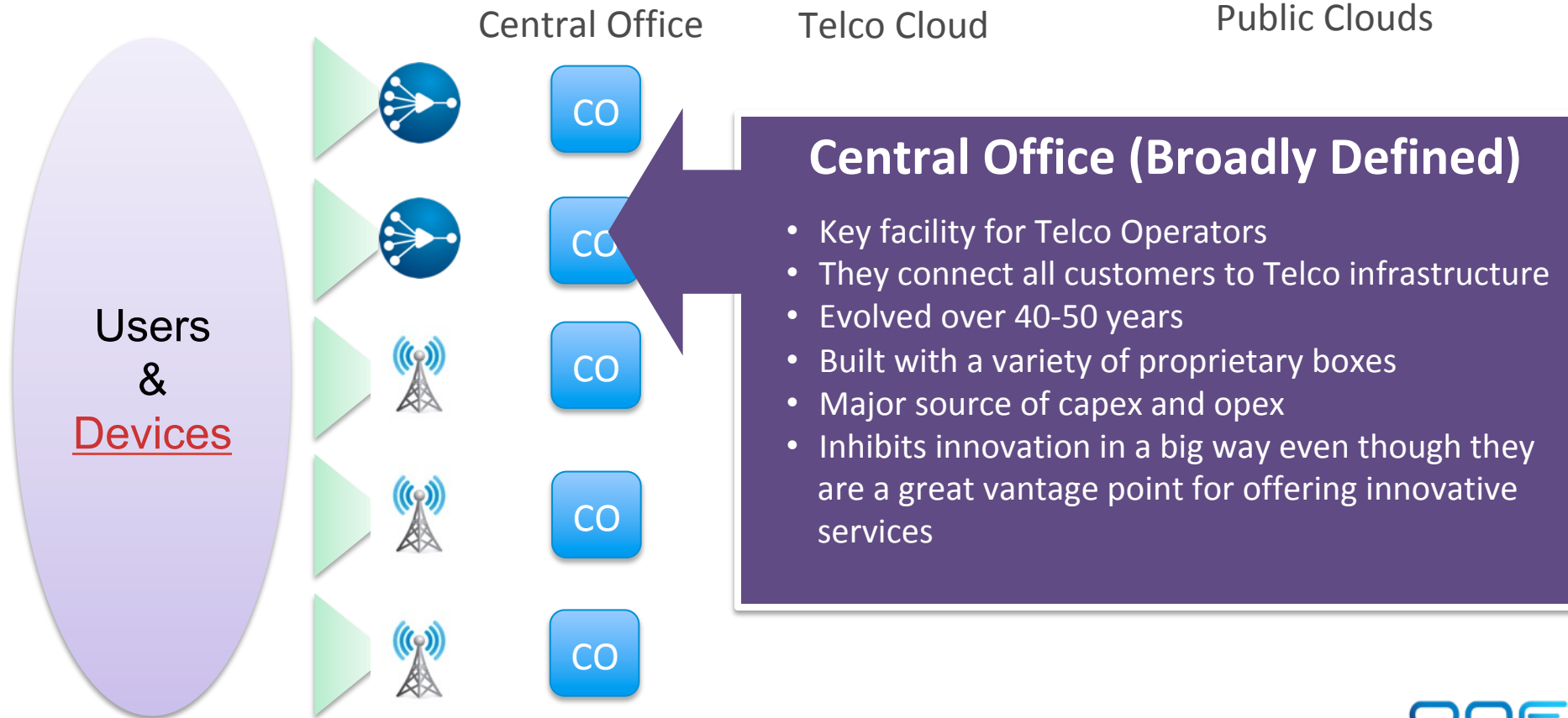
- Traffic is growing very fast
- Capex and Opex tracking traffic growth and not declining fast enough
- Revenue is flat or declining

They threaten viability of their business

- **Network operators' publicly stated resolve**

- Transform their networks into a platform for innovative services and build the “network as a platform” with SDN/NFV/Cloud with disaggregation, open source, white boxes to significantly reduce Capex and Opex

# When it comes to Telco Network Operators It is the Access and Edge, Stupid!



ONF, Its Operator Partners, and Community have  
created a solution for access and edge...

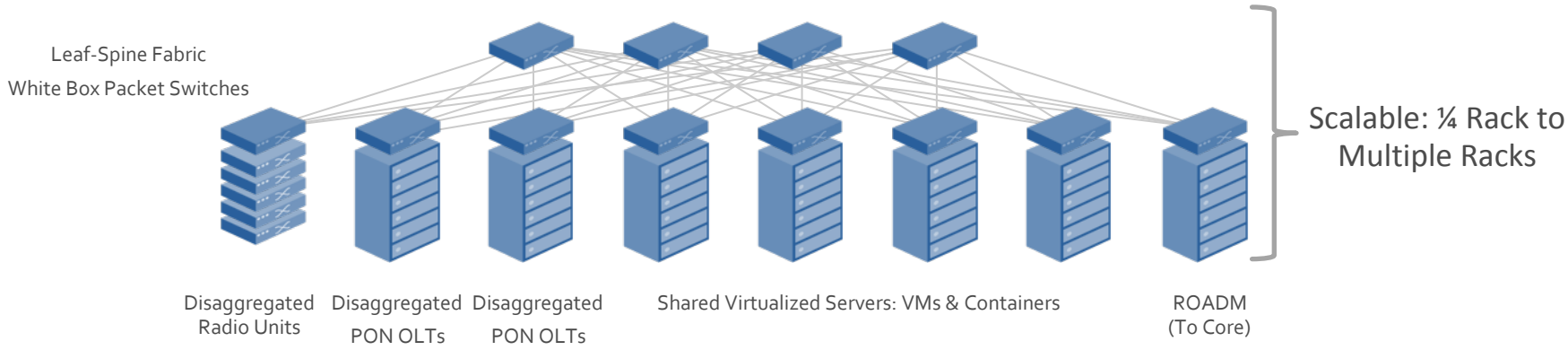
# CORD: Central Office Re-Architected as a Data Center

Bring data center economies and cloud agility to access and edge

# CORD Architecture



Open Source Software Stack





# Open Source Components

Mobile, Residential,  
Enterprise Services

Network Functions as a Service: EPC functions, BNG, ...

XOS

A Service OS for service management, composition, orchestration

EPC

A Disaggregated Virtualized EPC

ONOS

An SDN OS for control and config designed for scale, performance, HA

VOLTHA

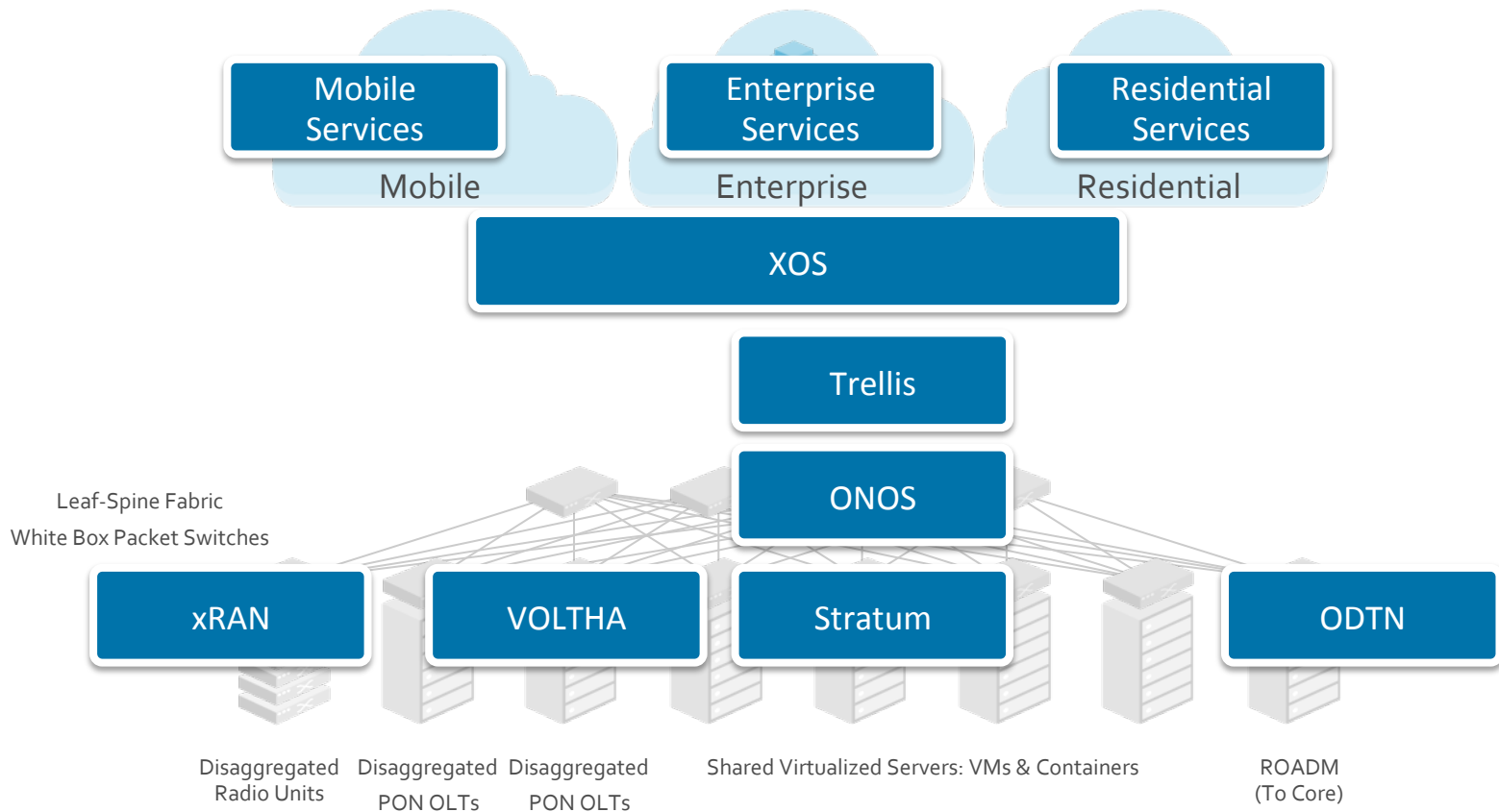
A software layer creating OF switch abstraction for OLT devices

Stratum

A Thin Switch OS supporting P4, P4RT, OpenConfig/gNMI, gNOI



# Open Source Software Stack for Access and Edge



# Service Inventory as part of the CORD Release

## Residential

vSG Virtual Subscriber Gateway  
vOLT Virtual OLT

## Mobile

vHSS Virtual Home Subscriber Server  
vMME Virtual Mobility Management Entity  
vEPC Virtual Evolved Packet Core  
vTR Virtual Truck Roll  
SGW Virtual Serving Gateway (User)  
vSGWc Virtual Serving Gateway (Control)  
vPGW Virtual Packet Gateway  
vPGWc Virtual Packet Gateway (Control)  
vBBU Virtual Baseband Unit  
xRAN Virtual RAN

## Enterprise

vEG Virtual Enterprise Gateway  
vEE Virtual Enterprise Ethernet  
VNaaS Virtual Network-as-a-Service

## Infrastructure

ONOS Network OS  
OpenStack Infrastructure-as-a-Service  
Swarm Cloud Management Service  
Fabric Management Service  
VTN Virtual Network  
vRouter Network-as-a-Service  
vFW Virtual Firewall  
vSR Virtual Server  
vLB Virtual Load Balancer  
vCR Virtual Content Router  
vSRV Virtual Server  
vR Virtual Router  
vCC Virtual Content Cache  
vLBaaS Virtual Load Balancer-as-a-Service

## Helper Services

AAA Access Control  
AddressMgr Allocate IP Addresses  
IGMP Multicast Signalling  
MCAST Multicast  
SADIS Subscriber Authentication

Mostly POC Quality & Not Ready for Production  
ONOS/Trellis on path to production readiness  
Intel/Sprint Contributed EPC becoming production ready

This is all well and good

But

Are operators really committed to these solutions?

Can multiple operators agree on common reference designs and create economy of scale?

# Network Operators Will Rebuild Their Access and Edge Infrastructure

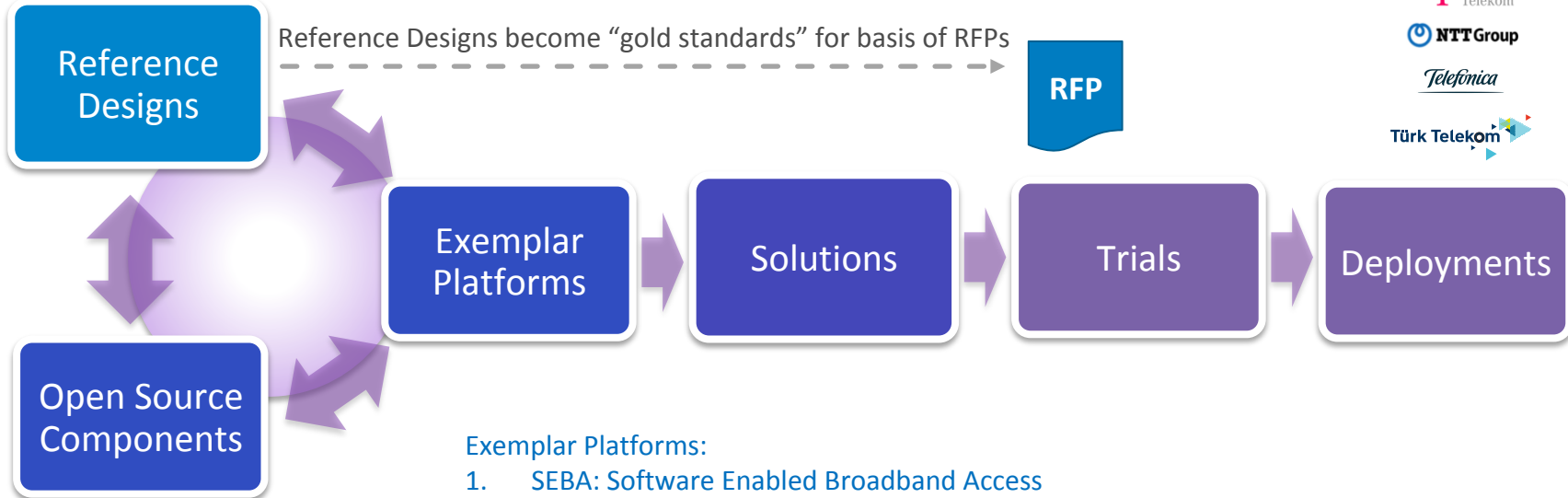
In support of

- 5G
- Gigabit Broadband
  - GPON, XGS-PON, NG-PON, G.FAST, ...
- Edge Cloud

# Operators Commitments to Reference Designs & Exemplar Platforms

Reference Designs:

- SEBA-RD
- Trellis-RD
- UPAN-RD
- ODTN-RD



Open Source Components

Components:

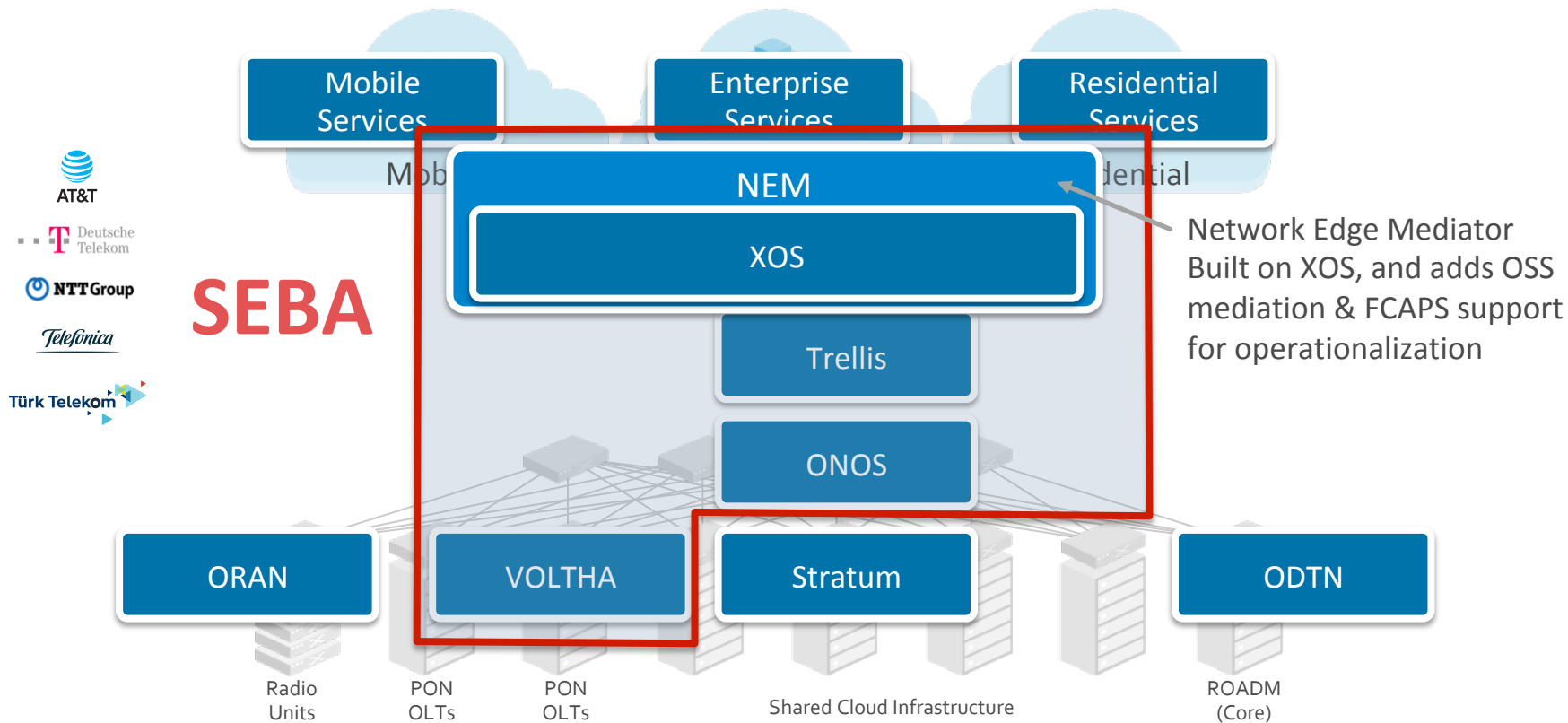
- XOS
- ONOS
- Stratum
- VOLTHA

Exemplar Platforms:

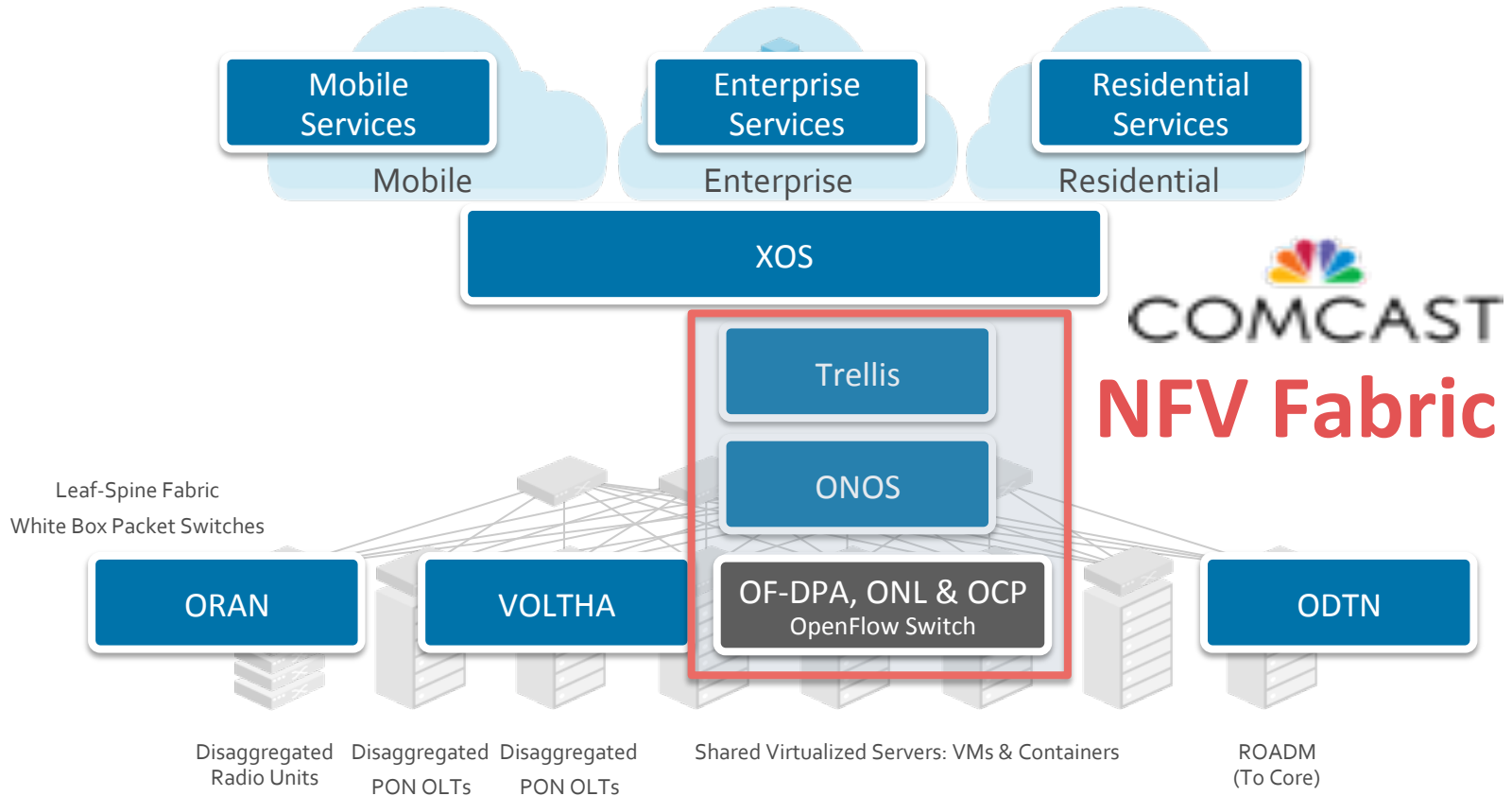
1. SEBA: Software Enabled Broadband Access
2. Trellis: A Leaf-Spine Fabric
3. UPAN: Unified Programmable Autonomous Network
4. ODTN: Open Disaggregated Transport Network



# Virtualized Broadband Access - SEBA Exemplar Platform

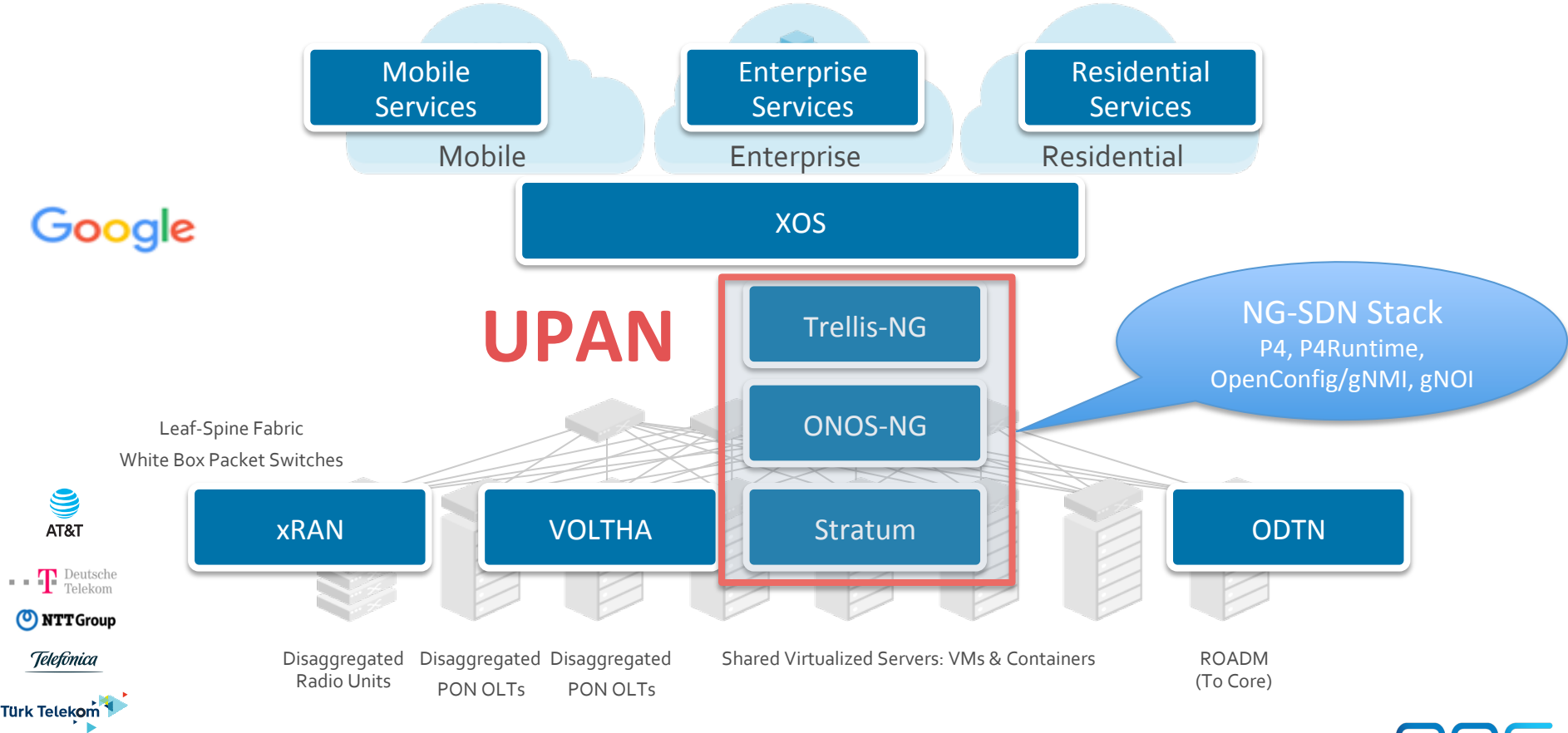


# Trellis: A Leaf-Spine Fabric for NFV

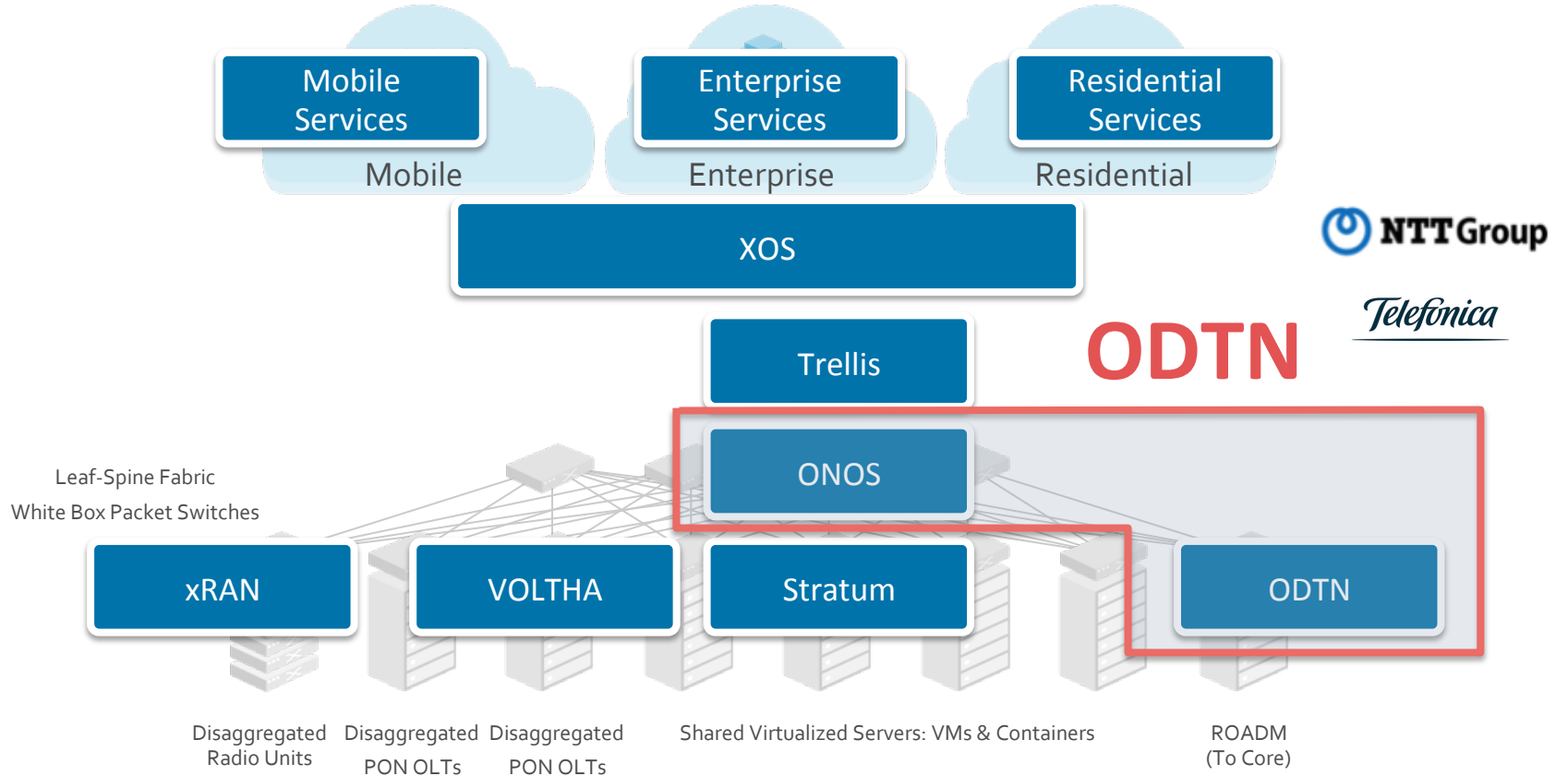




# Next-Gen SDN: Unified Programmable Autonomous Network (UPAN)



# ODTN: Open Disaggregated Transport Network



# Disaggregation and Open Source: Challenges It Poses

**To enable innovation, we need:**

Disaggregation and  
Open Source Components

**To be able to deploy:**

Operators Require Integrated  
Solutions Leveraging Open Source  
Disaggregated Components

**Challenges:** Proliferation of Open Source & Disaggregated Components

- Too many components
- Too many choices for each component
- Too difficult for operators/vendors to build integrated solutions leveraging the components

# ONF's Ying-Yang Model for Disaggregation & Integration

**To enable innovation, we need:**

Disaggregation and  
Open Source Components



**To be able to deploy:**

Operators Require Integrated  
Solutions Leveraging Open Source  
Disaggregated Components

## Open Source Components

- Stratum
- VOLTHA
- ONOS
- XOS

## Integrated Solutions:

### Reference Designs & Exemplar Platforms

- SEBA, Trellis, UPAN, ODTN
  - Multi-Access Edge Cloud
- That leverage the components

ONF is unique in delivering **Integrated Solutions** leveraging open source **Disaggregated Components**

# Here is the Puzzle

Access and Edge Platform  
POC/Trial Quality

Operators  
want to  
transform  
infra &  
services



A portfolio of Services/VNFs

An Open Source Software Stack  
XOS, ONOS, VOLTHA, xRAN,  
Stratum



Many operators want to deploy  
solutions based on this platform  
and want productized and  
commercially supported version



OLT



RAN



Switch

White Box  
Devices

No one jumping in “with two feet” to do this!  
How can we get the supply-chain to do this?

# Who can unlock this billion<sup>+</sup> dollar puzzle?

- It takes a community or ecosystem of “end to end supply-chain”
- ONF Connect has brought this community together
- Now it is your opportunity to understand and influence
  - the state of technology, platforms and solutions and the roadmap
  - operators commitment and what they need
  - the ecosystem

And unlock this puzzle!

# Guide to Unlocking the Puzzle

- OEMs don't want to risk their existing business (model) while they wait for open source solutions to mature and new business models emerge
  - It is risky to wait! Help them reinvent a new business model
- New comers and System Integrators are “dipping their toes”
  - Help them understand it is time to jump in!
- VCs and Entrepreneurs tend to be skeptical of operator space
  - They need to take a closer look – the world of operators has changed a lot
- Forward thinking operators think they are already doing a lot
  - Cheer them and encourage them to go extra mile!  
By investing alongside their supply chains and creating a successful DevOps model to productize solutions they need



## Plenary Sessions

- Great lineup of keynotes
- Plenary Sessions highlighting major themes
- ONF Governance

## Major Themes for Tracks

- Edge Cloud
- Broadband Access
- Next Gen SDN
- Mobile and 5G
- Optical Transport
- Ecosystem & Marketplace

## POCs Demos

- For each major theme
- For each RD/EP

And more

Designed to be the right size for quality interactions:  
Not too big and not too small





**Thank You**

