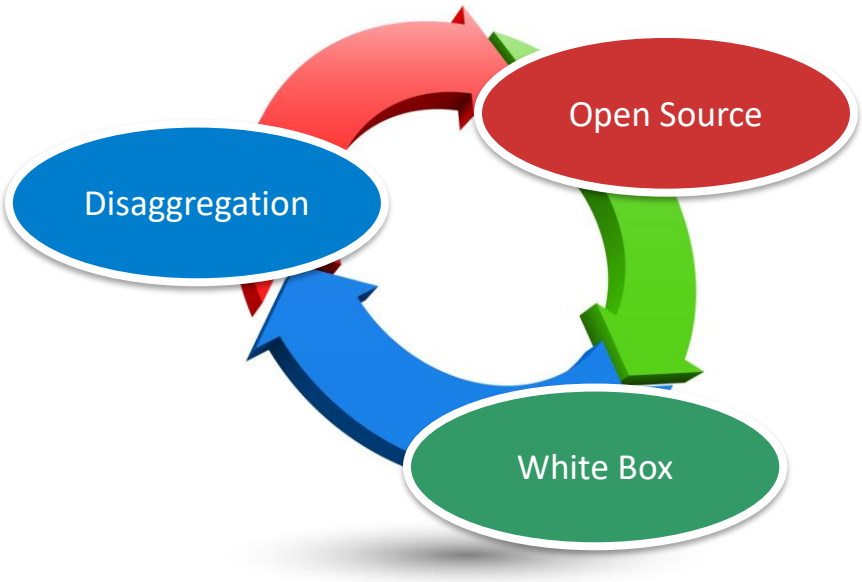
Guru Parulkar

guru@opennetworking.org

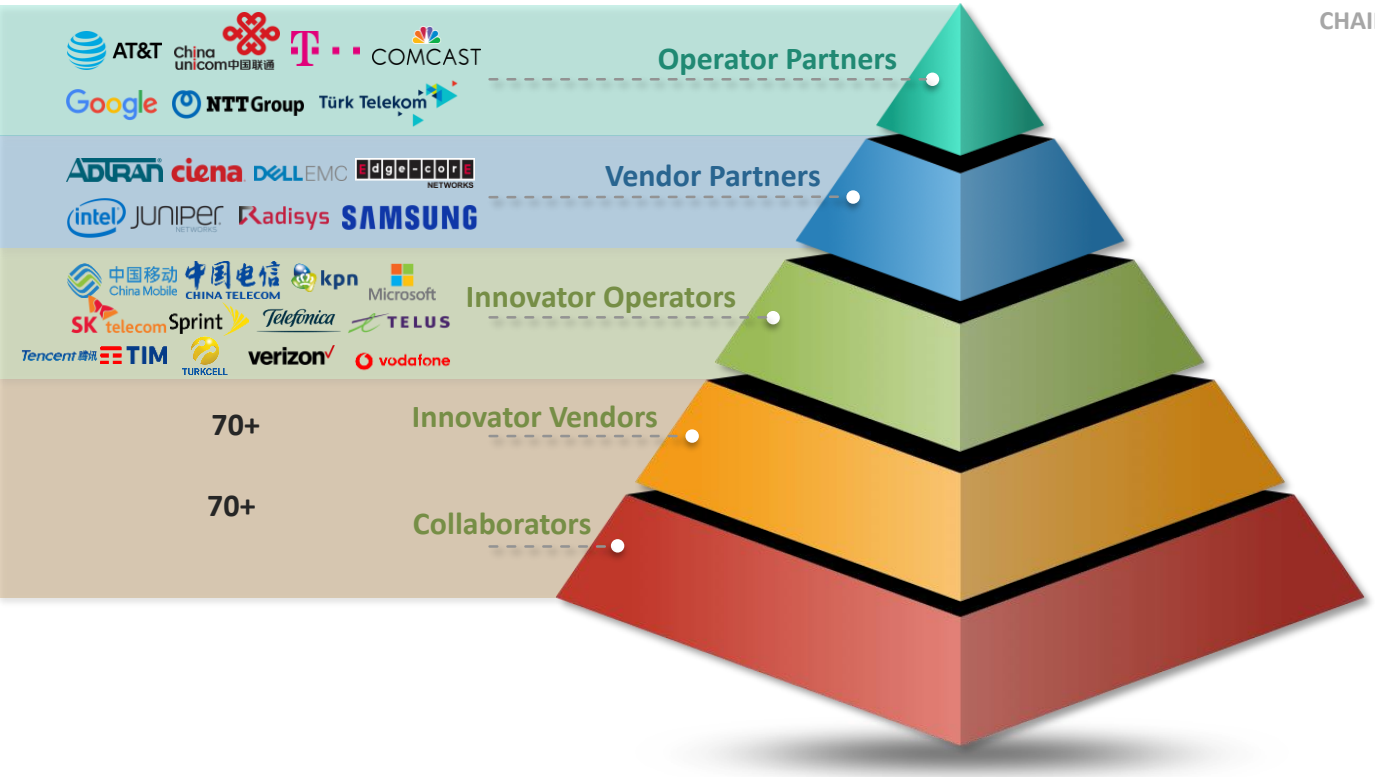
Mission

Transform network infrastructure and services with SDN, NFV, & Cloudification to bring Capex and Opex efficiencies and innovation to network operators leveraging



The ONF Ecosystem – 160+ Members Strong

Vibrant Operator Led Consortium Positioned for Success



ONF BOARD

CHAIR: AT&T	Andre Feutsch - CTO
T-Mobile	Jochen Appel - VP
Google	Amin Vahdat - Fellow
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STANFORD	Nick McKeown - Prof
ONF STANFORD	Guru Parulkar, Exec Dir

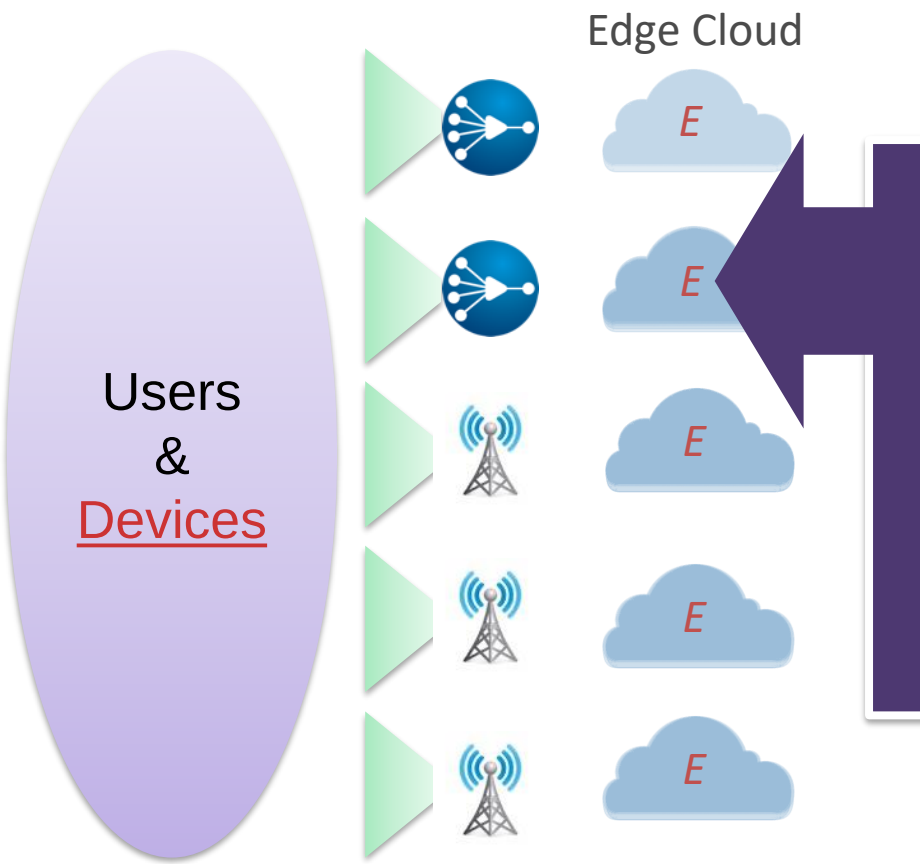
Comprehensive Open Source Components & A Track Record of Impact

ONF Scope: 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 ← Contributed by Intel and Sprint
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

How do these components enable solutions for network operators?

Emerging Multi-Tier Cloud with New Edge



Edge Processing is Vital

- Subscriber experience dictated from here

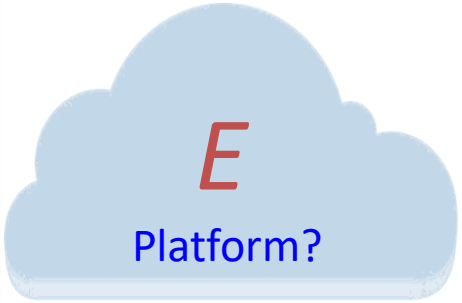
- Human Reaction time: 210ms
- Machine to machine interactions < 100ms
- Latency to Centralized Cloud: 100 – 400ms

- Emerging Applications Require Edge Processing
  - AR visual overlays
  - Autonomous Vehicle Coordination
  - IoT Battery Life (50-75% improvement with edge processing)

What would an Edge platform need?

Functionality

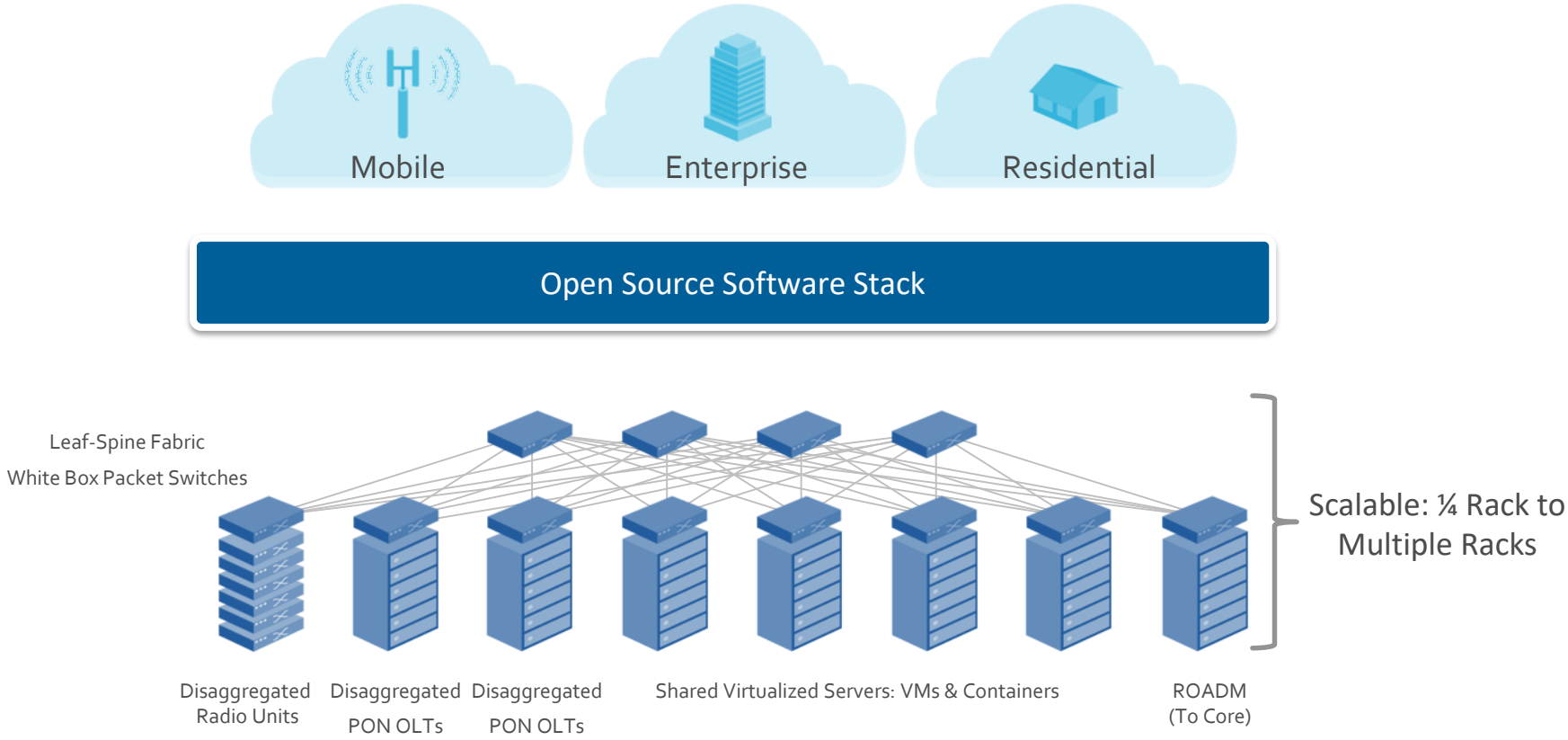
- A service delivery platform
  - For known & yet unknown services
- Many different configurations
  - Small to large
- Ability to plug-in different access devices/technologies
- Programmable control & monitoring
  - Millisecond control loops
- Economics of a datacenter
  - Space and power efficient
- Zero-touch/automated provisioning, config, & operation



Approach

- Built with
  - Merchant silicon
  - White boxes
  - Open source
- Committed community
- Future proof
  - Hard to predict services & access technologies
- Proprietary components as special components (“tabasco sauce”)

ONF Open Source Software Stack for Access and Edge



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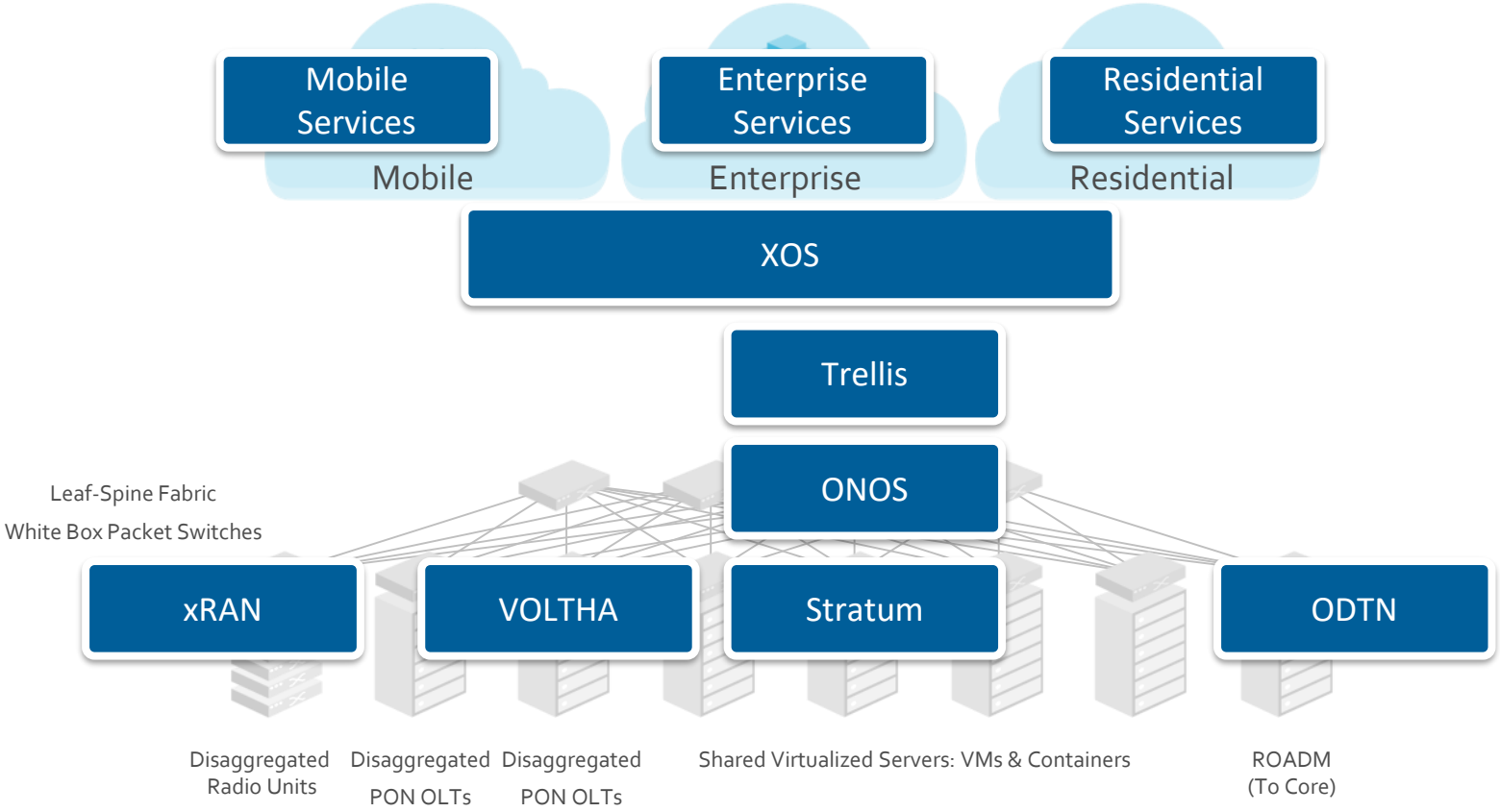


Service Inventory in the Latest Release of CORD

Residental

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 G
vSGWc	Virtual Ser
vPGW	Virtual
vPGWc	Virtual P
vBBU	Virtual Br
xRAN	Virtual Rad

Enterprise

vEG	Virtual Enterprise Gateway

Infrastructure

ONOS	
On	s-a-Service
	gement Service
	ent Service
	Network
	ing-as-a-Service

ervices

Router	Virtual Router
HyperCache	Akamai CDN
LBaaS	Load Balancer-as-a-Service

Helper Services

AAA	Access Control
AddressMgr	Allocate IP Addresses
IGMP	Multicast Signalling

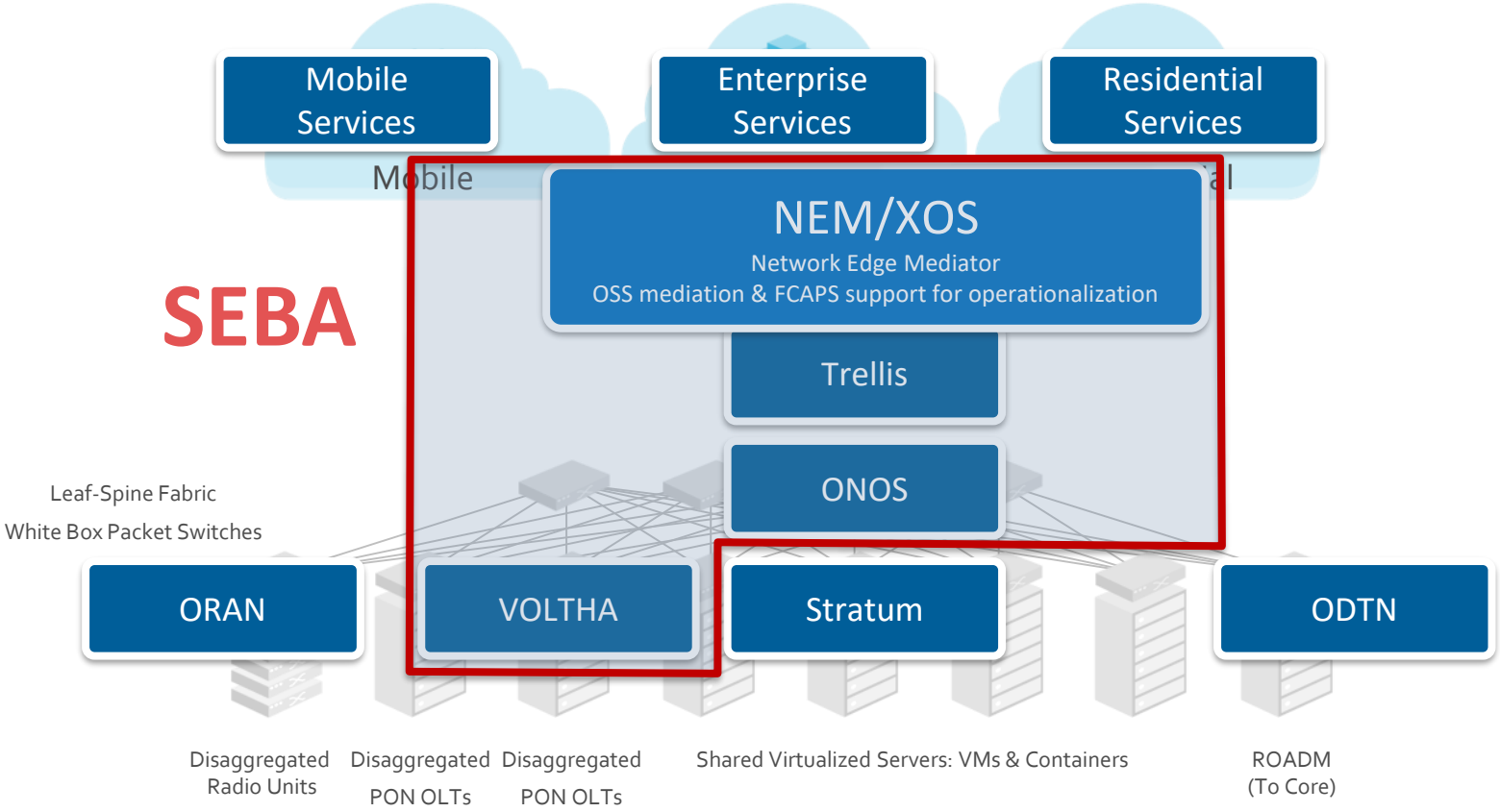
Mostly POC Quality & Not Ready for Production
ONOS/Trellis on path to production readiness
SEBA related services also on path to production readiness
Intel/Sprint Contributed EPC becoming production ready

Bring your favorite (even proprietary) VNF!
Love to demonstrate on CORD!

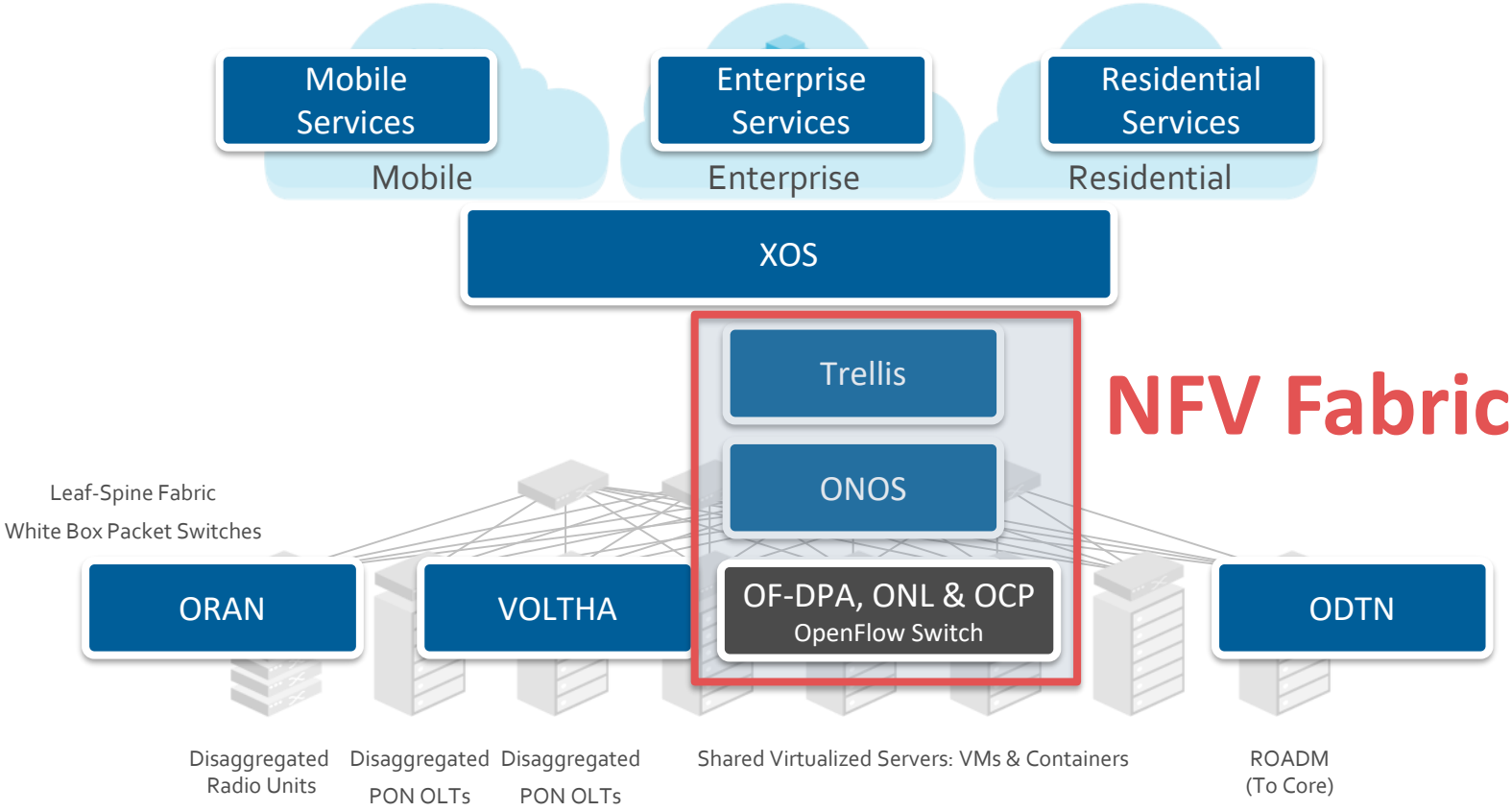
How do these components enable solutions for network operators?

There are multiple solutions with a subset of components

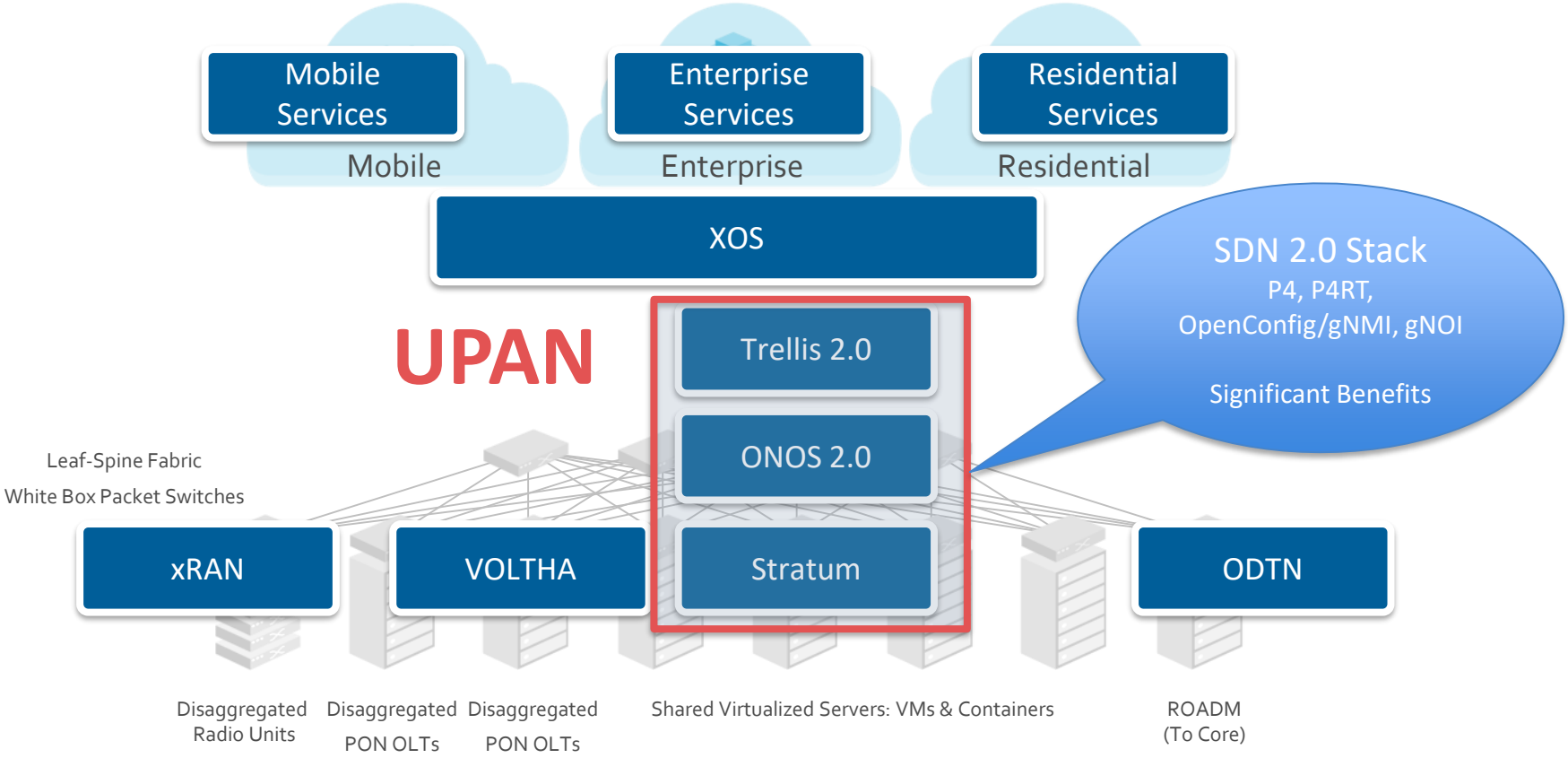
SEBA: Software Enabled Broadband Access



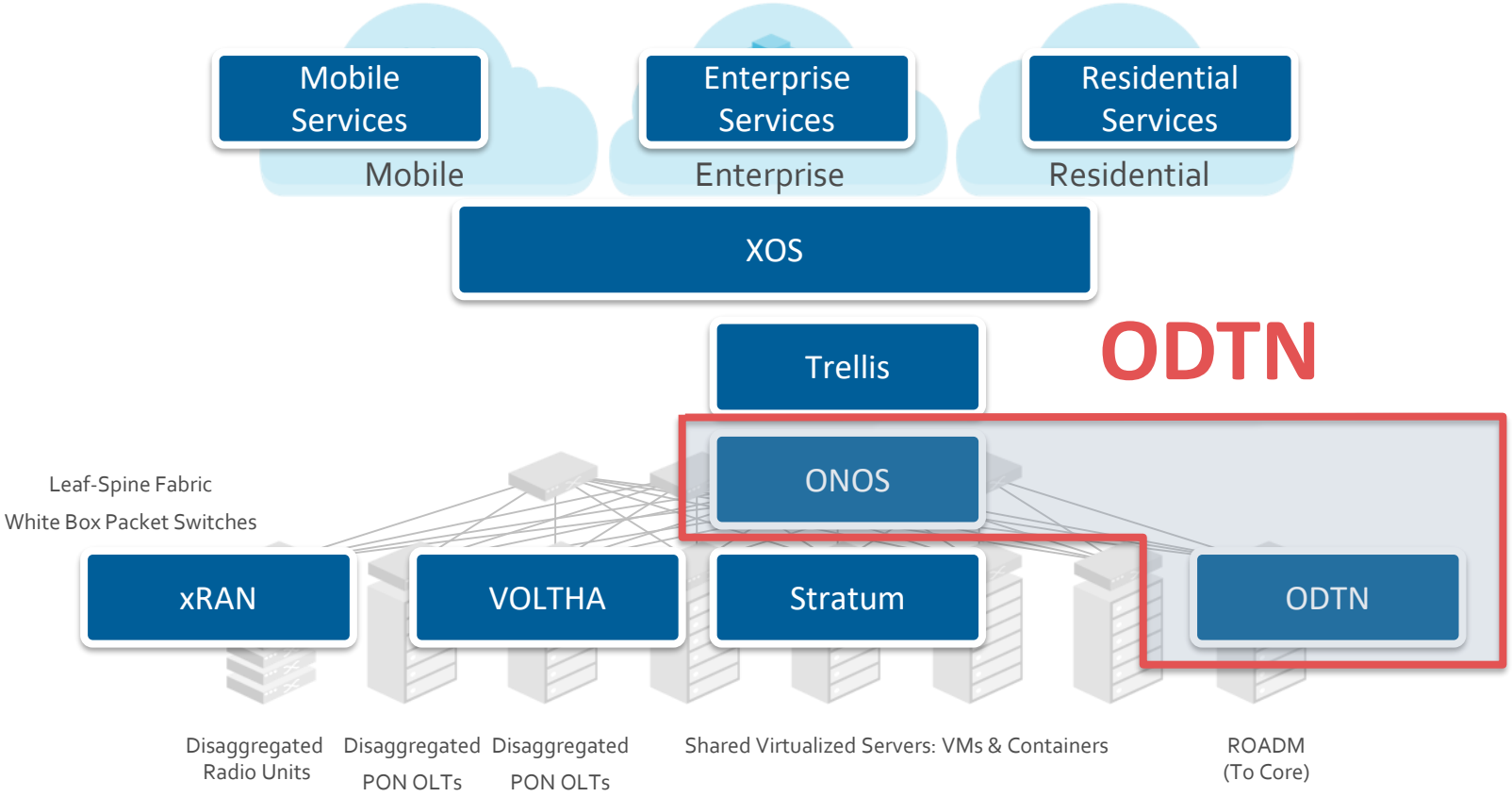
Trellis: A Leaf-Spine Fabric for NFV



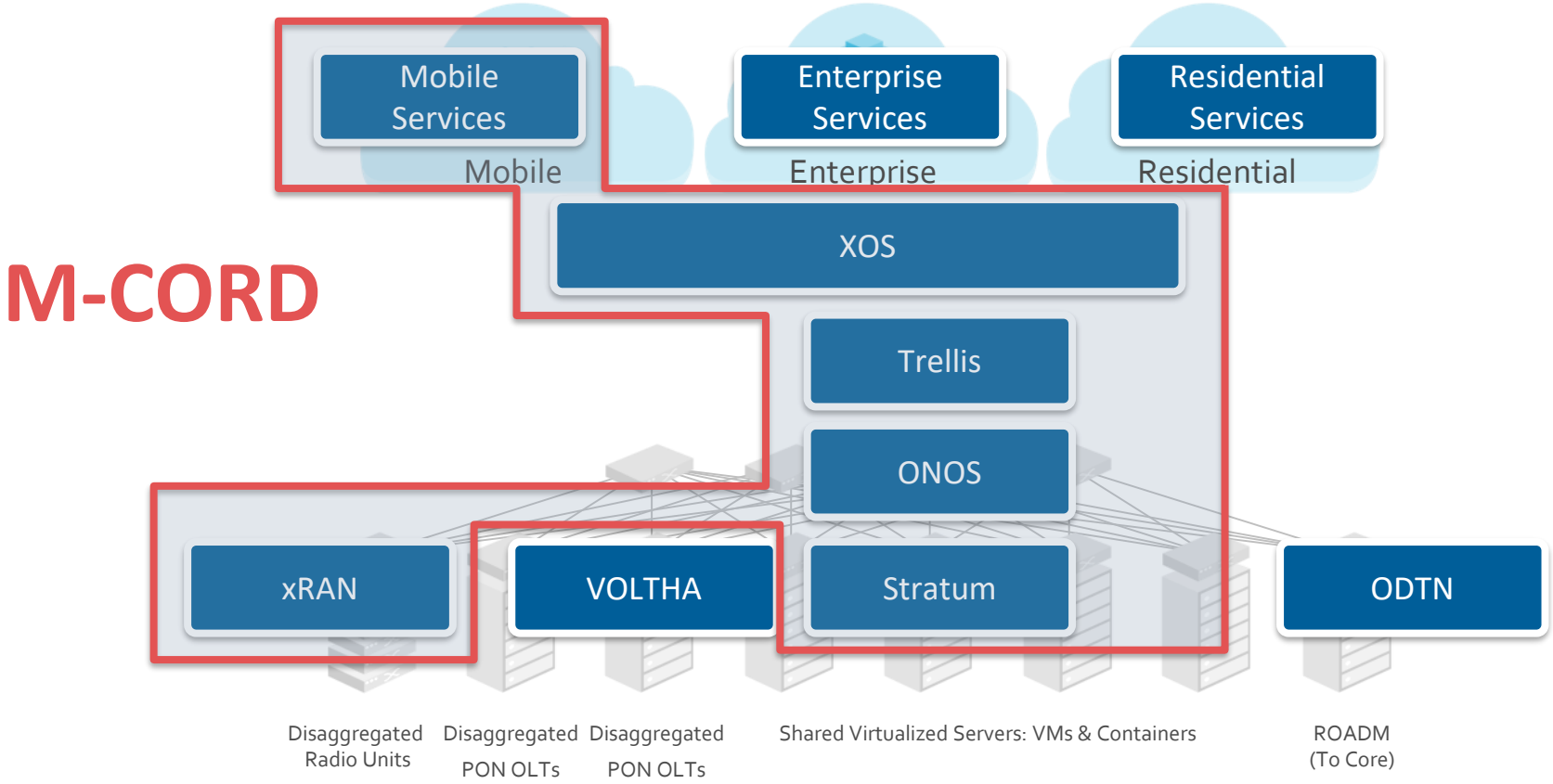
UPAN: Unified Programmable Autonomous Network



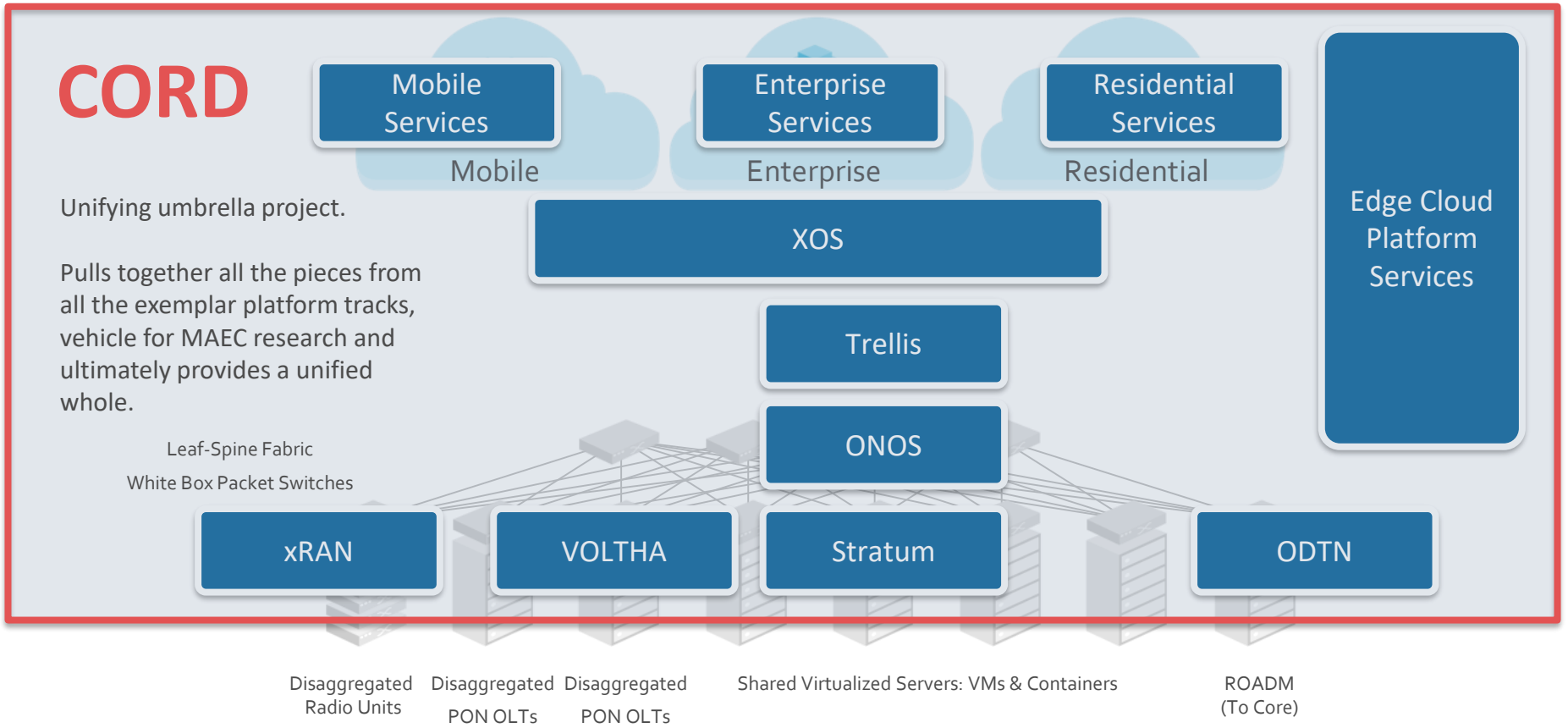
ODTN: Open Disaggregated Transport Network



M-CORD: A Platform for 5G

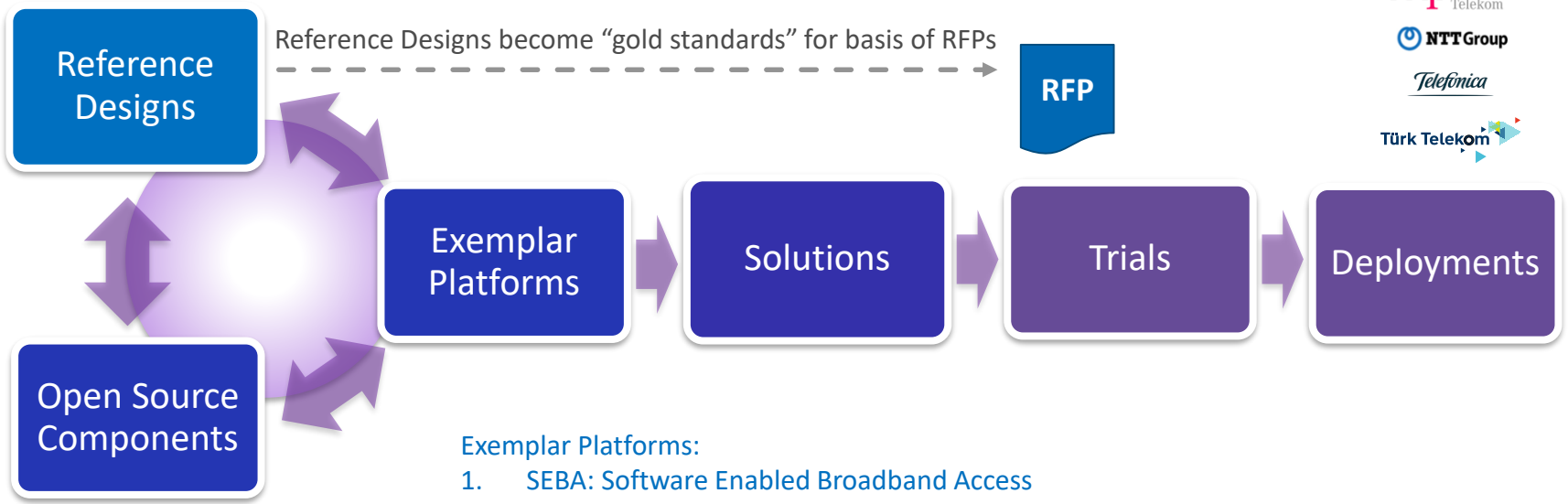


CORD® as Multi-Access Edge Cloud Platform



Components to Reference Designs & Exemplar Platforms

Reference Designs:
SEBA-RD
Trellis-RD
UPAN-RD
ODTN-RD

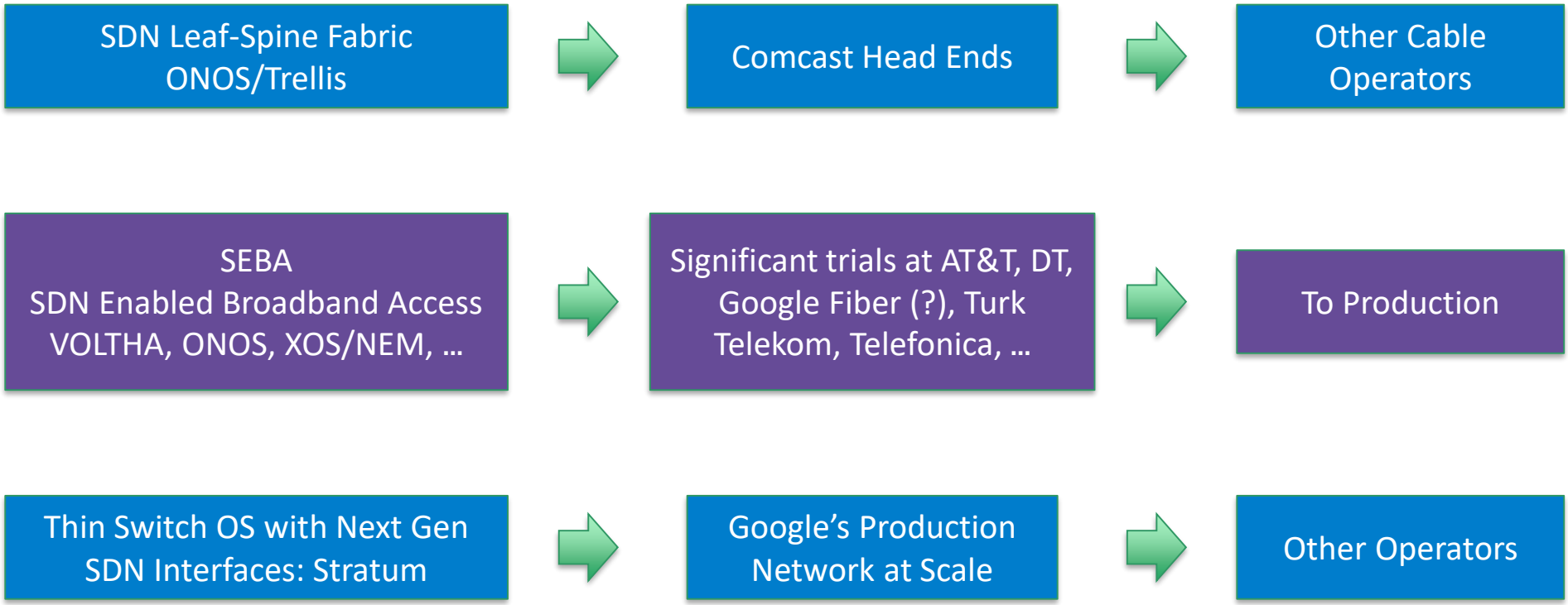


Components:
XOS
ONOS
Stratum
VOLTHA

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

ONF Opportunities for Real Impact

Solutions with White Boxes and Open Source SDN/NFV to Production Networks



ONF Opportunities

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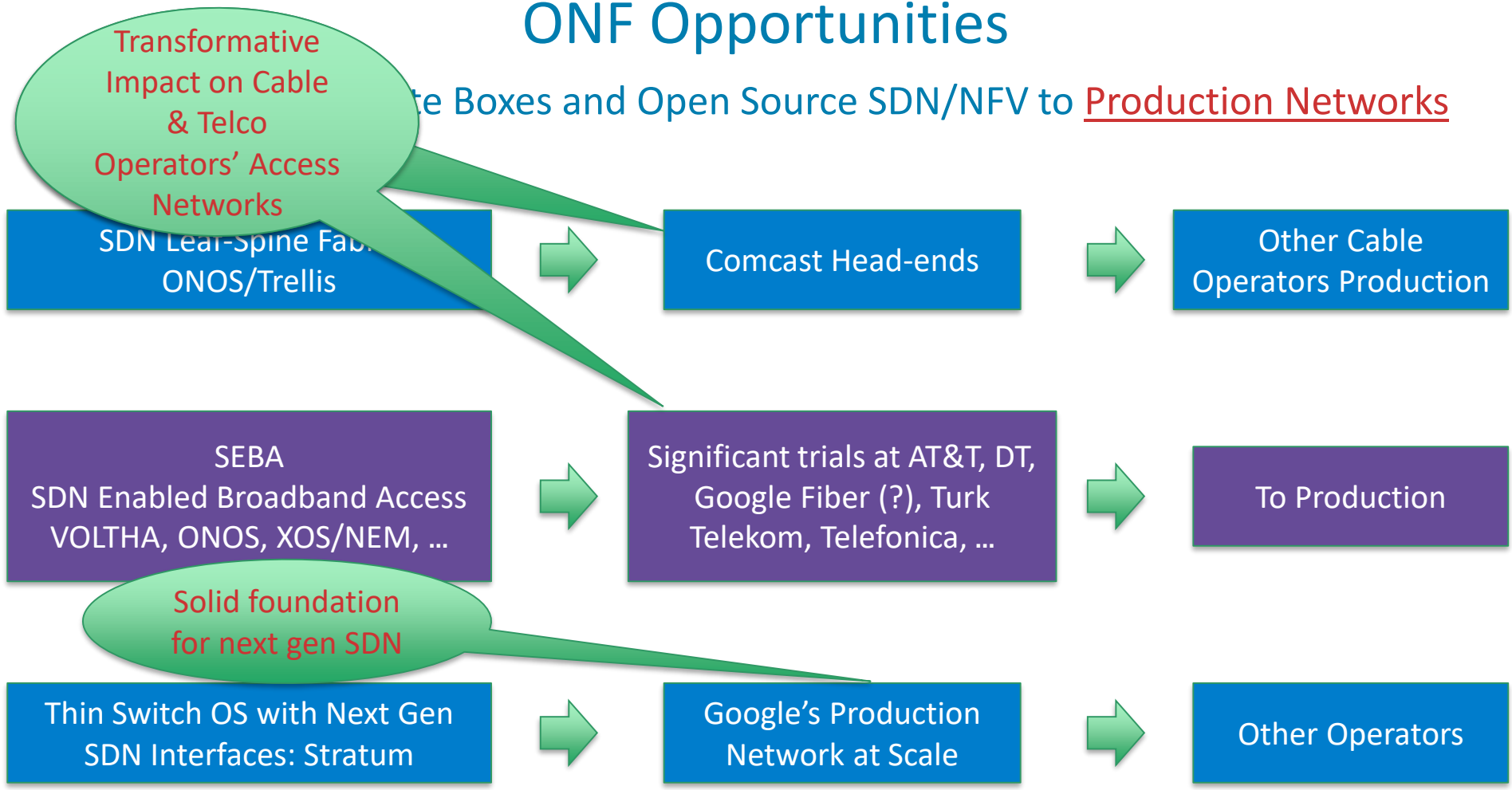


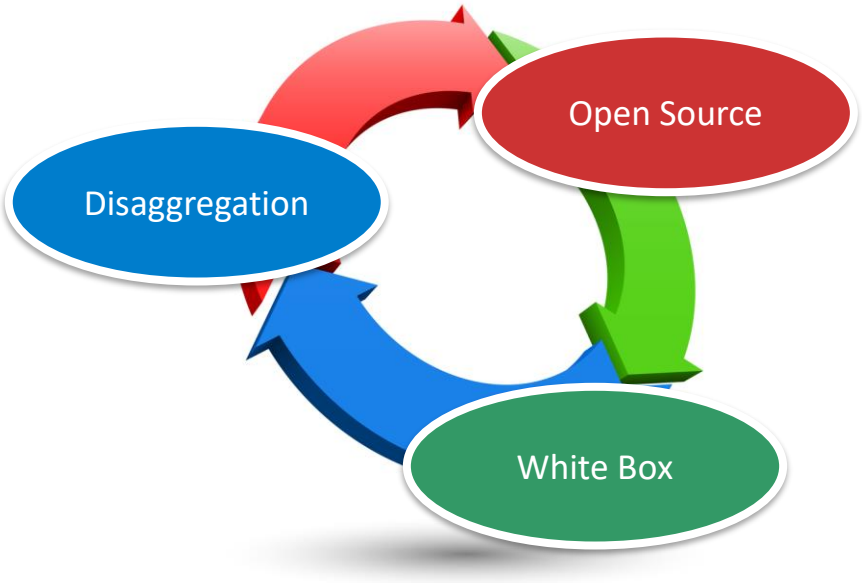
ONF Future Directions

- SDN 2.0 Software Stack
  - Stratum + ONOS 2.0 and Trellis 2.0 built on P4, P4RT, OpenConfig/gNMI, and gNOI
  - Delivering software defined control and zero-touch config/management, VNF acceleration
- M-CORD
  - Open source implementation of ORAN with disaggregation and white boxes
  - Converged packet core for mobile wireless and wireline
- CORD to Multi-access Edge Cloud
  - Service-meshes in a multi-cloud environment

ONF's Unique Open Source Model

ONF's Unique Open Source

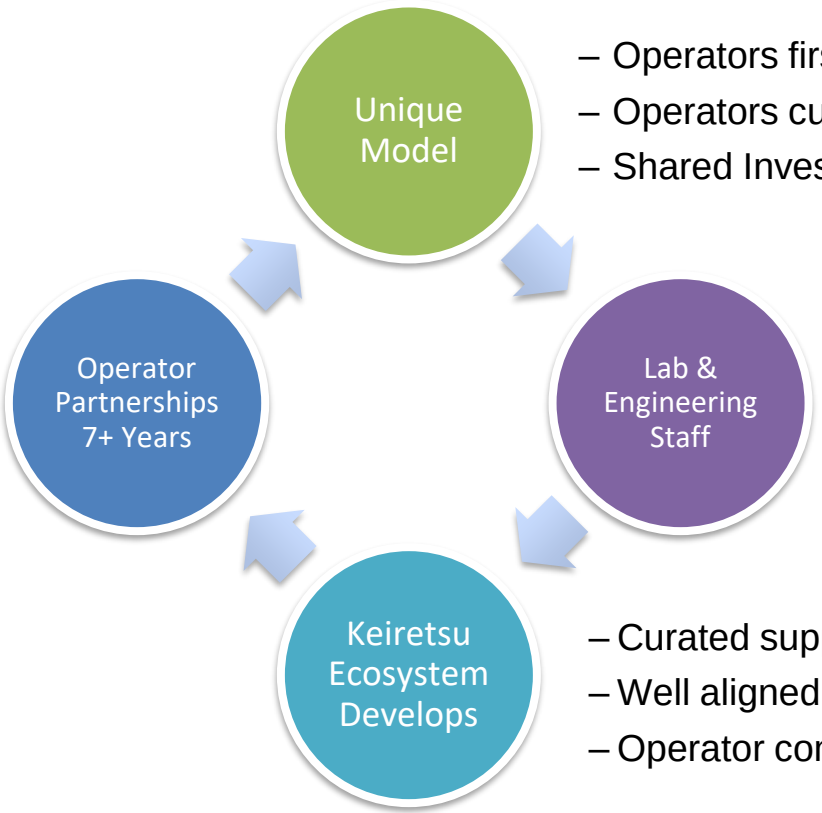
ONF Operator Partners want to transform their infrastructure with



This is disruptive to current business model of incumbent vendors

ONF's Operator Led Curated Open Source is the Solution

ONF Unique Approach – Operator Led Curated Open Source



– Operators first agree on common Use Cases to jointly pursue
– Operators curate components
– Shared Investment in Open Source for Operators

– "Small & mighty" independent engineering team
– Dedicated to the mission with no legacy to protect

– Curated supply chain engages to embrace opportunity
– Well aligned vendors each contribute value to overall solution
– Operator commitment to deployment ensures ROI

Disaggregation and Open Source and 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
- vRAN and Converged Packet Core
- Access Edge Cloud

That leverage the components

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

Want to learn more and contribute, plan to attend

December 4-7, Santa Clara

Keynote Speakers

JOCHEN APPEL
VP of Access Network & Cost Engineering
Deutsche Telekom

ERIC BREWER
VP Infrastructure & Google Fellow
Google

ANDRE FUETSCH
President, AT&T Labs and Chief Technology Officer

ROB HOWALD
Vice President of Network Architecture
Comcast

DAI KASHIWA
VP of SDN/NFV technology development
NTT Communications

CHIH-LIN I
CMCC Chief Scientist of Wireless Technologies,
China Mobile

RON MARQUARDT
VP of Technology
Sprint

PRANAV MEHTA
CTO Communication & Storage Infrastructure Group
Intel

AMIN VAHDAT
Google Fellow and Technical Lead for networking at Google

TANG XIONGYAN
Chief Scientist
China Unicom

5 Major Themes

- Next Generation SDN
- Software Defined Broadband Access
- 5G and Mobile
- Multi-access Edge Cloud
- Ecosystem and Business Models