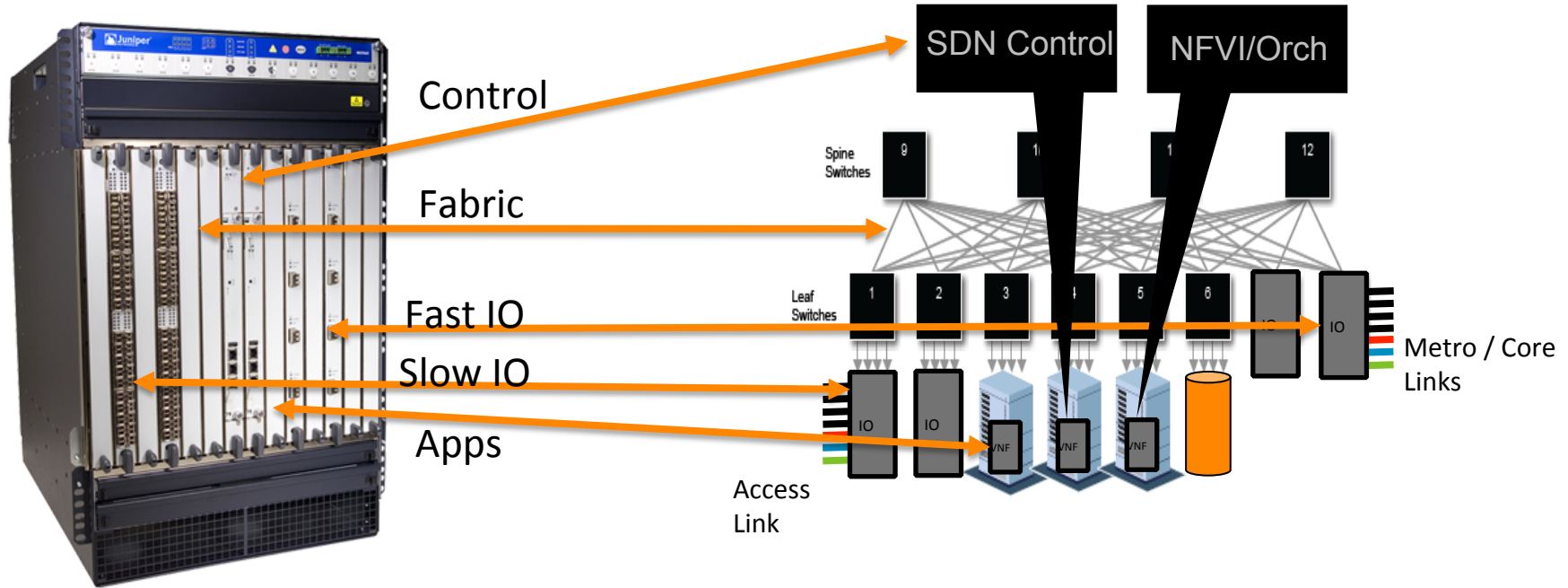


A long cable-stayed bridge spans across a body of water under a clear blue sky. The bridge features a prominent pylon with multiple stay cables. The water is calm, reflecting the bridge and the sky. The overall scene is serene and modern.

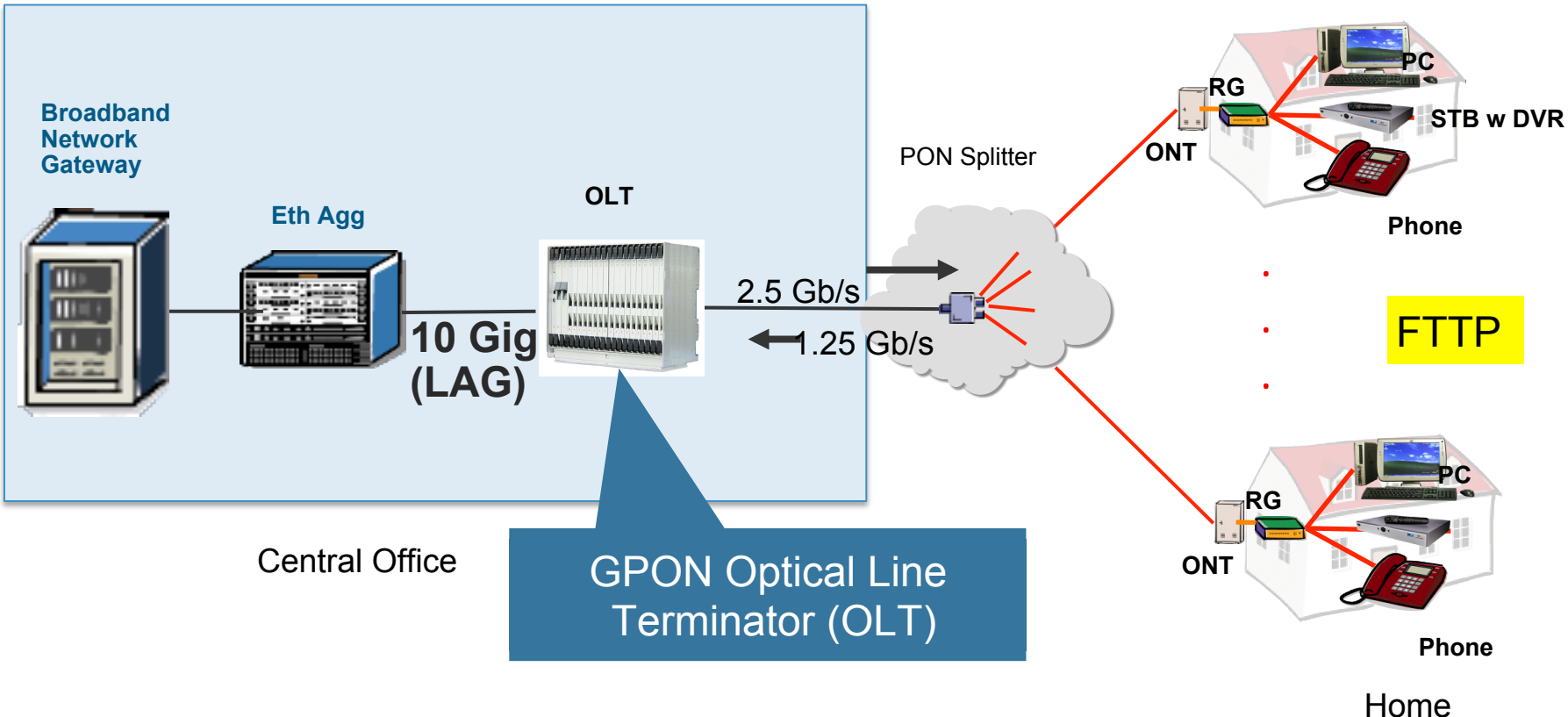
# CORD Deployment- Bringing it all together (vCPE + vOLT + Fabric + NFaaS)

# Mapping then to now



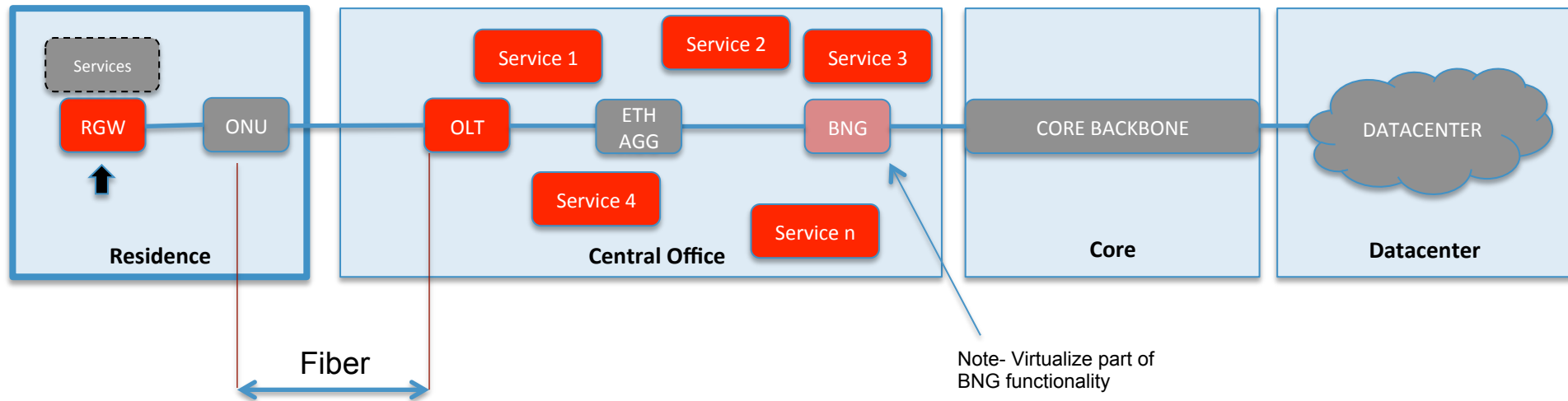
Source – Tom Anschutz, AT&T

# Legacy GPON Access Architecture



Source – Tom Anschutz, AT&T

# Devices we want to virtualize (Phase 1 - GPON)

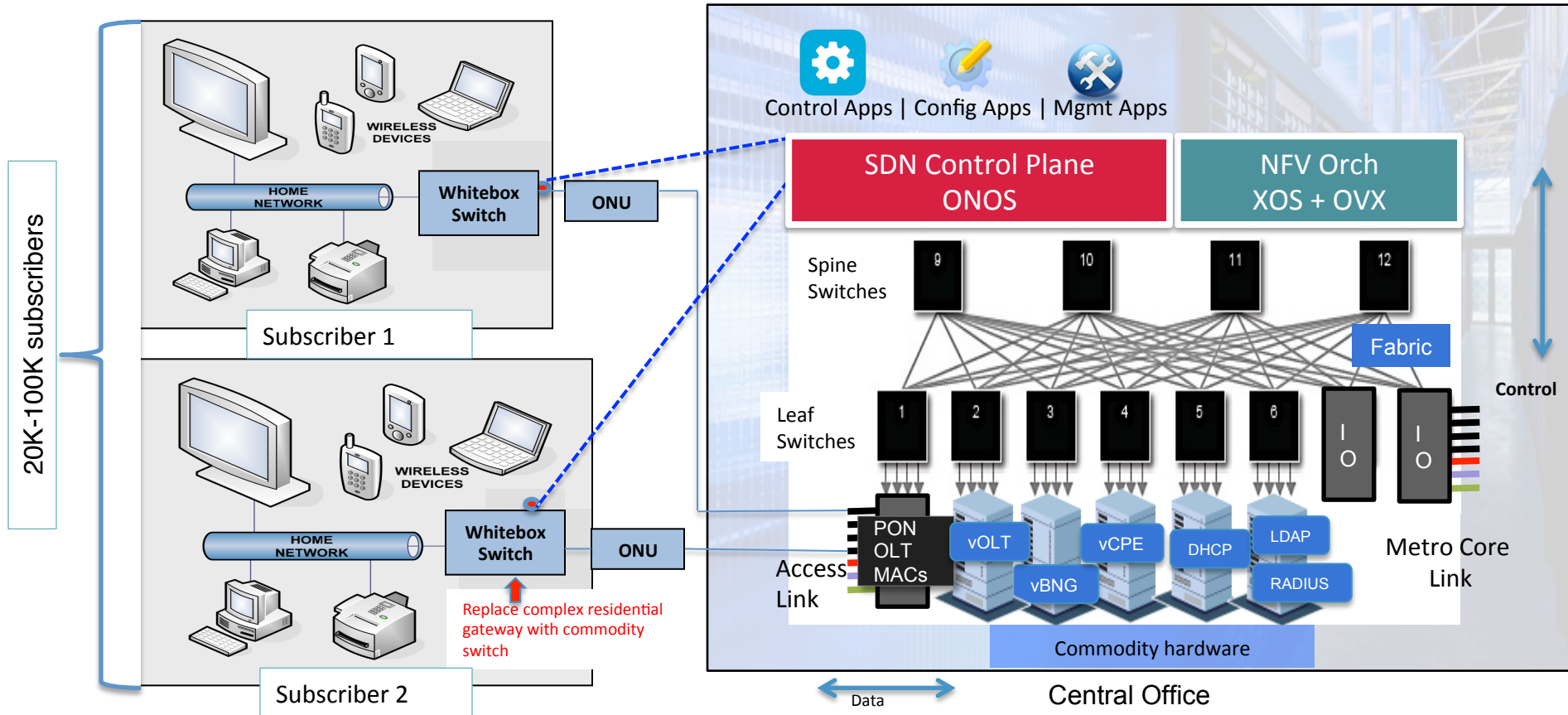


GPON - Gigabit Passive Optical network

CPE – Customer Premises equipment = HGW, RGW

ONU (Optical Network unit) = ONT (Optical network termination)

# CORD – vCPE+vOLT+NaaS+Fabric



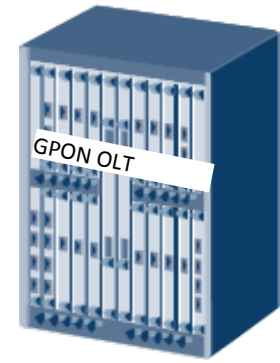
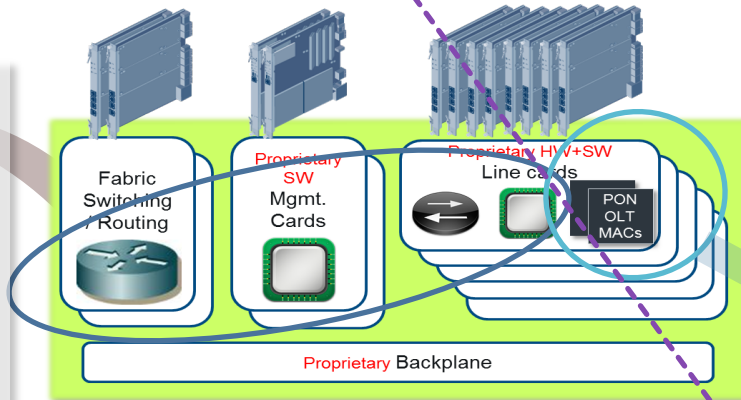
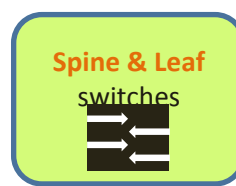
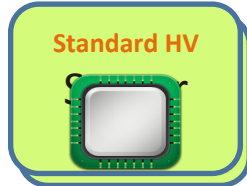


# Virtualizing the OLT (vOLT)

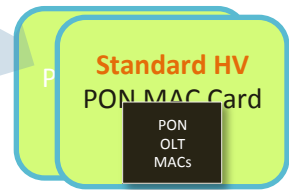
# Virtual OLT (vOLT)

Everything but the MACs can be virtualized and moved to NFVI running over standard:

- Fabric Switches
- Storage
- Servers



PON MACs is moving to standalone HW



Standard Equipment

NFV OLT



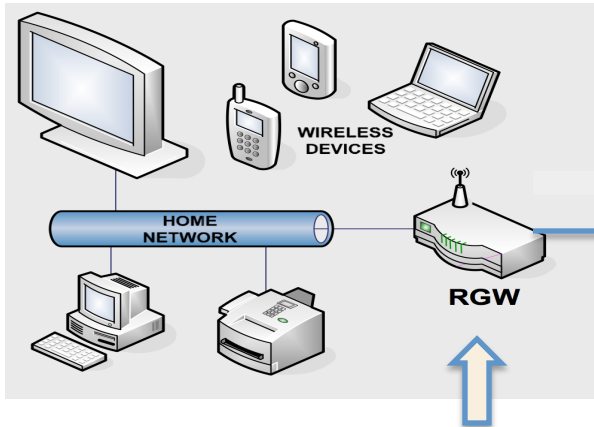
# Virtualizing the CPE (vCPE)



# Residential Gateways - functionality



But provisioning and managing these services and introducing new ones is cumbersome for providers.



Residential Gateways provide a variety of services.

DHCP server
NAT router
PPoE Client

Firewall, IPS
Parental ctrl
Port mapping
VPN server



Central Office

# Problems with Residential Gateways



- Complex – NAT, Routing etc.
- Costly to maintain and debug
- Difficult to launch new services
- Difficult to customize services
- Non-homogenous installed base- diversity of residential gateways of varying capabilities

# Solution- virtualize the CPE (vCPE)



- CPE replaced with simple (whitebox) switch
- Functionality that currently exists on CPE virtualized and moved into the Central Office
- Services can be customized per subscriber per device

Virtualizing CPE = a simple switch (bridge) in the home and a remotely-hosted Virtual CPE for that residence that connects to services in the Cloud.

# Benefits of vCPE



For subscriber -

- No downtime for upgrades
- New and customized services easily available

For Service Provider –

- CAPEX/OPEX savings
- Introduce new services quickly
- Customize services for subscribers easily

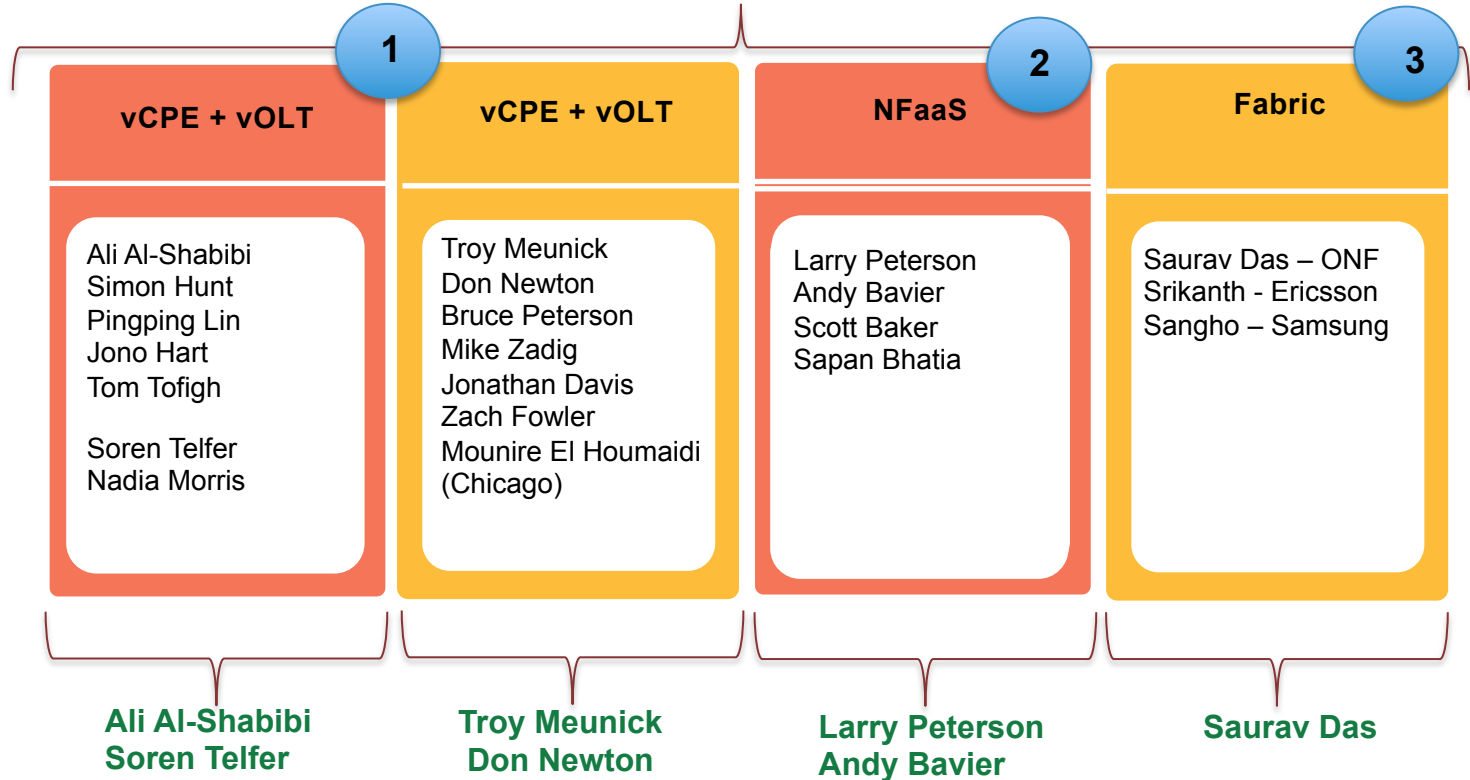


# **ONS Demo- June 2015**

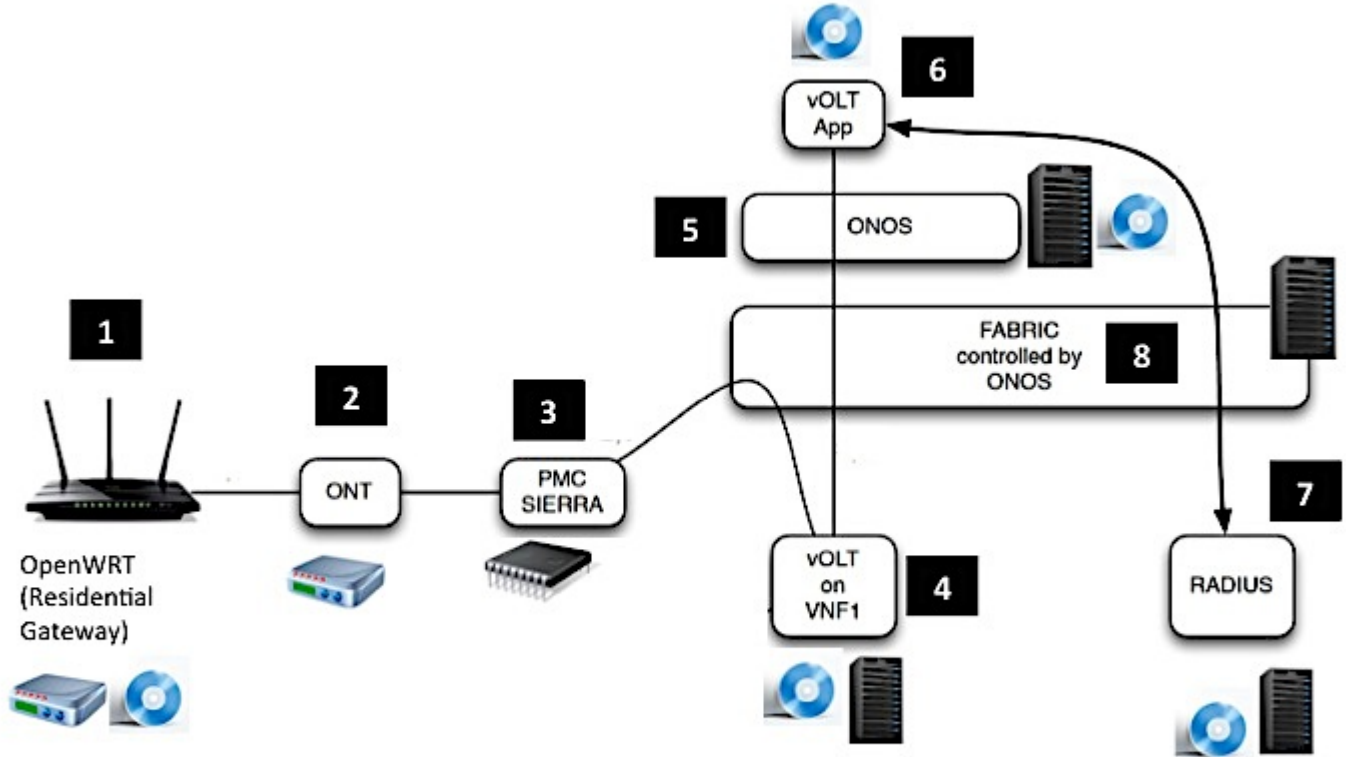
# CORD Team – Division of Labor/fun



Tom Anschutz (AT&T)



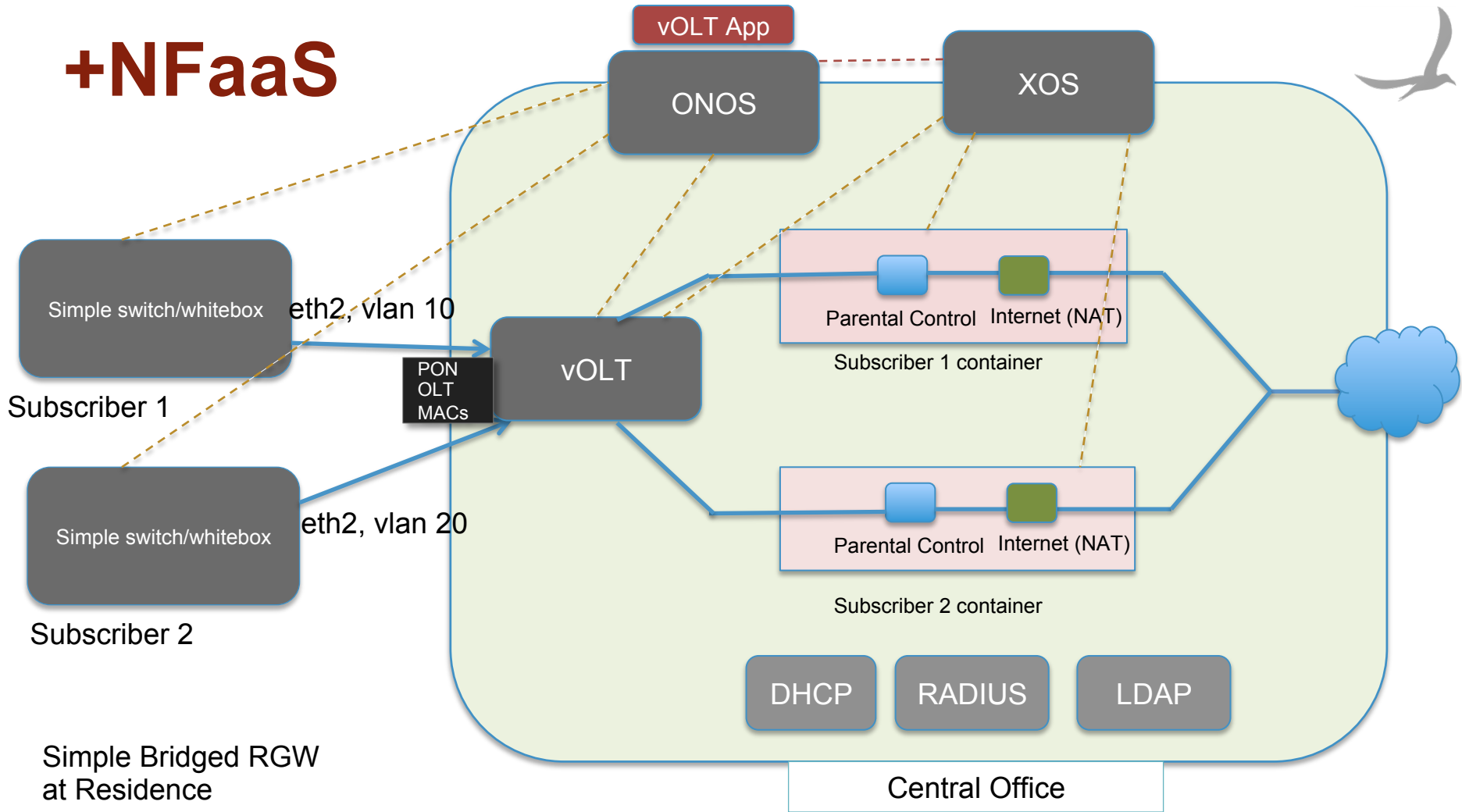
# ONS Demo: vCPE + vOLT + Fabric



Demo Set-up Part 1 ( does not include NFaaS)

Chip      Server      Device      Software

# +NFaaS





# Resources



- Mailing list: [onos-co@onosproject.org](mailto:onos-co@onosproject.org)
- Wiki page:

<http://bit.ly/1JKR3QK>



# **CORD Roadmap – 2015/16**

# CORD Delivery milestones

June 2015



**Demonstrate at ONS**

## CORD Demo at ONS

- Fabric
- NFaaS
- vOLT+vCPE
- ONOS, XOS
- Open WRT on Netgear

## Partners identified

Dec 2015



**Lab trial at AT&T**

## Central Office PODS for AT&T Lab Trials

- Access: vOLT + G-FAST
- Fabric white boxes: OCP switches
- White box software: OCP (ONIE + ONL)
- CO infrastructure software: ON.Lab (ONOS + OpenStack + XOS + Control Apps)
- VNFs: ON.Lab + AT&T (vCPE + vBNG + CDN, ...)
- Residential white box: OpenWRT
- POD: Integration by AT&T Foundry (Atlanta, Palo Alto, others)
- Lab trials: Key AT&T locations

**Partnerships initiated and finalized**

**Integration, testing, performance validation**

**Trial: U-verse with vCPE over vOLT/G.FAST + NFaaS**

June 2016



**Trial Deployment at AT&T**

Dec 2016



**Ready for deployment in AT&T Central Office**

## CORD ready for deployment in AT&T CO:-

- Partnerships and robust ecosystem in place
- Integration complete
- Testing complete
- Trial deployment completed successfully before Dec 2016

**Launched in AT&T Central Office**



**ONOS**

Open Network Operating System

**Software Defined Transformation of Service Provider Networks**

*Join the journey @ [onosproject.org](http://onosproject.org)*