R-CORD: A Disaggregation Story
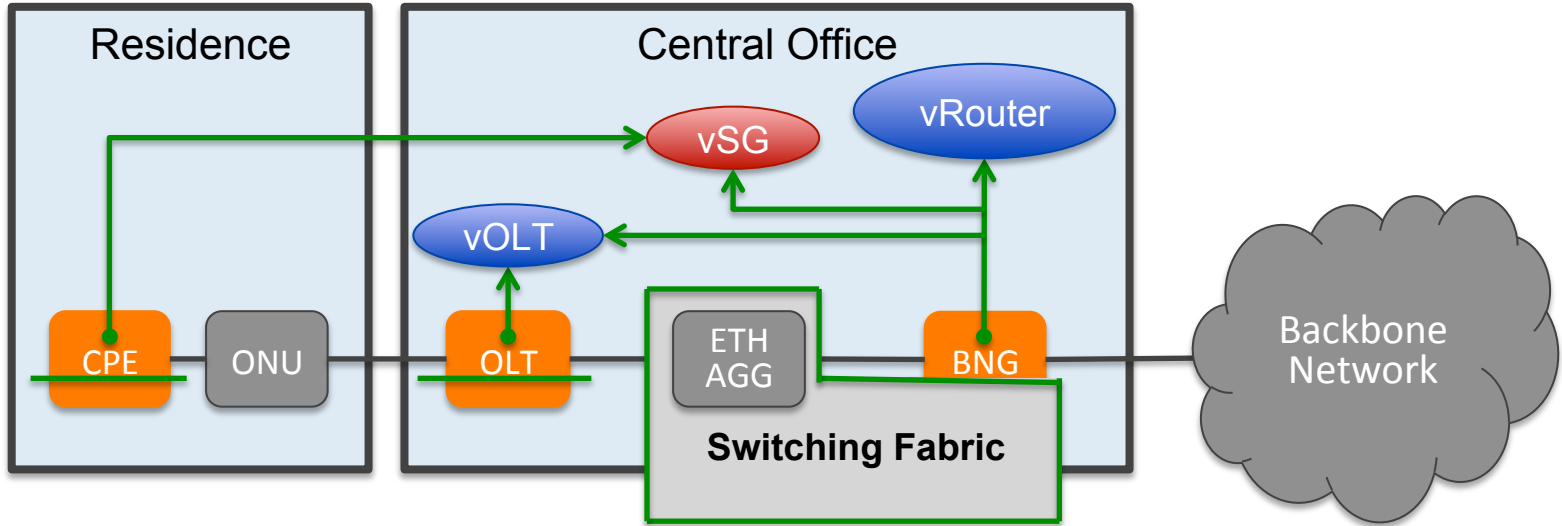## (and how it fits together)

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Open Networking Lab

CORD
Central Office Re-architected as a Datacenter

Disaggregation

CPE – Customer Premises Equipment
OLT – Optical Line Termination
BNG – Broadband Network Gateway

# Access hardware - CPE

- Simple commodity NetGear device
  - Flashed with OpenWrt
  - Runs OVS as dataplane switch
  - OpenFlow capable
  - Runs 802.1X authentication
- Several design options available here
  - OpenFlow enabled?
  - Run a DHCP server?
  - Should make use of IPv6?

Access hardware – AT&T GPON OLT

- One rack unit GPON OLT MAC
  - 48 PON ports (arranged as 12 OLT chips)
  - 6x40Gbps Ethernet ports
  - Arranged as three primary and three secondary
- NetConf to configure power settings, fan speed, etc.
- OpenFlow Controllable
  - via external OF agent
- External software bootstraps firmware
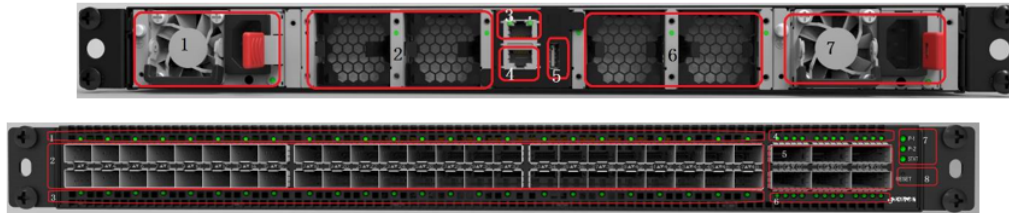
Software – Microsemi vOLT

- Runs as an external entity
  - Either in a VM or container
- Exposes an OpenFlow interface north
- Manages OLT via an L2 protocol
  - Contains OMCI messages to provision ONTs
- Ability to punt IGMP and 802.1X packets to controller

ONOS
Open Network Operating System

PMC vOLT

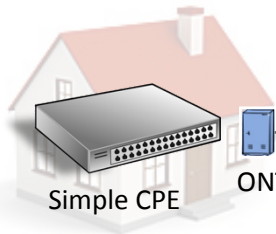L2/OMCI
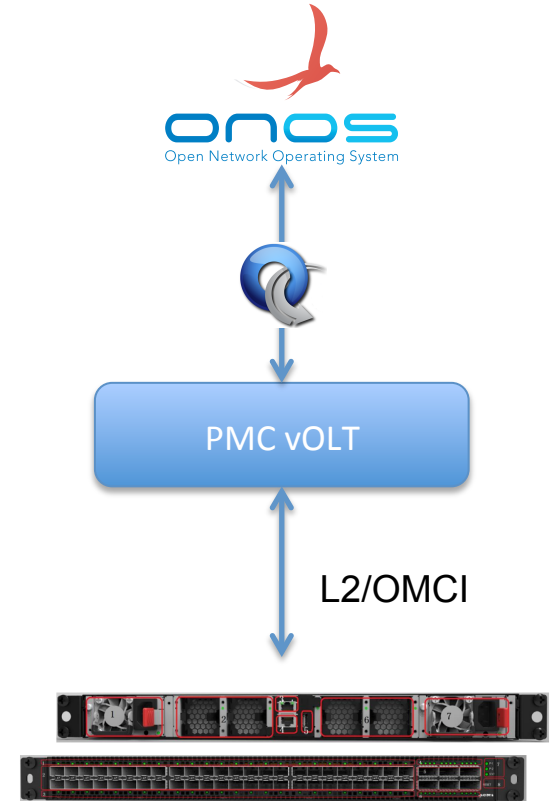
CORD – Software Stack

- XOS orchestrates both ONOS and Openstack/Docker
- Openstack is used to spawn VMs while docker provides containers
- ONOS (via neutron) creates virtual networks and connects them together to achieve service composition
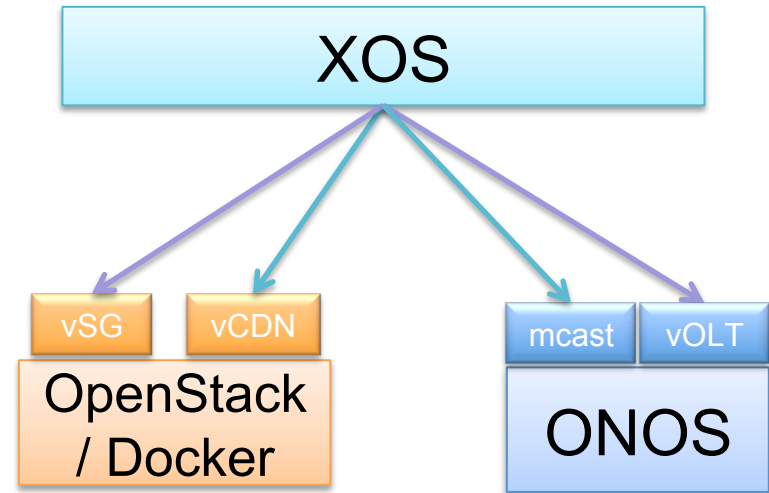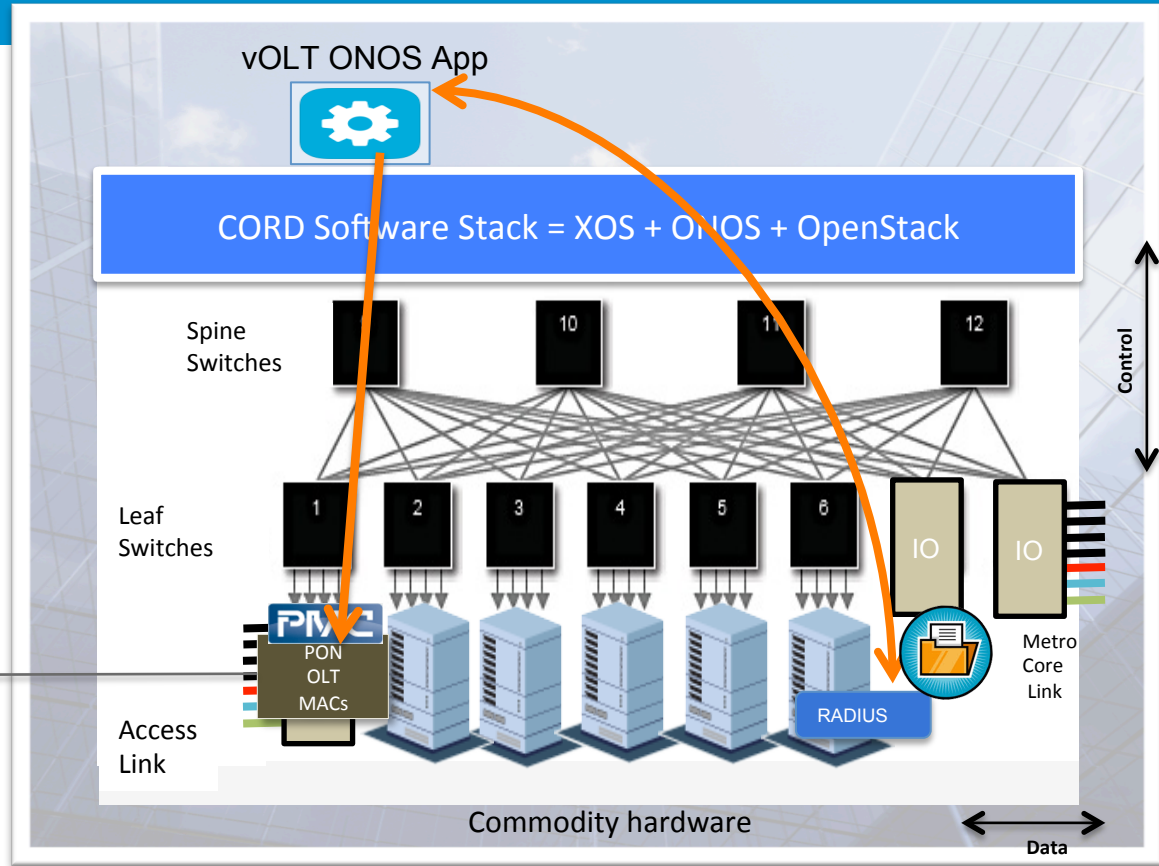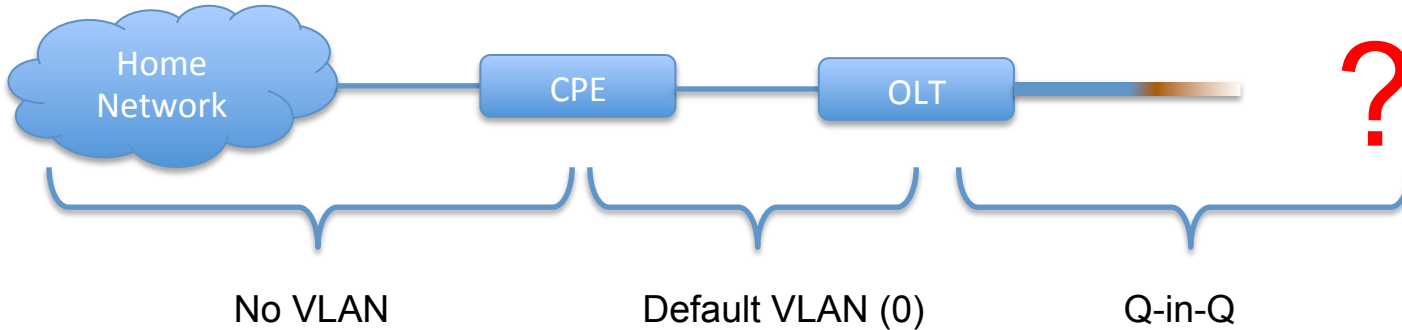
CPE boot and Authentication

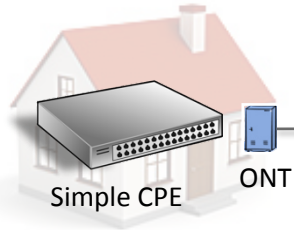# Dataplane Configuration

- OLT double tags packets from customer
  - C-tag identifies the customer
  - S-tag identifies the OLT the customer is connect to
- OLT also meters customer connections
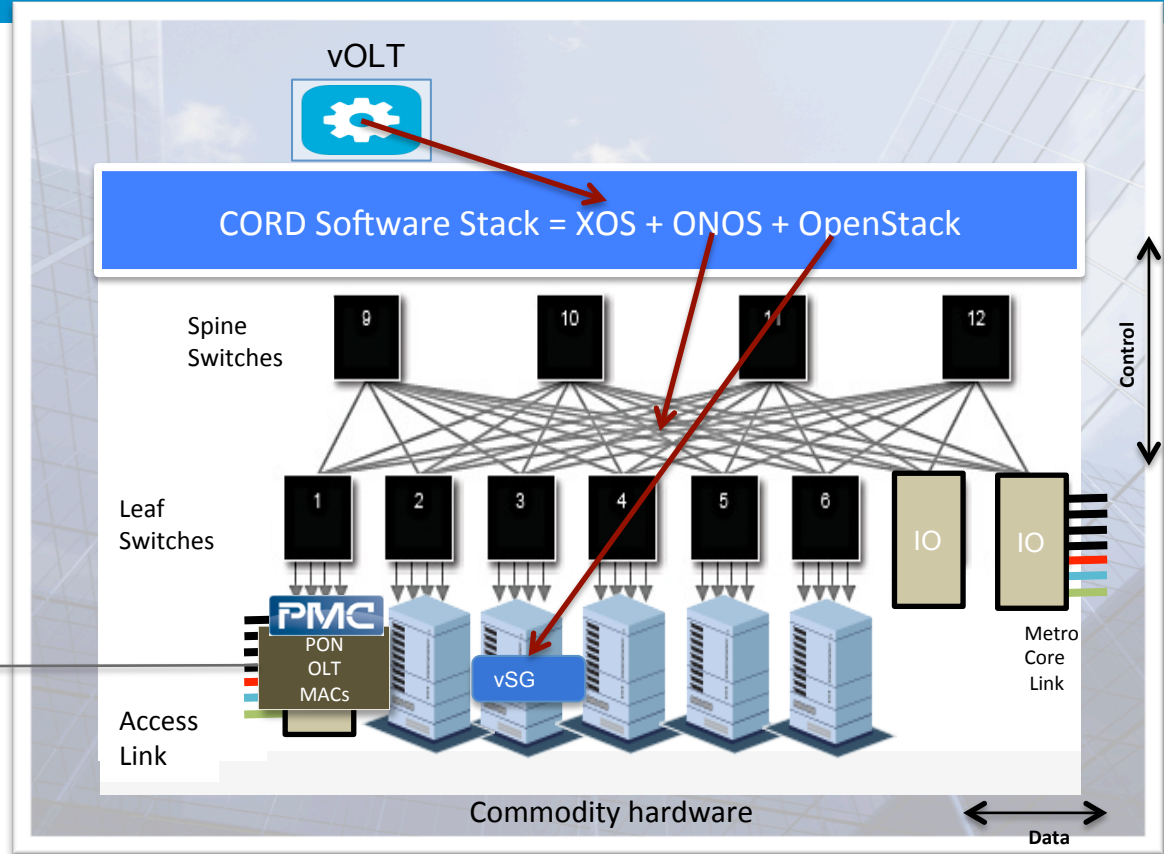- OLT maintains group information to handle multicast traffic
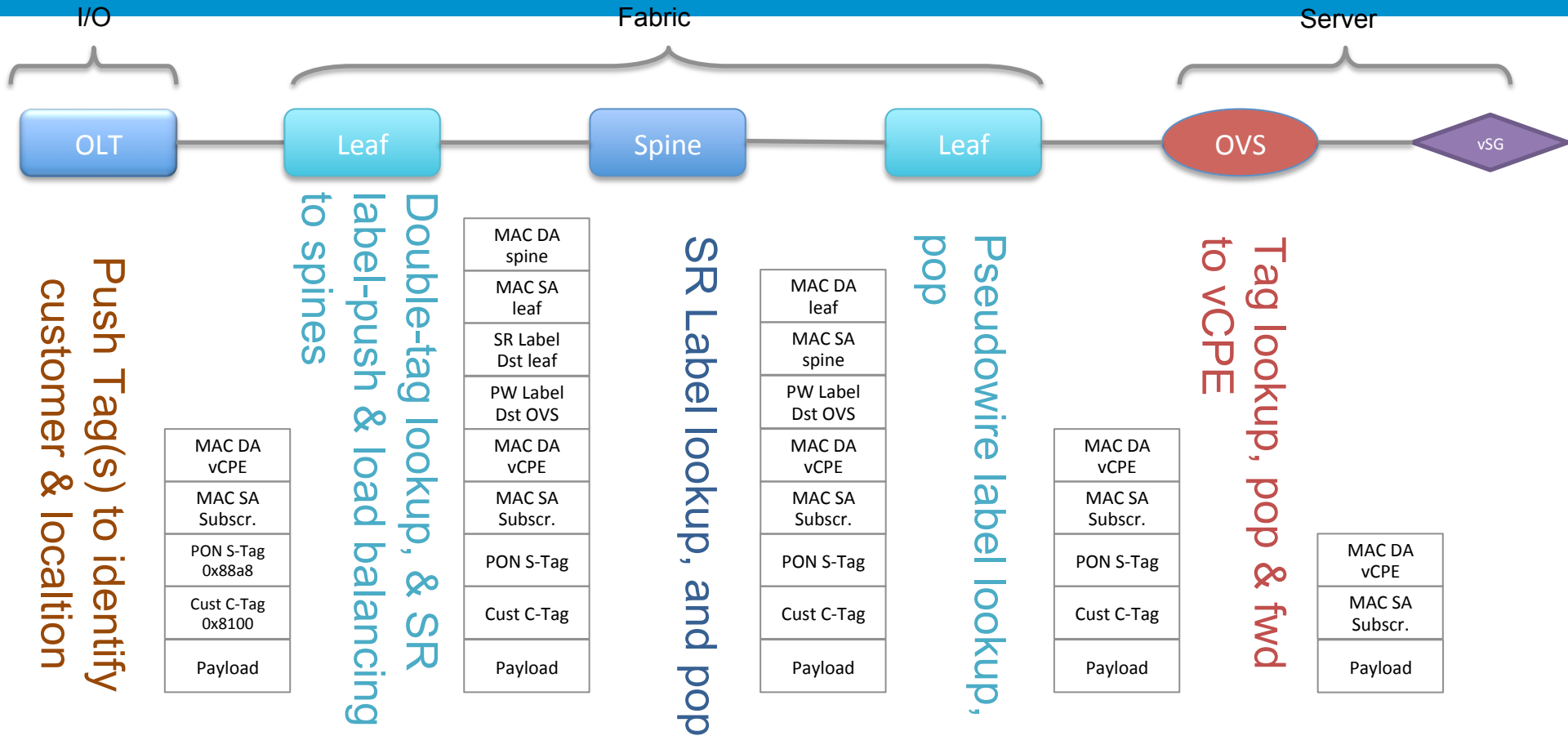
Spinning Up a vSG

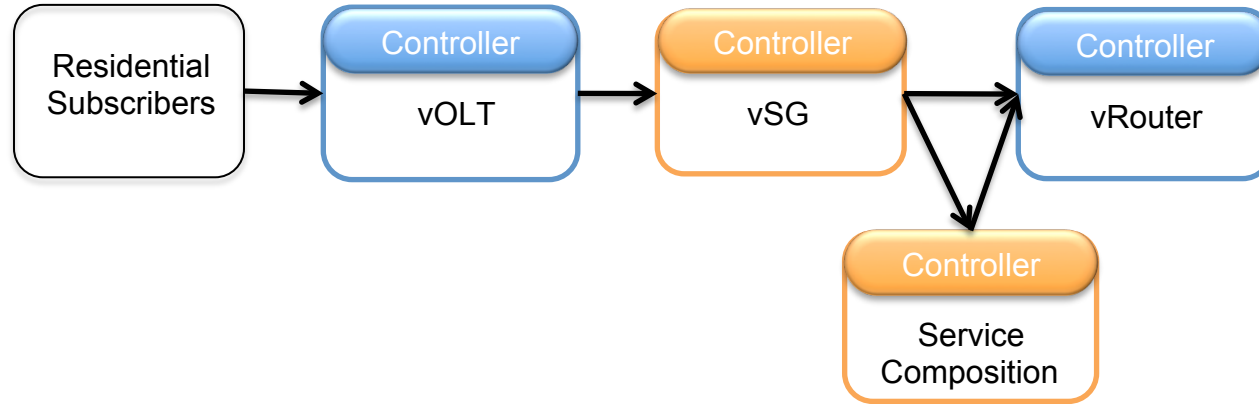Authentication has been successful. A vSG is now needed.

Putting it all together

I/O   Fabric   Server

OLT — **Leaf** — **Spine** — **Leaf** — **OVS** — vSG

Push Tag(s) to identify customer & location

MAC DA vCPE
MAC SA Subscr.
PON S-Tag 0x88a8
Cust C-Tag 0x8100
Payload

Double-tag lookup, & SR label-push & load balancing to spines

MAC DA spine
MAC SA leaf
SR Label Dst leaf
PW Label Dst OVS
MAC DA vCPE
MAC SA Subscr.
PON S-Tag
Cust C-Tag
Payload

SR Label lookup, and pop

Pseudowire label lookup, pop

MAC DA leaf
MAC SA spine
PW Label Dst OVS
MAC DA vCPE
MAC SA Subscr.
PON S-Tag
Cust C-Tag
Payload

Tag lookup, pop & fwd to vCPE

MAC DA vCPE
MAC SA Subscr.
PON S-Tag
Cust C-Tag
Payload

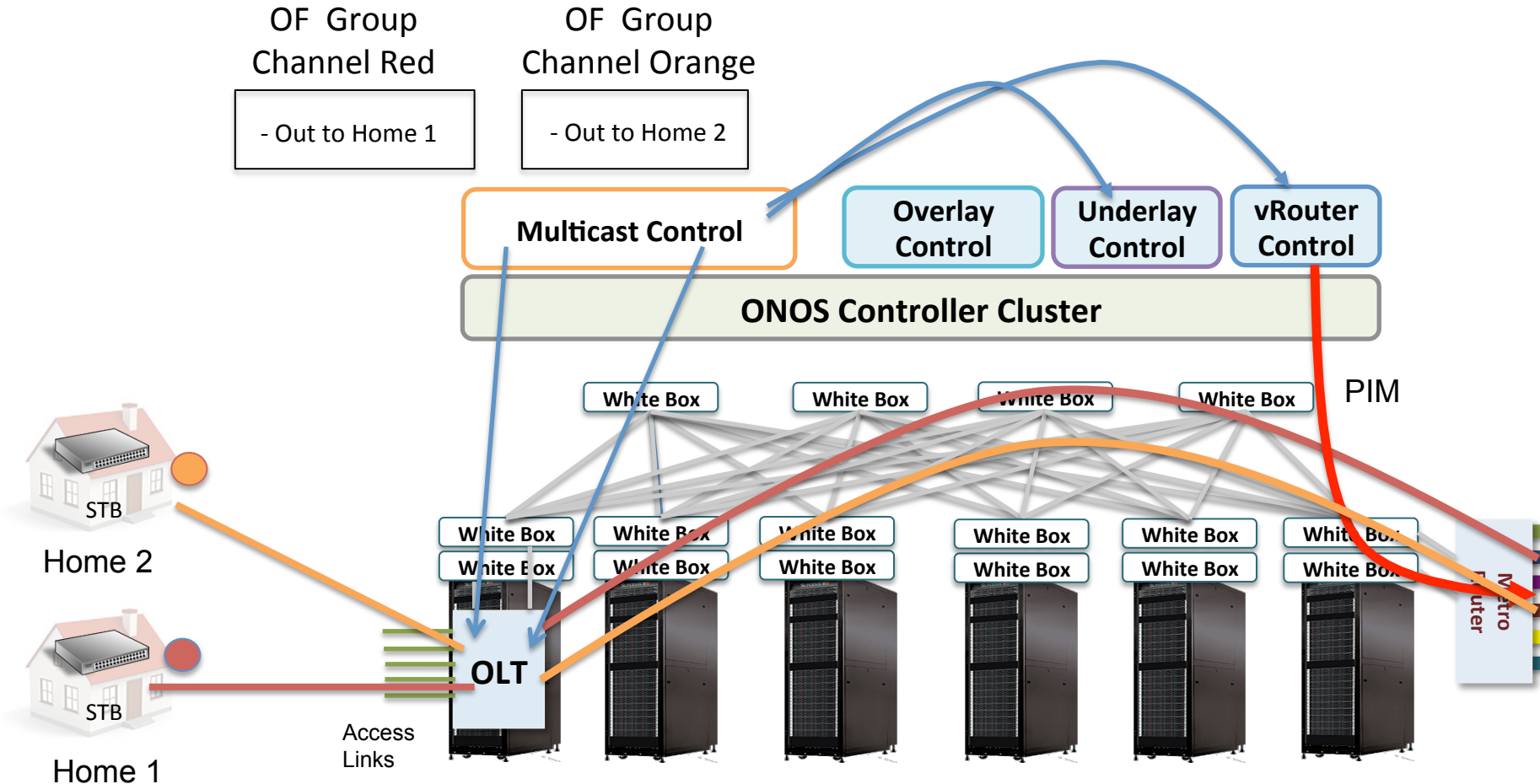| MAC DA vCPE |
| --- |
| MAC SA Subscr. |
| Payload |

Beyond the vSG

- Traffic delivered to the vSG is NAT'ed
- It can then either go straight to the vRouter; or
- It can be passed through a service chain and then to the vRouter

What about multicast traffic?

Conclusion

- Understanding of the hardware components

- Understanding of the end to end traffic flow

- Disaggregation is about breaking large systems into scalable micro services

Thank you!

Questions?