Evolution of Broadband Access Network - Software-Defined Access (SD-Access): CORD, SDN/NFV and VOLTHA

1. Legacy PON OLT/Access

- Driving forces of change:
  - OLT Control Plane
  - Attachment, Authentication & 802.1X VLAN establish and manage
  - IGPMP snooping/DAM
  - OMC

- Proprietary OMS
  - OLT proprietary

- Proprietary Control/mgt
- OLT S/W
- OLT Chassis

2. OLT Disaggregation/Virtualization (CORD)

- Beginning of change: move from vendor-fed model
  - vOLT app
  - vOLT AAA(802.1x), DHCP, IGMP
  - RG authentication, VLAN, IGMP allocation, DHCP

- Openflow Agent
  - Network agent
  - ToR switch

- Proprietary OLT

3. Multi - OLT vendor Environment

- Too Many OLT vendors
  - vOLT, AAA(802.1x), DHCP, IGMP
  - RG authentication, VLAN, IGMP allocation, DHCP

- VRM: vOLT app

4. OLT Virtualization/Disaggregation + VOLTHA

- Evolve into the future
  - VOLTHA: AT&T → ONF

- VOLTHA 1.3: 2018.03 (Open OMCI)
  - VOLTHA 1.0: 2017.09 (NGS-PON)

- VOLTHA allows the SDN Controller to recognize
  - The box below as an Ethernet switch

- VOLTHA Northbound

- VOLTHA Southbound
  - Edges: OLT, ONU
    - OLT: ONU
    - ONU: OLT

5. OLT PON Stick + WB Switch

- Zaram OLT PON Stick + Whitebox Switch
  - Zaram OLT PON Stick consists of PON MAC and optical transceiver
  - The embedded CPU is located on the MAC chip, and the management frame such as OMC is processed in-band (communication with vOLT). VOLTHA.
  - Expansion in PON port units as the number of subscribers increases.
  - It is possible to use Ethernet switch without using PON-specific H/W and use standard Ethernet switch (SDN WB switch, Ethernet switch, router)
  - Flexible, per-port utilization: Upgrade per-port
  - Whitebox switches are used in telecom sector / enterprise area and have more demand and more suppliers than communication specialized equipment companies: The price of Ethernet switch (general purpose equipment) is lower than that of OLT blade (PON specialized equipment) = Future guarantee
  - Operators choose a switch in the market that has the capacity and number of ports required
  - Single switch allows PEP Ethernet, GPON, XGS-PON and NG-PON2 for each switch port
  - The operator can upgrade the service only by replacing the OLT PON-Stick (if there is room in the switch capacity)