### Capgemini 🤣 engineering

# NEXT GENERATION VIRTUALIZED NETWORKS

With SDN-Enabled Virtualized Access Solution (SDvAS) for virtual optical line terminals



## The next generation of virtualized networks

It's clear that tomorrow's networks will be completely virtualized, which means today's solutions need to pave the way. Capgemini Engineering offers a portfolio of SDN-enabled virtualized access solutions to help communications service providers (CSPs) navigate the massive software-based shift in the thought process and implementation of broadband access networks.

## Capgemini Engineering approach to SDN enabled, virtualized OLT solutions

Capgemini Engineering is uniquely positioned to enable OEMs and the eco-system partners to address the current shift to SDN enabled, virtualized networks. Capgemini Engineering's SDN-enabled virtualized Access Solution, SDvAS, built upon the trusted Capgemini Engineering Intelligent Switch Solution (ISS), provides a portfolio of software frameworks optimized for the software defined enterprise access and broadband access.

Capgemini Engineering SDvAS Virtual OLT solution provides a VOLTHA based Virtual OLT control plane that works with white box physical OLT systems. Along with support for the SEBA and Cloud CO models of SDN controller based vOLT control plane, Capgemini Engineering Virtual OLT control plane also enables additional deployment models for the Virtual OLT control plane as a VNF on a compute node, as well as within the Physical OLT (P-OLT), providing an "in-box" model like traditional OLT systems.

### SDvAS Virtual OLT Specifications:

- Supports white box OLT platforms
- Supports disaggregated architecture with "in-box" and "out-of-box" OLT models
  - ONF SEBA & BBF cloud CO models
- Abstraction layer
  - ONF VOLTHA based
  - Optimized for In-box models
- Capgemini Engineering's ISS-Based Virtual OLT control
  - Proven switching / routing / MPLS control plane with PON and subscriber management
  - Support for BBF Cloud CO NETCONF / YANG models
  - Supplemented by Capgemini Engineering's BNG/ Virtual BNG solutions
- Support for XGS-PON, GPON
- Multiple deployment options
  - Virtual OLT as SDN app
    - Virtual OLT as Compute VNF
    - Local "virtual" OLT running inside an OLT system
- Flexible licensing models

VOLTHA, the Virtual OLT hardware abstraction component, supports the ONF CORD objective of multi-vendor, multidomain, any broadband access-as-a-service. Using the ONF VOLTHA framework enables Capgemini Engineering Virtual OLT to support any White box OLT system that supports VOLTHA. Capgemini Engineering SDvAS Virtual OLT offers a hardware optimized model for VOLTHA to realize the "in-box" OLT deployments.

### The SDvAS Virtual OLT control plane provides the

- Subscriber Management
  - Authenticate the subscriber device & confiure the flows
  - Manage end-to-end services context for the subscribers
  - Enable/Disable, remove and reinitialize subscribers

- Service Management
  - Download the service profile (Triple Play or any value-added service) for the subscriber
  - Activation/De-activation of the service profile
  - Maintain the service profile mapping to subscriber
  - ONU software download and configuration management
- FCAPS
  - Logging/Alarm Reporting
  - Fault Management & Reporting
  - Performance Management
- Multicast CAC
  - Connection Admission control on a per multicast VLAN/per subscriber basis
- Custom Service Framework
  - Ability to manipulate subscriber flows to add in value added services on top of the existing services



Figure 1: Capgemini Engineering SDvAS Virtual OLT on Edgecore Networks White box OLT Platform Source: Capgemini Engineering

### Capgemini Engineering SDVAS Virtual OLT on Edgecore Networks white box OLT platform

Partnering with Edgecore Networks, Capgemini Engineering's SDvAS vOLT on the Edgecore OCP-AcceptedTM ASXvOLT16 Open OLT platform enables rapid realization of disaggregated, SDN-enabled XGS-PON OLT deployments. Capgemini Engineering SDvAS has a roadmap support for the Edgecore GPON OLT platforms, the ASGvOLT32 and ASGvOLT64.



Figure 2: Capgemini Engineering SDvAS – Virtual OLT solution Source: Capgemini Engineering



### SDvAS Virtual OLT enables flexibility of deployment

Deployment requirements for the OLTs vary greatly based on the geographies, and the service uptake. A lower subscriber density, or a lower rate of service adoption needs a model that is cost competitive on a per-port, per-subscriber basis. At the same time, operators would like to see a growth path leading from moderate densities to increasingly higher densities. Instead of having to swap out a newer solution, it is preferable if the same solution can be refit for the changed requirements. Capgemini Engineering SDvAS enables such incremental deployments with support for multiple models

- 1. As a Virtual OLT application on SDN controller (ONOS)
- 2. As a Virtual OLT VNF running on an independent compute node
- 3. In-Box solution On the Physical OLT platform

#### Option#1: vOLT as app on SDN controller

In this deployment model based ONF SEBA or the BBF CloudCO, vOLT Control Plane is realized as an 'App' running on ONOS. The vOLT App implements the control plane functionality of the traditional OLT using the application and services offered by ONOS. In this deployment architecture, the protocol functionalities provided by the ONOS core layer is used for realizing the vOLT control plane portion. The vOLT Control Plane App on top of ONOS stitches different ONOS functionalities and services.

### Option#2: vOLT as a VNF on a compute node

As a Control plane VNF on compute node, the Capgemini Engineering SDvAS-vOLT offers a comprehensive protocol stack with the following functionality:

- L2
- Static / Dynamic L3 routing
- MPLS
- Ring Protection
- Multicast Support
- Timing support

- DHCP Relay Agent, PPPoE IA
- QoS, OAM
- Security ACLs/DOS Protection
- Authentication
- PON Management
- OMCI Support

The control plane VNF interacts with vOLTHA locally on the same Compute node and manages the remote Physical OLT platform.

Both these options enable one instance of the Control plane (App or VNF) to manage multiple physical OLT platforms, leading to a simplicity of software management, device maintenance and new service introduction.

#### Option #3: in-box solution

In this deployment model, the vOLT VNFs runs inside the pOLT Box and using the VOLTHA optimized for "in-box" usage. This model enables deployments which may not plan to start with separate Compute nodes for VNF or an SDN controller applications, while providing a migration path for Compute node or SDN controller based deployments.

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### About Capgemini Engineering

Capgemini Engineering combines, under one brand, a unique set of strengths from across the Capgemini Group: the world leading engineering and R&D services of Altran – acquired by Capgemini in 2020 – and Capgemini's digital manufacturing expertise. With broad industry knowledge and cutting-edge technologies in digital and software, Capgemini Engineering supports the convergence of the physical and digital worlds. Combined with the capabilities of the rest of the Group, it helps clients to accelerate their journey towards Intelligent Industry. Capgemini Engineering has more than 52,000 engineer and scientist team members in over 30 countries across sectors including aeronautics, automotive, railways, communications, energy, life sciences, semiconductors, software & internet, space & defence, and consumer products.

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