Building Broadband Networks with Open Source and Open Standards – A Path worth taking

ONF Broadband Community Meeting

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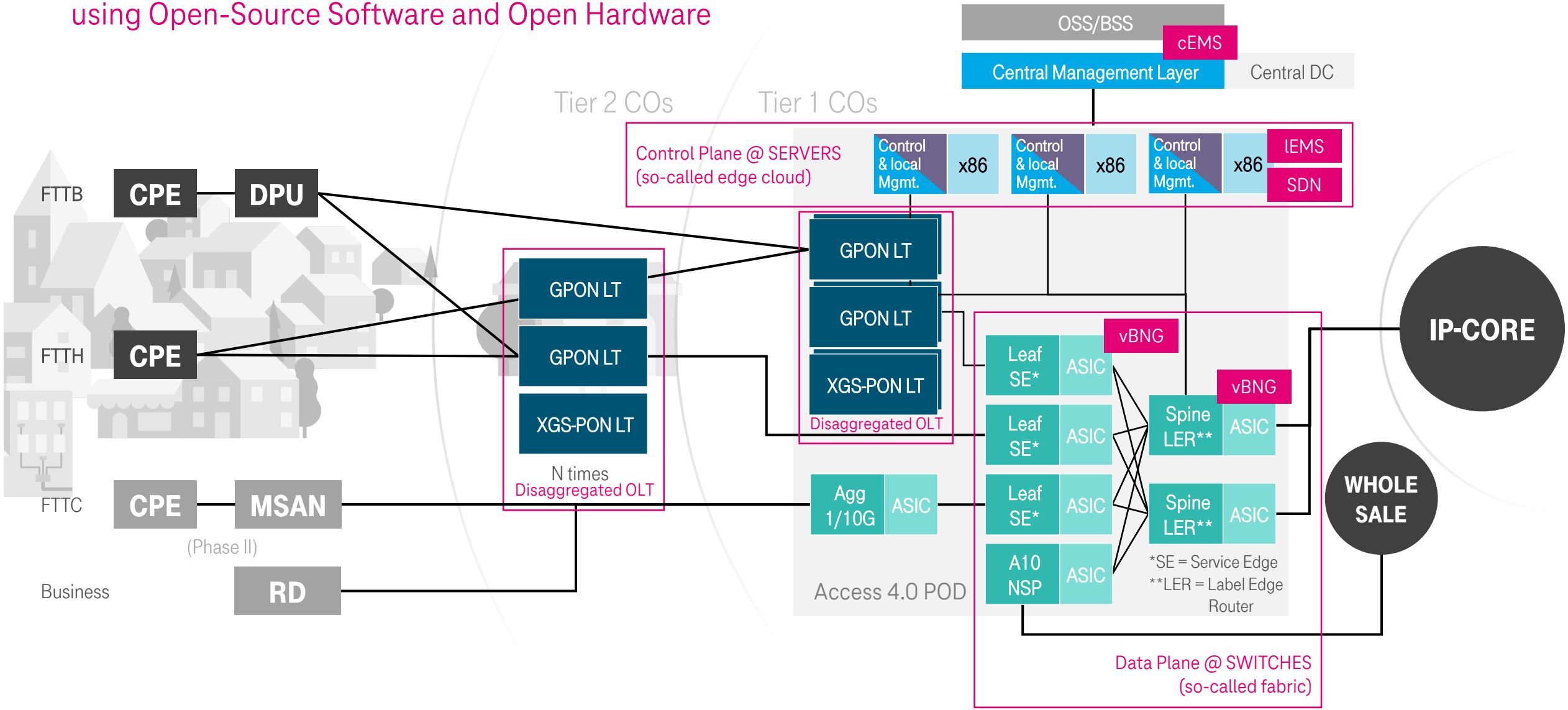
Scope: Highlight value of VOLTHA open-source reference implementation, DT community objectives and contributions

- Achieving disaggregated open access
  - Relevance of open-source and standards for Access 4.0
- Access 4.0 Multivendor PON system evolution
  - OLT and ONT supplier support
  - Smooth migration in a brownfield
- Perspectives and requirements for future VOLTHA releases
  - Efficiency & performance at large scale
- Importance of Open Community Collaboration
  - Hardware reference testbed hosted by DT
  - BBF / standards collaboration

Achieving Disaggregated Open Access

The Solution: Access 4.0 (A4)

Disaggregated Access, Aggregation and Service Edge
using Open-Source Software and Open Hardware

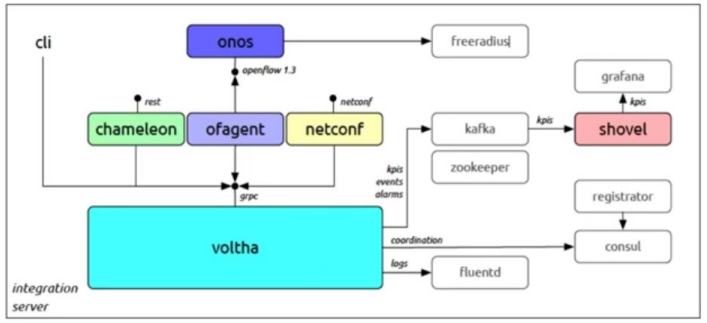


Delivering on the promise of Open, Disaggregated, Cloud-Native Solutions for Operator Networks

Responding to operators‘ need for innovative solutions supporting disaggregation and programmability

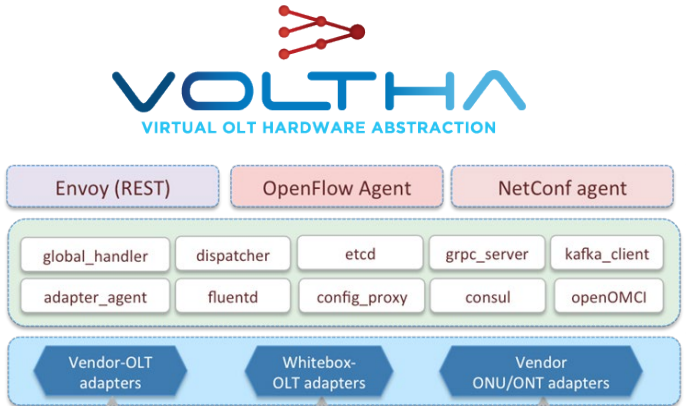
- Modern Micro-Service Architecture and APIs
- SDN Abstraction & Programmability
- Built from state-of-the-art Open Source tools & components
- Scalable
- Extensible

Cloud Software X Telco Functions

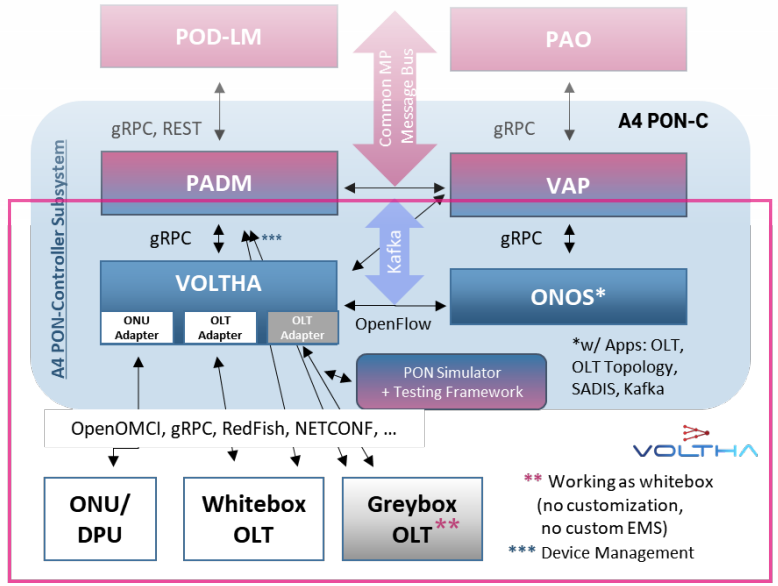


An open, cloud-native disaggregated broadband solution: feature rich, tested, scalable, extensible

- Ready to take, integrate and validate
- Allows to plug-in & run any compliant hardware
- Deployable in Tier-1 networks



✓ **VOLTHA is perfect fit for DT’s Access 4.0 PON-Controller**

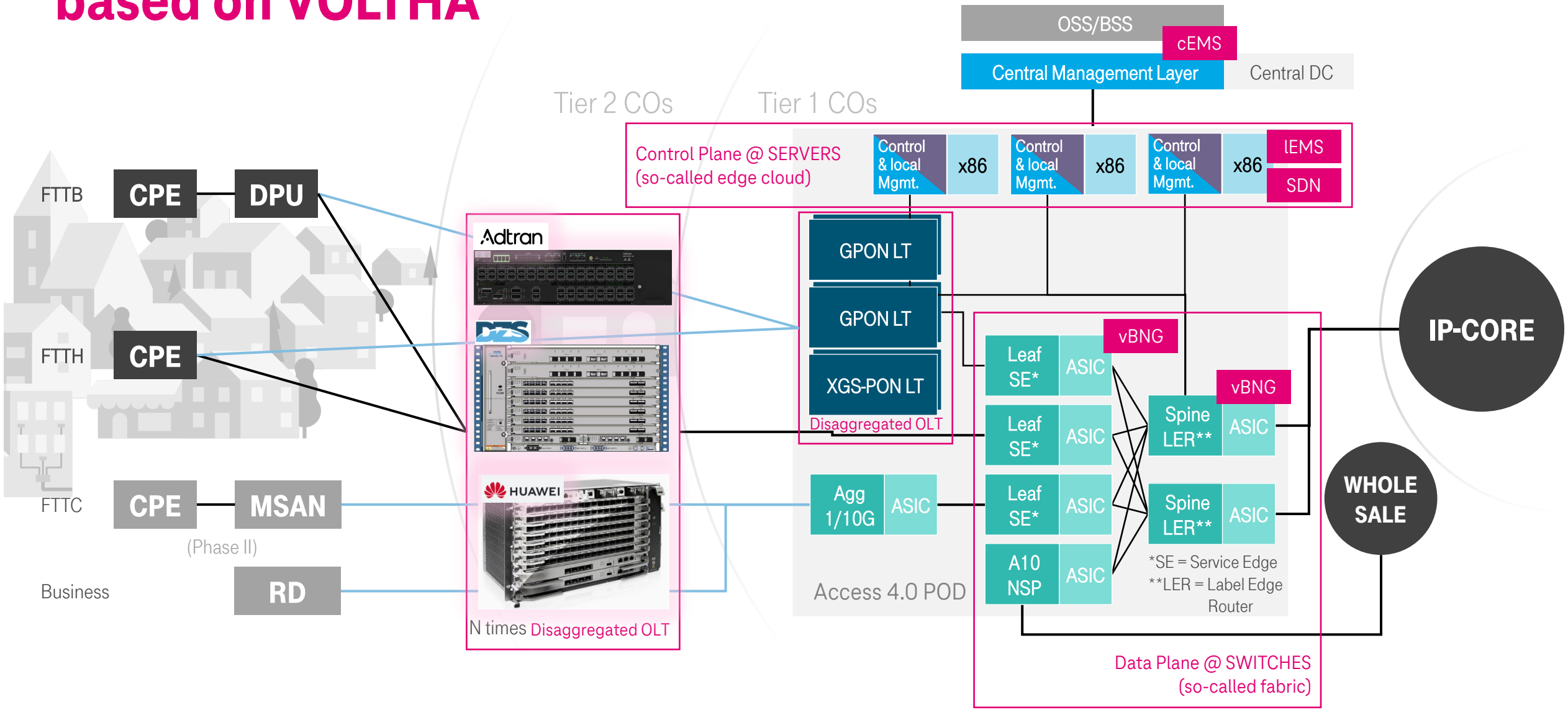


Success Factor: an Operator-driven Open-Source Platform

Note: DT‘s Acess 4.0 POD Architecture comprises more components (e.g. BNG) – this slide scopes on PON system components

Multi-Vendor PON Support & System Evolution

Access 4.0 features an evolved Multi-Vendor PON System based on VOLTHA



Major OLT and ONU suppliers support VOLTHA

VOLTHA supports hardware (OLT and ONU) to run in virtualized and disaggregated Access 4.0 scenario

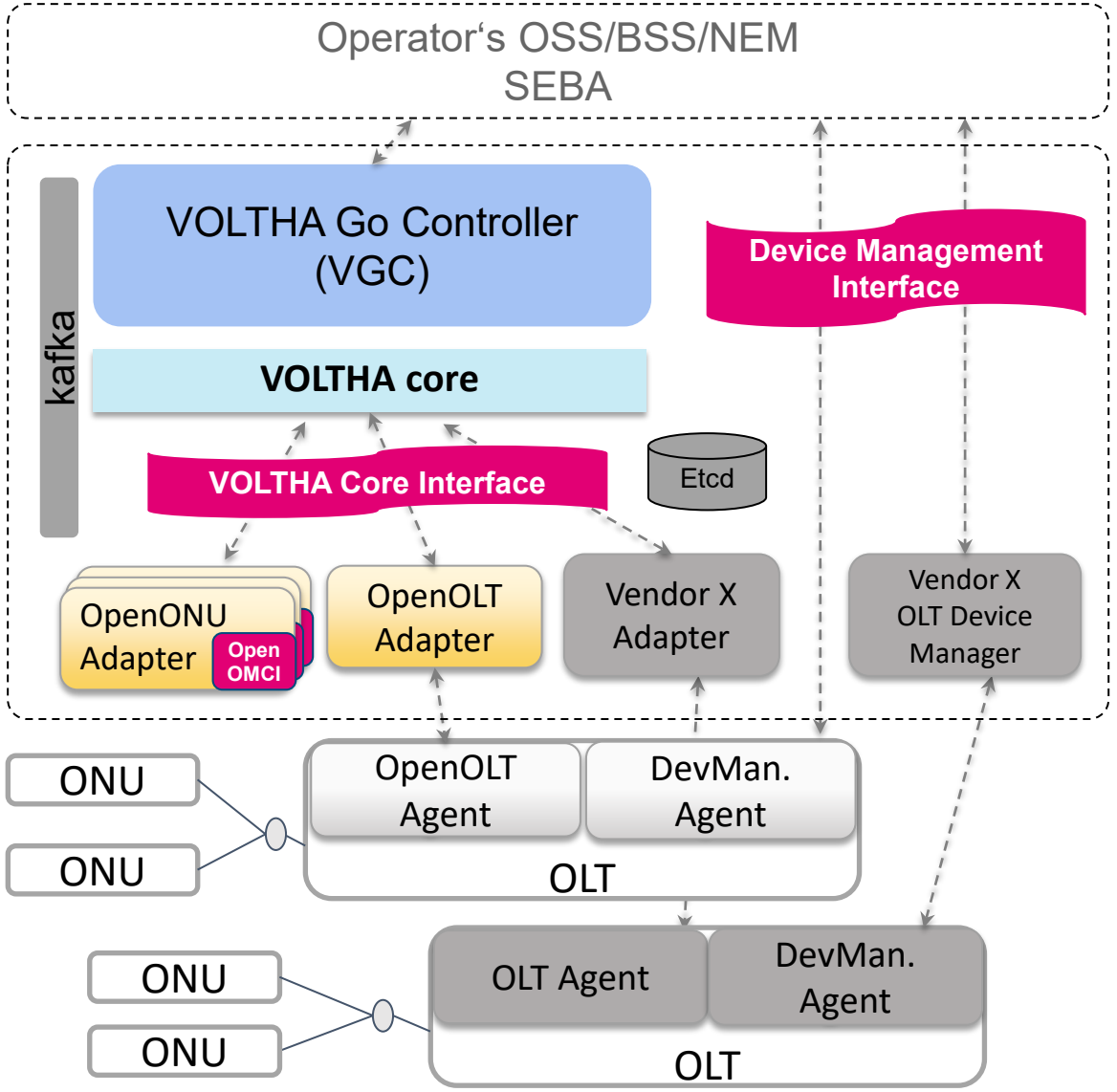
- Adtran OLT in combination with Adtran VOLTHA adapter and Device Manager
- Huawei OLT in combination with Huawei VOLTHA adapter and Device Manager
- Sercomm and further ONT / RGW in combination with OpenONU adapter
- Future: Dasan Zhone Solution OLT in combination with DZS VOLTHA adapter and Device Manager

Supporting VOLTHA has been the pre-condition but other important aspects have been considered as well

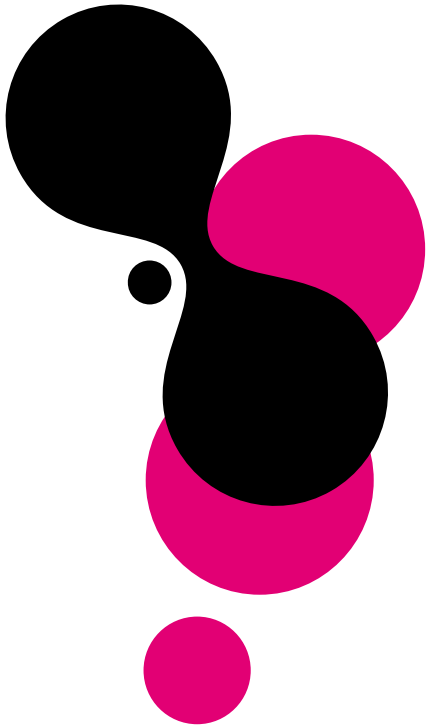
- Must support smooth migration from existing BNG based access platform (brownfield, not greenfield)
  - No forklift/replacement of existing hardware
- Hardware model dimensions must meet Telco requirements
- ONF VOLTHA feature roadmap is reference for integration
- Operational aspects

Reference APIs for Multi-vendor support with VOLTHA

- Multi-Vendor PON support (OLTs and ONUs)
- Protocol to the device can be vendor proprietary
- Common **Open Source APIs** implemented in protobuf: **VOLTHA Core interface** and **Device Management Interface**
  - Adapter-Core Interface: voltha-protos
  - Device Management Interface: based on IETF RFC-8348 and BBF WT-383
- OpenOMCI stack within OpenONU adapter represents a single open interface to control multiple ONUs based on the ITU standard



Source: ONF / VOLTHA Project, augmented.



Requirements and Perspectives for future VOLTHA Releases

VOLTHA is mature!

But there is always something to improve

For production deployments Performance at large scale comes into focus

Functionally, VOLTHA has pretty much all we (DT) need in production

Enhancements in scope for upcoming VOLTHA releases

- Improvements for operations (e.g., PON distance measurement)
- OLT dual-homing support

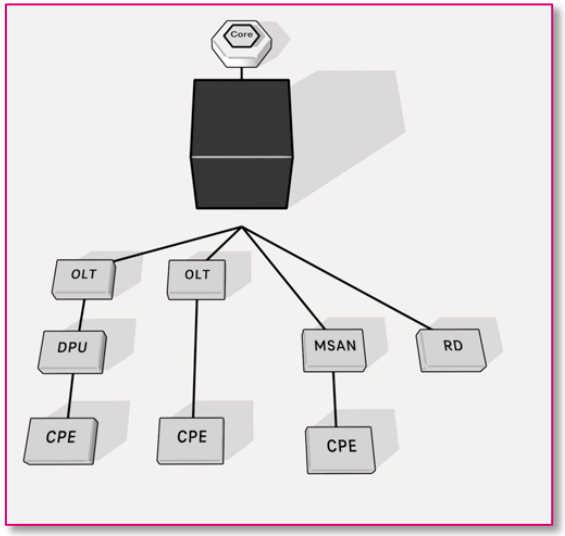
Immersion into standards/interfaces/data models →In progress with BBF

And what about scale? → We (the ONF community) have already achieved a lot!

- VOLTHA has been designed for scale, continuously improved during implementation, and verified by testing
- The new Voltha-Go-Controller (VGC) gives VOLTHA another leap forward

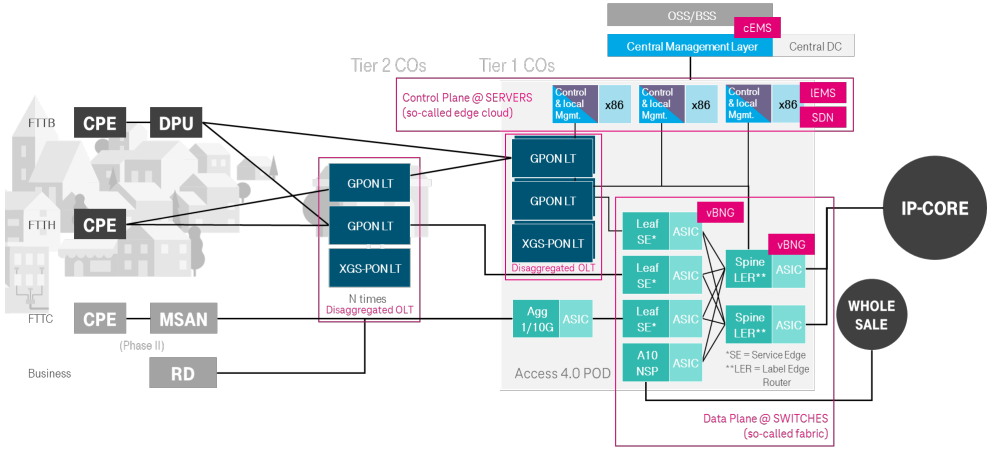
What is „Scale“?

Need a systemic, multi-layered view*



Scale is dependent on the deployment (Architecture, Topology,..)

A4 scales with multiple PODs, supervised by a centralized Management Plane



Major requirements to be considered:

- Service types & SLAs to be supported
- Restoration times
- Disaster Recovery time (one CO)

Management Plane scale

- defined by sum of logical resources of All PODs

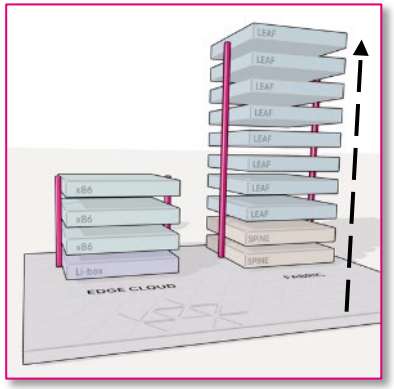
- Control Plane scale
  - defined by logical resources to be supported in one A4 POD
    Network Elements, Network Element Ports, Network Element Links, Termination Points, Network Service Profiles

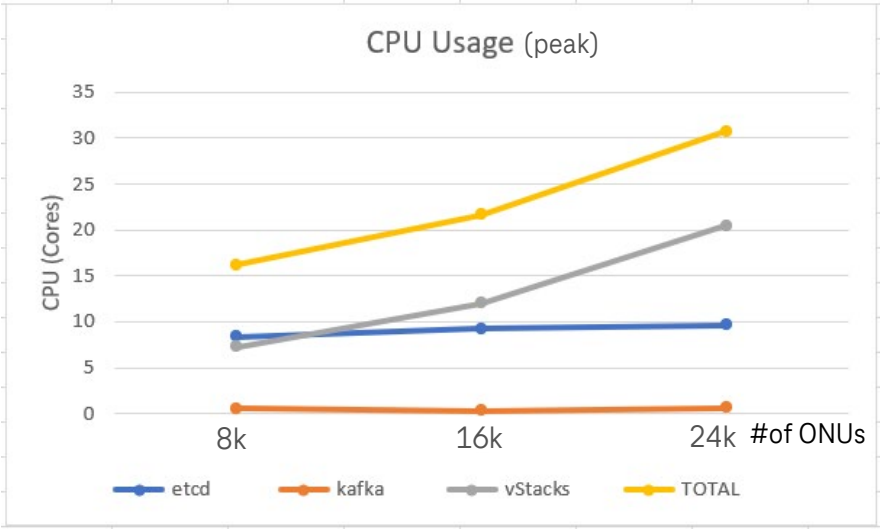
- User Plane scale
  - defined by number of sessions X capacity of each

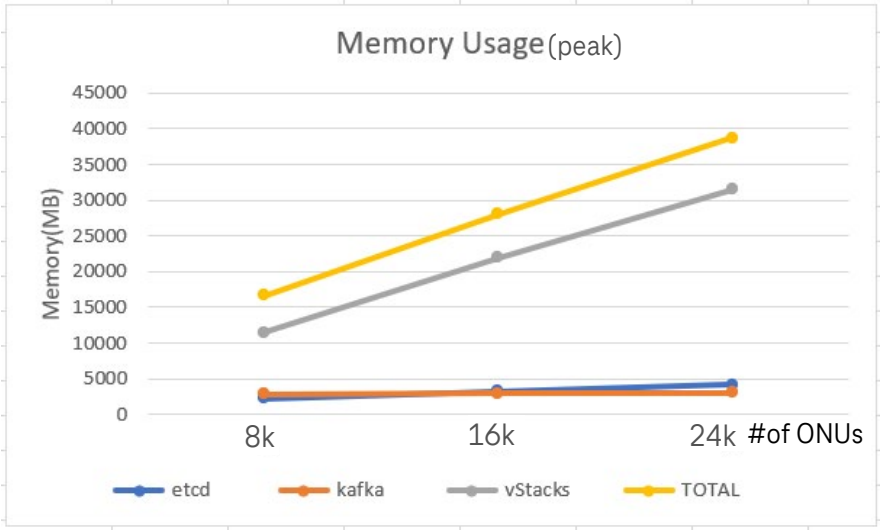
➢ **VOLTHA is part of the control plane → scales per POD**

Heads up: For DT‘s Access 4.0, the scope is broader >disaggregated PON and includes the OpenBNG

Increase VOLTHA‘s Efficiency for Performance at large Scale







✓ **VOLTHA is Scalable!**

- It was designed to be scalable: micro-service architecture & modularity
- The new VOLTHA-Go-Controller (VGC) has removed bottlenecks
- Design goals have been proven in testing: with simulators & hardware

But: (Virtual) Infrastructure has limits and we need to minimize the TCO

- VOLTHA shares ressources with other services/software componts in the POD → the footprint of each component should be rationalized
- Extrapolation of current measurements (~25k ONT per POD) to target scale (100k ONT per POD) identifies: memory footprint is to be optimized

➢ **Next Step: Increase VOLTHA‘s efficiency at Large Scale**

Preserving and Growing the Open Community in an era of production deployments

Reference Implementation in Production

Support, maintenance, evolution of open-source reference over the whole lifecycle, building on a skilled community

- KPI: solidity + scale

Build Reference Implementation

Bring relevant components towards production readiness, with reference designs, and "surge programs"

- KPI: MVP functionality + solidity

Building innovative prototypes

Rapid prototyping in open-source, shared development approach

- KPI: cool stuff

Key Success Factors

Committment and Participation

Collaboration

Focus on implementation

of real-world use cases and deployment priorities

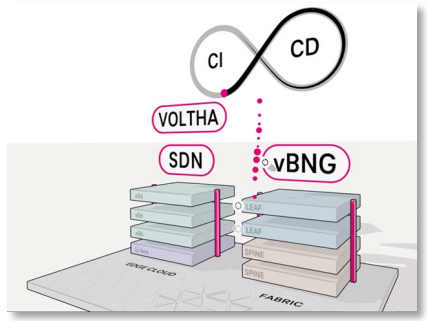
We are committed to the open community

We support the Collaboration with BBF and TIP

DT is proud host of the VOLTHA Community POD
(comprising real hardware, operator workflows, test automation)

Open is the Way to go

Open Software-Defined Broadband Solutions ARE HERE

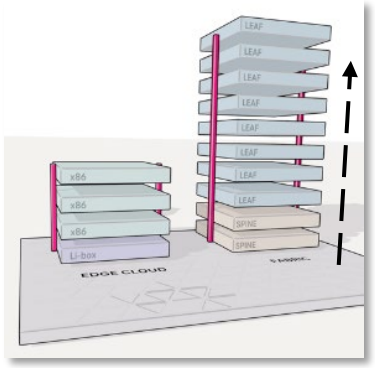


Operator-Driven

Standardized & Implemented in Open Source

Tested & Production-Grade

Modern FTTx platforms facilitate service innovation and convergence



More flexible deployment

Functional and structural network convergence

Collaboration IS KEY

broadband forum

3GPP A GLOBAL INITIATIVE

ONF

TELECOM INFRA PROJECT

THANK YOU