Access 4.0 & VOLTHA

Network leadership by disaggregation - Leveraging Open-Source Software and Hardware Innovations

Fabian Schneider, Manuel Paul et al. | May 2022
Access 4.0 Update

Fabian Schneider,
Head of Access 4.0 Development & Engineering
Why: Key Challenges in Fixed Access

- Monolithic solution with vendor lock
- Feature introduction-time of years
- Fixed cost scale with further rollout
- Intense mega lifecycles
Access 4.0 in a nutshell

~25 mio customers – 900 locations – ~1 billion euros spent in 10 years
“A4 aims to be the next generation of access, aggregation and service edge between customer and core in DT’s fixed network in Germany.”
1. **Separation of Control & User Plane**  
   Management and control plane are separated from the user plane.

2. **Separation of hardware and software**  
   Hardware is separated from the software and even cut in pieces.

3. **Cloud-native microservices**  
   Management and control plane software is microservice-based.

   ![Diagram showing various components and their relationships]

   - any µ-service can access common base services

   *This results into highest transparency and flexibility ...  
   ... as well as allows for agile DevOps.*
A4 || solution components & network topology

disaggregated access, aggregation and service edge

control-plane @ SERVERS
(so-called edge cloud)

data-plane @ SWITCHES
(so-called fabric)
A4 || POD access orchestrator (PAO)
serves as control plane centerpiece which controls all network components

- POD is **self-contained**; all control components physically run on the local PODs
- Technology-knowledge taken out of OSS-IT and "down" to POD → i.e. we pull them in the network domain (=complete OSS-IT/NT process abstraction)
- "Ability to easily change / extend" is a design paradigm; additional components are integrated always with a dedicated POD-local control component

"DESIGNED FOR CHANGE"
Simply add other access technologies like FTTC, WTT... and re-use the new interface to OSS-IT
A4 || virtual POD site visit in Bonn
base configuration in one rack – scaling of access devices results in further racks

“Wirkbetriebsvalidierung” in Bonn
front back

Base Rack

- SIFE 1
- SIFE 2
- BOR 1
- BOR 2
- SERVER 1
- SERVER 2
- SERVER 3
- LI BOX
- SPINE 1
- SPINE 2
- LEAF 1
- LEAF 2
- A10NSP
A4 update || Summary

**TODAY**
2,200 and increasing black boxes at 900 locations

**CONTROL-PLANE**
It comes with a software-defined network running on a local edge cloud with standard x86 hardware.

**USER-PLANE**
The virtual BNG resides on a spine-leaf fabric which is made of white-box switches.

**TOMORROW**
900 PODs at 900 locations (1 each)

A4 has a scalable architecture for both hardware and software and full redundancy on each level.

And even the OLT will be softwarized.

All software is developed in an agile framework under hyper-collaboration with relevant partners.
The A4 VOLTHA PON Controller

Manuel Paul
Access4.0 VOLTHA Team Product Owner
VOLTHA’s Roots: Operators’ Quest for Open, Disaggregated, Cloud-ready Telco Implementations

- Modern Micro-Service Architecture and APIs
- SDN Abstraction & Programmability
- Built leveraging Open Source tools and components
- Scalable
- Extensible

➢ Cloud Software || Telco Functions
**DT Access4.0’s „Access Workflow“ and Requirements**
- Contributed and Openly Implemented

**Goal: An Open Multi-Vendor Access Network**
- OpenOLT - not just some virtualized OLT functions, but a comprehensive common hardware resource abstraction
- OpenONU - true multi-vendor PON system interoperability (including ONUs) via OpenOMCI

✔ Addressed by BBF Specifications and ONF SEBA Reference Design Blueprint
✔ Implemented with VOLTHA in Open Source - continuously extended, improved and tested upstream

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**ONF SEBA Operator Access Workflows:** [https://drive.google.com/drive/folders/1MfxwoDSvAR_rgFHt6n9Sai7luiJPrHxF](https://drive.google.com/drive/folders/1MfxwoDSvAR_rgFHt6n9Sai7luiJPrHxF)
Note: DT's Acess4.0 POD Architecture comprises more components (e.g. ASG/BNG) – this slide scopes on PON system components
A4 PON-C & VOLTHA

VOLTHA resulted from operators‘ need for an open software implementation supporting disaggregation and programmability

Key Success Factor: an Operator-driven Open-Source Framework

- Suppliers can easily and rapidly integrate upstream and validate
- Allows to take, plug-in and run any compliant hardware

This has been perfect fit for DT Access4.0‘s PON-Controller
THANK YOU