IMPLEMENTING A PROGRAMMABLE SERVICE EDGE - UPDATE
ONF CONNECT 2019
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We develop a cost-efficient, lean-to-operate and scalable access platform to deliver gigabit products.
ACCESS4.0 IS A MINI DATA CENTER AT THE NETWORK EDGE  
(AKA DT’S SEBA INCARNATION)

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**Central Management Layer**

- Spine-Switch
- Spine-Switch
- Leaf/ToR Service Edge
  - Control & local Mgmt. x86
  - WDM
  - WDM
  - GPON LT
  - GPON LT
  - GPON LT
  - GPON LT

**IP-CORE**

**WHOLE SALE**

- MERCHANT SILICON BARE METAL
- HW / SW SPLIT (CUPS, …)
- COMMUNITY & OPEN SOURCE
- HORIZONTALLY & VERTICALLY SCALABLE

LIFE IS FOR SHARING.
BNG: SUBSCRIBER-AWARE IP EDGE & A SPLIT PERSONALITY

Access Device → Access Node → Aggregation → BNG → IP Routers

BNG service edge part
- terminates subscribers
  - Tunnel protocols
  - Services

BNG routing part
- Full PE router
  - protocols
  - interfaces
ARCHITECTURE FIRST: WHERE TO PUT THE BNG (=SE+ROUTER)
As always, ça depend...

**External monolith**
SE and router external
- Possible migration scenario
- Lots of things to be implemented twice

**Internal appliance**
SE and Routing can be split
- Hairpin routing
- Part of the SDN fabric and management

**Embedded**
SE and Routing split
- Service Edge (SE) in TOR switch
- Router in fabric
  - Using devices that are anyway in the data path

SDN Control App shall support all three. SEBA does, too. Our target architecture is embedded SE
Basic SE feature set
- Termination of Q-in-Q tagged Ethernet frames (S-VLAN, C-VLAN)
- Termination of PPPoE session (including LCP, IPCP, IPv6CP)
- Authentication, Authorization and Accounting (RADIUS) (control plane only)
- Subscriber IP address management (control plane only)
- Customer specific IP packet filter, for instance anti-spoofing filters
- Hierarchical (aka per subscriber) Quality of Service for various services (e.g. VoIP, IPTV, etc.)
- Multicast Replication
- Termination of L2TP tunnel for wholesale
- Subscriber-aware counting and statistics for both operation as well as billing
- Legal intercept
- Uplink encap/decap to MPLS-based fabric

Our current prototype
- BM switch with Broadcom Qumran, rtbrick control plane, DT PAO controller
- Routing happens in fabric

PPPoE on bare metal switch
THOUGHTS ON CP/UP SPLIT

**CP local per device**
- Swiches run containers, too 😊
- Less delay, less distributed state
- Less synch issues – no additional abstraction like with PFCP
- Local packet handling via host path short cut

**Programmable chipsets**
- Open APIs to allow SW companies provide SE functionality

- **PAO / Radius**
- **Common API**
- **SE control plane**
- **Common API**
- **Open Network Linux**
- **chip / merchant silicon**
- **Device ODM**

Owned by DT
- Open
- closed
LEARNINGS, CHALLENGES, ETC

- CP IS NOT TRIVIAL
- DP IS NOT TRIVIAL
- LEARNING TO PROGRAM CHIPSETS IS PRETTY USEFUL
- MULTIPLE ENFORCEMENT POINTS VS SINGLE ONE
- CARRIER REQUIREMENTS DO NOT MAKE IT EASIER
- DIFFERENT TYPES OF SILICON WORK AND CAN BE USED
- A SWITCH IS NEEDED 😊
- HARD-TO-COPY TECHNOLOGY VS VENDOR LOCK

LIFE IS FOR SHARING.

FPGAs are also interesting devices
ECOSYSTEM VIEW WRT CURRENT PROTOTYPE
APIs decouple proprietary components

Decoupling via APIs
- Common API
- Routing / SE control plane
- Common API
- Open Network Linux
- chip / merchant silicon
- Device ODM

Pioneers
- rtbrick
- BROADCOM

Long term

Ecosystem and "new kids on the block"

Owned by DT
- Open
- closed
Core Technologies in SEBA and Access 4.0

- SDN Control & Apps (incl. DT PAO)
- Open Hardware
- OLT, Switch, DPU, ...
- Automation, CI/CD
- Network Management & IT Abstraction
- “Las Vegas Principle“ at DT
- Service Edge & Router (BNG)
MOVING ON!

OPEN / ACCESSIBLE APIs TOWARDS SILICON ARE IMPORTANT

WE ARE BRINGING OUR EXPERIENCE NOW INTO SEBA

WE ARE GOING INTO PRODUCTION 2020

SEBA SHALL CATER FOR DIFFERENT DEPLOYMENT VARIANTS

AND CREATE APIs

ALWAYS LOOK LEFT AND RIGHT 😊

NEED TO MAKE SURE WE SNYC WITH STANDARDS BODIES
Dr. Hans-Joerg Kolbe, 10:00AM
KEYNOTE: ACCESS NETWORK TRANSFORMATION

Manuel Paul, 4:30PM
COMAC AND OMEC AT DT

Bjoern Nagel, 2:15PM
VOLTHA ROADMAP

Dr. Hans-Joerg Kolbe, 11:00AM
INSIDE VIEW INTO OPERATOR BUSINESS CASES

Dr. Fabian Schneider, 5:30PM
SEBA REALITY CHECK! HOW TO TAKE THE DESIGN TO THE NEXT LEVEL?

Robert Soukup, 4:30PM
ACCESS4.0 PROGRAM UPDATE

Manuel Paul, 11:55AM
PANEL: TECHNICAL LEADERSHIP TEAM (TLT)

Michal Sewera, 5:30PM
OPEN SOURCE EPC

Michal Sewera, 11:45AM
5G AND OPEN SOURCE
ADDITIONAL MATERIAL
TOWARDS A COMMON SUBSCRIBER EDGE

**LOCATION CONSOLIDATION**

Traffic grooming, local coupling
- H-CORD (hybrid)
- Edge Cloud
- Low Latency

**USER PLANES CONSOLIDATION**

Same data path for fixed and mobile user plane (UP)
- Bare Metal-based UP,
- Virtualized CP

**FUNCTIONAL CONVERGENCE**

Control Plane consolidation
- Converged control plane
- Includes slicing
- Following 3GPP+BBF work

Diagram:
- PGW-C
- BNG-C
- Bare Metal
- Control Plane
- Bare Metal
Platform Compatibility Framework with standard set of APIs
- avoids hardware lock-in
- provides compatibility to apps/features through common protocol and data model for forwarding
- provides compatibility of management tools and practices

Anything south of the line to be provided by hardware vendor

Fixed / mobile or converged control applications
(usually on x86)

Platform Compatibility Framework with standard set of APIs
- avoids hardware lock-in
- provides compatibility to apps/features through common protocol and data model for forwarding
- provides compatibility of management tools and practices

Anything south of the line to be provided by hardware vendor

Programmable hardware on bare metal
(Differentiate through performance & exposed feature sets)