IMPLEMENTING A PROGRAMMABLE SERVICE EDGE - UPDATE

ONF CONNECT 2019

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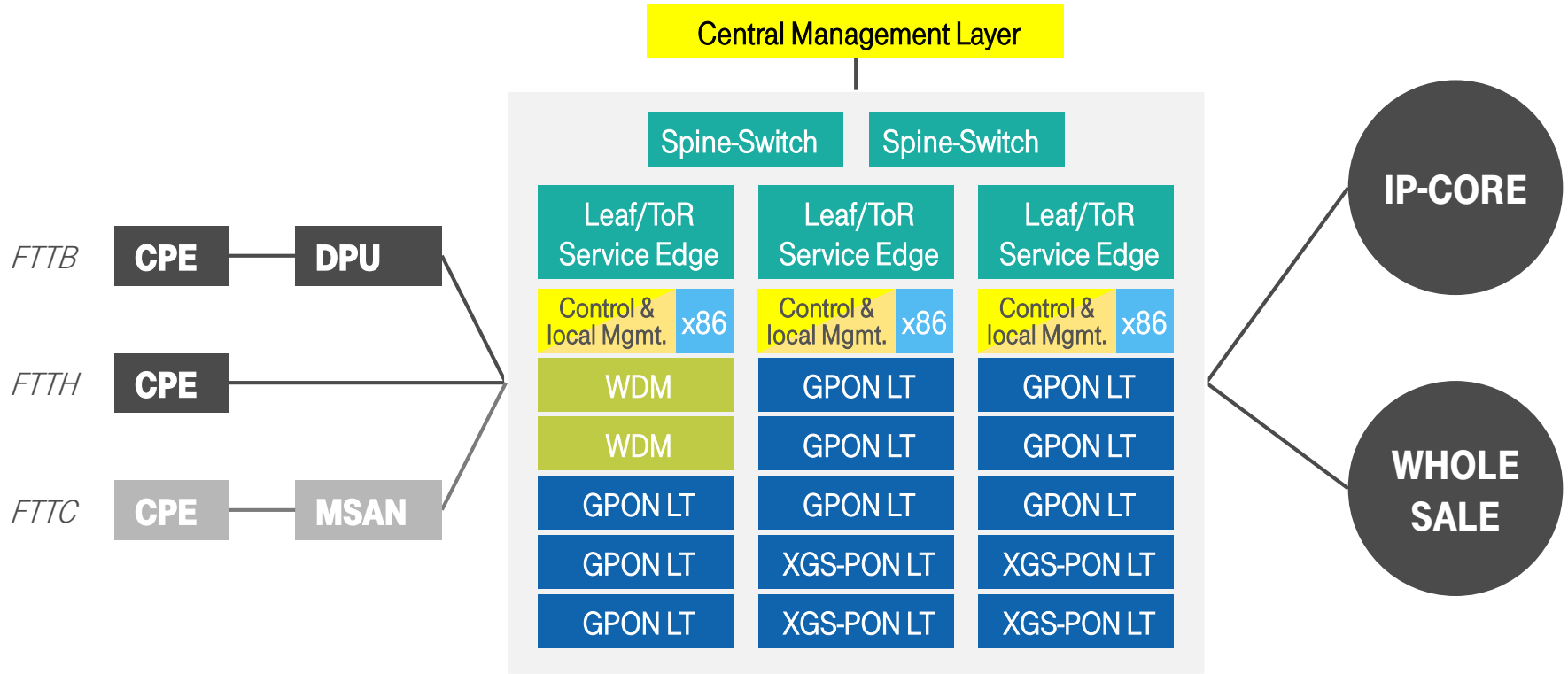
LIFE IS FOR SHARING.

ACCESS 4.0

"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)



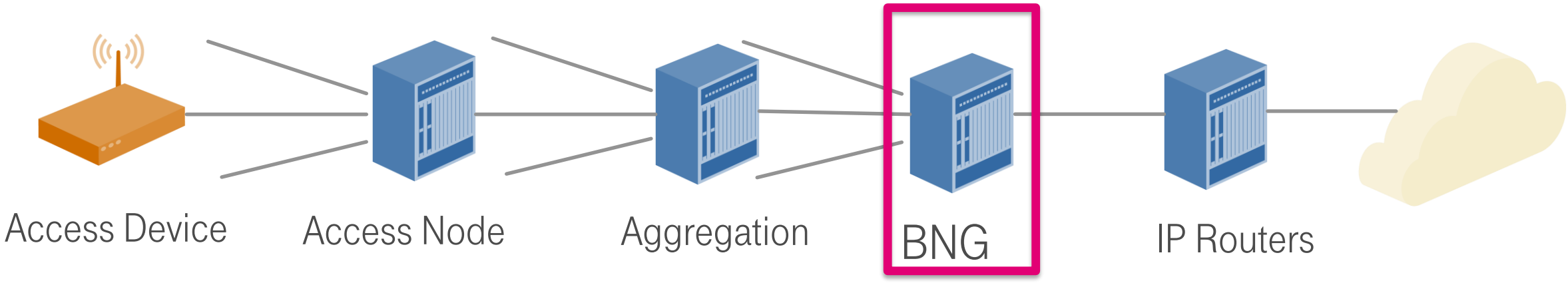
MERCHANT SILICON BARE METAL

HW / SW SPLIT (CUPS, ...)

COMMUNITY & OPEN SOURCE

HORIZONTALLY & VERTICALLY SCALABLE

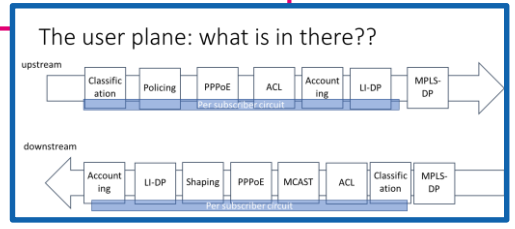
BNG: SUBSCRIBER-AWARE IP EDGE & A SPLIT PERSONALITY



BNG service edge part

terminates subscribers

- Tunnel protocols
- Services



BNG routing part

Full PE router

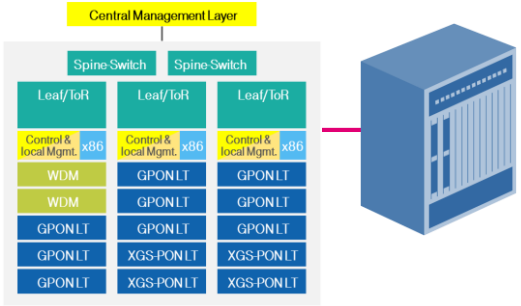
- protocols
- interfaces

ARCHITECTURE FIRST: WHERE TO PUT THE BNG (=SE+ROUTER)

As always, ça depend...

External monolith

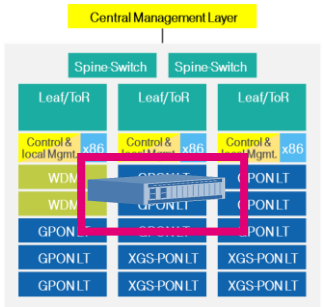
SE and router external



- Possible migration scenario
- Lots of things to be implemented twice

Internal appliance

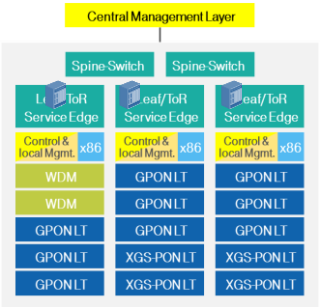
SE and Routing can be split



- 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

A BNG/SE ON BARE METAL SWITCHES

ACCESS 4.0

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

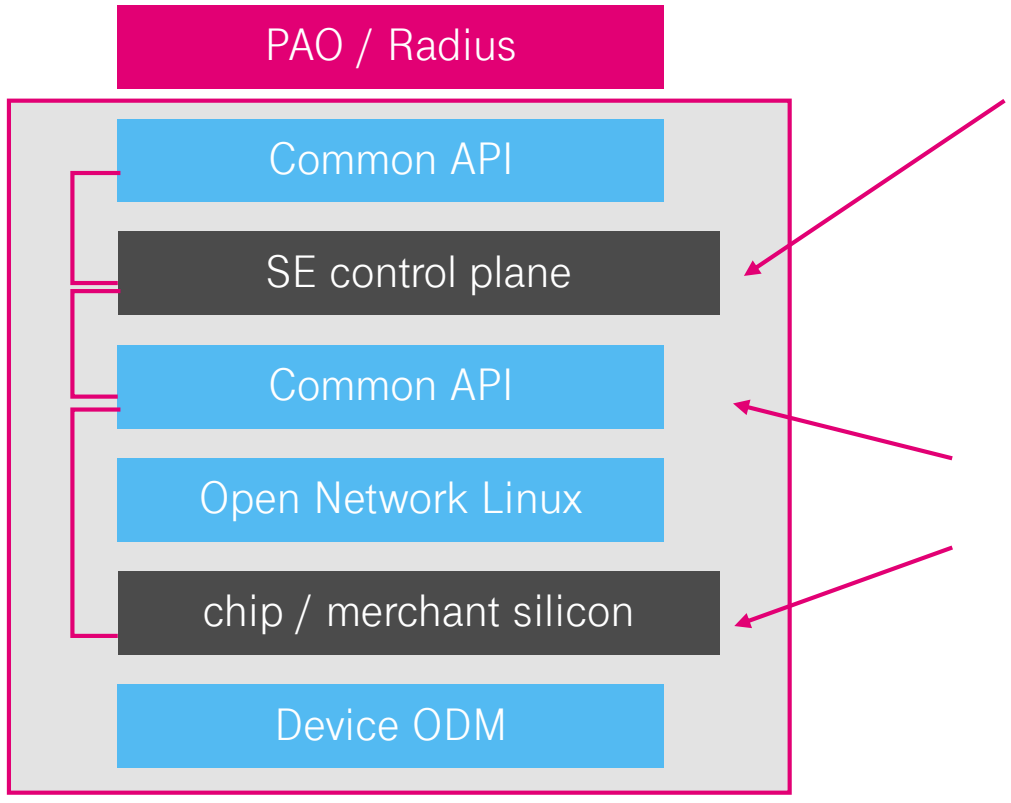
- BM switch with Broadcom Qumran, rtbrick control plane, DT PAO controller
- Routing happens in fabric

```
ubuntu@leaf1:~$ rtb accessd show ppp session detail

User: cpe1@a4.de, Session ID: 1, Client MAC address: 44:4e:6d:20:87:84, State: NETWORK
  Server MAC address: 00:1e:5e:00:00:1c, Service Name: internet, Interface: ifp-0/0/7:0
  Ordinal: 104, Inner VLAN: 7, Outer VLAN: 128
  Last flap reason: PPP_FRESH_BRINGUP
  LCP:
    State: OPENED, Negotiated Protocols: 3, Negotiated Parameters: 42, Terminate Reason: 0
    Negotiated:
      My magic number: 70529702, Peer magic number: 31620830
      My MRU: 1500, Peer MRU: 1492
      My auth protocol: 49187
    Timer Settings:
      Retransmit Interval: 58200, Control Retransmit Interval: 5000, Echo Interval: 60000
    Statistics:
      Retransmit count: 0, Nack sent count: 0, Nack received count: 0
  CHAP:
    Timer Settings:
    Statistics:
  PAP:
    State: OPENED
    Timer Settings:
      Dead Interval: Timer Stopped
  IPCP:
    State: OPENED, Terminate Reason: 0
    Negotiated:
      My IP address: 5.5.5.5, Peer IP address: 217.94.69.251
    Timer Settings:
      Retransmit Interval: Timer Stopped, Control Retransmit Interval: 5000
    Statistics:
      Retransmit count: 0, Nack sent count: 0, Nack received count: 0
  IP6CP:
    Negotiated:
    Timer Settings:
    Statistics:
```

PPPoE on bare metal switch

THOUGHTS ON CP/UP SPLIT



CP local per device

Swicthes 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

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

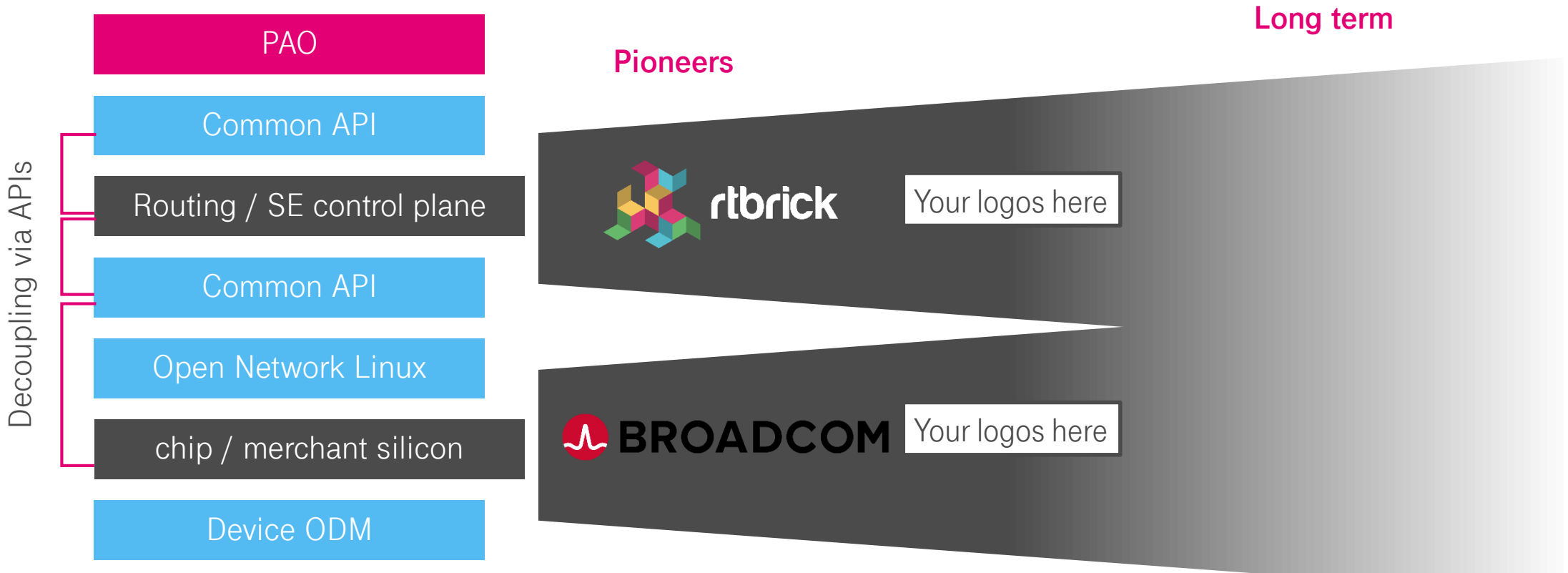
DIFFERENT TYPES OF SILICON WORK AND CAN BE USED

A SWITCH IS NEEDED ☺

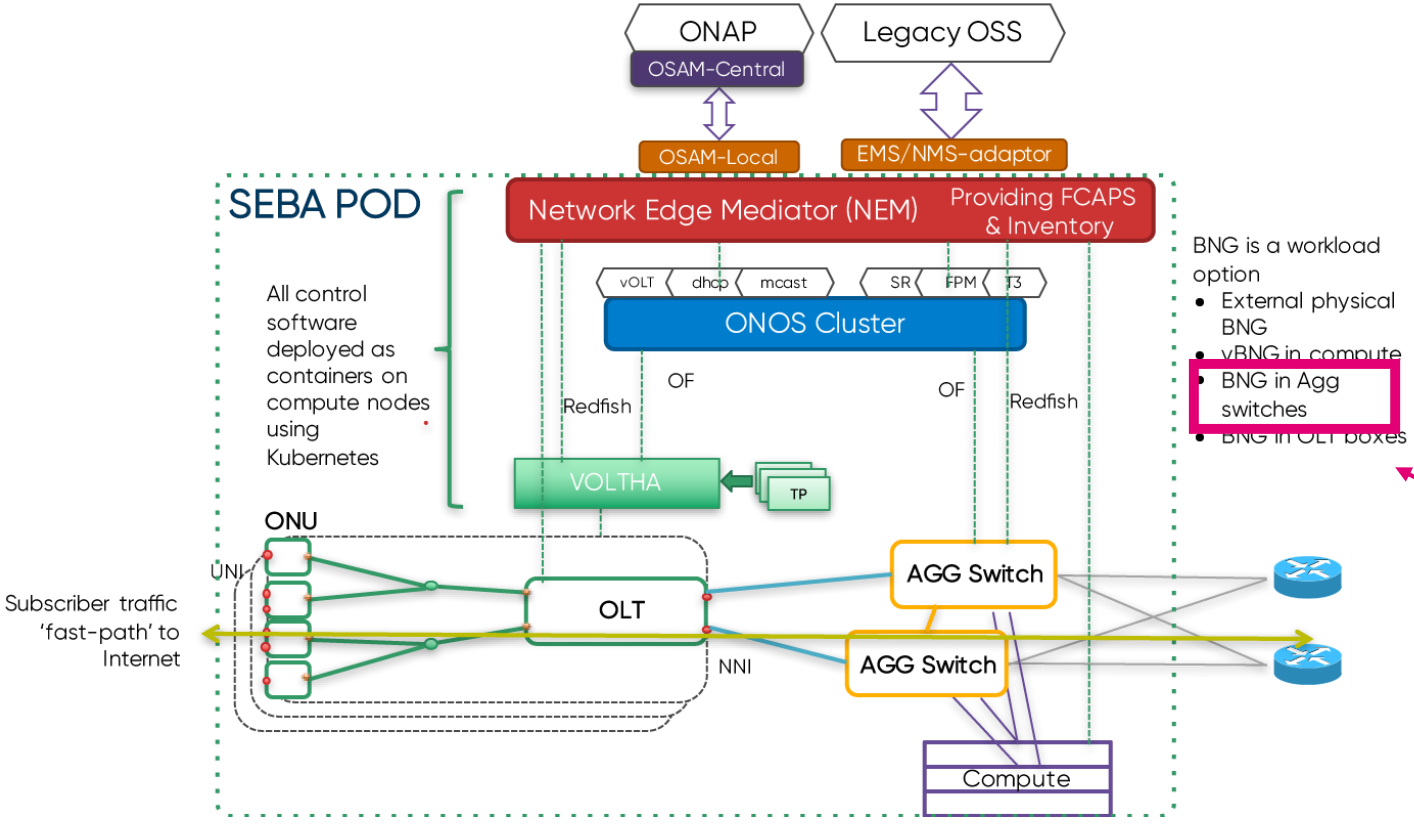
HARD-TO-COPY TECHNOLOGY VS VENDOR LOCK

ECOSYSTEM VIEW WRT CURRENT PROTOTYPE

APIs decouple proprietary components



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

DEUTSCHE TELEKOM @ ONF CONNECT 2019

DEEP DIVES ON ACCESS4.0 AND MUCH MORE

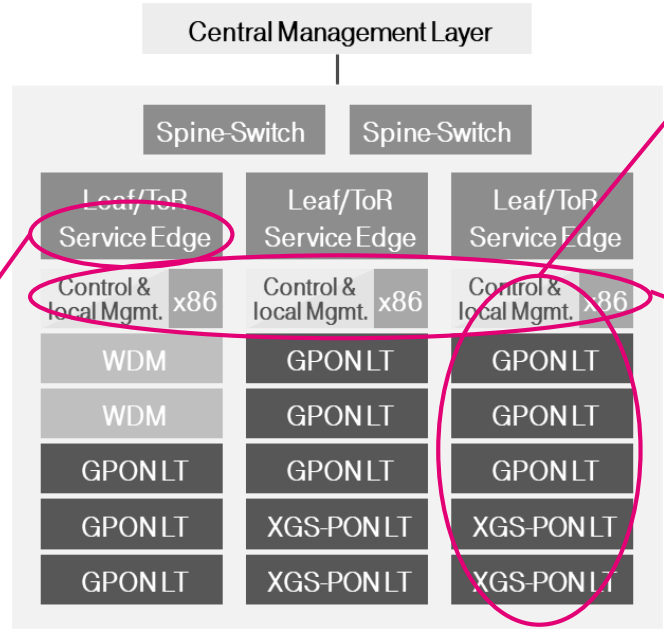
FRI — Jochen Appel, **10:00AM**
KEYNOTE: ACCESS NETWORK TRANSFORMATION

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

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

THU — Dr. Hans-Joerg Kolbe, **2:30PM**
IMPLEMENTING THE PROGRAMMABLE SERVICE EDGE

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



WED — Bjoern Nagel, **2:15PM**
VOLTHA ROADMAP

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

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

WED — Michal Sewera, **5:30PM**
OPEN SOURCE EPC

WED — Michal Sewera, **11:45AM**
5G AND OPEN SOURCE

ADDITIONAL MATERIAL

TOWARDS A COMMON SUBSCRIBER EDGE

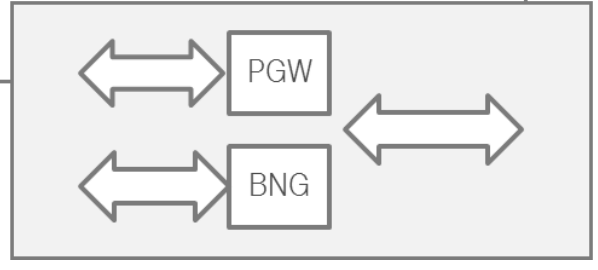
STRUCTURAL CONVERGENCE

FUNCTIONAL CONVERGENCE

Location consolidation

Traffic grooming, local coupling

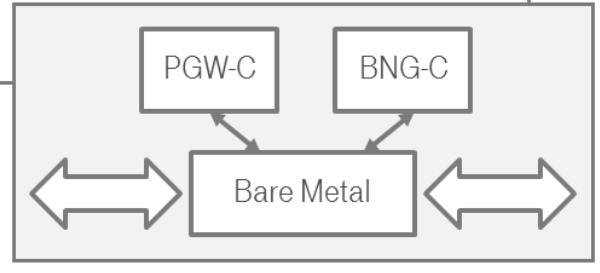
- H-CORD (hybrid)
- Edge Cloud
- Low Latency



User Plane consolidation

Same data path for fixed and mobile user plane (UP)

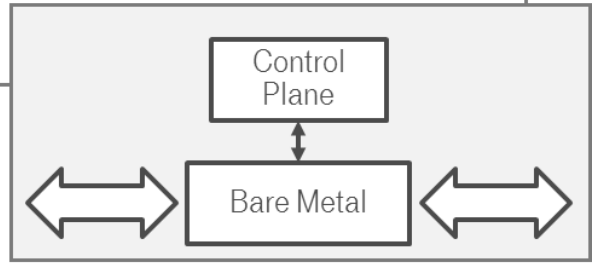
- Bare Metal-based UP,
- virtualized CP



Control Plane consolidation

converged control plane

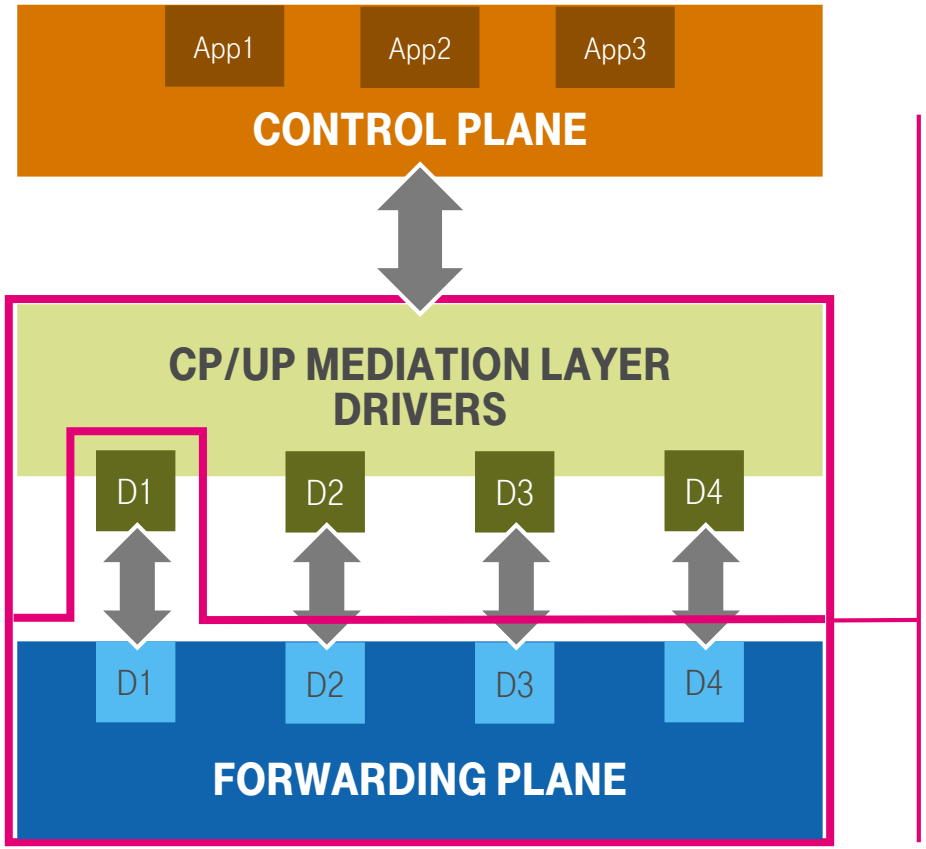
- includes slicing
- Following 3GPP+BBF work



DESIGN PARADIGM: CONTROL PLANE / USER PLANE SPLIT

NO FRAGMENTATION, PLEASE...

COMMUNITY WORK



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)

FIN