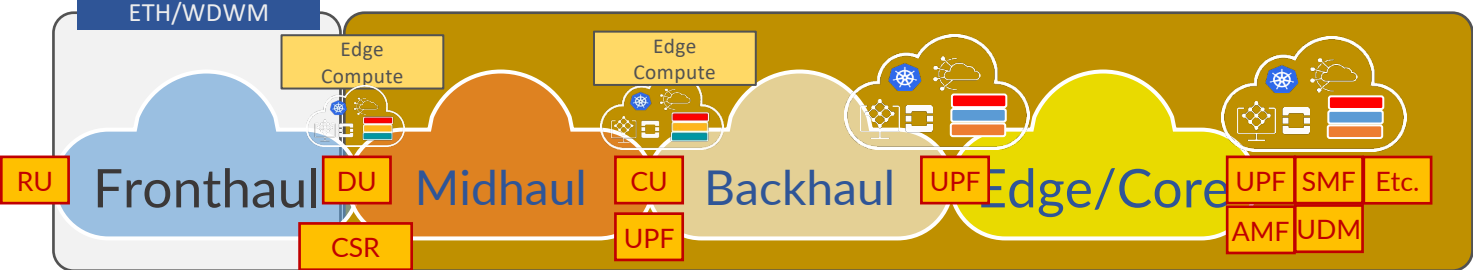




Speeding up Network FPGA Design using P4

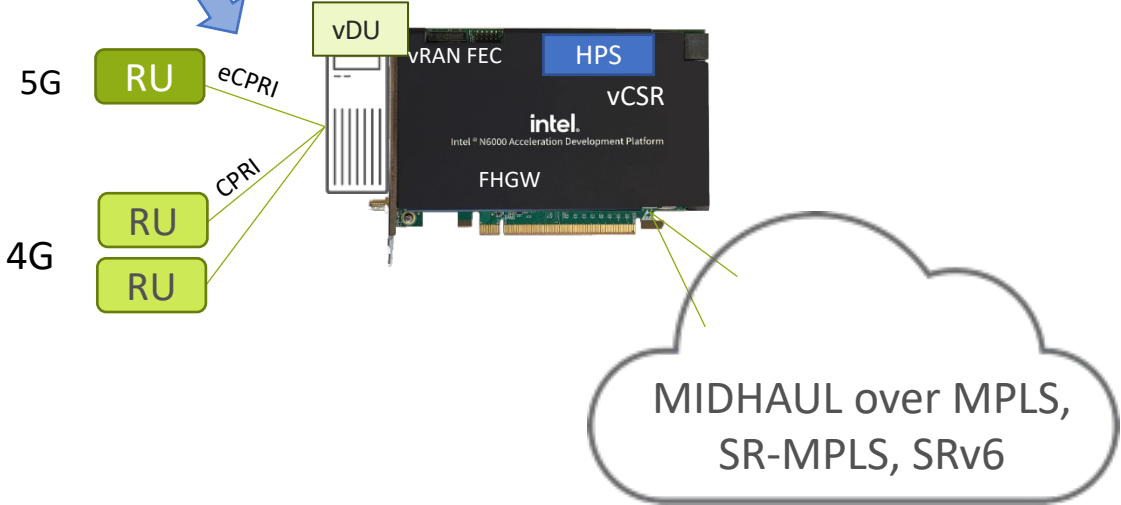
Mirosław Walukiewicz, Intel
Bert Klaps, Intel

P4 can address multiple use-cases in mobile infrastructure



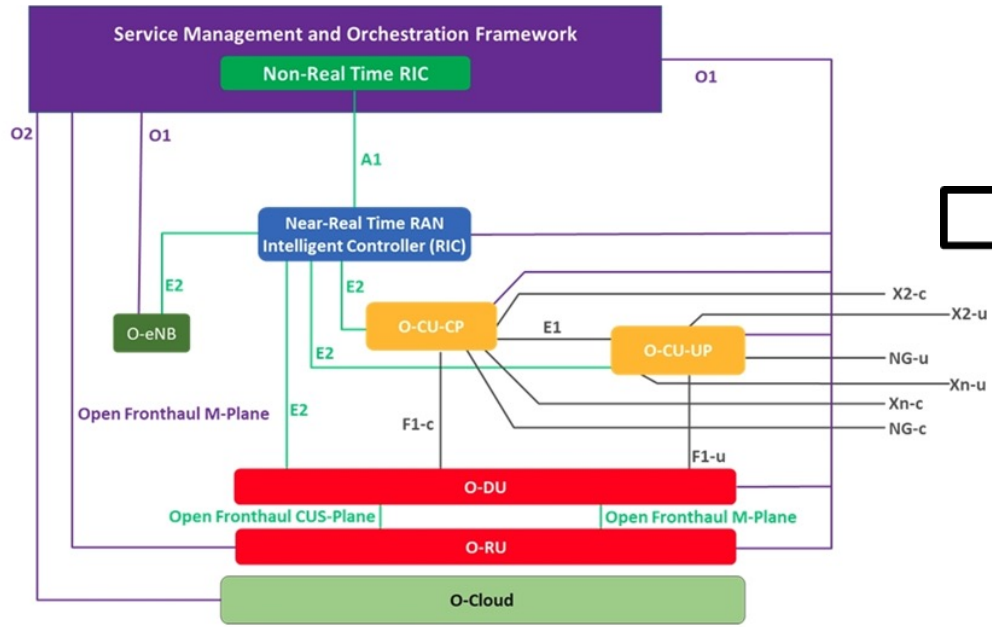
Consolidate on PAC / Custom board with Xeon host

Virtualized x86 Server



- CU: Centralized Unit
- DU: Distributed Unit
- RU: Radio Unit
- AMF: Access and Mobility Management Function
- SMF: Session Management Function
- UDM: Unified Data Management
- UPF: User Plane Function
- CSR: Cell Site Router
- FEC: Forward Error Correction
- FHGW: Fronthaul Gateway
- HPS: Hard Processor System
- RAN: Radio Access Network
- PAC: Programmable Acceleration Card
- CPRI: Common Public Radio Interface

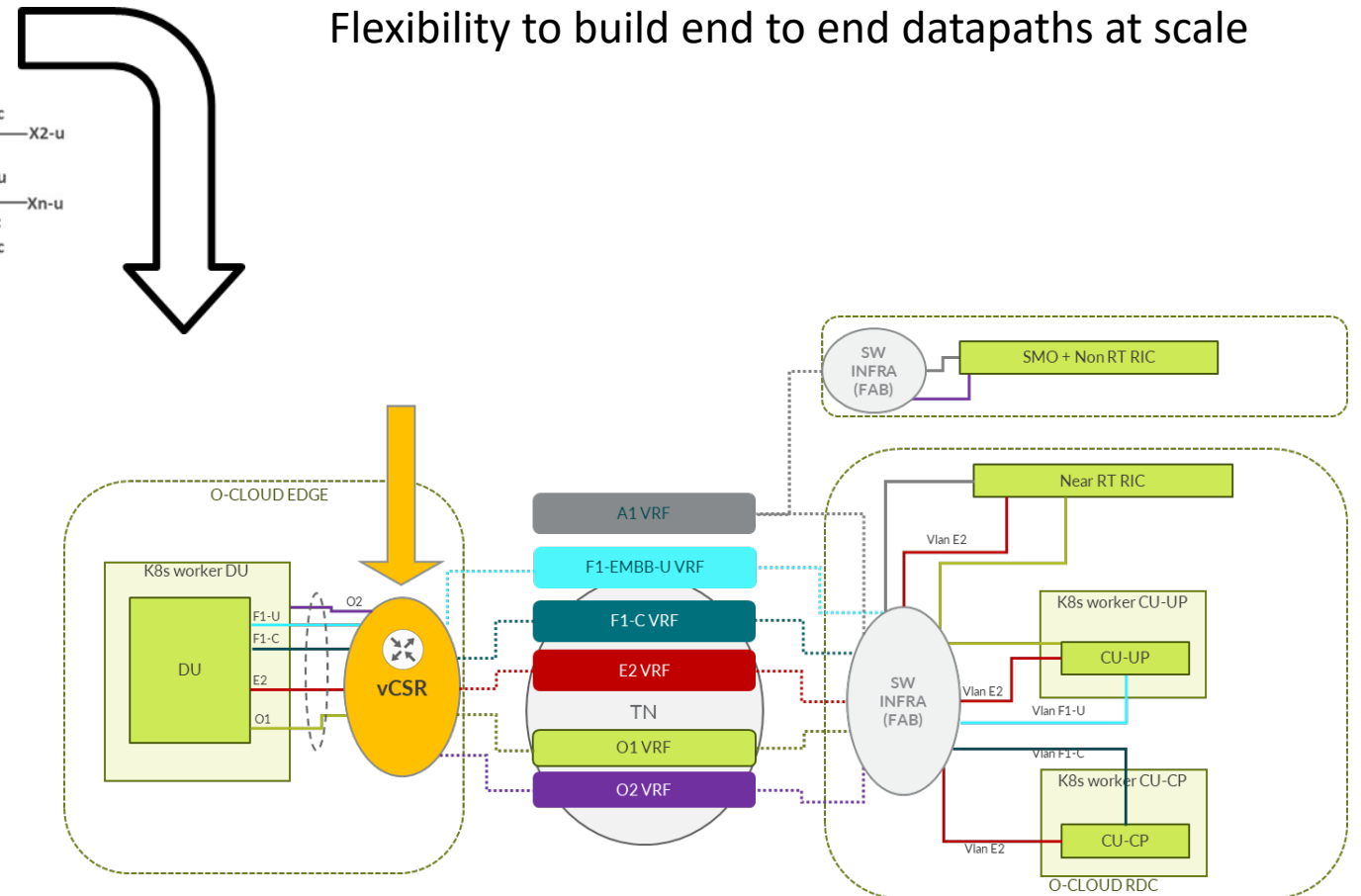
Example O-RAN connectivity enforcement



Source: [O-RAN architecture overview](#) licensed under [CC BY 4.0](#)

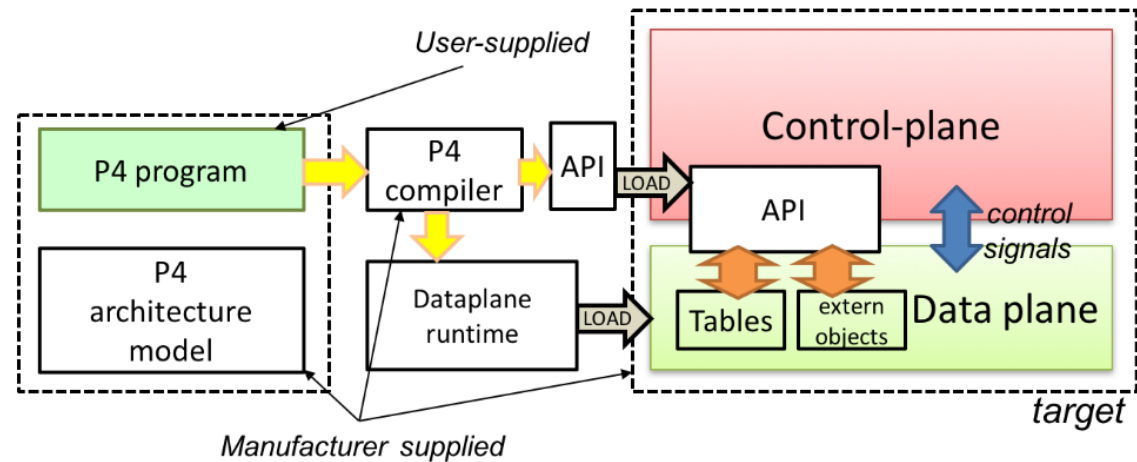
Solution can support various mobile infrastructures including seamless MPLS, SR-MPLS and SRv6

Flexibility to build end to end datapaths at scale



P4 for vCSR – example of custom architecture

MPLS/SR-MPLS/SRv6 router core as pure P4 code

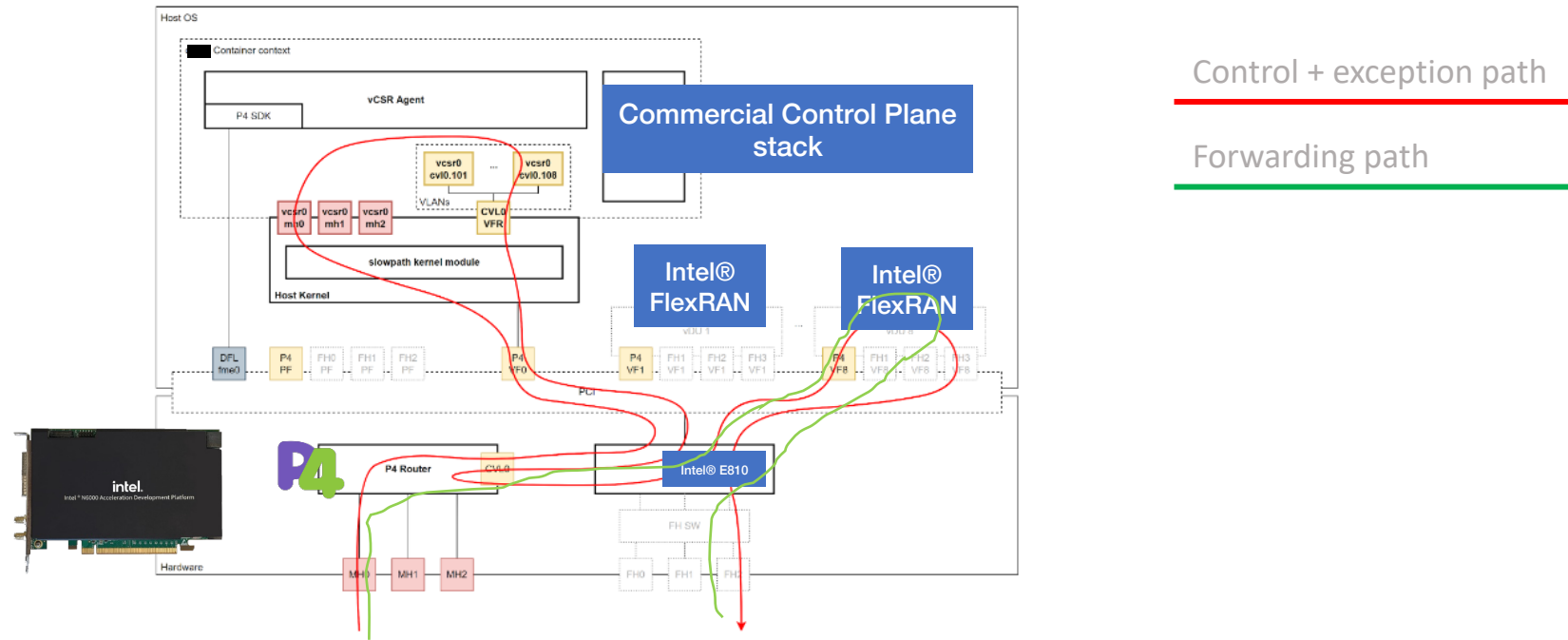


Source: [Programming a target with P4](#) by [p4.org](#)

clock synchronization + QoS + FHGW as P4 extern objects

CSR: Cell Site Router
FHGW: Fronthaul Gateway
HPS: Hard Processor System
QoS: Quality of Service
RAN: Radio Access Network

P4 Integration with commercial router stack



Commercial router stack used as control plane
Native Intel® FlexRAN stack integrated for vDU

Summary – FPGA is easy with P4

- Working vCSR example in FPGA completed in 6 months by engineers without RTL skills
 - Most of work spent on aligning P4 code for commercial MPLS pipeline
- Using well-defined host interfaces makes P4 based designs compatible with commercial applications like Intel[®] FlexRAN and commercial routing planes
- P4 tool can also be used for SRv6 and new use-cases such as network slicing

- Challenges:
 - P4 custom architecture in FPGA is not standardized
 - Externs are still in RTL
 - Work on simulation is ongoing – BMv2 is very limited
 - Need to integrate with standard tools like Intel[®] P4 SDE

➤ Early-Access P4 toolchain is available for qualified customers



Thank You