

Aether : 5G Private Network

TheNetworkingChannel : 5G and NextG Innovation Opportunities and Challenges

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Evolution Towards a Disaggregated, Distributed & Scalable, Secure 5G Private Network

Time

2021+

SDN Disaggregation

Cloud Native

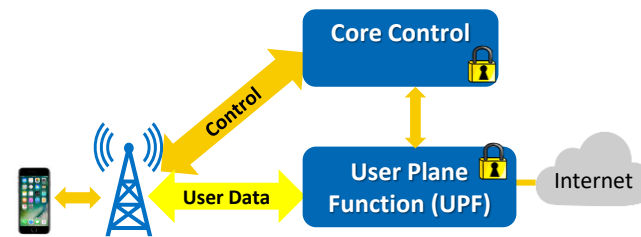
From: HW/Proprietary solution

- Mobile core on monolithic vertically integrated proprietary solutions
- Provisioned for peak traffic
- Single purpose device



To: SDN/NFV Disaggregated 4G/LTE Mobile Core

- Transitioning workload on High Volume Server
- Use CPU improvements and features, platform and SW differentiation, e.g., SGX, DPDK to support I/O intensive workload

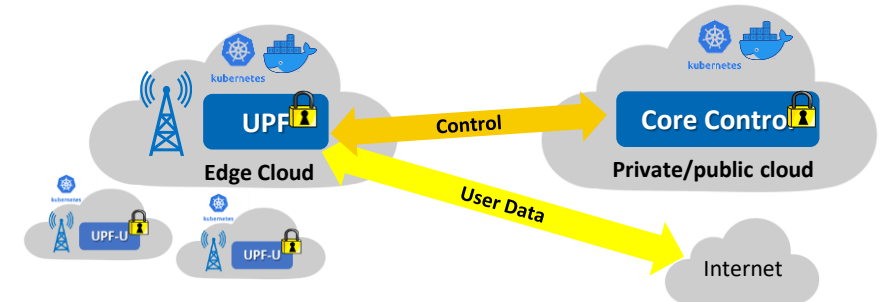


4G/LTE Open Mobile Evolved Core (O MEC)

<https://opennetworking.org/omec/>

To Cloud native, distributed & scalable, secure 5G Private Network

- Distributed edge Gateways enabling applications at the edges
- Scaling-up or scaling-out necessary component in private/public cloud
- CPU, platform and SW differentiation with DDP, ADQ, SGX, Smart NIC
- More disaggregated components, e.g., O-RAN based SW Defined RAN



Aether : 5G Private Network

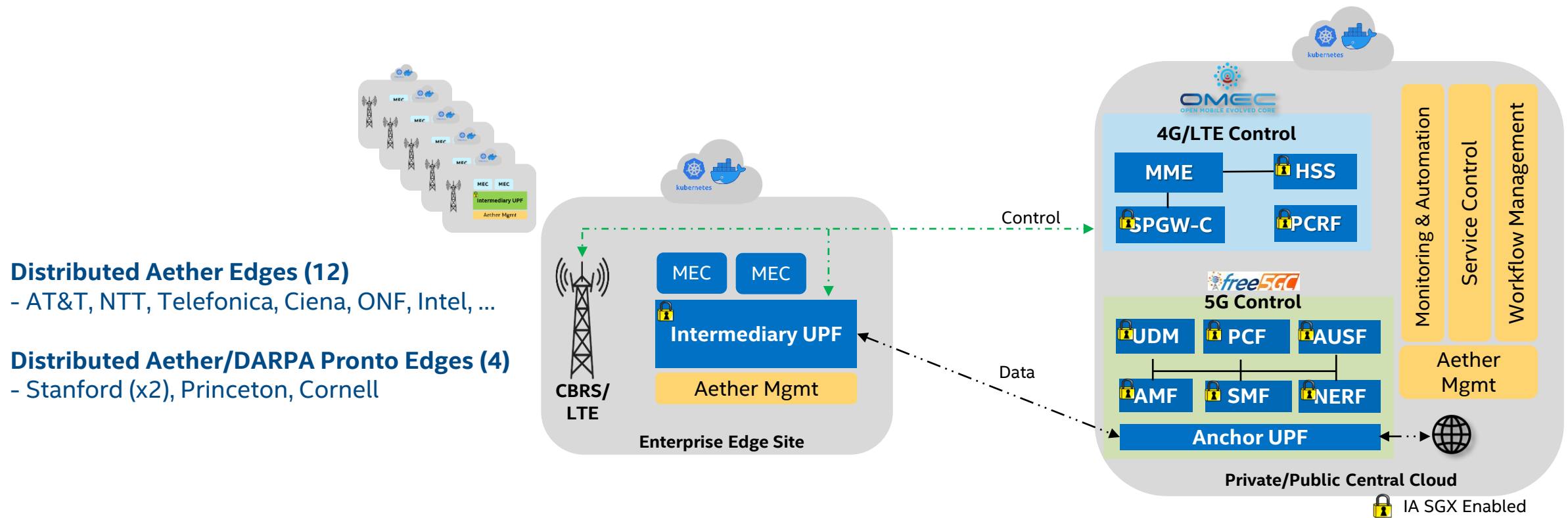
<https://opennetworking.org/aether/>

• Deliver cloud native, disaggregated, SDN/NFV based ref. implementation with Open Networking Foundation (ONF) and partners

- Deploy solutions with Operators, e.g., DT/T-Mobile Poland deploying O MEC for Fixed Wireless Services, Aether POCs with various partners
- DARPA \$30M funding of ONF (w/ Stanford, Princeton, Cornell) to deploy & operate Aether 5G network

Aether : Cloud Native Private 4G/5G Networks

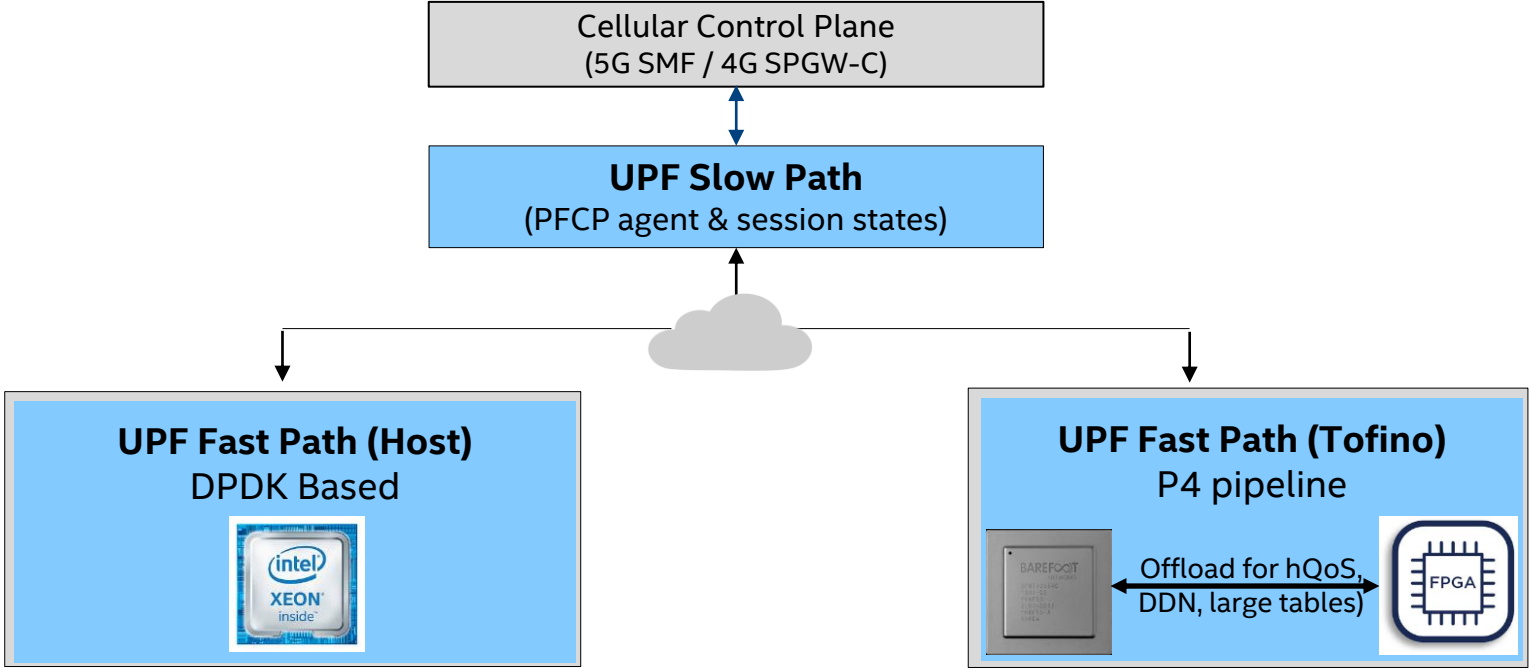
ONF, Intel & partners SW
ONF SW



- Cloud Native mobile core with ability to scale-up (i.e., add compute power) or scale-out (i.e., add instances)
- ONF deploys & operates Aether (Day-0, 1 & 2) - Scalable & Distributed Edge Gateways with control in public cloud
 - Including for DARPA/Pronto – DARPA \$30M “Verifiable Closed Loop Control Network”

Addressing Various Deployment Model and/or Research with Intel Platforms

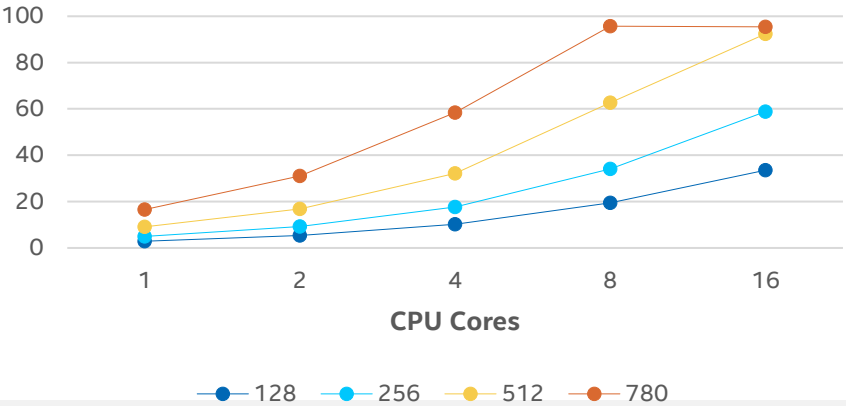
- Host based implementation making use of CPU features, e.g., number of cores, SGX as well as platform features to scale-up, e.g., E800 NIC Dynamic Device Personalization (DDP) enabling a HW based load balancer or Application Device Queue (ADQ) enabling priority queue management



- Support all UPF features e.g., hQoS, DDN, DPI
- Use CPU/Platform differentiation : DDP, SGX, DLB

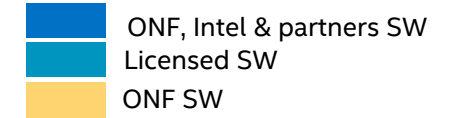
- Offload to FPGA/CPU for hQoS, DDN, DPI, large tables

Throughput (Gbps) w/ E800 DDP per single NIC

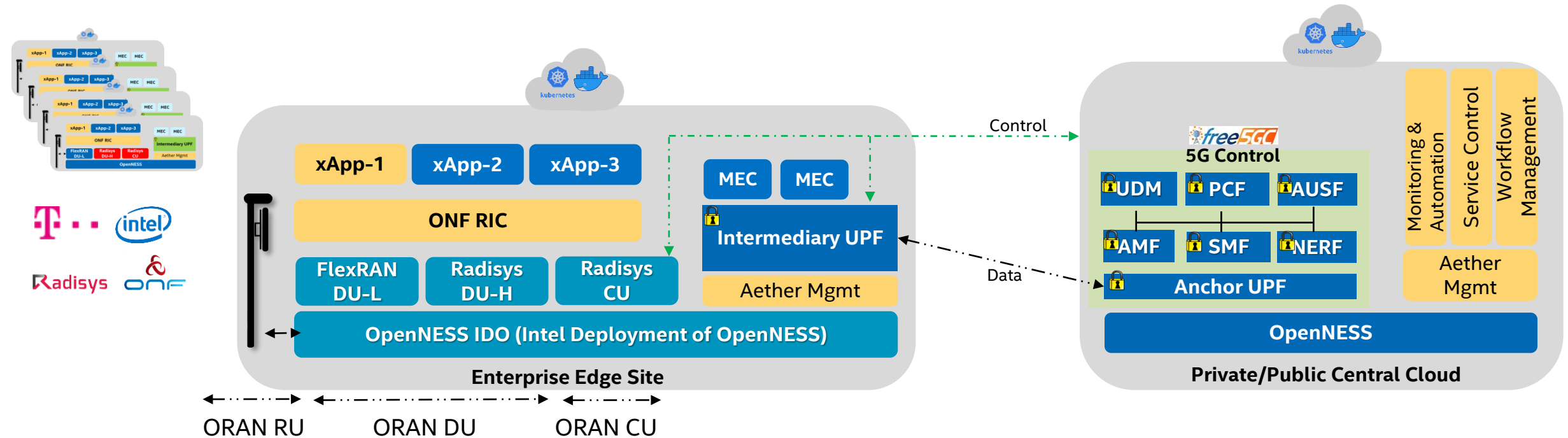


 **developing on Tofino**

2021 -- Aether with SD-RAN : E2E 5G Private Networks



Aether with a disaggregated O-RAN based 5G SW Defined RAN – FoxConn RU, Intel FlexRAN DU-L, Radisys DU-H/CU

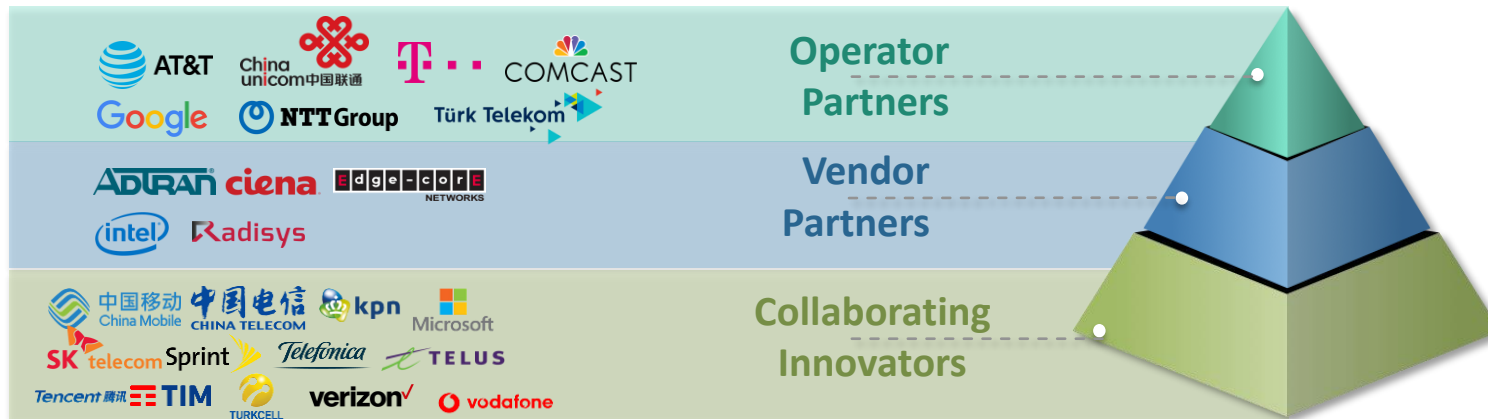


- A Radio Intelligent Controller (RIC) with a Near Real Time RIC enabling xApps
 - E.g., ONF Load Balancing, Intel AI/ML based Connection Management, FB/AirHop Self Organizing Network

Aether: A Cloud Native 5G Private Network Platform enabled by disaggregation, SDN/NFV and Open Source

ONF & ORAN are Complementary & Leveraging Each Other's Work

ONF & ORAN chaired by Andre Fuetsch, AT&T CTO

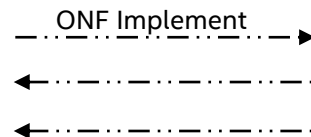


ONF BOARD ↔ E-SAB* Board

| | | |
|--------------------|---------------|--------------------|
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| STANFORD | N. McKeown | |
| ONF | Guru Parulkar | |



- Define Reference Open Architectures
- Standardize Specifications for Intelligent RAN
- ORAN SW Community – enable plugfests, POCs, reference e-e implementations



- Implement ORAN Arch., e.g., RIC
- Feedback on spec. based on implementation
- Contribute "xApps" Portability SDK to ORAN SW Community
- ONF has dedicated engineering resources assigned to projects

Summary / Call to Action

- Intel, ONF and Partners will continue open-sourcing disaggregated, SDN/NFV based 5G components and functionality
- Aether, an open, disaggregated, SDN/NFV based cellular platform available for research
 - A programmable platform from RAN to Core to underlying infrastructure (e.g., Tofino™ P4 programmable Ethernet switch ASIC)
 - An open cellular network available to academia and partners to shape 5G, NextG research and deployment
 - Opportunities to perform RAN, including xApps, Core, or innovative edge deployment research

Join the community and contribute to shape the platform, the industry and 5G/NextG

