



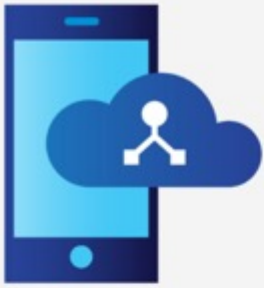
ATLANTA, GA
OCTOBER 11-14

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UNLEASH THE POWER OF LIMITLESS CONNECTIVITY



**2021 Fall
Technical Forum**
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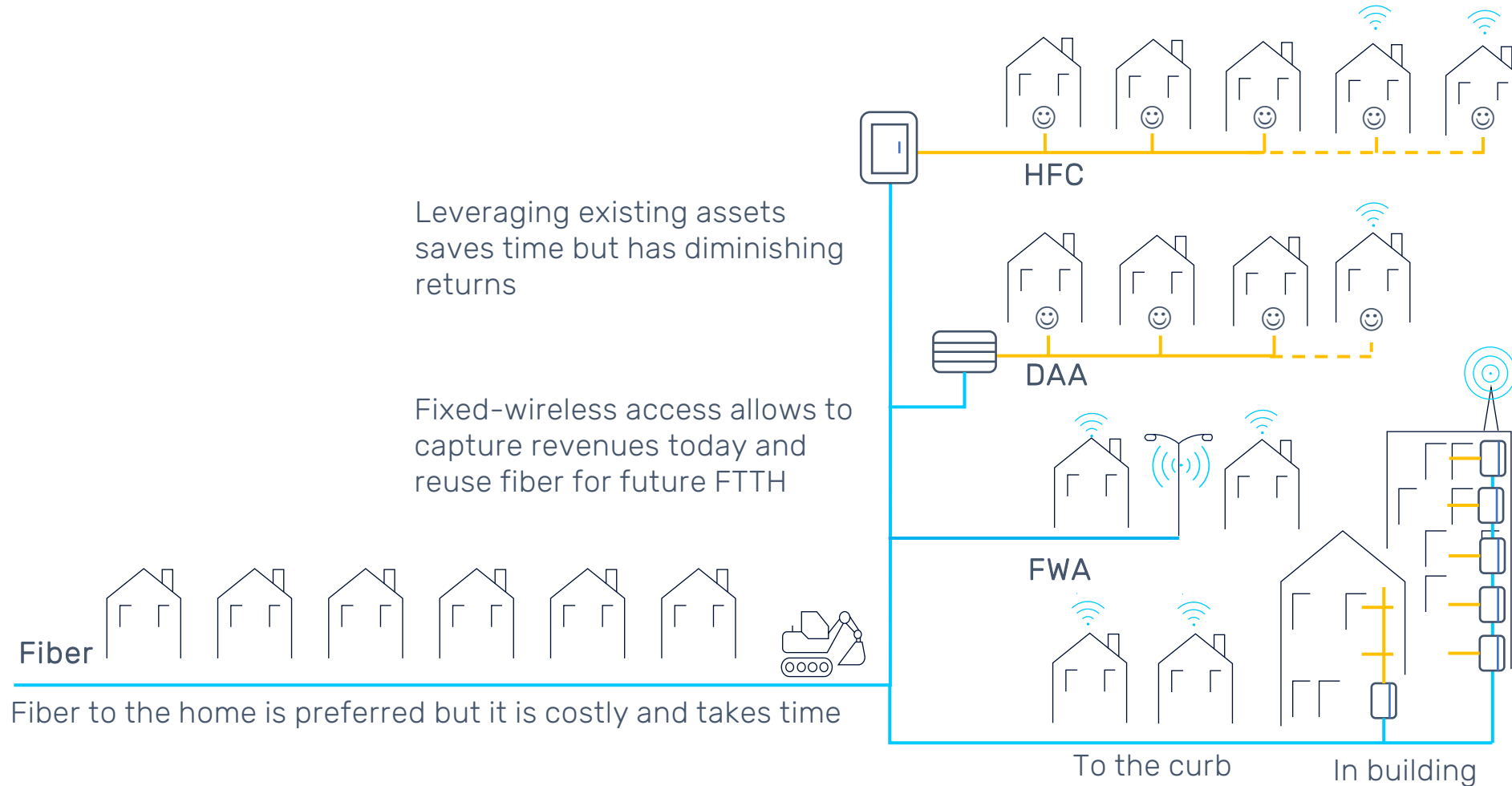
Converged Networks and Mobility

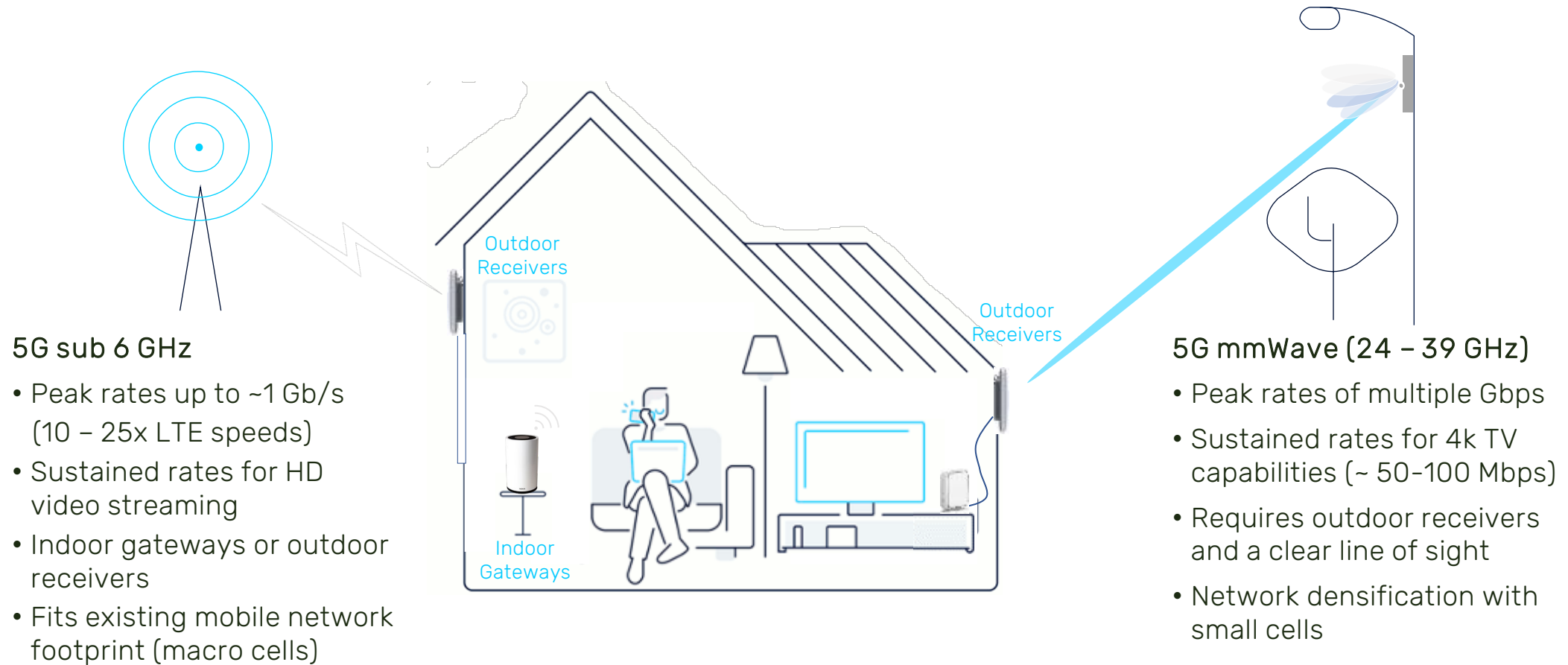
Fixed-wireless convergence on a multi-access broadband edge

Juan Rodriguez

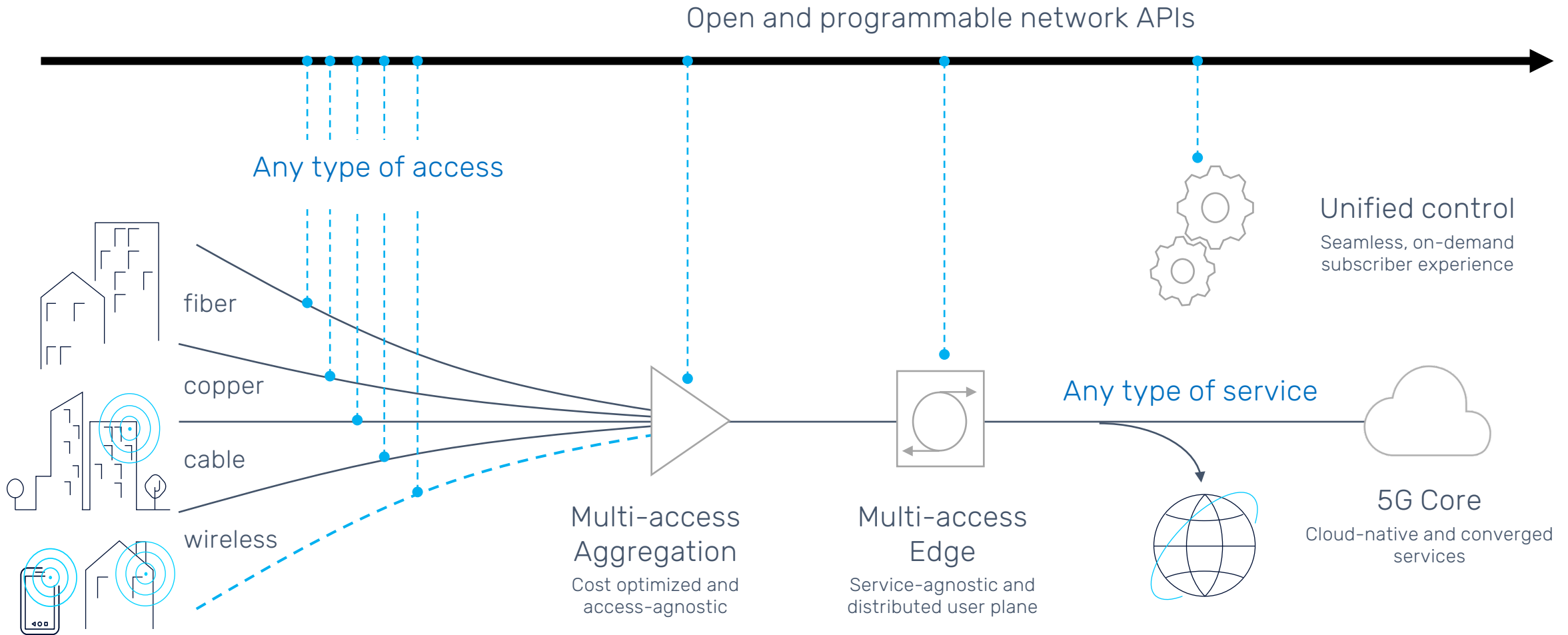
Sr Director US MAJORS/MSOs
Nokia

Expanding broadband coverage with fixed-wireless access

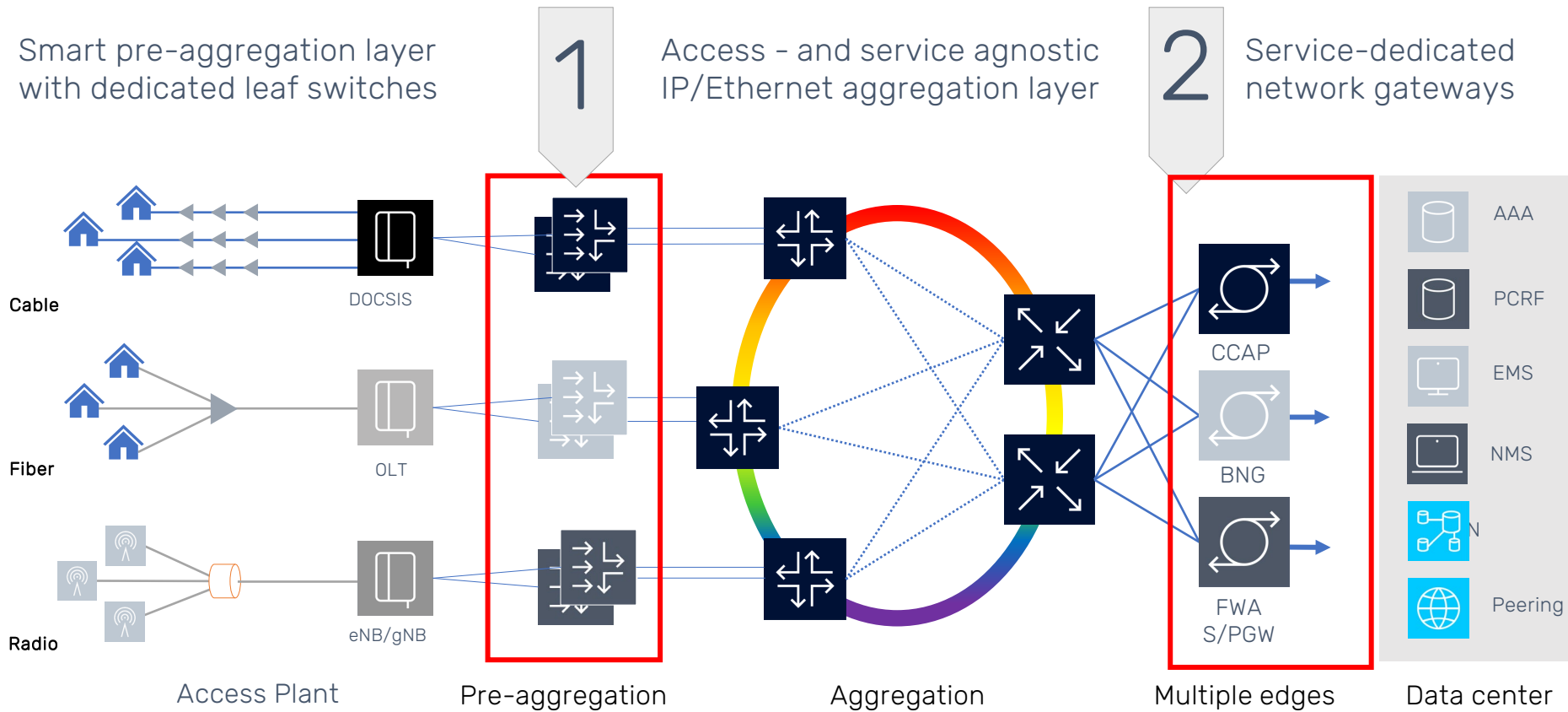




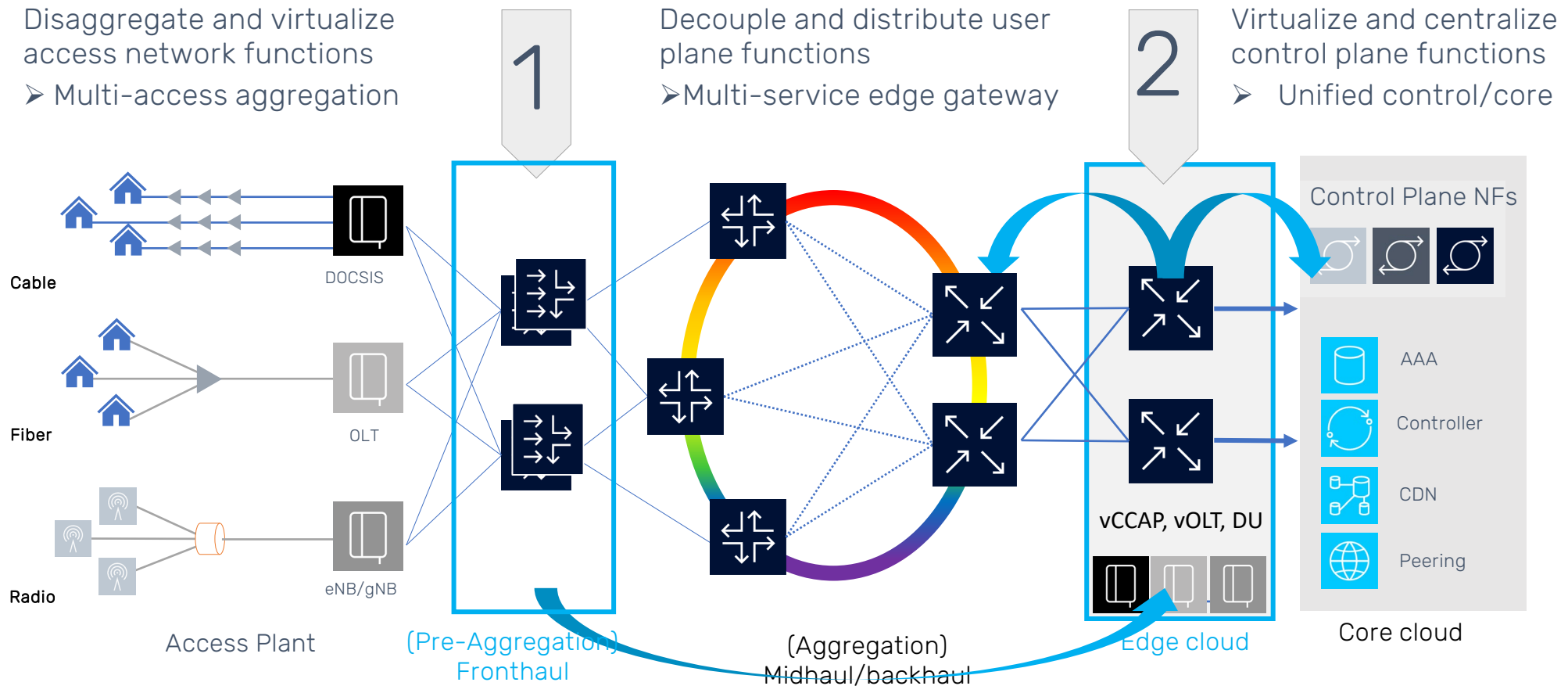
Multi-access broadband target architecture

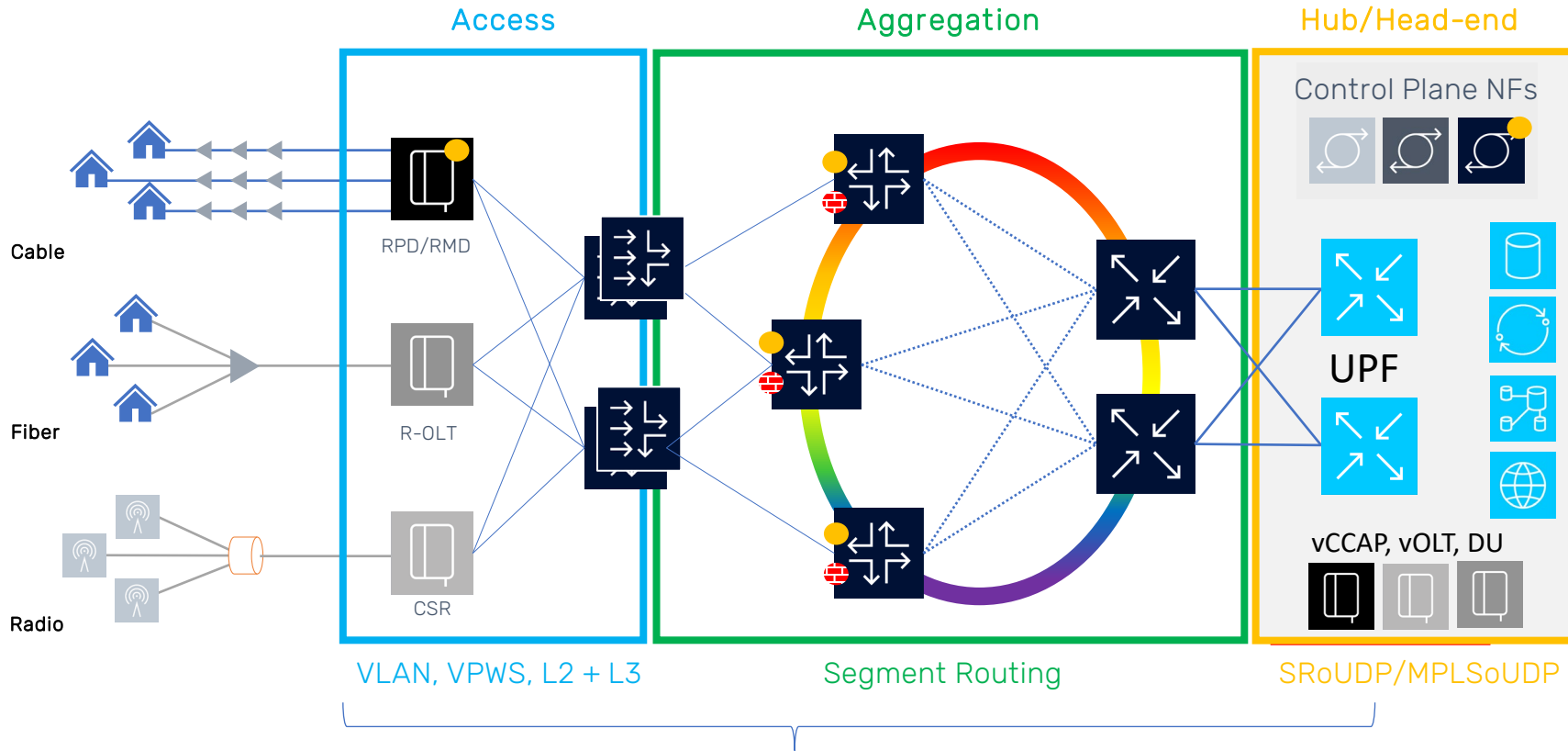


Inherent complexity and functional duplication



Extract complexity by moving functions into the cloud





- Virtualized control plane
 - Centralized, cloud-native, 5G enabled
 - Unified subscriber/session management
- Disaggregated user plane
 - Distributed, network-native (NPU)
 - High-performance broadband
 - Cost-efficient internet offload
 - Fabric-based IP multicast replication
 - Integrated edge security (DDoS)
- Virtualized access functions
 - Distributed, cloud-native/appliance-based

- Access and transport slicing
- Flexible VNF/PNF connectivity: IP-VPN, EVPN overlay
 - Multiple underlay options: VXLAN, SR-MPLS, SRoUDP

- Subscriber Management
- ⊕ Volumetric DDoS filtering

Edge gateway requirements

Requirement	Mobile user	Wireline user
User devices	1 (Typically)	> 10 perhome
Servicetype	Nomadic	Stationary
Session type	Dynamic	Always on
Monthlyusage	~3-5 GB	100s ofGB
Averagespeed	10 kbps	1000 kbps
Gateway location	Centralized	Distributed
Gateway functions	Virtualized (x86)	Physical (NPU)

Mobile Gateway

High-performance control plane

- Dynamic sessions/elastic scaling
- Low volume/high revenue per bit



Compute and storage intensive

- Virtualized network functions
- General purpose silicon (x86)

Wireline Gateway

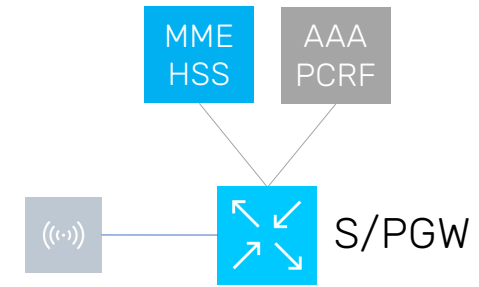
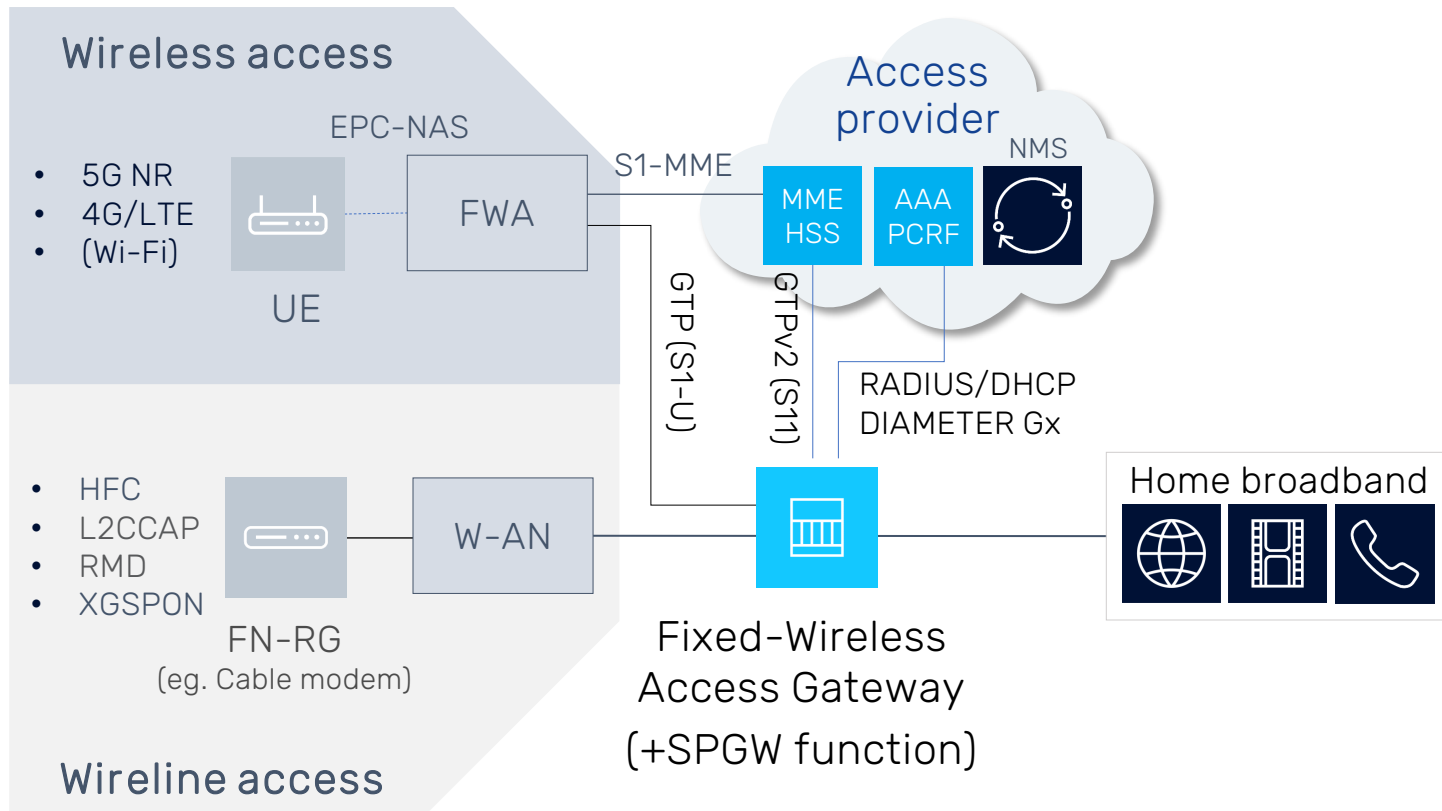
High-performance user plane

- Static user devices/always-on
- High volume/low revenue per bit



Bandwidth and packet intensive

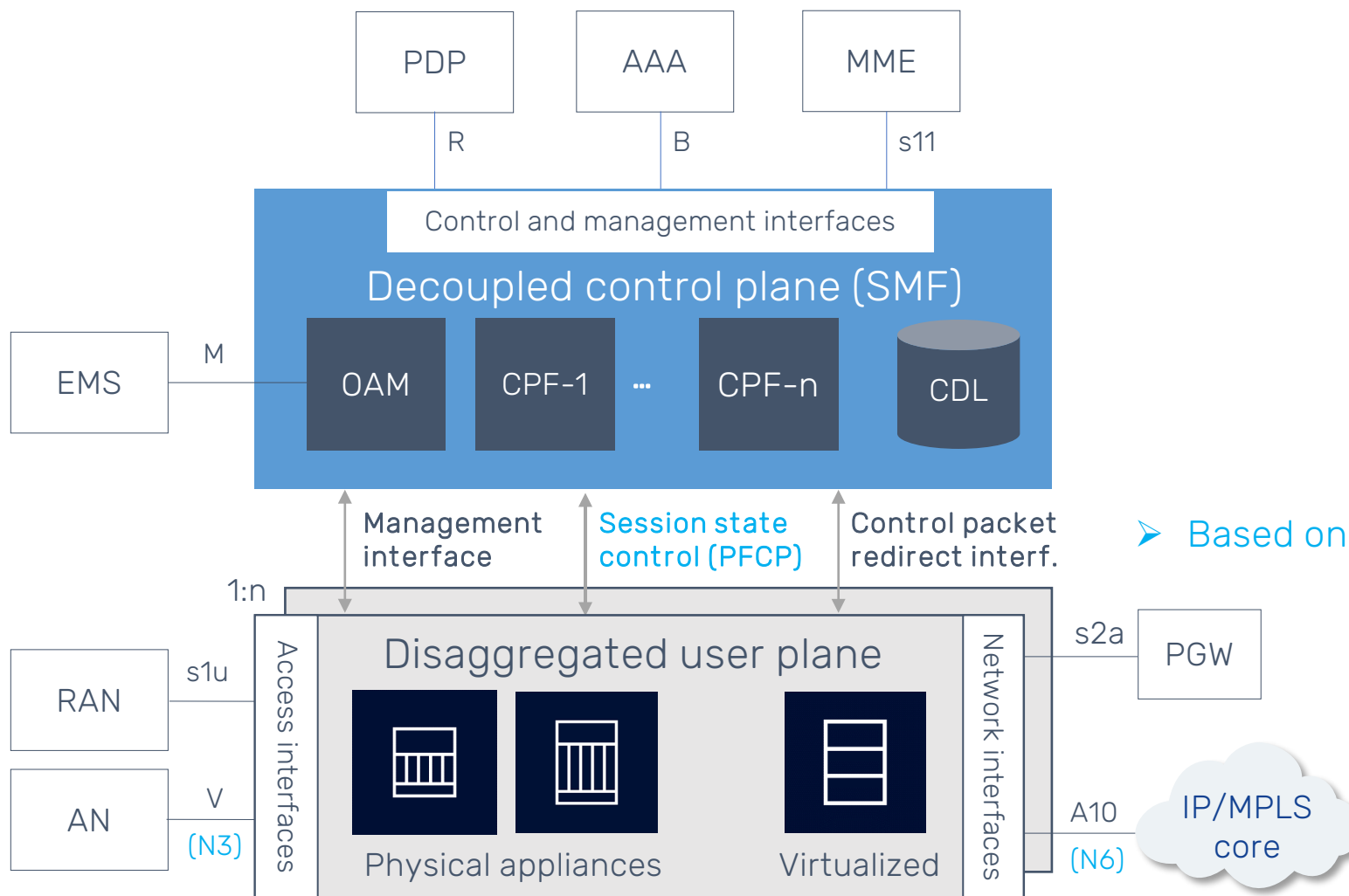
- Physical network appliances
- Custom routing silicon (NPU)



FWA gateway requirements

- Serving and PDN Gateway support
- High-performance user plane (SPGW-u)
- Integrated or virtualized control plane
- MME/HSS subset (no roaming)

Disaggregated broadband gateway with Control and user plane separation (CUPS)



Control plane functions

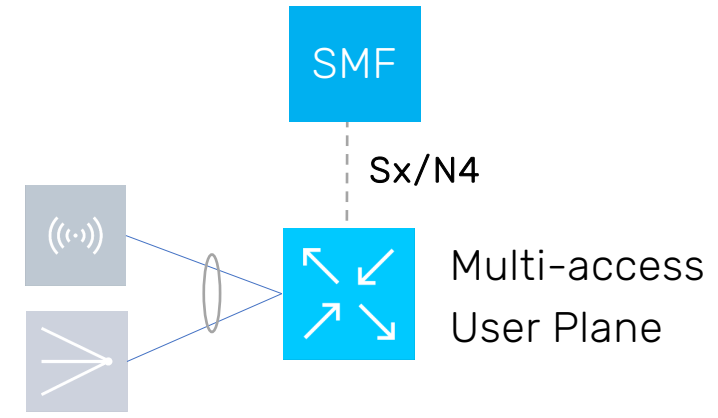
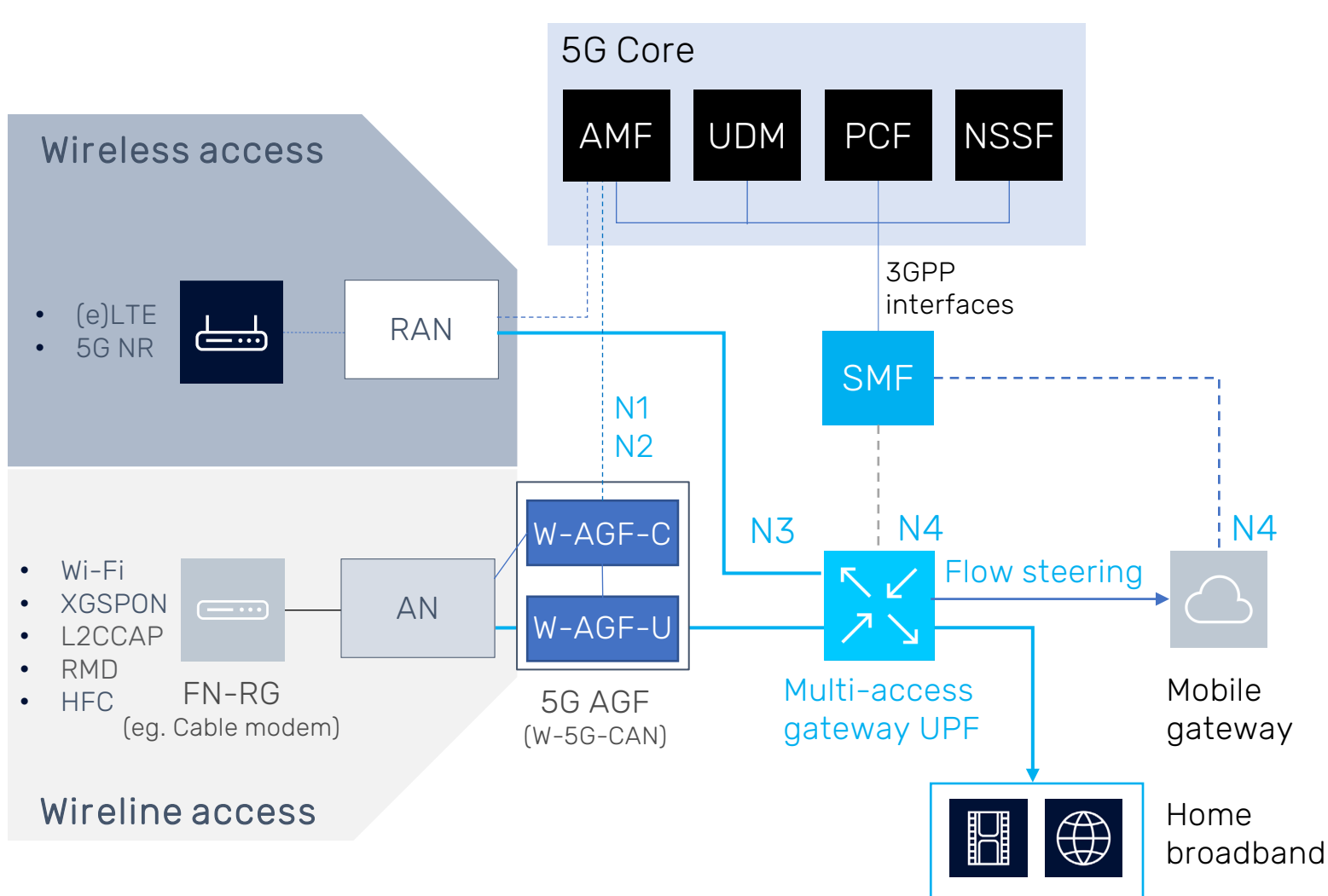
- Session state management
- IP address management
- PEP, AAA client, accounting
- LAC, LNS, TWAG, FWAG, HAG
- Access control, QoS control
- Keep alives: LACP, BFD, etc

➤ Based on 3GPP CUPS interface (Sx/N4)

User plane functions

- Traffic management/statistics
- Subscriber routing/forwarding
- QoS functions, IPTV multicast
- Keep alives: PPP hellos, etc

Multi-access edge convergence on a 5G core



Key features

- Common SMF for fixed-mobile converged interworking
- UPF with Packet Forwarding Control based on 3GPP Sx/N4 interface
 - Dynamic UPF selection based on APN/DNN, IP address range, etc
 - Flow steering of 5G service traffic to mobile cloud gateway
 - Off-load video and internet
- 5G Access Gateway Function for wireline interworking (optional)

Brownfield

Complement wireline for better experience and service coverage



Greenfield

Compete with rapid coverage and short time to revenue



5G services

Combine fixed and wireless access for cost-efficiency and a seamless user experience



Over the wires

Multi-access aggregation and edge for optimal cost and performance synergies



To the core

Cloud-native services for elastic scaling and high service velocity





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Thank You!

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