



Creating Infinite
Possibilities.

Why, How, and Where to Converge Fixed and Mobile Networks

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AGENDA:

- ✓ Introduction
 - ✓ Current state of cable fixed and wireless networks
 - ✓ Drivers of convergence
 - ✓ Cable moves to 5G, and problem to be solved
- ✓ Why you should converge fixed, and wireless networks
- ✓ How to look at convergence
- ✓ Where and how to converge to achieve maximum value
 - ✓ Converging MVNO with cable 5G MNO Cores
 - ✓ Using the access gateway function (AGF) to converge broadband
 - ✓ Converging fixed and wireless voice services
 - ✓ Using a 5G adaptive core to achieve access network agnostic service delivery
- ✓ Why converging networks requires a new approach
- ✓ Summary

- Current State of Cable Fixed and Wireless Networks
 - **Network Centric Service Access:**
 - Fixed and wireless networks have historically been built with separate access, cores and OSS, making the job of managing and assuring services and customers experience in near real time exponentially more complicated and costly as services begin to span networks.
 - Services are not easily accessible seamlessly across network access technologies today

- Drivers of Convergence

- **Bundling:** Services and applications are becoming more bundled and agnostic to network access technology
- **Network Agnostic Services :** Network services need to be decoupled from the network access, to enable network agnostic delivery through a multitude of access technologies, devices, and locations with mobility at the center.
- **FMC (Fixed Mobile Convergence) :** The Distinction between fixed and wireless access will be blurred into a seamless blended access capability.
- **Improving Opex :** Initial driver behind network convergence in 2022 and beyond will be the need to offload wireless data from the MVNO 4/5G MNO network on to the MSO's 5G network
- **Market pressures and Digital Divide :** FWA (Fixed Wireless Access) Broadband with OTT (over the top) applications and content to out of network footprint residential and business customers, and Government subsidized network builds (RDOF)

- Cable Moving to 5G problems to be solved
 - **Cable Goes 5G :**
 - Deploying 5G networks is further complicating the need to manage access to Fixed/Wi-Fi, MVNO, 5G, Private, and partner networks.
 - Managing service assurance, reliability, quality, devices, and customers experience as service access becomes networks agnostic and devices are intelligently switching networks.
 - **Reducing complexity and cost:**
 - With the advent of 5G service oriented open architecture, it is now possible to eliminate redundant network and OSS functions and costs, while achieving service and device network access agnosticism

Why you should converge fixed and wireless networks

- Understanding the Benefits of Convergence

- **Improve Opex** : Reduce high level of redundancy, cost and complexity in common converged layers
- **Improve Service Quality** : Seamless service control and resilient continuity for all devices Improving ability to assure service quality and customer experience resulting in reduced churn and increased revenue, loyalty, monetization and retention.
- **Improve Top/Bottom Line** : New Revenue generating opportunities in the enterprise market for converged private wireless, and the delivery of low latency applications at 5G speeds.
- **Fast TTM** : In the Residential market it means for example new revenue streams from cloud gaming at the edge accessed through 5G slices, 4/5G MVNO and Wi-Fi seamlessly

How to look at Convergence

- **Agnosticism:** Cable fixed and wireless services and applications should be agnostic from the network access types fixed or wireless
- **The COREs :** Stitching Cores together enables session and management continuity, and moving to a universal adaptive core enables optimal convergence.
- **The Data :** Enabling fixed and wireless network operations to create and measure a universal set of KPIs (key performance indicators) will require a common shared data layer (SDL) containing an aggregated blended set of operational network data from Wi-Fi, 5G SA, MVNO, DOCSIS, PON, for all services under a single management umbrella.
- **B/OSS :** Fixed and Wireless OSS/BSS systems can be normalized via convergence of specific O/BSS functions to support multiple network and access types enabling Network agnostic customer experience management (CEM), Device Management (DSDS, eSIM/iSIM, and common service profile, entitlements, policy and assurance management.

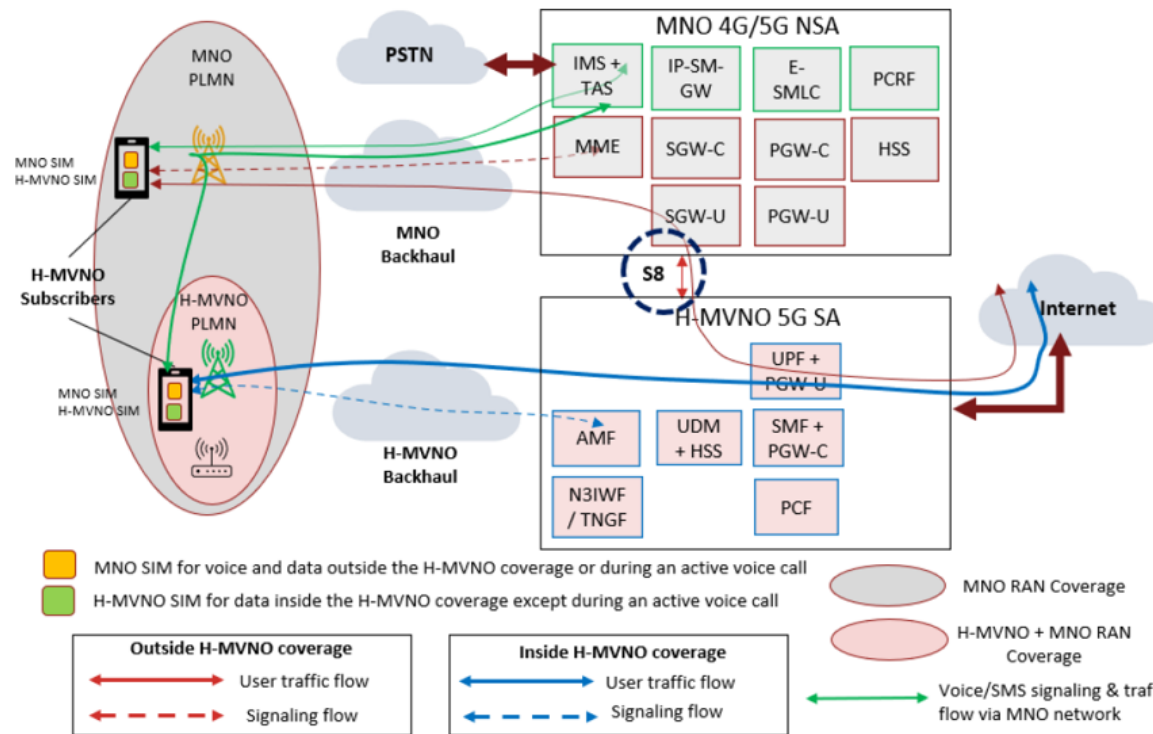
- Where to Converge for maximum Results and Value
 - **Convergence between the Cores**
 - Converging MVNO and MNO 5G Cores
 - Thin vs Thick MVNO models, enable “more knobs to turn”
 - Using AGF to Converge Data services Wi-Fi and 5G
 - Converging Fixed and Wireless Voice at the IMS Core
 - Achieve access network agnostic service delivery via universal adaptive core
 - **Convergence at the Data Layer**
 - Leveraging SDL to optimize network agnostic service access
 - **Convergence at the B/OSS layer**
 - Service Assurance Profiles and entitlements
 - Customer service experience Insights

- **Converging Fixed and wireless network Cores enables..**
 - Unified Session, mobility, and security management
 - Multiple simultaneous connections
 - e2E policy Service Profile management
 - Enhancing service QoS with core automation
 - Converged common multi technology transport layer



Where and how to converge to achieve maximum value

- Converging MVNO with Cable MNO 5G Cores



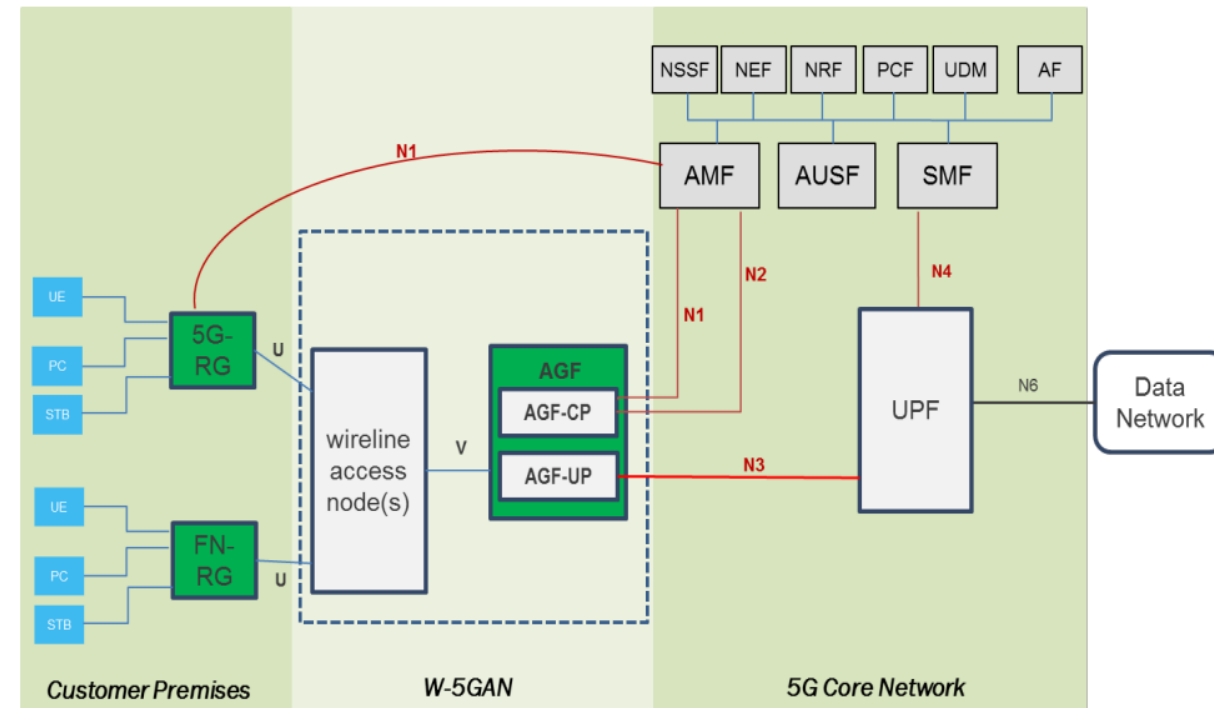
Recommendation from CableLabs using the S8 interface between SGW-U and the UPF/P-GWU to maintain session control and management.

Figure shows MNO network to be a 4G/5G NSA, but the architecture also applies to a scenario where both MNO and H-MVNO networks are 5G SA
The core network elements shown within the MNO and H-MVNO networks will use standardized interfaces

2021 SCTE Fall Technical Forum : Evolved MVNO Architectures for Converged Wireless Deployments

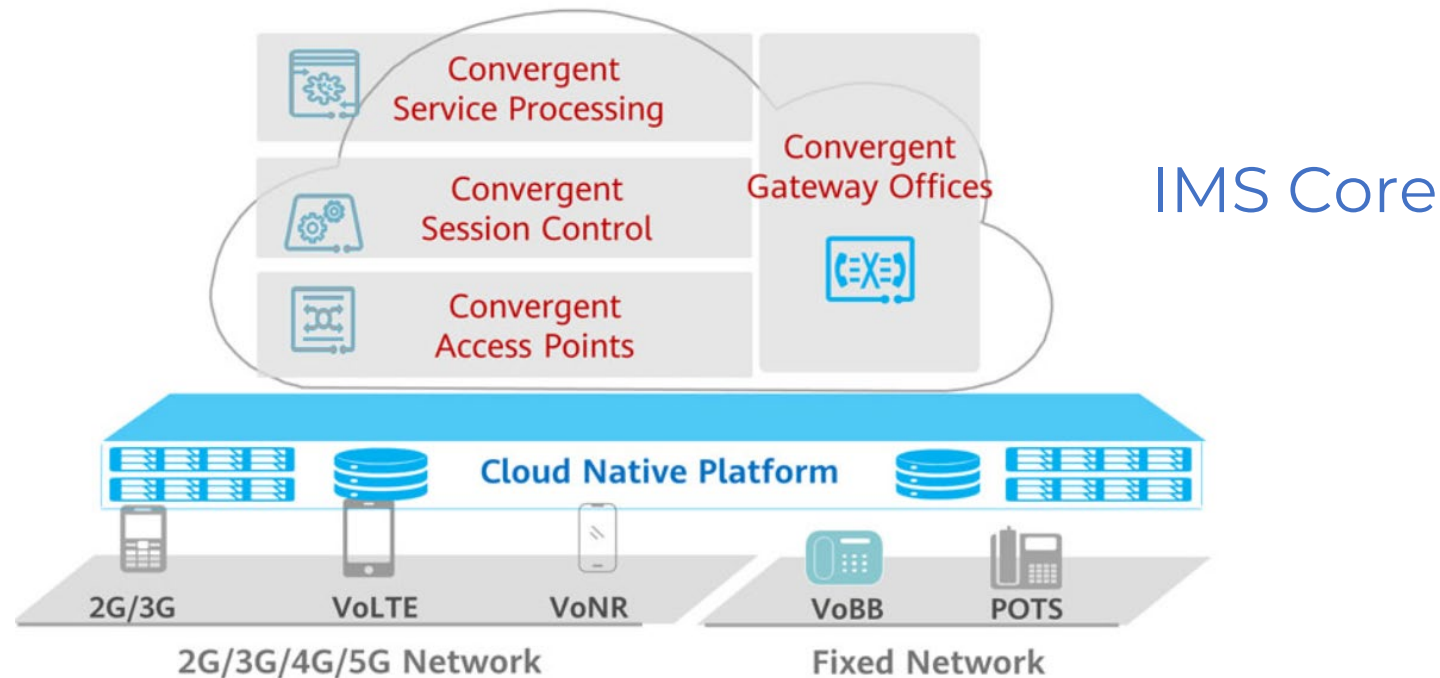
Where and how to converge to achieve maximum value

- Using the access gateway function (AGF) to converge broadband
- One of the main points of convergence is where devices access the networks.
- A key network function which enables fixed and wireless convergence is the access gateway function (AGF),
- The AGF controls network access for fixed networks to the 5G core, and is critical to the success of any network convergence initiative



Where and how to converge to achieve maximum value

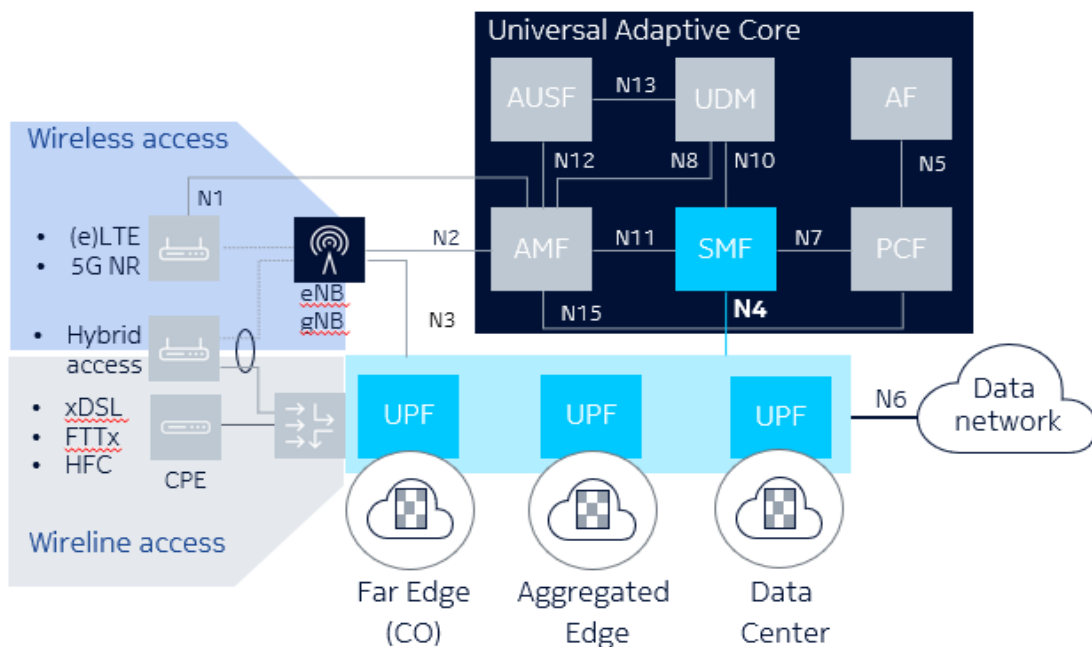
- Converging fixed and wireless voice services
 - Convergence should be achieved at the IP Multimedia Subsystem (IMS) core level to bringing together wireline and wireless voice services across all access networks, which will enable centralized management and control of voice services access thru and spanning fixed and wireless networks.



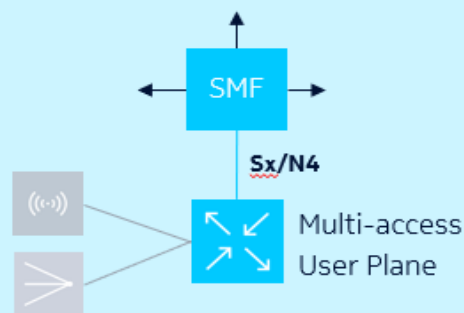
Where and how to Converge to achieve maximum value

- Using an Adaptive Core to enable network access agnostic service delivery

Future Evolution to 5G Universal Adaptive Core
Flexibility to deliver any service over any access



Fixed-Mobile Convergence



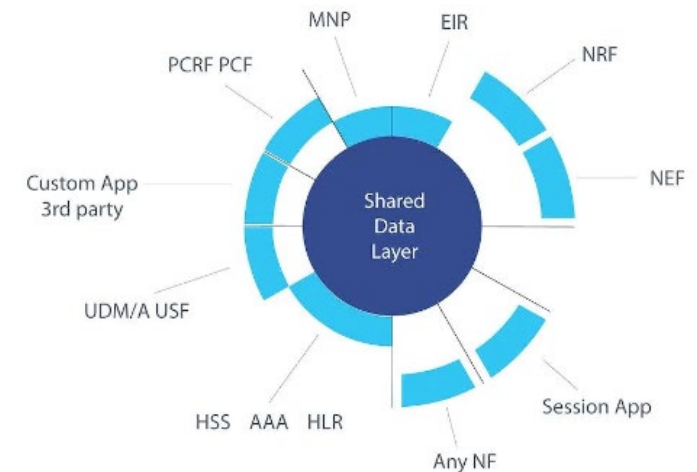
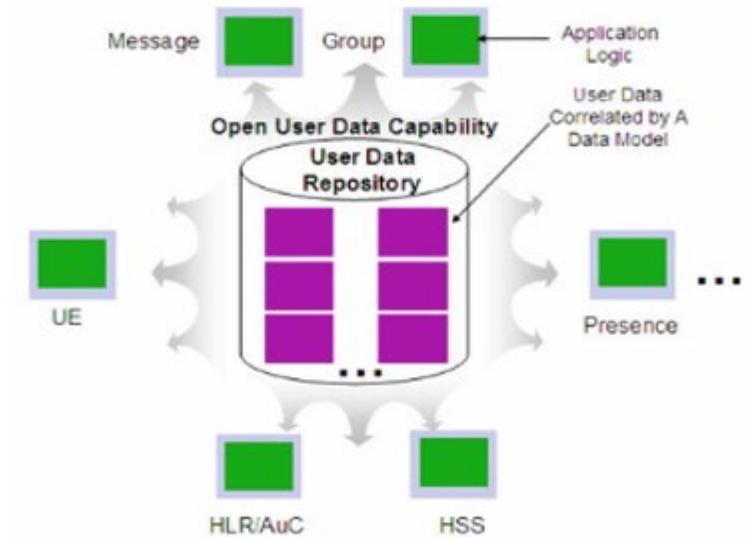
Fixed-Mobile Access Gateway

- Common SMF for fixed-mobile converged interworking
- UPF Packet Forwarding Control based on 3GPP Sx/N4 interface
- Dynamic UPF selection based on APN/DNN
- 5G services over any access!

- New services will require complete “connectivity agnosticism” with subscriber expectation of seemingly infinite service quality and ubiquitous connectivity.
- Enabling a massive scale in access, coupled to an evolved converged core, or new universal adaptive core control function that provides seamless service control and resilient continuity for all devices and associated flows..

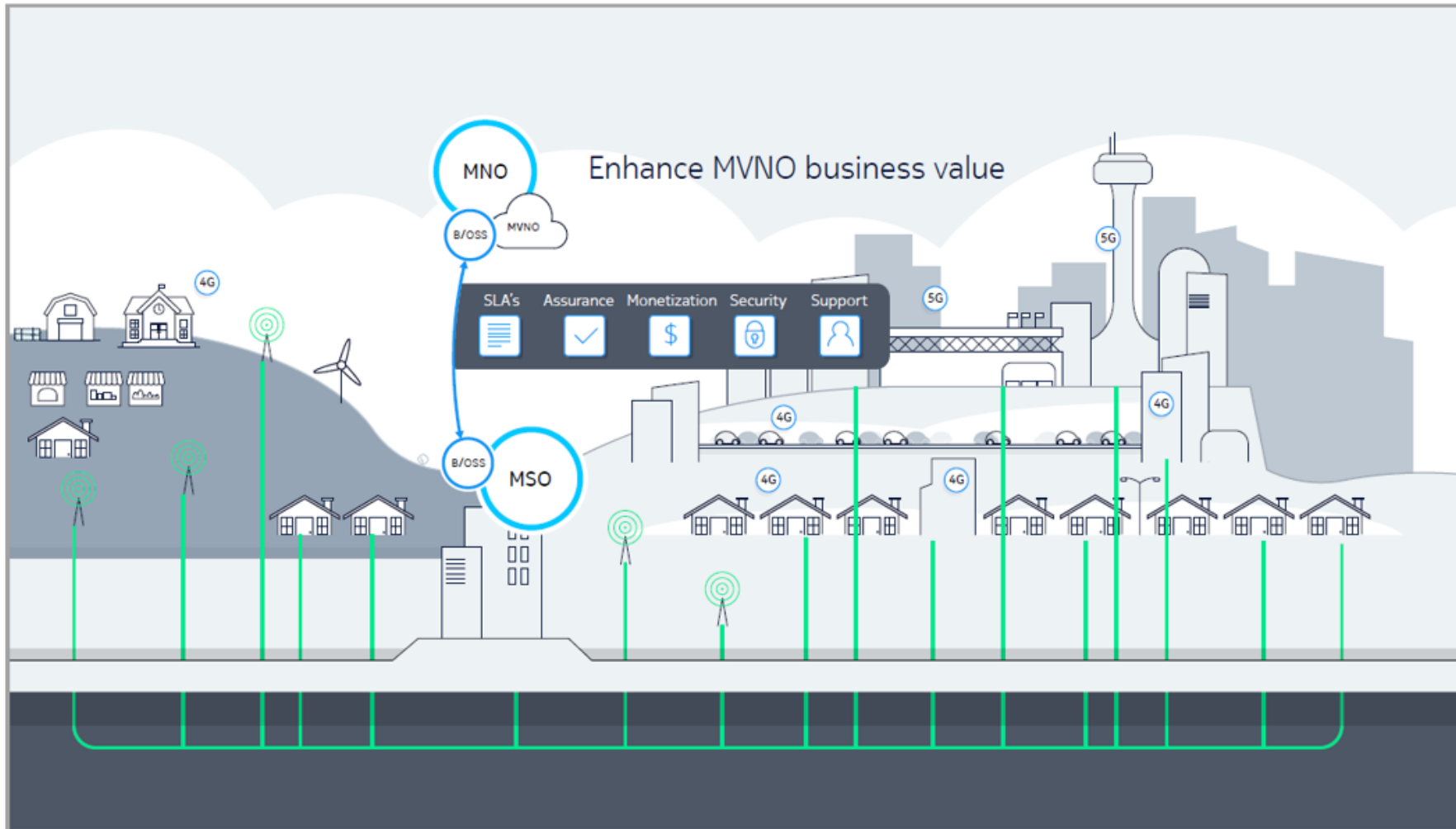
Why Converging networks requires a new approach

- Convergence of network and user data
 - Achieving the right convergence of fixed and mobile networks will mean rethinking the way you currently collect, aggregate, and normalize service and experience data from different access networks
 - Leveraging a User Data Repository (UDR) eliminates data redundancy, error, complexity and operational inefficiencies
 - The shared data layer (SDL) will enable optimal fixed wireless convergence of network and subscriber data



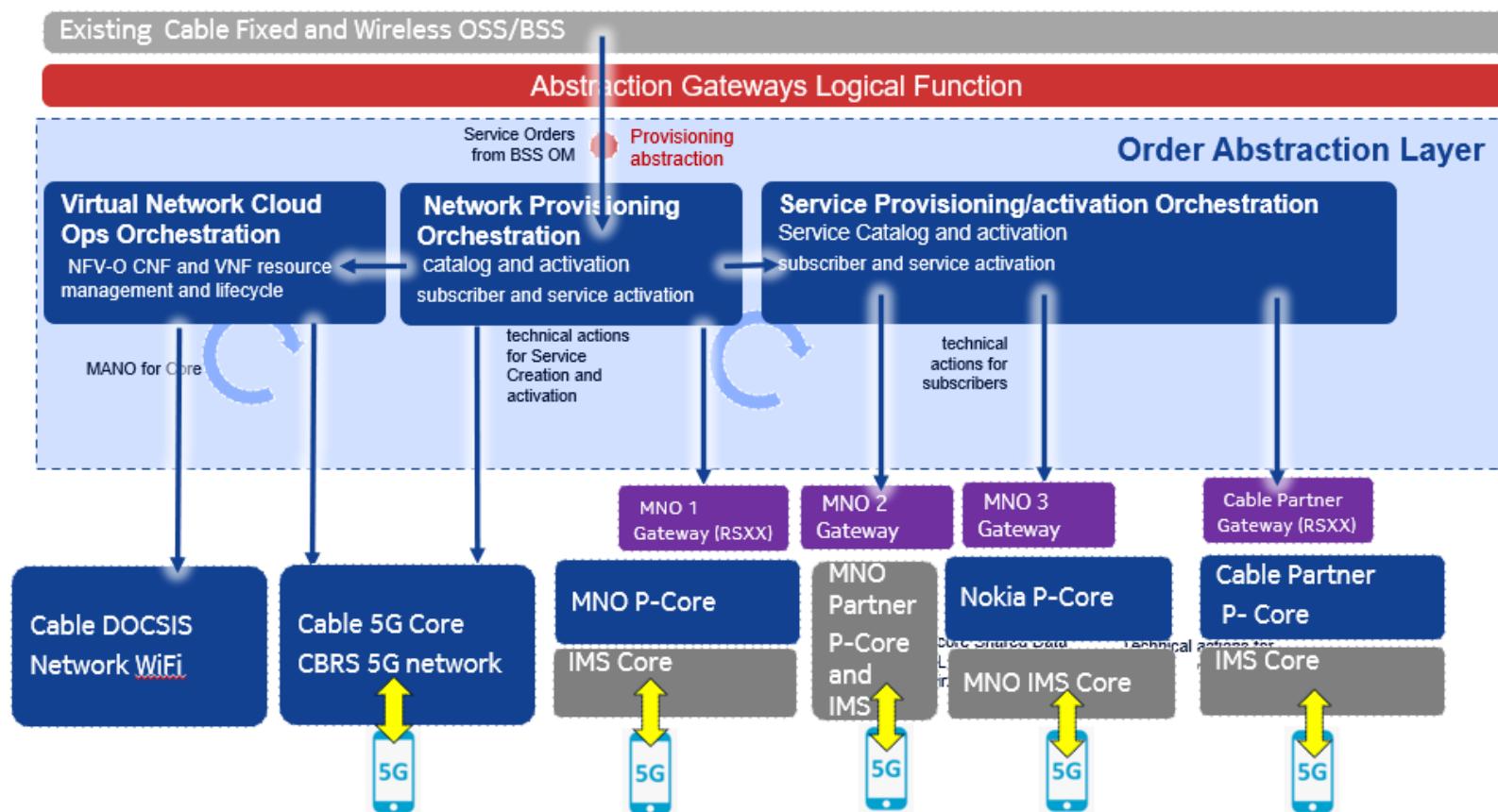
Why Converging networks requires a new approach

- Getting a converged view of subscribers on multiple networks



Why converging networks requires a new approach

- Simplifying Order management for multiple network service access



- **Not all convergence is the same** : Cable operators with multiple Fixed and Wireless networks will need to execute the right convergence architecture to offer, manage and assure network agnostic services
- **True Network Agnostic Services** : Customers will expect to access services and applications regardless of the countless dynamic handoffs which will occur between Wi-Fi, MVNO 4/5G, and CBRS 5G core and RAN owned or partnered.
- **Isolate Current Complexities** : An affective strategy is isolating B/OSS and normalizing network and subscriber data of current fixed and networks from services, devices to enable universal customer experience and situational awareness.
- **Its Convergence at the Network, Data and IT that counts** : Converging at the right points across multiple Cores enables an aggregated umbrella management architecture to provision, activate, assure, control, and measure customer experience via analytics insights, while enforcing entitlements, managing devices, service profiles and policies of services for customers across all fixed and mobile network domains.



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Thank You!

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