



19 JAN - 8 FEB, 2021
ASIA TELECOM SUMMIT

Wi-Fi & 5G **The Path to Convergence**

Steve Andrews
2nd Feb 2021: 08:30 PST

#WGC | #wifirevolution | #lovewifi | #openroaming





Moderator Introduction & Welcome

STEVE ANDREWS

CHAIRMAN LUMINET, NED EDGEWATER WIRELESS & WBA BOARD ADVISOR





ASIA TELECOM SUMMIT

We would like to thank all our sponsors!



Asia Telecom Summit

Full Program Agenda

3rd – 4th February – WBA Members Only Working Sessions

Start time: 10:00 ET; 07:00 PT; 23:00 Singapore; 15:00 GMT

4th February – WBA Members Only Working Sessions: **Briefing for Asia-based members**

Start Time: 08:30 GMT; 16:30 Singapore – 09:30 CET

ASIA TELECOM SUMMIT OPEN CONFERENCE:

Start time 16:00 Singapore; 08:00 GMT; 03:00 ET; 00:00 PT

Tuesday 19th January

WBA Executive
Plenary



Wednesday 27th January

OpenRoaming®:
Transforming
Public & Guest
Wi-Fi



Thursday 28th January

Next Generation of
Wi-Fi



Tuesday 2nd February

Wi-Fi & 5G: The Path
To Convergence

16:00 PM Singapore

Wi-Fi & 5G: The Path
To Convergence

08:30 AM PST

Monday 8th February

Next Gen Wi-Fi
&
IoT



Wi-Fi & 5G: The Path to Convergence



Steve Andrews

Chairman Luminet,
NED Edgewater
Wireless &
WBA Board Advisor



Paul Crane

Head of Mobile,
Wireless & Network
Services
BT



Jonas Björklund

CTO
Aptilo Networks



Nigel Bird

NGN Standardization
Manager
Orange



Wi-Fi & 5G: The Path to Convergence



Binita Gupta

Sr. Staff Systems
Architect
Intel Corporation



Florin Baboescu

Senior Principal
Scientist
Broadcom



Mark Grayson

Distinguished
Consulting Engineer
Cisco



Bruno Tomás

Director of Programs
Wireless Broadband
Alliance

Wi-Fi & 5G: The Path To Convergence



TODAY'S AGENDA	
16:30am (GMT)	Moderator Introduction & Welcome Steve Andrews, Chairman Luminet, NED Edgewater Wireless & WBA Board Advisor
16:35am (GMT)	Delivering new architecture for 5G over Wi-Fi: RAN Convergence Paul Crane, Head of Mobile, Wireless & Network Services, BT
16:55am (GMT)	Maximizing Wi-Fi Opportunities in the 5G Era Jonas Björklund, CTO, Aptilo Networks.
17:15am (GMT)	Overview: WBA's 5G Workgroup program Nigel Bird, NGN Standardization Manager, Orange
17:25am (GMT)	Overview of WBA's Latest White Paper: 5G & Wi-Fi RAN Convergence. Aligning the Industry on Opportunities & Challenges Binita Gupta, Senior Systems Architect, Intel; Florin Baboescu, Senior Principal Scientist, Broadcom; Mark Grayson, Distinguished Consulting Engineer, Cisco
18:05am (GMT)	Moderated Q & A All
18:15am (GMT)	WBA 5G Program: What next? Bruno Tomás, Director of Programs, Wireless Broadband Alliance
18:30am (GMT)	Close Steve Andrews, Chairman Luminet, NED Edgewater Wireless & WBA Board Advisor



Delivering new architecture for 5G over Wi-Fi: RAN Convergence

PAUL CRANE

HEAD OF MOBILE, WIRELESS & NETWORK SERVICES



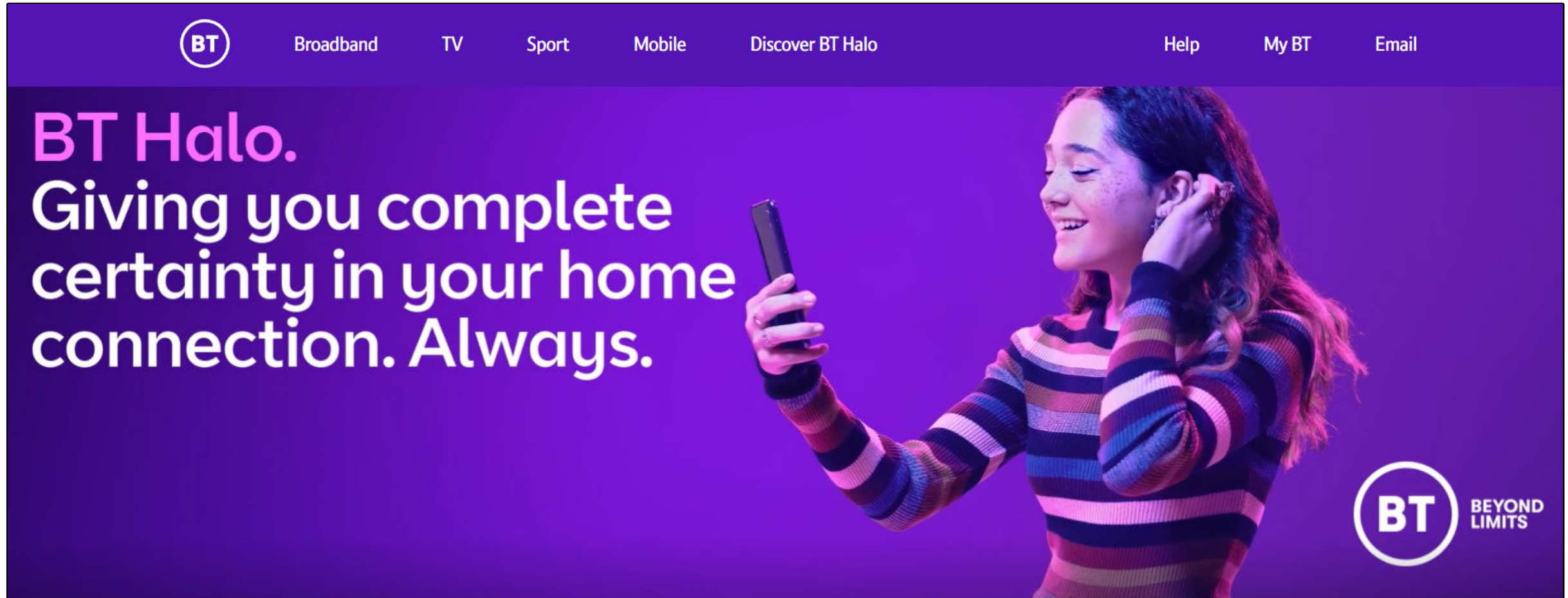
Connecting for good: Wi-Fi and 5G convergence

Paul Crane
Networks research director
BT





Why Convergence?

A promotional banner for BT Halo. The background is a solid blue color. On the right side, there is a photograph of a young woman with long brown hair, wearing a blue and white striped sweater, smiling and holding a black smartphone. On the left side, there is white text. The top navigation bar is blue and contains the BT logo, links for Broadband, TV, Sport, Mobile, Discover BT Halo, Help, My BT, and Email. The main text reads 'BT Halo. Giving you complete certainty in your home connection. Always.' The BT logo and 'BEYOND LIMITS' tagline are in the bottom right corner of the banner.

BT Broadband TV Sport Mobile Discover BT Halo Help My BT Email

BT Halo.
Giving you complete
certainty in your home
connection. Always.

BT BEYOND LIMITS

Connectivity needs

Further, Faster,
Cheaper



Security and trust
under threat



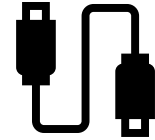
Sustainability



Wireless connectivity will
be essential



Reliability, latency &
coverage will be vital



Many more
machines than
people connected



Emerging service needs



Collaboration



Entertainment

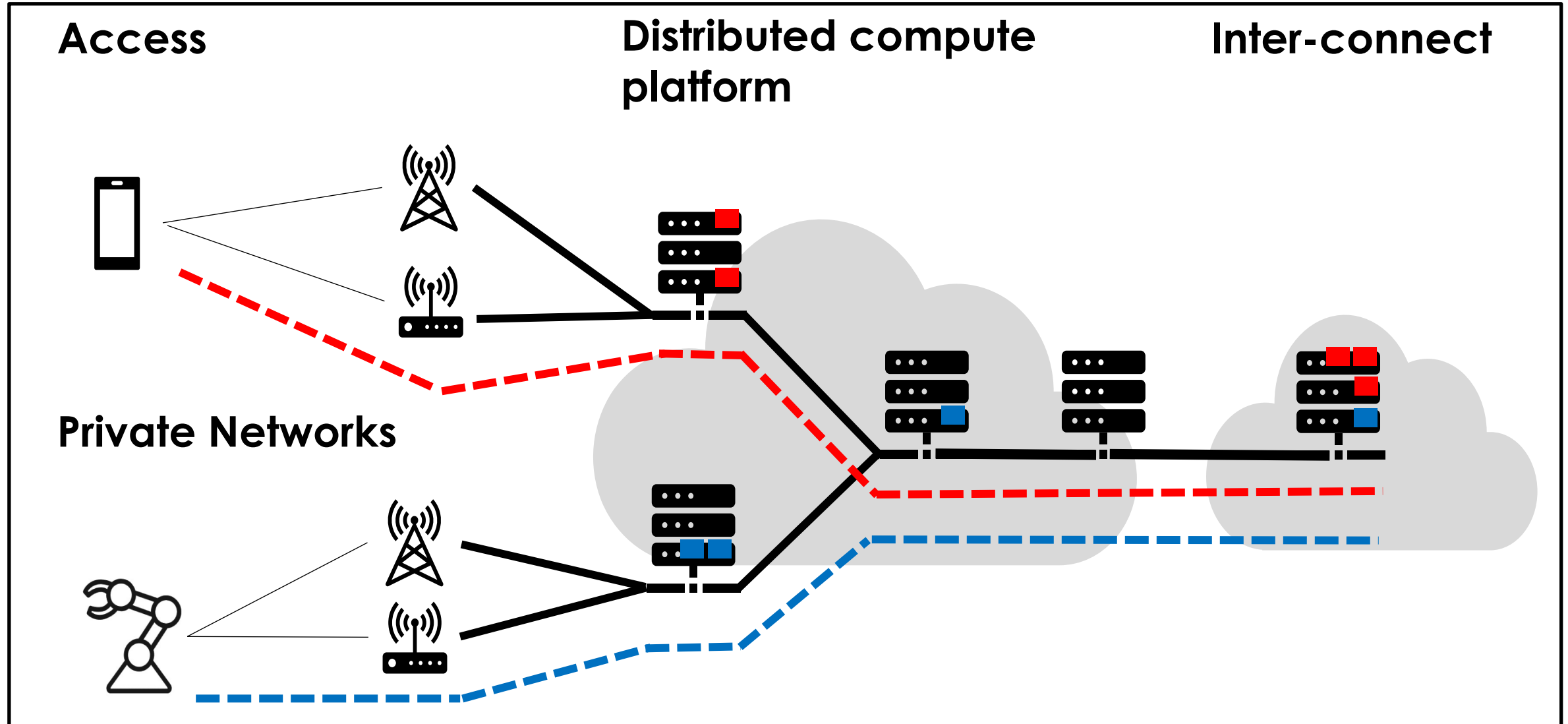


Education

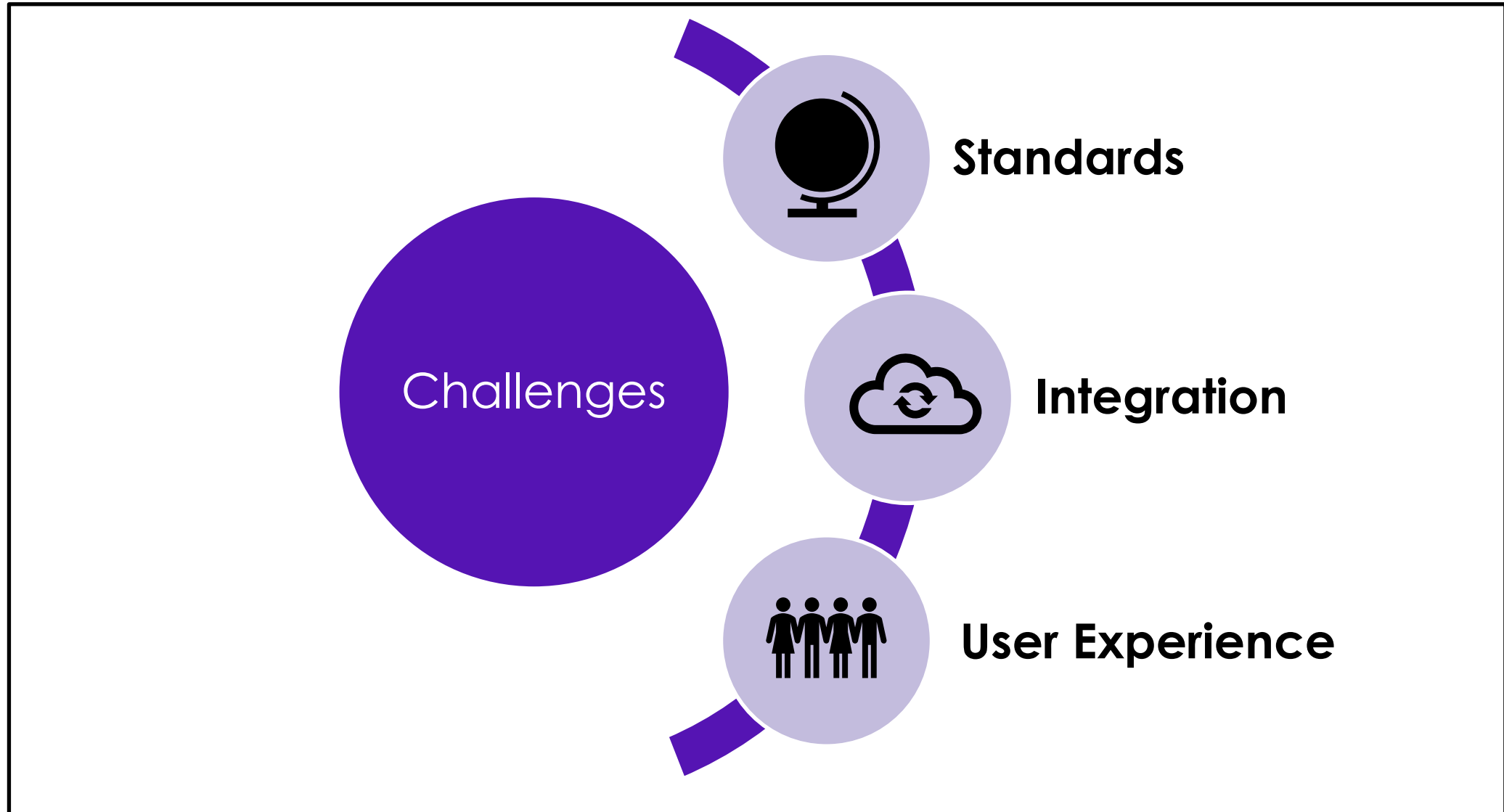


Inform

Converged network platform



Enablers for success



Connecting for good

Paul Crane
Networks research director
BT





Offices Worldwide

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Maximizing Wi-Fi opportunities in the 5G era

JONAS BJÖRKLUND

CTO, APTILO NETWORKS



Step Up Your Wi-Fi and IoT.



MAXIMIZING WI-FI OPPORTUNITIES
IN THE 5G ERA

JONAS BJÖRKLUND, CTO

APTILO NETWORKS [EST. 2001]



WORLDS #1

PROVIDER OF WI-FI SERVICE MANAGEMENT
FOR LARGE SCALE WI-FI DEPLOYMENTS



+200 MILLION
PEOPLE POWERED WITH WI-FI



+100
CARRIER WI-FI CUSTOMERS



+75
COUNTRIES

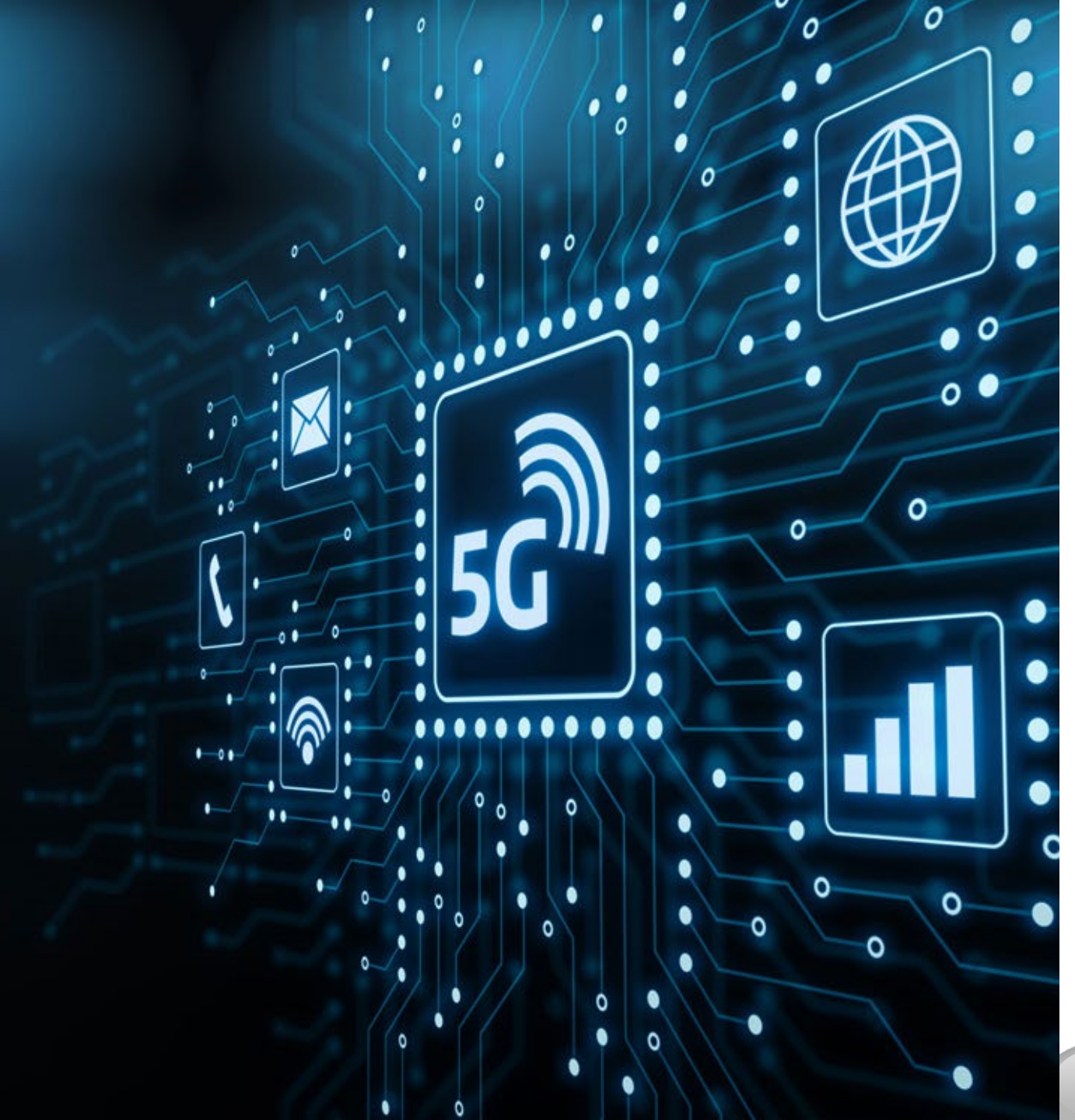
MNOs MUST RENEW THEIR WI-FI STRATEGIES



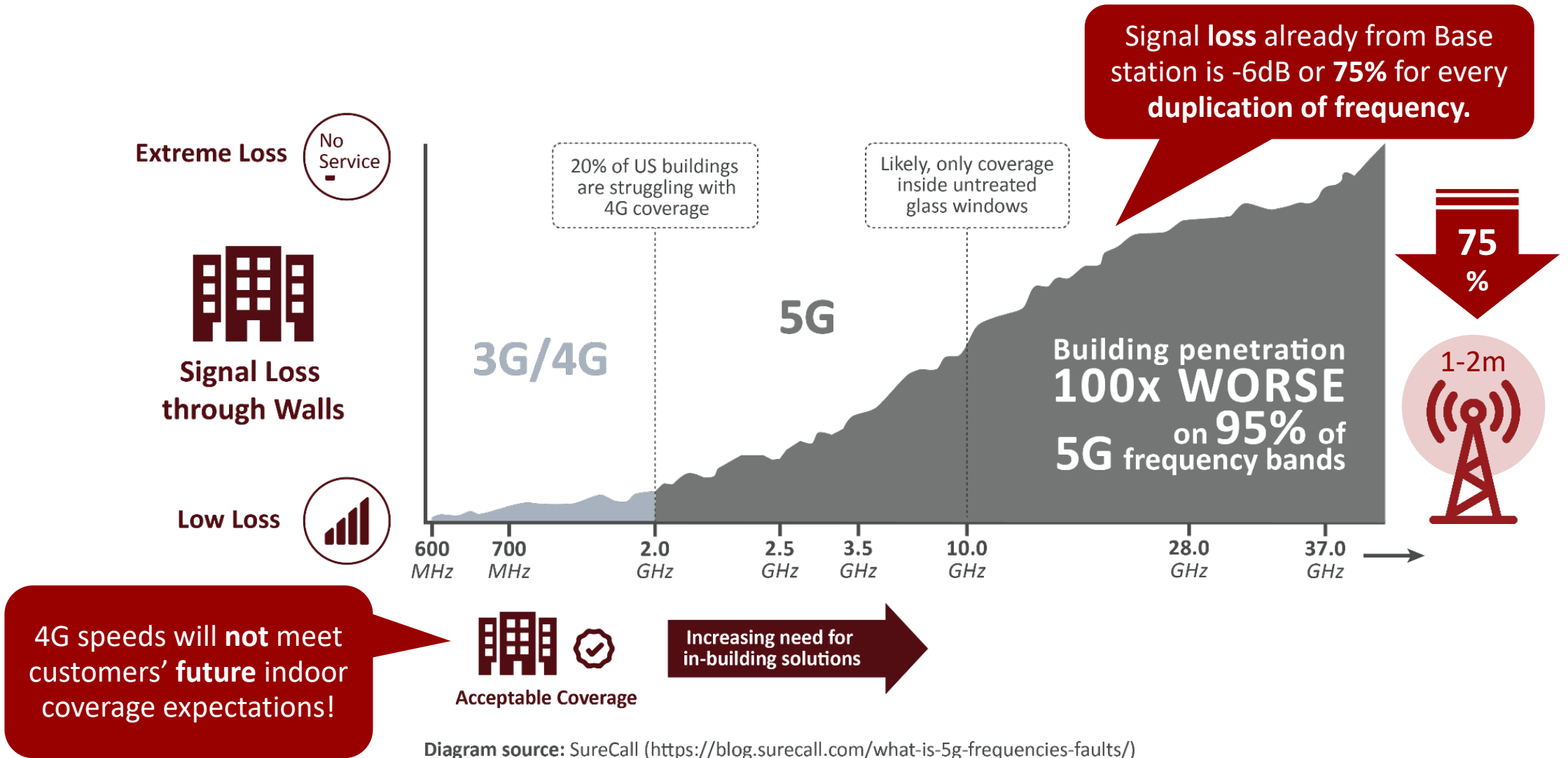
Great my customers
connect to other
peoples' networks!

THE PROMISES OF 5G

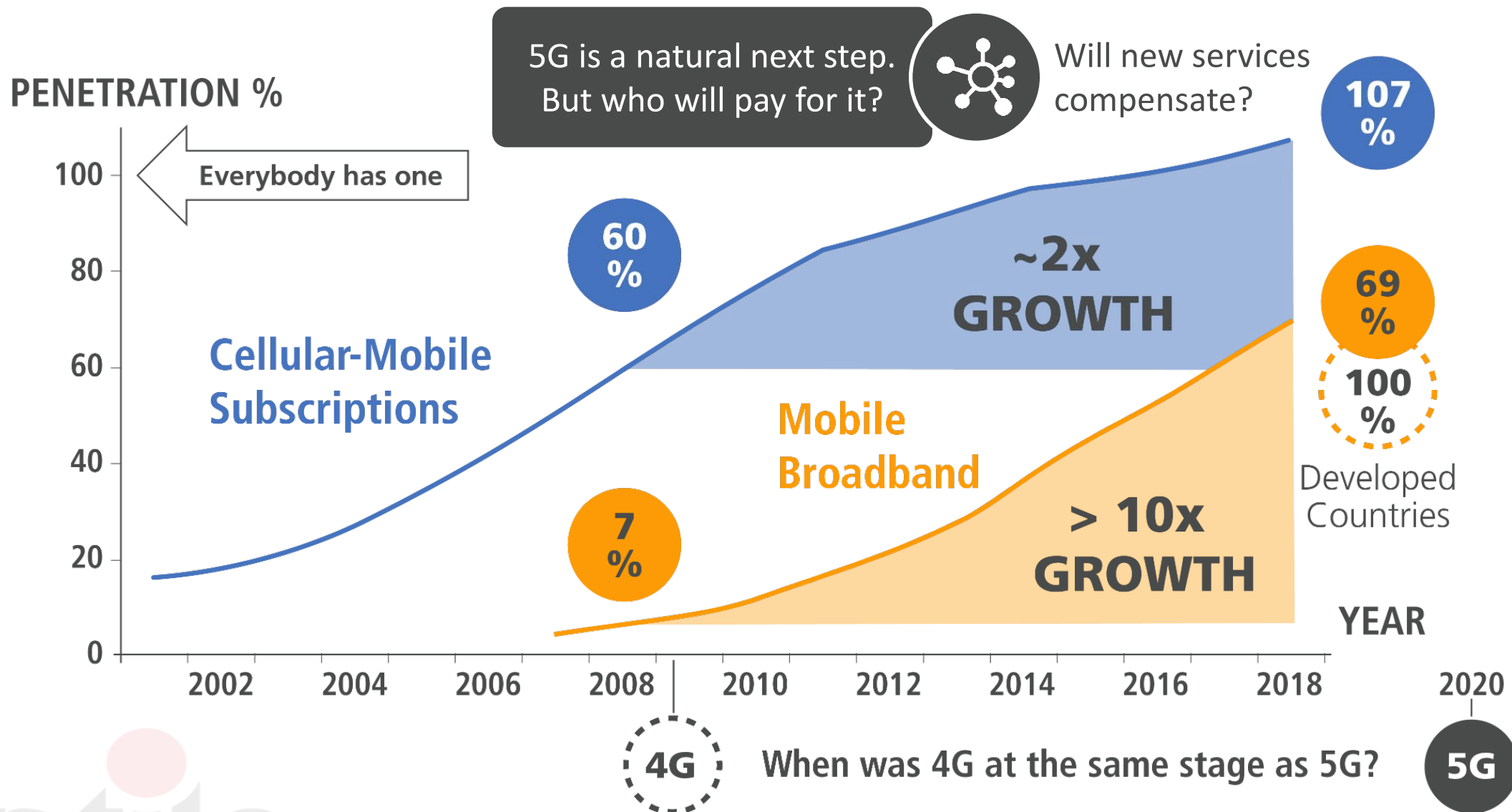
But there are
some challenges!



5G: ~100X HARDER TO PENETRATE WALLS



PREDICTING THE FUTURE LOOKING AT THE PAST



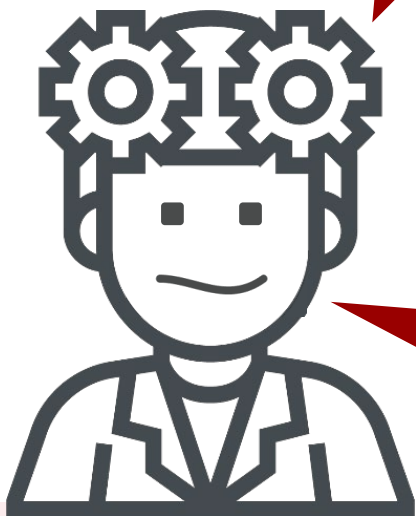
Source: ITU World Telecommunication/ICT Indicators database

THINGS HAVE CHANGED **WI-FI IS NOT THE FOE!**

MNO's traditional perspective

Wi-Fi is only
"best-effort"

....and it runs on
unlicensed
spectrum.



I like
Wi-Fi too!

3GPP
ADVOCATES

Reality check 2021

Wi-Fi 6 has OFDMA



Wi-Fi 6 has scheduling similar to LTE



6 GHz: The Wi-Fi spectrum will triple!



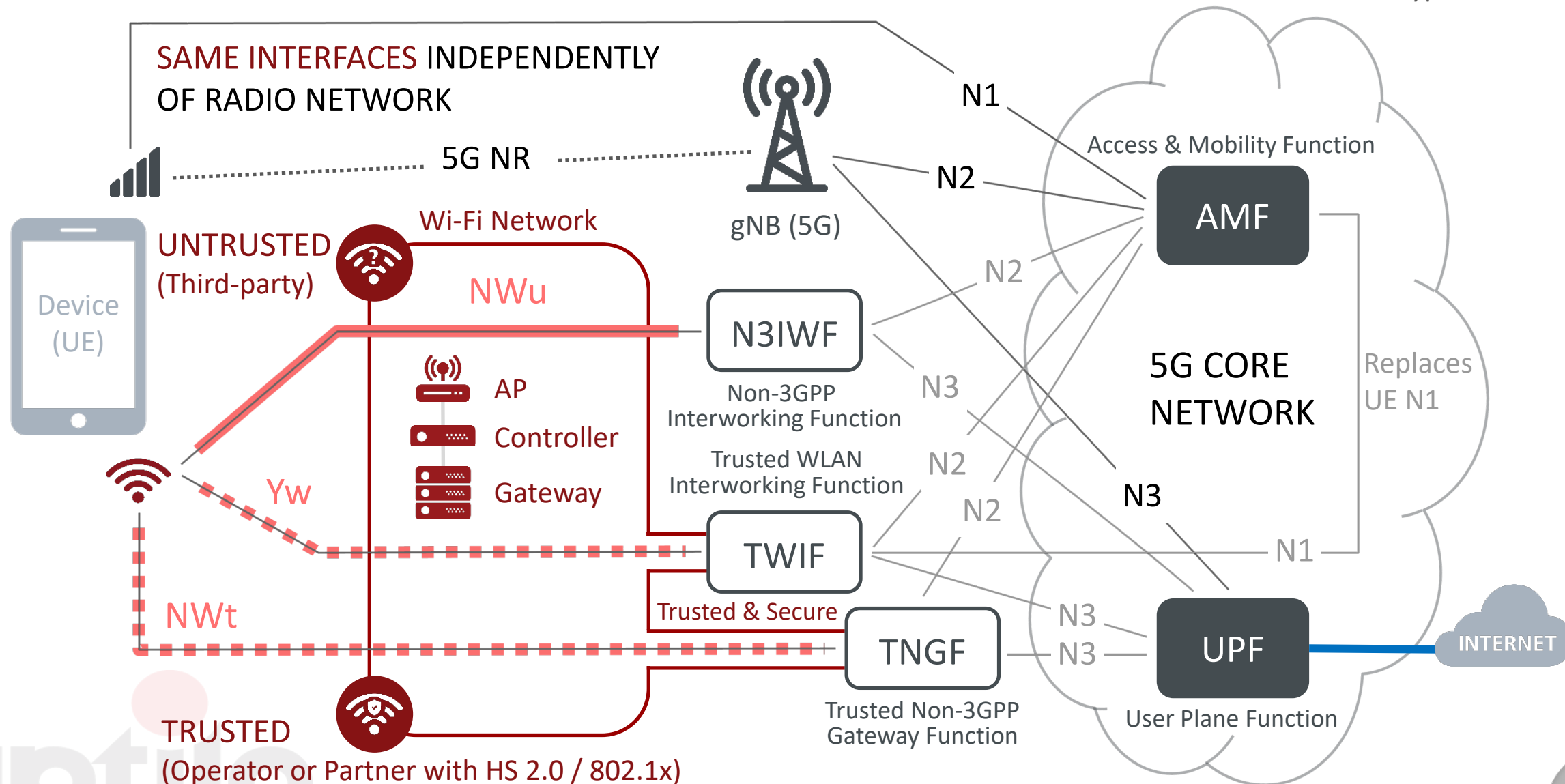
Wi-Fi for indoor coverage



Wi-Fi for additional capacity

5G AND WI-FI RAN CONVERGENCE

— IPSec*
 - - - IPSec* with NULL encryption



ATSSS ACCESS TRAFFIC STEERING, SWITCHING & SPLITTING

 The holy grail of 3GPP integration

 Rely on multipath technology

 Rely on device support

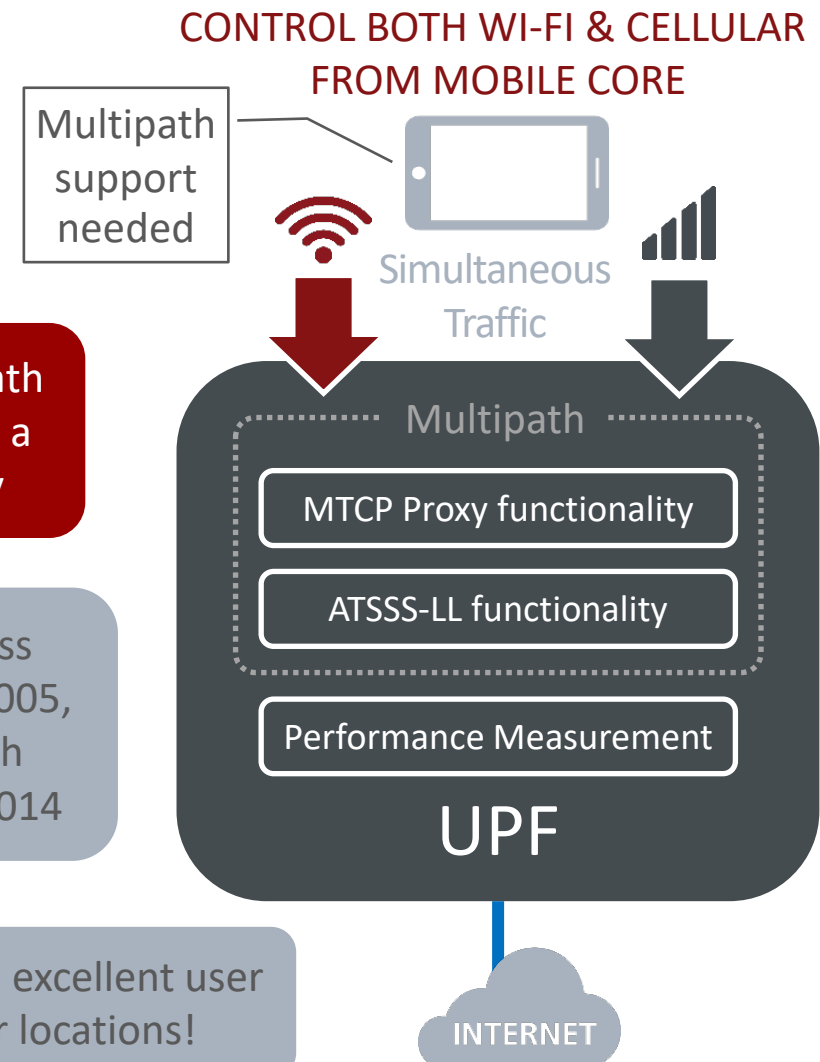
 Still very early days!

 No reason to wait!

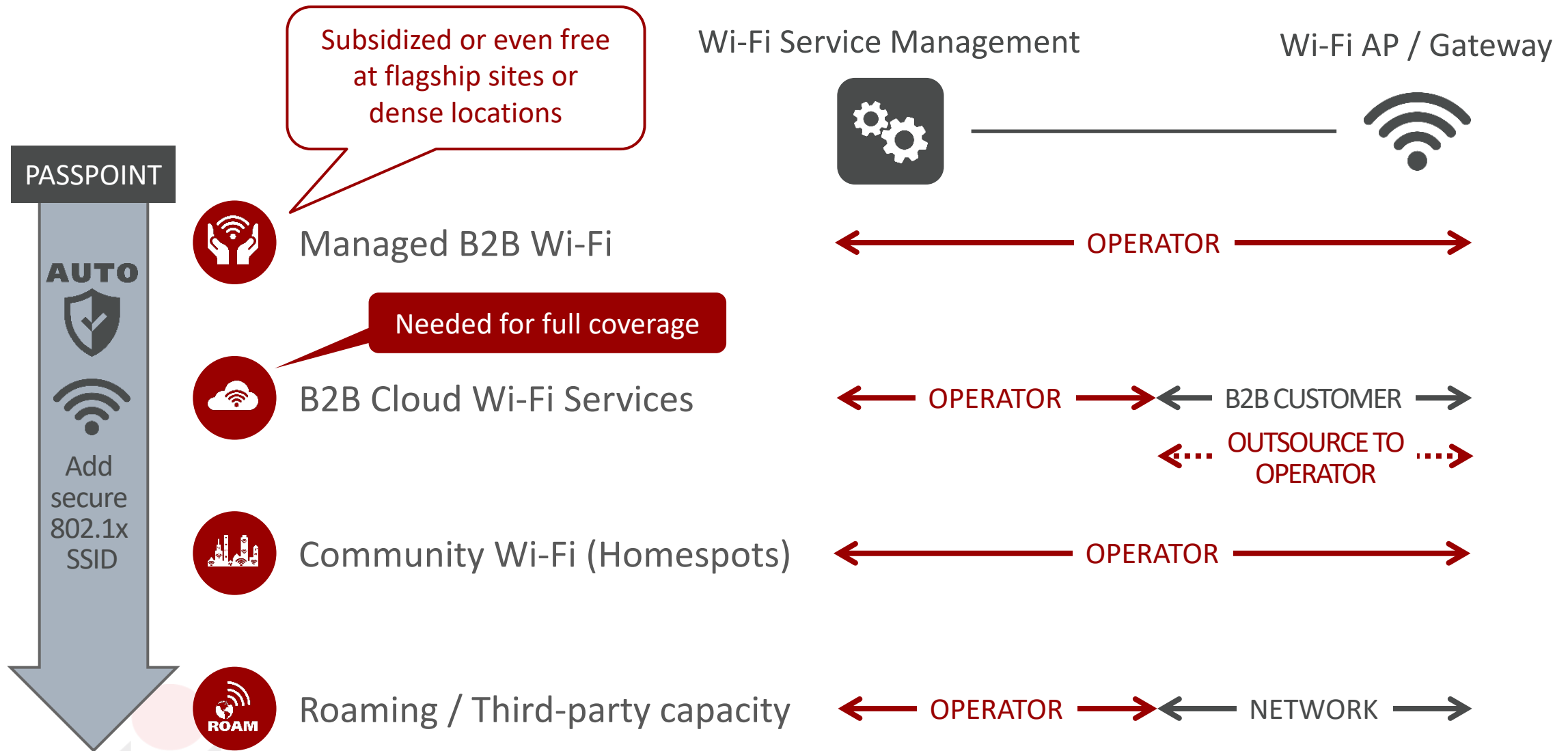
Apple use multipath for e.g Siri, but in a proprietary way

Untrusted access standardized in 2005, but took off with Wi-Fi Calling in 2014

Wi-Fi 6 is already delivering an excellent user experience in dense indoor locations!



HOW TO BUILD WI-FI INDOOR FOOTPRINT?



THE FIXED & MOBILE CONVERGENCE TREND



Acquisitions and mergers globally

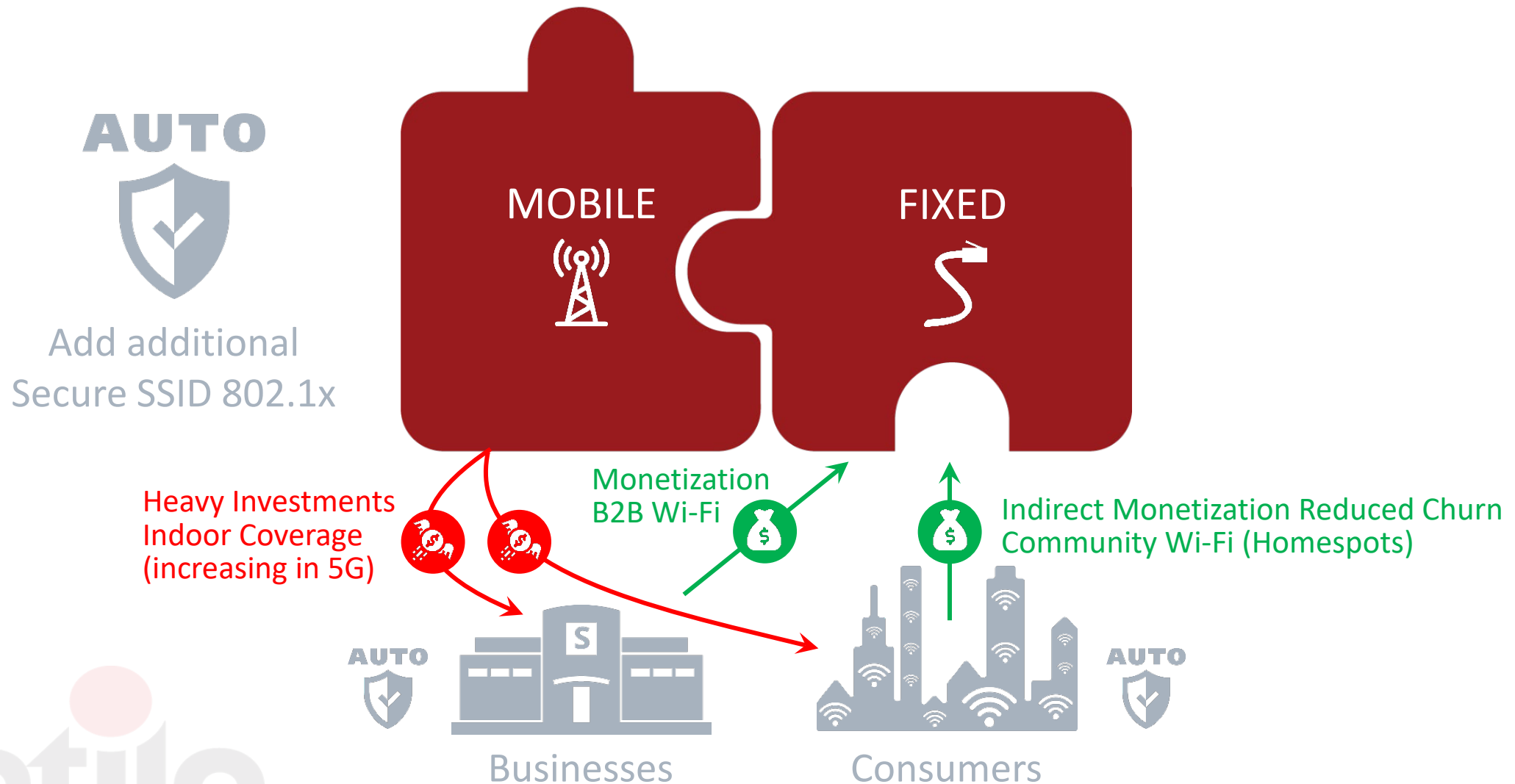
“Europe is a success story and convergence is the jewel in our crown,” said Ramon Fernandez, Orange CFO and Head of Europe.



January 2020

THE FIXED & MOBILE CONVERGENCE TREND

IS STRONG, BUT OPERATORS MUST BREAK DEPARTMENTAL SILOS TO MAXIMIZE THE VALUE



B2B WI-FI IT'S A WIN

× 5

END-USERS
WIN

BUSINESS
CUSTOMERS
WIN

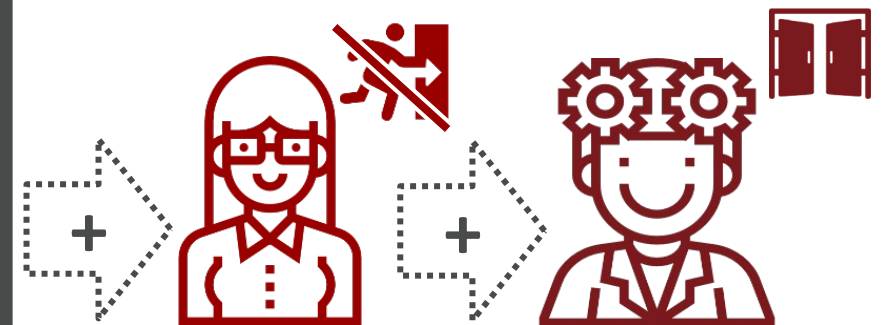


BUSINESS TO
BUSINESS (B2B)
WIN



CONSUMER
BUSINESSES
WIN

NETWORK
OPERATIONS
WIN



SERVICE PROVIDER DEPARTMENTS

Step Up Your Wi-Fi and IoT.

Thank-you!

<https://www.aptilo.com>





Overview: WBA's 5G Work Group program

NIGEL BIRD

NGN STANDARDIZATION MANAGER, ORANGE



5G WORKGROUP OVERVIEW

2 February 2021

WBA storyline since 2017 work inception:

1. 5G Networks – The Role of Wi-Fi and Unlicensed Technologies
2. Network Slicing for 5G – Wi-Fi Capabilities
3. Unlicensed Integration with 5G Networks
4. WBA & NGMN RAN Convergence paper
5. **NEW** - 5G and Wi-Fi RAN Convergence



Next Steps:

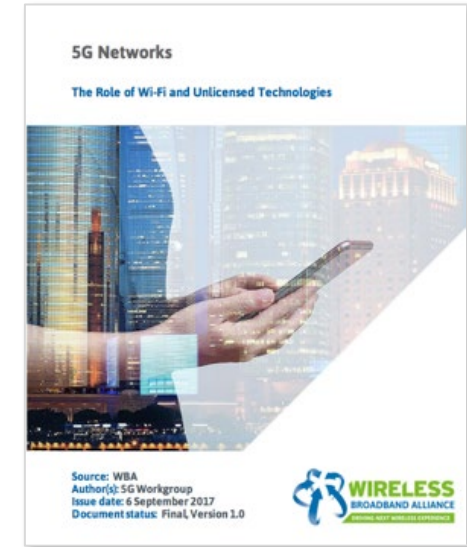
Next project –
5G and Wi-Fi
Convergence in
Private 5G
Networks

1. 5G Networks – The Role of Wi-Fi and Unlicensed Technologies

The next generation of mobile technology, 5G, is beginning to take shape. 5G intends to enable a seamless society connection, bringing people together along with things, data, applications, transport systems and cities in a 'smarter' networked communication environment.

This whitepaper provides initial assessment on how Wi-Fi and other unlicensed technologies will contribute to the 5G framework definition.

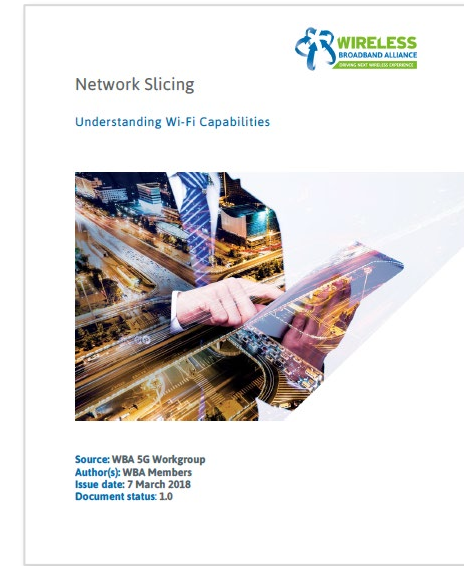
The whitepaper also explores the opinions of more than 65 companies across the globe.



2. Network Slicing for 5G – Wi-Fi Capabilities

In this paper, the WBA explains how Wi-Fi operators can embrace the slicing concepts being defined by 3GPP and leverage the already existing capabilities to deliver sliced Wi-Fi networks today.

It also demonstrates how the key network slicing requirements associated with the access network can be addressed using commercial Wi-Fi capabilities

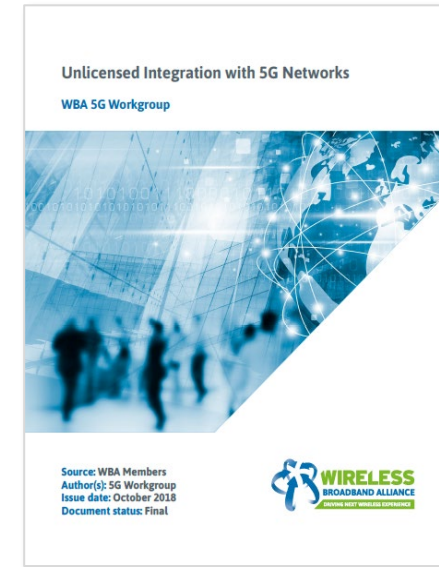


3. Unlicensed Integration with 5G Networks

This whitepaper outlines the options and alternative approaches available for combining access over Wi-Fi and cellular based networks in the run up to 5G.

The report builds on the WBA's previous report, to provide an analysis of the varied approaches for integrating cellular and Wi-Fi networks and defines three alternative approaches to integration describing key requirements for each approach:

- Access Centric Solutions integrate Wi-Fi into the cellular access-stratum.
- Core Centric Solutions integrate Wi-Fi into the cellular non-access stratum core network.
- Above-the-core Centric Solutions integrate Wi-Fi above-the-core network using IETF defined multi-path protocols.



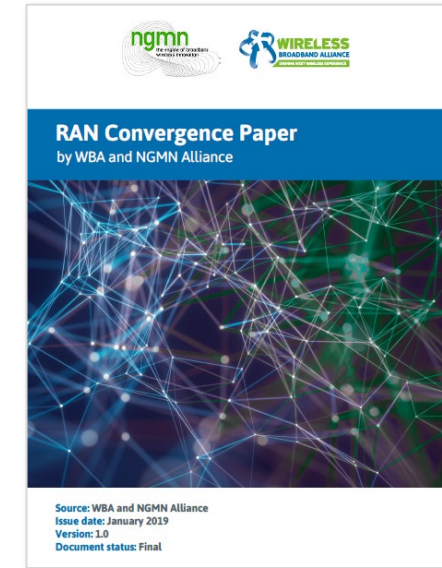
4. WBA & NGMN RAN Convergence paper

This White Paper, explores the importance of existing and future Wi-Fi and cellular convergence, highlighting techniques that enable convergence and identifying solutions to bridge technology gaps – critically this is a major step towards realizing the full benefits of the 5G vision enabled by Wi-Fi.

The paper outlines how mobile operators will benefit from the convergence of Wi-Fi and 5G by gaining improved visibility into Wi-Fi networks, affording them the ability to control customer experience, deliver better services to customers and provide enterprise Wi-Fi network management solutions to enterprise customers.

Wi-Fi operators will benefit from convergence by gaining improved visibility and transition management as they operate overlapping cellular and Wi-Fi networks, ultimately resulting in an improved user experience.

Additionally, enterprise Wi-Fi networks will gain the ability to access operator-provided 5G services.



5. NEW - 5G and Wi-Fi RAN Convergence

This paper enhances on the previous work done in WBA and NGMN on RAN Convergence and continues to explore the topic of Cellular and Wi-Fi convergence with in-depth look at 3GPP defined solutions to support integration of WLAN with the 5G system and identifies some key challenges and gaps in current solutions which the industry needs to address.

With continued development of 5G networks in 3GPP and continued evolution of Wi-Fi technology with Wi-Fi 6/6E and Wi-Fi 7, the industry stands to benefit a great deal from the continued convergence of Wi-Fi and 3GPP systems.

This convergence can enable leveraging capabilities of both access networks to provide seamless and interoperable services to the end-users across a variety of use cases and verticals.

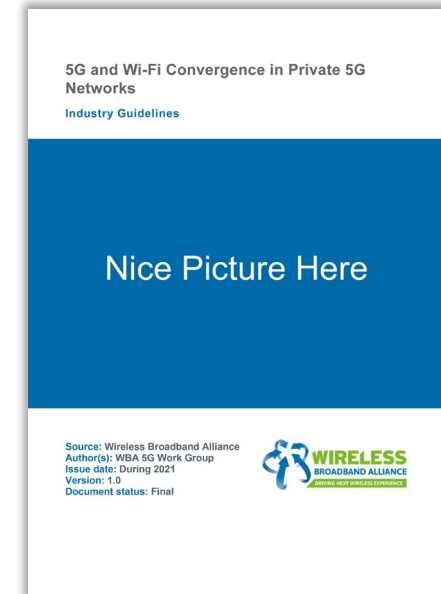


6. NEXT - 5G and Wi-Fi Convergence in Private 5G Networks

Scope of the project will be to further study, analyse and propose some high level solutions and guidelines following key challenges and gaps identified to enable the Wi-Fi and 5G convergence in private 5G networks.

The main objectives of the project will be:

- Capture business opportunities for Wi-Fi and 5G convergence in private 5G networks
- Document analysis, approaches and potential solutions related to identified challenges of convergence in private 5G networks
- Deployment guidelines for converged Wi-Fi and 5G private networks
- Potential trials for Wi-Fi and 5G convergence in private 5G networks.



Three Main Parts:

Part I (Chapter 2):

- 3GPP state-of-the-art of integrating WLAN with the 3GPP 5G system Release 15 and 16.
- WLAN integration architecture, related features, functions, policies and associated procedures.

Part II (Chapter 3):

- Identifies key challenges and gaps in current 3GPP-defined solutions to support interworking between WLAN and 3GPP 5G system
- Suggests high-level solutions to address some of the identified gap items.

Part III (Chapter 4 & 5):

- Provides recommendations and next steps for the industry and the relevant standard bodies to address the key challenges and gaps related to the 5G and Wi-Fi convergence.

Key Messages Cover:

- 5G and Wi-Fi Convergence Architecture
- ATSSS Multi-Access Steering Functionality
- End-to-end QoS Support
- Policy Interworking and Enhancements across 5G and Wi-Fi
- Support for Wi-Fi only devices

Our three presenters, and paper contributors, will cover the technical areas as follows:



Co-leader & Editor: Binita Gupta (Intel)
Integration Architecture, Wi-Fi Only Devices, End-to-end QoS



Co-Chair: Florin Baboescu (Broadcom)
3GPP ATSSS Multi-Access Functionality



Co-Chair: Mark Grayson (Cisco)
Enhancing Experiences using Wi-Fi and 5G

THANK YOU



5G AND WIFI CONVERGENCE

INTEGRATION ARCHITECTURE, ~~NOT~~ ONLY DEVICES, ENDO-END QoS

BINITA GUPTA

SENIOR STAFF SYSTEMS ARCHITECT, INTEL CORP.





5G and Wi-Fi Convergence

Integration Architecture, Wi-Fi Only Devices, End-to-end QoS

Binita Gupta

Sr. Staff Systems Architect, Intel Corporation



5G and Wi-Fi Convergence Opportunities

Business Drivers

Ubiquitous Wi-Fi devices

Significant Wi-Fi Advancements

Lower TCO

Higher Network Capacity

Improved Reliability

Seamless Mobility

Applications and Verticals



Enterprise/Retail



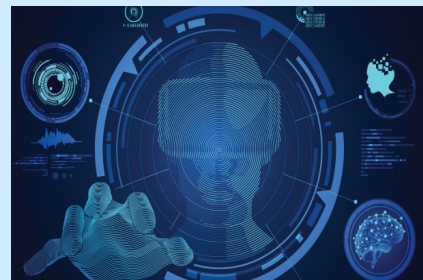
Healthcare



Smart Cities



Industry 4.0



AR/VR



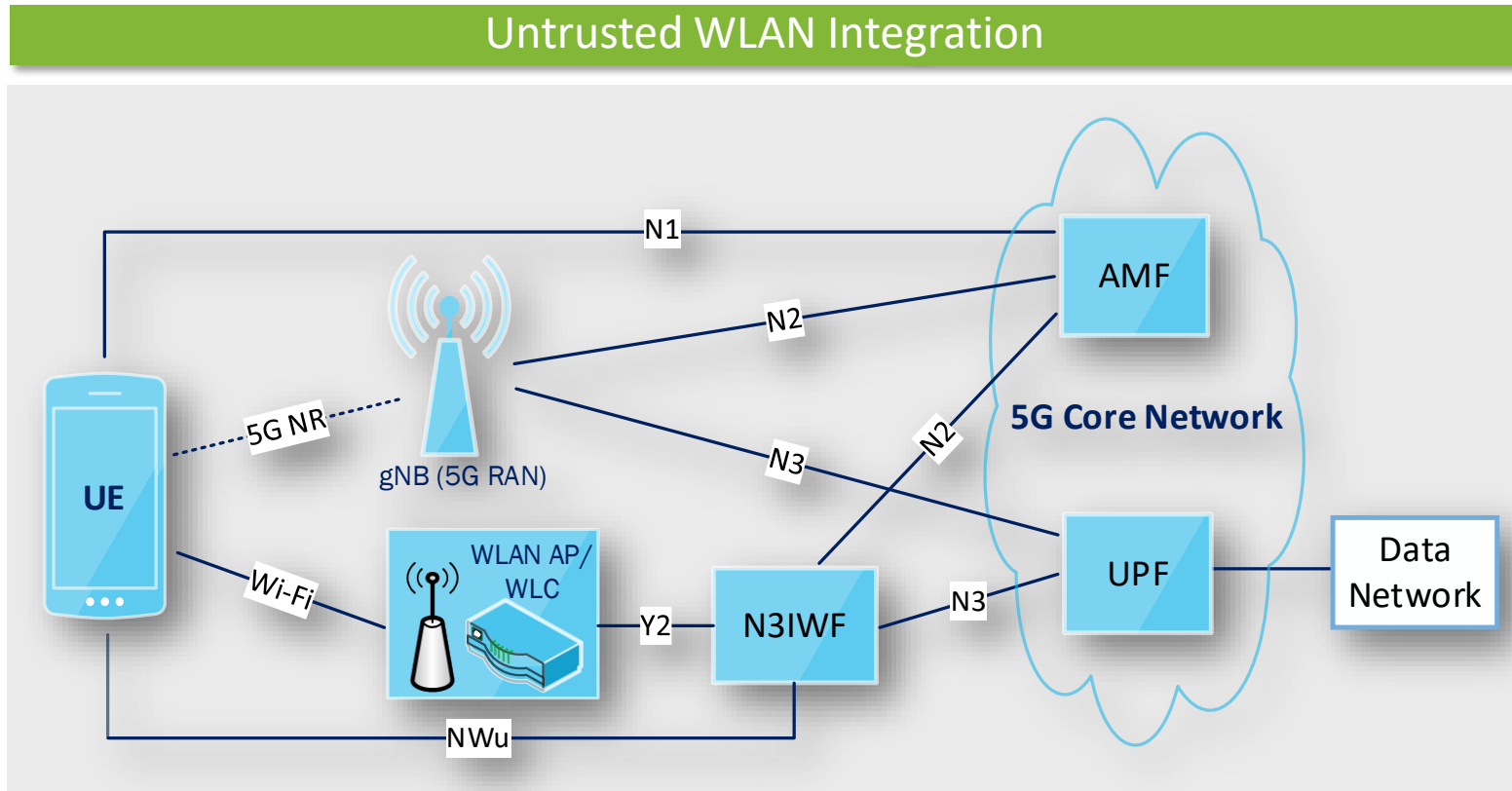
Logistics/Supply Chain

WBA 5G and Wi-Fi convergence work aims to educate the industry on convergence architecture and solutions and highlights associated challenges for the industry to address

3GPP 5G architecture supports UEs connecting to 5G core over WLAN access, without requiring primary connectivity over cellular access

Untrusted WLAN integration:

- Loose coupling over generic IP (Y2) between untrusted WLAN access and N3IWF
- IPsec tunnel between UE and N3IWF (NWu) – applies encryption for secure transport of signaling & data
- Wi-Fi Only UEs need to be 5G capable (support 5G NAS)



N3IWF: Non-3GPP Interworking Function
AMF: Access and Mobility Management Function
UPF: User Plane Function
NAS: Non-Access Stratum

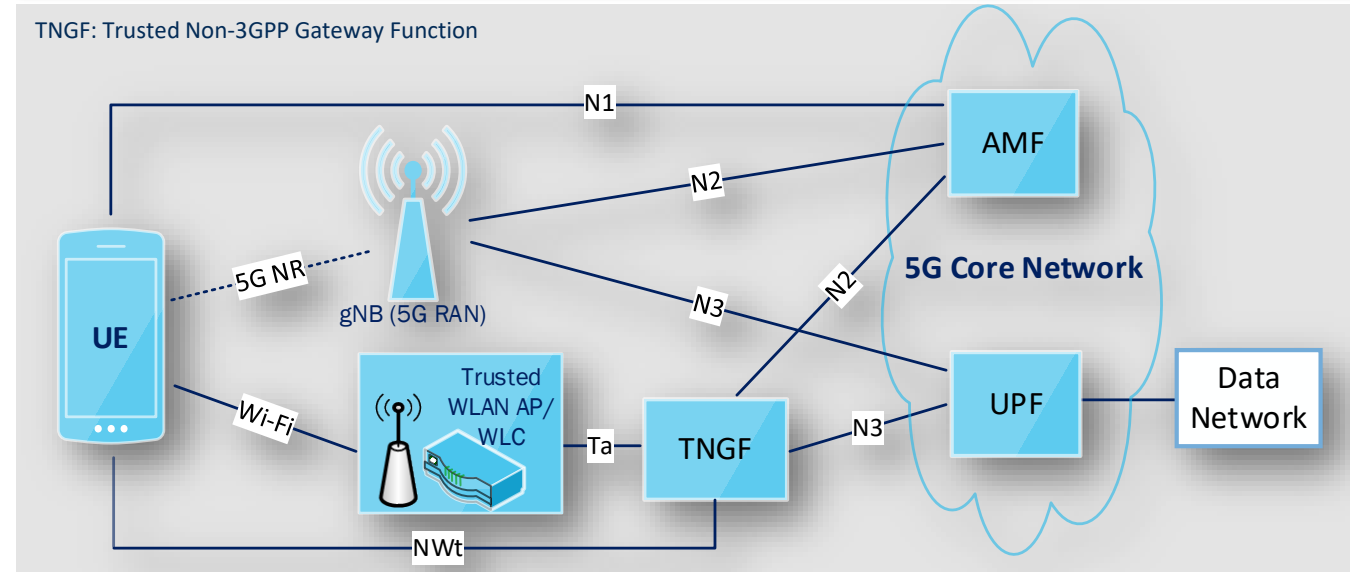
Trusted WLAN integration:

- Tight coupling between trusted WLAN access and gateway functions TNGF & TWIF
- WLAN layer-2 authentication gets tied to a key derived from UE 5G core authentication
- IPsec tunnel between UE and TNGF with NULL encryption applied (NWt), avoiding double encryption
- Non 5G Capable UEs supported via TWIF
- AAA-based interfaces Ta and Yw between WLAN access and gateway functions
- Trusted WLAN discovery can be done over 802.11 ANQP - advertise list of PLMNs with which trusted 5G connectivity is supported

ANQP: Access Network Query Protocol

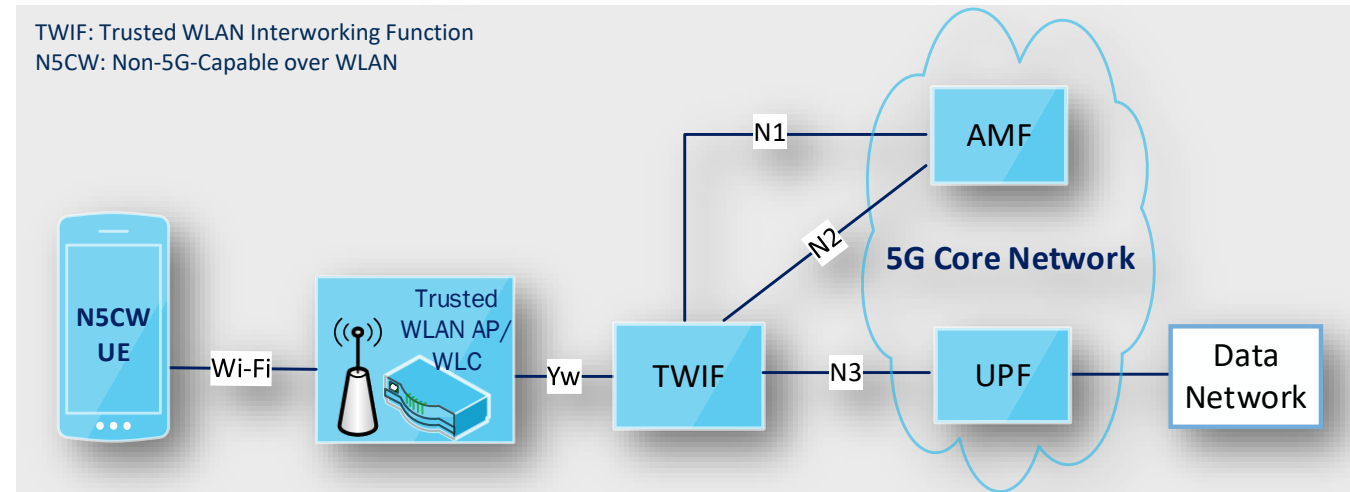
Trusted WLAN Integration

TNGF: Trusted Non-3GPP Gateway Function



5G Capable UEs

TWIF: Trusted WLAN Interworking Function
N5CW: Non-5G-Capable over WLAN

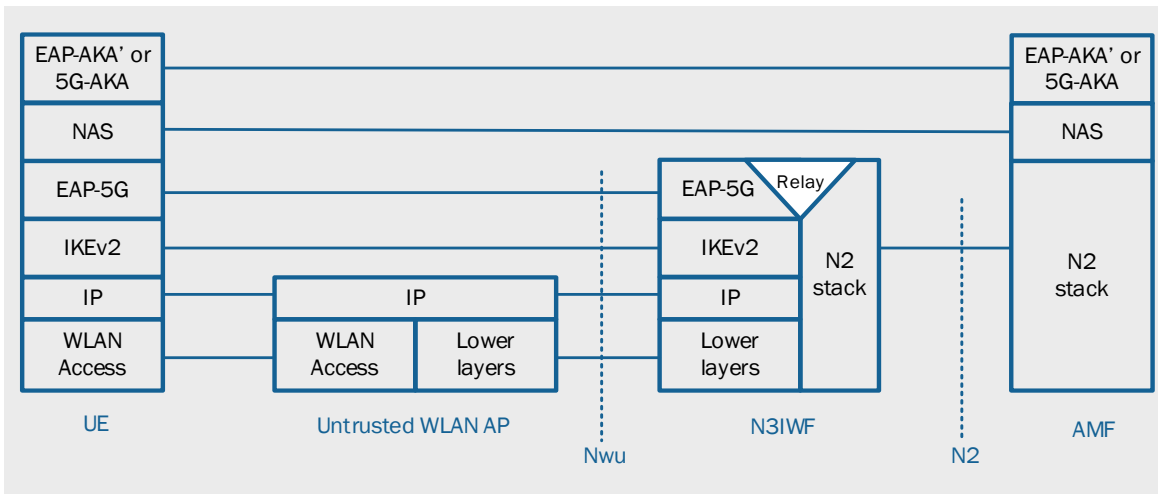


Non 5G Capable UEs

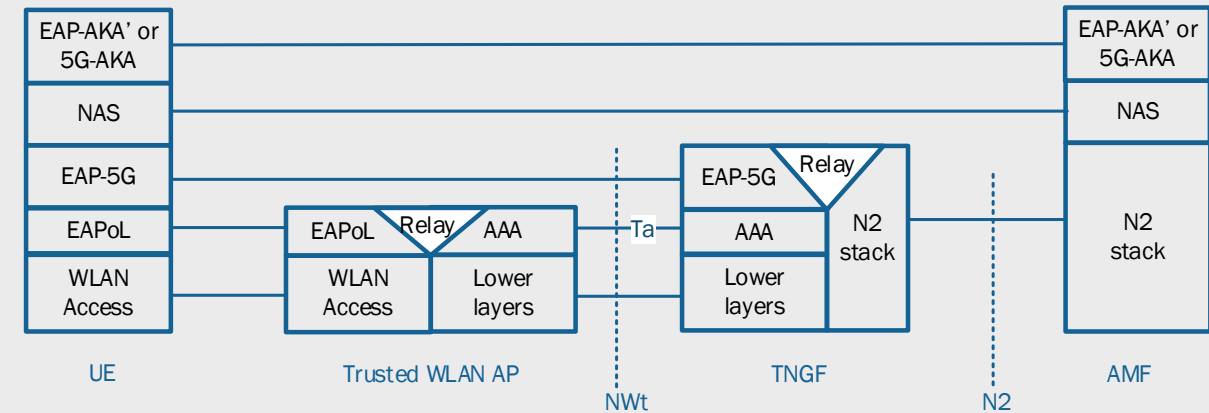
Signaling IPsec SA for control plane:

- Signaling IPsec SA created between UE and N3IWF/TNGF
- Vendor specific EAP-5G method defined for encapsulating 5G NAS messages
- For trusted WLAN, a key from TNGF/TWIF used as PMK for the 802.11 4-way handshake for WLAN security

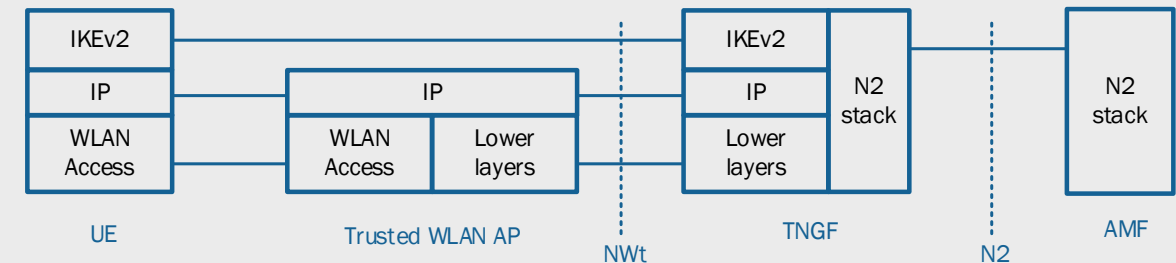
Control plane for Signaling IPsec SA for Untrusted WLAN



Control plane for Signaling IPsec SA for Trusted WLAN



Control plane over Trusted WLAN before UE is assigned IP address



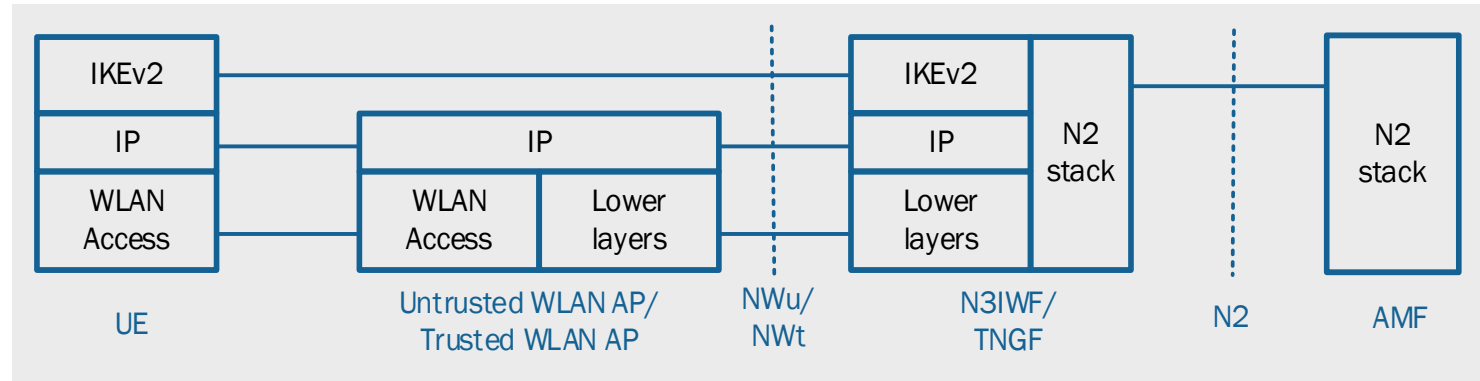
Control plane over Trusted WLAN after UE is assigned IP address

IKEv2: Internet Key Exchange Version 2
SA: Security Association

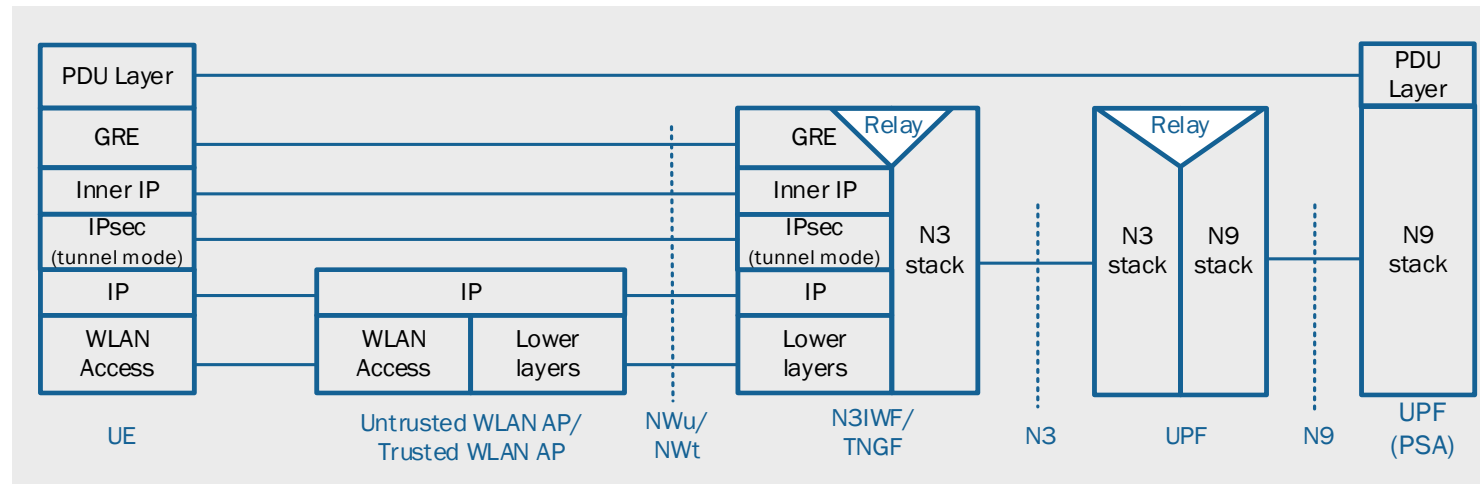
IPsec child SAs for user plane:

- PDU session establishment over WLAN access is based on procedure defined over 3GPP access
- Multi-access PDU session to carry user data over both 3GPP and WLAN access
- One or more IPsec child SAs created between N3IWF/TNGF and UE to carry user data over WLAN
- N3IWF/TNGF determine how to map 5G QoS flow(s) to IPsec child SAs
- User data packets get encapsulated in GRE packets

Establishment of User Plane IPsec child SA



User plane for transport of data over WLAN Access



GRE: Generic Routing Encapsulation

Trusted WLAN Access Selection

Advertise list of 5G PLMNs over ANQP with which trusted 5G connectivity supported by WLAN

UE to discover (over ANQP) and select a preferred WLAN network providing trusted 5G connectivity

New Capabilities on WLAN AP/WLC

Support for Ta and Yw AAA-based Interfaces on WLAN AP/WLC*

Support filtering for EAP-5G protocol messages

Support for using TNAP key from TNGF/TWIF as the PMK for 802.11 4-way handshake

New Capabilities on WLAN STA

Support filtering for EAP-5G protocol messages

Provide 3GPP specific NAI for UE for connectivity via TNGF/TWIF

"<any_non_null_string>@nai.5gc.mnc<MNC>.mcc<MCC>.3gppnetwork.org"

TNAP: Trusted Non-3GPP Access Point
PMK: Pairwise Master Key
NAI: Network Address Identifier

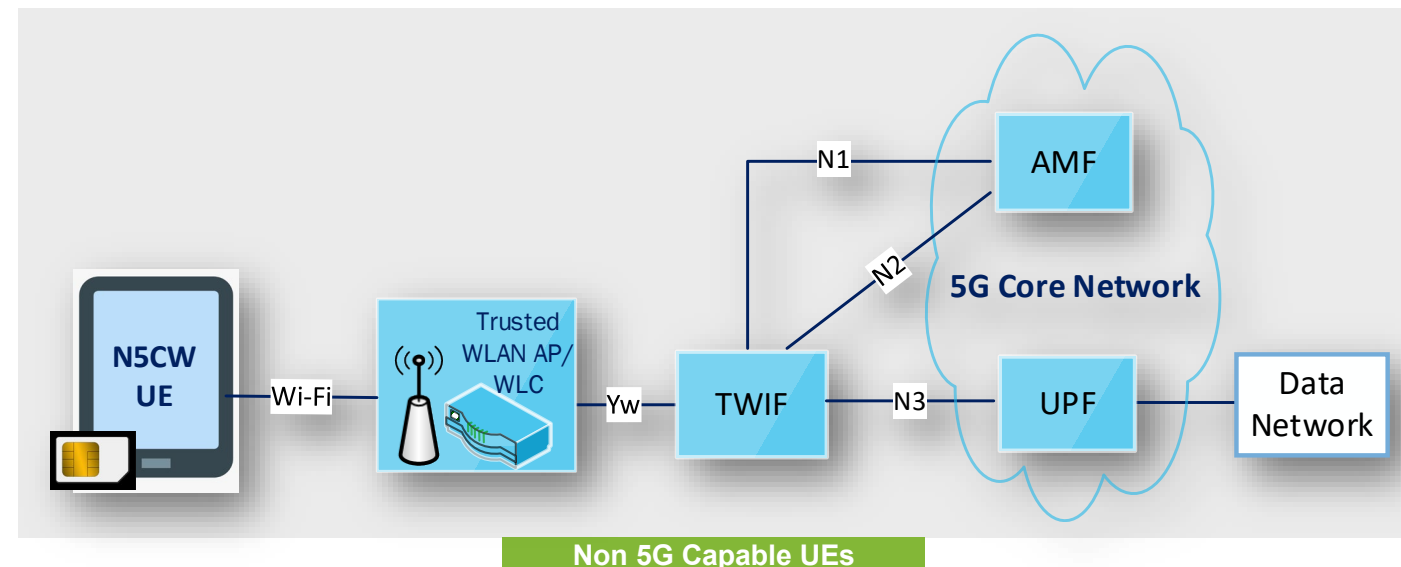
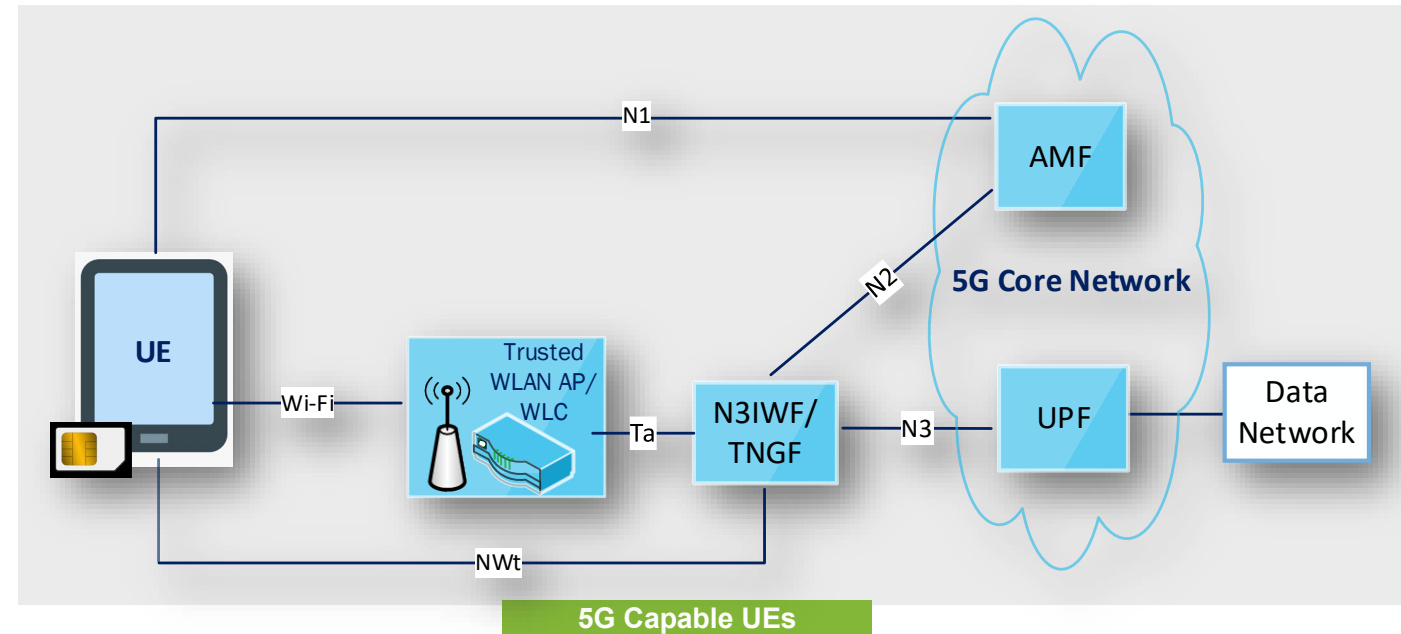
***Standardization of Ta and Yw interfaces can provide improved integration of WLAN access within the 5G System**

Support for Wi-Fi Only Devices

Wi-Fi Only devices with USIM capability:

- Such devices supported by the 5G Core
- Authenticated using SIM-credential based auth. methods EAP-AKA' or 5G-AKA
- Both 5G Capable and Non-5G-Capable Wi-Fi Only UEs with SIM are supported

Most Wi-Fi only devices do not include USIM – need support for non-SIM devices



Support for Wi-Fi Only Devices w/o USIM

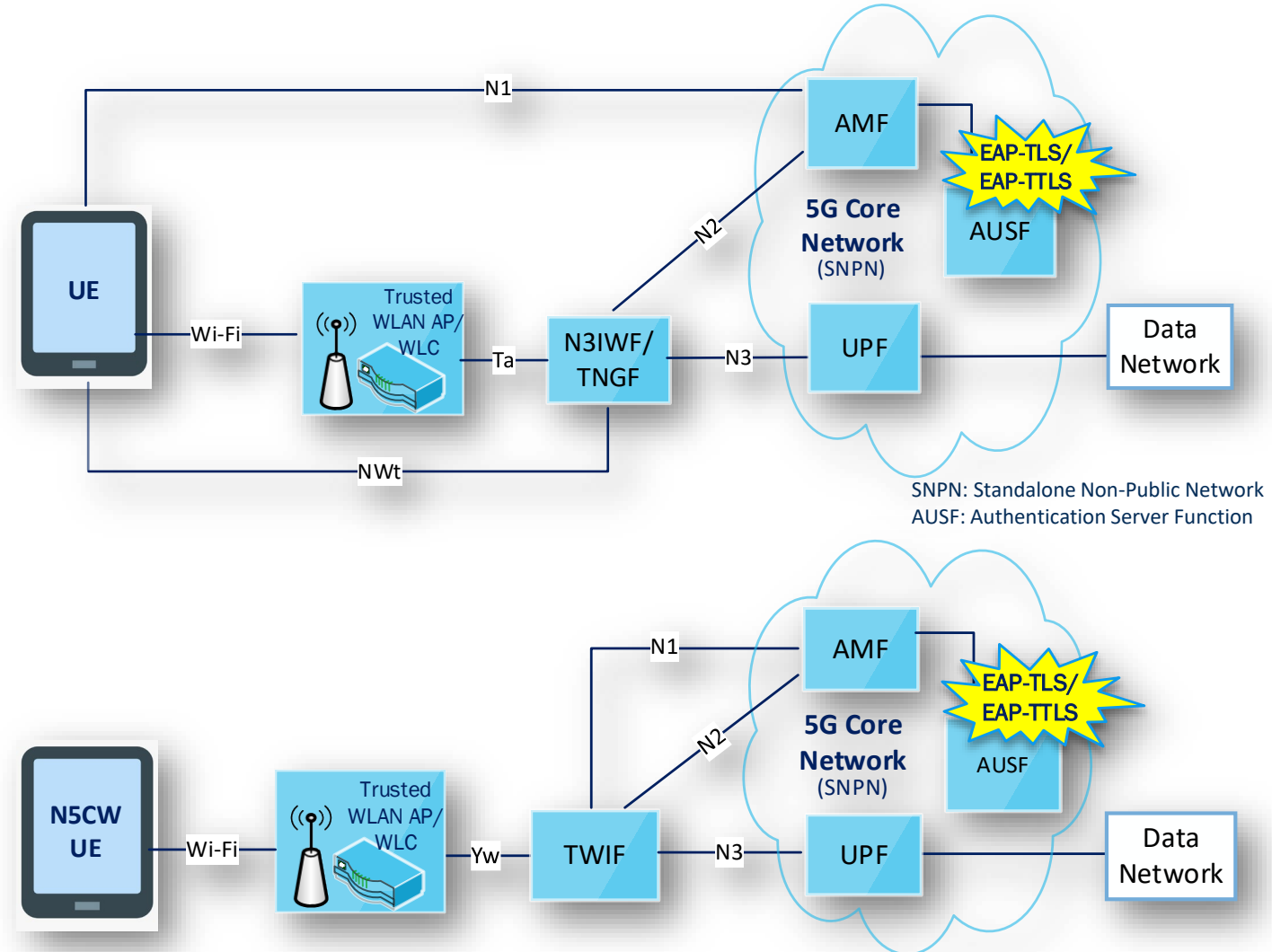
Requires support for EAP-TLS/EAP-TTLS

- Support for non-IMSI based identity and certificate based auth methods EAP-TLS/EAP-TTLS
- Current 3GPP specs define EAP-TLS/EAP-TTLS for private networks (SNPN) over 3GPP access only

3GPP support for SNPN over WLAN access

- 3GPP specs need to define access to SNPN over WLAN access via N3IWF/TNGF/TWIF
- Define EAP-TLS/EAP-TTLS procedure for SNPN over WLAN access

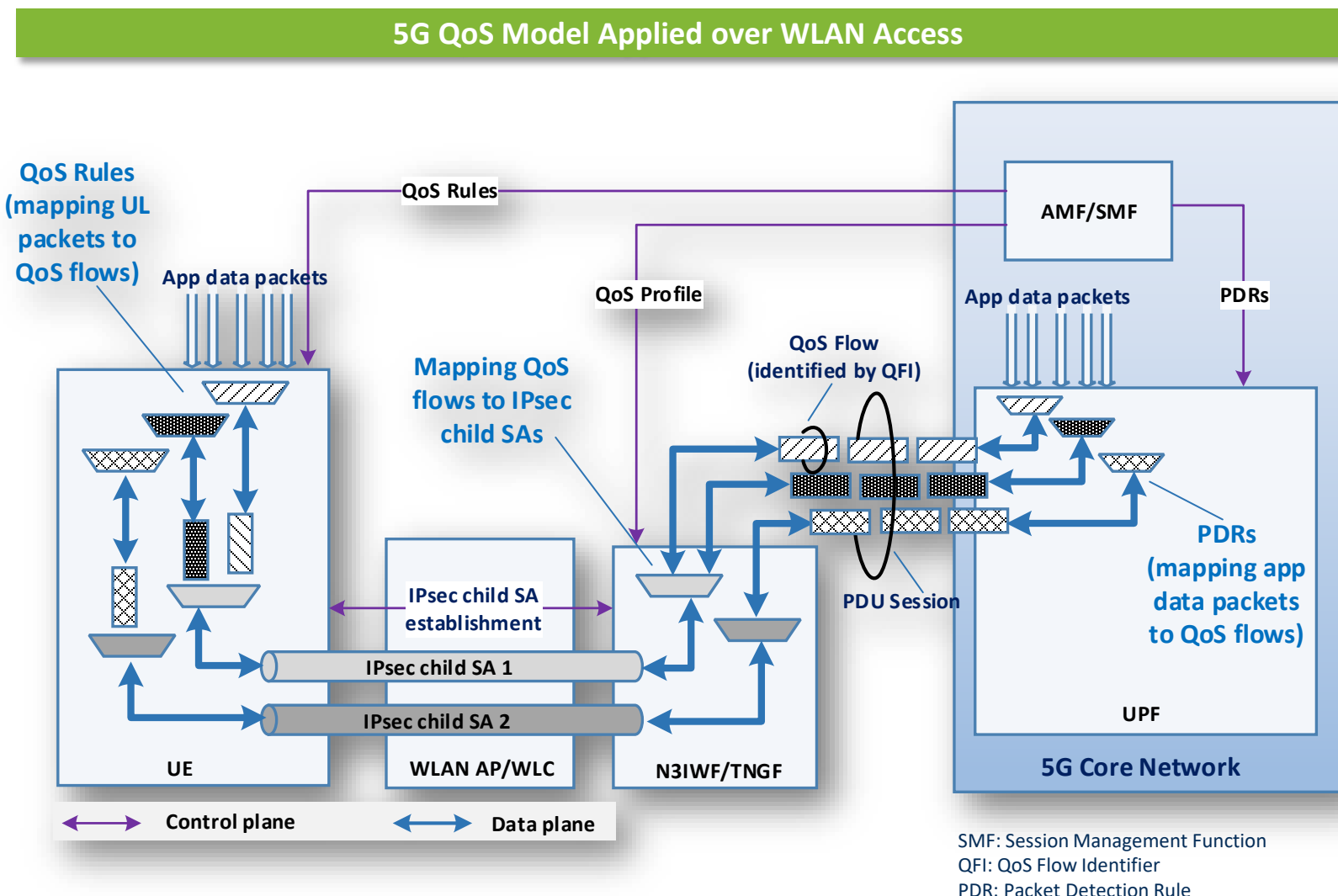
Operator's considerations for EAP-TLS/EAP-TTLS support over PLMNs for Wi-Fi only devices



Enabling Wi-Fi only devices w/o USIM can expand reach of 5G services and applications to many more devices across enterprises and verticals

5G QoS model over WLAN access:

- 3GPP 5G QoS model is also applied when traffic is carried over WLAN access
- QoS Flow (identified by QFI) is the finest granularity of QoS differentiation
- 5QI (5G QoS Identifier) value identifies QoS characteristics for a QoS flow
 - Standardized 5QI values defined for frequently used services
- 5G QoS flows get mapped to IPsec child SAs when carried over WLAN access



- To support end-to-end QoS, need QoS differentiation for 5G flows over WLAN access per 5G QoS characteristics and parameters
- Two approaches to provide QoS management for 5G flows within WLAN access:

1) DSCP based QoS Mapping

- ☐ QoS differentiation done based on DSCP marking in the IP header for UL and DL data packets
- ☐ Applicable across all types of WLAN integration architecture (via N3IWF, TNGF and TWIF)

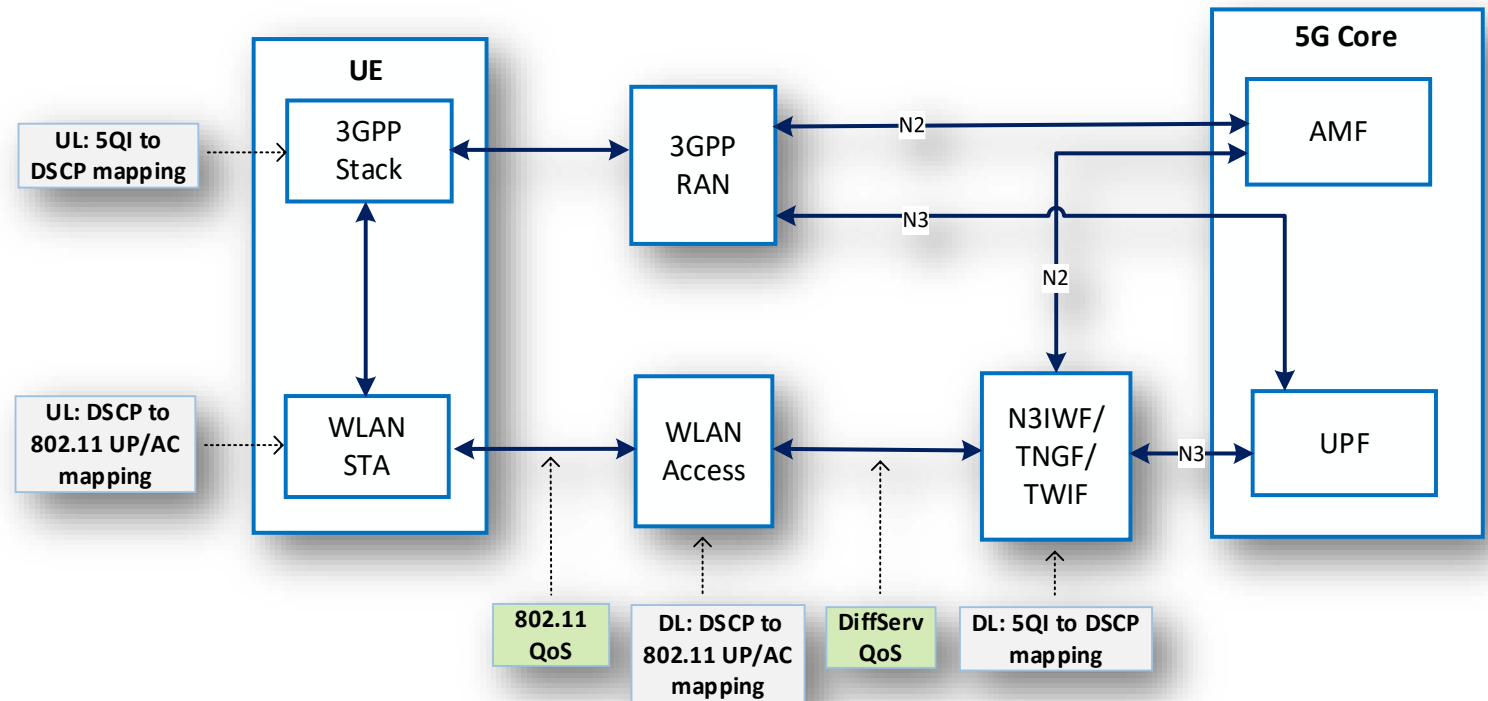
2) IPsec SA based QoS Management

- ☐ QoS differentiation done based on identifying and prioritizing IPsec child SAs carrying 5G flows
- ☐ WLAN STA initiates QoS Traffic Stream setup for IPsec child SAs using EDCA admission control
- ☐ Applicable for WLAN integration architecture via N3IWF and TNGF

- 5QI to DSCP mapping done at the N3IWF/TNGF (for DL) and at the UE (for UL)
- DSCP markings get mapped to 802.11 UP/AC on WLAN AP (for DL) and STA (for UL)

Gaps and enhancements needed:

- ☐ Standardized 5QI values to DSCP mapping
 - IETF **draft-henry-tsvwg-diffserv-to-qci-04** defines a mapping but it has expired
- ☐ Support for tagging 5G data packets with appropriate DSCP for UL/DL
- ☐ Define mapping between updated set of DSCP values to 802.11 UP/AC

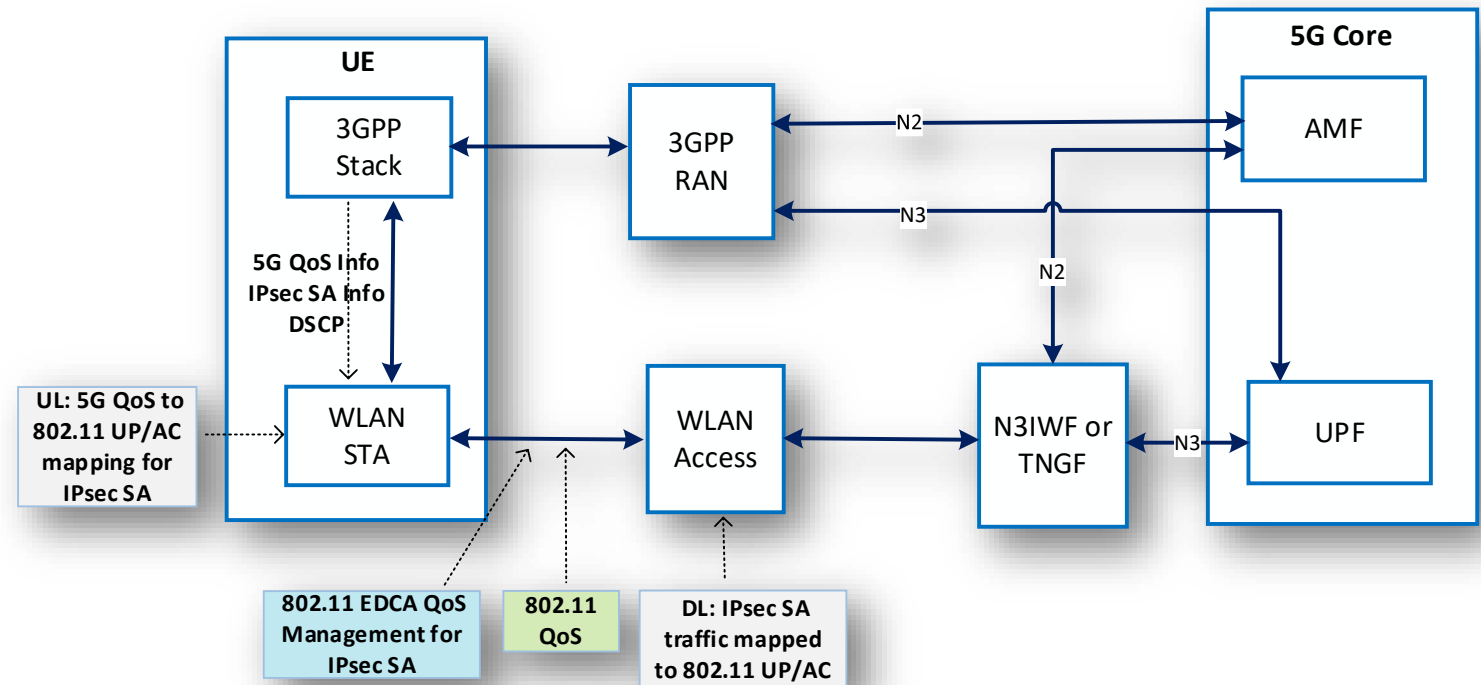


Simpler implementation, no 3GPP/WLAN integration needed on UE for QoS mapping

- 5G QoS parameters and IPsec SA info for child SAs sent to WLAN STA on the UE
- WLAN STA maps 5G QoS parameters to 802.11 TSPEC, UP/AC and creates TCLAS from IPsec SA info
- **WFA OCE** project is addressing IPsec SA based QoS management within WLAN

Gaps and enhancements needed:

- ❑ Mapping of 5G QoS parameters to 802.11 TSPEC parameters for WLAN QoS Traffic Stream setup
- ❑ Determine 802.11 UP/AC based on 5G QoS parameters (or DSCP)
- ❑ TCLAS element to specify filtering for IPsec SA traffic



More involved approach, with challenges around tighter 3GPP/WLAN integration on the UE and addressing 5G to WLAN QoS parameters mapping

- Wi-Fi 7 includes features like Multi-link operation, Multi-AP and 320 MHz which can provide further lower latency than Wi-Fi 6
- IEEE 802.11be is also considering enhancements to provide **Deterministic Low Latency** for TSN support
 - New Access Category for TSN
 - TSPEC enhancements
- Wi-Fi 7 QoS enhancements should also consider providing fine grain QoS differentiation (throughput, latency, PER, data burst) for 5G flows

Wi-Fi 7 Based on IEEE 802.11be	
Key features**	
■ 320 MHz channels	■ Multi-link operation
■ 4096-QAM	■ Multi-AP operation
■ 16 spatial streams	■ Deterministic low latency
■ Multi-RU (puncturing)	

It is timely for IEEE 802.11be QoS enhancements to consider how fine grain QoS can be provided for 5G flows based on 5G QoS characteristics (5QI) and parameters

Convergence enables new business opportunities

Better together for new breed of applications and services such as Industry 4.0, AR/VR, Connected Cities & Edge Computing benefiting operators and vendors to provide seamless end-user experiences

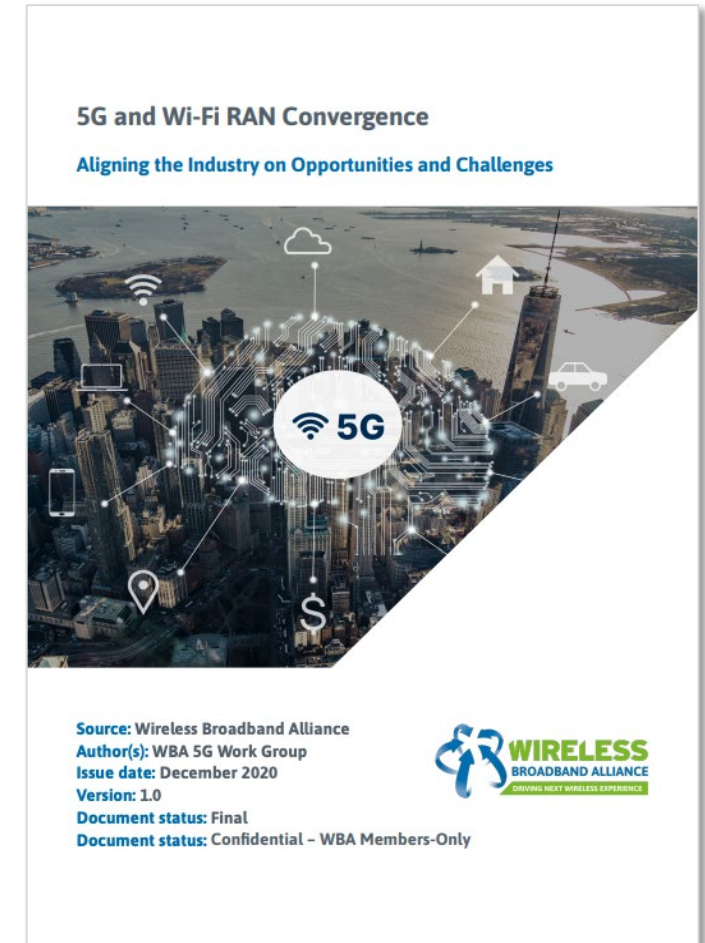
Convergence architecture defined in current 3GPP specifications

3GPP Release 15/16 defines WLAN integration architecture for untrusted and trusted WLAN, support for Wi-Fi Only devices with USIM and QoS model applicable over WLAN

Convergence related challenges and enhancements are highlighted in three key areas

- Support for trusted WLAN integration
- Support for Wi-Fi Only devices w/o USIM for private 5G networks
- Enabling QoS mapping and differentiation for 5G flows over the WLAN access

Addressing identified challenges can provide improved integration and facilitate converged network deployments





5G AND WIFI CONVERGENCE

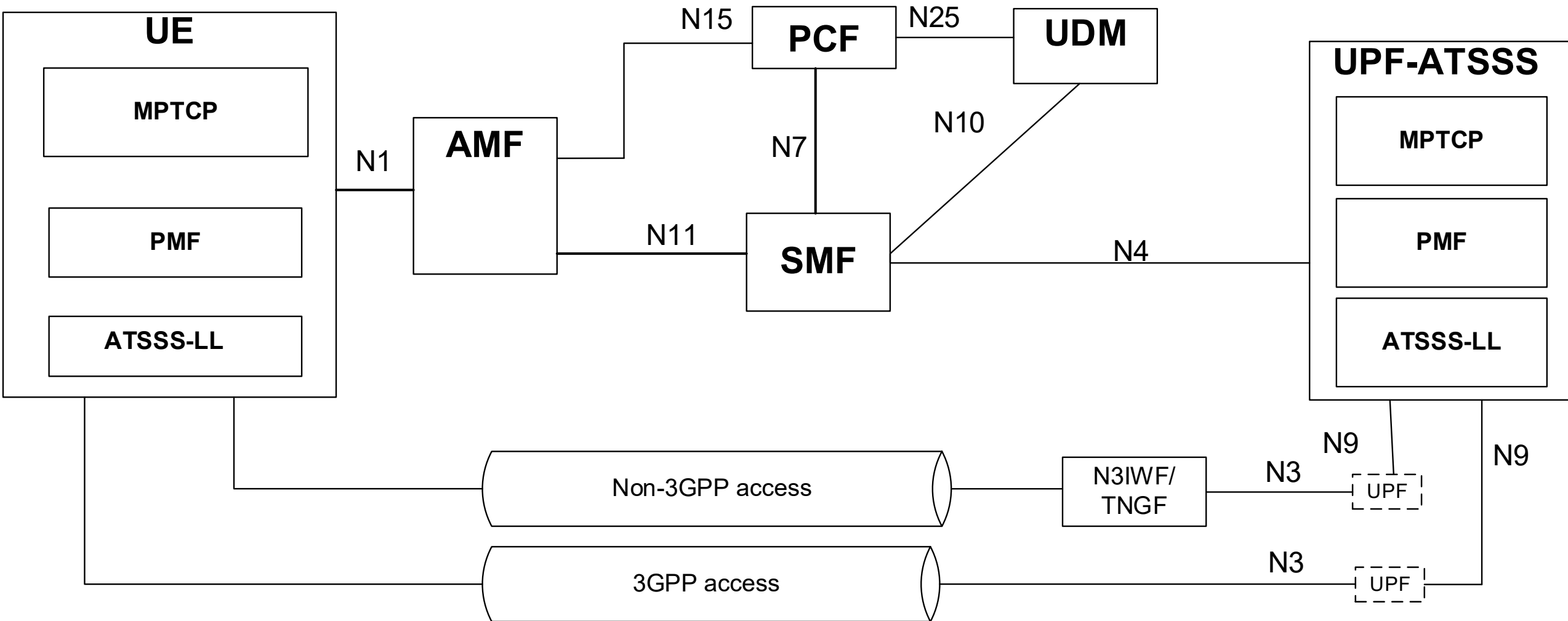
Hybrid Access

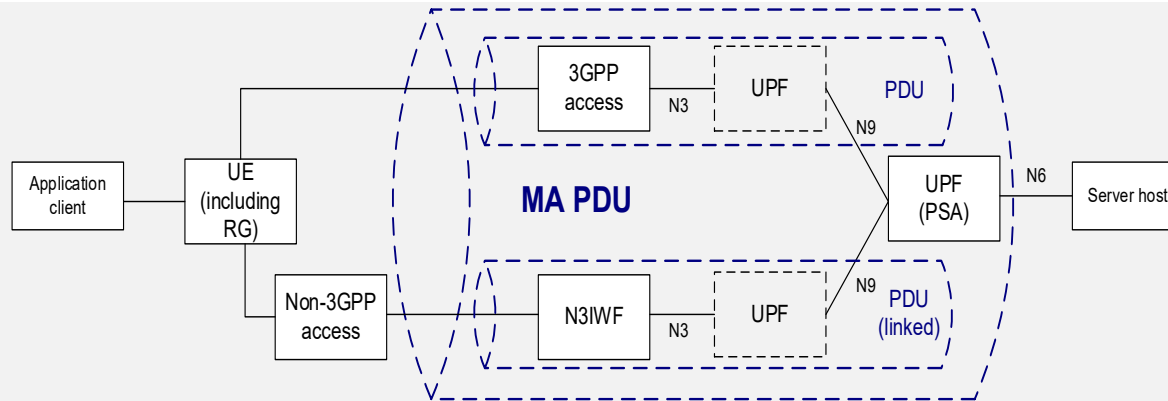
Florin Baboescu

Senior Principal Scientist, Broadcom



- Campus/Enterprise Use Case:
 - A subscriber is simultaneously using both cellular and WLAN connectivity to access the same service
 - This use case provides:
 - For the user: 1) Increased capacity, 2) Increased coverage and 3) Increased reliability
 - For the access provider: 1) Increased capacity, 2) Increased coverage, 3) Increased reliability and 4) Minimized cost
- End to end server access:
 - An end user may access end to end services using multiple thin bi-directional pipes using multiple links to the server
 - This use case provides(on top of the previous use case):
 - For end user: 1) Minimized latency, 2) reduced playback stalls and reduced stall duration (Apple music, youtube, etc.)

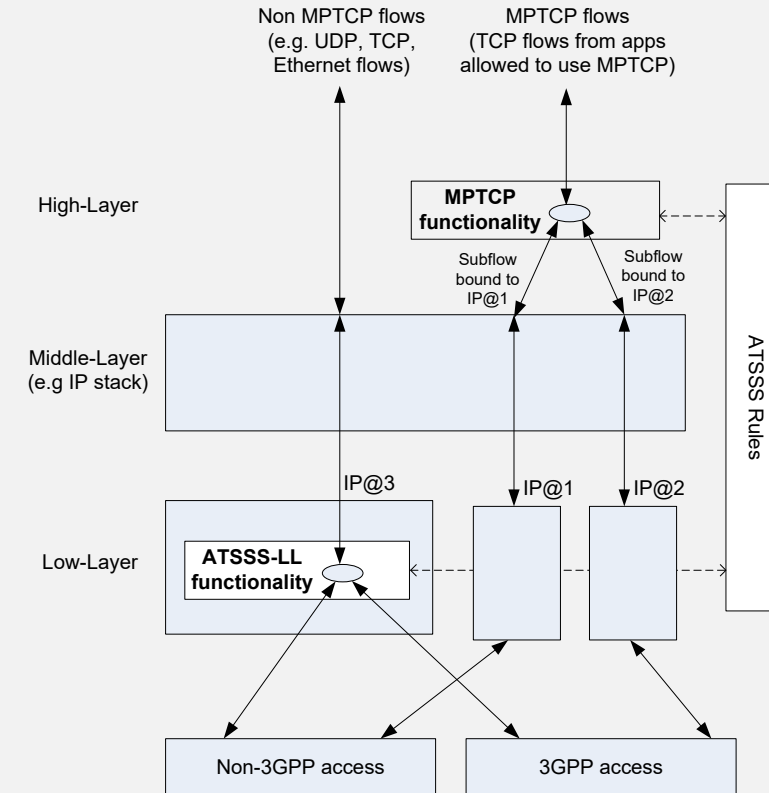


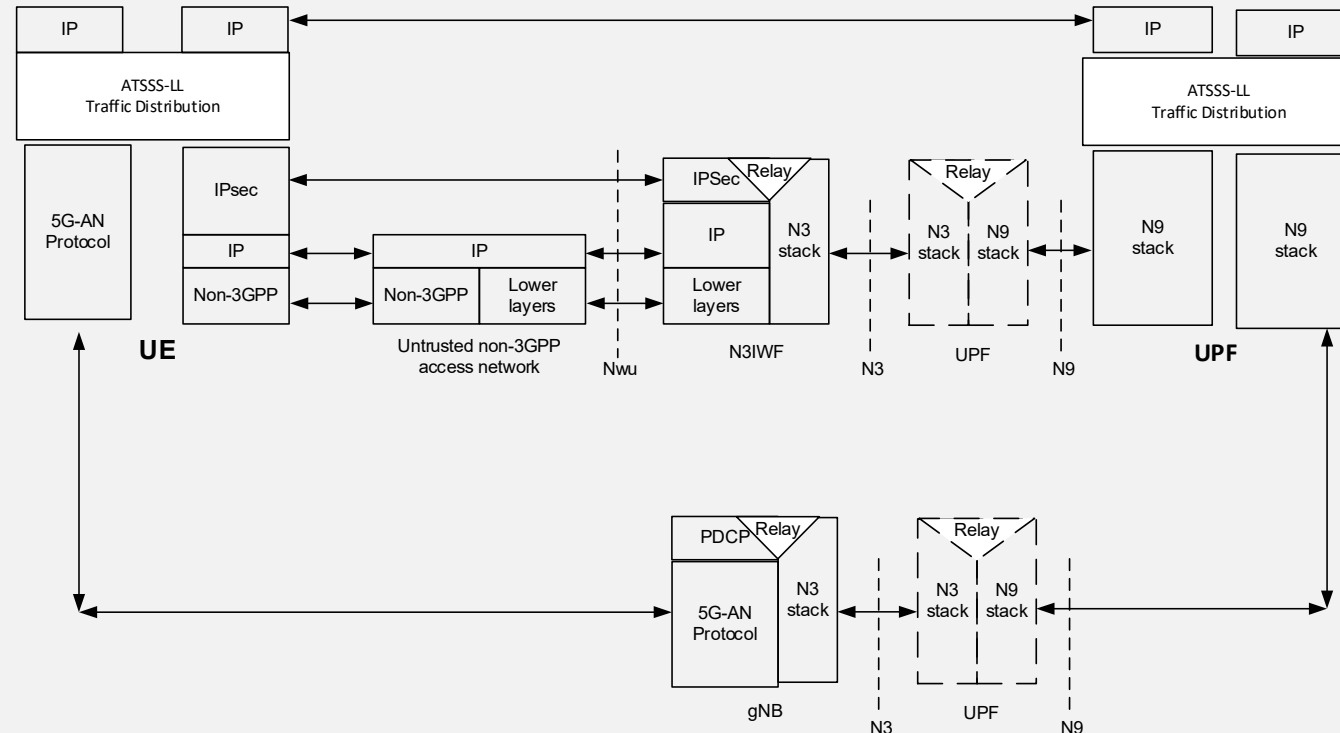


It supports Multi-Access (MA PDU). A MA PDU is a type of PDU session that may have user-plane resources on two access networks.

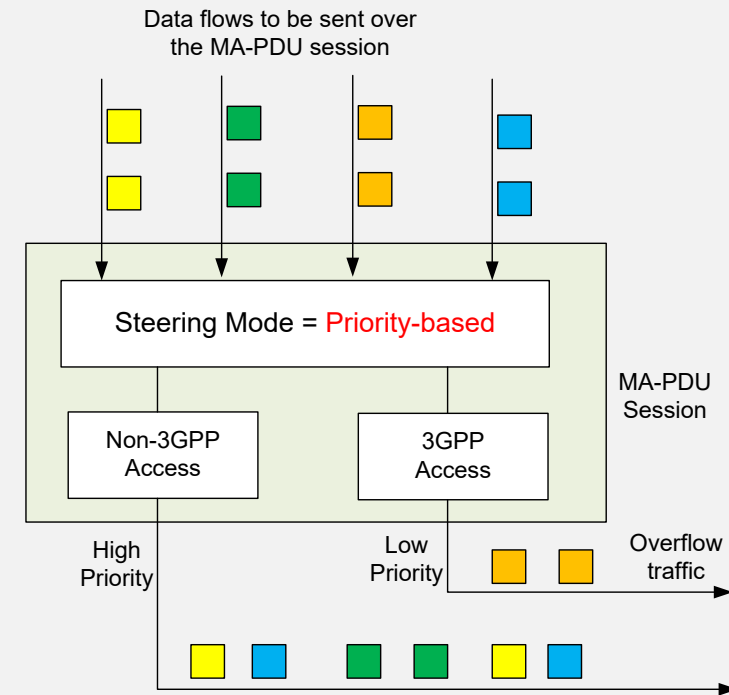
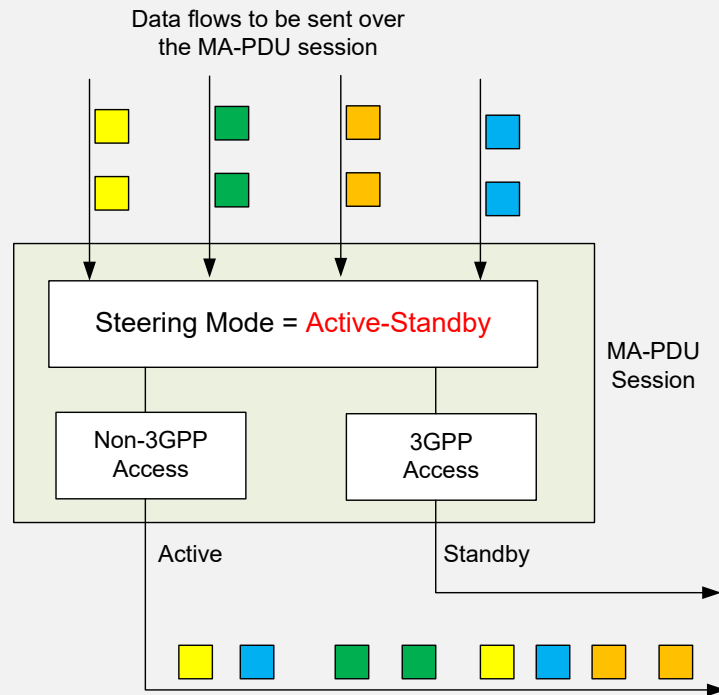
- The UE applies network-provided policy (i.e. ATSSS rules) and considers local conditions (such as network interface availability, signal loss conditions, user preferences, etc.) for deciding how to distribute the uplink traffic across the two access networks.
When there are user-plane resources on only one access network, the UE applies the ATSSS rules and considers local conditions for triggering the establishment or activation of the user plane resources over another access.
- The UPF anchor of the MA PDU Session applies network-provided policy (i.e. N4 rules) and feedback information received from the UE via the user-plane (such as access network Unavailability or Availability) for deciding how to distribute the downlink traffic across the two N3/N9 tunnels and two access networks.

- Application Traffic Steering, Switching, and Splitting (ATSSS)
 - RFC8803 (0-RTT TCP Convert Protocol) based solution using MPTCP
 - ATSSS Lower Layer (ATSSS-LL) supports traffic aggregation of 3GPP and non-3GPP user plane paths, without any specific protocol between UE and UPF (steering/switching only)
- Enhanced ATSSS (eATSSS)
 - Goal: add splitting support for non-TCP traffic/any IP & Ethernet traffic
 - Additional goal: support for additional eATSSS modes

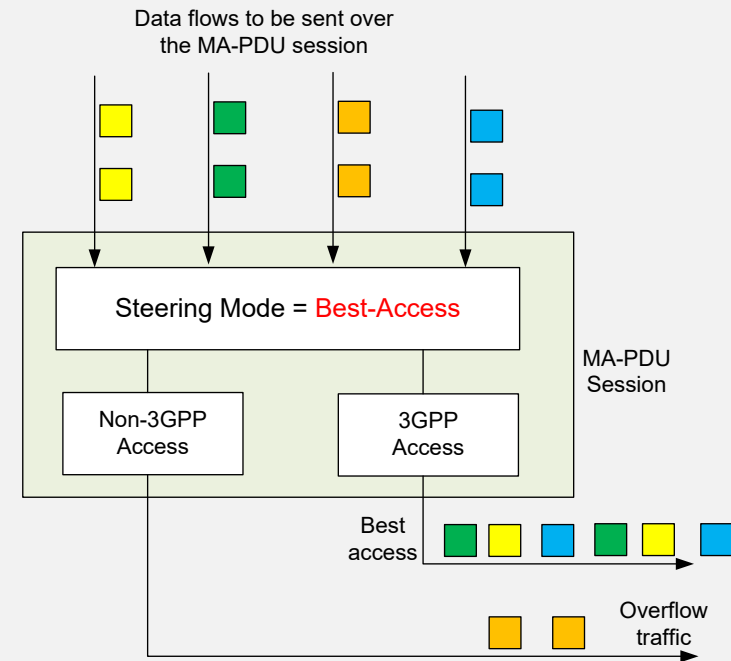
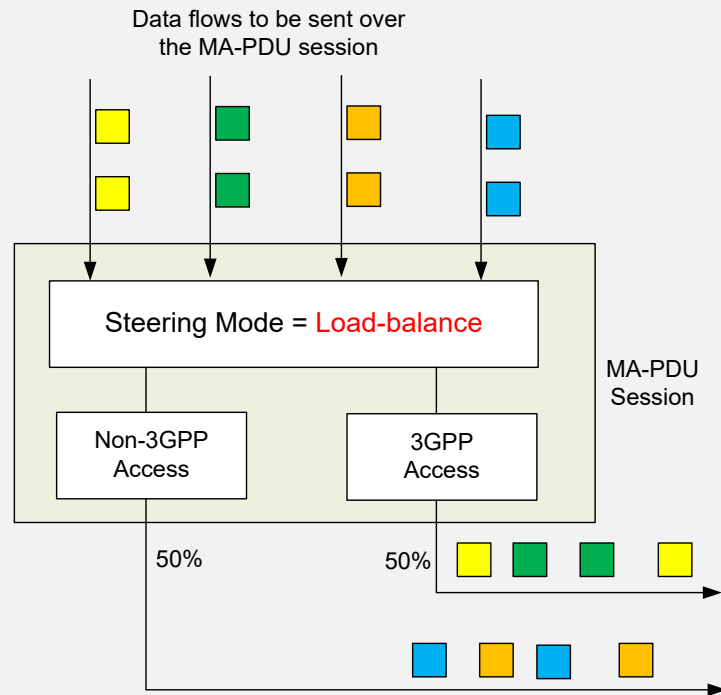




- It supports traffic aggregation of 3GPP and non-3GPP user plane paths, without any specific protocol between UE and UPF;
- It applies to both IP and Ethernet traffic;

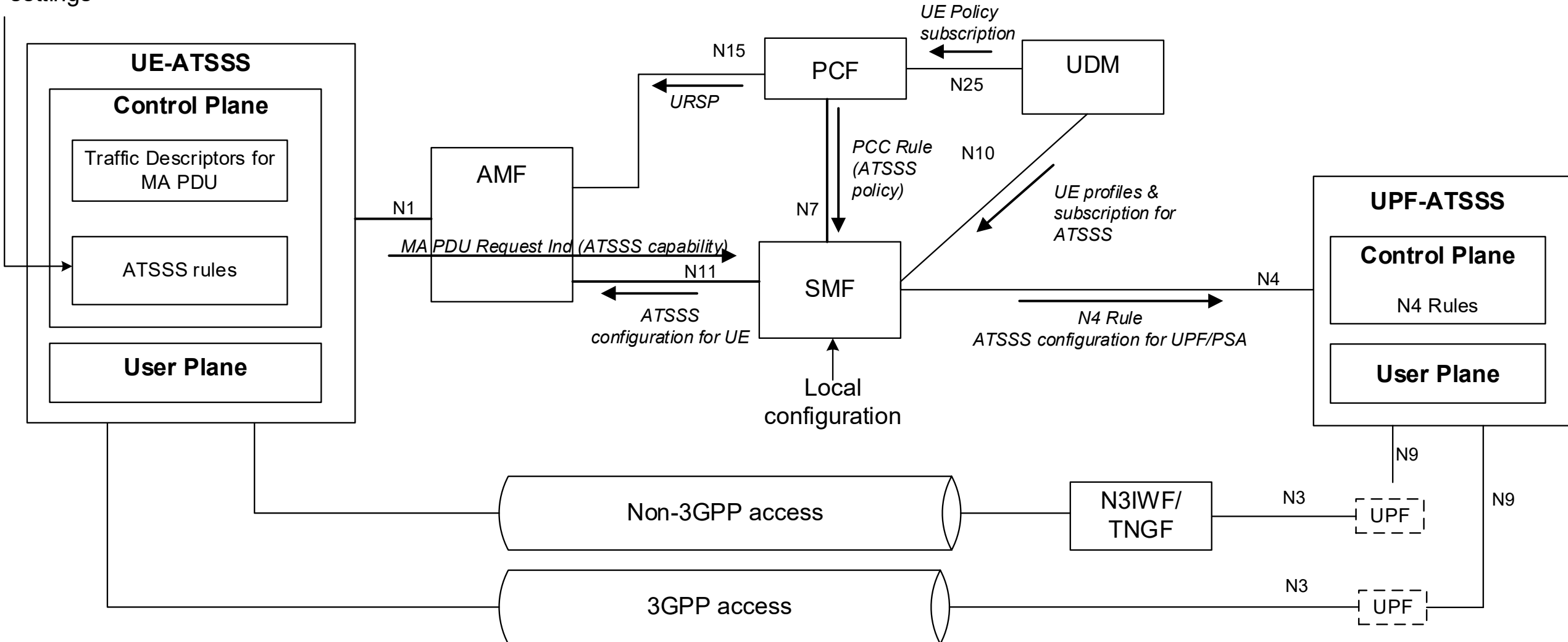


3GPP ATSSS modes:

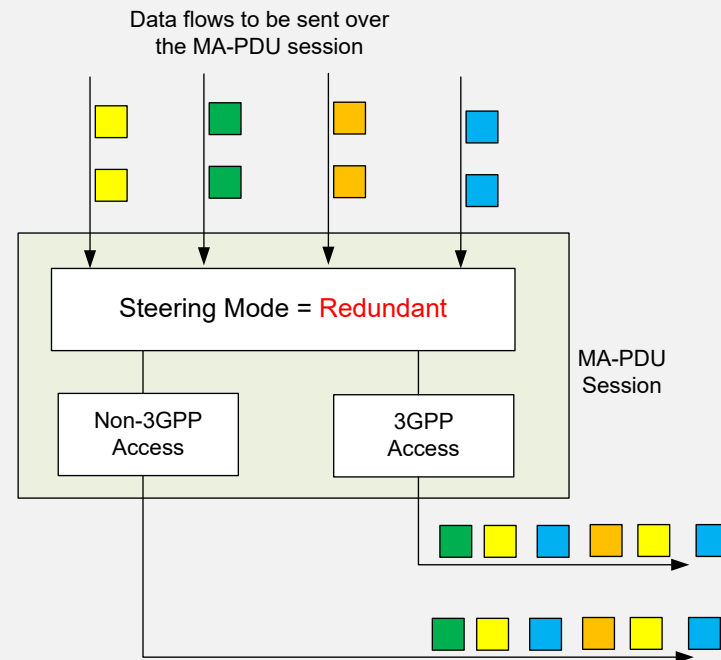


3GPP ATSSS – setting up a MA PDU session

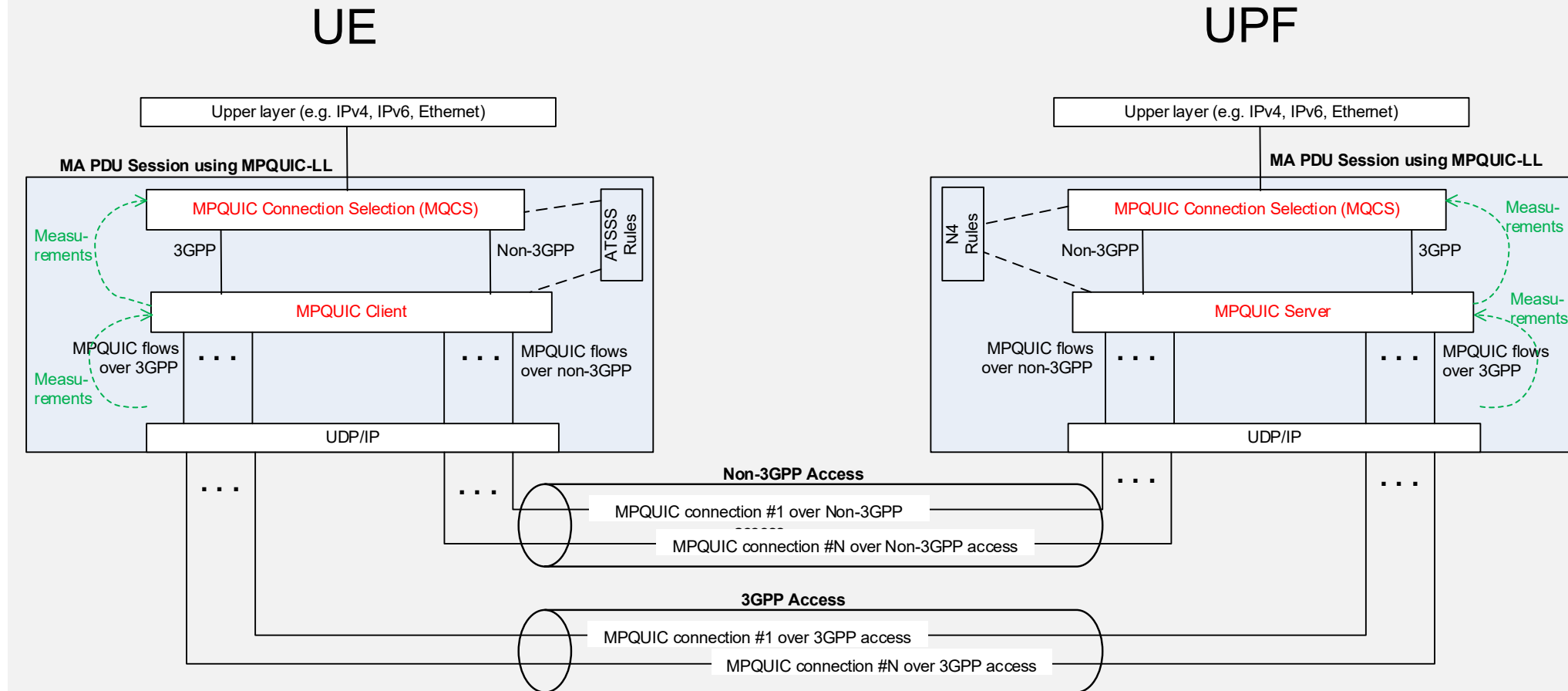
User preference
settings



- New steering mode: redundant mode.



- New multi access transport for both IP and Ethernet using MPQUIC





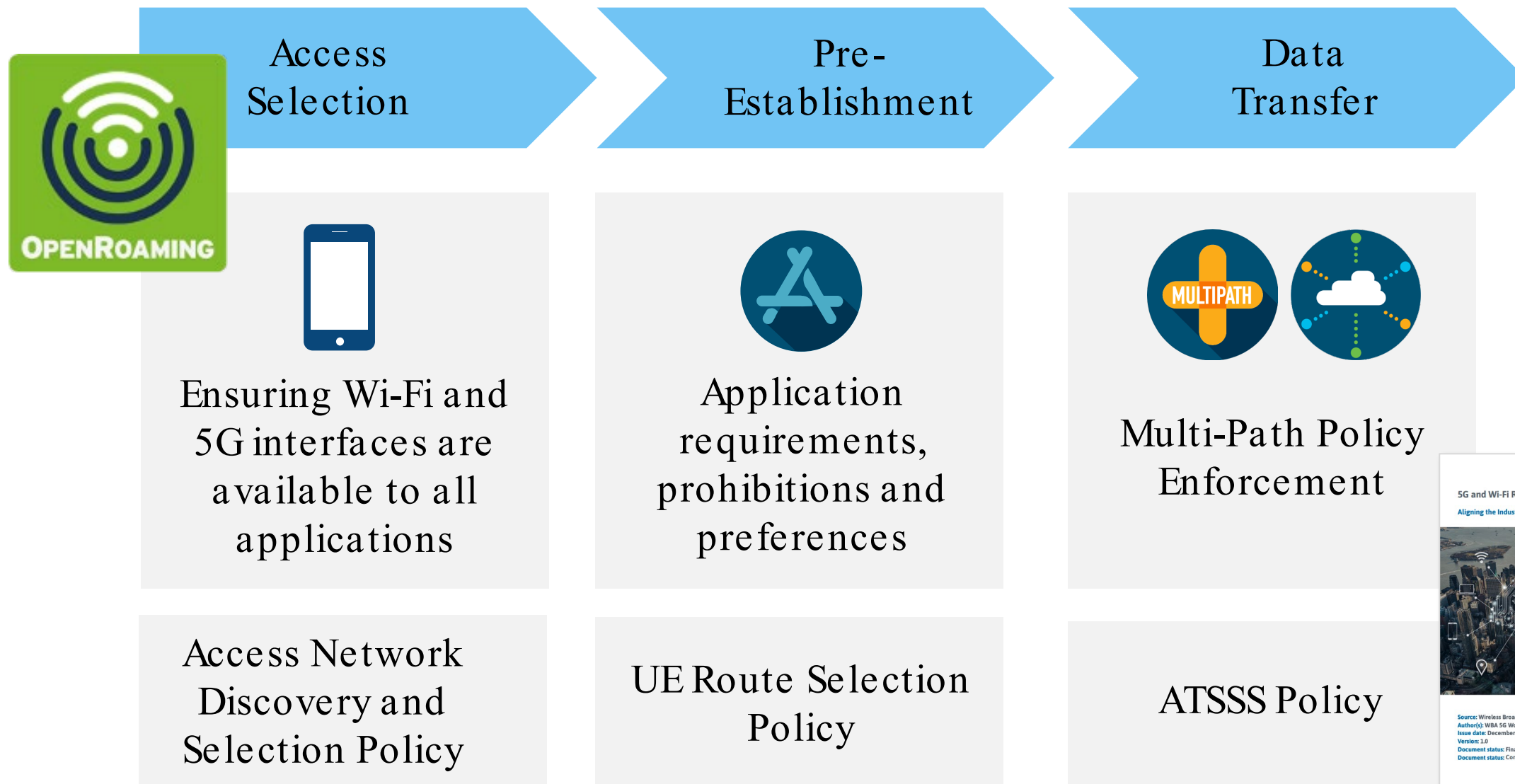
5G AND WIFI CONVERGENCE

Policy Interworking and enhancements across Wi-Fi and 5G

MARK GRAYSON

DISTINGUISHED ENGINEER, CISCO

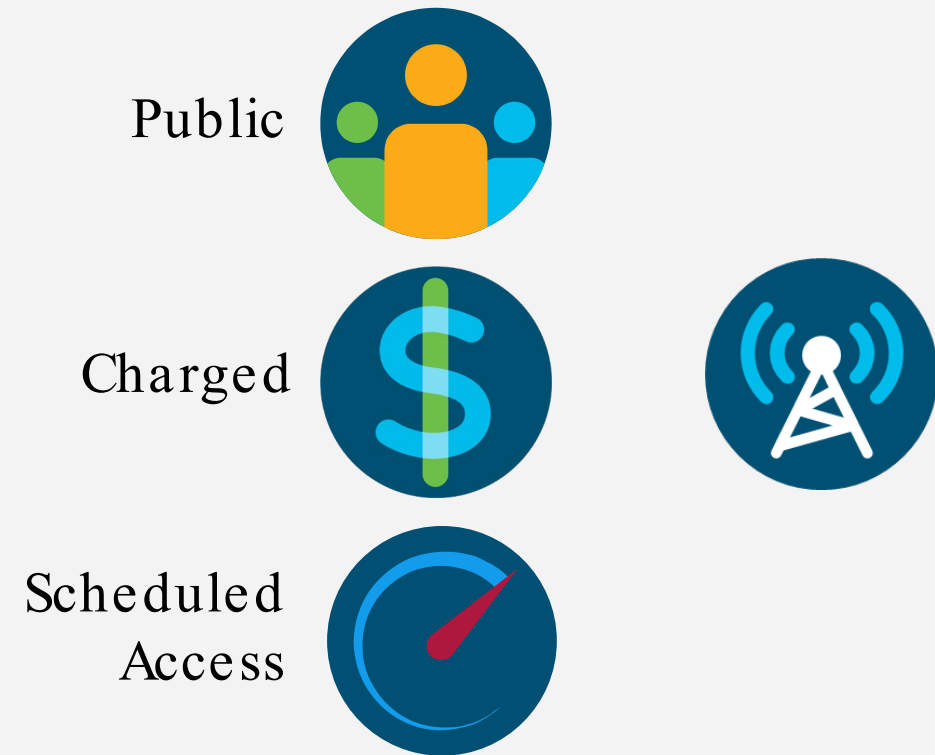




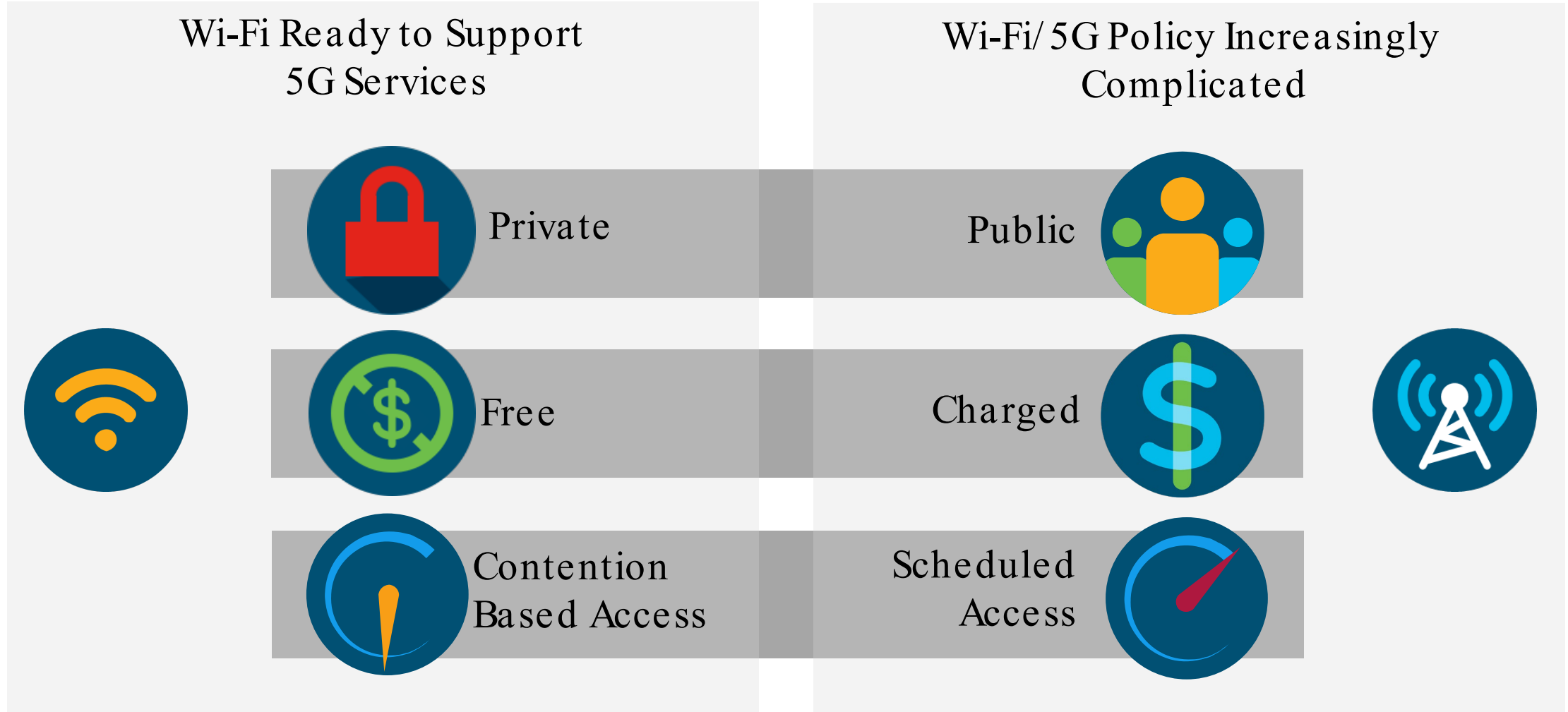
Wi-Fi



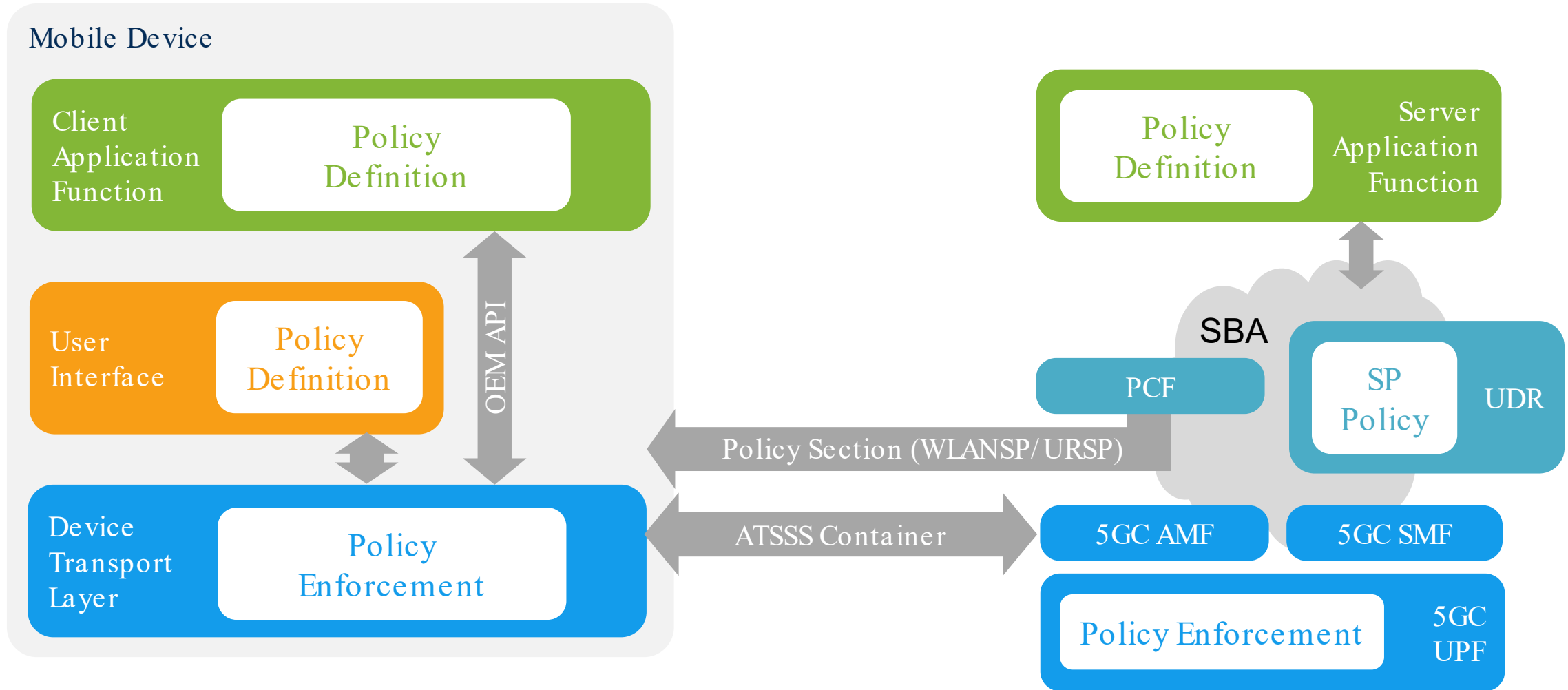
Cellular

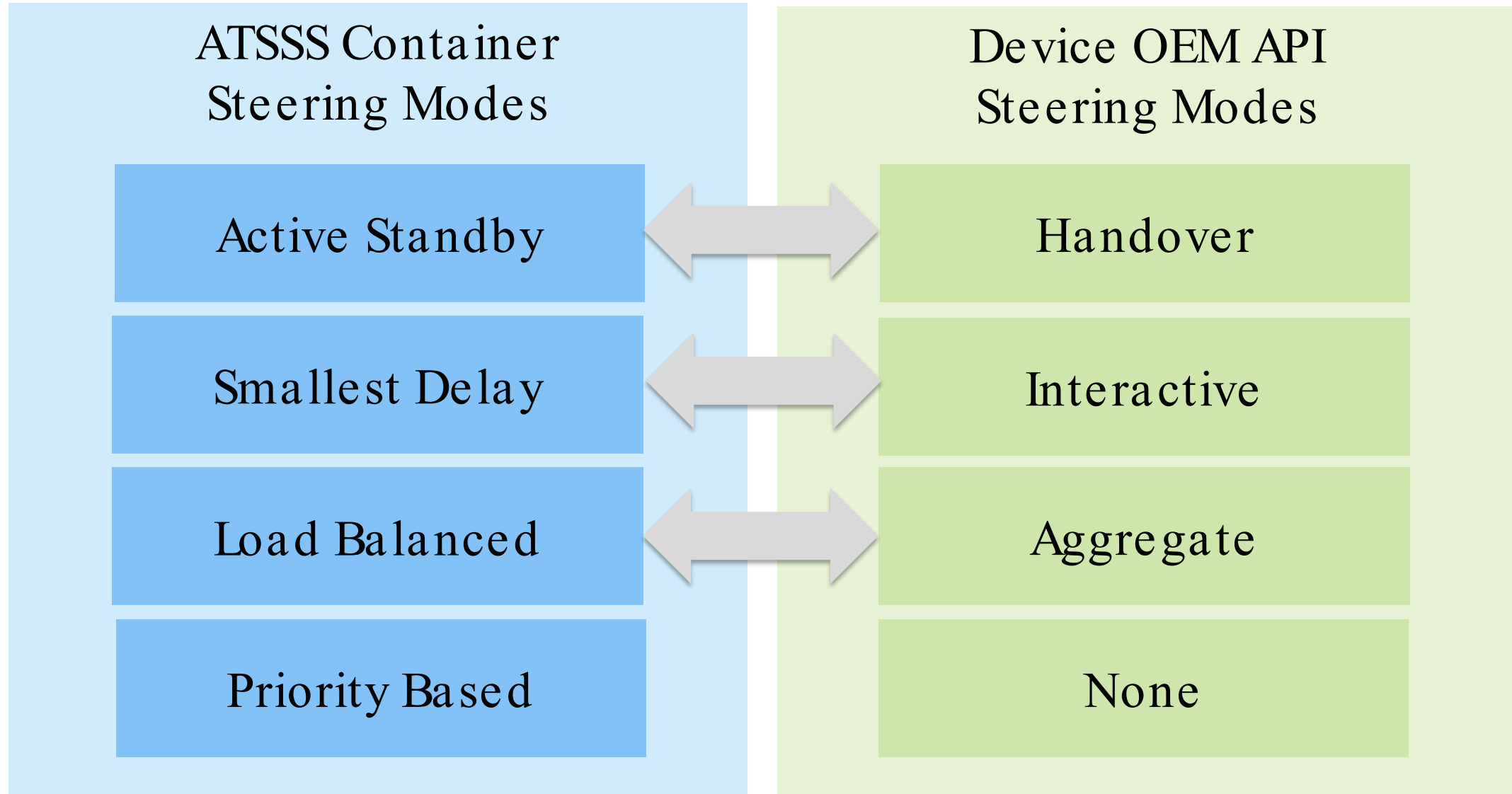


The Present: Blurred Boundaries Between Access Technologies



Complex Coexistence of Policies





1. Not either/ or, but always 5G-NR combined with Wi-Fi
2. Blurring between Wi-Fi and 5G-NR creates opportunities for Wi-Fi, but complicates policy decisions
3. Common framework for policies:
access selection, pre-establishment and data transfer
4. Alignment of data transfer policies between 3GPP ATSSS and device OEM APIs
Active-Standy/ Handover, Smallest-Delay/ Interactive, Load-Balanced/ Aggregate
5. Large number of policy stakeholders:

App Provider
Defined Policy

Device OEM
Defined Policy

User
Defined Policy

Service Provider
Defined Policy

Enterprise IT
Defined Policy

WBA 5G and Wi-Fi RAN Convergence paper provides a deep-dive into convergence architecture and solutions

- 3GPP Release 15/16 defined solutions on WLAN integration architecture, trusted WLAN access selection, policies for access selection and traffic steering, ATSSS multi-access steering functionality and QoS model over WLAN access

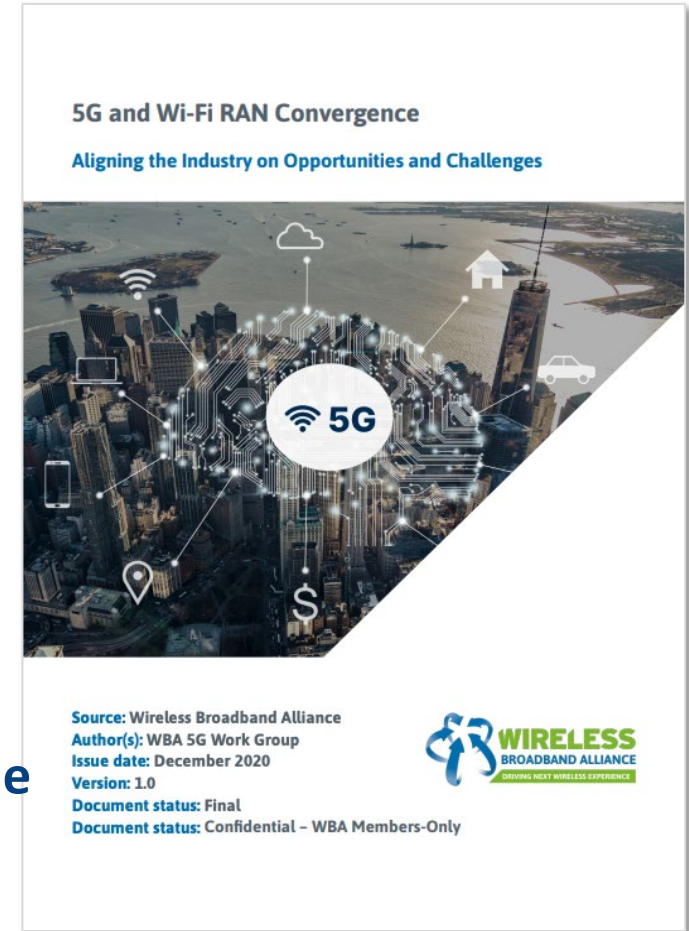
It explores challenges and enhancements for the industry to address to provide improved integration

- 5G and Wi-Fi integration architecture
- ATSSS multi-access functionality
- End-to-end QoS for 5G flows over WLAN access
- Policy Interworking and enhancements across 5G and Wi-Fi
- Support for Wi-Fi only devices w/o USIM

Next steps: WBA is conducting liaison activities with other SDOs to align the industry and facilitate actions to address identified issues

- Liaisons being sent to 3GPP SA, WFA, IEEE 802.11, GSMA, IETF, ATIS and NGMN

Inviting operators, vendors and SDOs to work together to fully define and deliver on the 5G and Wi-Fi converged solutions





Moderated Q & A

5G & RAN Convergence White Paper



WBA 5G Program: What next?

BRUNOTOMÁS

DIRECTOR OF PROGRAMS, WIRELESS BROADBAND ALLIANCE



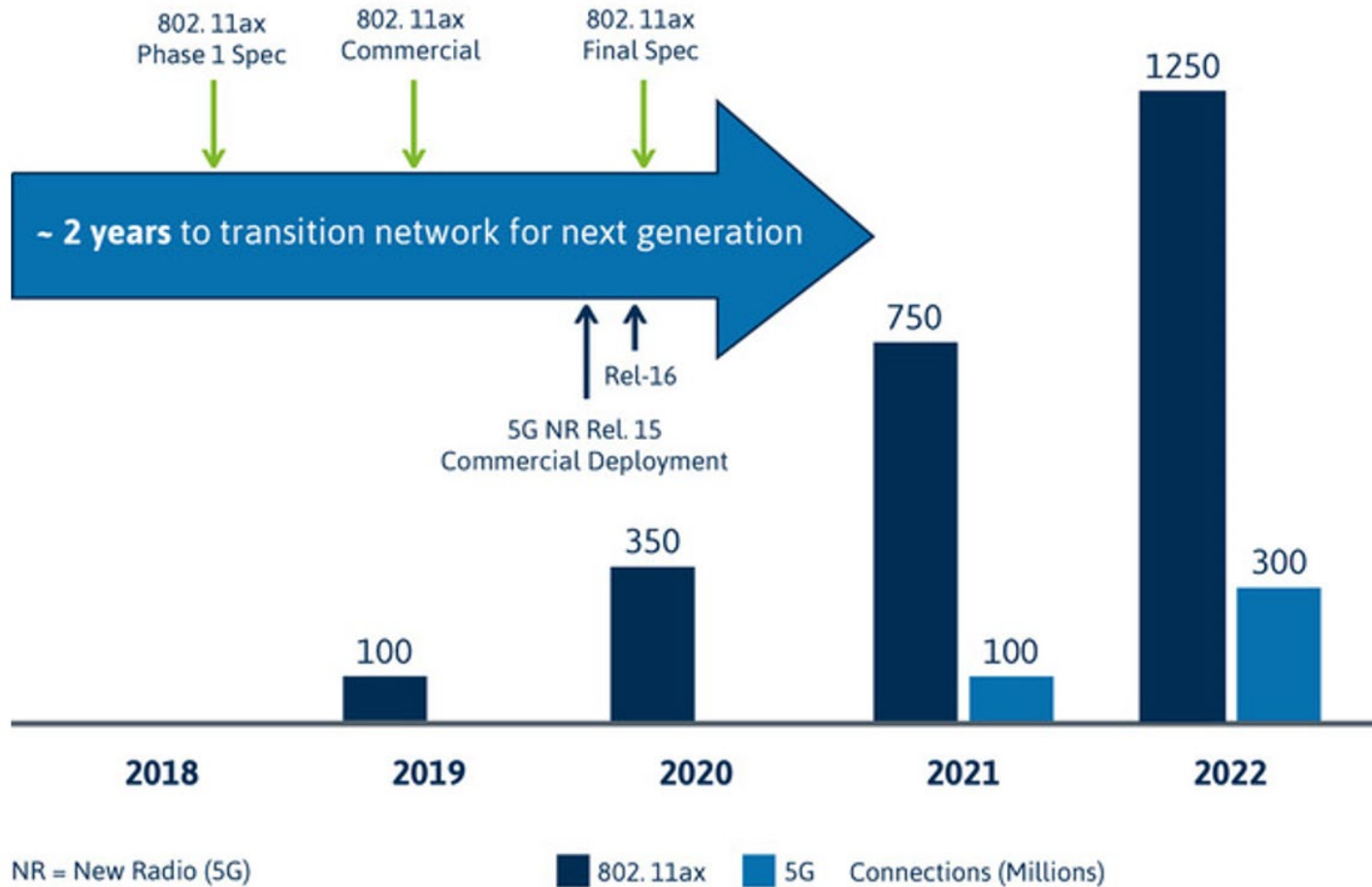


WBA 5G WORK GROUP

Call for Participation

PMO – February 2021

Uptake of Wi-Fi 6 and 5G NR based on the number of connections ...



Source: GSMA, EISG, IHS Markit

Business rationale

Accelerate time to market for 5G with Wi-Fi (802.11ax)

Free, global and widely available Spectrum

Improves Return of Investment (ROI) for 5G

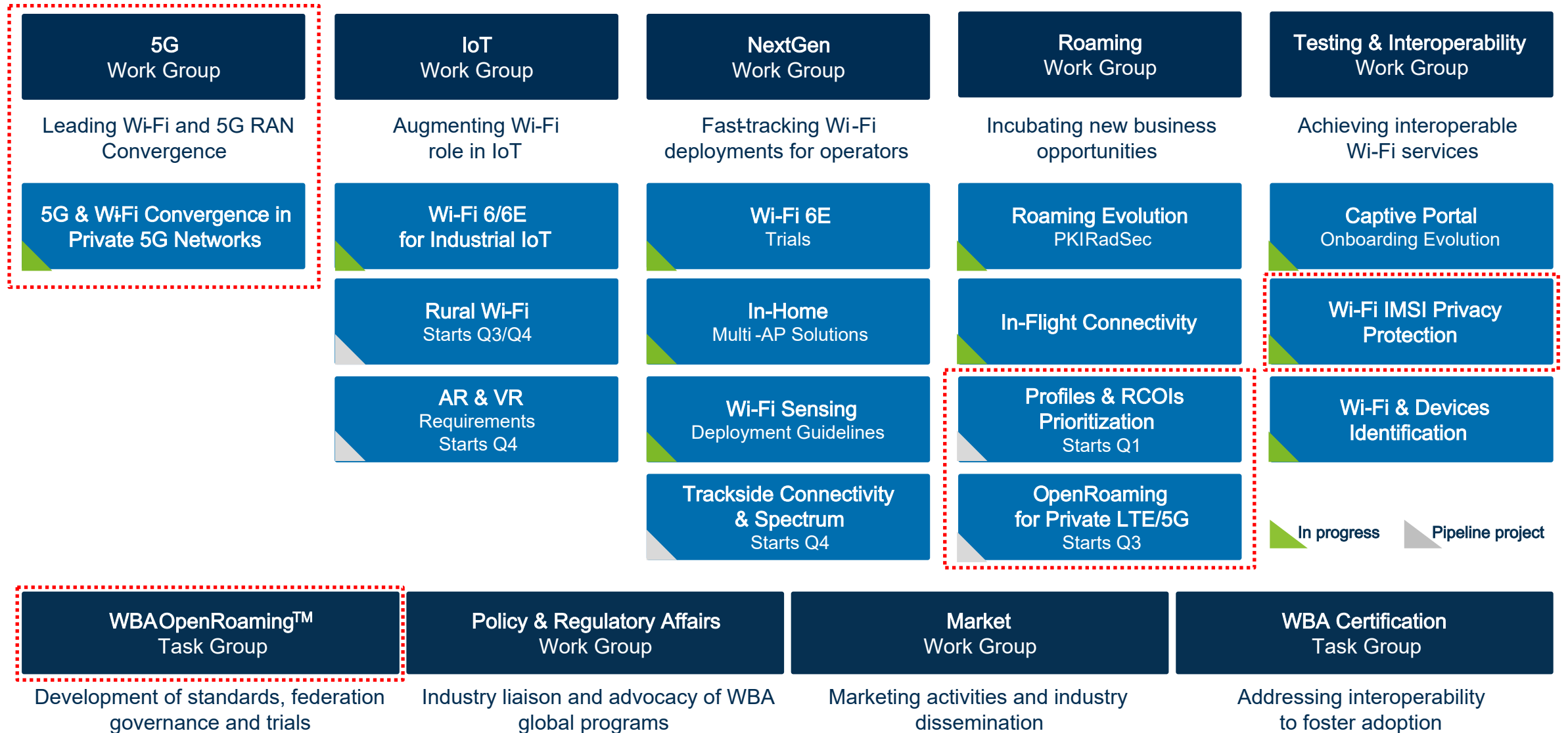
Lower cost/bit & complement other 5G tech

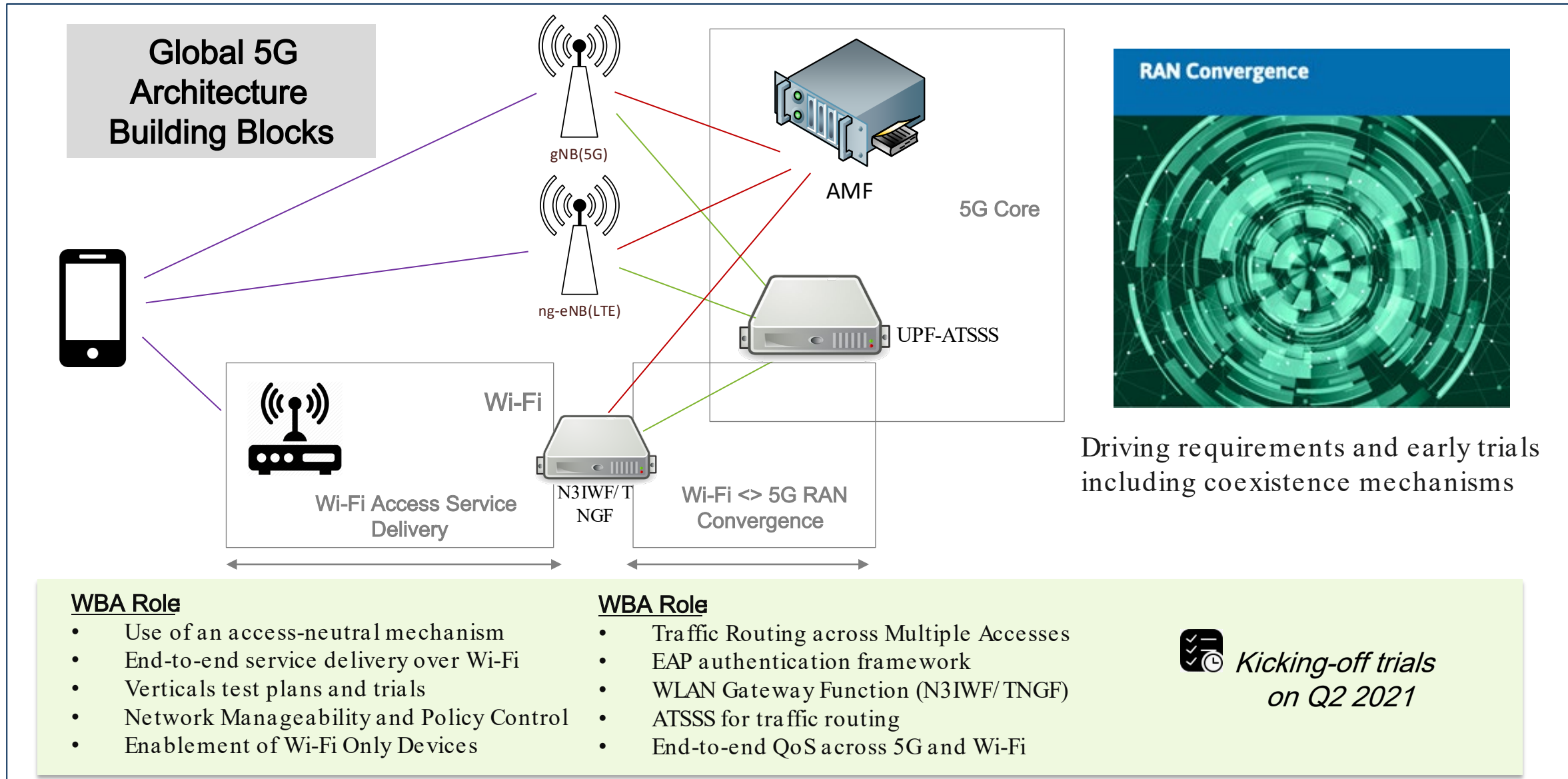
Enhanced Carrier Grade & Cellular Integration

WBA Roadmap 2021



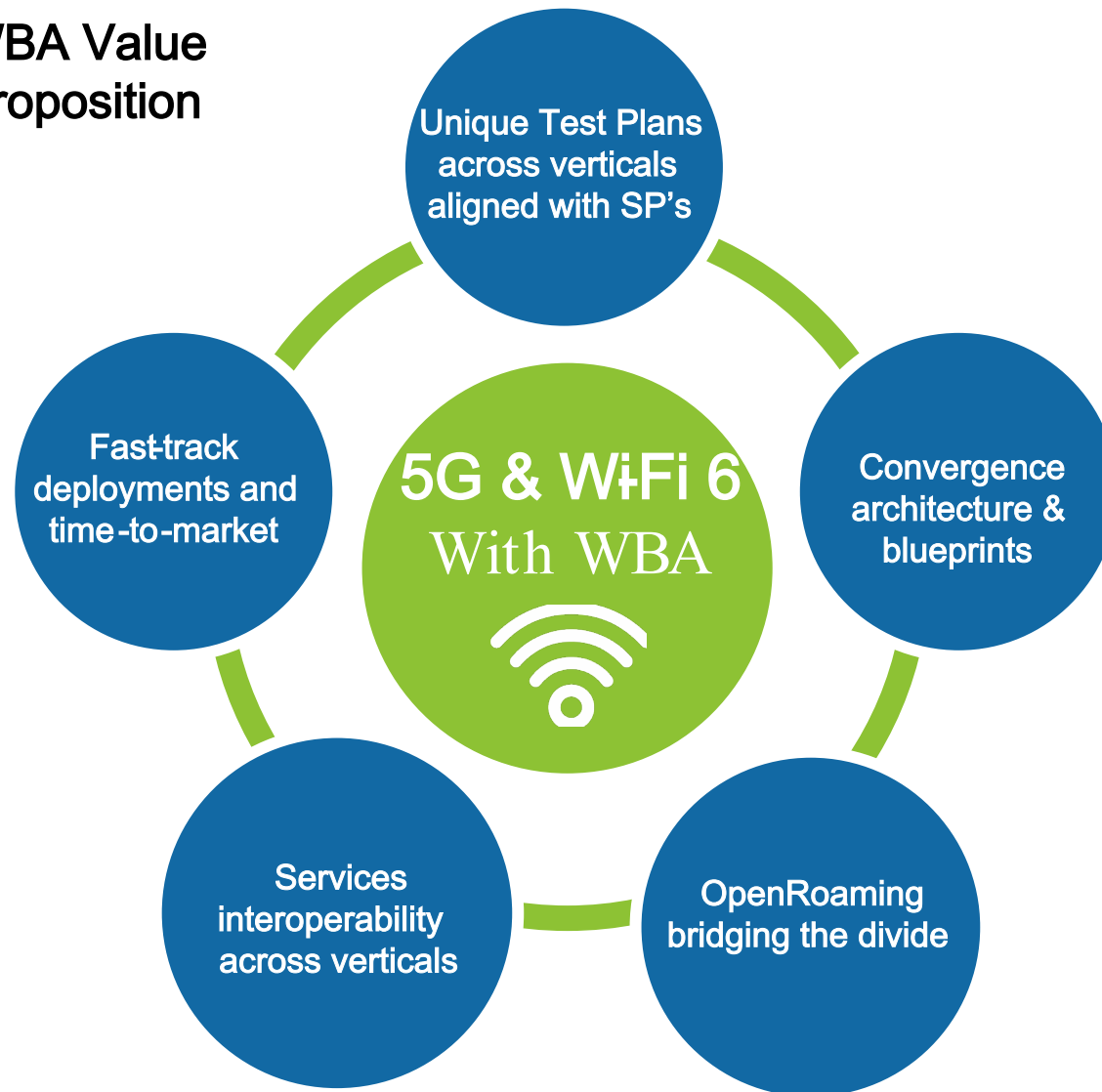
WBA WORK GROUPS & PROJECTS



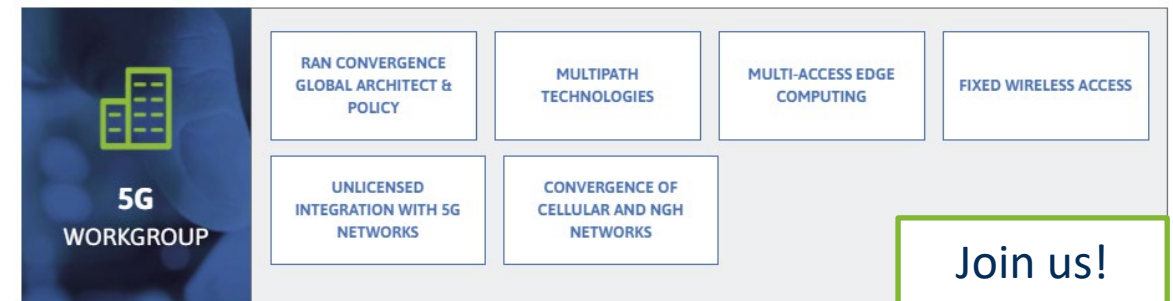


non-exhaustive

WBA Value Proposition



Participants for the WBA 5G Program





CLOSING

STEVE ANDREWS

CHAIRMAN LUMINET, NED EDGEWATER WIRELESS & WBA BOARD ADVISOR



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THANKS FOR ATTENDING

Next event:

Feb 8th – Next Generation of Wi-Fi & IoT
08:00 GMT

For 2021 events: wirelessglobalcongress.com/register-your-interest-for-2021-events

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