Date	Dec 8, 2020	**Meeting Time**	California/USA: 9am – 10am (PST) London/Lisbon: 5pm – 6pm (GMT)
WG / Project	5G Work Group		
To	3GPP SA, SA2 TSG		
5G Work Group Leadership	Nigel Bird (Orange) – WG Chair Binita Gupta (Intel) – Chief Editor of 5G & Wi-Fi RAN Convergence Paper Mark Grayson (Cisco) – WG Co-Chair Florin Baboescu (Broadcom) – WG Co-Chair		
Topic	WBA Partner Release of 5G & Wi-Fi RAN Convergence Paper		
Action ID Prefix	N/A		

Dear 3GPP SA Chair Georg Mayer, and SA2 Chair Puneet Jain,

WBA thanks 3GPP TSG-SA for ongoing work regarding WLAN integration into 3GPP 5G systems in the Release 16 and Release 17.

The WBA 5G Work Group has been looking into 5G and Wi-Fi RAN convergence topic for over 2 years. WBA published phase 1 analysis on this topic jointly with the NGMN as part of a RAN Convergence Paper published in September 2019. During 2020, WBA Members approved the creation of a phase 2 project to conduct further in-depth analysis on 5G & Wi-Fi RAN Convergence (https://wballiance.com/5g-wi-fi-ran-convergence-global-architecture-policy).

The WBA 5G Work Group has now concluded the phase 2 of the project in the form of a whitepaper titled '5G and Wi-Fi RAN Convergence – Aligning the Industry on Opportunities and Challenges', identifying potential challenges and gaps related to providing end-to-end 5G services using both 5G and Wi-Fi accesses.

Reason for contact:

The WBA 5G Work Group has highlighted potential challenges and gaps in the following key areas related to the 5G and Wi-Fi convergence:

- 5G and Wi-Fi convergence architecture (for Trusted and Untrusted WLAN access);
- ATSSS multi-access functionality;
- End-to-end QoS;
- Policy Interworking and enhancements across 5G and Wi-Fi;
- Support for Wi-Fi only devices.

Potential challenges and gaps identified in these key areas are captured in Section 3 of the paper. Section 4 provides recommendations for the industry to address them and Section 5 lists specific items to be addressed by relevant standard bodies.

Executive summary included in the annex below highlights potential challenges identified in these areas.

Specific ask

Today it is possible that 5G services may be realized over WLAN, however these services may be enhanced by adding some standard based solutions for the challenges identified in the 5G and Wi-Fi RAN Convergence paper.

As a result, we believe close cooperation with the industry and standard bodies is key, and we will be looking to receive any feedback on the challenges identified in the paper related to the 5G and Wi-Fi convergence, pertaining to the current scope of work of your organization.

Some of the specific challenges for 3GPP considerations may include:

- ATSSS related challenges, including ATSSS policy combining with other UE-based policy, deployment limitations of ATSSS MPTCP converter proxy, incorporating UE local conditions in ATSSS, support for packet level traffic steering for all traffic types, enabling ATSSS operation with MP-Capable servers, incorporating RAN level measurements for dynamic traffic steering decisions in ATSSS, and coexistence of ATSSS inner MPTCP with outer MPTCP on the UE.
- End-to-end QoS related challenges, including considerations for leveraging standardized 5QI to DSCP mapping on TNGF/N3IWF and UE, providing 5G QoS information to the UE for untrusted WLAN access, and considerations for mapping each 5G QoS flow to a separate IPsec SA on TNGF/N3IWF to enable supporting per 5G flow QoS differentiation over the WLAN access.
- Policy related challenges and potential enhancements, including extension to WLANSP rules with additional Wi-Fi QoS metrics for selection criteria and enhancement to URSP rules by extending the validity criteria to specify valid Wi-Fi networks for MA-PDU session.
- Challenges related to supporting Wi-Fi only devices without USIM connecting to the 5G Core, including the need to define 3GPP architecture and procedures for supporting Wi-Fi only UEs with non-IMSI based identity and EAP-TLS/EAP-TTLS based authentication to access 5G SNPN core over WLAN access via N3IWF, TNGF or TWIF.

We believe that further actions are needed by the industry and standards bodies to address key challenges and gaps highlighted in the WBA 5G and Wi-Fi RAN Convergence paper, for realizing new business opportunities presented by the convergence between 5G and Wi-Fi.

We look forward to working together with your organization to address the issues highlighted above. Please let us know if we could collaborate on any items that might be of interest to your organization.

Looking forward to continued cooperation between our organizations.

Thank you very much in advance and for any additional information please contact WBA PMO (pmo@wballiance.com).

Best Regards,

WBA PMO (pmo@wballiance.com)

Next WBA Meetings:

2021 Q1 Virtual Working Sessions – February 2-4

2021 Q2 Hybrid Working Sessions – Jun 14-17

Learn more here - https://www.wirelessglobalcongress.com/

Annex: Executive Summary

With the continued evolution of Wi-Fi and 5G technologies, convergence between these two technologies will enable new use cases and business opportunities for the industry to realize. Some key use cases which can benefit from and leverage Wi-Fi and 5G convergence include verticals/enterprises, industrial IoT and connected cities.

The paper on Wi-Fi and 5G convergence builds and further expands on the previous RAN Convergence paper published in September 2019, jointly authored by WBA and NGMN [1]. It continues to explore the topic of 5G and Wi-Fi convergence with an 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.

The paper is organized into three main parts:

Part I (Chapter 2): Focuses on 3GPP state-of-the-art on the integration of WLAN with the 3GPP 5G system as defined by 3GPP Release 15 and 16, including 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 and suggests some 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 identified related to the 5G and Wi-Fi convergence.

The paper covers WLAN integration architecture for the untrusted and trusted WLAN integration with the 5G Core and identifies some gap areas related to enabling trusted WLAN integration. It captures establishment of IPsec security associations (SAs) for transport of signalling and user data over the WLAN access. The 5G policies for access selection and route selection are described including the Access Network Discovery and Selection Policy (ANDSP) containing WLAN Selection Policy (WLANSP) and the UE Route Selection Policy (URSP). Various aspects of the Access Traffic Steering, Switching and Splitting (ATSSS) feature are covered, including ATSSS architecture, steering functionality, ATSSS rules and ATSSS procedures for multi-access traffic steering. A detailed description of 5G QoS model is captured as it applies to 5G flows carried over the WLAN access, including QoS related signalling and the QoS flow data transport over the WLAN access.

An in-depth analysis of the challenges and gaps related to the ATSSS feature is captured. As part of this analysis, a number of important ATSSS related issues have been highlighted including combining ATSSS policy with other UE based policy, deployment limitations of ATSSS MPTCP converter proxy and incorporation of UE local conditions in ATSSS. Other key issues emphasized include ATSSS support for packet level traffic steering for all traffic types, ATSSS operation with Multi-path capable servers, incorporating RAN level measurements for dynamic traffic steering in ATSSS and interworking challenges of ATSSS MPTCP functionality with the already deployed outer MPTCP on certain device platforms. The importance of key issues identified in Release 17 ATSSS phase 2 study is underscored.

Further analysis is conducted on the policy interworking across Wi-Fi and 5G taking into consideration that policies for access selection and/or multi-path selection can be defined by multiple entities including application providers, device manufacturers, end users, enterprise IT admins as well as the service provider. The issue of choosing a high quality WLAN network connection based on Wi-Fi QoS metrics is considered and the policy related enhancements needed to enable such a capability are highlighted. Relating to policy, another key issue identified is how to enable an operator to provide differentiated service over 5G and Wi-Fi as part of a converged service bundle.

The paper also examines the key issue of how the end-to-end QoS requirements for 5G applications and services can be satisfied over the WLAN access. It highlights the importance of providing QoS differentiation within WLAN access for 5G QoS flows based on 5G QoS characteristics and QoS parameters. It analyses the issues associated with mapping of 5G QoS to Wi-Fi QoS and underscores the need to define a standardized mapping between 5QI to DSCP values as one of the gap areas to support QoS differentiation. In addition, it identifies some IEEE 802.11 related gaps to support QoS differentiation for 5G flows based on identifying and prioritizing the 5G user traffic carried over IPsec child security associations within the WLAN access.

The importance of supporting 5G connectivity for Wi-Fi only devices is underscored, to be able to provide 5G experiences to such devices in enterprises and verticals. The issues associated with supporting Wi-Fi only devices without USIM in the 5G and WLAN converged system are explored. The need to define full support for non-IMSI based identity and EAP-TLS/EAP-TTLS authentication methods over WLAN access for stand-alone non-public network (SNPN) is highlighted, for enabling Wi-Fi only devices in private 5G networks. Additionally, the important discussion point on the topic of supporting Wi-Fi only devices without USIM over the PLMN networks is highlighted.

Finally, the paper provides recommendations on what the industry can do to address key challenges and gaps identified to fully support the 5G and Wi-Fi convergence. It suggests liaisons with relevant standard bodies as the next step to align the industry on the challenges and issues, and facilitate standardization efforts for addressing these issues, to provide fully deployable end-to-end 5G and Wi-Fi convergence solutions.