



Motivation for WI: Enhanced LTE-WLAN Aggregation (eLWA)

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Background

- With the ever increasing demand on mobile broadband services, the usage of unlicensed spectrum in general and WLAN in particular remains to be important for 3GPP operators
- Release-13 LTE-WLAN Aggregation (LWA) provides a solid framework for integrating WLAN into 3GPP networks
 - Operator control, significant performance gains, improved mobility, etc
- However, due to lack of time, many important LWA enhancements and optimizations did not make it into Release-13
- Additionally, 802.11 technologies continue to evolve. Even though LWA framework is generic enough to support all 802.11 flavors, certain optimizations may be needed for extremely high data rates supported by new 802.11 standards
- The Rel-14 WI proposal contains “leftovers” from Rel-13 WI and additional enhancements to support high data rate new 802.11 technologies and new 802.11 bands

802.11 standards evolution

- IEEE 802.11 specifications continue to evolve
- 802.11ax aims at increasing spectral efficiency in 2.4 and 5 GHz bands
 - Focus on dense deployments
 - Scheduled uplink
 - Theoretical peak throughputs up to 9.6Gbps (1.6Gbps under more realistic conditions)
- 802.11ad is a ratified amendment to 802.11 that adds support for millimetre wave band of 60GHz
 - Offers up to 7Gbps throughputs
- 802.11ay is in the process of enhancing 802.11ad
 - Improved mobility and range
 - Data rates of at least 20Gbps
- IEEE 802.11 discuss “802.11 as a component” to improve 802.11 integration into other systems (e.g. 3GPP)

Objectives (1/4)

- Uplink
 - Uplink support was part of Rel-13, however as a second priority objective it did not make it
 - Uplink support may be beneficial, e.g. for video, which WLAN is increasingly being used for
 - 802.11ax standard aims at improving WLAN uplink, e.g. by adding scheduled transmission
 - Based on the above, it is proposed to standardize support for uplink transmission on WLAN and uplink bearer split
- Mobility
 - In Rel-13, LWA is disabled (and potentially re-enabled by target eNB) at intra and inter eNB handovers
 - Mobility enhancements, e.g. intra and inter eNB handover without WT change (similar to DC HO without SeNB change), are deemed beneficial to minimize service interruption on HO

Objectives (2/4)

- Optimizations for high data rate 802.11 technologies and new 802.11 bands
 - LWA framework is transparent to 802.11 and therefore supports all 802.11 technologies
 - However, extremely high (e.g. 802.11ay 20Gbps) data rates may require certain optimizations in user plane
 - In particular, switched bearer may be more attractive in case of high WLAN/LTE data rate ratio and certain other PDCP optimizations might be beneficial
 - In control plane, at least support for new 802.11 band must be added
 - Additional enhancements to optimize WLAN discovery in 60Ghz band may also be beneficial
- In-Device coexistence
 - Current IDC assumes that WLAN is beyond 3GPP control and thus only actions on LTE may be taken to mitigate IDC
 - LWA makes it possible to further optimize IDC, exercising eNB control over WLAN

Objectives (3/4)

- Additional measurements/feedback
 - Currently WLAN measurements are based on RSSI only – there is no metric for signal quality
 - Better metrics, e.g. estimated throughput, have been discussed in Rel-13
 - Addition of such metrics (and others) to Xw and Uu signaling is deemed beneficial
- Automatic Neighbor Relation (ANR)
 - LWA framework requires a fair amount of information to be configured (via OAM) in eNB (e.g. information about WLAN APs under eNB coverage)
 - Some basic ANR functionality (WT TNL address discovery) has been agreed for LWA in Rel-13
 - Additional ANR enhancements can reduce the OAM burden and lower LWA deployment costs

Objectives (4/4)

- Access control for enterprise WLAN
 - Enterprise WLAN is a valid LWA deployment scenario
 - Typically, in enterprise case, WLAN access is limited to certain groups of users, which is not visible to eNB controlling LWA
 - This has been discussed in RAN3 in Rel-13
- LWA and DC co-deployment
 - LWA and DC co-deployment is valid deployment scenario considered by some operators
 - While three-way bearer split is probably not needed, support for LWA with SCG and MCG bearers is easy to standardize
 - Both deployments of WT connected to MeNB and SeNB may be considered
- Power saving
 - In Rel-13 LWA, LTE DRX and WLAN power saving operate independently
 - LTE DRX and WLAN PS synchronization and other optimizations are deemed beneficial

Conclusions

- It is proposed to approve an enhanced LWA WI proposal based on considerations above
- Certain level of prioritization between various objectives listed above may be needed.

