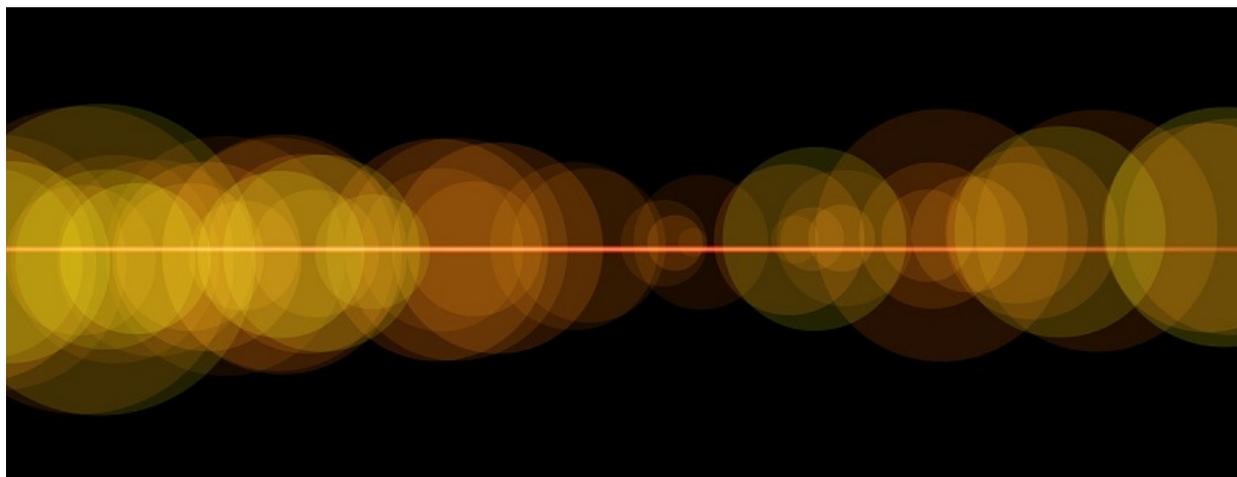


## Rysavy: Accelerating innovation in unlicensed spectrum

by Peter Rysavy | Nov 30, 2016



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Unlicensed spectrum reached a critical milestone on Sept. 20, when the Wi-Fi Alliance issued its Coexistence Test Plan that measures the impact of LTE-U on Wi-Fi. Culminating many months of intensive work by stakeholders in both Wi-Fi and cellular companies, the test plan defines criteria to “determine whether an LTE-U network impacts a Wi-Fi network any more than a Wi-Fi network impacts another Wi-Fi network.” Vendors have already submitted products for testing to Cetecom, an authorized test laboratory; assuming these products pass muster, cellular operators can begin deploying LTE-U. The implications for the wireless industry are huge, expanding how different entities use unlicensed spectrum for innovative new services and enabling entirely new business models.

Getting here was not easy. Camps with different strategic agendas had to wrestle thorny issues to the ground through various compromises. Wisely, the FCC resisted imposing any form of regulatory solution. As Julius Knapp of the FCC [recently stated](#), “Throughout this process we have strongly encouraged industry to address and resolve sharing concerns while preserving the principle of permission-less access for unlicensed devices throughout the spectrum.” With LTE-U now on the runway, and its successor technology, Licensed Assisted Access, already standardized in 3GPP Release 13 and expected to be deployed in 2017, LTE cellular systems will be able to expand capacity using unlicensed channels at 5 GHz in a manner that is seamless and transparent to the user.

The Coexistence Test Plan does not apply to LAA. The FCC has not indicated that the Wi-Fi Alliance needs to be involved with LAA. Moreover, at the last Wi-Fi Alliance coexistence workshop in September, the Wi-Fi Alliance explicitly removed all references to LAA. This is appropriate for permission-less operation in unlicensed bands, especially because LAA implements listen-before talk (LBT) capability and because 3GPP is finalizing its own conformance testing program. Unfortunately, in recent 3GPP meetings, some of the same discussions that delayed the LTE-U coexistence test plan now threaten to complicate LAA completion.

Assuming coexistence considerations are resolved promptly and sensibly, LAA should experience rapid adoption. Not only is LTE-U upgradeable to LAA, but LAA’s capabilities, including LBT, address regulatory requirements for operation in unlicensed bands in Europe and Japan, paving the way for global adoption.

In parallel, the MulteFire Alliance is pushing MulteFire, which adapts LAA to run in an unlicensed-only mode, meaning operators do not need an anchor in licensed spectrum, as they do for LTE-U and LAA. With MulteFire, any entity can deploy a cellular-compatible network. For example, a stadium owner could install MulteFire access points, set up roaming arrangements with operators, and allow devices to roam onto its system. In this fashion, MulteFire networks could operate as cellular neutral hosts, a capability that some consider the holy grail of small cells. Whether this approach becomes commonplace remains to be seen, but such an architecture presents an entirely new business model for unlicensed spectrum.

MulteFire networks could also operate as unlicensed users at 3.5 GHz, a complicated band [that I recently wrote about](#). This band will use a spectrum-access system to coordinate access by multiple types of entities, including government users classified as Incumbent Access, operators with licenses as Primary Access, and unlicensed users as General Authorized Access.

If operators solve small-cell challenges and integrate LTE-U/LAA into these cells, and if MulteFire gains traction, 10 years from now, a significant percentage of bits flowing across unlicensed radio channels will be using cellular protocols, whether LTE or 5G flavors. Compared with alternate approaches, using consistent cellular protocols across

licensed and unlicensed channels promises better range, higher capacity under load, better mobility, and better voice operation.

Expansion of cellular systems does raise questions around the future role of Wi-Fi protocols based on the IEEE 802.11 standards. Will cellular systems take over?

Although some worry this will happen, it is not likely. Wi-Fi, due to its simplicity and low cost for high performance, will remain the better choice for many enterprises and especially for consumers. Plus, technologies such as Licensed Wi-Fi Aggregation (WFA), LTE Wi-Fi Aggregation with IPSec Tunnel (LWIP), Multipath TCP, and Wi-Fi Calling provide alternate architectures for integrating unlicensed spectrum with cellular networks. Depending on exact needs, some operators will use these instead of LAA.

Wi-Fi has succeeded in unleashing the power of unlicensed spectrum, with Bluetooth also playing an important role. Until now, cellular systems have used only licensed spectrum. But now, with LTE-based technologies also able to use unlicensed spectrum and 5G technology in the wings that will adopt similar or even enhanced approaches, the industry is on the verge of a profound shift. Wireless technologies are already a fundamental driver for mobile computing. The transformation of unlicensed spectrum will further accelerate wireless innovation.

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