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Why Operators Must Simplify Network Configuration

By Jesse Cryderman

Navigating the sea of standards is not unlike spooning through alphabet soup. CDMA. 802.11n. 4G LTE. Can I get a YOLO? Which acronyms will be with us in five years, and which will fall to the bottom of the soup bowl and down the drain?

Although all standards play an important role in enabling the communication technology we use every day, not all standards are created equal. Naturally, some recently developed standards are driving more than just better signal processing or faster billing; these standards are fundamentally changing the way we will communicate in the future. While by no means an exhaustive list, the following five standards will alter the shape of our signals in the coming years.

Hotspot 2.0

Imagine Wi-Fi that works just as effectively as cellular service and you've grasped the gist of Hotspot 2.0. The standard, driven by the Wi-Fi Alliance, handles authentication over carrier-owned or carrier-partnered Wi-Fi hotspots; the same credentials used for cellular access (SIM cards) permit authentication over the Wi-Fi network. From there, service providers can enforce policies that include best-network selection, service provisioning and service level.

In its current incarnation Wi-Fi is susceptible to many attacks, from eavesdropping and sidejacking to "evil twin" attacks and spoofing the SSID. That's because legacy Wi-Fi is best-effort technology that was designed around a different set of expectations. Hotspot 2.0 is framed by carrier-grade expectations and applies a higher level of security, WPA2-Enterprise, to protect over-the-air transmissions.

"Hotspot 2.0 brings Wi-Fi into the mainstream for service providers," says David Callisch of Ruckus Wireless. "It completely changes the user experience and the ability for a carrier to offer Wi-Fi service in a more seamless fashion."

ANDSF

A close partner standard to Hotspot 2.0 is Access Network Discovery and Selection Function (ANDSF), a component of evolved packet core networks as defined by 3GPP. ANDSF enables devices to discover and connect with noncellular networks (Wi-Fi, WiMAX) and enforce user policies. ANDSF is a crucial part of the framework that the GMSA and the WBA are advancing that will fundamentally transform the relationship between Wi-Fi and cellular networks.

"Successful and speedy implementation of ANDSF in NGH [Next-Generation Hotspot] is critical to the growth of carrier Wi-Fi," says Nick Marshall, principal analyst at ABI Research. ABI predicts that carrier Wi-Fi equipment sales will grow tenfold in the next five years as a result of these standards.

In fact the evolution of carrier Wi-Fi is setting up some new competition, as vendors like Cisco and Ruckus Wireless will fight against traditional mobile infrastructure players like Ericsson and Alcatel-Lucent for carrier Wi-Fi sales and support.

From an OSS and BSS perspective, ANDSF increases the requirements for policy management. Companies

like Tekelec, Opent, and Alcatel-Lucent offer policy management solutions with ANDSF that permit service providers to take full advantage of Wi-Fi.

IPv6

There is tremendous buzz around Machine to Machine (M2M) these days, and for good reason: as the "Internet of things" goes online we will see not only Jetsons-like technical advancements but considerable market opportunities for all of the players in the M2M value chain. On the other hand IPv6, the latest Internet addressing standard, hasn't quite generated the same amount of popularity. It could be that the name itself sounds like an experimental drug treatment, but to say that IPv6 is one of the most important acronyms in connectivity is an understatement. Quite simply, the Internet of things doesn't happen without IPv6.

Every M2M device requires a unique IP address in order to connect to the world and leverage its smarts. The signaling from a traffic camera must be routed into a traffic control system, not a smart meter or an aware appliance, so these modules must have their own identifier. The problem is, there are no more name tags left under the old system, IPv4, and we'll need many billions more in the coming years to make M2M a reality.

Enter IPv6 and its staggeringly large pool of IP addresses. Whereas IPv4 provides for around 4.3 billion unique addresses, IPv6 delivers 4.8×1028 unique addresses per person currently alive on the planet, or enough address capacity to assign a unique IP to every atom on the surface of the earth, and still has enough left over for a hundred more planets.

The Internet Engineer Task Force (IETF) is the champion behind the standard, and has been urging the wholesale transition to IPv6 for some time. The main problem? "The biggest weakness of IPv6 is its incompatibility with IPv4," says the IETF.

The Regional Internet Registry (RIR) announced in September that IP addresses in Europe, the Middle East, and parts of APAC are exhausted. The RIR urged a rapid transition to IPv6, saying, "It is now imperative that all stakeholders deploy IPv6 on their networks to ensure the continuity of their online operations and the future growth of the Internet."

Today, many CSPs are in the process of moving to a native IPv6 environment and are using various translation techniques to ensure service continuity in the meantime. But sooner than later all communication devices will be running IPv6.

Unified LTE

The WiMAX vs. LTE battle has been effectively decided by the market, with most large wireless service providers voting for 4G LTE. However, the Holy Grail of network convergence isn't LTE plus WiMAX but rather LTE plus LTE, because not all LTE is the same. There are two main varieties of LTE being deployed around the world: FD-LTE and TD-LTE. The way in which the two technologies manage downstream and upstream data is the main difference between the two, and why they lack native interoperability.

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FD-LTE, or Frequency Division Duplex LTE, predominates in North America and Europe. It uses separate, paired spectrum to handle two-way signaling and requires a diplexer to separate upstream from downstream transmissions. Furthermore, the capacity is static and determined by the frequency allocation.

TD-LTE, or Time Division Duplex LTE, was developed in China (soon to be the largest mobile market in the world) and transmits and receives over the same channel. Therefore, it does not require paired spectrum, and the upstream and downstream capacity is dynamic.

In order for LTE devices to work all over the world Unified LTE has to happen, and thankfully it's slowly gaining steam. Today, this is primarily a market-driven interoperability standard, and has yet to be defined by an SDO. At Mobile World Congress, Qualcomm and HiSilicon unveiled unified LTE chipsets; more recently, ZTE announced multimode LTE devices.

Service providers have been active as well. China Mobile plans to launch a converged TD/FD LTE network in Hong Kong, Vodafone and Yota have publicly supported unified LTE, and 3 Scandinavia has deployed a unified LTE network. In the United States 4G wholesaler Clearwire is working with chipmaker Sequans on "performance testing and certification, standards development, and the creation of devices to support multi-band, multi-mode TD-LTE and FDD-LTE solutions."

Analysts are predicting it's only a matter of time before unified LTE is a reality. Wireless research group Maravedis-Rethink projects 458 million dual-mode (TD-LTE + FDD-LTE) devices will be activated in the next four years. "By 2016, more than 80% of LTE devices activated worldwide will be dual-

mode, meaning they will support both FDD and TDD duplexing modes."

5G

Most of the world has yet to experience 4G, but it's not too early to start talking about 5G, especially if you're Alcatel-Lucent, Bell Labs or Telefonica. While none of these organizations is developing a 5G standard (that's up to the ITU-R), they are preparing for the world of 5G, and delivered a compelling presentation to that end at Mobile World Congress.

"5G won't be about more speed, necessarily," said Tod Sizer, wireless research leader at Alcatel-Lucent's (ALU) Bell Labs. "It may be faster, but it will be more about meeting the expectation of service quality."

Meeting service-quality expectations will be challenging with 4G networks; some analysts expect global networks will be clogged (due in no small part to M2M traffic) within five years. The standard for the fifth generation of mobile connectivity will require intelligent networks that easily handle billions of connections with stability and superior service quality. "The trend of telephony is now headed towards machines that connect to the network," said Sizer. "Networks will have to understand each application and know what quality means."

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In cellular technology we probably won't see 5G as a deployed standard until 2020, but the Wi-Fi world is already pushing a 5G standard. Companies like Broadcom and Netgear are pushing fifth-generation technology and 5G routers, which take advantage of the IEEE 802.11ac standard and the 5Ghz spectrum. Netgear recently demonstrated a 5G router effortlessly streaming four high-definition (1080p) movies simultaneously to four devices. Two different 5G standards may cause some confusion in the marketplace, but it's also possible that the two 5Gs may dovetail in the future, particularly in light of the deepening connection between Wi-Fi and cellular access vis-a-vis Hotspot 2.0 and ANDSF.