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WiFi World Summit: Seamless WiFi Is Coming

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Three wireless technology events came together in Barcelona. The goal: develop a network where your phone will automatically switch to WiFi when you're indoors.

WiFi World Summit took place October 28 and 29 in Barcelona, Spain. It's really three technology shows, the other two being Small Cells Global Congress, and Fronthaul and centralized radio access network (C-RAN). The three themes naturally merge into the next generation wireless architecture.

The WiFi event is now in its third year, the Small Cells event in its fourth and the Fronthaul and C-RAN track is brand new. Fronthaul, which I'll explore below, is associated with distributed antenna system architecture (DAS).

Participants included telecom operators and their suppliers: AT&T, British Telecom, Orange, Telefonica, Fon, China Mobile, Huawei, Qualcomm, Microsoft, and others. octoScope, with its small anechoic wireless test bed, was the only test equipment exhibitor.

The WiFi track focused on operator-managed WiFi, monetization of WiFi, and the WiFi Alliance Passpoint 2.0 capability. Passpoint lets mobile operators manage and monetize WiFi access.

What does Passpoint and operator management mean for the WiFi users? Basically, it means that WiFi will work more like cellular once the operators deploy the WiFi roaming infrastructure.

Inter-operator cellular roaming now works well. When I got off the plane in Barcelona and turned on my phone, it instantly found a local mobile network and gave me voice and data access. When I got to the conference and tried to connect my PC to WiFi, the process was far from seamless. I saw a long list of access points (Aps) and had to run around figuring out which one to connect to and what login credentials to use. The WiFi connectivity at the show was sporadic.

The two key benefits of Passpoint are ability to seamlessly connect to the WiFi network and reliable WiFi access. The underlying standards for Passpoint are the IEEE 802.11u and the emerging 802.11aq general advertising service (GAS) and access network query protocol (ANQP). GAS and ANQP (Figure 1) let mobile devices automatically connect to an operator's WiFi network using a SIM card or other method. Furthermore, users can find desired services prior to associating with an AP. If, for example, I want to use a WiFi enabled printer or projector at the show, I don't need to know which AP will connect me to them.

My device can use GAS and ANQP to tell me which services are available and I can print or project while, unbeknownst to me, my device determines the AP to associate with and which access credentials to use.

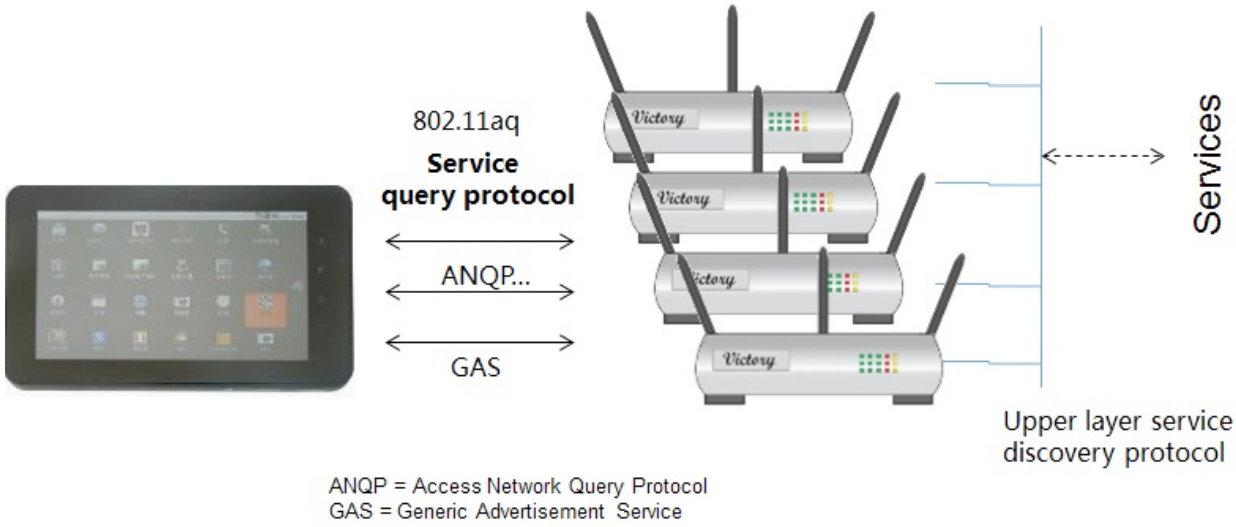

Figure 1. GAS and QNQP protocols, the foundation of the WiFi Alliance Passpoint.

The Small Cell and Fronthaul tracks were interdependent. Fronthaul is part of the DAS small-cell architecture and is the network that interconnects RRHs (remote radio heads) with a centralized digital part of the base station. In a traditional cellular architecture, the base station (a.k.a. NodeB or eNodeB) is typically placed on the ground next to a tower with a long coaxial cable running up the tower to the antennas. This coax can have high RF losses causing inefficiencies in power amplifiers, which means higher power dissipation for a shorter range. Furthermore, traditional tower-based macro cell architecture is difficult to scale in terms of capacity (i.e. adding more users and more traffic). Small cells increase the capacity by virtue of the divide-and-conquer principle. In a typical operator network, there may be thousands of macro cells and in the future, millions of small cells.

DAS is one type of small-cell architecture whereby the base station is split into the RRH and baseband subsystems. RRH is the radio part and baseband is the digital-signal-processing subsystem that may also be integrated with the MAC (medium access control) layer and higher protocol layer implementation. The digital subsystem can be connected to the RRH/antenna modules distributed throughout a facility (e.g., an airport) or outdoors. Fronthaul is the network connecting RRH modules to the baseband subsystems. Fronthaul forms a C-RAN (centralized radio access network) that can be implemented as a specialized synchronous fiber optic network, CPRI (common public radio interface). Fronthaul (Figure 2) can also include microwave links, metro Ethernet, and other technologies.

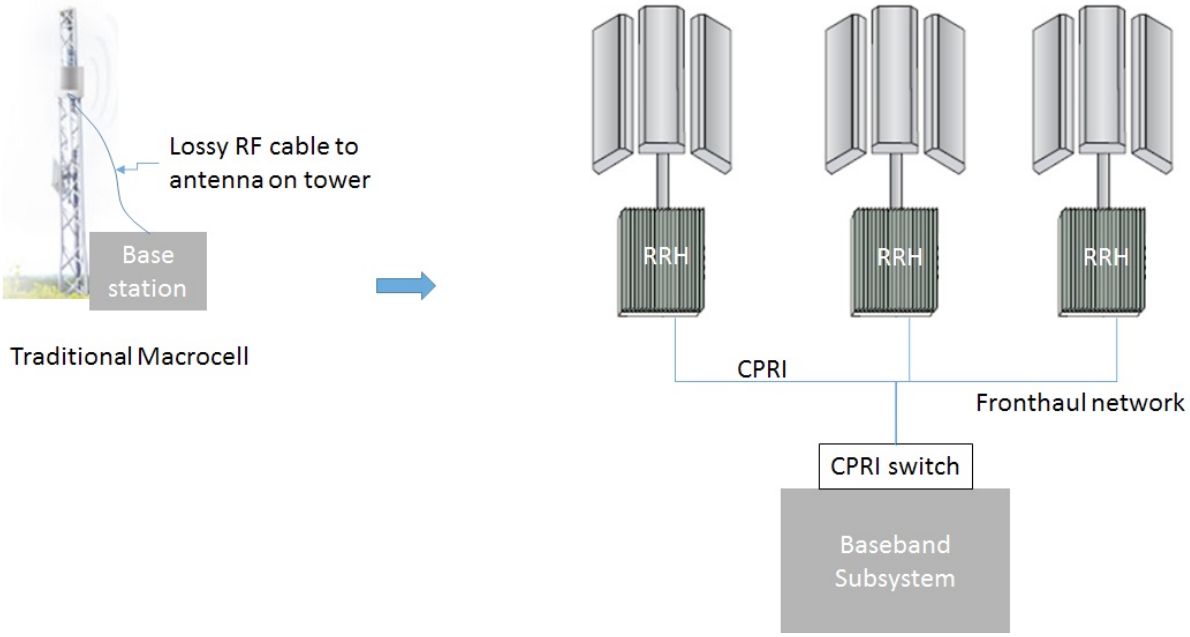

Figure 2. Traditional tower-based macro cell (left); DAS based small cell C-RAN architecture (right)

According to Heng (Henry) Huang, director of DAS Engineering and Small Cells at AT&T, RRH units will incorporate WiFi, moving us one step closer to a converged new generation wireless network.

But, the story goes beyond the marriage of cellular and WiFi because the wireless industry is also working to enable and standardize the LTE-Unlicensed (LTE-U) technology to coexist with WiFi in the 5 GHz unlicensed UNII (national information infrastructure) band, the topic covered by Huawei's Louis Lou, VP of Small Cell Product Line. The allure of the UNII band is free spectrum: more than 500 MHz today with about 700 MHz expected when the FCC completes its spectrum sharing regulations (Figure 3).

- U-NII-1 = 5150-5250
- U-NII-2A = 5250-5350
- U-NII-2B = 5350-5470 NEW
- U-NII-2C = 5470-5725
- U-NII-3 = 5725-5825 (NEW Proposal to extend to 5850)
- U-NII-4 = 5850-5925 (NEW)

Figure 3. UNII spectrum allocation showing the new bands, UNII-2B and UNII-4, being considered by the FCC as candidates for spectrum sharing to increase the available unlicensed spectrum

While the new 802.11ac is the offload technology of choice for the wireless operators today, LTE-U, being better integrated into the cellular network architecture, may be a contender for the UNII band in the near future. Some dust will need to clear on the WiFi/LTE-U coexistance.

In the end, we will all welcome reliable, seamless and cost-effective connectivity. I for one don't need to know what access network (WiFi, 2G/3G, LTE or LTE-U) my device is on, just as long as my call or IP session continues through a complex inter-operator roam.