Alberto Escudero-Pascual <aep@it46.se>
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Creating wireless opportunities in a “Garbage Band”

The history of the popular WiFi started as long as twenty (20) years ago. Back in 1985 the U.S. Federal Communications Commission (FCC) decided to make several bands of the wireless spectrum available without a government license.

One of the radio bands was the “garbage band of 2.4 Ghz”, a radio band that was already allocated to other noisy equipment as microwaves ovens. From 1985, one of those pieces of spectrum could be used not only for heating a glass of milk but also for Industrial, Medical and Scientific (ISM) purposes.

The spectrum became accessible

Although the spectrum was available, the technology that could operate in such a noisy band was not accessible to everyone. To improve communication efficiency in the “garbage bands”, the communication devices required to “spread" the radio signal over a wide frequency range, a range several magnitudes higher than minimum requirement. The communication devices required the use of “spread spectrum”.

The history of spread spectrum dates back to 1940. The very first version of a spread spectrum method was invented by the actress Hedy Lamarr. The technology was patented as “Secret Communication System” and used to guide torpedoes. The technology was widely used for military communication systems after the patent expired in the 1950s.

The technology became accessible

In 1990, the Institute of Electrical and Electronics Engineer known as IEEE, formed a new working group, 802.11. One of the roles of the IEEE was to promote industry standards. Having the spectrum available (unlicensed ISM) and the military technology accessible (spread spectrum) was not enough to see personal wireless broadband taking off. A communication standard was needed.

The IEEE Standardization process is open to any individual with independence of their industrial affiliation. The philosophy behind an IEEE Standard is that mass adoption of a certain technology can only be achieved by representing a broad "consensus".

Although pre-standard devices were manufactured, it was not until 1997 that IEEE approved the Standard IEEE 802.11 - Wireless Local Area Network (Wireless LAN). The first standard, IEEE 802.11, was soon followed by another IEEE standard called 802.11b in 1999. In order to guarantee interoperability between different implementations of the IEEE Standard 802.11, a new organization called Wireless Fidelity (WiFi, known as WFA today) was launched.

The standard for “indoor” wireless communications was available

The IEEE Standard 802.11b was designed to operate in indoor environments and to deliver a maximum of 11 Mbps using a spread spectrum technique called Direct Sequence Spread Spectrum (DSSS). Although it was initially conceived as a short range, low power wireless technology for indoor use, it did not take long until we saw WLAN-based products in point-to-point (PtP) and point-to-multipoint (PtMP) outdoor solutions in metropolitan area networks (MAN) and rural areas.

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Outdoor wireless, a new opportunity made possible

Between 2000 and 2005, the possibility of using WiFi to carry backbone Internet traffic, including data and voice, at very low cost in comparison with the existing traditional Telecom equipment encouraged vendors and users to find innovative approaches to overcome the IEEE 802.11b native problems in outdoor environments. In a very short time, different vendors had already added extensions to the protocol to overcome the lack of performance in some particular scenarios (e.g. presence of hidden nodes, lack of Quality of Service, big overhead in Voice over IP (VoIP), etc.).

The way that WiFi-based solutions are spreading is similar to "the revolution of the open standards and the personal computers" some twenty years ago. There was a need, the technology was available and a standard aiming for interoperability and mass production was created.

While other IEEE 802.11 Standards[1] are trying to improve things and get ready to overcome several problems in 802.11b, WiFi is still spreading and growing stronger as enables deployment of wireless infrastructure right away. Independently of what roles other standards as IEEE 802.16 (WMAN-WiMAX)[2] (will) play in the future history of broadband wireless communication, the future will certainly bring more opportunities.

WiFi was never intended to be the best radio technology for long distance point-to-multipoint radio links but WiFi will always be remembered as the technology that enabled the radio world what the open architecture did to the personal computer.

Reasons for its worldwide success in data infrastructure can be found in the low cost of the radio equipment due to its mass production, the possibility of easy integration with personal computers and operative systems, the existence of a certified interoperability between vendors (WiFi) and the possibility of finding a very favourable regulatory framework in comparison with other radio technologies and related services.

Time to move!

For the price of a personal computer, it is possible to link two villages situated 10 kms from each other.

WiFi brings the possibility of providing both data and voice services at low cost. This new opportunity is not only a challenge for us but also for the traditional telecommunication markets and its regulators.

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1 IEEE 802.11 family of standards has just included two new standards that addresses some of the problems faced in IEEE 802.11b: security and quality of service. IEEE 802.11i will include the WPA2 as a substitution of WEP and IEEE 802.11e will include an easy way to implement Quality of Service (QoS) by means of new Coordination Function able to support traffic classes.

2 IEEE 802.16 is another IEEE working group that was established to specialize in point-to-multipoint broadband wireless access. The original standard, IEEE 802.16 (2001), was designed to operate in the frequency range from 10 to 66 GHz range. A later addition, IEEE 802.16a (2004), added support for the 2 to 11 GHz range and competed with the latest security and QoS enhancements in IEEE 802.11 (11i and 11e).