Wireless LAN protocol

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Categories : Computer Networks

Protocols:

IEEE 802.11 The original 2.4 GHz wireless LAN protocol, but also includes infrared communication too. Data rates available are 1 and 2 Mbps. The protocol uses the 2.4 to 2.5 GHz ISM (Industrial, Scientific, and Medical) band. IEEE 802.11 in the United Stares allows the frequency band from 2400 to 2483.5 MHz. Modulation protocol is FHSS (Frequency Hopping Spread Spectrum). The standard was modified on August 31, 2000 and now allows a maximum data rate of 10 Mbps.

IEEE 802.11a The standard specifies WLAN in the 5 GHz UNII (Unlicensed National Information Infrastructure) and supports maximum a data rate of 54 Mbps and uses OFDM (orthogonal frequency division modulation). The protocol also supports data rates of 6, 9, 12, 18, 24, 36, and 48 Mbps. The 5 GHz UNII frequency band consists of 3 sub-bands, each with a defined maximum output power. The lower frequency band consists of 4 non-overlapping channels from 5,150 to 5,250 MHz with a maximum power level of 40 mW. The middle band goes from 5,250 to 5,350 MHz with a maximum transmit power of 200 mW and also with 4 non-overlapping channels. The upper frequency band again consists of 4 non-overlapping channels from 5,725 to 5,825 MHz with a maximum output power of 800 mW.The Wi-Fi alliance certifies the products for interoperability between manufacturers.

IEEE 802.11b This standard uses DSSS (Direct Sequence Spread Spectrum) and uses the 2.4 GHz ISM band and provides for maximum data rate of 11 Mbps and with fall-back to 5.5 Mbps. The standard is also backward compatible to IEEE 802.11 standard operating at 1 or 2 Mbps. The 2400 to 2483.5 Mhz band is divided into 11 overlapping 22 Mhz wide frequency bands. This means that at any one location, there are 3 non-interfering bands which are channels 1, 6, and 11. The Wi-Fi Alliance (wireless fidelity) to assure interoperability of products from one manufacturer to another in the same frequency band. Wi-Fi Alliance certifies products for 802.11a, 802.11b, and 802.11g). The IEEE 802.11b standard was ratified in 1999.

IEEE 802.11g The standard uses the same 2.4 GHz frequency band as 802.11b. OFDM (Orthogonal Frequency Division Modulation) is used with a maximum data rate of 54 Mbps with lower rates of 6, 9, 12, 18, 24, 36, and 48 Mbps. The standard is backward compatible with 802.11b. Wi-Fi Alliance certifies the products so that they interoperable between manufacturers. The standard was approved in June 2003.

IEEE 802.11af The standard is more correctly known as 802.3af and defines PoE or power over ethernet. This feature is very useful for the powering of VoIP (Voice over Internet Protocol) phones

and WLAN access points with the same cable that is used for the ethernet connection.

IEEE 802.11e The standard will define the standard for QoS or Quality of Service. QoS is important for VoIP (Voice over Internet protocol) and video data streams and the standard will give priority to this data. Standard approval is expected by September 2005.

IEEE 802.11h The standard defines the use of DFS (dynamic frequency selection) in the 802.11a 5 GHz WLAN band. DFS detects possible interference from other devices in the area using the same frequency and switches to another frequency channel in order to avoid interference. TPC (transmit power control) is used to adjust the WLAN access point transmit power in order to minimize interference with other services.

IEEE 802.11i This standard is the new WLAN security standard approved June 2004. The standard uses WPA2 (WI-Fi Protected Access) that corrects the problems associated with WEP (Wired Equivalent Privacy). The standard also defines the use of AES (Advanced Encryption Standard) for data encryption. AES will require a hardware upgrade for access points due to the higher processor requirement.

IEEE 802.11k This the proposed standard that will allow more efficient use of WLAN access points with dynamic control of channel frequency and or power level. Approval is expected by June 2006.

IEEE 802.11n This standard is only in the approval process at this time. This proposed standard uses MIMO (Multiple Input Multiple Output) and should allow data rates up to 200 Mbps. The standard would be an upgrade to IEEE 802.11a, IEEE 802.11b, and IEEE 802.11g. Approval is not expected before the end of 2008 or early 2009.

IEEE 802.11r The standard will allow for fast roaming, particularly for mobile and wireless VoIP (Voice over Internet Protocol) phones. First approval is expected by September 2006.

IEEE 802.1X This standard defines port access control and is used for both the wired network and WLAN. The standard is typically used with a RADIUS (Remote Authentication Dial-In User Service) application. A user is allowed access to the network once authenticated.

IEEE 802.15.4 This is the wireless standard describing a wireless personal area network or WPAN. IEEE 802.15.4 defines the PHY (physical or frequency definition) and MAC (media access control) layer. The ZigBee Alliance defines network, security, and application layers. The ZigBee standard is quite different from the other wireless LAN specifications. The goal is for products that are low cost, low power consumption, have high security for control and monitoring applications, e.g., home automation, and with relatively low data rates, i.e., 250 Kbps. Typical products will be battery powered and have long life. Frequency bands are 868 MHz, 915 MHz, and the 2.4 GHz ISM band. The number of nodes in a network is essentially unlimited (> 65,000). The first ZigBee compliant chips were certified in April 2005. Products should be available in late 2005.

IEEE 802.16e This is the new wireless standard that is designed to provide the last mile or backhaul connection to the client. Most use will probably be in the rural areas where DSL or cable modem connections are not available. Frequency range will be between 10 and 60 GHz for line-of-sight configurations and below 11 GHz for non line-of-sight. Both licensed and license-free bands will be used. The standard will accommodate data rates as high as 268 Mbps. The WiMAX Forum is promoting the IEEE 802.16 standard and will certify equipment. The initial frequency bands to be approved will probably in the 5 GHz band. The 3.4 to 3.6 GHz licensed band is also of high interest for outside US. Frequency bands below 1 GHz are also of interest. Some of the analog TV channels that will be abandoned in the switch to digital TV could become available. First equipment to be available will be in the 3.5 GHz band and be available at the end of 2005 outside the United States. Equipment for the US will probably be available by mid 2006.