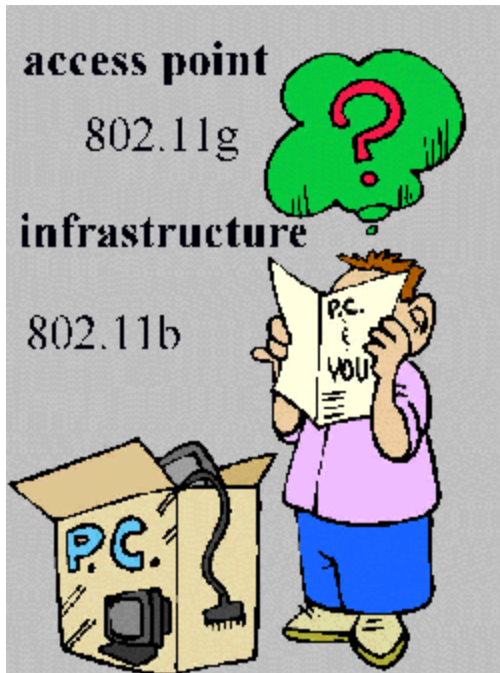# 802.11 TECHNOLOGIES EXPLAINED

Wireless handheld technology has been around for over 20 years. Symbol/MSI-1983, Motorola's "Four Phase System"-1985 and Telxon's "Dataspan-2000"-1990. More recently it has made a greater commercial impact due to the advances of both hardware and operating system software.

10 years ago if you wanted to run a portable wireless data collection device it was on a highly proprietary device and if lucky maybe it would run with something like the DOS operating system.

Earlier systems were typically 900 Mhz which due to the lower frequency can travel further distances than the 2.4 and 5 Ghz bands. What 900 Mhz gains in distance though it loses in performance. Throughput for high volume systems comes to a crawl when using 900 Mhz based systems. In this case high volume is more than dozen devices.

What is present today are several standards, 802.11b is predominantly the most popular. This runs in the 2.4 Ghz range. Other standards are 802.11, Home-RF, 802.11a and the emerging 802.11g. Note IrDA and BlueTooth will not be discussed here because they are for Personal Area Networks, networks typically confined to a very tiny area like one room.
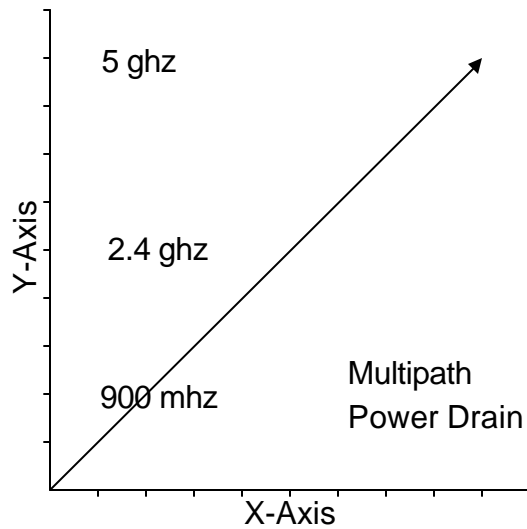
802.11 is the earliest specification discussed here. It runs at slower speeds, one to two Mbps (million of bits per second) in the 2.4 Ghz range.

802.11a is an effort to offer wireless technology at faster rates: up to 54 Mbps in the 5 Ghz range. There are some distinct advantages to 802.11a. The first is that you can co-locate more access points per area. The other advantage is that 802.11a can be used where other 802.11b systems have been deployed and saturated the airwaves already. Of course the inverse holds true for deploying 802.11b networks in a saturated 802.11a area.

802.11a has several drawbacks, it is more expensive than 802.11b. Along with the higher frequency goes both higher power consumption and a diminished range capability when compared to 802.11b. Another

problem termed "Multipath Fading" also

Y-Axis: 5 ghz, 2.4 ghz, 900 mhz
X-Axis
Multipath
Power Drain

Y-Axis: 900 mhz, 2.4 ghz, 5 ghz
X-Axis
Range
Battery Life

increases as the frequency increases. "Multipath Fading" can be simply understood as the radio waves canceling themselves out due to interference

HomeRF Sitting in the 2.4 Ghz range this has primarily presented itself in the small office and home environments. This standard is limited in transmission power. As of 12/2002 the HomeRF standard is defunct. All manufacturers have abandoned this technology.
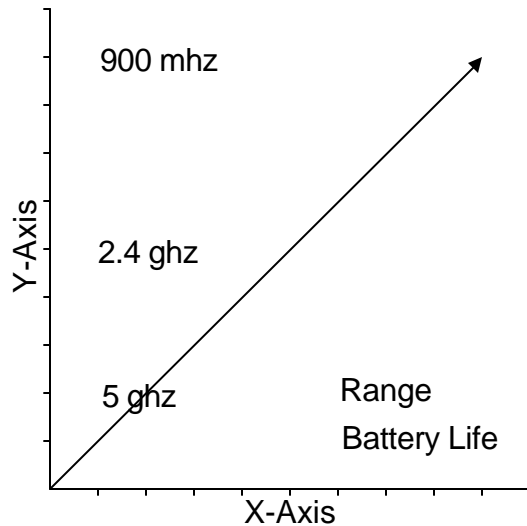
802.11b

The premium standard in my opinion. 802.11b uses direct sequencing modulation. Most vendors have hopped on the 802.11b bandwagon as it offers speeds up to 11 Mbps and 11 overlapping channels. As frequency deceases battery life and range increase. 802.11b offers a nice trade off.

802.11g is still in the process of being defined but promises backwards compatibility with 802.11b and proposed ranges of up to 54 Mbps in the 2.4 Ghz range. The g draft should have been finalized in June 2003. Hardware is already appearing in stores.
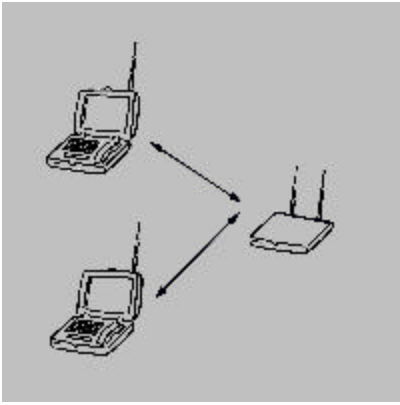
Both b and g offer the best path for both present and future deployment

MODES IN 802.11B
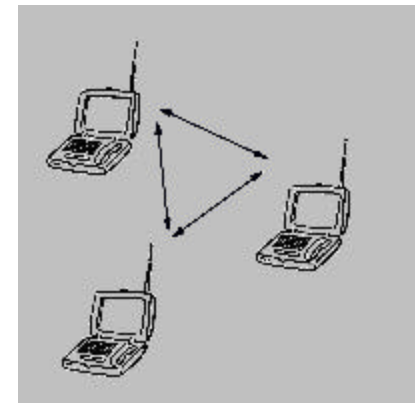
Peer to Peer, Ad-Hoc, IBSS (Independent Basic Service Set), All of these terms mean the same thing. Basically device to device mode. There is no central point in this

configuration.

Infrastructure or BSS (Basic Service Set) This is a configuration where you have any number of wireless clients and a single access point The access point is the intermediary between the devices

ESS (Extended Service Set) Numerous client devices along with multiple access points. This configuration is used in areas demanding any of the following requirements; wide area coverage, roaming client devices and compensation for physical obstructions limiting RF transmissions.

RANGE HOPS IN 802.11B

For an unlicensed band the FCC allows a good deal of output power to be used in a point to point hop and slightly less in a point to multipoint hop

The maximum range for a PTP hop is around 25 miles. Typically you would use a specific type of access point known as a "bridge" to span this distance.

Accounting for your own local building codes unless a tower is over 200 feet in height you do not need FCC or FAA approval in order to build it. You can beam a signal clear across town. For a local network with no geographic obstructions you can easily cover a square acre with a single access point and an omni-directional antenna. This second example would provide a small neighborhood with complete coverage.

SPARE BATTERIES NOT INCLUDED

Windows XP comes with 802.11b support as part of the base operating system. I have had success running XP in both IBSS and BSS modes.

With The emergence of portable devices running high powered operating systems such as Windows CE, Symbian OS and Linux it is now viable to run networked applications utilizing wireless technology. What lacks improvement is battery technology. Keeping a device networking running at 100 mW can drain down a small PDA device within 5 minutes. This is the next hurdle to be solved in portable devices.

Windows XP is a trademark of Microsoft Corporation, 802.11 is a trademark of the IEEE