



## Wireless Networking with WLANs and Bluetooth

**Local Area Networks (LAN) are essential to organisations that need their computers to communicate and share resources such as external hard disks, servers and printers. Wireless networking is an alternative to traditional networking which removes the restriction on the movement of devices. Portable PCs can be carried around an office, and desktop clients can be located in places that are difficult to wire.**

### What is Wireless Local-Area Networking?

Wireless LANs (WLANs) are not entirely wireless. Workstations and devices are connected together using access points. One side of an access point handles connection to wireless devices; the other side provides a wired connection to an existing LAN. If a user decides to move around, the user's device will automatically connect (wirelessly) to the nearest access point.

Data is transmitted using either infrared light (IR) or radio frequencies (RF). The use of radio frequencies is often preferred as IR cannot pass through solid objects (although this can be viewed as a security feature). However, even RF has a maximum range of 100-500 feet, due to interference from walls, power lines and furniture, and the effectiveness of indoor antenna. As an alternative, Directional Outdoor Antenna can

offer a 5-mile range in a city environment. Thus WLANs are an attractive alternative to setting up Wide Area Networking (WAN) for which there may be expensive line rates as well as wiring costs.

### The Wireless LAN Standard

An open standard (802.11b) for WLANs has been developed by the Institute of Electrical and Electronics Engineers (IEEE). Radio signals are transmitted using an unlicensed frequency band (2.4 GHz), and use either Direct Sequence Spread Spectrum (DSSS) or Frequency Hopping Spread Spectrum (FHSS). Both of these techniques are used to avoid intruders eavesdropping on signals and jamming transmissions.



With DSSS, data is encrypted before it is sent and decrypted when it is received, using a random key known only to receiver and transmitter. With FHSS, data randomly 'hops' (moves) across small sub-frequencies; the hopping sequence is known only to receiver and transmitter. FHSS is less susceptible to interference and extremely difficult to intercept or jam. However, FHSS is currently limited to a transfer rate of 2 Mbps, much slower than the 11 Mbps of DSSS. This has led to concerns regarding the security of the 802.11b standard.

### What is Bluetooth?

Bluetooth is a new wireless standard designed to enable communication between a range of devices such as mobile phones, headsets, PCs, pagers, and Palms. For example, a Bluetooth-enabled headset could be used in conjunction with a mobile phone. Devices start to communicate as soon as they are within range of each other, with little or no connection procedure. The standard is open but is governed by the nine promoters of the Bluetooth Special Interest Group: Ericsson, IBM, Intel, Nokia, Toshiba, 3Com, Agere, Microsoft and Motorola.

Bluetooth has a much shorter range and a smaller transmission capacity than 802.11. The range of Bluetooth is typically about 10 metres, although a higher-power option offers up to 100 metres. Bluetooth's transmission rate is 1 Mbps, significantly less than the 11 Mbps of DSSS WLANs. However, Bluetooth provides true 'global roaming': WLANs are restricted to the office or campus. Bluetooth devices can nevertheless be networked into 'piconets' of 8 devices; these in turn can overlap to form 'scatternets'.

Bluetooth transmits using RF on the same frequency band as wireless LANs (2.4 GHz). Consequently, a Bluetooth network in the vicinity of a WLAN may cause interference with a resulting loss of data and reduction in network performance. In fact, it is more

probable that Bluetooth signals will degrade the operation of WLANs (rather than viceversa), due to the faster hopping rate of Bluetooth.

Security features in Bluetooth resemble those in 802.11b. Frequency hopping with a high hopping rate is used, which is effective in reducing interference and fading. To promote security, each piconet has a unique hopping sequence. Data encryption and authentication can also be included in Bluetooth networks. These features are subject to the same weaknesses as in 802.11b; however, for many applications, the data transmitted via Bluetooth may not be of as critical a nature as data transmitted via 802.11b. Furthermore, due to the short range of Bluetooth, a hacker would have to be at least in the same building to intercept any transmission.

The official Bluetooth standard was finalised in March 2001, superseding the previous three unofficial standards. When all devices conform to this official standard, Bluetooth devices will be interoperable. As a comparison, wireless LANs cannot guarantee interoperability as manufacturers frequently use 802.11 as only a starting point for development, before altering its capabilities.

### Conclusions

Bluetooth and 802.11 are complementary rather than competing technologies. Bluetooth does not, as yet, seek to replace wireless LANs, but is designed to provide cheap and simple communication between a range of electronic devices. Bluetooth is at a much earlier stage of development than 802.11 and, like 802.11, has its fair share of security concerns.

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