

Bluetooth™

What is Bluetooth?

Bluetooth is a de facto wireless protocol standard that was initially conceived by Ericsson. It is named after the Danish king Harald Blåtand (Bluetooth). Bluetooth chips transmit over a short range (about 30 feet) and consume very little power. Bluetooth aims to replace the use of cables to connect devices that are close to each other. Cables are messy to use and impose mobility constraints on the connected devices. Adding to complexity is the use of many different types of cables.

Bluetooth (enabled) devices communicate directly with each other (without the use of cables). These devices instantly establish direct contact with each other as soon as they come within the Bluetooth range. Bluetooth devices can then automatically form “personal” (ad hoc) networks. Other Bluetooth devices can join a network as soon as they move within the Bluetooth range. Of course, all this assumes that appropriate permissions have been set by applications running in the devices.

Bluetooth chips use the unlicensed (free) ISM band at 2.4GHz. Bluetooth is designed to enable devices to operate in noisy frequency environments. Bluetooth chips avoid interference by hopping to a new frequency after transmission or receipt of each packet.

The Bluetooth protocol specification is designed to enable its implementation by inexpensive low-power chips. Because Bluetooth chips are expected to eventually cost less than five US dollars, the hope is that they will soon be widely used and be installed in all kinds of devices. Because the application domain is very large, Bluetooth chip sales can be huge – in the billions of dollars within a few years.

Where will Bluetooth be Used?

Bluetooth chips will be used to

- o replace the use of cables to connect devices,
- o allow devices to find each other and form personal (ad hoc) networks and then share or synchronize data,
- o allow devices to access the internet via other devices such as a cell phone, etc.

™ The Bluetooth trademark is owned by Bluetooth SIG Inc., USA

Examples of Bluetooth Use: Replacing Cables

Bluetooth will be used to connect

- o printers to PCs,
- o keyboards to PCs,
- o home devices such as furnace and refrigerators to a PC,
- o cordless headsets to cell phones,
- o etc.

Examples of Bluetooth Use: Ad Hoc Networking for Mobile Devices

Bluetooth will be used to

- o enable mobile devices such as PDAs to communicate with each other and other devices such as digital cameras and PCs,
- o allow cell phones to talk to each other directly as “walkie-talkies” as soon as they come within range -- no need to use the services of the wireless carrier,
- o connect cell phones to vending machines for payment,
- o implementing tags on cars/trucks that can be read as the vehicles drive past (like EZ Pass),
- o etc.

Security

Bluetooth protocol provides built-in support for

- o encryption, frequency hopping, and automatic output power adaptation to control the range – all this makes eavesdropping difficult, and
- o authentication to prevent communication with unauthorized devices.

Competition

Bluetooth is facing strong competition from the wireless LAN standard called Wi-Fi (formally known as IEEE 802.11b). Bluetooth devices talk to each other and form an ad hoc network. In contrast, Wi-Fi allows computers and PDAs to connect to an established network such as a LAN. Because Bluetooth chips are expected to be inexpensive (less than \$5) and have low power requirements, Bluetooth is more suited for small devices such as PDAs, cell phones, and digital cameras. On the other hand, Wi-Fi, because of its range and bandwidth, is more suited for the larger devices such as laptops.

Bluetooth

- **Advantages**
 - o inexpensive chips
 - o low power chips
 - o suitable for small devices such as cordless phones, headsets, etc.

- **Disadvantages**
 - Small bandwidth and range
 - Bandwidth: 721KB
 - Range: about 30 feet

Wi-Fi (802.11b)

- **Advantages**
 - High bandwidth and range
 - Bandwidth: 11 MB
 - Range: about 150 feet
- **Disadvantages**
 - card cost
 - power use

Other

- The Bluetooth Special Interest Group (SIG) is an industry group driving the development of the Bluetooth technology and commercializing it.
- Joining the Bluetooth SIG enables its members to build a royalty free license to build Bluetooth products (you will find the Bluetooth application at <http://www.bluetooth.com/>)

Where Can I Find More Information?

- [Official Bluetooth Website](http://www.bluetooth.com/) (<http://www.bluetooth.com/>)