[Template:About](/wiki/Template:About" \o "Template:About) [Template:Infobox protocol](/wiki/Template:Infobox_protocol)

[Template:Use dmy dates](/wiki/Template:Use_dmy_dates) **Bluetooth** is a [wireless](/wiki/Wireless) technology standard for exchanging data over short distances (using short-wavelength [UHF](/wiki/UHF) [radio waves](/wiki/Radio_waves) in the [ISM band](/wiki/ISM_band) from 2.4 to 2.485 GHz[[1]](#cite_note-1)) from fixed and mobile devices, and building [personal area networks](/wiki/Personal_area_network) (PANs). Invented by telecom vendor [Ericsson](/wiki/Ericsson) in 1994,[[2]](#cite_note-2) it was originally conceived as a wireless alternative to [RS-232](/wiki/RS-232) data cables. It can connect several devices, overcoming problems of synchronization.

Bluetooth is managed by the [Bluetooth Special Interest Group](/wiki/Bluetooth_Special_Interest_Group) (SIG), which has more than 25,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics.[[3]](#cite_note-3) The [IEEE](/wiki/Institute_of_Electrical_and_Electronics_Engineers) standardized Bluetooth as **IEEE 802.15.1**, but no longer maintains the standard. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks.[[4]](#cite_note-4) A manufacturer must make a device meet [Bluetooth SIG standards](/wiki/Bluetooth_Special_Interest_Group#Qualification) to market it as a Bluetooth device.[[5]](#cite_note-5) A network of [patents](/wiki/Patent) apply to the technology, which are licensed to individual qualifying devices.

## Contents

* 1 Origin[[edit](/index.php?title=(none)&action=edit&section=1)]
* 2 Name and logo[[edit](/index.php?title=(none)&action=edit&section=2)]
* 3 Implementation[[edit](/index.php?title=(none)&action=edit&section=3)]
  + 3.1 Communication and connection[[edit](/index.php?title=(none)&action=edit&section=4)]
* 4 Uses[[edit](/index.php?title=(none)&action=edit&section=5)]

## Origin[[edit](/index.php?title=(none)&action=edit&section=1)]

The development of the "short-link" radio technology, later named Bluetooth, was initiated in 1989 by Dr. Nils Rydbeck CTO at Ericsson Mobile in [Lund](/wiki/Lund) and Dr. [Johan Ullman](/wiki/Johan_Ullman). The purpose was to develop wireless headsets, according to two inventions by [Johan Ullman](/wiki/Johan_Ullman), [Template:Cite patent](/wiki/Template:Cite_patent) and [Template:Cite patent](/wiki/Template:Cite_patent). Nils Rydbeck tasked Tord Wingren with specifying and [Jaap Haartsen](/wiki/Jaap_Haartsen) and Sven Mattisson with developing. Both were working for [Ericsson](/wiki/Ericsson) in [Lund](/wiki/Lund), Sweden.[[6]](#cite_note-6)The specification is based on [frequency-hopping spread spectrum](/wiki/Frequency-hopping_spread_spectrum) technology.

## Name and logo[[edit](/index.php?title=(none)&action=edit&section=2)]

The name "Bluetooth" is an [Anglicised](/wiki/Anglicisation) version of the Scandinavian *Blåtand*/*Blåtann* ([Old Norse](/wiki/Old_Norse) *blátǫnn*), the [epithet](/wiki/Epithet) of the tenth-century king [Harald Bluetooth](/wiki/Harald_Bluetooth) who united dissonant Danish tribes into a single kingdom and, according to legend, introduced Christianity as well. The idea of this name was proposed in 1997 by [Jim Kardach](/wiki/Jim_Kardach) who developed a system that would allow mobile phones to communicate with computers. At the time of this proposal he was reading [Frans G. Bengtsson's](/wiki/Frans_G._Bengtsson) historical novel [*The Long Ships*](/wiki/The_Long_Ships) about Vikings and King Harald Bluetooth.[[7]](#cite_note-7)[[8]](#cite_note-8) The implication is that Bluetooth does the same with communications protocols, uniting them into one universal standard.[[9]](#cite_note-9) The Bluetooth logo is a [bind rune](/wiki/Bind_rune) merging the [Younger Futhark](/wiki/Younger_Futhark) [runes](/wiki/Runic_alphabet) [8px](/wiki/File:Runic_letter_ior.svg) ([Hagall](/wiki/Haglaz)) (ᚼ) and [8px](/wiki/File:Runic_letter_berkanan.svg) ([Bjarkan](/wiki/Berkanan)) (ᛒ), Harald's initials.[[10]](#cite_note-10)

## Implementation[[edit](/index.php?title=(none)&action=edit&section=3)]

Bluetooth operates at frequencies between 2402 and 2480 MHz, or 2400 and 2483.5 MHz including [guard bands](/wiki/Guard_band) 2 MHz wide at the bottom end and 3.5 MHz wide at the top.[[11]](#cite_note-11) This is in the globally unlicensed (but not unregulated) Industrial, Scientific and Medical ([ISM](/wiki/ISM_band)) 2.4 GHz short-range radio frequency band. Bluetooth uses a radio technology called [frequency-hopping spread spectrum](/wiki/Frequency-hopping_spread_spectrum). Bluetooth divides transmitted data into packets, and transmits each packet on one of 79 designated Bluetooth channels. Each channel has a bandwidth of 1 MHz. It usually performs 800 hops per second, with [Adaptive Frequency-Hopping](/wiki/Frequency-hopping_spread_spectrum#Variations_of_FHSS) (AFH) enabled.[[11]](#cite_note-11) [Bluetooth low energy](/wiki/Bluetooth_low_energy) uses 2 MHz spacing, which accommodates 40 channels.

Originally, [Gaussian frequency-shift keying](/wiki/Gaussian_frequency-shift_keying) (GFSK) modulation was the only modulation scheme available. Since the introduction of Bluetooth 2.0+EDR, π/4-[DQPSK](/wiki/DQPSK) (Differential Quadrature Phase Shift Keying) and 8DPSK modulation may also be used between compatible devices. Devices functioning with GFSK are said to be operating in basic rate (BR) mode where an instantaneous [data rate](/wiki/Bit_rate) of 1 [Mbit/s](/wiki/Data_rate_units) is possible. The term Enhanced Data Rate (EDR) is used to describe π/4-DPSK and 8DPSK schemes, each giving 2 and 3 Mbit/s respectively. The combination of these (BR and EDR) modes in Bluetooth radio technology is classified as a "BR/EDR radio".

Bluetooth is a [packet-based protocol](/wiki/Packet_based) with a [master-slave structure](/wiki/Master-slave_(technology)). One master may communicate with up to seven slaves in a [piconet](/wiki/Piconet). All devices share the master's clock. Packet exchange is based on the basic clock, defined by the master, which ticks at 312.5 µs intervals. Two clock ticks make up a slot of 625 [µs](/wiki/Μs), and two slots make up a slot pair of 1250 µs. In the simple case of single-slot packets the master transmits in even slots and receives in odd slots. The slave, conversely, receives in even slots and transmits in odd slots. Packets may be 1, 3 or 5 slots long, but in all cases the master's transmission begins in even slots and the slave's in odd slots.

The above is valid for "classic" BT. Bluetooth Low Energy, introduced in the 4.0 specification, uses the same spectrum but somewhat differently; see [Bluetooth low energy#Radio interface](/wiki/Bluetooth_low_energy#Radio_interface).

### Communication and connection[[edit](/index.php?title=(none)&action=edit&section=4)]

A master Bluetooth device can communicate with a maximum of seven devices in a piconet (an ad-hoc computer network using Bluetooth technology), though not all devices reach this maximum. The devices can switch roles, by agreement, and the slave can become the master (for example, a headset initiating a connection to a phone necessarily begins as master—as initiator of the connection—but may subsequently operate as slave).

The Bluetooth Core Specification provides for the connection of two or more piconets to form a [scatternet](/wiki/Scatternet), in which certain devices simultaneously play the master role in one piconet and the slave role in another.

At any given time, data can be transferred between the master and one other device (except for the little-used broadcast mode.[Template:Citation needed](/wiki/Template:Citation_needed)) The master chooses which slave device to address; typically, it switches rapidly from one device to another in a [round-robin](/wiki/Round-robin_scheduling) fashion. Since it is the master that chooses which slave to address, whereas a slave is (in theory) supposed to listen in each receive slot, being a master is a lighter burden than being a slave. Being a master of seven slaves is possible; being a slave of more than one master is difficult.[Template:Citation needed](/wiki/Template:Citation_needed) The specification is vague as to required behavior in scatternets.

## Uses[[edit](/index.php?title=(none)&action=edit&section=5)]

|  |  |  |  |
| --- | --- | --- | --- |
| **rowspan=2| Class** | **Max. permitted power** | | **Typ. range**[**[12]**](#cite_note-12) **(m)** |
| **(mW)** | **(**[**dBm**](/wiki/DBm)**)** |  |
| **1** | 100 | 20 | ~100 |
| **2** | 2.5 | 4 | ~10 |
| **3** | 1 | 0 | ~1 |
| **4** | 0.5 | -3 | ~0.5 |

Bluetooth is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost [transceiver](/wiki/Transceiver) [microchips](/wiki/Integrated_circuit) in each device.[[13]](#cite_note-13)Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other, however a [*quasi optical*](/wiki/Quasi-optical) wireless path must be viable.[[3]](#cite_note-3) Range is power-class-dependent, but effective ranges vary in practice; see the table on the right.

Officially Class 3 radios have a range of up to [Template:Convert](/wiki/Template:Convert), Class 2, most commonly found in mobile devices, [Template:Convert](/wiki/Template:Convert), and Class 1, primarily for industrial use cases,[Template:Convert](/wiki/Template:Convert).[[12]](#cite_note-12) Bluetooth Marketing qualifies that Class 1 range is in most cases [Template:Convert](/wiki/Template:Convert), and Class 2 range [Template:Convert](/wiki/Template:Convert).[[14]](#cite_note-14)