



Bluetooth

Wireless Connections Made Easy

The open Bluetooth™ wireless technology is intended to relieve us of cumbersome cables and make adhoc networking possible. The technology was initiated by Ericsson and then developed in collaboration with the world's leading telecom, computing and chip integration companies. In early 1998 they formed the Bluetooth Special Interest Group (SIG) and now more than 1700 companies have signed as adopters of the technology.

The Bluetooth wireless technology is designed for low-cost, low-power and small-size digital electronic devices. On the back of this leaflet you will find a summary of the most important general features found in the royalty-free Bluetooth Specification.

The Bluetooth solution comprises hardware, software and interoperability requirements.

Interoperability

One World, One Version

The Bluetooth vision, that any Bluetooth compliant device can find and interact with any other nearby Bluetooth compliant device, anywhere in the world, is now a fact – as long as they share the same Bluetooth Function.

Usage Models

When creating the technology, the focus was on describing different usage models, scenarios from everyday life where cable replacement will make mobility easy and simplify communication.

Bluetooth Functions (Profiles)

While the usage models describe applications and intended devices, the Profiles specify how to use the Bluetooth protocol stack for an interoperable solution. In each Profile it is stated how to reduce options and set parameters in the protocols, and a common user experience is also defined.

The Profiles are a part the Bluetooth Specification, and all devices must be tested against one or more of the Profiles in order to fulfill the Bluetooth compliance requirements. Profiles will be added as new Bluetooth applications are developed.

Compliance

The Bluetooth Qualification Program guarantees global interoperability between devices regardless of the vendor and regardless of the country in which it is used. During the test procedure that all devices must pass, it is verified that they meet all requirements regarding: radio link quality, lower layer protocols, profiles and information to end-users.

Regulatory and governmental approvals still have to be fulfilled and are not part of the Bluetooth Qualification Program.

General Bluetooth Features

RADIO	Coverage area (Transmit power)	<ul style="list-style-type: none"> up to 10 meters (33 ft.) with 1mW (0dBm) solution up to 100 meters (328 ft.) with 100 mW (20dBm) solution
	Frequency band	<ul style="list-style-type: none"> 2.4 GHz - the unlicensed ISM band (83.5 MHz, divided into 79 RF channels 1 MHz apart, is available)
	Modulation	<ul style="list-style-type: none"> Shaped, binary frequency modulation (Gaussian Frequency Shift Keying) BT = 0.5 Modulation index = 0.28 <math>< h < 0.35</math>
	Receiver sensitivity	<ul style="list-style-type: none"> -70dBm at 0.1% Bit Error Rate
	Physical channel	<ul style="list-style-type: none"> a pseudo-random hopping sequence hopping through the 79 RF channels. 1600 hops/s gives 625µs long Time Slots for packet transmission
	Symbol rate	<ul style="list-style-type: none"> 1Ms/s.
TOPOLOGY	<p>A Piconet is formed when one device (A) sends an <i>Inquiry</i>, and another device (B) answers. The first device (A) now <i>Page</i> the second (B) and establish a Physical Link. In this Piconet "A" is the Master and "B" is the slave. One Master can have up to seven active slaves.</p> <p>Slaves can participate in different Piconets and a master of one Piconet can be the slave in another. This is known as a Scatternet. Up to 10 piconets within range can form a Scatternet without noticeable performance degradation.</p>	
PHYSICAL LINKS	Synchronous Connection-Oriented (SCO) link	<ul style="list-style-type: none"> circuit switching symmetric, synchronous services slot reservation at fixed intervals
	Asynchronous Connection-Less (ACL) link	<ul style="list-style-type: none"> packet switching (a)symmetric, asynchronous services polling access scheme
	A up to three simultaneous synchronous voice channels, or a channel which simultaneously supports asynchronous data and synchronous voice. <ul style="list-style-type: none"> each voice channel supports a 64 kb/s synchronous (voice) channel in each direction. B an asynchronous data channel, <ul style="list-style-type: none"> the asynchronous channel can support maximal 723.2 kb/s asymmetric (and still up to 57.6 kb/s in the return direction), or 433.9 kb/s symmetric. a Master can share an asynchronous channel with up to 7 simultaneously active slaves in a Piconet. by swapping active and parked slaves out respectively in the piconet, 255 slaves can be virtually connected using the PM_ADDR (a device can participate again within 2 ms). to park even more slaves the BD_ADDR can be used. There is no limitation to the number of slaves that can be parked. 	
ADDRESSING	Bluetooth Device Address (BD_ADDR)	<ul style="list-style-type: none"> 48-bit IEEE 802 address
	Active Member Address (AM_ADDR)	<ul style="list-style-type: none"> 3-bit Active Member slave address all-zero broadcast address
	Parked Member Address (PM_ADDR)	<ul style="list-style-type: none"> 8-bit Parked Member slave address
ERROR CORRECTION	Forward-Error Correction (FEC)	<ul style="list-style-type: none"> 1/3 rate: bit-repeat code 2/3 rate: (15,10) shortened Hamming code
	Automatic Repeat Request (ARQ)	<ul style="list-style-type: none"> 1-bit fast ACK/NAK 1-bit sequence number header piggy-backing retransmitted on another frequency
SECURITY	Authentication	<ul style="list-style-type: none"> challenge/response system with E1 algorithm
	Encryption (privacy)	<ul style="list-style-type: none"> encrypts data between two devices stream cipher with E0 algorithm
	Key management	<ul style="list-style-type: none"> configurable encryption key length (016 bytes)
	Initialization	<ul style="list-style-type: none"> by user interaction
POWER CONSUMPT ¹	Standby current	<ul style="list-style-type: none"> < 0.3 mA (3 months*)
	Voice mode	<ul style="list-style-type: none"> 8-30 mA (75 hours*)
	Data mode average	<ul style="list-style-type: none"> 5 mA [0.3-30mA, 20 kbit/s, 25%] (120 hours*)
	Hold & Park modes	<ul style="list-style-type: none"> 60 µA
PROTOCOL STACK	<p style="text-align: center;"> Applications like e.g. WAP, vCard, vCal AT Commands OBEX TCP/IP Telephony Control Specification (TCS) RFCOMM (Service Discovery Protocol) SDP Logical Link Control and Adaptation Protocol (L2CAP) Audio Link Manager (LM) Baseband Bluetooth Radio </p>	
PROFILES	<p>The following 13 Profiles are described in Bluetooth Specification v1.0B: Generic Access Profile, Service Discovery Application Profile, Cordless Telephony Profile, Intercom Profile, Serial Port Profile, Headset Profile, Dial-up Networking Profile, Fax Profile, LAN Access Profile, Generic Object Exchange Profile, Object Push Profile, File Transfer Profile and Synchronization Profile</p>	

¹Estimates calculated with 600 mAh battery and internal amplifier, power will vary with implementation

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Ericsson Mobile Communications AB, SE-221 83 Lund, Sweden.
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<http://bluetooth.ericsson.se>

Further information, including the complete Specification, are available at: <http://www.bluetooth.com/>