

IEEE Std 802.15.1™-2002

IEEE Standards

802.15.1™

**IEEE Standard for Information technology—
Telecommunications and information exchange between systems—
Local and metropolitan area networks—
Specific requirements**

Part 15.1: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Wireless Personal Area Networks (WPANs)

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee



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Abstract: The lower transport layers [(Logical Link Control and Adaptation Protocol (L2CAP), Link Manager Protocol (LMP), baseband and radio] of the Bluetooth™ wireless technology are defined. Bluetooth is an industry specification for short-range radio frequency (RF)-based connectivity for portable personal devices. The IEEE 802.15.1 Task Group has reviewed and provided a standard adaptation of the Bluetooth specification (version 1.1) medium access control (MAC) (L2CAP, LMP, and baseband) and physical layer (PHY) (radio). Also specified is a clause on service access points (SAPs), which includes a logical link control (LLC)-MAC interface for the ISO/IEC 8802-2 LLC. A normative annex is included that provides a Protocol Implementation Conformance Statement (PICS) proforma, and a informative high-level behavioral ITU-T Z.100 specification and description language (SDL) model for an integrated Bluetooth MAC sublayer are also specified.

Keywords: ad hoc network, Bluetooth, Bluetooth wireless technology, circuit switching, FH-CDMA, frequency-hopping code division multiple access, mobile, mobility, nomadic, packet switching, piconet, radio, radio frequency, scatternet, short-range, ubiquitous computing and communications, wearables, wireless, wireless personal area network, WPAN

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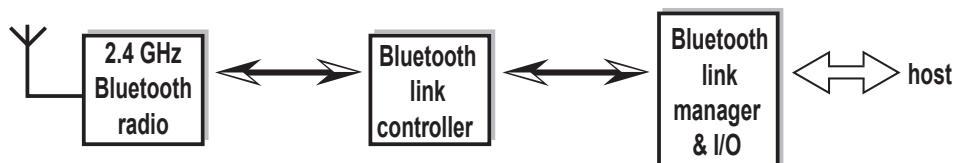


Figure 11—Different functional blocks in the Bluetooth system

The Bluetooth system provides a point-to-point connection (only two Bluetooth units involved), or a point-to-multipoint connection (see Figure 12). In the point-to-multipoint connection, the channel is shared among several Bluetooth units. Two or more units sharing the same channel form a *piconet*. One Bluetooth unit acts as the master of the piconet, whereas the other unit(s) acts as slave(s). Up to seven slaves can be active in the piconet. In addition, many more slaves can remain locked to the master in a so-called parked state. These parked slaves cannot be active on the channel, but remain synchronized to the master. Both for active and parked slaves, the channel access is controlled by the master.

Multiple piconets with overlapping coverage areas form a *scatternet*. Each piconet can only have a single master. However, slaves can participate in different piconets on a time-division multiplex basis. In addition, a master in one piconet can be a slave in another piconet. The piconets shall not be frequency-synchronized. Each piconet has its own hopping channel.

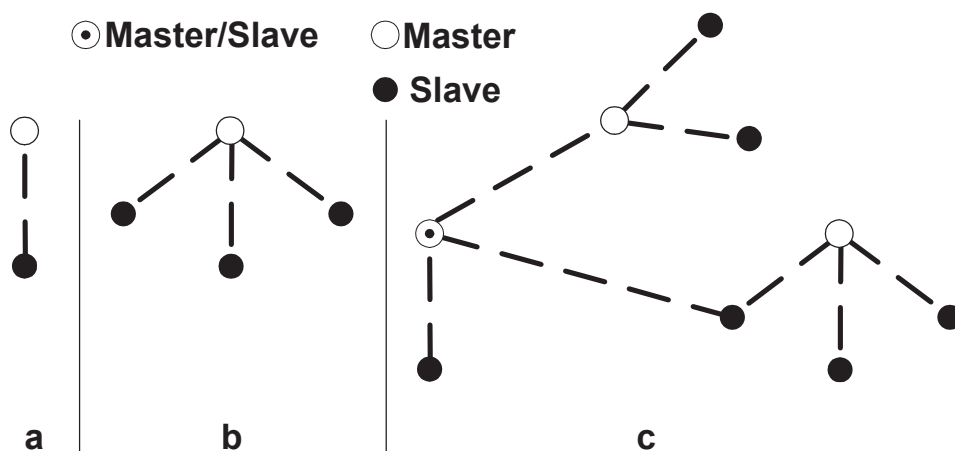


Figure 12—Various piconet formations: (a) single slave operation; (b) multislave operation; and (c) scatternet operation (Master with dot is Master/Slave)

8.2 Physical channel

8.2.1 Channel definition

The channel is represented by a pseudo-random hopping sequence hopping through the 79 or 23 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops