

Bluetooth: Vision, Goals, and Architecture

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Wireless Applications

- Satellite Networks
 - Wireless WAN
- 802.11
 - Wireless LAN

Both have rigid applications and are intended to interface with specific devices.

The Problem

Such rigid application of wireless technology does not allow us ubiquitous access.

Cutting the Cord

- RF technology could be applied to a wide variety of devices.
 - Computers
 - PDA's
 - Mobile phones
- Such devices could interface with each other without cables.

Ubiquitous Computing?

- So how does this scheme achieve ubiquitous computing?
- The mobile phone is the key.
 - The phone could act as a gateway to the Internet.
 - Thus, we could exploit the mobile phone network infrastructure.

We Need a Specification

- Who will design the specification for this new application?
- Leaders of the mobile telephony and computing industries.
 - Ericsson, IBM, Intel, Nokia, Toshiba
- And so the Bluetooth SIG was formed in February 1998
 - The name Bluetooth was inspired by the Danish Viking King, Harald Bluetooth (910 – 986)

The Core Concept

- Inter-connected devices form a “personal area network” (PAN) via lower-power RF
 - Typical range: 10 meters
 - Maximum range: 100 meters
- Devices connect to the PAN ad hoc
- Devices retain their individual functionality
- Devices augment the PAN with their individual functionality
- PAN’s are mobile and is defined in terms of the mobility of the devices in the PAN
 - Some PAN devices can be stationary
- PAN’s can bridge with other PAN’s seamlessly

Bluetooth SIG Goals

- Promote new usage models
 - 3-in-1 phone
 - Briefcase trick
 - Automatic synchronizer
- Overcome challenges
 - Handle both voice and data
 - Ad hoc connections
 - Withstand interference (2.4 GHz)
 - Worldwide use
 - Security similar to wired connections
 - Small size
 - Negligible power consumption
 - Ubiquitous Deployment
- Draft a specification

Bluetooth Architecture

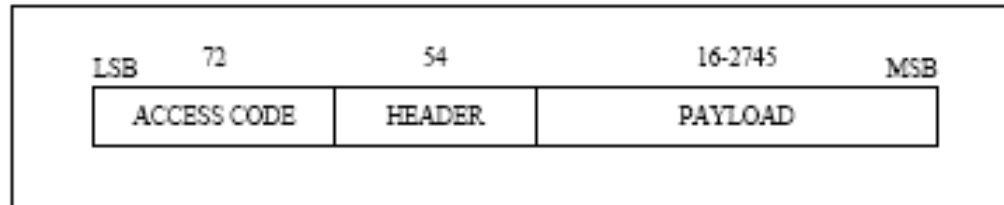
- Master/Slave Definition
- Network Topology
 - point-to-point
 - point-to-multipoint
 - piconets
- Robust Air Protocol and Adaptive Range
 - frequency hopping
 - 1600 per second
 - 79 1MHz hops across the entire bandwidth
 - data
 - ARQ
 - CRC
 - FEC
 - voice
 - continuous variable slope delta modulation (CSVD)
 - received signal strength indicator (RSSI)

Bluetooth Architecture Continued

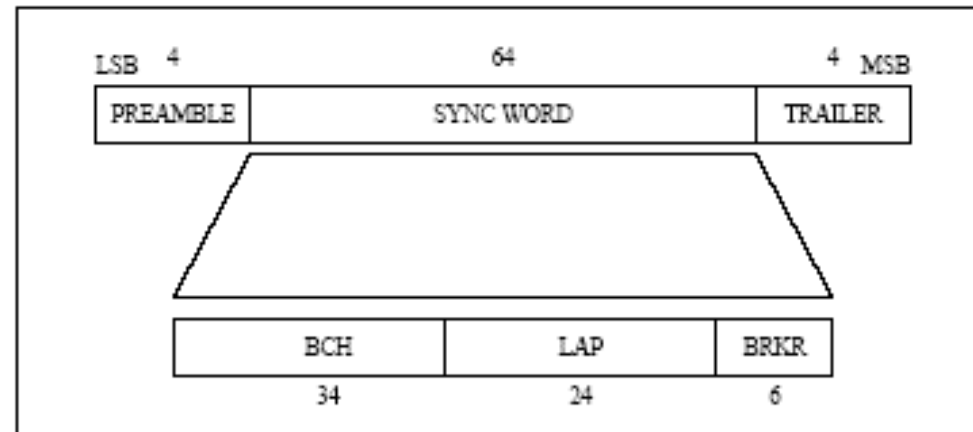
- Establishing Network Connections
 - identify units
 - dynamic connections
 - connection states
 - STANDBY
 - PARK
 - HOLD
 - SNIFF
 - connected
 - message types
 - PAGE
 - INQUIRY
- Link Types
 - synchronous connection-oriented link (SCO)
 - asynchronous connectionless link (ACL)

Bluetooth Packet Structure

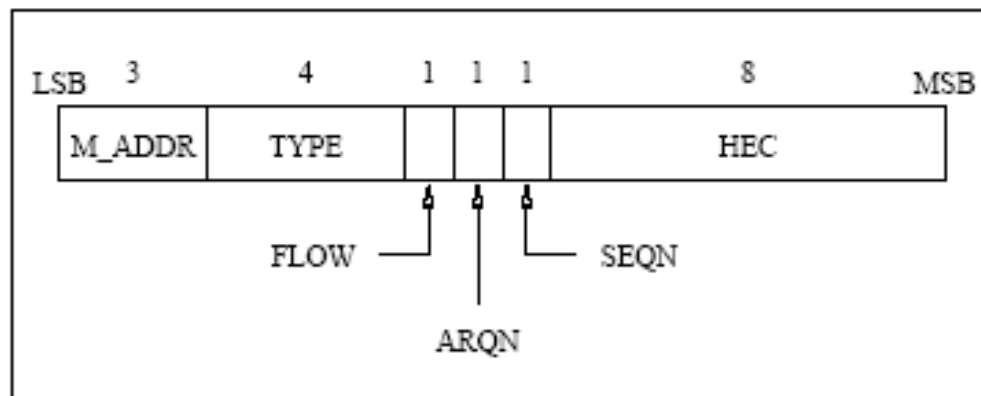
Packet



Access Code



Header



Bluetooth Architecture Part III

- Packet Types
 - control packets (NULL, POLL, etc.)
 - single-slot packets
 - 3-slot packets
 - 5-slot packets
- Error Correction
 - 1/3 rate FEC
 - 2/3 rate FEC
 - ARQ
- Speech Coding
 - CVSD
 - logPCM
- Authentication and Privacy
 - Bluetooth address
 - private key
 - random transaction key

Summary

- Bluetooth is a low-cost and low-power replacement for cables
- Presented
 - Bluetooth SIG vision
 - Bluetooth SIG goals
 - Bluetooth architecture
- Read <http://www.bluetooth.com> for more information