Examining the Changes with Bluetooth™ Core Specification Version 1.1

Tom Siep, Texas Instruments

siep@ti.com

Topics

- Overview of Specification 1.1
- The general nature of the changes in the specification
- Changes in:
  - Radio
  - Baseband
  - LMP
  - L2CAP
  - HCI
  - Other
- Summary

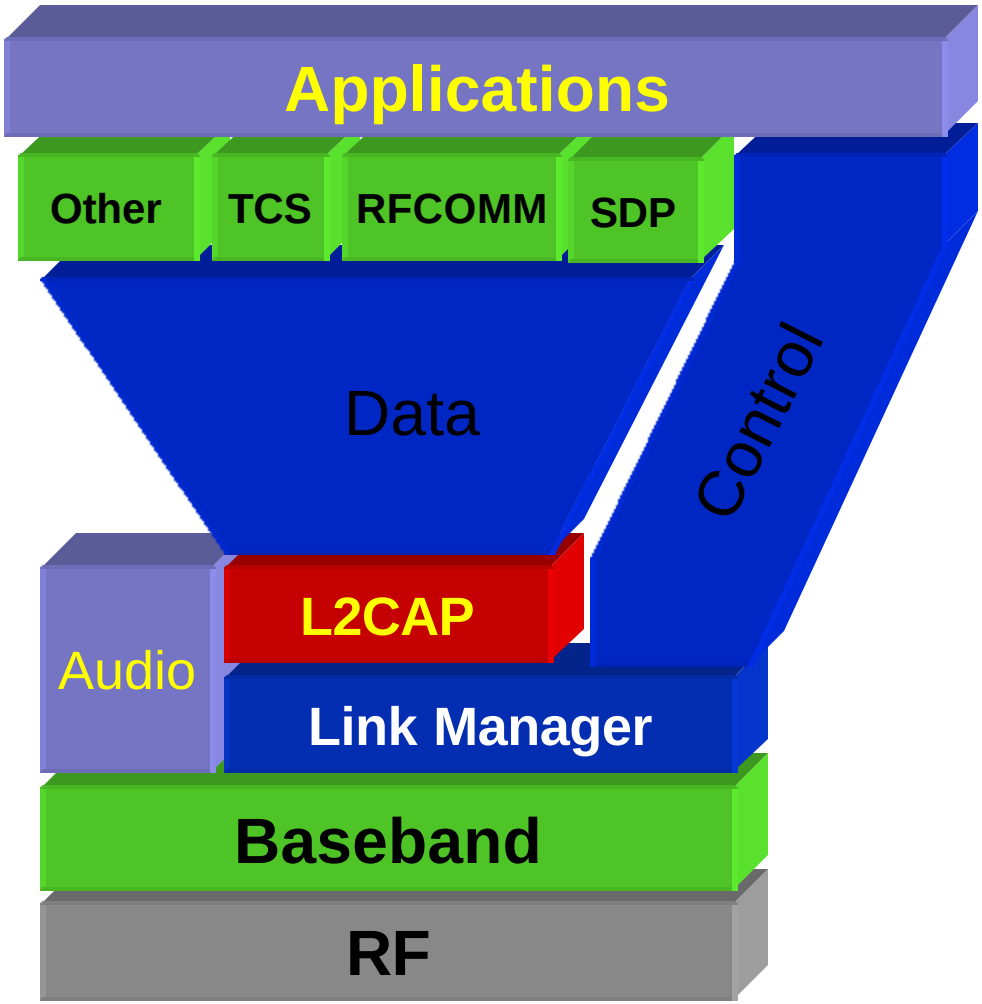
My Involvement with Bluetooth

- TI Short Distance Wireless Business Unit formed
- Chief Technical Editor, IEEE802.15
- Lead Technical Editor, IEEE802.15.1
- Editorial interface between BSIG and 802.15.1
- Author

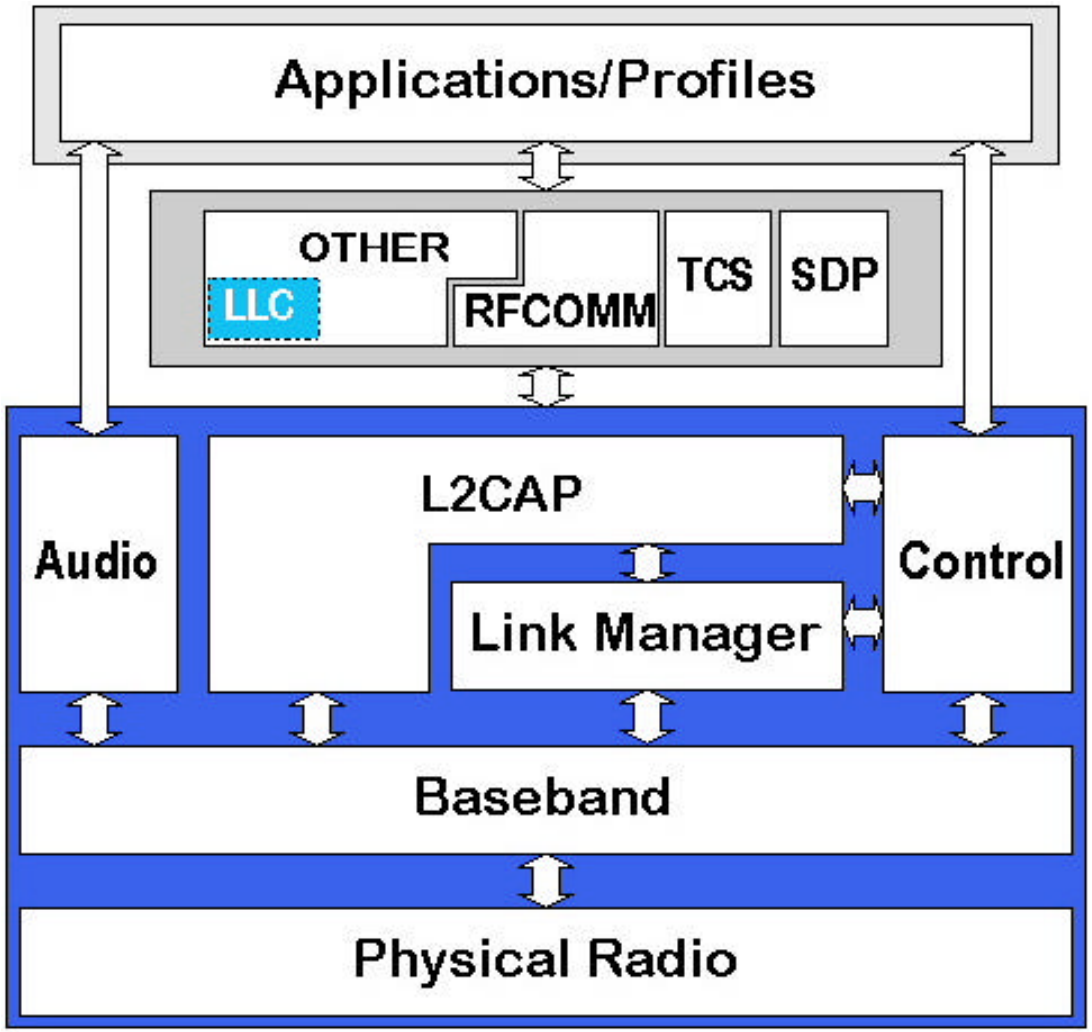
  "An IEEE Guide: How to Find What You Need in the Bluetooth Spec"

  http://standards.ieee.org/catalog/press/index.html#Bluetooth
- Bluetooth Specification Section Owner, L2CAP

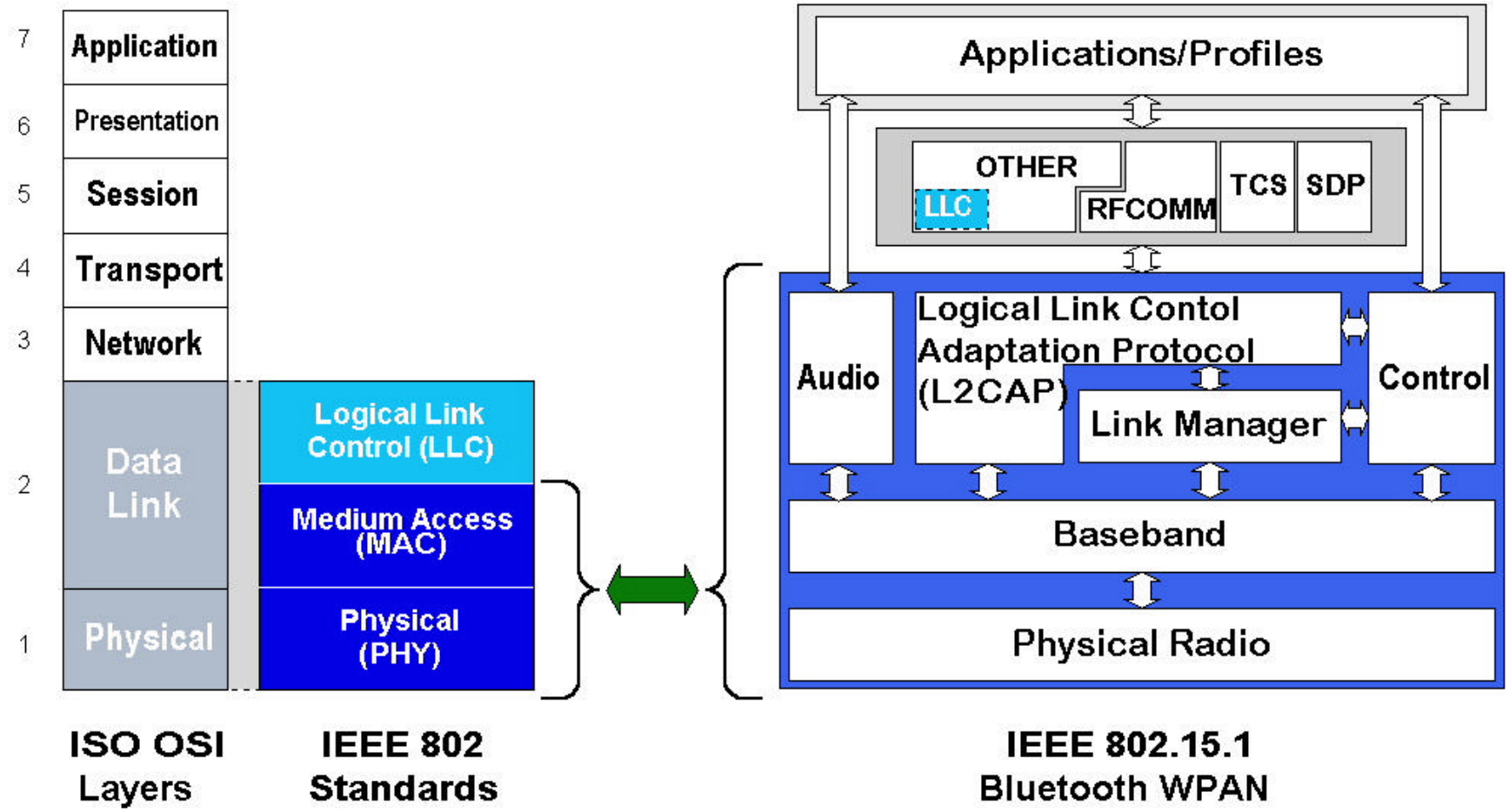
Bluetooth Architecture



Bluetooth Architecture



How Does IEEE 802.15.1 Relate to Bluetooth?



How the Bluetooth Spec Changes

- Discovery of problem during:
  - Reading the Spec
  - Implementation
  - Usage
- Submission to Errata system
  - Critical
  - Recommended

Changes to Spec Described

- Debate/Resolution by Section members
- Integration into proposed revision of Spec
- Approval by Bluetooth Architecture Review Board
- Approval by Promoters → Associates → Adopters
- Publication of new Specification

What Changed?

Lots of edits

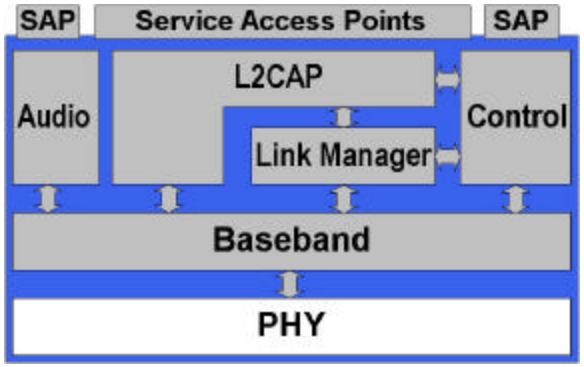
but

Not a lot of fundamental changes

A Little More Detail on v1.1

- In general
  - Clarifications
  - Corrections
  - Little or no “new” features
- Specifically
  - Radio – Regulatory domain changes
  - Baseband – Connection issues in the channel
  - LMP – Link Control issues clarified/corrected
  - L2CAP – Corrections to a few complex interactions

Radio



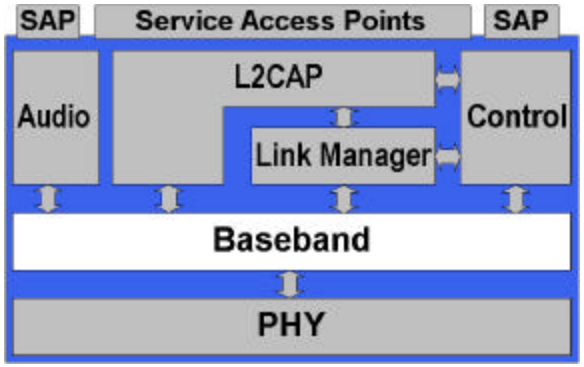
- Radio (RF) Defines Bluetooth radio front-end
  (IEEE calls this a PHY)
  - 2.4GHz ISM band
  - 1Mbps
  - 1,600hops/sec
  - 0dBm (1mW) radio, up to 20dBm

Radio Critical Errata

- Harmonisation (or in the US, Harmonization) of frequency bands
  - France
  - Spain
  - Japan

Baseband

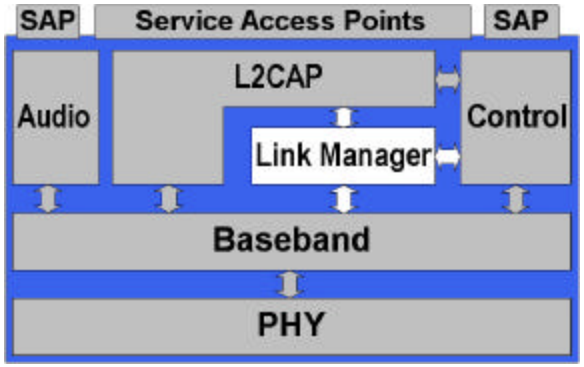
- Baseband (BB)
  - Piconet/Channel definition
  - “Low-level” packet definition
  - Channel sharing



Baseband Critical Errata

- Master Slave switch – clarification
- ACO Correction – generation of an encryption key is optional
- Audio – text clarifying the order of the CVSD encoded bit stream when sent over air
- Sniff Mode – Inactive connection modes HOLD and SNIFF do not affect the ARQN scheme
- Sniff Mode – Alignment with LMP

Link Management Protocol

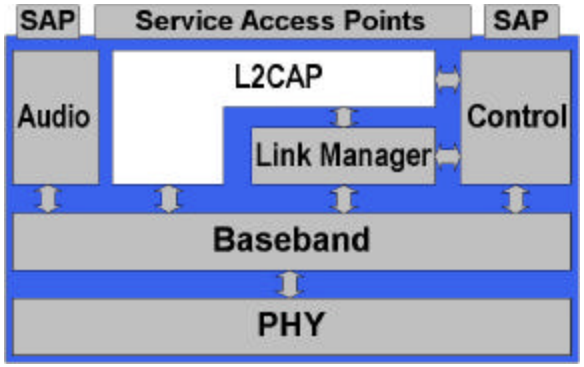


- Link Management Protocol (LMP) – Defines link properties
  - encryption/authentication
  - polling intervals set-up
  - SCO link set-up
  - low power mode set-up

LMP Critical Errata

- Stopping encryption
- Allowed PDUs on host_connection_req
- Link setup procedure
- Mutual authentication on Kinit
- Slave needs to control slots in uplink
- TransactionID in LMP_setup_complete
- Change link key problems
- Temporary link keys
- LMP/BB inconsistency for encryption restart
- AM address position in unpark command
- Counting sniff slots
- No text describing master initiating sniff mode
- Handling disallowed PDUs
- LMP version
- Dynamically enabling encryption
- Definition of Transaction
- Synchronisation
  - detach
  - hold
  - park
  - switch
- LC level timings.
- Timeouts between trasactions
- slot offset definition
- ACO mismatch fix
- Flow control lag feature

Logical Link Control & Adaptation Protocol

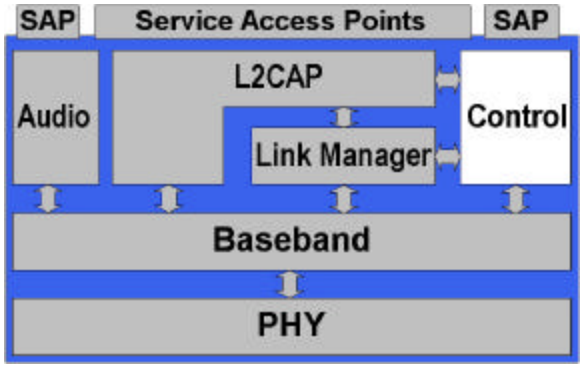


- Logical Link Control & Adaptation Protocol (L2CAP)
  - A simple data link protocol on top of the baseband
    - connection-oriented & connectionless
    - protocol multiplexing
    - segmentation & reassembly
    - QoS flow specification per connection (channel)
    - group abstraction

L2CAP Critical Errata

- Actions on timer expiration
- Configuration request sent to invalid CID
- Continue flag sequencing on lost packets

Host Controller Interface



- Host Controller Interface (HCI)
  - Provides a common interface between a Bluetooth host and a Bluetooth module
    - Physical Interfaces – USB; UART; RS-232
    - Control Interface

HCI Critical Errata

- No critical Errata

Other Critical Errata

- Service Discovery Protocol
  - Base UUID incorrect
  - UUID error in PublicBrowseRoot
  - MaximumAttributeCount ambiguous
- RF Comm
  - Multiple multiplexer control messages
  - DLC parameter negotiation
  - Message Sequence Chart (MSC) command clarification
  - Mandatory requirements unnecessary

Other Critical Errata (profiles)

- Cordless Telephone Profile
  - Ordering ServiceClass UUIDs
  - CTP with optional PARK mode
- Intercom Profile
  - ServiceClass UUID ordering
  - SCO establishment initiator
- Headset Profile
  - Service Record for the Audio Gateway
  - Definition of "gain"
  - RING not always necessary
  - Bonding should be optional
- Dial-up Networking Profile and FAX Profile
  - Ordering ServiceClass UUIDs
  - General/Limited Discoverable modes should match GAP
- LAN Access Profile
  - PinCode

Summary

- Process of change of 1.x continues
- Evolutionary not Revolutionary
- Continuity and backward compatibility is considered to be a critical success factor