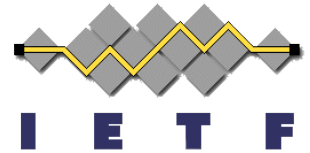


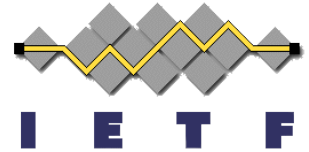
# Bluetooth 4.0 update to 4.1

*and what it means for IPv6 over Bluetooth Low-Energy*

IETF 6lo WG meeting @ IETF#89  
March 5, 2014

*draft-ietf-6lo-btle-00*  
Teemu Savolainen  
Nokia



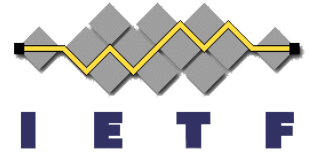


# Bluetooth 4.1

- Published at 3rd December 2013 by Bluetooth Special Interest Group (BT SIG)
  - Press release:  
<http://www.bluetooth.com/Pages/Press-Releases-Detail.aspx?ItemID=197>
  - Core Version 4.1 specification here:  
<https://www.bluetooth.org/en-us/specification/adopted-specifications>

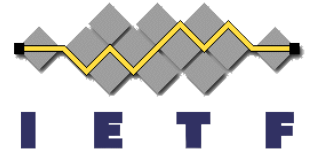
*“Bluetooth 4.1 is an important evolutionary update to the wireless specification, which experienced a revolutionary update in July 2010 with Bluetooth Smart, the intelligent, low-energy technology enabling the Internet of Things (IoT). The updates will improve consumer usability with increased co-existence support for LTE, bulk data exchange rates, and aid developer innovation by allowing devices to support multiple roles simultaneously. **The new release also lays the groundwork for IP-based connections, extending Bluetooth technology's role as the essential wireless link for the IoT.**”*

# New major features in Bluetooth 4.1



- BR/EDR Secure Connections
- Train Nudging
- Generalized Interlaced Scan
- Low Duty Cycle Directed Advertising
- 32-bit UUID Support in LE
- **LE Dual Mode Topology**
- Piconet Clock Adjustment
- **LE L2CAP Connection Oriented Channel Support**
- LE Privacy v1.1
- **LE Link Layer Topology**
- LE Ping

# L2CAP Connection Oriented Channels



- **Credit Based Flow Control Mode** for credit-based scheme for L2CAP data (not for signaling).
  - Helps multiplexing data send on one channel with data possibly sent on different channels at the same time
  - Helps constrained nodes to throttle incoming data flows (causing buffering on previous node, though).
- **Segmentation and Reassembly (SAR)** scheme is used for fragmentation – this allows multiplexing of parallel data flows
- **Negotiated up using LE Protocol/Service Multiplexer (LE\_PSM)** code point (which can be static or discovered separately). Following values are communicated by both parties (*values for up- and downlink are independent from each other*)
  - MTU and Maximum PDU Size – from 23 up to 65533 octets
  - Dynamic L2CAP Channel Identifier
  - Number of initial credits – from 0 to 65535 credits

# Dual-mode and Link-layer topology changes

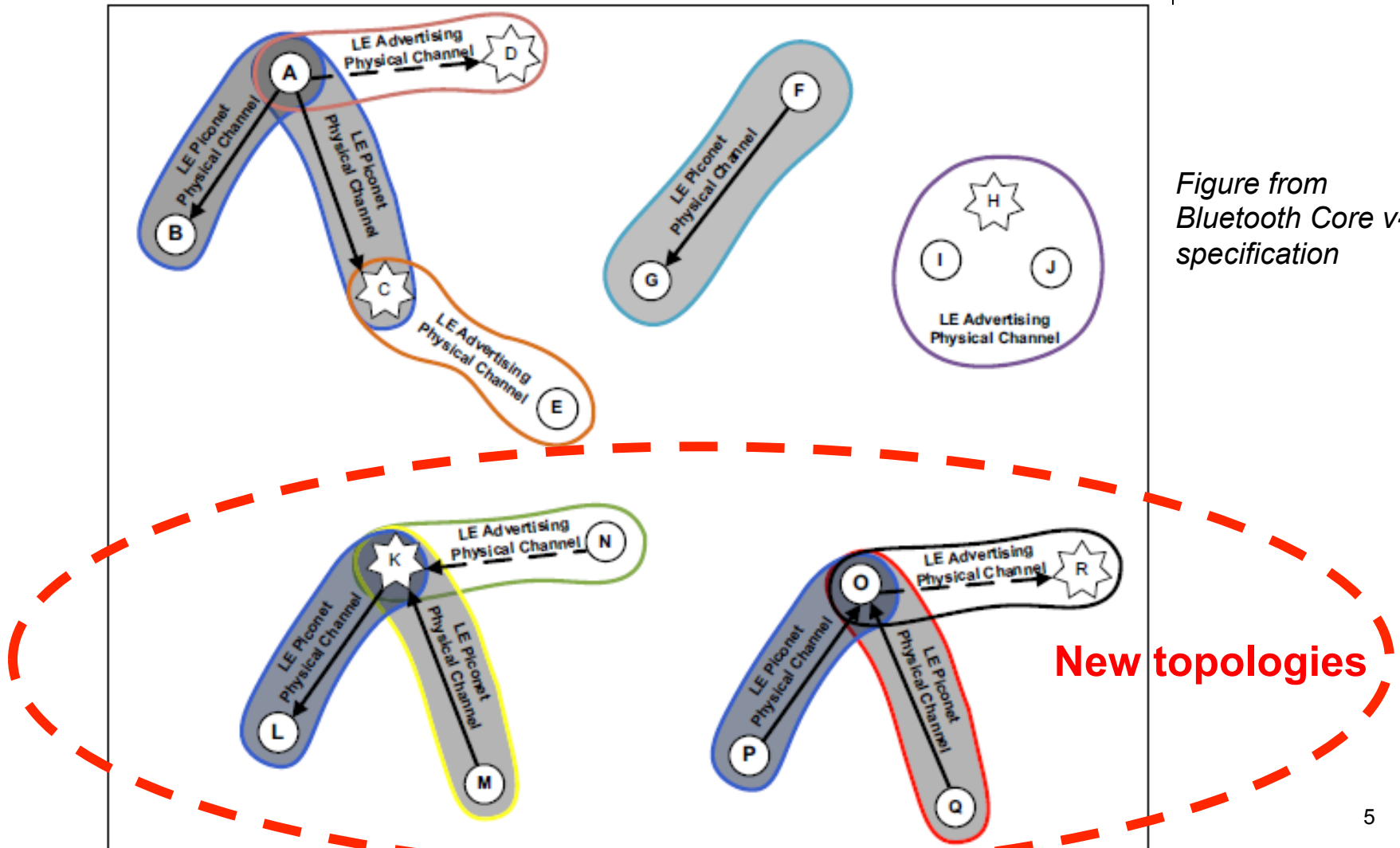
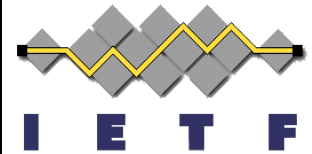


Figure from Bluetooth Core v4.1 specification

New topologies

Figure 4.2: Example of Bluetooth LE topology

## Next steps

- Work is ongoing in BT SIG's Internet WG to finalize additional documentation required for IPv6 functionality
- Next I-D revision, draf-ietf-6lo-btle-01, will be published once the required additional references are available from BT SIG