Bluetooth® Health Device Profile

Bluegiga Technolgies

Topics

- Introduction
- *Bluetooth* Health Device Profile
- IEEE 11073 – Optimized Exchange Protocol
- iWRAP with HDP
- HDP offering

Introduction

Introduction: Background

- **Getting rid of cables is also a trend in the medical field, as it gives patients and healthcare workers more freedom and possibilities.**
- **Bluetooth as a secure and robust technology is ideal for this purpose and at the moment there are in many medical solutions where Bluetooth has been used as a wireless interface.**
- **Bluetooth is used in a variety of medical applications as a secure and reliable connection method.**
- **Typically the implementations have been based on Bluetooth Serial Port Profile (SPP) and manufacturer specific proprietary implementations and protocols.**

  Therefore different implementations have had a poor level of interoperability with each other.

Introduction: Example

Pulse oximeter

BodyTel: Blood glugoce

RTD Ltd: Tempus IC

Blood pressure

Bluetooth headset

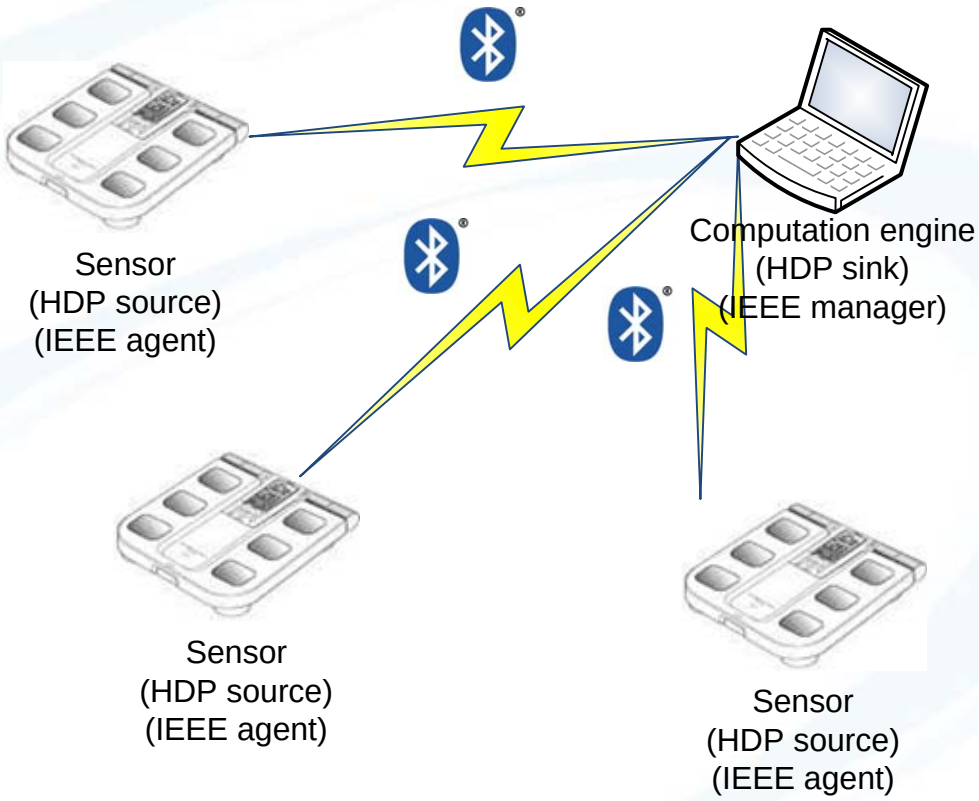
Introduction: Background

- For this reason the Bluetooth SIG formed the Medical Device Working Group and set a goal to develop a profile that would introduce interoperability between different medical sensors and collecting devices from different manufacturers.
- The work resulted Multi-channel Adaptation Protocol (MCAP) and the Bluetooth Health Device Profile (HDP), which were adopted during 2008.
- First level implementations started to appear early 2009

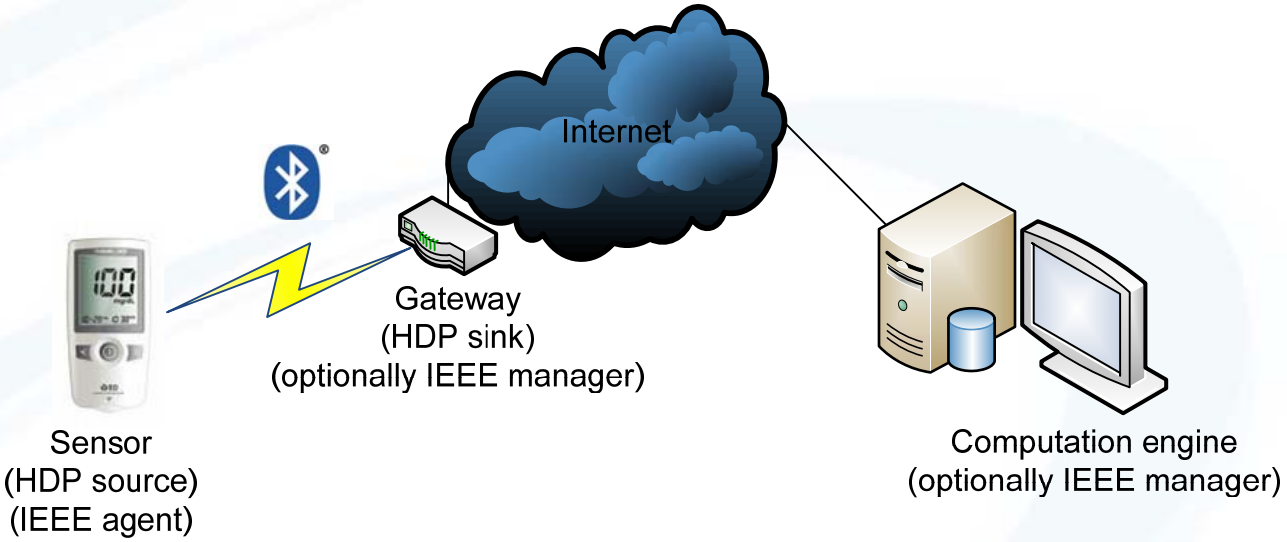
Introduction: Background

- HDP is mainly targeted to supporting variety of in-home or in-hospital applications.
- The most typical use cases are different portable sensors like ECG transmitters, blood glucose level meters or blood pressure meters that transmit the measurements in the hospital to a monitoring PC.
- In an in-home application the measurements could be transmitted to a gateway device that forwards the information to remote servers for further processing.

Introduction: Use cases



Introduction: Use cases



Introduction: Advantages

- **Medical, Healthcare and Fitness Applicability**
- **Wireless Service Discovery**
  Device types and features discovered with SDP
- **Reliable Connection-oriented Behavior**
  Data flows on top of reliable Bluetooth eL2CAP
- **Reliable Control Channel**
  Control channel on top of eL2CAP as well

Introduction: Advantages

- **Support for Flexible Data Channel Configurations**
  Manager cna handle several devices simultanously
- **Application-level Interoperability**
  IEEE 11073-xxxxx Personal Health Devices
- **Efficient Reconnection Mechanism**
- **High resolution Clock Synchronization**
  Synchronize data from several sources (ECG for example)
- **Optimized for Devices with Low Resources**

Bluetooth Health Device Profile

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Bluetooth Health Device Profile

HDP provides a way to set up:

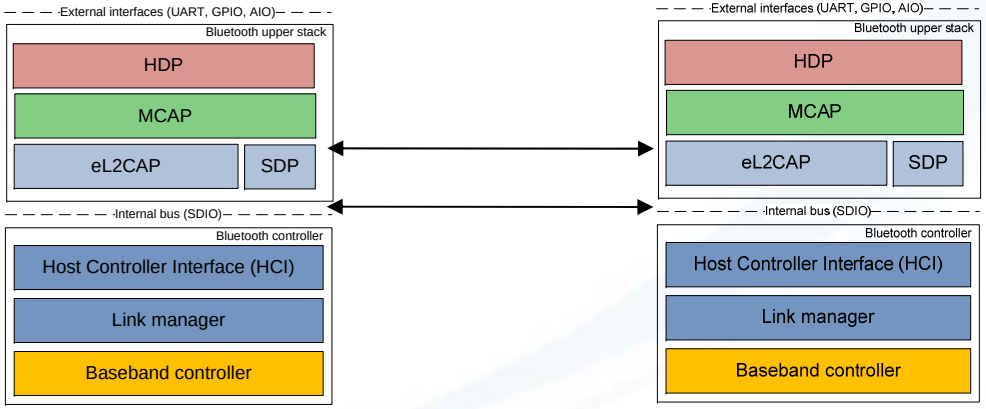
- A control channel and
- One or multiple reliable data channels

between two devices.

HDP profile also provides optional clock synchronization between the devices and device type identification.

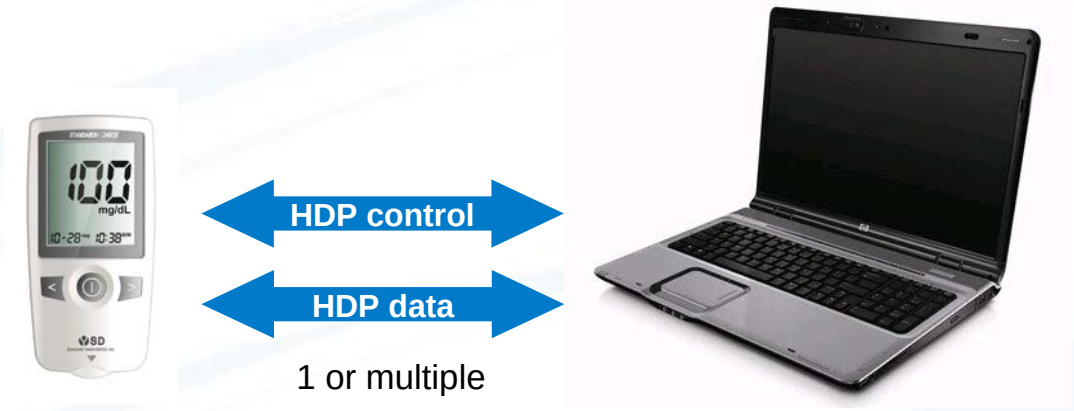
Source: Acts as a source of the medical data

Sink: Receives the medical data from single or multiple sources



HDP Source HDP Sink

Bluetooth Health Device Profile



HDP together with MCAP provides the following:

• Provides a standard structured approach for using a Control Channel to connect and coordinate connection of necessary Data Channels.

HDP is specialized for health applications and thus has the following advantages over other more generic profiles:

• Provides strong application level interoperability by operating with the ISO/IEEE 11073-20601 Personal Health Data Exchange Protocol

• Provisions for a standardized method by which the device-type and supported application data-types of a device can be determined wirelessly, using the Bluetooth Service Discovery Protocol (SDP).

• Connection-oriented to ensure more reliable behavior when a *Source* moves out of range or disconnects (either inadvertently or intentionally), allowing the device to recognize the condition and take appropriate actions.

IEEE 11073 – Optimized Exchange Protocol

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IEEE 11073 Optimized Exchange Protocol

- The application level interoperability is provided with ISO/IEEE 11073-xxxxx
- The IEEE 11073-20601 Optimized Exchange Protocol provides a framework of object-oriented information modeling, information access and measurement data transfer suitable to a wide variety of personal health devices.
- Examples of such health devices are as follows: weight scales, thermometers, pulse oximeters, blood pressure monitors, and glucose meters. On addition the protocol is designed to support a range of home health sensors.
- The goal of IEEE 11072-20601 is to enable interoperability between sensors and data management devices to process, display or transfer the specific measurements.
- The ISO/IEEE 11073 specifications contains the 20601 core protocol specification describing the tools to represent and convey data and a set of Device Data Specializations (DDS), which contains details how 20601 is applied to a specific health device.
- At the time of writing this presentation the following DDSs existed:
  - IEEE 11073-10404 – Pulse Oximeter
  - IEEE 11073-10407 – Blood Pressure Monitor
  - IEEE 11073-10408 - Thermometer
  - IEEE 11073-10415 – Weighing Scale
  - IEEE 11073-10417 – Glucose Meter

IEEE 11073 Optimized Exchange Protocol

Data type	MDEP Data type	IEEE 11073	IEEE 11073 Document name
Pulse oximeter	0x1004 (4100 decimal)	11073-10404	Health informatics - Personal health device communication - Device specialization - Pulse oximeter
Blood pressure monitor	0x1007 (4103 decimal)	11073-10407	Health informatics - Personal health device communication - Device specialization - Blood pressure monitor
Body thermometer	0x1008 (4104 decimal)	11073-10408	Health informatics - Personal health device communication - Device specialization - Thermometer
Body weight scale	0x100F (4111 decimal)	11073-10415	Health informatics - Personal health device communication - Device specialization - Weighing scale
Glucose meter	0x1011 (4113 decimal)	11073-10417	Health informatics - Personal health device communication - Device Specialization - Glucose meter

iWRAP with HDP

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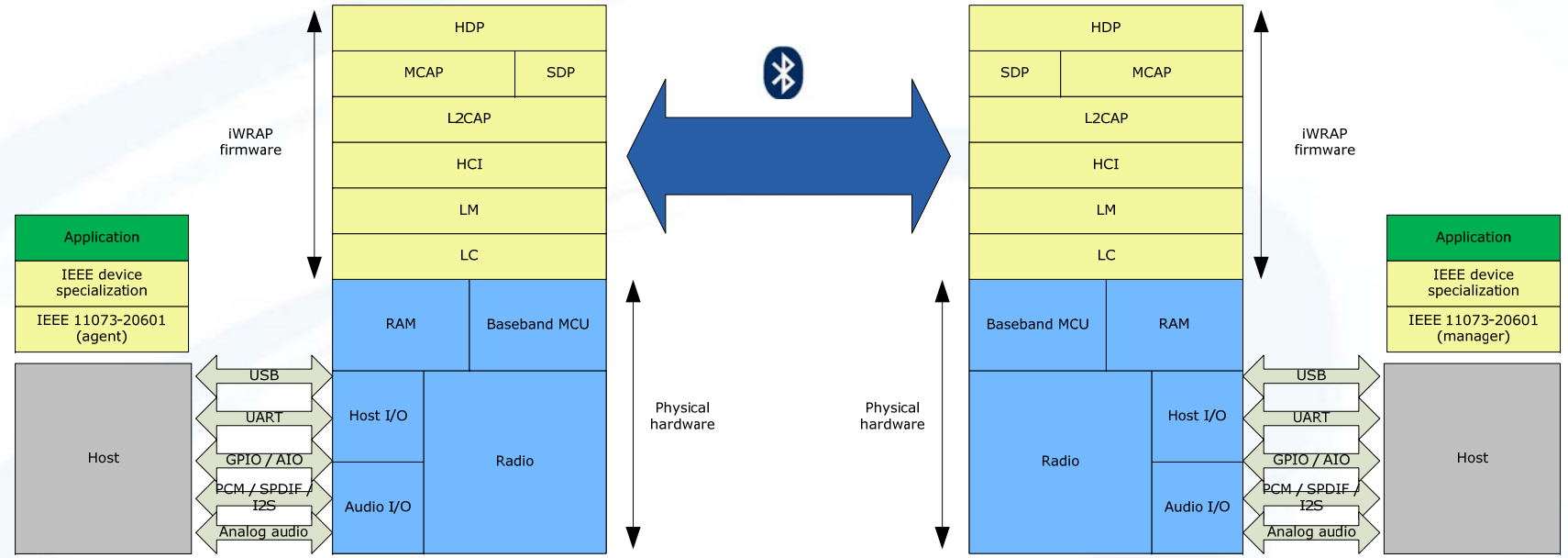
iWRAP with HDP



iWRAP implements:

- MCAP protocol
- HDP profile
- SDP profile

IEEE data need to be sent in single Bluetooth L2CAP frames -> UART needs to be MUXed

IEEE stack must be implemented by the host at the moment

HDP offering

HDP offering

- **HDP beta** **: Now**
  - Wireless Service Discovery
  - Reliable Connection-oriented Behavior
  - Reliable Control Channel
  - Support for Flexible Data Channel Configurations
  - Application-level Interoperability
  - Efficient Reconnection Mechanism

- **Beta Bluetooth / IEEE qualified** **: Q3-Q4 / 2009**

- **IEEE 11073-20601** **: Now**
  - ANSI C soruce code for agent / manager
  - iWRAP handling, MUX handling
  - QT based graphical user interface
  - Source code documentation

- **Device Data Specializations**
  - IEEE 11073-10417 – Glucose Meter : Later
  - IEEE 11073-10404 – Pulse Oximeter : Later
  - IEEE 11073-10407 – Blood Pressure Monitor : **Now**
  - IEEE 11073-10408 - Thermometer: Later : Later
  - IEEE 11073-10415 – Weighing Scale : Later

- **Project based customization** **:Now**
  - For example integrating DDS into WTxx.

Thank you