



iWRAP5 *Bluetooth*[®] stack

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iWRAP5 Overview



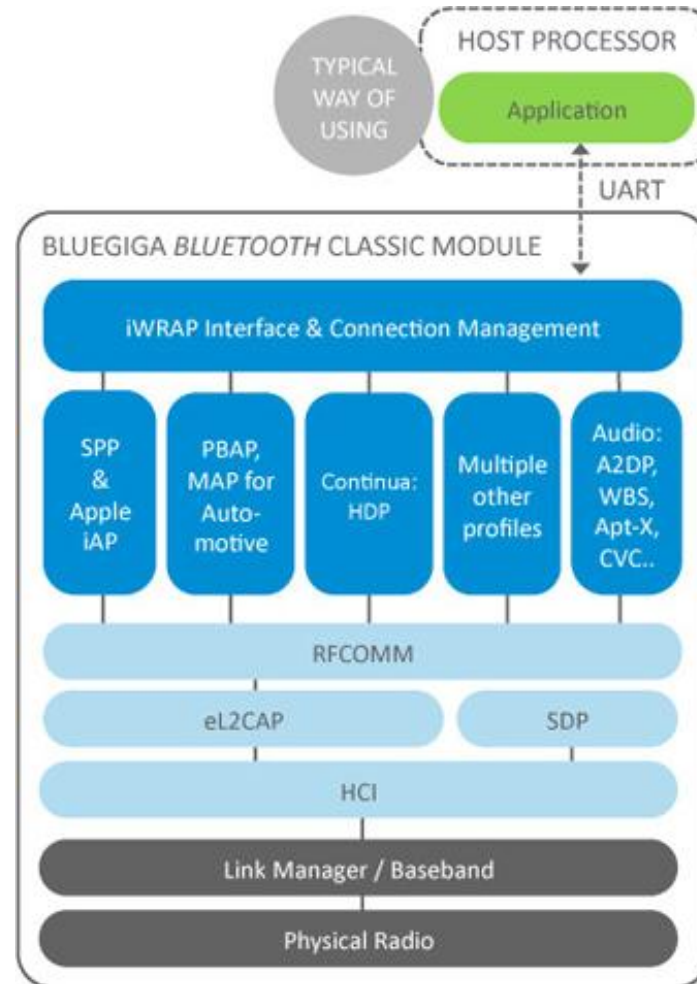
iWRAP5 Overview



Bluegiga iWRAP Software

- iWRAP5 software is an embedded *Bluetooth* stack
- Designed for Bluegiga's WT12, WT11i, WT41 and WT32 *Bluetooth* modules
- iWRAP5 implements the full *Bluetooth* stack and 13 qualified *Bluetooth* profiles
- iWRAP5 also supports the Apple iAP profile required to exchange data with Apple iOS devices
- In addition iWRAP5 implements two Bluegiga proprietary profiles
 - Bluegiga IO Profile (BGIO)
 - Over-the-Air Configuration Profile (OTA)
- Bluegiga can easily customize the iWRAP5 software for specific application needs

iWRAP5 Overview





Technical Features



Technical Features

Feature	Value
MAX simultaneous ACL (data) connections	7
MAX simultaneous SCO/eSCO connections	1 (2 with WT32)
MAX data rate	500-600 kbps (depends also on the receiving device)
Data transmission delay	5-15ms
Typical SCO/eSCO delay	30-40ms
Typical A2DP delay	150-200ms
Supported A2DP codecs	SBC and aptX®
Encryption length	From 56 or 128-bits
MAX simultaneous pairings	16
Supported power saving modes	Sniff and deep sleep
Secure Simple Pairing	Just works mode Man-in-the-middle protection (MITM) Out-of-Band (OOB) pairing



Supported *Bluetooth* Profiles



Supported *Bluetooth* Profiles

- **Serial Port Profile (SPP)**
 - DevA and DevB
- **Hands Free Profile (HFP) v.1.6**
 - HF and HFP-AG modes
- **Headset Profile (HSP) v.1.2**
 - HSP and HSP-AG modes
- **Object Push Profile (OPP)**
 - OPP server and client
- **File Transfer Profile (FTP)**
 - FTP client
- **Dial-up Networking Profile (DUN)**
 - Terminal emulation
- **Human Interface Device (HID)**
 - HID device (mouse and keyboard)
- **Advanced Audio Distribution Profile v.1.2 (A2DP)**
 - Sink and source modes
- **A/V Remote Control Profile v.1.3 (AVRCP)**
 - AVRCP controller and target
- **Health Device Profile (HDP)**
 - HDP sink and source
- **Phone Book Access Profile (PBAP)**
 - PBAP client
- **Message Access Profile (MAP)**
 - MAP client
- **Device Identification Profile (DI)**



iWRAP Features Highlights





Apple iAP profile support

- Allows OEMs to easily build *Bluetooth* based Apple iOS accessories
- iWRAP can directly interface to Apple authentication co-processor via I2C
- Transparent iAP to SPP transition to easily switch from iOS to Android devices

Hands-Free Profile v.1.6

- Introduces Wide Band Speech (WBS) codec also known as HD voice
- Increases HFP audio bandwidth from 8 kHz to 16 kHz and significantly improves audio quality

aptX[®] codec for outstanding quality A2DP audio

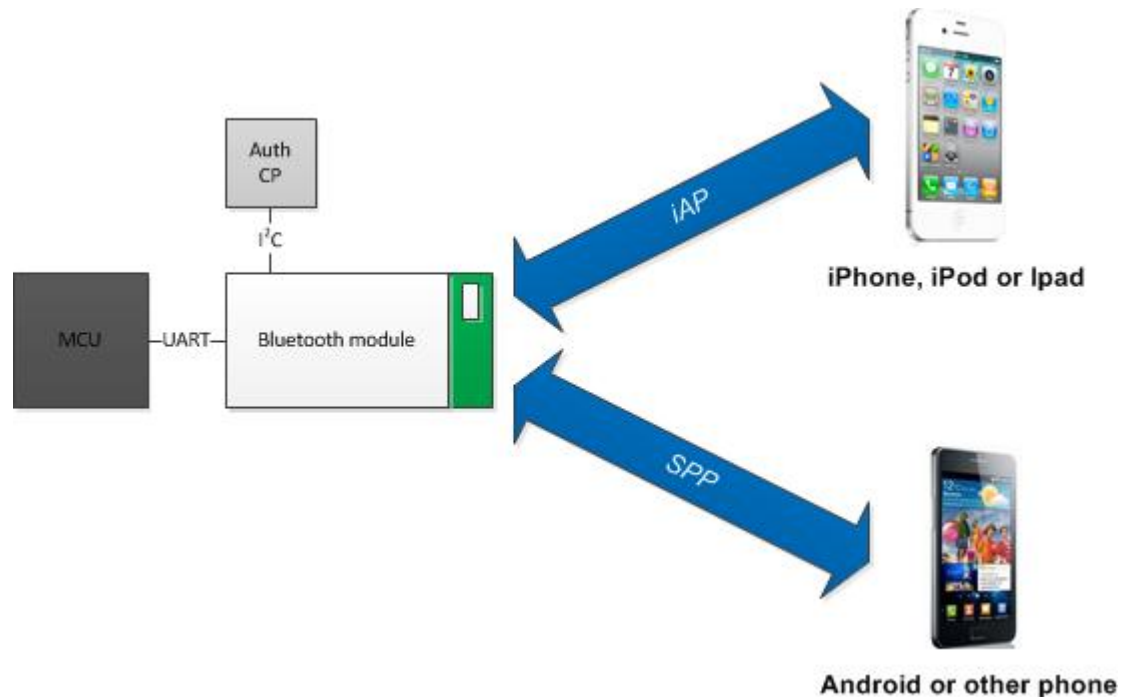
Fifth generation CVC[™] echo cancellation and noise reduction

Health Device Profile updated to support Continua v.1.5 specification

20+ other improvements and feature add-ons

Apple iAP Support

- The Apple authentication co-processor can directly be connected to the *Bluetooth* modules via I²C
- Simple 2-wire hardware implementation



Apple iAP Support

The iWRAP handles the communication between iOS and authentication co-processor

- Handles authentication
- Implements iAP protocol
- Simple command & configuration with ASCII commands
- Supports features such as automatic App download and auto launch etc

Offers two operational modes

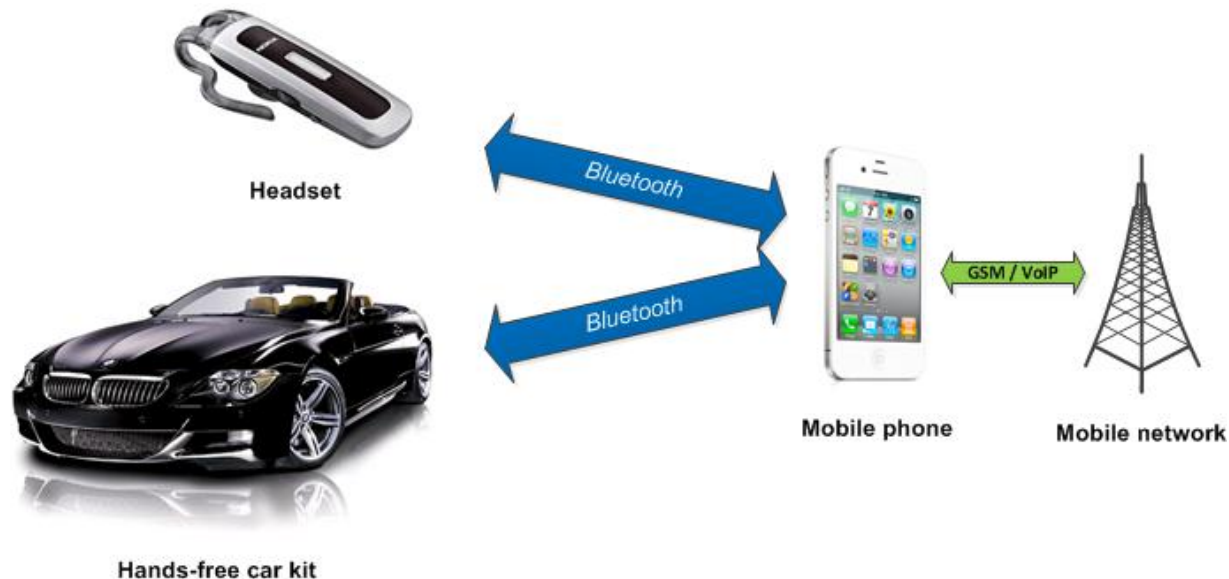
- Fully transparent mode: hides iAP complexity from the host and offers transparent data pipe
- iAP mode: manages initial authentication and connection setup, but iAP needs to be handled by the host

Fully transparent mode allows same host software to be used for Apple devices as well as "SPP devices", such as Android phones



Hands-Free Profile v.1.6

- Hands-Free Profile v.1.6 introduces support for Wide Band Speech also known as HD voice
- Increases hands-free audio bandwidth from 8kHz to 16kHz and significantly improves audio quality



Hands-Free Profile v.1.6



- Wide-band speech implemented using mSBC codec
- iWRAP does automatic codec negotiation and falls back to CVSD for HFP v.1.5 or older devices
- WBS already used by Apple Siri and Android voice recognition
- Only available for WT32 *Bluetooth* module

aptX[®] audio codec for A2DP

- aptX codec significantly improves the audio quality of A2DP connections
 - provides nearly lossless audio quality
- aptX is suitable for Hi-Fi audio applications, where better audio quality is preferred
 - Such as high-end headset, headphones, audio amplifiers etc.
- aptX has quickly become most widely adopted audio codec alternative to SBC
 - Supported for example by MacBooks, iMacs, several Android phones and tablets
- An extra license cost applies to aptX codec



Health Device Profile

- *Bluetooth* Health Device Profile (HDP) enables device vendors to Continua compliant health devices



HDP source



HDP sink

- HDP provides a reliable and secure transport for transmitting sensitive information over a *Bluetooth* link
- Application level protocol is defined very well with IEEE 11073 standards that provide device interoperability between vendors

Health Device Profile

- iWRAP5 now implements Continua v.1.5 compliant HDP and several IEEE agents
- Required for all new Continua compliant, *Bluetooth* enabled devices
- IEEE agents implements many Continua devices, such as:
 - Blood pressure monitor
 - Weight scale
 - Pulse oximeter
 - etc.



Human Interface Device Profile

- HID profile allows vendors to build wireless keyboards, mice and joysticks
- iWRAP5 implements a flexible HID profile, where the vendor can define the HID descriptors used on the fly
- This allows one to build flexible HID devices, which for example support multiple keyboard layouts, simultaneous keyboard and mouse devices etc.
- HID reports can also be sent from the host to the device



HID device



HID host

Other Improvements and Features



- Proximity pairing, which enables automatic pairing based on distance
- Device discover filtering, allowing only certain devices to be discovered for example based on *Bluetooth* address
- IO control for external audio amplifiers, which allows iWRAP to enable/disable external audio amps based on A2DP or HFP connection status
- SCO connection parameter configuration, which enables SCO connection parameters to be optimized based on audio quality or QoS requirements
- Commands to set initial PIO states and blink leds
- And many more...



Thank You

