# Mindtree

*Welcome to possible*

# EtherMind Bluetooth® 5.1

Comprehensive, production proven and qualified
Bluetooth Stack and Profiles IP

## Introduction

Mindtree is acknowledged by the Bluetooth SIG as one of the creators of the Bluetooth version 4.x and 5.x specification. We have been building and Licensing Bluetooth IP solutions since 2000, over the years, we have consistently certified enerations of our silicon and software IP by the Bluetooth SIG.
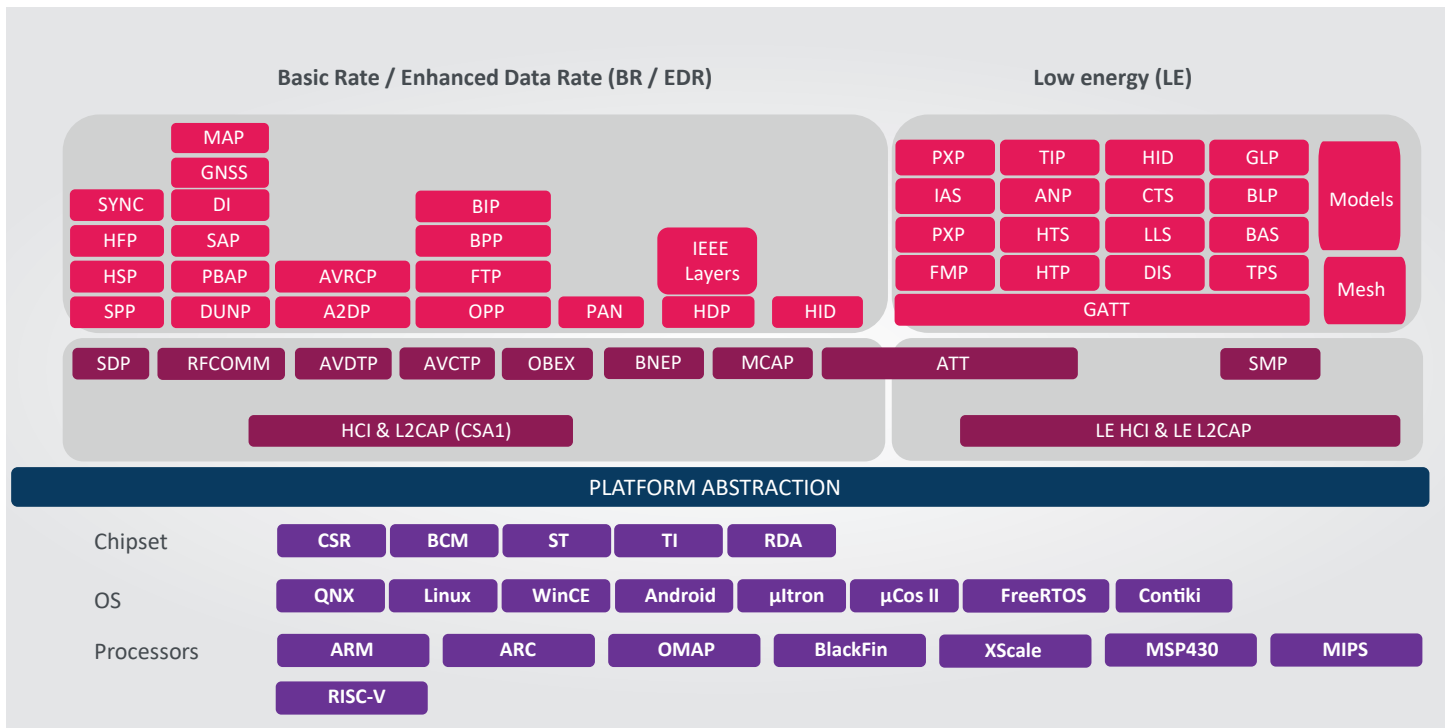
Mindtree's EtherMind Dual Mode Stack and Profiles has been widely licensed to numerous semiconductor companies and OEMs across the globe. Today EtherMind is licensed to more than 60+ customers. The v5, v4.x and v2.1+EDR IP has been licensed to OEMs including a major Asian Mobile OEM, Garmin, LG, QNX, Panasonic and Logitech.  Semiconductor companies including Intel, Texas Instruments and Rohm have also licensed our  EtherMind IP

EtherMind Bluetooth low energy Stack and Profiles has been hardened in many consumer devices including mobile phones and mono headsets as it simplifies maintenance, builds reliable functioning and takes a holistic view to increase quality of service (QoS).

Mindtree's Bluetooth Stack and Profiles supports all the mandatory as well as optional features of the Bluetooth core stack and the profiles.  EtherMind is optimized for embedded applications and offer significant savings in hardware "Bill of Materials". EtherMind requires just 1/10th the memory of competitive stacks that have been designed for PC and mobile phone applications.

# EtherMind Bluetooth 5.1 – Product Features

## Basic Rate / Enhanced Data Rate (BR / EDR)

MAP, GNSS, SYNC, DI, HFP, SAP, HSP, PBAP, AVRCP, SPP, DUNP, A2DP, BIP, BPP, FTP, OPP, PAN, IEEE Layers, HDP, HID

SDP, RFCOMM, AVDTP, AVCTP, OBEX, BNEP, MCAP

HCI & L2CAP (CSA1)

## Low energy (LE)

PXP, TIP, HID, GLP, IAS, ANP, CTS, BLP, PXP, HTS, LLS, BAS, FMP, HTP, DIS, TPS, Models, Mesh

GATT

ATT, SMP

LE HCI & LE L2CAP

## PLATFORM ABSTRACTION

**Chipset:** CSR, BCM, ST, TI, RDA

**OS:** QNX, Linux, WinCE, Android, µItron, µCos II, FreeRTOS, Contiki

**Processors:** ARM, ARC, OMAP, BlackFin, XScale, MSP430, MIPS, RISC-V

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EtherMind Bluetooth 5.1 is a software IP capable of single and dual mode operations consisting of Stack, Profiles and application frameworks.

## Key advantages

### Complete Bluetooth 5.1 Protocol Stack and profiles

- Bluetooth low energy profiles (Annexure-1)
- Classic Bluetooth profiles (Annexure-2)

### Proven interoperability

- Proven at different Unplug Fests
- Tested for interoperability with more than 200 smart phone models

### Easy portability

- 8/16/32 bit MCUs – ARM, ARC, OMAP, Blackfin, Xscale, MSP430 etc.
- Operating systems – QNX, Windows CE, Android, FreeRTOS, MQX, etc.
- Bluetooth chipsets – CSR, TI, BCM, ST

### Modular configurable architecture

- Non-blocking architecture – enables multiple parallel operations
- Two task or single task model
- UART, USB, 3-wire, SDIO and software transport
- Over-the-air firmware (FOTA) upgrade
- Feature/compilation flags to enable/disable features of Core Stack, Profiles and Role

### Low memory footprint

- Typical Dual Mode Stack & Profiles (RAM) ~25KB
- Typical Dual Mode Stack & Profiles (Flash) ~240 KB
- Sizes include the core Stack, typical Audio Profiles such as A2DP, AVRCP, HFP, PBAP,MAP and SBC encoder

## Key Benefit

### Easy Maintenance
- Bug fixes can be easily integrated into the IP

### Reduced development risk

- Robust, interoperable and optimized implementation
- Leverages 19+ years of experience helping product companies engineer low- footprint products
- Complete implementation in ANSI C code to enable easy portability across processors of choice
- Platform and operating system (OS)-agnostic
- Proven portability across Mindtree as well as third party Bluetooth Stack

### Reduced product cost

- The low memory footprint of EtherMind reduces product BOM due to decreased Flash and ROM requirement.
- Highly configurable to suit the product needs of OEMs and enables further optimizations

### Competitive differentiation

- All mandatory and optional feature support; all mode support; extensive profile support
- Flexible support in various stages of development and productization cycle

- Helps customers win business by adding new profiles, feature licensing and providing support in selling

## Key Deliverables

- Classic Bluetooth and Bluetooth low energy Stack for core specification 5.1
- Bluetooth Profiles
  - Traditional Profiles
  - GATT-based specifications
- Source code for core stack, profiles and abstraction layers.

- Modification rights for abstraction layers. This enables customers to integrate EtherMind Stack onto the target platform easily.
- Source code of sample application to illustrate the use of APIs
- Documentation
  - EtherMind architecture document
  - EtherMind software programmer manual
  - EtherMInd IP user guide

## Bluetooth Leadership Credentials

MIndtree is a pioneer in Bluetooth IP licensing and providing engineering services for semiconductor companies and OEMs.

**80+**
Customers for Bluetooth IPs

**35 mn+**
Products shipped with IP

**500+**
Person-years of investment

**40 +**
Unplug Fests attended

Co-creator of
**4.x & 5.x**
specifications

**4/5** top Microprocessor companies are licensees

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## Annexure 1 – Bluetooth low energy Profiles

| Profile | Specification Name | Profile version Number |
|---------|--------------------|------------------------|
| ANP / ANS | Alert Notification Profile & Service | 1 |
| AIOP / AIOS | Automation IO Profile & Service | 1 |
| BAS | Battery Service | 1 |
| BCS | Body Composition Service | 1 |
| BLP | Blood Pressure Profile & Service | 1 |
| BMS | Bond Management Service | 1 |
| CGMP / CGMS | Continuous Glucose Monitoring Profile & Service | 1.0.1 |
| CPP / CPS | Cycling Power Profile & Service | 1.1 |

| CSCP / CSCS | Cycling Speed and Cadence Profile  & Service | 1 |
|---|---|---|
| CTS | Current Time Service | 1.1 |
| DIS | Device Information Service | 1.1 |
| ESP & ESS | Environmental Sensing Profile  & Service | 1 |
| FMP | Find Me Profile | 1 |
| GLP & GLS | Glucose Profile  & Service | 1 |
| HIDS | HID Service | 1 |
| HOGP | HID over GATT Profile | 1 |
| HPS | HTTP Proxy Service | 1 |
| HRP / HRS | Heart Rate Profile & Service | 1 |
| HTP / HTS | Health Thermometer Profile  & Service | 1 |
| IAS | Immediate Alert Service | 1 |
| IPS | Indoor Positioning Service | 1 |
| IPSP | Internet Protocol Support Profile | 1 |
| LLS | Link Loss Service | 1.0.1 |
| LNP / LNS | Location and Navigation Profile & Service | 1 |
| NDCS | Next DST Change Service | 1 |
| OTP / OTS | Object Transfer Profile & Service | 1 |
| PASP / PASS | Phone Alert Status Profile & Service | 1 |
| PXP | Proximity Profile | 1.0.1 |
| PLXP / PLXS | Pulse Oximeter Profile  & Service | 1 |
| RSCP / RSCP | Running Speed and Cadence Profile  & Service | 1 |
| RTUS | Reference Time Update Service | 1 |
| ScPP / ScPS | Scan Parameters Profile  & Service | 1 |
| TDS | Transport Discovery Service | 1 |
| TIP | Time Profile | 1 |
| TPS | Tx Power Service | 1 |
| UDS | User Data Service | 1 |
| WSP / WSS | Weight Scale Profile  & Service | 1 |

## Annexure 2 – Classic Bluetooth Profiles

| Profile | Specification Name | Profile version Number |
|---|---|---|
| A2DP | Advanced Audio Distribution Profile | 1.3.1 |
| AVRCP | Audio/Video Remote Control Profile | 1.6 |
| BIP | Basic Imaging Profile | 1.2 |
| BPP | Basic Printing Profile | 1.2 |
| CTN | Calendar Tasks and Notes Profile | 1.0 |
| DI | Device Identification Profile | 1.3 |
| DUN | Dial-Up Networking Profile | 1.2 |
| FTP | File Transfer Profile | 1.3 |
| GAVDP | Generic Audio/Video Distribution Profile | 1.3 |
| GNSS | Global Navigation Satellite System Profile | 1 |
| GOEP | Generic Object Exchange Profile | 2.1 |
| HDP | Health Device Profile | 1.1 |
| HFP | Hands-Free Profile | 1.7 |
| HID | Human Interface Device Profile | 1.1 |
| HSP | Headset Profile | 1.2 |

| MAP | Message Access Profile | 1.3 |
|------|------------------------|-----|
| MPS | Multi Profile Specification | 1.0 |
| OPP | Object Push Profile | 1.2 |
| PAN | Personal Area Networking Profile | 1.0 |
| PBAP | Phone Book Access Profile | 1.2 |
| SAP | SIM Access Profile | 1.1 |
| SPP | Serial Port Profile | 1.2 |
| SYNCH | Synchronization Profile | 1.2 |