ZigBee Stack Solutions

Product information 2016/2017

ubisys®

ZigBee® 3.0
Better Together

About ubisys

Promoting the ubiquitous deployment of smart wireless systems, ubisys technologies GmbH is a leading Smart Home and Internet-of-Things company based in Düsseldorf, Germany. Its broad portfolio includes core technologies like certified ZigBee Golden Unit stacks, cloud services, advanced products including roller shade controllers, dimmers, smart power outlets and heating controllers as well as complete, consumer-facing solutions with gateways and apps for iOS and Android.
ubisys is member of the ZigBee Alliance and part of the ARM Connected Community.

ZigBee® Member

ARM® Connected Community

ubisys ZigBee Tools

IEEE 802.15.4 Wireshark USB Stick

Diagnostics tool with remarkable performance for analyzing wireless IEEE 802.15.4 networks in the 2.4GHz band. Use the standard tool Wireshark™ to analyze protocols like 6lowpan, ZigBee and ZigBee PRO, as well as diagnose errors during network installation and evaluate network protocols etc.

This solution is also suitable in case you have realized own protocols based on IEEE 802.15.4 MAC and want to verify them, because Wireshark can easily be extended adding new protocols (e.g. WirelessHART, ISA100.11a etc.) by plug-ins.
High-end components as well as our own ubisys Compact15.4™ MAC implementation allows this Wireshark™ capture device enough performance reserves to analyze dense, high traffic networks — without having to discard frames due to memory shortage or lack of system performance. Especially in network-wide broadcasts leading to a large number of packets within a short period of time, regular IEEE 802.15.4 Dongles from other manufacturers will quickly reach their limits.

Technical specifications

- IEEE 802.15.4
- ZigBee 3.0
- ZigBee Green Power
- 6lowpan
- USB 2.0 full-speed
- ARM7, 48MHz, 64KB RAM
- 128 Frames à 127Bytes

ZigBee USB Stick U1 and Network Manager

The U1 allows notebooks, netbooks and PCs to grant access to IEEE 802.15.4/ZigBee radio networks. You require this stick if you want to use ubisys ZigBee commissioning software Network Manager for professional installation to set up basic configuration without a gateway during shell construction phase.

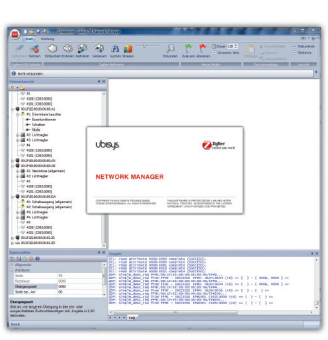
Technical specifications of the U1

- ZigBee Coordinator and Trust Center
- ZigBee Router
- IEEE 802.15.4
- Centralized and distributed security
- ZigBee 3.0 (Certified)
- USB 2.0 full-speed

ZigBee® Certified product

Features of the Network Manager

- Network functions
- Management (ZDO/ZDP)
- Basic Cluster
- Identify Cluster
- Groups Cluster
- Scenes Cluster
- Level-Control Cluster
- Color-Control Cluster
- Etc.

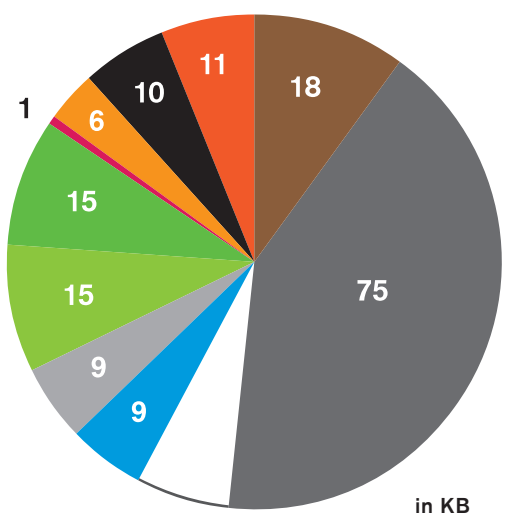


Memory Requirements

ZigBee Device Role	Coordinator & Trust Center	Router	End Device	Universal (Runtime Configurable)
Flash (Release)	256KB	256KB	128K	256KB
Flash (Full Debug)	+256KB	+256KB	+128KB	+256KB
Flash on-chip OTA	Twice the above number	Twice the above number	Twice the above number	Twice the above number
RAM	64KB	32KB/64KB	16KB	64KB

Above numbers are for the ARMv7-M architecture (e.g. Cortex-M3/M4), including Compact15.4, Compact7B and a typical application.
Examples: A Trust Center product with the release build and not implementing on-chip OTA (e.g. using external memory or another upgrade approach) can be implemented in a device with 256KB Flash. A router using the full debug build and supporting OTA downloads at the same time on the same chip would require up to 1MB of flash memory.

Code Memory Usage Example



- IEEE 802.15.4 MAC and PHY interface CC2520/SPI, FFD with extensions for GP (c15dot4)
- ZigBee 2015 core stack (c7b)
- ZigBee Foundation Core (included in c7bfx)
- Sample set of standard clusters used in this project: Basic, Groups, Identify, Level Control, On/off, Scenes, Thermostat (just a stub that receives temperature reports from GP or ZigBee temperature sensors) (included in c7bfx)
- ZigBee Network Co-processor Application including USB device stack
- ZigBee Green Power Proxy (c7bgp)
- ZigBee Green Power Sink with support for all kinds of devices (c7bgp)
- AES pure software (e.g. allows to protect ZLL key in dual-chip solutions) (ccrypto)
- Storage (non-volatile flash storage with dynamic memory allocation and flash wear-levelling for frequently changing values like frame counters)
- IAR C/C++ Runtime Library (most of this accounts to the advanced heap manager)

ubisys technologies GmbH
Am Wehrhahn 45
40211 Düsseldorf, Germany

T +49. 211. 54 21 55 - 00
F +49. 211. 54 21 55 - 99

info@ubisys.de
www.ubisys.de

ubisys ZigBee Stack Solutions

Overview of Features and Supported System Architectures

Compact7B™ ZigBee Stack Solution

- C++ class library with all the benefits of inheritance, polymorphism, templates, STL, etc. designed and optimized to run on 32-bit ARM micro-controllers, SoCs and application processors
- Covers all software from IEEE 802.15.4 MAC and PHY glue, to ZigBee Network (NWK) and Application Support (APS), to ZigBee 3.0 Base Device Behavior (BDB), to the ZigBee Cluster Library (ZCL)
- Industry-unique, fully-integrated ZigBee Green Power (GP)
- All ZigBee device roles supported (Coordinator, Router, Sleeping and non-sleeping End-Device), also in a single binary image (e.g. USB dongle or gateway with configurable role)
- Sophisticated Application Framework with comprehensive and automated support for ZCL clusters, attributes, reporting, etc. with in-built flexibility for customization
- Simplifies application development and maintenance by providing overloadable/overridable default behavior, such that applications are only required to react on changes to attributes, commands etc.
- Use readily available clusters or derive your own implementation with specific tweaks to certain behavior
- Framework includes support for finding & binding, application only has to enable endpoints as finding & binding target or initiator
- Framework automatically generates all the descriptors (active endpoints, simple descriptors, etc.) on behalf of the application
- Supports applications defined at compile-time and optionally applications defined at run-time (e.g. for gateways or bridges)
- Modular and still tightly coupled, monolithic design to ensure optimum code reuse
- Framework libraries for core services, peripherals, timers, smart packet handling, security etc.
- Persistent Storage in flash-memory with ability to repair bad blocks and predictable, deterministic wear leveling for frequently changing values (like counters) featuring an advanced API for searching and updating tokens
- Firmware completely upgradable via USB (e.g. USB dongles, embedded into gateways etc.) or ZigBee OTA Upgrade Cluster
- Designed for performance, reliability and robustness
- Advanced debugging features in debug builds (assertions, heap usage and detailed dump, stack usage etc.)
- Silicon-vendor independent; portable to a variety of microcontroller and IEEE 802.15.4 radio combinations; simplifies migration e.g. when parts are discontinued and also facilitates second source

Compact15.4™ IEEE 802.15.4 MAC/PHY

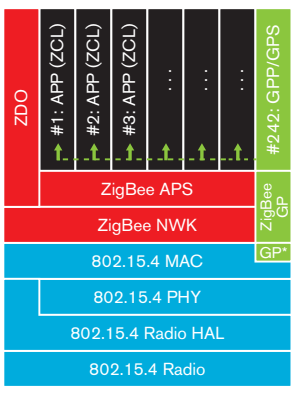
- Embedded C++ library
- Provides radio hardware abstraction
- Supports varying levels of hardware acceleration
- ubisys extensions for bidirectional Green Power (GP) support
- Depending on the target platform
  - either a full MAC implementation, or
  - a wrapper glue for an existing customer MAC implementation

Platform7B™ Certification Status & Awards

- **All** twelve **ZigBee 3.0 Certified Products** so far (October 2016) are **based on this platform**
- Platform7B™ consists of
  - ubisys Compact7B™ ZigBee Stack
  - ubisys Compact15.4™ IEEE 802.15.4 MAC & PHY glue
  - Atmel AT91SAM7S512 ARM7TDMI, 512KB Flash, 64KB RAM
  - Texas Instruments CC2520 2.4GHz IEEE 802.15.4 radio
- Platform7B™ is a ZigBee 2015 Certified Platform
  - Awarded **Golden Unit** designation for its ZigBee Core Stack
  - Awarded **Golden Unit** designation for its ZigBee Green Power feature
- Compact15.4™ is a certified IEEE 802.15.4 MAC

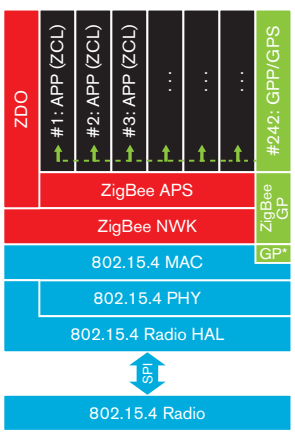
ZigBee SoC Solution (Single-Chip)

- Solution for „things“, i.e. actuators and sensors
- SoC includes radio and MCU running the stack
- All ZigBee device roles supported: Trust Center, Router, or End-Device
- Recommended: Cortex-M, 256KB Flash (512KB for on-chip OTA storage or full debugging features), 32KB+ RAM
- Examples: CC2538, GP69x, ARM Cortex-M + Cordio 15.4



ZigBee Transceiver Solution (Dual-Chip or SiP)

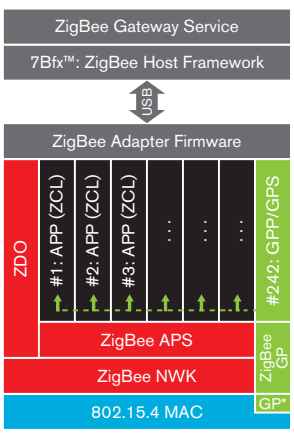
- Solution for „things“, i.e. actuators and sensors
- MCU runs stack and application
- Transceiver connected via SPI
- All ZigBee device roles supported: Trust Center, Router, or End-Device
- Recommended: Cortex-M, 256KB Flash ROM (512KB for on-chip OTA storage or full debugging features), 32KB+ RAM
- Transceiver Examples: CC2520, AT86RF233, GP712
- SiP examples: ATSAMR21



ubisys ZigBee Gateway Solutions and Services

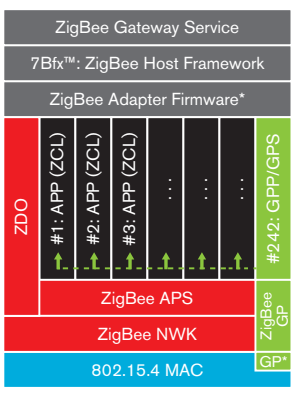
ZigBee Gateway – Coprocessor Solution

- Solution for „hubs“, i.e. gateway-grade devices
- Host Processor with Linux OS
- ubisys ZigBee Gateway Service with GRIP binding (ASN.1 binary TCP stream), fully standards-compliant
- ZigBee Adapter Firmware on Single-Chip or Dual-Chip platform serves as ZigBee Network Coprocessor, fully off-loading the host from timing critical tasks

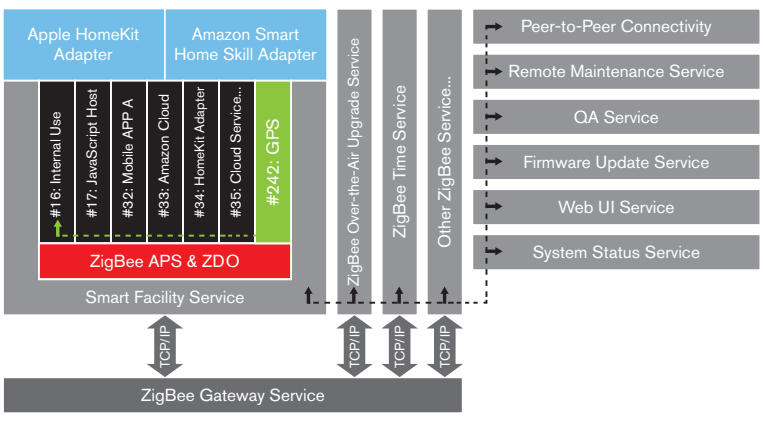


ZigBee Gateway – Embedded Stack Solution

- Solution for „hubs“, i.e. gateway-grade devices
- Host Processor with Linux OS
- ubisys ZigBee Gateway Service with GRIP binding (ASN.1 binary TCP stream), fully standards-compliant
- Virtual ZigBee Adapter Firmware on top of embedded ZigBee Stack instead of dedicated ZigBee Network Coprocessor



ZigBee Gateway – Complementary Services for a Complete Solution



ubisys ZigBee 3.0 Stack Certifications

- ZigBee 2015 Certified Platform & Golden Unit, certification tests run by TÜV Rheinland
- ZigBee Green Power Basic (Infrastructure), Golden Unit
- ZigBee 3.0 Base Device Behavior
- ZigBee 3.0 Cluster Library (Release 6)
- ZigBee 3.0 Lighting & Occupancy

ZigBee 3.0 Better Together

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Green Power

TÜVRheinland®