UG103.0

EMBER® APPLICATION DEVELOPMENT FUNDAMENTALS: OVERVIEW

The documents collected under the title *Ember® Application Development Fundamentals* cover a number of topics that project managers, application designers and developers should understand before beginning to work on an embedded networking solution using Ember chips, the EmberZNet PRO stack, and associated development tools. These documents can be used a starting place for anyone needing an introduction to developing ZigBee applications, or who are new to the Ember development environment. The first section provides an overview of the various *Fundamentals* documents. Other documents that may be of assistance are then described. Finally, a list of abbreviations and acronyms is included.

1 Topics

Silicon Labs offers Fundamentals documents on the following topics.

Wireless Networking: Introduces some fundamental concepts of wireless networking. These concepts are referred to in other *Fundamentals* documents. If you are new to wireless networking, you should read this document first.

ZigBee: Describes the characteristics of the ZigBee solution, and discusses a variety of topics, including a summary of the decisions to be made when designing a ZigBee solution.

Design Choices: Discusses the major decisions that must be made about how to architect a ZigBee solution.

Introducing the Ember HAL: The first half of the document describes some of the basic aspects of the Ember HAL, and is recommended for anyone using EmberZNet PRO. If you need to modify the HAL or port it to a new hardware platform, you should read the entire document.

Security: Introduces some basic security concepts, including network layer security, trust centers, and application support layer security features. It then discusses the types of standard security protocols available in EmberZNet PRO. Coding requirements for implementing security are reviewed in summary. Finally, information on implementing ZigBee Smart Energy security is provided.

Bootloading: Introduces bootloading for Ember ZigBee networking devices. The document looks at the concepts of standalone and application bootloading and discusses their relative strengths and weaknesses. In addition, it looks at design and implementation details for each method.

The Token System: Describes tokens and shows how to use them in code. The document also discusses bindings, the application-defined associations between two devices on a network.

Tools: Provides an overview of the toolchain used to develop, build, and deploy your applications, and discusses some additional tools and utilities.

ZLL: Compares the ZLL stack and network with the EmberZNet PRO stack and network, with notes about considerations when implementing a ZLL solution. Includes a basic description of ZLL configuration and commissioning, notes about the interoperability of ZLL and non-ZLL devices.

2 Related Documentation

For a general introduction to testing and debugging applications, see document UG104, *Testing and Debugging Applications for the Ember EM2xx and EM3xx Platforms*. For an overview of manufacturing testing, see document AN718, *Manufacturing Test Overview*.

If you are developing a ZigBee-compliant application, additional information about the Ember AppBuilder tool and the Ember application framework can be found in Ember Desktop online help as well as document UG102, *Application Framework Developer Guide*. Ember AppBuilder is a tool for generating ZigBee-compliant applications, and provides a graphical interface for turning on or off embedded clusters and features in the code. The Ember application framework is a superset of all source code needed to develop any ZigBee-compliant device.

If your application requires functionality not available through Ember AppBuilder and the Ember application framework, see document UG105, *Advanced Application Programming with the Stack and HAL APIs*.

Finally, the individual documents in this collection often point to more detailed documentation on their specific topic.

3 Abbreviations and Acronyms

Table 1 lists the abbreviations and acronyms used in the Ember Application Development Fundamentals collection as well as in other related documentation.

Table 1. Abbreviations and Acronyms

Acronym/Abbreviation	Meaning
ACK	Acknowledgement
ADC	Analog to Digital Converter
AES	Advanced Encryption Standard
AF	Application Framework
API	Application Programmer Interface
APS	Application Support
CBA	Commercial Building Automation
CBKE	Certificate-based Key Establishment
CCM	Counter with CBC-MAC Mode for AES encryption
CCM*	Improved Counter with CBC-MAC Mode for AES encryption
CLI	Command Line Interface
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CSMA	Carrier Sense Multiple Access
CW	Continuous Wave
EBL	Ember Bootload
EEPROM	Electrically Erasable Programmable Read Only Memory
EHF	Extremely High Frequency
ESP	Ember Serial Protocol
EZSP	EmberZNet Serial Protocol
GPIO	General Purpose I/O (pins)
GUI	Graphical User Interface
HA	Home Automation
HAL	Hardware Abstraction Layer
HC	Health Care
HF	High Frequency
HVAC	Heating, Ventilation, and Air Conditioning
HTML	Hypertext Markup Language

Acronym/Abbreviation	Meaning
I2C	Inter-Integrated Circuit
IDE	Integrated Development Environment
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IP	Internet Protocol
JTAG	Joint Test Action Group
LAN	Local Area Network
LF	Low Frequency
LQI	Link Quality Indicator
LSB	Least significant bit
MAC	Medium Access Control
MF	Medium Frequency
MIC	Message Integrity Code
MSB	Most significant bit
MSP	Manufacturer-specific Profile
MTOR	Many-to-one Routing
NACK	Negative Acknowledge
NCP	Network Coprocessor
NIST	National Institute of Standards and Technology
NWK	Network (layer)
OEM	Original Equipment Manufacturer
OQPSK	Offset Quadrature Phase-shift Keying
OTA	Over-the-Air
PA	Power Amplifier
PAN	Personal Area Network
PHY	Physical Layer
POSIX	Portable Operating Standard (for Unix)
PSK	Phase-Shift Keying
PTI	Packet Trace Interface
RAM	Random Access Memory
RCM	(Reader control module?)
RF	Radio Frequency
RNAP	Remote Node Access Protocol
Rx	Receive
SE	Smart Energy
SHF	Super High Frequency
SoC	System-on-Chip
SPI	Serial Peripheral Interface
SWJ	Serial Wire and JTAG Interface
TA	Telecom Application
TCP	Transmission Control Protocol
Tx	Transmit

Acronym/Abbreviation	Meaning
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
UHF	Ultra High Frequencies
VCO	Voltage Controlled Oscillator
VHF	Very High Frequency
VLF	Very Low Frequency
WPAN	Wireless Personal Area Network
WSN	Wireless Sensor Network
XML	Extensible Markup Language
ZC	ZigBee Coordinator
ZCL	ZigBee Cluster Library
ZED	ZigBee End Device
ZDO	ZigBee Device Object
ZR	ZigBee Router

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Please visit the Silicon Labs Technical Support web page for ZigBee products:
www.silabs.com/zigbee-support and register to submit a technical support request