UG103.0

APPLICATION DEVELOPMENT FUNDAMENTALS: OVERVIEW

Silicon Labs offers a series of documents collected under the title *Application Development Fundamentals.* These documents cover topics that project managers, application designers, and developers should understand before beginning to work on an embedded networking solution using Silicon Labs chips, networking stacks such as the EmberZNet stack or the Silicon Labs Thread stack, and associated development tools. The documents can be used a starting place for anyone needing an introduction to developing wireless networking applications, or who is new to the Silicon Labs development environment. This 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 foundational 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.

Design Choices: Discusses the major decisions that must be made about how to architect a wireless networking solution, as well as additional decisions to be made if you are designing a ZigBee solution.

Ember HAL: The first half of the document describes some of the basic aspects of the Ember Hardware Abstraction Layer HAL), and is recommended for anyone using one of the wireless networking stacks. If you need to modify the HAL or port it to a new hardware platform, you should read the entire document.

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

ZigBee PRO Security: Introduces some basic ZigBee PRO 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.

ZigBee PRO Bootloading: Introduces bootloading for wireless 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.

Tokens: Describes tokens and shows how to use them in EmberZNet PRO, EmberZNet RF4CE, and Silicon Labs Thread applications. The document also discusses bindings, the application-defined associations between two devices on a network, used in EmberZNet PRO applications.

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

ZLL: Compares the ZLL (ZigBee Light Link) 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.

RF4CE: Describes the ZigBee RF4CE (Radio Frequency for Consumer Electronics) specification with notes about considerations when implementing an RF4CE solution. It includes a basic description of RF4CE device types, the network formation process, power saving, and security.

Thread: Provides a brief background on Thread and the emergence of the Silicon Labs Thread stack. It also provides some of the key features of Thread to consider when implementing a Thread solution.

Connect: Describes the features and functions of the Silicon Labs Connect stack, including its device types, network topologies, and its "building block" development methodology using plugins.

2 Related Documentation

For a general introduction to testing and debugging applications, see document UG104, *Testing and Debugging Applications for the Ember EM3x Platforms*. For an overview of manufacturing testing, see document AN718, *Manufacturing Test Overview*.

If you are developing a networking application, you may wish to use the Application Builder tool and one of the Silicon Labs application frameworks. Application Builder is a tool for generating networking applications, with deep support for all wireless networking stacks, and provides a graphical interface for turning on or off embedded features in the code. The application frameworks are stack-specific, modular, low footprint frameworks that enable you to create scalable, flexible applications quickly. Additional information is available in the Silicon Labs development environment installed documentation and online help as well as document UG102, *Application Framework Developer Guide*. If your application requires functionality not available through Application Builder and one of the application frameworks, contact Silicon Labs customer support.

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 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
AM	Amplitude Modulation
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
CE	Consumer Electronics
CERC	Consumer Electronics Remote Control
CLI	Command Line Interface
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CSMA	Carrier Sense Multiple Access
CW	Continuous Wave

Acronym/Abbreviation	Meaning
DSP	Digital Signal Processing
EBL	Ember Bootloader
EEPROM	Electrically Erasable Programmable Read Only Memory
EHF	Extremely High Frequencies
EZSP	EmberZNet Serial Protocol
FCC	Federal Communications Commission
FM	Frequency Modulation
GDP	Generic Device Profile
GPIO	General Purpose I/O (pins)
GUI	Graphical User Interface
HA	Home Automation
HAL	Hardware Abstraction Layer
HC	Health Care
HF	High Frequencies
HDMI	High-Definition Multimedia Interface
HDMI-CEC	HDMI Consumer Electronics Control
HVAC	Heating, Ventilation, and Air Conditioning
HTML	Hypertext Markup Language
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 Frequencies
LNA	Low-Noise Amplifier
LQI	Link Quality Indicator
LSB	Least significant bit
MAC	Medium Access Control
MF	Medium Frequencies
MIC	Message Integrity Code
MSB	Most significant bit
MSO	Multiple System Operators
MSP	Manufacturer-specific Profile
MTOR	Many-to-one Routing
NACK	Negative Acknowledge
NCP	Network Coprocessor
NIST	National Institute of Standards and Technology
NTIA	National Telecommunications and Information Association
NWK	Network (layer)
OEM	Original Equipment Manufacturer

Acronym/Abbreviation	Meaning
OQPSK	Offset Quadrature Phase-shift Keying
OSI	Open Systems Interconnection
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
RC	Remote Control
RCM	Radio Communications Module
RF	Radio Frequency
RF4CE	Radio Frequency for Consumer Electronics
RNAP	Remote Node Access Protocol
Rx	Receive
SE	Smart Energy
SHF	Super High Frequencies
SoC	System-on-Chip
SPI	Serial Peripheral Interface
SWJ	Serial Wire and JTAG Interface
TA	Telecom Application
TCP	Transmission Control Protocol
TMSP	Thread Management Serial Protocol
Tx	Transmit
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
UHF	Ultra High Frequencies
VCO	Voltage Controlled Oscillator
VHF	Very High Frequencies
VLF	Very Low Frequencies
WG	Working Group
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
ZLL	ZigBee Light Link
ZR	ZigBee Router
ZRC	ZigBee Remote Control

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