Application Note

Document No.:	APL12957
Version:	4
Description:	Easy-reading introduction to Device Type and Command Class specification text on battery support. The doc covers WakeUp and FLiRS beaming functionality.
Written By:	PSH
Date:	2022-09-06
Reviewed By:	NTJ;JFR
Restrictions:	Partners Only

Approved by:				
Date	CET	Initials	Name	Justification
2022-09-06	12:26:12	NTJ	Niels Johansen	

SILICON LABS

REVISION RECORD

| Doc. Rev	Date	By	Pages affected	Brief description of changes
1	20140522	ABR	All	First revision
2	20180306	BBR	All	Added Silicon Labs template
3	20220905	PSH	All	• Updated references • Updated terms to Z-Wave plus specification • Added link to Z-Wave alliance specification page

1   Z-WAVE BATTERY SUPPORT BASICS

Z-Wave enables a variety of monitoring and control applications. Sensors can send data to a gateway or control actuators directly based on certain criteria. Input devices like remote controls or wall controllers may report button presses to a scene controller or control actuators directly.

Battery operation necessitates strict control of the power consumption. Ideally, a battery powered node should be in power down state at any time. In power down state, the processor and memory system is powered down. Before powering down, the application makes sure to configure hardware peripherals to a state of minimum power consumption.

A node in permanent power down state is called a Sleeping node.

The example below shows a sleeping node implementing a remote control. The remote control only wakes up in response to a button press. Other nodes cannot send commands to a sleeping node as it returns to the power down state immediately after completing its task.
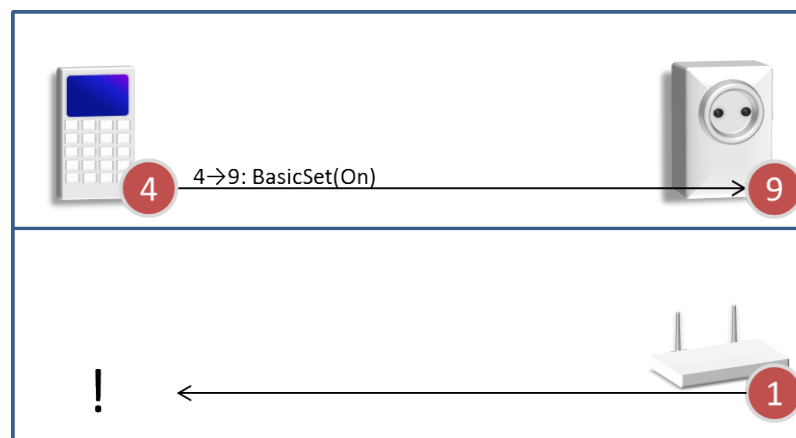
1.1   Reporting Sleeping Node (RSS)

It may be useful to send commands to a battery powered node, for instance to change configuration parameters. A Reporting Sleeping node wakes up periodically to contact another node, e.g. a gateway and/or to send commands directly to other nodes in the network.

In this example, a Reporting Sleeping node implements a temperature sensor. The node wakes up to make temperature measurements and report the readings to a display device. At more rare events, e.g. every 70 minutes, the node also sends a WakeUp Notification to a gateway.
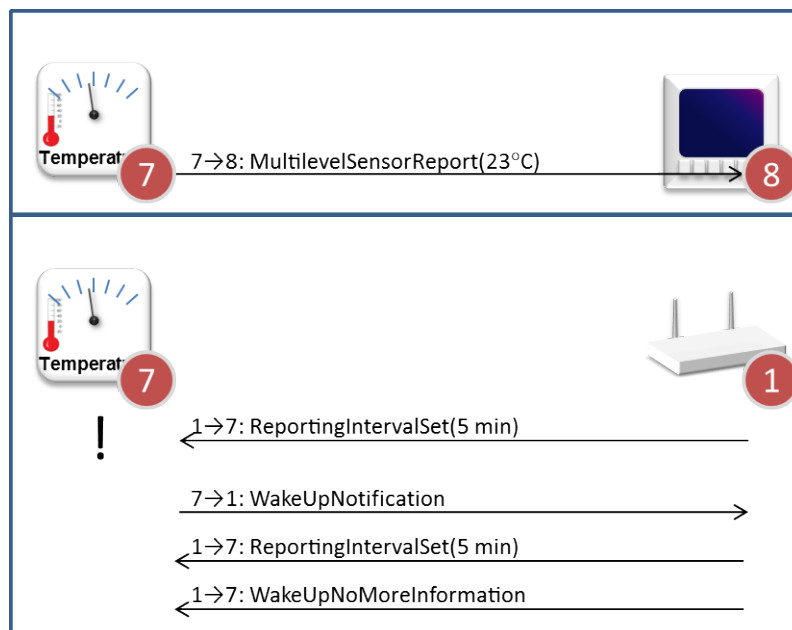

By only waking up a few times every hour to report a measurement, the RSS may remain in power down state most of the time while being able to receive commands from other nodes in relation to the WakeUp Notification. The gateway may try an immediate transmission to the Sleeping node, hoping that the node is already awake, but it can only be sure of reaching the Sleeping node after receiving a WakeUp Notification.

A gateway based control system will often monitor the system in order to detect defunct nodes. Always listening nodes may be polled at low frequency. WakeUp Notifications from a RSS can be used to achieve a similar monitoring of the health of Sleeping nodes.

1.2   Listening Sleeping Node (LSS)

A Listening Sleeping node uses a special radio transmission method called beaming. This allows other nodes to deliver a command to the LSS within one second.

The following example shows how a FLiRS node may be used to implement a remote controlled door lock.
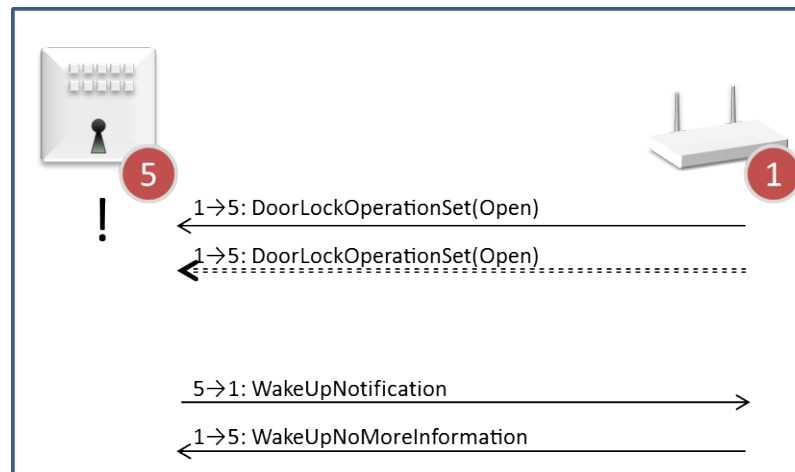
Beaming is slower than other transmission methods and it is power consuming. Further, beaming causes a short interruption to other nodes in the network. The gateway may try an immediate transmission to the LSS node, hoping that the node is already awake, before using beaming to deliver the command.

A gateway based control system will often monitor the system in order to detect defunct nodes. Always listening nodes may be polled at low frequency. WakeUp Notifications can be used to achieve a similar monitoring of the health of LSS nodes; thus avoiding beaming when there is no actual need for quick delivery of a command.

A battery powered node monitors its battery and issues a warning when reaching a critical level.
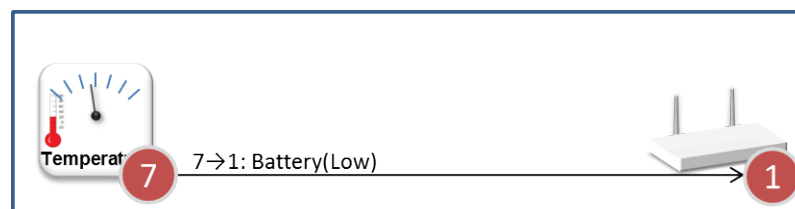
1.3   Battery monitoring

Due to the chemistry of batteries, the voltage tends to be higher when there is no significant load on the battery. Therefore, a battery operated node monitors the battery during periods where the load is highest; typically while transmitting.
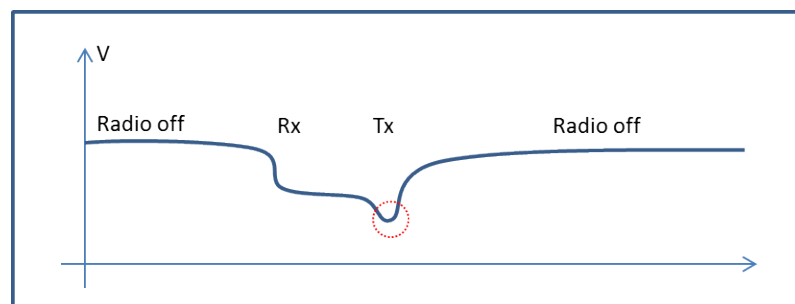
1.4   More information

More information about the Role Types in Z-Wave and the WakeUp Command Class can be found in the latest documentation package from the Z-Wave alliance https://z-wavealliance.org/z-wave-specifications/

Smart. Connected.
Energy-Friendly.

IoT Portfolio
www.silabs.com/products

Quality
www.silabs.com/quality

Support & Community
www.silabs.com/community

Disclaimer

Silicon Labs intends to provide customers with the latest, accurate, and in-depth documentation of all peripherals and modules available for system and software implementers using or intending to use the Silicon Labs products. Characterization data, available modules and peripherals, memory sizes and memory addresses refer to each specific device, and "Typical" parameters provided can and do vary in different applications. Application examples described herein are for illustrative purposes only. Silicon Labs reserves the right to make changes without further notice to the product information, specifications, and descriptions herein, and does not give warranties as to the accuracy or completeness of the included information. Without prior notification, Silicon Labs may update product firmware during the manufacturing process for security or reliability reasons. Such changes will not alter the specifications or the performance of the product. Silicon Labs shall have no liability for the consequences of use of the information supplied in this document. This document does not imply or expressly grant any license to design or fabricate any integrated circuits. The products are not designed or authorized to be used within any FDA Class III devices, applications for which FDA premarket approval is required or Life Support Systems without the specific written consent of Silicon Labs. A "Life Support System" is any product or system intended to support or sustain life and/or health, which, if it fails, can be reasonably expected to result in significant personal injury or death. Silicon Labs products are not designed or authorized for military applications. Silicon Labs products shall under no circumstances be used in weapons of mass destruction including (but not limited to) nuclear, biological or chemical weapons, or missiles capable of delivering such weapons. Silicon Labs disclaims all express and implied warranties and shall not be responsible or liable for any injuries or damages related to use of a Silicon Labs product in such unauthorized applications.
Note: This content may contain offensive terminology that is now obsolete. Silicon Labs is replacing these terms with inclusive language wherever possible. For more information, visit www.silabs.com/about-us/inclusive-lexicon-project

Trademark Information

Silicon Laboratories Inc.®, Silicon Laboratories®, Silicon Labs®, SiLabs® and the Silicon Labs logo®, Bluegiga®, Bluegiga Logo®, EFM®, EFM32®, EFR, Ember®, Energy Micro, Energy Micro logo and combinations thereof, "the world's most energy friendly microcontrollers", Redpine Signals®, WiSeConnect , n-Link, ThreadArch®, EZLink®, EZRadio®, EZRadioPRO®, Gecko®, Gecko OS, Gecko OS Studio, Precision32®, Simplicity Studio®, Telegesis, the Telegesis Logo®, USBXpress® , Zentri, the Zentri logo and Zentri DMS, Z-Wave®, and others are trademarks or registered trademarks of Silicon Labs. ARM, CORTEX, Cortex-M3 and THUMB are trademarks or registered trademarks of ARM Holdings. Keil is a registered trademark of ARM Limited. Wi-Fi is a registered trademark of the Wi-Fi Alliance. All other products or brand names mentioned herein are trademarks of their respective holders.

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
USA

www.silabs.com