BANDI ↔ Z-WAVE Controller INTERFACE SPECIFICATION

ver 1.0
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개요

🔥 본 문서는 Z-Wave Controller와 Bandi smart switch device간의 무선 통신을 위한 통신 규약임.

Version 변경 사항

🔥 v 1.0 SKT Smart Home 용 Interface

Z-WAVE PROTOCOL

1. Overview

The Z-Wave protocol is a low bandwidth half-duplex protocol designed for reliable and robust wireless communication in a low cost control mesh network. The protocols main purpose is to communicate short control messages in a reliable manner from a control unit to one or more nodes in the network.

The protocol is not designed to transfer large amounts of data or to transfer any kind of streaming or timing critical data.

The protocol consist of 4 layers, the MAC Layer that controls the RF media, the Transfer Layer that handles frame integrity checks, acknowledgements, and retransmissions, the Routing Layer that controls the routing of frames in the network and application interface; and finally the Application Layer controls the payload in the transmitted and received frames.

Application Layer
Routing Layer
Transfer Layer
MAC Layer
RF Media

Figure 1 Z-Wave Protocol Layers

2. MAC LAYER

The Z-Wave MAC layer controls the radio frequency medium. The data stream is Manchester coded (true for 9600 bps transmission mode) and consists of a preamble, start of frame (SOF), frame data and an end of frame (EOF) symbol. The frame data is the part of the frame that is passed on to the transport layer.
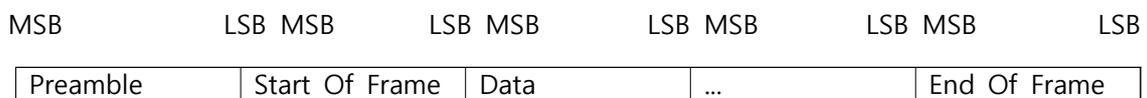
MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB
Preamble		Start Of Frame		Data		...		End Of Frame	

Figure 2 Z-Wave data stream

All data is sent in little endian format

3. TRANSFER LAYER

The Z-Wave transfer layer controls the transfer of data between two nodes including retransmission, checksum check and acknowledgements.

3.1 Frame Layout

The Z-Wave transfer layer contains four basic frame formats used for transferring commands in the network. All four frames use the following frame layout:

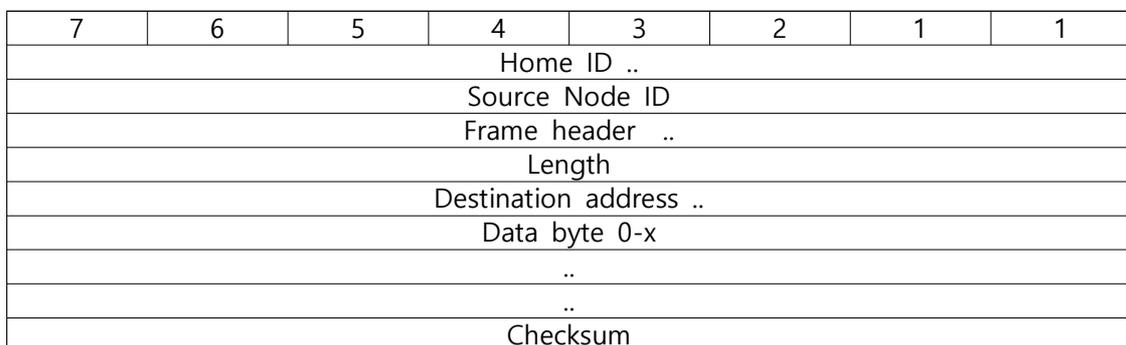| 7	6	5	4	3	2	1	1
Home ID ..							
Source Node ID							
Frame header ..							
Length							
Destination address ..							
Data byte 0-x							
..							
..							
Checksum							

Figure 3 Z-Wave basic frame format

Payload data is preceded by a header that contains information about the Z-Wave networks Home ID, source Node ID, frame header, length of frame, destination Node ID, and payload. To verify integrity of the frame, a checksum byte is appended to the end of frame.

4. ROUTING LAYER

The Z-Wave routing layer controls the routing of frames from one node to another. Both controllers and slaves can participate in routing of frames in case they are always listening and have a static position. The layer is responsible for both sending a frame with a correct repeater list, and also to ensure that the frame is repeated from node to node. The routing layer is also responsible for scanning the network topology and maintaining a routing table in the controller.

5. APPLICATION LAYER

The Z-Wave application layer is responsible for decoding and executing commands in a Z-Wave network. The only part of the application layer that is described in this overview is the assignment of Home ID's and Node ID's and the replication of controllers. The rest of the application layer is implementation specific, and can be different from one implementation to another.

5.1. Frame Layout

The frame format used in the Z-Wave application layer is described in this section.

5.1.1 Application Layer Frame Format

7	6	5	4	3	2	1	0
Single/Multi/Broadcast frame header							
Application command class							
Application command							
Command parameter 1							
Command parameter 2							
...							
Command parameter x							

Figure 4 Z-Wave application frame format

Application command class:

The application command class specifies which class of commands the command belongs to.

Currently defined command classes:

Command Class	Description
00h-1Fh	Reserved for the Z-Wave Protocol
20h-FFh	Reserved for the Z-Wave Application

Figure 5 Z-Wave command class range

Application command:

The application command specifies the specific command or action within the command class. The commands in the Application specific command classes are described in [1] and [2].

Command parameter 1-x:

The command parameters contain any parameters associated with the specified command. The number of parameters depends on the command.

6. Multi Channel End Point Find Report Command

The Multi Channel End Point Find Report Command is used to advertise End Points which implement a given combination of Generic and Specific Device Classes.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_MULTI_CHANNEL							
Command = MULTI_CHANNEL_END_POINT_FIND_REPORT							
Reports to Follow							
Generic Device Class							
Specific Device Class							
Res		End Point 1					
...							
Res		End Point n					

Reports to Follow (8 bits)
Multiple End Points may match the requested generic and specific device classes.
This field is used to advertise the number of outstanding End Point Find Report commands.

Generic Device Class (8 bits)
The generic device class of all advertised End Points in this report.
The value 0xFF MUST be advertised, if this value was specified in the Multi Channel End Point Find Command. If 0xFF is advertised, the Specific Device Class field MUST also advertise the value 0xFF.
If the value 0xFF is advertised, the advertised End Points MAY implement different generic and specific device classes.

Specific Device Class (8 bits)
The specific device class of all advertised End Points in this report.
If the value 0xFF is advertised, the advertised End Points MAY implement different
specific device classes.
The value 0xFF MUST be advertised, if the report advertises multiple End

Points which implement the same generic device class but different specific device classes.

The value 0xFF MUST be advertised if the advertised generic device class is 0xFF.

SDS12657-6 Z-Wave Command Class Specification, A-M 2015-02-12

Sigma Designs Inc. Command Class Definitions Page 354 of 435

Res

This field MUST be set to 0 by a sending device and MUST be ignored by a receiving device.

End Point 1 ... N (N * 7 bits)

The End Point(s) that matches the advertised generic and specific device class values.

If no End Point matches the advertised Generic Device Class and/or Specific Device Class requested in the Multi Channel End Point Find Command, the responding node MUST return a Multi Channel End Point Find Report Command with the End Point 1 field set to 0.

7. Binary Switch Command Class, version 1

The Binary Switch Command Class is used to control devices with On/Off or Enable/Disable capability.

The Binary Switch Command Class is an actuator control command class. Refer to 3.7.

7.1 Binary Switch Set Command

The Binary Switch Set command, version 1 is used to set a binary value.

The device MAY apply a non-zero duration to the transition from one value to a new value.

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_SWITCH_BINARY							
Command = SWITCH_BINARY_SET							
Value							

Value (8 bits)

The encoding of the Value field MUST be according to Table 19.

Table 19, Binary Switch Set :: Value

Value	Level	State
0 (0x00)	0%	Off
1..99 (0x01..0x63)	100%	On
...	reserved	reserved
255 (0xFF)	100%	On

All other values are reserved and MUST NOT be used by a sending device. Reserved values MUST be ignored by a receiving device.

The above mapping of the Binary Switch Command Class Value allows a controlling device to control a mixed group of Binary Switch and Multilevel Switch devices via Basic Set commands. Devices implementing the Binary Switch CC turn On or Off while devices implementing the Multilevel Switch CC sets the specified level.

8. Bandi Smart switch information

8.1 APP_MANUFACTURER_ID : 0x0236//BANDI Communications Co., LTD.

8.2 APP_PRODUCT_TYPE_ID : PRODUCT_TYPE_ID_ZWAVE_PLUS

8.3 SWITCH_BINARY_SET : Value = 1 is Light On.

    8.3.1 Switch On : Value = 1 is Light On.

    8.3.2 Switch Off : Value = 0 is Light Off.

8.3.3 COMMAND_CLASS_MULTI_CHANNEL.MULTI_CHANNEL_CMD_ENCAP

8.4 MULTI_CHANNEL_END_POINT_FIND_REPORT

8.4.1 Reports to Follow : Number of EndPoint.

8.4.2 Generic Device Class : GENERIC_TYPE_SWITCH_BINARY

8.4.3 Specific Device Class : SPECIFIC_TYPE_POWER_SWITCH_BINARY

8.4.4 Res : EndPoint ID.