Software Design Specification

Z-Wave Command Class Control Specification

Description:	The document describes how to use the Z-Wave Command Classes and associated Commands for controlling a Z-Wave node.
Written By:	Z-Wave Alliance
Date:	2021.08.27
Reviewed By:	AWG
Restrictions:	Public

Approved by:
Z-Wave Alliance Board of Directors

THIS SPECIFICATION IS BEING OFFERED WITHOUT ANY WARRANTY WHATSOEVER, AND IN PARTICULAR, ANY WARRANTY OF NON-INFRINGEMENT IS EXPRESSLY DISCLAIMED. ANY USE OF THIS SPECIFICATION SHALL BE MADE ENTIRELY AT THE IMPLEMENTER'S OWN RISK, AND NEITHER THE ALLIANCE, NOR ANY OF ITS MEMBERS OR SUBMITTERS, SHALL HAVE ANY LIABILITY WHATSOEVER TO ANY IMPLEMENTER OR THIRD PARTY FOR ANY DAMAGES OF ANY NATURE WHATSOEVER, DIRECTLY OR INDIRECTLY, ARISING FROM THE USE OF THIS SPECIFICATION.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

REVISION RECORD

Doc. Rev	Date	By	Pages affected	Brief description of changes
1	20180125	NOBRIOT	ALL	Initial revision
2	20180306	NOBRIOT	Chapter 2 & 3	Fixing references
3	20180418	NOBRIOT	ALL	Updated document template
4	20180701	NOBRIOT	6.2.4.3 4.20 6.5 5.1.4.1 & 5.7.4.1 4.19	Contributions 2018B: • Added a recommendation for Multi Channel nodes and Association group mirroring • Added User Code Command Class, version 2 • Added Supervision Command Class, version 1 • Added requirements about removing associations • Clarified how to use scales with Thermostat Setpoint Command Class
5	20181001	NOBRIOT	3.2	Contributions 2018C: • Updated the version discovery requirements
6	20190101	DEWASSIE NOBRIOT	4.11.3, 4.12.3, 4.14.4 4.14.4.1.4 5.1.4 & 5.7.4 5.9.1	Contributions 2018D: • Clarified the mandatory free-text descriptions and requirements for unknown Meter reading, Sensor reading and Notification • Changed Notification CC timeout recommendation for State Idle • Clarified additional control requirements of Association and Multi Channel Association Command classes • Relaxed non-SIS Wake Up Command Class interview requirement
7	20190401	NOBRIOT	5.3 5.5 5.1 & 5.7 4.14.1 4.10	Contributions 2019A: • Updated Battery Command Class polling requirements • Updated Firmware Update battery level recommendations • Added Association v3 and Multi Channel Association v4 • Updated Notification Command Class interview • Added IR Command Class control definitions
8	20190701	NOBRIOT	5.6	Contributions 2019B: • Relaxed the mandatory control of Identify for nodes also supporting the Wake Up Command Class
9	20191001	DEWASSIE	4.3.4	Contribution 2019C: • Clarified the usage of Basic Command Class when a controller uses one actuator CC for controlling a node
10	20200101	DEWASSIE NOBRIOT	5.8.1 5.6.4 4.1	Contribution 2019D: • Updated the mandatory node interview of Version Command Class • Rephrased identify recommendation in the Indicator Command Class • Added the Anti-Theft Unlock Command Class, version 1
11	20200401	NOBRIOT	Figure 33	Contributions 2020A: • Updated the Multi Channel Command Class mandatory interview figure
12	20200701	NOBRIOT DEWASSIE	6.5.4 3.3.3 3.3.2 4.11.1 & 4.11.4 4.13.1	Contributions 2020B: • Added a recommendation to accept Wake Up Notifications using the same Supervision SessionID. • Clarified the generic control requirements about commands versions. • Clarified the usage of “User defined or x” in the document. • Clarified mandatory interview and supported scales for Meter Command Class • Made Multilevel Switch Supported Get optional for the node interview

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

REVISION RECORD				
Doc. Rev	**Date**	**By**	**Pages affected**	**Brief description of changes**
13	2020.10.01	DEWASSIE	4.19.1	Contribution 2020C: • Relaxed a supported Setpoint Types probing requirement using Thermostat Setpoint Get command.
14	2021.08.25	Nicolas Obriot	6.2	2021B Release: • Relaxed control requirements for aggregated endpoints
15	2021.08.25	Nicolas Obriot Adam Feinstein	5.7.1	2021C Release: • Full and partial control definitions Comment #31: Lifeline establishment
15	2021.08.27	ZWA Board		Approved for Publication

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table of Contents

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table of Figures

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table of Tables

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

1 Abbreviations

Abbreviation	Explanation
AGI	Association Group Information (Command Class)
AOS	Always On Slave
CSC	Central Static Controller
DT	Device Type
IP	Internet Protocol
LAN	Local Area Network
LSB	Less significant bit
LSS	Listening Sleeping Slave
MSB	Most significant bit
NIF	Node Information Frame
NOP	No Operation (Command Class)
PAN	Personal Area Network
PC	Portable Controller
PS	Portable Slave
QR	Quick Reponse
RPC	Reporting Portable Controller
RSS	Reporting Sleeping Slave
RT	Role Type
S0	Security 0 Command Class
S2	Security 2 Command Class
SIS	SUC NodeID Server
SSC	Sub Static Controller
SUC	Static Update Controller
Z/IP	Z-Wave for IP

2 Introduction

2.1 Purpose

This document describes the requirement associated to the control of Z-Wave Command Classes. It contains a list of requirements applying for all Z-Wave compliant node controlling a given Command Class.

2.2 Audience and prerequisites

This document is public. The reader is expected to be familiar with Z-Wave development, Command Classes, Device Types and Role Types.

2.3 Precedence of definitions

Individual Z-Wave Role Type, Z-Wave Plus v2 Device Type and Command Class Specifications approved as a final version during the type/class development process MUST take precedence over this document temporarily until such individual specifications have been integrated into this document.

2.4 Terms used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document MUST be interpreted as described in IETF RFC 2119 [1].

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

3 Command Class Control Overview

3.1 Controlled and Supported Command Classes

A node can support and/or control a given Command Class.

If a Command Class is supported:
The node implements all the Command Class functionalities and can be set and read back by other nodes. When a Command Class is supported, the node is REQUIRED to implement the whole Command Class and observe the requirements specified in [2], [3], [4] and [5].

CL:0000.00.11.0D.1

If a Command Class is controlled:
The node implements the ability to interview, read and/or set other nodes supporting the Command Class. Nodes controlling Command Classes MAY use a subset of the Commands within a Command Class (for example only Set commands).

CL:0000.00.13.01.1

3.1.1 Control via association groups

A Basic Set Command sent to Association Group destinations is a form of (static or partial) Command Class control via association groups.

Even if using a Command Class for controlling other nodes via association groups, the usage MUST comply with the Command Class description ([2], [3], [4] and [5]) and the controlling node use properly formed commands.

CL:0000.00.11.02.1

3.1.2 "Full" control

When a Command Class is marked as fully controlled during certification, the controlling node is said to implement "full" control of the actual Command Class and it MUST observe the requirements for the Command Class defined in this document.

CL:0000.00.11.03.1

The Z-Wave Plus v2 Device Type Specification [7] mandates some nodes to control a given set of Command Classes. It means that the controlling node MUST respect the requirements described in this document for the actual Command Classes.

CL:0000.00.11.04.1

3.1.3 Partial control

When a Command Class is marked as partially controlled during certification, the controlling node is said to implement partial control of the actual Command Class and it MAY observe only a subset of the requirements for the Command Class defined in this document. The specific features which are partially controlled MUST be noted during certification.

CL:0000.00.13.03.1
CL:0000.00.11.10.1

If a Command Class is partially controlled, the controlling node MAY skip steps or perform them in a different order for the mandatory node interview detailed in this document. The controlling node MAY retrieve capabilities from a database based on a node's manufacturer specific information.

CL:0000.00.13.04.1

Even if the mandatory node interview is not followed, and not all capabilities are queried, the controlling node MUST NOT send commands or values that the supporting node does not support.

CL:0000.00.11.11.1

If a Command Class is partially controlled, the controlling node MAY implement a subset of the minimum end user functionalities and user interface. A controlling node SHOULD provide functionalities for the lowest non-deprecated, non-obsoleted Command Class version.

CL:0000.00.13.05.1
CL:0000.00.12.01.1

All Z-Wave commands sent for a partially controlled Command Class MUST be valid Z-Wave commands

CL:0000.00.11.12.1

All Z-Wave commands sent for a partially controlled Command Class MUST be sent at the highest Security Class granted during security bootstrapping.

CL:0000.00.11.13.1

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

3.2 Command Classes support discovery requirements

CL:0000.00.11.05.1 A controlling node MUST read the capabilities and secure capabilities of a node/End Point once before trying to control a given Command Class.

CL:0000.00.11.06.2 A controlling node MUST read the Command Class version number of a supporting node using the Version Command Class prior to controlling the Command Class. There can be 2 exceptions to this rule:

- If the controlling node controls only version 1 of a given Command Class, it may skip requesting the supporting node version for the actual Command Class.
- A controlling node may issue version 1 commands in the supporting node interview before knowing the supporting node Command Class' version. (e.g., when interviewing the Version Command Class itself)

CL:0000.00.11.07.1 A node controlling a given command class MUST allow an end user to control the command class in all listening supporting nodes present in the network operating with a security class that is granted to the controlling node.

CL:0000.00.11.08.1 A node controlling a Command Class MUST allow an end user to control a sleeping supporting node if it is the Wake Up destination.

3.3 Command Classes control requirements

This specification defines how to provide full control of Command Classes by specifying:

- A required Command Class interview or capability discovery
- A minimum required set of actions that an end user can perform or trigger and their associated Z-Wave commands
- A minimum required set of information relating to the supporting node that the end user can see or access.
- An optional set of additional requirements to controlling nodes

3.3.1 Mandatory supporting node interview

CL:0000.00.21.01.2 The mandatory node interview specifies the frame flow that MUST be observed on the Z-Wave radio for full control.

CL:0000.00.21.02.1 This interview MUST be performed prior to issuing any control command to the supporting node.

Preferably, it should be done during the commissioning phase of the supporting node or shortly after the inclusion of the controlling node.

CL:0000.00.23.01.1 A fully controlling node MAY issue additional commands that are not specified in the frame flows and MAY issue some commands in a different order. The mandatory frame flow indicates the minimum set

CL:0000.00.21.03.1 of commands that MUST be transmitted to a destination.

CL:0000.00.21.04.1 A fully controlling node MUST NOT skip or abort the interview of a Command Class if another independent Command Class could not be correctly interviewed.

CL:0000.00.23.02.1 A "partially" controlling node MAY skip steps in the specified frame flow if the queried data would not be used by the controller, or the data is retrieved from a separate source (i.e. database of Manufacturer Specific information and capabilities)

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

CL:0000.00.22.01.1 The following order for reading Command Class capabilities is RECOMMENDED after discovering the Security Class and encapsulation capabilities of a node:

- Version Command Class
- Z-Wave Plus Info Command Class
- Wake Up Command Class
- Association OR Multi Channel Association Command Class
- Association Group Information (AGI) Command Class
- Actuator Command Classes
- Data reporting Command Classes
- Multi Channel Command Class (and repeat the above order for each End Point, if any)

CL:0000.00.22.02.1 Some interviews or controlling scenarios may trigger no response in return to get type commands. In this case, it is RECOMMENDED to use timeouts according to [6].

3.3.2 Minimum end user functionalities

The minimum end user functionalities section specifies what minimum set of actions an end user can perform on a supporting node when using the controlling node.

CL:0000.00.31.01.1
CL:0000.00.33.01.1 Each section describing a required functionality indicates the command(s) that MUST be transmitted on the Z-Wave radio for full control. Fields not present or described in the mandatory command(s) MAY be used freely by the controlling node either automatically or based on user input.

CL:0000.00.31.02.1 Fields indicated as “user defined” MUST be filled based on end user input. In this case, the end user MUST be able to select any value. (e.g. if the field is 2 bytes long, values from 0 to 65535 MUST be available)

CL:0000.00.31.03.1 Fields indicated as “User defined among supported” MUST be filled based on user input and the supported values by the supporting node. The controlling node MUST allow the end user to set values supported by a supporting node even if it does not know what a given value represents.

CL:0000.00.31.04.1 Fields indicated as “User defined among x..y and z” MUST be filled based on user input and MUST be able to select between the indicated values.

CL:0000.00.31.06.1 Fields indicated as “User defined or x” MUST be filled either based on user input or automatically by the controller using the indicated value.

CL:0000.00.31.05.1 The product documentation MUST point out how to perform each action associated to the minimum end user functionalities required by a Command Class.

CL:0000.00.31.07.1 If a Command Class is partially controlled and some minimum end user functionality are not met, the product documentation MUST describe how the partially controlled command class differs from the behavior of a fully controlled command class.

3.3.3 Command Class control version

CL:0000.00.11.09.1 Like a supporting node implements a version of its supported Command Classes, a controlling node MUST also implement a given version of a Command Class it controls. A node controlling version 3 of a Command Class will be able to control the functionalities of version 1, 2 and 3 supporting nodes.

CL:0000.00.11.0A.2 When issuing commands, a controlling node MUST NOT use the fields described in the mandatory commands sections if they belong to a newer version than the version it claims to control.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

CL:0000.00.11.0E.1 If a controlling node A controls a node B supporting a lower version, node A MUST still use the format (command payload) corresponding to the version node A controls, regardless of the version supported by node B.

CL:0000.00.11.0F.1 A controlling node A sending commands to a node B supporting a lower version MUST NOT use commands introduced in versions that are newer than Node B's version.

A node controlling a Command Class is not mandated to interview, provide minimum end user functionality or show node properties belonging to a newer version of the actual Command Class.

CL:0000.00.11.0B.1 When a version is indicated in the mandatory interview or mandatory commands for end user functionalities, it MUST represent the minimum common version number between the supporting and controlling node. For example, with a version 4 controlling node and version 2 supporting node, the interview, minimum end user functionalities and properties MUST follow version 1 and 2 indications.

3.4 Command Classes not present in this document

CL:0000.00.13.02.1 CL:0000.00.11.0C.1 A node MAY advertise that it controls a Command Class not (yet) defined in this document during certification. In this case, the controlling node MUST comply with the following guidelines:

- It MUST use all Get type commands to read the nodes capabilities during the node interview
- It SHOULD provide the end user actions using all Set type Commands available in the Command Class
- It SHOULD show or let the end user access all relevant state/property/configuration relating to the Command Class using the Report type Commands available in the Command Class.

A controller following this guideline is likely to be compliant when a new control specification is released for an actual Command Class.

4 Application Command Class Control Definitions

4.1 Anti-Theft Unlock Command Class, version 1

4.1.1 Mandatory node interview

CL:007E.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 1

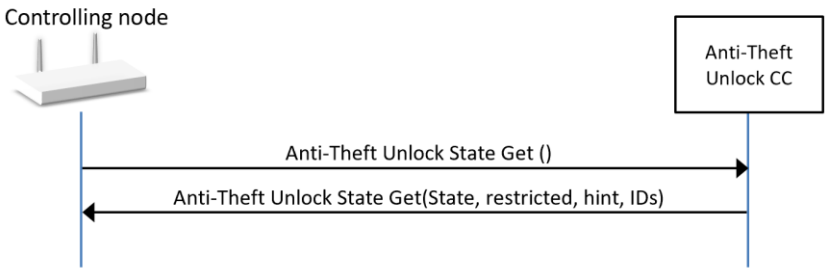

Figure 1, Anti-Theft Unlock Command Class interview

4.1.2 Minimum end user functionalities

4.1.2.1 Unlock the node

CL:007E.01.31.01.1 CL:007E.01.31.02.1 If the supporting node is in the locked state and runs in restricted mode, the end user MUST be able send an unlock command. When the end user performs this action, the issued command MUST comply with Table 1

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table 1, Anti-Theft Unlock::Unlock the node

Field	Value
Command	COMMAND_ANTITHEFT_UNLOCK_SET
Magic Code length	Controlling node defined in 0x01..0xA, based on user input.
Magic Code	User defined The Magic Code SHOULD be shown as a hexadecimal value to the end users.

CL:007E.01.32.01.1

4.1.3 Node properties

CL:007E.01.41.01.1 If the supporting node is in the locked state and runs in restricted mode, the controlling node MUST have a UI allowing the end user to see that the supporting node is restricted and that the supporting node requires unlocking to use the full functionality.

CL:007E.01.43.01.1 A controlling node MAY display the information provided in [10] for the reported Z-Wave Alliance locking entity ID.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.2 Barrier Operator Command Class, version 1

4.2.1 Mandatory node interview

CL:0066.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 2.

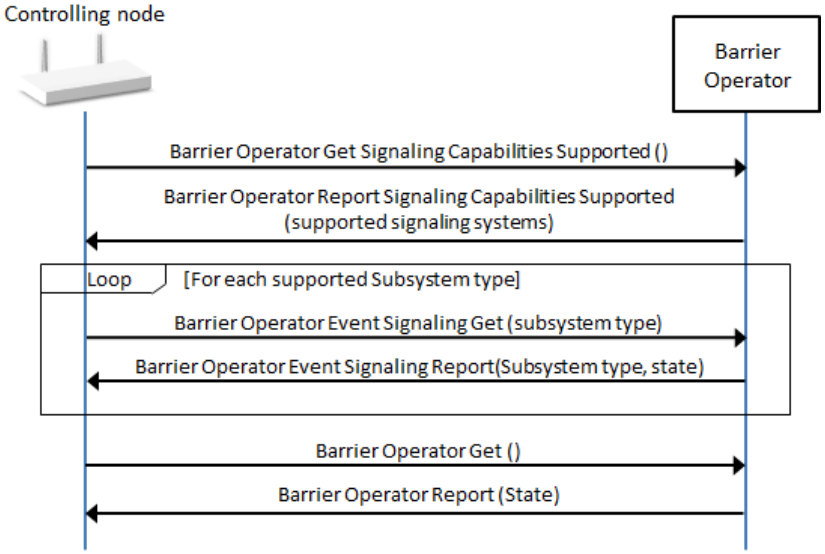

Figure 2, Barrier Operator Command Class interview

4.2.2 Minimum end user functionalities

CL:0066.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.2.2.1 Activate/deactivate supported subsystems

CL:0066.01.31.02.1 For all supported subsystems, the end user must be able to activate and deactivate each of them. When the end user performs this action, the issued command MUST comply with Table 2.

Table 2, Barrier Operator::Activate/deactivate supported subsystems

Field	Value
Command	BARRIER_OPERATOR_SIGNAL_SET
Subsystem type	User defined among supported subsystems.
State	User defined among 0x00 and 0xFF.

4.2.2.2 Initiate opening (or stop closing)

CL:0066.01.31.03.1 When the end user performs this action, the issued command MUST comply with Table 3.

Table 3, Barrier Operator::Initiate opening (or stop closing)

Field	Value
Command	BARRIER_OPERATOR_SET
Target Value	0xFF

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.2.2.3 Initiate Closing

CL:0066.01.31.04.1 When the end user performs this action, the issued command MUST comply with Table 4.

Table 4, Barrier Operator::Initiate closing

Field	Value
Command	BARRIER_OPERATOR_SET
Target Value	0x00

4.2.3 Node properties

CL:0066.01.42.01.1 The controlling node SHOULD have a UI allowing the end user to see/access the following properties:

- Last known Barrier State (Open, Closed, stopped at a % position or unknown)
- Last known Subsystems' state (ON/OFF), if any

4.2.4 Additional control requirements

CL:0066.01.52.01.1 A node controlling this command class SHOULD also control the Notification Command Class.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.3 Basic Command Class, version 1-2

4.3.1 Mandatory node interview

CL:0020.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 3.

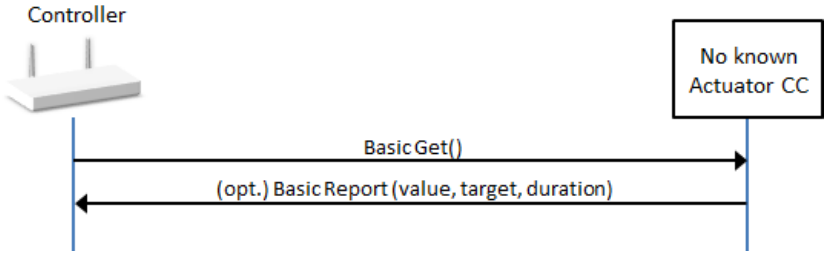

Figure 3, Basic Command Class interview

CL:0020.01.21.02.2 A controlling node MUST conclude that the Basic Command Class is not supported by a node (or endpoint) if no Basic Report is returned.

4.3.2 Minimum end user functionalities

CL:0020.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.3.2.1 Set the node On/Off state

CL:0020.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 5.

Table 5, Basic::Set the node state

Field	Value
Command	BASIC_SET
Value	User defined among 0x00 and 0xFF. More values MAY be available to the end user.

4.3.3 Node properties

CL:0020.01.43.01.1 A controlling node MAY have a UI allowing the end user to see the following properties:

- Last known state (On or Off)

CL:0020.01.42.01.1 A controlling node SHOULD NOT assume that the last state is as defined in the last Set Command and SHOULD issue a subsequent Basic Get Command even if receiving a Supervision SUCCESS status after issuing a Basic Set Command.

4.3.4 Additional control requirements

CL:0020.01.51.01.3 A controlling node MUST NOT use the Basic Command Class for controlling nor showing status (receiving report) of a node (or endpoint) if the controlling node controls at least one actuator command class supported by a node (or endpoint). The actuator command classes are defined in the Application Command Class specification ([2]).

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.4 Binary Switch Command Class, version 1-2

4.4.1 Mandatory node interview

CL:0025.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 4.

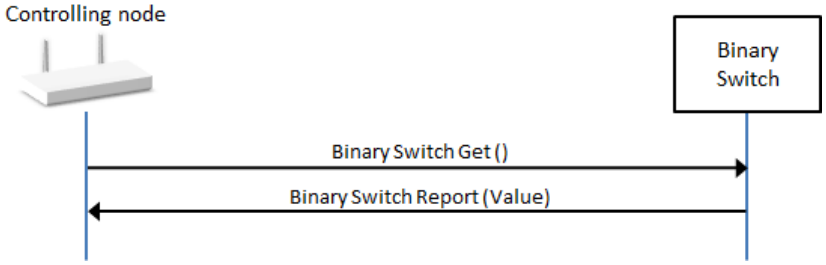

Figure 4, Binary Switch Command Class interview

4.4.2 Minimum end user functionalities

CL:0025.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.4.2.1 Set the node On/Off state

CL:0025.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 6.

Table 6, Binary Switch::Set the node state

Field	Value
Command	SWITCH_BINARY_SET
Value	User defined among 0x00 and 0xFF.
Duration (v2)	User defined or 0xFF

4.4.3 Node properties

CL:0025.01.51.01.1 A node controlling this Command Class SHOULD have a UI allowing the end user to see the following properties:

- Last known state (On or Off)

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.5 Central Scene Command Class, version 1-3

4.5.1 Mandatory node interview

CL:005B.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 5.

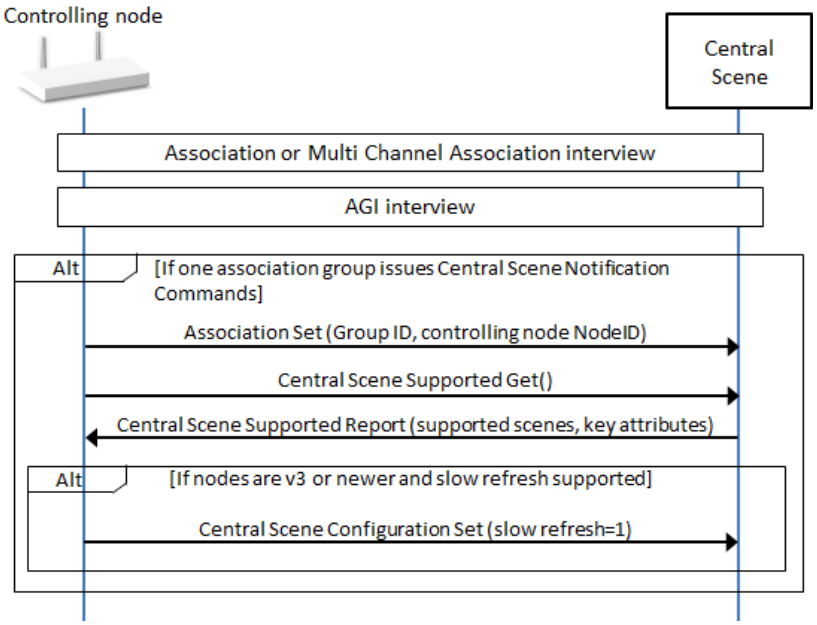

Figure 5, Central Scene Command Class interview

4.5.2 Minimum end user functionalities

There is no minimum end user functionalities associated with the control of this Command Class.

CL:005B.01.32.01.1 A controlling node SHOULD allow the user to define which other nodes to actuate when receiving a Central Scene Notification from a given node with a given key attribute and SceneID.

4.5.3 Node properties

CL:005B.01.41.01.1 The controlling node MUST have a UI allowing the end user to see how many Scenes ID (or buttons) and key attributes are supported by a node.

CL:005B.01.41.02.1 The controlling node MUST make received Central Scene Notifications available to the end user.

4.5.4 Additional control requirements

CL:005B.01.51.01.1 A node controlling this command class MUST also control:

- Association Command Class, version 2
- Association Group Information, version 3

CL:005B.01.51.02.1 A controlling node MUST associate itself to a group issuing Central Scene Notification Commands in order to provide end user functionalities.

CL:005B.01.51.03.1 A controlling node MUST NOT remove associations in order to associate itself to an association group issuing Central Scene Notification Commands.

CL:005B.01.53.01.1 It is OPTIONAL for a controlling node to provide end user functionalities and node properties if it cannot associate itself to an association group sending Central Scene Notification Commands. (e.g. all Association Groups sending the relevant command are full)

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.6 Color Switch Command Class, version 1-3

4.6.1 Mandatory node interview

CL:0033.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 6.

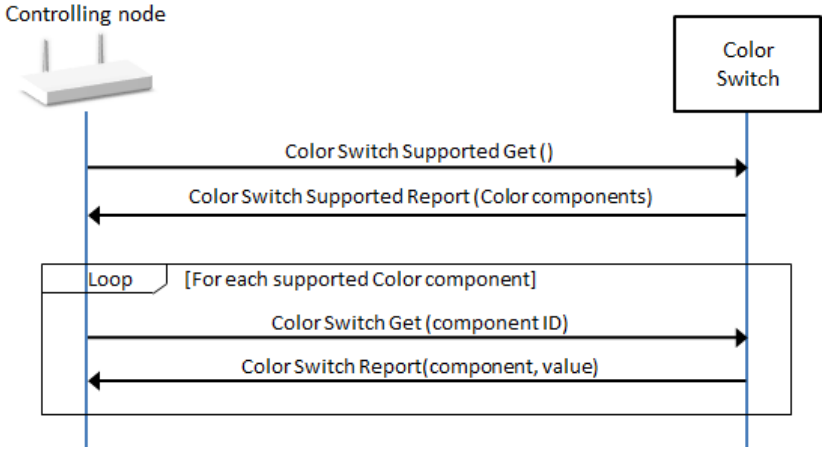

Figure 6, Color Switch Command Class interview

4.6.2 Minimum end user functionalities

CL:0033.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.6.2.1 Set the color

CL:0033.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 7.

Table 7, Color Switch::Set the color

Field	Value
Command	SWITCH_COLOR_SET
Color component count	Determined by the controlling node based on user input
Color Component ID x	User defined among supported
Value x	User defined
Duration (v2)	User defined or 0xFF

CL:0033.01.31.03.1 For this functionality, the color selected by the end user MUST be set using a single command.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.6.2.2 Fade/enhance a color component

CL:0033.01.31.04.1 When the end user performs this action, the issued command MUST comply with Table 8.

Table 8, Color Switch::Fade/enhance a color component

Field	Value
Command	SWITCH_COLOR_START_LEVEL_CHANGE
Up/down	User defined
Color Component ID	User defined among supported
Duration (v3)	User defined or 0xFF

4.6.2.3 Stop fading/enhancing a color component

CL:0033.01.31.05.1 When the end user performs this action, the issued command MUST comply with Table 9.

Table 9, Color Switch::Stop fading/enhancing a color component

Field	Value
Command	SWITCH_COLOR_STOP_LEVEL_CHANGE
Color Component ID	User defined among supported

4.6.3 Node properties

CL:0033.01.42.01.1 A controlling node SHOULD have a UI allowing the end user to see the following properties:

- Last known configured color or color components values

4.6.4 Additional control requirements

CL:0033.01.51.01.1 A node controlling this Command Class MUST also control:

- Binary Switch Command Class, version 2
- Multilevel Switch, version 4

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.7 Configuration Command Class, version 1-4

4.7.1 Mandatory node interview

CL:0070.03.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 7.

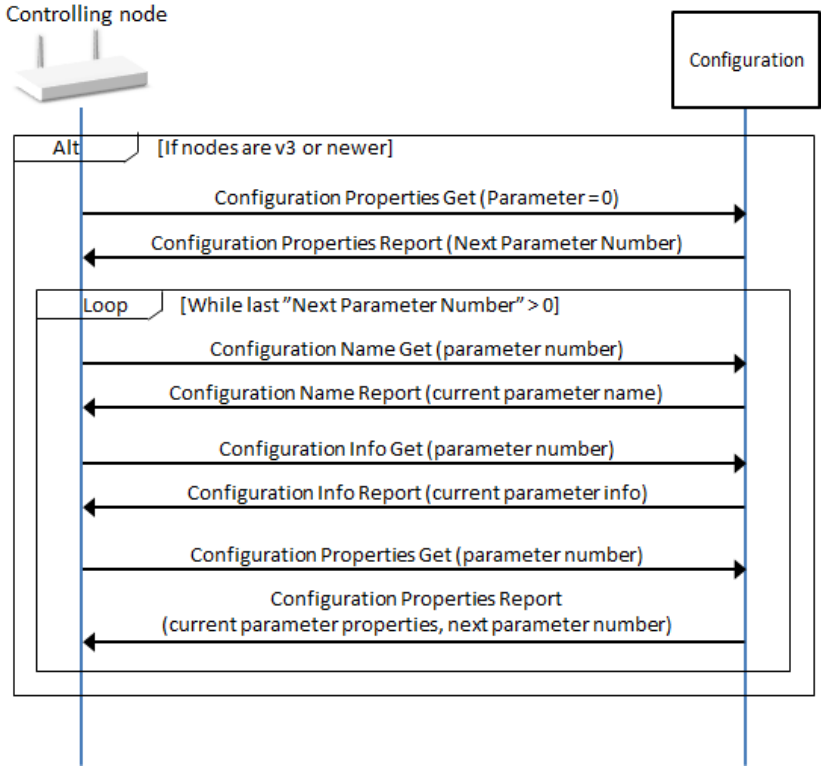

Figure 7, Configuration Command Class interview

4.7.2 Minimum end user functionalities

CL:0070.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.7.2.1 Set a configuration parameter value

CL:0070.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 10 for parameters numbers smaller than 256 and Table 11 for parameter numbers greater or equal to 256.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table 10, Configuration::Set a (normal) configuration parameter value

Field	Value
Command	CONFIGURATION_SET
Parameter number	For version 2 or older: User defined For version 3 or newer: User defined among supported parameter numbers.
Size	For version 2 or older: User defined among 1, 2 and 4. For version 3 or newer: Automatically determined from configuration parameter number properties
Default	User defined or 0x00 For version 3 or older: this field SHOULD NOT be set to 1.
Configuration Value	For version 2 or older: User defined. For version 3 or newer: User defined among supported values

Table 11, Configuration::Set an extended range configuration parameter value

Field	Value
Command (v2)	CONFIGURATION_BULK_SET
Parameter offset (v2)	For version 2: User defined among any value (256..65535). For version 3 or newer: User defined among supported parameter numbers.
Number of Parameters (v2)	User defined or 0x01.
Size (v2)	For version 2: User defined among 1, 2 and 4. For version 3 or newer: Automatically determined from configuration parameter number properties
Default (v2)	User defined or 0x00 For version 3 or older: this field SHOULD NOT be set to 1.
Handshake (v2)	0x00
Configuration Value (v2)	For version 2: User defined. For version 3 or newer: User defined among supported values

4.7.2.2 Reset all configuration parameter values to default

CL:0070.04.31.01.1 When the end user performs this action, the issued command MUST comply with Table 12.

Table 12, Configuration::Reset all configuration parameter values to default

Field	Value
Command (v4)	CONFIGURATION_DEFAULT_RESET

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.7.3 Node properties

CL:0070.03.41.01.1 If nodes are version 3, the controlling node MUST have a UI allowing the end user to see supported parameter numbers, their current value, their allowed value range and their default value.

Values MUST be presented according to the Format advertised in the Configuration Properties Report Command.

CL:0070.01.41.01.1 If nodes are version 1 or 2, the controlling node MUST have a UI showing the known parameters that have been set by the end user and their current value.

4.7.4 Additional control requirements

CL:0070.04.51.01.1 If nodes are version 4, a node controlling this command class MUST NOT issue a Bulk Set Command supporting nodes advertising “No Bulk support” in the Configuration Properties Report Commands.

CL:0070.04.51.02.1 If nodes are version 4, a node controlling this command class MUST NOT allow an end user to issue a Configuration Set or a Bulk Set Command for parameters advertised as “read-only” in the Configuration Properties Report Command.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.8 Door Lock Command Class, version 1-4

4.8.1 Mandatory node interview

CL:0062.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 8.

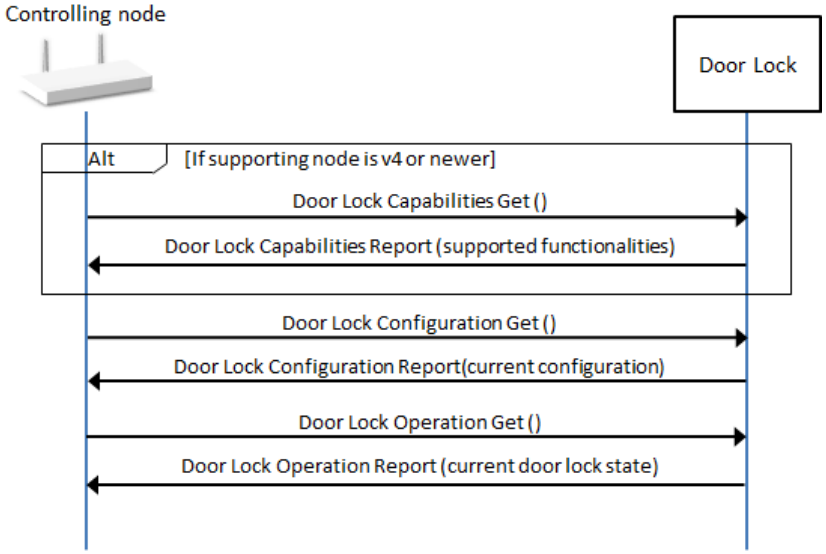

Figure 8, Door Lock Command Class interview

4.8.2 Minimum end user functionalities

CL:0062.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.8.2.1 Configure the door lock

CL:0062.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 13.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table 13, Door Lock::Configure the door lock

Field	Value
Command	DOOR_LOCK_CONFIGURATION_SET
Operation type	For version 4 or newer: User defined among supported operation types. For version 3 or older: User defined among 0x01..0x02
Outside Door Handles Mode	Free (0xF recommended)
Inside Door Handles Mode	Free (0xF recommended)
Lock Timeout Minutes	User defined (0x00..0xFD) if Operation Type is set to 0x02, else 0xFE
Lock Timeout seconds	User defined (0x00..0x3B) if Operation Type is set to 0x02, else 0xFE
Auto-relock time (v4)	User defined if supported, else 0
Hold and release time (v4)	User defined if supported, else 0
BTB (v4)	User defined if supported, else 0
TA (v4)	User defined if supported, else 0

4.8.2.2 Set the door mode

CL:0062.01.31.03.1 When the end user performs this action, the issued command MUST comply with Table 14.

Table 14, Door Lock::Set the door mode

Field	Value
Command	DOOR_LOCK_OPERATION_SET
Door Lock Mode	For version 4 or newer: User defined among supported modes. For version 3 or older: User defined among 0x00 and 0xFF. Timed Operation modes MUST NOT be selectable by the end user if the door lock is not configured in Timed Operation

4.8.3 Node properties

CL:0062.01.41.01.1 Controller SHOULD have a UI allowing the end user to see the following properties:

- Last known Door Lock mode (Secure, Unsecured, etc.)
- Current door lock configuration

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.9 Entry Control Command Class, version 1

4.9.1 Mandatory node interview

CL:006F.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 9.

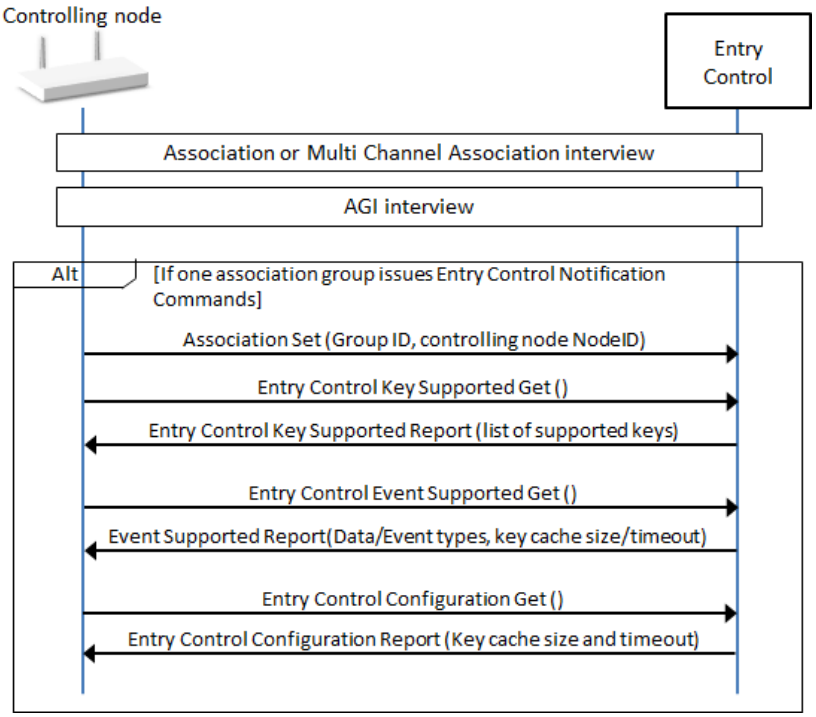

Figure 9, Entry Control Command Class interview

4.9.2 Minimum end user functionalities

CL:006F.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.9.2.1 Configure the keypad

CL:006F.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 15.

Table 15, Entry Control Keypad::Configure the keypad

Field	Value
Command	ENTRY_CONTROL_CONFIGURATION_SET
Key Cache Size	User defined among supported values
Key Cache Timeout	User defined among supported values

4.9.3 Node properties

CL:006F.01.41.01.1 A controlling node MUST have a UI allowing the end user to see the received Entry Control Notifications (Event type and data)

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.9.4 Additional control requirements

CL:006F.01.51.01.1 A node controlling this command class MUST also control:

- Association Command Class, version 2
- Association Group Information, version 3

CL:006F.01.51.02.1 A controlling node MUST associate itself to a group issuing Entry Control Notification Commands before performing a supporting node interview and providing end user functionalities.

CL:006F.01.51.03.1 A controlling node MUST NOT remove associations in order to associate itself to an association group issuing Entry Control Notification Commands.

CL:006F.01.52.01.1 A controlling node SHOULD NOT provide end user functionalities if it cannot associate itself to an association group sending Entry Control Notification Commands. (e.g. all Association Groups sending the relevant command are full)

CL:006F.01.52.02.1 A controlling node SHOULD have a UI allowing the end user to define what actions to take based on received Entry Control Notifications.

CL:006F.01.52.03.1 A controlling node SHOULD also control Door Lock Command Class and Barrier Operator Command Class. It SHOULD also allow the user to set the door mode or initiate opening/closing of a given node based on received Entry Control Notifications.

4.10 IR Repeater Command Class, version 1

4.10.1 Mandatory node Interview

CL:0xA0.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 10.

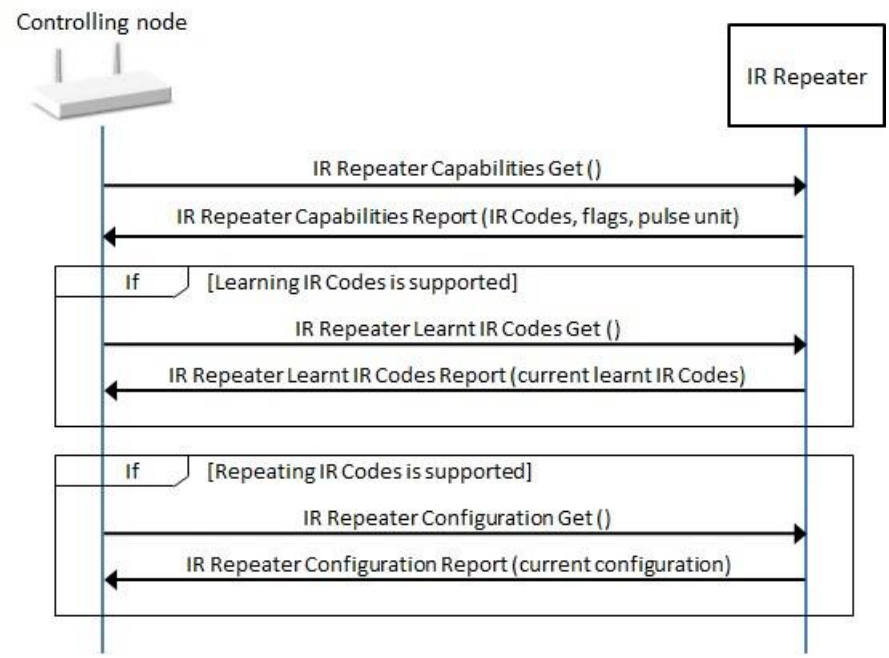

Figure 10, IR Repeater Command Class interview

4.10.2 Minimum end user functionalities

CL:0xA0.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.10.2.1 Repeat an IR Code

CL:0xA0.01.31.02.1 This action MUST be available to the end user if the supporting node supports repeating IR Codes.
CL:0xA0.01.31.03.1 When the end user performs this action, the issued commands MUST comply with Table 16.

Table 16, IR Repeater::Repeat an IR Code

Field	Value
Command	IR_REPEATER_REPEAT
Sequence number	Controlling node defined. It MUST be incremented at each new repeat action
Sub carrier	Controlling node defined within the capabilities of the supporting node
Duty Cycle	Controlling node defined within the capabilities of the supporting node
Pulse time unit	Controlling node defined within the range advertised by the supporting node in the IR Repeater Capabilities Report Command
Report Number	Controlling node defined.
Last	1 for the last command, 0 else.
Data	Controlling node defined. The end user MUST be able to select an IR Code that will be transfered

4.10.2.2 Learn an IR Code

This action MUST be available to the end user if the supporting node supports Learning IR Codes.
CL:0xA0.01.31.04.1 When the end user performs this action, the issued command MUST comply with Table 17.
CL:0xA0.01.31.04.1

Table 17, IR Repeater::Learn an IR Code

Field	Value
Command	IR_REPEATER_IR_CODE_LEARNING_START
IR Code identifier	User defined among available IR Codes slots
Timeout	Controlling node or User defined.
Pulse time unit	Controlling node defined within the range advertised by the supporting node in the IR Repeater Capabilities Report Command

The Controlling node MUST inform the user about the status of the IR Code learning when the IR Code Learning Status Command is received.
The controlling node MAY allow the end user to interrupt the learning process, if it does, the issued command MUST comply with Table 18.

Table 18. IR Repeater::Stop learning an IR Code

Field	Value
Command	IR_REPEATER_IR_CODE_LEARNING_STOP

4.10.2.3 Erase a learnt IR code

CL:0xA0.01.31.05.1 This action MUST be available to the end user if the supporting node supports Learning IR Codes.
CL:0xA0.01.31.06.1 When the end user performs this action, the issued command MUST comply with Table 19.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

Table 19, IR Repeater::Erase an IR Code from memory

Field	Value
Command	IR_REPEATER_LEARNT_IR_CODE_REMOVE
IR Code identifier	User defined among available IR Codes slots that have a defined IR Code

4.10.2.4 Repeat a learnt IR code

CL:0xA0.01.31.07.1 This action MUST be available to the end user if the supporting node supports Repeating IR Codes.

CL:0xA0.01.31.08.1 When the end user performs this action, the issued command MUST comply with Table 19.

Table 20, IR Repeater::Repeat a learnt IR Code

Field	Value
Command	IR_REPEATER_REPEAT_LEARNT_CODE
IR Code identifier	User defined among available Learnt IR Codes slots

4.10.3 Node properties

If the supporting node supports IR Code learning:

CL:0xA0.01.41.01.1

- A controlling node MUST have a UI allowing the end user to see the which IR Code Identifiers contain a valid learnt code.

4.11 Meter Command Class, version 1-5

4.11.1 Mandatory node interview

CL:0032.01.21.01.2 A node controlling this Command Class MUST perform a supporting node interview according to Figure 11.

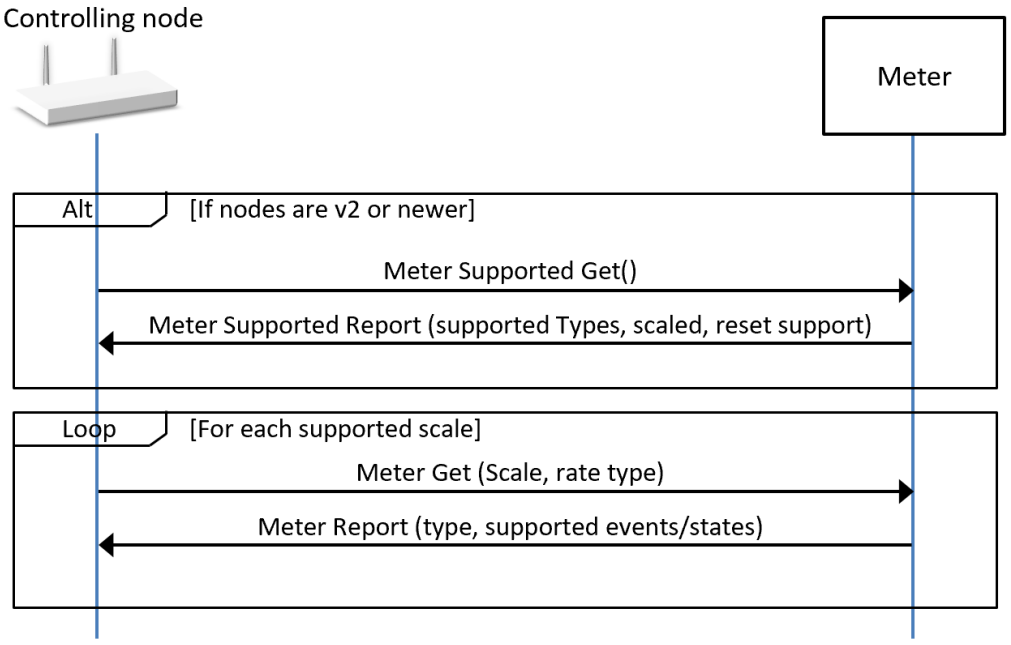

Figure 11, Meter Command Class interview

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.11.2 Minimum end user functionalities

CL:0032.02.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.11.2.1 Reset cumulated data

CL:0032.02.31.02.1 This action MUST be available to the end user if both nodes implement version 2 or newer and the supporting node indicates that meter reset is supported.

CL:0032.02.31.03.1 When the end user performs this action, the issued command MUST comply with Table 21.

Table 21, Meter::Reset cumulated data

Field	Value
Command (v2)	METER_RESET

4.11.3 Node properties

CL:0032.01.41.01.2 A controlling node MUST have a UI allowing the end user to see the last readings for each supported scale and all cumulated values. For version 1 supporting nodes, the scale reported in the Meter Report MUST be accessible to the end user.

CL:0032.01.41.02.1 A controlling node MUST always show the value even if the Type and/or Scale are unknown.

CL:0032.01.42.01.1 A controlling node SHOULD implement the capability to update its list of Meter Type and Scales, so that new Meter Types and scales added in more recent versions are not presented as unknown.

CL:0032.01.41.03.1 If a controlling node receives an unknown Meter Type or Scale, it MUST allow the end user to identify the Meter reading and MAY allow the user to assign a free-text description to that Meter reading

4.11.4 Additional control requirements

CL:0032.01.51.01.1 Unless unsolicited Meter Report Commands are received, a controlling node MUST:

- Probe the current meter readings for each supported scale (and rate type if v4 nodes) at least every 6 hours for listening nodes.
- Probe the current meter readings for each supported scale (and rate type if v4 nodes) when the supporting node issues a Wake Up Notification Command for sleeping nodes.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.12 Multilevel Sensor Command Class, version 1-11

4.12.1 Mandatory node interview

CL:0031.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 12.

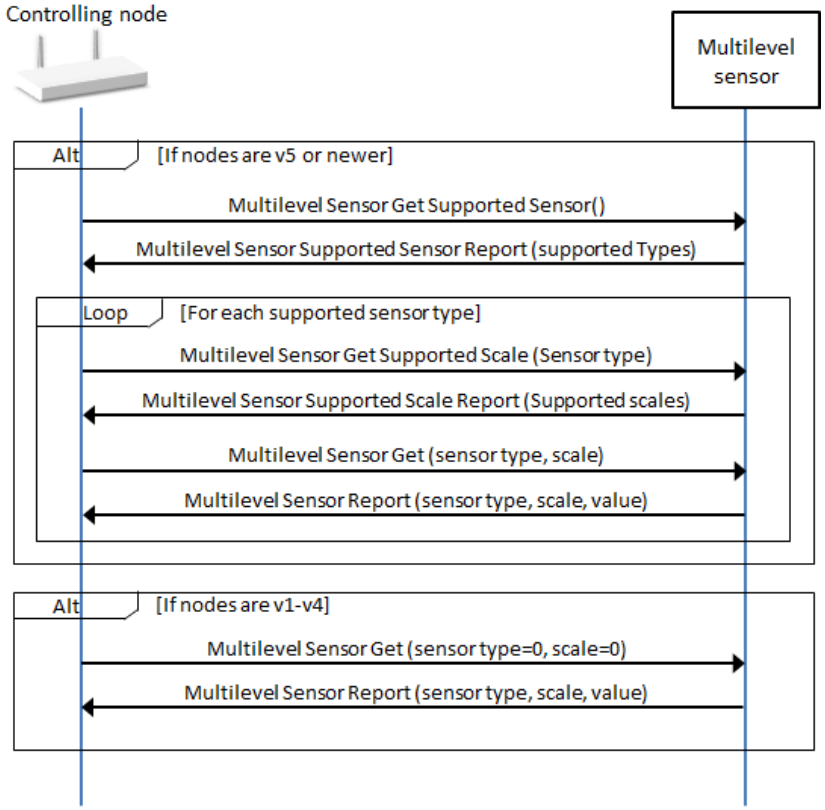

Figure 12, Multilevel Sensor Command Class interview

4.12.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

4.12.3 Node properties

CL:0031.01.41.01.1 A controlling node MUST allow the end user to see the received readings for every Sensor types

CL:0031.01.41.02.1 A controlling node MUST always show the sensor reading values even if the Sensor Type and/or Scale are unknown.

CL:0031.01.42.01.1 A controlling node SHOULD implement the capability to update its list of Sensor Type and Scales, so that new Sensor Types and Scales added in [9] are not presented as unknown.

CL:0031.01.41.03.2 If a controlling node receives an unknown Sensor Type or Scale, it MUST allow the end user to identify the Sensor reading and MAY allow the end user to assign a free-text description to the sensor reading.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.12.4 Additional control requirements

CL:0031.01.51.01.1 Unless unsolicited Multilevel Sensor Report Commands are received, a controlling node MUST:

- Probe the current reading for each supported sensor type at least every 6 hours for listening nodes.
- Probe the current reading for each supported sensor type when the supporting node issues a Wake Up Notification Command for sleeping nodes.

CL:0031.01.52.01.1 A node controlling this command class SHOULD also control:

- Association Command Class, version 2
- Association Group Information, version 3

CL:0031.01.52.02.1 A controlling node SHOULD associate itself to an association group issuing Multilevel Report Commands after performing a supporting node interview and providing end user functionalities.

CL:0031.01.51.02.1 A controlling node MUST NOT remove associations in order to associate itself to an association group issuing Multilevel Report Commands.

CL:0031.01.52.03.1 Controller SHOULD have a UI allowing the end user to define rules or commands based on received readings.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.13 Multilevel Switch Command Class, version 1-4

4.13.1 Mandatory node interview

CL:0026.01.21.01.2 A node controlling this Command Class MUST perform a supporting node interview according to Figure 13. It is OPTIONAL to issue the Multilevel Switch Supported Get Command if a controlling node does not use this information for its UI.

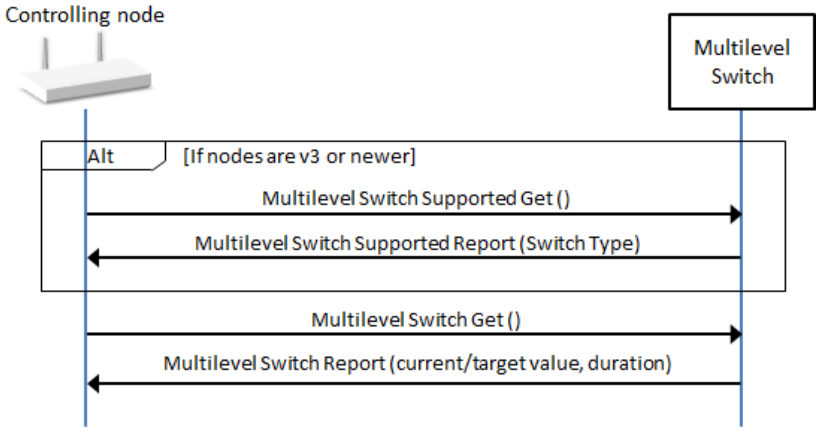

Figure 13, Multilevel Switch Command Class interview

4.13.2 Minimum end user functionalities

CL:0026.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.13.2.1 Set the level

CL:0026.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 22.

Table 22, Multilevel Switch::Set the level

Field	Value
Command	SWITCH_MULTILEVEL_SET
Value	User defined among 0x00..0x63 and 0xFF
Duration (v2)	User defined or 0xFF

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.13.2.2 Start level change up or down

CL:0026.01.31.03.1 When the end user performs this action, the issued command MUST comply with Table 23.

Table 23, Multilevel Switch::Start level change up/down

Field	Value
Command	SWITCH_MULTILEVEL_START_LEVEL_CHANGE
(Primary Switch) Up/Down	User defined among 0x00 and 0x01
Secondary Switch Inc/Dec	User defined if supported
Duration (v2)	User defined or 0xFF
Secondary Switch Step Size (v3)	User defined if supported

4.13.2.3 Stop level change

CL:0026.01.31.04.1 When the end user performs this action, the issued command MUST comply with Table 24.

Table 24, Multilevel Switch::Stop level change up/down

Field	Value
Command	SWITCH_MULTILEVEL_STOP_LEVEL_CHANGE

4.13.3 Node properties

CL:0026.01.42.01.1 Controller SHOULD have a UI allowing the end user to see the following properties:

- Last known state (xx %)

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.14 Notification Command Class, version 1-8

4.14.1 Mandatory node interview

CL:0071.02.21.01.2 A node controlling this command class MUST perform a supporting node interview according to Figure 14.

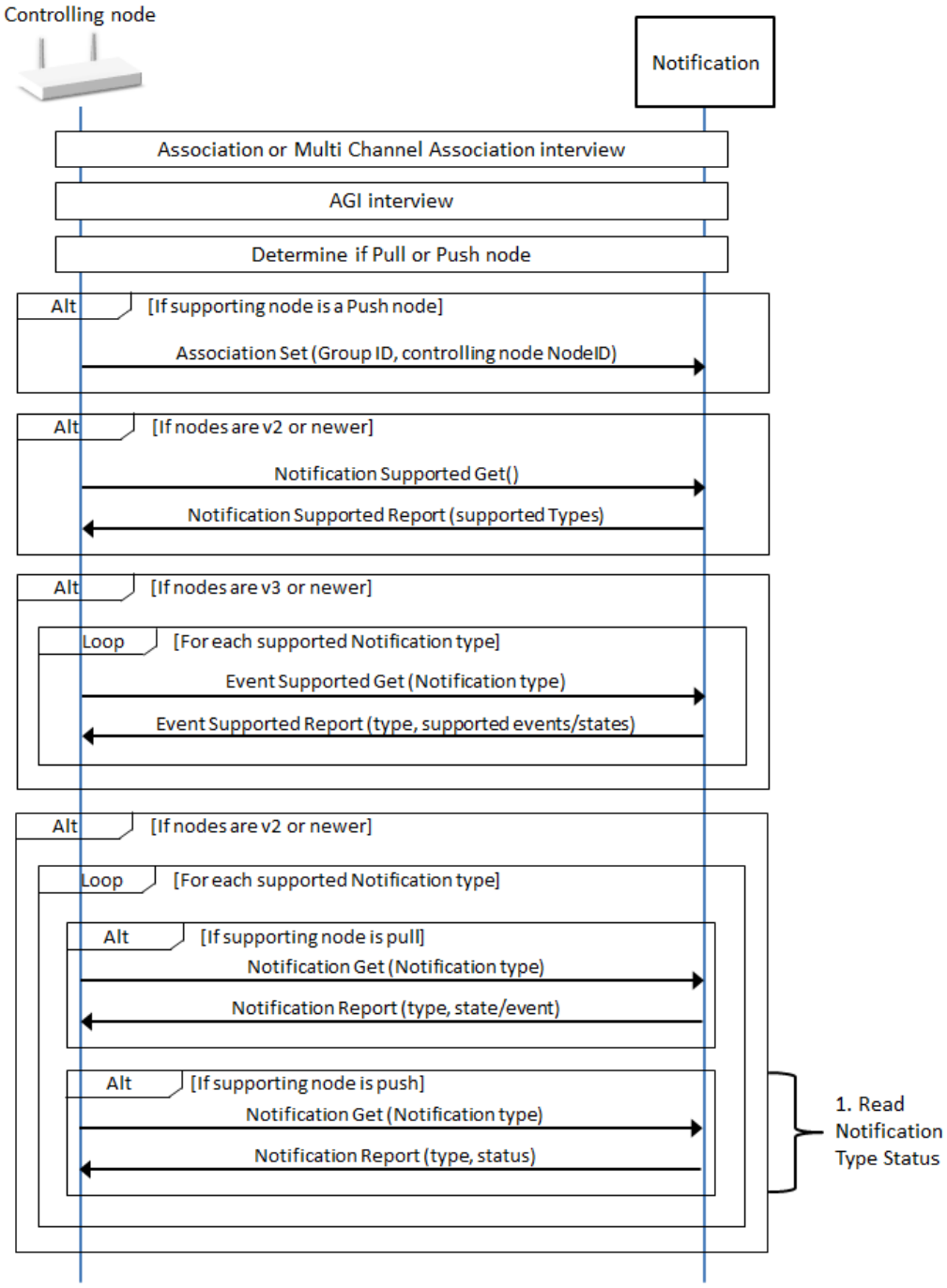

Figure 14, Notification Command Class interview

CL:0071.02.23.01.1 The step denoted as “1. Read Notification Type Status” in Figure 14 MAY be replaced by Notification Set commands for each Notification Type, with the Status field set to 0x00 or 0xFF.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.14.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

4.14.3 Node properties

CL:0071.01.41.01.1 A controlling node MUST have a UI allowing the end user to see the received Notification Reports (Notification Type and event/state)

4.14.4 Additional control requirements

CL:0071.01.51.01.1 A controlling node MUST probe state/event notifications from pull nodes

- at least every 6 hours for listening nodes.
- when the supporting node issues a Wake Up Notification Command for sleeping nodes.

CL:0071.01.51.02.1 A node controlling this command class MUST also control:

- Association Command Class, version 2
- Association Group Information, version 3

CL:0071.01.51.03.1 For Push supporting nodes, a controlling node MUST associate itself to a group issuing Notification Report Commands before performing a supporting node interview and providing end user functionalities.

CL:0071.01.53.01.1 For Push supporting nodes, it is OPTIONAL for a controlling node to provide end user functionalities and node properties if it cannot associate itself to an association group sending Notification Report Commands. (e.g. all Association Groups sending the relevant command are full)

CL:0071.01.51.04.1 A controlling node MUST NOT remove associations in order to associate itself to an association group issuing Notification Report Commands.

CL:0071.01.52.01.1 Controller SHOULD have a UI allowing the end user to define rules or commands based on received notifications events/states.

CL:0071.01.52.02.1 A controlling node SHOULD implement the capability to update its Notifications list, so that new Notifications added in [8] are not presented as unknown.

CL:0071.01.51.05.2 If a controlling node receives an unknown Notification, it MUST allow the end user to identify this notification and MAY allow the end user to assign a free-text description to that Notification.

4.14.4.1 Detailed controller guidelines

This section presents guidelines for controlling legacy sensors nodes supporting the Notification Command Class, version 3-8.

Alarm Command Class version 2 supporting nodes operate in Push mode only. The guidelines presented in 4.14.4.1.6 Controlling Pull Mode Sensors can also be used for controlling Alarm CC version 2 supporting nodes.

4.14.4.1.1 Sensor database

The following sections present discovery methods for sensor properties, such as Push/Pull mode or the use of state idle notifications. Some sensor properties (e.g. configuration parameters, Association group properties, state variables dependencies) cannot always be discovered.

CL:0071.01.52.03.1 If a controlling node has a database of known certified Notification sensors, it SHOULD be consulted first before attempting to interview the Notification Command Class of a supporting node. If the

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

supporting node is present in the database, a controlling node SHOULD read the sensor properties from the database and skip any discovery.

4.14.4.1.2 Push/Pull mode discovery

CL:0071.01.51.06.1 A supporting node does not advertise whether it operates in Push or Pull mode. Therefore a controlling node MUST discover what mode a supporting node implements.

CL:0071.01.52.04.1 The RECOMMENDED discovery steps for a controlling node are the following:

If the supporting node does not support the Association Command Class, it may be concluded that the supporting node implements Pull Mode and discovery may be aborted.

If the supporting node supports the AGI Command Class, probe the AGI table in the following way or read the already probed AGI table:

1. Discover how many Association groups the supporting node (and its eventual End Points) implements by issuing an Association Supported Groupings Get Command.
2. For each association group, issue an Association Group Command List Get for the grouping identifier. Inspect the returned Association Group Command List Report and look for the following pair:
   {Command Class x = COMMAND_CLASS_NOTIFICATION, Command x = NOTIFICATION_REPORT}. If a match is found, conclude that the supporting node implements Push Mode and stop the discovery process.

If no match is found at the end of the AGI test, conclude that the supporting node implements Pull Mode. The AGI test is illustrated in Figure 15.

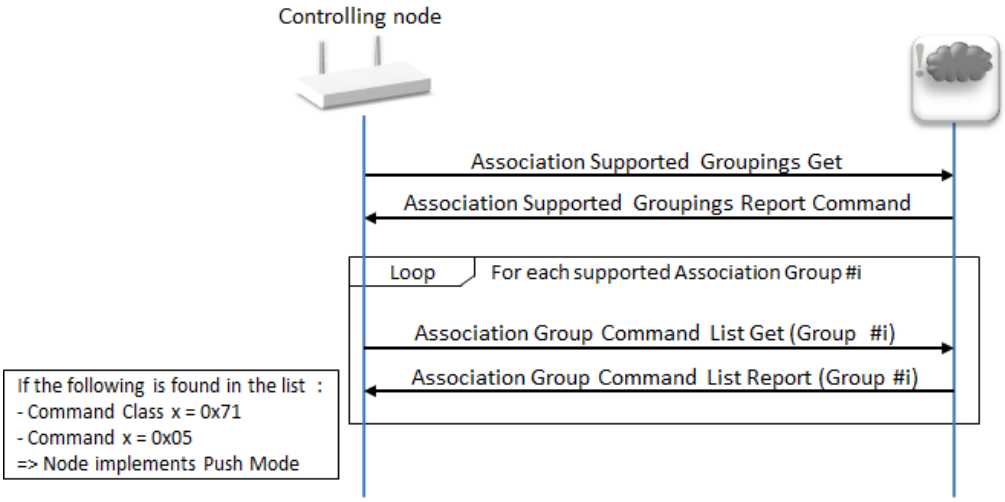

Figure 15, Push/Pull node discovery, AGI table probing

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

If the supporting node does not support the AGI Command Class, proceed with the following Notification Command Class test:

1. Discover the list of supported Notification Types by issuing a Notification Supported Get Command.
2. For each supported Notification Type, query the supported Events/States via the Event Supported Get Command.
3. Set the status of one of the Supported Notification Types at the target node using a Notification Set Command with the following values:
    a. Notification Type = (a supported type discovered in step 1)
    b. Notification Status = 0xFF
4. Issue a Notification Get Command with the following values:
    a. Notification Type = (Same as step 3.a).
    b. Notification Event = (a supported Event/State discovered in step 2).
5. The supporting node returns a Notification Report Command.
    a. If the Notification Status is 0xFF, the target node implements Push Mode
    b. If the Notification Status is 0xFE or 0x00, the target node implements Pull Mode
    c. If the target node did not return a report within 10 seconds, it implements Pull Mode

The Notification Command Class test is illustrated in Figure 16.

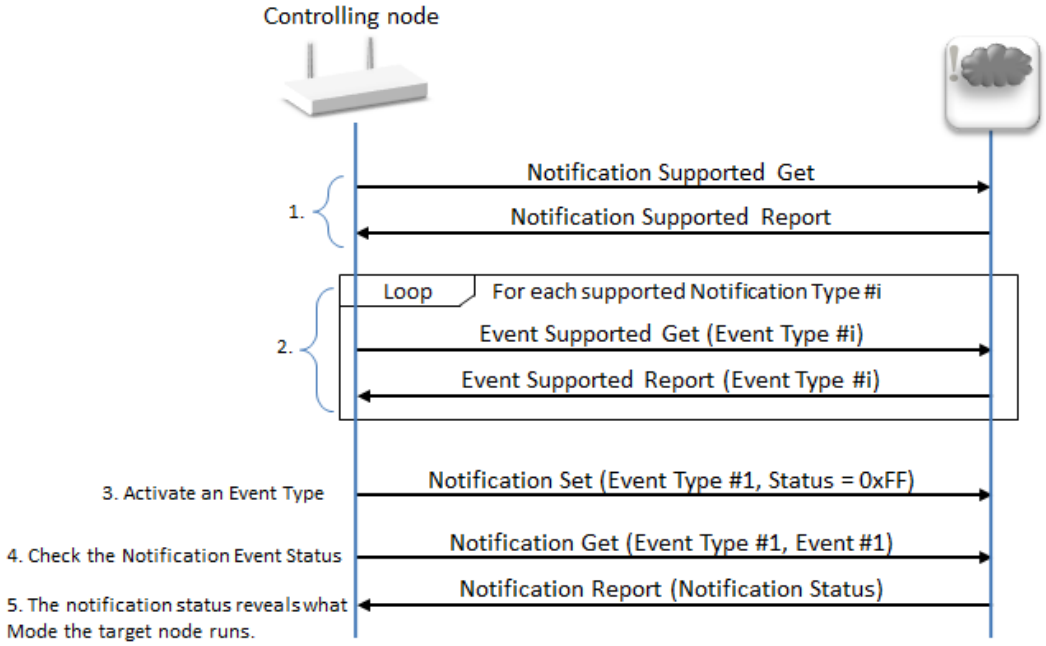

Figure 16, Push/Pull node discovery, Notification Command Class test

4.14.4.1.3 Unknown Notifications

CL:0071.01.52.05.1 This Command Class defines some Notifications as event or states. It is RECOMMENDED to treat an unknown Notification as its own state variable.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.14.4.1.4 State idle

A controlling node receiving a “State idle” Notification for an event or state of which the “State idle” Notification does not apply (e.g. the “heartbeat” event) SHOULD ignore the Notification. Refer to [8] for state variables to which the “State idle” notification applies.

CL:0071.01.52.06.1

It is not mandatory for nodes supporting Notification Command Class, version 7 or older to send a “State idle” Notification for returning a state variable to idle. Thus, there is a risk that a “State idle” is never sent. A controlling node SHOULD NOT use timeouts to consider a state variable to be idle for example 5 minutes after the last received Notification for v8 or newer supporting nodes. It MAY allow the end user to mark states variables as idle.

CL:0071.01.52.07.2
CL:0071.01.53.02.1

4.14.4.1.5 Parameter encapsulation

A node implementing version 5 or older MAY use the following parameter encapsulation format: (User ID, User Code Report Command) instead of (User Code Report Command).

CL:0071.01.53.03.1

A controlling node SHOULD accept the end user Code Report Event Parameter with a User ID byte prefixed at the beginning of the Notification Event Parameter for backwards compatibility. A controlling node can detect the beginning of the end user Code Report by finding the following consecutive bytes: {byte x= COMMAND_CLASS_USER_CODE, byte x+1 = USER_CODE_REPORT}.

CL:0071.01.52.08.1

4.14.4.1.6 Controlling Pull Mode Sensors

The following sections present guidelines for controlling Pull sensors nodes.

4.14.4.1.6.1 Notification Get Command

This command is used to retrieve the next Notification from the receiving node’s queue. Below are recommendations for what values controlling nodes should set in the fields of this command.

Notification Type (8 bits)

A controlling node SHOULD set the Notification Type field to 0xFF.

CL:0071.01.52.09.1

Earlier specification text suggested that Pull nodes must not ignore this command if the Notification Type is set to a supported type; rather than 0xFF. Therefore, Pull sensors may respond to a Notification Get for a supported Notification type by retrieving the next notification in the queue matching the specified Notification Type.

Notification Event /State (8 bits)

A controlling node SHOULD set this field to 0x00.

CL:0071.01.52.0A.1

A receiving node will have an unpredictable behavior if this field is set to a supported Event.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.14.4.1.6.2 Detecting and clearing persistent notifications.

It is optional for Pull nodes to specify a sequence number in notifications.

CL:0071.01.52.0B.1 A controlling node receiving twice the same Notification with identical sequence number SHOULD consider the Notification as persistent. An example is given in Figure 17.

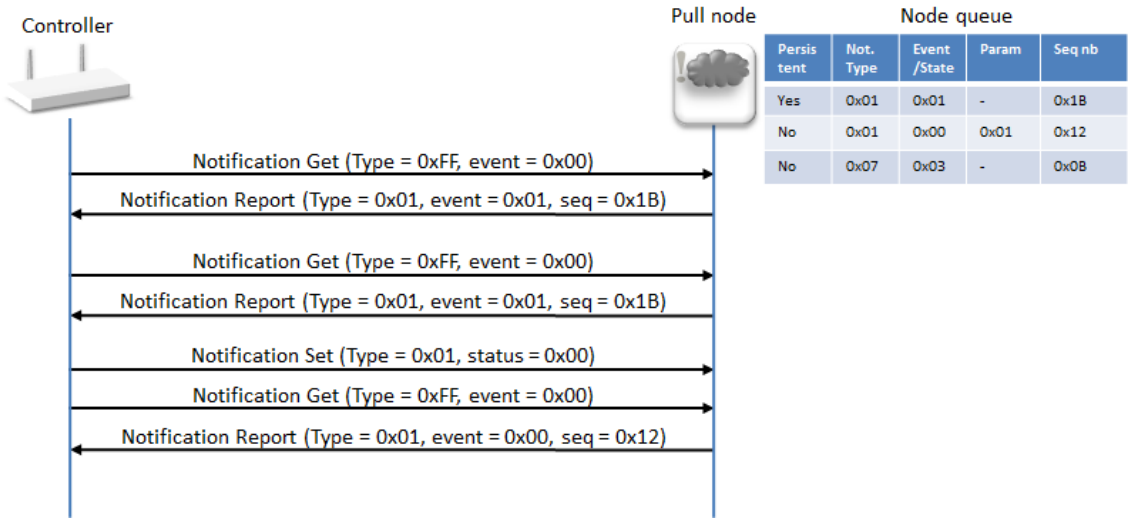

Figure 17, detecting and clearing persistent notifications, identical sequence numbers

CL:0071.01.52.0C.1 Due to unclear specification text, sensors may issue persistent Notifications without a sequence number field or with a new sequence number every time. Therefore, a controlling node SHOULD consider a notification to be persistent if it receives the same Notification (type and event/state) 5 times or more. An example is given in Figure 18.

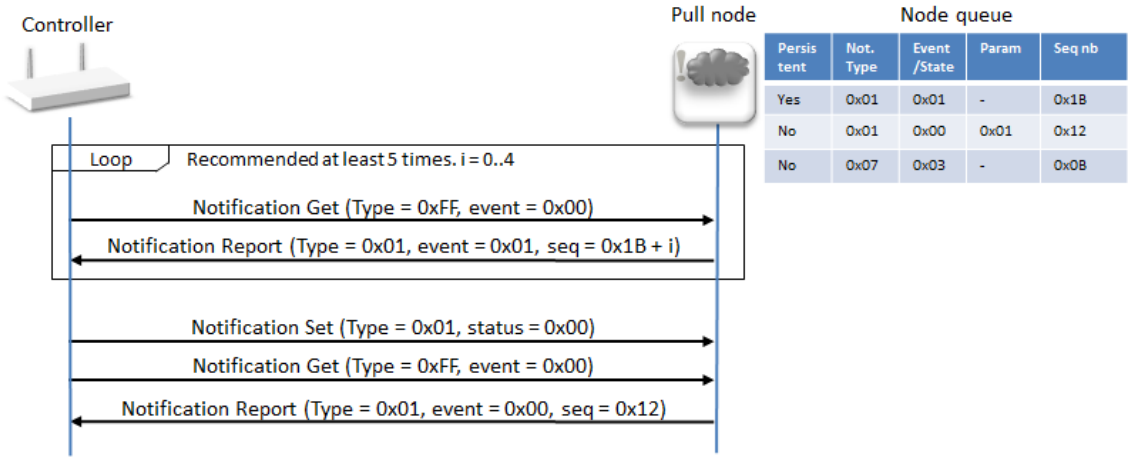

Figure 18, detecting and clearing persistent notifications with incremental sequence numbers

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.14.4.1.6.3 Status and queue empty

CL:0071.01.52.0D.1 A controlling node SHOULD stop issuing Notification Get Commands when receiving a Queue empty notification (0xFE). Illustration is given in Figure 19.

CL:0071.01.53.04.1 All fields following the Status field MAY be omitted in the Notification Report if it advertises a Status of 0xFE (queue empty).

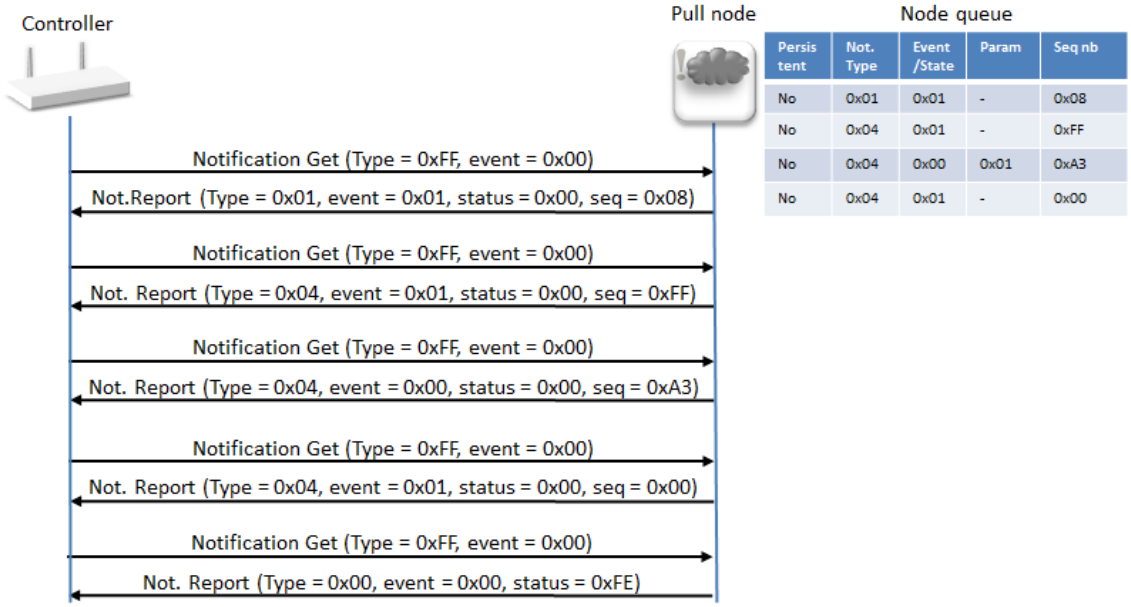

Figure 19, Pull node event retrieval until receiving queue empty

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.15 Simple AV Control Command Class, version 1-4

4.15.1 Mandatory node interview

CL:0094.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 20.

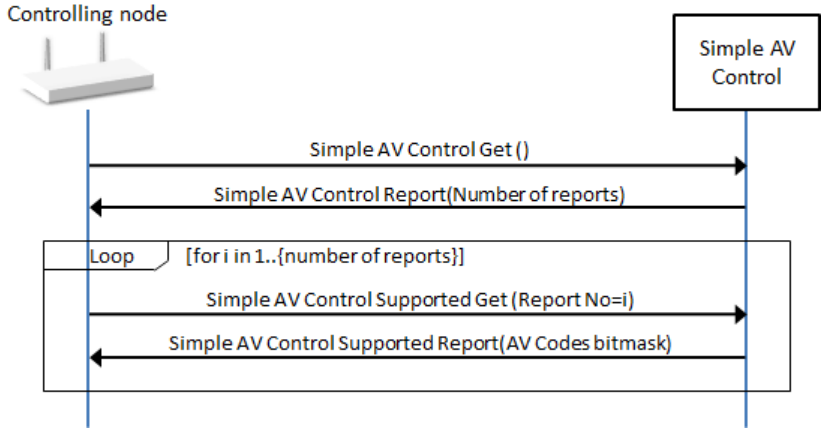

Figure 20, Simple AV Control Command Class interview

4.15.2 Minimum end user functionalities

CL:0094.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.15.2.1 Send a supported AV code

CL:0094.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 25.

Table 25, Simple AV Control::Send a supported AV code

Field	Value
Command	SIMPLE_AV_CONTROL_SET
Sequence number	Controlling node defined. This field MUST be incremented every time the end user perform this action
Key attributes	User defined
Command x	User defined among supported AV codes

CL:0094.01.31.03.1 The end user MUST be able to select among all supported AV codes even if the controlling node does not know what the code actually represents.

4.15.3 Node properties

CL:0094.01.41.01.1 Controller SHOULD have a UI allowing the end user to see the following properties:

- List of supported AV Codes

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.16 Sound Switch Command Class, version 1

4.16.1 Mandatory node interview

CL:0079.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 21.

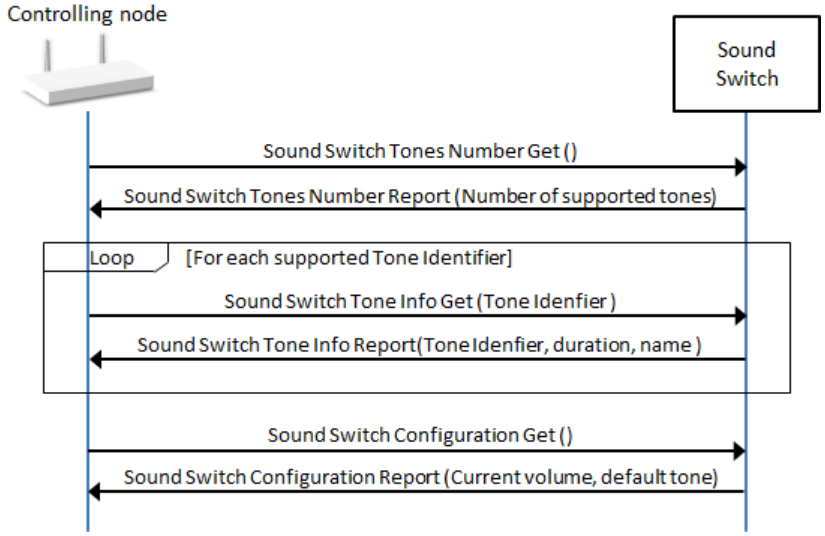

Figure 21, Sound Switch Command Class interview

4.16.2 Minimum end user functionalities

CL:0079.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.16.2.1 Configure the sound switch

CL:0079.01.31.02.1 The end user MUST be able to configure the volume and default tone at the supporting node. When the end user performs this action, the issued command MUST comply with Table 26.

Table 26, Sound Switch::Configure the sound switch

Field	Value
Command	SOUND_SWITCH_CONFIGURATION_SET
Volume	User defined among 0x00..0x64 or 0xFF
Default Tone identifier	User defined among supported or 0x00

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.16.2.2 Play/stop a selected or default tone

CL:0079.01.31.03.1 The end user MUST be able to play the default tone, play a selected tone or stop playing a tone. When the end user performs this action, the issued command MUST comply with Table 27.

Table 27, Sound Switch::Play/stop a selected or default tone

Field	Value
Command	SOUND_SWITCH_TONE_PLAY_SET
Tone identifier	User defined among supported tones, 0x00 and 0xFF.

4.16.3 Node properties

CL:0079.01.42.01.1 Controller SHOULD allow the end user to see/access the following properties:

- (Last known) configured volume
- (Last known) configured default tone
- List of supported tones and their duration

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.17 Thermostat Mode Command Class, version 1-3

4.17.1 Mandatory interview

CL:0040.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 22.

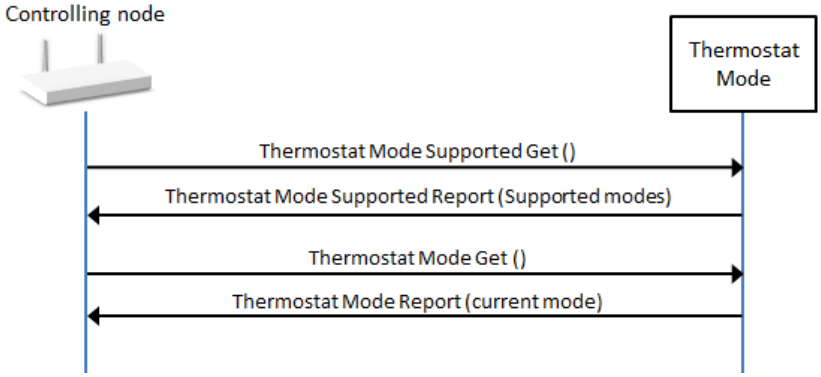

Figure 22, Thermostat Mode Command Class interview

4.17.2 Minimum end user functionalities

CL:0040.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.17.2.1 Change mode

CL:0040.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 28.

Table 28, Thermostat Mode::Change mode

Field	Value
Command	THERMOSTAT_MODE_SET
Mode	User defined among supported modes

CL:0040.01.31.03.1 The end user MUST be able to select between all supported modes by the supporting node, even if the controlling node does not know what a given mode represents.

4.17.3 Node properties

CL:0040.01.42.01.1 A controlling node SHOULD have a UI allowing the end user to see the following properties:

- Last known mode

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.18 Thermostat Setback Command Class, version 1

4.18.1 Mandatory interview

CL:0047.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 23.

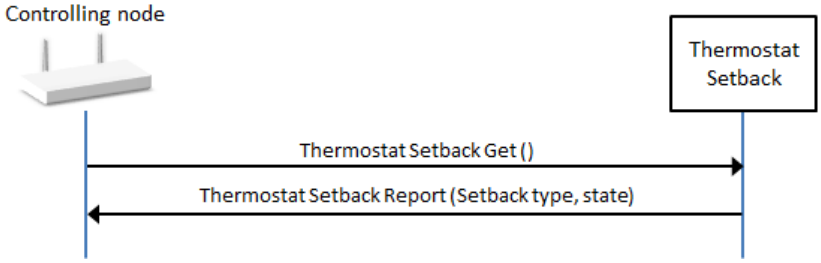

Figure 23, Thermostat Setback Command Class interview

4.18.2 Minimum end user functionalities

CL:0047.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.18.2.1 Configure setback

CL:0047.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 29.

Table 29, Thermostat Setback::Change setback for a supported type

Field	Value
Command	THERMOSTAT_SETBACK_SET
Setback Type	User defined among 0x00..0x02
Setpoint State	User defined among 0x00..0x7A and 0x80..0xFF

4.18.3 Node properties

CL:0047.01.42.01.1 Controller SHOULD have a UI allowing the end user to see the following properties:

- Last known setback type and state.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.19 Thermostat Setpoint Command Class, version 1-3

4.19.1 Mandatory interview

CL:0043.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 24.

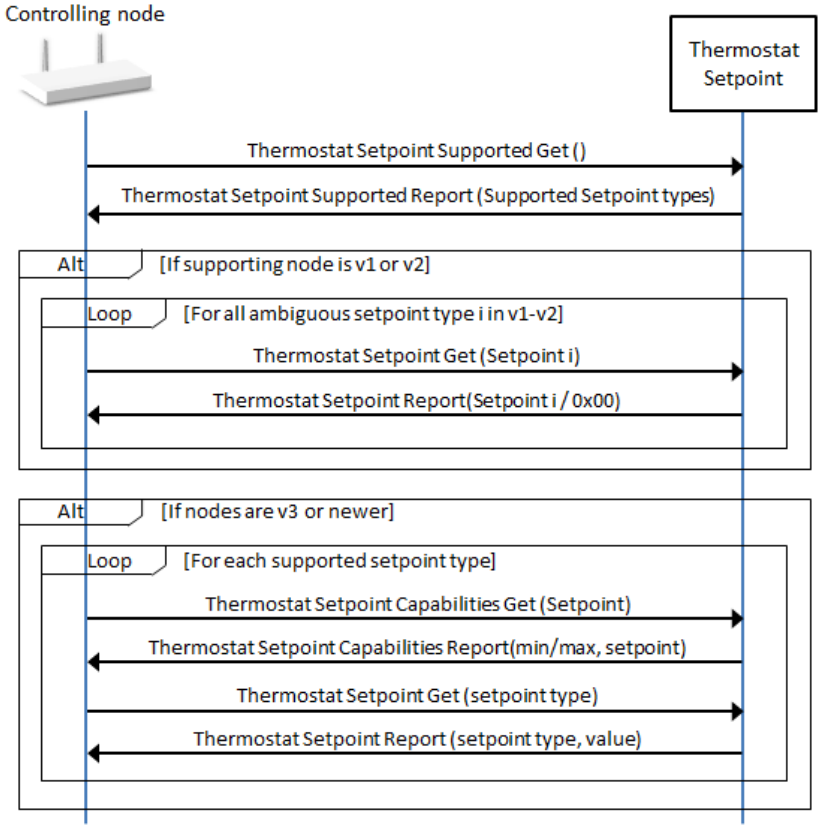

Figure 24, Thermostat Setpoint Command Class interview

It has been found that early implementations of this Command Class applied two non-interoperable interpretations of the bit mask advertising the support for specific Setpoint Types in the Thermostat Setpoint Supported Report Command.

Refer to the Thermostat Setpoint Command Class definition for the possible bitmask interpretations [2].

CL:0043.01.22.01.1 A controlling node SHOULD determine the supported Setpoint Types of a version 1 and version 2 supporting node by sending one Thermostat Setpoint Get Command at a time while incrementing the requested Setpoint Type.

CL:0043.01.21.03.1 If the same Setpoint Type is advertised in the returned Thermostat Setpoint Report Command, the controlling node MUST conclude that the actual Setpoint Type is supported.

CL:0043.01.21.04.1 If the Setpoint Type 0x00 (type N/A) is advertised in the returned Thermostat Setpoint Report Command, the controlling node MUST conclude that the actual Setpoint Type is not supported.

4.19.2 Minimum end user functionalities

CL:0043.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.19.2.1 Change setpoint for a supported type

CL:0043.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 30.

Table 30, Thermostat Setpoint::Change setpoint for a supported type

Field	Value
Command	THERMOSTAT_SETPOINT_SET
Setpoint Type	User defined among supported
Setpoint Value	If nodes are version 3 or newer: User defined among supported values If nodes are version 1 or 2: User defined.
Precision	User defined
Scale	Controller defined
Size	User defined

CL:0043.01.31.03.1 If controlling a version 1 or 2 supporting node, the controlling node MUST allow the user to define the Setpoint Value freely. The controlling node MUST read back the value with a Thermostat Mode Get(Setpoint type) or use Supervision Get encapsulation and indicate to the end user if the operation was successful.

CL:0043.01.31.04.1 The end user MUST be able to set the setpoint for any setpoint type, even if the controlling node does not know what a given type represents.

CL:0043.01.31.05.1 The Scale field value MUST be identical to the value received in the Thermostat Setpoint Report for the actual Setpoint Type during the node interview.

CL:0043.01.31.06.1 The controlling node SHOULD let the user define the Setpoint Value in their preferred scale but MUST convert the value into the supporting node's scale for issuing the Z-Wave Command

4.19.3 Node properties

CL:0043.01.42.01.1 A controlling node SHOULD have a UI allowing the end user to see the following properties:

- Last known setpoint value for each supported setpoint type.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.20 User Code Command Class, version 1-2

4.20.1 Mandatory interview

CL:0063.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 25.

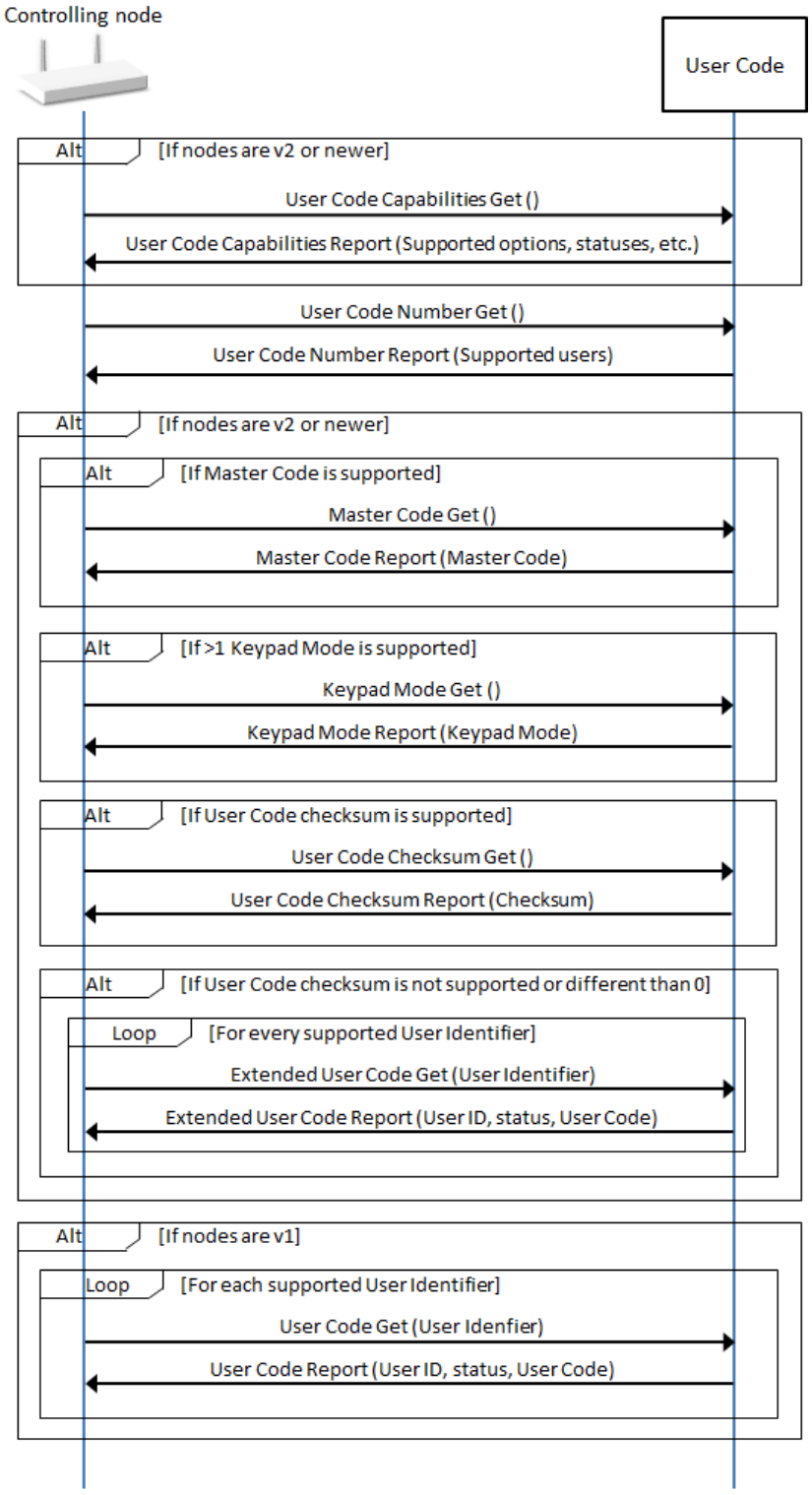

Figure 25, User Code Command Class interview

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.20.2 Minimum end user functionalities

CL:0063.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.20.2.1 Set/modify a User Code

CL:0063.01.31.02.1 When the end user performs this action, the issued command MUST comply with Table 31 if nodes are v1 or Table 32 if nodes are v2 or newer.

Table 31, User Code::Set a User Code

Field	Value
Command	USER_CODE_SET (0x01)
User Identifier	User defined or controlling node defined among supported User Identifiers.
User ID status	Used defined among 0x01 and 0x02 0x02 must be used to set a reserved/forbidden user code.
User Code	User defined among 0x30..0x39 with a length in the range 4..10 bytes.

A forbidden or reserved User Code is a User Code that cannot be used at the supporting node and cannot be allocated to a new user, for example if User Code can also be updated locally via a user interface.

Table 32, User Code::Set a User Code (v2)

Field	Value
Command (v2)	EXTENDED_USER_CODE_SET (0x0B)
Number of User Codes (v2)	Controlling node defined
User Identifier 1..M (v2)	User defined or controlling node defined among supported User Identifiers.
User ID status (v2)	Used defined among supported User ID statuses.
User Code Length (v2)	Controlling node defined based on the length of the User Code field.
User Code (v2)	User defined among supported ASCII characters with a length in the range 4..10 bytes.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.20.2.2 Erase a User Code

CL:0063.01.31.03.1 When the end user performs this action, the issued command MUST comply with Table 33 if nodes are v1 and Table 34 if nodes are v2 or newer.

Table 33, User Code::Erase a User Code

Field	Value
Command	USER_CODE_SET
User Identifier	User defined or controlling node defined among supported User Identifiers.
User ID status	0x00
User Code	0x00000000

CL:0063.01.31.04.1 A controlling node MAY allow the end user to erase all user codes at once. In this case, the User Identifier field MUST be set to 0x00.

Table 34, User Code::Erase a User Code (v2)

Field	Value
Command (v2)	EXTENDED_USER_CODE_SET (0x0B)
Number of User Codes (v2)	Controlling node defined
User Identifier 1..M (v2)	User defined or controlling node defined among supported User Identifiers.
User ID status (v2)	0x00
User Code Length (v2)	0x00
User Code (v2)	Omitted

4.20.2.3 Set the keypad mode (v2)

CL:0063.01.31.05.1 This action MUST be available to the end user if nodes are v2 or newer and the supporting node supports more than one keypad mode. When the end user performs this action, the issued command MUST comply with Table 35.

Table 35, User Code::Set the keypad mode

Field	Value
Command (v2)	USER_CODE_KEYPAD_MODE_SET (0x08)
Keypad Mode (v2)	User defined among supported keypad modes.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.20.2.4 Set the Master Code (v2)

CL:0063.01.31.06.1 This action MUST be available to the end user if nodes are v2 or newer and the supporting node supports the Master Code functionality. When the end user performs this action, the issued command MUST comply with Table 36.

Table 36, User Code::Set the Master Code

Field	Value
Command (v2)	MASTER_CODE_SET (0x0E)
Master Code Length (v2)	Controlling node defined based on the length of the User Code field. It MUST be possible to de-activate the Master Code if the supporting node supports Master Code Deactivation.
Master Code (v2)	User defined among supported ASCII characters with a length in the range 4..10 bytes.

4.20.3 Node properties

CL:0063.01.41.01.1 Controller MUST have a UI allowing the end user to see the following properties:

- Number of supported User Codes
- The list of last known set User Codes
- The current keypad mode, if the supporting node supports more than one (v2)
- The current set Master Code, if the supporting node supports a Master Code (v2)

4.20.4 Additional control requirements

It has been found that some version 1 nodes wrongfully report obfuscated User Codes in the User Code Report (e.g. '******').

CL:0063.01.52.01.1 A controlling node SHOULD understand that a code has been set correctly but cannot be read back with such nodes

CL:0063.01.52.02.1 If nodes are version 2 or newer, a controlling node SHOULD verify the User Code checksum (if supported) periodically (e.g. once a day) to ensure that User Code databases are synchronized.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.21 Window Covering Command Class, version 1

4.21.1 Mandatory interview

CL:006A.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 26.

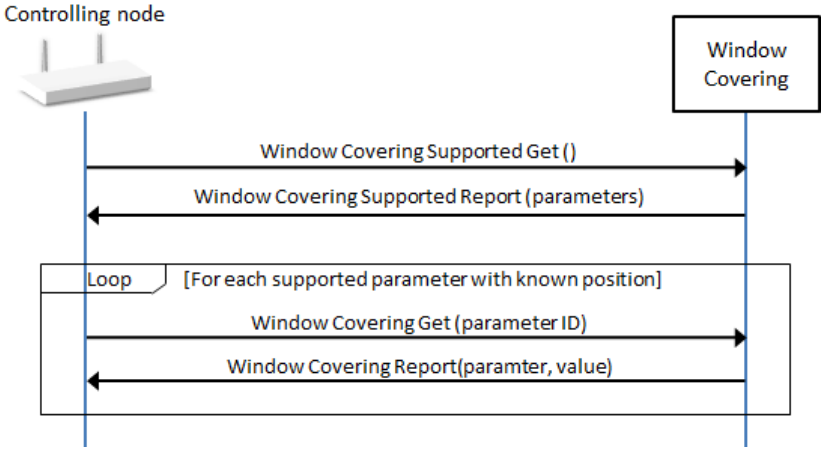

Figure 26, Window Covering Command Class interview

4.21.2 Minimum end user functionalities

CL:006A.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

4.21.2.1 Go to position

CL:006A.01.31.02.1 This action MUST be available to the end user for parameters ID with known positions (odd parameters IDs). When the end user performs this action, the issued command MUST comply with Table 37.

Table 37, Window covering::Go to a position

Field	Value
Command	WINDOW_COVERING_SET
Parameter count	User defined (≥ 0x01)
Parameter ID x	User defined among supported (odd values)
Value x	User defined among 0x00..0x63
Duration	User defined or 0xFF

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

4.21.2.2 Start level change up or down

CL:006A.01.31.03.1 This action MUST be available to the end user for all supported parameters ID. When the end user performs this action, the issued command MUST comply with Table 38.

Table 38, Window covering::Start level change up or down

Field	Value
Command	WINDOW_COVERING_START_LEVEL_CHANGE
Up/Down	User defined among 0x00 and 0x01
Parameter ID	User defined among supported parameters ID
Duration	User defined or 0xFF

4.21.2.3 Stop level change

CL:006A.01.31.04.1 This action MUST be available to the end user for all supported parameters ID. When the end user performs this action, the issued command MUST comply with Table 39.

Table 39, Window covering::Stop level change

Field	Value
Command	WINDOW_COVERING_STOP_LEVEL_CHANGE
Parameter ID	User defined among supported parameters ID

4.21.3 Node properties

CL:006A.01.42.01.1 Controller SHOULD have a UI allowing the end user to see the following properties:

- Last known position/value for all parameters IDs with known position

4.21.4 Additional control requirements

CL:006A.01.51.01.2 A controlling node MUST NOT interview and provide controlling functionalities for the Multilevel Switch Command Class for a node (or endpoint) supporting this Command Class, as it is a fully redundant and less precise application functionality.

5 Management Command Class Control Definitions

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.1 Association Command Class, version 1-3

5.1.1 Mandatory node interview

CL:0085.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 27.

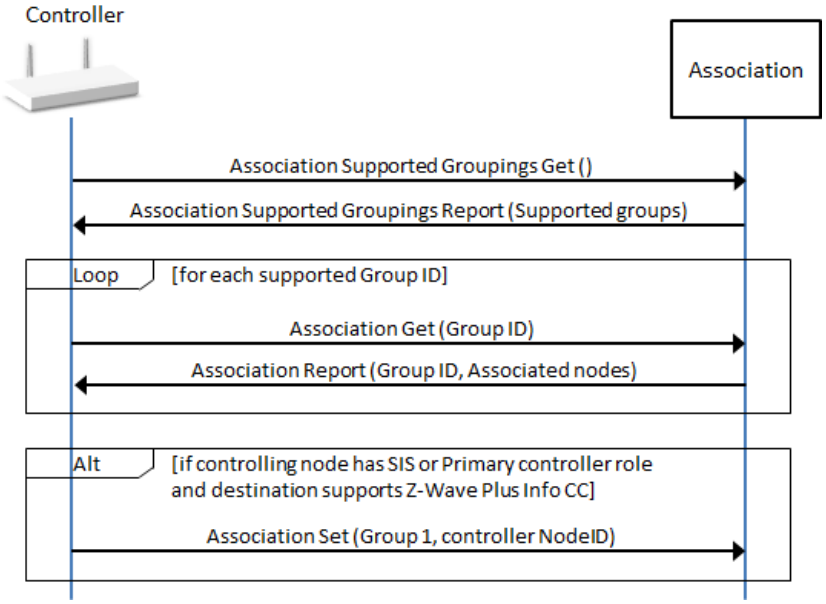

Figure 27, Association Command Class interview

5.1.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

CL:0085.01.31.01.1 A controlling node implementing a UI that allows an end user to establish association between nodes MUST NOT restrict the end user from establishing associations that are allowed. Refer to 5.1.4 for allowed associations.

5.1.3 Node properties

No node property is required to be made available to the end user for this Command Class.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.1.4 Additional control requirements

CL:0085.01.51.01.1 If the supporting node also supports Multi Channel Association and the controlling node controls Multi Channel Association, the controlling node MUST interview and control the Multi Channel Association Command Class instead of this Command Class.

CL:0085.01.51.02.1 A controlling node MUST use the Association Group Information (AGI) Command Class to probe the commands that a given association group will be sending before creating associations towards other nodes.

If an association group in a Node A sends one or more controlling commands:

CL:0085.01.51.03.3
- A controlling node MUST NOT associate Node A to a Node B destination that does not support the Command Class that the Node A will be controlling.

CL:0085.01.53.01.3
- A controlling node MAY create an association to a destination supporting an actuator Command Class if the actual association group sends Basic Control Command Class.

  For Association version 1 and version 2:

  CL:0085.01.51.04.3
  - A controlling node MUST NOT associate Node A to a Node B destination if Node A and Node B's highest Security Class are not identical.

  For Association version 3:

  CL:0085.03.51.01.1
  - A controlling node MUST NOT associate Node A to a Node B destination if Node A was not granted Node B's highest Security Class.

If an association group in Node A sends only supporting commands:

CL:0085.01.53.02.3
- A controlling node MAY create an association to any Node B destination if the actual association group sends commands reflecting the support of a Command Class by the sending Node/End Point. Refer to [10] for supporting/controlling commands.

CL:0085.01.51.06.1
- A controlling node MUST NOT associate Node A to a Node B destination if Node B was not granted Node A's highest Security Class.

5.1.4.1 Removing associations

CL:0085.01.51.05.1 A controlling node MUST NOT remove already associated nodes to a destination Group to associate themselves, unless:

- The destination NodeID/Endpoint has left the network (i.e. SIS has received a Device Reset Locally Notification)
- The destination of a group has changed capabilities and does not support the command received via the association group (also if a Multi Channel End Point is removed).
- An end user has actively confirmed to remove associations
- The lifeline group is full and the controlling node has the SIS Role.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.2 Association Group Information (AGI) Command Class, version 1-3

5.2.1 Mandatory node interview

CL:0059.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 28.

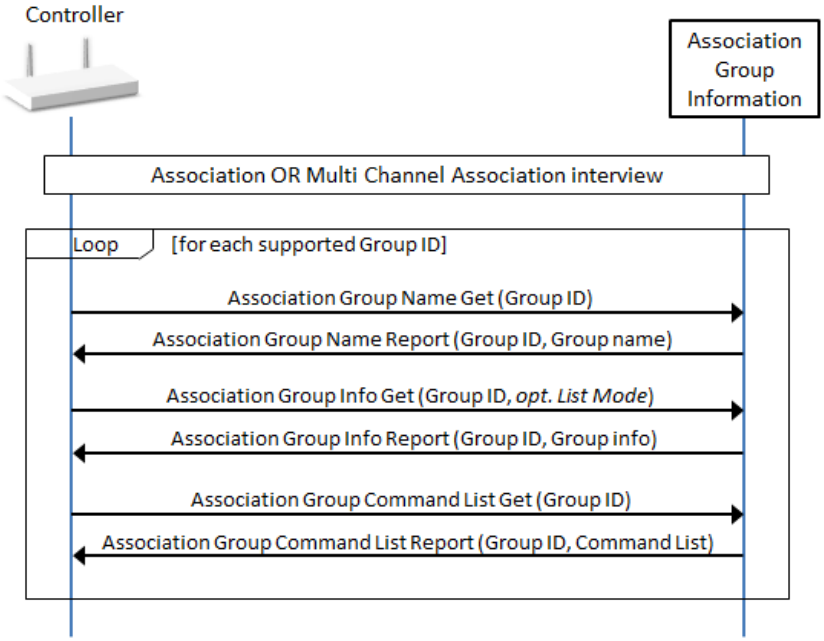

Figure 28, Association Group Information Command Class interview

CL:0059.01.23.01.1 A controlling node MAY issue a single Association Group Info Get Command by using the List Mode flag.

5.2.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

5.2.3 Node properties

No node property is required to be made available to the end user for this Command Class.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.3 Battery Command Class, version 1

5.3.1 Mandatory node interview

CL:0080.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 29.

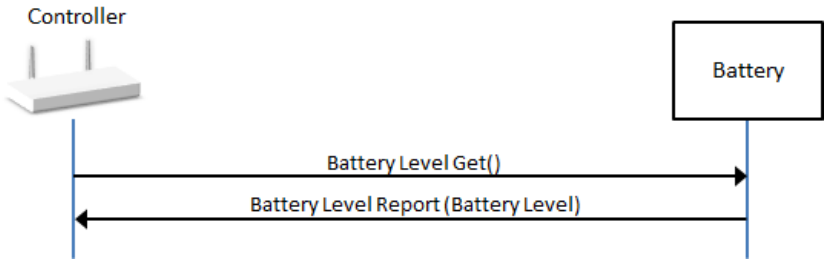

Figure 29, Battery Command Class interview

5.3.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

5.3.3 Node properties

CL:0080.01.41.01.1 A controlling node MUST allow the end user to see the last known battery level.

5.3.4 Additional control requirements

CL:0080.01.52.01.1 Unless unsolicited Battery Report Commands are received, a controlling node SHOULD Probe the current battery level at least every month

CL:0080.01.51.02.1 A controlling node MUST indicate to the end user that the battery needs to be replaced or reloaded when the supporting node issues a Battery Report with the *Battery Level* field set to 0xFF.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.4 Device Reset Locally Command Class, version 1

5.4.1 Mandatory node interview

No mandatory node interview is required for this Command Class.

5.4.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

5.4.3 Node properties

No node property is required to be made available to the end user for this Command Class.

5.4.4 Additional control requirements

CL:005A.01.52.01.1 A controlling node receiving the Device Reset Locally Notification Command SHOULD consider the sending node to be a failing node and accordingly perform relevant maintenance operations like removing failing nodes, removing associations to failing nodes, etc.

CL:005A.01.51.01.1 A controlling node receiving the Device Reset Locally Notification Command MUST indicate to the end user that the node has been reset and left the Z-Wave network.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.5 Firmware Update Meta Data Command Class, version 1-6

5.5.1 Mandatory node interview

CL:007A.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 30.

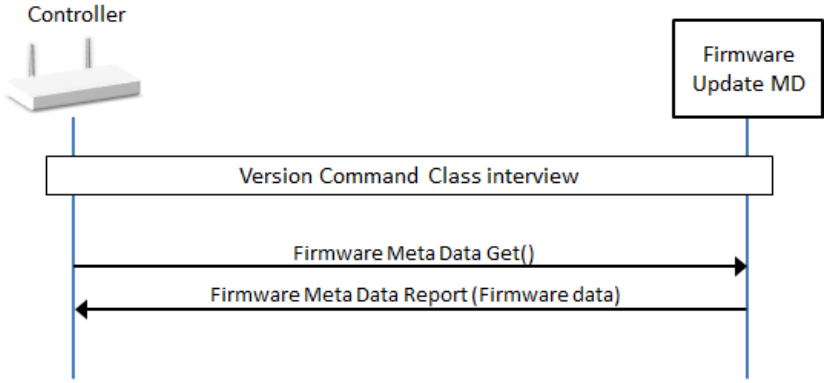

Figure 30, Firmware Update Meta Data Command Class interview

5.5.2 Minimum end user functionalities

5.5.2.1 Firmware update

CL:007A.01.32.01.1 A controlling node SHOULD provide a method for updating the firmware of a supporting node. The end user SHOULD be able to select a firmware file or ask the controller to look for updates automatically.

CL:007A.01.31.01.1 If this functionality is available, the issued commands MUST comply with Figure 31 when the end user performs this action.

CL:007A.01.33.01.1 A controlling node MAY use additional commands such as Firmware Update Activation Set Command for the firmware update.

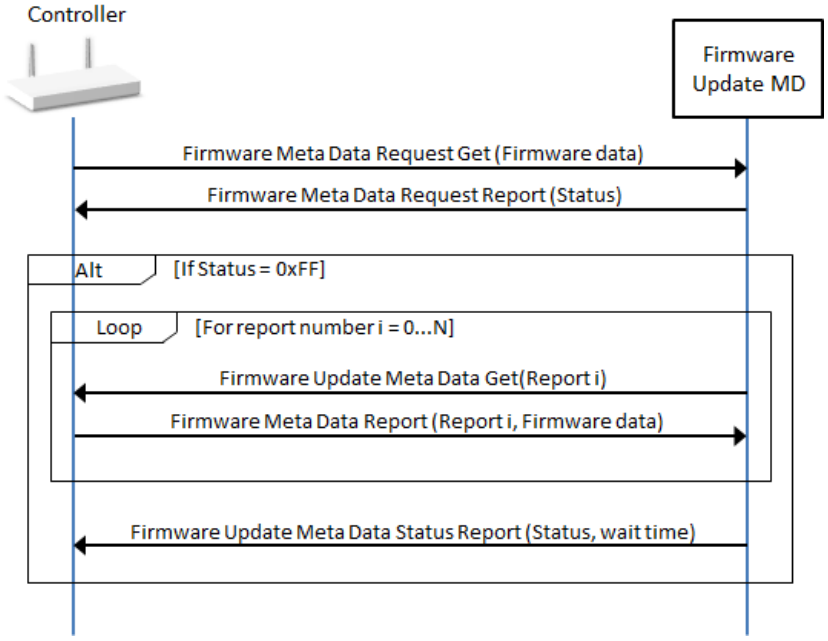

Figure 31, Firmware Update Meta Data::Firmware Update

CL:007A.01.32.02.1

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

If a controlling node allows the end user to interrupt an ongoing firmware update transfer, it SHOULD issue a FIRMWARE_UPDATE_MD_REPORT Command with the *Last* field set to 1 prematurely.

5.5.3 Node properties

No node property is required to be made available to the end user for this Command Class.

CL:007A.01.42.01.1 A controlling node SHOULD have a UI allowing the end user to see the Firmware version of a supporting node.

5.5.4 Additional control requirements

CL:007A.01.52.01.1 If the supporting node supports Battery Command Class and the controlling node controls Battery Command Class, the controlling node SHOULD issue a Battery Get and read the battery level before initiating a Firmware Update.

CL:007A.01.52.02.1 A controlling node SHOULD NOT initiate a Firmware Update if the supporting node Battery level is less than 50%.

CL:007A.01.51.01.1 A controlling node MUST perform a full interview of a node after performing a firmware update.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.6 Indicator Command Class, version 1-3

5.6.1 Mandatory node interview

CL:0087.01.21.01.1 A node controlling this Command Class MUST perform a supporting node interview according to Figure 32.

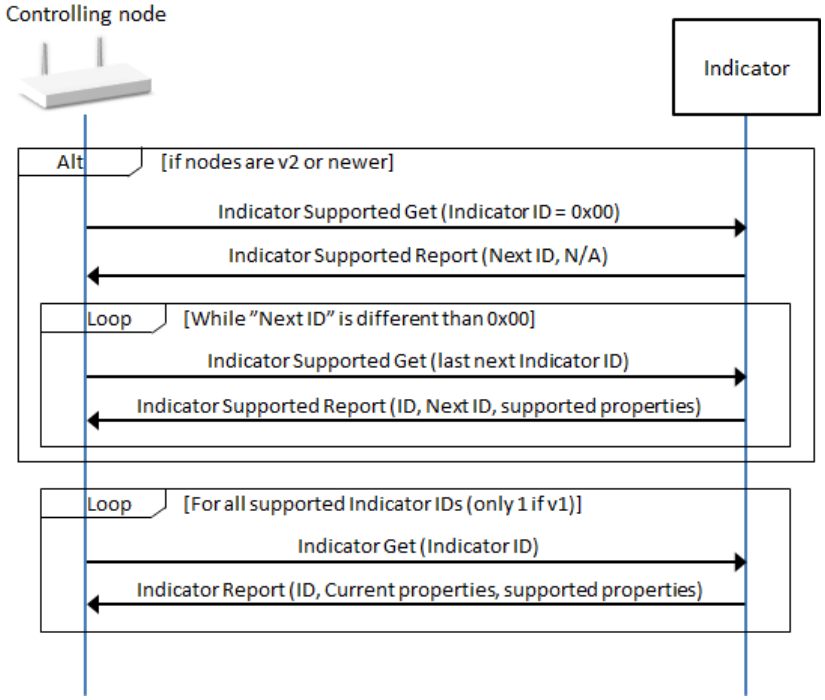

Figure 32, Indicator Command Class interview

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.6.2 Minimum end user functionalities

CL:0087.01.31.01.1 A node controlling this command class MUST allow the end user to perform the actions described below.

5.6.2.1 Identify

CL:0087.01.31.02.1 If the supporting and controlling nodes are version 3 or newer, the end user MUST be able to instruct the node to identify itself. When the end user performs this action, the issued command MUST comply with Table 40.

Table 40, Indicator::Identify

Field	Value
Command	INDICATOR_SET
Indicator 0 Value	0x00
Indicator object count	0x03
Indicator ID 1	0x50
Property ID 1	0x03
Value 1	0x08
Indicator ID 2	0x50
Property ID 2	0x04
Value 2	0x03
Indicator ID 3	0x50
Property ID 3	0x05
Value 3	0x06

The supporting node will be switched on 600ms and switched off 200ms three times.

CL:0087.01.33.01.1 A controlling node MAY hide this functionality away from the end user if the supporting node also supports the Wake Up Command Class.

5.6.3 Node properties

CL:0087.01.42.01.1 The controlling node SHOULD have a UI allowing the end user to see/access the following properties:

- Last known Indicators' state/value (ON/OFF or x%), if any

5.6.4 Additional control requirements

CL:0087.01.51.01.1 A node controlling this command class MUST NOT reuse the identify command for any other purpose than a node identification application.

CL:0087.01.52.01.3 A node controlling this Command Class SHOULD NOT make a supporting node blink 3 times for any indication (except when using the Identify Indicator for the Identify purpose).

CL:0087.01.52.02.1 A node controlling this Command Class SHOULD allow the end user to actuate additional indicating resources.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.7 Multi Channel Association Command Class, version 2-4

5.7.1 Mandatory node interview

CL:008E.01.21.01.1 A node controlling this command class MUST perform a supporting node interview according to Figure 33.

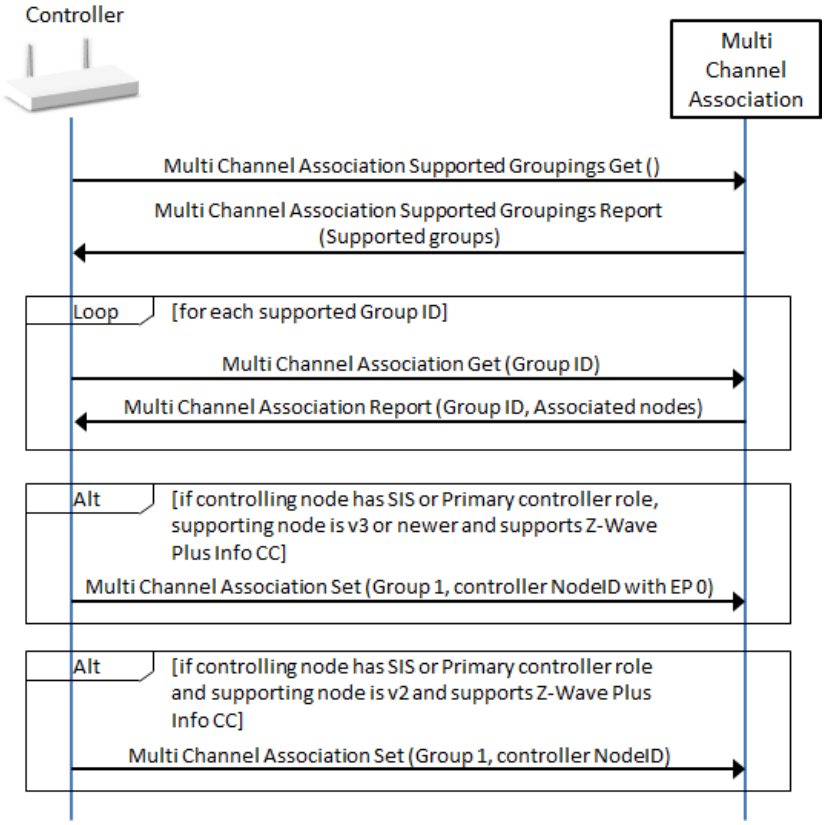

Figure 33, Multi Channel Association Command Class interview

CL:008E.01.21.02.2 The lifeline association MUST be an End Point Association (controller NodeID after the MULTI_CHANNEL_ASSOCIATION_SET_MARKER) if:

- Both nodes implement Multi Channel Association, version 3 or newer.
- The supporting node also supports the Multi Channel Command Class.

CL:008E.01.22.01.1 The lifeline association SHOULD be a NodeID association in any other case.

5.7.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

CL:008E.01.31.01.1 A controlling node implementing a UI which allows an end user to establish association between nodes MUST NOT restrict the end user from establishing associations that are allowed. Refer to 5.7.4 for allowed associations.

5.7.3 Node properties

No node property is required to be made available to the end user for this Command Class.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.7.4 Additional control requirements

CL:008E.01.51.01.1 If the supporting node also supports Association and the controlling node controls Association, the controlling node MUST NOT interview and control the Association Command Class.

CL:008E.01.51.02.1 A controlling node MUST use the Association Group Information (AGI) Command Class to probe the commands that a given association group will be sending before creating associations towards other nodes.

If an association group in a Node A sends one or more controlling commands:

- CL:008E.01.51.03.3 A controlling node MUST NOT associate Node A to a Node B destination that does not support the Command Class that the Node A will be controlling.
- CL:008E.01.53.01.3 A controlling node MAY create an association to a destination supporting an actuator Command Class if the actual association group sends Basic Control Command Class.

  For Multi Channel Association version 2 and version 3:

  - CL:008E.02.51.01.1 A controlling node MUST NOT associate Node A to a Node B destination if Node A and Node B's highest Security Class are not identical.

  For Multi Channel Association version 4:

  - CL:008E.04.51.01.1 A controlling node MUST NOT associate Node A to a Node B destination if Node A was not granted Node B's highest Security Class.

If an association group sends only supporting commands:

- CL:008E.01.53.02.2 A controlling node MAY create an association to any destination if the actual association group sends commands reflecting the support of a Command Class by the sending Node/End Point. Refer to [10] for supporting/controlling commands.
- CL:008E.01.51.06.1 A controlling node MUST NOT associate Node A to a Node B destination if Node B was not granted Node A's highest Security Class.

5.7.4.1 Removing associations

CL:008E.01.51.05.1 A controlling node MUST NOT remove already associated nodes to a destination Group to associate themselves, unless:

- The destination NodeID/Endpoint has left the network (i.e. SIS has received a Device Reset Locally Notification)
- The destination has changed capabilities and does not support the command received via the association group (also if a Multi Channel End Point is removed).
- An end user has actively confirmed to remove associations
- The lifeline group is full and the controlling node has the SIS Role.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.8 Version Command Class, version 1-3

5.8.1 Mandatory node interview

CL:0086.01.21.01.2 A node controlling this command class MUST perform a supporting node interview according to Figure 34.

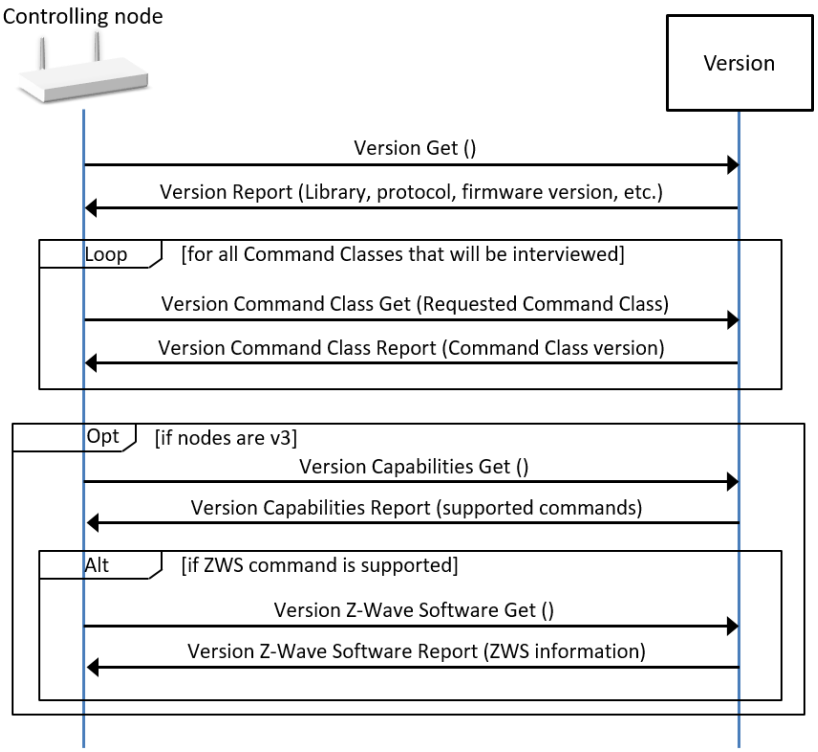

Figure 34, Version Command Class interview

CL:0086.01.21.02.1 The interview part starting from the Version Capabilities Get Command is optional. The Controlling node MUST interview the Version Capability Get Command before issuing the Version Z-Wave Software Get Command if the Controlling node has the intent of using the Z-Wave software version.

5.8.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

5.8.3 Node properties

No node property is required to be made available to the end user for this Command Class.

5.8.4 Additional control requirements

CL:0086.01.51.01.1 A controlling node interviewing a Multi Channel End Point MUST request the End Point's Command Class version from the Root Device if the End Point does not advertise support for the Version Command Class.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.9 Wake-Up Command Class, version 1-2

5.9.1 Mandatory node interview

CL:0084.01.23.01.1
CL:0084.01.21.01.2
If the controlling node has the inclusion controller or secondary controller role in a network, it MAY skip the node interview. In any case, it MUST NOT issue a Wake-Up Interval Set to a supporting node.

CL:0084.01.21.02.1
If the controlling node has the SIS or primary controller role in a network, it MUST perform a supporting node interview according to Figure 35.

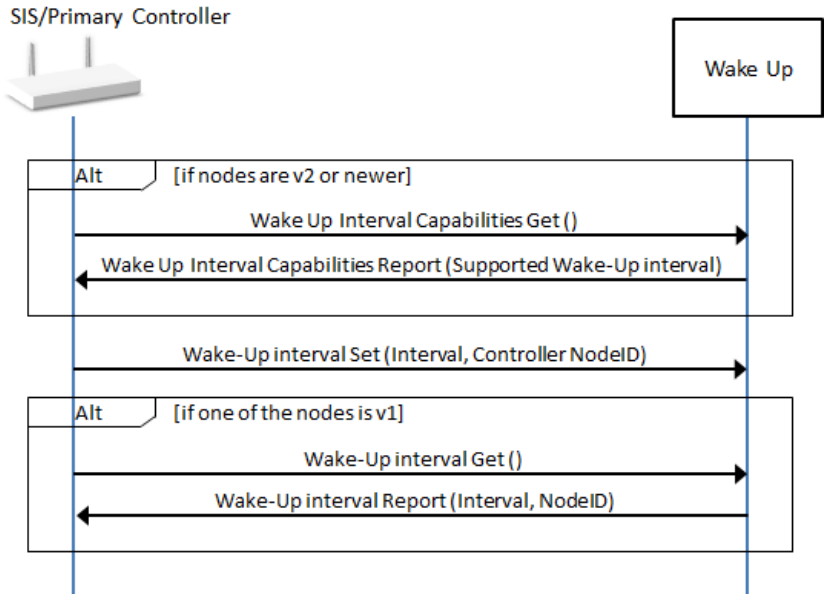

Figure 35, Wake Up Command Class interview

CL:0084.01.21.03.1
A controlling node MUST set a supported Wake Up Interval time value when commissioning a version 2 supporting node.

CL:0084.01.21.04.1
A controlling node MUST set its own NodeID as the Wake-Up destination.

5.9.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

5.9.3 Node properties

No node property is required to be made available to the end user for this Command Class.

CL:0084.01.42.01.1
A controlling node queuing commands for a Wake-Up node SHOULD indicate to the end user that the commands will be transmitted when the destination wakes up again.

CL:0084.01.43.01.1
A controlling node MAY show to the end user the expected time until the next Wake-Up.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

5.9.4 Additional control requirements

CL:0084.01.52.01.1 A controlling node SHOULD verify that the Wake Up Interval Set Command executed successfully by either using Supervision encapsulation or reading back the Wake Up Interval settings.

CL:0084.01.52.02.1 If the Wake Up Interval Set Command was ignored by a version 1 supporting node, the controlling node SHOULD try again using the currently defined interval at the supporting node and its NodeID.

CL:0084.01.52.03.1 A controlling node SHOULD read the Wake Up Interval of a supporting node when the delays between Wake Up periods are larger than what was last set at the supporting node.

6 Transport-Encapsulation Command Class Control Definitions

6.1 CRC-16 Encapsulation Command Class, version 1

6.1.1 Mandatory node interview

No node interview is required for this Command Class

6.1.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

6.1.3 Node properties

No node property is required to be made available to the end user for this Command Class.

6.1.4 Additional control requirements

CL:0056.01.52.01.1 A controlling node SHOULD use CRC-16 encapsulation to communicate with a supporting node when no security encapsulation is used and the communication speed is lower than 100 kbits/s.

CL:0056.01.51.01.1 A controlling node MUST support the CRC-16 Command Class and correctly handle received commands encapsulated with CRC-16.

CL:0056.01.51.02.1 A controlling node MUST use CRC-16 encapsulation to return a response to a command if the request was received using CRC-16 encapsulation (aka “answer-as-asked”).

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

6.2 Multi Channel Command Class, version 3-4

6.2.1 Mandatory node interview

CL:0060.01.21.01.3 A node controlling this Command Class MUST perform a supporting node interview as follows:

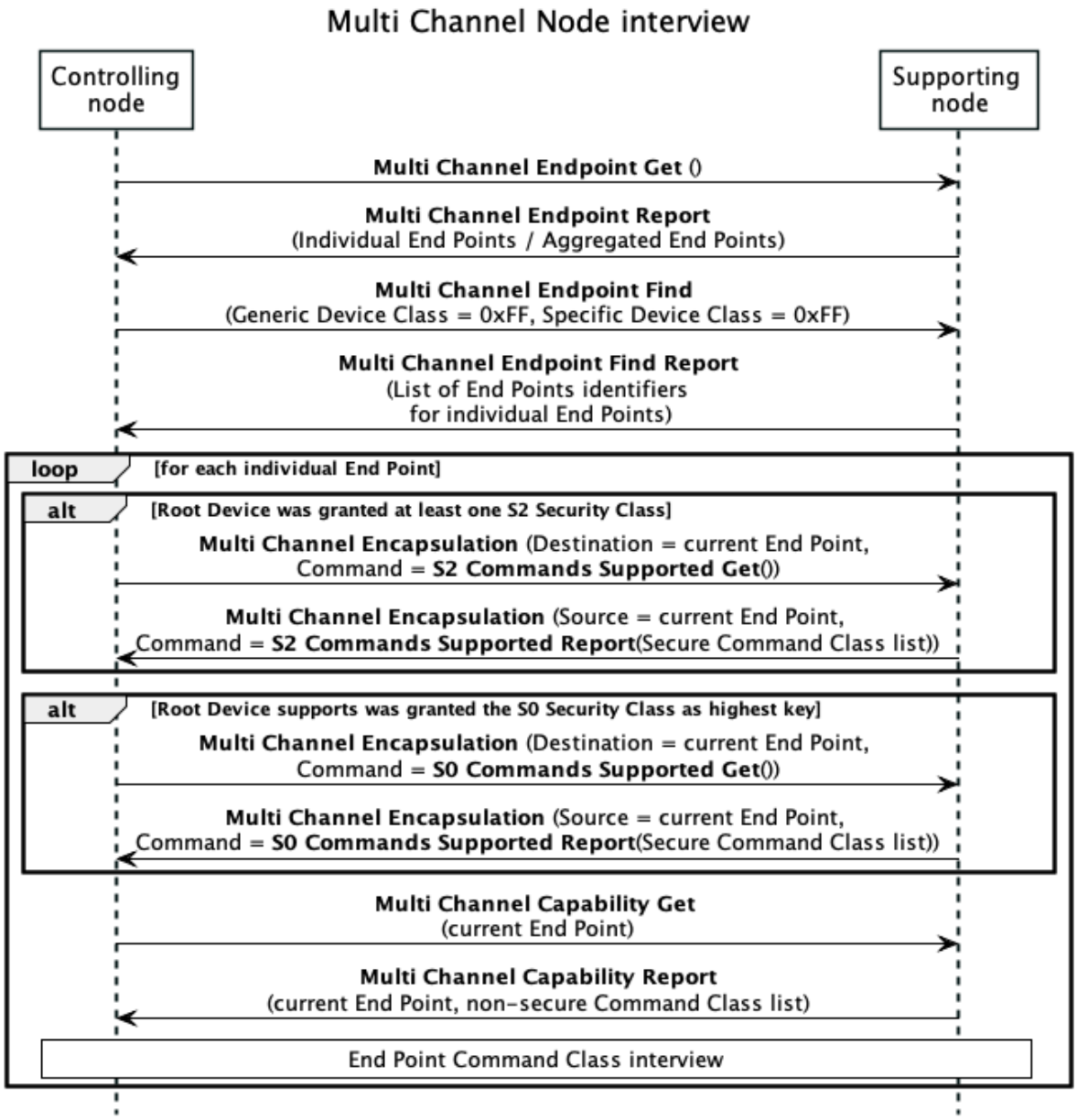

Figure 36, Multi Channel Command Class interview

CL:0060.01.23.01.1 A controlling node MAY skip the interview of aggregated End Points and MAY skip issuing a Multi Channel Capability Get for any of the aggregated endpoints.

6.2.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

6.2.3 Node properties

No node property is required to be made available to the end user for this Command Class.

6.2.4 Additional control requirements

CL:0060.01.51.01.2 A node controlling this Command Class MUST provide control of all its controlled command classes on every individual End Point.

6.2.4.1 Root Device and End Point Command Classes

When End Point functionality is advertised in the Root Device NIF, service discovery mechanisms like mDNS and installer-style GUIs risk presenting a Root Device functionality which is actually a mirror representation of an End Point functionality.

CL:0060.01.52.01.1 Therefore, application command classes of the Root Device capabilities that are also advertised by at least one End Point SHOULD be filtered out by controlling nodes before presenting the functionalities via service discovery mechanisms like mDNS or to users in a GUI.

6.2.4.2 S0 only Multi Channel nodes

The following considerations apply for nodes supporting S0 and Multi Channel Command Class but do not support S2 Command Class.

Legacy S0 only nodes may implement some secure and some non-secure End Points. Such a node supporting S0 must advertise S0 in the Multi Channel Capability Report Command for a given End point if the End Point can be addressed with S0 encapsulation.

It has been found that legacy nodes do not always advertise S0 in their Multi Channel Capability Report Command but still support their Command Classes with S0 encapsulation.

CL:0060.01.52.02.1 A controlling node SHOULD use S0 encapsulation with all End Points if the Root Device was bootstrapped with the S0 Command Class.

CL:0060.01.53.01.1 A controlling node MAY interview and control Command Classes present in the Multi Channel Capability Report of an End Point non-securely if the End Point does not respond to S0 encapsulated traffic.

6.2.4.3 Association and Multi Channel Association mapping

The following considerations apply for nodes supporting Association and/or Multi Channel Association and Multi Channel Command Class.

The Association groups functionality may be fully or partially mirrored between the Root Device and End Points. For example, an Association Remove Command issued to the Root Device may clear the association destination at the End Point groups.

CL:0060.01.52.03.1 A controlling node SHOULD read back the destinations in every group, including End Points groups after configuring associations.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

6.3 Security 0 Command Class

6.3.1 Mandatory node interview

CL:0098.01.21.01.1 A node controlling this Command Class MUST observe the Z-Wave Plus Role Type specification [6] requirements when including an S0 node.

6.3.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

6.3.3 Node properties

No node property is required to be made available to the end user for this Command Class.

6.3.4 Additional control requirements

A node is controlling S0 when it can perform S0 bootstrapping of other nodes. The S0 bootstrapping
CL:0098.01.51.01.1 process is described in the S0 Command Class [4] and a controlling node MUST observe these requirements.

CL:0098.01.51.02.1 A node controlling this Command Class MUST provide control of all its controlled command classes using S0 encapsulation.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

6.4 Security 2 Command Class

6.4.1 Mandatory node interview

CL:009F.01.21.01.1 A node controlling this command class MUST observe the Z-Wave Plus Role Type specification [6] requirements when including an S2 node.

6.4.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

6.4.3 Node properties

No node property is required to be made available to the end user for this Command Class.

6.4.4 Additional control requirements

S2 Security is controlled when a node can perform S2 bootstrapping of other nodes. The Bootstrapping
CL:009F.01.51.01.1 process is described in the S2 Command Class [4] and a controlling node MUST observe these requirements.

CL:009F.01.51.02.1 A node controlling this Command Class MUST provide control of all its controlled command classes using S2 encapsulation and at all its granted S2 Security Classes.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

6.5 Supervision Command Class, version 1

6.5.1 Mandatory node interview

There is no mandatory node interview for a node controlling this Command Class.

6.5.2 Minimum end user functionalities

No minimum end user functionality is required for this Command Class.

6.5.3 Node properties

No node property is required to be made available to the end user for this Command Class.

6.5.4 Additional control requirements

CL:006C.01.51.01.1 A node issuing Supervision Get Commands MUST declare the Supervision Command Class as controlled during certification.

CL:006C.01.51.02.1 Any node issuing Supervision Get Commands MUST comply with the following:

- The Session ID field MUST be incremented each time a new unique Supervision Get Command is issued.
- A sending node MAY use the same Session ID for a multicast and singlecast follow-up carrying the same encapsulated command. A sending node MAY also use the same Session ID for all destinations of singlecast follow-up commands.

CL:006C.01.52.01.1 It has been found that some nodes issue Wake Up Notifications using the same Supervision SessionID every time. A controlling node SHOULD accept Wake Up Notifications even if they use the same SessionID.

.

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.

References

[1] IETF RFC 2119, Key words for use in RFC's to Indicate Requirement Levels, http://tools.ietf.org/pdf/rfc2119.pdf

[2] Z-Wave Application Command Class Specification

[3] Z-Wave Management Command Class Specification

[4] Z-Wave Transport-Encapsulation Command Class Specification

[5] Z-Wave Network-Protocol Command Class Specification

[6] Z-Wave Plus Role Type Specification.

[7] Z-Wave Plus v2 Device Type Specification.

[8] Notification Command Class, list of assigned Notifications

[9] Multilevel Sensor Command Class, list of assigned Multilevel Sensor types and scales

[10] List of defined Z-Wave Command Classes

[11] Anti-Theft Command Class, list of assigned Locking Entity IDs

© 2021 Z-Wave Alliance, Inc. All Rights Reserved. This document may only be copied and distributed internally.