



Software Design Specification

Z-Wave Plus Role Type Specification

Document No.:	SDS11846
Version:	15
Description:	This document defines the Z-Wave Plus Role Types, which specify how a Z-Wave Plus node must react from a network perspective.
Written By:	NTJ;BBR;ABR;JFR;NOBRIOT
Date:	2017-01-04
Reviewed By:	ABR;BBR;JFR;NTJ;NOBRIOT;TRO
Restrictions:	Public

Approved by:

Date	CET	Initials	Name	Justification
2017-01-04	13:45:07	NTJ	Niels Thybo Johansen	

Documentation disclaimer on next page regarding copyright notice, trademark notice, license restrictions warranty/consequential damages disclaimer, warranty disclaimer, restricted rights notice and hazardous applications notice.



DOCUMENTATION DISCLAIMER

Copyright Notice

Copyright © August 23, 2016, Sigma Designs, Inc. and/or its affiliates. All rights reserved.

Trademark Notice

Sigma Designs, Inc. and Z-Wave are the registered trademarks of Sigma Designs, Inc. and/or its affiliates. Other names may be trademarks of their respective owners.

License Restrictions Warranty/Consequential Damages Disclaimer

This documentation is provided under certain restrictions on use and disclosure and is protected by intellectual property laws. You may not license, any part, in any form, or by any means. You may use, copy and re-distribute this documentation, in whole or in part. This permission does not grant the recipient's right to modify information contained in this documentation and redistribute this modified information, in whole or in part. Notwithstanding anything contained to the contrary herein, the creation of any derivative works which affects Z-Wave interoperability, based on this documentation shall be strictly prohibited, unless such derivative works are first submitted to the Z-Wave Alliance for review and approval.

Warranty Disclaimer

The information contained herein is subject to change without notice and is not warranted to be error-free. Sigma Designs and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to this documentation and will not be responsible for any loss, costs, or damages incurred due to the use of this documentation.

Restricted Rights Notice

If this is documentation that is delivered or accessed by the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT END USERS: Any Sigma Designs software, hardware and/or documentation delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs and/or software or documentation, including any integrated software, any programs installed on hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

Hazardous Applications Notice

This documentation is developed for general use. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this documentation to create or facilitate the creation of dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Sigma Designs and its affiliates disclaim any liability for any damages caused by use of this documentation in dangerous applications.

REVISION RECORD

Doc. Ver.	Date	By	Pages affected	Brief description of changes
13	20160823	JFR	All	Prepared for Public Z-Wave initiative
14	20161020	NOBRIOT	3.4.1 4.9	Integrated contents from 2016C contributions - Added Security 2 controller bootstrapping requirements - Added the NAS Role Type
15	20170102	NOBRIOT	3.4.1, 3.8.2 & 3.10	Integrated contents from 2016D contributions

Table of Contents

1	ABBREVIATIONS	1
2	INTRODUCTION	1
2.1	Purpose	1
2.2	Precedence of definitions	1
2.3	Terms used in this document	2
3	Z-WAVE COMPLIANCE OVERVIEW	3
3.1	Controllers and slaves	3
3.2	SIS Assignment	3
3.2.1	Controller network roles	3
3.2.2	Portable Controllers & non-SIS capable Static Controllers	3
3.2.3	Static Controllers	4
3.2.4	SIS return route assignment	4
3.3	Inclusion	4
3.4	Security bootstrapping	4
3.4.1	Security 0 Command Class	4
3.4.1	Security 2 Command Class	4
3.4.1.1	Bootstrapping capabilities	4
3.4.1.2	Granting Security classes key	5
3.4.1.3	Informing the user about security	5
3.5	Device Reset Locally support	6
3.6	Polling Devices	6
3.6.1	Polling with no errors	6
3.6.2	Polling with transmit error	7
3.6.3	Polling with missing Report frame	8
3.7	Unsolicited communication	9
3.7.1	Unsolicited data collection communication	10
3.7.2	Unsolicited control communication	10
3.8	Runtime communication	10
3.8.1	Routing	10
3.8.2	Heartbeat communication timeout protection	12
3.9	Network maintenance	13
3.10	Encapsulation order	14
3.11	Lifeline concept and other associations	15
	ROLE TYPE OVERVIEW	16
3.12	Detecting the Role Type of a device	18
4	ROLE TYPE DEFINITIONS	19
4.1	Central Static Controller (CSC)	20
4.1.1	CSC Protocol Requirements	20
4.1.1.1	If first node in the network	20
4.1.2	CSC Setup	20
4.1.2.1	Inclusion process	20
4.1.2.2	CSC including a SSC, PC, RPC or NAS	20
4.1.2.3	CSC including a PS, LSS or RSS	21
4.1.2.4	CSC including an AOS	21
4.1.2.5	CSC including another CSC	21
4.1.2.6	CSC included by a PC, RPC, SSC	22
4.1.3	CSC Runtime Configuration	22
4.1.4	CSC Runtime Communication	22

4.2	Sub Static Controller (SSC)	23
4.2.1	SSC Protocol Requirements	23
4.2.1.1	If first node in the network	23
4.2.2	SSC Setup	23
4.2.2.1	Inclusion process	23
4.2.2.2	SSC including a CSC	23
4.2.2.3	SSC including an RPC, PS or RSS	24
4.2.2.4	SSC including an SSC, PC, AOS, LSS or NAS	24
4.2.3	SSC Runtime Configuration	24
4.2.4	SSC Runtime communication	24
4.3	Portable Controller (PC)	25
4.3.1	PC Protocol Requirements	25
4.3.1.1	If first node in the network	25
4.3.2	PC Setup	25
4.3.2.1	Inclusion process	25
4.3.2.2	PC including a CSC	25
4.3.2.3	PC including an RPC, PS or RSS	26
4.3.2.4	PC including an SSC, PC, AOS, LSS or NAS	26
4.3.3	PC Runtime Configuration	26
4.3.4	PC Runtime communication	26
4.4	Reporting Portable Controller (RPC)	27
4.4.1	RPC Protocol Requirements	27
4.4.1.1	If first node in the network	27
4.4.2	RPC Setup	27
4.4.2.1	Inclusion process	27
4.4.2.2	RPC including a CSC	27
4.4.2.3	RPC Including an RPC, PS or RSS	28
4.4.2.4	RPC including an SSC, PC, AOS, LSS or NAS	28
4.4.3	RPC runtime configuration	28
4.4.4	RPC runtime communication	29
4.5	Portable Slave (PS)	30
4.5.1	PS Protocol Requirements	30
4.5.2	PS Setup	30
4.5.2.1	Inclusion process	30
4.5.3	PS Runtime configuration	30
4.5.4	PS Runtime communication	30
4.6	Always On Slave (AOS)	31
4.6.1	AOS Protocol Requirements	31
4.6.2	AOS Setup	31
4.6.2.1	Inclusion process	31
4.6.3	AOS Runtime Configuration	31
4.6.4	AOS Runtime communication	31
4.7	Reporting Sleeping Slave (RSS)	32
4.7.1	RSS Protocol Requirements	32
4.7.2	RSS Setup	32
4.7.2.1	Inclusion process	32
4.7.3	RSS Runtime configuration	32
4.7.4	RSS Runtime communication	32
4.8	Listening Sleeping Slave (LSS)	33
4.8.1	LSS Protocol Requirements	33
4.8.2	LSS Setup	33
4.8.2.1	Inclusion process	33
4.8.3	LSS Runtime configuration	33
4.8.4	LSS Runtime communication	33
4.9	Network Aware Slave (NAS)	34
4.9.1	NAS Protocol Requirements	34
4.9.2	NAS Setup	34

4.9.2.1	Inclusion process.....	34
4.9.3	NAS Runtime Configuration.....	34
4.9.4	NAS Runtime communication.....	34
APPENDIX A INCLUSION PROCESS.....		35
REFERENCES.....		37
INDEX.....		38

Table of Figures

Figure 1, Polling (No errors, without security).....	7
Figure 2, Polling (No errors, with security).....	7
Figure 3, Polling (No Ack, without security).....	8
Figure 4, Polling (No Ack, with security 0).....	8
Figure 5, Polling (No Report frame, without security).....	9
Figure 6, Polling (No Report frame, with security).....	9
Figure 7, Successful transmission using last working routes.....	10
Figure 8, Successful transmission using Explorer Frame.....	11
Figure 9, Unsuccessful transmission.....	12
Figure 10, Wake Up Command Class.....	13
Figure 11, Encapsulation overview.....	14
Figure 12, Node Setup.....	19
Figure 13, Inclusion process for the node being included.....	35
Figure 14, Inclusion process for the including node.....	36

Table of Tables

Table 1, Overview of Role Types.....	16
Table 2, Role Type identifiers.....	18

1 ABBREVIATIONS

Abbreviation	Explanation
AOS	Always On Slave
AGI	Association Group Information
CSC	Central Static Controller
DT	Device Type
NAS	Network Aware Slave
NIF	Node Information Frame
PC	Portable Controller
RPC	Reporting Portable Controller
PS	Portable Slave
LSS	Listening Sleeping Slave
SDK	Software Developer's Kit
SIS	SUC (Node) ID Server
RSS	Reporting Sleeping Slave
SSC	Sub Static Controller
SUC	Static Update Controller

2 INTRODUCTION

2.1 Purpose

This document describes the Z-Wave Plus Role Types. The purpose of the Role Type is to provide a high level definition of how Z-Wave nodes must react from a Z-Wave networking perspective.

This document is not meant to be read in full. It is aimed at being a scalable documentation process for network specific functionality for various Z-Wave devices. It should be read together with the Device Type specification [1], which highlights what Role Types should be used for different Device Types. A device will typically have one Role Type associated with it, but in some cases there can be more than one. The developer now only needs to look at one Role Type to determine the implementation of the network specific functionality to pass certification.

It is however necessary to understand how the Central Static Controller (CSC) works as most devices will heavily depend on it for direct communication.

2.2 Precedence of definitions

In terms of reviewing products for Z-Wave Plus Compliance, definitions in this document have precedence over the files distributed as part of the Software Developer's Kit (SDK). However, assignments of identifiers for all Role Types, Device Types, Device Classes and Command Classes are located in [5].

Role Type, Device Type and Command Class Specifications approved as a final version during the Type/Class development process have precedence over this document temporarily until integrated into this document.

2.3 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 [4].

3 Z-WAVE COMPLIANCE OVERVIEW

The following sections present Z-Wave properties applying to all Z-Wave Plus Role Types defined in this document. Requirements presented in this chapter MUST be respected by all Z-Wave Plus devices.

3.1 Controllers and slaves

Based on the Role Type, a node can be either a controller or a slave.

Controllers are capable of setting up and performing maintenance operations in a Z-Wave network.

Slaves do not offer any network setup or maintenance function. Slaves can only be added or removed from a network by a controller. Slaves can nevertheless send commands to other nodes and “control” others at the application level.

3.2 SIS Assignment

3.2.1 Controller network roles

A controller can take the following network roles:

Primary Controller: It is the controller that is used to set up and maintain a network. It can include/exclude nodes and knows the network topology. When no SUC/SIS is present in the network, other controllers included by the Primary Controller MUST become Secondary Controllers.

Secondary Controller: The Secondary Controller can control nodes but MUST NOT include/exclude nodes. The Secondary Controller MUST NOT provide any other network functionality than Learn Mode.

Static Update Controller (SUC): When a controller is configured as SUC, the Primary Controller automatically sends network updates to the SUC. The SUC is in charge of keeping the network topology map up to date and deliver it to any controller upon request.

SUC ID Server (SIS): When a SUC is also configured as SIS, it enables other controllers to include/exclude nodes on its behalf, by granting NodeIDs for the nodes to include. The SIS automatically becomes the Primary Controller when enabled.

Inclusion Controller: A controller included in a network with a SIS becomes an Inclusion Controller. It can include/exclude nodes on behalf of the SIS and all network management functionalities supported by the controller MUST be available.

Controllers provide network management functionalities such as Learn Mode, Network inclusion/exclusion or remove/replace failing nodes. Requirements depend on the Role Types and are detailed in Chapter 4

3.2.2 Portable Controllers & non-SIS capable Static Controllers

A Z-Wave Plus network may have no SIS capable controller. For instance this is the case if the network consists of a Portable Controller (PC) which is used to include a number of Always On Slaves (AOS). In this case, the PC acts as the Primary Controller.

If no SIS is present in the network, when including a static controller supporting SIS functionality, the Primary Controller MUST assign the SIS role to the new static controller.

3.2.3 Static Controllers

All static controllers that support SIS functionality MUST accept to become SIS upon request from a Primary Controller.

A static controller operating as Primary Controller that supports SIS functionality MUST assume the SIS role when creating a new network.

3.2.4 SIS return route assignment

When the SIS is present, an including node MUST always assign SIS return route when including a slave type device.

3.3 Inclusion

A Z-Wave Plus compliant node MUST support both Classic and Network Wide Inclusion (NWI)

All nodes (controllers and slaves) can enter Learn Mode. Learn Mode is used for several purposes:

- If a node is not included in a network (or a controller is alone in its own network), Learn Mode is used for joining a network.
- If a node is included in a network, Learn Mode is used for being excluded from the network

Appendix A outlines the inclusion process.

3.4 Security bootstrapping

3.4.1 Security 0 Command Class

Controllers MUST be able to perform Security 0 bootstrapping if they support the Security 0 Command Class. Refer to [1].

If a controller has the Inclusion Controller role in a network and includes a node that supports Security 0 Command Class only (i.e. does not support Security 2 Command Class), it MUST perform Security 0 bootstrapping immediately after including the node.

3.4.1 Security 2 Command Class

The following sections describe requirements for controllers supporting Security 2 Command Class

3.4.1.1 Bootstrapping capabilities

Security 2 mandates certain functionalities depending on the controller's role in the network.

If a controller has the SIS role:

- It MUST support the SIS side of the Inclusion Controller Command Class
- It MUST perform Security 2 bootstrapping.
- It MUST support all Security 2 Security Classes
- It MUST have input and display method for support of all Security Classes

If a controller has the Inclusion Controller role:

- It MUST support the Inclusion Controller side of the Inclusion Controller Command Class
- It MUST NOT perform Security 2 bootstrapping
- It MAY support any Security 2 Security Classes
- It MAY have input and display method depending on supported Security Classes

If a controller has the Primary Controller role:

- It MAY perform Security 2 bootstrapping
- It MAY support one or more Security 2 Security Classes
- It MAY have input and display method depending on supported security classes

3.4.1.2 Granting Security classes key

A controller with a user interface for PIN code input (and optionally a QR scanning capability) MUST comply with following when bootstrapping S2 nodes:

- It MUST grant membership of all requested Classes if the joining node requests membership of the S2 Access Control Class
- It SHOULD grant only the S2 Unauthenticated Class key by default if the joining node does not request membership of the S2 Access Control Class
- It MUST ask the user for confirmation before granting S2 Authenticated Class key if the node does not request membership of the S2 Access Control Class.
- It SHOULD provide a way to inspect and adjust the list of the Security Class memberships that will be granted to the joining node

A constrained controller with no QR scanning capability and no user interface for PIN code input MUST comply with following when bootstrapping S2 nodes:

- It MUST grant membership of the S2 Unauthenticated Class if the joining node requests membership of the S2 Unauthenticated Class.
- It MUST abort the S2 bootstrapping entirely (grant no key) if the joining node does not request membership of the S2 Unauthenticated Class.

3.4.1.3 Informing the user about security

If a node has been security bootstrapped with the S0 Command Class in a S2 capable network, the SIS MUST issue a warning message to the user informing that the node has not been included securely.

This is made to ensure that the end user is aware of which security level a node has been bootstrapped and therefore identify if a S0 downgrade attack took place during bootstrapping.

If an S2 node has not been granted the highest requested S2 key during bootstrapping, the SIS MUST issue a warning message to the user informing that the node has not been included with the highest security.

3.5 Device Reset Locally support

If a device can be reset to factory default locally on the device, the device **MUST** be able to issue a Device Reset Locally Command via its Lifeline to notify the Lifeline destination that the device has been reset to its factory default state. The product documentation **MUST** include instructions on how to perform a reset to factory default operation. The device **MUST** clear network settings (HomeID and NodeID) after issuing the Device Reset Locally Command.

If a device cannot be locally (or manually) reset to factory default, the device **MUST NOT** implement the Device Reset Locally functionality and **MUST NOT** list the Device Reset Locally Command Class identifier in the NIF.

If a device is reset, it **MUST** perform the reset operation regardless of whether or not the delivery of the Device Reset Locally Notification is successful.

It is **RECOMMENDED** that devices implement a mechanism that allows the user to determine when the reset operation is completed.

3.6 Polling Devices

A controlling device may monitor nodes or issue requests for status information. Communication patterns include, but are not limited to, the transmission of a:

- No Operation (NOP) Command to verify that a node is operational
- Get Command requesting status information in a Report Command
- Set Command followed by a Get Command requesting status information in a Report Command

Communication **MUST** be considered polling if a controlling device autonomously sends requests to one or more nodes in a repeating fashion to monitor nodes or to get information from nodes. This applies to any combination of commands.

Z-Wave is a radio technology with limited bandwidth. Therefore, it is **NOT RECOMMENDED** to use polling. If used, polling communication **MUST** comply with the requirements stated in the sections 3.6.1 through 3.6.3.

Communication **MAY** be considered non-polling if:

- A device issues one or more commands in a burst initiated by a user action. This applies to any combination of commands; also requests.
- A devices issues one or more commands initiated by the inclusion of a new node. This applies to any combination of commands; also requests.

3.6.1 Polling with no errors

Two timers named CommandTime and PollTime are used for polling requirements with no error. Illustrations are given for secure and non-secure cases in Figure 1 and Figure 2

The following requirements apply to the normal case where a polling request is successful.

- CommandTime **MUST** be measured by the application
- The application **MUST** wait PollTime before polling any other node
- PollTime **SHOULD** be 10 seconds + CommandTime or more
- PollTime **MUST NOT** be less than 1 second + CommandTime

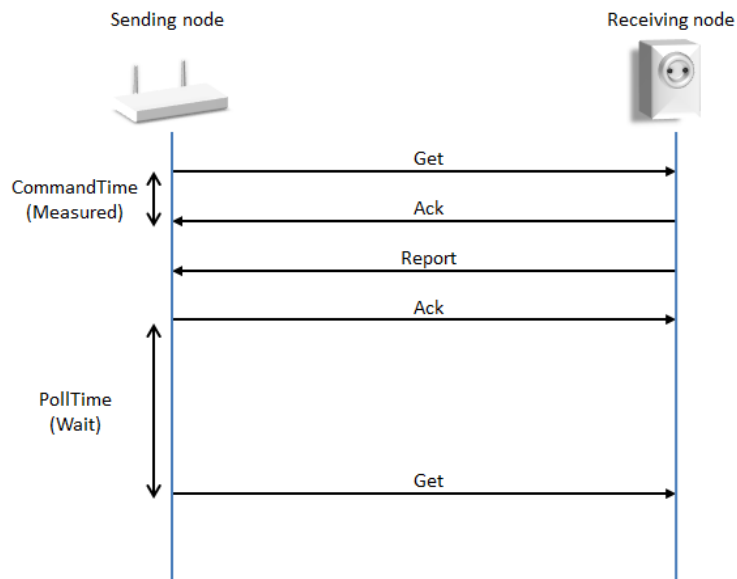


Figure 1, Polling (No errors, without security)

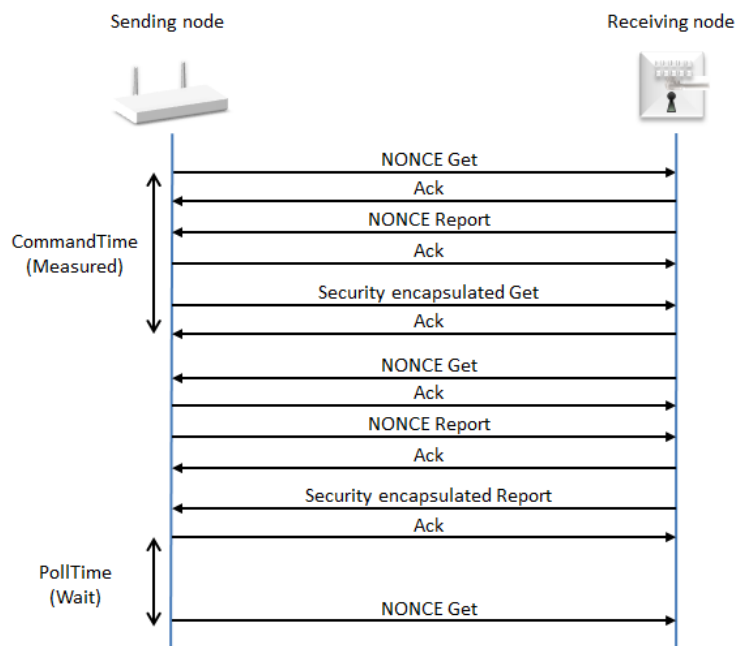


Figure 2, Polling (No errors, with security)

3.6.2 Polling with transmit error

Two timers named CommandTime and PollTime are used for polling requirements with transmission error. Illustrations are given for secure and non-secure cases in Figure 3 and Figure 4. Note that in the case of a missing Ack, the Sending node MUST transmit the Get Command 3 times before considering the Ack to be missing. CommandTime is measured from the first Get Command transmission to the timeout.

The following requirements apply to the case where a polling request is not successful.

- If the transmission fails, the application **MUST** wait PollTime before polling any other node. PollTime **MUST** be 10 seconds + CommandTime or more

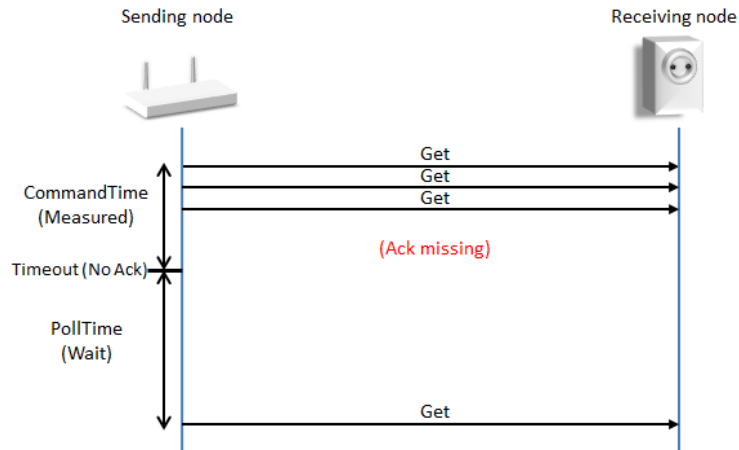


Figure 3, Polling (No Ack, without security)

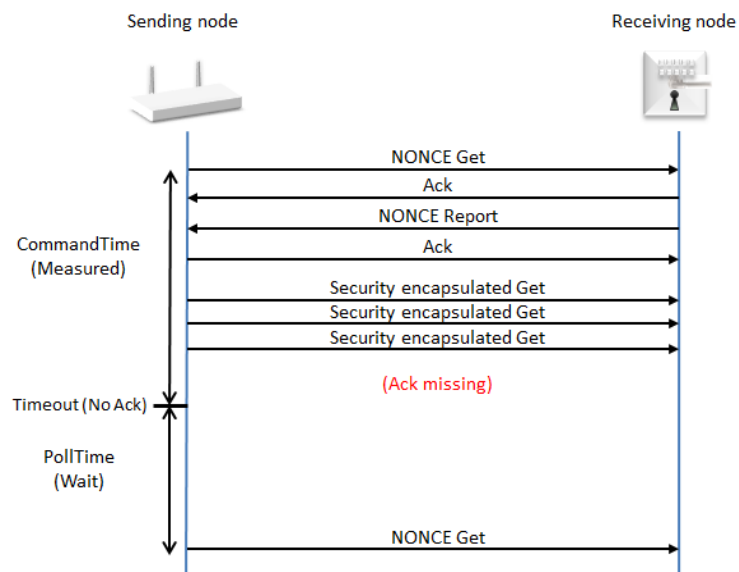


Figure 4, Polling (No Ack, with security 0)

3.6.3 Polling with missing Report frame.

Two timers named CommandTime and ReportTime are used for polling requirements when the transmission is successful but with missing report. Illustrations are given for secure and non-secure cases in Figure 5 and Figure 6

The following requirements apply to the case where a polling request is successful but no Report frame is received.

- The application **MUST** wait ReportTime for the reply from node X before polling any other node
- ReportTime **MUST** be CommandTime + 10 seconds or more

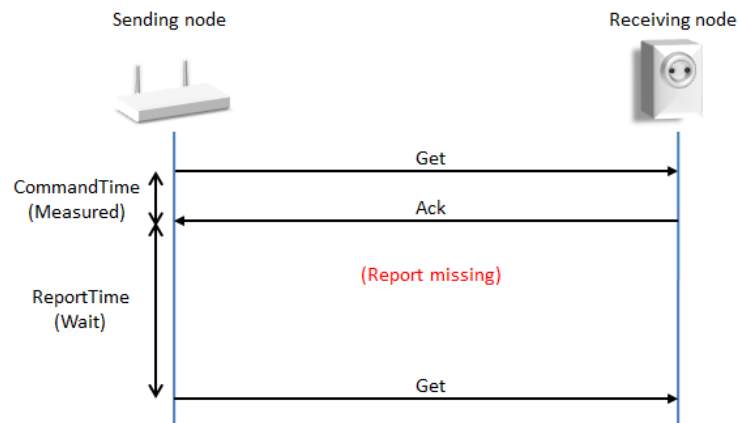


Figure 5, Polling (No Report frame, without security)

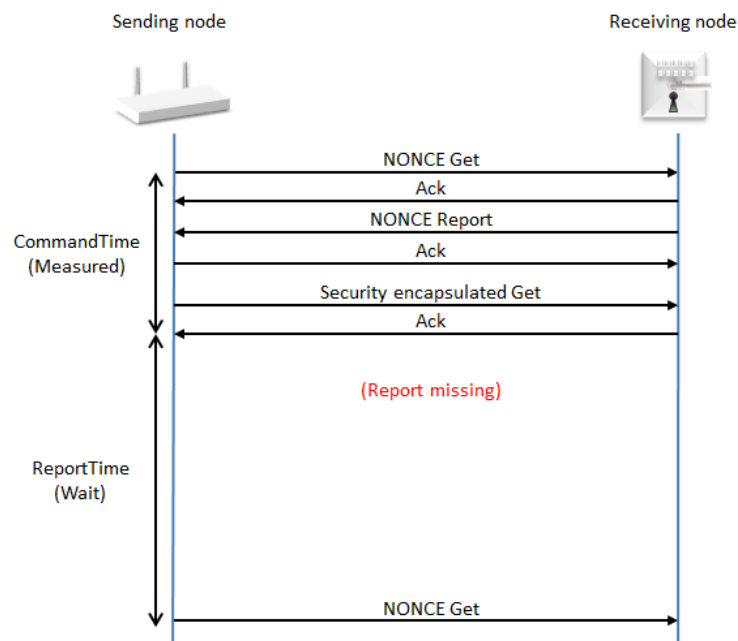


Figure 6, Polling (No Report frame, with security)

3.7 Unsolicited communication

A device **MAY** autonomously send control commands or status information in response to physical events or in response to a timer.

Unsolicited communication patterns include, but are not limited to, the transmission of a:

- Control command turning on light in response to a detected movement
- Power meter report sending a usage report

Different requirements apply to unsolicited data collection communication and unsolicited control communication, respectively.

3.7.1 Unsolicited data collection communication

Bursts of one or more commands which carry status information transmitted repeatedly without any user intervention **MUST** be considered to be unsolicited data collection communication.

Using the transmission of a control command or a NOP command as a heartbeat indication **MUST** also be considered unsolicited data collection communication.

To save bandwidth, data collection communication **MUST** comply with the following requirements.

- A device **MAY** issue unsolicited data collection communication in any burst size
- A device **MUST NOT** issue new unsolicited data collection communication less than 30 seconds since the last burst.

3.7.2 Unsolicited control communication

Bursts of one or more control commands initiated by a user action, a physical event or a time trigger **MUST** be considered control communication. Control communication **MUST** comply with the following requirements:

- A device **MAY** issue unsolicited control communication in any burst size.
- A device **MAY** issue unsolicited control communication at any interval since the last burst

3.8 Runtime communication

3.8.1 Routing

A Z-Wave Plus node **MUST** use by default the last working route to communicate with a target node. An illustration is given in Figure 7

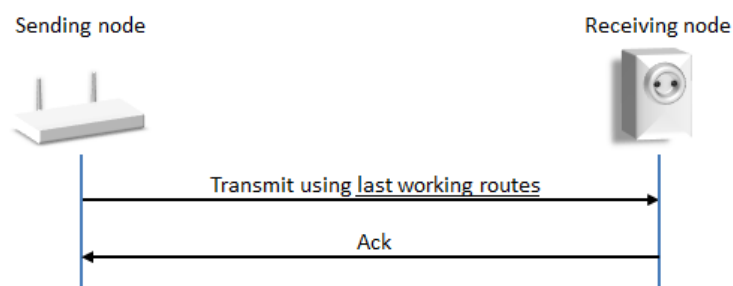


Figure 7, Successful transmission using last working routes

Over time, there is a risk that nodes are moved or stop working. To ensure that nodes adapt to changing network topology and failing repeaters, a Z-Wave Plus node **MUST** enable dynamic route resolution. Dynamic route resolution consists of trying the following routes:

- Last working routes
- Calculated routes
- Explorer Frame

Illustrations are given in Figure 8 and Figure 9

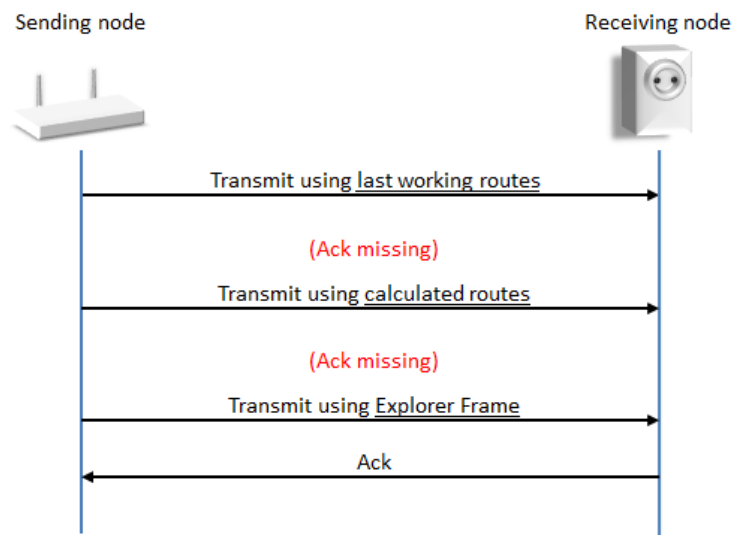


Figure 8, Successful transmission using Explorer Frame

A node **MUST** perform 3 routing attempts based on last working routes and/or calculated routes before sending an Explorer Frame. As outlined in Figure 8, controllers may calculate routes using the local neighbor map. Listening Sleeping Slaves (LSS) and Reporting Sleeping Slaves (RSS) **MAY** use return routes injected by a controller. The outlined sequence of transmission attempts is handled entirely by the routing protocol.

In case the target is not working, all routed transmission attempts will fail and ultimately, the routing protocol will have to give up delivering the frame. After a failed transmission, the application **MAY** try to transmit again in case a new event occurs, e.g. because the user issues a new button press.

The steps in Figure 9 involve at least three routing attempts. When all routing attempts are unsuccessful, it is very unlikely that any other transmission attempt to the same target will succeed. The sending node *MAY* give up the frame transmission.

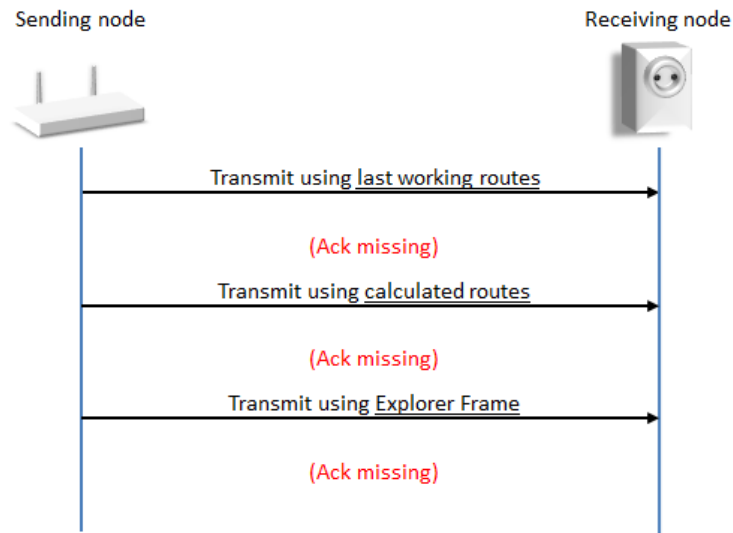


Figure 9, Unsuccessful transmission

3.8.2 Heartbeat communication timeout protection

A battery powered node supporting heartbeat communication sends a Wake Up Notification Command to get attention when it is awake and receives a Wake Up No More Information Command when it can safely return to sleep.

A battery powered Z-Wave Plus node supporting heartbeat communication *SHOULD* implement a timeout mechanism which makes the node return to sleep if the node does not receive a Wake Up No More Information Command.

If no Wake Up No More Information Command is received from the Wake Up destination, the node *MUST* respond to the Wake Up destination until 10 seconds have elapsed since the last transmission or reception with the Wake Up destination.

An illustration is given in Figure 10

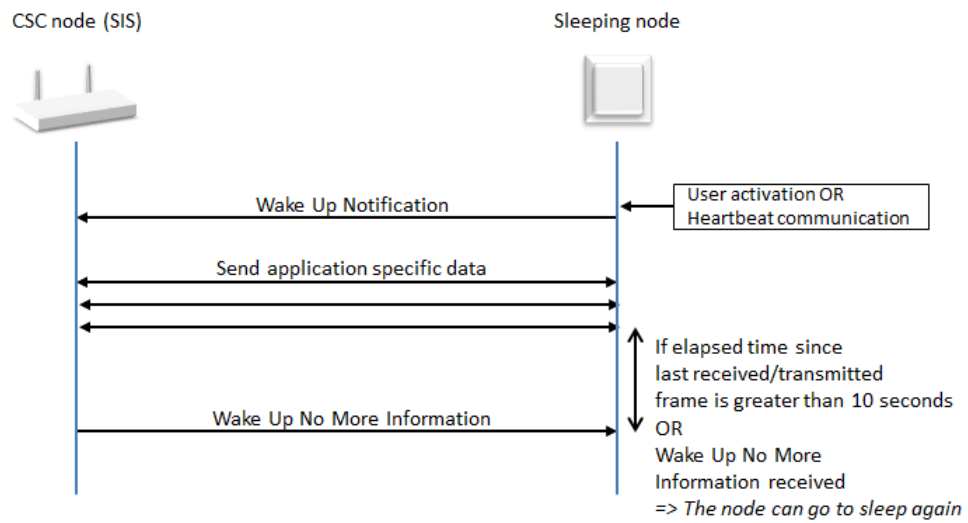


Figure 10, Wake Up Command Class

3.9 Network maintenance

The network rediscovery (Request neighbor update) feature SHOULD only be used as last resort in case the runtime communication fails.

3.10 Encapsulation order

A number of Z-Wave encapsulation Command Classes exist, they MUST be applied in the following order:

1. Any one of the following combinations:
 - a. Transport Service followed by Security
 - b. Transport Service
 - c. Security
 - d. CRC16
2. Multi Channel
3. Supervision
4. Multi Command
5. Schedule
6. Encapsulated Command Class (payload), e.g. Basic Get

Note: The Transport Service and CRC16 Command Classes are mutually exclusive as well as Security and CRC16.

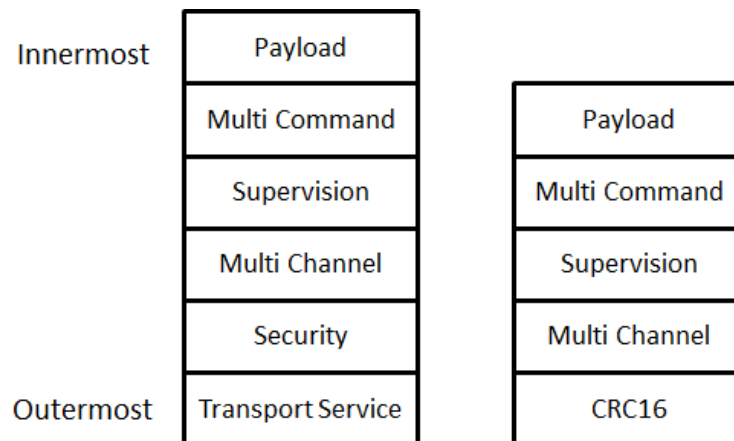


Figure 11, Encapsulation overview

Responses to a given frame must be carried out using the same encapsulation or lack of encapsulation as it was received, unless specified otherwise in the Command Class specifications [2] and [3]. An exception to this is the transport service where the response may require Transport Service encapsulation to fit the entire report. In this case it is mandatory to support the Transport Service Encapsulation when controlling a Command Class that may have to respond using Transport Service. An example of this is the Network Management Proxy Command Class which requires the Transport Service Command Class, both on the Supporting and the Controlling device.

Utilization of the Transport Service, CRC16 and Multi Command command classes can be done on all command classes reported as supported by the receiving node. However, when using Multi Channel or Security, some command classes may not be supported securely or on a specific endpoint and others may be.

Note that additional requirements may exist when using encapsulation of certain command classes. The Command Class specification for a given Command Class must always be referred to.

3.11 Lifeline concept and other associations

The Lifeline concept is a part of the Z-Wave Plus framework. The concept supports easy configuration of nodes in a centrally controlled network. The Lifeline provides a “plug-and-play” configuration experience when a node is added by a central controller.

The Association Command Class is used to establish a logical link from a node to the SIS when the node is included. Association Group 1 MUST be used for the Lifeline association. All events which are mandated by a Device Type MUST be reported via the Lifeline association. Refer to [1] for more details.

A controlling node MAY further interview a node through the use of Association Group Information (AGI) Command Class to obtain a full list of events supported by a node. This could be events which are not mandated in a Device Type or events which are already included in the Lifeline group but are also individually available via other association groups.

Unless the association destination is a gateway, a controlling node MUST NOT create an association if the association destination does not support the commands that the actual association group will be sending. The AGI CC MUST be used to probe the commands that a given association group will be sending.

ROLE TYPE OVERVIEW

Z-Wave Role Types is used as part of the Z-Wave Plus certification program. Role types define how key network devices or functionalities **MUST** be implemented. This is to provide better uniformity and hence ensuring better interoperability between Z-Wave Plus devices.

Role types are backwards compatible with Z-Wave products certified under earlier certification programs.

The Role Types are device specific and hence the Device Type will define which Role Type(s) a given device can support.

The below matrix shows an overview of Role Types which are described in details in Chapter 4.

Table 1, Overview of Role Types

Role Type	Abbreviation	Repeater	Power source	Can be SIS	MUST support security	Network setup	Setup lifeline	Report through lifeline	Direct controllable	Heart beat comms.	Push button WakeUp
Central Static Controller	CSC	✓	Mains	✓	✓	✓	✓	✓	✓	✗	✗
Sub Static Controller	SSC	✓	Mains	✗	✗	✓	✗	✓	✓	✗	✗
Portable Controller	PC	✗	Battery	✗	✗	✓	✗	✓	✗	✗	✗
Reporting Portable Controller	RPC	✗	Battery	✗	✗	✓	✗	✓	✗	✓	✓
Portable Slave	PS	✗	Battery	✗	✗	✗	✗	✓	✗	✗	✓
Always On Slave	AOS	✓	Mains	✗	✗	✗	✗	✓	✓	✗	✗
Listening Sleeping Slave	LSS	✗	Battery	✗	✗	✗	✗	✓	✓	✗	✗
Reporting Sleeping Slave	RSS	✗	Battery	✗	✗	✗	✗	✓	✗	✓	✓
Network Aware Slave	NAS	✓	Mains	✗	✗	✗	✗	✓	✓	✗	✗

The following functionalities depend on the actual Role Type:

Repeater: Indicates whether the device can act as repeater in the network. This requires an always listening device, which can accommodate any routing requests immediately.

Power source: Mains powered devices are accessible immediately and are always listening devices. Battery powered devices focus on battery lifetime extension as one of the primary objectives.

Can be SIS: The device MUST support the Static Update Controller (SUC) and SUC node ID Server (SIS) functions. When SIS functionality is enabled, the controller also takes the Primary Controller role. All other controllers operate as Inclusion Controllers, i.e. they can request that nodes are included/excluded.

If a SIS is present in the network, it is RECOMMENDED that all other devices update their network topology once a day and before configuring associations.

MUST support security: The device MUST support the Security Command Class to facilitate applications which require support of security. (For example door locks or metering devices)

Network setup: The device MUST be capable of managing the network and mastering inclusion/exclusion of nodes. In the actual context, the device MAY be operated as an inclusion controller.

Setup lifeline: The device MUST be able to configure lifeline associations to a central home control application.

Report through lifeline: The device MUST be able to report events via a lifeline association to a central home control application.

Direct controllable: Mains powered devices and battery devices configured as Frequently Listening Routing Slave (FLIRS) can be controlled at any time.

Heart beat communication: Operating as a sleeping device, the device MUST be able to connect at given intervals to a central home control application to allow delivery of messages from other devices. The device MUST support the Wake Up Command Class.

Push button wake-up: The device SHOULD have a push button for waking up a sleeping device for expedited communication. This enables interactive delivery of new configuration parameters or firmware updates.

3.12 Detecting the Role Type of a device

The Role Type may be requested via the Z-Wave Plus Info Command Class, which MUST be listed as the first supported Command Class in the Node Information Frame (NIF) by Z-Wave Plus devices. For details about Z-Wave Plus Info Command Class, refer to [2].

Table 2, Role Type identifiers

Role Type	Identifiers
Central Static Controller (CSC)	ROLE_TYPE_CONTROLLER_CENTRAL_STATIC
Sub Static Controller (SSC)	ROLE_TYPE_CONTROLLER_SUB_STATIC
Portable Controller (PC)	ROLE_TYPE_CONTROLLER_PORTABLE
Reporting Portable Controller (RPC)	ROLE_TYPE_CONTROLLER_PORTABLE_REPORTING
Portable Slave (PS)	ROLE_TYPE_SLAVE_PORTABLE
Always On Slave (AOS)	ROLE_TYPE_SLAVE_ALWAYS_ON
Listening Sleeping Slave (LSS)	ROLE_TYPE_SLAVE_SLEEPING_LISTENING
Reporting Sleeping Slave (RSS)	ROLE_TYPE_SLAVE_SLEEPING_REPORTING
Network Aware Slave (NAS)	ROLE_TYPE_SLAVE_NETWORK_AWARE

Refer to [5] regarding the assigned values of the Role Type identifiers.

4 ROLE TYPE DEFINITIONS

The following sections describe how each of the Role Types **MUST** be implemented. Each Role Type has requirements categorized in the following subsections:

1. **Protocol Requirements**
2. **Setup**
3. **Runtime Configuration**
4. **Runtime Communication**

The Setup subsection describes the specific requirements for a given Role Type during and after the inclusion. Figure 12 shows the different steps of the node setup.

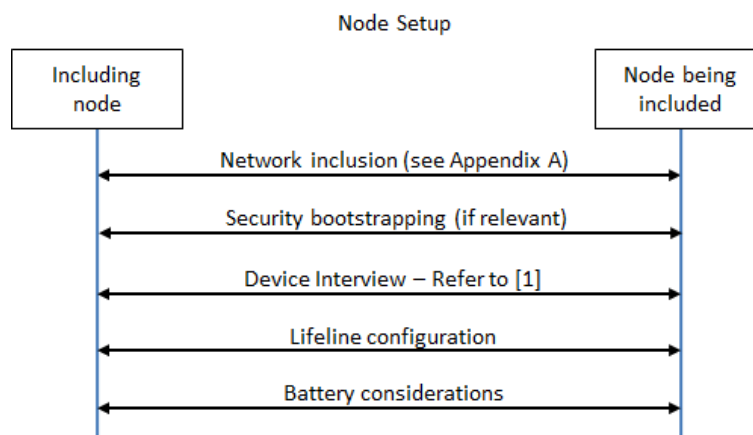


Figure 12, Node Setup

Network inclusion

The network inclusion process is described in Appendix A. Additional recommendations are given for the different Roles Types.

Security bootstrapping

The security (Security 0 and/or Security 2) bootstrapping takes place immediately after the network inclusion. Refer to [2].

Device interview

The device interview is depending on the capabilities of the node being included. [1] provides guidelines for interviewing devices.

Lifeline configuration

If a SIS is present in the network, the destination NodeID of the Lifeline group **MUST** be the SIS NodeID. Requirements are detailed for each Role Type in the following sections.

Battery considerations

Some requirements apply for battery powered nodes. Details are given for each Role Type.

4.1 Central Static Controller (CSC)

The Central Static Controller Role Type SHOULD be used for always powered devices which are capable of operating as a central controller. The CSC will be the central device for most network communications and other devices will rely on it for unsolicited information via the lifeline association to the CSC (which is also the SIS). This will enable the user to receive key information without having to perform major network configuration tasks.

The CSC is typically a router, central gateway or some sort of central communication panel.

4.1.1 CSC Protocol Requirements

The CSC MUST respect requirements described in chapter 3
The CSC MUST support and control the Security Command Class.

The CSC MUST support the following network roles:

- SIS
- Secondary controller
- Inclusion controller

4.1.1.1 If first node in the network

If the CSC is the first node in the network, it MUST set itself the SIS role and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode
- Remove failing node
- Replace failing node

It MUST NOT be possible to activate Learn Mode if the CSC is the SIS and other nodes are included in the network.

4.1.2 CSC Setup

4.1.2.1 Inclusion process

It is RECOMMENDED to use soft buttons for activating learn mode and add mode on a CSC Role Type.

4.1.2.2 CSC including a SSC, PC, RPC or NAS

Lifeline configuration

If the CSC is the SIS, MUST set itself as the Association group ID 1 destination.

Battery considerations

If the included node is of Role Type RPC:

- The CSC MUST configure the Wake Up Interval Set Command destination NodeID to be the SIS NodeID.
- The CSC MUST send a Wake Up No More Information Command when the CSC has no more command to transmit.

4.1.2.3 CSC including a PS, LSS or RSS

Lifeline configuration

If the CSC is the SIS, it MUST set itself as the Association group ID 1 destination. The CSC MUST assign a return route for the SIS.

Battery considerations

If the included node is of Role Type PS or RSS:

- The CSC MUST configure the Wake Up Interval Set Command destination NodeID to be the SIS NodeID.
- If the CSC is the SIS, it MUST send a Wake Up No More Information Command when the CSC has no more command to transmit.

If the included node is of Role Type PS:

- The Wake Up Interval Set Command Seconds field MUST be equal to 0

4.1.2.4 CSC including an AOS

Lifeline configuration

The CSC MUST set the SIS NodeID as the Association group ID 1 destination. The CSC MUST assign a return route for the SIS.

Battery considerations

None

4.1.2.5 CSC including another CSC

If the CSC is included by another CSC, the included CSC MUST take the Inclusion Controller role and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode
- Remove failing node
- Replace failing node

Lifeline configuration

None

Battery considerations

None

4.1.2.6 CSC included by a PC, RPC, SSC

The CSC MUST accept to take the SIS role when a PC, RPC or SSC assigns it to the included CSC.

Lifeline configuration

Previously added nodes may have no lifeline associations. The CSC SHOULD create lifeline associations in all directly reachable nodes.

If the including node is an RPC, the CSC MUST create a lifeline association to the RPC.

Battery considerations

None

4.1.3 CSC Runtime Configuration

The CSC MUST instruct a reporting node (RPC, RSS, PS) to return to sleep after application data has been delivered to the node. This is done by sending a Wake Up No More Information Command. An illustration is given in Figure 10

4.1.4 CSC Runtime Communication

No requirements

4.2 Sub Static Controller (SSC)

The Sub Static Controller Role Type SHOULD be used for static controllers which are not suitable as central controllers. It is aimed at applications that require a static controller to manage a subset of nodes. It is typically offered as a bundled package with e.g. sensors.

4.2.1 SSC Protocol Requirements

The SSC MUST respect requirements described in chapter 3
The SSC MUST NOT support the SIS functionality.
The SSC SHOULD NOT configure lifeline associations.

The SSC MUST support the following network roles:

- Primary controller
- Secondary controller
- Inclusion controller

4.2.1.1 If first node in the network

If the SSC is the first node in the network, it MUST take the Primary Controller role and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode

It MUST NOT be possible to activate Learn Mode if the SSC is the Primary Controller and other nodes are included in the network.

4.2.2 SSC Setup

4.2.2.1 Inclusion process

It is RECOMMENDED to use a physical push button for activating learn mode and a soft button for activating add mode on a SSC Role Type.

4.2.2.2 SSC including a CSC

If the SSC is the Primary Controller and has already included multiple nodes and a CSC is added to the network, the SSC MUST assign the SIS role to the CSC.

The SSC MAY keep the Wake Up destination NodeID as previously set or reconfigure it to the CSC (SIS) NodeID.

The SSC becomes an inclusion controller and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode

Lifeline configuration

None

Battery considerations

None

4.2.2.3 SSC including an RPC, PS or RSS**Lifeline configuration**

None.

Battery considerations

If there is no SIS present in the network, the SSC SHOULD send a Wake Up Interval Set Command with its own NodeID as destination.

If there is a SIS in the network, the SSC MUST send a Wake Up Interval Set Command to the included node and MUST respect the following rules:

- If the included node is of Role Type RPC, PS or RSS:
 - The SSC MUST configure the Wake Up Interval Set Command destination NodeID to be the SIS NodeID.
 - The SSC SHOULD set the Wake Up Interval Set Command Seconds field to the default Wake Up time advertised by the included node.
- If the included node is of Role Type PS:
 - The Wake Up Interval Set Command Seconds field MUST be equal to 0

4.2.2.4 SSC including an SSC, PC, AOS, LSS or NAS**Lifeline configuration**

None.

Battery considerations

None

4.2.3 SSC Runtime Configuration

No requirements

4.2.4 SSC Runtime communication

No requirements

4.3 Portable Controller (PC)

The Portable Controller Role Type SHOULD be used for portable controllers that can setup and maintain a Z-Wave network but do not require unsolicited reporting. It is typically used by home control remotes that control a few lights.

4.3.1 PC Protocol Requirements

The PC MUST respect requirements described in chapter 3
The PC SHOULD NOT configure lifeline associations when adding nodes to the network.
The PC MUST support the following network roles:

- Primary controller
- Secondary controller
- Inclusion controller

4.3.1.1 If first node in the network

If the PC is the first node in the network, it MUST take the Primary Controller role and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode

It MUST NOT be possible to activate Learn Mode if the PC is the Primary Controller and other nodes are included in the network.

4.3.2 PC Setup

4.3.2.1 Inclusion process

It is RECOMMENDED to use physical push buttons for activating learn mode and add mode on a PC Role Type.

4.3.2.2 PC including a CSC

If the PC is the Primary Controller and has already included multiple nodes and a CSC is added to the network, the PC MUST assign the SIS role to the CSC.

The PC becomes an inclusion controller and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode

Lifeline configuration

None

Battery considerations

None

4.3.2.3 PC including an RPC, PS or RSS

Lifeline configuration

None.

Battery considerations

If there is no SIS present in the network, the PC SHOULD NOT send a Wake Up Interval Set Command. If there is a SIS in the network, the PC MUST send a Wake Up Interval Set Command to the included node.

If the included node is of Role Type RPC, PS or RSS:

- The PC MUST configure the Wake Up Interval Set Command destination NodeID to be the SIS NodeID.
- The PC SHOULD set the Wake Up Interval Set Command Seconds field to the default Wake Up time advertised by the included node.

If the included node is of Role Type PS:

- The Wake Up Interval Set Command Seconds field MUST be equal to 0

4.3.2.4 PC including an SSC, PC, AOS, LSS or NAS

Lifeline configuration

None.

Battery considerations

None

4.3.3 PC Runtime Configuration

No requirements

4.3.4 PC Runtime communication

No requirements

4.4 Reporting Portable Controller (RPC)

The Reporting Portable Controller Role Type SHOULD be used for portable reporting controllers, which need to setup a Z-Wave network and also send unsolicited messages.

The RPC Role Type may for instance be used for a battery powered thermostat which can include and exclude nodes in a small network. In addition, the thermostat may be configured remotely.

4.4.1 RPC Protocol Requirements

The RPC MUST respect requirements described in chapter 3

The RPC SHOULD NOT configure lifeline associations when adding nodes to the network.

The RPC MUST support the following network roles:

- Primary controller
- Secondary controller
- Inclusion controller

4.4.1.1 If first node in the network

If the RPC is the first node in the network, it MUST take the Primary Controller role and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode

It MUST NOT be possible to activate Learn Mode if the RPC is the Primary Controller and other nodes are included in the network.

4.4.2 RPC Setup

4.4.2.1 Inclusion process

It is RECOMMENDED to use physical push buttons for activating learn mode and add mode on an RPC Role Type.

4.4.2.2 RPC including a CSC

If the RPC is the Primary Controller and has already included multiple nodes and a CSC is added to the network, the RPC MUST assign the SIS role to the CSC.

The RPC becomes an inclusion controller and MUST support the following network functions:

- Include new nodes (“Add mode”)
- Exclude nodes
- Learn mode

Lifeline configuration

None

Battery considerations

None

4.4.2.3 RPC Including an RPC, PS or RSS

Lifeline configuration

If a SIS is present in the network, the RPC SHOULD set the SIS NodeID as the Association group ID 1 destination.

Battery considerations

If there is no SIS present in the network, the RPC SHOULD NOT send a Wake Up Interval Set Command. If there is a SIS in the network, the RPC MUST send a Wake Up Interval Set Command to the included node.

If the included node is of Role Type RPC, PS or RSS:

- The RPC MUST configure the Wake Up Interval Set Command destination NodeID to be the SIS NodeID.
- The RPC SHOULD set the Wake Up Interval Set Command Seconds field to the default Wake Up time advertised by the included node.

If the included node is of Role Type PS:

- The Wake Up Interval Set Command Seconds field MUST be equal to 0

4.4.2.4 RPC including an SSC, PC, AOS, LSS or NAS

Lifeline configuration

If a SIS is present in the network, the RPC SHOULD set the SIS NodeID as the Association group ID 1 destination.

Battery considerations

None

4.4.3 RPC runtime configuration

The RPC MUST support the Wake Up Command Class as described in 3.8.2.

The RPC SHOULD have a physical push button for waking up the device for expedited communication. This enables interactive delivery of new configuration parameters or firmware updates.

The RPC MUST implement a Minimum Wake Up Interval in the range 0 ..4200 (i.e. between 0 second and 70 minutes).

If the RPC's Minimum Wake Up Interval is 0, the RPC MUST implement a Maximum Wake Up Interval greater than 0. The RPC MUST send Wake Up Notifications to the NodeID configured via the Wake Up Interval Set Command. The RPC MUST NOT send Wake Up Notifications if no NodeID has been configured via the Wake Up Interval Set Command.

4.4.4 RPC runtime communication

The RPC **MUST** communicate via the lifeline association if any lifeline association exists. Lifeline requirements depend on the Device Type. Refer to [1] for more details.

4.5 Portable Slave (PS)

The Portable Slave Role Type SHOULD be used for battery powered devices that aim for the lowest possible power consumption. The PS only wakes up in response to a physical event such as a button press.

This Role Type is intended for simple AV remote controls that only need to talk to one device. The PS allows for optimal cost, as no EEPROM is required.

4.5.1 PS Protocol Requirements

The PS MUST respect requirements described in chapter 3
The PS can only be added to a network and has no network role requirement.

4.5.2 PS Setup

The setups of a PS by a CSC, SSC, PC or RPC are respectively described in 4.1.2.3, 4.2.2.3, 4.3.2.3 or 4.4.2.3. The PS has no additional requirement when being included.

4.5.2.1 Inclusion process

It is RECOMMENDED to use a physical push button for activating learn mode on a PS Role Type.

4.5.3 PS Runtime configuration

The PS MUST support the Wake Up Command Class as described in 3.8.2.

The PS SHOULD have a physical push button for waking up the device for expedited communication. This enables interactive delivery of new configuration parameters or firmware updates.

4.5.4 PS Runtime communication

The PS MUST communicate via the lifeline association if any lifeline association exists. Lifeline requirements depend on the Device Type. Refer to [1] for more details.

4.6 Always On Slave (AOS)

The Always On Slave Role Type SHOULD be used for mains powered devices that are always reachable. One example of such a device is a light switch.

4.6.1 AOS Protocol Requirements

The AOS MUST respect requirements described in chapter 3
The AOS can only be added to a network and has no network role requirement.

4.6.2 AOS Setup

The setups of an AOS by a CSC, SSC, PC or RPC are respectively described in 4.1.2.4, 4.2.2.4, 4.3.2.4 or 4.4.2.4. The AOS has no additional requirement when being included.

4.6.2.1 Inclusion process

It is RECOMMENDED to use a physical push button for activating learn mode on an AOS Role Type.

4.6.3 AOS Runtime Configuration

AOS can always be configured, as it is always listening.

4.6.4 AOS Runtime communication

The AOS MUST communicate via the lifeline association if any lifeline association exists. Lifeline requirements depend on the Device Type. Refer to [1] for more details.

4.7 Reporting Sleeping Slave (RSS)

The Reporting Sleeping Slave Role Type SHOULD be used for battery-powered devices that only wake up and communicates when an event has occurred. This allows to reconfigure the device remotely. Examples include sensors, wall controllers etc.

4.7.1 RSS Protocol Requirements

The RSS MUST respect requirements described in chapter 3.
The RSS can only be added to a network and has no network role requirement.

4.7.2 RSS Setup

The setups of an RSS by a CSC, SSC, PC or RPC are respectively described in 4.1.2.3, 4.2.2.3, 4.3.2.3 or 4.4.2.3. The RSS has no additional requirement when being included.

4.7.2.1 Inclusion process

It is RECOMMENDED to use a physical push button for activating learn mode on an RSS Role Type.

4.7.3 RSS Runtime configuration

The RSS MUST support the Wake Up Command Class as described in 3.8.2 and in Figure 10.

The device SHOULD have a physical push button for waking up the device for expedited communication. This enables interactive delivery of new configuration parameters or firmware updates.

The RSS MUST implement a Minimum Wake Up Interval in the range 0 ..4200 (i.e. between 0 second and 70 minutes).

If the RSS's Minimum Wake Up Interval is 0, the RSS MUST implement a Maximum Wake Up Interval greater than 0. The RSS MUST send Wake Up Notifications to the NodeID configured via the Wake Up Interval Set Command.

4.7.4 RSS Runtime communication

The RSS MUST communicate via the lifeline association if any lifeline association exists. The lifeline reports depend on the Device Type. Refer to [1] for details.

4.8 Listening Sleeping Slave (LSS)

The Listening Sleeping Slave Role Type is intended for battery-operated devices that can be reached even though they are sleeping thanks to Beaming (FLiRS devices). Examples include Door Locks and Battery operated Thermostats.

The LSS MUST support the lifeline unless otherwise specified in the Device type specification [1].

4.8.1 LSS Protocol Requirements

The LSS MUST respect requirements described in chapter 3.

The LSS can only be added to a network and has no network role requirement

4.8.2 LSS Setup

The setups of an LSS by a CSC, SSC, PC or RPC are respectively described in 4.1.2.3, 4.2.2.3, 4.3.2.3 or 4.4.2.3. The LSS has no additional requirement when being included.

4.8.2.1 Inclusion process

It is RECOMMENDED to use a physical push button for activating learn mode on a LSS Role Type.

4.8.3 LSS Runtime configuration

A LSS can always be configured, as it is reachable via FLiRS communication.

4.8.4 LSS Runtime communication

The LSS MUST communicate via the lifeline association if any lifeline association exists. The lifeline reports depend on the Device Type. Refer to [1] for details.

The LSS MUST stay awake for at least 2 seconds after communicating.

4.9 Network Aware Slave (NAS)

The Network Aware Slave Role Type is used for slaves with application controlling capabilities, which are leveraging controller functionalities to be aware of the network topology and nodes capabilities.

The SIS (or primary controller) will consider a NAS as a controller, but the NAS will not be able to include new nodes in the network.

The NAS MUST be mains powered and always reachable.

4.9.1 NAS Protocol Requirements

The NAS MUST respect requirements described in chapter 3.

The NAS can only be added to a network and MUST take the inclusion controller or the secondary controller role when added to a network.

The NAS MUST NOT provide the following network functions:

- Include new nodes
- Exclude nodes
- Remove failing node
- Replace failing node

4.9.2 NAS Setup

The setups of an NAS by a CSC, SSC, PC or RPC are respectively described in 4.1.2.2, 4.2.2.4, 4.3.2.4 or 4.4.2.4. The NAS has no additional requirement when being included.

4.9.2.1 Inclusion process

It is RECOMMENDED to use a physical push button for activating learn mode on an NAS Role Type.

4.9.3 NAS Runtime Configuration

The NAS can always be configured, as it is always listening.

4.9.4 NAS Runtime communication

The NAS MUST communicate via the lifeline association if any lifeline association exists. Lifeline requirements depend on the Device Type. Refer to [1] for more details.

APPENDIX A INCLUSION PROCESS

This section outlines the recommended inclusion process that all Role Types should follow. The processes for both node including and being included are covered.

Appendix A.1 Being included

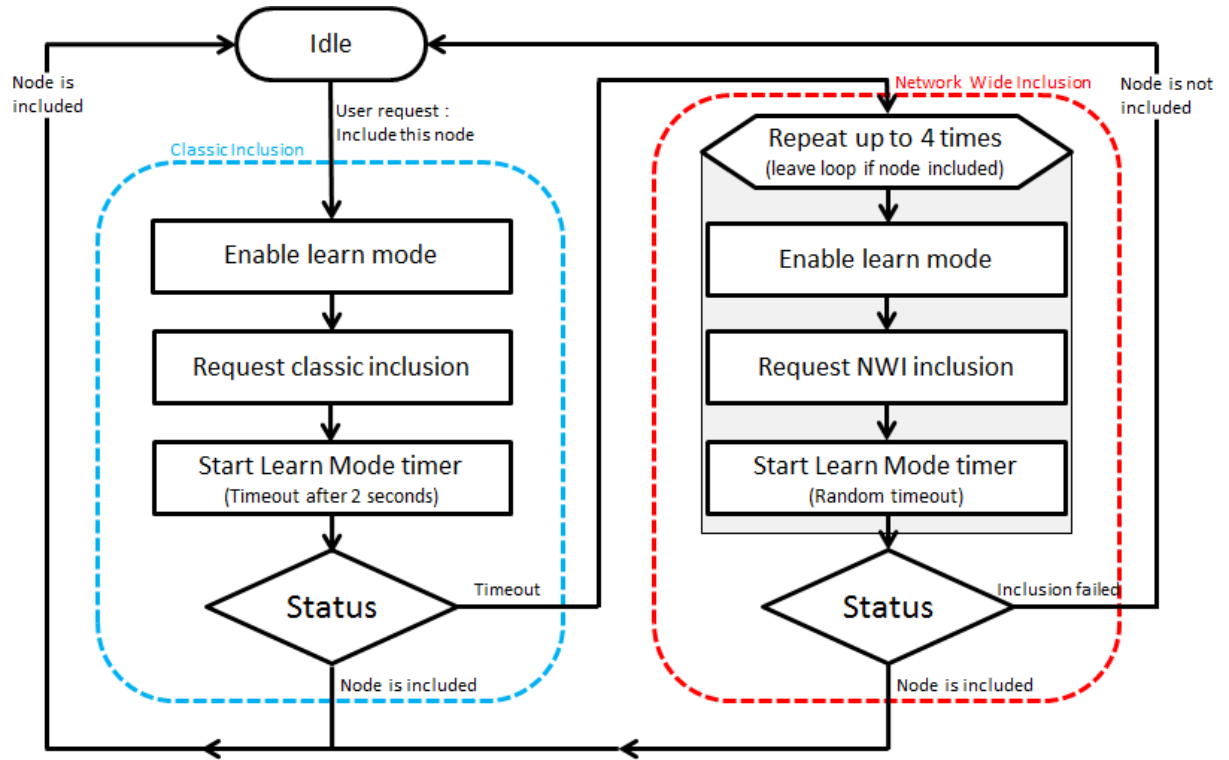


Figure 13, Inclusion process for the node being included

Appendix A.2

Including a node

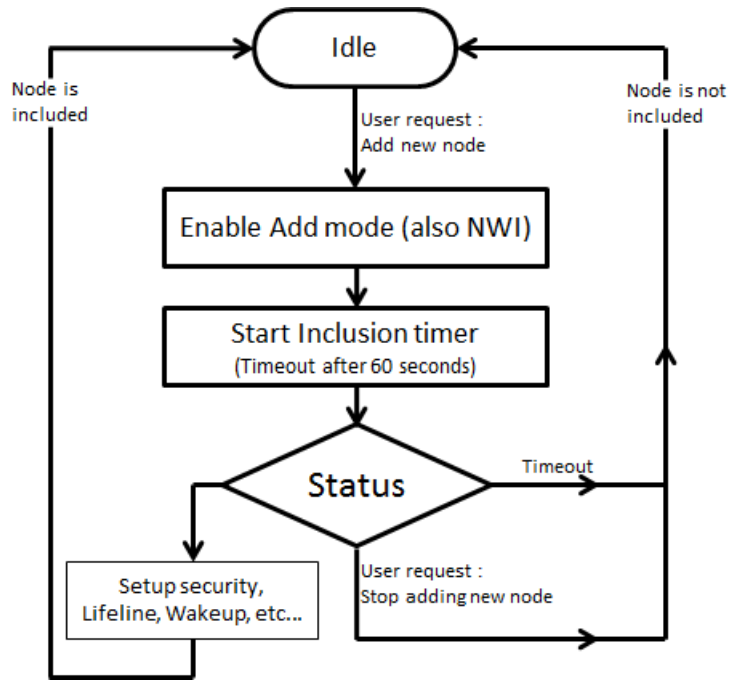


Figure 14, Inclusion process for the including node

REFERENCES

- [1] Sigma Designs, SDS11847, Software Design Specification, Z-Wave Plus Device Types Specification.
- [2] Sigma Designs, SDS12652, Software Design Specification, Z-Wave Command Class Specification, N-Z.
- [3] Sigma Designs, SDS12657, Software Design Specification, Z-Wave Command Class Specification, A-M.
- [4] IETF RFC 2119, Key words for use in RFC's to Indicate Requirement Levels, <http://tools.ietf.org/pdf/rfc2119.pdf>
- [5] Sigma Designs, SDS13740, Software Design Specification, Z-Wave Device and Command Class Types and Defines Specification.

INDEX

A

Always On Slave.....	31
Association Command Class.....	15
Association Group Information Command Class	15

C

Central Static Controller	20
---------------------------------	----

D

Device Reset Locally Command	6
------------------------------------	---

I

<u>Inclusion Controller</u>	3
-----------------------------------	---

L

Listening Sleeping Slave	33
--------------------------------	----

N

Network Aware Slave	34
---------------------------	----

P

Portable Controller.....	25
Portable Slave	30
<u>Primary Controller</u>	3

R

Reporting Portable Controller	27
Reporting Sleeping Slave	32

S

<u>Secondary Controller</u>	3
<u>Static Update Controller</u>	3
Sub Static Controller.....	23
<u>SUC ID Server</u>	3

W

Wake Up No More Information Command	12
Wake Up Notification Command	12

Z

Z-Wave Plus Info Command Class	18
--------------------------------------	----