



DCC Guidance Note

Zigbee Stack Interoperability

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Document Control

Revision history

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Reviews

Name	Title / Responsibility	Release Date	Version number
DCC	Raj Chandrasekaran	12/10/2020	2.0
DCC	Stuart Drinan	12/10/2020	2.0
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Approvals

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Stuart Drinan	Devices Team Lead	12/07/2023	2.4

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1. Introduction

This document supersedes the v1.0 stack guidance note available to industry and authored in 2018.

DCC have identified issues in interoperability between ZigBee stack versions and chipset vendors within testing and production environments. This document will detail interoperability coverage and issues that DCC are aware of.

As this is a DCC guidance note the interoperability issues mentioned and the interoperability test results will focus only on chipset vendors NXP & Silicon Labs (SiLabs). This is due to DCC products, the communications hubs using those 2 chipsets. DCC are aware that multiple end device manufacturers are using a wider variety of chips and stack versions. DCC to this date have tested against end devices (ESME, GSME, PPMID etc) that are based on the following chipset vendors:

- NXP
- Exegin
- Freescale
- Silicon Labs
- Texas Instruments
- Manufacturer custom stack

(Please Note - This specific document version is only a refresh into the latest DCC branding document template, the technical contents have not been changed.)

2. Interoperability & Issue Definition

The below problem and defect table examines ZigBee and application-level issues that are currently affecting interoperability between communication hubs and a variety of devices.

Issue	Status
Silicon Labs have indicated that any device using stack version 6.x & greater will suffer from Silicon Labs issue #414941. The issue is that devices after performing the CBKE procedure and during the device receiving ZigBee packets will be unable to process correctly, resulting in devices losing communication with CH. The fix is applicable to all devices (CH, ESME, GSME, PPMID) that uses Silicon Labs stack version 6.0 or greater.	Silicon Labs has released the fix for this issue in Stack version 6.7.3. Silab has indicated any device manufacturer who use Silicon Labs stack version 6.x & greater to pick up the fix for Silicon Labs issue#414941. DCC is aware of this issue impacting ESME's in production and Silicon Labs have informed DCC it can affect any device connected to the CH.
GBCS 3.2 Compliance: Contained within GBCS 3.2, IRP595 calls for CH to only support "End device timeout Request" for the child aging procedure. We have found an issue with Silicon Labs stack where; 1) Devices do not send End Device Timeout Request periodically. 2) Devices would only send End Device timeout Request once per timeout period rather than the recommended three times.	Silicon Labs issue #394208 covers End Device Request sent multiple times. Fix available in Silicon Labs stack 6.6.0 & later. Applicable to Devices that are compliant to GBCS 3.2 / S2v4.2.
GBCS 3.2 Compliance: Any Co-ordinator or Router that supports End Device timeout Request (IRP595) consider timer expired 2% earlier than indicated by end device. This results in Co-ordinator or Router sending "Leave with Rejoin" prematurely.	Silicon Labs has fixed this issue from Silab stack 6.5 onwards. Fix is applicable to Co-ordinator (CH) and Router (ESME) if they support GBCS 3.2 / S2v4.2.
GBCS 3.2 Compliance: Silicon labs case – In the CH Sub-Ghz implementation, Silicon labs stack does not compensate for processing time before closing the receive window resulting in ZigBee message not received if CH transmits late but still within specification window.	Silicon Labs Issue#451683 covers this issue. Only applicable for Sub-GHz devices. This only happens if any stack version used before 6.4 (excluding 6.4)
Silab has indicated there was an issue (471327) with event scheduling where a device may stop sending periodically scheduled messages after a period of 2 days. This issue affects all devices using any branch of the 6.7 stack (6.7.5 fixes this issue) with EFR32.	This issue is fixed with the release of 6.7.5. Silicon Labs clarified this issue may not impact sleepy device like GSME

Issue	Status
GBCS 2.x Compliance: NXP R22 compliant stack, sends “Leave with Rejoin” after end device uses Orphan notification to rejoin but doesn’t send Network key encrypted packet within 3 sec. To ensure R1 PPMID does not display “waiting for data” on reception of “Leave with Rejoin”, this timeout value was increased to 37 sec.	NXP provided API for application to be able to set the timeout value. Fix is applicable to Co-ordinator (CH) and Router (ESME) if they use NXP stack to be compliant to Release 2 or greater.
Silab has indicated that they have fixed a network retry queue overflow issue affecting both ALT HAN bridge nodes and Dual Band Coordinators. The issue happens when forwarding a broadcast packet failed on one interface but succeeds on another. This could lead to DBCH losing HAN devices.	Issue was introduced in Silab stack version 6.7.0 & fixed in Silab stack version 6.7.7. This does not impact single band coordinators. Existing DBCH FW in production that uses silab stack 6.3.4 is not impacted by this issue. Next DBCH FW will use Silab stack 6.7.7 to avoid this issue.

3. Communication Hub Zigbee Stack Version

The below set of tables details the latest ZigBee stack version on all 3 of DCC's communication hub providers.

(correct as at date of original document issue – October 2020)

3.1. Toshiba

Toshiba product using the SiLabs ZigBee stack, the stack versions are listed below.

Release Build	SiLabs Stack Version
R1.3 Single Band	5.6.1
R2.0 Single Band	6.3.1
R2.0 Dual Band	6.3.4

3.2. WNC

WNC product using the SiLabs ZigBee stack, the stack versions are listed below.

Release Build	SiLabs Stack Version
R1.3 Single Band	5.7.2
R2.0 Single Band	6.0.2
R2.0 Dual Band	6.3.4

3.3. EDM I

EDMI product using the SiLabs ZigBee stack, the stack versions are listed below.

Release Build	NXP Stack Version
R1.3 Single Band	ICENI 5.0 - ZigBee Smart Energy Profile 1.2b
R2.0 Single Band	ICENI 6.0 - ZigBee Smart Energy Standard 1.4
R2.0 Dual Band	ICENI 10.0 - ZigBee Smart Energy Profile 1.4

4. Communication Hub Zigbee Stack & Firmware Overview

The below table details the latest ZigBee stack, ZSE compliance and device firmware version details on all 3 of DCC's communication hub providers.

CH Device	Device Firmware Version	Zigbee Stack	ZSE Spec	Stack Provider
Toshiba SBCH	12.29	6.3.1	1.4	SiLabs
Toshiba DBCH	12.35	6.3.4	1.4	SiLabs
WNC SBCH	3.10.0.5	6.0.2	1.4	SiLabs
WNC DBCH	1.13.0.2	6.3.4	1.4	SiLabs
EDMI SBCH	2.02.06	ICENI 6.0	1.4	NXP
EDMI DBCH	2.12.5	ICENI 10.0	1.4	NXP

5. Test Tool Stack and Firmware Overview

The main 3 test tools used by DCC in interoperability test events and other test environments are the Hand-Held Terminal (HHT) emulator for local command delivery, Parse and Correlate for parsing commands and responses and GBCS for Industry (GFI) for payload generation/customization.

The below matrices show the ZigBee stack version and firmware versions of these tools in **2019**.

5.1. HHT Emulator

HHT Emulator details	Feb 2019	April 2019	July 2019	Aug 2019	Oct 2019	Dec 2019	Stack Provider
SiLabs Zigbee Stack 6.0.1 FW Version 1.0.4	Tosh Stack: 6.3.1	Tosh Stack: 6.3.1	Tosh Stack: 6.3.1	Tosh Stack: 6.3.1	Tosh Stack: 6.3.2	Tosh Stack: 6.3.3	SiLabs
	WNC Stack: 6.2.2	WNC Stack: 6.2.2	WNC Stack: 6.2.2	WNC Stack: 6.2.2	WNC Stack: 6.3.2	WNC Stack: 6.3.2	SiLabs
	EDMI Stack: ICENI 10.0 ZigBee Smart Energy Profile 1.4	EDMI Stack: ICENI 10.0 ZigBee Smart Energy Profile 1.4	EDMI Stack: ICENI 10.0 ZigBee Smart Energy Profile 1.4	EDMI Stack: ICENI 10.0 ZigBee Smart Energy Profile 1.4	EDMI Stack: ICENI 10.0 ZigBee Smart Energy Profile 1.4	EDMI Stack: ICENI 10.0 ZigBee Smart Energy Profile 1.4	NXP

5.2. GFI Tool

Test Event	GFI FW Version	GFI Stack Version	Parse & Correlate Version
February 19	2.1.2	6.2.3	2.0.5
April 19	2.1.3	6.2.3	D3-G2-1.0
July 19	2.1.5	6.2.3	D3-G2-1.1
August 19	2.1.5	6.2.3	D3-G3-1.0
October 19	3.0.0	6.2.3	D3-G3-1.0
December 19	3.0.2	6.2.3	D3-G3-1.1

6. Zigbee Stack Matrix

The ZigBee stack matrix covers ZigBee specification / smart energy version 1.2 & 1.4 compliant stack versions.

The matrix is specific to DCC testing in 2019 and does not consider all stack version from all stack vendors available, but untested.

This matrix looks at all smart metering devices including communication hubs, GSME, ESME, PPMIDS, HCALCS and a variety of type 2 devices.

Zigbee Vendor	Version	Zigbee Specification Aligned
NXP:		1.2
Exegin:	R21	
Freescale:	5.1.0 / 5.1.1 / 5.3 / 5.3.1 / 5.3.2 / 5.7.1 / 5.7.2 / 5.8.1	
Texas Instruments:	35	
NXP:	1.121.99.0 / DB4 / R1901 / 1.25.97.0 / b1995.1 / 1.127.215.0 / 1.127.43.0-OL:b2044 / 1.130.149.0 / XPro2.0	1.4
Exegin:	R22 / ASP09.02.45-61603 /	
Freescale:	04.10 / 04.11.15	
Silicon Labs:	6.0.2 / 6.2.1 / 6.3 / 6.3.1 / 6.3.2 / 6.3.3 / 6.3.1.2 / 6.3.1.6 / 6.2.1.0 / 6.4.1.0 / 6.4.1.1 / 6.5.0 / 6.5.1 / 6.5.2 / 6.5.5 / 6.6 / 6.6.0 / 6.6.1 / 6.6.2 / 6.6.3 / 6.7.0 / 6.7.1 / 6.7.5 (SB only) / 6.7.7	
Texas Instruments:	36 / 891c305	

7. Discrepancy

If a SEC party, device manufacturer or service provider have concerns with any of the information documented within this guidance note, then they should raise these concerns with the DCC directly and email DCCDevices@smartdcc.co.uk .