Thread SDK 2.10.4.0 GA
19Q2 Gecko SDK Suite
November 8, 2019

Reliable, Scalable and Upgradeable. Thread is a secure, wireless IPv6 based mesh networking protocol providing low-cost bridging to other IP networks while optimized for low-power / battery-backed operation. The Thread stack is designed specifically for Connected Home applications where IP-based networking is desired and a variety of application layers may be required. The Silicon Labs Thread SDK contains Silicon Labs' implementation of the Thread stack specification.

These release notes cover SDK version(s):

2.10.4.0 released November 8, 2019
2.10.3.0 released September 13, 2019
2.10.2.0 released August 16, 2019
2.10.1.0 released July 19, 2019
2.10.0.0 released June 7, 2019

Thread

KEY FEATURES

- DotDot v1.0 Support
- Thread 1.2 DUA + Multicast Support
- Dynamic Multi-Protocol (DMP) Thread + BLE
- Support for MG21 Modules: MGM210P and MGM210L

Important Notice

Silicon Labs Thread has been deprecated in favor of the popular OpenThread implementation. More information on this move, including End of Service dates, can be found in the Deprecated Items section of this document.

Compatibility and Use Notices

If you are new to the Silicon Labs Thread SDK, see Using This Release.

Compatible Compilers:

IAR Embedded Workbench for ARM (IAR-EWARM) version 8.30.1

- Using wine to build with the IarBuild.exe command line utility or IAR Embedded Workbench GUI on macOS or Linux could result in incorrect files being used due to collisions in wine's hashing algorithm for generating short file names.
- Customers on macOS or Linux are advised not to build with IAR outside of Simplicity Studio. Customers who do should carefully verify that the correct files are being used.

GCC (The GNU Compiler Collection) version 7.2.1, provided with Simplicity Studio.

- GCC is not supported with the EM35x, EM358x, and EM359x device families.

Contents

1 New Items

Gecko Platform release notes are now available through Simplicity Studio's Launcher Perspective, under **SDK Documentation > Thread SDK 2.10.n.n > Release Notes**. The Gecko Platform code provides functionality that supports protocol plugins and APIs in the form of drivers and other lower layer features that interact directly with Silicon Labs chips and modules. Gecko Platform components include EMLIB, EMDRV, RAIL Library, NVM3, and mbedTLS.

1.1   New Plugins

The following is a list of new plugins included with this release. A brief description is given for each. For additional information refer to the plugin description within Simplicity Studio.

Added in release 2.10.0.0

Antenna CLI - This plugin provides a command line interface (CLI) for controlling antenna configuration, setting the TX and RX antenna modes.

Backbone border router support - This plugin adds backbone border router support to a host application in a border router role.

BLE - This plugin enables the Bluetooth Low Energy stack to be run in parallel with the Thread stack. Both stacks run as Micrium OS tasks.

Dotdot Manufacturing Certificates - This plugin provides the ability to use x509 certificates to create DTLS sessions.

mbed TLS Micrium Library - This plugin includes the cryptographic algorithms to support J-PAKE, SSL/DTLS capabilities, and X.509 certificate support running on Micrium OS.

Radio Coexistence CLI - This plugin provides a command line interface (CLI) for the radio coexistence configuration.

1.2   New APIs

For additional documentation please refer to the Thread API Reference Guide.

Added in release 2.10.0.0

emberConfigureDefaultDomainPrefix - This function sets the domain prefix on a network.

emberConfigureDefaultDomainPrefixReturn - This function provides the result of a call to emberConfigureDefaultDomainPrefix.

emberBecomeBackboneRouter - This function requests the device to act in a backbone router role.

emberBecomeBackboneRouterReturn - This function provides the result of a call to emberConfigureDefaultDomainPrefix.

emberSetBbrDataset - This function sets the properties of the active BBR dataset.

emberSetBbrDatasetReturn - This function provides the result of a call to emberSetBbrDataset.

emberRequestMulticastListener - Request a listener for an multicast group address of any scope.

emberRequestMulticastListenerReturn - This function provides the result of a call to emberRequestMulticastListener.

emberMulticastListenerHandler - This function is called when a multicast group listener registration was successful, indicating that multicast packets coming from non-Thread IPv6 hosts can be sent to this device by the (primary) BBR.

emberBackbonePrefixHandler - This function is called when the stack knows about a new backbone prefix or if a backbone server has become unavailable.

emberRequestDomainUniqueAddress - The application can choose to request a new DUA when it is informed via emberBackbonePrefixHandler of an available backbone router prefix.

emberRequestDomainUniqueAddressReturn - This function provides the result of a call to emberRequestDomainUniqueAddress.

emberAddMeshDuaEntry - Create a copy of DUA table entries for mesh address resolution on the stack.

emberAddMeshDuaEntryReturn - This function provides the result of a call to emberAddMeshDuaEntry.

emberRemoveMeshDuaEntry - Remove a copy of the DUA table entry to aid mesh address resolution on the stack.

emberRemoveMeshDuaEntryReturn - This function provides the result of a call to emberRemoveMeshDuaEntry.

emberForceTxAfterFailedCca - For each packet to be transmitted by the MAC, disables CCA after a number of consecutive CSMA failures due to CCA. The packet is then transmitted using the standard number of mac retries, but with CCA off.

emberForceTxAfterFailedCcaReturn - This function provides the result of a call to emberForceTxAfterFailedCca.

emberSendLinkMetricsQuery - This function sends an MLE Data Request message to the specifed node(address), to request link metrics based on the specified configuration

emberSendLinkMetricsQueryReturn - This function provides the result of a call to emberSendLinkMetricsQuery.

emberInitiateLinkMetricsProbing - This function initiates forward link metrics probing by sending an MLE Link Management Request message to the specifed node(address), based on the specified configuration.

emberInitiateLinkMetricsProbingReturn - This function provides the result of a call to emberSendLinkMetricsProbing.

emberSendLinkProbeMessages - This function sends the MLE Probe messages to the specifed node(address), based on the specified configuration.

emberSendLinkProbeMessagesReturn - This function provides the result of a call to emberSendLinkProbeMessages.

emberLinkMetricsMgmtHandler - This function is called when the link metrics initiator gets a link management response message.

emberLinkMetricsResponseHandler - This function is called when the link metrics initiator gets an MLE Data Response message in response to a link metrics query.

emberSetCommProxyAppJoinKey - A callback to provide the commission-proxy-app on the host with an [EUI, join passphrase] pair.

emberZclDiscCoreRd - This function appends a core.rd query to the discovery request string.

emberZclIsAddressGroupMulticast - This function returns TRUE if the supplied address is associated with one of the groups on the device.

emberGetAntennaRxMode - This function fetches the current RX antenna mode.

emberGetAntennaRxModeReturn - This function provides the result of a call to emberGetAntennaRxMode.

emberSetAntennaRxMode - This function configures the Rx antenna mode.

emberSetAntennaRxModeReturn - This function provides the result of a call to emberSetAntennaRxMode.

emberGetPtaPhySelectTimeout - This function fetches the packet traffic arbitration PHY select timeout in milliseconds. (Only valid on EFR32)

emberGetPtaPhySelectTimeoutReturn - This function provides the result of a call to emberGetPtaPhySelectTimeout. (Only valid on EFR32)

emberSetPtaPhySelectTimeout - This function configures packet traffic arbitration PHY select timeout. (Only valid on EFR32)

emberSetPtaPhySelectTimeoutReturn - This function provides the result of a call to emberSetPtaPhySelectTimeout. (Only valid on EFR32)

EmberStatus - New error codes added to diversify PHY failure error classification. In addition to EMBER_PHY_TX_CCA_FAIL, there are now also EMBER_PHY_TX_BLOCKED and EMBER_PHY_TX_SCHED_FAIL.

1.3 New Sample Applications

Added in release 2.10.0.0

Thread/BLE DMP Test Application - This application includes the basic Thread and Bluetooth LE(BLE) network management CLI commands, as well as some custom commands for exercising Thread and BLE traffic.

Dynamic Multiprotocol Light with BLE - This is a sample application demonstrating a light application using dynamic multiprotocol (Thread + BLE).

Dynamic Multiprotocol Switch with BLE - This is a sample application demonstrating a switch application using dynamic multiprotocol (Thread + BLE).

2 Improvements

2.1 Changed Plugins

Changed in release 2.10.0.0

Default cache size for NVM3 Library plugin in AFV6 increased from 100 entries to 200

2.2 Changed APIs

For additional documentation please refer to the Thread API Reference Guide.

Changed in release 2.10.0.0

emberGetLocalIpAddress – Index now represents the following:

- Index 0 contains the mesh-local 64 address of the node.
- Index 1 contains the link-local 64 address of the node.
- Index 2 contains the domain-unique address of the node, if it exists.
- Index 3 and greater will return any global unicast addresses (GUAs) of this node.

emberGetAntennaModeReturn - Antenna mode can now be any of the following: 0-don't alter antenna selection, 1-antenna 1, 2-antenna 2, 3-TX antenna diversity

emberSetAntennaMode - Antenna mode can now be any of the following: 0-don't alter antenna selection, 1-antenna 1, 2-antenna 2, 3-TX antenna diversity

emberGetPtaOptionsReturn – The list of PTA options that can be returned has changed.

emberSetPtaOptions – The list of PTA options that can be set has changed.

3 Fixed Issues

Fixed in release 2.10.3.0

ID #	Description
407407	Address issue with certification test 5.2.5 when using test harness version 50.3.

Fixed in release 2.10.2.0

ID #	Description
283490	Issues with vUART over SWO. Fix requires WSTK firmware release 1.4.3.
405333	Some register bit fields for EM3xx devices in the Device headers implied that a field was a simple 1 or 0. Those bit field defines were removed. An alternative is using a field's _MASK define instead.
407401	Incorporated the DELAY_JOIN_ENT delay of 50 ms when sending the Joining Entrust Message.
407410	Address issue with certification test 5.5.3 when using test harness version 50.3.
415347	Fixed "Invalid include file path" warning when compiling with the plugin "micrium-rtos"
421055	Address issue with certification tests 8.x when using test harness version 50.3.

Fixed in release 2.10.1.0

ID #	Description
188203	Clear serial RX errors in emberSerialFlushRx().
335364	Fixed reporting of stack usage in the crash diagnostic information.
375921	Trampoline function for PendSV_Handler fixed to branch to halPendSvIsr instead of itself.
390334	The Micrium RTOS plugin now supports sleepy end devices via the plugin option "Enable EM1/EM2". The idle-sleep plugin should not be used with Micrium.
391057	Fixed compilation error encountered when building vNCP applications with the idle-sleep plugin enabled. `Error[Li005]: no definition for "emberStackIdleTimeMs" [referenced from idle-sleep\idle-sleep.o]`
392293	Add fix so that wake up from sleep on UART RX will work without the button driver enabled.
401762	FEM control plugin settings now show up for MG21 devices.
403734	Fixed an issue where in a large enough network that forms two partitions after a leader goes down a secondary BBR can some-times fail to promote itself to primary.
406302	Resolved multiple compilation issues related to building with HAL_COEX_RUNTIME_PHY_SELECT and HAL_ANTDIV_RX_RUNTIME_PHY_SELECT macros enabled.
406938	Address issue with certification test 5.1.3 when using test harness version 50.2.
406939	Address issue with certification test 5.1.13 when using test harness version 50.2.
407047	Fixed an EFR32xG21 issue where CSMA/LBT CCA durations were significantly shorter than specified.
407408	Address issue with certification test 5.6.6 when using test harness version 50.2.
408096	Fixed the 802.15.4 ACK turnaround time on the EFR32xG21 platform. Due to a calculation error this was actually 18us too short which could cause interoperability problems.
408103	An issue with debug output timing on EFR32xG21 has been fixed. This results in improved speed and/or reliability in a number of areas, including sleep and NCP communications, when the Debug plugin is enabled.
412946	Fixed a joining issue between Thread 2.9 and 2.10 applications. When a 2.10 application acted as a joiner, there was a bug related to a version check after authentication.

Fixed in release 2.10.0.0

ID #	Description
251786	Added new 802.15.4 RAIL APIs RAIL_IEEE802154_EnableEarlyFramePending() and RAIL_IEEE802154_EnableDataFramePending() to support Thread Basil-Hayden Enhanced Frame Pending feature.
256939	Added LFXO tune manufacturing token and added support for reading and writing LFXO tune.
315661	On the EM35x platform the random number seeding is now done in parts instead of waiting for complete seed. This does not require any changes from the application. If needed complete seeding can be done with a single call to emPrngReseed(). Weak random numbers can be obtained by calling emRadioGetWeakRandomNumbers(). emRadioGetRandomNumbers() will continue providing strong random numbers.
345589	Reduced vector table alignments of dies such that they are now as minimum as required.
355239	This release fixes an issue where CREATOR code defines were always required for all tokens. With this fix only applications that include either the Simulated EEPROM version 1 or 2 plugins or the Simulated EEPROM version 2 to NVM3 upgrade plugin need to define CREATOR codes for the all tokens.
356632	Fixed issue where a sleepy device would wake up every 10 seconds when not in a network.

366276	Fixed compilation error encountered when enabling the micrium plugin in SoC applications.
	
	``platform/base/rtos/generic/rtos-sleep-manager.c:54:27: error: 'EMBER_WAKE_PORT_A'
	undeclared (first use in this function); did you mean 'EMBER_COAP_PORT'?
	   sleepGpioWakeBitMask = (EMBER_WAKE_PORT_A << 0)
	                          ^~~~~~~~~~~~~~~~~
	                          EMBER_COAP_PORT
	platform/base/rtos/generic/rtos-sleep-manager.c:54:27: note: each undeclared iden-
	tifier is reported only once for each function it appears in
	platform/base/rtos/generic/rtos-sleep-manager.c:55:29: error: 'EMBER_WAKE_PORT_B'
	undeclared (first use in this function); did you mean 'EMBER_WAKE_PORT_A'?
	
		(EMBER_WAKE_PORT_B << 8)
		                  ^~~~~~~~~~~~~~~~~
		                  EMBER_WAKE_PORT_A
		platform/base/rtos/generic/rtos-sleep-manager.c:56:29: error: 'EMBER_WAKE_PORT_C'
		undeclared (first use in this function); did you mean 'EMBER_WAKE_PORT_B'?
		
			(EMBER_WAKE_PORT_C << 16)
			                  ^~~~~~~~~~~~~~~~~
			                  EMBER_WAKE_PORT_B```

368359	If the token initialization encounters an error during NVM3 open, it will erase the NVM3 flash pages and create a new blank NVM3 instance.
371376	Addressed an issue where OTA bootloading was failing to start. The multicast IP address used for OTA bootloading changed from `ff33::fd` (All Thread Nodes) to `ff05::fd` (All CoAP Nodes) and we simply needed to have our host implementations listen on the `ff05::fd` address.
376134	SimEE1 to SimEE2 upgrade code use to search entire MFB for SimEE1, with the changes it will start scanning from _DATA_INIT_SEGMENT_END.
378035	Use of the unsafe enum GPIO_Port_TypeDef within RAIL aggregate types RAIL_PtiConfig_t and. RAIL_AntennaConfig_t has been replaced by safe uint8_t.
380487	A maximum UDP payload length of EMBER_MAX_UDP_PAYLOAD_LENGTH (1232) is now enforced on transmit and receive. In particular, for coap messages, the length of the coap header plus the coap payload must not exceed EMBER_MAX_UDP_PAYLOAD_LENGTH. If it does, an EmberStatus of EMBER_MESSAGE_TOO_LONG is returned from the sending function.
382850	The led driver now checks the led polarity and then sets or clears the pins. This fixes the issue on boards with shared pins for buttons and leds where the kit enters the bootloader instead of booting up normally.

ID #	Description

389572	Fixed two issues associated micrium-rtos builds.
	
	`"micrium-rtos-startup.c",27  Fatal  error[Pe1696]:  cannot  open  source  file "bsp_tick_rtcc.h"`
	
	and
	
	`Error[Li005]: no definition for "emberStackPollForData" [referenced from polling.o]`
	
	The first issue would occur when using the IAR compiler and enabling the micrium-rtos plugin. The second issue would occur when enabling both the polling and micrium-rtos plugins.

396956	Default cache size for NVM3 Library plugin in AFV6 increased from 100 entries to 200.
397233	Support for xGM210P Panther PCB Module OPNs. Support for BRD4308A / BRD4308B.
403249	Address issue where Thread/Micrium vNCP applications could assert in micrium-ipc-link.c.

4 Known Issues in the Current Release

Issues in bold were added since the previous release.

ID #	Description	Workaround
251287	To achieve the lowest current during sleep on EFR32xG12, EFR32xG13, and EFR32xG14 parts, you must turn on voltage scaling. However, the radio will not operate with voltage scaling turned on, so to turn it on you must also make sure to disable it after each wake-up. Furthermore, some resets will not turn off voltage scaling, so please ensure that it is disabled before attempting to turn on the radio. Note that there is a ramp when turning voltage scaling on or off, so enabling this feature may increase the time it takes to go to sleep or wake up.	Ensure that voltage scaling is enabled prior to sleeping and disabled after wake up and before attempting to turn on the radio.
260589	ip-driver-app logs messages regardless of "-l" options	Under investigation
281231	Enabling Serial 3 or USB functionality on EM358x and EM359x may cause memory management faults and other errors. As EM358x and EM359x USB support has been deprecated, please ensure that Serial 3 and USB functionality are disabled.	Ensure that Serial 3 and USB functionality are disabled when using EM358x and EM359x.
312291	The halCommonGetIntxxMillisecondTick functions on linux hosts currently use the gettimeofday function, which is not guaranteed to be monotonic. If the system time changes, it can cause issues with stack timing.	Modify these functions to use clock_gettime with the CLOCK_MONOTONIC source instead.

5 Deprecated Items

Deprecated in release 2.10.1.0

Deprecated item: Silicon Labs Thread (SL-Thread)

Reason: Silicon Labs has a continued focus on Thread strategy, adoption and participation and is committed to continuing as a leading-edge Thread supplier. Due to low customer interest in vendor-specific implementations, Silicon Labs has decided to remove SL-Thread and there are no plans to expand its functionality. The Thread technology has tremendous potential and moving forward Silicon Labs is aligning our Thread offering with the current market trends by utilizing OpenThread on GitHub and its community. In parallel, Silicon Labs is investigating ways to integrate OpenThread into future Gecko SDK Suite releases.

End-of-Service (EoS) Date: December 31, 2019. As of this EoS date, SL-Thread will no longer be available in the then current and future GSDK releases, and SL-Thread will no longer be supported in any GSDK releases.

Maintenance Period: From now until the EoS date, only critical bug fixes and security patches may be made available on currently supported GSDK releases.

Replacement: OpenThread (https://openthread.io/)

Deprecated in release 2.10.0.0

Simplicity Studio:

As of June 2019 Simplicity Studio 3.0 is being deprecated. All support for Simplicity Studio 3 is scheduled to end December 1st 2019.

Plugins:

The following plugins are scheduled to be removed in the next major release:
- accelerometer LED
- battery-monitor
- battery-monitor-stub
- bulb-pwm-driver
- bulb-pwm-driver-stub
- button-interface
- button-interface-stub
- generic-interrupt-control
- generic-interrupt-control-stub
- gpio-sensor
- gpio-sensor-stub
- humidity-si7021-stub
- Humidity-temperature-si7021
- i2c-driver
- i2c-driver-stub
- illuminance-si1141
- illuminance-si1141-stub
- key-matrix
- led-blink
- led-blink-stub
- linked-list
- microphone-codec-msadpcm
- microphone-imaadpcm
- occupancy-pyd1698
- occupancy-pyd1698-stub
- power-meter-cs5463

- power-meter-cs5463-stub
- sb1-gesture-sensor
- sb1-gesture-sensor-stub
- tamper-switch
- tamper-switch-stub
- temperature
- temperature-si7021-stub
- temperature-si7053
- temperature-si7053-stub

If you wish to continue using one or more of these plugins in your application, you are advised to keep a local copy in your source code repository and maintain and test the code yourself going forward.

Alternatively, you may wish to explore some of the peripheral usage examples found in the Silicon Labs GitHub repository here: https://github.com/SiliconLabs/peripheral_examples.

6 Removed Items

6.1 Removed Plugins

Removed in release 2.10.0.0

resource-directory-client – the functionality previously provided by this plugin in now part of the zcl-core plugin.

6.2 Removed APIs

Removed in release 2.10.0.0

Documentation for these unsupported functions has been removed.

- emberSetMessageFlag
- emberClearMessageFlag
- emberPollHandler

6.3 Removed Sample Applications

Removed in release 2.10.0.0

Capacitive Touch Sensing Switch

Contact Sensor

Dimmable Light

Light (Host)

Occupancy Sensor

Server (vNCP)

Smart Outlet

7 Using This Release

This release contains the following:

- Silicon Labs Thread stack
- Constrained Application Protocol (CoAP) API for Thread
- Application Framework for Thread
- Application Framework for ZCL/IP
- Thread Sample Applications

The Silicon Labs Thread stack is a complete implementation of all features defined in the Thread 1.1 specification.

For more information about the Thread SDK see UG103.11: Silicon Labs Thread Fundamentals.

If you are a first-time user, see QSG113: Getting Started with Silicon Labs Thread, for instructions on installing and configuring your development environment, building and flashing a sample application, and documentation references pointing to next steps.

For information on how to build border router examples as well as your own border router applications, see UG116: Developing Custom Border Router Applications.

7.1 Installation and Use

Stack installation instruction are covered in QSG113: Getting Started with Silicon Labs Thread.

Use the Thread SDK with the Silicon Labs Simplicity Studio V4 development platform. Simplicity Studio ensures that most software and tool compatibilities are managed correctly. Install software and board firmware updates promptly when you are notified.

Documentation specific to the SDK version is installed with the SDK. Additional information can often be found in the knowledge base articles (KBAs). API references and other information about this and earlier releases is available on https://docs.silabs.com/.

7.2 Support

Development Kit customers are eligible for training and technical support. You can use the Silicon Laboratories Thread web page to obtain information about all Silicon Labs Thread products and services, and to sign up for product support.

You can contact Silicon Laboratories support at http://www.silabs.com/support.

8 Legal

8.1 Disclaimer

Silicon Labs intends to provide customers with the latest, accurate, and in-depth documentation of all peripherals and modules available for system and software implementers using or intending to use the Silicon Labs products. Characterization data, available modules and peripherals, memory sizes and memory addresses refer to each specific device, and "Typical" parameters provided can and do vary in different applications.

Application examples described herein are for illustrative purposes only.

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