EmberZNet SDK 6.2.3.0 GA

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1 Release Highlights

1.1 Version 6.2.3.0 GA:

- Enhanced Zigbee 3.0 Compliance

  - Green Power Proxy Basic updates
  - Added Touchlink support
  - Additional Clusters support

1.2 Version 6.2.2.0 GA:

- Bug fixes

- This release will not be Zigbee certified. A further EmberZNet 6.2.x patch will be sent for certification.

1.3 Version 6.2.1.0 GA:

- Add support for QFN68 variants of EFR32xG12

- This release will not be Zigbee certified. A further EmberZNet 6.2.x patch will be sent for certification.

1.4 Version 6.2.0.0 GA:

EmberZNet 6.2.0 includes significant improvements towards Zigbee 3.0 and SE 1.4/GBCS compliance. A minor patch release (EmberZNet 6.2.1) will be issued in the coming weeks to address remaining compliance gaps and will be submitted for official Zigbee Certified Platform (ZCP) testing. Customers seeking Zigbee 3.0 or SE1.4/GBCS product certifications should start migration to EmberZNet 6.2.0 and adopt the 6.2.1 patch before entering certifications. For details on compliance issues refer to open issues list.

- Zigbee 3.0 Compliance Improvements–Green Power Proxy Basic, Touchlink, Enhanced Cluster Support

- Improved LQI/RSSI link cost mapping to improve routing performance in hybrid networks with both EFR32MG and EM35xx devices.

- Support for EFR32MG14 SoCs

- Beta release of NVM3 for Dynamic Multiprotocol (BLE+Zigbee) on EFR32MG12/13

- Bug fixes

2 Using This Release

This release contains the following

- Zigbee stack EmberZNet Pro v6.2

- Zigbee Application Framework v6.2

- Zigbee Sample Applications

For more information about the Silicon Labs EmberZNet Pro stack see UG103.02 - Zigbee Fundamentals. If you are a first time user, see QSG106: Getting Started with EmberZNet Pro.

2.1 Support

Development Kit customers are eligible for training and technical support. You can use the Silicon Laboratories web site http://www.silabs.com to obtain information about all Silicon Labs Zigbee products and services, and to sign up for product support.

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

3 Added Items

3.1 Version 6.2.3.0 GA:

3.1.1 New Stack APIs:

- **ember/ezspZllRxOnWhenIdleGetActive** Check whether the special touchlink radio idle mode is active.

3.2 Version 6.2.2.0 GA:

3.2.1 New Stack APIs:

- **New API: ember/ezspZllOperationInProgress** Enables the application to identify a classically-joined node at network up, in order to correctly update the Stack's ZLL state, so that it will be set to 'Non-Factory-New', and so that the address and group range assignment mechanism will be disabled for a subsequent touchlink operation.

3.3 Version 6.2.0.0 GA:

3.3.1 New Application Plugins:

- **NVM3 plugin** The NVM3 plugin is used to include the NVM3 feature. NVM3 acts as persistent storage, which can be used to store tokens and other nonvolatile data. NVM3 is used in lieu of simee 1 and simee 2.

3.3.2 New Stack APIs:

- **ember/ezspZllSetRadioIdleMode** Set the default radio power mode.

- **ember/ezspSetZllNodeType** Set the default node type for touchlink commissioning.

- **ember/ezspSetZllAdditionalState** Set additional capability bits in the touchlink information bitmask.

- **emberCommandInterpreterBusy** Returns true if the CLI command interpreter is reading a command.

- **emberZllCancelRxOnWhenIdle** Cancels the scheduled event to revert the radio idle mode after it has been temporarily changed it to 'RX ON' by emberZ—llSetRxOnWhenIdle. Called automatically in the event of the device joining, or attempting to join another node.

- **emberSetLogicalAndRadioChannel** Set the current logical and physical channel

- **emberGetLogicalChannel** Get the current logical channel.

- **emberIsRadioOffScanActivated** (only SoC) Check if the radio off scan mode(radio shut down) is activated.

- **emberSetRejoinMode** (only SoC) Set the policy to (dis)allow insecure end-device rejoins, either it is allowing no rejoin at all, allowing rejoin only with non-default link keys (default), or allowing all kinds of rejoins.

- **emberGetRejoinMode** (only SoC) Get the (in)secure end-device rejoin policy.

3.3.3 New CLI commands:

- **plugin zll-commissioning disable** Disable touchlink commissioning

- **plugin zll-commissioning enable** Enable touchlink commissioning

3.3.4 New Sample Applications:

- **Dynamic multi-protocol w/ NVM3** A dynamic multiprotocol application with NVM3 has been added, called DynamicMultiprotocolDemoLightWithNvm3. This application showcases the dynamic multiprotocol feature running zigbee and bluetooth in parallel. The persistent storage used for both protocols utilizes the NVM3 feature, which replaces simee and psstore completely. A matching DynamicMultiprotocolDemoSwitchWithNvm3 application has been added which does not run multiprotocol but is meant to be used in conjunction with DynamicMultiprotocolDemoLightWithNvm3 to demonstrate the features. DynamicMultiprotocolDemoSwitchWithNvm3 does utilize the NVM3 feature.

4 Changed Items

4.1 Version 6.2.3.0 GA:

- Support is added for behavior controlled by the Level Control cluster's Options attribute CoupleColorTempToLevel option bit. When this bit is set, a change in Level Control CurrentLevel will induce a corresponding change in Color Control's ColorTemperatureMireds. (level-control and color-control-server plugins)

- Enhancements to the new radio-on-at-startup mechanism:
  - The touchlink radio idle mode (rx on) will resume automatically after a device leave, or after a join attempt fails, if it is still within the specified duration.
  - An application may specify a duration of 0xffffffff to indicate that the touchlink radio idle mode will last indefinitely, and hence that the receiver will remain permanently switched on, (unless the device happens to be joined as a sleepy end device).

4.2 Version 6.2.2.0 GA:

- For consistency with the Base Device Behaviour specification, which defines 'Factory New' as 'bdbNodeIsOnANetwork = FALSE', a network formed via emberZllFormNetwork will be considered to be 'Non-Factory-New', and hence an attempt by another node to touchlink to it will technically be considered as a stealing attempt.

- Start-up initialization of ZCL OnOff cluster OnOff attribute and LevelControl cluster CurrentLevel attribute is now based on settings of their respective StartUp attributes.

    - **On-off plugin** The on-off plugin implements emberAfOnOffClusterServerInitCallback(), which sets the value of the OnOff attribute according to the setting of the StartUpOnOff attribute. The startup options are off, on, toggle, or preserve previous value of OnOff. This implemented callback invokes new callback emberAfPluginOnOffClusterServerPostInit() which can be implemented to perform any additional initialization based on the resulting OnOff startup state. To support the defined start-up behavior across power cycles, the OnOff and StartUpOnOff attributes must be implemented as persisted attributes.

    - **Level-control plugin** The level-control plugin implements emberAfLevelControlClusterServerInit-Callback(), which sets the value of the CurrentLevel attribute according to the setting of the StartUpCurrentLevel attribute. The startup options are minimum value of CurrentLevel, preserve previous value of CurrentLevel, or CurrentLevel value in range 0x01-0xFE. This implemented callback invokes new callback emberAfPluginLevelControlClusterServerPostInit() which can be implemented to perform any additional initialization based on the resulting CurrentLevel startup state. To support the defined start-up behavior across power cycles, the CurrentLevel and StartUpCurrentLevel attributes must be implemented as persisted attributes.

4.3 Version 6.2.0.0 GA:

- The mapping used to determine the cost of a link on EFR chips has changed. The former mapping was overly strict and only assigned good cost values to links with extremely high link margins. This resulted in very stable links being assigned high costs, which is undesirable. One consequence was that in mixed networks of EM3xx and EFR chips, the routing algorithm would avoid using EFR chips as relays. The new mapping brings the EFR cost assignments more closely into line with the EM3xx assignments. Note: to avoid biased route selection, when upgrading to this release of the SDK it is recommended to upgrade all the nodes on a network, and not mix nodes running older versions with this version.

- FEM Control and LNA functionality has been merged into the FEM plugin. The plugin options RX/TX location, channel and active low/high which existed before have stayed but have been changed to use different logic, while TX/RX channel inversion has been removed, and a sleep pin and channel have been added. Therefore the user will have to enable the FEM peripheral properties again if an upgrade was run on the FEM module. In the case of only TX location and channel being defined, it is changed to be RX. If both TX and RX are defined, they both remain defined. A sleep pin with a PRS channel needs to be added.

- Changed emberSetNodeId: could now be used to set a non-conflicting node ID after the network is up.

- Changed emberSetNwkUpdateId: (only SoC) could now be used after a network is formed to set the network update ID in a single node network.

- The default settings for network initialization now persist parent information in tokens

    - This behavior is dictated with the EMBER_AF_CUSTOM_NETWORK_INIT_OPTIONS macro, which can be overridden

5 Deprecated Items

5.1 Version 6.2.0.0 GA:

- Legacy CLI (used by older plugins) is deprecated and will be removed in the next release.

6 Removed Items

6.1 Version 6.2.0.0 GA:

- Mobile End Device node type support has been removed. Customers presently using this feature should migrate to Sleepy End Device node type.

- The legacy Ember one-hop OTA bootloader has been deprecated. For new products which require OTA updating, please use either an Ember application or Gecko storage bootloader in conjunction with the storage/update mechanism of the chosen stack.

7 Fixed Issues

7.1 Version 6.2.3.0 GA:

- 299937 A child device requesting a Direct CBKE from another child device without performing a Partner Key Exchange first will now correctly return NO_RESOURCES instead of BAD_MESSAGE.

- 301132 A touchlink initiator will always scan secondary channels if configured to do so. Previously, it would only do so if it was scanning for a reset to factory, or if it was either not joined at all, or joined by means other than touchlink commissioning (that is, it was either classically joined to a distributed network, or it itself had formed a 'commissioning network' by calling emberZllFromNetwork())

- 303471 The callback linkage between two ZCL cluster plugins (On/Off and Level Control) and three LED hardware interface plugins (dim, rgb, temp) has been improved. The clusters' relevant attributes (OnOff, CurrentLevel) are properly set according to their respective StartUp settings before the LED plugins attempt to use them to initialize the hardware.

7.2 Version 6.2.2.0 GA:

- 181793 RCD device types are now eligible to be a Time Source (SF: 98635)

- 269282 Concentrator plugin's state machine now starts start upon joining or forming a network rather than at boot time.

- 274451 An OTA download resume bug was resolved via the fix for bug 288819.

- 280374 An issue was fixed where an end device could not communicate to devices on the network when leaving a network and joining again.

- 289220 Sleepy end devices will now poll up to 9 times (200ms interval)

- 297990 A linker issue causing watchdog timer resets in DMP apps has been identified and resolved.

- 298234 This fixes an issue when a node will not respond to incoming scan requests after it has been reset to factory new with a remote command, unless it is rebooted. With this change, the device will automatically enter radio-on-at-startup mode for the specified duration, without a reboot being required.

- 298457 This fixes an issue when a node joins a distributed network by means of classical commissioning, then subsequently attempts to act as a touchlink initiator, where the node was still being regarded as 'Factory New' by the Stack.

- 298584 Added new option to Zll Commissioning plugin to allow the device, when acting as a touchlink target, to reject incoming touchlink start and join requests (AKA 'stealing'), if it is not factory-new. This ties in with the existing CLI command, "plugin zll-commissioning notouchlink-nfn", and the existing public API, emberZllSetPolicy, which allows the stealing policy to be changed at run-time. A device will also reject touchlink start, join, and reset requests if it is a co-ordinator on a centralized network.

- 299820 This fixes a problem where touchlinking may be incorrectly disabled after a node sends a network update request.

- 301189 Factory new zigbee router devices no longer emit a NETWORK_DOWN when commissioned by a touchlink initiator.

- 298461 Start-up initialization of ZCL OnOff cluster OnOff attribute and LevelControl cluster CurrentLevel attribute is now based on settings of their respective StartUp attributes. See Changed Items section for more detail.

- 298624 This issue is fixed, touchlink targets will drop network request if the request is not a valid request for the target type instead of responding with failure status. Following are the type of behavior shown by the different types of target this regards:

    - A Router will drop network join end device request
    - An End Device will drop network start request and network join router request.

- 298630 This fixes a problem where touchlinking may be incorrectly disabled after a node sends a network update request.

7.3   Version 6.2.0.0 GA:

- 193248 Simplicity Studio has been updated to not generate null defines for the custom security section.

- 205394 A SoC-based concentrator now initiates an IEEE address request to recover its broken source route entry in a timely manner.

- 227955 The RNG algorithm has been upgraded on EM35x parts as the previous method could result in slight correlations. Please see platform/base/phy/em3xx/phy.h for further information.

- 252422 OTA client plugin should select first available OTA server when multiple servers respond to the query. Note that this can cause confusion if the OTA client device also has a local endpoint that is an OTA server, so a new option has been added to the OTA Client plugin to ignore servers with a loopback address to the local client.

- 258970 Some issues with custom token data generation in App Framework V2 (ZCL) have been resolved.

- 262393 EmberKeyStatus values in EmberTypes.h have been updated to hexadecimal format.

- 266888 Z3 apps now perform an active scan to find available network settings before forming a network during a touchlink commissioning process.

- 268553 Application JIT messaging functionality (via emberSetMessageFlag) was removed in a previous release. This functionality has been restored.

- 272367 The Z3Light sample applications have been updated to use the new L&O device types instead of the legacy ZLL device types on endpoint 2.

- 281831 Green Power Client Plugin: Previously: When commissioning bi-directional green power devices, sometimes the node will change its channel permanently instead of recovering back to expected Zigbee channel. The Proxy now correctly returns to the zigbee channel correctly

- 285469 Several issues with Green Power memory management have been fixed.

- 288066 Some missing MG13 parts were added to the available device list for NCP Framework projects

- 288195 Packet buffer leakage when sending broadcast to address 0xFFFF and a node has end device children

- 288819 A bug where resuming OTA downloads would fail has been fixed. Previously, resuming OTA downloads would write to incorrect memory, resulting in crashing the device or corrupting the OTA image. Resuming OTA downloads now works for all OTA configurations, both those utilizing slots with the Gecko storage bootloader or address offsets with the legacy bootloader.

- 290851 Several compiler warnings have been addressed.

- 292916 On the EFR32, updates to the HFXO CTUNE value will only be applied to HFXOSTEADYS-TATECTRL, with HFXOSTARTUPCTRL left unchanged.

- 293387 Previously, the MAC RX Unicast Counter did not increment for incoming data polls from children, while the MAC TX Unicast counter did increment on the child when sending a data poll. This has been made consistent by incrementing the RX counter on incoming polls.

- 293997 The Transport Key (NWK) frame to end device child does not include the source route information anymore.

- 294853 The default antenna mode for Hal-Config was set to 0(select antenna 0). The appbuilder plugin uses default antenna mode 2(enable antenna diversity). As a result, Hal-Config users needed to manually enable antenna diversity after configuring the antenna select GPIOs. The default Hal-Config antenna mode has been updated to 2(enable antenna diversity). In addition, the antenna diversity feature was removed from the Zigbee 6.0 release. The antenna diversity feature has been reintroduced.

- 289924 An issue where the last two bytes of the destination EUI64 address in a Transport Key message being zeroed out has been resolved. This issue prevented the Trust Center Swap Out feature from functioning, where a joining device would refute the Transport Key message from the new trust center due to the malformed destination EUI64.

8 Open Issues

8.1 EmberZNet Open Issues:

- 60757 Indirect Transaction Expiry route error not being sent when TX failure count is reached on parent router.

- 60774 MTORR reception by concentrator neighbor sometimes causes assert in route-discovery.c (emHandleRouteCommand).

- 60858 Sleepy broadcast payload is sometimes corrupted when relaying to child

- 60868 Extra retries seen on ZDO requests; ZDO response going out before APS ACK.

- 60944 EZSP-SPI NCP may become unresponsive if callbacks are received during ECC operations.

- 60970 TC link key should be used for Transport Key to rejoining devices even if decision is Send Key In Clear

- 60975 EZSP_VALUE_TOKEN_STACK_NODE_DATA, EZSP_VALUE_UART_SYNCH_CALLBACKS, EZSP_VALUE_MAXIMUM_INCOMING_TRANSFER_SIZE, and EZSP_VALUE_MAXIMUM_OUTGOING_TRANSFER_SIZE ValueIDs are writable but not readable.

- 61008 Scanning state machine (stack level or form-and-join util) can get stuck in "scanning" state indefinitely

- 66508 Framework should avoid sending unicast loopback messages with APS security since stack doesn't support this

- 66785 Messaging Client plugin should differentiate between Cancel Msg command and timed out / replaced message

- 66786 "zcl ota server reload" doesn't properly reload image info when using OTA Simple Storage plugin

- 66944 Duplicate Key Confirm Response message can lock up KE plugin state machine

- 70799 Overlay of RESETINFO on CSTACK causes IAR stack overflow warning

- 82600 Setting a non-zero MAC Filter Table Size but no MAC Filter Table Entries causes NCP resets when joining a network

- 86948 Fragmented messages can be passed to the application with old data from the rxFragmentedPacket buffer

- 92147 ZLL Scan Response Should Be Sent at Power 0 rather than last-used power level

- 103833 Second energy scan request caught in first energy scan request knocks node out of network.

- 106307 Nodetest calChannel command does not wake the radio to work properly.

- 108582 For the ZigBee Over-the-air Cluster the minBlockRequestPeriod is in milliseconds but compared to imageBlockRequestMinRequestPeriodSeconds as if they are both seconds. Unfortunately this causes problems for servers that make use of this value and try to throttle the rate of the client. Recommend that the client disables support for this feature to avoid problems.

- 119037 Packet-buffer.c Assert at line 352 occurs during rapid packet transmission and Partner-link-key-exchange.

- 119828 ota-client.c does not use the server EUI64 in Partner Link Key Exchange.

- 119939 ZDO IEEE Request's APS ACK proxied by parent incorrectly includes long source address.

- 121984 Turning off NCP concentrator support does not disable all stack concentrator logic.

- 123399 Non-sleepy endpoint does not always keep correct network parameters on reset in multi-networking.

- 126087 Sleepy end device would return NO_LOCAL_RESOURCES when a coordinator initiates key establishment with it in Multi-networking.

- 135649 Multi-networking can cause APS frame counter confusion between networks. Workaround: Use emberAfSecurityInitCallback to add EMBER_NO_FRAME_COUNTER_RESET to EmberInitialSecurityBitmask.

- 158598 OTA Client plugin's Bootloading Message Timeout doesn't account for Short Poll Interval being longer than the default and may spuriously time out messages before the sleepy client has had a chance to poll for the response.

- 162190 Fixed issue in packet reception that could cause misprocessing of non-ACK-requesting packets after an ACK with frame-pending bit set was sent.

- 177619 Including OTA Server and OTA Common Plugins but not using OTA Server Policy Plugin to implement Image Block Request Callback results in linker error for emAfOtaServerImageBlockRequestCallback.

- 180028 OTA Client Plugin should send ZCL Default Response to messages with wrong Mfg Code

- 201417 Adding GPIO Sensor Interface plugin to an EM358x project results in error: "identifier "GPIO_SENSOR_IRQ" is undefined".

- 213424 Problem with ZLL Devices responding to a multicast addScene when they should not.

- 229938 ZLL devices are sending ZLL device information frames with the 0x0104 HA/Z3 common profile ID instead of 0xC05E ZLL profile ID.

- 235222 Virtual UART (VUART) works on Ethernet but does not work over USB on WSTK.

- 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.

- 261670 Harden the ZLL touchlink process to mitigate malicious attacks

- 266341 Z3 Light sample app has two endpoints that support similar cluster commands, so duplicate responses may be generated for certain commands.

- 267722 Centralized Trust Center in ZIgbee 3.0 security mode doesn't allow more than 10 devices to join during the Network Creator Open Network period

- 271896 Certain non-standard/malformed packets may trigger packet-buffer.c assert on receiver.

- 274414 AFv2 blank app project template for SOC and Host should use Z3 defaults, not ZHA defaults

- 277029 Green Power Security security level default bitmask should be 0x00, not 0x10

- 277510 nWAKE handshake does not complete between EM35x SPI NCP and host, causing the host to assert

- 278063 Smart Energy Tunneling plugins have conflicting treatment/usage of address table index

- 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.

- 281832 Green Power Common plugin incorrectly formats groupList and groupListCount parameters of GP Pairing Configuration frame.

- 281833 Green Power Pairing Response frame is malformed by Green Power Common plugin.

- 281835 Green Power Channel Request message is always tunneled to the sink with spurious LQI of 0xFF.

- 285563 platform/base/phy/phy.h is incorrectly included in the stack install and references other header files not available in the installer.

- 289569 network-creator plugin power level picklist doesn't offer full range of supported values for EFR32

- 289624 In a SPI NCP, if you assert the nWAKE line while the NCP is awake, it will cause the NCP to become locked in a state that draws a higher current and can no longer sleep.

- 290265 Sleepy end device doesn't go to sleep for approximately 30 seconds when sending APS-retried unicast to unreachable parent. Workaround: Disable EMBER_APS_OPTION_RETRY for current message or poll during delivery process to detect and repair the broken parent link.

- 295498 UART reception sometimes drops bytes under heavy load in Zigbee+BLE DMP use case

- 296468 Battery Monitor plugin is not working in EFR32MG14 parts.

- 300091 Enabling EM4 plugin causes unexpected resets during sleep cycles

- 300264 ZCL Report generation: A change to a string-like attribute type (String, LongString, OctetString, LongOctetString) is not properly detected and no ZCL report is generated for that change.

- 302001 The end device Touchlink initiator is not able to proceed with a touch link process with another target (FN or NFN) when the initiator's state is not-factory-new, there is no parent present, and the initiator undergoes a power reset. Thus, to do a touch link with a target, the NFN initiator needs to be in its network with the parent present.

- 303864 Default "ZLL Commissioning" plugin settings cause TouchLink transaction time to exceed the 8 second transaction timer. Reduce the TouchLink delay time option from 3s to 1s in order to comply.

9 Intended Behavior

10 Documentation Changes

11 History