Application Note:
Upgrading To Z-Stack v2.3

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Version	Description	Date
1.0	Initial release	01/17/2010
1.1	Updated for ZStack-2.3.1 release	08/12/2010

Table of Contents

1. Purpose

This document describes considerations to make when upgrading to Texas Instruments Z-Stack™ version 2.3.0 or 2.3.1, discussing changes made since the 2.2.2 release of Z-Stack. Most importantly, changes have been made to introduce the ZigBee Network Processor (ZNP) application for the CC2530/CC2531, better performance of larger networks, and various enhancements/optimizations of OSAL and Z-Stack functionality. This document deals with the "core" and "full" Z-Stack installation packages listed below. "Core" packages include the latest Z-Stack files and libraries along with one simple sample application. "Full" packages include all components of the associated "core" package, along with additional sample applications, additional documentation, Z-Tool, SBDemo, and ZOAD.

- ***ZStack-CC2530-2.3.x.exe*** - "Core" package for SmartRF05EB + CC2530EM
- ***ZStack-EXP5438-2.3.x.exe*** - "Core" package for MSP-EXP430F5438 + CC2520EM
- ***ZStack-MSP2618-2.3.x.exe*** - "Core" package for SmartRF05EB + MSP2618 + CC2520EM
- ***ZStack-CC2530-2.3.x-1.4.0.exe*** - "Full" package for SmartRF05EB + CC2530EM
- ***ZStack-EXP5438-2.3.x-1.4.0.exe*** - "Full" package for MSP-EXP430F5438 + CC2520EM
- ***ZStack-MSP2618-2.3.x-1.4.0.exe*** - "Full" package for SmartRF05EB + MSP2618 + CC2520EM

2. Summary of Changes

2.1 ZStack-2.3.0 Changes

This section summarizes changes to Z-Stack that are observed when upgrading from version 2.2.2 to 2.3.0.

2.1.1 CC2530 ZigBee Network Processor

Z-Stack now supports an IAR project to build ZigBee Network Processor (ZNP) devices. CC2530-ZNP devices can be used in conjunction with any host MCU (via SPI or UART interface) to add ZigBee PRO wireless communication to existing or new product designs. ZNP images can be built from standardized configurations or the developer can alter project build options to produce customized ZNP images. Refer to the *"CC2530-ZNP Interface Specification"* document for details on using a ZNP device.

2.1.2 OSAL Enhancements

Enhancements have been made to OSAL functionality as described below. These new features were developed for use in the Z-Stack system but are also available for application program usage. Refer to the *"OSAL API"* document for details on the use of OSAL features and functions.

2.1.2.1 Reloading Timers

The OSAL_Timer API has been extended to add capability to define automatically reloading timers. In addition to simplifying the use of periodic timers, this feature eliminates problems that could occur when re-scheduling of a periodic timer failed due to depletion of dynamic memory (heap) under heavy traffic conditions. See section 5.3 of the *"OSAL API"* document for details on use of *osal_start_reload_timer()*.

2.1.2.2 Queued Message Search

The OSAL_MSG API has been extended to add capability to search for an existing OSAL message in the queue. See section 3.6 of the *"OSAL API"* document for details on use of *osal_msg_find()*.

2.1.3 Monitor-Test Extensions

Additions have been made to the Monitor-Test (MT) API to expand command/response capability for serial control of Z-Stack devices. Read *"Z-Stack Monitor and Test API"* for details on MT commands and responses.

2.1.3.1 Inter-Pan Communication

The MT_AF API has been extended to support control of Inter-Pan communication. Sections 3.2.1.5 and 3.2.1.3 of the *"Z-Stack Monitor and Test API"* has details on using this MT function. Section 12 of the *"Z-Stack Developer's Guide"* provides a discussion of the Inter-Pan feature.

2.1.3.2 Source Routing

The MT_AF API has been extended to provide support for sending messages using source routing. Sections 3.2.1.4 and 3.12.2.27 of the *"Z-Stack Monitor and Test API"* have details on using these MT functions. Refer to section 5.4 of the *"Z-Stack Developer's Guide"* for a discussion of the many-to-one and source routing features.

2.1.3.3 Application Link Keys

The MT_ZDO API has been extended to provide support for configuring application link keys. Refer to sections 3.12.1.28 through 3.12.1.30 of the *"Z-Stack Monitor and Test API"* document for details of using MT commands and responses for link key configuration. Refer to section 10.5 of the *"Z-Stack Developer's Guide"* for discussion of link key usage in Smart Energy devices.

2.1.3.4 ZDO Message Callback

The MT_ZDO API has been extended to provide for single command and response for ZDO callbacks. Refer to sections 3.12.1.24, 3.12.1.25, and 3.12.2.28 of the *"Z-Stack Monitor and Test API"* document for details of using MT commands/responses for ZDO callbacks. Refer to section 6 of the *"Z-Stack Developer's Guide"* for discussions of registering for and receiving ZDO callbacks.

2.1.4 Performance Improvements

Changes to ZStack-2.3.0 have been made to improve stability and performance in dense and higher traffic networks. See the README document accompanying the installation for a summary of improvements for this release.

2.1.4.1 Best Router Algorithm

To improve the quality of network structure formation in ZigBee PRO, the "best router" algorithm that is used to select a parent device during joining, has been changed to consider the link quality of received beacons. In the past, minimizing network depth (hops from the Coordinator) was the dominant criterion when choosing a parent device.

2.1.4.2 Neighbor Table Size

The default size of the neighbor table has been increased from 8 to 16. This improves "out-of-the-box" performance in denser networks (many routers within one hop of each other). Performance will be best when setting the size of the neighbor table at or near to the number of actual neighbor devices in the network.

2.1.4.3 CC2530 Virtual Registers

For Z-Stack packages that support CC2530-based platforms, the default setting for *Virtual Registers* increased from 8 to 16. This typically results in code size reduction of approximately 1% and slight performance gain. Developers could reduce code size slightly more by further increasing the *Virtual Registers* setting but there is a risk of causing an "out of ISTACK" linker error.

2.1.5 MSP430 Compiler Change

Z-Stack-2.3.0 packages that support MSP430-based platforms (MSP2618 and EXP5438) have been upgraded to use the IAR EW430 v4.21 Embedded Workbench toolset. The Z-Stack-2.2.2 release used v4.20. Note that ZStack-2.3.0 projects will not build properly with the v4.20 toolset – developers should upgrade to the v4.21 version.

2.2 ZStack-2.3.1 Changes

This section summarizes changes to Z-Stack that are observed when upgrading from version 2.3.0 to 2.3.1.

2.2.1 CC253x ZigBee Network Processor

The ZigBee Network Processor (ZNP) sample application project now supports CC2530 and CC2531 devices with default configurations for three platforms – CC2530EM, CC2531_Dongle, and ZNP Mini-Kit. Support for use with a serial boot loader has been added, along with extended command/response capability. Refer to the *"CC2530-ZNP Interface Specification"* document for information on ZNP usage.

2.2.1.1 Default Pin Configurations

The ZNP sample application project has been extended to provide three "default" pin configurations, as well as, support for CC2531 USB devices (CC2531DK_Dongle) and the ZNP Mini-Kit. See section 2.1 of the *"CC2530-ZNP Interface Specification"* document for details on the ZNP interface pin configurations.

2.2.1.2 Serial Boot Loader

The ZNP sample application project now provides configurations to build ZNP targets for use with an associated serial bootloader (SBL). The SBL can be configured to load a ZNP image via UART, SPI, or USB. Read sections 3.3 and 4.5 of *"Z-Stack User's Guide for CC2530 ZigBee-PRO Network Processor – Sample Applications"* for information on using SBL with ZNP devices.

2.2.2 Performance Improvements

Changes have been made to ZStack-2.3.1 to improve stability and performance in larger and higher traffic networks. See the README document accompanying the installation for a summary of improvements for this release.

2.2.2.1 CSMA Optimization

Power consumption during CSMA has been reduced. For CC253x devices, the "RX-on" time was reduced by one backoff period (except for a requested backoff time of zero). For CC2520 devices, RX is now turned off during the entire backoff sequence except for the last fixed backoff period.

2.2.2.2 Over Air Download

Over Air Download (OAD) via serial dongle has been significantly improved. Upgrade of a "full size" image (240K) may be completed up to 8-10 times faster than with previous versions. In addition, the OAD boot loader has been changed to retry (possibly continually) copying the new image to the MCU if the checksum validation fails. Refer to *"Over Air Download for CC2530"* or *"Over Air Download for MSP430"*, depending on the Z-Stack version in use.

2.2.2.3 LQI Adjustment

Z-Stack now provides capability to adjust the Link Quality Index (LQI) that gets passed from the 802.15.4 MAC layer to the ZigBee NWK layer. By default, LQI adjustment is disabled, resulting in LQI values that are directly scaled from Received Signal Strength Index (RSSI) that is received from the radio. See section 13 of the *"Z-Stack Developer's Guide"* document for details on usage of this feature.

2.2.2.4 Link Status Jitter

Z-Stack provides for random "jitter" in the timing of Link Status message transmission to reduce contention in ZigBee-Pro networks where devices may get reset at the same time. In ZStack-2.3.1, the maximum jitter has been increased from 127 to 4095 milliseconds, and made available to the developer for modification. See

2.2.2.5 Network Throughput

ZStack-2.3.1 significantly increases reliability of message delivery in large networks by reducing broadcast traffic (specifically route requests) and improving management of Link Status information. Testing in a dense network with over 400 routers has demonstrated improved throughput in concentrator applications, in both normal and APS acknowledge scenarios. Changes in this area include:

- Decreased loss of Link Status messages by passing radius 1 broadcast messages directly through the network RX unicast buffer, bypassing the separate broadcast RX buffer.
- Shortened the re-broadcast delay from 30-60 milliseconds to 20-50 milliseconds.
- Increased filtering for corrupt/illegal frames at the MAC, NWK, APS, and AF levels. Added error statistics counters to allow monitoring of message filtering.
- Changed the callback for Concentrator Indication to include the concentrator's extended address and pktCost.
- Filter out Route Responses that come from devices not in device's neighbor table.
- Changed the routing loop detection to include NWK source address.
- Changed the 'link down' calculation to mark the link down only after exceeding the down trigger and clear the TX fail counter whenever successfully sending a message.
- Added validation of the next hop address of a routing table with a neighbor table entry.
- Send a network status instead of a route request if the destination address is a known concentrator.
- Changed route maintenance to not mark neighbor as LINK_DOWN until the LINK_DOWN_TRIGGER met.
- Added a filter to check for an existing route if the sending indicates that the destination is a concentrator.

2.2.3 Monitor-Test Extensions

Additions have been made to the Monitor-Test (MT) API to expand command/response capability for serial control of Z-Stack devices. The *"Z-Stack Monitor and Test API"* document provides details on MT commands/responses.

2.2.3.1 Soft Reset
The SYS_RESET_REQ command has been modified to support both "soft" and "hard" resets. Soft reset is useful when serial communication hardware (particularly USB) needs to be unaffected by the reset operation. Refer to section 3.8.1.1 of the *"Z-Stack Monitor and Test API"* document for details of using the MT reset command.

2.2.3.2 Data Loopback
The UTIL_TEST_LOOPBACK command has been added to provide for serial I/O loopback testing of a device via the MT interface. See section 3.10.1.1 of the *"Z-Stack Monitor and Test API"* document for use of MT loopback.

2.2.3.3 Manual Data Poll
The UTIL_DATA_REQ command has been added to provide a "manual" data poll request. This allows a host device to control data polling by the target device instead of having the target automatically poll via timer. Refer to section 3.10.1.12 of the *"Z-Stack Monitor and Test API"* document for details on using MT manual polling.

2.2.3.4 Fragmentation
The MT API has been extended to support fragmentation for sending and receiving large messages (up to 250 bytes). See sections 3.2.1.6 and 3.2.1.7 of the *"Z-Stack Monitor and Test API"* document for details on using fragmentation on the MT interface. Refer to section 9.9 of the *"Z-Stack Developer's Guide"* for discussion of fragmentation in Z-Stack devices.

2.2.3.5 Security Management
A new compile option, MT_SYS_KEY_MANAGEMENT, has been added to control MT access to security-related items. By default, Z-Stack does *not* define this compile option, thus disabling MT read/write access to security data. For test purposes, the developer can define this option in the project to enable various security item MT commands.

2.2.4 Security Enhancements
Commissioning, storage, and handling of security "keys" has been updated in ZStack-2.3.1 to improve programming and testing of a few or many devices, as well as, remove possibility of security material upload from device memory.

2.2.4.1 Certificate Commissioning
Support has been added for commissioning security related data items when devices are programmed "at the factory". This allows for loading Certicom certificates (Device Private Key, Implicit Certificate, and CA Public Key) into non-volatile flash memory during automated device programming. See section 3.3 of the *"Smart Energy Application User's Guide"* document for details on using this feature.

2.2.4.2 Security Material Storage
In previous versions of Z-Stack, security material (keys and frame counters) was stored statically in RAM memory, allowing the possibility of reading that data from a halted device. Security material is now stored only in non-volatile (NV) memory and read by applications from NV at time of use. Read section 10.6 of the *"Z-Stack Developer's Guide"* for details on management of security material in NV memory of Z-Stack applications.

2.2.5 CC253x Serial Boot Loader
The CC2530 package now includes a project to build a serial boot loader (SBL) that permits loading of SBL-enabled images onto CC253x target devices. The SBL supports communication via UART, SPI, and USB interfaces. Read the *"Serial Boot Loader for CC253x"* document for details on building the SBL and using it with Z-Stack.

2.2.6 MSP430 Compiler Change
Z-Stack-2.3.1 packages that support MSP430-based platforms (MSP2618 and EXP5438) have been upgraded to use the IAR EW430 v5.10 Embedded Workbench toolset. The previous Z-Stack release used v4.21. Note that ZStack-2.3.1 projects will not build properly with the v4.21 toolset – developers must upgrade to the v5.10.4 version.

3. Changes to Installed Files
Refer to the tables in Sections 3.1 and 3.2 for file changes to the ZStack "core" and "full" installers, respectively. Items with Modified, New or Removed in the **Change** column occurred in the 2.3.0 release. Italicized items in the **Change** column (*Modified, New* or *Removed*) occurred in the 2.3.1 release. Folder updates are indicated when there

is no entry in the **File** column. Making changes to existing project files (*.ewp,*.ewd,*.eww) can be done with the Embedded Workbench IDE or by editing the XML files directly.

3.1 Changes to "Core" Installed Files

The following "core" Z-Stack files have been changed since the v2.2.2 release:

File	Location	Change
hal_assert.c	…\Components\hal\common	Modified
hal_drivers.c	…\Components\hal\common	*Modified*
hal_adc.h	…\Components\hal\include	*Modified*
hal_flash.h	…\Components\hal\include	*Modified*
_hal_uart_dma.c	…\Components\hal\target\CC2530EB	*Modified*
_hal_uart_isr.c	…\Components\hal\target\CC2530EB	*Modified*
hal_adc.c	…\Components\hal\target\CC2530EB	*Modified*
hal_aes.h	…\Components\hal\target\CC2530EB	Modified
hal_board_cfg.h	…\Components\hal\target\CC2530EB	*Modified*
hal_dma.c	…\Components\hal\target\CC2530EB	*Modified*
hal_dma.h	…\Components\hal\target\CC2530EB	*Modified*
hal_flash.c	…\Components\hal\target\CC2530EB	*Modified*
hal_key.c	…\Components\hal\target\CC2530EB	*Modified*
hal_lcd.c	…\Components\hal\target\CC2530EB	*Modified*
hal_mac_cfg.h	…\Components\hal\target\CC2530EB	*Modified*
hal_mcu.h	…\Components\hal\target\CC2530EB	*Modified*
hal_oad.c	…\Components\hal\target\CC2530EB	*Modified*
hal_oad.h	…\Components\hal\target\CC2530EB	*Modified*
hal_sleep.c	…\Components\hal\target\CC2530EB	*Modified*
hal_timer.c	…\Components\hal\target\CC2530EB	*Modified*
hal_adc.c	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_aes.h	…\Components\hal\target\MSP2618CC2520	Modified
hal_board_cfg.h	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_key.c	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_mac_cfg.c	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_mac_cfg.h	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_mcu.h	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_oad.c	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_oad.h	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_sleep.c	…\Components\hal\target\MSP2618CC2520	*Modified*
hal_timer.c	…\Components\hal\target\MSP2618CC2520	Modified
hal_adc.c	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_aes.h	…\Components\hal\target\MSP5438CC2520	Modified
hal_board_cfg.h	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_dco.c	…\Components\hal\target\MSP5438CC2520	Modified
hal_key.c	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_lcd.c	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_mac_cfg.c	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_mac_cfg.h	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_mcu.h	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_oad.c	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_oad.h	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_sleep.c	…\Components\hal\target\MSP5438CC2520	*Modified*
hal_timer.c	…\Components\hal\target\MSP5438CC2520	Modified
mac_high_level.h	…\Components\mac\high_level	Modified
mac_pib.c	…\Components\mac\high_level	*Modified*
mac_api.h	…\Components\mac\include	*Modified*

mac_dualchip.c	…\Components\mac\low_level\srf04\dual_chip	*Modified*
mac_dualchip_tx.c	…\Components\mac\low_level\srf04\dual_chip	*Modified*
mac_radio_defs.c	…\Components\mac\low_level\srf04\dual_chip	Modified
mac_radio_defs.h	…\Components\mac\low_level\srf04\dual_chip	*Modified*
mac_csp_tx.c	…\Components\mac\low_level\srf04\single_chip	*Modified*
mac_mcu.c	…\Components\mac\low_level\srf04\single_chip	*Modified*
mac_radio_defs.c	…\Components\mac\low_level\srf04\single_chip	*Modified*
mac_radio_defs.h	…\Components\mac\low_level\srf04\single_chip	*Modified*
mac_rffrontend.c	…\Components\mac\low_level\srf04\single_chip	*Modified*
DebugTrace.h	…\Components\mt	Modified
MT.c	…\Components\mt	Modified
MT.h	…\Components\mt	*Modified*
MT_AF.c	…\Components\mt	*Modified*
MT_AF.h	…\Components\mt	*Modified*
MT_APP.c	…\Components\mt	Modified
MT_MAC.c	…\Components\mt	*Modified*
MT_NWK.c	…\Components\mt	*Modified*
MT_NWK.h	…\Components\mt	*Modified*
MT_RPC.h	…\Components\mt	*Modified*
MT_SAPI.c	…\Components\mt	*Modified*
MT_SYS.c	…\Components\mt	*Modified*
MT_SYS.h	…\Components\mt	Modified
MT_TASK.c	…\Components\mt	*Modified*
MT_UTIL.c	…\Components\mt	*Modified*
MT_VERSION.c	…\Components\mt	*Modified*
MT_ZDO.c	…\Components\mt	*Modified*
MT_ZDO.h	…\Components\mt	Modified
OSAL.c	…\Components\osal\common	Modified
OSAL_Timers.c	…\Components\osal\common	Modified
OSAL.h	…\Components\osal\include	Modified
OSAL_Timers.h	…\Components\osal\include	Modified
ZComDef.h	…\Components\osal\include	*Modified*
OSAL_Nv.c	…\Components\osal\mcu\cc2530	*Modified*
OSAL_Nv.c	…\Components\osal\mcu\msp430	*Modified*
saddr.c	…\Components\services\saddr	Modified
saddr.h	…\Components\services\saddr	Modified
AF.c	…\Components\stack\af	*Modified*
AF.h	…\Components\stack\af	*Modified*
AddrMgr.h	…\Components\stack\nwk	Modified
APSMEDE.h	…\Components\stack\nwk	*Modified*
NLMEDE.h	…\Components\stack\nwk	*Modified*
nwk.h	…\Components\stack\nwk	*Modified*
nwk_bufs.h	…\Components\stack\nwk	*Modified*
nwk_globals.c	…\Components\stack\nwk	Modified
nwk_globals.h	…\Components\stack\nwk	*Modified*
nwk_util.h	…\Components\stack\nwk	*Modified*
rtg.h	…\Components\stack\nwk	*Modified*
sapi.c	…\Components\stack\sapi	*Modified*
ssp.h	…\Components\stack\sec	*Modified*
ZGlobals.c	…\Components\stack\sys	*Modified*
ZGlobals.h	…\Components\stack\sys	*Modified*
ZDApp.c	…\Components\stack\zdo	*Modified*
ZDApp.h	…\Components\stack\zdo	*Modified*
ZDConfig.h	…\Components\stack\zdo	*Modified*

ZDNwkMgr.h	…\Components\stack\zdo	*Modified*
ZDObject.c	…\Components\stack\zdo	*Modified*
ZDProfile.c	…\Components\stack\zdo	*Modified*
ZDProfile.h	…\Components\stack\zdo	Modified
ZDSecMgr.c	…\Components\stack\zdo	*Modified*
ZDSecMgr.h	…\Components\stack\zdo	*Modified*
ZMAC.h	…\Components\zmac	*Modified*
zmac.c	…\Components\zmac\f8w	*Modified*
zmac_cb.c	…\Components\zmac\f8w	*Modified*
zmac_internal.h	…\Components\zmac\f8w	*Modified*
802.15.4 MAC API	…\Documents	Modified
OSAL API	…\Documents	Modified
Upgrading To Z-Stack v2.3	…\Documents	*Modified*
Z-Stack API	…\Documents	*Modified*
Z-Stack Developer's Guide	…\Documents	*Modified*
Z-Stack Monitor and Test API	…\Documents	*Modified*
Z-Stack User's Guide – CC2530DB	…\Documents\CC2530	*Modified*
Z-Stack User's Guide – CC2520	…\Documents\MSP2618	*Modified*
Z-Stack User's Guide – EXP5438	…\Documents\EXP5438	*Modified*
EndDevice.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
EndDevice-Pro.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
EndDeviceMT.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
EndDeviceMT-Pro.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
Router.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
Router-Pro.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
RouterMT.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
RouterMT-Pro.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
Security.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
EndDevice2618.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
EndDevice2618-Pro.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
EndDevice2618MT.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
EndDevice2618MT-Pro.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
Router2618.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
Router2618-Pro.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
Router2618MT.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
Router2618MT-Pro.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
Security2618.lib	…\Projects\zstack\Libraries\MSP2618\bin	*Modified*
EndDevice54xx.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
EndDevice54xx-Pro.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
EndDevice54xxMT.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
EndDevice54xxMT-Pro.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
Router54xx.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
Router54xx-Pro.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
Router54xxMT.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
Router54xxMT-Pro.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
Security54xx.lib	…\Projects\zstack\Libraries\MSP54xx\bin	*Modified*
TIMAC-CC2530.lib	…\Projects\zstack\Libraries\TIMAC\bin	*Modified*
TIMAC-MSP2618.lib	…\Projects\zstack\Libraries\TIMAC\bin	*Modified*
TIMAC-MSP54xx.lib	…\Projects\zstack\Libraries\TIMAC\bin	*Modified*
SampleApp.ewd	…\Projects\zstack\Samples\SampleApp\CC2520DB	*Modified*
SampleApp.ewp	…\Projects\zstack\Samples\SampleApp\CC2520DB	*Modified*
SampleApp.ewp	…\Projects\zstack\Samples\SampleApp\CC2530DB	*Modified*
SampleApp.ewd	…\Projects\zstack\Samples\SampleApp\EXP5438	*Modified*
SampleApp.ewp	…\Projects\zstack\Samples\SampleApp\EXP5438	*Modified*

f8w2530.xcl	…\Projects\zstack\Tools\CC2530DB	*Modified*
f8wConfig.cfg	…\Projects\zstack\Tools\CC2530DB	*Modified*
f8wCoord.cfg	…\Projects\zstack\Tools\CC2530DB	*Modified*
f8wEndev.cfg	…\Projects\zstack\Tools\CC2530DB	*Modified*
f8wRouter.cfg	…\Projects\zstack\Tools\CC2530DB	*Modified*
f8wConfig.cfg	…\Projects\zstack\Tools\MSP2618	*Modified*
f8wCoord.cfg	…\Projects\zstack\Tools\MSP2618	*Modified*
f8wEndev.cfg	…\Projects\zstack\Tools\MSP2618	*Modified*
f8wRouter.cfg	…\Projects\zstack\Tools\MSP2618	*Modified*
MSP430F2618.ddf	…\Projects\zstack\Tools\MSP2618	Removed
MSP430F2618.sfr	…\Projects\zstack\Tools\MSP2618	Removed
MSP430F2618.xcl	…\Projects\zstack\Tools\MSP2618	*Modified*
f8wConfig.cfg	…\Projects\zstack\Tools\MSP5438	*Modified*
f8wCoord.cfg	…\Projects\zstack\Tools\MSP5438	*Modified*
f8wEndev.cfg	…\Projects\zstack\Tools\MSP5438	*Modified*
f8wRouter.cfg	…\Projects\zstack\Tools\MSP5438	*Modified*
MSP430F5438.xcl	…\Projects\zstack\Tools\MSP5438	*Modified*
chipcon_cstartup.s51	…\Projects\zstack\ZMain\TI2530DB	*Modified*
OnBoard.c	…\Projects\zstack\ZMain\TI2530DB	*Modified*
OnBoard.h	…\Projects\zstack\ZMain\TI2530DB	*Modified*
ZMain.c	…\Projects\zstack\ZMain\TI2530DB	*Modified*
OnBoard.c	…\Projects\zstack\ZMain\MSP2618	*Modified*
OnBoard.h	…\Projects\zstack\ZMain\MSP2618	*Modified*
ZMain.c	…\Projects\zstack\ZMain\MSP2618	*Modified*
OnBoard.c	…\Projects\zstack\ZMain\MSP5438	*Modified*
OnBoard.h	…\Projects\zstack\ZMain\MSP5438	*Modified*
ZMain.c	…\Projects\zstack\ZMain\MSP5438	*Modified*

3.2 Changes to "Full" Installed Files

In addition to the "core" installer file changes listed in Section 3.1, the following Z-Stack "full" installer files have been changed since the v2.2.2 release:

File	Location	Change
_hal_uart_usb.c	…\Components\hal\target\CC2530USB	*Modified*
hal_adc.c	…\Components\hal\target\CC2530USB	*Modified*
hal_aes.h	…\Components\hal\target\CC2530USB	New
hal_board_cfg.h	…\Components\hal\target\CC2530USB	*Modified*
hal_dma.c	…\Components\hal\target\CC2530USB	*Modified*
hal_dma.h	…\Components\hal\target\CC2530USB	*Modified*
hal_flash.c	…\Components\hal\target\CC2530USB	*Modified*
hal_key.c	…\Components\hal\target\CC2530USB	*Modified*
hal_lcd.c	…\Components\hal\target\CC2530USB	*Modified*
hal_led.c	…\Components\hal\target\CC2530USB	New
hal_mac_cfg.h	…\Components\hal\target\CC2530USB	New
hal_mcu.h	…\Components\hal\target\CC2530USB	*Modified*
hal_oad.c	…\Components\hal\target\CC2530USB	*Modified*
hal_oad.h	…\Components\hal\target\CC2530USB	*Modified*
hal_sleep.c	…\Components\hal\target\CC2530USB	*Modified*
hal_startup.c	…\Components\hal\target\CC2530USB	New
hal_timer.c	…\Components\hal\target\CC2530USB	*Modified*
hal_types.h	…\Components\hal\target\CC2530USB	New
hal_uart.c	…\Components\hal\target\CC2530USB	New
_hal_uart_dma.c	…\Components\hal\target\CC2530ZNP	*Modified*

_hal_uart_isr.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_adc.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_aes.h	…\Components\hal\target\CC2530ZNP	New
hal_board_cfg.h	…\Components\hal\target\CC2530ZNP	*Modified*
hal_dma.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_dma.h	…\Components\hal\target\CC2530ZNP	*Modified*
hal_flash.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_key.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_lcd.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_led.c	…\Components\hal\target\CC2530ZNP	New
hal_mac_cfg.h	…\Components\hal\target\CC2530ZNP	New
hal_mcu.h	…\Components\hal\target\CC2530ZNP	*Modified*
hal_oad.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_oad.h	…\Components\hal\target\CC2530ZNP	*Modified*
hal_sleep.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_spi.c	…\Components\hal\target\CC2530ZNP	New
hal_spi.h	…\Components\hal\target\CC2530ZNP	New
hal_startup.c	…\Components\hal\target\CC2530ZNP	New
hal_timer.c	…\Components\hal\target\CC2530ZNP	*Modified*
hal_types.h	…\Components\hal\target\CC2530ZNP	New
hal_uart.c	…\Components\hal\target\CC2530ZNP	New
zcl.c	…\Components\stack\zcl	*Modified*
zcl.h	…\Components\stack\zcl	*Modified*
zcl_cert_data.c	…\Components\stack\zcl	*New*
zcl_general.c	…\Components\stack\zcl	*Modified*
zcl_key_establish.c	…\Components\stack\zcl	*Modified*
zcl_key_establish.h	…\Components\stack\zcl	Modified
zcl_pi.c	…\Components\stack\zcl	New
zcl_pi.h	…\Components\stack\zcl	New
zcl_se.c	…\Components\stack\zcl	*Modified*
zcl_se.h	…\Components\stack\zcl	Modified
Smart Energy Sample Application User's Guide	…\Documents	*Modified*
Z-Stack Compile Options	…\Documents	*Modified*
Z-Stack ZCL API	…\Documents	*Modified*
Z-Stack User's Guide ZNP - Sample Applications	…\Documents	*Modified*
CC2530ZNP Interface Specification	…\Documents\CC2530	*Modified*
Over Air Download for CC2530	…\Documents\CC2530	*Modified*
Power Management For The CC2530	…\Documents\CC2530	*Modified*
Serial Boot Loader for CC253x	…\Documents\CC2530	*New*
Over Air Download for MSP430	…\Documents\MSP2618	Modified
Over Air Download for MSP430	…\Documents\EXP5438	Modified
SampleLight.ewd	…\Projects\zstack\HomeAutomation\SampleLight\CC2520DB	*Modified*
SampleLight.ewp	…\Projects\zstack\HomeAutomation\SampleLight\CC2520DB	*Modified*
SampleLight.eww	…\Projects\zstack\HomeAutomation\SampleLight\CC2520DB	Modified
SampleLight.ewp	…\Projects\zstack\HomeAutomation\SampleLight\CC2530DB	*Modified*
SampleLight.eww	…\Projects\zstack\HomeAutomation\SampleLight\CC2530DB	Modified
SampleLight.ewd	…\Projects\zstack\HomeAutomation\SampleLight\EXP5438	*Modified*
SampleLight.ewp	…\Projects\zstack\HomeAutomation\SampleLight\EXP5438	*Modified*
SampleLight.eww	…\Projects\zstack\HomeAutomation\SampleLight\EXP5438	*Modified*
zcl_samplelight.h	…\Projects\zstack\HomeAutomation\SampleLight\Source	Modified
SampleSwitch.ewd	…\Projects\zstack\HomeAutomation\SampleSwitch\CC2520DB	*Modified*
SampleSwitch.ewd	…\Projects\zstack\HomeAutomation\SampleSwitch\CC2520DB	*Modified*
SampleSwitch.eww	…\Projects\zstack\HomeAutomation\SampleSwitch\CC2520DB	Modified
SampleSwitch.ewp	…\Projects\zstack\HomeAutomation\SampleSwitch\CC2530DB	*Modified*

SampleSwitch.eww	…\Projects\zstack\HomeAutomation\SampleSwitch\CC2530DB	Modified
SampleSwitch.ewd	…\Projects\zstack\HomeAutomation\SampleSwitch\EXP5438	*Modified*
SampleSwitch.ewp	…\Projects\zstack\HomeAutomation\SampleSwitch\EXP5438	*Modified*
SampleSwitch.eww	…\Projects\zstack\HomeAutomation\SampleSwitch\EXP5438	Modified
zcl_samplesw.h	…\Projects\zstack\HomeAutomation\SampleSwitch\Source	Modified
AllDevice-Pro.lib	…\Projects\zstack\Libraries\TI2530DB\bin	*Modified*
GenericApp.ewd	…\Projects\zstack\Samples\GenericApp\CC2520DB	*Modified*
GenericApp.ewp	…\Projects\zstack\Samples\GenericApp\CC2520DB	*Modified*
GenericApp.ewd	…\Projects\zstack\Samples\GenericApp\CC2530DB	*Modified*
GenericApp.ewp	…\Projects\zstack\Samples\GenericApp\CC2530DB	*Modified*
GenericApp.eww	…\Projects\zstack\Samples\GenericApp\CC2530DB	*Modified*
GenericApp.ewd	…\Projects\zstack\Samples\GenericApp\EXP5438	*Modified*
GenericApp.ewp	…\Projects\zstack\Samples\GenericApp\EXP5438	*Modified*
GenericApp.eww	…\Projects\zstack\Samples\GenericApp\EXP5438	*Modified*
SimpleApp.ewd	…\Projects\zstack\Samples\SimpleApp\CC2520DB	*Modified*
SimpleApp.ewp	…\Projects\zstack\Samples\SimpleApp\CC2520DB	*Modified*
SimpleApp.ewp	…\Projects\zstack\Samples\SimpleApp\CC2530DB	*Modified*
SimpleApp.ewd	…\Projects\zstack\Samples\SimpleApp\EXP5438	*Modified*
SimpleApp.ewp	…\Projects\zstack\Samples\SimpleApp\EXP5438	*Modified*
SimpleSensor.c	…\Projects\zstack\Samples\SimpleApp\Source	Modified
SampleApp.ewd	…\Projects\zstack\SE\SampleApp\CC2520DB	*Modified*
SampleApp.ewp	…\Projects\zstack\SE\SampleApp\CC2520DB	*Modified*
SampleApp.eww	…\Projects\zstack\SE\SampleApp\CC2520DB	Modified
SampleApp.ewp	…\Projects\zstack\SE\SampleApp\CC2530DB	*Modified*
SampleApp.ewd	…\Projects\zstack\SE\SampleApp\EXP5438	*Modified*
SampleApp.ewp	…\Projects\zstack\SE\SampleApp\EXP5438	*Modified*
esp.c	…\Projects\zstack\SE\SampleApp\Source\ESP	*Modified*
esp.h	…\Projects\zstack\SE\SampleApp\Source\ESP	Modified
esp_data.c	…\Projects\zstack\SE\SampleApp\Source\ESP	Modified
OSAL_esp.c	…\Projects\zstack\SE\SampleApp\Source\ESP	Modified
ipd.c	…\Projects\zstack\SE\SampleApp\Source\IPD	*Modified*
ipd.h	…\Projects\zstack\SE\SampleApp\Source\IPD	Modified
ipd_data.c	…\Projects\zstack\SE\SampleApp\Source\IPD	Modified
OSAL_ipd.c	…\Projects\zstack\SE\SampleApp\Source\IPD	Modified
loadcontrol.c	…\Projects\zstack\SE\SampleApp\Source\LoadControl	*Modified*
loadcontrol.h	…\Projects\zstack\SE\SampleApp\Source\LoadControl	Modified
loadcontrol_data.c	…\Projects\zstack\SE\SampleApp\Source\LoadControl	Modified
OSAL_LoadControl.c	…\Projects\zstack\SE\SampleApp\Source\LoadControl	Modified
OSAL_pct.c	…\Projects\zstack\SE\SampleApp\Source\PCT	Modified
pct.c	…\Projects\zstack\SE\SampleApp\Source\PCT	*Modified*
pct.h	…\Projects\zstack\SE\SampleApp\Source\PCT	Modified
pct_data.c	…\Projects\zstack\SE\SampleApp\Source\PCT	Modified
OSAL_RangeExt.c	…\Projects\zstack\SE\SampleApp\Source\RangeExt	Modified
rangeext.c	…\Projects\zstack\SE\SampleApp\Source\RangeExt	*Modified*
rangeext.h	…\Projects\zstack\SE\SampleApp\Source\RangeExt	Modified
rangeext_data.c	…\Projects\zstack\SE\SampleApp\Source\RangeExt	Modified
OSAL_SimpleMeter.c	…\Projects\zstack\SE\SampleApp\Source\SimpleMeter	Modified
simplemeter.c	…\Projects\zstack\SE\SampleApp\Source\SimpleMeter	*Modified*
simplemeter.h	…\Projects\zstack\SE\SampleApp\Source\SimpleMeter	Modified
simplemeter_data.c	…\Projects\zstack\SE\SampleApp\Source\SimpleMeter	Modified
cc2530-sb.xcl	…\Projects\zstack\Tools\CC2530DB	*New*
f8wZCL.cfg	…\Projects\zstack\Tools\CC2530DB	*Modified*
oad.xcl	…\Projects\zstack\Tools\CC2530DB	*Modified*
oad-boot.xcl	…\Projects\zstack\Tools\CC2530DB	*Modified*

sb-boot.xcl	…\Projects\zstack\Tools\CC2530DB	*New*
znp.cfg	…\Projects\zstack\Tools\CC2530DB	*Removed*
	…\Projects\zstack\Utilities\BootLoad	*New*
	…\Projects\zstack\Utilities\BootLoad\CC2530	*New*
Boot.ewd	…\Projects\zstack\Utilities\BootLoad\CC2530	*New*
Boot.ewp	…\Projects\zstack\Utilities\BootLoad\CC2530	*New*
Boot.eww	…\Projects\zstack\Utilities\BootLoad\CC2530	*New*
	…\Projects\zstack\Utilities\BootLoad\CC2530\source	*New*
interrupt_stubs.s51	…\Projects\zstack\Utilities\BootLoad\CC2530\source	*New*
sb_main.c	…\Projects\zstack\Utilities\BootLoad\CC2530\source	*New*
sb_main.h	…\Projects\zstack\Utilities\BootLoad\CC2530\source	*New*
	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP	*New*
Boot.ewd	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP	*New*
Boot.ewp	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP	*New*
Boot.eww	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP	*New*
	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP\source	*New*
_hal_uart_spi.c	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP\source	*New*
interrupt_stubs.s51	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP\source	*New*
sb_main.c	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP\source	*New*
sb_main.h	…\Projects\zstack\Utilities\BootLoad\CC2530ZNP\source	*New*
	…\Projects\zstack\Utilities\BootLoad\CC2531	*New*
Boot.ewd	…\Projects\zstack\Utilities\BootLoad\CC2531	*New*
Boot.ewp	…\Projects\zstack\Utilities\BootLoad\CC2531	*New*
Boot.eww	…\Projects\zstack\Utilities\BootLoad\CC2531	*New*
	…\Projects\zstack\Utilities\BootLoad\CC2531\source	*New*
interrupt_stubs.s51	…\Projects\zstack\Utilities\BootLoad\CC2531\source	*New*
sb_main.c	…\Projects\zstack\Utilities\BootLoad\CC2531\source	*New*
sb_main.h	…\Projects\zstack\Utilities\BootLoad\CC2531\source	*New*
	…\Projects\zstack\Utilities\BootLoad\Source	*New*
sb_exec.c	…\Projects\zstack\Utilities\BootLoad\Source	*New*
sb_exec.h	…\Projects\zstack\Utilities\BootLoad\Source	*New*
Dongle.ewd	…\Projects\zstack\Utilities\OAD\CC2520DB	*Modified*
Dongle.ewp	…\Projects\zstack\Utilities\OAD\CC2520DB	*Modified*
Dongle.eww	…\Projects\zstack\Utilities\OAD\CC2520DB	*Modified*
Boot.ewp	…\Projects\zstack\Utilities\OAD\CC2530DB	*Modified*
Dongle.ewd	…\Projects\zstack\Utilities\OAD\CC2530DB	*Modified*
Dongle.ewp	…\Projects\zstack\Utilities\OAD\CC2530DB	*Modified*
	…\Projects\zstack\Utilities\OAD\CC2530DB\source	*New*
interrupt_stubs.s51	…\Projects\zstack\Utilities\OAD\CC2530DB\source	*New*
Dongle.ewd	…\Projects\zstack\Utilities\OAD\EXP5438	*Modified*
Dongle.ewp	…\Projects\zstack\Utilities\OAD\EXP5438	*Modified*
Dongle.eww	…\Projects\zstack\Utilities\OAD\EXP5438	*Modified*
oad_app.c	…\Projects\zstack\Utilities\OAD\Source	*Modified*
oad_app.h	…\Projects\zstack\Utilities\OAD\Source	*Modified*
SerialApp.ewd	…\Projects\zstack\Utilities\SerialApp\CC2520DB	*Modified*
SerialApp.ewp	…\Projects\zstack\Utilities\SerialApp\CC2520DB	*Modified*
SerialApp.ewp	…\Projects\zstack\Utilities\SerialApp\CC2530DB	*Modified*
SerialApp.ewd	…\Projects\zstack\Utilities\SerialApp\EXP5438	*Modified*
SerialApp.ewp	…\Projects\zstack\Utilities\SerialApp\EXP5438	*Modified*
TransmitApp.ewd	…\Projects\zstack\Utilities\Transmit\CC2520DB	*Modified*
TransmitApp.ewp	…\Projects\zstack\Utilities\Transmit\CC2520DB	*Modified*
TransmitApp.eww	…\Projects\zstack\Utilities\Transmit\CC2520DB	*Modified*
TransmitApp.ewp	…\Projects\zstack\Utilities\Transmit\CC2530DB	*Modified*
TransmitApp.ewd	…\Projects\zstack\Utilities\Transmit\EXP5438	*Modified*

TransmitApp.ewp	…\Projects\zstack\Utilities\Transmit\EXP5438	*Modified*
	…\Projects\zstack\ZMain\TI2530ZNP	New
chipcon_cstartup.s51	…\Projects\zstack\ZMain\TI2530ZNP	*Modified*
OnBoard.c	…\Projects\zstack\ZMain\TI2530ZNP	*Modified*
OnBoard.h	…\Projects\zstack\ZMain\TI2530ZNP	*Modified*
ZMain.c	…\Projects\zstack\ZMain\TI2530ZNP	*Modified*
	…\Projects\zstack\ZNP	New
	…\Projects\zstack\ZNP\CC2530DB	*Removed*
	…\Projects\zstack\ZNP\CC253x	*New*
	…\Projects\zstack\ZNP\CC253x\bin	*New*
CC2530ZNP-SB.hex	…\Projects\zstack\ZNP\CC253x\bin	*New*
CC2531SB.hex	…\Projects\zstack\ZNP\CC253x\bin	*New*
	…\Projects\zstack\ZNP\CC253x\tools	*New*
sim2bin.exe	…\Projects\zstack\ZNP\CC253x\tools	*New*
znp.bat	…\Projects\zstack\ZNP\CC253x\tools	*New*
znp.js	…\Projects\zstack\ZNP\CC253x\tools	*New*
znp-prod.xcl	…\Projects\zstack\ZNP\CC253x\tools	*New*
CC2530.ewd	…\Projects\zstack\ZNP\CC253x\tools	*New*
CC2530.ewp	…\Projects\zstack\ZNP\CC253x\tools	*New*
CC2531.ewd	…\Projects\zstack\ZNP\CC253x\tools	*New*
CC2531.ewp	…\Projects\zstack\ZNP\CC253x\tools	*New*
znp.eww	…\Projects\zstack\ZNP\CC253x\tools	*New*
znp.ewd	…\Projects\zstack\ZNP\CC2530DB	*Removed*
znp.ewp	…\Projects\zstack\ZNP\CC2530DB	*Removed*
znp.eww	…\Projects\zstack\ZNP\CC2530DB	*Removed*
	…\Projects\zstack\ZNP\Source	New
OSAL_ZNP.c	…\Projects\zstack\ZNP\Source	*Modified*
znp_app.c	…\Projects\zstack\ZNP\Source	*Modified*
znp_app.h	…\Projects\zstack\ZNP\Source	*Modified*
znp.cfg	…\Projects\zstack\ZNP\Source	*Modified*
znp_spi.c	…\Projects\zstack\ZNP\Source	*Modified*
znp_spi.h	…\Projects\zstack\ZNP\Source	*Modified*
TI.CommonLib.dll	…\Tools\Z-Tool	*Modified*
TI.Config.xml	…\Tools\Z-Tool	*Modified*
TI.ZCmdMatchings.dll	…\Tools\Z-Tool	*Modified*
TI.ZPI.dll	…\Tools\Z-Tool	*Modified*
TI.ZPI.xml	…\Tools\Z-Tool	*Modified*
TI.ZPortLib.dll	…\Tools\Z-Tool	*Modified*
TI.ZScript.dll	…\Tools\Z-Tool	*Modified*
Z-Tool 2.0.exe	…\Tools\Z-Tool	*Modified*
Z-Tool.exe.config	…\Tools\Z-Tool	*Modified*
ZPI Help.chm	…\Tools\Z-Tool	*Modified*