



Application Note: Upgrading To Z-Stack v2.2.0

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1. Purpose

This document describes considerations to make when upgrading to Texas Instruments Z-Stack™ version v2.2.0, discussing changes made since the v2.1.0 release of Z-Stack. Most importantly, changes have been made to introduce the CC2530 System-on-Chip, support the CC2520EM on MSP-EXP430F5438, add a new ZigBee Smart Energy Sample Application, improve support of Over Air Download (OAD) for MSP430 platforms, and various 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 “core”, along with additional sample applications, additional documentation, Z-Tool, and ZOAD.

- **ZStack-CC2530-2.2.0.exe** - “Core” package for SmartRF05EB + CC2530EM
- **ZStack-EXP5438-2.2.0.exe** - “Core” package for MSP-EXP430F5438 + CC2520EM
- **ZStack-MSP2618-2.2.0.exe** - “Core” package for SmartRF05EB + MSP2618 + CC2520EM
- **ZStack-CC2530-2.2.0-1.3.0.exe** - “Full” package for SmartRF05EB + CC2530EM
- **ZStack-EXP5438-2.2.0-1.3.0.exe** - “Full” package for MSP-EXP430F5438 + CC2520EM
- **ZStack-MSP2618-2.2.0-1.3.0.exe** - “Full” package for SmartRF05EB + MSP2618 + CC2520EM

2. Details of Changes

2.1 CC2530 Support

Z-Stack now includes support for the new Texas Instruments CC2530 System-on-Chip. Development of Z-Stack applications for this device may be performed with the CC2530 ZigBee Development Kit, in conjunction with the IAR Embedded Workbench EW8051-7.51 toolset. Two Z-Stack packages are available for CC2530 development - **ZStack-CC2530-2.2.0.exe** and **ZStack-CC2530-2.2.0-1.3.0.exe**. See Section 1 for a description of these packages.

ZStack-CC2530 can be used with two revisions of the SmartRF05 Evaluation Board – Rev 1.3 and Rev 1.7. The software defaults to the newer Rev 1.7 board but can be configured for use with Rev 1.3 boards by using the compile option **HAL_BOARD_CC2530EB_REV13**. Refer to the “Z-Stack Compile Options” document for instructions on using compile options in Z-Stack.

2.2 EXP5438 Support

Z-Stack now supports the Texas Instruments MSP430F5438 with CC2520. Development of Z-Stack applications using these devices may be performed with the MSP-EXP430F5438 Experimenter’s Board and CC2520EM radio modules, in conjunction with the IAR Embedded Workbench EW430-4.20 toolset. Two Z-Stack packages are available for EXP5438+CC2520 development - **ZStack-EXP5438-2.2.0.exe** and **ZStack-EXP5438-2.2.0-1.3.0.exe**. See Section 1 for a description of these packages.

2.3 MSP2618 Support

Z-Stack continues support for the Texas Instruments MSP430F2618 with CC2520. Development of Z-Stack applications using these devices may be performed with the SmartRF05 Evaluation Board, CCMS-EM430F2618, and CC2520EM radio modules, in conjunction with IAR Embedded Workbench EW430-4.20 toolset. Two Z-Stack packages are available for MSP2618+CC2520 development - **ZStack-MSP2618-2.2.0.exe** and **ZStack-MSP2618-2.2.0-1.3.0.exe**. See Section 1 for a description of these packages.

2.4 Smart Energy Sample Application

This release introduces the new *SE Sample App* for providing samples for several Smart Energy applications (in the “full” Z-Stack packages for all three platforms). Refer to the “Smart Energy Sample Application User's Guide” for details on the use of this application. The *SETestApp* project that was included in the MSP2618-2.1.0-1.2.0 release and all ZStack-2.2.0-Beta releases has been removed.

2.5 Improved Over-Air-Download

Z-Stack's Over-Air-Download (OAD) is an extended feature that provides a mechanism for program upgrades of deployed ZigBee devices without the need for physical access to the device. This release improves support of OAD on the MSP2618 platform, as well as providing it for the new platforms (see Sections 2.1 and 2.2). Refer to the "Over Air Download for MSP430" or "Over Air Download for CC2530" document (depending on your version of Z-Stack) for details on the implementation and usage of OAD-enabled devices.

2.6 OSAL Timer Optimization

The OSAL Timer system has received two upgrades which improve performance on systems using timers. First, the calculation of timer offsets in the *osalTimeUpdate()* function was changed from 32-bit to 16-bit arithmetic. This reduces the timer offset computation time, lowering system overhead when timers are used. Second, the processing of the timer linked-list was optimized to reduce interrupt latency when searching for or deleting a timer. This results in a reduction of about 60% of the minimum latency, which is now constant – latency no longer varies with changing numbers of active timers.

2.7 IEEE Address Initialization

Handling of IEEE address initialization during the device start-up was re-organized to eliminate the "write-once" policy of previous Z-Stack releases. This allows developers freedom to change IEEE address when needed. When a "temporary" IEEE address is generated at start-up, Z-Stack no longer waits for user intervention - previously, a flashing LED after device reset was used to prompt the user for a button push. Refer to Section 7.2 of the "Z-Stack User's Guide" for details on IEEE address initialization.

2.8 RSSI Passed To Application

In previous Z-Stack releases, the only "signal quality" indication that was passed from the MAC to the application layer was LinkQuality. With this release, **rssi** and **correlation** have been added to the *afIncomingMSGPacket_t* structure that is received by the application OSAL message handler. Refer to Section 3.2.1.3 of the "Z-Stack API" document for information on received data packets.

2.9 Changes to Installed Files

Refer to the tables in Sections 2.9.1 and 2.9.2 for file changes to the ZStack-MSP2618 "core" and "full" installers, respectively. Since ZStack-CC2530 and ZStack-EXP5438 are new products, no references to them are included here. Pay particular attention to items with **NEW** or **REMOVED** in the **Change** column. Folder updates are indicated when there is no entry in the **File** column. Making changes to project files (*.ewp and *.ewd) can be done with the IDE or by editing the project files directly.

2.9.1 Changes to "Core" Installed Files

The following "core" Z-Stack files have been changed since the v2.1.0 release:

File	Location	Change
hal_drivers.c	...\Components\hal\common	Modified
hal_assert.h	...\Components\hal\include	Modified
hal_ccm.h	...\Components\hal\include	Modified
hal_defs.h	...\Components\hal\include	Modified
hal_flash.h	...\Components\hal\include	NEW
hal_lcd.h	...\Components\hal\include	Modified
hal_oad.h	...\Components\hal\include	REMOVED
hal_uart.h	...\Components\hal\include	Modified
hal_xnv.h	...\Components\hal\include	REMOVED
DCO_calibrate.s43	...\Components\hal\target\MSP2618CC2520	Modified
hal_board_cfg.h	...\Components\hal\target\MSP2618CC2520	Modified
hal_ivec.s43	...\Components\hal\target\MSP2618CC2520	NEW
hal_lcd.c	...\Components\hal\target\MSP2618CC2520	Modified
hal_mac_cfg.h	...\Components\hal\target\MSP2618CC2520	Modified

hal_oad.c	...\Components\hal\target\MSP2618CC2520	Modified
hal_oad.h	...\Components\hal\target\MSP2618CC2520	NEW
hal_sleep.c	...\Components\hal\target\MSP2618CC2520	Modified
hal_timer.c	...\Components\hal\target\MSP2618CC2520	Modified
hal_uart.c	...\Components\hal\target\MSP2618CC2520	Modified
hal_xnv.c	...\Components\hal\target\MSP2618CC2520	Modified
hal_xnv.h	...\Components\hal\target\MSP2618CC2520	NEW
mac_main.h	...\Components\mac\high_level	Modified
mac_api.h	...\Components\mac\include	Modified
mac_autopend.c	...\Components\mac\low_level\srf04	NEW
mac_autopend.h	...\Components\mac\low_level\srf04	NEW
mac_low_level.h	...\Components\mac\low_level\srf04	Modified
mac_radio.c	...\Components\mac\low_level\srf04	Modified
mac_rx.c	...\Components\mac\low_level\srf04	Modified
mac_rx.h	...\Components\mac\low_level\srf04	Modified
mac_dualchip.c	...\Components\mac\low_level\srf04\dual_chip	Modified
mac_mcu_timer.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
DebugTrace.h	...\Components\mt	Modified
MT.c	...\Components\mt	Modified
MT.h	...\Components\mt	Modified
MT_AF.c	...\Components\mt	Modified
MT_MAC.c	...\Components\mt	Modified
MT_NWK.c	...\Components\mt	Modified
MT_SYS.c	...\Components\mt	Modified
MT_TASK.c	...\Components\mt	Modified
MT_UART.c	...\Components\mt	Modified
MT_UART.h	...\Components\mt	Modified
MT_UTIL.c	...\Components\mt	Modified
MT_UTIL.h	...\Components\mt	Modified
MT_VERSION.c	...\Components\mt	Modified
MT_VERSION.h	...\Components\mt	Modified
MT_ZDO.c	...\Components\mt	Modified
OSAL.c	...\Components\osal\common	Modified
OSAL_Clock.c	...\Components\osal\common	Modified
OSAL_Memory.c	...\Components\osal\common	Modified
OSAL_PwrMgr.c	...\Components\osal\common	Modified
OSAL_Timers.c	...\Components\osal\common	Modified
comdef.h	...\Components\osal\common	NEW
OSAL.h	...\Components\osal\include	Modified
OSAL_Memory.h	...\Components\osal\include	Modified
OSAL_Nv.h	...\Components\osal\include	Modified
OSAL_Timers.h	...\Components\osal\include	Modified
ZComDef.h	...\Components\osal\include	Modified
MSP430FlashUtil.c	...\Components\osal\mcu	Modified
OSAL_Nv.c	...\Components\osal\mcu	Modified
saddr.c	...\Components\services\saddr	Modified
AF.c	...\Components\stack\af	Modified
AF.h	...\Components\stack\af	Modified
AddrMgr.h	...\Components\stack\nwk	Modified
APS.h	...\Components\stack\nwk	Modified
aps_frag.h	...\Components\stack\nwk	Modified
APSMED.h	...\Components\stack\nwk	Modified

NLMEDE.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
reflecttrack.h	...\Components\stack\nwk	Modified
rtg.h	...\Components\stack\nwk	Modified
stub_aps.h	...\Components\stack\nwk	Modified
sapi.c	...\Components\stack\sapi	Modified
ZGlobals.h	...\Components\stack\sys	Modified
ZDApp.c	...\Components\stack\zdo	Modified
ZDNwkMgr.c	...\Components\stack\zdo	Modified
ZDObject.c	...\Components\stack\zdo	Modified
ZDProfile.c	...\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\8w	Modified
zmac_cb.c	...\Components\zmac\8w	Modified
802.15.4 MAC API	...\Documents	Modified
HAL Driver API	...\Documents	Modified
Heap Memory Management	...\Documents	Modified
OSAL API	...\Documents	Modified
Upgrading To Z-Stack v2.2.0	...\Documents	NEW
Z-Stack API	...\Documents	Modified
Z-Stack Compile Options	...\Documents	Modified
Z-Stack Developer's Guide	...\Documents	Modified
Z-Stack HAL Porting Guide	...\Documents	Modified
Z-Stack Monitor and Test API	...\Documents	NEW
Create New Application For MSP2618	...\Documents\MSP2618	Modified
Power Management For MSP430 and CC2520	...\Documents\MSP2618	Modified
Z-Stack Sample Application for MSP2618	...\Documents\MSP2618	Modified
Z-Stack User's Guide – CC2520	...\Documents\MSP2618	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
TIMAC-MSP2618.lib	...\Projects\zstack\Libraries\TIMAC\bin	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
OnBoard.c	...\Projects\zstack\Tools\ZMain	Modified
OnBoard.h	...\Projects\zstack\Tools\ZMain	Modified
ZMain.c	...\Projects\zstack\Tools\ZMain	Modified

2.9.2 Changes to “Full” Installed Files

In addition to the “core” installer file changes listed in Section 2.9.1, the following Z-Stack “full” installer files have been changed since the v2.1.0 release:

File	Location	Change
eccapi.h	...\Components\stack\sec	Modified
zcl.c	...\Components\stack\zcl	Modified
zcl.h	...\Components\stack\zcl	Modified
zcl_closures.c	...\Components\stack\zcl	Modified
zcl_general.c	...\Components\stack\zcl	Modified
zcl_general.h	...\Components\stack\zcl	Modified
zcl_hvac.c	...\Components\stack\zcl	Modified
zcl_key_establish.c	...\Components\stack\zcl	Modified
zcl_key_establish.h	...\Components\stack\zcl	Modified
zcl_lighting.c	...\Components\stack\zcl	Modified
zcl_lighting.h	...\Components\stack\zcl	Modified
zcl_ms.c	...\Components\stack\zcl	Modified
zcl_se.c	...\Components\stack\zcl	Modified
zcl_se.h	...\Components\stack\zcl	Modified
Application-Level Tuning of Z-Stack	...\Documents	Modified
Method for Discovering Network Topology	...\Documents	Modified
Smart Energy Sample Application User’s Guide	...\Documents	NEW
Z-Stack Smart Energy Developer’s Guide	...\Documents	NEW
Z-Stack Sample Applications	...\Documents	Modified
Z-Stack Simple API	...\Documents	Modified
Z-Stack ZCL API	...\Documents	Modified
Over Air Download for MSP430	...\Documents\MSP2618	Modified
SampleLight.ewp	...\Projects\zstack\HomeAutomation\SampleLight\CC2520DB	Modified
zcl_samplelight.c	...\Projects\zstack\HomeAutomation\SampleLight\Source	Modified
SampleSwitch.ewp	...\Projects\zstack\HomeAutomation\SampleSwitch\CC2520DB	Modified
zcl_samplesw.c	...\Projects\zstack\HomeAutomation\SampleSwitch\Source	Modified
GenericApp.ewp	...\Projects\zstack\Samples\GenericApp\CC2520DB	Modified
GenericApp.c	...\Projects\zstack\Samples\GenericApp\Source	Modified
SampleApp.ewp	...\Projects\zstack\Samples\SampleApp\CC2520DB	Modified
SampleApp.c	...\Projects\zstack\Samples\SampleApp\Source	Modified
SimpleApp.ewp	...\Projects\zstack\Samples\SimpleApp\CC2520DB	Modified
SimpleApp.h	...\Projects\zstack\Samples\SimpleApp\Source	Modified
SimpleSensor.c	...\Projects\zstack\Samples\SimpleApp\Source	Modified
se.h	...\Projects\zstack\SE\Source	Modified
	...\Projects\zstack\SE\SETTestApp	REMOVED
	...\Projects\zstack\SE\SampleApp	NEW
	...\Projects\zstack\SE\SampleApp\CC2520DB	NEW
SampleApp.ewd	...\Projects\zstack\SE\SampleApp\CC2520DB	NEW
SampleApp.ewp	...\Projects\zstack\SE\SampleApp\CC2520DB	NEW
SampleApp.eww	...\Projects\zstack\SE\SampleApp\CC2520DB	NEW
	...\Projects\zstack\SE\SampleApp\Source	NEW
	...\Projects\zstack\SE\SampleApp\Source\ESP	NEW
esp.c	...\Projects\zstack\SE\SampleApp\Source\ESP	NEW
esp.h	...\Projects\zstack\SE\SampleApp\Source\ESP	NEW
esp_data.c	...\Projects\zstack\SE\SampleApp\Source\ESP	NEW
OSAL_ESP.c	...\Projects\zstack\SE\SampleApp\Source\ESP	NEW
	...\Projects\zstack\SE\SampleApp\Source\IPD	NEW
ipd.c	...\Projects\zstack\SE\SampleApp\Source\IPD	NEW
ipd.h	...\Projects\zstack\SE\SampleApp\Source\IPD	NEW

ipd_data.c	... \Projects\zstack\SE\SampleApp\Source\IPD	NEW
OSAL_ipd.c	... \Projects\zstack\SE\SampleApp\Source\IPD	NEW
	... \Projects\zstack\SE\SampleApp\Source\LoadControl	NEW
loadcontrol.c	... \Projects\zstack\SE\SampleApp\Source\LoadControl	NEW
loadcontrol.h	... \Projects\zstack\SE\SampleApp\Source\LoadControl	NEW
loadcontrol_data.c	... \Projects\zstack\SE\SampleApp\Source\LoadControl	NEW
OSAL_loadcontrol.c	... \Projects\zstack\SE\SampleApp\Source\LoadControl	NEW
	... \Projects\zstack\SE\SampleApp\Source\PCT	NEW
OSAL_pct.c	... \Projects\zstack\SE\SampleApp\Source\PCT	NEW
pct.c	... \Projects\zstack\SE\SampleApp\Source\PCT	NEW
pct.h	... \Projects\zstack\SE\SampleApp\Source\PCT	NEW
pct_data.c	... \Projects\zstack\SE\SampleApp\Source\PCT	NEW
	... \Projects\zstack\SE\SampleApp\Source\RangeExt	NEW
OSAL_RangeExt.c	... \Projects\zstack\SE\SampleApp\Source\RangeExt	NEW
rangeext.c	... \Projects\zstack\SE\SampleApp\Source\RangeExt	NEW
rangeext.h	... \Projects\zstack\SE\SampleApp\Source\RangeExt	NEW
rangeext_data.c	... \Projects\zstack\SE\SampleApp\Source\RangeExt	NEW
	... \Projects\zstack\SE\SampleApp\Source\SimpleMeter	NEW
OSAL_SimpleMeter.c	... \Projects\zstack\SE\SampleApp\Source\SimpleMeter	NEW
simplemeter.c	... \Projects\zstack\SE\SampleApp\Source\SimpleMeter	NEW
simplemeter.h	... \Projects\zstack\SE\SampleApp\Source\SimpleMeter	NEW
simplemeter_data.c	... \Projects\zstack\SE\SampleApp\Source\SimpleMeter	NEW
f8wZCL.cfg	... \Projects\zstack\Tools\MSP2618	Modified
oad_preamble.h	... \Projects\zstack\Tools\MSP2618	REMOVED
oad.xcl	... \Projects\zstack\Tools\MSP2618	Modified
	... \Projects\zstack\Utilities\OAD	NEW
	... \Projects\zstack\Utilities\OAD\CC2520DB	NEW
Dongle.ewd	... \Projects\zstack\Utilities\OAD\CC2520DB	NEW
Dongle.ewp	... \Projects\zstack\Utilities\OAD\CC2520DB	NEW
Dongle.eww	... \Projects\zstack\Utilities\OAD\CC2520DB	NEW
	... \Projects\zstack\Utilities\OAD\Source	NEW
MT_TASK.c	... \Projects\zstack\Utilities\OAD\Source	NEW
MT_UART.c	... \Projects\zstack\Utilities\OAD\Source	NEW
MT_X.c	... \Projects\zstack\Utilities\OAD\Source	NEW
MT_X.h	... \Projects\zstack\Utilities\OAD\Source	NEW
oad_app.c	... \Projects\zstack\Utilities\OAD\Source	NEW
oad_app.h	... \Projects\zstack\Utilities\OAD\Source	NEW
oad_preamble.h	... \Projects\zstack\Utilities\OAD\Source	NEW
OSAL_Dongle.c	... \Projects\zstack\Utilities\OAD\Source	NEW
SerialApp.ewp	... \Projects\zstack\Utilities\SerialApp\CC2520DB	Modified
SerialApp.c	... \Projects\zstack\Utilities\SerialApp\Source	Modified
TransmitApp.ewp	... \Projects\zstack\Utilities\Transmit\CC2520DB	Modified
TransmitApp.c	... \Projects\zstack\Utilities\Transmit\Source	Modified
ZOAD_Help.chm	... \Tools\ZOAD	Modified
TL.CommonLib.dll	... \Tools\Z-Tool	Modified
TL.ZCmdMatchings.dll	... \Tools\Z-Tool	Modified
TL.ZPI.dll	... \Tools\Z-Tool	Modified
TL.ZPI.xml	... \Tools\Z-Tool	Modified
TL.ZPortLib.dll	... \Tools\Z-Tool	Modified
TL.ZScript.dll	... \Tools\Z-Tool	Modified
ZPI_Help.chm	... \Tools\Z-Tool	Modified
Z-Tool 2.0.exe	... \Tools\Z-Tool	Modified
Z-ToolHelp.chm	... \Tools\Z-Tool	Modified