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SHENZHEN FEIBIT ELECTRONIC TECHNOLOGY CO., LTD

地址：深圳市福田区梅华路深华科技园 1 栋西座 5 楼 5A6 室

电话：0755-83287930

传真：0755-83159815

Z-STACK 编译设置 (Compile Options)

翻译自 *Z-Stack Compile Options*。

本文基于 IAR EW80517.51A 讲解 Z-Stack 的编译选项设置，本例使用的 Z-STACK 版本为 ZStack-CC2530-2.3.0-1.4.0。

一、使用 Z-Stack 编译选项

1.1 选择逻辑设备类型

ZigBee 设备可以配置为下列三种设备之一：

ZigBee 的协调器 - 建立并启动的 IEEE 802.15.4 网络，一个 Zigbee 网络只能有一个 Coordinator。

ZigBee 的路由器 - 是一种支持关联的设备，将自己关联至协调器或者已在网络的其他的路由器，同时允许另外的路由器和终端设备加入网络。主要功能是加入已存在的 Zigbee 网络，为 Zigbee 网络通信提供中继和路由。

ZigBee 终端设备 - 加入一个已经存在的网络，与 ZigBee 的协调器或 ZigBee 路由器关联。执行具体的任务，如信息采集等，并使用 Zigbee 网络实现信息交互。

1.2 编译选项的位置(Locating Compile Options)

对于一个具体项目，编译选项位于两个位置：

一是针对上述设备逻辑类型的编译选项设置，位于链接器的控制文件(linker control files)。

二是位于 IAR 项目文件里的用户自定义的功能编译选项（使能/不使能）。

作为演示范例，这两类文件在 SampleLight 协调器项目都可被设置。当然，其它所有 Z-Stack 项目也是相似的。

1.3 位于链接器控制文件的编译选项



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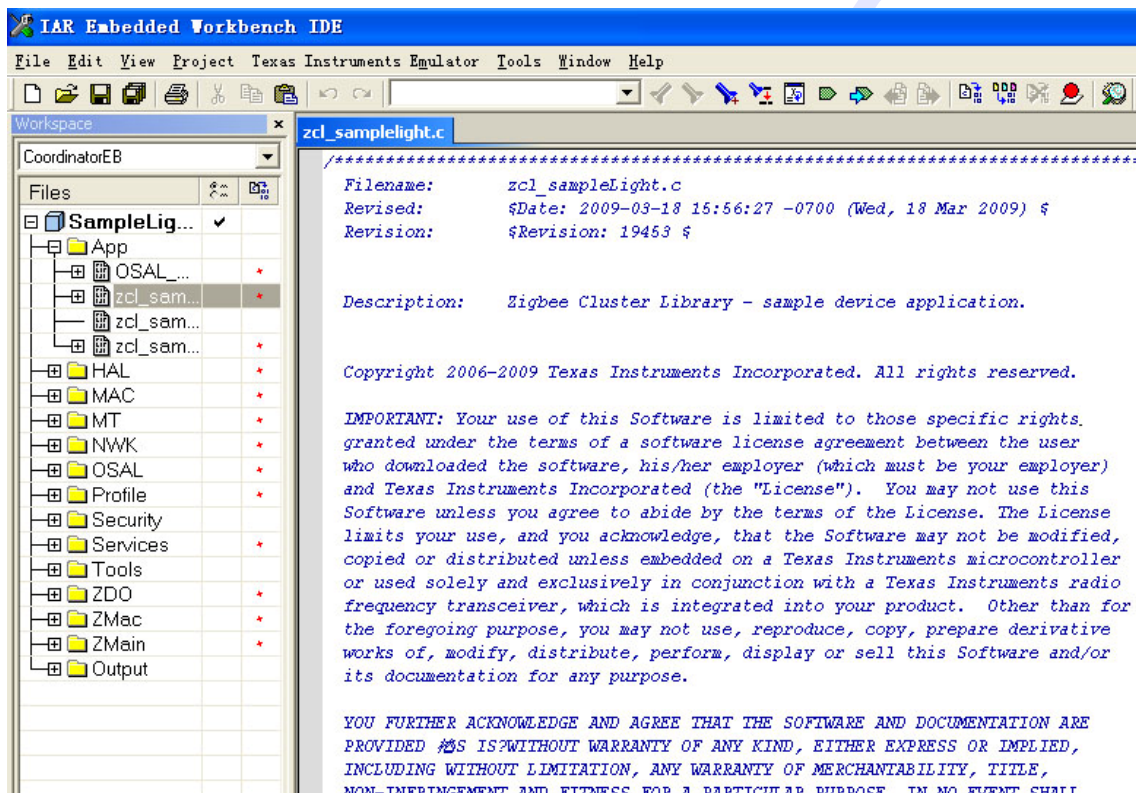
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SampleLight 项目文件位于 *C:\Texas Instruments\ZStack-CC2530-2.3.0-1.4.0\Projects\zstack*
\HomeAutomation\SampleLight\CC2530DB 文件夹中找到。双击 *SampleLight.eww* 文件打开项目，
从工作区下面的下拉菜单中选择 **CoordinatorEB** 配置。



然后打开 Tools 文件夹(这个文件夹包含不同的配置文件和应用用于 Z-Stack 项目的可执行工具)。
可以看到共有 5 个链接控制文件(linker control files)和 1 个 CC2530 配置文件。在这个 Tools 文件夹：
f8w2530.xcl; f8wConfig.cfg; f8wCoord.cfg; f8wEndev.cfg; f8wRouter.cfg; f8wZCL.cfg 。



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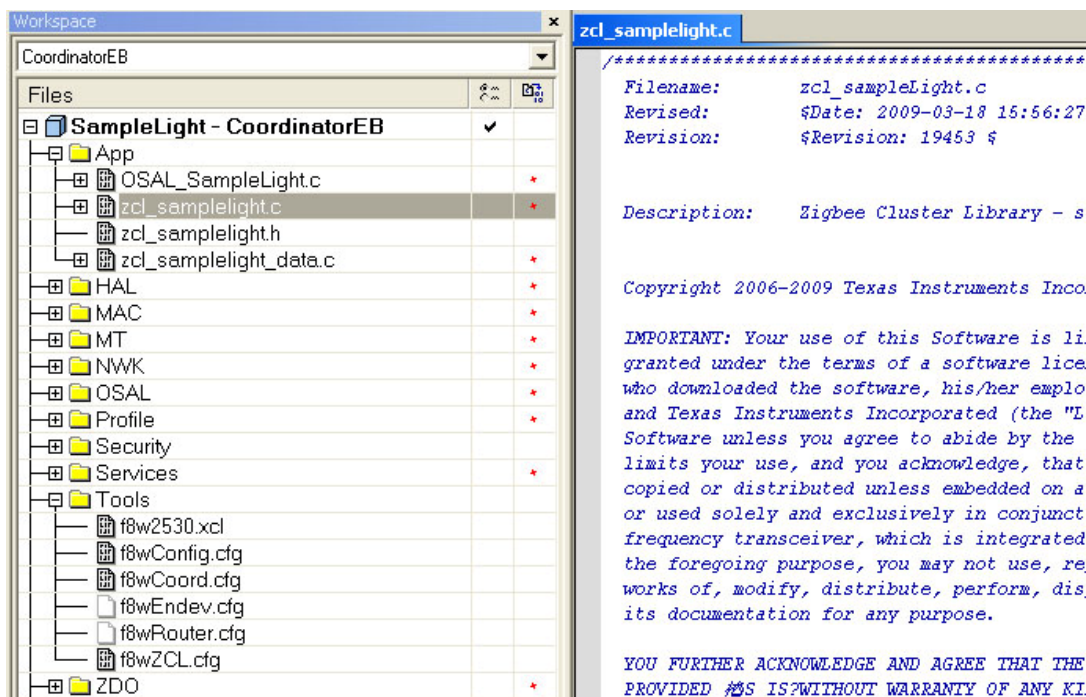
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- ◆ **f8w2530.xcl** : CC2530 的底层配置文件，此文件有一项重要设置需要引起大家注意：

```
// Include these two lines when generating a .hex file for banked code model:  
// -M(CODE)[(_CODEBANK_START+_FIRST_BANK_ADDR)-(_CODEBANK_END+_FIRST_BANK_ADDR)]*\  
// _NR_OF_BANKS+_FIRST_BANK_ADDR=0x8000  
//
```

那就是需要生成 HEX 文件的话，需要将这几行程序加入编译。

- ◆ **f8wConfig.cfg** : 存放通用的编译选项。例如指定信道和 PAN ID(网络识别码)等，当一个设备启动时.这些参数将被使用来建立（或选择）一个具体的信道，使用某一个网络标志（PANID）。允许开发者为自己的应用项目选择专用的信道和网络识别码等参数来避免与周围其它的 ZigBee 冲突干扰。

- ◆ **f8wCoord.cfg**, **f8wEndev.cfg**, **f8wRouter.cfg** :各类型设备具体的编译选项，分别对应协调器/路由器/终端设备。当我们在从工作区（Workspace）下面的下拉菜单中选择 **CoordinatorEB** 配置时，**f8wEndev.cfg**, **f8wRouter.cfg** 这两个文件将变灰，不会被编译。

SampleLight 协调器项目使用 **f8wCoord.cfg** 文件.如下图所示：



```
/*
 *
 *                               f8wCoord.cfg
 *
 * Compiler command-line options used to define a TI Z-Stack
 * Coordinator device. To move an option from here to the project
 * file, comment out or delete the option from this file and
 * enter it into the "Define Symbols" box under the Preprocessor
 * tab of the C/C++ Compiler Project Options. New user defined
 * options may be added to this file, as necessary.
 *
 */

/* Common To All Applications */
-DCPU32MHZ                // CC2530s Run at 32MHz
-DROOT=__near_func         // MAC/ZMAC code in NEAR

/* MAC Settings */
-DMAC_CFG_APP_PENDING_QUEUE=TRUE

/* Coordinator Settings */
-DZDO_COORDINATOR         // Coordinator Functions
-DRTR_NWK                 // Router Functions

/* Optional Settings */
-DBLINK_LEDS              // LED Blink Functions
```

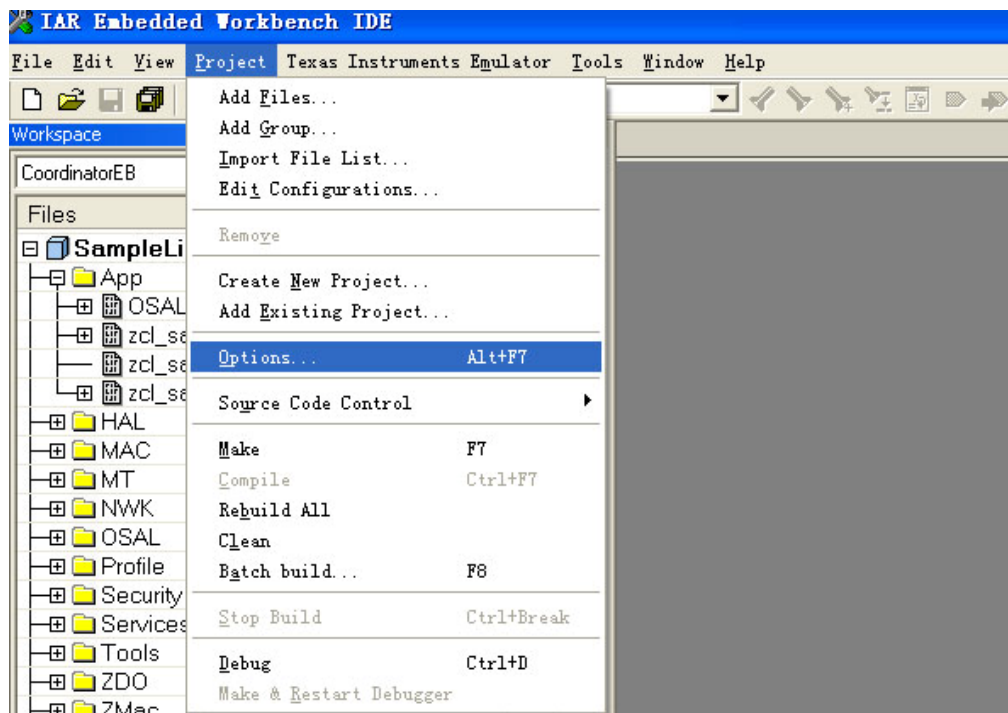
该编译选项文件为协调器设备提供通用的（generic）Z-Stack 功能。*f8wCoord.cfg* 文件被该工程下的所有项目用于建立协调器设备。因此,对这个文件的任何改变将影响该工程下的所有协调器。

同样,*f8wRouter.cfg* 和 *f8wEnd.cfg* 文件的修改将分别影响该工程下的所有路由器和终端设备项目。

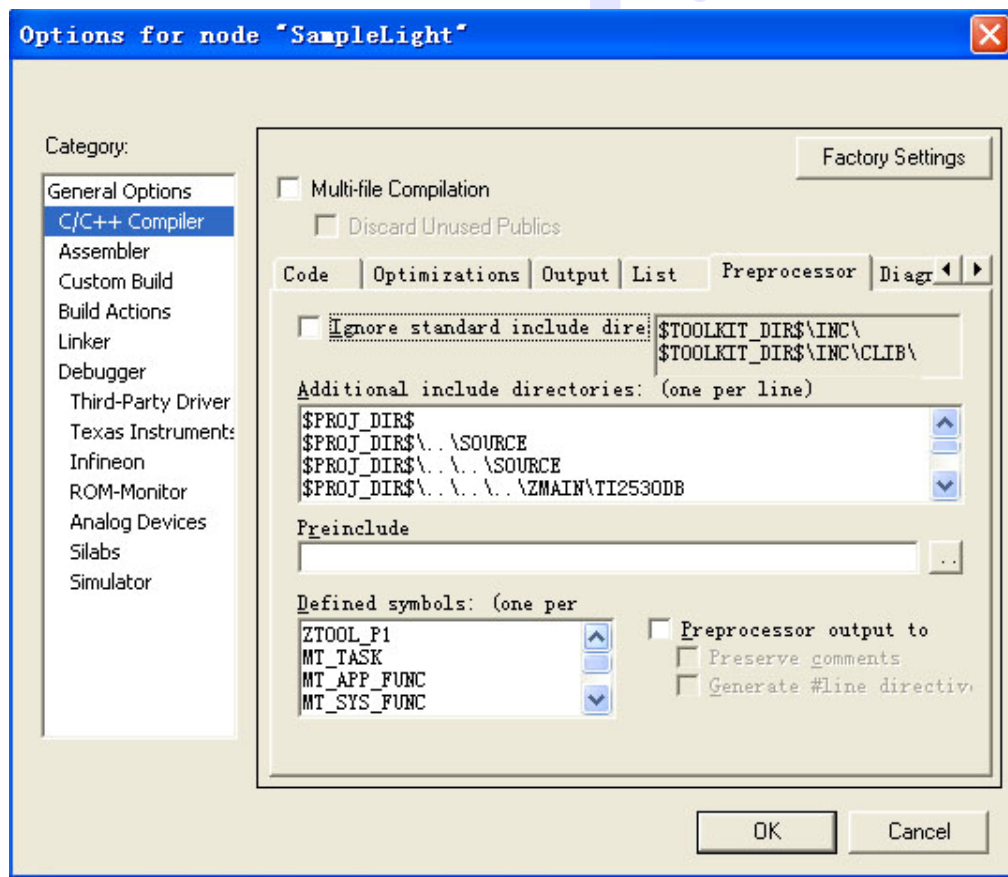
给某一个设备类型的所有项目增加编译选项,简单增加一个新行在链接控制文件(linker control file)的适当位置。如果需要关闭某一编译选项,通过在一行的左边放置“//”来注释掉该选项。尽量不要采取直接删除,因为这个编译选项有可能以后需要重新打开。

1.4 在 IAR 项目文件的功能编译选项

各种支持的功能配置的编译选项设置存储在 SampleLight.ewp 文件里,要修改这些编译选项,须从"Project"下拉菜单中选择"Options..."项:

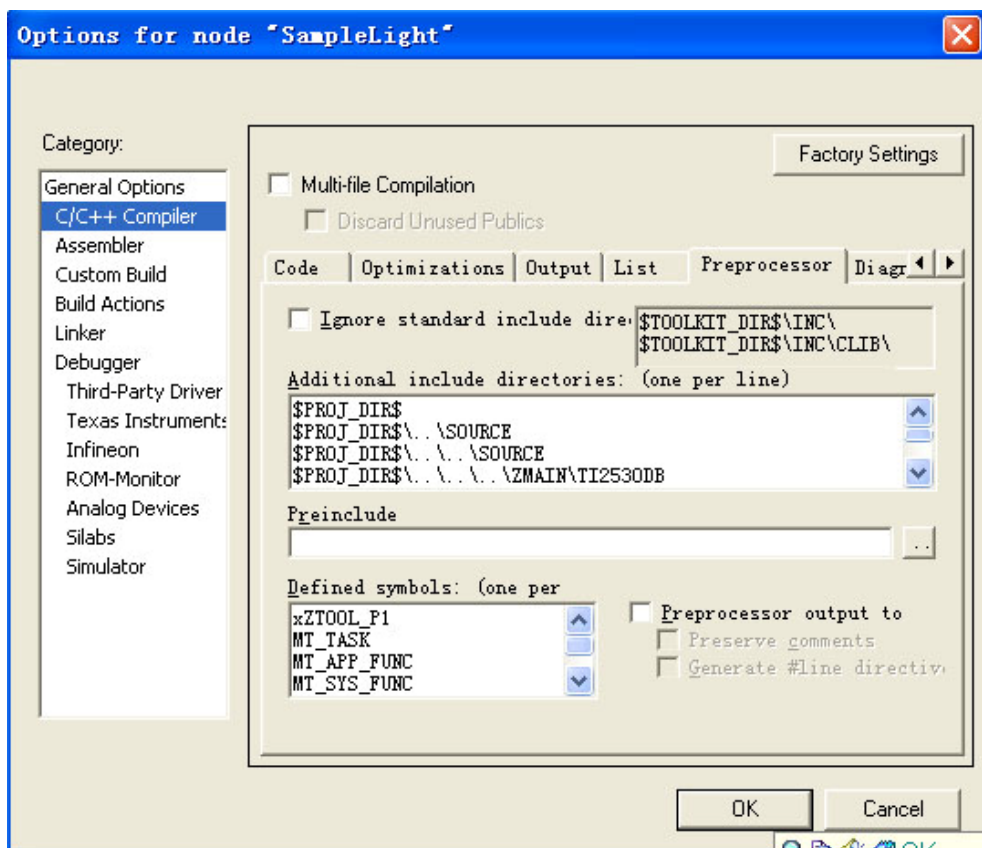


打开 Option 窗口后,选择"C/C++ Compiler"项和单击"Preprocessor"条目.这个功能配置的编译选项是位于标有"Defined symbols:(one per line)"的方框:



在这个配置中增加一个功能编译选项,简单地在这个方框内的新行增加条目。

关闭一个功能编译选项,只需要在这行的左边放置一个'x'。如下图, ZTOOL_P1 功能选项已经被注释掉:



尽量不要采取直接删除,因为这个功能编译选项有可能以后需要重新打开。

1.4 配置编译选项的注意事项

编译选项是用来配置源程序所提供的多种功能:大多数编译选项就只配置相应功能程序段的编译开关(ON/OFF);另一些编译选项是主要用来提供一些用户自定义数值,像 DEFAULT_CHANLIST,通过编译器编译为系统默认值。

TI 提供的每一个 Z-Stack 应用项目都提供一个 IAR 项目文件,该项目文件包含针对该应用项目的编译选项设置。开发人员可以增加或移除编译选项,比如要包含或去除部分有效软件功能。

注意: 改变 IAR 项目文件的编译选项设置有可能要求对其它的项目文件进行改变。例如,增加 MT_NWK 功能选项就要求将 MT_NWK.c 文件加入源程序文件夹和使用适当的 MT-使能网络库



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(network library)。如果你使用的是 SampleLight 协调器项目,就需要使用 RouterMt.lib 文件将代替 Router.lib 文件。

二、支持的编译选项和定义

这里提供一个支持的编译选项列表,这个列表选项简单的描述他们使能或不使能的功能特性。被标注为"do not change"的编译选项是为确保程序正常运行而必须保持的基本设置；被标注为"do not use"的编译选项表示不适合在 CC2530 板上使用。

2.1 通用编译选项

下列表格的编译选项能够改变或设置：

(注：这些编译选项多数可以在 *f8wConfig.cfg* 配置文件中找到,详细的说明请参阅 *Z-Stack Developer's Guide*)

NWK_START_DELAY	Minimum number of milliseconds to hold off the start of the device in the network and the minimum delay between joining cycles
OSAL_TOTAL_MEM	Track OSAL memory heap usage (display if LCD_SUPPORTED)
POLL_RATE	For end devices only: number of milliseconds to wait between data request polls to its parent. Example POLL_RATE=1000 is a data request every second. This is changed in f8wConfig.cfg.
POWER_SAVING	Enable power saving functions for battery-powered devices
QUEUED_POLL_RATE	This is used after receiving a data indication to poll immediately for queued messages (in milliseconds)
REFLECTOR	Enable binding
REJOIN_POLL_RATE	This is used as an alternate response poll rate only for rejoin request. This rate is determined by the response time of the parent that the device is trying to join
RESPONSE_POLL_RATE	This is used after receiving a data confirmation to poll immediately for response messages (in milliseconds)
ROUTE_EXPIRY_TIME	Number of seconds before an entry expires in the routing table; set to 0 to turn off route expiry
RTR_NWK	Enable Router networking
SECURE	Enable ZigBee security (SECURE=0 to disable, SECURE=1 to enable)
ZAPP_Px	Enable ZApp messages via serial port Px where x is the port (1 or 2)
ZDAPP_CONFIG_PAN_ID	Coordinator's PAN ID; used by Routers and End Devices to join PAN with this ID
ZDO_COORDINATOR	Enable the device as a Coordinator
ZIGBEEPRO	Enable usage of ZigBee Pro features
ZTOOL_Px	Enable ZTool messages via serial port Px where x is the port (1 or 2)



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APS_DEFAULT_INTERFRAME_DELAY	Delay between Tx packets when using fragmentation
APS_DEFAULT_MAXBINDING_TIME	Maximum time in seconds that a Coordinator will wait between receiving match descriptor bind requests to perform binding
APS_DEFAULT_WINDOW_SIZE	Size of a Tx window when using fragmentation
APS_MAX_GROUPS	Maximum number of entries allowed in the groups table
APSC_ACK_WAIT_DURATION_POLLED	Number of 2 milliseconds periods a polling End Device will wait for an APS acknowledgement from the destination device
APSC_MAX_FRAME_RETRIES	Maximum number of retries allowed (at APS layer) after a transmission failure
ASSERT_RESET	Specifies that the device should reset when there's an assertion. When not defined, all LEDs will flash when an assertion occurs.
BEACON_REQUEST_DELAY	Minimum number of milliseconds to delay between each beacon request in a joining cycle
BLINK_LEDS	Enable extended LED blinking functions
DEFAULT_CHANLIST	Change this list in f8wConfig.cfg
EXTENDED_JOINING_RANDOM_MASK	Mask for the random joining delay
HOLD_AUTO_START	Disable automatic start-up of ZDApp event processing loop
LCD_SUPPORTED	Enable LCD emulation – text sent to ZTool serial port
MANAGED_SCAN	Enable delays between channel scans
MAX_BCAST	Maximum number of simultaneous broadcasts supported by a device at any given time
MAX_BINDING_CLUSTER_IDS	Maximum number of cluster IDs in a binding record
MAX_POLL_FAILURE_RETRIES	Number of times retry to poll parent before indicating loss of synchronization with parent. Note that larger value will cause longer delay for the child to rejoin the network
MAX_RREQ_ENTRIES	Number of simultaneous route discoveries in network
MAX_RTG_ENTRIES	Number of entries in the regular routing table plus additional entries for route repair
MAXMEMHEAP	Determines the total memory available for dynamic memory. Every request for an amount of dynamic memory requires dynamic memory space for overhead used in managing the allocated memory. So MAXMEMHEAP does not reflect the total amount of dynamic memory that the user can expect to be usable. As a rule of thumb, each memory allocation requires at least 2+N bytes, where N represents the word-alignment block size of the target CPU (e.g., N=1 on the AVR and CC2430 but N=2 on the MSP430). MAXMEMHEAP must be defined to be less than 32768
NONWK	Disable NWK, APS, and ZDO functionality
NV_INIT	Enable loading of "basic" NV items at device reset
NV_RESTORE	Enables device to save/restore network state information to/from NV
NWK_AUTO_POLL	Enable End Device to poll from the parents automatically
NWK_INDIRECT_MSG_TIMEOUT	Number of milliseconds the parent of a polling End Device will hold a message
NWK_MAX_BINDING_ENTRIES	Maximum number of entries in the binding table
NWK_MAX_DATA_RETRIES	The maximum number of times retry looking for the next hop address of a message
NWK_MAX_DEVICE_LIST	Maximum number of devices in the Association/Device list
NWK_MAX_DEVICES	Maximum number of devices in the network



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下列表格的编译选项不能改变或使用：

CC2420DB	Target is a CC2420DB evaluation board (do not change)
CC2430BB	Target is a SoC-BB battery board (do not change)
CC2430DB	Target is a CC2430DB evaluation board (do not change)
CC2430EB	Target is a SmartRF04EB evaluation board (do not change)
MSP430FG4618	Target is an MSP430FG4618 processor (do not change)
MSP430FG4619	Target is an MSP430FG4619 processor (do not change)
MSP430F2618	Target is an MSP430F2618 processor (do not change)
CPU6MHZ	Clock rate of the CPU – 6 MHZ (do not change)
CPU16MHZ	Clock rate of the CPU – 16 MHZ (do not change)
CPU32MHZ	Clock rate of the CPU – 32 MHZ (do not change)
MACSIM	Enable MAC simulation (do not use)
NWK_TEST	Enable Network test functions (do not use)

2.2 监视测试(Monitor-Test) (MT) 编译选项：

你能够使能与 MT_TAST 选项相关的下列 APIs 和函数，必须包含 MT_TASK 选项：

MT_TASK	Enable Monitor-Test task
MT_AF_FUNC	Enable Monitor-Test processing of AF commands issued from ZTool or ZTrace
MT_AF_CB_FUNC	Enable Monitor-Test processing of AF callbacks registered by ZTool or ZTrace
MT_APP_FUNC	Enable Monitor-Test processing of APP commands issued from ZTool or ZTrace
MT_DEBUG_FUNC	Enable Monitor-Test processing of DEBUG commands issued from ZTool or ZTrace
MT_MAC_FUNC	Enable Monitor-Test processing of MAC commands issued from ZTool or ZTrace
MT_NWK_FUNC	Enable Monitor-Test processing of NWK commands issued from ZTool or ZTrace
MT_NWK_CB_FUNC	Enable Monitor-Test processing of NWK callbacks registered by ZTool or ZTrace
MT_SAPI_FUNC	Enable Monitor-Test processing of SAPI commands issued from ZTool or ZTrace
MT_SAPI_CB_FUNC	Enable Monitor-Test processing of SAPI callbacks registered by ZTool or ZTrace
MT_SYS_FUNC	Enable Monitor-Test processing of SYS commands issued from ZTool or ZTrace
MT_SYS_OSAL_NV_READ_CERTIFICATE_DATA	Default define to FALSE in MT_SYS.c and only applicable if ZCL_KEY_ESTABLISH is defined. If ZCL_KEY_ESTABLISH is defined and MT_SYS_OSAL_NV_READ_CERTIFICATE_DATA is defined to TRUE, then the three NV items containing Certicom certificate data can be read via MT: ZCD_NV_IMPLICIT_CERTIFICATE 0x006A ZCD_NV_CA_PUBLIC_KEY 0x006B ZCD_NV_DEVICE_PRIVATE_KEY 0x006C Otherwise, the certificate data cannot be read via MT.
MT_UTIL_FUNC	Enable Monitor-Test processing of UTIL commands issued from ZTool or ZTrace
MT_ZDO_CB_FUNC	Enable Monitor-Test processing of ZDO commands issued from ZTool or ZTrace
MT_ZDO_FUNC	Enable Monitor-Test processing of ZDO commands issued from ZTool or ZTrace
MT_ZDO_MGMT	Enable Monitor-Test processing of ZDO MGMT commands from ZTool or ZTrace

2.3 ZigBee 设备对象(ZDO)编译选项



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ZDO_NWKADDR_REQUEST	Enable Network Address Request function and response processing
ZDO_IEEEADDR_REQUEST	Enable IEEE Address Request function and response processing
ZDO_MATCH_REQUEST	Enable Match Descriptor Request function and response processing
ZDO_NODEDESC_REQUEST	Enable Node Descriptor Request function and response processing
ZDO_POWERDESC_REQUEST	Enable Power Descriptor Request function and response processing
ZDO_SIMPLEDESC_REQUEST	Enable Simple Descriptor Request function and response processing
ZDO_ACTIVEEP_REQUEST	Enable Active Endpoint Request function and response processing
ZDO_COMPLEXDESC_REQUEST	Enable Complex Descriptor Request function and response processing
ZDO_USERDESC_REQUEST	Enable User Descriptor Request function and response processing
ZDO_USERDESCSET_REQUEST	Enable User Descriptor Set Request function and response processing
ZDO_ENDDEVICEBIND_REQUEST	Enable End Device Bind Request function and response processing
ZDO_BIND_UNBIND_REQUEST	Enable Bind and Unbind Request function and response processing
ZDO_SERVERDISC_REQUEST	Enable Server Discovery Request function and response processing
ZDO_MGMT_NWKDISC_REQUEST	Enable Mgmt Nwk Discovery Request function and response processing
ZDO_MGMT_LQI_REQUEST	Enable Mgmt LQI Request function and response processing
ZDO_MGMT_RTG_REQUEST	Enable Mgmt Routing Table Request function and response processing
ZDO_MGMT_BIND_REQUEST	Enable Mgmt Binding Table Request function and response processing
ZDO_MGMT_LEAVE_REQUEST	Enable Mgmt Leave Request function and response processing
ZDO_MGMT_JOINDIRECT_REQUEST	Enable Mgmt Join Direct Request function and response processing
ZDO_MGMT_PERMIT_JOIN_REQUEST	Enable device to respond to Mgmt Permit Join Request function
ZDO_USERDESC_RESPONSE	Enable device to respond to User Descriptor Request function
ZDO_USERDESCSET_RESPONSE	Enable device to respond to User Descriptor Set Request function
ZDO_SERVERDISC_RESPONSE	Enable device to respond to Server Discovery Request function
ZDO_MGMT_NWKDISC_RESPONSE	Enable device to respond to Mgmt Network Discovery Request function
ZDO_MGMT_LQI_RESPONSE	Enable device to respond to Mgmt LQI Request function
ZDO_MGMT_RTG_RESPONSE	Enable device to respond to Mgmt Routing Table Request function
ZDO_MGMT_BIND_RESPONSE	Enable device to respond to Mgmt Binding Table Request function
ZDO_MGMT_LEAVE_RESPONSE	Enable device to respond to Mgmt Leave Request function
ZDO_MGMT_JOINDIRECT_RESPONSE	Enable device to respond to Mgmt Join Direct Request function
ZDO_MGMT_PERMIT_JOIN_RESPONSE	Enable device to respond to Mgmt Permit Join Request function
ZDO_ENDDEVICE_ANNC	Enable device to respond to End Device Annce Message function
ZDO_NV_SAVE_RFDs	Default define to TRUE in ZDApp.c and only applicable if NV_RESTORE is defined. If NV_RESTORE is defined and ZDO_NV_SAVE_RFDs is defined to FALSE, then RFD joins will not trigger a call to NLME_UpdateNV() and the delay time between receiving a trigger event and actually invoking NLME_UpdateNV() is extended to the OSAL timer maximum of 65 seconds (see ZDAPP_UPDATE_NWK_NV_TIME). This compile option is intended to be used to greatly extend the life of the NV pages of the RFD's in a network with mobile or purged RFD's. When this flag is defined to FALSE, any RFD children that exist at the time an FFD is reset will not be restored and the FFD can re-issue their network addresses to other joining RFD's.
ZDAPP_UPDATE_NWK_NV_TIME	Default define to 700 msec and only applicable if NV_RESTORE is defined. The delay time between receiving a network save state trigger event and actually invoking NLME_UpdateNV(). The longer this delay is, the longer the life of the NV pages since this data is very large and in a busy network (especially one with mobile RFD's) the frequency of trigger events could be high.

默认情况下, 指令性消息(由 ZigBee 规范定义)是在 ZDO 中进行设置启用, 所有其它的消息处理是通过编译标志进行设置使能与否。在 *ZDConfig.h* 文件中, 你可以使能/不使能、注释/不注释或包含/不包含这些编译选项。有一个非常简单的方法去使能所有 ZDO 函数和管理选项. 你能用 *MT_ZDO_FUNC* 去使能所有 ZDO 函数选项, *MT_ZDO_FUNC* 和 *MT_ZDO_MGMT* 去使能所有 ZDO 函数+管理选项。

更详细的使用方法请参阅 *Z-Stack Developer's Guide* 和 *Z-Stack API* 。