



## **Z-Stack Monitor and Test API**

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| Version | Description                                                                                                                                                      | Date       |
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| 1.1     | Update address type for AUTOPEND                                                                                                                                 | 04/02/2009 |
| 1.2     | Add MT_AF command and MT_ZDO callback for source routing                                                                                                         | 06/25/2009 |
| 1.3     | Add MT_AF commands to support inter-pan<br>Add MT_ZDO commands to support link key configuration<br>Add MT_ZDO commands to MSG callback register/remove/indicate | 01/17/2010 |

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## 1. Introduction

### 1.1 Scope

This document describes the Monitor and Test (MT) interface that is used for communication between the host tester and a ZigBee device through RS-232 serial port. Tester can issue MT commands to the ZigBee target through a PC application called Z-Tool. The target must be programmed with the latest Texas Instruments Z-Stack™.

### 1.2 Overview

MT interfaces are divided into categories, shown in the table below. Most interfaces can be disabled or enabled by a compile flag. Depending on the desired interfaces, certain flags need to be enabled during compilation. For a list of supported compile flags, check the “**Z-Stack Compile Option**” document.

| Interface  | Description                                                                                                                                         | Compile flags                   |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| MT_AF      | This interface allows tester to interact with AF layer of the target.                                                                               | MT_AF_FUNC<br>MT_AF_CB_FUNC     |
| MT_APP     | This interface allows tester to interact with APP layer of the target to control custom tests such as test profile or user-defined test.            | MT_APP_FUNC                     |
| MT_DEBUG   | This interface allows tester to control the debug-messaging mechanism such as debug threshold, debug messages...etc                                 | MT_DEBUG_FUNC                   |
| MT_NWK     | This interface allows tester to interact with NWK layer of the target.                                                                              | MT_NWK_FUNC<br>MT_NWK_CB_FUNC   |
| MT_SAPI    | This interface allows tester to interact with simple API interface.                                                                                 | MT_SAPI_FUNC<br>MT_SAPI_CB_FUNC |
| MT_SYS     | This interface allows the tester to interact with the target at system level such as reset, read/write memory, read/write extended address...etc.   | MT_SYS_FUNC                     |
| MT_TASK    | This interface handles communication between the Monitor Test interface and Z-Stack. Tester has no control direct over this interface.              | MT_TASK                         |
| MT_UART    | This interface handles communication between the target and Z-Tool. Tester has no direct control over this interface.                               | N/A                             |
| MT_UTIL    | This interface provides tester supporting functionalities such as setting PanId, getting device info, getting NV info, subscribing callbacks...etc. | MT_UTIL_FUNC                    |
| MT_VERSION | This interface contains information about the release version of the software.                                                                      | N/A                             |
| MT_ZDO     | This interface allows tester to interact with the ZDO layer of the target.                                                                          | MT_ZDO_FUNC<br>MT_ZDO_CB_FUNC   |

### 1.3 Requirements

There are several requirements for a tester to interact with the ZigBee target through the MT interface:

- ZigBee target is programmed with Texas Instruments Z-Stack™ (ZStack-2.1.0 or newer).
- Z-Tool 2.0 or newer installed on the tester PC.
- PC is connected to ZigBee target though RS-232 serial port.

## 1.4 Acronyms

|                |                                             |
|----------------|---------------------------------------------|
| <b>MT</b>      | Monitor and Test                            |
| <b>Z-Stack</b> | Texas Instruments ZigBee protocol stack     |
| <b>Z-Tool</b>  | Texas Instruments ZigBee PC-based test tool |
| <b>RPC</b>     | Remote Procedure Call                       |
| <b>FCS</b>     | Frame Check Sequence                        |
| <b>SOF</b>     | Start of Frame                              |
| <b>SAPI</b>    | Simple API                                  |
| <b>AF</b>      | Application Framework                       |
| <b>SREQ</b>    | Synchronous Request                         |
| <b>AREQ</b>    | Asynchronous Request                        |
| <b>SRSP</b>    | Synchronous Response                        |
| <b>ADC</b>     | Analog to Digital Conversion                |

## 1.5 Reference Documents

- [1] Z-Stack Compile Options (SWRA188).
- [2] Z-Stack User's Guides (SWRA161, SWRA162, SWRA163, SWRA164, SWRA165)
- [3] Z-Stack Developer's Guide (SWRA176)
- [4] Z-Stack Application Programming Interface (SWRA195)

## 2. Monitor and Test Transport Protocol

- A transport protocol is necessary so that messages can be exchanged between the tester and target over an RS-232 serial link. The purpose of the transport protocol is to frame the messages in packets for proper transmission and reception and to ensure message integrity.
- The physical transmission uses: no Parity; 8 data bits and 1 stop bits for each byte.
- The transmission rate will be 38.4 kbps, 57.6kbps and 115.2kbps
- The Z-Tool program must send one message at a time and wait for either the expected response message to a timeout before sending the next message or resending the current message.
- Fields that are multi-byte fields are transmitted Least Significant byte first (LSB). There is no provision for retransmission of lost packets

### 2.1 Format

#### 2.1.1 General Serial Packet

- Serial packets are sent between the Z-Tool PC application and the target ZigBee device. They contain an SOF (Start of Frame), followed by a variable-length MT packet, and terminated by an FCS (Frame Check Sequence).
- Building of the serial packets is handled by MT\_TransportSend() where the SOF is inserted at the beginning of the packet and FCS is computed and appended to the end of the packet.

| SOF     | MT CMD | FCS |
|---------|--------|-----|
| Byte: 1 | 3-256  | 1   |

**SOF** (Start of Frame): This is a one byte field with value equal to **0xFE** that defines the start of each general serial packet.



**MT CMD** (Monitor Test Command): This contains 1 byte for the length of the actual data, 2 bytes for the MT command ID, and the data ranging from 0-253 bytes. Check 2.1.2 for more details.

**FCS** (Frame Check Sequence): This is a one byte field that is used to ensure packet integrity. This field is computed as an XOR of all the bytes in the message starting with LEN field and through the last byte of data. The receiver XORs all the received data bytes as indicated above and then XORs the received FCS field. If the sum is not equal to zero, the received packet is in error.

### 2.1.2 MT CMD

- MT CMD is the actually Monitor and Test command. It contains information that Z-Tool and Z-Stack need to control the target.
- It contains 1 byte for the length of the actual data, 2 bytes for the command, and data ranging from 0-253 bytes.

| LEN     | CMD | DATA  |
|---------|-----|-------|
| Byte: 1 | 2   | 0-253 |

**LEN** (Length): This one byte field is the number of bytes in the **DATA** field. If the **DATA** field contains no information this LEN field has a value of 0 and the total length of the **MT CMD** is 3 bytes (0 data message).

**CMD** (Command ID): This is a two byte field with a value denoting the Command Identification (ID) for this message. This field is described in detail below.

| CMD0     |           | CMD1 |
|----------|-----------|------|
| Bit: 7-5 | 4-0       | 7-0  |
| Type     | Subsystem | ID   |

**Type:** Type for the command is described by bit 5, 6, 7 of CMD0 byte. The command type has one of the following values:

| Type | CMD0Value |
|------|-----------|
| POLL | 0x00      |
| SREQ | 0x20      |
| AREQ | 0x40      |
| SRSP | 0x60      |

- 0: POLL. A POLL command is used to retrieve queued data. This command is only applicable to SPI transport. For a POLL command the subsystem and ID are set to zero and data length is zero.
- 1: SREQ: A synchronous request that requires an immediate response. For example, a function call with a return value would use an SREQ command.
- 2: AREQ: An asynchronous request. For example, a callback event or a function call with no return value would use an AREQ command.
- 3: SRSP: A synchronous response. This type of command is only sent in response to a SREQ command. For an SRSP command the subsystem and ID are set to the same values as the corresponding SREQ. The length of an

SRSP is generally nonzero, so an SRSP with length=0 can be used to indicate an error.

- 4-7: Reserved.

**Subsystem:** The subsystem of the command is described by bit 0, 1, 2, 3, 4 of CMD0. The command subsystem has one of the following values:

| Subsystem       | Subsystem Value |
|-----------------|-----------------|
| Reserved        | 0x00            |
| SYS interface   | 0x01            |
| MAC interface   | 0x02            |
| NWK interface   | 0x03            |
| AF interface    | 0x04            |
| ZDO interface   | 0x05            |
| SAPI interface  | 0x06            |
| UTIL interface  | 0x07            |
| DEBUG interface | 0x08            |
| APP interface   | 0x09            |

**ID:** The command ID. The ID maps to a particular interface message. Range: 0-255.

**DATA:** This field contains the actual data to be transmitted. This is a field which varies in size according to the command. It can be 0 to 253.

## 2.2 Example

SYS\_PING command will look like **0xFE 0x00 0x21 0x01 0x20**

| SOF     | LEN  | CMD0 | CMD1 | DATA | FCS  |
|---------|------|------|------|------|------|
| Byte: 1 | 1    | 1    | 1    | 0    | 1    |
| 0xFE    | 0x00 | 0x21 | 0x01 | N/A  | 0x20 |

SYS\_PING response will look like **0xFE 0x02 0x61 0x01 0x11 0x00 0x73**

| SOF     | LEN  | CMD0 | CMD1 | DATA0 | DATA1 | FCS  |
|---------|------|------|------|-------|-------|------|
| Byte: 1 | 1    | 1    | 1    | 1     | 1     | 1    |
| 0xFE    | 0x02 | 0x61 | 0x01 | 0x11  | 0x00  | 0x73 |

## 3. Monitor and Test Commands

### 3.1 Introduction

Monitor and Test commands (MT commands) exchanged between the target and the tester via a supported H/W medium (i.e.RS-232 or USB.) The tester controls the target using Z-Tool 2.0. In order for the target to communicate with Z-Tool 2.0, Z-Stack must be compiled with MT\_SYS\_FUNC. This enables the MT\_SYS interface so Z-Tool 2.0 can communicate to establish the connection. Some MT interfaces support callbacks. This requires MT\_UTIL\_FUNC to be compiled with Z-Stack in order for the tester to subscribe callback. The corresponding MT interface must also be compiled with the

correct flag in order for the callbacks to be received and processed correctly by Z-Stack and Z-Tool 2.0. For the complete details on MT flags, check section 1.2 or “Z-Stack Compile Option” document (SWRA188).

Summary:

- Z-Tool 2.0 installed and connected to target using the supported H/W interface.
- Z-Stack must be compiled with MT\_SYS\_FUNC and MT\_UTIL\_FUNC.
- Z-Stack must be compiled with MT interface what tester will use.
- Z-Stack and Z-Tool must be set at the same baud rate, no Parity, 8 data-bits and 1 stop-bit for each byte.
- If the target supports flow control, this must be set correctly as well in Z-Tool 2.0

### 3.2 MT\_AF

This interface allows the tester to interact with the Application Framework layer (AF).

#### 3.2.1 MT\_AF Commands

##### 3.2.1.1 AF\_REGISTER

**Description:**

This command enables the tester to register an application’s endpoint description.

**Usage:**

**SREQ:**

|                    |             |                  |                  |                   |                   |
|--------------------|-------------|------------------|------------------|-------------------|-------------------|
| 1                  | 1           | 1                | 1                | 2                 | 2                 |
| Length = 0x09-0x49 | Cmd0 = 0x24 | Cmd1 = 0x00      | EndPoint         | AppProfId         | AppDeviceId       |
| 1                  | 1           | 1                | 0-32             | 1                 | 0-32              |
| AppDevVer          | LatencyReq  | AppNumInClusters | AppInClusterList | AppNumOutClusters | AppOutClusterList |

**Attributes:**

| Attribute         | Length (byte) | Description                                                                     |
|-------------------|---------------|---------------------------------------------------------------------------------|
| EndPoint          | 1             | Specifies the endpoint of the device                                            |
| AppProfId         | 2             | Specifies the profile id of the application                                     |
| AppDeviceId       | 2             | Specifies the device description id for this endpoint                           |
| AddDevVer         | 1             | Specifies the device version number                                             |
| LatencyReq        | 1             | Specifies latency.<br>0x00-No latency<br>0x01-fast beacons<br>0x02-slow beacons |
| AppNumInClusters  | 1             | the number of Input cluster Ids following in the AppInClusterList               |
| AppInClusterList  | 32            | Specifies the list of Input Cluster Ids                                         |
| AppNumOutClusters | 1             | Specifies the number of Output cluster Ids following in the AppOutClusterList   |
| AppOutClusterList | 32            | Specifies the list of Output Cluster Ids                                        |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte:1        | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x64 | Cmd1 = 0x00 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.2.1.2 AF\_DATA\_REQUEST

#### Description:

This command is used by the tester to build and send a message through AF layer.

#### Usage:

#### SREQ:

|                    |             |             |         |             |     |       |
|--------------------|-------------|-------------|---------|-------------|-----|-------|
| Byte: 1            | 1           | 1           | 2       | 1           |     |       |
| Length = 0x0A-0x8A | Cmd0 = 0x24 | Cmd1 = 0x01 | DstAddr | DstEndpoint |     |       |
| Byte: 1            | 2           | 1           | 1       | 1           | 1   | 0-128 |
| SrcEndpoint        | ClusterID   | TransID     | Options | Radius      | Len | Data  |

#### Attributes:

| Attribute   | Length (byte) | Description                                                                                                                                                                               |
|-------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr     | 2             | Short address of the destination device                                                                                                                                                   |
| DstEndpoint | 1             | Endpoint of the destination device                                                                                                                                                        |
| SrcEndpoint | 1             | Endpoint of the source device                                                                                                                                                             |
| ClusterID   | 2             | Specifies the cluster ID                                                                                                                                                                  |
| TransID     | 1             | Specifies the transaction sequence number of the message.                                                                                                                                 |
| Options     | 1             | Transmit options bit mask according to the following defines from AF.h: bit 4: turns on/off 'APS ACK'; bit 5 sets "discover route"; bit 6 sets 'APS security'; bit 7 sets 'skip routing'. |
| Radius      | 1             | Specifies the number of hops allowed delivering the message (see AF_DEFAULT_RADIUS.)                                                                                                      |
| Len         | 1             | Length of the data.                                                                                                                                                                       |
| Data        | 0-128         | 0-128 bytes data                                                                                                                                                                          |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x64 | Cmd1 = 0x01 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.2.1.3 AF\_DATA\_REQUEST\_EXT

#### Description:

This extended form of the AF\_DATA\_REQUEST must be used to send an inter-pan message (note that the target code must be compiled with the INTER\_PAN flag defined.)

#### Usage:

#### SREQ:

|                    |             |             |             |         |             |     |       |
|--------------------|-------------|-------------|-------------|---------|-------------|-----|-------|
| 1                  | 1           | 1           | 1           | 8       | 1           |     |       |
| Length = 0x13-0x93 | Cmd0 = 0x24 | Cmd1 = 0x02 | DstAddrMode | DstAddr | DstEndpoint |     |       |
| 2                  | 1           | 2           | 1           | 1       | 1           | 1   | 0-128 |
| DstPanId           | SrcEndpoint | ClusterID   | TransID     | Options | Radius      | Len | Data  |

#### Attributes:

| Attribute   | Length (byte) | Description                                                                                                                                                                                                                               |
|-------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddrMode | 1             | A value of 3 (the enumeration value for 'afAddr64Bit') indicates 8-byte (64-bit) address mode; otherwise a value of 2 indicates 2-byte (16-bit) address mode, using only the 2 LSB's of the DstAddr field to form a 2-byte short address. |
| DstAddr     | 8             | LSB to MSB for the long or short address of the destination device (upper 6 bytes are don't care when short address.)                                                                                                                     |
| DstEndpoint | 1             | Endpoint of the destination device (but a don't care if the DstPanId is non-zero, which indicates an inter-pan message.)                                                                                                                  |
| DstPanId    | 2             | PanId of the destination device: 0x0000=Intra-Pan; otherwise, Inter-Pan.                                                                                                                                                                  |

|             |       |                                                                                                                                                                                                                                            |
|-------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SrcEndpoint | 1     | Endpoint of the source device.                                                                                                                                                                                                             |
| ClusterID   | 2     | Specifies the cluster ID                                                                                                                                                                                                                   |
| TransID     | 1     | Specifies the transaction sequence number of the message.                                                                                                                                                                                  |
| Options     | 1     | Transmit options bit mask according to the following defines from AF.h: bit 4: turns on/off 'APS ACK'; bit 5 sets "discover route"; bit 6 sets 'APS security'; bit 7 sets 'skip routing'. (This is a don't care for an inter-pan message.) |
| Radius      | 1     | Specifies the number of hops allowed delivering the message (reference DEF_NWK_RADIUS.)                                                                                                                                                    |
| Len         | 1     | Length of the data.                                                                                                                                                                                                                        |
| Data        | 0-128 | 0-128 bytes data                                                                                                                                                                                                                           |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x64 | Cmd1 = 0x02 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.2.1.4 AF\_DATA\_REQUEST\_SRC\_RTG****Description:**

This command is used by the tester to build and send a message through AF layer using source routing.

**Usage:****SREQ:**

|                    |             |             |         |             |
|--------------------|-------------|-------------|---------|-------------|
| Byte: 1            | 1           | 1           | 2       | 1           |
| Length = 0x0B-0xFF | Cmd0 = 0x24 | Cmd1 = 0x03 | DstAddr | DstEndpoint |

|             |           |         |         |        |                 |           |     |       |
|-------------|-----------|---------|---------|--------|-----------------|-----------|-----|-------|
| Byte: 1     | 2         | 1       | 1       | 1      | 1               | 2N        | 1   | 0-128 |
| SrcEndpoint | ClusterID | TransID | Options | Radius | Relay Count (N) | RelayList | Len | Data  |

**Attributes:**

| Attribute   | Length (byte) | Description                                                                                                           |
|-------------|---------------|-----------------------------------------------------------------------------------------------------------------------|
| DstAddr     | 2             | Short address of the destination device                                                                               |
| DstEndpoint | 1             | Endpoint of the destination device                                                                                    |
| SrcEndpoint | 1             | Endpoint of the source device                                                                                         |
| ClusterID   | 2             | Specifies the cluster ID                                                                                              |
| TransID     | 1             | Specifies the transaction sequence number of the message.                                                             |
| Options     | 1             | Transmit options bit mask: Bit 0: turns on/off 'APS ACK'; bit 2 sets 'APS security'; bit 3 sets 'skip routing'.       |
| Radius      | 1             | Specifies the number of hops allowed delivering the message (reference DEF_NWK_RADIUS.)                               |
| Relay Count | 1             | Specifies the number of devices in the relay list for source routing                                                  |
| Relay List  | 2N            | List of relay devices on the source routing path. For each device, it contains 2 bytes short address for each device. |
| Len         | 1             | Length of the data.                                                                                                   |
| Data        | 0-128         | 0-128 bytes data                                                                                                      |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x64 | Cmd1 = 0x03 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                            |
|-----------|---------------|--------------------------------------------------------|
| Status    | 1             | Status is either Success (0) or Memory Failure (0x10). |

### 3.2.1.5 AF\_INTER\_PAN\_CTL

**Description:**

Inter-Pan control command and data. The data content depends upon the command and the available commands are enumerated as InterPanCtl\_t.

**Usage:**
**SREQ:**

|                    |             |             |         |      |
|--------------------|-------------|-------------|---------|------|
| Byte: 1            | 1           | 1           | 1       | 0-3  |
| Length = 0x01-0x04 | Cmd0 = 0x24 | Cmd1 = 0x10 | Command | Data |

**Data:**

| Command        | Data Length (byte) | Description                                                                                                                                                                                                                                       |
|----------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0: InterPanClr | 0                  | Proxy call to StubAPS_SetIntraPanChannel() to switch channel back to the NIB-specified channel.                                                                                                                                                   |
| 1: InterPanSet | 1                  | Proxy call to StubAPS_SetInterPanChannel() with the 1-byte channel specified.                                                                                                                                                                     |
| 2: InterPanReg | 1                  | If the 1-byte Endpoint specified by the data argument is found by invoking affFindEndPointDesc(), then proxy a call to StubAPS_RegisterApp() with the pointer to the endPointDesc_t found (i.e. the Endpoint must already be registered with AF). |
| 3: InterPanChk | 3                  | Proxy a call to StubAPS_InterPan() with the 2-byte PanId (LSB:MSB) and 1-byte EndPoint data.                                                                                                                                                      |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x64 | Cmd1 = 0x10 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                             |
|-----------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status    | 1             | Success (0)<br>Failure (0x10) if a channel change is in progress<br>Invalid_Parameter ( 0x02).<br>ZApsNotAllowed (0xBA) if MAC is not in an idle state. |

## 3.2.2 MT\_AF Callbacks

### 3.2.2.1 AF\_DATA\_CONFIRM

**Description:**

This command is sent by the device to the user after it receives a data request.

**Usage:**
**AREQ:**

|               |             |             |        |          |         |
|---------------|-------------|-------------|--------|----------|---------|
| Byte: 1       | 1           | 1           | 1      | 1        | 1       |
| Length = 0x03 | Cmd0 = 0x44 | Cmd1 = 0x80 | Status | Endpoint | TransID |

**Attributes:**

| Attribute | Length (byte) | Description                                              |
|-----------|---------------|----------------------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1).             |
| Endpoint  | 1             | Endpoint of the device                                   |
| TransId   | 1             | Specified the transaction sequence number of the message |

### 3.2.2.2 AF\_INCOMING\_MSG

**Description:**

This callback message is in response to incoming data to any of the registered endpoints on this device.

**Usage:****AREQ:**

|                    |              |             |             |           |                |             |       |
|--------------------|--------------|-------------|-------------|-----------|----------------|-------------|-------|
| 1                  | 1            | 1           | 2           | 2         | 2              | 1           |       |
| Length = 0x11-0x91 | Cmd0 = 0x44  | Cmd1 = 0x81 | GroupID     | ClusterID | SrcAddr        | SrcEndpoint |       |
| 1                  | 1            | 1           | 1           | 4         | 1              | 1           | 0-128 |
| DstEndpoint        | WasBroadcast | LinkQuality | SecurityUse | Timestamp | TransSeqNumber | Len         | Data  |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                    |
|----------------|---------------|--------------------------------------------------------------------------------|
| GroupID        | 2             | Specifies the group ID of the device                                           |
| ClusterID      | 2             | Specifies the cluster ID (only the LSB is used in V1.0 networks.)              |
| SrcAddr        | 2             | Specifies the ZigBee network address of the source device sending the message. |
| SrcEndpoint    | 1             | Specifies the source endpoint of the message                                   |
| DstEndpoint    | 1             | Specifies the destination endpoint of the message                              |
| WasBroadcast   | 1             | Specifies if the message was a broadcast or not                                |
| LinkQuality    | 1             | Indicates the link quality measured during reception                           |
| SecurityUse    | 1             | Specifies if the security is used or not                                       |
| TimeStamp      | 4             | Specifies the timestamp of the message                                         |
| TransSeqNumber | 1             | Specifies transaction sequence number of the message                           |
| Len            | 1             | Specifies the length of the data.                                              |
| Data           | 0-128         | Contains 0 to 128 bytes of data.                                               |

**3.2.2.3 AF\_INCOMING\_MSG\_EXT****Description:**

This callback message is in response to incoming data to any of the registered endpoints on this device when the code is compiled with the INTER\_PAN flag defined.

**Usage:****AREQ:**

|                    |             |              |             |             |              |                |             |       |
|--------------------|-------------|--------------|-------------|-------------|--------------|----------------|-------------|-------|
| 1                  | 1           | 1            | 2           | 2           | 1            | 8              | 1           |       |
| Length = 0x1A-0x9A | Cmd0 = 0x44 | Cmd1 = 0x82  | GroupID     | ClusterID   | SrcAddr Mode | SrcAddr        | SrcEndpoint |       |
| 2                  | 1           | 1            | 1           | 1           | 4            | 1              | 1           | 0-128 |
| SrcPanId           | DstEndpoint | WasBroadcast | LinkQuality | SecurityUse | Timestamp    | TransSeqNumber | Len         | Data  |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                                                                                                                           |
|----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GroupID        | 2             | Specifies the group ID of the device                                                                                                                                                  |
| ClusterID      | 2             | Specifies the cluster ID (only the LSB is used in V1.0 networks.)                                                                                                                     |
| SrcAddrMode    | 1             | A value of 3 (i.e. the enumeration value for 'afAddr64Bit') indicates 8-byte/64-bit address mode; otherwise, only the 2 LSB's of the 8 bytes are used to form a 2-byte short address. |
| SrcAddr        | 8             | LSB to MSB for the long or short address of the destination device (upper 6 bytes are don't care when short address.)                                                                 |
| SrcEndpoint    | 1             | Specifies the source endpoint of the message                                                                                                                                          |
| SrcPanId       | 2             | Specifies the source PanId of the message.                                                                                                                                            |
| DstEndpoint    | 1             | Specifies the destination endpoint of the message                                                                                                                                     |
| WasBroadcast   | 1             | Specifies if the message was a broadcast or not                                                                                                                                       |
| LinkQuality    | 1             | Indicates the link quality measured during reception                                                                                                                                  |
| SecurityUse    | 1             | Specifies if the security is used or not                                                                                                                                              |
| TimeStamp      | 4             | Specifies the timestamp of the message                                                                                                                                                |
| TransSeqNumber | 1             | Specifies transaction sequence number of the message                                                                                                                                  |
| Len            | 1             | Specifies the length of the data.                                                                                                                                                     |
| Data           | 0-128         | Contains 0 to 128 bytes of data.                                                                                                                                                      |

### 3.3 MT\_APP

This interface allows tester to interact with APP layer of the target to control custom tests such as test profile or user-defined test.

#### 3.3.1 MT\_APP Commands

##### 3.3.1.1 APP\_MSG

**Description:**

This command is sent to the target in order to test the functions defined for individual applications. This command sends a raw data to an application.

**Usage:**

**SREQ:**

|                    |             |             |             |             |
|--------------------|-------------|-------------|-------------|-------------|
| Byte: 1            | 1           | 1           | 1           | 2           |
| Length = 0x07-0x87 | Cmd0 = 0x29 | Cmd1 = 0x00 | AppEndpoint | DestAddress |
| 1                  | 2           | 1           | 0-128       |             |
| DestEndpoint       | ClusterID   | MsgLen      | Message     |             |

**Attributes:**

| Attribute    | Length (byte) | Description                                  |
|--------------|---------------|----------------------------------------------|
| AppEndpoint  | 1             | Application endpoint of the outgoing message |
| DestAddress  | 2             | Destination address of the outgoing message  |
| DestEndpoint | 1             | Destination endpoint of the outgoing message |
| ClusterID    | 2             | Cluster ID of the outgoing message           |
| MsgLen       | 1             | Length of the outgoing message               |
| Message      | 0-128         | Raw data packet to send to the application   |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x69 | Cmd1 = 0x00 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

##### 3.3.1.2 APP\_USER\_TEST

**Description:**

This command is used by tester to issue user's defined commands to the application.

**Usage:**

**SREQ:**

|               |             |             |       |           |            |            |
|---------------|-------------|-------------|-------|-----------|------------|------------|
| Byte: 1       | 1           | 1           | 1     | 2         | 2          | 2          |
| Length = 0x07 | Cmd0 = 0x29 | Cmd1 = 0x01 | SrcEP | CommandID | Parameter1 | Parameter2 |

**Attributes:**

| Attribute  | Length (byte) | Description                                 |
|------------|---------------|---------------------------------------------|
| SrcEP      | 1             | Source Endpoint of the user-defined command |
| CommandID  | 2             | Command ID of the user-defined command      |
| Parameter1 | 2             | Parameter #1 of the command                 |
| Parameter2 | 2             | Parameter #2 of the command                 |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x69 | Cmd1 = 0x01 | Status |

**Attributes:**



| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.3.2 MT\_APP Callbacks

NONE

## 3.4 MT\_DEBUG

This interface allows tester to control the debug-messaging mechanism such as debug threshold, debug messages...etc

### 3.4.1 MT\_DEBUG Commands

#### 3.4.1.1 DEBUG\_SET\_THRESHOLD

**Description:**

This command allows the user to set the threshold for the debug message

**Usage:**

**SREQ:**

| Byte: 1       | 1           | 1           | 1           | 1         |
|---------------|-------------|-------------|-------------|-----------|
| Length = 0x03 | Cmd0 = 0x28 | Cmd1 = 0x00 | ComponentID | Threshold |

**Attributes:**

| Attribute   | Length (byte) | Description                                                                           |
|-------------|---------------|---------------------------------------------------------------------------------------|
| ComponentID | 1             | Uniquely identifies a particular software component on the target                     |
| Threshold   | 1             | Specifies the threshold value for reporting debug messages by that software component |

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x68 | Cmd1 = 0x00 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

#### 3.4.1.2 DEBUG\_MSG

**Description:**

This command sends a debug string to Z-Tool. The content of the string is defined by the application.

**Usage:**

**AREQ:**

| Byte: 1            | 1           | 1           | 1      | 0-254  |
|--------------------|-------------|-------------|--------|--------|
| Length = 0x01-0xFF | Cmd0 = 0x48 | Cmd1 = 0x00 | Length | String |

**Attributes:**

| Attribute | Length (byte) | Description                          |
|-----------|---------------|--------------------------------------|
| Length    | 1             | Length of the string                 |
| String    | 0-254         | String to be displayed by Z-Tool 2.0 |

### 3.4.2 MT\_DEBUG Callbacks

NONE

## 3.5 MT\_MAC

This interface allows tester to interact with the TI-MAC

### 3.5.1 MT\_MAC Commands

#### 3.5.1.1 MT\_MAC\_RESET\_REQ

**Description:**

This command is used to send a MAC Reset command to reset MAC state machine.

**Usage:**

**SREQ:**

| Byte:         | 1           | 1           | 1          | 1 |
|---------------|-------------|-------------|------------|---|
| Length = 0x02 | Cmd0 = 0x22 | Cmd1 = 0x01 | SetDefault |   |

**Attributes:**

| Attribute  | Length (byte) | Description                                      |
|------------|---------------|--------------------------------------------------|
| SetDefault | 1             | TRUE – Set the MAC pib values to default values. |

**SRSP:**

| Byte:         | 1           | 1           | 1      | 1 |
|---------------|-------------|-------------|--------|---|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x00 | Status |   |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

#### 3.5.1.2 MT\_MAC\_INIT

**Description:**

This command is used to initialize the MAC.

**Usage:**

**SREQ:**

| Byte:         | 1           | 1           | 1 |
|---------------|-------------|-------------|---|
| Length = 0x00 | Cmd0 = 0x22 | Cmd1 = 0x02 |   |

**Attributes:**

None

**SRSP:**

| Byte:         | 1           | 1           | 1      | 1 |
|---------------|-------------|-------------|--------|---|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x02 | Status |   |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

#### 3.5.1.3 MT\_MAC\_START\_REQ

**Description:**

This command is used to start the MAC as a coordinator or end device.

**Usage:**

**SREQ:**

|               |             |             |           |       |                |             |
|---------------|-------------|-------------|-----------|-------|----------------|-------------|
| Byte: 1       | 1           | 1           | 4         | 2     | 1              | 1           |
| Length = 0x1C | Cmd0 = 0x22 | Cmd1 = 0x03 | StartTime | PanID | LogicalChannel | ChannelPage |

|             |                 |                |                |                  |                  |
|-------------|-----------------|----------------|----------------|------------------|------------------|
| Byte: 1     | 1               | 1              | 1              | 1                | 8                |
| BeaconOrder | SuperFrameOrder | PanCoordinator | BatteryLifeExt | CoordRealignment | RealignKeySource |

|                      |                  |                 |                 |                     |
|----------------------|------------------|-----------------|-----------------|---------------------|
| Byte: 1              | 1                | 1               | 8               | 1                   |
| RealignSecurityLevel | RealignKeyIdMode | RealignKeyIndex | BeaconKeySource | BeaconSecurityLevel |

|                 |                |
|-----------------|----------------|
| Byte: 1         | 1              |
| BeaconKeyIdMode | BeaconKeyIndex |

**Attributes:**

| Attribute        | Length (byte) | Description                                                                                                                                                      |
|------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| StartTime        | 4             | The time to begin transmitting beacons relative to the received beacon                                                                                           |
| PanID            | 2             | The PAN ID to use. This parameter is ignored if Pan Coordinator is FALSE                                                                                         |
| LogicalChannel   | 1             | The logical channel to use. This parameter is ignored if Pan Coordinator is FALSE                                                                                |
| ChannelPage      | 1             | The channel page to use. This parameter is ignored if Pan Coordinator is FALSE                                                                                   |
| BeaconOrder      | 1             | The exponent used to calculate the beacon interval                                                                                                               |
| SuperFrameOrder  | 1             | The exponent used to calculate the superframe duration                                                                                                           |
| PanCoordinator   | 1             | Set to TRUE to start a network as PAN coordinator                                                                                                                |
| BatteryLifeExt   | 1             | If this value is TRUE, the receiver is disabled after MAC_BATT_LIFE_EXT_PERIODS full backoff periods following the interframe spacing period of the beacon frame |
| CoordRealignment | 1             | Coordinator Realignment                                                                                                                                          |
| RealignKeySource | 8             | Key Source of this data frame                                                                                                                                    |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

|                 |   |                               |
|-----------------|---|-------------------------------|
| RealignKeyIndex | 1 | Key Index of this data frame  |
| BeaconKeySource | 8 | Key Source of this data frame |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

|                 |   |                                |
|-----------------|---|--------------------------------|
| BeaconKeyIdMode | 1 | Key Id Mode of this data frame |
| BeaconKeyIndex  | 1 | Key Index of this data frame   |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x03 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.4 MT\_MAC\_SYNC\_REQ****Description:**

This command is used to request synchronization to the current network beacon

**Usage:****SREQ:**

|               |             |             |                |             |             |
|---------------|-------------|-------------|----------------|-------------|-------------|
| Byte: 1       | 1           | 1           | 1              | 1           | 1           |
| Length = 0x03 | Cmd0 = 0x22 | Cmd1 = 0x04 | LogicalChannel | ChannelPage | TrackBeacon |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                                                                                |
|----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| LogicalChannel | 1             | The logical channel to use.                                                                                                                |
| ChannelPage    | 1             | The channel page to use.                                                                                                                   |
| TrackBeacon    | 1             | Set to TRUE to continue tracking beacons after synchronizing with the first beacon. Set to FALSE to only synchronize with the first beacon |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x04 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.5 MT\_MAC\_DATA\_REQ****Description:**

This command is used to send (on behalf of the next higher layer) MAC Data Frame packet.

**Usage:****SREQ:**

|                     |             |             |                 |             |           |
|---------------------|-------------|-------------|-----------------|-------------|-----------|
| Byte: 1             | 1           | 1           | 1               | 8           | 2         |
| Length = 0x15-0x114 | Cmd0 = 0x22 | Cmd1 = 0x05 | DestAddressMode | DestAddress | DestPanID |

|                |        |          |                |       |           |               |           |
|----------------|--------|----------|----------------|-------|-----------|---------------|-----------|
| Byte: 1        | 1      | 1        | 1              | 1     | 8         | 1             | 1         |
| SrcAddressMode | Handle | TxOption | LogicalChannel | Power | KeySource | SecurityLevel | KeyIdMode |

|          |            |       |
|----------|------------|-------|
| Byte: 1  | 1          | 0-255 |
| KeyIndex | MSDULength | MSDU  |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Specifies the format of the destination address.

| Mode                | Value | Description         |
|---------------------|-------|---------------------|
| ADDRESS_NOT_PRESENT | 0x00  | Address Not Present |
| GROUP_ADDRESS       | 0x01  | Group address       |
| ADDRESS_16_BIT      | 0x02  | Address 16 bit      |
| ADDRESS_64_BIT      | 0x03  | Address 64 bit      |
| BROADCAST           | 0xFF  | Broadcast           |

DestAddressMode 1  
 DestAddress 8 Address of the destination.  
 DestPanID 2 PAN ID of the destination.

Specifies the format of the source address.

| Mode                | Value | Description         |
|---------------------|-------|---------------------|
| ADDRESS_NOT_PRESENT | 0x00  | Address Not Present |
| GROUP_ADDRESS       | 0x01  | Group address       |
| ADDRESS_16_BIT      | 0x02  | Address 16 bit      |
| ADDRESS_64_BIT      | 0x03  | Address 64 bit      |
| BROADCAST           | 0xFF  | Broadcast           |

SrcAddressMode 1  
 Handle 1 Handle of the packet.

Transmitting options:

| Option                  | Value | Description                                                                                                                                          |
|-------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC_TXOPTION_ACK        | 0x01  | Acknowledged transmission. The MAC will attempt to retransmit the frame until it is acknowledged                                                     |
| MAC_TXOPTION_GTS        | 0x02  | GTS transmission (unused)                                                                                                                            |
| MAC_TXOPTION_INDIRECT   | 0x04  | Indirect transmission. The MAC will queue the data and wait for the destination device to poll for it. This can only be used by a coordinator device |
| MAC_TXOPTION_NO_RETRANS | 0x10  | This proprietary option prevents the frame from being retransmitted                                                                                  |
| MAC_TXOPTION_NO_CNF     | 0x20  | This proprietary option prevents a MAC_MCPS_DATA_CNF event from being sent for this frame                                                            |
| MAC_TXOPTION_ALT_BE     | 0x40  | Use PIB value MAC_ALT_BE for the minimum backoff exponent                                                                                            |
| MAC_TXOPTION_PWR_CHAN   | 0x80  | Use the power and channel values in macDataReq_t instead of the PIB values                                                                           |

TxOption 1  
 LogicalChannel 1 Channel that data frame will be transmitted.  
 Power 1 Power level that data frame will be transmitted.  
 KeySource 8 Key Source of this data frame.

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

SecurityLevel 1

Key Id Mode of this data frame:

|           |   |                    |              |
|-----------|---|--------------------|--------------|
| KeyIdMode | 1 | <b>Key Id Mode</b> | <b>Value</b> |
|           |   | NOT_USED           | 0x00         |
|           |   | KEY_1BYTE_INDEX    | 0x01         |
|           |   | KEY_4BYTE_INDEX    | 0x02         |
|           |   | KEY_8BYTE_INDEX    | 0x03         |

  

|            |       |                                |
|------------|-------|--------------------------------|
| KeyIndex   | 1     | Key Index of this data frame.  |
| MSDULength | 1     | Length of the data.            |
| MSDU       | 0-255 | Actual data that will be sent. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x05 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.6 MT\_MAC\_ASSOCIATE\_REQ**

**Description:**

This command is used to request (on behalf of the next higher layer) an association with a coordinator

**Usage:**

**SREQ:**

|               |             |             |                |             |                  |
|---------------|-------------|-------------|----------------|-------------|------------------|
| Byte: 1       | 1           | 1           | 1              | 1           | 1                |
| Length = 0x12 | Cmd0 = 0x22 | Cmd1 = 0x06 | LogicalChannel | ChannelPage | CoordAddressMode |

  

|              |            |                       |           |               |           |          |
|--------------|------------|-----------------------|-----------|---------------|-----------|----------|
| Byte: 8      | 2          | 1                     | 8         | 1             | 1         | 1        |
| CoordAddress | CoordPanID | CapabilityInformation | KeySource | SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute             | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
|-----------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-------------|---------------------|------|---------------------|---------------|------|---------------|----------------|------|----------------|----------------|------|----------------|-----------|------|-----------|
| LogicalChannel        | 1             | Channel that data frame will be transmitted.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ChannelPage           | 1             | The channel page to be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| CoordAddressMode      | 1             | Specifies the format of the coordinator address.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
|                       |               | <table border="1"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_NOT_PRESENT</td> <td>0x00</td> <td>Address Not Present</td> </tr> <tr> <td>GROUP_ADDRESS</td> <td>0x01</td> <td>Group address</td> </tr> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> <tr> <td>BROADCAST</td> <td>0xFF</td> <td>Broadcast</td> </tr> </tbody> </table> | Mode | Value | Description | ADDRESS_NOT_PRESENT | 0x00 | Address Not Present | GROUP_ADDRESS | 0x01 | Group address | ADDRESS_16_BIT | 0x02 | Address 16 bit | ADDRESS_64_BIT | 0x03 | Address 64 bit | BROADCAST | 0xFF | Broadcast |
| Mode                  | Value         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_NOT_PRESENT   | 0x00          | Address Not Present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| GROUP_ADDRESS         | 0x01          | Group address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_16_BIT        | 0x02          | Address 16 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_64_BIT        | 0x03          | Address 64 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| BROADCAST             | 0xFF          | Broadcast                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| CoordAddress          | 8             | Address of the Coordinator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| CoordPanID            | 2             | PAN ID of the coordinator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| CapabilityInformation | 1             | Bit map which specifies the operational capabilities of the device.<br>Bit: 0 – Alternate PAN Coordinator<br>1 – Device type: 1- ZigBee Router; 0 – End Device<br>2 – Power Source: 1 Main powered<br>3 – Receiver on when idle<br>4 – Reserved<br>5 – Reserved<br>6 – Security capability<br>7 – Reserved                                                                                                                                                                                            |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| KeySource             | 8             | Key Source of this data frame                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |

Security Level of this data frame:

| SecurityLevel | 1 | Security Level         | Value |
|---------------|---|------------------------|-------|
|               |   | NO_SECURITY            | 0x00  |
|               |   | MIC_32_AUTH            | 0x01  |
|               |   | MIC_64_AUTH            | 0x02  |
|               |   | MIC_128_AUTH           | 0x03  |
|               |   | AES_ENCRYPTION         | 0x04  |
|               |   | AES_ENCRYPTION_MIC_32  | 0x05  |
|               |   | AES_ENCRYPTION_MIC_64  | 0x06  |
|               |   | AES_ENCRYPTION_MIC_128 | 0x07  |

Key Id Mode of this data frame:

| KeyIdMode | 1 | Key Id Mode     | Value |
|-----------|---|-----------------|-------|
|           |   | NOT_USED        | 0x00  |
|           |   | KEY_1BYTE_INDEX | 0x01  |
|           |   | KEY_4BYTE_INDEX | 0x02  |
|           |   | KEY_8BYTE_INDEX | 0x03  |

KeyIndex 1 Key Index of this data frame.

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x06 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.7 MT\_MAC\_ASSOCIATE\_RSP

**Description:**

This command is sent by the host to response to the MAC\_ASSOCIATE\_IND.

**Usage:**

**SREQ:**

| Byte: 1       | 1           | 1           | 8       | 2                 | 1           |
|---------------|-------------|-------------|---------|-------------------|-------------|
| Length = 0x0B | Cmd0 = 0x42 | Cmd1 = 0x50 | ExtAddr | AssocShortAddress | AssocStatus |

**Attributes:**

| Attribute         | Length (byte) | Description                                                            |
|-------------------|---------------|------------------------------------------------------------------------|
| ExtAddr           | 8             | Extended Address of the device requesting association                  |
| AssocShortAddress | 2             | Short address for the associated device. Allocated by the coordinator. |

Status of the association:

| AssocStatus | 1 | Status                 | Value |
|-------------|---|------------------------|-------|
|             |   | SUCCESSFUL_ASSOCIATION | 0x00  |
|             |   | PAN_AT_CAPACITY        | 0x01  |
|             |   | PAN_ACCESS_DENIED      | 0x02  |

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x50 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.8 MT\_MAC\_DISASSOCIATE\_REQ

**Description:**

This command is used to request (on behalf of the next higher layer) a disassociation of the device from the coordinator.

**Usage:**

**SREQ:**

|               |             |             |                   |               |             |
|---------------|-------------|-------------|-------------------|---------------|-------------|
| Byte: 1       | 1           | 1           | 1                 | 8             | 2           |
| Length = 0x18 | Cmd0 = 0x22 | Cmd1 = 0x07 | DeviceAddressMode | DeviceAddress | DevicePanID |

|                    |            |           |               |           |          |
|--------------------|------------|-----------|---------------|-----------|----------|
| Byte: 1            | 1          | 8         | 1             | 1         | 1        |
| DisassociateReason | TxIndirect | KeySource | SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Specifies the format of the device address.

| Mode                | Value | Description         |
|---------------------|-------|---------------------|
| ADDRESS_NOT_PRESENT | 0x00  | Address Not Present |
| GROUP_ADDRESS       | 0x01  | Group address       |
| ADDRESS_16_BIT      | 0x02  | Address 16 bit      |
| ADDRESS_64_BIT      | 0x03  | Address 64 bit      |
| BROADCAST           | 0xFF  | Broadcast           |

|                   |   |                           |
|-------------------|---|---------------------------|
| DeviceAddressMode | 1 |                           |
| DeviceAddress     | 8 | Device Address.           |
| DevicePanID       | 2 | Network PAN ID of device. |

Reason of disassociation:

| Reason                | Value |
|-----------------------|-------|
| RESERVED              | 0x00  |
| COOR_WISHES_DEV_LEAVE | 0x01  |
| DEV_WISHES_LEAVE      | 0x02  |

|            |   |                                |
|------------|---|--------------------------------|
| TxIndirect | 1 | Tx indirect                    |
| KeySource  | 8 | Key Source of this data frame. |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

|           |   |                               |
|-----------|---|-------------------------------|
| KeyIdMode | 1 |                               |
| KeyIndex  | 1 | Key Index of this data frame. |

**SRSP:**



|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x07 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.9 MT\_MAC\_GET\_REQ

**Description:**

This command is used to read (on behalf of the next higher layer) a MAC PIB attribute.

**Usage:**

**SREQ:**

|               |             |             |           |
|---------------|-------------|-------------|-----------|
| Byte: 1       | 1           | 1           | 1         |
| Length = 0x01 | Cmd0 = 0x22 | Cmd1 = 0x08 | Attribute |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Specifies the MAC PIB Attributes:

| Attribute                         | Length (byte) | Value |
|-----------------------------------|---------------|-------|
| ZMAC_ACK_WAIT_DURATION            |               | 0x40  |
| ZMAC_ASSOCIATION_PERMIT           |               | 0x41  |
| ZMAC_AUTO_REQUEST                 |               | 0x42  |
| ZMAC_BATT_LIFE_EXT                |               | 0x43  |
| ZMAC_BATT_LEFT_EXT_PERIODS        |               | 0x44  |
| ZMAC_BEACON_MSDU                  |               | 0x45  |
| ZMAC_BEACON_MSDU_LENGTH           |               | 0x46  |
| ZMAC_BEACON_ORDER                 |               | 0x47  |
| ZMAC_BEACON_TX_TIME               |               | 0x48  |
| ZMAC_BSN                          |               | 0x49  |
| ZMAC_COORD_EXTENDED_ADDRESS       |               | 0x4A  |
| ZMAC_COORD_SHORT_ADDRESS          |               | 0x4B  |
| ZMAC_DSN                          |               | 0x4C  |
| ZMAC_GTS_PERMIT                   |               | 0x4D  |
| ZMAC_MAX_CSMA_BACKOFFS            |               | 0x4E  |
| ZMAC_MIN_BE                       |               | 0x4F  |
| ZMAC_PANID                        |               | 0x50  |
| ZMAC_PROMISCUOUS_MODE             |               | 0x51  |
| ZMAC_RX_ON_IDLE                   |               | 0x52  |
| ZMAC_SHORT_ADDRESS                |               | 0x53  |
| ZMAC_SUPERFRAME_ORDER             |               | 0x54  |
| ZMAC_TRANSACTION_PERSISTENCE_TIME |               | 0x55  |
| ZMAC_ASSOCIATED_PAN_COORD         |               | 0x56  |
| ZMAC_MAX_BE                       |               | 0x57  |
| ZMAC_FRAME_TOTAL_WAIT_TIME        |               | 0x58  |
| ZMAC_MAC_FRAME_RETRIES            |               | 0x59  |
| ZMAC_RESPONSE_WAIT_TIME           |               | 0x5A  |
| ZMAC_SYNC_SYMBOL_OFFSET           |               | 0x5B  |
| ZMAC_TIMESTAMP_SUPPORTED          |               | 0x5C  |
| ZMAC_SECURITY_ENABLED             |               | 0x5D  |
| ZMAC_PHY_TRANSMIT_POWER           |               | 0xE0  |
| ZMAC_LOGICAL_CHANNEL              |               | 0xE1  |
| ZMAC_EXTENDED_ADDRESS             |               | 0xE2  |
| ZMAC_ALT_BE                       |               | 0xE3  |

**SRSP:**

|         |   |   |   |    |
|---------|---|---|---|----|
| Byte: 1 | 1 | 1 | 1 | 16 |
|---------|---|---|---|----|

Length = 0x11      Cmd0 = 0x62      Cmd1 = 0x08      Status      Data

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |
| Data      | 16            | 1-16 bytes value of the PIB attribute.       |

**3.5.1.10 MT\_MAC\_SET\_REQ**

**Description:**

This command is used to request the device to write a MAC PIB value.

**Usage:**

**SREQ:**

| Byte: 1       | 1           | 1           | 1         | 16             |
|---------------|-------------|-------------|-----------|----------------|
| Length = 0x11 | Cmd0 = 0x22 | Cmd1 = 0x09 | Attribute | AttributeValue |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Specified the MAC PIB Attribute:

| MAC PIB Attribute                 | Value |
|-----------------------------------|-------|
| ZMAC_ACK_WAIT_DURATION            | 0x40  |
| ZMAC_ASSOCIATION_PERMIT           | 0x41  |
| ZMAC_AUTO_REQUEST                 | 0x42  |
| ZMAC_BATT_LIFE_EXT                | 0x43  |
| ZMAC_BATT_LEFT_EXT_PERIODS        | 0x44  |
| ZMAC_BEACON_MSDU                  | 0x45  |
| ZMAC_BEACON_MSDU_LENGTH           | 0x46  |
| ZMAC_BEACON_ORDER                 | 0x47  |
| ZMAC_BEACON_TX_TIME               | 0x48  |
| ZMAC_BSN                          | 0x49  |
| ZMAC_COORD_EXTENDED_ADDRESS       | 0x4A  |
| ZMAC_COORD_SHORT_ADDRESS          | 0x4B  |
| ZMAC_DSN                          | 0x4C  |
| ZMAC_GTS_PERMIT                   | 0x4D  |
| ZMAC_MAX_CSMA_BACKOFFS            | 0x4E  |
| ZMAC_MIN_BE                       | 0x4F  |
| ZMAC_PANID                        | 0x50  |
| ZMAC_PROMISCUOUS_MODE             | 0x51  |
| ZMAC_RX_ON_IDLE                   | 0x52  |
| ZMAC_SHORT_ADDRESS                | 0x53  |
| ZMAC_SUPERFRAME_ORDER             | 0x54  |
| ZMAC_TRANSACTION_PERSISTENCE_TIME | 0x55  |
| ZMAC_ASSOCIATED_PAN_COORD         | 0x56  |
| ZMAC_MAX_BE                       | 0x57  |
| ZMAC_FRAME_TOTAL_WAIT_TIME        | 0x58  |
| ZMAC_MAC_FRAME_RETRIES            | 0x59  |
| ZMAC_RESPONSE_WAIT_TIME           | 0x5A  |
| ZMAC_SYNC_SYMBOL_OFFSET           | 0x5B  |
| ZMAC_TIMESTAMP_SUPPORTED          | 0x5C  |
| ZMAC_SECURITY_ENABLED             | 0x5D  |
| ZMAC_PHY_TRANSMIT_POWER           | 0xE0  |
| ZMAC_LOGICAL_CHANNEL              | 0xE1  |
| ZMAC_EXTENDED_ADDRESS             | 0xE2  |
| ZMAC_ALT_BE                       | 0xE3  |

Attribute      1      Specified the MAC PIB Attribute:

AttributeValue      16      1-16 bytes of the PIB attribute value.

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x09 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.11 MT\_MAC\_SCAN\_REQ

**Description:**

This command is used to send a request to the device to perform a network scan.

**Usage:**

**SREQ:**

|               |             |             |              |          |              |
|---------------|-------------|-------------|--------------|----------|--------------|
| Byte: 1       | 1           | 1           | 4            | 1        | 1            |
| Length = 0x13 | Cmd0 = 0x22 | Cmd1 = 0x0C | ScanChannels | ScanType | ScanDuration |

|             |            |           |               |           |          |
|-------------|------------|-----------|---------------|-----------|----------|
| Byte: 1     | 1          | 8         | 1             | 1         | 1        |
| ChannelPage | MaxResults | KeySource | SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

This represents a bit-mask of channels to be scanned when starting the device:

|              |   |              |            |
|--------------|---|--------------|------------|
| ScanChannels | 4 | Channel      | Value      |
|              |   | NONE         | 0x00000000 |
|              |   | ALL_CHANNELS | 0x07FFF800 |
|              |   | CHANNEL 11   | 0x00000800 |
|              |   | CHANNEL 12   | 0x00001000 |
|              |   | CHANNEL 13   | 0x00002000 |
|              |   | CHANNEL 14   | 0x00004000 |
|              |   | CHANNEL 15   | 0x00008000 |
|              |   | CHANNEL 16   | 0x00010000 |
|              |   | CHANNEL 17   | 0x00020000 |
|              |   | CHANNEL 18   | 0x00040000 |
|              |   | CHANNEL 19   | 0x00080000 |
|              |   | CHANNEL 20   | 0x00100000 |
|              |   | CHANNEL 21   | 0x00200000 |
|              |   | CHANNEL 22   | 0x00400000 |
|              |   | CHANNEL 23   | 0x00800000 |
|              |   | CHANNEL 24   | 0x01000000 |
|              |   | CHANNEL 25   | 0x02000000 |
|              |   | CHANNEL 26   | 0x04000000 |

Specifies the scan type:

|          |   |               |       |
|----------|---|---------------|-------|
| ScanType | 1 | Scan Type     | Value |
|          |   | ENERGY_DETECT | 0x00  |
|          |   | ACTIVE        | 0x01  |
|          |   | PASSIVE       | 0x02  |
|          |   | ORPHAN        | 0x03  |

|              |   |                                                                            |
|--------------|---|----------------------------------------------------------------------------|
| ScanDuration | 1 | Duration of the scan - The exponent used in the scan duration calculation. |
| ChannelPage  | 1 | The channel page on which to perform the scan.                             |
| KeySource    | 8 | Key Source of this data frame.                                             |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

SecurityLevel 1

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

KeyIdMode 1

KeyIndex 1 Key Index of this data frame.

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x0C | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.12 MT\_MAC\_ORPHAN\_RSP**

**Description:**

This command is sent by the host to response to the ORPHAN\_IND.

**Usage:**

**SREQ:**

| Byte: 1       | 1           | 1           | 8       | 2                 | 1                |
|---------------|-------------|-------------|---------|-------------------|------------------|
| Length = 0x0B | Cmd0 = 0x42 | Cmd1 = 0x51 | ExtAddr | AssocShortAddress | AssociatedMember |

**Attributes:**

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| ExtAddr           | 8             | Extended Address of the device sending the orphan notification |
| AssocShortAddress | 2             | Short address of the orphan device                             |
| AssociatedMember  | 1             | TRUE if the orphan is a associated member. FALSE otherwise.    |

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x51 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.13 MT\_MAC\_POLL\_REQ**

**Description:**

This command is used to send a MAC data request poll.

**Usage:**

**SREQ:**

|               |             |             |                  |              |            |
|---------------|-------------|-------------|------------------|--------------|------------|
| Byte: 1       | 1           | 1           | 1                | 8            | 2          |
| Length = 0x16 | Cmd0 = 0x22 | Cmd1 = 0x0D | CoordAddressMode | CoordAddress | CoordPanID |

|           |               |           |          |
|-----------|---------------|-----------|----------|
| 8         | 1             | 1         | 1        |
| KeySource | SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

|                  |   |                     |       |                     |
|------------------|---|---------------------|-------|---------------------|
| CoordAddressMode | 1 | Mode                | Value | Description         |
|                  |   | ADDRESS_NOT_PRESENT | 0x00  | Address Not Present |
|                  |   | GROUP_ADDRESS       | 0x01  | Group address       |
|                  |   | ADDRESS_16_BIT      | 0x02  | Address 16 bit      |
|                  |   | ADDRESS_64_BIT      | 0x03  | Address 64 bit      |
|                  |   | BROADCAST           | 0xFF  | Broadcast           |

|              |   |                                |
|--------------|---|--------------------------------|
| CoordAddress | 8 | 64-bit Coordinator Address     |
| CoordPanID   | 2 | Coordinator PanID              |
| KeySource    | 8 | Key Source of this data frame. |

Security Level of this data frame:

|                        |      |                       |       |
|------------------------|------|-----------------------|-------|
| SecurityLevel          | 1    | Security Level        | Value |
|                        |      | NO_SECURITY           | 0x00  |
|                        |      | MIC_32_AUTH           | 0x01  |
|                        |      | MIC_64_AUTH           | 0x02  |
|                        |      | MIC_128_AUTH          | 0x03  |
|                        |      | AES_ENCRYPTION        | 0x04  |
|                        |      | AES_ENCRYPTION_MIC_32 | 0x05  |
|                        |      | AES_ENCRYPTION_MIC_64 | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07 |                       |       |

Key Id Mode of this data frame:

|                 |      |                 |       |
|-----------------|------|-----------------|-------|
| KeyIdMode       | 1    | Key Id Mode     | Value |
|                 |      | NOT_USED        | 0x00  |
|                 |      | KEY_1BYTE_INDEX | 0x01  |
|                 |      | KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03 |                 |       |

|          |   |                               |
|----------|---|-------------------------------|
| KeyIndex | 1 | Key Index of this data frame. |
|----------|---|-------------------------------|

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x0D | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.14 MT\_MAC\_PURGE\_REQ

**Description:**

This command is used to send a request to the device to purge a data frame

**Usage:**

**SREQ:**

|         |   |   |   |
|---------|---|---|---|
| Byte: 1 | 1 | 1 | 1 |
|---------|---|---|---|

Length = 0x01    Cmd0 = 0x22    Cmd1 = 0x0E    MsduHandle

**Attributes:**

| Attribute  | Length (byte) | Description |
|------------|---------------|-------------|
| MsduHandle | 1             | Msdu Handle |

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x0E | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.15 MT\_MAC\_SET\_RX\_GAIN\_REQ

**Description:**

This command is used to send a request to the device to set Rx gain.

**Usage:**

**SREQ:**

| Byte: 1       | 1           | 1           | 1    |
|---------------|-------------|-------------|------|
| Length = 0x01 | Cmd0 = 0x22 | Cmd1 = 0x0F | Mode |

**Attributes:**

| Attribute | Length (byte) | Description              |
|-----------|---------------|--------------------------|
| Mode      | 1             | PA/PNA mode – TRUE/FALSE |

**SRSP:**

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x0F | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.16 MT\_MAC\_SRC\_MATCH\_ENABLE

**Description:**

This command is used to enable AUTOPEND and source address matching.

**Usage:**

**SREQ:**

| Byte: 1       | 1           | 1           | 1        | 1          |
|---------------|-------------|-------------|----------|------------|
| Length = 0x02 | Cmd0 = 0x22 | Cmd1 = 0x10 | AddrType | NumEntries |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Address types used in AutoPend

|          |   |                        |      |
|----------|---|------------------------|------|
| AddrType | 1 | Auto Pend Address Type |      |
|          |   | SHORT_ADDRESS          | 0x02 |
|          |   | EXTENDED_ADDRESS       | 0x03 |

NumEntries    1    Numbers of source address table entries to be used.

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x10 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.17 MT\_MAC\_SRC\_MATCH\_ADD\_ENTRY**

**Description:**

This command is used to add a short or extended address to source address table.

**Usage:**

**SREQ:**

|               |             |             |             |         |
|---------------|-------------|-------------|-------------|---------|
| Byte: 1       | 1           | 1           | 1           | 8       |
| Length = 0x0B | Cmd0 = 0x22 | Cmd1 = 0x11 | AddressMode | Address |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                                                                                                                                                                                                                  |       |                |             |                |      |                |                |      |                |
|----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------|-------------|----------------|------|----------------|----------------|------|----------------|
| AddressMode    | 1             | <table border="1"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> </tbody> </table> | Mode  | Value          | Description | ADDRESS_16_BIT | 0x02 | Address 16 bit | ADDRESS_64_BIT | 0x03 | Address 64 bit |
|                |               | Mode                                                                                                                                                                                                                                                                         | Value | Description    |             |                |      |                |                |      |                |
|                |               | ADDRESS_16_BIT                                                                                                                                                                                                                                                               | 0x02  | Address 16 bit |             |                |      |                |                |      |                |
| ADDRESS_64_BIT | 0x03          | Address 64 bit                                                                                                                                                                                                                                                               |       |                |             |                |      |                |                |      |                |
| Address        | 8             | Address of the device that will be added - Can be short or extended depends on the address mode.                                                                                                                                                                             |       |                |             |                |      |                |                |      |                |
| PanID          | 2             | PAN ID of the device. Only use when the address is a short address.                                                                                                                                                                                                          |       |                |             |                |      |                |                |      |                |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x11 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.18 MT\_MAC\_SRC\_MATCH\_DEL\_ENTRY**

**Description:**

This command is used to delete a short or extended address to source address table.

**Usage:**

**SREQ:**

|               |             |             |             |         |       |
|---------------|-------------|-------------|-------------|---------|-------|
| Byte: 1       | 1           | 1           | 1           | 8       | 2     |
| Length = 0x0B | Cmd0 = 0x22 | Cmd1 = 0x12 | AddressMode | Address | PanID |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                                                                                                                                                                                                                  |       |                |             |                |      |                |                |      |                |
|----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------|-------------|----------------|------|----------------|----------------|------|----------------|
| AddressMode    | 1             | <table border="1"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> </tbody> </table> | Mode  | Value          | Description | ADDRESS_16_BIT | 0x02 | Address 16 bit | ADDRESS_64_BIT | 0x03 | Address 64 bit |
|                |               | Mode                                                                                                                                                                                                                                                                         | Value | Description    |             |                |      |                |                |      |                |
|                |               | ADDRESS_16_BIT                                                                                                                                                                                                                                                               | 0x02  | Address 16 bit |             |                |      |                |                |      |                |
| ADDRESS_64_BIT | 0x03          | Address 64 bit                                                                                                                                                                                                                                                               |       |                |             |                |      |                |                |      |                |
| Address        | 8             | Address of the device that will be deleted - Can be short or extended depends on the address mode.                                                                                                                                                                           |       |                |             |                |      |                |                |      |                |
| PanID          | 2             | PAN ID of the device. Only use when the address is a short address.                                                                                                                                                                                                          |       |                |             |                |      |                |                |      |                |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x12 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.19 MT\_MAC\_SRC\_MATCH\_CHECK\_SRC\_ADDR**

**Description:**

This command is used to check if a short or extended address is in the source address table.

**Usage:**

**SREQ:**

|               |             |             |             |         |       |
|---------------|-------------|-------------|-------------|---------|-------|
| Byte: 1       | 1           | 1           | 1           | 8       | 2     |
| Length = 0x0B | Cmd0 = 0x22 | Cmd1 = 0x13 | AddressMode | Address | PanID |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                                                                                                                                                                                                                  |       |                |             |                |      |                |                |      |                |
|----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------|-------------|----------------|------|----------------|----------------|------|----------------|
| AddressMode    | 1             | <table border="1"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> </tbody> </table> | Mode  | Value          | Description | ADDRESS_16_BIT | 0x02 | Address 16 bit | ADDRESS_64_BIT | 0x03 | Address 64 bit |
|                |               | Mode                                                                                                                                                                                                                                                                         | Value | Description    |             |                |      |                |                |      |                |
|                |               | ADDRESS_16_BIT                                                                                                                                                                                                                                                               | 0x02  | Address 16 bit |             |                |      |                |                |      |                |
| ADDRESS_64_BIT | 0x03          | Address 64 bit                                                                                                                                                                                                                                                               |       |                |             |                |      |                |                |      |                |
| Address        | 8             | Address of the device that will be checked - Can be short or extended depends on the address mode.                                                                                                                                                                           |       |                |             |                |      |                |                |      |                |
| PanID          | 2             | PAN ID of the device. Only use when the address is a short address.                                                                                                                                                                                                          |       |                |             |                |      |                |                |      |                |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x13 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.5.1.20 MT\_MAC\_SRC\_MATCH\_ACK\_ALL\_PENDING**

**Description:**

This command is used to enabled/disable acknowledging all packets with pending bit set.

**Usage:**

**SREQ:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x22 | Cmd1 = 0x14 | Option |

**Attributes:**

| Attribute | Length (byte) | Description                                                                |
|-----------|---------------|----------------------------------------------------------------------------|
| Option    | 1             | TRUE - acknowledging all packets with pending field set. FALSE - Otherwise |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x14 | Status |

**Attributes:**



| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.5.1.21 MT\_MAC\_SRC\_MATCH\_CHECK\_ALL\_PENDING

#### Description:

This command is used to check if acknowledging all packets with pending bit set is enabled.

#### Usage:

#### SREQ:

| Byte: 1       | 1           | 1           |
|---------------|-------------|-------------|
| Length = 0x00 | Cmd0 = 0x15 | Cmd1 = 0x09 |

#### Attributes:

None

#### SRSP:

| Byte: 1       | 1           | 1           | 1      | 1     |
|---------------|-------------|-------------|--------|-------|
| Length = 0x01 | Cmd0 = 0x62 | Cmd1 = 0x15 | Status | Value |

#### Attributes:

| Attribute | Length (byte) | Description                                                                          |
|-----------|---------------|--------------------------------------------------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1).                                         |
| Value     | 1             | TRUE - acknowledging all packets with pending bit set is enabled. FALSE – otherwise. |

## 3.5.2 MT\_MAC Callbacks

### 3.5.2.1 MT\_MAC\_SYNC\_LOSS\_IND

#### Description:

This callback is called by the MAC to send (on behalf of the next higher layer) an indication of the synchronization loss.

#### Usage:

#### AREQ:

| 1             | 1           | 1           | 1      | 2     | 1              | 1           |
|---------------|-------------|-------------|--------|-------|----------------|-------------|
| Length = 0x10 | Cmd0 = 0x42 | Cmd1 = 0x80 | Status | PanId | LogicalChannel | ChannelPage |

| 8         | 1             | 1         | 1        |
|-----------|---------------|-----------|----------|
| KeySource | SecurityLevel | KeyIdMode | KeyIndex |

#### Attributes:

| Attribute      | Length (byte) | Description                                                     |
|----------------|---------------|-----------------------------------------------------------------|
| Status         | 1             | This field indicates either SUCCESS (0) or FAILURE (1).         |
| PanId          | 2             | PAN ID of the device                                            |
| LogicalChannel | 1             | Logical Channel of the device where the synchronization is lost |
| ChannelPage    | 1             | Channel Page of the device where the synchronization is lost    |
| KeySource      | 8             | Key Source of this data frame.                                  |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

SecurityLevel 1

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

KeyIdMode 1

KeyIndex 1 Key Index of this data frame.

### 3.5.2.2 MT\_MAC\_ASSOCIATE\_IND

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) an association indication message.

**Usage:**

**AREQ:**

|               |             |             |                       |              |
|---------------|-------------|-------------|-----------------------|--------------|
| 1             | 1           | 1           | 8                     | 1            |
| Length = 0x14 | Cmd0 = 0x42 | Cmd1 = 0x81 | DeviceExtendedAddress | Capabilities |

|           |               |           |          |
|-----------|---------------|-----------|----------|
| 8         | 1             | 1         | 1        |
| KeySource | SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute             | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DeviceExtendedAddress | 8             | Extended address of the device                                                                                                                                                                                                                                                                                                                  |
| Capabilities          | 1             | Specifies the operating capabilities of the device being directly joined.<br>Bit weighted values follow:<br>Bit: 0 – Alternate PAN Coordinator<br>1 – Device type: 1- ZigBee Router; 0 – End Device<br>2 – Power Source: 1 Main powered<br>3 – Receiver on when idle<br>4 – Reserved<br>5 – Reserved<br>6 – Security capability<br>7 – Reserved |
| KeySource             | 8             | Key Source of this data frame.                                                                                                                                                                                                                                                                                                                  |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

SecurityLevel 1

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

KeyIdMode 1

KeyIndex 1 Key Index of this data frame.

### 3.5.2.3 MT\_MAC\_ASSOCIATE\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) an association confirmation message.

**Usage:**

**AREQ:**

|               |             |             |        |                    |
|---------------|-------------|-------------|--------|--------------------|
| 1             | 1           | 1           | 1      | 2                  |
| Length = 0x0E | Cmd0 = 0x42 | Cmd1 = 0x82 | Status | DeviceShortAddress |

|           |               |           |          |
|-----------|---------------|-----------|----------|
| 8         | 1             | 1         | 1        |
| KeySource | SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute          | Length (byte) | Description                                             |
|--------------------|---------------|---------------------------------------------------------|
| Status             | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |
| DeviceShortAddress | 2             | Short address of the device                             |
| KeySource          | 8             | Key Source of this data frame.                          |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

SecurityLevel 1

Key Id Mode of this data frame:

|                 |      |                    |              |
|-----------------|------|--------------------|--------------|
| KeyIdMode       | 1    | <b>Key Id Mode</b> | <b>Value</b> |
|                 |      | NOT_USED           | 0x00         |
|                 |      | KEY_1BYTE_INDEX    | 0x01         |
|                 |      | KEY_4BYTE_INDEX    | 0x02         |
| KEY_8BYTE_INDEX | 0x03 |                    |              |

KeyIndex 1 Key Index of this data frame.

### 3.5.2.4 MT\_MAC\_BEACON\_NOTIFY\_IND

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC beacon notify indication.

**Usage:**

**AREQ:**

|                            |             |                |                |           |                        |
|----------------------------|-------------|----------------|----------------|-----------|------------------------|
| 1                          | 1           | 1              | 1              | 4         | 1                      |
| Length = 0x24-0xBC         | Cmd0 = 0x42 | Cmd1 = 0x83    | BSN            | Timestamp | CoordinatorAddressMode |
| 8                          | 2           | 2              | 1              | 1         | 1                      |
| CoordinatorExtendedAddress | PanID       | SuperframeSpec | LogicalChannel | GTSPermit | LinkQuality            |
| 1                          | 8           | 1              | 1              | 1         | 1                      |
| SecurityFailure            | KeySource   | SecurityLevel  | KeyIdMode      | KeyIndex  | PendingAddrSpec        |
| 1                          | 1           | 0-128          |                |           |                        |
| AddressList                | SDULength   | NSDU           |                |           |                        |

**Attributes:**

| Attribute                  | Length (byte) | Description                         |
|----------------------------|---------------|-------------------------------------|
| BSN                        | 1             | BSN                                 |
| Timestamp                  | 4             | Timestamp of the message            |
| CoordinatorAddressMode     | 1             | Address mode of the coordinator     |
|                            |               | Mode                                |
|                            |               | Value                               |
|                            |               | Description                         |
|                            |               | Mode                                |
| CoordinatorExtendedAddress | 8             | Extended address of the coordinator |
| PanID                      | 2             | Pan ID of the device                |
| SuperframeSpec             | 2             |                                     |
| LogicalChannel             | 1             | Current logical channel             |
| GTSPermit                  | 1             | TRUE/FALSE - Permit/Not permit GTS  |
| LinkQuality                | 1             | Link quality of the message         |
| SecurityFailure            | 1             |                                     |
| KeySource                  | 8             | Key Source of this data frame.      |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

  

|                 |       |                                           |
|-----------------|-------|-------------------------------------------|
| SecurityLevel   | 1     |                                           |
| KeyIndex        | 1     | Key Index of this data frame.             |
| PendingAddrSpec | 1     |                                           |
| AddressList     | 1     | List of address associate with the device |
| SDULength       | 1     | Beacon Length                             |
| NSDU            | 0-128 | Beacon payload                            |

### 3.5.2.5 MT\_MAC\_DATA\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC data confirmation.

**Usage:**

**AREQ:**

|               |             |             |        |        |           |            |
|---------------|-------------|-------------|--------|--------|-----------|------------|
| 1             | 1           | 1           | 1      | 1      | 4         | 2          |
| Length = 0x08 | Cmd0 = 0x42 | Cmd1 = 0x84 | Status | Handle | Timestamp | Timestamp2 |

**Attributes:**

| Attribute  | Length (byte) | Description                                             |
|------------|---------------|---------------------------------------------------------|
| Status     | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |
| Handle     | 1             | Handle of the message                                   |
| Timestamp  | 4             | 64bit timestamp of the message                          |
| Timestamp2 | 2             | 16bit timestamp of the message                          |

### 3.5.2.6 MT\_MAC\_DATA\_IND

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC data indication.

**Usage:**

**AREQ:**

|                    |             |             |             |          |             |             |      |
|--------------------|-------------|-------------|-------------|----------|-------------|-------------|------|
| 1                  | 1           | 1           | 1           | 8        | 1           | 8           |      |
| Length = 0x2C-0xAC | Cmd0 = 0x42 | Cmd1 = 0x85 | SrcAddrMode | SrcAddr  | DstAddrMode | DstAddr     |      |
| 4                  | 2           | 2           | 2           | 2        | 1           | 1           |      |
| Timestamp          | Timestamp2  | SrcPanID    | SrcPanID    | DstPanID | LinkQuality | Correlation | RSSI |

|     |           |               |           |          |        |       |
|-----|-----------|---------------|-----------|----------|--------|-------|
| 1   | 8         | 1             | 1         | 1        | 1      | 0-128 |
| DSN | KeySource | SecurityLevel | KeyIdMode | KeyIndex | Length | Data  |

**Attributes:**

| Attribute              | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|-------------|---------------------|-----------------|---------------------|-----------------|------|-----------------|----------------|----------------|----------------|-----------------------|------|-----------------------|-----------|------------------------|-----------|
|                        |               | Source address mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| SrcAddrMode            | 1             | <table border="1"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_NOT_PRESENT</td> <td>0x00</td> <td>Address Not Present</td> </tr> <tr> <td>GROUP_ADDRESS</td> <td>0x01</td> <td>Group address</td> </tr> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> <tr> <td>BROADCAST</td> <td>0xFF</td> <td>Broadcast</td> </tr> </tbody> </table>                              | Mode           | Value               | Description | ADDRESS_NOT_PRESENT | 0x00            | Address Not Present | GROUP_ADDRESS   | 0x01 | Group address   | ADDRESS_16_BIT | 0x02           | Address 16 bit | ADDRESS_64_BIT        | 0x03 | Address 64 bit        | BROADCAST | 0xFF                   | Broadcast |
|                        |               | Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Value          | Description         |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | ADDRESS_NOT_PRESENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0x00           | Address Not Present |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | GROUP_ADDRESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0x01           | Group address       |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | ADDRESS_16_BIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0x02           | Address 16 bit      |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| ADDRESS_64_BIT         | 0x03          | Address 64 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| BROADCAST              | 0xFF          | Broadcast                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| SrcAddr                | 8             | Source address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| DstAddrMode            | 1             | Destination address mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| DstAddr                | 8             | Destination address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| Timestamp              | 4             | 32bit timestamp of the message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| Timestamp2             | 2             | 16bit timestamp of the message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| SrcPanID               | 2             | Pan ID of the source address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| DstPanID               | 2             | Pan ID of the destination address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| LinkQuality            | 1             | Link quality                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| Correlation            | 1             | Correlation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| RSSI                   | 1             | RSSI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| DSN                    | 1             | DSN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| KeySource              | 8             | Key Source of this data frame.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | Security Level of this data frame:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| SecurityLevel          | 1             | <table border="1"> <thead> <tr> <th>Security Level</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>NO_SECURITY</td> <td>0x00</td> </tr> <tr> <td>MIC_32_AUTH</td> <td>0x01</td> </tr> <tr> <td>MIC_64_AUTH</td> <td>0x02</td> </tr> <tr> <td>MIC_128_AUTH</td> <td>0x03</td> </tr> <tr> <td>AES_ENCRYPTION</td> <td>0x04</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_32</td> <td>0x05</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_64</td> <td>0x06</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_128</td> <td>0x07</td> </tr> </tbody> </table> | Security Level | Value               | NO_SECURITY | 0x00                | MIC_32_AUTH     | 0x01                | MIC_64_AUTH     | 0x02 | MIC_128_AUTH    | 0x03           | AES_ENCRYPTION | 0x04           | AES_ENCRYPTION_MIC_32 | 0x05 | AES_ENCRYPTION_MIC_64 | 0x06      | AES_ENCRYPTION_MIC_128 | 0x07      |
|                        |               | Security Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Value          |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | NO_SECURITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0x00           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | MIC_32_AUTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0x01           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | MIC_64_AUTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0x02           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | MIC_128_AUTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0x03           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | AES_ENCRYPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0x04           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| AES_ENCRYPTION_MIC_32  | 0x05          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| AES_ENCRYPTION_MIC_64  | 0x06          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| AES_ENCRYPTION_MIC_128 | 0x07          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | Key Id Mode of this data frame:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| KeyIdMode              | 1             | <table border="1"> <thead> <tr> <th>Key Id Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>NOT_USED</td> <td>0x00</td> </tr> <tr> <td>KEY_1BYTE_INDEX</td> <td>0x01</td> </tr> <tr> <td>KEY_4BYTE_INDEX</td> <td>0x02</td> </tr> <tr> <td>KEY_8BYTE_INDEX</td> <td>0x03</td> </tr> </tbody> </table>                                                                                                                                                                                                                      | Key Id Mode    | Value               | NOT_USED    | 0x00                | KEY_1BYTE_INDEX | 0x01                | KEY_4BYTE_INDEX | 0x02 | KEY_8BYTE_INDEX | 0x03           |                |                |                       |      |                       |           |                        |           |
|                        |               | Key Id Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Value          |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | NOT_USED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0x00           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
|                        |               | KEY_1BYTE_INDEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0x01           |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| KEY_4BYTE_INDEX        | 0x02          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| KEY_8BYTE_INDEX        | 0x03          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| KeyIndex               | 1             | Key Index of this data frame.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| Length                 | 1             | Data length                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |
| Data                   | 0-128         | Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                     |             |                     |                 |                     |                 |      |                 |                |                |                |                       |      |                       |           |                        |           |

**3.5.2.7 MT\_MAC\_DISASSOCIATE\_IND**

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC disassociation indication.

**Usage:**

**AREQ:**

|               |             |             |                 |                    |           |
|---------------|-------------|-------------|-----------------|--------------------|-----------|
| 1             | 1           | 1           | 8               | 1                  | 8         |
| Length = 0x14 | Cmd0 = 0x42 | Cmd1 = 0x86 | ExtendedAddress | DisassociateReason | KeySource |

|               |           |          |
|---------------|-----------|----------|
| 1             | 1         | 1        |
| SecurityLevel | KeyIdMode | KeyIndex |

**Attributes:**

| Attribute                                     | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
|-----------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|-----------------------------------------------|------|--------------------------------------|------|-----------------|------|-----------------|------|----------------|------|-----------------------|------|-----------------------|------|------------------------|------|
| ExtendedAddress                               | 8             | Extended address of the device leaving the network                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| DisassociateReason                            | 1             | Reason of the disassociation: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Reason</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Coordinator wishes the device to disassociate</td> <td>0x01</td> </tr> <tr> <td>Device itself wishes to disassociate</td> <td>0x02</td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                            | Reason         | Value | Coordinator wishes the device to disassociate | 0x01 | Device itself wishes to disassociate | 0x02 |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| Reason                                        | Value         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| Coordinator wishes the device to disassociate | 0x01          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| Device itself wishes to disassociate          | 0x02          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| KeySource                                     | 8             | Key Source of this data frame.<br>Security Level of this data frame: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Security Level</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>NO_SECURITY</td> <td>0x00</td> </tr> <tr> <td>MIC_32_AUTH</td> <td>0x01</td> </tr> <tr> <td>MIC_64_AUTH</td> <td>0x02</td> </tr> <tr> <td>MIC_128_AUTH</td> <td>0x03</td> </tr> <tr> <td>AES_ENCRYPTION</td> <td>0x04</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_32</td> <td>0x05</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_64</td> <td>0x06</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_128</td> <td>0x07</td> </tr> </tbody> </table> | Security Level | Value | NO_SECURITY                                   | 0x00 | MIC_32_AUTH                          | 0x01 | MIC_64_AUTH     | 0x02 | MIC_128_AUTH    | 0x03 | AES_ENCRYPTION | 0x04 | AES_ENCRYPTION_MIC_32 | 0x05 | AES_ENCRYPTION_MIC_64 | 0x06 | AES_ENCRYPTION_MIC_128 | 0x07 |
| Security Level                                | Value         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| NO_SECURITY                                   | 0x00          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| MIC_32_AUTH                                   | 0x01          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| MIC_64_AUTH                                   | 0x02          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| MIC_128_AUTH                                  | 0x03          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| AES_ENCRYPTION                                | 0x04          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| AES_ENCRYPTION_MIC_32                         | 0x05          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| AES_ENCRYPTION_MIC_64                         | 0x06          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| AES_ENCRYPTION_MIC_128                        | 0x07          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| SecurityLevel                                 | 1             | Key Id Mode of this data frame: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Key Id Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>NOT_USED</td> <td>0x00</td> </tr> <tr> <td>KEY_1BYTE_INDEX</td> <td>0x01</td> </tr> <tr> <td>KEY_4BYTE_INDEX</td> <td>0x02</td> </tr> <tr> <td>KEY_8BYTE_INDEX</td> <td>0x03</td> </tr> </tbody> </table>                                                                                                                                                                                                                                                           | Key Id Mode    | Value | NOT_USED                                      | 0x00 | KEY_1BYTE_INDEX                      | 0x01 | KEY_4BYTE_INDEX | 0x02 | KEY_8BYTE_INDEX | 0x03 |                |      |                       |      |                       |      |                        |      |
| Key Id Mode                                   | Value         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| NOT_USED                                      | 0x00          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| KEY_1BYTE_INDEX                               | 0x01          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| KEY_4BYTE_INDEX                               | 0x02          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| KEY_8BYTE_INDEX                               | 0x03          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| KeyIdMode                                     | 1             | Key Index of this data frame.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |
| KeyIndex                                      | 1             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |                                               |      |                                      |      |                 |      |                 |      |                |      |                       |      |                       |      |                        |      |

**3.5.2.8 MT\_MAC\_DISASSOCIATE\_CNF**

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC disassociate confirm.

**Usage:**

**AREQ:**

|               |             |             |        |                |            |             |
|---------------|-------------|-------------|--------|----------------|------------|-------------|
| 1             | 1           | 1           | 1      | 1              | 8          | 2           |
| Length = 0x0C | Cmd0 = 0x42 | Cmd1 = 0x87 | Status | DeviceAddrMode | DeviceAddr | DevicePanID |

**Attributes:**

| Attribute           | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
|---------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-------------|---------------------|------|---------------------|---------------|------|---------------|----------------|------|----------------|----------------|------|----------------|-----------|------|-----------|
| Status              | 1             | This field indicates either SUCCESS (0) or FAILURE (1).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| DeviceAddrMode      | 1             | Address mode of the device <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_NOT_PRESENT</td> <td>0x00</td> <td>Address Not Present</td> </tr> <tr> <td>GROUP_ADDRESS</td> <td>0x01</td> <td>Group address</td> </tr> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> <tr> <td>BROADCAST</td> <td>0xFF</td> <td>Broadcast</td> </tr> </tbody> </table> | Mode | Value | Description | ADDRESS_NOT_PRESENT | 0x00 | Address Not Present | GROUP_ADDRESS | 0x01 | Group address | ADDRESS_16_BIT | 0x02 | Address 16 bit | ADDRESS_64_BIT | 0x03 | Address 64 bit | BROADCAST | 0xFF | Broadcast |
| Mode                | Value         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_NOT_PRESENT | 0x00          | Address Not Present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| GROUP_ADDRESS       | 0x01          | Group address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_16_BIT      | 0x02          | Address 16 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_64_BIT      | 0x03          | Address 64 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| BROADCAST           | 0xFF          | Broadcast                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| DeviceAddr          | 8             | Address of the device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| DevicePanID         | 2             | Pan ID of the device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |

### 3.5.2.9 MT\_MAC\_ORPHAN\_IND

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC orphan indication.

**Usage:**

**AREQ:**

|               |               |             |              |
|---------------|---------------|-------------|--------------|
| 1             | 1             | 1           | 8            |
| Length = 0x13 | Cmd0 = 0x42   | Cmd1 = 0x8A | ExtendedAddr |
| 8             | 1             | 1           | 1            |
| KeySource     | SecurityLevel | KeyIdMode   | KeyIndex     |

**Attributes:**

| Attribute    | Length (byte) | Description                           |
|--------------|---------------|---------------------------------------|
| ExtendedAddr | 8             | Extended address of the orphan device |
| KeySource    | 8             | Key Source of this data frame.        |

Security Level of this data frame:

| Security Level         | Value |
|------------------------|-------|
| NO_SECURITY            | 0x00  |
| MIC_32_AUTH            | 0x01  |
| MIC_64_AUTH            | 0x02  |
| MIC_128_AUTH           | 0x03  |
| AES_ENCRYPTION         | 0x04  |
| AES_ENCRYPTION_MIC_32  | 0x05  |
| AES_ENCRYPTION_MIC_64  | 0x06  |
| AES_ENCRYPTION_MIC_128 | 0x07  |

SecurityLevel 1

Key Id Mode of this data frame:

| Key Id Mode     | Value |
|-----------------|-------|
| NOT_USED        | 0x00  |
| KEY_1BYTE_INDEX | 0x01  |
| KEY_4BYTE_INDEX | 0x02  |
| KEY_8BYTE_INDEX | 0x03  |

KeyIdMode 1

KeyIndex 1 Key Index of this data frame.

### 3.5.2.10 MT\_MAC\_POLL\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC poll confirmation.

**Usage:**

**AREQ:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x42 | Cmd1 = 0x8B | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |



### 3.5.2.11 MT\_MAC\_SCAN\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC scan confirmation.

**Usage:**

**AREQ:**

|                      |                 |                     |            |    |          |             |
|----------------------|-----------------|---------------------|------------|----|----------|-------------|
| 1                    | 1               | 1                   | 1          | 1  | 1        | 1           |
| Length = 0x0A-0x8A   | Cmd0 = 0x42     | Cmd1 = 0x8C         | Status     | ED | ScanType | ChannelPage |
| 4                    | 1               | 1                   | 0-128      |    |          |             |
| UnscannedChannelList | ResultListCount | ResultListMaxLength | ResultList |    |          |             |

**Attributes:**

| Attribute            | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                  |           |       |               |      |        |      |         |      |        |      |
|----------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|---------------|------|--------|------|---------|------|--------|------|
| Status               | 1             | This field indicates either SUCCESS (0) or FAILURE (1).                                                                                                                                                                                                                                                                                      |           |       |               |      |        |      |         |      |        |      |
| ED                   | 1             | ED max energy.                                                                                                                                                                                                                                                                                                                               |           |       |               |      |        |      |         |      |        |      |
| ScanType             | 1             | Specifies the scan type: <table border="1" data-bbox="747 787 1055 919"> <thead> <tr> <th>Scan Type</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>ENERGY_DETECT</td> <td>0x00</td> </tr> <tr> <td>ACTIVE</td> <td>0x01</td> </tr> <tr> <td>PASSIVE</td> <td>0x02</td> </tr> <tr> <td>ORPHAN</td> <td>0x03</td> </tr> </tbody> </table> | Scan Type | Value | ENERGY_DETECT | 0x00 | ACTIVE | 0x01 | PASSIVE | 0x02 | ORPHAN | 0x03 |
| Scan Type            | Value         |                                                                                                                                                                                                                                                                                                                                              |           |       |               |      |        |      |         |      |        |      |
| ENERGY_DETECT        | 0x00          |                                                                                                                                                                                                                                                                                                                                              |           |       |               |      |        |      |         |      |        |      |
| ACTIVE               | 0x01          |                                                                                                                                                                                                                                                                                                                                              |           |       |               |      |        |      |         |      |        |      |
| PASSIVE              | 0x02          |                                                                                                                                                                                                                                                                                                                                              |           |       |               |      |        |      |         |      |        |      |
| ORPHAN               | 0x03          |                                                                                                                                                                                                                                                                                                                                              |           |       |               |      |        |      |         |      |        |      |
| ChannelPage          | 1             | Channel Page                                                                                                                                                                                                                                                                                                                                 |           |       |               |      |        |      |         |      |        |      |
| UnscannedChannelList | 4             | List of un-scanned channels                                                                                                                                                                                                                                                                                                                  |           |       |               |      |        |      |         |      |        |      |
| ResultListCount      | 1             | Number of item in the result list                                                                                                                                                                                                                                                                                                            |           |       |               |      |        |      |         |      |        |      |
| ResultListMaxLength  | 1             | Max length of the result list in bytes                                                                                                                                                                                                                                                                                                       |           |       |               |      |        |      |         |      |        |      |
| ResultList           | 0-128         | Result list                                                                                                                                                                                                                                                                                                                                  |           |       |               |      |        |      |         |      |        |      |

### 3.5.2.12 MT\_MAC\_COMM\_STATUS\_IND

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC communication indicator.

**Usage:**

**AREQ:**

|               |             |             |           |               |             |          |
|---------------|-------------|-------------|-----------|---------------|-------------|----------|
| 1             | 1           | 1           | 1         | 8             | 1           | 8        |
| Length = 0x24 | Cmd0 = 0x42 | Cmd1 = 0x8D | Status    | SrcAddr       | DstAddrMode | DstAddr  |
| 4             | 2           | 1           | 8         | 1             | 1           | 1        |
| Timestamp     | DevicePanID | Reason      | KeySource | SecurityLevel | KeyIdMode   | KeyIndex |

**Attributes:**

| Attribute           | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
|---------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-------------|---------------------|------|---------------------|---------------|------|---------------|----------------|------|----------------|----------------|------|----------------|-----------|------|-----------|
| Status              | 1             | This field indicates either SUCCESS (0) or FAILURE (1).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| DstAddrMode         | 1             | Destination address mode <table border="1" data-bbox="673 1680 1266 1837"> <thead> <tr> <th>Mode</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ADDRESS_NOT_PRESENT</td> <td>0x00</td> <td>Address Not Present</td> </tr> <tr> <td>GROUP_ADDRESS</td> <td>0x01</td> <td>Group address</td> </tr> <tr> <td>ADDRESS_16_BIT</td> <td>0x02</td> <td>Address 16 bit</td> </tr> <tr> <td>ADDRESS_64_BIT</td> <td>0x03</td> <td>Address 64 bit</td> </tr> <tr> <td>BROADCAST</td> <td>0xFF</td> <td>Broadcast</td> </tr> </tbody> </table> | Mode | Value | Description | ADDRESS_NOT_PRESENT | 0x00 | Address Not Present | GROUP_ADDRESS | 0x01 | Group address | ADDRESS_16_BIT | 0x02 | Address 16 bit | ADDRESS_64_BIT | 0x03 | Address 64 bit | BROADCAST | 0xFF | Broadcast |
| Mode                | Value         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_NOT_PRESENT | 0x00          | Address Not Present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| GROUP_ADDRESS       | 0x01          | Group address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_16_BIT      | 0x02          | Address 16 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| ADDRESS_64_BIT      | 0x03          | Address 64 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| BROADCAST           | 0xFF          | Broadcast                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| SrcAddr             | 8             | Source address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |
| DstAddr             | 8             | Destination address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |       |             |                     |      |                     |               |      |               |                |      |                |                |      |                |           |      |           |

|             |   |                                                   |
|-------------|---|---------------------------------------------------|
| Timestamp   | 4 | Timestamp of the message                          |
| DevicePanID | 2 | Pan ID of the device that generate the indication |
| Reason      | 1 | Reason for this communication indication.         |
| KeySource   | 8 | Key Source of this data frame.                    |

Security Level of this data frame:

| SecurityLevel          | 1    | <table border="1"> <thead> <tr> <th>Security Level</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>NO_SECURITY</td> <td>0x00</td> </tr> <tr> <td>MIC_32_AUTH</td> <td>0x01</td> </tr> <tr> <td>MIC_64_AUTH</td> <td>0x02</td> </tr> <tr> <td>MIC_128_AUTH</td> <td>0x03</td> </tr> <tr> <td>AES_ENCRYPTION</td> <td>0x04</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_32</td> <td>0x05</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_64</td> <td>0x06</td> </tr> <tr> <td>AES_ENCRYPTION_MIC_128</td> <td>0x07</td> </tr> </tbody> </table> | Security Level | Value | NO_SECURITY | 0x00 | MIC_32_AUTH | 0x01 | MIC_64_AUTH | 0x02 | MIC_128_AUTH | 0x03 | AES_ENCRYPTION | 0x04 | AES_ENCRYPTION_MIC_32 | 0x05 | AES_ENCRYPTION_MIC_64 | 0x06 | AES_ENCRYPTION_MIC_128 | 0x07 |
|------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|-------------|------|-------------|------|-------------|------|--------------|------|----------------|------|-----------------------|------|-----------------------|------|------------------------|------|
|                        |      | Security Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Value          |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
|                        |      | NO_SECURITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0x00           |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
|                        |      | MIC_32_AUTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0x01           |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
|                        |      | MIC_64_AUTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0x02           |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
|                        |      | MIC_128_AUTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0x03           |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
|                        |      | AES_ENCRYPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0x04           |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
|                        |      | AES_ENCRYPTION_MIC_32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0x05           |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
| AES_ENCRYPTION_MIC_64  | 0x06 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |
| AES_ENCRYPTION_MIC_128 | 0x07 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |       |             |      |             |      |             |      |              |      |                |      |                       |      |                       |      |                        |      |

Key Id Mode of this data frame:

| KeyIdMode       | 1    | <table border="1"> <thead> <tr> <th>Key Id Mode</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>NOT_USED</td> <td>0x00</td> </tr> <tr> <td>KEY_1BYTE_INDEX</td> <td>0x01</td> </tr> <tr> <td>KEY_4BYTE_INDEX</td> <td>0x02</td> </tr> <tr> <td>KEY_8BYTE_INDEX</td> <td>0x03</td> </tr> </tbody> </table> | Key Id Mode | Value | NOT_USED | 0x00 | KEY_1BYTE_INDEX | 0x01 | KEY_4BYTE_INDEX | 0x02 | KEY_8BYTE_INDEX | 0x03 |
|-----------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|----------|------|-----------------|------|-----------------|------|-----------------|------|
|                 |      | Key Id Mode                                                                                                                                                                                                                                                                                                   | Value       |       |          |      |                 |      |                 |      |                 |      |
|                 |      | NOT_USED                                                                                                                                                                                                                                                                                                      | 0x00        |       |          |      |                 |      |                 |      |                 |      |
|                 |      | KEY_1BYTE_INDEX                                                                                                                                                                                                                                                                                               | 0x01        |       |          |      |                 |      |                 |      |                 |      |
| KEY_4BYTE_INDEX | 0x02 |                                                                                                                                                                                                                                                                                                               |             |       |          |      |                 |      |                 |      |                 |      |
| KEY_8BYTE_INDEX | 0x03 |                                                                                                                                                                                                                                                                                                               |             |       |          |      |                 |      |                 |      |                 |      |

KeyIndex 1 Key Index of this data frame.

### 3.5.2.13 MT\_MAC\_START\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC start confirmation.

**Usage:**

**AREQ:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x42 | Cmd1 = 0x8E | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.5.2.14 MT\_MAC\_RX\_ENABLE\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC Rx enable confirmation.

**Usage:**

**AREQ:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x42 | Cmd1 = 0x8F | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.5.2.15 MT\_MAC\_PURGE\_CNF

**Description:**

This callback is called by the MAC to send (on behalf of the next higher layer) a MAC purge confirmation.

**Usage:**

**AREQ:**

|               |             |             |        |        |
|---------------|-------------|-------------|--------|--------|
| 1             | 1           | 1           | 1      | 1      |
| Length = 0x01 | Cmd0 = 0x42 | Cmd1 = 0x9A | Status | Handle |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |
| Handle    | 1             | Handle of this message                                  |

### 3.6 MT\_NWK

Not supported.

### 3.7 MT\_SAPI

This interface allows tester to interact with the simple API interface.

#### 3.7.1 MT\_SAPI Commands

##### 3.7.1.1 ZB\_SYSTEM\_RESET

**Description:**

This command will reset the device.

**Usage:**

**AREQ:**

|               |             |             |
|---------------|-------------|-------------|
| Byte: 1       | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x46 | Cmd1 = 0x09 |

**Attributes:**

None

##### 3.7.1.2 ZB\_START\_REQUEST

**Description:**

This command starts the ZigBee stack. When the ZigBee stack starts, the device reads configuration parameters from nonvolatile memory and the device joins its network. The ZigBee stack calls the zb\_StartConfirm callback function when the startup process completes. After the start request process completes, the device is ready to send, receive, and route network traffic.

**Usage:**

**SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| Byte: 1       | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x26 | Cmd1 = 0x00 |

**Attributes:**

None

**SRSP:**

|               |             |             |
|---------------|-------------|-------------|
| Byte: 1       | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x66 | Cmd1 = 0x00 |

**Attributes:**

None

**3.7.1.3 ZB\_PERMIT\_JOINING\_REQUEST****Description:**

This command is used to control the joining permissions and thus allows or disallows new devices from joining the network.

**Usage:****SREQ:**

|               |             |             |             |         |
|---------------|-------------|-------------|-------------|---------|
| Byte: 1       | 1           | 1           | 2           | 1       |
| Length = 0x03 | Cmd0 = 0x26 | Cmd1 = 0x08 | Destination | Timeout |

**Attributes:**

| Attribute   | Length (byte) | Description                                                                                                                                                                                                                                                                                                                             |
|-------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Destination | 2             | The destination parameter indicates the address of the device for which the joining permissions should be set. This is usually the local device address or the special broadcast address that denotes all routers and coordinator (0xFFFC). This way the joining permissions of a single device or the whole network can be controlled. |
| Timeout     | 1             | Indicates the amount of time in seconds for which the joining permissions should be turned on. If timeout is set to 0x00, the device will turn off the joining permissions indefinitely. If it is set to 0xFF, the joining permissions will be turned on indefinitely.                                                                  |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x66 | Cmd1 = 0x08 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.7.1.4 ZB\_BIND\_DEVICE****Description:**

This command establishes or removes a 'binding' between two devices. Once bound, an application can send messages to a device by referencing the commandId for the binding.

**Usage:****SREQ:**

|               |             |             |        |           |             |
|---------------|-------------|-------------|--------|-----------|-------------|
| 1             | 1           | 1           | 1      | 2         | 8           |
| Length = 0x0B | Cmd0 = 0x26 | Cmd1 = 0x01 | Create | CommandId | Destination |

**Attributes:**

| Attribute   | Length (byte) | Description                                                 |
|-------------|---------------|-------------------------------------------------------------|
| Create      | 1             | TRUE to create a binding, FALSE to remove a binding.        |
| CommandId   | 2             | The identifier of the binding                               |
| Destination | 8             | Specifies the 64-bit IEEE address of the device to bind to. |

**SRSP:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x66 | Cmd1 = 0x01 |

**Attributes:**

None

**3.7.1.5 ZB\_ALLOW\_BIND****Description:**

This command puts the device into the Allow Binding Mode for a given period of time. A peer device can establish a binding to a device in the Allow Binding Mode by calling `zb_BindDevice` with a destination address of NULL.

**Usage:****SREQ:**

|               |             |             |         |
|---------------|-------------|-------------|---------|
| 1             | 1           | 1           | 1       |
| Length = 0x01 | Cmd0 = 0x26 | Cmd1 = 0x02 | Timeout |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                                                                                         |
|-----------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timeout   | 1             | The number of seconds to remain in the allow binding mode. Valid values range from 1 through 65. If 0, the Allow Bind mode will be set false without timeout. If greater than 64, the Allow Bind mode will be true. |

**SRSP:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x66 | Cmd1 = 0x02 |

**Attributes:**

None

**3.7.1.6 ZB\_SEND\_DATA\_REQUEST****Description:**

This command initiates transmission of data to a peer device.

**Usage:****SREQ:**

|                    |             |             |             |           |        |
|--------------------|-------------|-------------|-------------|-----------|--------|
| Byte: 1            | 1           | 1           | 2           | 2         | 1      |
| Length = 0x08-0x5C | Cmd0 = 0x26 | Cmd1 = 0x03 | Destination | CommandId | Handle |

|     |        |     |      |
|-----|--------|-----|------|
| 1   | 1      | 1   | 0-84 |
| Ack | Radius | Len | Data |

**Attributes:**

| Attribute   | Length (byte) | Description                                                                                                                                                                                                                                                      |
|-------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Destination | 2             | The destination of the data. The destination can be one of the following:<br>- 16-Bit short address of device [0-0xffffD]<br>- ZB_BROADCAST_ADDR sends the data to all devices in the network.<br>- ZB_BINDING_ADDR sends the data to a previously bound device. |
| CommandId   | 2             | The command ID to send with the message. If the ZB_BINDING_ADDR destination is used, this parameter also indicates the binding to use.                                                                                                                           |
| Handle      | 1             | A handle used to identify the send data request.                                                                                                                                                                                                                 |
| Ack         | 1             | TRUE if requesting acknowledgement from the destination.                                                                                                                                                                                                         |
| Radius      | 1             | The max number of hops the packet can travel through before it is dropped.                                                                                                                                                                                       |

|      |      |                                                 |
|------|------|-------------------------------------------------|
| Len  | 1    | Specifies the size of the Data buffer in bytes. |
| Data | 0-84 | Data                                            |

**SRSP:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x66 | Cmd1 = 0x03 |

**Attributes:**

None

**3.7.1.7 ZB\_READ\_CONFIGURATION****Description:**

This command is used to get a configuration property from nonvolatile memory.

**Usage:****SREQ:**

|               |             |             |          |
|---------------|-------------|-------------|----------|
| Byte: 1       | 1           | 1           | 1        |
| Length = 0x01 | Cmd0 = 0x26 | Cmd1 = 0x04 | ConfigId |

**Attributes:**

| Attribute | Length (byte) | Description                                              |
|-----------|---------------|----------------------------------------------------------|
| ConfigId  | 1             | Specifies the identifier for the configuration property. |

**SRSP:**

|                    |             |             |        |          |     |       |
|--------------------|-------------|-------------|--------|----------|-----|-------|
| Byte: 1            | 1           | 1           | 1      | 1        | 1   | 0-128 |
| Length = 0x03-0x83 | Cmd0 = 0x66 | Cmd1 = 0x04 | Status | ConfigId | Len | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                              |
|-----------|---------------|----------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1).  |
| ConfigId  | 1             | Specifies the identifier for the configuration property. |
| Len       | 1             | Specifies the size of the Value buffer in bytes.         |
| Value     | 0-128         | buffer to hold the configuration property.               |

**3.7.1.8 ZB\_WRITE\_CONFIGURATION****Description:**

This command is used to write a Configuration Property to nonvolatile memory.

**Usage:****SREQ:**

|                    |             |             |          |     |       |
|--------------------|-------------|-------------|----------|-----|-------|
| Byte: 1            | 1           | 1           | 1        | 1   | 1-128 |
| Length = 0x03-0x83 | Cmd0 = 0x26 | Cmd1 = 0x05 | ConfigId | Len | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                                        |
|-----------|---------------|--------------------------------------------------------------------|
| ConfigId  | 1             | The identifier for the configuration property                      |
| Len       | 1             | Specifies the size of the Value buffer in bytes.                   |
| Value     | 1-128         | The buffer containing the new value of the configuration property. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x66 | Cmd1 = 0x05 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

**3.7.1.9 ZB\_GET\_DEVICE\_INFO****Description:**

This command retrieves a Device Information Property.

**Usage:****SREQ:**

| Byte: 1       | 1           | 1           | 1     |
|---------------|-------------|-------------|-------|
| Length = 0x01 | Cmd0 = 0x26 | Cmd1 = 0x06 | Param |

**Attributes:**

| Attribute | Length (byte) | Description                                |
|-----------|---------------|--------------------------------------------|
| Param     | 1             | The identifier for the device information. |

**SRSP:**

| 1             | 1           | 1           | 1     | 8     |
|---------------|-------------|-------------|-------|-------|
| Length = 0x09 | Cmd0 = 0x66 | Cmd1 = 0x06 | Param | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                |
|-----------|---------------|--------------------------------------------|
| Param     | 1             | The identifier for the device information. |
| Value     | 2             | A buffer to hold the device information    |

**3.7.1.10 ZB\_FIND\_DEVICE\_REQUEST****Description:**

This command is used to determine the short address for a device in the network. The device initiating a call to `zb_FindDeviceRequest` and the device being discovered must both be a member of the same network. When the search is complete, the `zv_FindDeviceConfirm` callback function is called.

**SREQ:**

| 1             | 1           | 1           | 8         |
|---------------|-------------|-------------|-----------|
| Length = 0x08 | Cmd0 = 0x26 | Cmd1 = 0x07 | SearchKey |

**Attributes:**

| Attribute | Length (byte) | Description                       |
|-----------|---------------|-----------------------------------|
| SearchKey | 8             | Specifies the value to search on. |

**SRSP:**

| 1             | 1           | 1           |
|---------------|-------------|-------------|
| Length = 0x00 | Cmd0 = 0x66 | Cmd1 = 0x07 |

**Attributes:**

None

**3.7.2 MT\_SAPI Callbacks**

### 3.7.2.1 ZB\_START\_CONFIRM

**Description:**

This callback is called by the ZigBee stack after a start request operation completes.

**Usage:**

**AREQ:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x46 | Cmd1 = 0x80 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.7.2.2 ZB\_BIND\_CONFIRM

**Description:**

This callback is called by the ZigBee stack after a bind operation completes.

**Usage:**

**AREQ:**

|               |             |             |           |        |
|---------------|-------------|-------------|-----------|--------|
| 1             | 1           | 1           | 2         | 1      |
| Length = 0x03 | Cmd0 = 0x46 | Cmd1 = 0x81 | CommandId | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                    |
|-----------|---------------|------------------------------------------------|
| CommandId | 2             | The command ID of the binding being confirmed. |
| Status    | 1             | Specifies the status of the bind operation.    |

### 3.7.2.3 ZB\_ALLOW\_BIND\_CONFIRM

**Description:**

This callback indicates another device attempted to bind to this device.

**Usage:**

**AREQ:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 2      |
| Length = 0x02 | Cmd0 = 0x46 | Cmd1 = 0x82 | Source |

**Attributes:**

| Attribute | Length (byte) | Description                                                          |
|-----------|---------------|----------------------------------------------------------------------|
| Source    | 2             | Contains the address of the device attempted to bind to this device. |

### 3.7.2.4 ZB\_SEND\_DATA\_CONFIRM

**Description:**

This callback indicates the data has been sent.



**Usage:****AREQ:**

|               |             |             |        |        |
|---------------|-------------|-------------|--------|--------|
| 1             | 1           | 1           | 1      | 1      |
| Length = 0x02 | Cmd0 = 0x46 | Cmd1 = 0x83 | Handle | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| Handle    | 1             | Specifies the handle.                                   |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

**3.7.2.5 ZB\_RECEIVE\_DATA\_INDICATION****Description:**

This callback is called asynchronously by the ZigBee stack to notify the application when data is received from a peer device.

**Usage:****AREQ:**

|                  |             |             |        |         |     |      |
|------------------|-------------|-------------|--------|---------|-----|------|
| 1                | 1           | 1           | 2      | 2       | 2   | 0-84 |
| Length = 0x06-5A | Cmd0 = 0x46 | Cmd1 = 0x87 | Source | Command | Len | Data |

**Attributes:**

| Attribute | Length (byte) | Description                                                        |
|-----------|---------------|--------------------------------------------------------------------|
| Source    | 2             | Specifies the short address of the peer device that sent the data. |
| Command   | 2             | The command ID associated with the data.                           |
| Len       | 2             | Specifies the number of bytes in the Data parameter.               |
| Data      | 0-84          | The data sent by the peer device.                                  |

**3.7.2.6 ZB\_FIND\_DEVICE\_CONFIRM****Description:**

This callback is called by the ZigBee stack when a find device operation completes.

**Usage:****AREQ:**

|               |             |             |                   |           |        |
|---------------|-------------|-------------|-------------------|-----------|--------|
| 1             | 1           | 1           | 1                 | 2         | 8      |
| Length = 0x0B | Cmd0 = 0x46 | Cmd1 = 0x85 | SearchType = 0x01 | SearchKey | Result |

**Attributes:**

| Attribute  | Length (byte) | Description                            |
|------------|---------------|----------------------------------------|
| SearchType | 1             | The type of search that was performed. |
| SearchKey  | 2             | Value that the search was executed on. |
| Result     | 8             | The result of the search.              |

**3.8 MT\_SYS**

This interface allows the tester to interact with the target at system level such as reset, read/write memory, read/write extended address...etc.

### 3.8.1 MT\_SYS Commands

#### 3.8.1.1 SYS\_RESET\_REQ

**Description:**

This command is sent by the tester to reset the target device

**Usage:**

**AREQ:**

|               |             |             |      |
|---------------|-------------|-------------|------|
| 1             | 1           | 1           | 1    |
| Length = 0x01 | Cmd0 = 0x41 | Cmd1 = 0x00 | Type |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                                                                                 |
|-----------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type      | 1             | Requests a target device reset (0) or serial bootloader reset (1). If the target device does not support serial bootloading, bootloader reset commands are ignored and no response is sent from the target. |

#### 3.8.1.2 SYS\_PING

**Description:**

This command issues PING requests to verify if a device is active and check the capability of the device.

**Usage:**

**SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x21 | Cmd1 = 0x01 |

**Attributes:**

None

**SRSP:**

|               |             |             |              |
|---------------|-------------|-------------|--------------|
| 1             | 1           | 1           | 2            |
| Length = 0x02 | Cmd0 = 0x61 | Cmd1 = 0x01 | Capabilities |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

This field represents the interfaces that this device can handle (compiled into the device). Bit weighted and defined as:

Capabilities 2

| Capability   | Value  |
|--------------|--------|
| MT_CAP_SYS   | 0x0001 |
| MT_CAP_MAC   | 0x0002 |
| MT_CAP_NWK   | 0x0004 |
| MT_CAP_AF    | 0x0008 |
| MT_CAP_ZDO   | 0x0010 |
| MT_CAP_SAPI  | 0x0020 |
| MT_CAP_UTIL  | 0x0040 |
| MT_CAP_DEBUG | 0x0080 |
| MT_CAP_APP   | 0x0100 |
| MT_CAP_ZOAD  | 0x1000 |

### 3.8.1.3 SYS\_VERSION

**Description:**

This command is used to request for the device's version string.

**Usage:**

**SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x21 | Cmd1 = 0x02 |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                                                                                 |
|-----------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type      | 1             | Requests a target device reset (0) or serial bootloader reset (1). If the target device does not support serial bootloading, bootloader reset commands are ignored and no response is sent from the target. |

**SRSP:**

|               |             |             |              |         |          |          |       |
|---------------|-------------|-------------|--------------|---------|----------|----------|-------|
| 1             | 1           | 1           | 1            | 1       | 1        | 1        | 1     |
| Length = 0x05 | Cmd0 = 0x61 | Cmd1 = 0x02 | TransportRev | Product | MajorRel | MinorRel | HwRev |

**Attributes:**

| Attribute    | Length (byte) | Description                   |
|--------------|---------------|-------------------------------|
| TransportRev | 1             | Transport protocol revision   |
| Product      | 1             | Product ID                    |
| MajorRel     | 1             | Software major release number |
| MinorRel     | 1             | Software minor release number |
| HwRev        | 1             | Chip hardware revision        |

### 3.8.1.4 SYS\_SET\_EXTADDR

**Description:**

This command is used to set the extended address of the device.

**Usage:**

**SREQ:**

|               |             |             |            |
|---------------|-------------|-------------|------------|
| 1             | 1           | 1           | 8          |
| Length = 0x08 | Cmd0 = 0x21 | Cmd1 = 0x03 | ExtAddress |

**Attributes:**

| Attribute  | Length (byte) | Description                    |
|------------|---------------|--------------------------------|
| ExtAddress | 8             | The device's extended address. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x03 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                 |
|-----------|---------------|---------------------------------------------|
| Status    | 1             | Status is either Success (1) or Failure (0) |

### 3.8.1.5 SYS\_GET\_EXTADDR

**Description:**

This command is used to get the extended address of the device.

**Usage:****SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x21 | Cmd1 = 0x04 |

**Attributes:**

| Attribute | Length (byte) | Description                                 |
|-----------|---------------|---------------------------------------------|
| Status    | 1             | Status is either Success (1) or Failure (0) |

**SRSP:**

|               |             |             |            |
|---------------|-------------|-------------|------------|
| 1             | 1           | 1           | 8          |
| Length = 0x08 | Cmd0 = 0x61 | Cmd1 = 0x04 | ExtAddress |

**Attributes:**

| Attribute  | Length (byte) | Description                    |
|------------|---------------|--------------------------------|
| ExtAddress | 8             | The device's extended address. |

**3.8.1.6 SYS\_RAM\_READ****Description:**

This command is used by the tester to read a single memory location in the target RAM. The command accepts an address value and returns the memory value present in the target RAM at that address.

**Usage:****SREQ:**

|               |             |             |         |     |
|---------------|-------------|-------------|---------|-----|
| 1             | 1           | 1           | 2       | 1   |
| Length = 0x03 | Cmd0 = 0x21 | Cmd1 = 0x05 | Address | Len |

**Attributes:**

| Attribute | Length (byte) | Description                                                |
|-----------|---------------|------------------------------------------------------------|
| Address   | 2             | Address of the memory that will be read.                   |
| Len       | 1             | The number of bytes that will be read from the target RAM. |

**SRSP:**

|                    |             |             |        |     |       |
|--------------------|-------------|-------------|--------|-----|-------|
| 1                  | 1           | 1           | 1      | 1   | 0-128 |
| Length = 0x02-0x82 | Cmd0 = 0x61 | Cmd1 = 0x05 | Status | Len | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                                |
|-----------|---------------|------------------------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1).               |
| Len       | 1             | The number of bytes that will be read from the target RAM. |
| Value     | 0-128         | The value read from the target RAM.                        |

**3.8.1.7 SYS\_RAM\_WRITE****Description:**

This command is used by the tester to write to a particular location in the target RAM. The command accepts an address location and a memory value. The memory value is written to the address location in the target RAM.

**Usage:****SREQ:**

|                    |             |             |         |     |       |
|--------------------|-------------|-------------|---------|-----|-------|
| 1                  | 1           | 1           | 2       | 1   | 1-128 |
| Length = 0x04-0x84 | Cmd0 = 0x21 | Cmd1 = 0x06 | Address | Len | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                                |
|-----------|---------------|------------------------------------------------------------|
| Address   | 2             | Address of the memory that will be read.                   |
| Len       | 1             | The number of bytes that will be read from the target RAM. |
| Value     | 1-128         | The value written to the target RAMS.                      |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x06 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.8.1.8 SYS\_OSAL\_NV\_READ****Description:**

This command is used by the tester to read a single memory item in the target non-volatile memory. The command accepts an attribute ID value and returns the memory value present in the target for the specified attribute ID.

**Usage:****SREQ:**

|               |             |             |    |        |
|---------------|-------------|-------------|----|--------|
| 1             | 1           | 1           | 2  | 1      |
| Length = 0x03 | Cmd0 = 0x21 | Cmd1 = 0x08 | Id | Offset |

**Attributes:**

| Attribute | Length (byte) | Description                                                |
|-----------|---------------|------------------------------------------------------------|
| Id        | 2             | The id of the NV item.                                     |
| Offset    | 1             | Number of bytes offset from the beginning or the NV value. |

**SRSP:**

|                    |             |             |        |     |       |
|--------------------|-------------|-------------|--------|-----|-------|
| 1                  | 1           | 1           | 1      | 1   | 0-128 |
| Length = 0x02-0x82 | Cmd0 = 0x61 | Cmd1 = 0x08 | Status | Len | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |
| Len       | 1             | Length of the NV value.                      |
| Value     | 0-128         | Value of the NV item.                        |

**3.8.1.9 SYS\_OSAL\_NV\_WRITE****Description:**

This command is used by the tester to write to a particular item in non-volatile memory. The command accepts an attribute ID and an attribute value. The attribute value is written to the location specified for the attribute ID in the target.

**Usage:****SREQ:**

|                    |             |             |    |        |     |       |
|--------------------|-------------|-------------|----|--------|-----|-------|
| 1                  | 1           | 1           | 2  | 1      | 1   | 1-128 |
| Length = 0x04-0x84 | Cmd0 = 0x21 | Cmd1 = 0x09 | Id | Offset | Len | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                                |
|-----------|---------------|------------------------------------------------------------|
| Id        | 2             | The id of the NV item.                                     |
| Offset    | 1             | Number of bytes offset from the beginning or the NV value. |
| Len       | 1             | Length of the NV value.                                    |
| Value     | 0-128         | Value of the NV item.                                      |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x09 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.8.1.10 SYS\_OSAL\_START\_TIMER****Description**

This command is used by the tester to start a timer event. The event will expired after the indicated amount of time and a notification will be sent back to the tester.

**Usage****SREQ:**

|               |             |             |    |         |
|---------------|-------------|-------------|----|---------|
| 1             | 1           | 1           | 1  | 2       |
| Length = 0x03 | Cmd0 = 0x21 | Cmd1 = 0x0A | Id | Timeout |

**Attributes:**

| Attribute | Length (byte) | Description                                                           |
|-----------|---------------|-----------------------------------------------------------------------|
| Id        | 1             | The id of the timer event (0-3)                                       |
| Timeout   | 2             | Amount of time it will take before the event expired in milliseconds. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x0A | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.8.1.11 SYS\_OSAL\_STOP\_TIMER****Description:**

This command is used by the tester to stop a timer event.

**Usage:****SREQ:**

|               |             |             |    |
|---------------|-------------|-------------|----|
| 1             | 1           | 1           | 1  |
| Length = 0x01 | Cmd0 = 0x21 | Cmd1 = 0x0B | Id |

**Attributes:**

| Attribute | Length (byte) | Description                      |
|-----------|---------------|----------------------------------|
| Id        | 1             | The id of the timer event (0-3). |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x0B | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.8.1.12 SYS\_RANDOM****Description:**

This command is used by the tester to get a random 16-bit number.

**Usage:****SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x21 | Cmd1 = 0x0C |

**Attributes:**

None

**SRSP:**

|               |             |             |       |
|---------------|-------------|-------------|-------|
| 1             | 1           | 1           | 2     |
| Length = 0x02 | Cmd0 = 0x61 | Cmd1 = 0x0C | Value |

**Attributes:**

| Attribute | Length (byte) | Description       |
|-----------|---------------|-------------------|
| Value     | 2             | The random value. |

**3.8.1.13 SYS\_ADC\_READ****Description**

This command is used by the tester to read a value from the ADC based on specified channel and resolution.

**Usage****SREQ:**

|               |             |             |         |            |
|---------------|-------------|-------------|---------|------------|
| 1             | 1           | 1           | 1       | 1          |
| Length = 0x02 | Cmd0 = 0x21 | Cmd1 = 0x0D | Channel | Resolution |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

The channel of the ADC that will be used.

|                 |      |                    |              |
|-----------------|------|--------------------|--------------|
| Channel         | 1    | <b>Channel</b>     | <b>Value</b> |
|                 |      | AIN0               | 0x00         |
|                 |      | AIN1               | 0x01         |
|                 |      | AIN2               | 0x02         |
|                 |      | AIN3               | 0x03         |
|                 |      | AIN4               | 0x04         |
|                 |      | AIN5               | 0x05         |
|                 |      | AIN6               | 0x06         |
|                 |      | AIN7               | 0x07         |
|                 |      | Temperature Sensor | 0x0E         |
| Voltage Reading | 0x0F |                    |              |

Resolution of the reading. This can be 8-bit, 10-bit, 12-bit or 14-bit.

|            |   |                   |              |
|------------|---|-------------------|--------------|
| Resolution | 1 | <b>Resolution</b> | <b>Value</b> |
|            |   | 8-bit             | 0x00         |
|            |   | 10-bit            | 0x01         |
|            |   | 12-bit            | 0x02         |
|            |   | 14-bit            | 0x03         |

**SRSP:**

|               |             |             |       |
|---------------|-------------|-------------|-------|
| 1             | 1           | 1           | 2     |
| Length = 0x02 | Cmd0 = 0x61 | Cmd1 = 0x0D | Value |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Value 2 Value of the ADC reading based on the specified information.

### 3.8.1.14 SYS\_GPIO

**Description**

This command is used by the tester to control the 4 GPIO pins on the CC2530-ZNP build.

**Usage**

**SREQ:**

|               |             |             |           |       |
|---------------|-------------|-------------|-----------|-------|
| 1             | 1           | 1           | 1         | 1     |
| Length = 0x02 | Cmd0 = 0x21 | Cmd1 = 0x0E | Operation | Value |

Operation – 1 byte – specifies the type of operation to perform on the GPIO pins. It can take the values, shown in the table below, with effects dictated by the bit values of the value parameter:

**Attributes:**

| Operation | Description |
|-----------|-------------|
|-----------|-------------|

Set direction ( 0x00 ) Configure the direction of the GPIO pins. A value of 0 in a bit position configures the corresponding GPIO pin as an Input while a value of 1 configures it as Output.

Set Input mode ( 0x01 ) Configure the Input mode of the GPIO pins. A value of 0 in a bit position configures it as pull-up mode while a 1 configures it in tri-state Input mode. ( *Note: P1\_0 and P1\_1 of the CC2530 can only be set in tri-state input mode* ).

Set ( 0x02 ) A value of 1 in a bit position will set the corresponding GPIO pin ( writes a 1 ).

Clear ( 0x03 ) A value of 0 in a bit position will clear the corresponding GPIO pin ( writes a 0 ).

Toggle ( 0x04 ) A value of 1 in a bit position will toggle the corresponding GPIO pin.

Read ( 0x05 ) Reads the GPIO pins.



**SRSP:**

|               |             |             |       |
|---------------|-------------|-------------|-------|
| 1             | 1           | 1           | 2     |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x0E | Value |

**Attributes:**

| Attribute | Length (byte) | Description                        |
|-----------|---------------|------------------------------------|
| Value     | 1             | The value read from the GPIO pins. |

**3.8.1.15 SYS\_STACK\_TUNE****Description**

This command is used by the tester to tune intricate or arcane settings at runtime.

**Usage****SREQ:**

|               |             |             |           |       |
|---------------|-------------|-------------|-----------|-------|
| 1             | 1           | 1           | 1         | 1     |
| Length = 0x02 | Cmd0 = 0x21 | Cmd1 = 0x0F | Operation | Value |

**Attributes:**

The tuning operation to be executed according to the STK\_Tune\_t enumeration:

| Operation                                                                                                                                                                                | Value |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Set the transmitter power level according to the value of the Value parameter which should correspond to the valid values specified by the ZMacTransmitPower_t enumeration (0xFD – 0x16) | 0x00  |
| Set RxOnWhenIdle off/on if the value of Value is 0/1; otherwise return the current setting of RxOnWhenIdle.                                                                              | 0x01  |

**SRSP:**

|               |             |             |       |
|---------------|-------------|-------------|-------|
| 1             | 1           | 1           | 2     |
| Length = 0x01 | Cmd0 = 0x61 | Cmd1 = 0x0F | Value |

**Attributes:**

| Attribute | Length (byte) | Description                                |
|-----------|---------------|--------------------------------------------|
| Value     | 1             | Applicable status of the tuning operation. |

**3.8.2 MT\_SYS Callbacks****3.8.2.1 SYS\_RESET\_IND****Description**

This command is sent by the device to indicate the reset

**Usage****AREQ:**

|               |             |             |        |              |           |
|---------------|-------------|-------------|--------|--------------|-----------|
| 1             | 1           | 1           | 1      | 1            | 1         |
| Length = 0x06 | Cmd0 = 0x41 | Cmd1 = 0x80 | Reason | TransportRev | ProductId |

|          |          |       |
|----------|----------|-------|
| 1        | 1        | 1     |
| MajorRel | MinorRel | HwRev |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Reason for the reset.

| Reason       | 1     |                                                                                                                                                                                                                                               |            |       |          |      |          |      |           |      |
|--------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------|----------|------|----------|------|-----------|------|
|              |       | <table border="1"> <thead> <tr> <th>Resolution</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Power-up</td> <td>0x00</td> </tr> <tr> <td>External</td> <td>0x01</td> </tr> <tr> <td>Watch-dog</td> <td>0x02</td> </tr> </tbody> </table> | Resolution | Value | Power-up | 0x00 | External | 0x01 | Watch-dog | 0x02 |
| Resolution   | Value |                                                                                                                                                                                                                                               |            |       |          |      |          |      |           |      |
| Power-up     | 0x00  |                                                                                                                                                                                                                                               |            |       |          |      |          |      |           |      |
| External     | 0x01  |                                                                                                                                                                                                                                               |            |       |          |      |          |      |           |      |
| Watch-dog    | 0x02  |                                                                                                                                                                                                                                               |            |       |          |      |          |      |           |      |
| TransportRev | 1     | Transport protocol revision.                                                                                                                                                                                                                  |            |       |          |      |          |      |           |      |
| Product      | 1     | Major release number.                                                                                                                                                                                                                         |            |       |          |      |          |      |           |      |
| MinorRel     | 1     | Minor release number.                                                                                                                                                                                                                         |            |       |          |      |          |      |           |      |
| HwRev        | 1     | Hardware revision number.                                                                                                                                                                                                                     |            |       |          |      |          |      |           |      |

### 3.8.2.2 SYS\_OSAL\_TIMER\_EXPIRED

#### Description:

This command is sent by the device to indicate a specific time has been expired.

#### Usage:

#### AREQ:

|               |             |             |    |
|---------------|-------------|-------------|----|
| 1             | 1           | 1           | 1  |
| Length = 0x01 | Cmd0 = 0x41 | Cmd1 = 0x81 | Id |

#### Attributes:

| Attribute | Length (byte) | Description                     |
|-----------|---------------|---------------------------------|
| Id        | 1             | The id of the timer event (0-3) |

## 3.9 MT\_UART

This interface handles communication between the target and Z-Tool. Tester has no direct control over this interface. There is no direct command for the tester to interact with this interface.

## 3.10 MT\_UTIL

This interface provides tester supporting functionalities such as setting PanId, getting device info, getting NV info, subscribing callbacks...etc.

### 3.10.1 MT\_UTIL Commands

#### 3.10.1.1 UTIL\_GET\_DEVICE\_INFO

#### Description:

This command is sent by the tester to retrieve the device info.

#### Usage:

#### SREQ:

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x27 | Cmd1 = 0x00 |

#### Attributes:

None

**SRSP:**

|               |             |             |        |          |           |            |
|---------------|-------------|-------------|--------|----------|-----------|------------|
| 1             | 1           | 1           | 1      | 8        | 2         | 1          |
| Length = 0x02 | Cmd0 = 0x67 | Cmd1 = 0x00 | Status | IEEEAddr | ShortAddr | DeviceType |

|             |                 |                 |
|-------------|-----------------|-----------------|
| 1           | 1               | 0-128           |
| DeviceState | NumAssocDevices | AssocDeviceList |

**Attributes:**

| Attribute        | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status           | 1             | Status is a one byte field and is either success(0) or fail(1). The fail status is returned if the address value in the command message was not within the valid range.                                                                                                                                                                                                                                                                                                                                      |
| IEEEAddr         | 8             | IEEE address of the device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ShortAddr        | 2             | Short address of the device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| DeviceType       | 1             | Indicates device type, where bits 0 to 2 indicate the capability for the device to operate as a coordinator, router, or end device, respectively.<br>Indicates the state of the device with different possible states as shown below:                                                                                                                                                                                                                                                                        |
| DeviceState      | 1             | 0x00: Initialized - not started automatically<br>0x01: Initialized - not connected to anything<br>0x02: Discovering PAN's to join<br>0x03: Joining a PAN<br>0x04: Rejoining a PAN, only for end devices<br>0x05: Joined but not yet authenticated by trust center<br>0x06: Started as device after authentication<br>0x07: Device joined, authenticated and is a router<br>0x08: Starting as ZigBee Coordinator<br>0x09: Started as ZigBee Coordinator<br>0x0A: Device has lost information about its parent |
| NumAssocDevices  | 1             | Specifies the number of devices being associated to the target device.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| AssocDevicesList | Array         | Array of 16-bits specifies the network address associated with the device.                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**3.10.1.2 UTIL\_GET\_NV\_INFO****Description:**

This command is used by the tester to read a block of parameters from Non-Volatile storage of the target device.

**Usage:****SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x27 | Cmd1 = 0x01 |

**Attributes:**

None

**SRSP:**

|               |             |             |        |          |              |       |
|---------------|-------------|-------------|--------|----------|--------------|-------|
| 1             | 1           | 1           | 1      | 8        | 4            | 2     |
| Length = 0x20 | Cmd0 = 0x67 | Cmd1 = 0x01 | Status | IEEEAddr | ScanChannels | PanID |

|               |              |
|---------------|--------------|
| 1             | 16           |
| SecurityLevel | PreConfigKey |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                                                                                                           |
|-----------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status    | 1             | A value of zero indicates success. Failure is indicated by a non-zero value, representing a bit mask of each item that failed to be retrieved from NV memory. Bit0 is used for the first item (IEEEAddress), bit1 for the second item |

|               |    |                                                                                                                                                     |
|---------------|----|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| IEEEAddr      | 8  | (ScanChannels), and so forth. Data values for failed items are returned as one or more bytes of 0xFF, the typical value read from erased NV memory. |
| ScanChannels  | 4  | IEEE address of the device                                                                                                                          |
| PanID         | 2  | This represents a bit-mask of channels to be scanned when starting the device.                                                                      |
| SecurityLevel | 1  | Specifies the Pan ID to start or join. Set to 0xFFFF to select a PAN after scanning.                                                                |
| PreConfigKey  | 16 | This specifies the network messaging security level, zero disables security.                                                                        |
|               |    | This specifies the pre-configured security key.                                                                                                     |

### 3.10.1.3 UTIL\_SET\_PANID

#### Description:

Store a PanID value into Non-Volatile memory to be used the next time the target device resets.

#### Usage:

#### SREQ:

|               |             |             |       |
|---------------|-------------|-------------|-------|
| 1             | 1           | 1           | 2     |
| Length = 0x02 | Cmd0 = 0x27 | Cmd1 = 0x02 | PanID |

#### Attributes:

| Attribute | Length (byte) | Description            |
|-----------|---------------|------------------------|
| PanID     | 2             | PanID that will be set |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x02 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.10.1.4 UTIL\_SET\_CHANNELS

#### Description:

This command is used to store a channel select bit-mask into Non-Volatile memory to be used the next time the target device resets.

#### Usage:

#### SREQ:

|               |             |             |          |
|---------------|-------------|-------------|----------|
| 1             | 1           | 1           | 4        |
| Length = 0x04 | Cmd0 = 0x27 | Cmd1 = 0x03 | Channels |

#### Attributes:

| Attribute | Length (byte) | Description                                                                            |
|-----------|---------------|----------------------------------------------------------------------------------------|
| Channels  | 4             | A bit-mask representing the channel(s) to scan the next time the target device resets. |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x03 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.10.1.5 UTIL\_SET\_SECLEVEL

#### Description:

This command is used to store a security level value into Non-Volatile memory to be used the next time the target device resets.

#### Usage:

#### SREQ:

| 1             | 1           | 1           | 1        |
|---------------|-------------|-------------|----------|
| Length = 0x01 | Cmd0 = 0x27 | Cmd1 = 0x04 | SecLevel |

#### Attributes:

| Attribute | Length (byte) | Description                                                                                     |
|-----------|---------------|-------------------------------------------------------------------------------------------------|
| SecLevel  | 1             | Security level to use the next time the target device resets. Zero is used to disable security. |

#### SRSP:

| 1             | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x04 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.10.1.6 UTIL\_SET\_PRECFGKEY

#### Description:

This command is used to store a pre-configured key array into Non-Volatile memory to be used the next time the target device resets.

#### Usage:

#### SREQ:

| 1             | 1           | 1           | 16        |
|---------------|-------------|-------------|-----------|
| Length = 0x10 | Cmd0 = 0x27 | Cmd1 = 0x05 | PreCfgKey |

#### Attributes:

| Attribute | Length (byte) | Description                                                                                 |
|-----------|---------------|---------------------------------------------------------------------------------------------|
| PreCfgKey | 16            | An array representing the pre-configured key to use the next time the target device resets. |

#### SRSP:

| 1             | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x05 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.10.1.7 UTIL\_CALLBACK\_SUB\_CMD

**Description:**

This command subscribes/unsubscribes to layer callbacks. For particular subsystem callbacks to work, the software must be compiled with a special flag that is unique to that subsystem to enable the callback mechanism. For example to enable ZDO callbacks, MT\_ZDO\_CB\_FUNC flag must be compiled when the software is built. For complete list of callback compile flags, check section 1.2 or “Z-Stack Compile Options” document.

**Usage:**

**SREQ:**

|               |             |             |             |        |
|---------------|-------------|-------------|-------------|--------|
| 1             | 1           | 1           | 2           | 1      |
| Length = 0x03 | Cmd0 = 0x27 | Cmd1 = 0x06 | SubsystemID | Action |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Subsystem ID of the expected layer

|               |        |           |        |
|---------------|--------|-----------|--------|
| SubsystemID   | 2      | Subsystem | ID     |
|               |        | MT_SYS    | 0x0100 |
|               |        | MT_MAC    | 0x0200 |
|               |        | MT_NWK    | 0x0300 |
|               |        | MT_AF     | 0x0400 |
|               |        | MT_ZDO    | 0x0500 |
|               |        | MT_SAPI   | 0x0600 |
|               |        | MT_UTIL   | 0x0700 |
|               |        | MT_DEBUG  | 0x0800 |
|               |        | MT_APP    | 0x0900 |
| ALL SUBSYSTEM | 0xFFFF |           |        |

Action                      1                      0: Disable, 1: Enable

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x06 | Status |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Status                      1                      Status is either Success (0) or Failure (1).

### 3.10.1.8 UTIL\_KEY\_EVENT

**Description:**

Sends a key event to the device registered application. The device register application means that the application registered for key events with OnBoard. Not all application support all keys, so you must know what keys the application supports

**Usage:**

**SREQ:**

|               |             |             |       |     |
|---------------|-------------|-------------|-------|-----|
| 1             | 1           | 1           | 1     | 1   |
| Length = 0x02 | Cmd0 = 0x27 | Cmd1 = 0x07 | Shift | Key |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Shift                      1                      0: No shift, 1: Shift

Key                    1                    Value of the key

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x06 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.10.1.9 UTIL\_TIME\_ALIVE****Description:**

This command is used by the tester to get the board's time alive.

**Usage:****SREQ:**

|               |             |             |
|---------------|-------------|-------------|
| 1             | 1           | 1           |
| Length = 0x00 | Cmd0 = 0x27 | Cmd1 = 0x09 |

**Attributes:**

None

**SRSP:**

|               |             |             |         |
|---------------|-------------|-------------|---------|
| 1             | 1           | 1           | 4       |
| Length = 0x04 | Cmd0 = 0x67 | Cmd1 = 0x09 | Seconds |

**Attributes:**

| Attribute | Length (byte) | Description                             |
|-----------|---------------|-----------------------------------------|
| Seconds   | 4             | The time of the board's live in seconds |

**3.10.1.10 UTIL\_LED\_CONTROL****Description:**

This command is used by the tester to control the LEDs on the board.

**Usage:****SREQ:**

|               |             |             |       |      |
|---------------|-------------|-------------|-------|------|
| 1             | 1           | 1           | 1     | 1    |
| Length = 0x02 | Cmd0 = 0x27 | Cmd1 = 0x0A | LedID | Mode |

**Attributes:**

| Attribute | Length (byte) | Description    |
|-----------|---------------|----------------|
| LedID     | 1             | The LED number |
| Mode      | 1             | 0: OFF, 1: ON  |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x67 | Cmd1 = 0x0A | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.10.2 MT\_UTIL Callbacks

None

### 3.11 MT\_VERSION

This interface contains information about the release version of the software. There is no direct command for tester to interact with this interface.

### 3.12 MT\_ZDO

This interface allows the tester to issue commands to the ZDO layer in the target and receive responses. Each of these messages has a corresponding message that is returned by the target. The response message only indicates that the command message was received and executed. The result of the command execution will be conveyed to the tester via a callback message interface.

#### 3.12.1 MT\_ZDO Commands

##### 3.12.1.1 ZDO\_NWK\_ADDR\_REQ

**Description:**

This message will request the device to send a “Network Address Request”. This message sends a broadcast message looking for a 16 bit address with a known 64 bit IEEE address. You must subscribe to “ZDO Network Address Response” to receive the response to this message. Check section 3.0.1.7 for more details on callback subscription. The response message listed below only indicates whether or not the message was received properly.

**Usage:**

**SREQ:**

|               |             |             |             |         |            |
|---------------|-------------|-------------|-------------|---------|------------|
| Byte: 1       | 1           | 1           | 8           | 1       | 1          |
| Length = 0x0A | Cmd0 = 0x25 | Cmd1 = 0x00 | IEEEAddress | ReqType | StartIndex |

**Attributes:**

| Attribute                            | Length (byte) | Description                                                                                                                                                                                                                           |      |       |                        |      |                                      |      |
|--------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|------------------------|------|--------------------------------------|------|
| IEEEAddress                          | 8             | 64 bit IEEE address of the device.                                                                                                                                                                                                    |      |       |                        |      |                                      |      |
|                                      |               | Value that the search was executed on.                                                                                                                                                                                                |      |       |                        |      |                                      |      |
| ReqType                              | 1             | <table border="1"> <thead> <tr> <th>Type</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Single Device response</td> <td>0x00</td> </tr> <tr> <td>Extended, include associated devices</td> <td>0x01</td> </tr> </tbody> </table> | Type | Value | Single Device response | 0x00 | Extended, include associated devices | 0x01 |
| Type                                 | Value         |                                                                                                                                                                                                                                       |      |       |                        |      |                                      |      |
| Single Device response               | 0x00          |                                                                                                                                                                                                                                       |      |       |                        |      |                                      |      |
| Extended, include associated devices | 0x01          |                                                                                                                                                                                                                                       |      |       |                        |      |                                      |      |
| StartIndex                           | 1             | Starting index into the list of children. This is used to get more of the list if the list is too large for one message.                                                                                                              |      |       |                        |      |                                      |      |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x00 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |



### 3.12.1.2 ZDO\_IEEE\_ADDR\_REQ

#### Description:

This command will request a device's IEEE 64-bit address. You must subscribe to "ZDO IEEE Address Response" to receive the data response to this message. The response message listed below only indicates whether or not the message was received properly.

#### Usage:

#### SREQ:

| Byte: 1       | 1           | 1           | 2         | 1       | 1          |
|---------------|-------------|-------------|-----------|---------|------------|
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x01 | ShortAddr | ReqType | StartIndex |

#### Attributes:

| Attribute                            | Length (byte) | Description                                                                                                                                                                                                                           |      |       |                        |      |                                      |      |
|--------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|------------------------|------|--------------------------------------|------|
| ShortAddr                            | 2             | Specifies the short address of the device.<br>Value that the search was executed on.                                                                                                                                                  |      |       |                        |      |                                      |      |
| ReqType                              | 1             | <table border="1"> <thead> <tr> <th>Type</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Single Device response</td> <td>0x00</td> </tr> <tr> <td>Extended, include associated devices</td> <td>0x01</td> </tr> </tbody> </table> | Type | Value | Single Device response | 0x00 | Extended, include associated devices | 0x01 |
| Type                                 | Value         |                                                                                                                                                                                                                                       |      |       |                        |      |                                      |      |
| Single Device response               | 0x00          |                                                                                                                                                                                                                                       |      |       |                        |      |                                      |      |
| Extended, include associated devices | 0x01          |                                                                                                                                                                                                                                       |      |       |                        |      |                                      |      |
| StartIndex                           | 1             | Starting index into the list of children. This is used to get more of the list if the list is too large for one message.                                                                                                              |      |       |                        |      |                                      |      |

#### SRSP:

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x01 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.3 ZDO\_NODE\_DESC\_REQ

#### Description:

This command is generated to inquire about the Node Descriptor information of the destination device

#### Usage

#### SREQ:

| 1             | 1           | 1           | 2       | 2                 |
|---------------|-------------|-------------|---------|-------------------|
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x02 | DstAddr | NWKAddrOfInterest |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |

#### SRSP:

| 1             | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x02 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.4 ZDO\_POWER\_DESC\_REQ

#### Description:

This command is generated to inquire about the Power Descriptor information of the destination device.

#### Usage:

#### SREQ:

| Byte: 1       | 1           | 1           | 2       | 2                 |
|---------------|-------------|-------------|---------|-------------------|
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x03 | DstAddr | NWKAddrOfInterest |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |

#### SRSP:

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x03 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.5 ZDO\_SIMPLE\_DESC\_REQ

#### Description:

This command is generated to inquire as to the Simple Descriptor of the destination device's Endpoint.

#### Usage:

#### SREQ:

| Byte: 1       | 1           | 1           | 2       | 2                 | 1        |
|---------------|-------------|-------------|---------|-------------------|----------|
| Length = 0x05 | Cmd0 = 0x25 | Cmd1 = 0x04 | DstAddr | NWKAddrOfInterest | Endpoint |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |
| Endpoint          | 1             | Specifies the application endpoint the data is from.           |

#### SRSP:

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x04 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.6 ZDO\_ACTIVE\_EP\_REQ

#### Description:

This command is generated to request a list of active endpoint from the destination device.

#### Usage:

#### SREQ:

|               |             |             |         |                   |
|---------------|-------------|-------------|---------|-------------------|
| Byte: 1       | 1           | 1           | 2       | 2                 |
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x05 | DstAddr | NWKAddrOfInterest |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x05 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.7 ZDO\_MATCH\_DESC\_REQ

#### Description:

This command is generated to request the device match descriptor.

#### Usage:

#### SREQ:

|                    |               |                |                |                   |           |
|--------------------|---------------|----------------|----------------|-------------------|-----------|
| 1                  | 1             | 1              | 2              | 2                 | 2         |
| Length = 0x08-0x48 | Cmd0 = 0x25   | Cmd1 = 0x06    | DstAddr        | NwkAddrOfInterest | ProfileID |
| 1                  | 0-32          | 1              | 0-32           |                   |           |
| NumInClusters      | InClusterList | NumOutClusters | OutClusterList |                   |           |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |
| ProfileID         | 2             | Specifies the profile ID of the device                         |
| NumInClusters     | 1             | Specifies the number of IDs in the InClusterList.              |
| InClusterList     | 0-32          | Contains the input cluster IDs.                                |
| NumOutClusters    | 1             | Specifies the number of IDs in the OutClusterList.             |
| OutClusterList    | 0-32          | Contains the output cluster IDs.                               |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x06 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.8 ZDO\_COMPLEX\_DESC\_REQ

#### Description:

This command is generated to request for the destination device's complex descriptor.

#### Usage:

#### SREQ:

| Byte: 1       | 1           | 1           | 2       | 2                 |
|---------------|-------------|-------------|---------|-------------------|
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x07 | DstAddr | NWKAddrOfInterest |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |

#### SRSP:

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x07 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.9 ZDO\_USER\_DESC\_REQ

#### Description:

This command is generated to request for the destination device's user descriptor.

#### Usage:

#### SREQ:

| 1             | 1           | 1           | 2       | 2                 |
|---------------|-------------|-------------|---------|-------------------|
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x08 | DstAddr | NWKAddrOfInterest |

#### Attributes:

| Attribute         | Length (byte) | Description                                                    |
|-------------------|---------------|----------------------------------------------------------------|
| DstAddr           | 2             | Specifies NWK address of the device generating the inquiry.    |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried. |

#### SRSP:

| Byte: 1       | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x08 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.10 ZDO\_END\_DEVICE\_ANNCE

#### Description:

This command will cause the CC2480 device to issue an “End device announce” broadcast packet to the network. This is typically used by an end-device to announce itself to the network.

#### Usage:

#### SREQ:

|               |             |             |         |          |             |
|---------------|-------------|-------------|---------|----------|-------------|
| 1             | 1           | 1           | 2       | 8        | 1           |
| Length = 0x0B | Cmd0 = 0x25 | Cmd1 = 0x0A | NwkAddr | IEEEAddr | Capabilites |

#### Attributes:

| Attribute   | Length (byte) | Description                                                                                                                                                                                   |
|-------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NwkAddr     | 2             | Specifies network address of the device generating the request.                                                                                                                               |
| IEEEAddr    | 8             | Specifies the 64 bit IEEE Address of the device being announced.<br>Specifies MAC capabilities<br>Bit: 0 – Alternate PAN Coordinator                                                          |
| Capabilites | 1             | 1 – Device type: 1- ZigBee Router; 0 – End Device<br>2 – Power Source: 1 Main powered<br>3 – Receiver on when idle<br>4 – Reserved<br>5 – Reserved<br>6 – Security capability<br>7 – Reserved |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x0A | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.11 ZDO\_USER\_DESC\_SET

#### Description:

This command is generated to write a User Descriptor value to the targeted device

#### Usage:

#### SREQ:

|                    |             |             |         |                   |     |                |
|--------------------|-------------|-------------|---------|-------------------|-----|----------------|
| 1                  | 1           | 1           | 2       | 2                 | 1   | 0-16           |
| Length = 0x05-0x15 | Cmd0 = 0x25 | Cmd1 = 0x0B | DstAddr | NWKAddrOfInterest | Len | UserDescriptor |

#### Attributes:

| Attribute         | Length (byte) | Description                                                         |
|-------------------|---------------|---------------------------------------------------------------------|
| DstAddr           | 2             | Specifies network address of the device generating the set request. |
| NWKAddrOfInterest | 2             | Specifies NWK address of the destination device being queried.      |
| Len               | 1             | Specifies the length of the user descriptor.                        |
| UserDescriptor    | 0-16          | User descriptor array (can be up to 16 bytes).                      |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x0B | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.12 ZDO\_SERVER\_DISC\_REQ

#### Description:

The command is used for local device to discover the location of a particular system server or servers as indicated by the ServerMask parameter. The destination addressing on this request is 'broadcast to all RxOnWhenIdle devices'.

#### Usage:

#### SREQ:

| 1             | 1           | 1           | 2          |
|---------------|-------------|-------------|------------|
| Length = 0x02 | Cmd0 = 0x25 | Cmd1 = 0x0C | ServerMask |

#### Attributes:

| Attribute  | Length (byte) | Description                                             |
|------------|---------------|---------------------------------------------------------|
| ServerMask | 2             | Specifies the system server capabilities of the device. |

#### SRSP:

| 1             | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x0C | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.13 ZDO\_END\_DEVICE\_BIND\_REQ

#### Description:

This command is generated to request an End Device Bind with the destination device.

#### Usage:

#### SREQ:

| 1                  | 1             | 1             | 2              | 2                | 1        |
|--------------------|---------------|---------------|----------------|------------------|----------|
| Length = 0x09-0x49 | Cmd0 = 0x25   | Cmd1 = 0x20   | DstAddr        | LocalCoordinator | Endpoint |
| 2                  | 1             | 0-32          | 1              | 0-32             |          |
| ProfileID          | NumInClusters | InClusterList | NumOutClusters | OutClusterList   |          |

#### Attributes:

| Attribute        | Length (byte) | Description                                                                                                              |
|------------------|---------------|--------------------------------------------------------------------------------------------------------------------------|
| DstAddr          | 2             | Specifies NWK address of the device generating the inquiry.                                                              |
| LocalCoordinator | 2             | Specifies local coordinator's short address. In the case of source binding, it's the short address of the source address |
| IEEE             | 8             | Local coordinator's IEEE address                                                                                         |
| Endpoint         | 1             | Device's endpoint.                                                                                                       |
| ProfileID        | 2             | Specifies the profile ID of the device.                                                                                  |
| NumInClusters    | 1             | Specifies the number of IDs in the InClusterList.                                                                        |
| InClusterList    | 0-32          | Contains the input cluster IDs.                                                                                          |
| NumOutClusters   | 1             | Specifies the number of IDs in the OutClusterList.                                                                       |
| OutClusterList   | 0-32          | Contains the output cluster IDs.                                                                                         |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x20 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.12.1.14 ZDO\_BIND\_REQ****Description:**

This command is generated to request a Bind.

**Usage:****SREQ:**

|                    |             |             |         |            |             |           |
|--------------------|-------------|-------------|---------|------------|-------------|-----------|
| 1                  | 1           | 1           | 2       | 8          | 1           | 2         |
| Length = 0x10-0x17 | Cmd0 = 0x25 | Cmd1 = 0x21 | DstAddr | SrcAddress | SrcEndpoint | ClusterID |

|             |            |             |
|-------------|------------|-------------|
| 1           | 2/8        | 0/1         |
| DstAddrMode | DstAddress | DstEndpoint |

**Attributes:**

| Attribute   | Length (byte) | Description                                                                 |
|-------------|---------------|-----------------------------------------------------------------------------|
| DstAddr     | 2             | Specifies the destination address of the device generating the bind request |
| SrcAddress  | 8             | 64 bit Binding source IEEE address                                          |
| SrcEndpoint | 1             | Specifies the binding source endpoint.                                      |
| ClusterID   | 2             | Specifies the cluster ID to match in messages.                              |

Specifies destination address mode

| Mode                | Value | Description         |
|---------------------|-------|---------------------|
| ADDRESS_NOT_PRESENT | 0x00  | Address Not Present |
| GROUP_ADDRESS       | 0x01  | Group address       |
| ADDRESS_16_BIT      | 0x02  | Address 16 bit      |
| ADDRESS_64_BIT      | 0x03  | Address 64 bit      |
| BROADCAST           | 0xFF  | Broadcast           |

|             |     |                                                                                                          |
|-------------|-----|----------------------------------------------------------------------------------------------------------|
| DstAddrMode | 1   |                                                                                                          |
| DstAddress  | 8/2 | Binding destination IEEE address. Not to be confused with DstAddr.                                       |
| DstEndpoint | 1/0 | Specifies the binding destination endpoint. It is used only when DstAddrMode is 64 bits extended address |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x21 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.12.1.15 ZDO\_UNBIND\_REQ****Description:**

This command is generated to request an UnBind

**Usage:**

**SREQ:**

|                    |             |             |         |            |             |           |
|--------------------|-------------|-------------|---------|------------|-------------|-----------|
| 1                  | 1           | 1           | 2       | 8          | 1           | 2         |
| Length = 0x10-0x17 | Cmd0 = 0x25 | Cmd1 = 0x22 | DstAddr | SrcAddress | SrcEndpoint | ClusterID |

|             |            |             |
|-------------|------------|-------------|
| 1           | 2/8        | 0/1         |
| DstAddrMode | DstAddress | DstEndpoint |

**Attributes:**

| Attribute   | Length (byte) | Description                                                              |
|-------------|---------------|--------------------------------------------------------------------------|
| DstAddr     | 2             | Specifies destination address of the device generating the bind request. |
| SrcAddress  | 8             | Specifies 64 bit Binding source IEEE address.                            |
| SrcEndpoint | 1             | Specifies the binding source endpoint.                                   |
| ClusterID   | 2             | Specifies cluster ID to match in messages.                               |

Specifies 64 bit Binding destination address mode:

|             |      |                                                                                     |       |                     |
|-------------|------|-------------------------------------------------------------------------------------|-------|---------------------|
| DstAddrMode | 1    | Mode                                                                                | Value | Description         |
|             |      | ADDRESS_NOT_PRESENT                                                                 | 0x00  | Address Not Present |
|             |      | GROUP_ADDRESS                                                                       | 0x01  | Group address       |
|             |      | ADDRESS_16_BIT                                                                      | 0x02  | Address 16 bit      |
|             |      | ADDRESS_64_BIT                                                                      | 0x03  | Address 64 bit      |
| BROADCAST   | 0xFF | Broadcast                                                                           |       |                     |
| DstAddress  | 8    | Specifies 64 bit Binding destination IEEE address. Not to be confused with DstAddr. |       |                     |
| DstEndpoint | 1    | Specifies the binding destination endpoint                                          |       |                     |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x22 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.16 ZDO\_MGMT\_NWK\_DISC\_REQ

**Description:**

This command is generated to request the destination device to perform a network discovery.

**Usage:**

**SREQ:**

|               |             |             |         |              |              |            |
|---------------|-------------|-------------|---------|--------------|--------------|------------|
| 1             | 1           | 1           | 2       | 4            | 1            | 1          |
| Length = 0x08 | Cmd0 = 0x25 | Cmd1 = 0x30 | DstAddr | ScanChannels | ScanDuration | StartIndex |

**Attributes:**

| Attribute | Length (byte) | Description                                                           |
|-----------|---------------|-----------------------------------------------------------------------|
| DstAddr   | 2             | Specifies the network address of the device performing the discovery. |



Specifies the Bit Mask for channels to scan:

| Channel      | Value      |
|--------------|------------|
| NONE         | 0x00000000 |
| ALL_CHANNELS | 0x07FFF800 |
| CHANNEL 11   | 0x00000800 |
| CHANNEL 12   | 0x00001000 |
| CHANNEL 13   | 0x00002000 |
| CHANNEL 14   | 0x00004000 |
| CHANNEL 15   | 0x00008000 |
| CHANNEL 16   | 0x00010000 |
| CHANNEL 17   | 0x00020000 |
| CHANNEL 18   | 0x00040000 |
| CHANNEL 19   | 0x00080000 |
| CHANNEL 20   | 0x00100000 |
| CHANNEL 21   | 0x00200000 |
| CHANNEL 22   | 0x00400000 |
| CHANNEL 23   | 0x00800000 |
| CHANNEL 24   | 0x01000000 |
| CHANNEL 25   | 0x02000000 |
| CHANNEL 26   | 0x04000000 |

ScanChannels 4

ScanDuration 1 Specifies the scanning time.  
 StartIndex 1 Specifies where to start in the response array list. The result may contain more entries than can be reported, so this field allows the user to retrieve the responses anywhere in the array list.

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x30 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.12.1.17 ZDO\_MGMT\_LQI\_REQ**

**Description:**

This command is generated to request the destination device to perform a LQI query of other devices in the network.

**Usage:**

**SREQ:**

|               |             |             |         |            |
|---------------|-------------|-------------|---------|------------|
| Byte: 1       | 1           | 1           | 2       | 1          |
| Length = 0x03 | Cmd0 = 0x25 | Cmd1 = 0x31 | DstAddr | StartIndex |

**Attributes:**

| Attribute  | Length (byte) | Description                                                                                                                                                                                        |
|------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr    | 2             | Specifies the network address of the device generating the query.                                                                                                                                  |
| StartIndex | 1             | Specifies where to start in the response array list. The result may contain more entries than can be reported, so this field allows the user to retrieve the responses anywhere in the array list. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x31 | Status |

**Attributes:**

| Attribute | Length (byte) | Description |
|-----------|---------------|-------------|
|-----------|---------------|-------------|

Status 1 Status is either Success (0) or Failure (1).

### 3.12.1.18 ZDO\_MGMT\_RTG\_REQ

#### Description:

This command is generated to request the Routing Table of the destination device

#### Usage:

#### SREQ:

| Byte:         | 1           | 1           | 1       | 2          | 1 |
|---------------|-------------|-------------|---------|------------|---|
| Length = 0x03 | Cmd0 = 0x25 | Cmd1 = 0x32 | DstAddr | StartIndex |   |

#### Attributes:

| Attribute  | Length (byte) | Description                                                                                                                                                                                        |
|------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr    | 2             | Specifies the network address of the device generating the query.                                                                                                                                  |
| StartIndex | 1             | Specifies where to start in the response array list. The result may contain more entries than can be reported, so this field allows the user to retrieve the responses anywhere in the array list. |

#### SRSP:

| Byte:         | 1           | 1           | 1      | 1 |
|---------------|-------------|-------------|--------|---|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x32 | Status |   |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.19 ZDO\_MGMT\_BIND\_REQ

#### Description

This command is generated to request the Binding Table of the destination device.

#### Usage

#### SREQ:

| Byte:         | 1           | 1           | 1       | 2          | 1 |
|---------------|-------------|-------------|---------|------------|---|
| Length = 0x03 | Cmd0 = 0x25 | Cmd1 = 0x33 | DstAddr | StartIndex |   |

#### Attributes:

| Attribute  | Length (byte) | Description                                                                                                                                                                                        |
|------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr    | 2             | Specifies the network address of the device being queried.                                                                                                                                         |
| StartIndex | 1             | Specifies where to start in the response array list. The result may contain more entries than can be reported, so this field allows the user to retrieve the responses anywhere in the array list. |

#### SRSP:

| Byte:         | 1           | 1           | 1      | 1 |
|---------------|-------------|-------------|--------|---|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x33 | Status |   |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.20 ZDO\_MGMT\_LEAVE\_REQ

#### Description:

This command is generated to request a Management Leave Request for the target device

#### Usage:

#### SREQ:

|               |             |             |         |            |                       |
|---------------|-------------|-------------|---------|------------|-----------------------|
| 1             | 1           | 1           | 2       | 8          | 1                     |
| Length = 0x0B | Cmd0 = 0x25 | Cmd1 = 0x34 | DstAddr | DeviceAddr | RemoveChildren/Rejoin |

#### Attributes:

| Attribute             | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                    |
|-----------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr               | 2             | Specifies the network address of the device generating the request.                                                                                                                                                                                                                                                                            |
| DeviceAddress         | 8             | Specifies the 64 bit IEEE Address of the target device you want to leave. This field has a value of 1 if the device being asked to leave the network is also being asked to remove its child devices, if any. Otherwise it has a value of 0. Currently, the stack profile of Home Control specifies that this field should always be set to 0. |
| RemoveChildren/Rejoin | 1             |                                                                                                                                                                                                                                                                                                                                                |

#### SRSP:

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x34 | Status |

#### Attributes:

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

### 3.12.1.21 ZDO\_MGMT\_DIRECT\_JOIN\_REQ

#### Description:

This command is generated to request the Management Direct Join Request of a designated device.

#### Usage:

#### SREQ:

|               |             |             |         |            |         |
|---------------|-------------|-------------|---------|------------|---------|
| Byte: 1       | 1           | 1           | 2       | 8          | 1       |
| Length = 0x0B | Cmd0 = 0x25 | Cmd1 = 0x35 | DstAddr | DeviceAddr | CapInfo |

#### Attributes:

| Attribute     | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                  |
|---------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr       | 2             | Network address of the device to which the device specified in DeviceAddress is to join.                                                                                                                                                                                                                                                     |
| DeviceAddress | 8             | The 64 bit IEEE Address of the device you want to be joined to the device at DstAddr.                                                                                                                                                                                                                                                        |
| CapInfo       | 1             | Specifies the operating capabilities of the device being directly joined. Bit weighted values follow:<br>Bit: 0 – Alternate PAN Coordinator<br>1 – Device type: 1- ZigBee Router; 0 – End Device<br>2 – Power Source: 1 Main powered<br>3 – Receiver on when idle<br>4 – Reserved<br>5 – Reserved<br>6 – Security capability<br>7 – Reserved |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| Byte: 1       | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x35 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.12.1.22 ZDO\_MGMT\_PERMIT\_JOIN\_REQ****Description:**

This command is generated to set the Permit Join for the destination device

**Usage:****SREQ:**

|               |             |             |         |          |                |
|---------------|-------------|-------------|---------|----------|----------------|
| 1             | 1           | 1           | 2       | 1        | 1              |
| Length = 0x04 | Cmd0 = 0x25 | Cmd1 = 0x36 | DstAddr | Duration | TCSignificance |

**Attributes:**

| Attribute      | Length (byte) | Description                                                                                                                        |
|----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr        | 2             | Specifies the network address of the destination device whose Permit Join information is to be modified.                           |
| Duration       | 1             | Specifies the duration to permit joining. 0 = join disabled. 0xff = join enabled. 0x01-0xfe = number of seconds to permit joining. |
| TCSignificance | 1             | Trust Center Significance.                                                                                                         |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x36 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.12.1.23 ZDO\_MGMT\_NWK\_UPDATE\_REQ****Description:**

This command is provided to allow updating of network configuration parameters or to request information from devices on network conditions in the local operating environment.

**Usage:****SREQ:**

|               |             |             |         |             |             |
|---------------|-------------|-------------|---------|-------------|-------------|
| 1             | 1           | 1           | 2       | 1           | 4           |
| Length = 0x0B | Cmd0 = 0x25 | Cmd1 = 0x37 | DstAddr | DstAddrMode | ChannelMask |

|              |           |                |
|--------------|-----------|----------------|
| 1            | 1         | 2              |
| ScanDuration | ScanCount | NwkManagerAddr |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                   |
|-----------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr   | 2             | Short address of the destination device(s). The destination addressing on this primitive can be unicast or broadcast to all devices for which |

macRxOnWhenIdle=TRUE (i.e., 0xFFFD)

Destination address mode:

| Mode                | Value | Description         |
|---------------------|-------|---------------------|
| ADDRESS_NOT_PRESENT | 0x00  | Address Not Present |
| GROUP_ADDRESS       | 0x01  | Group address       |
| ADDRESS_16_BIT      | 0x02  | Address 16 bit      |
| ADDRESS_64_BIT      | 0x03  | Address 64 bit      |
| BROADCAST           | 0xFF  | Broadcast           |

DstAddrMode 1

A bitmap indicating which channels are to be scanned:

| annel        | Value      |
|--------------|------------|
| NONE         | 0x00000000 |
| ALL_CHANNELS | 0x07FFF800 |
| CHANNEL 11   | 0x00000800 |
| CHANNEL 12   | 0x00001000 |
| CHANNEL 13   | 0x00002000 |
| CHANNEL 14   | 0x00004000 |
| CHANNEL 15   | 0x00008000 |
| CHANNEL 16   | 0x00010000 |
| CHANNEL 17   | 0x00020000 |
| CHANNEL 18   | 0x00040000 |
| CHANNEL 19   | 0x00080000 |
| CHANNEL 20   | 0x00100000 |
| CHANNEL 21   | 0x00200000 |
| CHANNEL 22   | 0x00400000 |
| CHANNEL 23   | 0x00800000 |
| CHANNEL 24   | 0x01000000 |
| CHANNEL 25   | 0x02000000 |
| CHANNEL 26   | 0x04000000 |

ChannelMask 4

ScanDuration 1 A value used to calculate the length of time to spend scanning each channel

ScanCount 1 This field represents the number of energy scans to be conducted and reported

NwkManagerAddr 2 Indicates the NWK address for the device with the Network Manager bit set in its Node Descriptor

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x36 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                  |
|-----------|---------------|----------------------------------------------|
| Status    | 1             | Status is either Success (0) or Failure (1). |

**3.12.1.24 ZDO\_MSG\_CB\_REGISTER**

**Description:**

This command registers for a ZDO callback (see Reference[3], “6. ZDO Message Requests” for example usage).

**Usage:**

**SREQ:**

|               |             |             |           |
|---------------|-------------|-------------|-----------|
| 1             | 1           | 1           | 2         |
| Length = 0x02 | Cmd0 = 0x25 | Cmd1 = 0x3E | ClusterID |

**Attributes:**

| Attribute | Length (byte) | Description                                                       |
|-----------|---------------|-------------------------------------------------------------------|
| ClusterID | 2             | Specifies the ZDO Cluster Id for which to receive a ZDO callback. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x3E | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                          |
|-----------|---------------|------------------------------------------------------|
| Status    | 1             | Return value of the call to ZDO_RegisterForZDOMsg(). |

**3.12.1.25 ZDO\_MSG\_CB\_REMOVE****Description:**

This command removes a registration for a ZDO callback (see Reference[3], “6. ZDO Message Requests” for example usage).

**Usage:****SREQ:**

|               |             |             |           |
|---------------|-------------|-------------|-----------|
| 1             | 1           | 1           | 2         |
| Length = 0x02 | Cmd0 = 0x25 | Cmd1 = 0x3F | ClusterID |

**Attributes:**

| Attribute | Length (byte) | Description                                                       |
|-----------|---------------|-------------------------------------------------------------------|
| ClusterID | 2             | Specifies the ZDO Cluster Id for which to receive a ZDO callback. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x3F | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                            |
|-----------|---------------|--------------------------------------------------------|
| Status    | 1             | Return value of the call to ZDO_RemoveRegisteredCB (). |

**3.12.1.26 ZDO\_STARTUP\_FROM\_APP****Description:**

This command starts the device in the network.

**Usage:****SREQ:**

|               |             |             |            |
|---------------|-------------|-------------|------------|
| 1             | 1           | 1           | 2          |
| Length = 0x01 | Cmd0 = 0x25 | Cmd1 = 0x40 | StartDelay |

**Attributes:**

| Attribute  | Length (byte) | Description                                        |
|------------|---------------|----------------------------------------------------|
| StartDelay | 2             | Specifies the time delay before the device starts. |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x40 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                                                               |
|-----------|---------------|-------------------------------------------------------------------------------------------|
| Status    | 1             | 0x00 – Restored network state<br>0x01 – New network state<br>0x02 – Leave and not Started |

**3.12.1.27 ZDO\_AUTO\_FIND\_DESTINATION****Description:**

This function will issue a Match Description Request for the requested endpoint outputs. This message will generate a broadcast message.

**Usage:****AREQ:**

| 1             | 1           | 1           | 1        |
|---------------|-------------|-------------|----------|
| Length = 0x01 | Cmd0 = 0x45 | Cmd1 = 0x41 | Endpoint |

**Attributes:**

| Attribute | Length (byte) | Description                                                        |
|-----------|---------------|--------------------------------------------------------------------|
| Endpoint  | 1             | Specifies which endpoint to issue the End Device Bind request for. |

**3.12.1.28 ZDO\_SET\_LINK\_KEY****Description:**

This Command sets the application link key for a given device.

**Usage:****SREQ:**

| 1             | 1           | 1           | 2         | 8        | 16          |
|---------------|-------------|-------------|-----------|----------|-------------|
| Length = 0x1A | Cmd0 = 0x45 | Cmd1 = 0x23 | ShortAddr | IEEEAddr | LinkKeyData |

**Attributes:**

| Attribute   | Length (byte) | Description                                                     |
|-------------|---------------|-----------------------------------------------------------------|
| ShortAddr   | 2             | Specifies the short address of the pair device of the link key. |
| IEEEAddr    | 8             | Specifies the IEEE address of the pair device of the link key   |
| LinkKeyData | 16            | 128 bit link key data of the device.                            |

**SRSP:**

| 1             | 1           | 1           | 1      |
|---------------|-------------|-------------|--------|
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x23 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                        |
|-----------|---------------|----------------------------------------------------------------------------------------------------|
| Status    | 1             | 0x00 – Success<br>0x01 – Fail to add to address manager.<br>0x11 – Security manager key table full |

### 3.12.1.29 ZDO\_REMOVE\_LINK\_KEY

**Description:**

This command removes the application link key of a given device.

**Usage:**

**SREQ:**

|               |             |             |          |
|---------------|-------------|-------------|----------|
| 1             | 1           | 1           | 8        |
| Length = 0x08 | Cmd0 = 0x45 | Cmd1 = 0x24 | IEEEAddr |

**Attributes:**

| Attribute | Length (byte) | Description                                                   |
|-----------|---------------|---------------------------------------------------------------|
| IEEEAddr  | 8             | Specifies the IEEE address of the pair device of the link key |

**SRSP:**

|               |             |             |        |
|---------------|-------------|-------------|--------|
| 1             | 1           | 1           | 1      |
| Length = 0x01 | Cmd0 = 0x65 | Cmd1 = 0x24 | Status |

**Attributes:**

| Attribute | Length (byte) | Description                              |
|-----------|---------------|------------------------------------------|
| Status    | 1             | 0x00 – Success<br>0xC8 – Unknown device. |

### 3.12.1.30 ZDO\_GET\_LINK\_KEY

**Description:**

This command removes the application link key of a given device.

**Usage:**

**SREQ:**

|               |             |             |          |
|---------------|-------------|-------------|----------|
| 1             | 1           | 1           | 8        |
| Length = 0x08 | Cmd0 = 0x45 | Cmd1 = 0x25 | IEEEAddr |

**Attributes:**

| Attribute | Length (byte) | Description                                                   |
|-----------|---------------|---------------------------------------------------------------|
| IEEEAddr  | 8             | Specifies the IEEE address of the pair device of the link key |

**SRSP:**

|               |             |             |        |          |             |
|---------------|-------------|-------------|--------|----------|-------------|
| 1             | 1           | 1           | 1      | 8        | 16          |
| Length = 0x19 | Cmd0 = 0x65 | Cmd1 = 0x25 | Status | IEEEAddr | LinkKeyData |

**Attributes:**

| Attribute   | Length (byte) | Description                              |
|-------------|---------------|------------------------------------------|
| Status      | 1             | 0x00 – Success<br>0xC8 – Unknown device. |
| IEEEAddr    | 8             | IEEE address of the device               |
| LinkKeyData | 16            | Link key data of the device.             |

## 3.12.2 MT\_ZDO Callbacks



### 3.12.2.1 ZDO\_NWK\_ADDR\_RSP

#### Description:

This command is issued by the tester to return the results from a ZDO\_NWK\_ADDR\_REQ.

#### Usage

#### AREQ:

|                    |             |              |        |          |         |
|--------------------|-------------|--------------|--------|----------|---------|
| 1                  | 1           | 1            | 1      | 8        | 2       |
| Length = 0x0D-0x53 | Cmd0 = 0x45 | Cmd1 = 0x80  | Status | IEEEAddr | NwkAddr |
| 1                  | 1           | 0-70         |        |          |         |
| StartIndex         | NumAssocDev | AssocDevList |        |          |         |

#### Attributes:

| Attribute    | Length (byte) | Description                                                                                                                                                                                           |
|--------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status       | 1             | This field indicates either SUCCESS or FAILURE.                                                                                                                                                       |
| IEEEAddr     | 8             | 64 bit IEEE address of source device.                                                                                                                                                                 |
| NwkAddr      | 2             | Specifies the short network address of responding device.                                                                                                                                             |
| StartIndex   | 1             | Specifies the starting index into the list of associated devices for this report.                                                                                                                     |
| NumAssocDev  | 1             | Specifies the number of associated devices.                                                                                                                                                           |
| AssocDevList | 0-70          | Contains the list of network address for associated devices. This list can be a partial list if the entire list doesn't fit into a packet. If it is a partial list, the starting index is StartIndex. |

### 3.12.2.2 ZDO\_IEEE\_ADDR\_RSP

#### Description:

This callback message is in response to the ZDO IEEE Address Request.

#### Usage:

#### AREQ:

|                    |             |              |        |          |         |
|--------------------|-------------|--------------|--------|----------|---------|
| 1                  | 1           | 1            | 1      | 8        | 2       |
| Length = 0x0D-0x53 | Cmd0 = 0x45 | Cmd1 = 0x81  | Status | IEEEAddr | NwkAddr |
| 1                  | 1           | 0-70         |        |          |         |
| StartIndex         | NumAssocDev | AssocDevList |        |          |         |

#### Attributes:

| Attribute    | Length (byte) | Description                                                                                                                                                                                           |
|--------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status       | 1             | This field indicates either SUCCESS or FAILURE.                                                                                                                                                       |
| IEEEAddr     | 8             | 64 bit IEEE address of source device.                                                                                                                                                                 |
| NwkAddr      | 2             | Specifies the short network address of responding device.                                                                                                                                             |
| StartIndex   | 1             | Specifies the starting index into the list of associated devices for this report.                                                                                                                     |
| NumAssocDev  | 1             | Specifies the number of associated devices.                                                                                                                                                           |
| AssocDevList | 0-70          | Contains the list of network address for associated devices. This list can be a partial list if the entire list doesn't fit into a packet. If it is a partial list, the starting index is StartIndex. |

### 3.12.2.3 ZDO\_NODE\_DESC\_RSP

#### Description:

This callback message is in response to the ZDO Node Descriptor Request.

#### Usage:

#### AREQ:

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 2 | 1 | 2 |
|---|---|---|---|---|---|

Length = 0x12    Cmd0 = 0x45    Cmd1 = 0x82    SrcAddr    Status    NwkAddr

|                                                            |                 |                            |                    |                        |
|------------------------------------------------------------|-----------------|----------------------------|--------------------|------------------------|
|                                                            | 1               | 1                          | 1                  | 2                      |
| LogicalType/<br>ComplexDescAvailable/<br>UserDescAvailable |                 | APSFlags/<br>FrequencyBand | MACCapabilityFlags | ManufacturerCode       |
|                                                            | 1               | 2                          | 2                  | 1                      |
| MaxBufferSize                                              | MaxTransferSize | ServerMask                 | MaxOutTransferSize | DescriptorCapabilities |

**Attributes:**

| Attribute                                                              | Length (byte) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|------------------------|------|---------------------|------|------------------------|------|------------------|------|----------------------|------|--------------------------|------|--------------------|------|
| SrcAddr                                                                | 2             | The message's source network address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| Status                                                                 | 1             | This field indicates either SUCCESS or FAILURE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| NWKAddrOfInterest                                                      | 2             | Device's short address of this Node descriptor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| LogicalType/<br>ComplexDescriptorAvailable/<br>UserDescriptorAvailable | 1             | <p>Logical Type: Bit 0-2</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>ZigBee Coordinator</td> <td>0</td> </tr> <tr> <td>ZigBee Router</td> <td>1</td> </tr> <tr> <td>ZigBee End Device</td> <td>2</td> </tr> </tbody> </table> <p>ComplexDescriptorAvailable: Bit 4– Indicates if complex descriptor is available for the node</p> <p>NodeFrequencyBand – Bit 5-7 – Identifies node frequency band capabilities</p>                                                                            | Description | Value | ZigBee Coordinator     | 0    | ZigBee Router       | 1    | ZigBee End Device      | 2    |                  |      |                      |      |                          |      |                    |      |
| Description                                                            | Value         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| ZigBee Coordinator                                                     | 0             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| ZigBee Router                                                          | 1             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| ZigBee End Device                                                      | 2             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| APSFlags/FrequencyBand                                                 | 1             | <p>- APSFlags – Bit 0-4 – Node Flags assigned for APS. For V1.0 all bits are reserved.</p> <p>- NodeFrequencyBand – Bit 5-7 – Identifies node frequency band capabilities</p>                                                                                                                                                                                                                                                                                                                                                                             |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| MacCapabilitiesFlags                                                   | 1             | <p>Capability flags stored for the MAC</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>CAPINFO_DEVICETYPE_RFD</td> <td>0x00</td> </tr> <tr> <td>CAPINFO_ALTPANCOORD</td> <td>0x01</td> </tr> <tr> <td>CAPINFO_DEVICETYPE_FFD</td> <td>0x02</td> </tr> <tr> <td>CAPINFO_POWER_AC</td> <td>0x04</td> </tr> <tr> <td>CAPINFO_RCVR_ON_IDLE</td> <td>0x08</td> </tr> <tr> <td>CAPINFO_SECURITY_CAPABLE</td> <td>0x40</td> </tr> <tr> <td>CAPINFO_ALLOC_ADDR</td> <td>0x80</td> </tr> </tbody> </table> | Description | Value | CAPINFO_DEVICETYPE_RFD | 0x00 | CAPINFO_ALTPANCOORD | 0x01 | CAPINFO_DEVICETYPE_FFD | 0x02 | CAPINFO_POWER_AC | 0x04 | CAPINFO_RCVR_ON_IDLE | 0x08 | CAPINFO_SECURITY_CAPABLE | 0x40 | CAPINFO_ALLOC_ADDR | 0x80 |
| Description                                                            | Value         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_DEVICETYPE_RFD                                                 | 0x00          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_ALTPANCOORD                                                    | 0x01          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_DEVICETYPE_FFD                                                 | 0x02          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_POWER_AC                                                       | 0x04          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_RCVR_ON_IDLE                                                   | 0x08          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_SECURITY_CAPABLE                                               | 0x40          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| CAPINFO_ALLOC_ADDR                                                     | 0x80          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| ManufacturerCode                                                       | 2             | Specifies a manufacturer code that is allocated by the ZigBee Alliance, relating to the manufacturer to the device.                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| MaxBufferSize                                                          | 1             | Indicates size of maximum NPDU. This field is used as a high level indication for management.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| MaxInTransferSize                                                      | 2             | Indicates maximum size of Transfer up to 0x7fff (This field is reserved in version 1.0 and shall be set to zero).<br>Bit 0 - Primary Trust Center<br>1 - Backup Trust Center                                                                                                                                                                                                                                                                                                                                                                              |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| ServerMask                                                             | 2             | 2 - Primary Binding Table Cache<br>3 - Backup Binding Table Cache<br>4 - Primary Discovery Cache<br>5 - Backup Discovery Cache                                                                                                                                                                                                                                                                                                                                                                                                                            |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| MaxOutTransferSize                                                     | 2             | Indicates maximum size of Transfer up to 0x7fff (This field is reserved in version 1.0 and shall be set to zero).                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |
| DescriptorCapabilities                                                 | 1             | Specifies the Descriptor capabilities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       |                        |      |                     |      |                        |      |                  |      |                      |      |                          |      |                    |      |

### 3.12.2.4 ZDO\_POWER\_DESC\_RSP

#### Description:

This callback message is in response to the ZDO Power Descriptor Request.

#### Usage:

#### AREQ:

|                                        |             |             |                                            |        |         |
|----------------------------------------|-------------|-------------|--------------------------------------------|--------|---------|
| 1                                      | 1           | 1           | 2                                          | 1      | 2       |
| Length = 0x07                          | Cmd0 = 0x45 | Cmd1 = 0x83 | SrcAddr                                    | Status | NwkAddr |
| 1                                      |             |             | 1                                          |        |         |
| CurrentPowerMode/AvailablePowerSources |             |             | CurrentPowerSource/CurrentPowerSourceLevel |        |         |

#### Attributes:

| Attribute                                  | Length (byte) | Description                                                           |
|--------------------------------------------|---------------|-----------------------------------------------------------------------|
| SrcAddr                                    | 2             | Specifies the message's source network address.                       |
| Status                                     | 1             | This field indicates either SUCCESS or FAILURE.                       |
| NWKAddr                                    | 2             | Specifies Device's short address that this response describes.        |
| CurrentPowerMode/AvailablePowerSources     | 1             | - CurrentPowerMode: bits 3-0<br>- AvailablePowerSources: bits 7-4     |
| CurrentPowerSource/CurrentPowerSourceLevel | 1             | - CurrentPowerSource: bits 3-0<br>- CurrentPowerSourceLevel: bits 7-4 |

### 3.12.2.5 ZDO\_SIMPLE\_DESC\_RSP

#### Description:

This callback message is in response to the ZDO Simple Descriptor Request

#### Usage:

#### AREQ:

|                  |               |                |                |        |         |     |
|------------------|---------------|----------------|----------------|--------|---------|-----|
| 1                | 1             | 1              | 2              | 1      | 2       | 1   |
| Length = 0x06-4E | Cmd0 = 0x45   | Cmd1 = 0x84    | SrcAddr        | Status | NwkAddr | Len |
| 1                | 2             | 2              | 1              |        |         |     |
| Endpoint         | ProfileID     | DeviceID       | DeviceVersion  |        |         |     |
| 1                | 0-32          | 1              | 0-32           |        |         |     |
| NumInClusters    | InClusterList | NumOutClusters | OutClusterList |        |         |     |

#### Attributes:

| Attribute      | Length (byte) | Description                                                                     |
|----------------|---------------|---------------------------------------------------------------------------------|
| SrcAddr        | 2             | Specifies the message's source network address.                                 |
| Status         | 1             | This field indicates either SUCCESS or FAILURE.                                 |
| NWKAddr        | 2             | Specifies Device's short address that this response describes.                  |
| Len            | 1             | Specifies the length of the simple descriptor                                   |
| Endpoint       | 1             | Specifies Endpoint of the device                                                |
| ProfileID      | 2             | The profile ID for this endpoint.                                               |
| DeviceID       | 2             | The Device Description ID for this endpoint.<br>Defined as the following format |
| DeviceVersion  | 1             | 0 – Version 1.00<br>0x01-0x0F – Reserved.                                       |
| NumInClusters  | 1             | The number of input clusters in the InClusterList.                              |
| InClusterList  | 0-32          | List of input cluster IDs supported.                                            |
| NumOutClusters | 1             | The number of output clusters in the OutClusterList.                            |
| OutClusterList | 0-32          | List of output cluster IDs supported.                                           |

### 3.12.2.6 ZDO\_ACTIVE\_EP\_RSP

**Description:**

This callback message is in response to the ZDO Active Endpoint Request.

**Usage:**

**AREQ:**

|                    |             |             |         |        |         |               |
|--------------------|-------------|-------------|---------|--------|---------|---------------|
| 1                  | 1           | 1           | 2       | 1      | 2       | 1             |
| Length = 0x06-0x53 | Cmd0 = 0x45 | Cmd1 = 0x85 | SrcAddr | Status | NwkAddr | ActiveEPCount |

0-77

ActiveEPList

**Attributes:**

| Attribute     | Length (byte) | Description                                          |
|---------------|---------------|------------------------------------------------------|
| SrcAddr       | 2             | The message's source network address.                |
| Status        | 1             | This field indicates either SUCCESS or FAILURE.      |
| NWKAddr       | 2             | Device's short address that this response describes. |
| ActiveEPCount | 1             | Number of active endpoint in the list                |
| ActiveEPList  | 0-77          | Array of active endpoints on this device.            |

### 3.12.2.7 ZDO\_MATCH\_DESC\_RSP

**Description:**

This callback message is in response to the ZDO Match Descriptor Request

**Usage:**

**AREQ:**

|                    |             |             |         |        |         |             |
|--------------------|-------------|-------------|---------|--------|---------|-------------|
| 1                  | 1           | 1           | 2       | 1      | 2       | 1           |
| Length = 0x06-0x53 | Cmd0 = 0x45 | Cmd1 = 0x86 | SrcAddr | Status | NwkAddr | MatchLength |

0-77

MatchList

**Attributes:**

| Attribute   | Length (byte) | Description                                                                 |
|-------------|---------------|-----------------------------------------------------------------------------|
| SrcAddr     | 2             | The message's source network address.                                       |
| Status      | 1             | This field indicates either SUCCESS or FAILURE.                             |
| NWKAddr     | 2             | Device's short address that this response describes.                        |
| MatchLength | 1             | The count of endpoints on the remote device that match the request criteria |
| MatchList   | 0-77          | List of bytes, each represents an 8 bit endpoint                            |

### 3.12.2.8 ZDO\_COMPLEX\_DESC\_RSP

**Description:**

This callback message is in response to the ZDO Complex Descriptor Request

**Usage:**

**AREQ:**

|                    |             |             |         |        |         |               |
|--------------------|-------------|-------------|---------|--------|---------|---------------|
| 1                  | 1           | 1           | 2       | 1      | 2       | 1             |
| Length = 0x06-0x53 | Cmd0 = 0x45 | Cmd1 = 0x87 | SrcAddr | Status | NwkAddr | ComplexLength |

0-77

ComplexList

**Attributes:**

| Attribute         | Length (byte) | Description                                          |
|-------------------|---------------|------------------------------------------------------|
| SrcAddr           | 2             | The message's source network address.                |
| Status            | 1             | This field indicates either SUCCESS or FAILURE.      |
| NWKAddr           | 2             | Device's short address that this response describes. |
| ComplexLength     | 1             | Length of the complex descriptor.                    |
| ComplexDescriptor | 0-77          | Array of bytes contains the complex descriptor.      |

**3.12.2.9 ZDO\_USER\_DESC\_RSP****Description:**

This callback message is in response to the ZDO User Descriptor Request

**Usage:****AREQ:**

|                    |             |             |         |        |         |     |                |
|--------------------|-------------|-------------|---------|--------|---------|-----|----------------|
| 1                  | 1           | 1           | 2       | 1      | 2       | 1   | 0-77           |
| Length = 0x06-0x16 | Cmd0 = 0x45 | Cmd1 = 0x88 | SrcAddr | Status | NwkAddr | Len | UserDescriptor |

**Attributes:**

| Attribute      | Length (byte) | Description                                          |
|----------------|---------------|------------------------------------------------------|
| SrcAddr        | 2             | The message's source network address.                |
| Status         | 1             | This field indicates either SUCCESS or FAILURE.      |
| NWKAddr        | 2             | Device's short address that this response describes. |
| UserLength     | 1             | Length of the complex descriptor.                    |
| UserDescriptor | 0-77          | Array of bytes contains user descriptor.             |

**3.12.2.10 ZDO\_USER\_DESC\_CONF****Description:**

This confirmation notifies the user when the device receives a user descriptor.

**Usage:****AREQ:**

|               |             |             |         |        |         |
|---------------|-------------|-------------|---------|--------|---------|
| 1             | 1           | 1           | 2       | 1      | 2       |
| Length = 0x05 | Cmd0 = 0x45 | Cmd1 = 0x89 | SrcAddr | Status | NwkAddr |

**Attributes:**

| Attribute | Length (byte) | Description                                          |
|-----------|---------------|------------------------------------------------------|
| SrcAddr   | 2             | The message's source network address.                |
| Status    | 1             | This field indicates either SUCCESS or FAILURE.      |
| NWKAddr   | 2             | Device's short address that this response describes. |

**3.12.2.11 ZDO\_SERVER\_DISC\_RSP****Description:**

This callback message is in response to the ZDO System Service Discovery Request. Upon receiving the request, remote devices shall compare the ServerMask parameter to the Server Mask field in their own Node descriptor. If no bits are found to match, no action is taken.

**Usage:****AREQ:**

|               |             |             |         |        |            |
|---------------|-------------|-------------|---------|--------|------------|
| 1             | 1           | 1           | 2       | 1      | 2          |
| Length = 0x05 | Cmd0 = 0x45 | Cmd1 = 0x8A | SrcAddr | Status | ServerMask |

**Attributes:**

| Attribute | Length (byte) | Description                                                                                                                                                                |
|-----------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SrcAddr   | 2             | The message's source network address.                                                                                                                                      |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1).<br>Each bit signifies one system server capability of the node. The bit setting is defined in the following table: |
|           |               | <b>Bit Number</b>                                                                                                                                                          |
|           |               | 0                                                                                                                                                                          |
|           |               | 1                                                                                                                                                                          |
|           |               | 2                                                                                                                                                                          |
|           |               | 3                                                                                                                                                                          |
|           |               | 4                                                                                                                                                                          |
|           |               | 5                                                                                                                                                                          |
|           |               | 6–15                                                                                                                                                                       |
|           |               | <b>Assignment</b>                                                                                                                                                          |
|           |               | Primary Trust Center                                                                                                                                                       |
|           |               | Backup Trust Center                                                                                                                                                        |
|           |               | Primary Binding Table Cache                                                                                                                                                |
|           |               | Backup Binding Table Cache                                                                                                                                                 |
|           |               | Primary Discovery Cache                                                                                                                                                    |
|           |               | Backup Discovery Cache                                                                                                                                                     |
|           |               | Reserved                                                                                                                                                                   |

**3.12.2.12 ZDO\_END\_DEVICE\_BIND\_RSP****Description:**

This callback message is in response to the ZDO End Device Bind Request

**Usage:****AREQ:**

|               |             |             |         |        |
|---------------|-------------|-------------|---------|--------|
| 1             | 1           | 1           | 2       | 1      |
| Length = 0x03 | Cmd0 = 0x45 | Cmd1 = 0xA0 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | The message's source network address.                   |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

**3.12.2.13 ZDO\_BIND\_RSP****Description:**

This callback message is in response to the ZDO Bind Request.

**Usage:****AREQ:**

|               |             |             |         |        |
|---------------|-------------|-------------|---------|--------|
| 1             | 1           | 1           | 2       | 1      |
| Length = 0x03 | Cmd0 = 0x45 | Cmd1 = 0xA1 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | The message's source network address.                   |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.12.2.14 ZDO\_UNBIND\_RSP

**Description:**

This callback message is in response to the ZDO Unbind Request.

**Usage:**

**AREQ:**

|               |             |             |         |        |
|---------------|-------------|-------------|---------|--------|
| Byte: 1       | 1           | 1           | 2       | 1      |
| Length = 0x03 | Cmd0 = 0x45 | Cmd1 = 0xA2 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | The message's source network address.                   |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.12.2.15 ZDO\_MGMT\_NWK\_DISC\_RSP

**Description:**

This callback message is in response to the ZDO Management Network Discovery Request

**Usage:**

**AREQ:**

|                    |                     |             |         |        |              |            |
|--------------------|---------------------|-------------|---------|--------|--------------|------------|
| 1                  | 1                   | 1           | 2       | 1      | 1            | 1          |
| Length = 0x06-0x4E | Cmd0 = 0x45         | Cmd1 = 0xB0 | SrcAddr | Status | NetworkCount | StartIndex |
| 1                  | 0-72                |             |         |        |              |            |
| NetworkListCount   | NetworkList Records |             |         |        |              |            |

**Attributes:**

| Attribute        | Length (byte) | Description                                                |
|------------------|---------------|------------------------------------------------------------|
| SrcAddr          | 2             | Source address of the message.                             |
| Status           | 1             | This field indicates either SUCCESS or FAILURE.            |
| NetworkCount     | 1             | Total number of entries available in the device.           |
| StartIndex       | 1             | Where in the total number of entries this response starts. |
| NetworkListCount | 1             | Number of entries in this response.                        |

An array of NetworkList items. NetworkListCount contains the number of items in this table

| Name                             | Size    | Description                                                                                                                                                                                                                |
|----------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PAN ID/Extended PAN ID           | 2 bytes | PAN ID of the neighbor device                                                                                                                                                                                              |
| Logical Channel                  | 1 byte  | The current logical channel occupied by the network.                                                                                                                                                                       |
| Stack Profile / ZigBee Version   | 1 byte  | StackProfile: bits 3-0<br>ZigBeeVersion: bits 7-4<br>A ZigBee stack profile identifier indicating the stack profile in use in the discovered network. The version of the ZigBee protocol in use in the discovered network. |
| Beacon Order / Super frame Order | 1 byte  | BeaconOrder: bits 3-0<br>SuperframeOrder: bits 7-4                                                                                                                                                                         |
| Permit Joining                   | 1 byte  | Permit joining flag                                                                                                                                                                                                        |

NetworkList List

### 3.12.2.16 ZDO\_MGMT\_LQI\_RSP

**Description:**

This callback message is in response to the ZDO Management LQI Request

**Usage:**

**AREQ:**

|                        |                          |             |         |        |                      |            |
|------------------------|--------------------------|-------------|---------|--------|----------------------|------------|
| 1                      | 1                        | 1           | 2       | 1      | 1                    | 1          |
| Length = 0x06-0x48     | Cmd0 = 0x45              | Cmd1 = 0xB1 | SrcAddr | Status | NeighborTableEntries | StartIndex |
| 1                      | 0-66                     |             |         |        |                      |            |
| NeighborTableListCount | NeighborTableListRecords |             |         |        |                      |            |

**Attributes:**

| Attribute            | Length (byte) | Description                                                |
|----------------------|---------------|------------------------------------------------------------|
| SrcAddr              | 2             | Source address of the message.                             |
| Status               | 1             | This field indicates either SUCCESS or FAILURE.            |
| NeighborTableEntries | 1             | Total number of entries available in the device.           |
| StartIndex           | 1             | Where in the total number of entries this response starts. |
| NeighborLqiListCount | 1             | Number of entries in this response.                        |

An array of NeighborLqiList items. NeighborLQICount contains the number of items in this table.

| Name                                         | Size    | Description                                                              |
|----------------------------------------------|---------|--------------------------------------------------------------------------|
| ExtendedPanID                                | 8 bytes | Extended PAN ID of the neighbor device                                   |
| ExtendedAddress                              | 8 bytes | Network extended address                                                 |
| NetworkAddress                               | 2 bytes | Device short address                                                     |
| DeviceType/<br>RxOnWhenIdle/<br>Relationship | 1 byte  | DeviceType: bits 1-0<br>RxOnWhenIdle: bits 3-2<br>Relationship: bits 6-4 |
| PermitJoining                                | 1 byte  | PermitJoining: bits 1-0                                                  |
| Depth                                        | 1 byte  |                                                                          |
| LQI                                          | 1 byte  |                                                                          |

NeighborLqiList                      0-66

### 3.12.2.17 ZDO\_MGMT\_RTG\_RSP

**Description:**

This callback message is in response to the ZDO Management Routing Table Request.

**Usage:**

**AREQ:**

|                       |                         |             |         |        |                     |            |
|-----------------------|-------------------------|-------------|---------|--------|---------------------|------------|
| 1                     | 1                       | 1           | 2       | 1      | 1                   | 1          |
| Length = 0x06-0x51    | Cmd0 = 0x45             | Cmd1 = 0xB2 | SrcAddr | Status | RoutingTableEntries | StartIndex |
| 1                     | 0-75                    |             |         |        |                     |            |
| RoutingTableListCount | RoutingTableListRecords |             |         |        |                     |            |

**Attributes:**

| Attribute | Length (byte) | Description                    |
|-----------|---------------|--------------------------------|
| SrcAddr   | 2             | Source address of the message. |



Status 1 This field indicates either SUCCESS or FAILURE.  
 RoutingTableEntries 1 Total number of entries available in the device.  
 StartIndex 1 Where in the total number of entries this response starts.  
 RoutingTableListCount 1 Number of entries in this response.  
 An array of RtgList items. RtgListCount contains the number of items in this table.

RoutingTableList 0-75

| Name                | Size    | Description                                                                                                                        |
|---------------------|---------|------------------------------------------------------------------------------------------------------------------------------------|
| Destination Address | 2 bytes | Network destination address                                                                                                        |
| Status              | 1 byte  | Route status: bits 2-0<br>0x00 Active<br>0x01 Discovery Underway<br>0x02 Discovery Failed<br>0x03 Inactive<br>0x04 – 0x07 Reserved |
| Next Hop            | 2 bytes | Next hop network address                                                                                                           |

### 3.12.2.18 ZDO\_MGMT\_BIND\_RSP

**Description:**

This callback message is in response to the ZDO Management Binding Table Request

**Usage:**

**AREQ:**

|                       |                         |             |         |        |                     |            |
|-----------------------|-------------------------|-------------|---------|--------|---------------------|------------|
| Byte: 1               | 1                       | 1           | 2       | 1      | 1                   | 1          |
| Length = 0x06-0x51    | Cmd0 = 0x45             | Cmd1 = 0xB3 | SrcAddr | Status | BindingTableEntries | StartIndex |
| 1                     | 0-75                    |             |         |        |                     |            |
| BindingTableListCount | BindingTableListRecords |             |         |        |                     |            |

**Attributes:**

| Attribute          | Length (byte) | Description                                                |
|--------------------|---------------|------------------------------------------------------------|
| SrcAddr            | 2             | Source address of the message                              |
| Status             | 1             | This field indicates either SUCCESS (0) or FAILURE (1).    |
| BindTableEntries   | 1             | Total number of entries available in the device.           |
| StartIndex         | 1             | Where in the total number of entries this response starts. |
| BindTableListCount | 1             | Number of entries in this response.                        |

An array of BindList items. BindListCount contains the number of items in this table.

BindTableList List

| Name        | Size    | Description                                                                                                                  |
|-------------|---------|------------------------------------------------------------------------------------------------------------------------------|
| SrcAddr     | 8 bytes | Binding Entry's source IEEE address                                                                                          |
| SrcEndpoint | 1 byte  | Binding Entry's source endpoint                                                                                              |
| ClusterID   | 1 byte  | Message ID in binding table                                                                                                  |
| DstAddrMode | 1 byte  | Address mode for binding entry's destination address                                                                         |
| DstAddr     | 8 bytes | Binding Entry's destination IEEE address                                                                                     |
| DstEndpoint | 1 byte  | Binding Entry's destination endpoint. For V1.1, this field is only present when the DstAddrMode is 64-bits extended address. |

### 3.12.2.19 ZDO\_MGMT\_LEAVE\_RSP

**Description:**

This callback message is in response to the ZDO Management Leave Request

**Usage:**

**AREQ:**

|               |             |             |         |        |
|---------------|-------------|-------------|---------|--------|
| Byte: 1       | 1           | 1           | 2       | 1      |
| Length = 0x03 | Cmd0 = 0x45 | Cmd1 = 0xB4 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | Source address of the message                           |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.12.2.20 ZDO\_MGMT\_DIRECT\_JOIN\_RSP

**Description:**

This callback message is in response to the ZDO Management Direct Join Request

**Usage:**

**AREQ:**

|               |             |             |         |        |
|---------------|-------------|-------------|---------|--------|
| 1             | 1           | 1           | 2       | 1      |
| Length = 0x03 | Cmd0 = 0x45 | Cmd1 = 0xB5 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | Source address of the message                           |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.12.2.21 ZDO\_MGMT\_PERMIT\_JOIN\_RSP

**Description:**

This callback message is in response to the ZDO Management Permit Join Request

**Usage:**

**AREQ:**

|               |             |             |         |        |
|---------------|-------------|-------------|---------|--------|
| 1             | 1           | 1           | 2       | 1      |
| Length = 0x03 | Cmd0 = 0x45 | Cmd1 = 0xB6 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | Source address of the message.                          |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

### 3.12.2.22 ZDO\_NEW\_DSTADDR\_IND

**Description:**

This callback message indicates there is a new destination address.

**Usage:**

**AREQ:** TBD

### 3.12.2.23 ZDO\_STATE\_CHANGE\_IND

**Description:**

This callback message indicates the ZDO state change.

**Usage:**

**AREQ:**

|               |             |             |       |
|---------------|-------------|-------------|-------|
| 1             | 1           | 1           | 1     |
| Length = 0x01 | Cmd0 = 0x45 | Cmd1 = 0xC0 | State |

**Attributes:**

| Attribute | Length (byte) | Description                      |
|-----------|---------------|----------------------------------|
| State     | 1             | Specifies the changed ZDO state. |

### 3.12.2.24 ZDO\_END\_DEVICE\_ANNCE\_IND

**Description:**

This callback indicates the ZDO End Device Announce.

**Usage:**

**AREQ:**

|               |             |             |         |         |          |             |
|---------------|-------------|-------------|---------|---------|----------|-------------|
| Byte: 1       | 1           | 1           | 2       | 2       | 8        | 1           |
| Length = 0x0D | Cmd0 = 0x45 | Cmd1 = 0xC1 | SrcAddr | NwkAddr | IEEEAddr | Capabilites |

**Attributes:**

| Attribute   | Length (byte) | Description                                         |
|-------------|---------------|-----------------------------------------------------|
| SrcAddr     | 2             | Source address of the message.                      |
| NwkAddr     | 2             | Specifies the device's short address.               |
| IEEEAddr    | 8             | Specifies the 64 bit IEEE address of source device. |
|             |               | Specifies the MAC capabilities of the device.       |
|             |               | Bit: 0 – Alternate PAN Coordinator                  |
|             |               | 1 – Device type: 1- ZigBee Router; 0 – End Device   |
|             |               | 2 – Power Source: 1 Main powered                    |
|             |               | 3 – Receiver on when idle                           |
|             |               | 4 – Reserved                                        |
|             |               | 5 – Reserved                                        |
|             |               | 6 – Security capability                             |
|             |               | 7 – Reserved                                        |
| Capabilites | 1             |                                                     |

### 3.12.2.25 ZDO\_MATCH\_DESC\_RSP\_SENT

**Description:**

This callback indicates that Match Descriptor Response has been sent.

**Usage:**

**AREQ:**

|                    |             |             |         |
|--------------------|-------------|-------------|---------|
| Byte: 1            | 1           | 1           | 2       |
| Length = 0x04-0x44 | Cmd0 = 0x45 | Cmd1 = 0xC2 | NwkAddr |
| 1                  | 0-32        | 1           | 0-32    |

NumInClusters    InClusterList    NumOutClusters    OutClusterList

**Attributes:**

| Attribute      | Length (byte) | Description                                          |
|----------------|---------------|------------------------------------------------------|
| NwkAddr        | 2             | Specifies the device's short address                 |
| NumInClusters  | 1             | The number of input clusters in the InClusterList.   |
| InClusterList  | 0-32          | List of input cluster IDs supported.                 |
| NumOutClusters | 1             | The number of output clusters in the OutClusterList. |
| OutClusterList | 0-32          | List of output cluster IDs supported.                |

**3.12.2.26 ZDO\_STATUS\_ERROR\_RSP****Description:**

This message is the default message for error status.

**Usage:****AREQ:**

| Byte: 1            | 1           | 1           | 2       | 1      |
|--------------------|-------------|-------------|---------|--------|
| Length = 0x04-0x44 | Cmd0 = 0x45 | Cmd1 = 0xC3 | SrcAddr | Status |

**Attributes:**

| Attribute | Length (byte) | Description                                             |
|-----------|---------------|---------------------------------------------------------|
| SrcAddr   | 2             | Source address of the message                           |
| Status    | 1             | This field indicates either SUCCESS (0) or FAILURE (1). |

**3.12.2.27 ZDO\_SRC\_RTG\_IND****Description:**

This message is an indication to inform host device the receipt of a source route to a given device.

**Usage:****AREQ:**

| Byte: 1            | 1           | 1           | 2       | 1               | 2N         |
|--------------------|-------------|-------------|---------|-----------------|------------|
| Length = 0x04-0x44 | Cmd0 = 0x45 | Cmd1 = 0xC4 | dstAddr | Relay Count (N) | Relay List |

**Attributes:**

| Attribute   | Length (byte) | Description                                                                                                                           |
|-------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------|
| DstAddr     | 2             | Short address of the destination of the source route                                                                                  |
| Relay Count | 1             | This field indicates number of devices in the relay list of the source route.                                                         |
| Relay List  | 2N            | This field contains the list of devices in the relay list of the source route. It includes a two bytes short address for each device. |

**3.12.2.28 ZDO\_MSG\_CB\_INCOMING****Description:**

This message is a ZDO callback for a Cluster Id that the host requested to receive with a ZDO\_MSG\_CB\_REGISTER request.

**Usage:****AREQ:**

| Byte: 1                         | 1           | 1           | 2                | 1            | 2         |
|---------------------------------|-------------|-------------|------------------|--------------|-----------|
| Length = 0x09-Max<br>MTU length | Cmd0 = 0x45 | Cmd1 = 0xFF | SrcAddr          | WasBroadcast | ClusterID |
| 1                               | 1           | 2           | 0-Max MTU length |              |           |
| SecurityUse                     | SeqNum      | MacDstAddr  | Data             |              |           |

**Attributes:**

| Attribute    | Length (byte)        | Description                                                                                                                                                                         |
|--------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SrcAddr      | 2                    | Short address (LSB-MSB) of the source of the ZDO message.                                                                                                                           |
| WasBroadcast | 1                    | This field indicates whether or not this ZDO message was broadcast.                                                                                                                 |
| ClusterID    | 2                    | The ZDO Cluster Id of this message.                                                                                                                                                 |
| SecurityUse  | 1                    | N/A – not used.                                                                                                                                                                     |
| SeqNum       | 1                    | The sequence number of this ZDO message.                                                                                                                                            |
| MacDstAddr   | 2                    | The MAC destination short address (LSB-MSB) of the ZDO message.                                                                                                                     |
| Data         | 0-Max MTU<br>length. | The data that corresponds to the Cluster Id of the message (see Reference[4], “ZDO Parsing Functions” for information on parsing the data that corresponds to each ZDO Cluster Id). |