1. **Packet**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Packet frame[27B] | | | | |
| Header | Timestamp | Non-encrypted/Encrypted payload | | Sequence |
| 1B | 4B | 20B DATA | 1B CRC | 1B |

- Header: to specify type of packet. It is included command and report packet with encryption or non-encryption

|  |  |
| --- | --- |
| Header | Type of packet |
| 0x55 | Command Non-Encrypted |
| 0x56 | Command Encrypted |
| 0x57 | Report Non-Encrypted |
| 0x58 | Report Encrypted |

- Timestamp: is 4 bytes Unix timestamp

- Payload: include 20 bytes DATA and 1 byte CRC with encryption or non-encryption

+ DATA payload format follow the type of packet and type of device

+ CRC = DATA[0] + DATA[1] + … + DATA[19]

- Sequence: to specify the message is relay message from another or original message

1. **Command packet**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Command Packet frame[27B] | | | | |
| Header | Timestamp | Command payload | | Sequence |
| 1B | 4B | 20B DATA | 1B CRC | 1B |

|  |  |  |
| --- | --- | --- |
| Command DATA payload[20B] | | |
| CMD | Length | Data |
| 1B | 1B | 18B |

|  |  |  |
| --- | --- | --- |
| List of CMD | Description | Encryption |
| 0x00 | Pairing open | No |
| 0x01 | Pairing request | Yes |
| 0x02 | Pairing ACK | Yes |
| 0x03 | Ping | Yes |
| 0x04 | Report request | Yes |
| 0x05 | Report ACK | Yes |

1. Pairing open

Gateway broadcast this CMD to all devices to ask for the pairing

|  |  |  |
| --- | --- | --- |
| Byte | Description | Value |
| 0..15 | Key encryption for network  (This actual key using to encrypt payload is derived from this key and default key) | any |
| 16..19 | Reverse |  |

1. Pairing request

Device send this CMD to gateway for asking to join network

|  |  |  |
| --- | --- | --- |
| Byte | Description | Value |
| 0 | Type of device | 0x00: power meter 1 phase 1 channel  0x01: power meter 1 phase 3 channel  0x02: power meter 3 phase 1 channel  0x03: product counter |
| 1..19 | Reverse |  |

1. Pairing ACK

ACK between gateway and device

|  |  |  |
| --- | --- | --- |
| Byte | Description | Value |
| 0 | Type of ACK | 0x00: pairing accepted  0x01: pairing cancle  0x02: pairing ack |
| 1..6 | MAC address  (address of device that gateway send to) | any |
| 7 | Group ID  (Gateway assigns to device in pairing accepted ) | 0 -> 255 |
| 8 | Device ID in group  (Gateway assigns to device in pairing accepted ) | 0 -> 19 |
| 9..19 | Reverse |  |

1. Ping

Gateway send to device to identification(blinking LED)

|  |  |  |
| --- | --- | --- |
| Byte | Description | Value |
| 0..19 | Reverse |  |

1. Report request

Gateway broadcast this CMD to all devices to ask for data report

|  |  |  |
| --- | --- | --- |
| Byte | Description | Value |
| 0 | Request type | 0x00: group id request  0x01: device id request  0x02: MAC request |
| 1..6 | MAC address | any |
| 7 | Group ID | 0 -> 255 |
| 8 | Device ID in group | 0 -> 19 |
| 9..19 | Reverse |  |

1. Report ACK

Gateway broadcast this CMD to all devices to show which device’s report is received successful

|  |  |  |
| --- | --- | --- |
| Byte | Description | Value |
| 0 | ACK type | 0x00: group ACK  0x01: device ACK  0x02: MAC ACK |
| 1..6 | MAC address | any |
| 7 | Group ID | 0 -> 255 |
| 8 | Device ID in group | 0 -> 19 |
| 9..11 | ACK check list (Every device in group will be presented by 1 bit)  Bit 0: device ID 0  Bit 1: device ID 1  ..  Bit 19: device ID 19  Bit 20..23: reverse | 0: No received  1: received |
| 12..19 | Reverse |  |

1. **Report packet**

Device send this packet for report data every time received CMD report request from gateway

1. Common format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Report Packet frame[27B] | | | | |
| Header | Timestamp | Report payload[21B] | | Sequence |
| 1B | 4B | 20B DATA | 1B CRC | 1B |

1. Data for power meter

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20B DATA payload for 1 phase 3 channel | | | | | | | | | |
| Voltage/Current | Current 1 | Current 2 | Current 3 | Power 1 | Power 2 | Power 3 | Energy 1 | Energy 2 | Energy 3 |
| 2B | 1B | 1B | 1B | 2B | 2B | 2B | 3B | 3B | 3B |

* 1. Voltage/current

Voltage range from 0 to 8191 V

|  |  |  |
| --- | --- | --- |
| Voltage/Current[2B] | | |
| Bit | Description | Value |
| 0..11 | Voltage = (Voltage multiple\*Voltage value/10)  Ex: Voltage value = 105, Voltage multiple = 1  -> Actual Voltage = 10.5V | 0 -> 8191 |
| 12 | Voltage multiple | 0: x1  1: x10 |
| 13 | Current 1 multiple | 0: x1  1: x10 |
| 14 | Current 2 multiple | 0: x1  1: x10 |
| 15 | Current 3 multiple | 0: x1  1: x10 |

* 1. Current 1,2,3

Current range from 0 to 255 A

Current = (Current multiple \* Current value/10)

Ex: Current value = 5, Current multiple = 1

-> Actual Current = 0.5A

* 1. Power 1,2,3

Power range from 0 to 65536 W

* 1. Energy 1,2,3

Energy range from 0 to 16,777,215 kWh

1. Data for product counter

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 20B DATA payload for product counter | | | | | | | |
| 1st 10s | 2nd 10s | 3rd 10s | 4th 10s | 5th 10s | 6th 10s | Total counter | Reverse |
| 1B | 1B | 1B | 1B | 1B | 1B | 4B | 10B |