TLV FORMAT

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type | Data Mark | Data Type | Length (Bytes) | Read Write | Fixed Unit |  |
| T | 0x09 | Acc Ax | 4 | R | G | Acceleration reading on the x axis |
| 0x0A | Acc Ay | 4 | R | G | Acceleration reading on the y axis |
| 0x0B | Acc Az | 4 | R | G | Acceleration reading on the z axis |
| 0x0C | Tmp102: Temp | 4 | R | °C | tmp102 temperature reading |
| 0x0D | Bme280: Temp | 4 | R | °C | bme280 temperature reading |
| 0x0E | Bme280: Hum | 4 | R | % | bme280 humidity reading |
| 0x0F | Bme280: hPa | 4 | R | hPa | pressure reading bme280 |
| 0x16 | Meter N. | 4 | RW | None | meter id |
| 0x19 | Packet Sentence | 1 | R | None | packet of data |
| 0x1B | Meter Type | 1 | RW | None | placeholder, variable that is consulted and is the reading of the gpio |
| 0x1C | Module Time | 6 | R | None |  |
| 0x1D | GPS coordinates | 8 | R | LA&LO | Corresponds to degrees, minutes, and seconds inHex |
| 0x1F | LEDs | 2 | RW | None | placeholder, variable that can be read (set state of the LEDs) or consulted (consult the state of the LEDs) |
| 0x22 | Error Status Word | 1 | R | None | error message header |

Error Status Word

|  |  |
| --- | --- |
| BIT3~BIT2 | BIT1~BIT0 |
| Sensor ID | Error Type |

|  |  |
| --- | --- |
| ID | sensor type |
| 0x30 | No sensor Error |
| 0x31 | Mpu6050 |
| 0x32 | Tmp102 |
| 0x33 | Bme280 |
| 0x34 | GPS |

|  |  |
| --- | --- |
| ID | error identifier |
| 0x40 | No error |
| 0x41 | No Device |
| 0x42 | No Data |
| 0x43 | Invalid Gps Data |

This section shows the ID of the associated sensor and the ID that identifies what type of error it is. At the moment, only errors have been established for the connection of the sensors and the failure to obtain data. More error codes will be added in future work. referring to other parts of the system

1. query of sensor measurements

data format: header+length +command code+ CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x24 |  |
| length | 1 | 0x03 | All bytes |
| Command code | 1 | 0xXX |  |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

End device response (return) data format

data format: header + packet data + length + meter n. + date time + GPS coordinates + sensor ID + error status + CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x26 |  |
| Packet data | 1 | 0x19 |  |
| length | 1 | 0x24 | All bytes |
| Meter n. | 1 | 0x16 |  |
| Meter n. data | 4 | 0xXXXXXXXX |  |
| Date time | 1 | 0x1C |  |
| Date time data | 6 | 0xXXXXXXXXXXXX |  |
| GPS coordenates | 1 | 0x1D |  |
| GPS coordenates data | 8 | 0xXXXXXXXXXXXXXXXX |  |
| Sensor ID | 1 | 0xXX | See TLV format |
| sensor measurement | 4 | 0xXXXXXXXX |  |
| Error status | 1 | 0x22 |  |
| Error device id | 1 | 0xXX | See Error Status |
| Error type | 1 | 0xXX |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

1. query of error

data format: header+length+command code+ CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x24 |  |
| length | 1 | 0x03 | All bytes |
| Command code | 1 | 0x22 | See Error Status |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

End device response (return) data format

data format: header + packet data + length + meter n. + date time + GPS coordinates + error status + CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x26 |  |
| Packet data | 1 | 0x19 |  |
| length | 1 | 0x1A | All bytes |
| Meter n. | 1 | 0x16 |  |
| Meter n. data | 4 | 0xXXXXXXXX |  |
| date time | 1 | 0x1C |  |
| Date time data | 6 | 0xXXXXXXXXXXXX |  |
| GPS coordenates | 1 | 0x1D |  |
| GPS coordenates data | 8 | 0xXXXXXXXXXXXXXXXX |  |
| Error status | 1 | 0x22 |  |
| Error device id | 1 | 0xXX | See Error Status Word |
| Error type | 1 | 0xXX |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

1. query of meter n.

data format: header+length+command code+ CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x24 |  |
| length | 1 | 0x03 | All bytes |
| Command code | 1 | 0x16 |  |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

End device response (return) data format

data format: header + packet data + length + meter n. + date time + GPS coordinates + CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x26 |  |
| Packet data | 1 | 0x19 |  |
| length | 1 | 0x17 | All bytes |
| Meter n. | 1 | 0x16 |  |
| Meter n. data | 4 | 0xXXXXXXXX |  |
| date time | 1 | 0x1C |  |
| Date time data | 6 | 0xXXXXXXXXXXXX |  |
| GPS coordenates | 1 | 0x1D |  |
| GPS coordenates data | 8 | 0xXXXXXXXXXXXXXXXX |  |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

1. status LED

QUERY

data format: header+length+command code+ CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x24 |  |
| length | 1 | 0x03 | All bytes |
| Command code | 1 | 0x1F |  |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

End device response (return) data format

data format: header + packet data + length + meter n. + date time + GPS coordinates+status led + CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x26 |  |
| Packet data | 1 | 0x19 |  |
| length | 1 | 0x19 | All bytes |
| Meter n. | 1 | 0x16 |  |
| Meter n. data | 4 | 0xXXXXXXXX |  |
| date time | 1 | 0x1C |  |
| Date time data | 6 | 0xXXXXXXXXXXXX |  |
| GPS coordenates | 1 | 0x1D |  |
| GPS coordenates data | 8 | 0xXXXXXXXXXXXXXXXX |  |
| LEDs | 1 | 0x1F |  |
| LEDs status | 1 | 0XX | 0X00: LED1 off  0x01：LED1 on  0x02：LED2 toggle |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

Change status

data format: header+length+command code+ code+CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x24 |  |
| length | 1 | 0x04 | All bytes |
| Command code | 1 | 0x1F |  |
| code | 1 | 0x00 | 0X00: LED1 off  0x01：LED1 on  0x02：LED2 toggle |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

End device response (return) data format

data format: header + packet data + length + meter n. + date time + GPS coordinates+status led + CRC16

|  |  |  |  |
| --- | --- | --- | --- |
| name | byte | Data | Description |
| Frame header | 1 | 0x26 |  |
| Packet data | 1 | 0x19 |  |
| length | 1 | 0x19 | All bytes |
| Meter n. | 1 | 0x16 |  |
| Meter n. data | 4 | 0xXXXXXXXX |  |
| date time | 1 | 0x1C |  |
| Date time data | 6 | 0xXXXXXXXXXXXX |  |
| GPS coordenates | 1 | 0x1D |  |
| GPS coordenates data | 8 | 0xXXXXXXXXXXXXXXXX |  |
| LEDs | 1 | 0x1F |  |
| LEDs status | 1 | 0XX | 0X00: LED1 off  0x01：LED1 on  0x02：LED2 toggle |
| CRC16 | 2 | 0xXXXX | Low bytes at the front,  high bytes at the back |

POR MODIFICAR:

Example:

26092F – acceleration query on the x axis

Answer:

24192116123456781C1303010000001B01094AC222344385

* 24: Header
* 1921: packet sentence + length 21
* 1612345678: meter no. Dec 12345678 - hex, 305419896
* 1C130301000000: wich 00:00:00 on march 1, 2019
* 1B01: consult gpio
* 094AC2: lectura aceleración eje x
* 223443: error status – 34 GPS – 43 invalid gps data.
* 85: checksum

262248 - error query

Answer:

241907223141B8

* 24: Header
* 1907: packet sentence + length 7
* 223441: error status – 31 MPU6050 – 41 no device
* B8: checksum