UC11-T1 Payload Structure V1.5

Contents

1.Uplink Payload Structure

An uplink message can be sent from end node to gateway. Additionally, the UC11-T1 sends different sensor data in different frames. In order to do that, all sensor data must be prefixed with two bytes:

Data Channel: Uniquely identifies each sensor in the UC11-T1 across frames, e.g. “TEMP Sensor”

Data Type: Identifies the data type in the frame, e.g. “Power”.

Note: The device cloud sends multiple sensor data at a time by using following payload structure:

1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	1 Byte	...
Channel1	Type1	Data1	Channel2	Type2	Data2	Channel 3	...

For UC11-T1, if the value of the channel is 1, it refers to the temperature sensor; if the value of the channel is 2, it refers to the humidity sensor; if the value of the channel is 3, it refers to the battery level.

Note: the app port of UC11-T1 is 85.

Uplink Packet Example

Frame N: Regular temperature and humidity uplink.

01 67 13 01 02 68 73					
Channel	Type	Value	Channel	Type	Value
01	67 (Temperature)	13 01 => 01 13 = 275 (27.5° C)	02	68 (Humidity)	73=>115 means 57.5%

Frame N+1: Battery capacity changes uplink.

03 75 5a		
Channel	Type	Value
03	75 (Battery Capacity)	5a = 90 means 90%

Frame N+2: Power on status, SN, hardware version, software version uplink

ff 0b ff ff 01 01					
Channel	Type	Value	Channel	Type	Value
ff=255	0b (Device Restart Notification)	0xff reserved.	ff=255	01 = 1 (Custom Format Version)	01 = 1 (Version 1)

ff 08 61 22 91 36 34 79		
Channel	Type	Value
ff=255	08 (Device SN)	61 22 91 36 34 79

ff 09 01 20 ff 0a 01 10					
Channel	Type	value	Channel	Type	Value
ff = 255	09 (Hardware version)	0120 (V1.2)	ff = 255	0a (Software version)	0110 (V1.10)

Frame N+3: temperature alarm report uplink

ff 0d 0a 0f 27 c8 00 2d 01		
Channel	Type	value
ff = 255	0d (Temperature alarm report)	0a=>10=2 (the mode of this alarm is above) 0f 27 means the lower warning threshold is null c8 00 => 00 c8 = 200 (20.0° C) means the upper warning threshold is 20.0° C 2d 01 => 01 2d = 301(30.1° C) means the current value of the temperature is 30.1° C

2.Downlink Payload Structure

A downlink message can be sent from gateway to end node in order to perform some actions on that device.

Note: the app port of UC11-T1 is 85.

1 Byte	2 Bytes	1 Byte1	1 Byte	2 Bytes	1 Byte
Channel1	Data1	0xff (reserved)	Channel2	Data2	0xff (reserved)

Downlink Packet Example

Devices with temperature and humidity sensors.

Frame N: Set the data reporting interval as 20mins (1200s).

ff 03 b0 04		
Channel	Type	Value
ff = 255	03 (set data collecting interval)	b0 04 => 04 b0 = 1200 (second)

Frame N+1: Set temperature threshold alarm to be triggered as soon as temperature goes above 35° C, and remains above 30° C for 15s. It will then start checking temperature again after 5 minutes and trigger once more if temperature is above 30° C for 15s.

ff 06 02 00 00 5e 01 2c 01 0f 00		
Channel	Type	Value
ff = 255	06 (set temperature threshold alarm)	02 = above 00 00 means the lower warning threshold is null 5e 01 => 01 5e => 350(35° C) 2c 01 => 01 2c = 300 (Lock time 300s) 0f 00 => 00 0f = 15 (Duration 15s)

Frame N+2: Set temperature threshold alarm to be triggered as soon as temperature goes below 20° C, and remains below 20° C for 15s. It will then start checking temperature again after 5 minutes and trigger once more if temperature is below 20° C for 15s.

ff 06 01 c8 00 00 00 2c 01 0f 00		
Channel	Type	Value
ff = 255	06 (Set temperature threshold alarm)	01 = below c8 00 => 00 c8 => 200(20° C) 00 00 means the upper warning threshold is null 2c 01 => 01 2c = 300 (Lock time 300s) 0f 00 => 00 0f = 15 (Duration 15s)

Frame N+3: Set temperature threshold alarm to be triggered as soon as temperature goes within 20° C and 35° C, and remains within 20° C and 30° C for 15s. It will then start checking temperature again after 5 minutes and trigger once more if temperature is within 20° C and 35° C for 15s.

ff 06 03 c8 00 5e 01 2c 01 0f 00		
Channel	Type	Value
ff = 255	06 (set temperature threshold alarm)	03 = within c8 00 => 00 c8 => 200(20° C) 5e 01 => 01 5e => 350(35° C) 2c 01 => 01 2c = 300 (Lock time 300s) 0f 00 => 00 0f = 15 (Duration 15s)

Frame N+4: Set LoRa channel mask, only enable channels with index 0,2,4,18,20.

ff 05 01 15 00 ff 05 02 14 00		
Channel	Type	Value
ff = 255	05 (set LoRa channel mask)	01 means set the channel index within 0-15. 15 00 => 00 15 => 0000000000010101 means enable channels with index 0,2,4.
Channel	Type	Value
ff = 255	05 (set LoRa channel mask)	02 means set the channel index within 16-31. 14 00 => 00 14 => 0000000000010100 means enable channels with index 18,20.

3.Data Types

3.1 IPSO Standard Definition

Data Types conform to the IPSO Alliance Smart Objects Guidelines, which identifies each data type with an “Object ID” . However, as shown below, a conversion is made to fit the Object ID into a single byte.

DATA_TYPE = IPSO_OBJECT_ID - 3200

Type	IPSO	Hex	Data Size	Data Resolution per bit
Temperature Sensor	3303	67	2	0.1 °C Signed MSB
Humidity Sensor	3304	68	1	0.5% Unsigned
Current	3317	75	1%	1%

Example:

Devices with temperature and humidity sensors.

Frame N

01 67 D7 FF		
Channel	Type	Value
01	67 means temperature	D7 FF=>FFD7 = -41 means -4.1° C

Frame N+1

01 68 73		
Channel	Type	Value
02	68 means humidity	73= 115 means 57.5%

3.2 Ursalink Custom Format

Type	Type ID	Data Size	Data Resolution (per bit)
Ursalink Custom Format Version	1	1	0x01
Data Collection Interval	2	2	1s
Data Reporting Interval	3	2	1s
LoRa Channel Mask	5	3	ID (1B) + Value (2B) ID: 1~6
Set Temperature Threshold Alarm	6	9	Mode(1Byte) +Min(2Bytes) +Max(2Bytes)+Lock Time(2Bytes) +Continue Time (2Bytes) Mode(bit0~bit2): 0: disable, 1: below, 2: above, 3: within, 4: above or below Min: the lower warning threshold Max: the upper warning threshold
Temperature Alarm Report	13	7	Mode (1B) +Min(2B) +Max (2B)+Cur(2B) Mode(bit0~bit2): 0: disable, 1: below, 2: above, 3: within 4: above or below Min: the lower warning threshold Max: the upper warning threshold Cur: the current value of the temperature sensor

Debug Level	7	1	Bit0: info Bit1: debug Bit2: warn Bit3: err
Product SN	8	6	641090824375 => 0x641090824375
Hardware Version	9	2	0110 => 0x01 0x10
Software Version	10	2	0110 => 0x01 0x10
Device Power on Notification	11	1	0xff reserved. Contents reported after reboot each time: Ursalink Custom Format Version+SN+Hardware Version +Software Version+the battery level
Device Power Off Notification	12	1	0xff reserved
Temperature Intelligent Report	19	1	00: Disabled 02: When the temperature changes beyond 2℃ (35.6℉), the device will automatically report the latest value.

3.3 LoRaWAN Parameter

Device EUI	24E1+SN
APP EUI	24E1+24C0002A0001
App Port	0x55
NetID	0x010203
DevAddr	The last 8 digits of SN.
AppKey	5572404c696e6b4c6f52613230313823
NwkSKey	5572404c696e6b4c6f52613230313823
AppSKey	5572404c696e6b4c6f52613230313823

4.Decoder Example

```
// T1: Payload Decoder
function Decoder(bytes, port) {
  var decoded={};

  for(i=0;i< bytes.length;){

    //BATTERY
    if(bytes[i]==0x03){
      decoded.battery=bytes[i+2];
      i+=3;
      continue;
    }

    //TEMPERATURE
    if(bytes[i]==0x01){
      decoded.temperature=(readInt16LE(bytes.slice(i+2, i+4)))/10;
      i+=4;
      continue;
    }

    //HUMIDITY
    if(bytes[i]==0x02){
      decoded.humidity=readUInt8LE(bytes[i+2]) / 2;
      i+=3;
      continue;
    }
```

```
    }
    return decoded;
}

function readUInt8LE(bytes) {
    return (bytes & 0xFF);
}

function readInt8LE(bytes) {
    var ref = readUInt8LE(bytes);
    return (ref > 0x7F) ? ref - 0x100 : ref;
}

function readUInt16LE(bytes) {
    var value = (bytes[1] << 8) + bytes[0];
    return (value & 0xFFFF);
}

function readInt16LE(bytes) {
    var ref = readUInt16LE(bytes);
    return (ref > 0x7FFF) ? ref - 0x10000 : ref;
}
```

---End---