Ursalink Control Protocol for UC11xx

V1.4

Contents

1.Uplink Payload Structure

An uplink message can be sent from end node to gateway. Additionally, the UC11xx sends different sensor data in different frames. Therefore, all sensor data must be prefixed with two bytes:
Data Channel: Uniquely identifies each sensor in the UC11xx across frames.
Data Type: Identifies the data type in the frame.

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

1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	1 Byte	...
Channel 1	Type 1	Data 1	Channel 2	Type 2	Data 2	Channel 3	...

Channel ID	Description
1	Digital Input 1
2	Digital Input 2
...	...
8	Digital Input 8
9	Digital Output 1
10	Digital Output 2
...	...
16	Digital Output 8
17	Analog Input 1
18	Analog Input 2
...	...
24	Analog Input 8

Uplink Packet Example:

UC1114 report uplink：

01 00 01 02 00 00 09 01 00 0a 01 01					
Channel	Type	Value	Channel	Type	Value
01 means Digital Input1	00 means Digit Input	01 means high	02 means Digital Input2	00 means Digit Input	00 means low
Channel	Type	Value	Channel	Type	Value
09 means Digital Output1	01 means Digital Output	00 means low	0a =>10 means Digital Output2	01 means Digit Output	01 means high

UC1122 regular report uplink (there are 3 uplink packages)：

11 02 7407 0000 8f07 6c00 12 02 9407 0000 ab07 6e00					
Channel	Type	Ccy Value	Min Value	Max Value	Avg Value
11=>17 means Analog Input1	02 means Analog Input	7407=> 19.080 000000 000002	0000=> 0000	8f07=> 19.35	6c00=> 1.08
Channel	Type	Ccy Value	Min Value	Max Value	Avg Value
12=>18 means Analog Input1	02 means Analog Input	7407=> 19.080 000000 000002	0000=> 0000	ab07=> 19.63	6c00=> 1.1

01 00 01		
Channel	Type	Value
01 means Digital Input1	00 means Digital Input	00 means high

09 01 00		
Channel	Type	Value
09 means Digital Output1	01 means Digital Input	00 means low

UC1152 regular report uplink (there are 3 uplink packages)：

ff 0e 19 08 01 ff 0e 1b 13 ec ff				
Channel	Type	Channel ID	Data Type	Value of this channel.
ff	0e means the Data of RS485 slave devices	19=>25 means RS485 (Modbus Master) Channel 1	08 => 00001000 000=>0 means Coil 00001=>1 means Data length = 1	01
Channel	Type	Channel ID	Data Type	Value of this channel.
ff	0e means the Data of RS485 slave devices	1b=>27 means RS485 (Modbus Master) Channel 3	13 => 00010011 011=>3 means Holding Register (INT16) 00010=>2 means Data length = 2	ecff=> 65516

01 00 01		
Channel	Type	Value
01 means Digital Input1	00 means Digital Input	00 means high

09 01 00		
Channel	Type	Value
09 means Digital Output1	01 means Digital Input	00 means low

2.Downlink Payload Structure

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

When the channel range is 1~253, the format is:

1 Byte	2 Bytes	1 Byte1	1 Byte	2 Bytes	1 Byte	...
Channel 1	Data 1	0xff (reserved)	Channel 2	Data2	0xff (reserved)	...

When the channel range is above 255, the format is:

1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes
255	Type 1	Data 1	255	Type 2	Data 2

Frame N: Set the data reporting interval as 20mins (1200s), and only enable channels with index 0,1,2.

ff 03 b0 04 ff 05 01 07					
Channel	Type	Value	Channel	Type	Value
ff = 255	03 (set data collecting interval)	b0 04 => 04 b0 = 1200 (second)	ff = 255	05 (set Channel Mask)	01 (set channel as with index within 0-15. 07= 00000111 (enable channels with index 0,1,2.)

Frame N+1: Set the data collection interval as 60s

ff 02 3c 00		
Channel	Type	Value
ff = 255	02 (set data collecting interval)	3c 00 => 00 3c = 60 (second)

Frame N+2: Set the digital output 1 as high

09 01 00 ff		
Channel	Type	00 ff
09 means Digital Output 1	01 means high	reserved

Frame N+3: Set the digital output 2 as low

0a 00 00 ff		
Channel	Type	00 ff
0a means Digital Output 2	00 means low	reserved

Frame N+4: Set the device time

ff 11 3d 1c de 5d		
Channel	Type	timestamp
ff = 255	11=> 17 means setting the device time	3d 1c de 5d => 5d de 1c 3d => 1574837309 => 2019/11/27 14:48:29

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 Byte
Digital Input	3200	0	1	1
Digital Output	3201	1	1	1
Analog Input	3202	2	8 (ccy+min+max+avg)	0.01 signed
Analog Output	3203	3	2	0.01 signed

3.2 Ursalink Custom Format

Type	Type ID	Data Size	Description/Example
Ursalink Custom Format Version	1	1	0x01
Data Collection Interval	2	2	Unit: 1s
Data Reporting Interval	3	2	Unit: 1s
LoRa Channel Mask	5	3	ID (1Byte) + Value (2Byte) ID: 1~6
Debug Level	7	1	Bit 0: info Bit 1: debug Bit 2: warn Bit 3: 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 rebooting each time: Ursalink Custom Format Version+SN+Hardware Version +Software Version+the battery level
The Data of RS485 Slave Devices	14	mutable	Channel ID of RS485 (1 bit) + Data Type (8 bits) + Value (N Bytes) Data Type (0~2 bits): 00: Coil 01: Discrete 02: Input Register (INT16) Input Register (INT 32 with upper 16 bits) Input Register (INT 32 with lower 16 bits) 03: Holding Register (INT16) Holding Register (INT 32 with upper 16 bits) Holding Register (INT 32 with lower 16 bits) 04: Holding Register (INT32)

			05: Holding Register (Float) 06: Input Register (INT32) 07: Input Register (Float) (3~7 Bits): Data Length
Set Device Time	17	4	3d 1c de 5d => 5d de 1c 3d => 1574837309 => 2019/11/27 14:48:29

Channel ID of RS485	Description
25	RS485(Modbus Master) Channel 1
26	RS485(Modbus Master) Channel 2
27	RS485(Modbus Master) Channel 3
...	...
32	RS485(Modbus Master) Channel 8

3.3 LoRaWAN Parameter

Device EUI	24E1+SN
APP EUI	24E124C0002A0002
App Port	0x85
NetID	0x010203
DevAddr	The last 8 digits of SN.
AppKey	5572404c696e6b4c6f52613230313823
NwkSKey	5572404c696e6b4c6f52613230313823
AppSKey	5572404c696e6b4c6f52613230313823