YDLIDAR

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YDLIDAR TIA DEVELOPMENT MANUAL BETA

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CONTENTS

1 SYSTEM COMMUNICATION

1.1 Communication Mechanism

TIA uses the network to interact with external devices for commands and data. When an external device sends a system command to TIA, TIA resolves the system command and returns a corresponding reply message. According to the command content, TIA switches the corresponding working status. According to the content of the message, the external system can parse the message and obtain the response data.

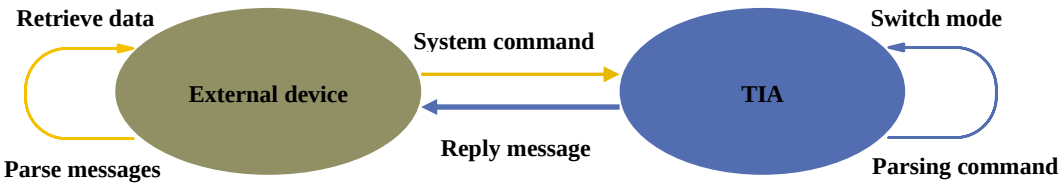
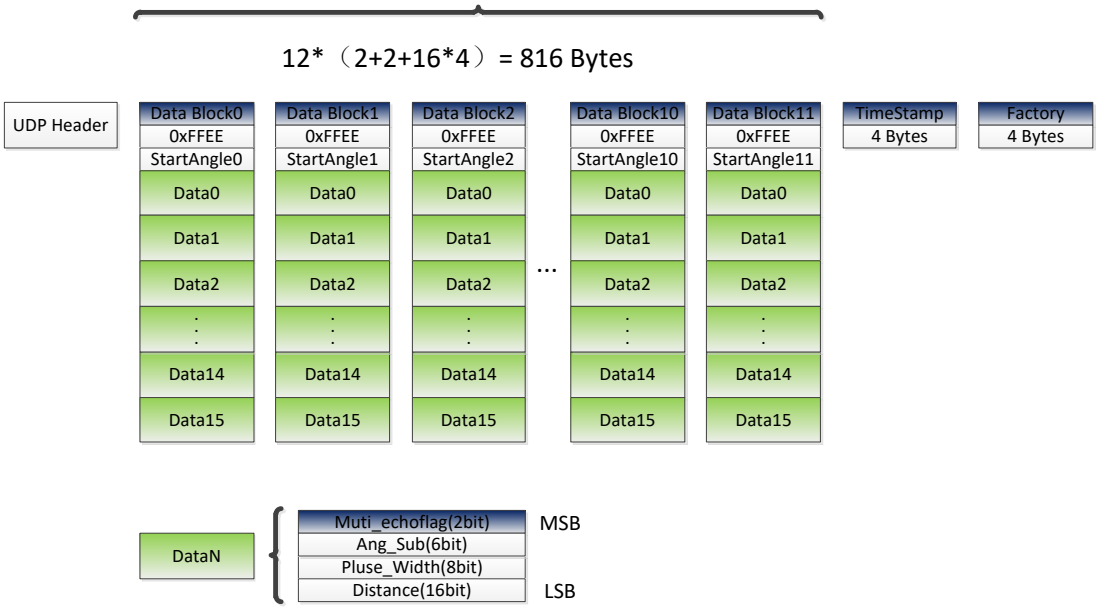


FIG 1 YDLIDAR TIA SYSTEM COMMUNICATION

2 DATA PROTOCOL

TIA point cloud data is transmitted based on UDP protocol packets over Ethernet. Each UDP packet has a total length of 832 Byte, including 8 UDP protocol information fields, 816 Byte point cloud information fields, 4 Byte timestamp fields and 4 Byte factory-defined fields.

The 816 Byte point cloud information field is divided into 12 groups of 68 Byte each, including 2 Byte of data header (0xFFEE), 2 Byte of start Angle information and 64 Byte of point cloud information (16 points). The point cloud information of each point contains 1 Byte of multi-echo flag & Angle value increment information, 1 Byte of intensity signal and 2 Byte of distance value.



Set Data Block0 in the data packet be:

```
FF EE 26 25 22 30 01 92 23 31 01 7F 26 30 01 8B 25 30 01 85 23 30 01 90 25 30
01 80 25 31 01 7B 23 30 01 7B 26 2F 01 7B 25 30 01 84 23 34 01 80 23 34 01 80
25 31 01 94 25 31 01 94 23 30 00 00 26 2F 00 00
```

According to the Data protocol, in Data Block0, the starting Angle is 26, 25, and Data0 is 22, 30, 01, 92.

2.1 Multi Echo Analysis

Multi-echo flag solution formula: $Muti\_echoflag = DataN[30:31]$

TIA integrates multiple echo recognition algorithm, and the points of multiple echo signals will be in Muti_ Echoflag is marked, and users can filter the points of multiple echo signals according to the actual use, as follows:

1) Muti_ Echo flag=0, first echo
2) Muti_ Echo flag=1, second echo

Data0 in the data package is 22 30 01 92, which is substituted into the formula, Muti_ Echo flag=0, which is the first echo.

2.2 Angle Analysis

Angle solution formula: $Angle_i = StartAngle + \sum_{i=0}^{i+1} Ang_{sub_i} \quad (i = 0,1,2 \dots 15)$

Starting angle solution formula： $StarAngle = \frac{Si}{100}$

Angle increment solution formula: $Ang\_Sub_i = \frac{DataN[24:29]}{100} \quad (i = n)$

In the data package, the starting angle is 26 25, and the Data0 is 22 30 01 92, which is substituted into the formula:

$StartAngle_0 = 97.65^\circ$ ， $Ang\_Sub_0 = 0.34^\circ$

$Angle_0 = 97.65^\circ + 0.34^\circ = 97.99^\circ$

2.3 Intensity signal analysis

Intensity calculation formula: $Pluse\_Width = DataN[16:23]$

Data0 in the data package is 22 30 01 92, which is substituted into the formula, Plus_ Width = 48.

2.4 Distance Analysis

Distance calculation formula: $Distance = DataN[0:15]$

In the data package, Data0 is 22 30 01 92, which is substituted into the formula, Distance=402mm.

2.5 Timestamp Parsing

The timestamp is used to record system time with a resolution of 100ns.

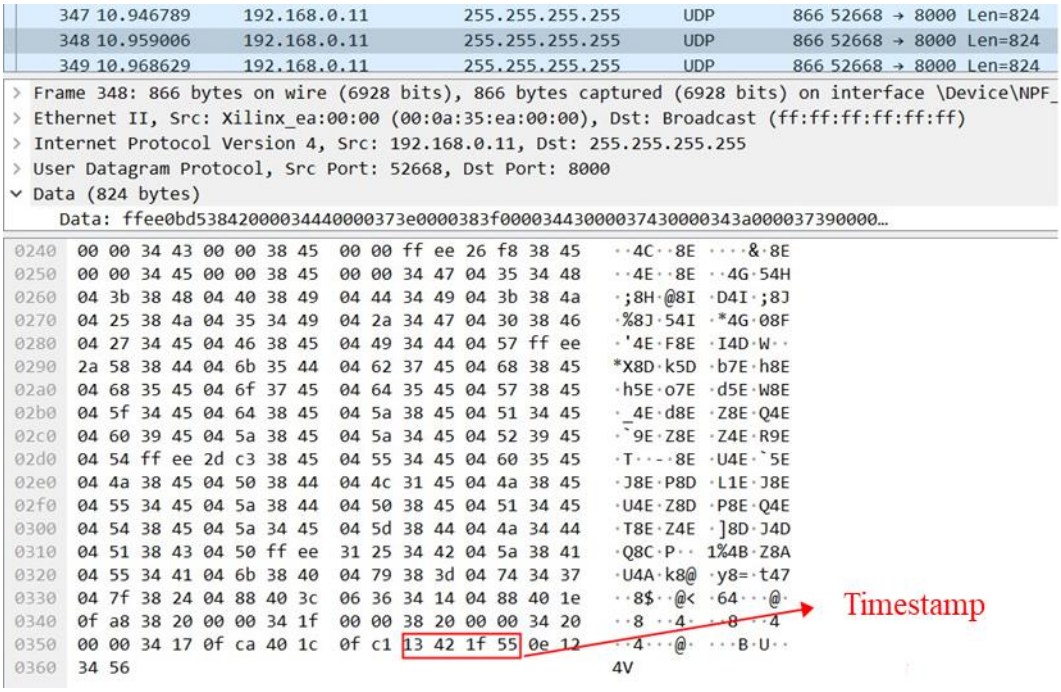


FIG 2 UDP PACKET PARSING INSTANCE

According to the data protocol, in Figure 2, TimeStamp is 13 42 1f 55.

The time calculation information is as follows:

1) Extract the hexadecimal timestamp of UDP packets: 0x13, 0x42, 0x1f, 0x55.
2) Convert decimal to 32310050.1us.

3 REVISE

Date	Version	Content
2023-04-26	0.1.0	The 1st release
2023-07-19	0.1.1	Update Section 2.1