ANYTREK TRACKING DEVICE TCP PROTOCOL

V1.9

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Version	Modification Date	Modify content	Remarks
V0.1	2016-03-17	create	KK Zhu
V0.2	2017-03-14	Add Charge and ACC status, add Bit5 for alarm status	KK Zhu
V0.3	2017-07-03	Add a flowchart that sets the upload interval	KK Zhu
V1.5	2018-01-03	Create English version	Mario
V1.6	2018-01-10	Revised	Noam
V1.7	2018-04-12	Tamper alarm and SOS alarm added	Finley Zheng
V1.8	2018-04-28	Server Response modified	Noam
V1.9	2019-01-29	Modify the Charging and ACC status	Noam

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Communication Protocol

1. Introduction

This document defines the application layer of Anytrek's GPS tracking platform. The relevant interface protocols only apply to the interaction between the platform and the tracking devices.

2. Compatibility

Applicable platform version VT1501/VT1508/VT1611/VT1711 and later versions, not compatible with earlier versions.

3. Terms and Definitions

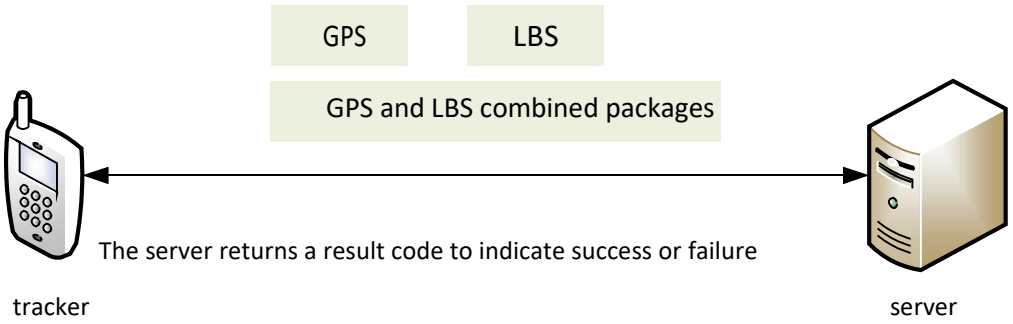
Acronym	Explanation
CMPP	China Mobile Peer to Peer
GPS	Global Positioning System
TCP	Transport Control Protocol
LBS	Location Based Services
IMEI	International Mobile Equipment Identity
MCC	Mobile Country Code
MNC	Mobile Network Code
LAC	Location Area Code
Cell ID	Cell Tower ID
UDP	User Datagram Protocol
CRC	Cyclic Redundancy Check

Basic Data Type

U8	1 Byte unsigned integer
S8	1 Byte signed integer
U16	2 Byte unsigned integer
S16	2 Byte signed integer
U32	4 Byte unsigned integer
S32	4 Byte signed integer

4. Basic rules

After connecting, the device sends GPS or LBS packets periodically or sends GPS and LBS combined packets to the server after the GPS information has changed. The server can set the default protocol.



5. Data Packet Format

5.1 Report Packet Sent from Device to Server

Communication is asynchronous, length size in bytes. Total package length：(11 + N) bytes.
However, the effective Packet Length is counted on the parts in Red only.

Field	Start	Packet Length	Protocol No.	Data Content	Sequential No.	CRC Check	Stop
Type	U16	U16	S8	N	U16	U16	U16

1) Start

Fixed value, unified as hexadecimal: 0x7878.

2) Packet Length

Effective data length, not the total package length.
Packet Length = Protocol Number + Data Content + Sequential Number + CRC Check
Total (5+N) bytes, the Data Content is a variable length field.

3) Protocol number

Different protocol number corresponds to different data content.

Content	Number
GPS, Heartbeat, status, statistics and merge information	0x30

4) Sequential Number

The first data packet (including Status, GPS and/or LBS and other data packets) sent after power-on has a sequential number of 1, and the sequential number increases by 1 with each data packet. This sequential number helps to tell the correct order of multiple packets.

5) Data Content

Different protocol number corresponds to different data content.

6) CRC Check

The device or the server can use the CRC Check to verify the integrity of the received information, and the CRC-ITU method is used here. The CRC-ITU values is calculated from Packet Length to Sequential Number (including Packet Length and Sequential Number).

7) Stop

Fixed value, unified as hexadecimal:0x0D0A.

5.2 Response Packet sent from Server to Device

Communication is asynchronous, length size in bytes. Total package length：(11 + N) bytes. However, the effective Packet Length is counted on the parts in Red only.

Field	Start	Packet Length	Protocol No.	Data Content	CRC Check	Stop
Type	U16	U16	S8	N	U16	U16

1) Start

Fixed value, unified as hexadecimal: 0x7878.

2) Packet Length

Effective data length, not the total package length.
Packet Length = Protocol Number + Data Content + CRC Check
Total (3+N) bytes, the Data Content is a variable length field.

3) Protocol number

Same as the report packet received.

4) Data Content

Different protocol number corresponds to different data content.

5) CRC Check

The device or the server can use the CRC Check to verify the integrity of the received information, and the CRC-ITU method is used here. The CRC-ITU values is calculated from Packet Length to Sequential Number (including Packet Length and Sequential Number).

6) Stop

Fixed value, unified as hexadecimal:0x0D0A.

6. Protocol

GPS, Heartbeat, status, statistics combined packet: 0x30

Field	Device ID	Firmware Version	Battery Voltage	Signal Strength	Date and Time	GPS	InfoIndex and SettingIndex	Charging and ACC status	Recharging Current	Mileage	Reserved
Type	U8[8]	U16	U16	U8	N	N	U8[8]	U8	U16	U32	U16

6.1 Device ID

For example, a device with a 15 digit IMEI number as: 123456789012345,
the Device ID is in BCD format as: 0x01 0x23 0x45 0x67 0x89 0x01 0x23 0x45

6.2 Firmware Version

Firmware version of the device in integer, such as: 1，2，3 …

6.3 Battery Voltage

One unit represents 10mV, if a voltage is 4.12V, the value is 412: 412*10mV=4.12V

6.4 Signal Strength

Expressed as a percentage between 0-100%

6.5 Date and Time

Field	Year	Month	Day	Hour	Minute	Second
type	U8	U8	U8	U8	U8	U8

The Year value is the current year minus 2000，e.g，for year 2016, value is 16.
e.g：2010 year 3 month 23 day 15 hour 50 minute 23 second
The value is: 0x0A 0x03 0x17 0x0F 0x32 0x17

6.6 GPS

GPS information length, Number of satellites used for fix	Latitude	Longitude	Speed	Status, Heading
U8	U32	U32	U8	U16

6.6.1 GPS information length, number of satellites used for fix

The high 4bits for GPS Information length, the low 4bits for the number of satellites used for fix.

Note: The GPS information length includes itself, aka 1 byte.

Example: for the above example, the value is 0 x CC, the length of the GPS information is 12 bytes, and the number of satellites used to fix the location is 12.

6.6.2 Latitude

The absolute value of the latitude data in a 64bit integer. The value range is from 0 to 162000000, which indicates 0 to 90 degree, unit: 1/500 second, the conversion method is as follows:

Convert the latitude output from the GPS module into degrees in decimal format first; and then multiplied by 30000, the result can be converted into hexadecimal. For example, 22° 32.7658', (22 x 60 + 32.7658) x 30000 = 40582974. Then convert to hexadecimal number as 0x02 0x6B 0x3F 0x3E.

6.6.3 Longitude

The absolute value of the longitude data in 64bit integer. The value range is 0 to 324000000, which indicates 0 to 180 degree, unit: 1/500 second, conversion method is the same as latitude above.

6.6.4 Speed

The value of speed, unit: 1km/h, the value range is from 0x00 ~ 0xFF, which indicates 0 ~ 255 km/h.

6.6.5 Status, Heading

Takes up 2 bytes, indicates GPS status and heading direction.
Heading direction takes last 10 bits, in the range of 0 ~ 360 degree, unit: degree, with 0 degree pointing to north and measured clockwise.

The first byte								The second byte							
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
No definition	No definition	No definition	GPS fixed or not	East or west longitude	South or north latitude	Heading direction									

0：South latitude　　1：North latitude
0：East longitude　　1：West longitude
0：GPS not fixed　　1：GPS is fixed

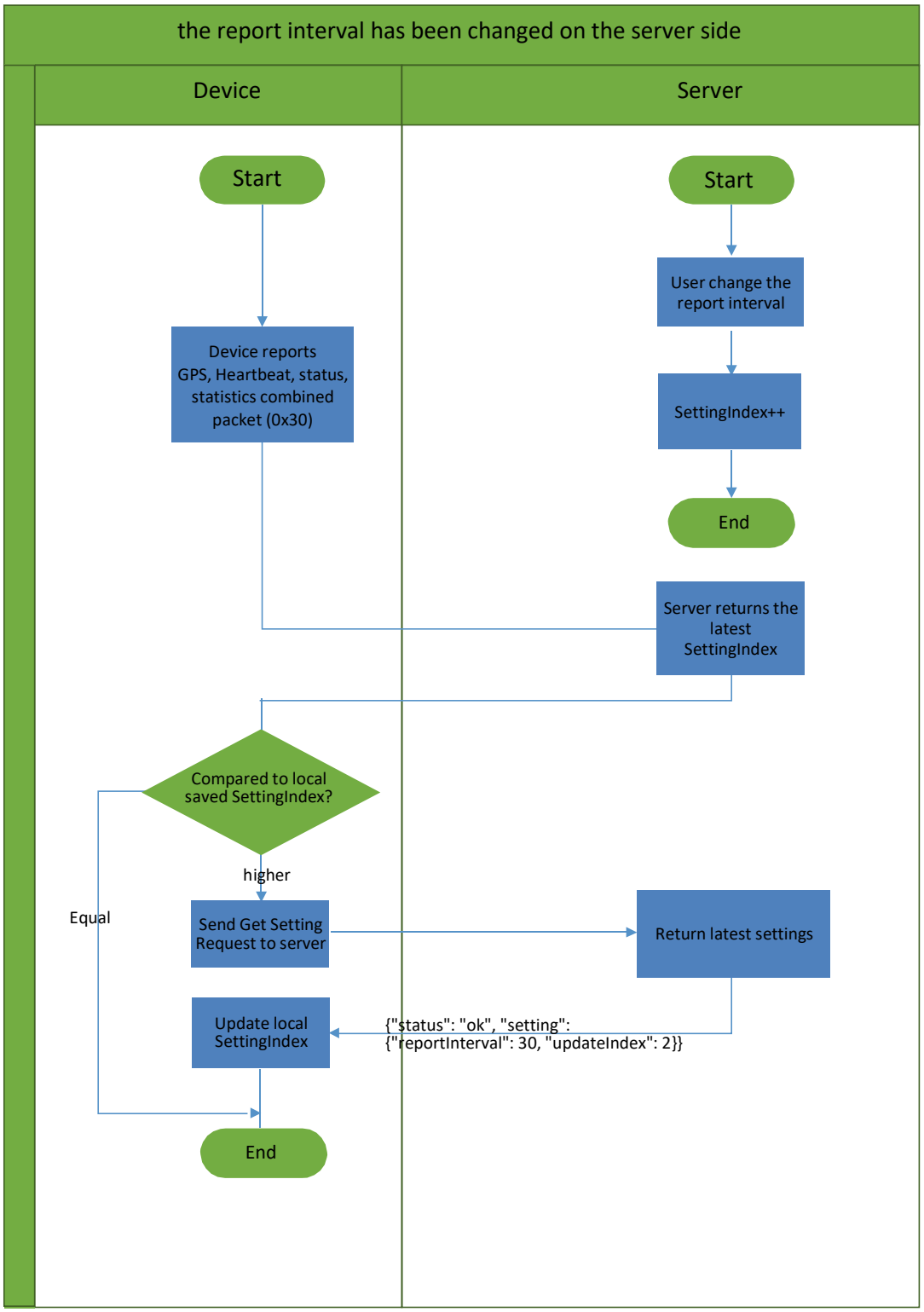
Note: The GPS information is captured at the moment specified by the Date and Time field.

For example: a value of 0x15 0x4C, into binary is 00010101 01001100, means that GPS has been fixed, east longitude, north latitude, heading 332 °

6.7 InfoIndex and SettingIndex

InfoIndex	SettingIndex
S32	S32

These two indexes are for the synchronization of device information and device settings between the device and the server. When the device communicates with the server, the two indexes will be compared, if the indexes is not the same, that means some information or settings has been changed, the side with a higher index number has the latest update. Thus a synchronization process will be triggered.
Fro example: how to change the report interval in the device


the report interval has been changed on the server side
Device
Server
Start
Start
User change the report interval
Device reports GPS, Heartbeat, status, statistics combined packet (0x30)
SettingIndex++
End
Server returns the latest SettingIndex
Compared to local saved SettingIndex?
higher
Equal
Send Get Setting Request to server
Return latest settings
Update local SettingIndex
{"status": "ok", "setting": {"reportInterval": 30, "updateIndex": 2}}
End

Flow chart supplementary explanation:

The device uses HTTP POST (POST only) to get the latest settings from the server, content format in JSON:

```
{
    "c": "uPulse",
    "id":  "123456789",
    "settingIndex":  1
}
```

Where:
"c" stands for command, value has to be "uPulse"
"id" is the identifier of the device, which can be found on the device
"settingIndex" is the local SettingIndex saved on the device side, set default as -1 in initial status.

After the server receives the request, it will compare the index to the SettingIndex saved on the server side. If the server side index is greater, means there is new update on the server, then it will return

```
{
    "status": "ok",
    "setting": {"reportInterval": 30, "updateIndex": 2}
}
```

Otherwise return

```
{
     "status": "ok"
}
```

The server must ensure that one of the two structures above is returned, or the device may not work properly.

6.8 Charging and ACC status

1 byte, 8 bits, each bit defined as follows

7	6	5	4	3	2	1	0
Reserved	Reserved	Tamper Alarm	SOS Alarm	Event		ACC	Charging

Bit7-6: Reserved
Bit5 : Tamper Alarm
0:Normal
1:Device is tampered
Bit4: SOS Alarm
0: Normal
1: SOS alarm is set off
Bit3-2: Event
00: still
01: driving
10: undefined
11: undefined
Bit1: ACC
1: ACC on
0: ACC off
Bit0: Charging
1:charging
0: Not Charging

6.9 Recharging Current

Battery charging current, unit in mA

6.10 Mileage

Unit: meter

6.11 Reserved

Two bytes

6.12 Server Response Data Content

	Error Code	Report Interval	Clear SOS Alarm Flag
format	0x00 *OK* 0x01 *Account does not exist* 0x02 *Server Error* 0x03 *Data Error* 0x04 *Other Errors*	*In seconds, new report interval setting sent from server to device*	0xFF: *clear alarm flag. Sent from server to confirm the alarm has been acknowledged* Other Value: *no effect*
type	U8	U16	U8

7. Sample Data

7.1 Report from Device to Server

The device uploads a data packet to the server, and the data is represented in hexadecimal as follows：

78 78 35 00 30 00 86 42 87 03 20 41 21 16 00 85 01 51 11 05 0C 0A 0D 20 C6 FD 24 A1 02 FF 8E AC 0C 01 00 14 04 00 00 00 FF FF FF FF 13 17 02 21 00 00 00 00 00 00 00 00 00 0D 0A

7878 - Start Mark
3500 – 0x0035 Package length: 53 bytes
30 – Protocol number: 48
0086428703204121 — Device ID: 86428703204121
1600 – 0x0016 Firmware version:22, LSB
8501 – 0x0185 Battery voltage:389, LSB
51 – 0x51 Signal strength:81
11 – 0x11 Year: 2017
05 – 0x05 Month: 5
0C – 0x0C Day: 12
0A – 0x0A Hour: 10
0D – 0x0D Minute: 13
20 – 0x20 Second: 32
C6 – 0xC6 GPS information length:12 bytes, number of satellites used for fix: 6
FD24A102 – 0x02A124FD Latitude:44115197 , divided by 1800000.0, equals to 24.50844277777778
FF8EAC0C – 0x0CAC8EFF Longitude:212635391, divided by 1800000.0, equals to 118.1307727777778
01 – Speed: 1km/h
0014 – 0x1400 Status and heading: LSB, details as follows:
GPS fixed or not: 0x1400>> 12 & 0x01, fixed
East or west longitude: 0x1400>> 11 & 0x01, East longitude
South or north latitude: 0x1400 >> 10 & 0x01, North latitude
Heading: 0x1400 & 0x03ff, 0 North direction
04000000 - 0x00000004 InfoIndex: LSB, 00004 in decimal
FFFFFFFF - 0xFFFFFFFF SettingIndex: LSB, -1 in decimal
13 - charge and ACC status:
Bit0: 1, charging
Bit1: 1, ACC on
Bit2-3: 00, idle
Bit4:1, alarm on
1702 - 0x0217 Charge current: LSB, 535 in decimal
21000000 - 0x00000021 Mileage: LSB, 33m
0000 - Reserved: two bytes
0000 - Sequential number: LSB, 0000
0000 - CRC Check: not a correct value, the device did not calculate CRC value, this field is not verified on our server side currently
0D0A - End Mark

7.2 Response from Server to Device

The server could response the following data back to the device:

78 78 07 00 30 00 00 00 00 00 00 0D 0A

7878 - Start Mark

0700 – 0x0007, Package length: 7 bytes

30 – 0x30 Protocol number: 48, same as

00 - Error Code: OK, no error

0000 – Reserved. Report Interval in seconds, not implemented on device side

00 - Clear Alarm: no effect

0000 – Reserved. CRC, not verified on device side

0D0A - End Mark