Chileaf BLE Protocol
(V0.6)

version	Date	Editor	reviewer	Description
V0.1	2019.10.09	jzhou		First release
V0.2	2019.10.14	jzhou		Bluetooth broadcast data.
V0.3	2020.3.20	Rickon		
V0.4	2021.9.10	Rickon		

1. Definition of Bluetooth UUID

1.1. Bluetooth broadcast name

[Model name]-xxxxxxx, where xxxxxxx is a 7-bit id code

1.2. Bluetooth broadcast Manufacturer data

Manufacturer data	Data type description
Manufacturer identification ID	0xff04
Byte 0	Reserve
Byte 1	Battery level (0~100%)
Byte 2	Reserve
Byte 3	Heart rate data

1.3. Service and characteristics

- Custom service UUID:
  aae28f00-71b5-42a1-8c3c-f9cf6ac969d0

type	Attribute UUID	description	attribute
service	8f00		
TX characteristics	8f01	Read data from device	NOTIFY
RX characteristics	8f02	Write data to device	WRITE

- Heart rate service

type	Attribute UUID	description	attribute
Heart rate service	180d		
Heart rate data	2a37	Device notification	NOTIFY
Wear position	2a38	Read data from device	READ

- The Device Information service

type	Attribute UUID	description	attribute
The DEVICE service	180a		
Name of manufacturer	2a29	Read data from device	READ
The Model name	2a24	Read data from device	READ
Serial number	2a25	Read data from device	READ

Hardware version	2a27	Read data from the device	READ
The Firmware version	2a26	Read data from the device	READ
Software version	2a28	Read data from the device	READ

- Battery service

type	Attribute UUID	description	attribute
The DEVICE service	180f		
battery	2a19	Read and notify data	READ, NOTIFY

Note: the APP can read the battery level directly, also device can notify it.

2. Definition of data format

2.1. Data format

Head	length	Command	Data	Checksum
0xFF	N + 4	0x**	--	checksum
1 byte	1 byte	1 byte	N bytes	1 byte

2.2. Frame field description

Item	byte	type	description	The instance
Head	1	HEX	Pack start byte	0xFF
Length	1	HEX	From head to checksum	0x04 + N
Command	1	HEX	Function of the command	0 x01
Data	N	HEX	The data content	--
Checksum	1	HEX	The sum of whole pack except checksum	checksum

2.3. Checksum calculation method

1) First calculate the sum of head/length/command/data.
2) Then subtract the sum from 0;
3) Finally XOR 0x3a, and take the low 8-bit value as the value of checksum.

The following is the calculation template for reference

```
Public byte calcChecksum(byte[] dat) {
        Int I = 0;
        Byte res = 0;
        Int len = dat.length-1;
        For (I = 0;   I <len.   I++) {
           Res + = dat [I];
        }

        Int temp = (int) res;
        Temp & = 0xFF;
        Temp = (0 - temp);
        Temp & = 0xFF;
        Temp ^ = 0x3a;

        Res = (byte) (temp & 0xff);
        Return res;
    }
```

3. Definition of command

3.1. System commands

3.1.1.Get function list and protocol version-0x01(reserve)

Data bits	Command from APP	Reply from device	Functional description
Command	0x01	0x01	Get the feature list and protocol version
			reserve

3.1.2.Get user info and status information-0x03

Data bits	APP request	Device reply	Functional description
Command	0x03	0 x03	Gets user and status information
Data segment	None	0 x * *	ECG is open: 0 is not open, 1 is open
		0 x * *	Device charging information: 0: not charged; 1: in charge; 2:The battery is fully charged while charging
		0 x * *	The percentage of battery power is 0~100%
		0 x * *	User age
		0 x * *	User gender: 0-female, 1-male
		0 x * *	User weight: unit: kg

		0 x * *	User height: unit: cm
		0 x * *	User phone number: high byte
		0 x * *	User phone number:
		0 x * *	User phone number:
		0 x * *	User phone number:
		0 x * *	User phone number: low byte

3.1.3.Configure user information-0x04

Data bits	APP send	Device reply	Functional description
Command	0x04	0x04	Configure user information
	0 x * *	NA	User age
	0 x * *		User gender: 0-female, 1-male
	0 x * *		User weight: unit: kg
	0 x * *		User height: unit cm
	0 x * *		User phone number: high byte
	0 x * *		User phone number:
	0 x * *		User phone number:
	0 x * *		User phone number:
	0 x * *		User phone number: low byte

3.1.4.Set UTC time (with time zone)-0x08

Data bits	APP send	Device reply	Functional description
Command	0x08	0x08	Configure user information
	0 x * *		UTC: high byte
	0 x * *		UTC:
	0 x * *		UTC:
	0 x * *		UTC: low byte

3.2. Heart rate and step command

3.2.1.Real-time sports data notification-0x15

Data bits	APP reply	device notify	Functional description
Command		0 x15	
		0 x * *	Step high byte
		0 x * *	Step middle byte
		0 x * *	Step low byte

		0 x * *	Distance high byte –unit: cm
		0 x * *	Distance middle byte
		0 x * *	Distance low byte
		0 x * *	Calorie high – unit: 0.1 Kcal
		0 x * *	Calorie middle
		0 x * *	Calorie low

3.2.2.Get 7days exercise data-0x16

Data bits	APP request device	Device to the APP	Functional description
Command	0 x16	0x16	Seven days of historical data
	NA	0 x * *	UTC: high
		0 x * *	UTC:
		0 x * *	UTC:
		0 x * *	UTC: low
		0 x * *	Step of one day(n) high
		0 x * *	Step of one day:
		0 x * *	Step of one day: low
		0 x * *	Calories of one day (n) : high
		0 x * *	Calories of one day:
		0 x * *	Calories of one day: low
		…	…

3.2.3.Heart rate history data list request-0x21

Data bits	The APP requests	Device reply APP	Functional description
Command	0 x21	0 x21	Request a list of heart rate history data
		0 x * *	UTC 0: high
		0 x * *	UTC 0:
		0 x * *	UTC 0:
		0 x * *	UTC 0: low
		...	
		0 x * *	UTC n:
		0 x * *	UTC n:
		0 x * *	UTC n:
		0 x * *	UTC n:

Note: UTC time means that there is a pack of heart rate data at the beginning of this time.
If there is no historical data, a UTC time 0xffffffff reply.

3.2.4.Heart rate history data request-0x22

Data bits	The APP requests	Device reply APP	Functional description
Command	0 x22	0 x22/0 x23	Request heart rate history
	1- Request single data 2- Request all data(reserve) 3- Request all data after utc(reserve)	0 x * *	UTC or package number: high
	UTC n: high	0 x * *	UTC or package number:
	UTC n:	0 x * *	UTC or package number:
	UTC n:	0 x * *	UTC or package number:
	UTC n: low	0 x * *	Heart rate data 0
		0 x * *	Heart rate data 1
		0 x * *	Heart rate data n

Note:
1:APP needs to request the heart rate list(0x21) first and get all the UTC time of records, and then use the UTC time to request data;
2: If package end or no history, device will send 0x23 command to indicate it;
3: The first package of each history data will include UTC time, from the second package it send package number instead of UTC.

		0 x * *	UTC or package number:
		0 x * *	UTC or package number: low
		0 x * *	ACT-0: 5 minute action index
		0 x * *	ACT-1:5-minute action index
		0 x * *	ACT-2: 5 minute action index
		0 x * *	ACT-n: 5 minute action index

3.2.5. Acceleration 3D raw data-0x0C(Optional)

Data bits	The APP requests	Device reply APP	Functional description
		0x0C	3D raw data
		0x**	Xl1: low byte
		0x**	Xh1: hight byte
		0x**	Yl1
		0x**	Yh1
		0x**	Zl1
		0x**	Zh1

		0x**	Xl2
		0x**	Xh2
		0x**	……..
		0x**	zln
		0x**	zhn

note:
Send every 250ms

3.2.6.SPO2 Mode-0x37

Data bits	The APP requests	Device reply APP	Functional description
Command	0x37	0x37	
	0x**	0x**	0: exit spo2 mode 1: enter spo2 mode 2:inquire
		0x**	SPO2 value
		0x**	0:wrist posture wrong 1:wrist posture correct(face up)
		0x**	0: no signal <8: signal week >15:signal good
		0x**	0: not wear 1:wear

3.2.7.Temperature

Data bits	The APP requests	Device reply APP	Functional description
Command	0x38	0x38	Real time temperature （unit:*10℃）
		0x**	Ambient temperature (MSB)
		0x**	
		0x**	Wrist temperature (MSB)
		0x**	
		0x**	body temperature (MSB)
		0x**	

3.3. Rope skipping

3.3.1.Rope status-0x40

Data bits	The APP	Device reply APP	Functional description

	requests		
command	**0x40**	0x40	
1		UTC	MSB
2			
3			
4			
5		MODE	0:FREE ;1:COUNTER ;2:TIMER
6		COUNTER: target	< 9999(MSB)
7			
8		COUNTER:jumps	MSB
9			
10		COUNTER:TIME	MINUTE
11			SECOND
12		COUNTER:Calorie	MSB
13			
14		TIMER:Target time	Minute(<99)
15			second
16		TIMER:Current time	Minute
17			second
18		TIMER:Jumps	
19			
20		TIMER:Calorie	MSB
21			
22		FREE:Jumps	
23			
24		FREE:TIME	MINUTE
25			SEDOND
26		FREE:Calorie	MSB
27			
28		Jumps of day	
29			
30		Time of day	
31			
32		Calorie of day	
33			

3.3.2.Realtime rope notify-0x41

Data bits	The APP requests	Device reply APP	Functional description
command		0x41	
1		Current MODE	

2		Current jumps	
3			
6		Time	
7			ms
8		Calorie	
9			
10		elapsed time	Minute
11			Second
12		Current count down time	Minute
13			Second
14		If restart	1:restart。0:not restart
15		Trip	msb
16			

3.3.3.Set mode-0x42

Data bits	The APP requests	Device reply APP	Functional description
command	0x42	0x42	0x42
1	mode	0,1,2	FREE/COUNTER/TIMER
2	Target counter		
3			
4	Timer	Minute	
5		second	

3.3.4.Clear-0x45

Data bits	The APP requests	Device reply APP	Functional description
command	0x45	0x45	clear
1			