



Wireless Protocols

Contents

1 Introduction	3
2 Protocols.....	3
2.1 SMAC.....	3
2.2 Thread.....	3
2.3 BLE.....	4
2.4 GFSK.....	5
2.5 Comparison.....	6
3 References.....	7

1 Introduction

In the following document, information about which is the best wireless protocol depending on your application can be found.

To find this document useful is important to know precisely what is needed on your application. The wireless protocols that will be examined are:

- SMAC
- Thread
- BLE
- GFSK

2 Protocols

2.1 SMAC

Simple-Media Access Control is a lightweight software protocol based on the IEEE 802.15.4 protocol. It is intended to be used for fast product development and system evaluation. Low-cost applications that require basic primitives, such as transmit, receive and power and channel selection are good examples of SMAC use cases.

Very low power, easy-to-use, bidirectional, broadcast and unicast communication are some of the features that can be found in this protocol. SMAC is so small that it can fit into 4-8 KB. The size of the SMAC depends on all the extra elements that are added.

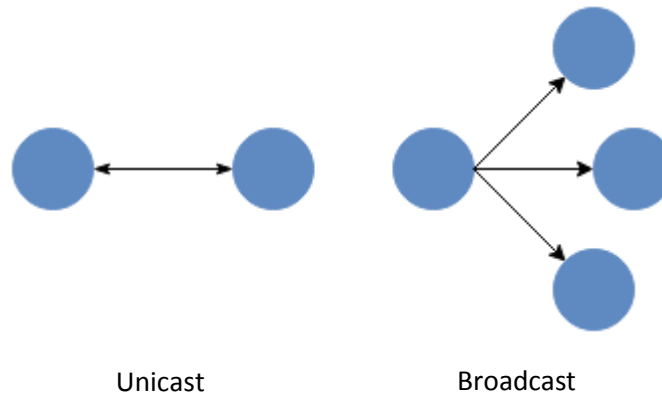


Figure 1. Basic SMAC topologies

2.2 Thread

Thread is an IPv6 based, closed-documentation (paid membership required for access to specifications) wireless protocol. The “Thread Group” is a working group formed by Nest Labs, Qualcomm, NXP and other companies with the intent to develop different Thread products.

The IEEE 802.15.4 technical standard is used by Thread as a physical and data link layer. This technical standard defines the operation of low-rate wireless personal area networks. Other wireless protocols,

for example ZigBee, are also based on this standard. Thus Thread and ZigBee applications can use the same chips. There are different applications as [dotdot](#) or OTAP that could be helpful for your project.

Thread is a mesh network topology designed to securely and reliably connect hundreds of products around the home. Being that Thread is only a network protocol, developers have the option to create any kind of application. Some good examples of Thread applications are: appliances, climate control, lighting and safety and security devices. The Thread Group is expanding its connectivity solution into the commercial building and professional sectors. It has been shown that Thread can be used for applications other than home automation. Such applications include advanced IT security options, multiple product commissioning and Large- and sub-network creation.

In summary, six advantages of using the IEEE 802.15.4/Thread are:

1. Designed for the home: Securely and reliably connect products around the home.
2. Built-In Security: Provides security at the network layer.
3. Battery friendly: Based on the power-efficient IEEE 802.15.4 MAC/PHY
4. Open IPv6 based protocol: Provides device-to-devices and device-to-cloud connections, interoperability and connectivity with other IP networks and make easier to connect different devices to a mesh because of the several number of directions provided by IPv6.
5. Robust mesh network: Devices can route messages with no single point of failure.
6. Simple to set up and use: Install using a smartphone, table or computer.

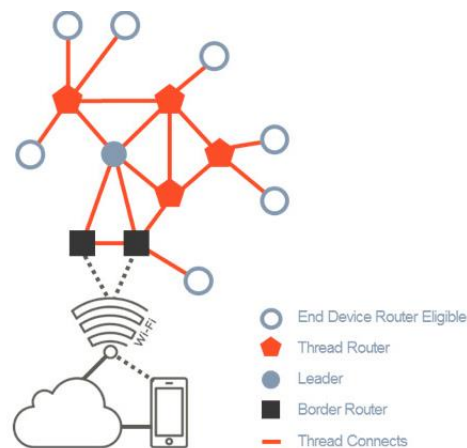


Figure 2. Example of Thread mesh¹

2.3 BLE

Bluetooth Low Energy (or Bluetooth Smart) is a wireless personal area network technology, this protocol is supported by several OS like Android, iOS, macOS, Windows and Linux. According to the Bluetooth SIG (Special Interest Group), is predicted that by 2018 more than 90 percent of smartphones will support BLE.²

This wireless protocol defines several profiles (specifications for how a device works in particular application) for low energy devices. Manufacturers are expected to implement the appropriate profile for their device in order to ensure compatibility. Some of the adopted profiles are:

- Health care profiles
- Sports and fitness profiles
- Internet connectivity
- Generic sensors
- HID Connectivity
- Proximity sensing
- Alerts and time profiles
- Battery

As we can see, there are several different profiles that may satisfy the needs of your application, even so, a custom profile can be developed incorporating custom services and characteristics that fulfill the requirements of your application. Tools provided by the Bluetooth SIG aid in the creation of custom profiles.

BLE applications are ideal for sensor-level technology, public transportation apps, health, fitness and monitoring devices. BLE is an excellent choice for smartphone/computer to device or device to device communication.

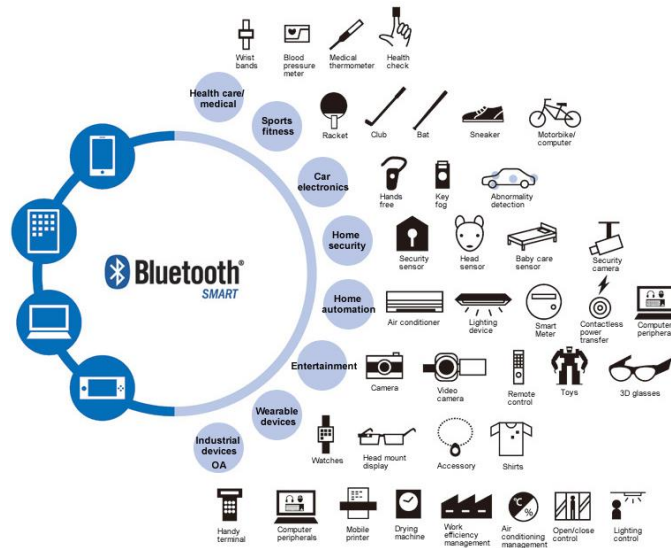


Figure 3. Different applications using BLE profiles³

2.4 GFSK

If none of the mentioned wireless protocols satisfies your necessities, using Generic frequency-shift keying (also known as GENFSK) to create your own protocol could be a good choice. GFSK is a frequency modulation scheme in which digital information is transmitted through discrete frequency changes. This modulation filters the data to make the transitions smoother has the advantage of reducing sideband

power and interference with neighbouring channels. With this modulation technique, you could create your own receiver and transmitter focusing on your needs such as data rate or distance.

2.5 Comparison

In table 1 can be found a comparison between the wireless protocols based on the KW41Z. GFSK is not included because its performance depends on the frequency modulation of the application.

	Size (kB)	Data rate (bps)	Network topology	Frequency (GHz)	Range (f)	Supported nodes
Thread	257-311	250k	Mesh	2.4	100	250
BLE	90-120	1M	P2P, star	2.4	200	2
SMAC	4-8	32k	Unicast, star	2.4	n/a	255

Table 1. Comparison between the wireless protocols

Considering the information in table 1, it will be easier to make a choice following the flow chart which is shown in figure 4.

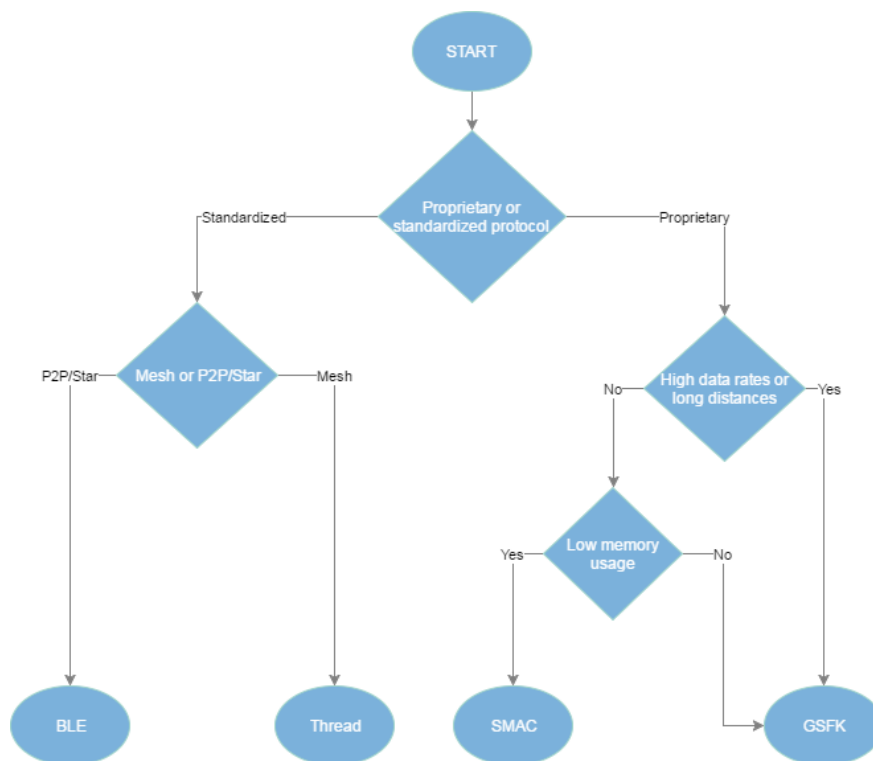


Figure 4. Wireless protocols flow chart

3 References

- 1- Thread Group. “*Our technology.*” Web. 18 Jan. 2017.
<http://threadgroup.org/technology/ourtechnology>
- 2- Rennison, Peter and Andrews, Allie. “*Sniffing and tracking wearable tech and smartphones.*” Realwire. 22 May 2015. Web. 18 Jan. 2017.
<http://www.realwire.com/releases/Sniffing-and-tracking-wearable-tech-and-smartphones>
- 3- Taiyo Yuden. “*Application Examples.*” Yuden. Web. 18 Jan. 2017.
<http://www.yuden.co.jp/ut/solutions/ble/application/>