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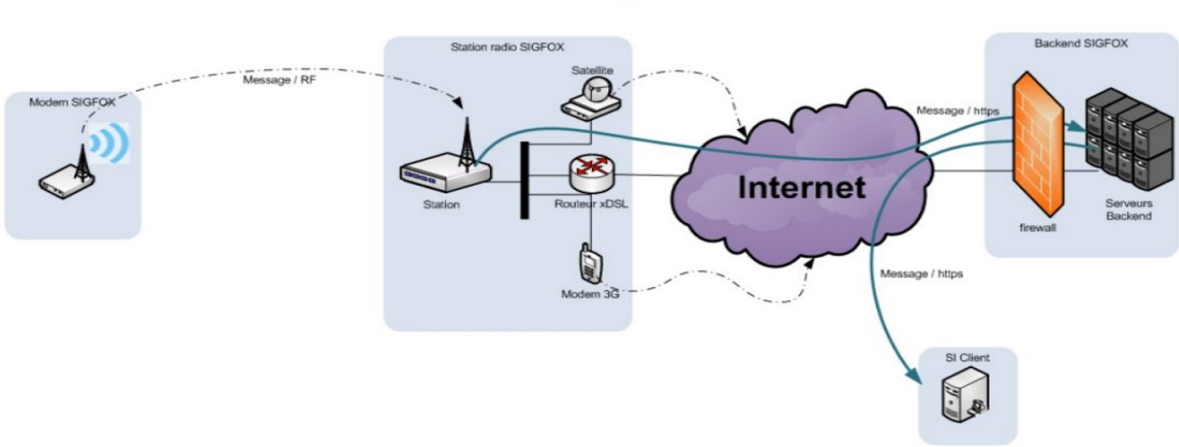
1. Introduction

Sigfox is an Ultra Narrow Band network developed by a french start-up in Toulouse. It is energetically efficient and uses unlicensed ISM-band frequency (868MHz in Europe). 92% of the French territory is covered by only 1200 antennas. Sigfox is settled in 26 countries and covers 1.6Million km². Sigfox is a fast and easy network to deploy. It is suitable for people who want to send small data a few times a day or less.



2. Characteristics

a. Communication

Sigfox is a 2-ways communication, but you can only use one way at a time (not full-duplex). However the device needs to request for data from the server. This means that it must be programmed to ask for data at specific events or time.

In the uplink communication, the Sigfox server can send messages with a 12 bytes payload against 8 bytes in downlink. Up to 140 messages can be sent per day with a 100Hz bandwidth. The spectral width used by Sigfox is 200kHz centered in 868MHz. This means that by taking a marge of 10% to avoid collisions, 200 (10% * 200kHz / 100Hz = 200) messages can circulate at the same time.

Sigfox transmission works in “Fire and Forget” mode: the modem is not waiting for any acknowledgement from the radio station it is sending to. The sender does not know which nodes are around and has 3 roles :

- Transmitting 3 times the same message at 3 different channels
- Choosing the transmission frequency
- The receiver’s frequency is computed according to the last emission frequency

Each device is identified by an unique ID that signs the transmitted message.

Localization

Sigfox is performing a macro-localization, few kilometers of precision. Each device is connected to only one base station, hence we can only have an estimation of the device’s location based on the base station’s antenna range.

Consumption

Sigfox has a low power consumption due to use of a mono-directional communication which is very valuable for IoT devices. It is based on the state pattern : wake up - send message - sleep, which allows it to reduce its consumption when nothing is transmitted. For instance a Sigfox based modem consumes 20-70mA for a communication and around 0 when it is inactive.

Mobility

Mobility is a problem for Sigfox. A message needs around 2.08s to be transmitted, when a message is being delivered, it is going through a certain path. If the sender is moving then the second part of the message can use a different path to reach the gateway. When the full message is received by the antenna, packets are disordered and cannot be reconstructed, therefore the message is corrupted.

Price

Per item: 1 to 14€/year according to the number of messages sent. The price decreases with the number of items.

Sigfox vs 2G

Sigfox data rate is less than the 2G’s data rate. Sigfox has a bigger transmission time than 2G. Using a bigger slot reduces the effect of the noise on the signal.

3. Recap

Frequency	Unlicensed ISM Band 868 MHz(Europe) 915 MHz(USA)
Range	30 to 50 Km (Rural areas) 3 to 10 Km (Urban areas)
Bandwidth	100 Hz
Payload size to be transmitted	12 bytes uplink, 8 bytes down-link
Power consumption	Very low, for example, energy meter in SIGFOX will consume 50 microwatts while in GSM cellular system it consumes 5000 microwatts
Stand by time for 2.5Ah battery	It takes 20 years in SIGFOX, while GSM cellular takes very less about 0 to 2 years
uplink/downlink	supports mono as well as bi-directional communication
Frequency Hopping	Supported
Emission Time	2.08 seconds
Modulation	UNB / GFSK / BPSK
Best Sensitivity (dBm)	-142

4. Conclusion

Sigfox is a long range network. It can be used to transmit data in a static environment. Only a few messages are allowed per day but it's enough for IoT devices because we don't need real time data but just to have an overview of the network or to send data punctually when an event occurs. Sigfox device only wakes up a few time a day and this time is managed by the sender so no need to listen to the medium. This way it can save energy, they just wake-up when a message has to be sent and stay in sleep mode the rest of the time. Sigfox is deploying its network all over the word and lots of IoT companies are using it.

SIGFOX ROCKS !!!! But maybe LoRa is better...

Our ressources:

file:///C:/Users/Co/Downloads/Rakon-Thinxtra-SIGFOX%20-%20your%20questions%20answered.pdf
https://developers.thethings.io/serialization-formats-sigfox.html
http://www.rfwireless-world.com/Terminology/SIGFOX-technology-basics.html
http://fr.slideshare.net/RobertVivancoSalcedo/comprendre-les-technologies-lpwa-sigfox-et-lora