

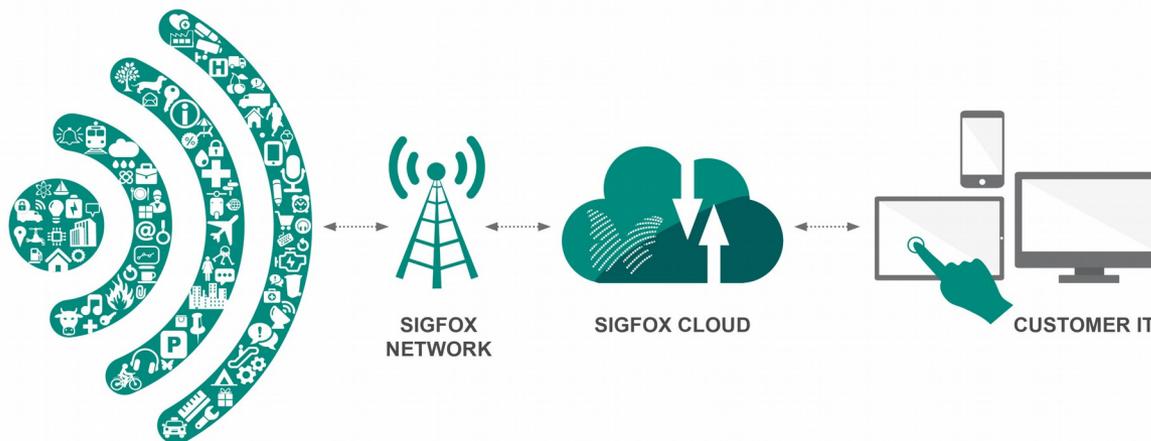
SIGFOX System Description

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draft-zuniga-lpwan-sigfox-system-description-00

Architecture

- Network protocols
 - Central LPWA Gateway / Cloud-based (Service Center)
 - Radio Gateway (Base Station)
 - End-device application transparent to the network
- End-device identification and localization
 - 32-bit globally unique device ID
 - Central authentication with no roaming requirements



Relevant L1 characteristics

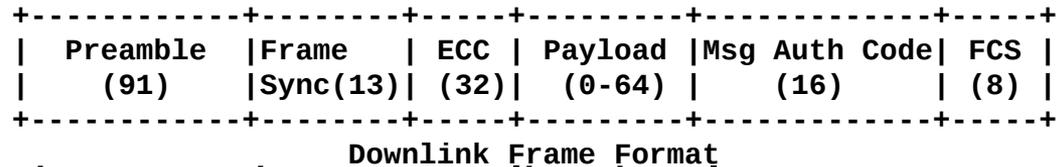
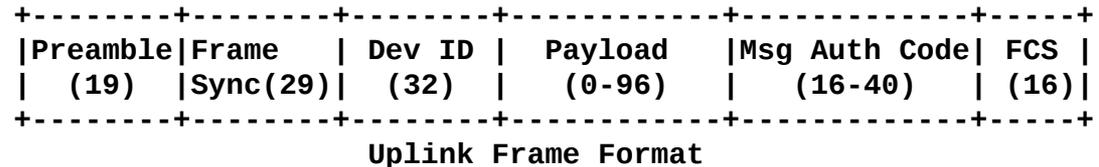
- Uplink
 - Channelization mask: 100 Hz (600 Hz in the USA)
 - Uplink baud rate: 100 baud (600 baud in the USA)
 - Modulation scheme: DBPSK
 - Uplink transmission power: compliant with local regulation
 - Link budget: 155 dB (or better)
 - Central frequency accuracy: not relevant, provided there is no significant frequency drift within an uplink packet
 - In Europe, the UNB uplink frequency band is limited to 868,00 to 868,60 MHz, with a maximum output power of 25 mW and a maximum mean transmission time of 1%

Relevant L1 characteristics

- Downlink
 - Channelization mask: 1.5 kHz
 - Downlink baud rate: 600 baud
 - Modulation scheme: GFSK
 - Downlink transmission power: 500 mW (4W in the USA)
 - Link budget: 153 dB (or better)
 - Central frequency accuracy: Centre frequency of downlink transmission set by the network according to the corresponding uplink transmission
 - In Europe, the UNB downlink frequency band is limited to 869,40 to 869,65 MHz, with a maximum output power of 500 mW with 10% duty cycle

Relevant L2 characteristics

- Framing



- Fragmentation and encryption at application layer
- Unicast asynchronous communications
- Unbalanced channels
 - Max limitation: 140 Uplink vs 4 Downlink messages per day
 - Limitations can be slightly relaxed depending on system conditions
- L2 security
 - Message authentication code and unique device ID
 - Key management: pre-provisioned

Network deployment + Target Apps

- Current Network Deployment

- SIGFOX LPWAN fully deployed in France, Spain, Portugal, Netherlands, Luxembourg, and Ireland
- Being rolled out in Germany, UK, Belgium, Denmark, Czech Republic, Italy, Mauritius Island, Australia, New Zealand, Oman, Brazil, Finland, Malta, Mexico, Singapore and the U.S.

- Coverage, number of devices

- 1,3 million square kilometers
- Population of 340 million people
- Max cell size of 50 km

- Example application

- Several device types, for instance: asset tracking, smart cities, home safety and security, utilities, environmental monitoring and personal health
- <https://partners.sigfox.com/>
- Expected battery lifetime 10-15 years

