

LoRaWAN vs. NB-IoT vs. Sigfox (English)

	LoRaWAN	NB-IoT	Sigfox
Modulation	CSS (Chirp Spread Spectrum)	QPSK (Quadrature Phase-Shift Keying)	BPSK (Binary Phase-Shift Keying)
Frequency	Unlicensed ISM bands (868 MHz in Europe, 915 MHz in North America, 433 MHz in Asia)	Licensed LTE frequency bands	Unlicensed ISM bands (868 MHz in Europe, 915 MHz in North America, 433 MHz in Asia)
Bandwidth	250 kHz and 125 kHz	200 kHz	100 Hz
Maximum data rate	50 kbps	200 kbps	0,1 kbps
Bidirectional	Yes / Half-duplex	Yes / Half-duplex	Limited / Half-duplex
Maximum messages/day	Unlimited (max. uplink duty cycle of 1%/hour, 864s/24h uplink time per device)	Unlimited	140 (UL), 4 (DL)
Maximum payload length	243 bytes	1600 bytes	12 bytes (UL), 8 bytes (DL)
Range	5 km (urban), 20 km (rural)	1 km (urban), 10 km (rural)	10 km (urban), 40 km (rural)
Interference immunity	Very high	Low	Very high
Authentication & encryption	Yes (AES 128b)	Yes (LTE encryption)	Authentication token
Adaptive data rate	Yes	No	No
Handover	End-devices do not join a single base station	End-devices join a single base station	End-devices do not join a single base station
Localization	Yes (TDOA: Time Difference Of Arrival)	No (under specification)	Yes (RSSI: Received Signal Strength Indicator)
Allow private network	Yes	No	No
Standardization	LoRa-Alliance	3GPP	Sigfox company is collaborating with European Telecommunications Standards Institute (ETSI) on the standardization of Sigfox-based network
Deep Indoor Coverage	Yes	Yes	Yes
Battery lifetime of end-nodes	Low Power in Sleep Mode	Low Power in Sleep Mode	Low Power in Sleep Mode
Uplink Power Consumption	~44 mA	~220 mA	~61 mA
Sleep Power Consumption	~0,1 µA	~3-8 µA	~0,1 µA
Spectrum Cost (License)	Free	> 500 Mio.€/MHz	140 Messages per day: 20€ per year and device
Deployment Cost	~200 €/indoor gateway, ~1500 €/outdoor gateway	> 15.000 €/base station (LTE Upgrade cost)	> 4000 €/base station
End-device RF Transceiver Cost	3-5 €	> 20 €	~2 €
Share of LPWAN IC Shipments 2017	58 %	33 %	2 %