

Introduction To IoT Communication Protocol

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Explore the IoT communication technologies like short-range and long-range communication technologies. Explore RFID, NFC, BLE, WIFI, LoRa technologies and their applications in the Internet of Things.

IoT communication standards									
Long-range IoT communication technologies				Short-range IoT communication technology					
Parameter	Cellular network	LoRaWAN	SigFox	6LoWPAN	Zigbee	Bluetooth LE	NFC	RFID	Z-wave
Network topology	NA	Star-of-stars	Star	Star and mesh	Star, mesh cluster network	Star, mesh, and P2P	P2P	P2P	Mesh
Data rate	NA	0.3–27 kbps	100 bps (UL), 600 bps (DL)	250 kbps	250 kbps	1 Mbps	424 kbps	4 Mbps	40 kbps
Network	WNAN	LPWAN	LPWAN	WPAN	WPAN	WPAN	P2P network	Proximity	WPAN
Frequency bands	Cellular band	Various, sub-gigahertz	868 or 902	2.4 GHz	2.4 GHz	2.4 GHz	860 MHz	902–928 MHz	868.42 MHz
Standard	3GPP and GSM, GSM/GPRS/EDGE (2G), UMTS/HSPA LTE (4G)	LoRaWAN	SigFox	IEEE 802.15.4	IEEE 802.15.4	IEEE 802.15.4	ISO/IEC 14443 A&B, JIS X-6319-4	RFID	Z-wave
Coverage range (km)	5 km	1–10 km in rural, 1–3 km in urban	30–50 km in rural, 3–10 km in urban	10–10 m	10–100 m	15–30 m	0–10 cm	1.5 m	30 indoor 100 outdoor
Common application	M2M	Smart lighting pollution monitoring	Street lighting	Monitor and control over the Internet	Home monitoring and control	Many include a smartphone, headset	Smartphones E-ticket booking	Tracking inventory access	Home monitoring and control

COMPARING COMMUNICATION TECHNOLOGIES FOR IoT APPLICATION²

	Satellite	Cellular	LoraWAN	Sigfox	Weightless-P	Wifi	Z-Wave	Zigbee	Bluetooth	Bluetooth Low Energy
Data Rate	200 kbps	14.4 kbps (GSM); 1 Gbps (LTE)	300 bps - 50 kbps	100 bps	200 bps - 100 kbps	54 - 1300 Mbps	40 - 200 Kbps	20/40/250 Kbps	1 - 3 Mbps	1 Mbps
Frequency Band	1-2 GHz	900/1800/1900/2100 MHz	868/915 MHz	868/915 MHz	169/433/470/780/868/915/923 MHz	2.4/5 MHz	868/915/2400 MHz	868/915/2400 MHz	2400 MHz	2400 MHz
ISM Band	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mode of operation	Full Duplex	Full Duplex	Half Duplex	Half Duplex	Half Duplex	Half Duplex	Half Duplex	Full Duplex	Full Duplex	Full Duplex
Max. Payload size	—	—	256 Bytes	12 Bytes	10 Bytes	—	64 Bytes	127 Bytes	358 Bytes	47 Bytes
Power profile	High (weeks)	Medium (months)	Low (+years)	Low (+years)	Low (+years)	High (weeks)	Low (+years)	Low (+years)	Medium (months)	Low (+years)
Typical Range	Global	35 Km	3-15 Km	5-25 Km	2 Km urban 5 Km outdoor	15-150 m	30-100 m	30-100 m	3-30 m	5-100 m
Standard	Proprietary	GSM; GPRS; EDGE; HSPA; LTE; LTE-A	LoraWan	Sigfox Proprietary	Weightless SIG	IEE 802.11 a/b/g/n/ac	Z-wave Proprietary	Zigbee (based on IEE 802.15.4)	IEEE 802.15.1	IEEE 802.15.1