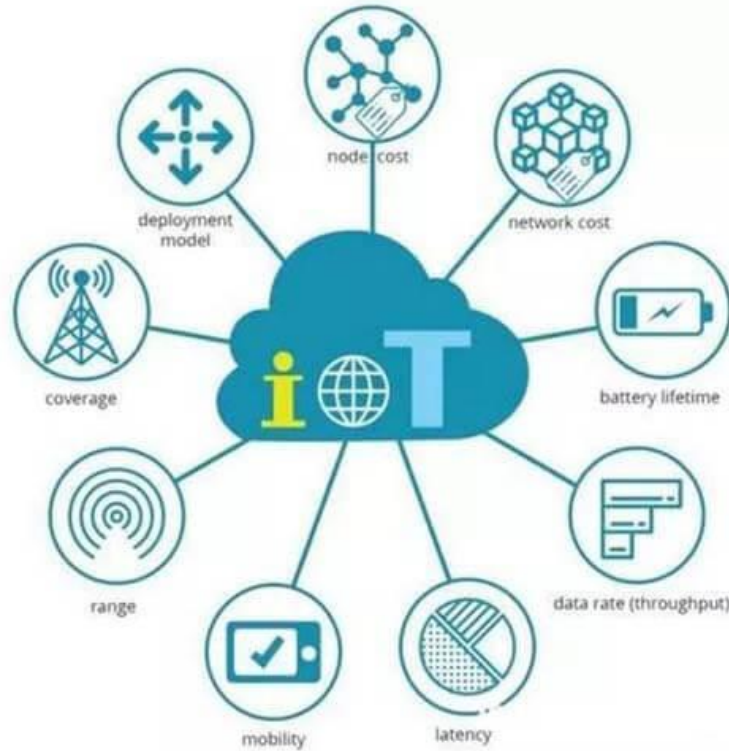




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13 Common IoT Communication Technologies



Today, we talk about the wired and wireless [IoT Communication Technologies](#), the simple 13 common communication technologies in [IoT](#).

We have compiled and summarized the commonly used wired and [wireless communication](#) methods of IoT for future reference.

Wired part of the IoT communication technologies

RS232 in the IoT communication Technologies

Communication method: full-duplex communication (can send and receive data at the same time)

Communication distance: the standard value is 50 feet, in fact, it can only be used at about 15 meters

Transmission method: asynchronous transmission

Transmission rate: 20Kbps

Description: One of the mainstream serial communication interfaces, commonly used are DB9 and DB25. The transmitted digital quantity adopts negative logic and is symmetrical with the ground (logic 1: -3 to -15V, logic 0: +3 to +15V). It can only be used for point-to-point communication.

RS485 in the IoT communication Technologies

Communication method: half-duplex communication (cannot send and receive data at the same time)

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Communication distance: The farthest can reach about 1200 meters, but its transmission rate is inversely proportional to the transmission distance. Only the transmission speed below 100Kb/s can reach the maximum communication distance. If you need to transmit longer distances, you can use it. Following Up to eight relays can be added, which means that theoretically, the maximum transmission distance of RS485 can reach 10.8 kilometers

Transmission method: asynchronous transmission

Transmission rate: 10Mbps

Illustrate:

One of the mainstream serial communication interfaces does not need to detect the signal relative to a certain reference point. The system only needs to detect the potential difference between the two wires.

It has a strong ability to resist common-mode interference. Logic "1" is represented by the voltage difference between the two lines as $+(2\sim 6)V$, and the logic "0" is represented by the voltage difference between the two lines as $-(2\sim 6)V$ said.

Supports multi-point data communication; And the network topology generally adopts a terminal-matched bus-type structure, that is, a bus is used to connect each node in series. Ring or star-shaped networks are not supported. It supports up to 32 nodes.

RS422 in the IoT communication Technologies

Communication method: full-duplex communication (can send and receive data at the same time)

Communication distance: about 1200 meters

Transmission method: asynchronous transmission

Transmission rate: 10Mbps

Note: Separate sending and receiving channels are used, so there is no need to control the data direction. Support multi-point data communication, up to 10 nodes.

M-BUS in the IoT communication Technologies

Communication method: half-duplex communication (master-slave)

Communication distance: up to 3600 meters

Transmission method: asynchronous transmission

Transmission rate: about 5kb/s

Note: It uses the caller/response method to communicate, that is, only after the central station (Master) sends an inquiry, the slave station (Slave) can transmit data to the master station.

Bus-type topology.

When the master station sends a logic "1" to the slave station, the bus voltage $V_{mark} \leq 42V$, and when a logic "0" is sent, the voltage drops by more than 10V, and drops to $V_{space} \geq 12V$;

When the slave station sends a logic "1" to the master station, the current drawn by the slave station is $I_{mark} \leq 1.5mA$. When a logic "0" is sent, the slave station will add a pulse current of 11-20mA to I_{mark} to form an I_{space} .

PLC (power carrier) in the IoT communication Technologies

Communication method: full-duplex communication

Communication distance: unstable

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Transmission method: synchronous transmission

Transmission rate: different according to different schemes

Illustrate:

Power line carrier communication is a communication method in which high-frequency carrier signals transmit information through high-voltage or low-voltage power lines. The power line causes high cuts to the carrier signal.

When the load on the power line is heavy, the line impedance can reach below 1 ohm, resulting in a high reduction in the carrier signal. In practical applications, when the power line is empty, the point-to-point carrier signal can be transmitted up to several kilometers. But when the load on the power line is heavy, only tens of meters can be transmitted.

The Wireless part of the IoT communication Technologies

Zigbee in the IoT communication Technologies

Communication frequency band: license-free frequency band. Use Industrial Scientific Medical (ISM) frequency band, [915MHz](#) (U.S.), [868MHz](#) (Europe), [2.4GHz](#) (Global)

Communication distance: The transmission range is generally between 10 and 100m, after increasing the transmission power, it can also be increased to 1 to 3km. This refers to the distance between adjacent nodes. If through the relay of routing and communication between nodes, the transmission distance will be farther

Low power consumption

Transmission rate: 20~250kbps

Description: Short-range, high-reliability, low-complexity, low-power, low-data-rate, and low-cost wireless network technology is mainly used for short-range wireless connections. Within the entire network, each ZigBee network data transmission module can communicate with each other. Each ZigBee network node can not only be a monitoring object by itself, for example, the connected sensor can directly collect and monitor data, but also can automatically transfer to other data from the network node.

In addition, each ZigBee network node can also wirelessly connect to multiple isolated sub-nodes that do not undertake the task of network information transfer within the range of its own signal coverage.

Bluetooth in the IoT communication Technologies

Communication frequency band: license-free frequency band. 2.4 GHz short-range radio frequency band for industrial, scientific, and medical (ISM) band

Communication distance: up to 100m, the range depends on the power

Power consumption: larger than Zigbee

Transmission rate: Bluetooth 2.0 speed: 1.8M/s, Bluetooth 3.0 speed: up to 24M/s, Bluetooth 4.0 speed: 24M/s

Illustrate:

[Bluetooth](#) uses frequency hopping technology to divide the transmitted data into data packets, which are respectively transmitted through 79 designated Bluetooth channels.

The bandwidth of each channel is 1 MHz. Bluetooth 4.0 uses 2 MHz spacing and can accommodate 40 channels. The Bluetooth master device can communicate with up to seven

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devices in a piconet, and the roles can be changed between the devices through the protocol, and the slave device can also be converted to the master device.

WI-FI in the IoT communication Technologies

Communication frequency band: License-free

Communication distance: depends on the router

Power consumption: larger

Transmission rate: 54Mbps

Illustrate:

The wireless network in the category of wireless local area network refers to "wireless compatibility certification", which is essentially a commercial certification and also a wireless networking technology. The common one is a wireless router, so the radio wave coverage of this wireless router is effective the range can be networked by a [Wi-Fi](#) connection. If the wireless router is connected to an ADSL line or another Internet line, it is also called a hotspot. The data security of WIFI is relatively poor.

NB-IoT in the IoT communication Technologies

Communication frequency band: use the frequency band number defined by LTE (according to the operator)

Communication distance: 15km

Low power consumption

Transmission rate: greater than 160kbps, less than 250kbps

Illustrate:

[NB-IoT](#) is built on a [cellular](#) network and only consumes about 180KHz of bandwidth, and can be directly deployed on a [GSM](#) network, UMTS network, or [LTE](#) network.

NB-IoT is an emerging technology in the IoT field, which supports the cellular data connection of low-power devices in the wide-area network. It is also called a low-power wide-area network (LPWAN).

Supports efficient connection of devices with long standby time, and high network connection requirements. At the same time, it can provide very comprehensive indoor cellular data connection coverage. Long-distance, low power consumption, and half-duplex communication are its characteristics.

LoRa in the IoT communication Technologies

Communication frequency band: ISM frequency band including [433MHz](#), 868MHz, 915MHz, etc.

Communication distance: 2-5 km for towns, 15 km for suburbs

Low power consumption

Transmission rate: the faster the rate, the shorter the transmission distance, usually 1.1kbps

Illustrate:

[LoRa](#) is monopolized by the US company SEMTECH's exclusive proprietary technology, and the terminal and gateway chip IP patents are exclusively controlled by SEMTECH. The biggest feature is that it can travel farther than other wireless methods under the same power consumption conditions, achieving low power consumption and long-distance Unified, it is 3-5 times longer than the traditional radio frequency communication distance under the same power

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consumption.

RFID in the IoT communication Technologies

Communication frequency band: low frequency (125KHz to 135KHz), high frequency (13.56MHz), and ultra-high frequency (860MHz to 960MHz)

Communication distance: dozens of meters

Low power consumption

Transmission rate: It depends on factors such as the length of the code, the data transmission rate of the carrier, the reading and writing distance, the carrier frequency between the carrier and the antenna, and the modulation technology of the data transmission. The transmission rate varies with the types of products in actual applications.

Illustrate:

Radio Frequency Identification (RFID) is a non-contact automatic identification technology. The basic principle is to use the transmission characteristics of radio frequency signals and spatial coupling (inductive or electromagnetic coupling) or radar reflection to realize automatic identification of the identified object.

NFC in the IoT communication Technologies

Communication frequency band: [13.56MHz](#)

Communication distance: less than 10cm

Low power consumption

Transmission rate: It depends on factors such as the length of the code, the data transmission rate of the carrier, the reading and writing distance, the carrier frequency between the carrier and the antenna, and the modulation technology of the data transmission. The transmission rate varies with the types of products in actual applications

Illustrate:

[NFC](#) is developed on the basis of RFID. In essence, NFC is not much different from RFID. Both are based on the signal transmission between two objects that are geographically close.

NFC technology adds a point-to-point communication function, which can quickly establish P2P (point-to-point) wireless communication between Bluetooth devices. NFC devices find each other and establish a communication connection.

The two devices of NFC communication are peer-to-peer, while the two devices of RFID communication are in a master-slave relationship. NFC is very safe because of its communication distance.

4G in the IoT communication Technologies

Communication frequency band: According to the operator

Communication distance: according to the base station

Power consumption: higher

Transmission rate: 100Mbps

Note: Including TD-LTE and FDD-LTE two standards.

Above are the 13 common IoT communication Technologies, besides that, there are other IoT communication Technologies for the internet of things application.

You may also be interested in the below articles.

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[About Wi-Fi, You Did Not Know](#)

[What is the difference between WIFI and WLAN?](#)

[Summary of 41 Basic Knowledge of LTE](#)

[What Spectrum Is Used In 5G?](#)

[What Is Wi-Fi 7?](#)

[How To Choose 2.4G And 5G?](#)

[What Are The Advantages And Characteristics Of NB-IoT And LoRa?](#)

[What Is The 5G Network Slicing?](#)

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