EION ByTES

Best 6 Wireless Technologies for IoT Use Cases

Selecting the best wireless technology for your IoT use case requires an accurate assessment of bandwidth, QoS, security, power consumption and network management. Below are the 6 best wireless technologies along with examples for the supported IoT use cases:

1. LPWANs

Low Power Wide Area Networks (LPWANs) is the new phenomenon in IoT. By providing long-range communication on small, inexpensive batteries that last for years, this family of technologies is purpose-built to support large-scale IoT networks sprawling over vast industrial and commercial campuses.

LPWANs can literally connect all types of IoT sensors – facilitating numerous applications from **asset tracking, environmental monitoring and facility management to occupancy detection and consumables monitoring**. Nevertheless, LPWANs can only send small blocks of data at a low rate, and therefore are better suited for use cases that don't require high bandwidth and are not time-sensitive.

2. Cellular 4G/5G

Cellular networks offer reliable broadband communication supporting various voice calls and video streaming applications. On the downside, they impose very high operational costs and power requirements.

While cellular networks are not viable for the majority of IoT applications powered by battery-operated sensor networks, they fit well in specific use cases such as **connected cars or fleet management in transportation and logistics**. For example, **in-car infotainment, traffic routing, advanced driver assistance systems (ADAS)** alongside fleet telematics and tracking services can all rely on the ubiquitous and high bandwidth cellular connectivity

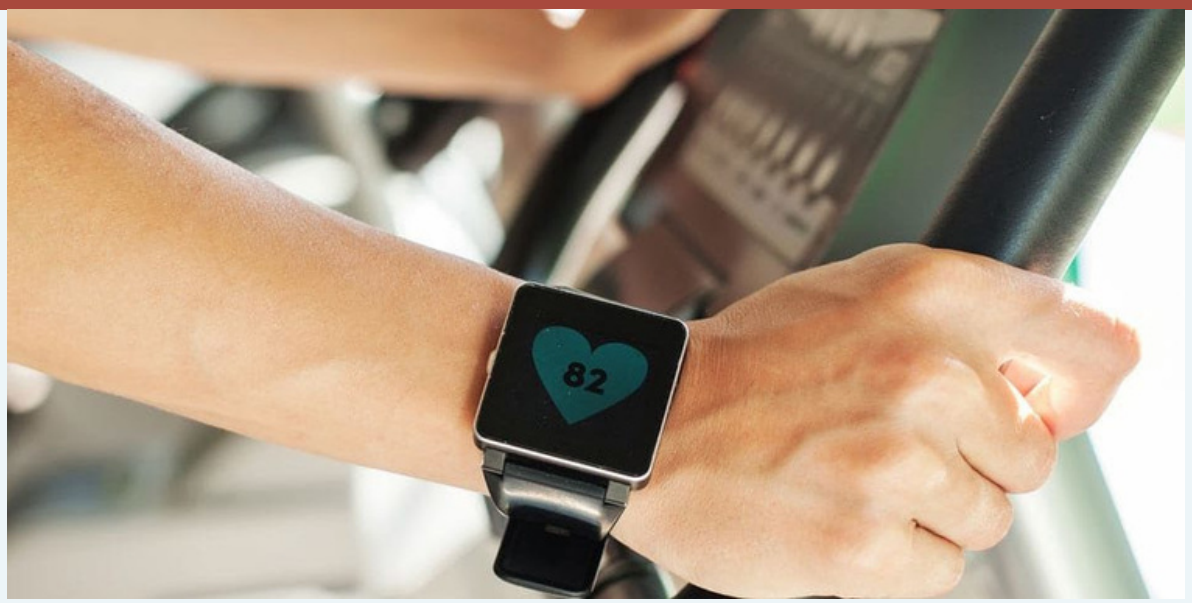
Cellular next-generation 5G with high-speed mobility support and ultra-low latency is positioned to be the future of autonomous vehicles and augmented reality. 5G is also expected to enable real-time video surveillance for public safety, **real-time mobile delivery of medical data sets for connected health**, and several time-sensitive industrial automation applications in the future.

3. Zigbee (IEEE 802.15.4)

Zigbee is a short-range, low-power, wireless standard (IEEE 802.15.4), commonly deployed in a mesh topology to extend coverage by relaying sensor data over multiple sensor nodes. Compared to LPWAN, Zigbee provides higher data rates, but at the same time, much less power efficiency due to mesh configuration.

Because of their physical short-range (< 100m), Zigbee and similar mesh protocols (e.g. Z-Wave) are best suited for medium-range IoT applications with an even distribution of nodes in close proximity. Typically, Zigbee is a perfect complement to Wi-Fi for various **home automation** use cases like **smart lighting, HVAC controls, security and energy management, etc**... – leveraging home sensor networks.

4. Bluetooth and BLE



Defined in the category of Wireless Personal Area Networks, Bluetooth is a short-range communication technology well-positioned in the consumer marketplace. Bluetooth Classic was originally intended for point-to-point or point-to-multipoint (up to seven slave nodes) data exchange among consumer devices. Optimized for power consumption, Bluetooth Low-Energy was later introduced to address small-scale **Consumer IoT** applications.

BLE-enabled devices are mostly used in conjunction with electronic devices, typically smartphones that serve as a hub for transferring data to the cloud. Nowadays, BLE is widely integrated into **fitness and medical wearables** (e.g. smartwatches, glucose meters, pulse oximeters, etc.) as well as **Smart Home devices** (e.g. door locks) – whereby data is conveniently communicated to and visualized on smartphones.

The release of the Bluetooth Mesh specification in 2017 aims to enable a more scalable deployment of BLE devices, particularly in retail contexts. Providing versatile indoor localization features, BLE beacon networks have been used to unlock new service innovations like **in-store navigation, personalized promotions, and content delivery.**

5. WiFi

Wi-Fi has a critical role in providing high-throughput data transfer for both enterprise and home environments. However, in the IoT space, its major limitations in coverage, scalability and power consumption make the technology much less prevalent.

Imposing high energy requirements, Wi-Fi is often not a feasible solution for large networks of battery-operated IoT sensors, especially in industrial IoT and smart building scenarios. Instead, it more pertains to connecting devices that can be conveniently connected to a power outlet like **smart home gadgets and appliances, digital signages or security cameras.**

Wi-Fi 6 – the newest Wi-Fi generation – brings in greatly enhanced network bandwidth (i.e. <9.6 Gbps) to improve data throughput per user in congested environments. With this, the standard is poised to level up public Wi-Fi infrastructure and transform customer experience with **new digital mobile services** in the retail and mass entertainment sectors. Also, **in-car networks for infotainment and onboard diagnostics** are expected to be the most game-changing use case for Wi-Fi 6. Yet, the development will likely take some more time.

6. RFID

Radio Frequency Identification (RFID) uses radio waves to transmit small amounts of data from an RFID tag to a reader within a very short distance. Till now, technology has facilitated a major revolution in **retail and logistics.**

By attaching an RFID tag to all sorts of products and equipment, businesses can track their inventory and assets in real-time – allowing for better stock and production planning as well as optimized **supply chain management**. Alongside increasing IoT adoption, RFID continues to be entrenched in the retail sector, enabling new IoT applications like smart shelves, self-checkout, and smart mirrors.

The highest usage applications in every household are video related, which could include video conferencing as well as cloud gaming. Different video applications use a range of resolutions and frame rates, leading to different requirements on data rates. Overall household data consumption depends on the number of people per home. The illustration above shows some examples of required data rates for different applications in households.

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