

Extra notes

Multipath: Phenomenon of a wireless signal taking multiple paths to reach the receiver due to reflections, refractions or scattering (signal redirected in multiple directions) of the signal by objects in its environment. This can cause the signal to be weaker, cause errors in the data transmitted, or receiver receives multiple copies of the signal. Directional antennas and advanced signal processing methods can be used.

Spread spectrum: Technique used to spread the energy of a signal across a wider bandwidth. This helps with resistance to interference and fading, helping reliability. Another reason is for security, making it difficult for an unauthorized user to detect or intercept the signal. Also, increases the capacity of wireless systems, more users without interference.

BLE vs Bluetooth: BLE is designed to provide low-power communication between devices and it uses a different protocol stack. It's a open short range radio technology.

This new protocol stack is designed for low power consumption and shorter range communication. BLE uses 'connection intervals' to communicate in bursts ^(state) thus reducing power consumption. Overall it's more suitable for sending small chunks of data due to its low power consumption and

shorter range. BT classic has longer range, higher data rate, more profiles / robustness, more supported devices and more profiles.

BLE is still Bluetooth, just optimized for other cases.

Sensor network challenges: low power consumption is important in a sensor network. Standardization, namely the technology used, is also very important when creating a sensor network, because different technologies have different purposes. Also, either cost-effectiveness or low bandwidth given the fact that such sensor devices transmit small packets of information.

WWSN: Wireless Wide-area Sensor Networks are designed for monitoring and sending info over a wide area, such as a city or large facility. They typically use cellular or satellite technology and have a longer range and higher bandwidth than WSN. They typically have a smaller number of nodes connected to base station or gateway.

WSN: low power consumption, low data rate. BLE and Zigbee are designed for this. Also wide availability. Small area, large number of sensors connected to gateway.

LPWSN: low power and long battery life ^{sensors}. Designed for short range communication. Technologies are Zigbee, BLE, Z-wave. The sensor nodes are close proximity to gateway / base station.

LPWANs: low power, low-bandwidth, long-range. Typically LoRaWAN, Sigfox or NB-IoT for low data apps.

Wide area communication.

LoRa: designed to provide long-range, low-power communication for IoT devices. Uses CSS which allows it to transmit data over long distances without consuming much power.

LoRaWAN: Is built on top of LoRa designed to provide secure and efficient communication protocol for low-power, wide-area IoT network. It provides a network architecture, network management features, security framework as well as adaptive data rate. Implements classes for end-devices. Much lower power consumption than NB-IoT, however a higher frequency.

BLE vs Zigbee: BLE has better power consumption, cost effectiveness, wider availability, shorter range, built-in security features such as secure pairing and encryption. BLE devices can operate with other technologies (interoperability).