

Wi-Fi & Bluetooth

- Bluetooth is a wireless communication technology that allows devices to be connected within a maximum range of about 30 meters
- Before communication can happen, two devices connect using a process called “**pairing**” to establish a secure connection
- When two devices **pair**, they both exchange a **cryptographic key**. Both these keys are used to generate a secret shared key which is used to encrypt the data between the two devices and create a **Wireless Personal Area Network (WPAN)**
- Bluetooth operates using a frequency range of around 2.4Ghz
- Connected devices continuously change their transmitting frequency between 79 different channels to avoid **interference** and improve the reliability of the connection. This is known as the **frequency hopping spread spectrum (FHSS)**
- **Bluetooth** may be preferred over **Wi-Fi** when:
 - File transfer required between two close-range devices such as a laptop and smartphone without the need for internet connectivity
 - **Streaming** audio from a smartphone to another wireless device such as a speaker or headphones
 - Connecting to a car system allows for music **streaming** and hands-free calling
 - When low power communication is required
- Wi-Fi is also a wireless communication technology that allows devices to be connected up to a range of about 100 meters depending on the standard that is being used
- **Wi-Fi** operates across the 2.4Ghz and 5Ghz frequency ranges and although 5Ghz is faster, the 2.4 GHz range is preferred as the lower frequencies often travel further and penetrate obstacles more easily
- Similar to Bluetooth bands are split into channels
- Wi-Fi-enabled devices connect to a network by connecting to a **hotspot** or **wireless access point (WAP)** also referred to as an access point (AP)
- Wi-Fi may be preferred over Bluetooth when:
 - High speed data transfer is required
 - Long range communication is required
 - Many devices are needed to be connected at the same time

Similarities between Bluetooth and Wi-Fi

- Use radio waves for wireless technologies
- Can connect multiple devices
- Support **encryption** for secure connections
- Based on **industry standards** that are universally accepted
- It can be used to connect Internet of Things (**IoT**) devices and applications

Differences between Bluetooth and -Wi-Fi

	Bluetooth	Wi-Fi
Maximum number of connections	7	30 (based on a standard consumer grade router with high end options providing substantially more)
Transmission frequency	2.4Ghz	2.4Ghz, 5Ghz
Maximum range (meters)	30 meters	100 meters (depending on obstructions)
Maximum transfer speed (Depending on the standard being used)	3 Mbytes / Sec	75 Mbytes / Sec