



INTRODUCTION TO BLUETOOTH LOW ENERGY (BLE)

Introduction : What is BLE ?

A short range wireless technology focused on low-power and low-bandwidth applications.



Introduction : Evolution of wireless technologies

Bluetooth

v1.1 : 1Mbps BR
v2.0 : 3Mbps EDR
v3.0 : 54Mbps MAC PHY
v4.0 : 0.3Mbps BLE
v5 : 2Mbps BLE

Ethernet

802.3i : 10Mbps
802.3u : 100Mbps
802.3ab : 1000Mbps
802.3an : 10000Mbps

Wi-Fi

802.11 : 2Mbps
802.11b : 11Mbps
802.11g : 54Mbps
802.11n : 135Mbps

Modems

V.21 : 0.3kbps
V.22 : 1.2kbps
V.32 : 9.6bps
V.34 : 28.6kbps

Each wireless technology increased its data rate in newer versions except in the case of Bluetooth where the data rate dropped from 54Mbps in version 3 to 0.3 Mbps in version 4 (BLE) and then increased to 2Mbps in version 5

Introduction : Key Characteristics of BLE

- **Operates in the 2.4GHz ISM Band**
- **Typical range of 10-30meters**
Although, range varies depending on the environment.
- **Optimized for low power**
- **Peak current consumption by chip during radio transmission is typically under 15mA**

Introduction : Evolution of BLE

- **Launched in early 2010 (v.4.0)**
- **First smartphone support, October 2011- Iphone 4S**
- **Support for multiple roles simultaneous, December 2013 (v. 4.1)**
- **Security upgrade, IP connectivity and increased speed, December 2014 (v. 4.2)**
- **2x speed increase, 4x range increase, December 2016 (v.5)**

Conclusion

- This is all there is for this **5 minutes** introduction to Bluetooth Low Energy, I know we are all busy so the aim of this short lecture was to provide you with the most useful information that can be consumed in 5 minutes.
- If you are really interested in Bluetooth Low Energy and other backbone technologies of IoT then take a look at our [Embedded Internet of Things \(IoT\) Learning Path](#).

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