Bluetooth Technology

Bluetooth, originally known as short-link radio technology, is a wireless communications technology that transmits across short distances with low-level radio waves. Bluetooth was designed to eliminate the need for cords between devices, such as a radio receiver and speakers. Billions of devices contain Bluetooth technology, including smartphones, speakers, and coffee makers. All Bluetooth devices contain a microchip, a receiving antenna, and a transmitting antenna. Bluetooth technology has several protocol specifications, such as radio technology and numbers of bits, which are units of information that allow devices to communicate and transfer data.

Radio Technology

Bluetooth radio waves operate on a reserved frequency band of 4.2GHz, which prevents interference from other devices. Bluetooth uses a technology called spread-spectrum frequency hopping, where transmitters change frequency up to 1600 times per second. By changing their frequency so often, any interference that does occur is too brief to notice. Bluetooth does not rely on Wi-Fi to connect, and it does not require a direct line of sight between devices like infrared devices. For example, an infrared remote control needs a direct line of sight to a television.

Networks

Once Bluetooth-enabled devices connect, they form a short-range wireless network called a personal-area network, or a piconet. When piconets overlap, they form a scatternet (see Figure 1).

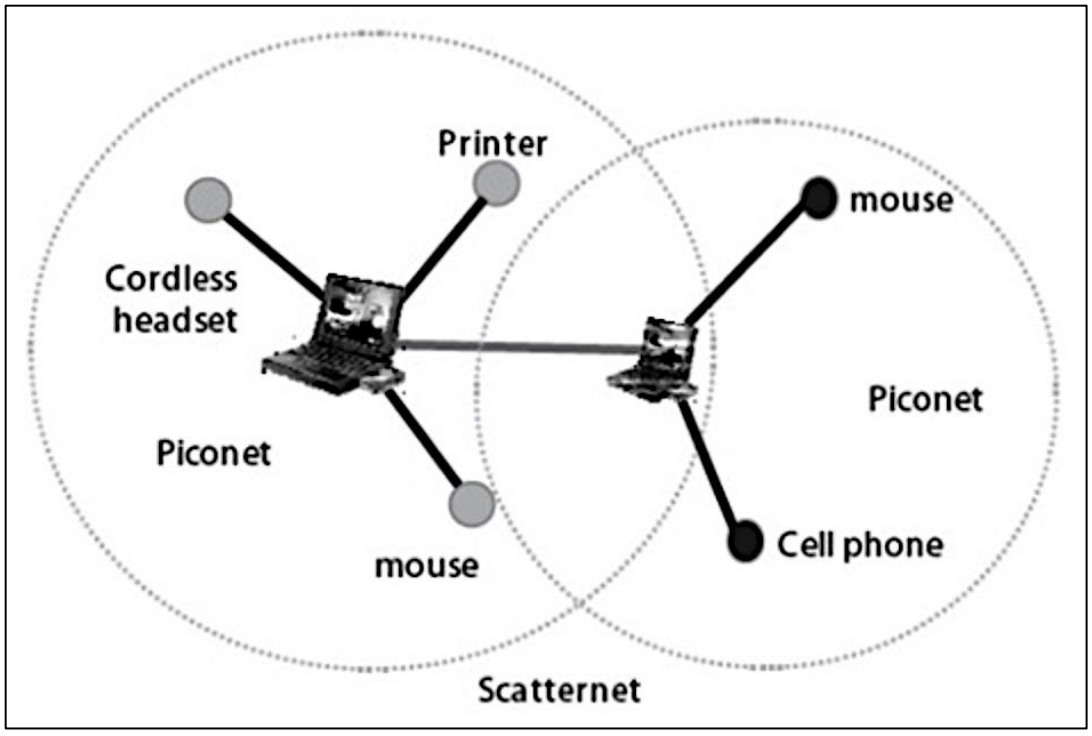

FIGURE 1 A Scatternet Made of Two Piconets[1]

1 Prajval.in, "Mobile Computing and Wireless Communication." Accessed on: Mar. 24, 2019. [Online]. Available: http://www.prajval.in/edudetail/207/1328/%3Cp%3E%3Cstrong%3EWrite-a-note-on-piconet-and-scatternet%3C-strong%3E%3C-p%3E-

Bluetooth technology operates on a primary and secondary model. Both devices communicate with each other, but only the primary device can control the secondary one. In Figure 1, the larger laptop is the primary object and the mouse, headset, printer, and smaller laptop are secondary objects. However, the smaller laptop functions as a primary object in the piconet on the right, controlling the mouse and cellphone. The smaller laptop has a primary *and* a secondary role in this scatternet scenario. A primary object can have up to seven secondary objects in a Bluetooth network.

Features

Bluetooth devices have several convenient features. They are inexpensive and easy to set up and use. Bluetooth devices communicate automatically when they are in range of each other, because of their established protocols. Paired devices, such as headphones linked to a smartphone, have a preferred relationship and remember important details about each other, such as their primary and secondary roles, and will automatically link when activated. Bluetooth was designed to use minimal battery power, so it operates efficiently without drawing down the battery on a smartphone.

However, Bluetooth devices cannot transfer large amounts of data. They are slow and have a range of just 1- 100 meters. Newer versions of Bluetooth are faster and work over longer distances than previous versions. However, more complicated and expensive technologies, such as Wi-Fi, are needed to quickly transfer large amounts of data or to easily connect to the Internet.

Conclusion

The use of Bluetooth technology has grown exponentially over the past two decades. Bluetooth is a reliable, low-cost, and easy to use technology, making it a preferred option for many devices. While more advanced tasks require more advanced technologies, such as Wi-Fi, the range of Bluetooth-enabled devices continues to increase in this age of the Internet of Things, where common household items become equipped with smart features and smartphone integration.