

Bluetooth in Android

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What is Bluetooth?

Bluetooth is a *standardized protocol* for sending and receiving data via a 2.4GHz wireless link. It's a secure protocol, and it's perfect for short-range, low-power, low-cost, wireless transmissions between electronic devices

Connection Process

Creating a Bluetooth connection between two devices is a multi-step process involving three progressive states:

- *Inquiry* – If two Bluetooth devices know absolutely nothing about each other, one must run an inquiry to try to *discover* the other. One device sends out the inquiry request, and any device listening for such a request will respond with its address, and possibly its name and other information.
- *Paging (Connecting)* – Paging is the process of forming a connection between two Bluetooth devices. Before this connection can be initiated, each device needs to know the address of the other (found in the inquiry process).
- *Connection* – After a device has completed the paging process, it enters the connection state. While connected, a device can either be actively participating or it can be put into a low power sleep mode.
 - *Active Mode* – This is the regular connected mode, where the device is actively transmitting or receiving data.
 - *Sniff Mode* – This is a power-saving mode, where the device is less active. It'll sleep and only listen for transmissions at a set interval (e.g. every 100ms).
 - *Hold Mode* – Hold mode is a temporary, power-saving mode where a device sleeps for a defined period and then returns back to active mode when that interval has passed. The master can command a slave device to hold.
 - *Park Mode* – Park is the deepest of sleep modes. A master can command a slave to "park", and that slave will become inactive until the master tells it to wake back up.

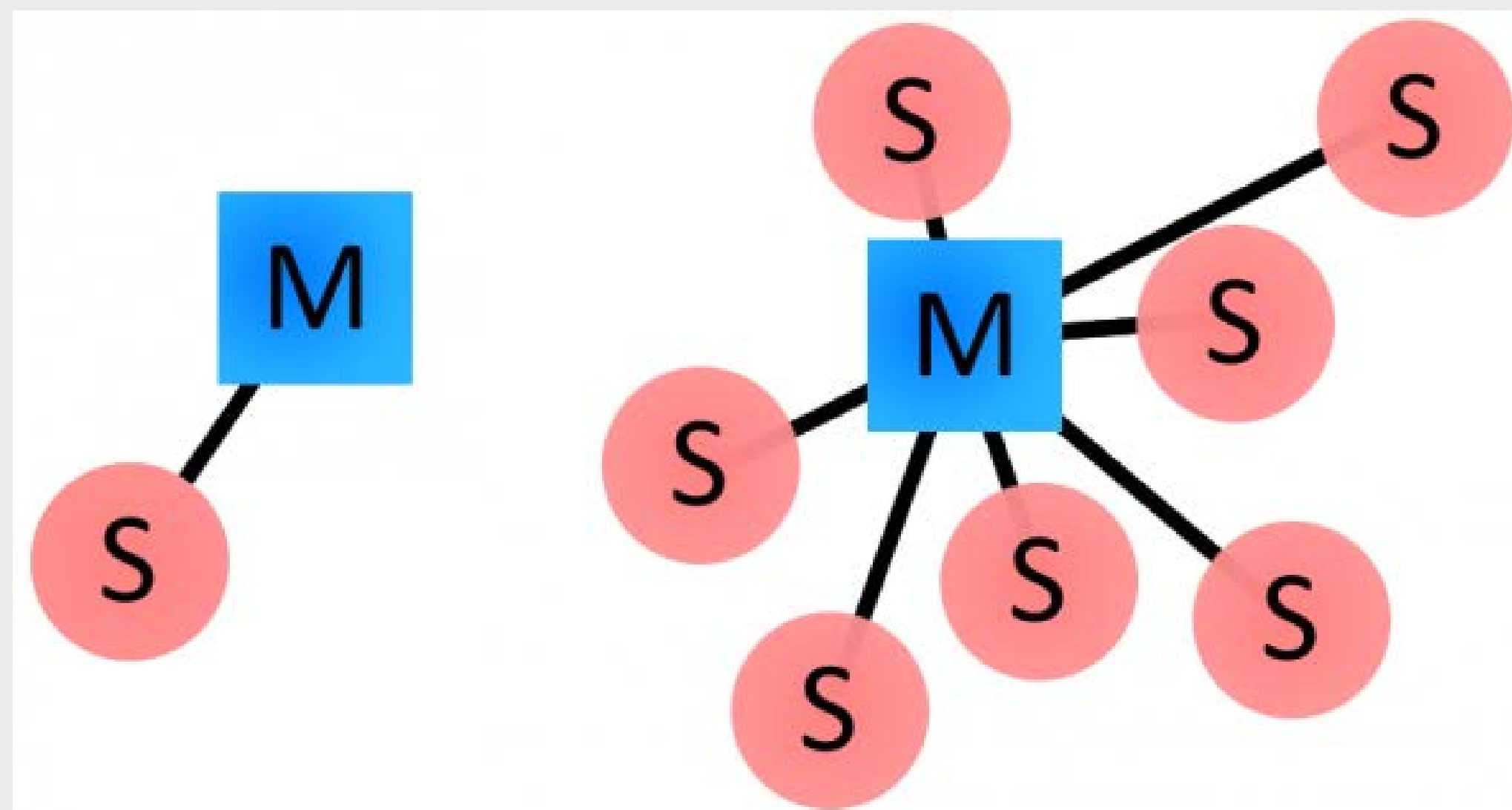
How Bluetooth Works

The Bluetooth protocol operates at 2.4GHz in the same unlicensed ISM frequency band where RF protocols like ZigBee and WiFi also exist. There is a standardized set of rules and specifications that differentiates it from other protocols. If you have a few hours to kill and want to learn every nook and cranny of Bluetooth, check out the published specifications, otherwise here's a quick overview of what makes Bluetooth special.

Masters, Slaves, and Piconets

Bluetooth networks (commonly referred to as *piconets*) use a master/slave model to control when and where devices can send data. In this model, a single master device can be connected to up to seven different slave devices. Any slave device in the piconet can only be connected to a single master.

The master coordinates communication throughout the piconet. It can send data to any of its slaves and request data from them as well. Slaves are only allowed to transmit to and receive from their master. They can't talk to other slaves in the piconet.



Android

The interface for Bluetooth Sockets is similar to that of TCP sockets: Socket and ServerSocket. On the server side, a BluetoothServerSocket is used to create a listening server socket. When a connection is accepted by the BluetoothServerSocket, it will return a new BluetoothSocket to manage the connection. On the client side, a single BluetoothSocket is used to both initiate an outgoing connection and to manage the connection.

The most common type of Bluetooth socket is RFCOMM, which is the type supported by the Android APIs. RFCOMM is a connection-oriented, streaming transport over Bluetooth. It is also known as the Serial Port Profile (SPP).

Serial Port Profile (SPP)

When replacing a serial communication interface (like RS-232 or a UART) with Bluetooth, SPP is the profile to use. SPP is great for sending bursts of *data* between two devices. It's one of the more fundamental Bluetooth profiles (Bluetooth's original purpose was to replace RS-232 cables after all).

Using SPP, each connected device can send and receive data just as if there were RX and TX lines connected between them. Two Arduinos, for example, could converse with each other from across rooms, instead of from across the desk.