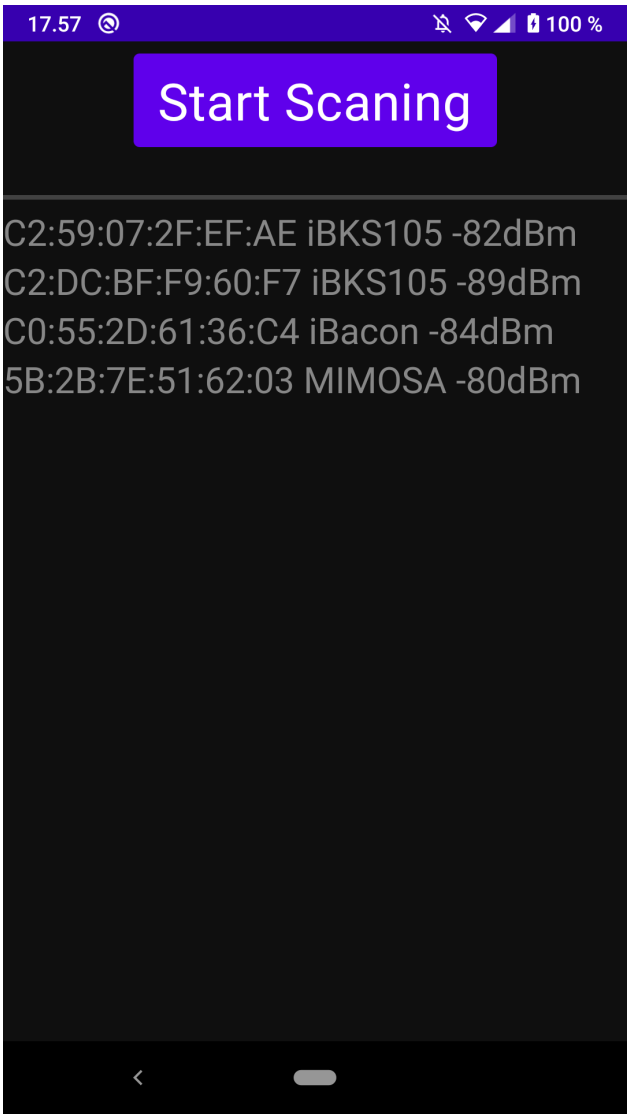
Communication to the IoT-type devices is more and more important nowadays. This kind of communication is in most cases done using Bluetooth LE technology. Android supports Bluetooth LE technology, but the API has changed recently and official Google tutorial documentation is based on the old version. Therefore it is important to practice with the Android Bluetooth LE basic operations.

## Exercise 11 Scanning Bluetooth LE devices

First we need to find out those Bluetooth LE devices around us. Create a program that scans Bluetooth LE devices around the phone. Represent the devices that are found as a List, something like what is shown here. First we have the name of the device (if it has a name), then the MAC address (represented like Ethernet MAC addresses) and finally the received signal strength indicator (RSSI[1]). If you cannot connect to the device (maybe it is a simple beacon or computer without access), the corresponding entry must be grayed in the list.




[1] RSSI unit is dBm, decibel related to the 1 mW power. You can convert this number to the milliwatts using the equation $10^{(RSSI/10)} \times 1mW$. For example, 0 dBm = 1 mW, -10 dBm = 0,1 mW, -60 dBm = 1 $\mu$W

Hint 1: Because we are using Bluetooth LE, you need to give all the three static permissions in the AndroidManifest.xml file and check at the runtime that those permissions are granted.

Hint 2: In order to disable one entry in your list , you can control the color of Text(..., color = if (scanresult.isConnectable) Color.

Hint 3: Put a button to your UI to start the scanning, and after about 3s (or more) stop the scanning and show the results on the list

Hint 4: There is a good Bluetooth LE scanner available from the Google Play store, called BLE Scanner. You can use this to find what kind of Bluetooth LE devices are around you. A more professional Bluetooth LE scanner available at the Google Play store is nRF Connect.

Hint 5: If you don’t have a Bluetooth device available to you, it is possible to make a Windows PC/laptop as a Bluetooth device emulator with Bluetooth LE Explorer (an application available from the Microsoft Store). nRF Connect app can also be used to simulate a Beacon if you have more than one Android phone.

Hint 6: Android Studio emulator simulates two Bluetooth LE devices (addresses BE:AC:10:00:00:01 and BE:AC:10:00:00:02). Therefore you can use a plain emulator to test your Bluetooth scanning application, but this seems to require the emulator to be API 30 x86 (32-bit version), not x86_64.