BlueCar: An RC Car Using Bluetooth

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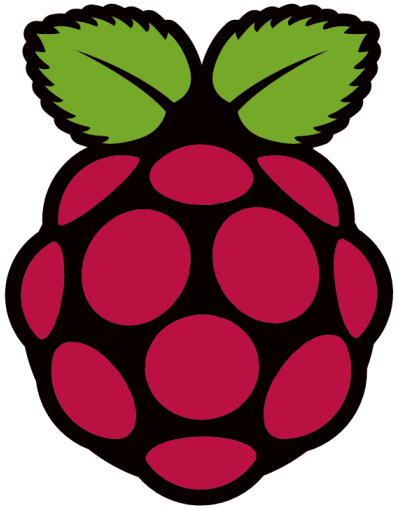
Motivation

- Development on various platforms & tools
- A remote control car using various methods

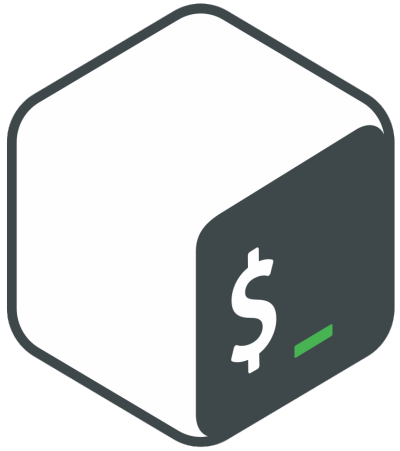


Platform

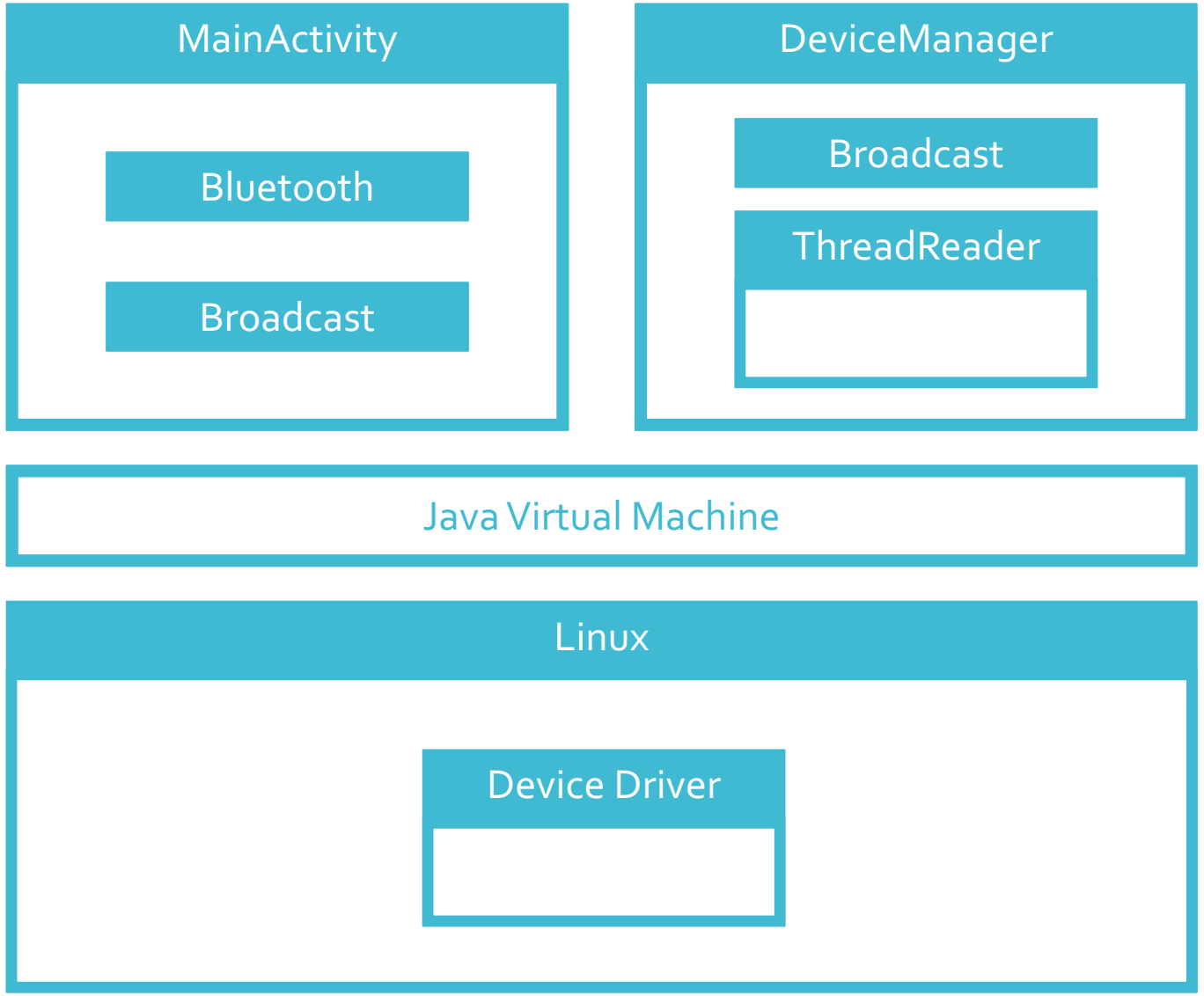
Connectivity

Voice Recognition

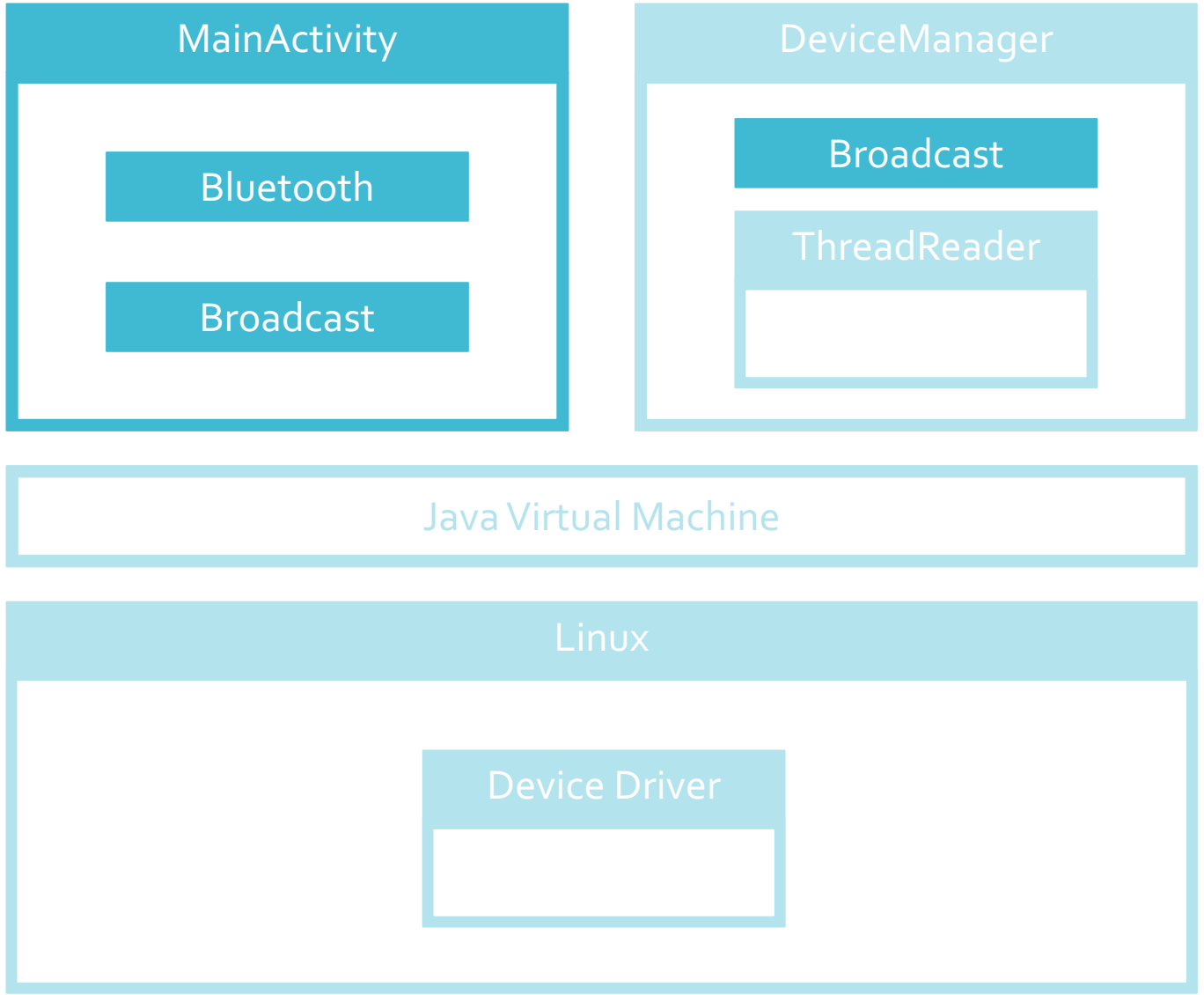
Implements



Android


MainActivity
Bluetooth
Broadcast
DeviceManager
Broadcast
ThreadReader
Java Virtual Machine
Linux
Device Driver

Android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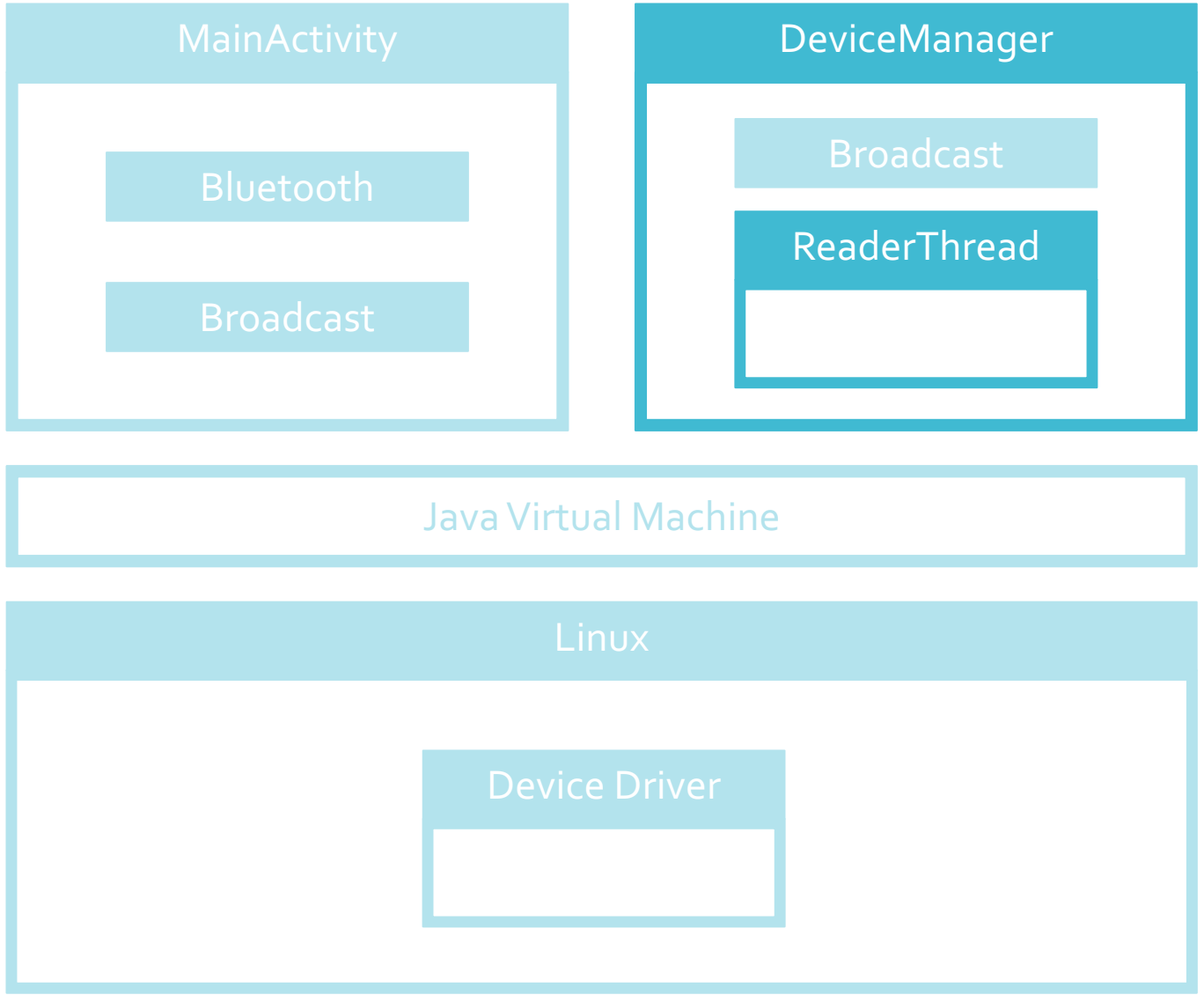
Android Bluetooth

- BluetoothAdapter
  - Return bonded devices
- BluetoothDevice
  - Create and return RFCOMM socket
- BluetoothSocket
  - Return stream for data transfer
- {Output|Input}Stream
  - Transfer data via methods read() and write()
  - Given a dedicated thread for read()

Android Broadcast

- Class LocalBroadcastManager
- Used for communication between main activity and DeviceManager service.
- Pass data via Intents.
  - registerReceiver() sets a listener
  - sendBroadcast() literally “broadcasts” the intent to the app.
  - The preregistered listener catches the broadcast and runs code.
  - Listener can filter intents to receive only meaningful data.

Android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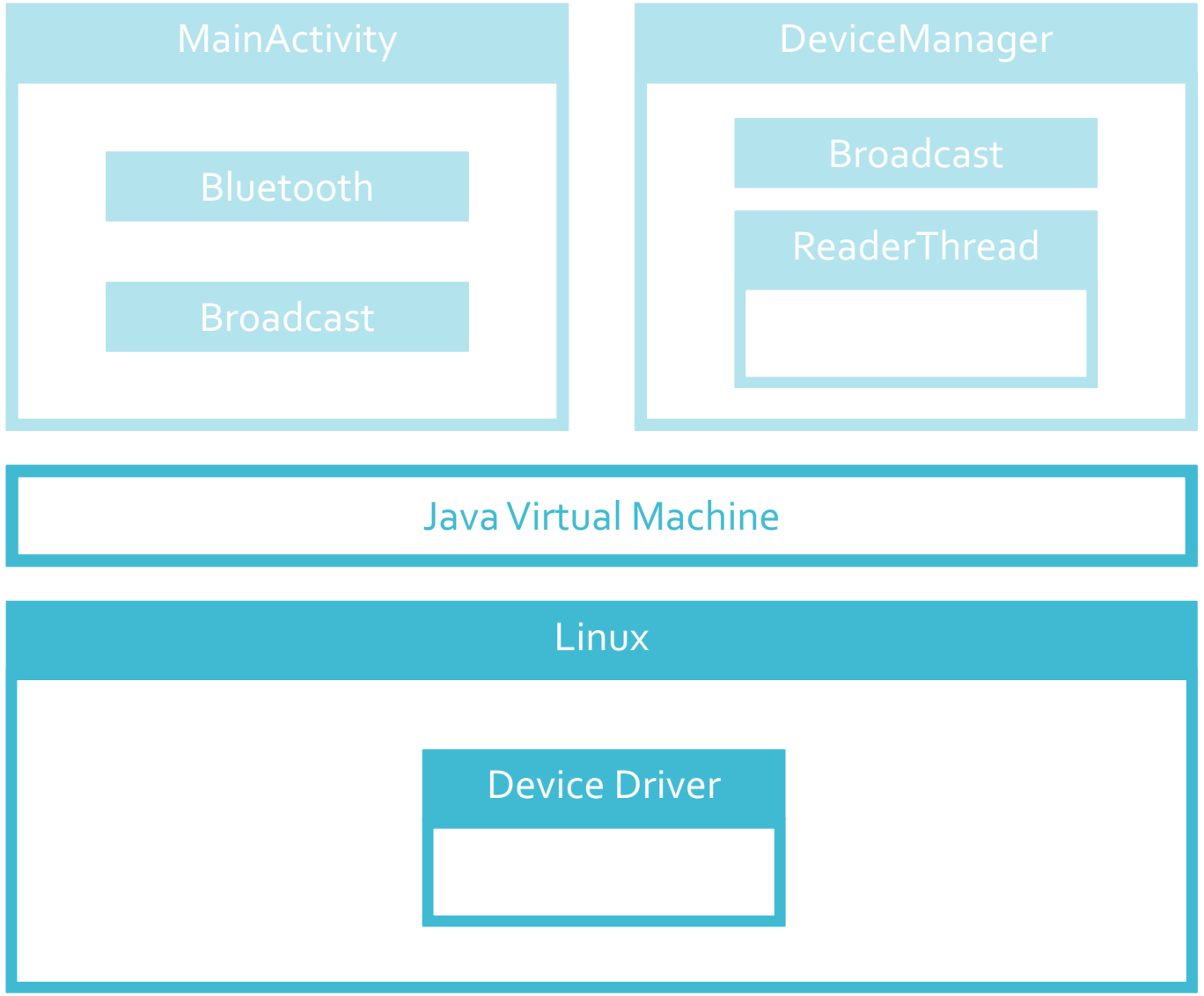
Android Service

- DeviceManager *extends* Service.
- Has an inner class ReaderThread which *implements* Runnable.
  - Services run on the same thread with the main activity. Needs a dedicated thread in our case.
- Manages operations on device drivers via JNI
  - Starts thread which reads device periodically

Android JNI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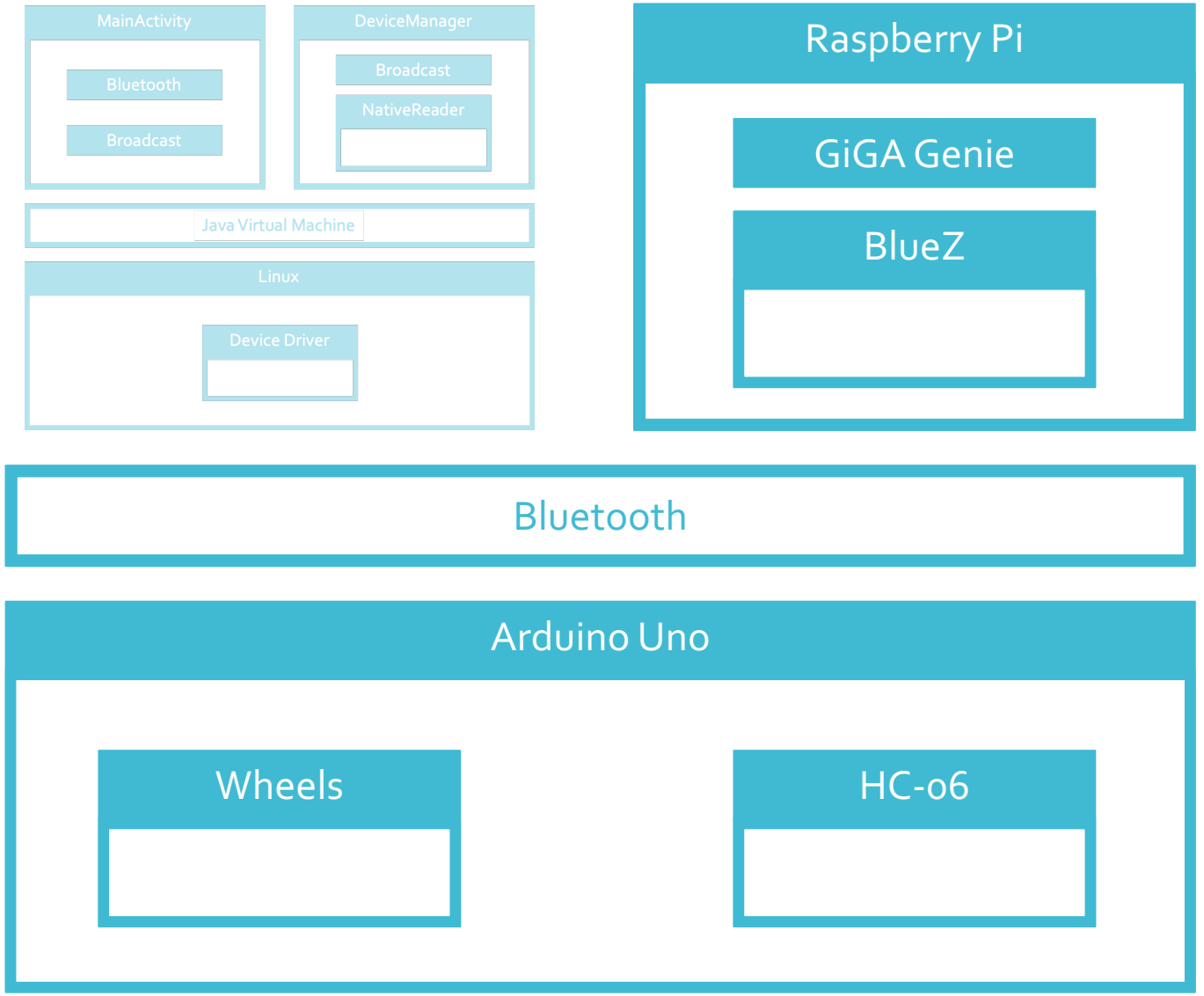
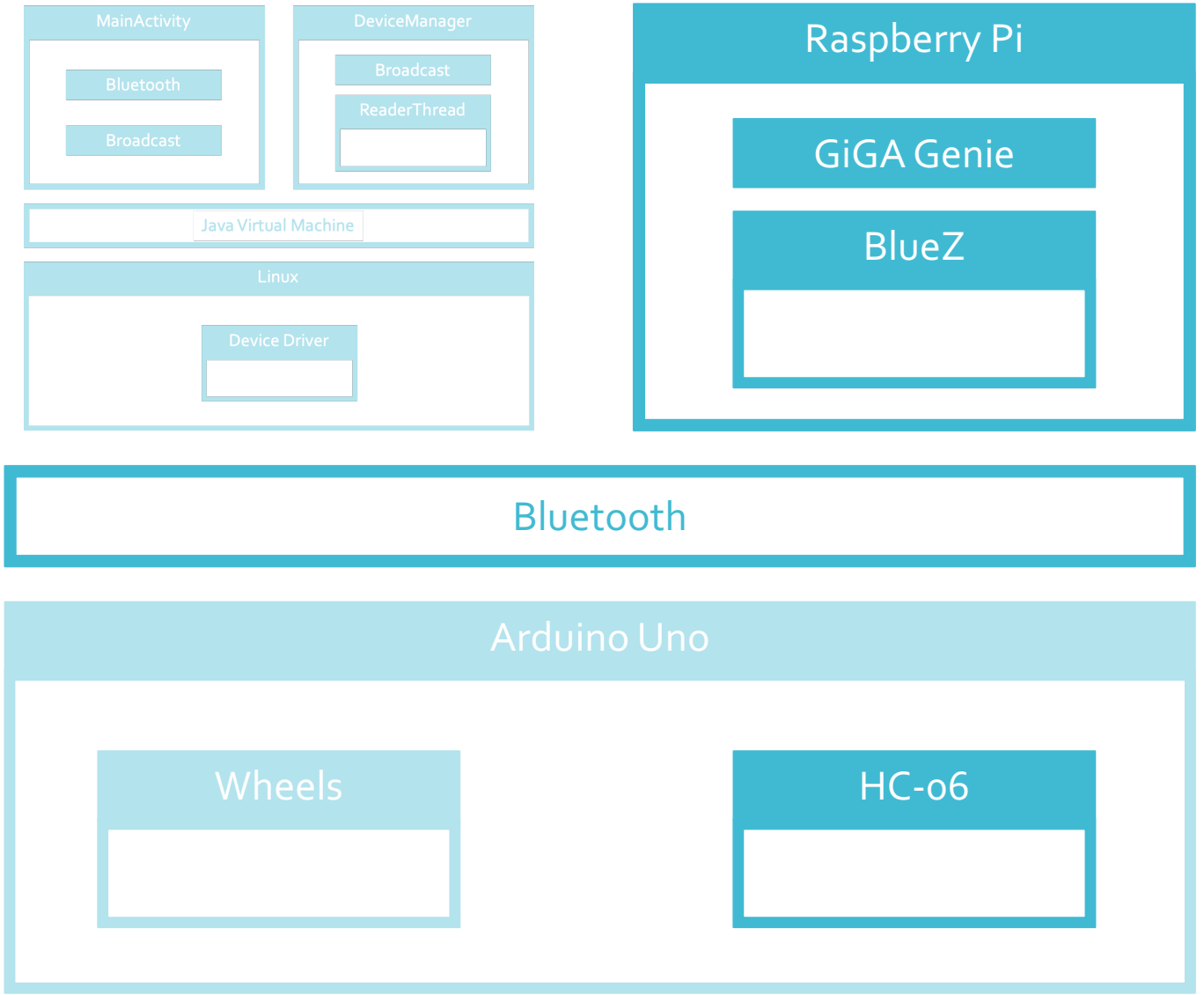
Android JNI

- Device drivers are written in C
  - Implemented in Linux kernel modules
- DeviceManager can access device drivers (switch, dot, and led) using JNI
  - DeviceManager can read/write data in the FPGA devices
  - Reads are done by a dedicated thread, and writes are performed by the service thread.

Peripherals



Peripherals



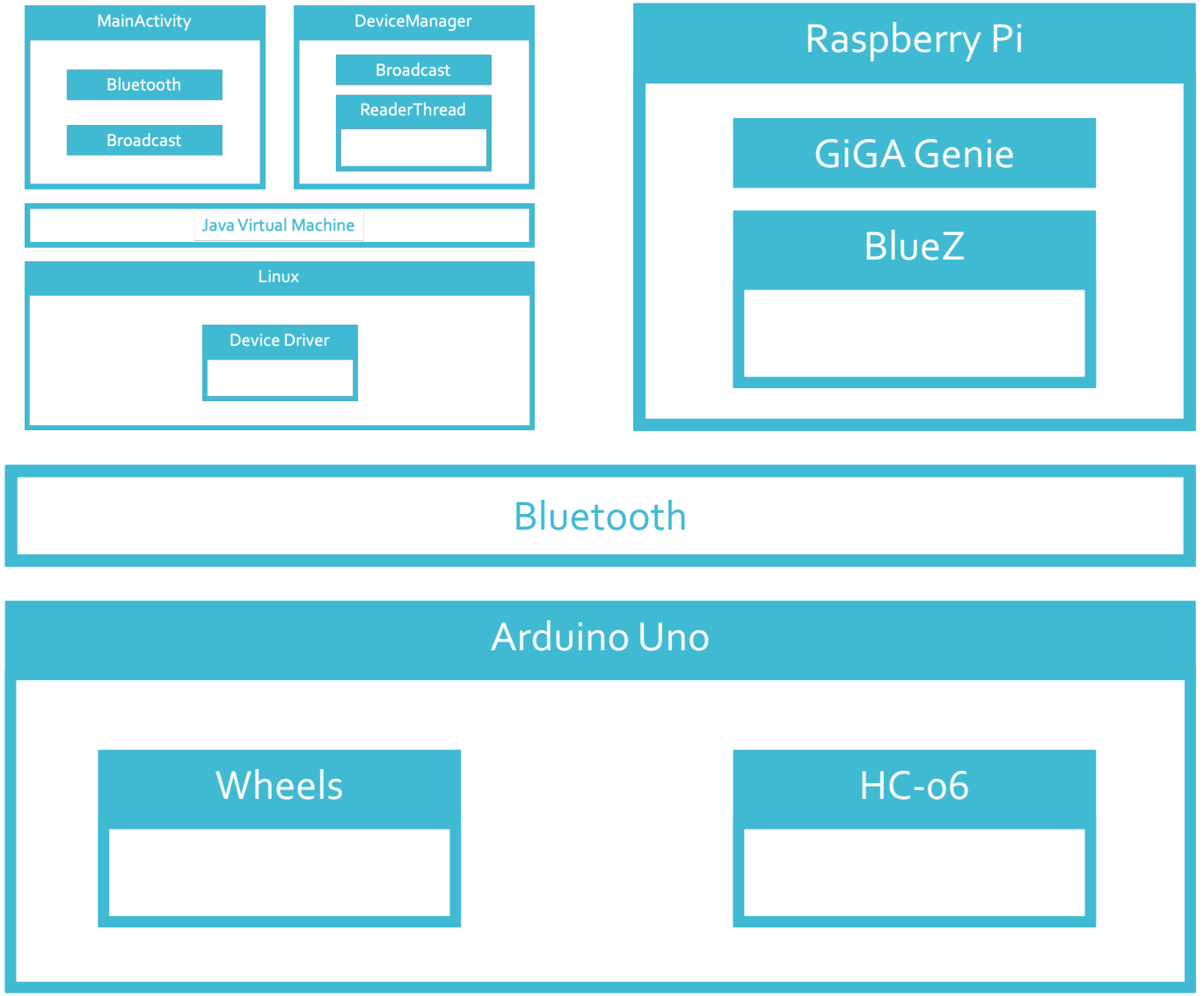
Peripherals GiGA Genie

- GiGA Genie is powered by KT API Link
  - Voice recognition process is implemented as a python script
  - Records the voice input and sends an API request to the KT server
  - The server responds with a (Korean text) string
- The result is sent to Arduino Uno using Bluetooth connection
  - BlueZ is activated by shell script running in the python process

Peripherals Bluetooth

- In order to use Bluetooth in Raspberry Pi, we install package BlueZ
- Pairing with Arduino is done by bluetoothctl
- BlueZ does the RFCOMM binding to initiate connection
- Voice recognition & transporting to Arduino can be done in a plug-n-play fashion.

Summary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Raspberry Pi
GiGA Genie
BlueZ
Bluetooth
Arduino Uno
Wheels
HC-06

Contributions

- C.Y. Sim
  - GiGA Genie
  - Bluetooth (Raspberry Pi ~ Arduino)
- K.Y. Lee
  - Android App (JNI)
  - Bluetooth (Android ~ Arduino)
- S. Hwang
  - Arduino UNO
  - Bluetooth
  - JNI