

android things

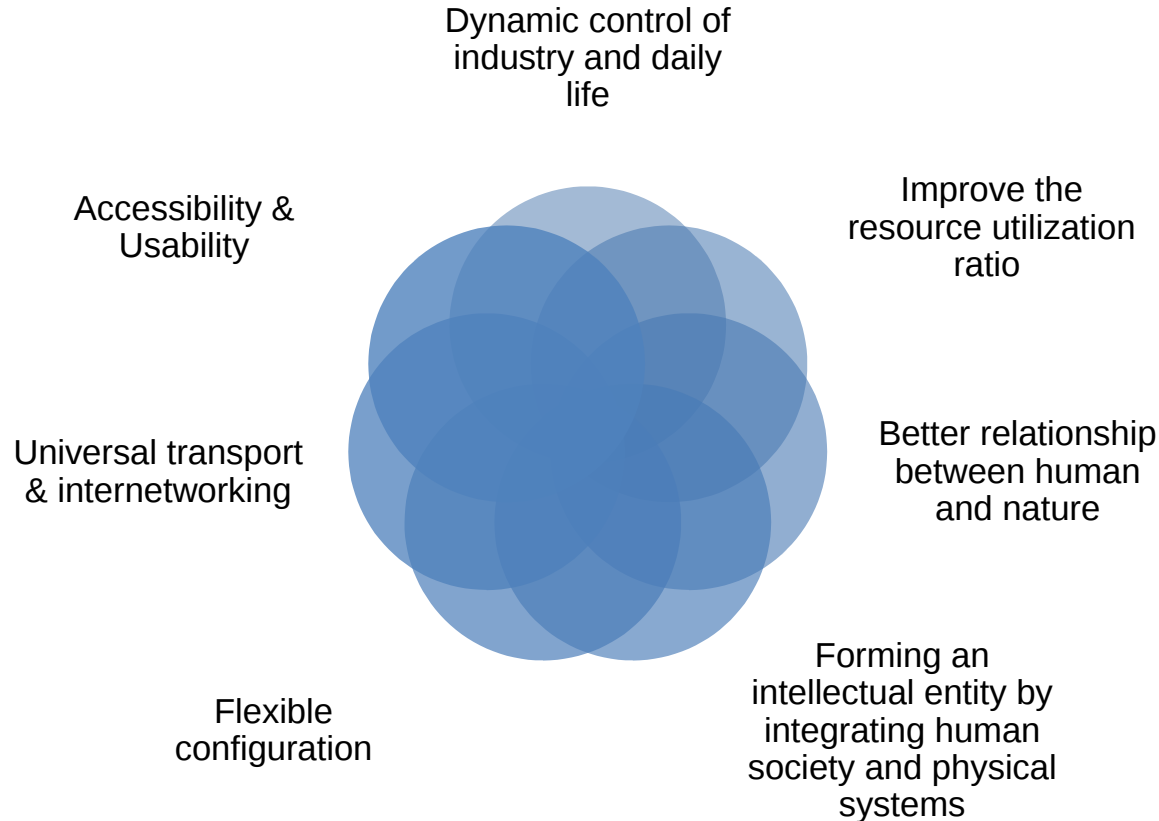
IoT GDE 王玉成

What is the Internet of Things?



- Internet connects all people, so it is called “the Internet of People”
- IoT connects all things, so it is called “the Internet of Things”

Why Internet of Things?



Ideal for **powerful, intelligent devices on the edge** that **need to be secure.**



Cameras

Gateways

HVAC Control

Smart Meters



Point of Sale

Inventory Control

Interactive Ads

Vending Machines



Security Systems

Smart Doorbells

Routers

Energy Monitors

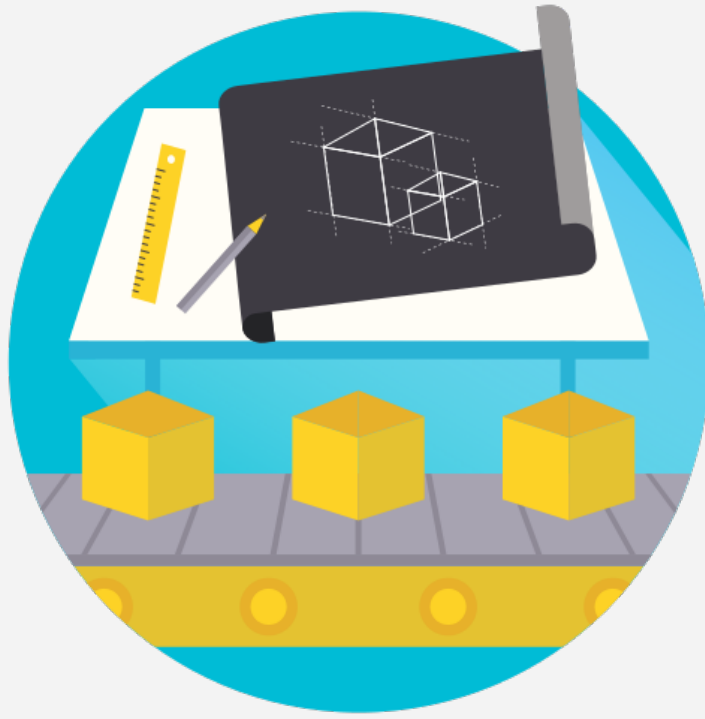


Asset Tracking

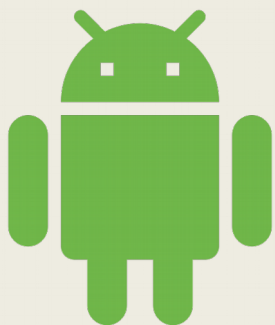
Fleet Management

Driver Assist

Predictive Service



From Prototype to Production



Android SDK



Android Studio



Play Services



Firebase



Cloud Platform



IoT Developer
Console



Automatic
Security
Updates



Signed Images



Verified Boot

Managed by Google

Android Framework

Hardware Libraries

Linux Kernel

Managed by Developers

Apps

User Drivers



Android Things for Developers

Applications

Launcher

Phone

Messaging

Contacts

Calendar

Browser

Application Framework

Activity
Manager

Window
Manager

Power
Manager

Resource
Manager

XMPP Service

Content
Providers

Wallpapers

SystemUI

Package
Manager

Telephony
Manager

Location
Manager

Connectivity
Manager

View System

Runtime
Permissions

Soft
Keyboards

Notifications

Libraries

Surface
Manager

Media
Framework

Chromium

SSL

HAL

Audio
Manager

SQLite

OpenGL

libc

Android Runtime

Core Libraries

Android Runtime
(ART)

Linux Kernel

Display Driver

Camera Driver

Bluetooth
Driver

Binder (IPC)
Driver

USB Driver

Audio Driver

WiFi Driver

Power
Management

Applications

Launcher

Phone

Messaging

Contacts

Calendar

Browser

Application Framework

Activity
Manager

Window
Manager

Power
Manager

Resource
Manager

XMPP Service

Content
Providers

Wallpapers

SystemUI

Package
Manager

Telephony
Manager

Location
Manager

Connectivity
Manager

View System

Runtime
Permissions

Soft
Keyboards

Notifications

Libraries

Surface
Manager

Media
Framework

Chromium

SSL

HAL

Audio
Manager

SQLite

OpenGL

libc

Android Runtime

Core Libraries

Android Runtime
(ART)

Linux Kernel

Display Driver

Camera Driver

Bluetooth
Driver

Binder (IPC)
Driver

USB Driver

Audio Driver

WiFi Driver

Power
Management



Displays are Optional



Consider Alternate UI



```
<application ...>
  <uses-library android:name="com.google.android.things"/>

  <activity ...>
    ...

    <!-- Launch activity automatically on boot -->
    <intent-filter>
      <action android:name="android.intent.action.MAIN"/>
      <category android:name="android.intent.category.IOT_LAUNCHER"/>
      <category android:name="android.intent.category.DEFAULT"/>
    </intent-filter>
  </activity>
</application>
```

Home Activity

Peripheral I/O

GPIO

PWM

I²C

SPI

UART

// Open a peripheral connection

```
PeripheralManagerService service = new PeripheralManagerService();  
Gpio button = service.openGpio(GPIO_PIN_NAME);
```

// Configure the peripheral

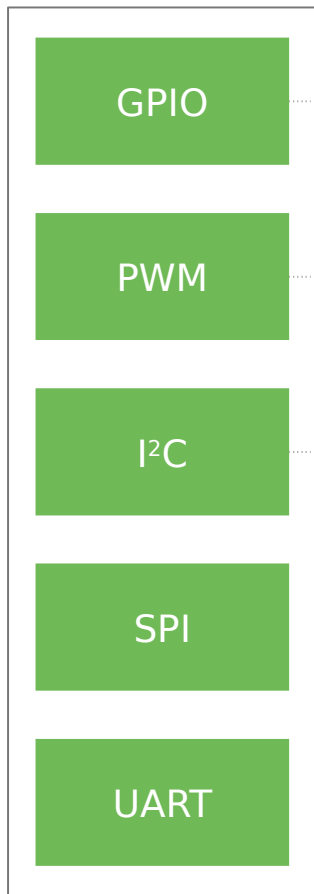
```
button.setDirection(Gpio.DIRECTION_IN);  
button.setEdgeTriggerType(Gpio.EDGE_FALLING);
```

// Attach callback for input events

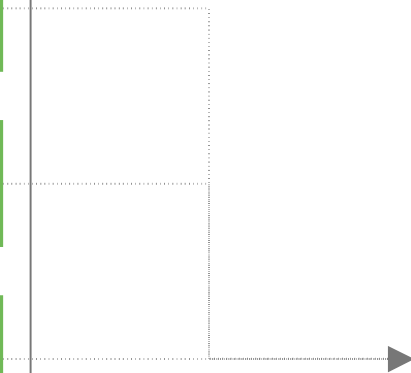
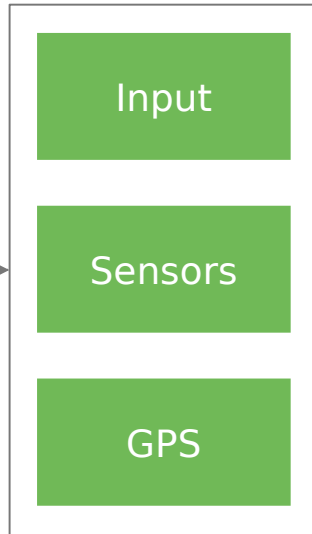
```
button.registerGpioCallback(new GpioCallback() {  
    @Override  
    public boolean onGpioEdge(Gpio gpio) {  
        Log.i(TAG, "GPIO changed");  
  
        // Return true to continue listening to events  
        return true;  
    }  
});
```

Simple Peripheral I/O

Peripheral I/O



User Drivers



```
InputDriver inputDriver = InputDriver.builder(InputDevice.SOURCE_CLASS_BUTTON)
    .setName(DRIVER_NAME)
    .setVersion(DRIVER_VERSION)
    .setKeys(new int[]{KeyEvent.KEYCODE_SPACE})
    .build();
UserDriverManager.getManager().registerInputDriver(inputDriver);
```

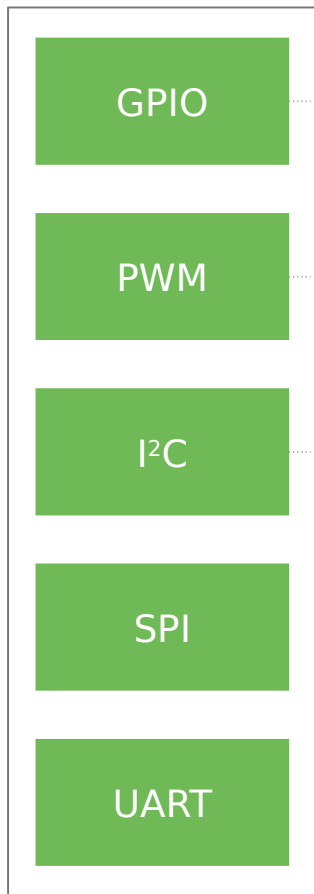
```
private GpioCallback callback = new GpioCallback() {
    @Override
    public boolean onGpioEdge(Gpio gpio) {
        int keyAction = gpio.getValue() ?
            KeyEvent.ACTION_DOWN : KeyEvent.ACTION_UP;

        inputDriver.emit(new KeyEvent[]{
            new KeyEvent(keyAction, KeyEvent.KEYCODE_SPACE)});

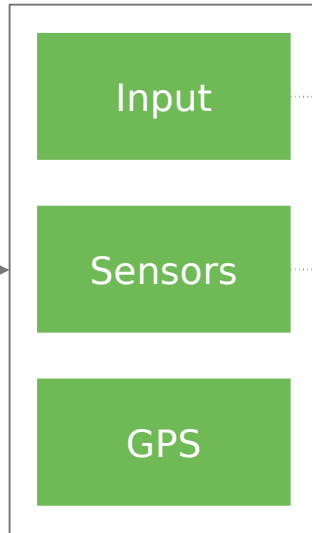
        return true;
    }
};
```

Button User Driver

Peripheral I/O



User Drivers



Periphera
I Driver
Library



```
dependencies {  
    compile 'com.google.android.things.contrib:driver-button:...'  
}
```

```
ButtonInputDriver inputDriver = new ButtonInputDriver(  
    GPIO_PIN_NAME,  
    Button.LogicState.PRESSED_WHEN_LOW,  
    KeyEvent.KEYCODE_SPACE);  
  
inputDriver.register();
```

Button Library Driver

androidthings



Google's IoT Developers Community
<https://g.co/iotdev>



Android Things Code
<https://github.com/androidthings>



Android Things SDK
<https://developer.android.com/things>