

Developing IoT Applications using Raspberry Pi and Android Things



ODTÜ KALTEV
Ev Sahibi



ODTÜ KKK
Ev Sahibi



Kuzey Kıbrıs Turkcell
Ana Sponsor



ARDIC Technology
Platform Sağlayıcı

H.Yavuz ERZURUMLU

Software Engineer / ARDIÇ
yavuz.erzurumlu@ardictech.com



<https://github.com/freeloki>

Ceyhun ERTÜRK

Software Engineer / ARDIÇ
ceyhun.erturk@ardictech.com

What are we going to learn ?

- **What is IoT?**
- **Why Android Things?**
- **What is IoT-Ignite?**
- **Demo Application**
- **An Introduction to IoT Devices and Environment**
- **How to setup a gateway**



What are we going to learn ?

- Practising IoT-Ignite apps on demo code
- Making an application trusted
- Configuration a gateway
- Visualizing thing data on IoT-Ignite
- Defining a complex event rule

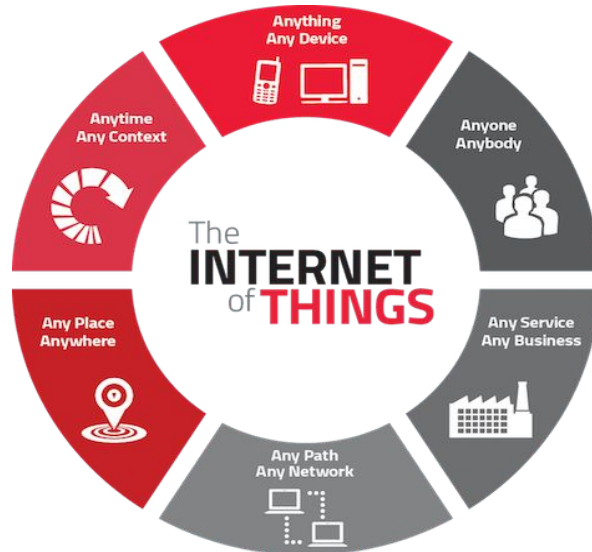




What is IoT?

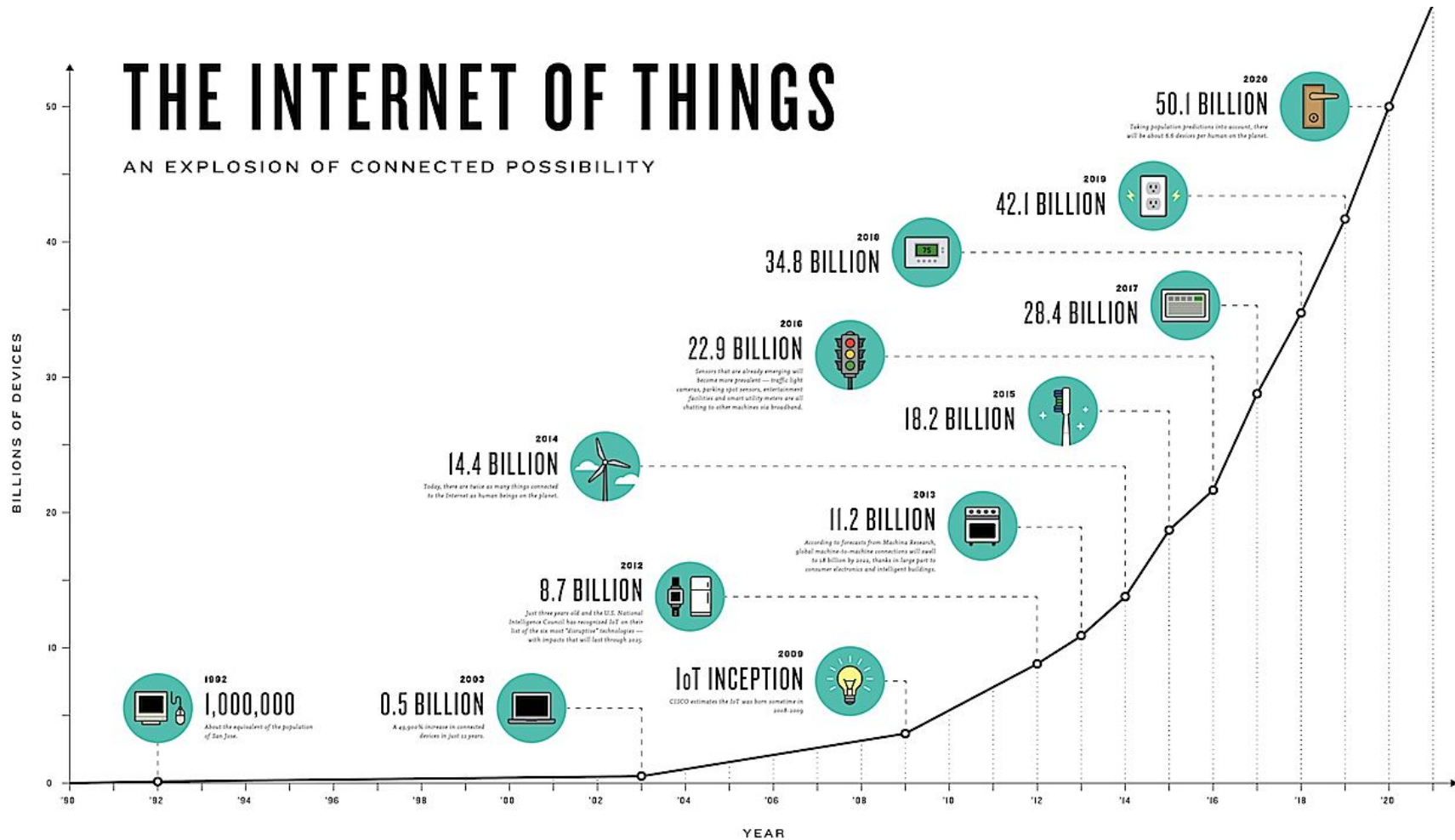
What is IoT?

- IoT is an abbreviation for Internet of Things.
- All devices around us can be managed locally or remotely by connecting them to the Internet in various ways. Even devices can manage others.



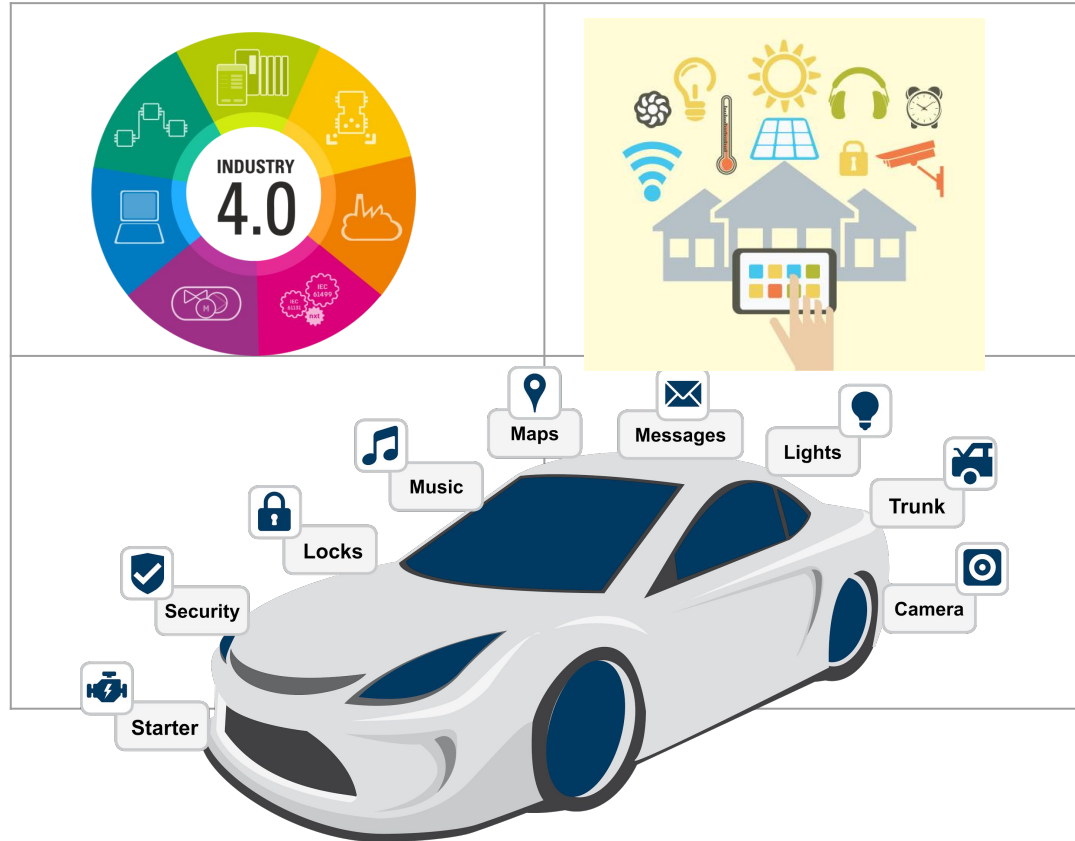
THE INTERNET OF THINGS

AN EXPLOSION OF CONNECTED POSSIBILITY



What are main IoT Application Areas?

- Smart Homes
- Industry 4.0
- Smart Cities
- Smart Agriculture
- Medical Applications
- Smart Cars

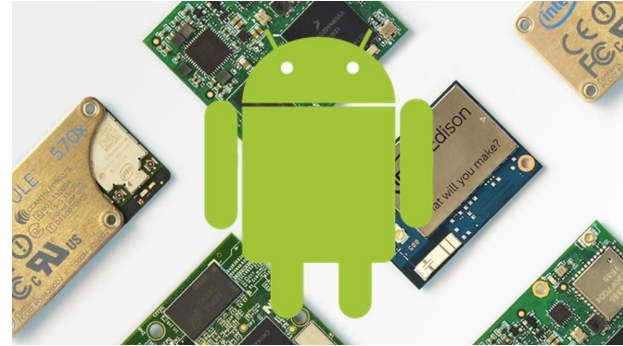


Android Things™

Google has developed the IoT version of Android OS, the most widely used operating system in the world, to run on embedded devices.

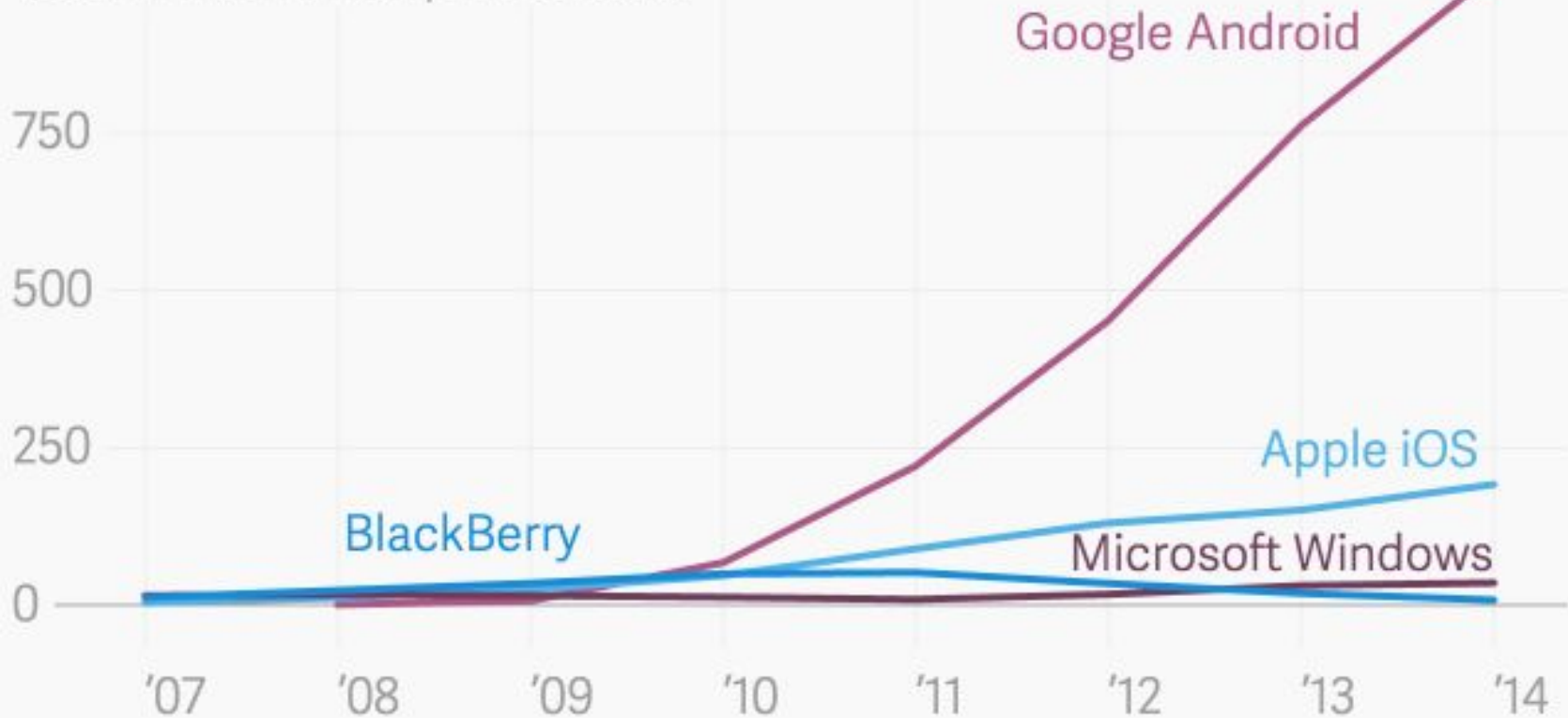
- Announce Date: December 2016 (Dev preview 1)
- <https://developer.android.com/things/index.html>

androidthings



Android rules the world—by volume, at least

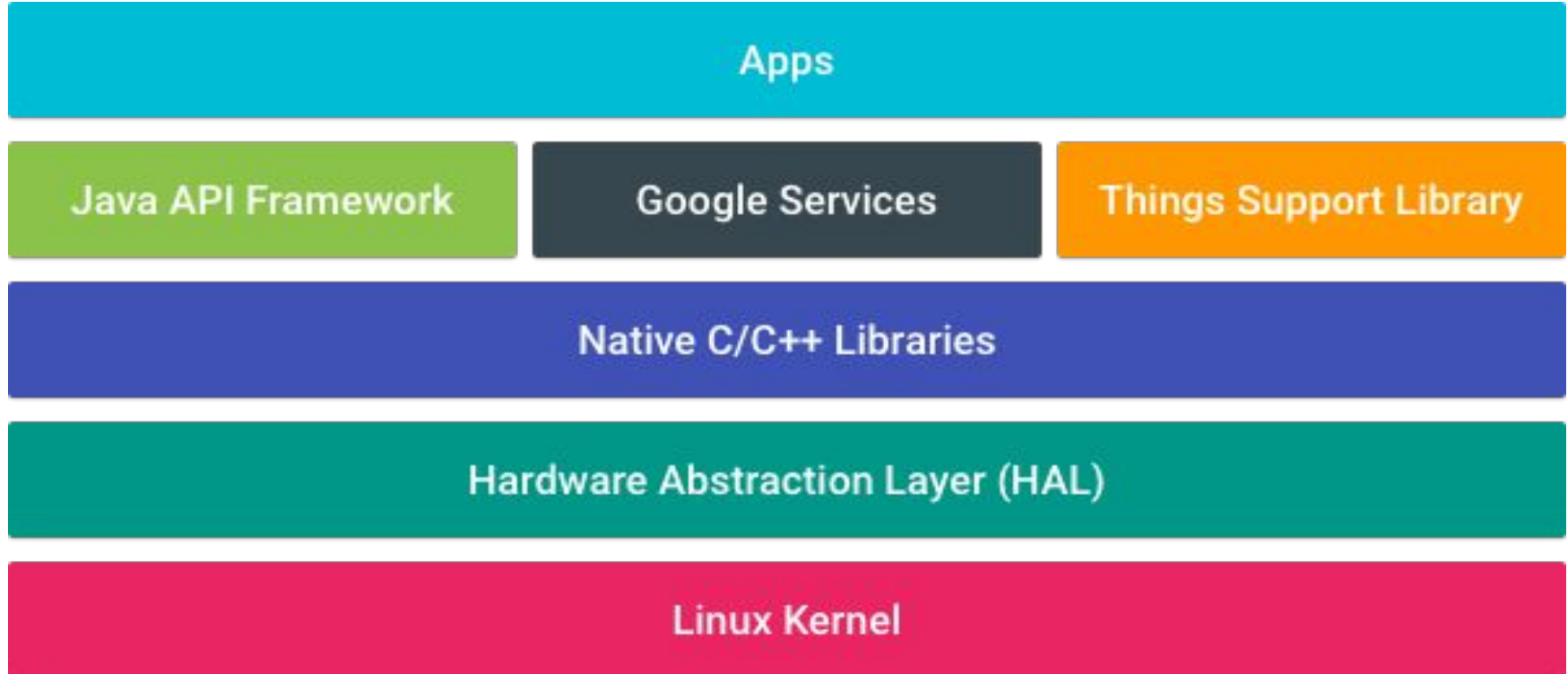
1,000 million smartphone sales



Advantages of Android Things

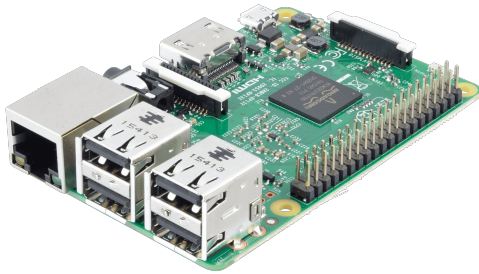
- Easy programming;
 - You develop your IoT applications in the same way you develop a mobile application.
 - You have the complete functional support of an IDE: Android Studio.
- It is free and open source (Source code will be published sooner).
- It is secure.
- Easy management.
- Officially supported hardware
- Platform with the largest developer community.

Android Things Architecture

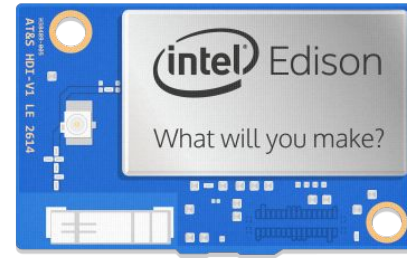


Supported Devices

Raspberry Pi 3



Intel Edison



Intel Joule



NXP Pico i.MX6UL



Installing Android Things

Download system
image from

<https://developer.android.com/things/preview/download.html>

The screenshot shows the 'System Image Downloads' page on the Android Things developer site. The left sidebar has a red box around 'System Image Downloads' with a red '2' next to it. Above it, 'Developer Kits' is also boxed with a red '1'. In the main content area, the table lists various system images, with 'androidthings_rpi3_devpreview_2.zip' highlighted by a red box and a red '3' next to it. The page includes a search bar, a 'Hardware' tab, and a table of system images with columns for Platform, Things package, Size, and SHA-1 checksum.

System Image Downloads

This page contains binary image files that allow you to update or restore Android Things on a supported [developer board](#).

Select a platform

Platform	Things package	Size	SHA-1 checksum
Intel Edison	androidthings_edison_devpreview_2.zip	249 MB (261384078 bytes)	0621e4a890c0cc25d6bb16aed87aee8d5ec819a7
Intel Joule	androidthings_joule_devpreview_2.zip	267 MB (280434440 bytes)	b11317de771a85a0bbe514c383a8974d87866b2
NXP Pico i.MX6UL	androidthings_imx6ul_pico_devpreview_2.zip	239 MB (250738643 bytes)	6571f00a785cd47f404722c8ae3ad63c821e5865
Raspberry Pi 3	androidthings_rpi3_devpreview_2.zip	244 MB (256381956 bytes)	b8790030c1bb889b65b0222e462f9911fc0f0a71

For more details, see the [preview release notes](#).

This site uses cookies to store your preferences for site-specific language and display options. [OK](#)

Installing Android Things

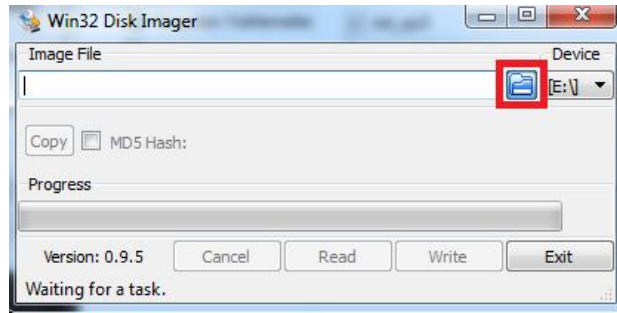
Download Win32DiskImager from the link below and install it.

<https://sourceforge.net/projects/win32diskimager/>

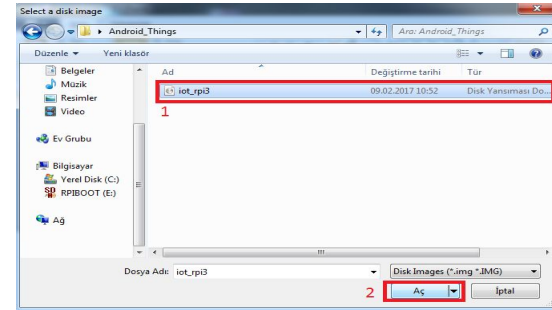
This program is capable of flashing Android Things “.img” file to Micro SD-Card.

Installing Android Things

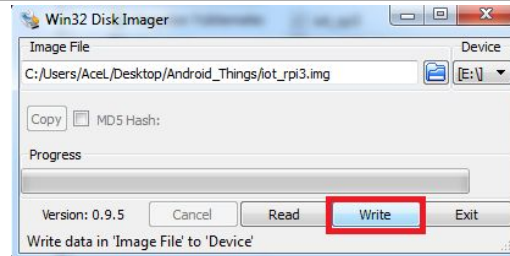
Click button to select file.



Select file with “.img” extension



Click “Write” button to flash image.



Installing Android Things

Insert flashed SD-Card to Raspberry Pi



Installing Android Things

Power up Raspberry Pi. You should see the boot up screen below.

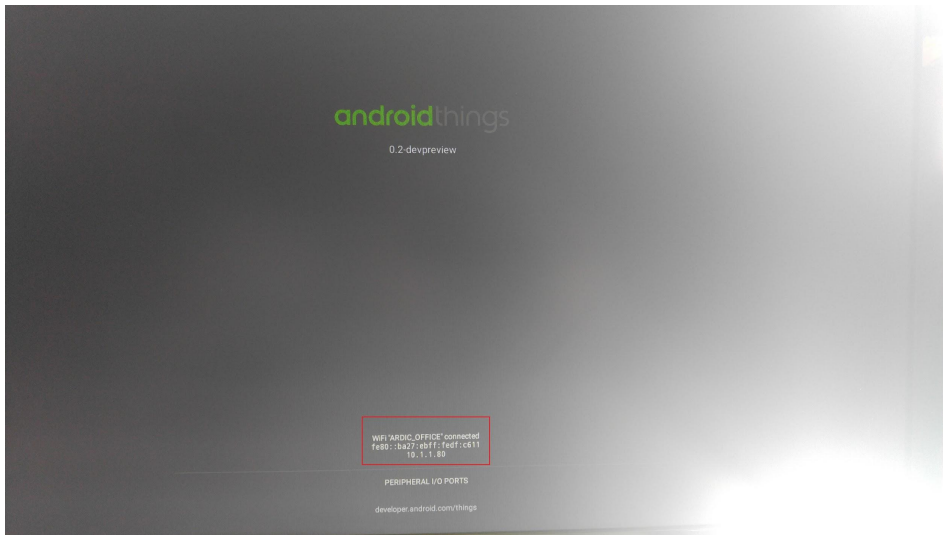
A dark gray rectangular area representing a boot screen. In the center, the text 'androidthings' is displayed. 'android' is in a light green color and 'things' is in a light gray color. Below the text, there are three small white dots arranged horizontally.

androidthings

...

Installing Android Things

Using the displayed IP at the bottom of this screen, we can connect to and configure this device. We are going to use “adb” application for this purpose.



Installing Android Things

```
am startservice -n com.google.wifisetup/.WifiSetupService -a
WifiSetupService.Connect -e ssid <SSID> -e passphrase <PASSWD>
```

```
Windows PowerShell
Copyright (C) 2009 Microsoft Corporation. All rights reserved.

PS C:\Users\AceL> adb connect 10.1.1.73
* daemon not running. starting it now on port 5555
* daemon started successfully *
connected to 10.1.1.73:5555
PS C:\Users\AceL>
PS C:\Users\AceL>
PS C:\Users\AceL>
PS C:\Users\AceL>
PS C:\Users\AceL> adb shell
rpi3:/ $
rpi3:/ $
rpi3:/ $
rpi3:/ $
rpi3:/ $
.wifisetup/.WifiSetupService -a WifiSetupService.Connect -e ssid {Ağ Adı} -e passphrase {Şifresi}
Starting service: Intent { act=WifiSetupService.Connect cmp=com.google.wifisetup/.WifiSetupService (has extras) }
rpi3:/ $
rpi3:/ $
rpi3:/ $
rpi3:/ $ reboot
```

Installation of IoT-Ignite Agent & Licensing Gateway

```
Windows PowerShell
Copyright (C) 2009 Microsoft Corporation. All rights reserved.

PS C:\Users\AceL> adb connect 10.1.1.80
already connected to 10.1.1.80:5555
PS C:\Users\AceL>
PS C:\Users\AceL>
PS C:\Users\AceL> adb devices
List of devices attached
10.1.1.80:5555 device
PS C:\Users\AceL>
PS C:\Users\AceL>
PS C:\Users\AceL> adb install C:\Users\AceL\Downloads\IoTigniteAgent-AR.IGF.0.8.25-20170113-R.apk
```

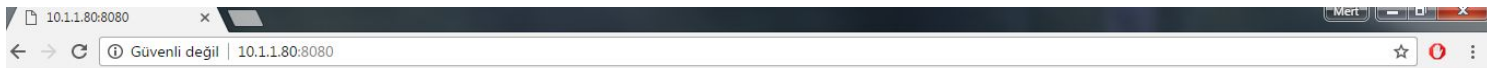
1st Step

2nd Step

3rd Step

Installation of IoT-Ignite Agent & Licensing Gateway

After you connect to the same network, open a web browser and enter <Gateway IP>:8080.



Ignite Agent Registration

Gateway ID:

b8:27:eb:df:c6:11@iotigniteagent

App Key:

Put your AppKey

Activation Code:

Put your activation code

Mode Name:

Put your mode name

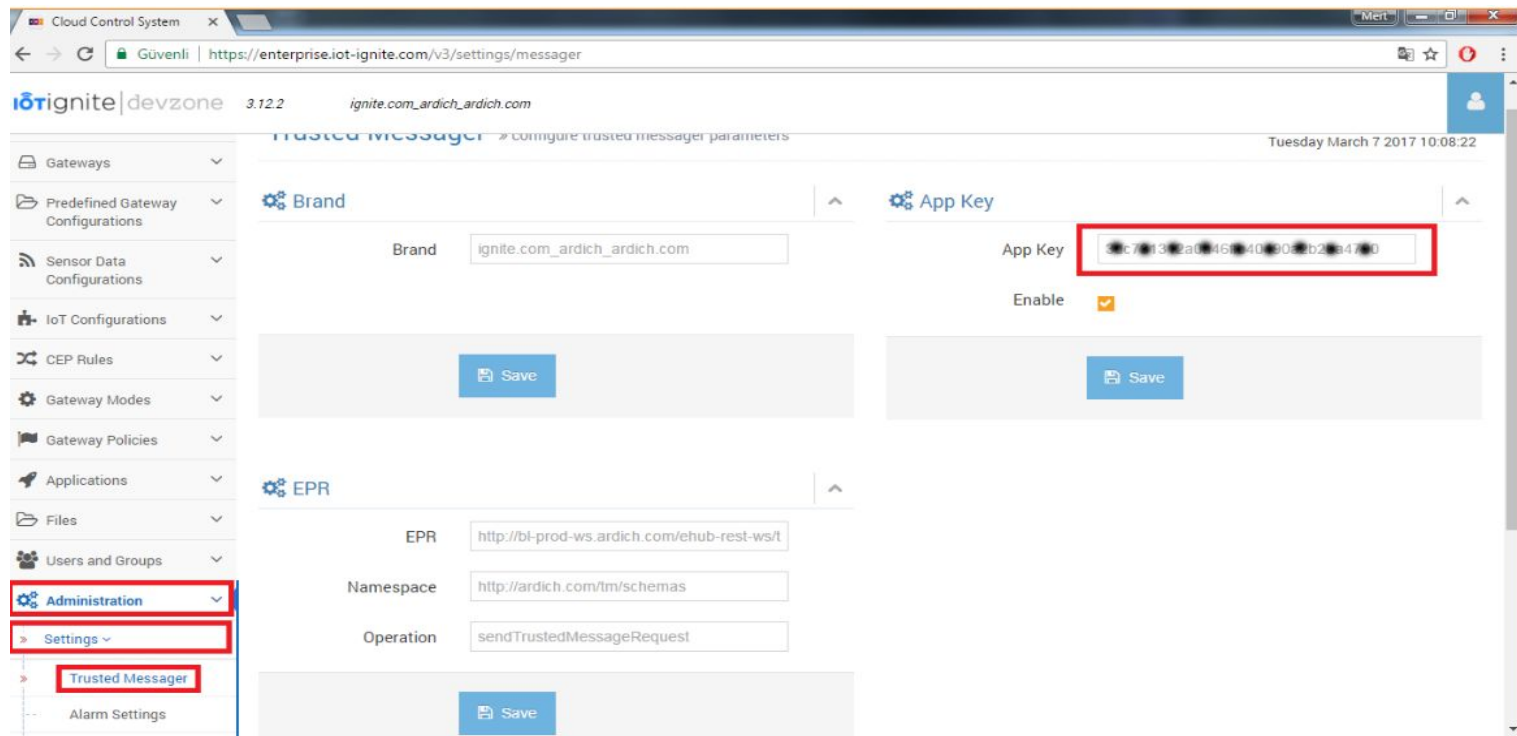
Apply and Start Registration

www.iot-ignite.com

Powered by ARDIC

Installation of IoT-Ignite Agent & Licensing Gateway

How to obtain application key:



Installation of IoT-Ignite Agent & Licensing Gateway

How to retrieve activation code:

The screenshot shows the IoT-Ignite Admin Console interface. The left sidebar contains a menu with 'Users and Groups' and 'Gateway Users' highlighted with red boxes. The main area displays the 'User List' for the 'DEFAULT_ADMIN_AREA'. A table lists users, with the first user 'ardich@ardich.com' having an activation code '728436' highlighted with a red box. The 'Send Mail' button is also visible.

Cloud Control System x

← → ↻ Güvenli | <https://enterprise.iot-ignite.com/v3/auth/enduser>

IoTignite|devzone 3.12.2 ignite.com_ardich_ardich.com

Select Admin Area

MQTT Gateways

Predefined Gateway Configurations

Sensor Data Configurations

IoT Configurations

CEP Rules

Gateway Modes

Gateway Policies

Applications

Files

Users and Groups

System Users

Gateway Users

Admin Areas

Working Group

Export

+ Create User + Upload

Show 10 entries

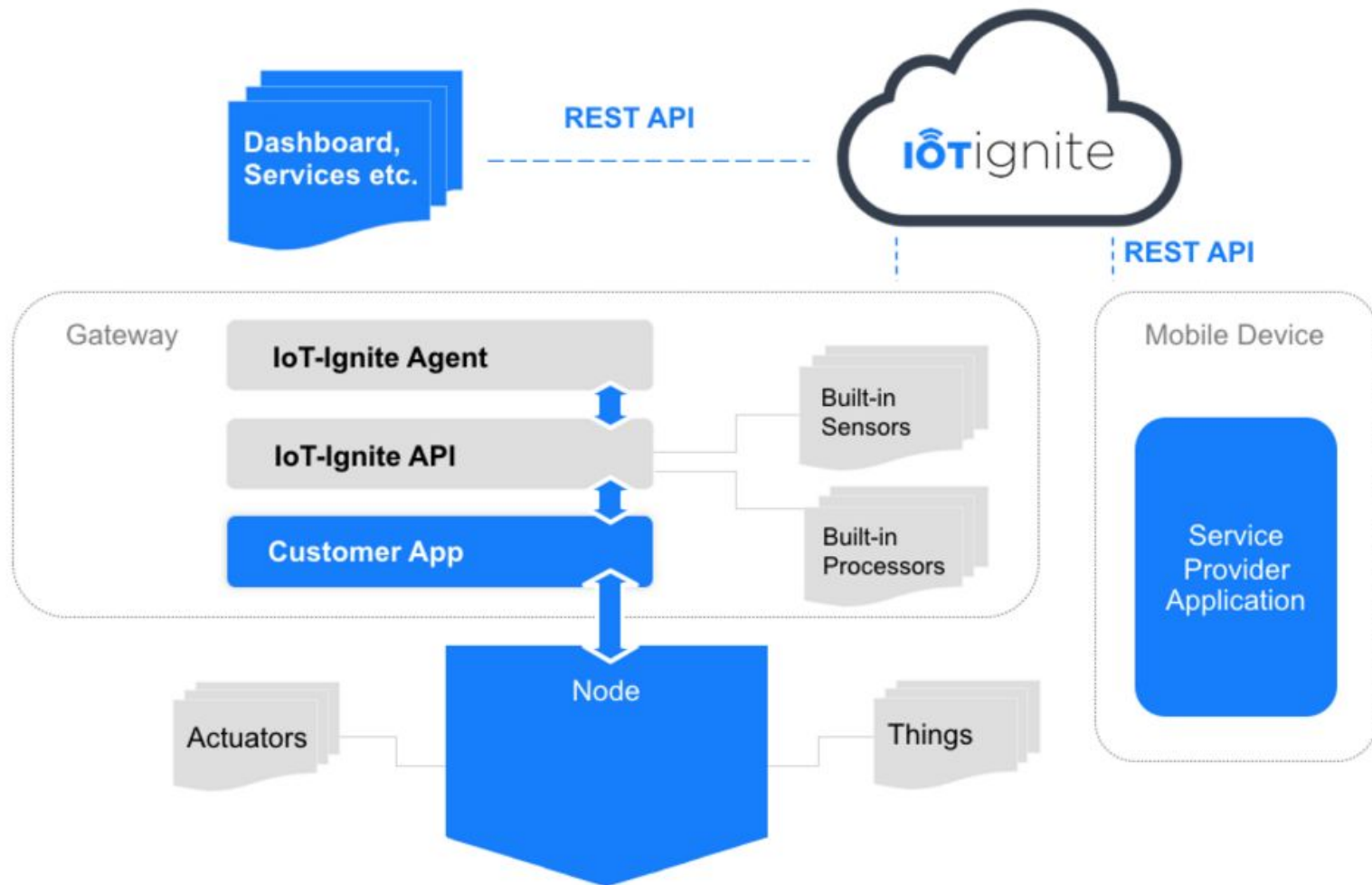
Username	Mode	Policy	Admin Area	Identity No	First Name	Last Name	Activation Code	Created Date	
ardich@ardich.com	DEMO	DEMO	DEFAULT_ADMIN_AREA		ardic	ardic	728436	2017-03-07 10:02	Send Mail

Showing 1 to 1 of 1 entries

Installation of IoT-Ignite Agent & Licensing Gateway

Mode Name:

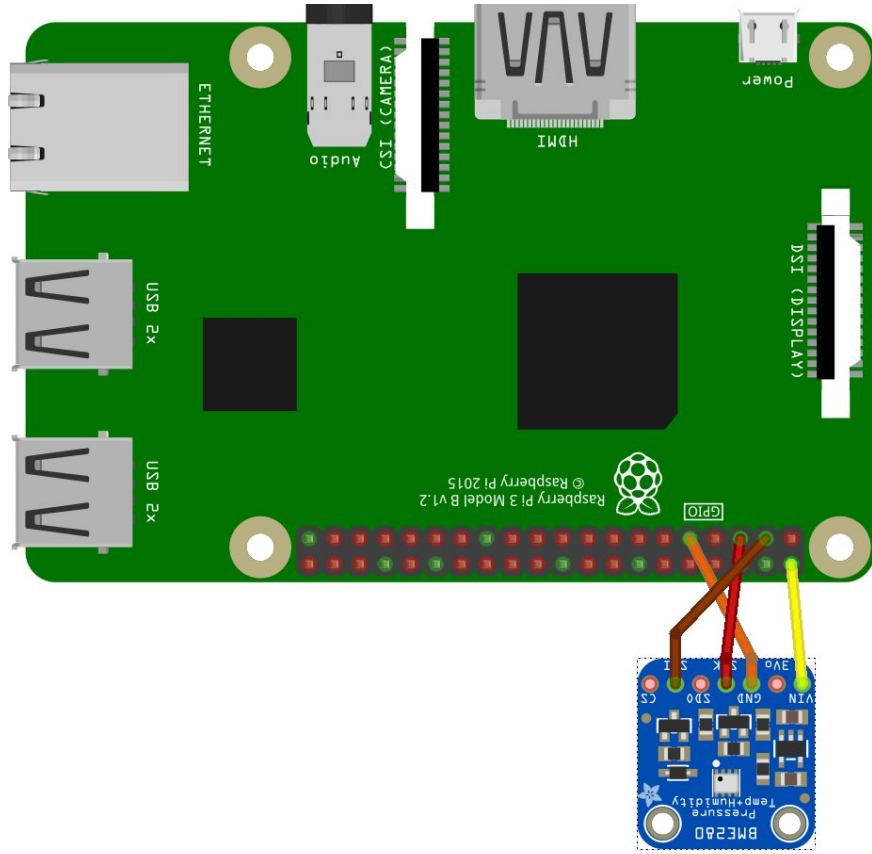
This step is optional. If skipped, gateway is switched to default mode. If you want your gateway to be switched to another mode, you can enter that mode name during licensing process.



Smart Weather Station

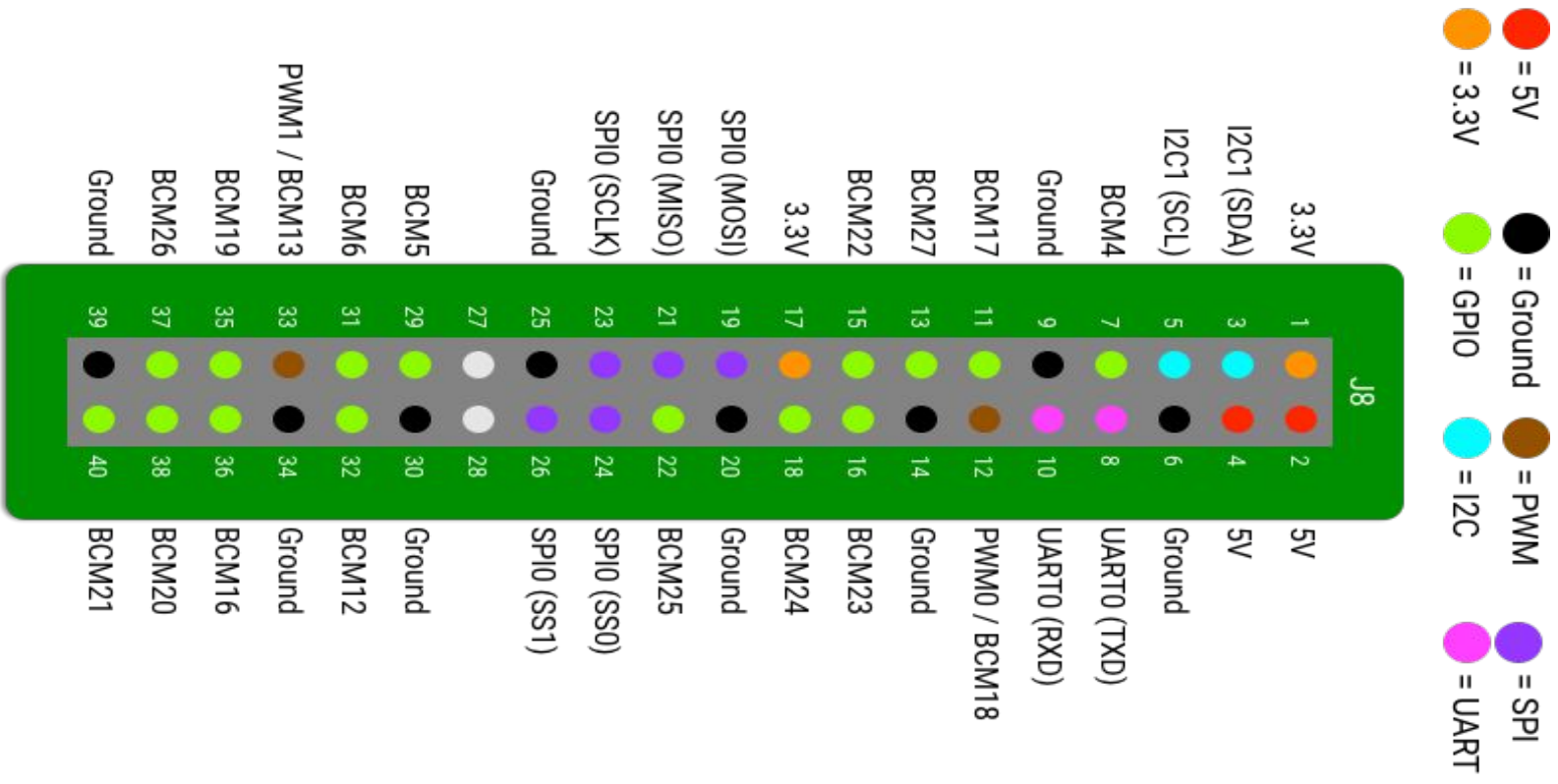
- Using BME280 sensor and Android Things I2C interface, send data to IoT-Ignite Cloud.
- Write a rule on pressure or temperature and twit it.

Smart Weather Station



fritzing

Raspberry Pi 3 PinOut



References

- <https://developer.android.com/things/sdk/index.html>
- <https://devzone.iot-ignite.com/documents/>
- <https://github.com/loT-Ignite>
- <https://github.com/androidthings>
- <https://github.com/androidthings/contrib-drivers>