Is it an app?
Is it a thing?

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What to cover?

- What is IoT?

- How will Google get into it?

- Android Things - what's included in Preview 3?

- Demo

About me

- Education

  - B.Sc., computer science

  - M.Sc. in chemistry

  - Ph.D. in soft material science

  - Studied at Univ. of Copenhagen, Prague Institute of Chemical Technology, Roskilde University, Univ. of Colorado at Boulder

- Work

  - bioinformatics, web development, credit card payments, 4GL modernisation, medical imaging

  - Currently member of Realm's Android team

- Fun facts

  - took guitar lessons as teenager: didn't become a rock star

  - bought a Commodore 64 as teenager: became a programmer

Internet of Things (IoT)

- Home appliances are connected to the Internet

  - washing machine, refrigerator, thermostat, weather station

- Embedded devices

  - low energy consumption

- Transferring data is the corner-stone

- IoT is a distributed computing problem

Client A

Client B

Gateway

Server
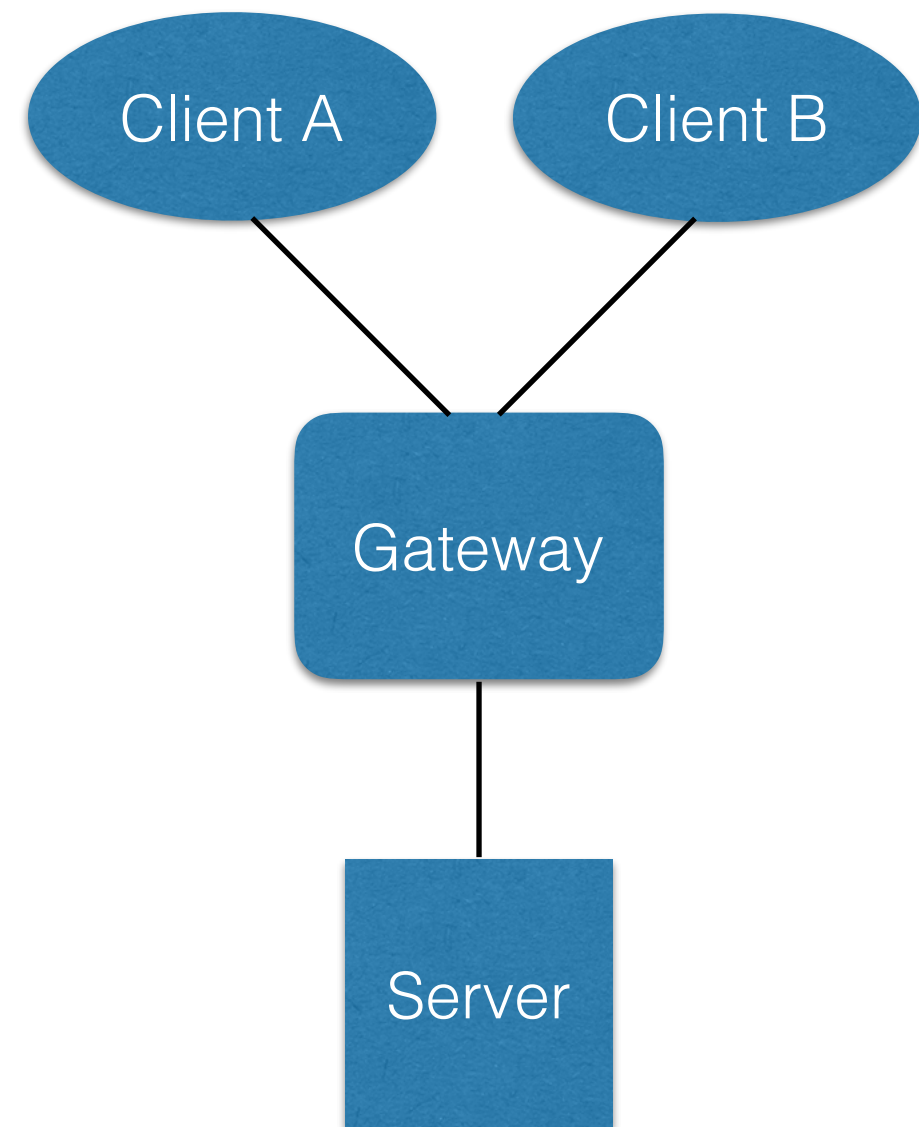
IoT frameworks

- MQTT (messaging protocol)

  - runs on top of TCP/IP

  - many client libraries

- openHAB (gateway)

  - develop in Java

- Wind River Linux/Yocto project (operating system)

  - primarily C/C++

- PlatformIO (IDE)

  - mBED (ARM) and Arduino

IoT hardware

- Arduino

  - development using a subset of C++

  - many models, many add-ons (shields)

- Raspberry Pi

  - fully fledged Linux

- Intel NUC

  - Wind River Linux

- Microchip's PIC

  - development in C

- ESP32 (has WiFi)

  - development in Arduino IDE

Why Google's interest?

- Because of the hype? And Google is nerdy?

- Home appliances generate data

- Data can be analysed (hey TensorFlow)

- Google can help users to make decisions

  - OR is it just an advertising network?

Privacy and security

- Who owns data from IoT devices?

- Merging data from different sources

  - your refrigerator will not order bacon before your scale says your BMI < 25?

  - your wine bottle opener orders a taxi as it has been used to many times this evening?

- Monthly (weekly?) reports about security vulnerabilities

  - sending data unencrypted (meter report 0 water consumption = family on vacation)

- Real example 1: Remotely control We-Vibe product

  - https://www.theguardian.com/technology/2016/aug/10/vibrator-phone-app-we-vibe-4-plus-bluetooth-hack

- Real example 2: Nest thermostats leak location

  - http://gizmodo.com/nest-thermostats-leaked-user-data-but-dont-freak-out-qu-1754123565

Android Things

- Current version: preview 3

- Based on Android 7.0

- Using known tools and technologies

  - Android Studio, Java, Gradle, …

- Adds specialised APIs for IoT devices

- Buy a developer kit for get started

Not quite Android (API)

- Display is not required

  - no status bar, no navigation

- Many Google services are supported

  - Firebase, Location, Maps, Search, Sign-in, …

- Additional I/O

  - General Purpose I/O (GPIO): binary value (motion detection, …)

  - Pulse Width Modulation (PWM): motors, lights, …

  - Serial communication (I2C, SPI, UART)
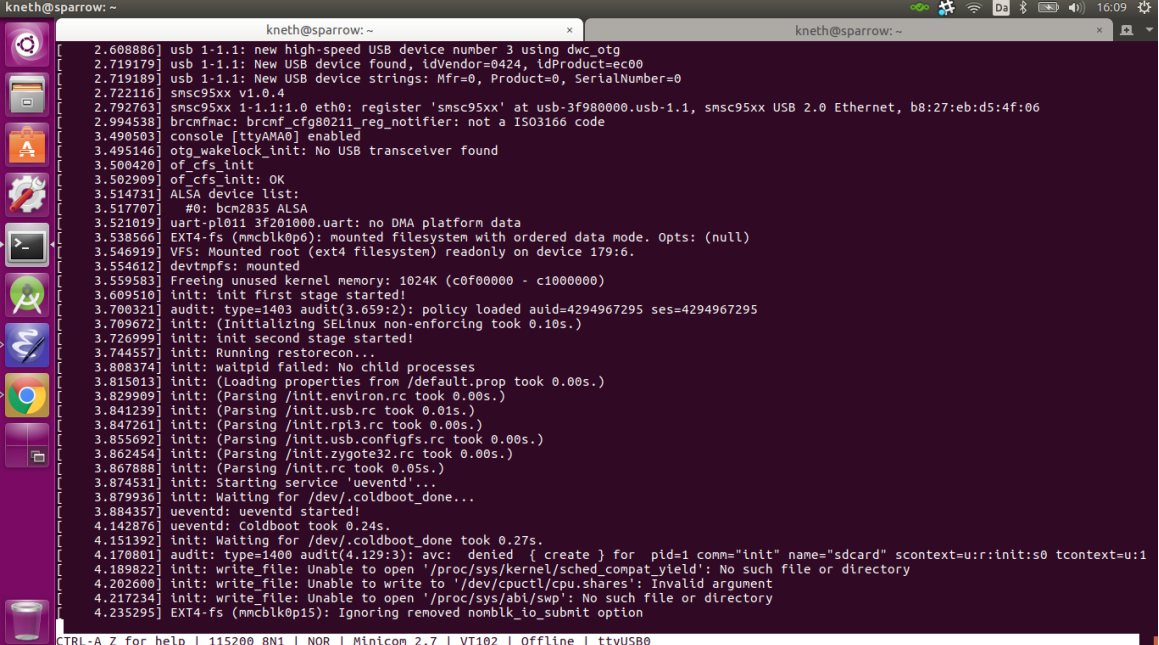
My device

- Raspberry Pi 3

- 8 GB SD card

- TTL/USB serial cable

- Rainbow HAT

  - multicolour LEDs, alphanumeric display, temperature/pressure sensor

Setting up the device

- Connect RPi with wired Ethernet

- Connect TTL/USB cable (optional)

  - black (GND), green (RX), white (TX)

  - minicom is still great 🤓

- Download image and unzip

- Transfer to SD card:

  ```
  sudo dd if=iot_rpi3.img of=/dev/sdb bs=4M
  ```

- Boot and find IP address (it is broadcasting hostname `Android.local`)

- Connect ADB over TCP

  ```
  adb connect 192.168.1.178
  ```

Create an app

- You can't create an app from Android Studio yet

- Download a project template

  - https://github.com/androidthings/new-project-template

- Unzip and rename

- Rename packages

- Open in Android Studio

- RUN!!!!

Random links

- Official site: https://developer.android.com/things/index.html

- Android Things community: https://plus.google.com/communities/107507328426910012281

- Samples: https://github.com/androidthings

- How to use Arduino libraries with Android Things: https://www.androidthings.rocks/2017/03/28/how-to-use-android-libraries-with-android-things