

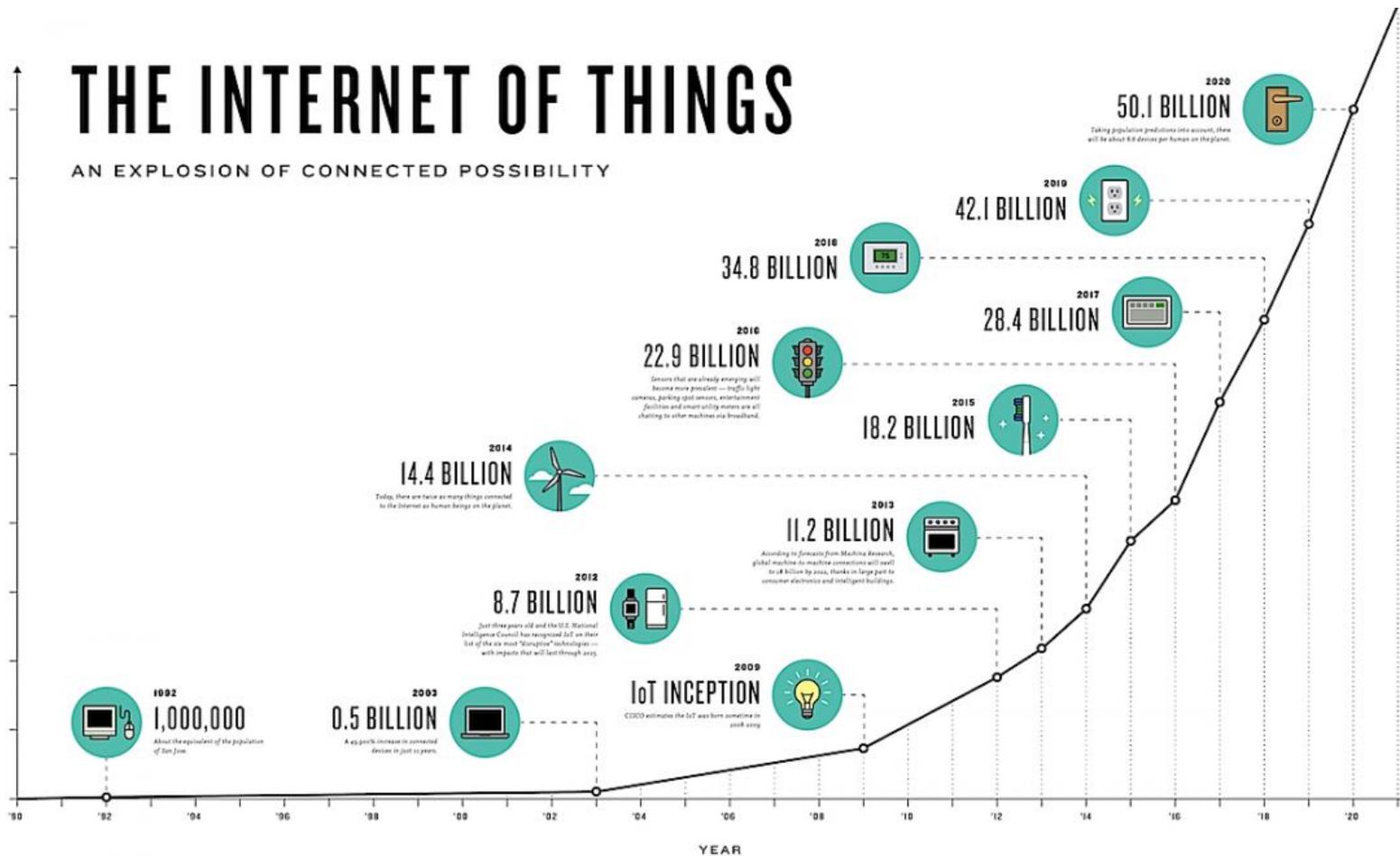


Building your first IoT Application with Arm

Tom Spink

THE INTERNET OF THINGS

AN EXPLOSION OF CONNECTED POSSIBILITY



About Me

Tom Spink

- Lecturer in **Computer Science** at the **University of St Andrews**
- Interested in **computer architecture, simulation, Internet-of-Things**
- Looking into **high-speed simulation of large-scale IoT systems**





What is the Internet of Things?

The Internet

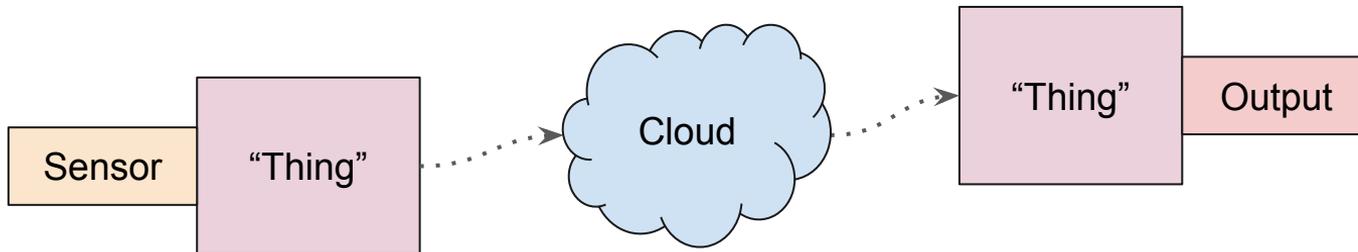
A global system of
“interconnected” networks

Things

Fitness trackers, light switches,
fridges, toasters, cars,
toothbrushes, kettles, doors,
cameras, security systems, ...

What is the Internet of Things?

- The Internet of Things (IoT) is a large collection of **Internet-connected physical objects** (things!)
- These “**things**” usually contain:
 - **Sensors** that generate data
 - **Actuators** that perform physical actions
 - Technologies for **communicating** with other devices or systems
- “The Cloud” plays a big role in IoT, hosting the programs that **consume** and **process** this data.



Why is the Internet of Things important?

- Better decisions
- Holistic overview
- Automation
- Efficiency
- Improved quality of life



How can I get involved?

- **Hardware**
 - Embedded systems designer
 - Security specialist
- **Software**
 - App developer
 - Firmware engineer
 - Web developer
 - Security specialist
- **Communications**
 - Network engineer
 - Security specialist
- **Cloud**
 - Cloud Engineer
 - Systems Administrator
 - Security specialist
- Solutions engineer

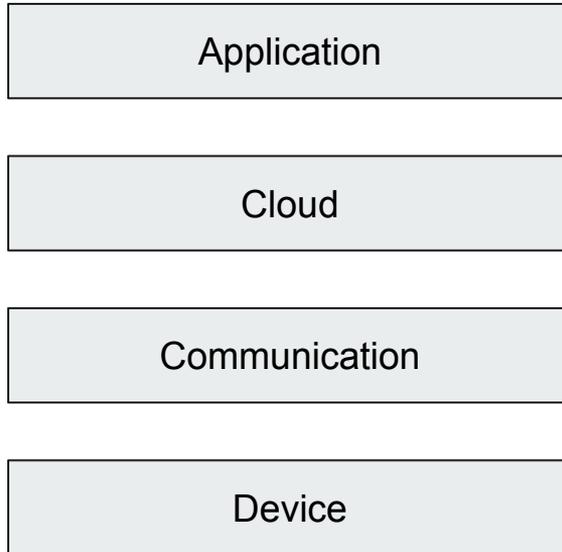


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IoT Design and Development





IoT Design and Development

1. What is the Internet of Things, and why is it important?
2. IoT Systems Architecture
3. IoT Device Architecture
4. Connectivity of Things
5. Connectivity on the Internet
6. The Cloud

Security and Privacy



IoT System Architecture





IoT Device Architecture





Local Connectivity



Global Connectivity



The Cloud

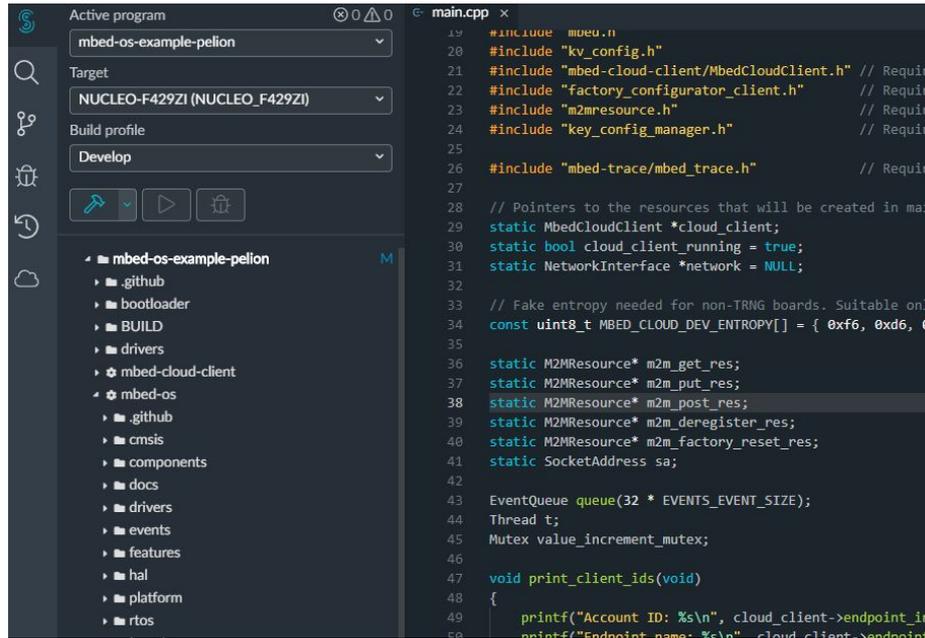




Practical Lab Exercises

1. Introduction to development ecosystem
2. Sensors
3. Local connectivity
4. Global connectivity
5. The Cloud

Introduction to Development Ecosystem

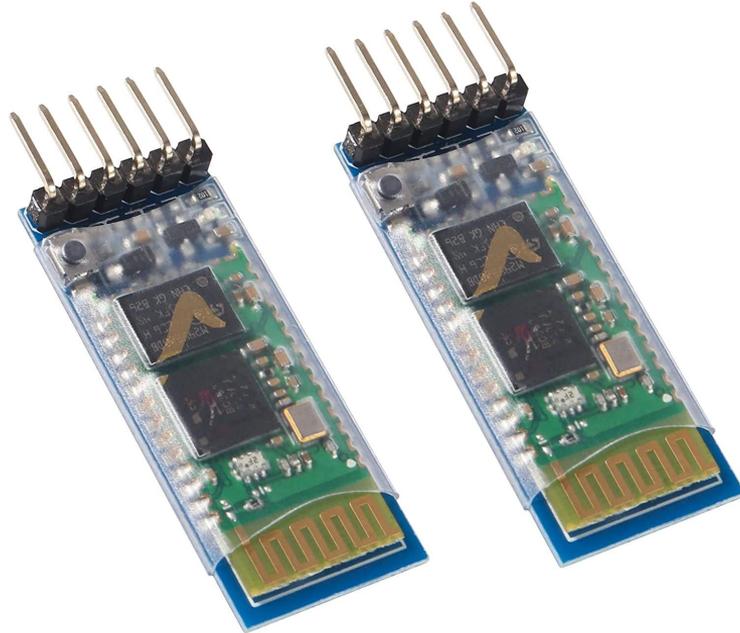


```
Active program: mbed-os-example-pelion
Target: NUCLEO-F429ZI (NUCLEO_F429ZI)
Build profile: Develop

main.cpp
19 #include "mbed.h"
20 #include "kv_config.h"
21 #include "mbed-cloud-client/MbedCloudClient.h" // Required
22 #include "factory_configurator_client.h" // Required
23 #include "m2mresource.h" // Required
24 #include "key_config_manager.h" // Required
25
26 #include "mbed-trace/mbed_trace.h" // Required
27
28 // Pointers to the resources that will be created in main()
29 static MbedCloudClient *cloud_client;
30 static bool cloud_client_running = true;
31 static NetworkInterface *network = NULL;
32
33 // Fake entropy needed for non-TRNG boards. Suitable only for development
34 const uint8_t MBED_CLOUD_DEV_ENTROPY[] = { 0xf6, 0xd6, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
35
36 static M2MResource* m2m_get_res;
37 static M2MResource* m2m_put_res;
38 static M2MResource* m2m_post_res;
39 static M2MResource* m2m_deregister_res;
40 static M2MResource* m2m_factory_reset_res;
41 static SocketAddress sa;
42
43 EventQueue queue(32 * EVENTS_EVENT_SIZE);
44 Thread t;
45 Mutex value_increment_mutex;
46
47 void print_client_ids(void)
48 {
49     printf("Account ID: %s\n", cloud_client->endpoint_id);
50     printf("Endpoint name: %s\n", cloud_client->endpoint_name);
```




Local Connectivity





Global Connectivity



The Cloud



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Thank-you