

Funding: Greater Cambridge Partnership



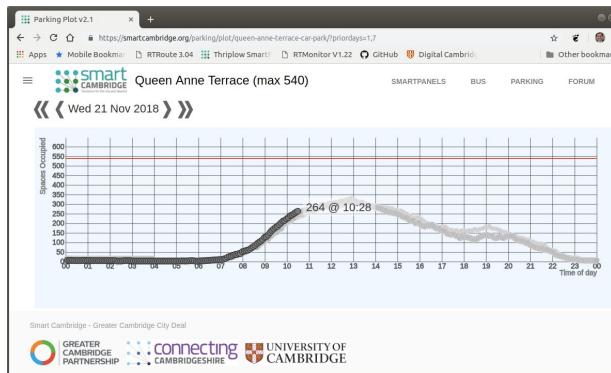
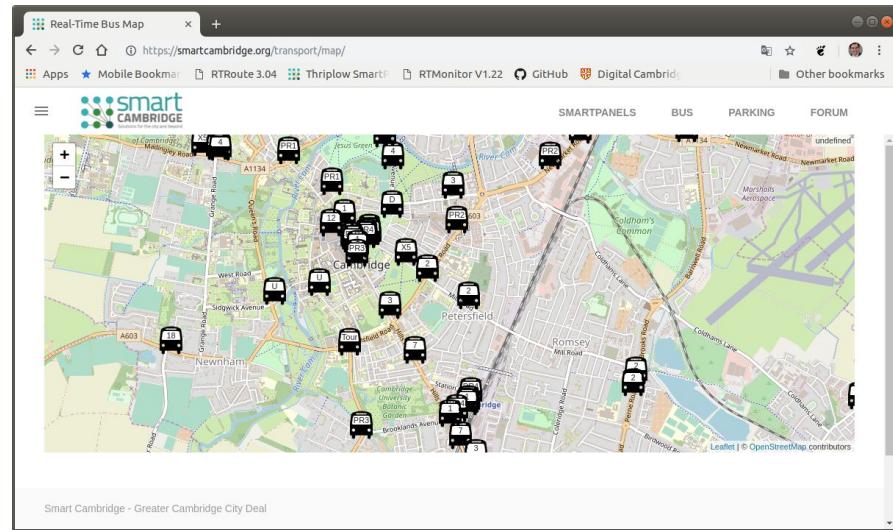
Funding: Department for Business, Energy & Industrial Strategy

LPWAN IoTUK BOOST CAMBRIDGE MEET UP

iot^{UK} | Boost

CW CONNECTING
THE DIGITAL
WORLD

Data we collect:

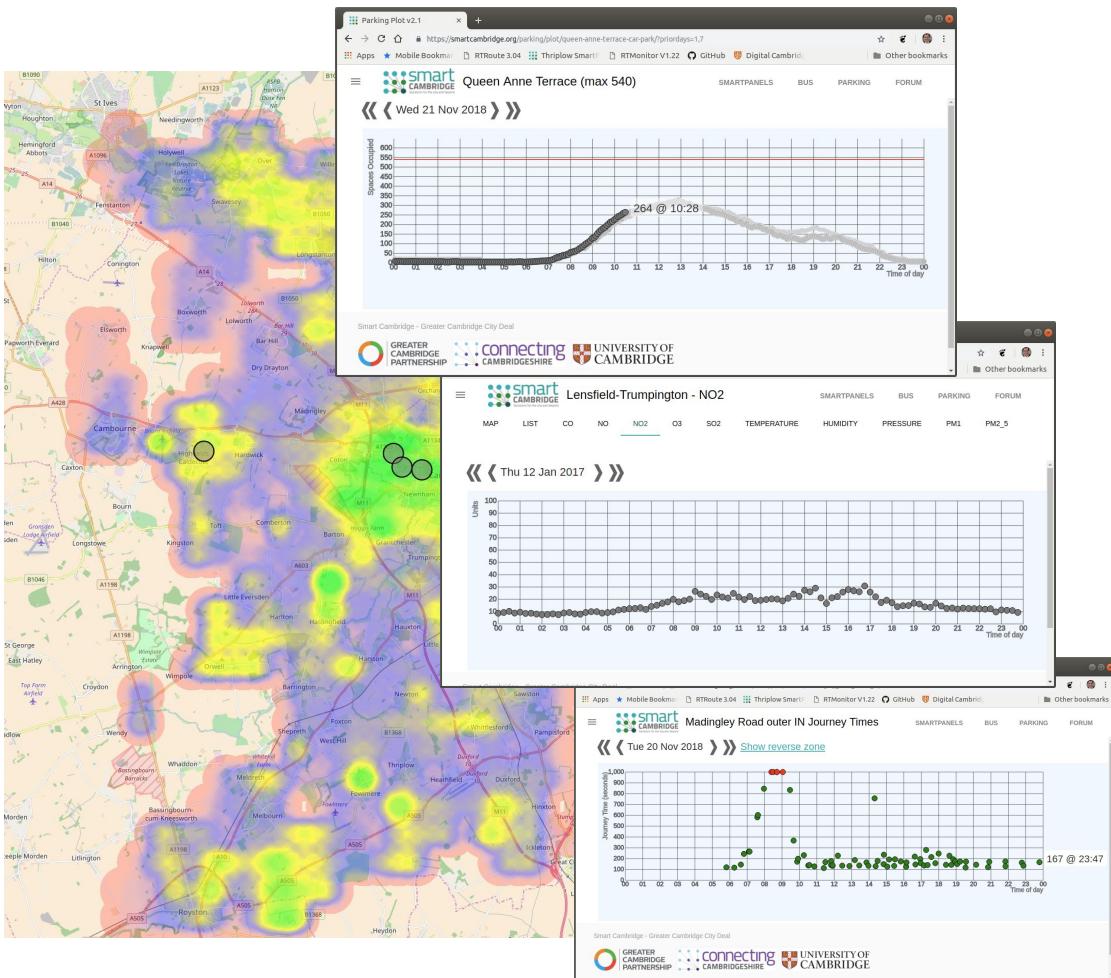


Spatio-Temporal Data:

1. Time

2. Space

3. “Other stuff”TM
(vs. Geospatial)

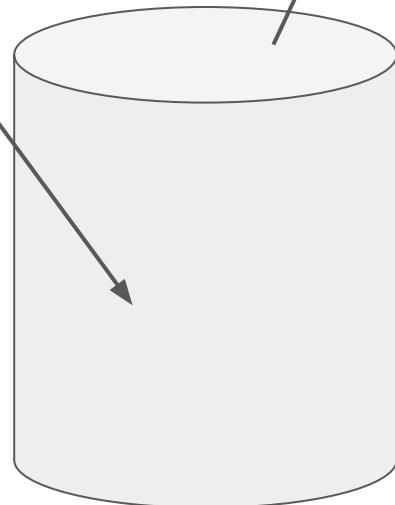
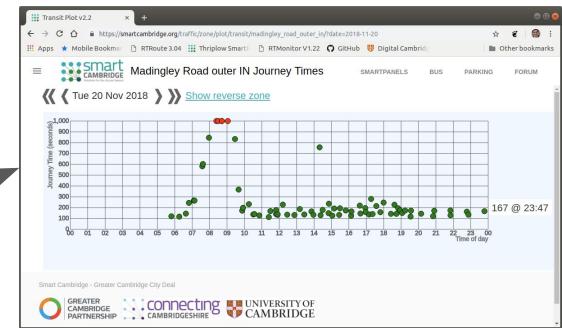


The Platform ?



Feed
Collector

Website



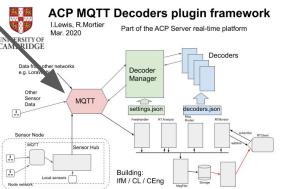
REST
API

REAL TIME ???

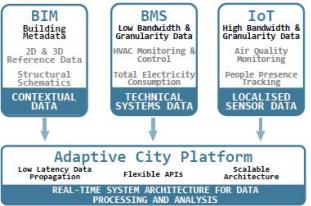
Responsiveness: Intelligent City Platform



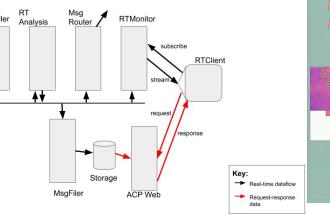
Sensor Networking



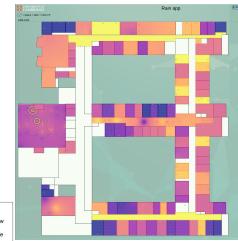
Building Information Management



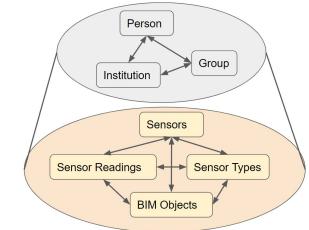
Stream Processing Architecture



Derived Data / Visualisation

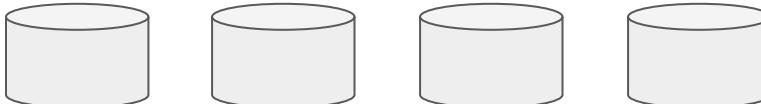


Privacy



PUSH

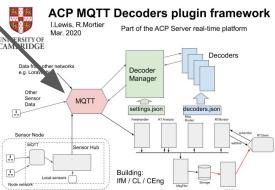
PLATFORM



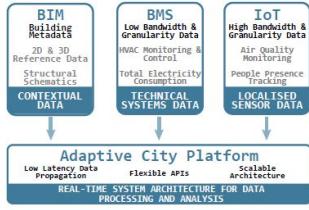
Platform tech we're actually using:



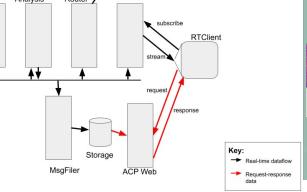
Sensor Networking



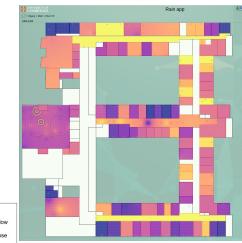
Building Information Management



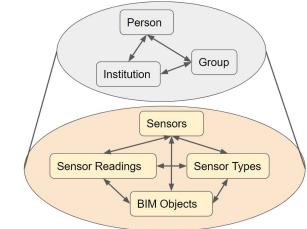
Stream Processing Architecture



Derived Data / Visualisation



Privacy



MOSQUITTO MQTT
PYTHON DECODERS

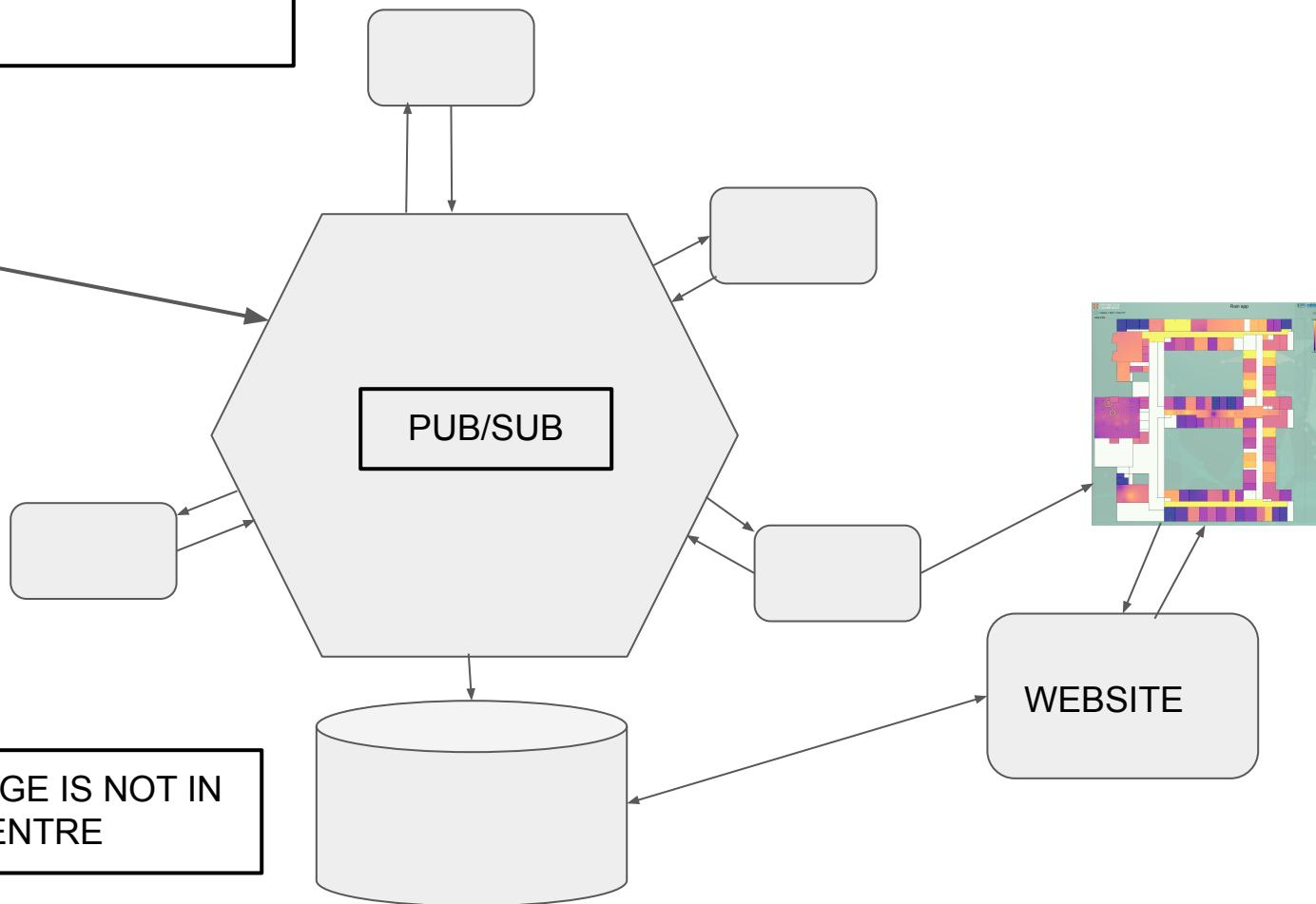
IN-MEMORY
DATA STRUCTURES

VERTX.IO

DJANGO WEBSITE
WEBSOCKETS

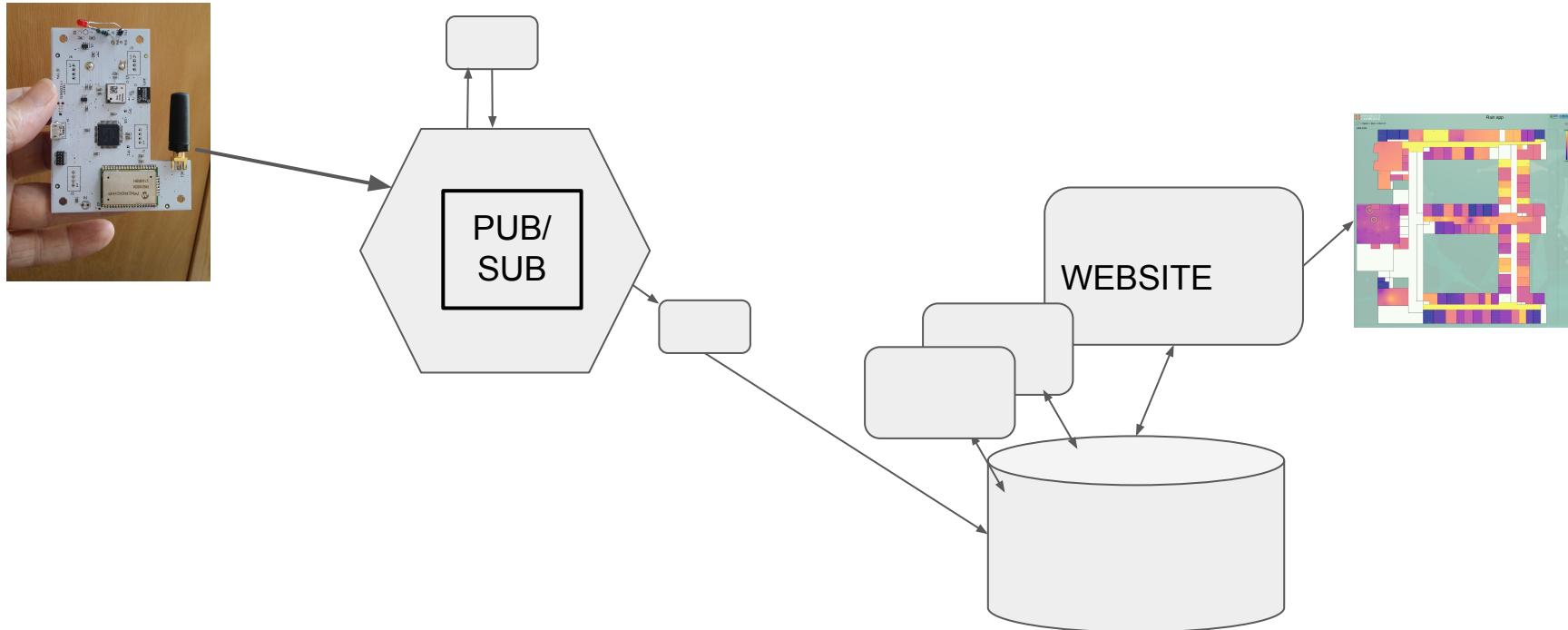
MQTT EMITTER.IO ?

PUSH PLATFORM

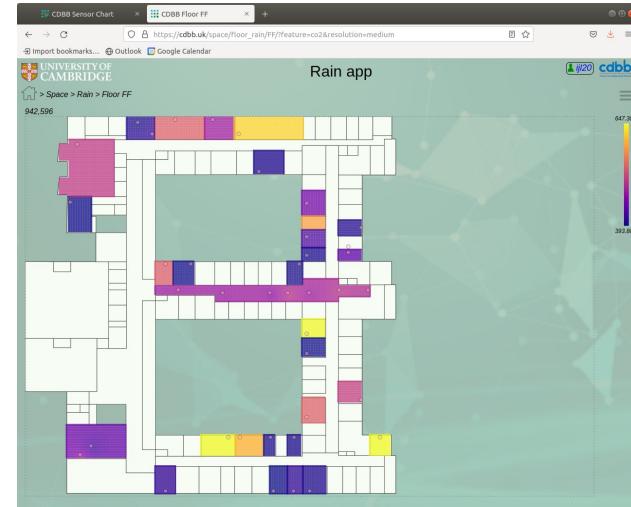
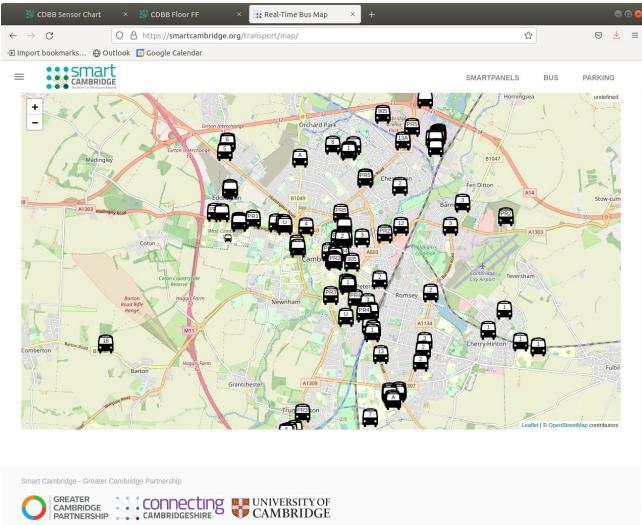


STORAGE IS NOT IN
THE CENTRE

PUSH PLATFORM?



EXPANSION/EVOLUTION OF THE PLATFORM IN-BUILDING



Funding: Greater Cambridge Partnership



Funding: Department for Business, Energy & Industrial Strategy

Scaled up the proportion of 'own' sensors



Environmental Sensors



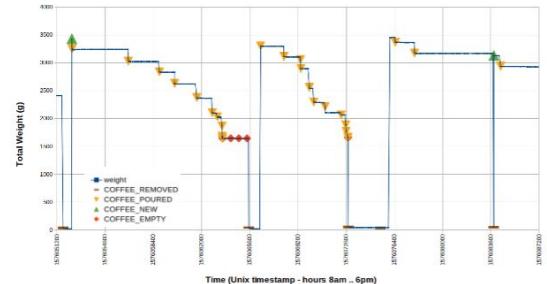
Smart Plugs

Dumb Sensors



DeepDish

Coffee Pot



Intelligent Sensors

Gateways



LoRaWAN TTN V3

Screenshot of the The Things Network console showing a list of gateways connected to the LoRaWAN network.

| ID | Name | Gateway EUI | Status |
|--------------------|--|-------------------------|--------------|
| cnn_mtcap-014abe | | 00 80 00 00 01 4A BE | Connected |
| cnn_mtcap-018d23 | Lockdown Lab V3 MTCAP | 00 80 00 00 01 8D 23 | Connected |
| cnn_mtcap-018d26 | | 00 80 00 00 01 8D 26 | Connected |
| cnn_mtcap-018d2d | MTCAP-VLAB | 00 80 00 00 01 8D 2D | Connected |
| cnn_mtcap-018d2e | KLAB MTCAP-Gateway | 00 80 00 00 01 8D 2E | Disconnected |
| cnn_mtcdt-00060f | cnn_mtcdt-00060f | 00 80 00 00 A0 00 00 0F | Connected |
| cnn_mtcdt-002f42 | Cambridge Sensor Network IFM internal 1 | 00 80 00 00 A0 00 2F 42 | Disconnected |
| cnn_mtcdt-002f48 | Cambridge Sensor Network IFM internal 2 | 00 80 00 00 A0 00 2F 48 | Disconnected |
| cnn_mtcdtip-003b02 | Cambridge Sensor Network University Library... | 00 80 00 00 A0 00 3B 02 | Connected |
| cnn_mtcdtip-003b03 | Cambridge Sensor Network Addenbrooke's H... | 00 80 00 00 A0 00 3B 03 | Connected |
| cnn_mtcdtip-003b04 | Cambridge Sensor Network New Museums Site | 00 80 00 00 A0 00 3B 04 | Connected |
| cnn_mtcdtip-003c6f | Cambridge Sensor Network Huntingdon Road | 00 80 00 00 A0 00 3C 6F | Connected |
| cnn_mtcdtip-003c70 | Computer Laboratory with MAC 00:0B:00:4A:7... | 00 80 00 00 A0 00 3C 70 | Connected |
| cnn_mtcdtip-004cb8 | Cambridge Sensor Network IFM external | 00 80 00 00 A0 00 4C BB | Connected |
| cnn_mtcdtip-005f06 | MTCOTIP FH07 | 00 80 00 00 A0 00 5F 06 | Connected |
| cnn_pygate-d66568 | cnn_pygate-d66568 | BE EF 24 62 AB D6 65 68 | Disconnected |
| cnn_pygate-d66a00 | WGB Central Corridor GF | BE EF 24 62 AB D6 6A 08 | Connected |
| cnn_pygate-d66a1c | cnn_pygate-d66a1c | BE EF 24 62 AB D6 6A 1C | Connected |
| cnn_pygate-d67058 | WGB Central Corridor FF | BE EF 24 62 AB D6 79 58 | Disconnected |
| cnn_pygate-d67594 | cnn_pygate-d67594 | BE EF 24 62 AB D6 79 94 | Disconnected |

Since ~ 2015:

Custom Lora G/W

Everynet V1 LoRaWAN

... SigFox (WND)

Everynet V2 LoRaWAN
+ homebuilt console

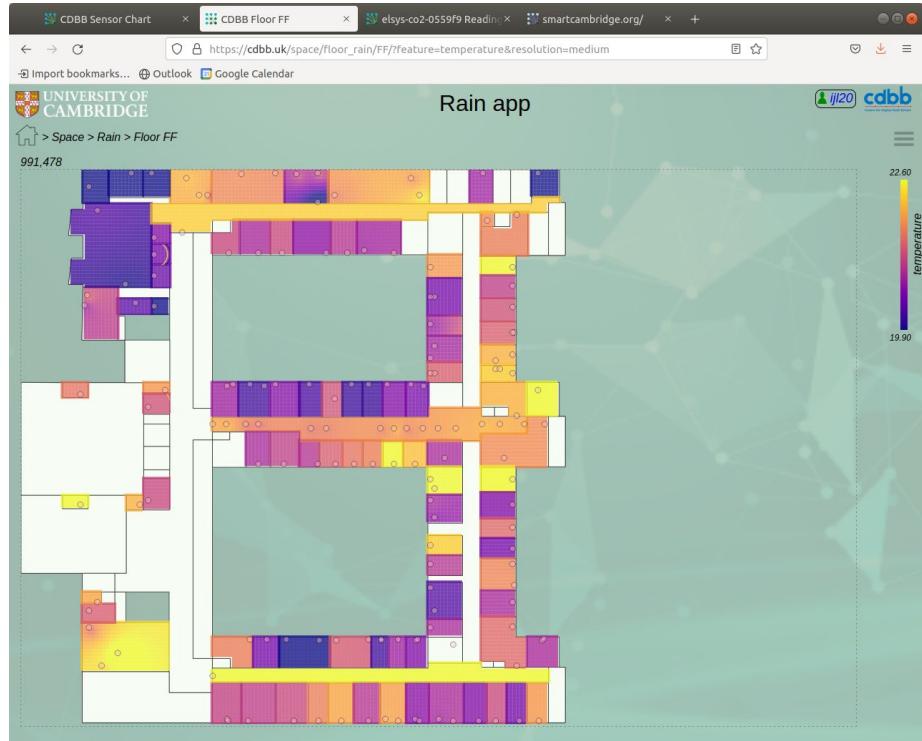
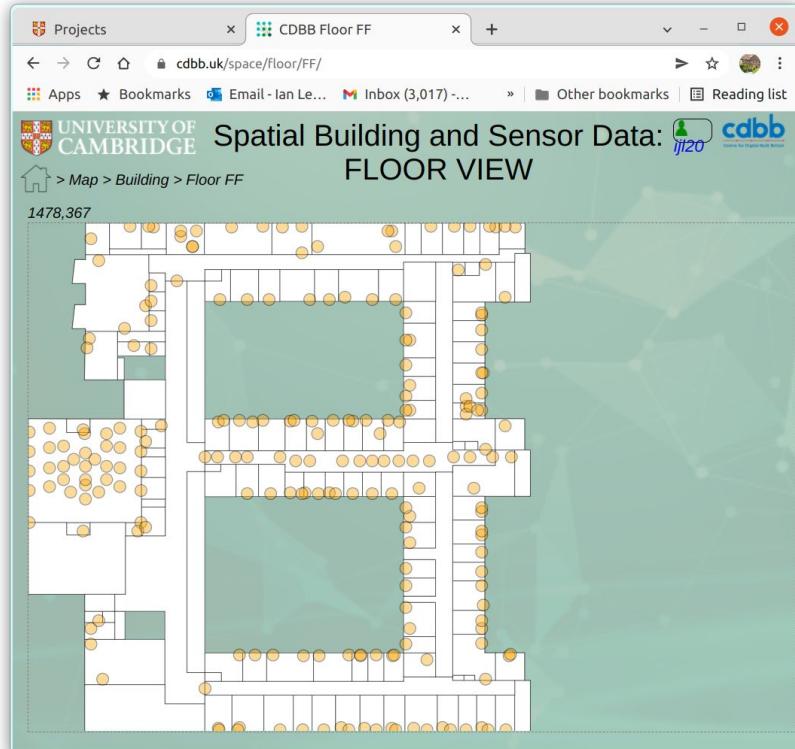
TTN V2 LoraWAN

TTN V3 LoRaWAN

Spatial Building and Sensor Data: MAP VIEW



Deployment density and visualisations





Multitech rooftop
g/w's



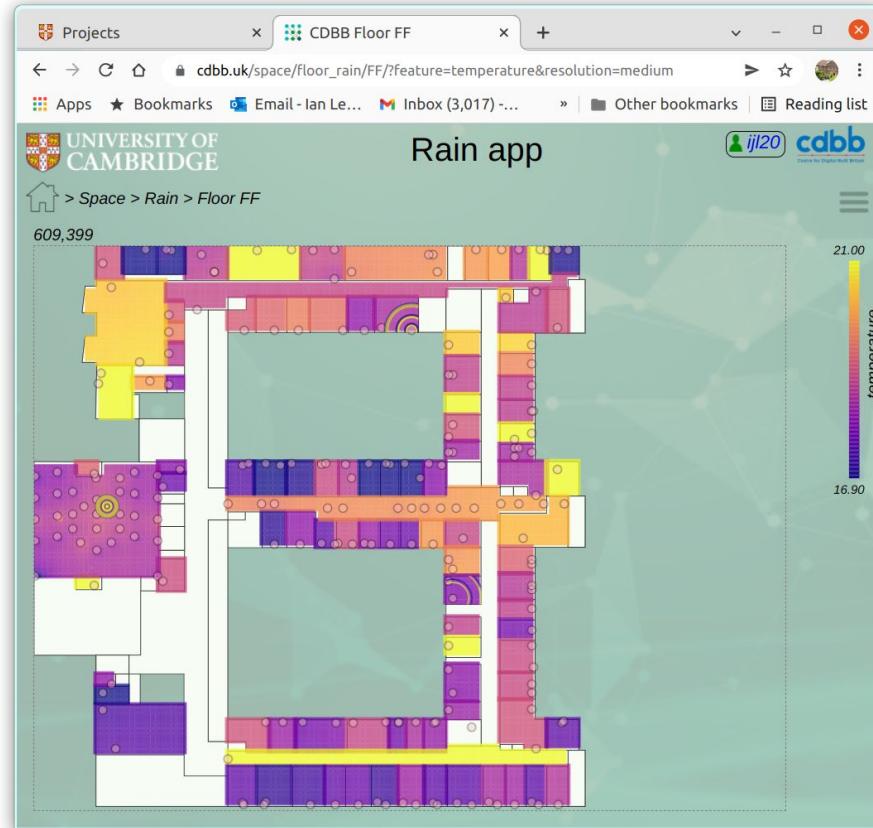
Adeunis Field Test



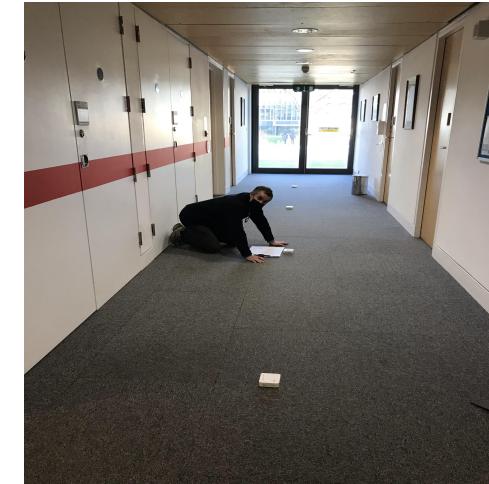
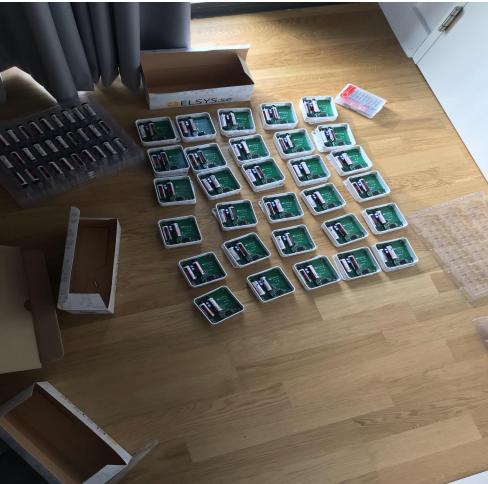
Pycom Pygate (LoPy4)



DEPLOYING LORAWAN SENSORS x600



Deployment: Physical Layer Labour



TTN V3 Console

The screenshot shows the TTN V3 Console interface. On the left, there's a sidebar with various navigation options like Overview, Applications, Gateways, Organizations, and Integrations. The main area is focused on the 'Applications' section, specifically the 'Cambridge Sensor Network v3' application. Under 'End devices', the device 'elsys-co2-0558ad' is selected. The device details page includes sections for General information, Activation information, and Session information. It shows the device ID as 'elsys-co2-0558ad', frequency plan as 'Europe 863-870 MHz (SF9 for RX2 - rec...)', and LoRaWAN version as 'LoRaWAN Specification 1.0.3'. The session start was on Nov 29, 2021 16:57:12, and the device address is '26 08 56 24'. A map shows the location of the device.

The screenshot shows the GitHub repository page for 'AdaptiveCity / acp_ttn_manager'. The repository has 2 branches and 0 tags. The 'Code' tab is active. A prominent message says 'Your master branch isn't protected' with a button to 'Protect this branch'. Below this, a list of commits is shown, all made by 'rv355'. The commits relate to the TTN Device Register Application, including changes for app updates, .gitignore, ACPTTNManager.py, README.md, V2-V3_Changes.md, api_register.py, device_settings_required_v2.txt, device_settings_required_v3.txt, requirements.txt, run.sh, status.sh, test_registration.py, ttn_manager.sh, and ttn_manager_v2.sh. The repository also includes sections for About, Releases, Packages, Contributors, and Languages.



Elsys EMS



Elsys ERS CO2



Elsys Eye



LoPy4
Pysense
Exp board.

Temperature

Humidity

Lux

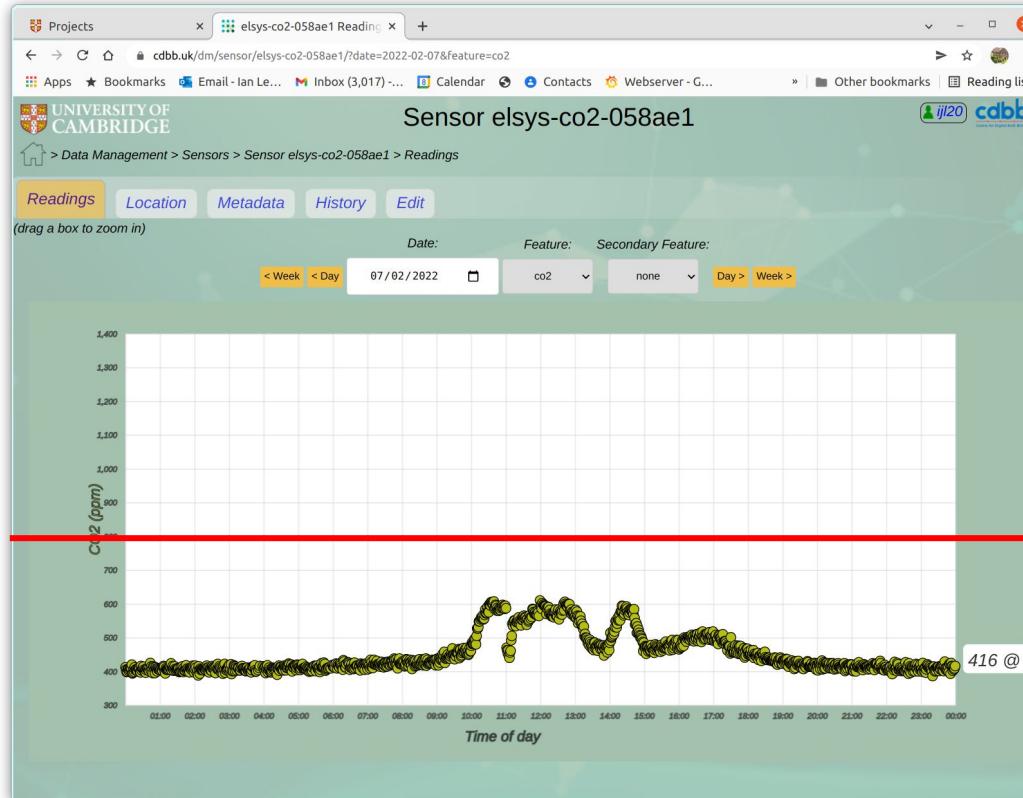
CO2

PIR / Door open/close

Effective device monitoring needed

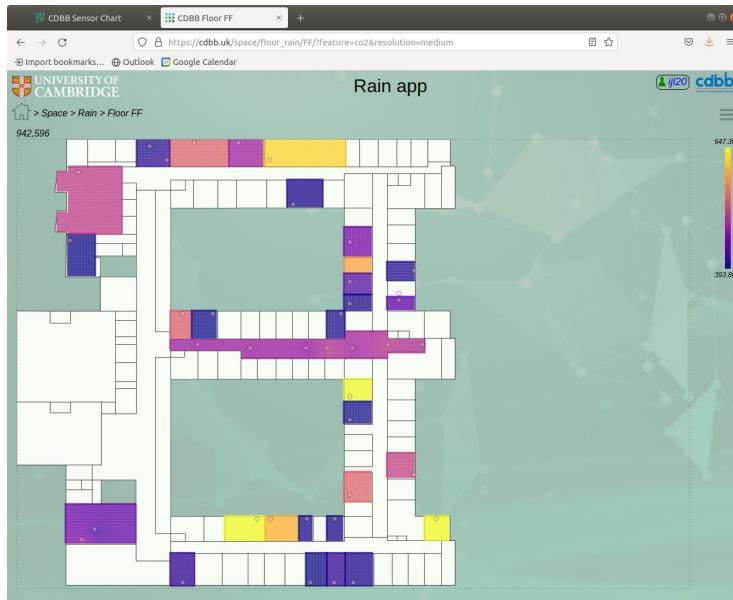
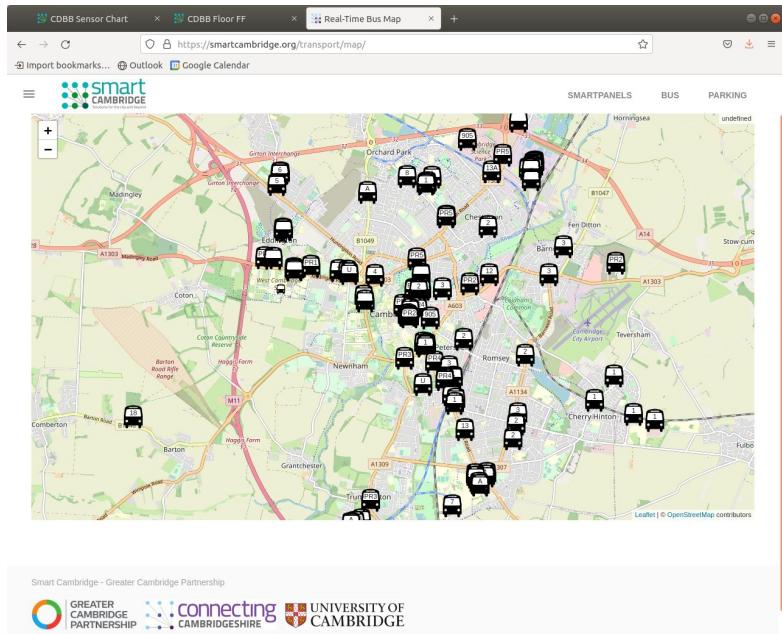
OTAA Connection delays with many g/w's

Unexpected outcome - CO₂ Sensors during COVID



Current status - Platform is working well, real-time visualisations to the web.
Ongoing development.





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