



**UCL CASA**  
**2025**



# Digital Frontiers

An urban data platform for the  
Queen Elizabeth Olympic Park (QEOP)

Yaman Kalaji, Duncan Wilson, Andy Hudson-Smith and  
Nick Turner

Funded by LLDC (London Legacy Development Corporation)  
Supported by AWS

# 1

# Problem



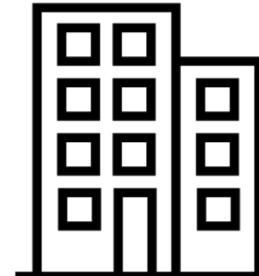
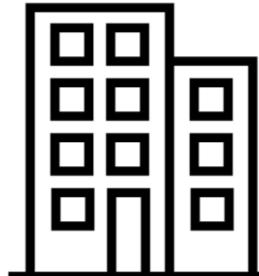
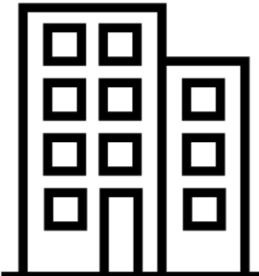
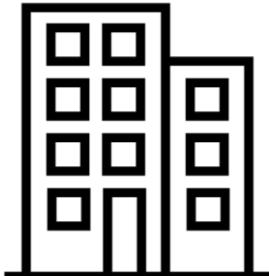
Urban data is generated by a lot of entities within a city

This creates  
**4 Main Challenges**

# 1. Institutional fragmentation

Data is locked across various organisations

(Government agencies, academic institutions, private corporations..)



## 2. Restrictive governance

Access policies, licensing terms and data-sharing agreements

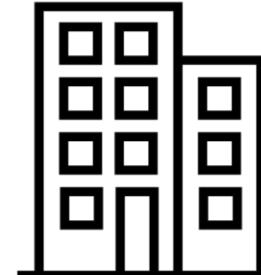
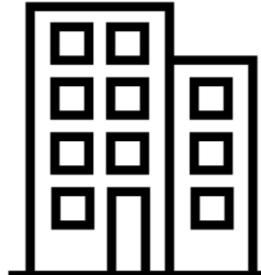
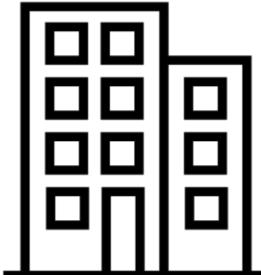
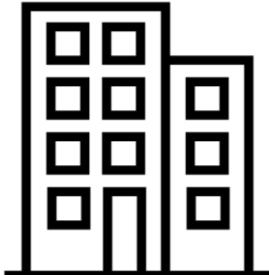
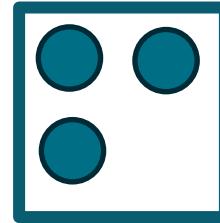
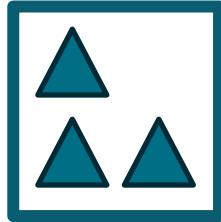
(Driven by privacy concerns and commercial interests..)



### 3. Different formats and types

Standardisation is difficult

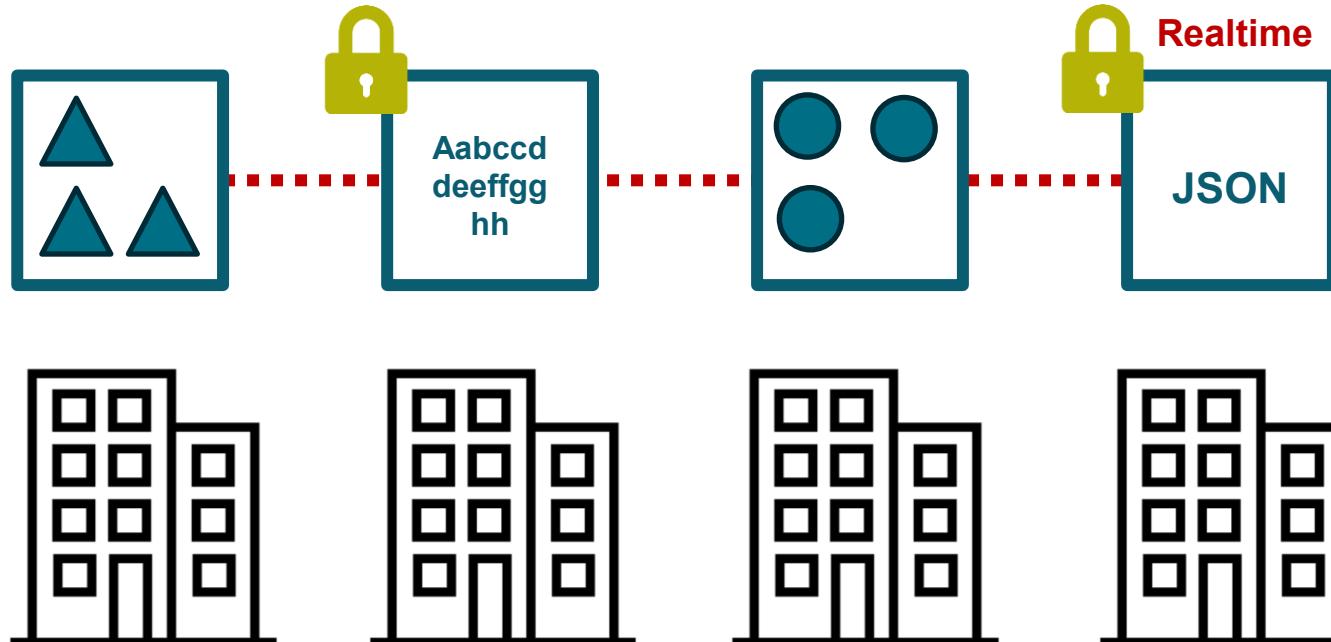
Resulting in numerous data formats and types (numerical, textual..)



## 4. Infrastructure demands

Static and real-time data streams requires costly infrastructures

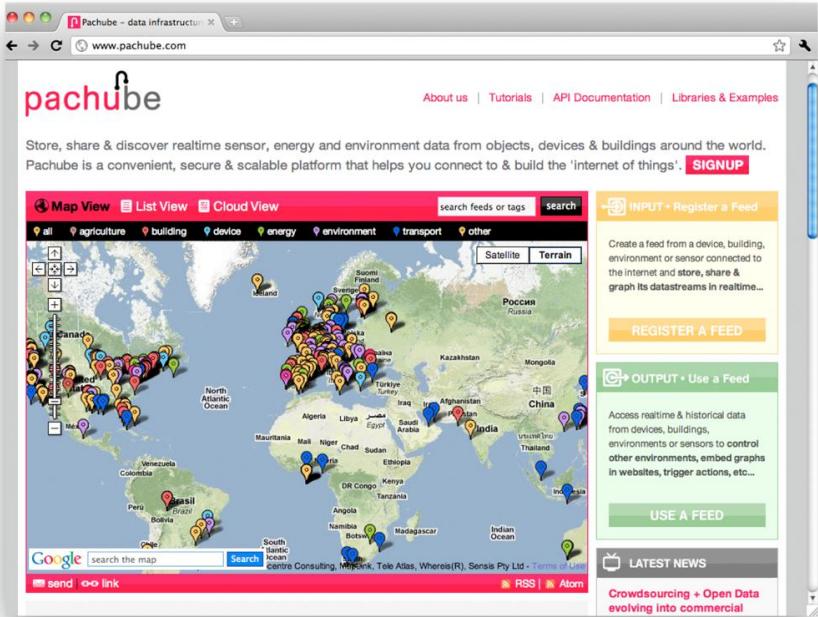
For storage, processing and bandwidth



# 2

## Related work

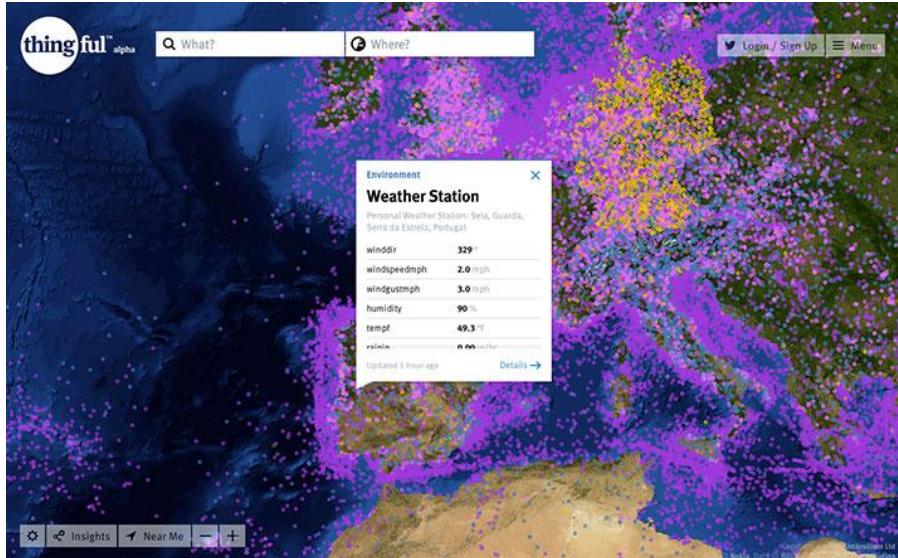
# London-related data platforms



**Pachube** (later Cosm/Xively)  
(Usman Haque)

- A foundational platform
  - Large community
  - Centralised
  - Real-time data
- 
- Not open-source
  - Data storage challenges
  - No sustainable business model
  - Discontinued

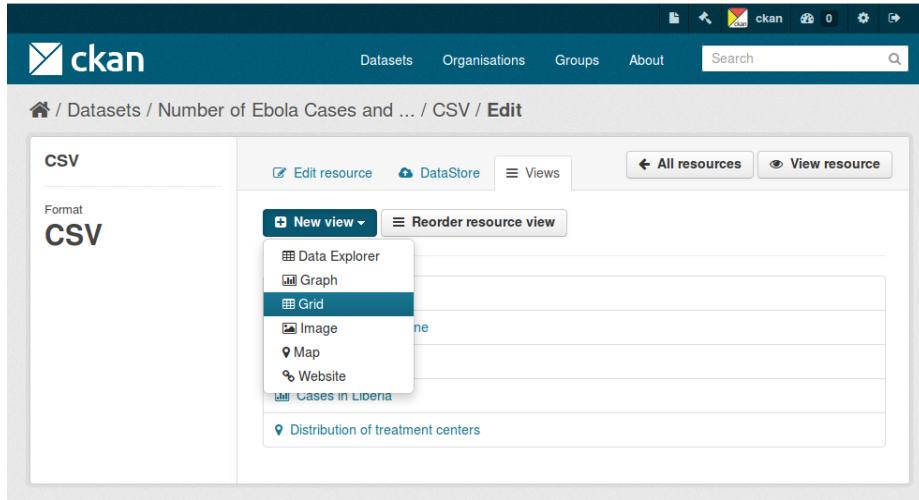
# London-related data platforms



- Search engine for the IoT data
  - Fixed the centralised problem
  - Less data storage challenges
- 
- Not open-source
  - Stale sensor data
  - Discontinued

**Thingful.net**  
(Usman Haque)

# London-related data platforms

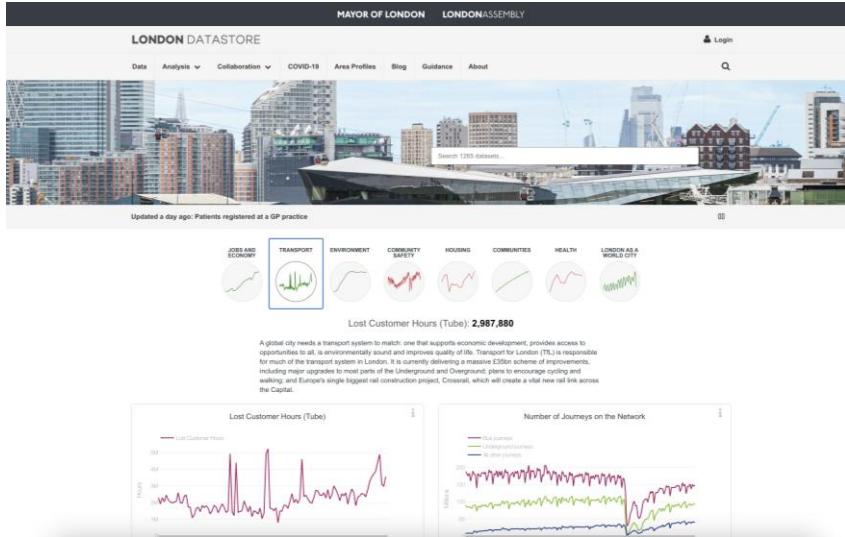


**CKAN**

(Comprehensive Knowledge Archive Network)

- Open-source
- Active
- Large community
- Strong metadata management
- Not focused on real-time data
- Limited UI / harder to customise
- Metadata-heavy focus

# London-related data platforms

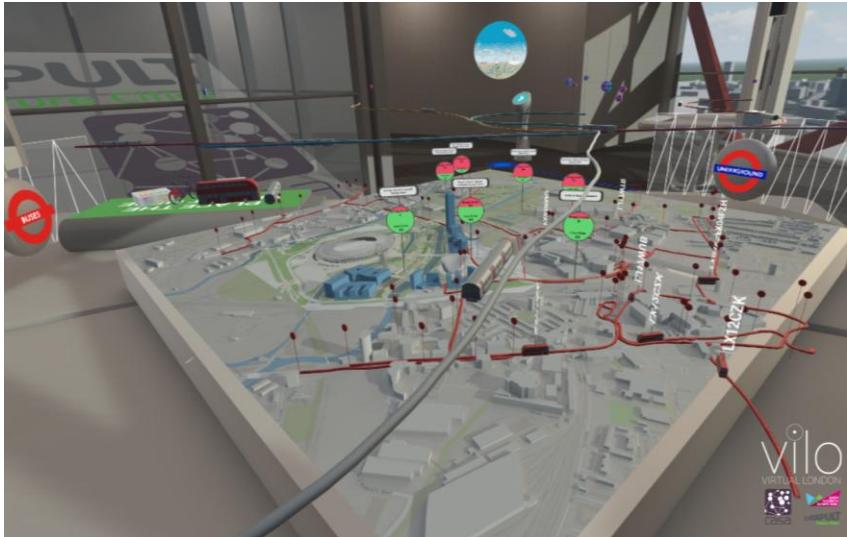


## London Datastore

(Based on CKAN )

- Focused on London
  - Trusted and rich data
  - General purpose
- 
- Partially open-source
  - Not focused on real-time sensor data
  - Stale data
  - Limited visualisations

# London-related data platforms

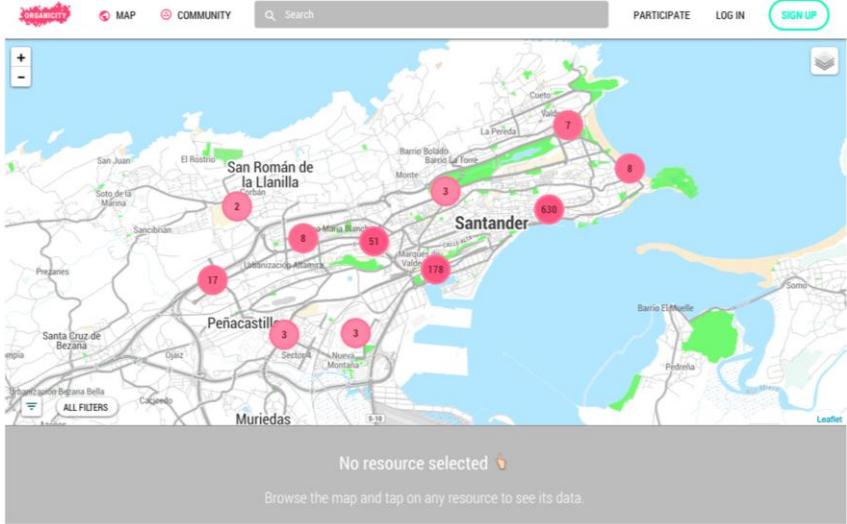


**ViLO**

(CASA)

- Focused on QEOP digital twin
  - Built for real-time sensor data
  - Strong visualisations and interactions
- 
- Not open-source
  - Not designed for community-access level
  - Discontinued

# London-related data platforms



**OrganiCity**

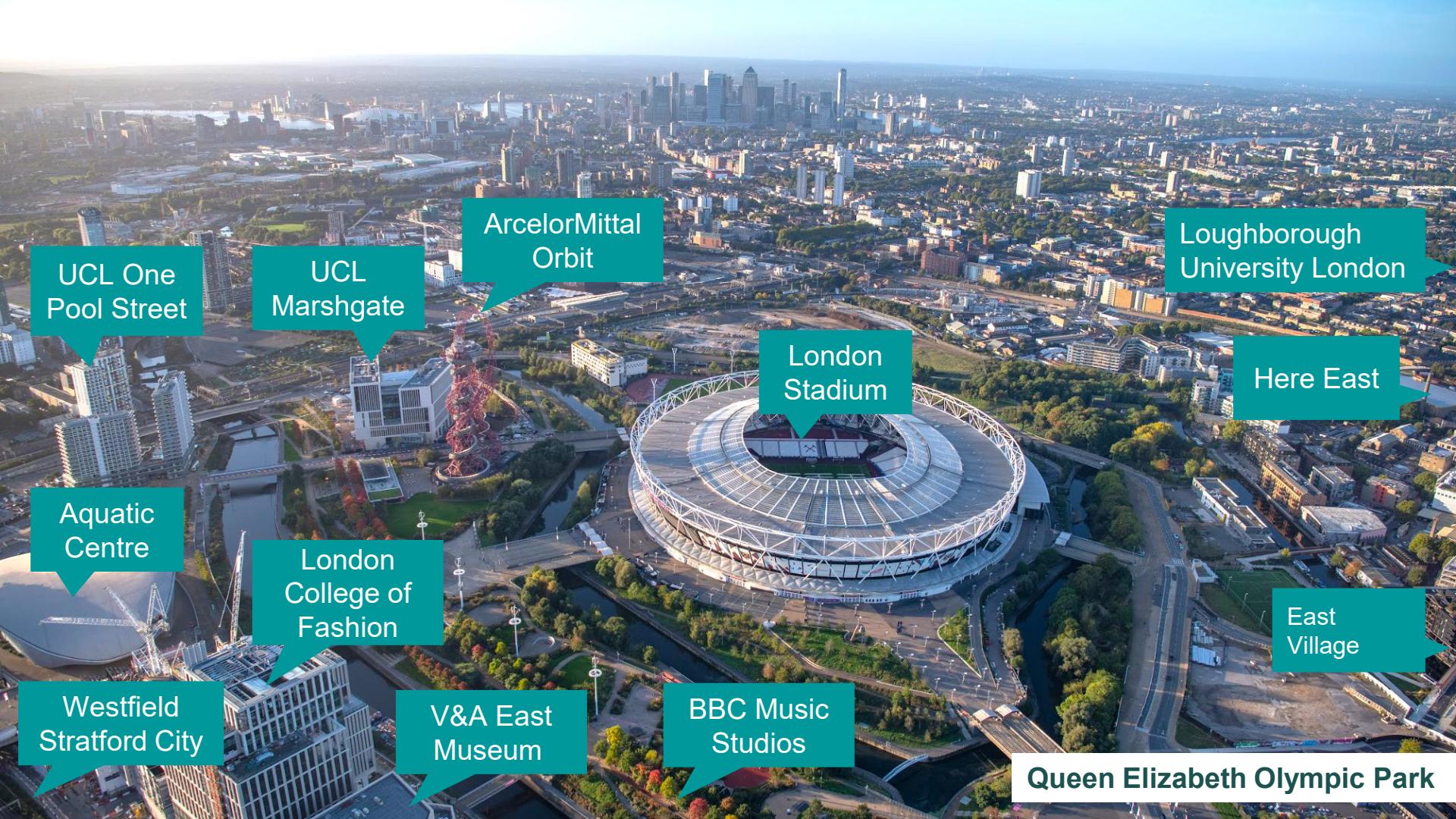
(Built on FIWARE)

- Multi-city scale
- Stronger data standardisation
- Real-time data

- Not designed for long-term sustainability
- Finished (research focused)

# 3

## Digital Frontiers Platform



UCL One  
Pool Street

UCL  
Marshgate

ArcelorMittal  
Orbit

London  
Stadium

Aquatic  
Centre

London  
College of  
Fashion

Westfield  
Stratford City

V&A East  
Museum

BBC Music  
Studios

Loughborough  
University London

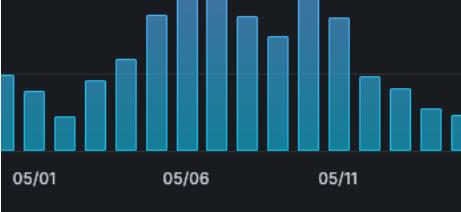
Here East

East  
Village

Queen Elizabeth Olympic Park

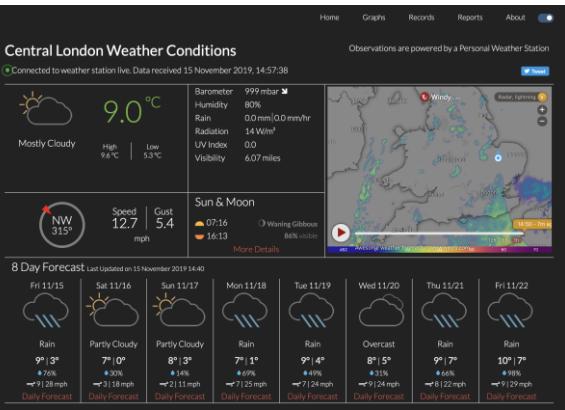
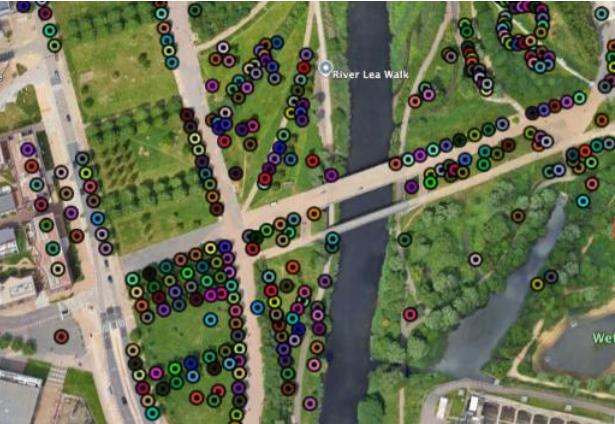
535 kWh

# Within a living lab... a test bed



Data examples:

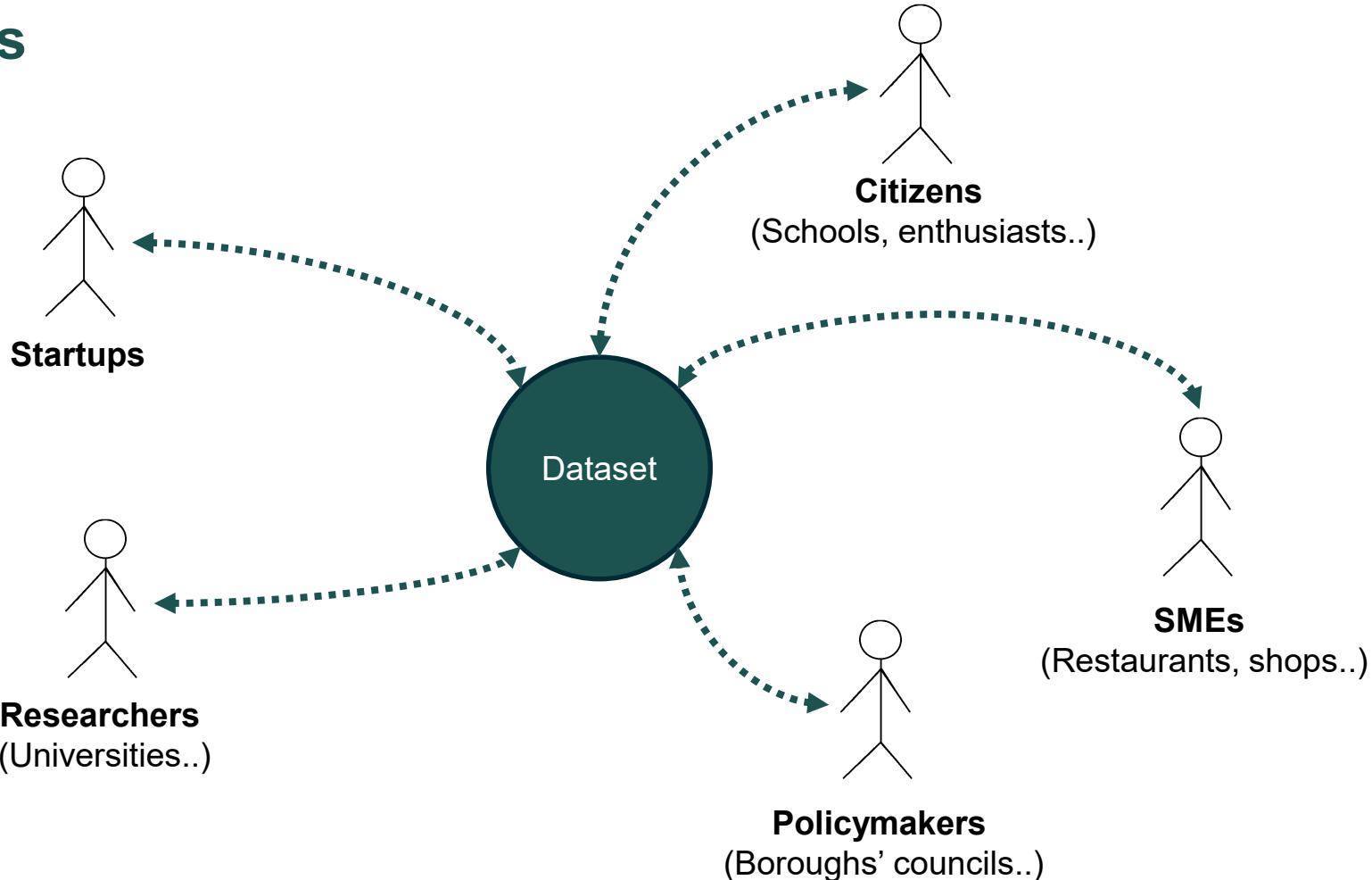
- Environmental sensors.
- Biodiversity records.
- Buildings power usage & solar energy.
- TfL data.



- What data is there in the Olympic Park and how use it?
- How can I contribute my live data to others?



# Users



# Personas

## Persona example

University → Data Consumer



**Kristin Watson**

AGE 26  
EDUCATION Master student in Urban Spatial Science  
OCCUPATION Architect  
LOCATION Hackney, UCL East  
TECH LITERATE High

**Bio**

Kristin is an MSc Urban Spatial Science student, with a background in architecture. She worked in the government sector for couple of years and was involved in designing outdoor public spaces.

**Core needs**

- Data on people movement through the QEOP.
- Data should be free and easy to use. Historical and real-time data is required.
- Data should be accurate and well annotated.

**Pain points**

- Hard to get reliable data for public spaces' usage.
- Lots of paper work to use the data.

**Used brands**

SPSS, Python, GIS, Google Maps, OpenStreetMap, Revit

**Preferred platform**

Website Macbook iPad

**Attributes**

Student Academic  
Architect Tech-savvy

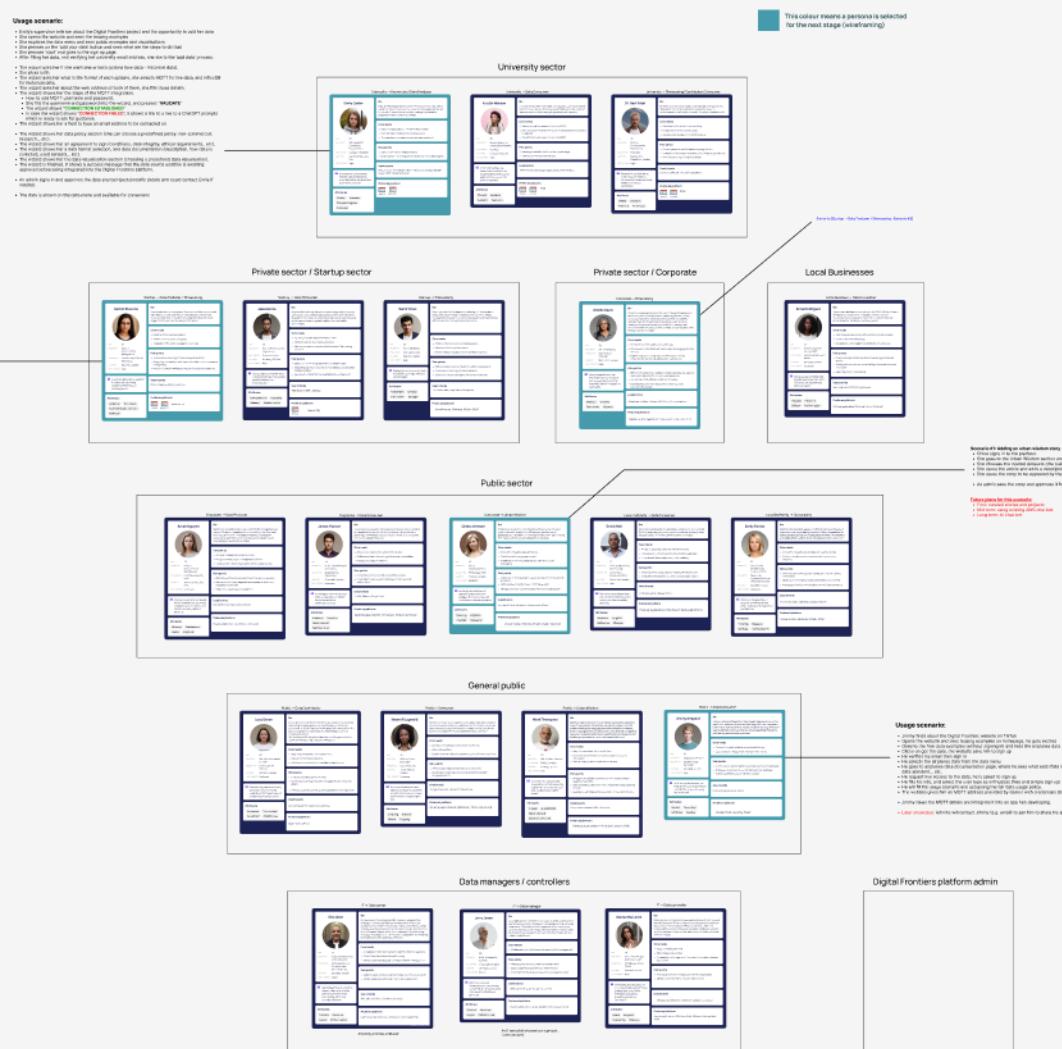
In my USS masters, my dissertation is about how people utilise public spaces, such as shopping centres, parks or squares.

# Personas

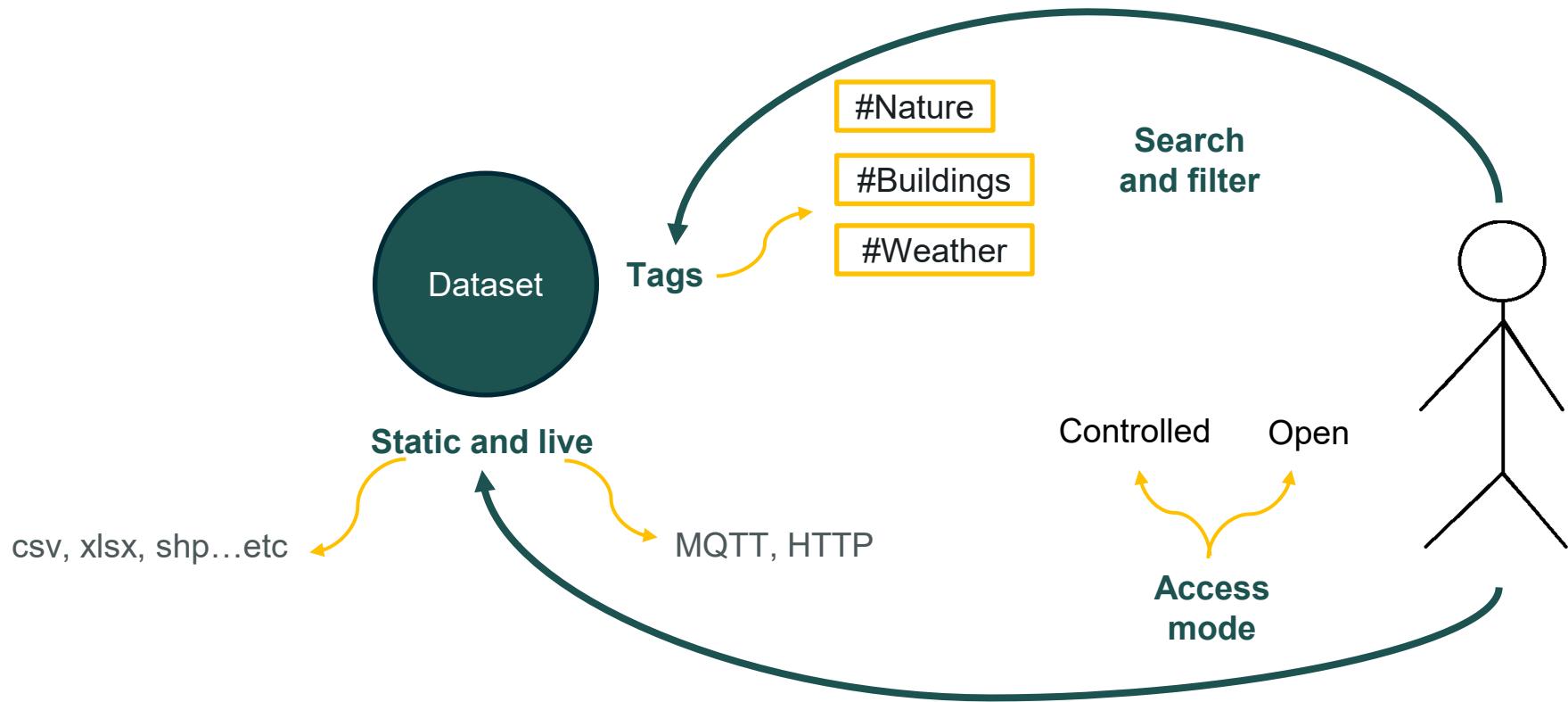
Total studied: 20

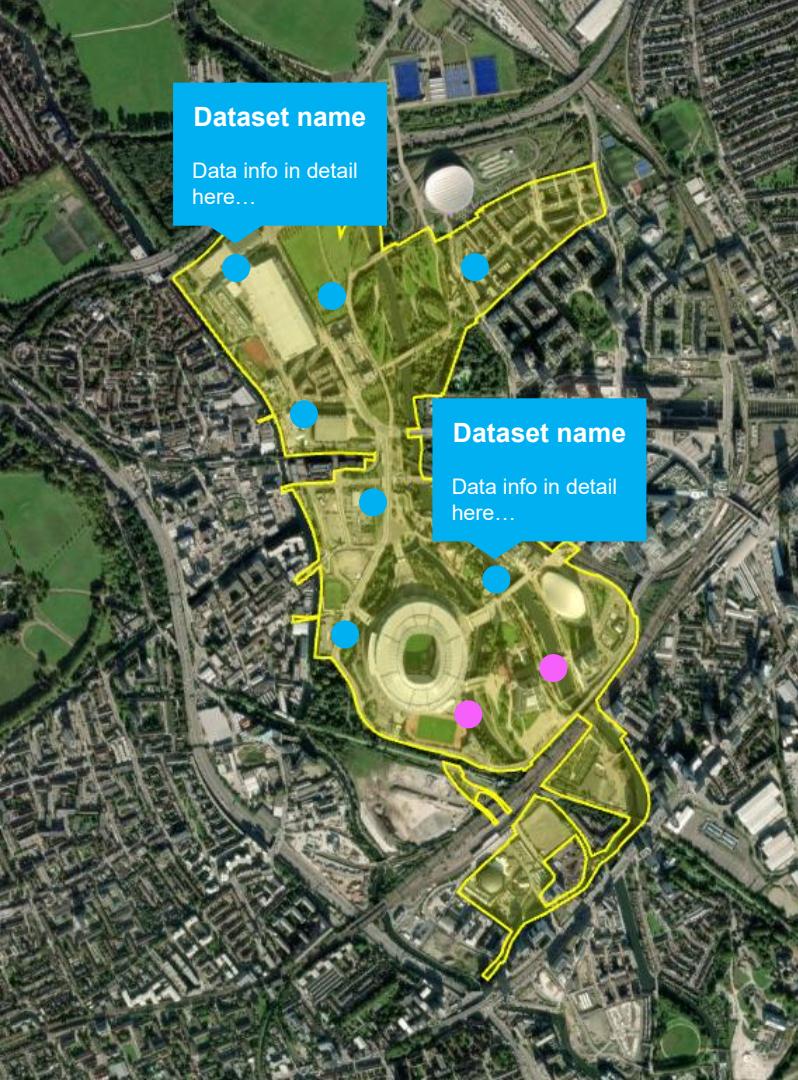
MVP focused: 5

- University researcher
- Startup analyst
- Corporate marketing specialist
- Public sector: PR manager
- General Public: high school app developer



## At the Heart: Datasets with Metadata





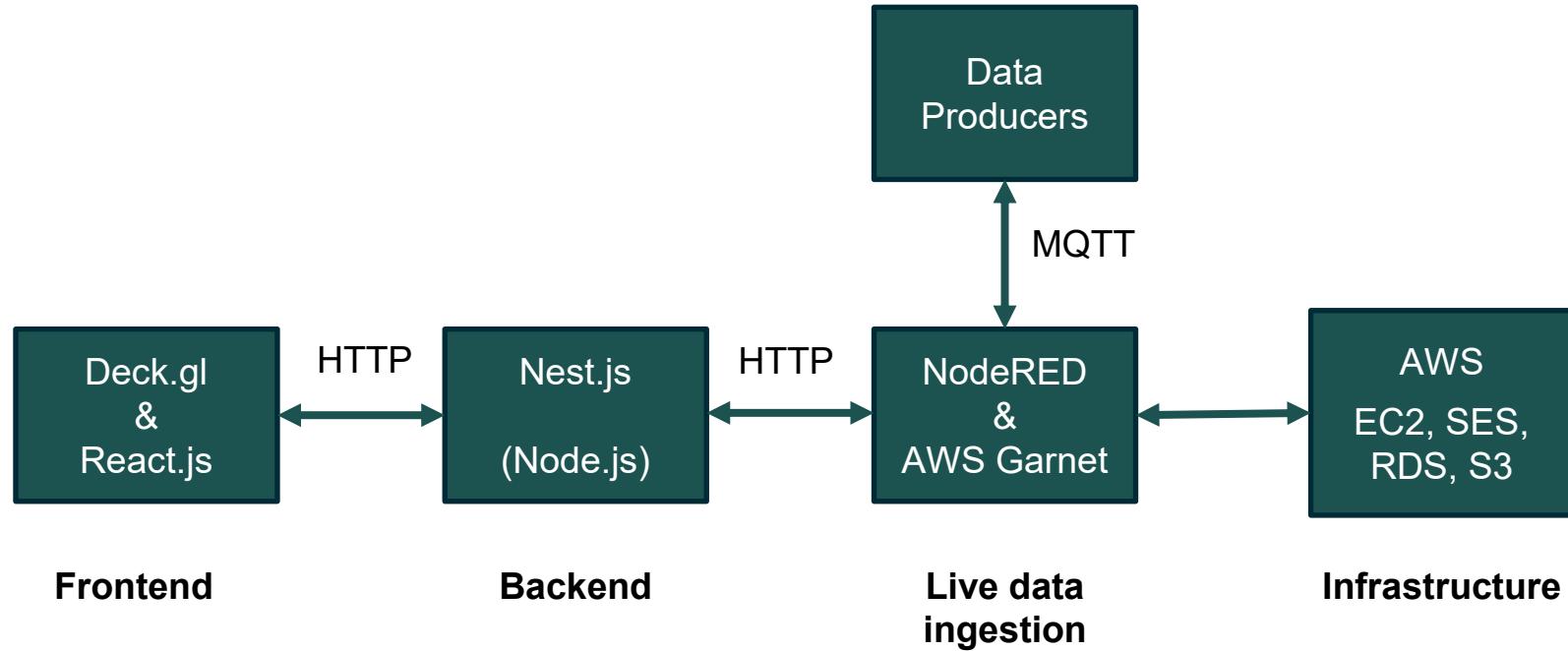
## What this platform can offer?

- Explore datasets **visually** in the Queen Elizabeth Olympic Park.
- Each dataset is **Geo-located** including sensor locations.
- Data consumers can get **dataset details**
- Data providers can add **new datasets**

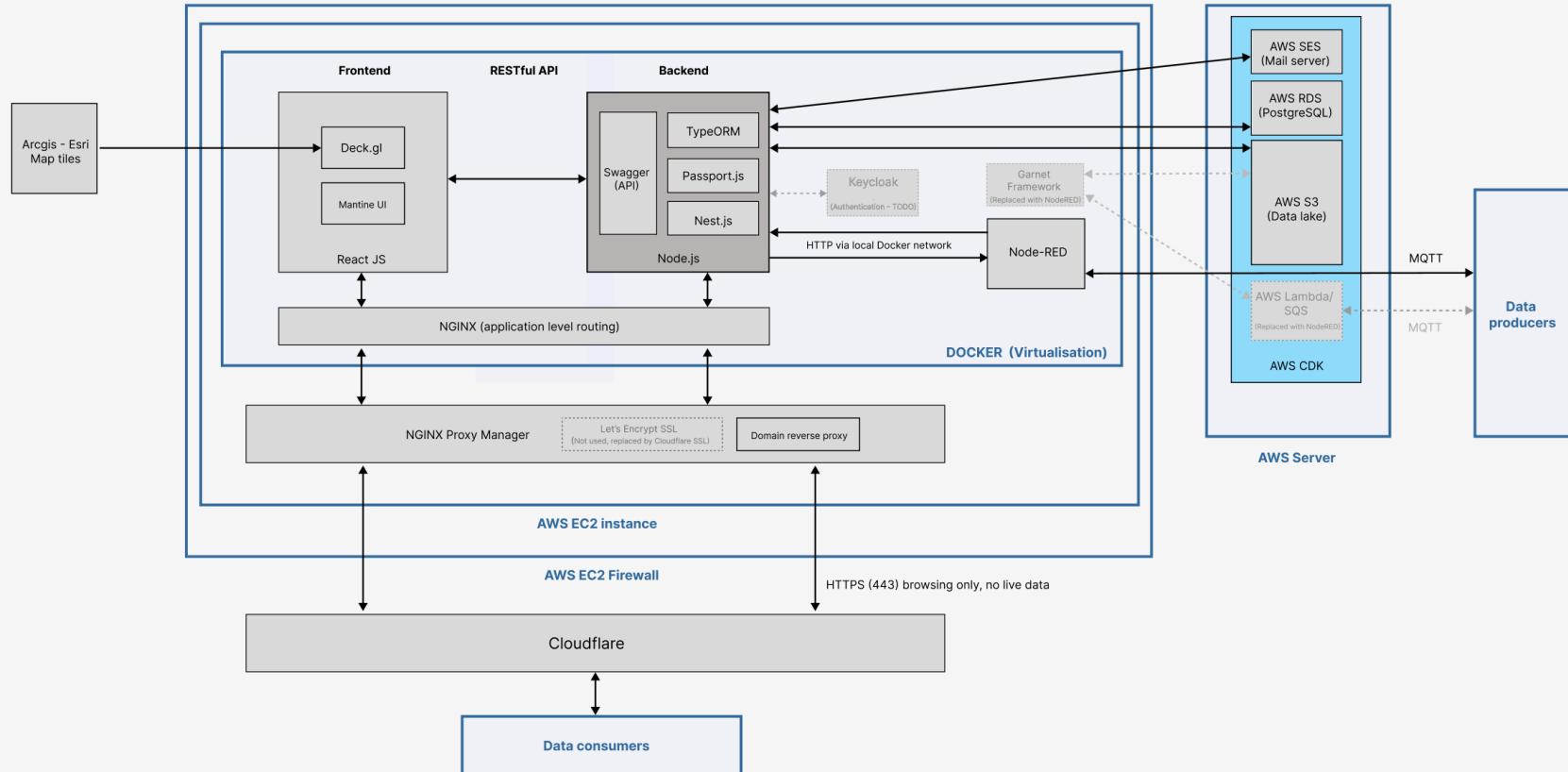
# 4

# Platform design

## Architecture – simplified



# Architecture – full



(Available on GitHub)

# 5

## Initial results

Give it a try!

[digital-frontiers.co.uk](https://digital-frontiers.co.uk)

(Launched during the Here & There workshop)

The screenshot shows a map interface titled "Data Menu" from the website [digital-frontiers.co.uk](https://digital-frontiers.co.uk). The map displays a satellite view of a dense urban area, likely London, with numerous colored dots representing bicycle docking stations. A yellow polygon highlights a specific cluster of stations in the center. A callout box provides detailed information about the highlighted data:

**TFL live bicycle docking stations**  
Transport for London  
**CYCLING TRANSPORT**

The TFL Live Cycle Hire Updates Feed provides real-time data on the availability of bicycles and docking points at all operational Santander Cycles...

The top navigation bar includes links for Home, Data menu, Showcases, About, and Sign In. The "Data menu" link is currently active, indicated by a blue underline.

# Data for impact: Showcases

## Latest showcases

Browse the latest showcases related to our datasets



SEPTEMBER 9, 2022

### Mosa, a QEOP-based Startup to Enhance Bike Parking Security with Intelligent Solution

As urban environments strive for sustainability, traditional bike racks and CCTV cameras often fall short in truly promoting cycling. But you see the bigger picture. Whether you're a property manager, transport planner, or landlord, you understand the transformative potential of cycling and are eager to overcome the challenges that discourage two-wheeled transportation. Mosa shares your commitment to innovation and creating greener, more sustainable urban spaces. By integrating our intelligent, retrofit solutions, you can enhance bike parking security, encourage cycling, and make a meaningful impact on your community's future.



OCTOBER 17, 2023

### Air Quality improves at Hackney School after School Streets Initiative Introduced



SEPTEMBER 9, 2022

### MapMortar, Plan, track and scale your path to Net Zero

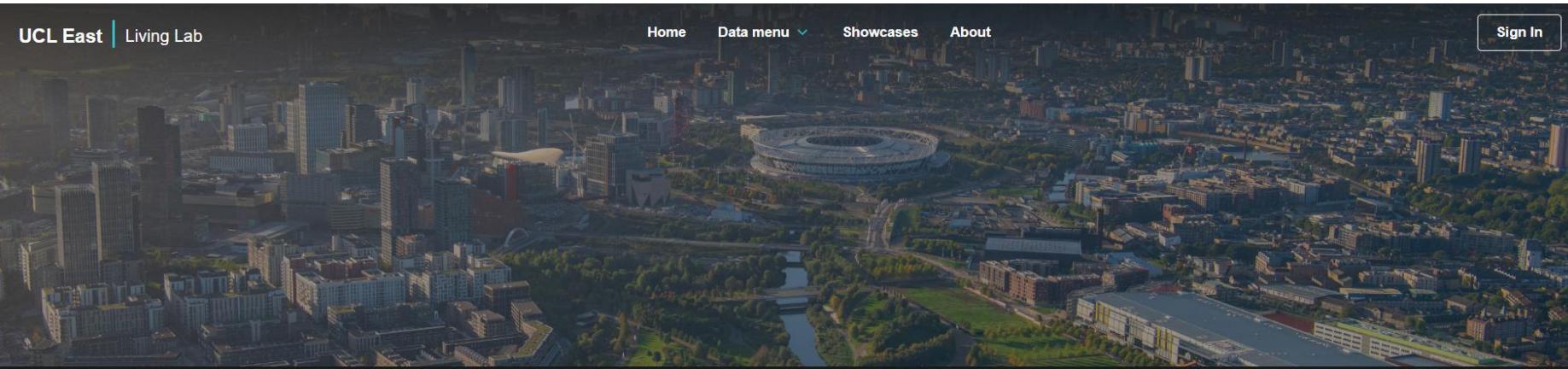


NOVEMBER 5, 2019

### Shazam for bats: Internet of Things for biodiversity monitoring

# 6

UCL East | Living lab



UCL East | Living Lab

Home Data menu Showcases About

Sign In

## A Data Platform for **Digital Innovators** to Collaborate, Test and Showcase

Living Lab provides innovators with a set of curated data streams and product showcasing tools.

All data is hyperlocal, co-located in Queen Elizabeth Olympic Park and is ready for plug and play collaboration.

### Featured datasets

Browse the featured datasets below. You can go to the data menu section and use an interactive map to explore the data.

# 7

## Summary & future work

# So, what Digital Frontiers is about?

- Realtime data contribution
- Showcases: Data in a closed loop ecosystem
- Governance: aligning stakeholders across sectors
- Long term vision: Park → Borough → London → Other cities

# Next steps

- Out-of-date databases
- Automatic standardisation
- LLMS integration for public wisdom



[github.com/syk-yaman/digital-frontiers](https://github.com/syk-yaman/digital-frontiers)

Digital Frontiers  
is on GitHub

Do give it a star :)

[yaman.kalaji@ucl.ac.uk](mailto:yaman.kalaji@ucl.ac.uk)