

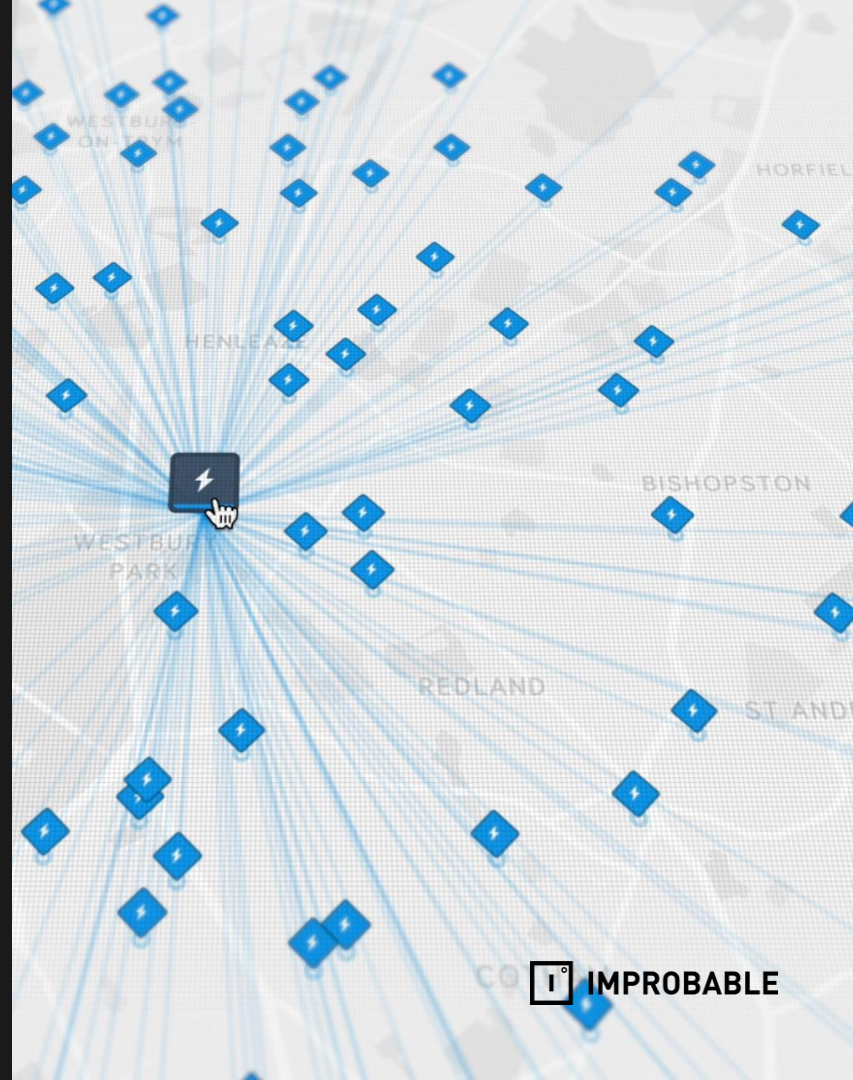
# Simulation as a Service for Decision Support & Training

Improbable Defence

# Complexity and interconnectedness

“Globalization has produced structural defects that propagate new forms of risk.”

The Butterfly Defect, Ian Goldin





## Old news?

- Data itself is inherently old news. We can only collect data on what has happened in the past.
- It tells us things about what has happened, but is limited in what it can tell us about what might happen.

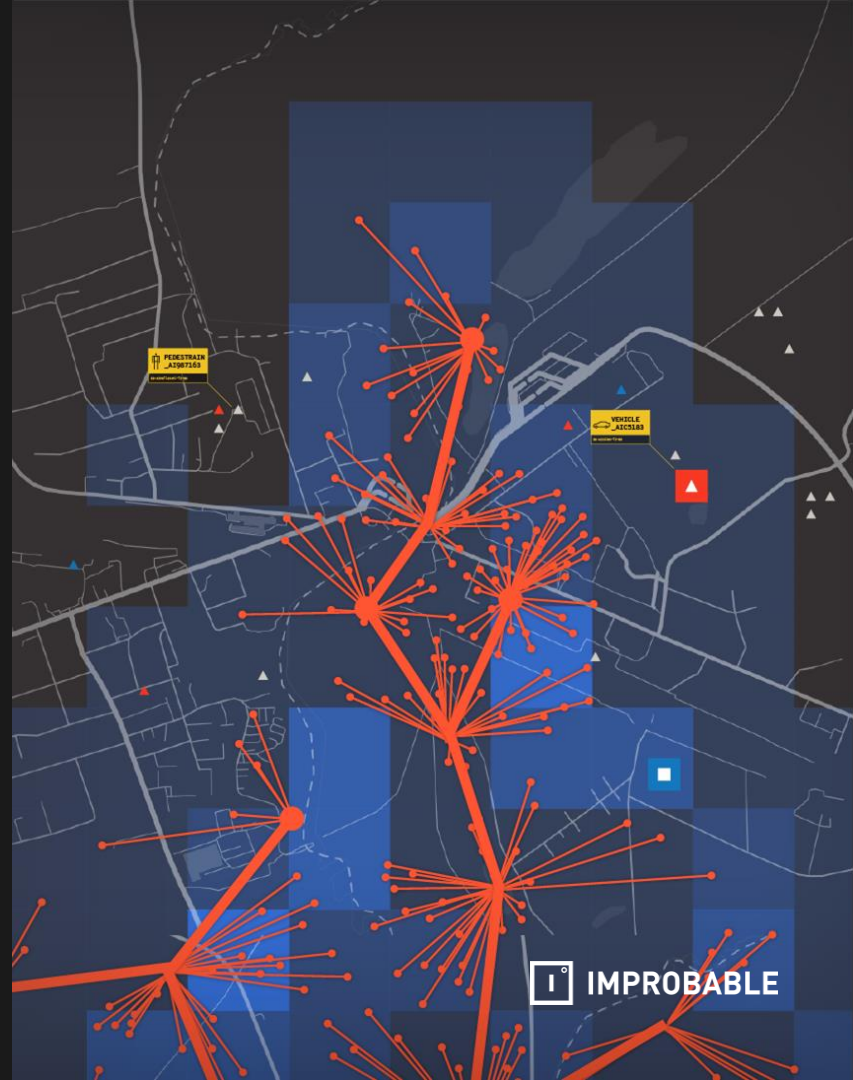
# Playing forward



- Data lets us understand the world as it is, simulation lets us explore how it might play out.
- Without a seamless connection to data, synthetics are an island.

# Improbable

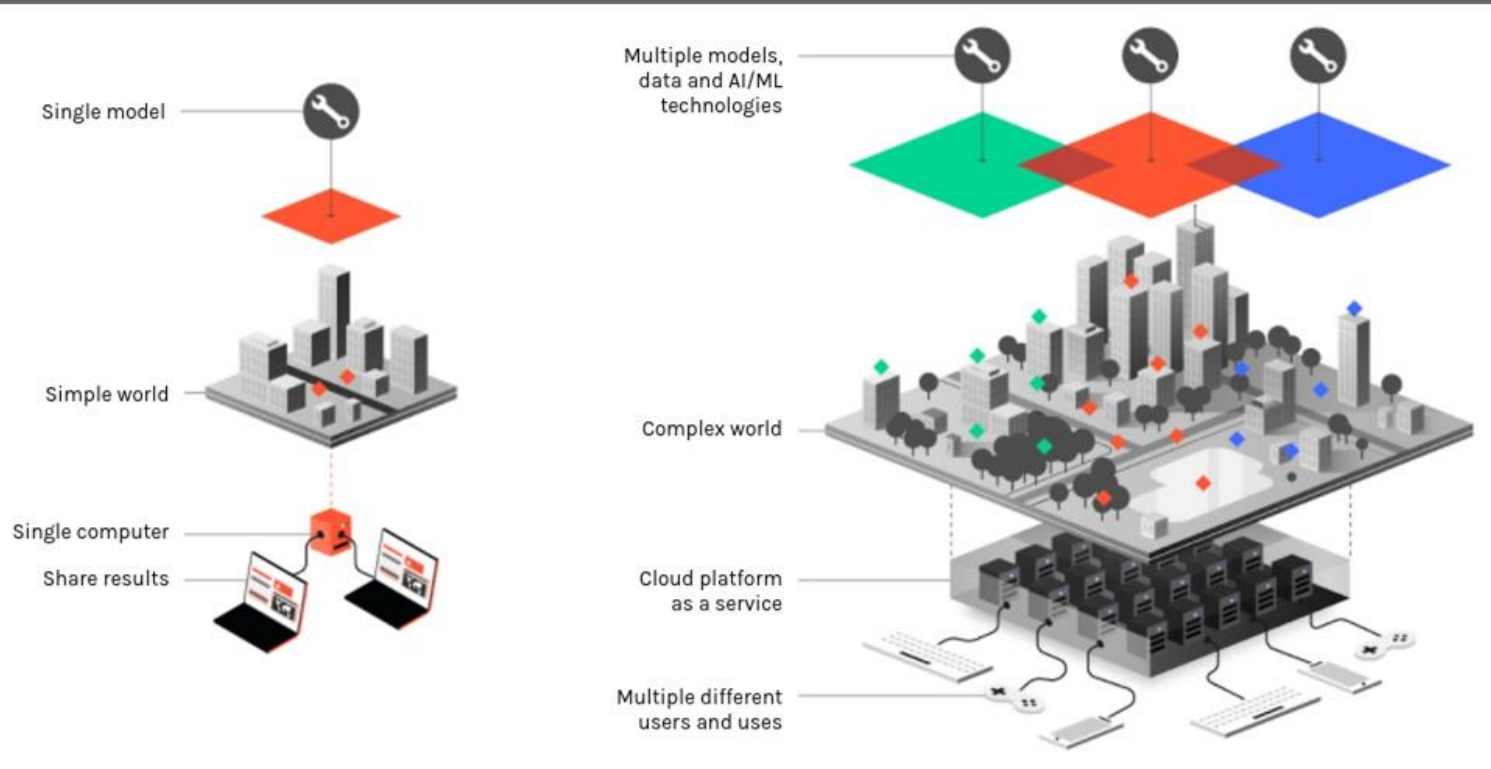
- Set up in 2012 by Herman Narula and Rob Whitehead.
- Cambridge computer science graduates who wanted to build the largest game imaginable.
- Headquartered in Spitalfields, East London.
- Substantial work in defence and national security through Improbable Defence business.



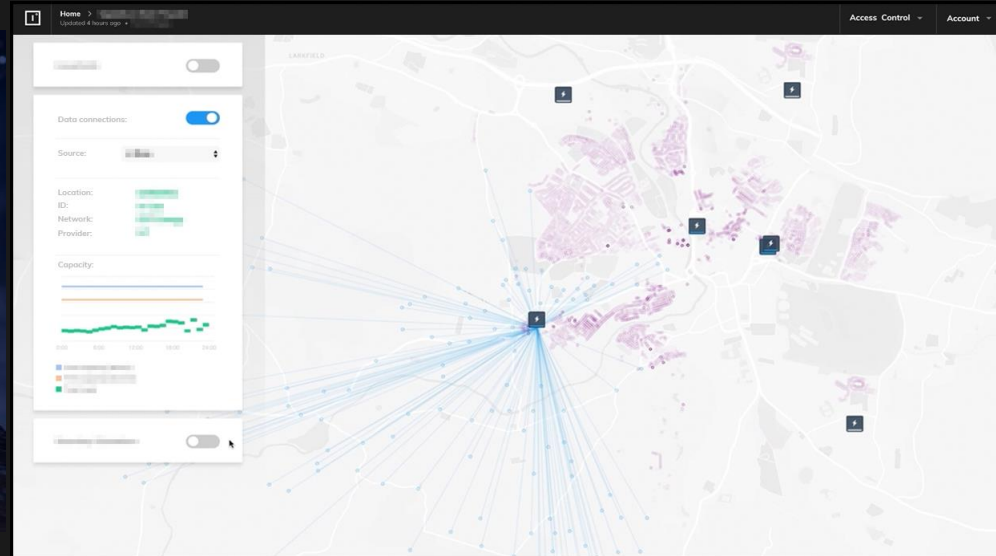
# Games and Simulations

- Massive games were chopped up with small numbers of players on each shard.
- Of the millions of players subscribing, you would only meet a small fraction of that number at any given time.
- The commercial games industry revenue in 2019 \$152 bn - \$230 bn by 2022.
- They minimise commercial risk through modularity and composability.





# Closed or interactive simulation

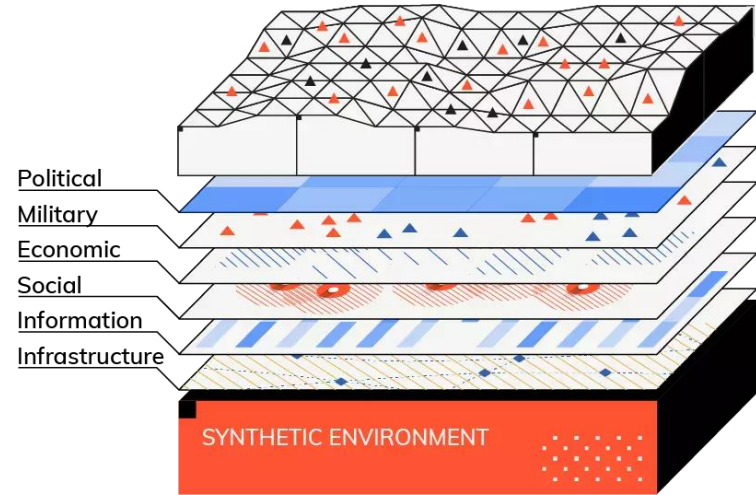




# Synthetic Environments

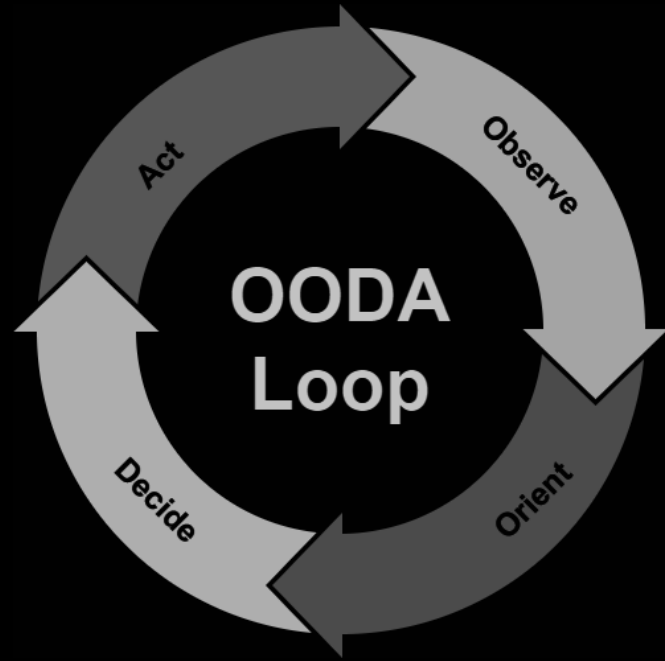
Enable a variety of models from different disciplines to be integrated together and then scaled.

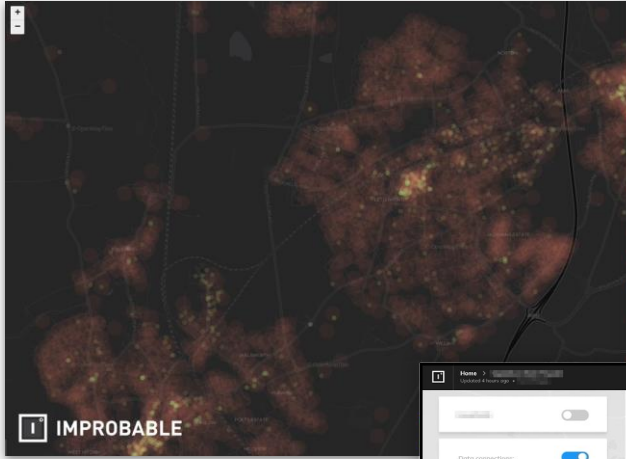
This allows the exploration of the cascading consequences, systemic risks and messy emergent effects of different actions within and across the layers of the simulation.



# Completing the loop

- 'As a service' availability.
- Interconnection between analytics and synthetics.
- Processes become richer - plans can be evaluated, rehearsed and iterated quickly and cheaply.
- Perpetual readiness.





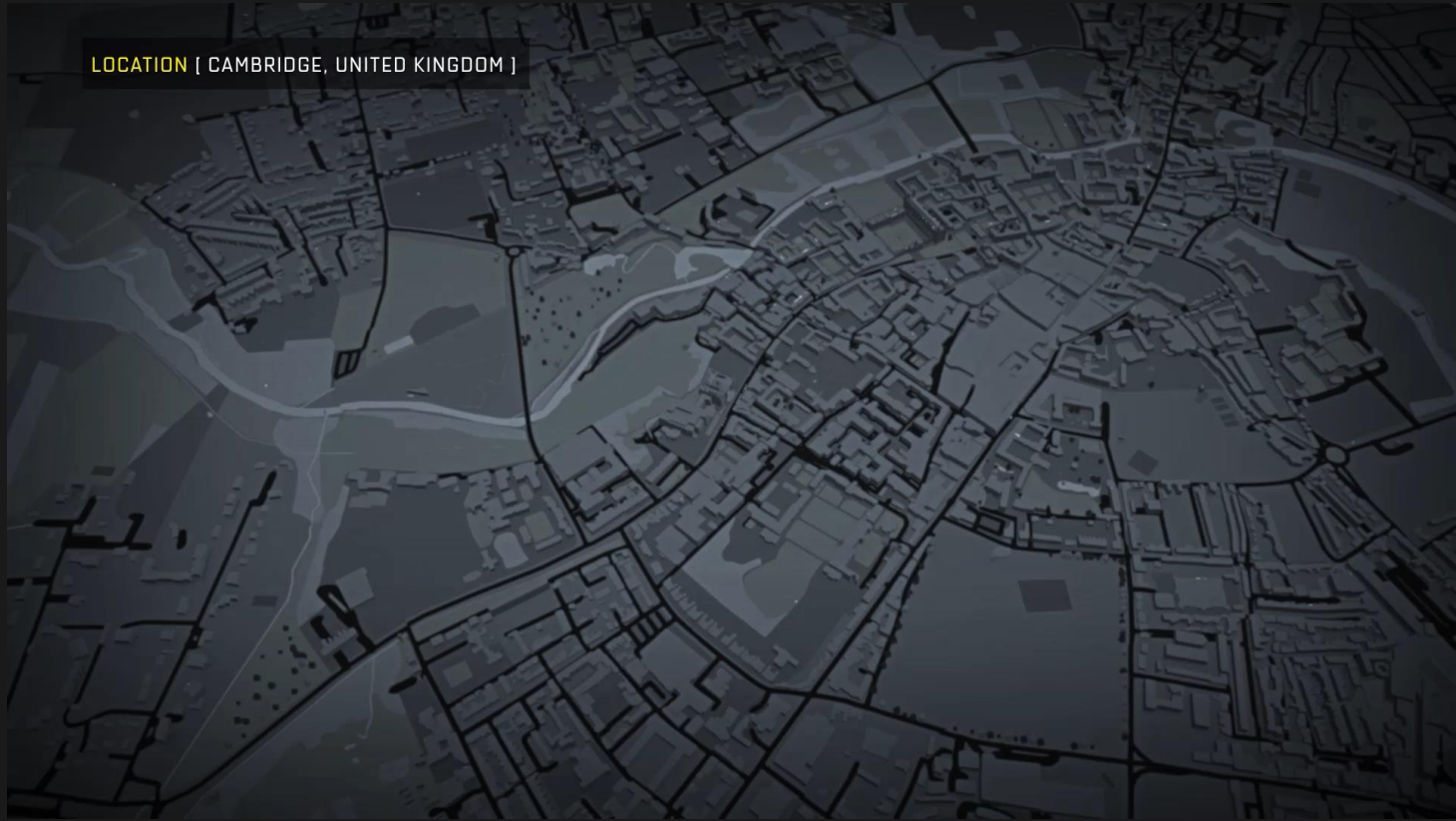
A screenshot of the 'Synthetic environment library' interface. The top navigation bar includes 'SSE Library - Data and Models' and 'Account'. A search bar is present with the text 'Synthetic environment library'. Below the search bar, a list of data items is shown, including 'Power Network', 'Water Network', 'Gas Supply Network', 'Mobile Teleco Network', 'Fixed Teleco Network', 'Hospitals (England)', 'PPE Supply Levels', 'Covid 19 Epidemiological Model', and 'Hospital Capacity Forecast Model'. The 'Hospitals (England)' item is selected, showing a detailed view with a map of the United Kingdom. The map highlights the United Kingdom and shows major cities like London, Manchester, and Birmingham. The interface also includes sections for 'Connected items (2)', 'Connected viewlayers (2)', and 'Hospital locations'.

A screenshot of a data visualization interface. On the left, there is a sidebar with a 'Data connections' toggle, a 'Source' dropdown, and a 'Capacity' section with a line graph. The main area shows a map with a network graph overlay. The graph consists of numerous nodes (represented by small blue squares) and edges (represented by blue lines) connecting them. The nodes are distributed across a geographical area, with a dense cluster in the center. The interface also includes a 'Home' button and 'Account' options.



Exploring  
the real  
world

LOCATION [ CAMBRIDGE, UNITED KINGDOM ]



File View

World Data

World Bounds  
Min: 0, 0, 0  
Max: 2, 2, 2

Tiles

World Tile Info

World Tile coords: 3, 3

Size: 400 x 400  
Zoom: 50%

Number of OSM buildings: 4281  
Number of OSM roads: 1863

Process: In Export Process: Free

View: Google Map Photo View: In Spotlight

Open Output Folder

Centre Bound RasterShape

Visibility

Roads  All  Tile

Bridges  All  Tile

Pathways  All  Tile

Pathways  All  Tile

OSM Buildings  All  Tile

Points Buildings  All  Tile

6.000 Tile Separation

6.000 Tile Rotation

6.000 OSM Terrain Scale

1004 Tile Mesh resolution

Update Tile Mesh resolution

Gridmap mode



World Objects

Select by Height: 214491145

Agriculture	Alignment
Agriculture	Shed
Residential	House
Agriculture	Alignment
Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed
Residential	House
Agriculture	Alignment
Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed
Residential	House
Agriculture	Alignment
Agriculture	Shed



World Objects

Select by Height: 214491145

Agriculture	Alignment
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Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed
Residential	House
Agriculture	Alignment
Agriculture	Shed
Agriculture	Alignment
Agriculture	Shed

Building Info

OSM Map ID: 444444444

Height: 14 (lowest figure)

Enclosure: 9

Area: 101.016m²

Ratio: 1.182995

Area: 29.47m x 25.2m

Included Size: 24.5m x 25.0m

Included Box Angle: 8.262742

Position: Access: 981470,111470,1470

Region: Residential

Open: Apartment

View: In Spotlight

Open Building: 1000.00, 101.016m²

Building Outline

Show Included version

Show Vertex Numbers (Show Normals)

Process: In Export Process: Free

View: Google Map Photo View: In Spotlight

Open Output Folder

Centre Bound RasterShape

Visibility

Roads  All  Tile

Bridges  All  Tile

Pathways  All  Tile

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1004 Tile Mesh resolution

Update Tile Mesh resolution

# Approach to Innovation:

## User focussed, agile, tight learning curves.

- User is key: customers have a project team permanently attached to Improbable.
- Development process draws heavily on repeat interviews with diverse range of users to explore UX/UI.
- Objective is to build Minimum Viable Product and get this into hands of users rapidly.
- Rapid learning and tight feedback loops.
- Application of Agile Project Management.



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