

Designing Buildings in Realtime from Anywhere

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Principal, CIO

KPF

Applied Research

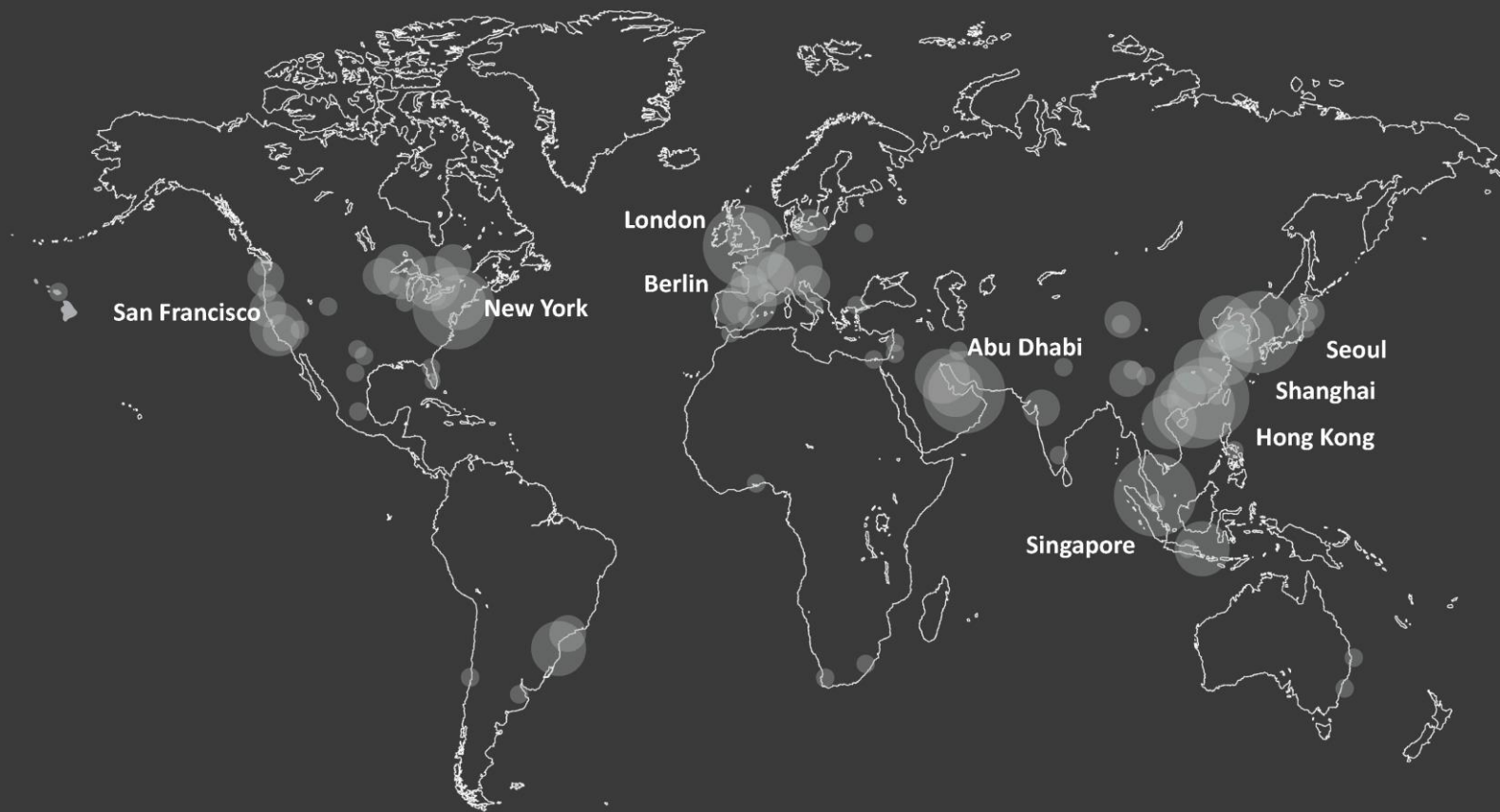
- 01 | KPF Overview
- 02 | Designing Real Time
- 03 | Collaborating Real Time
- 04 | KPF 10th Office

01 | KPF Overview

A: Introduction to KPF



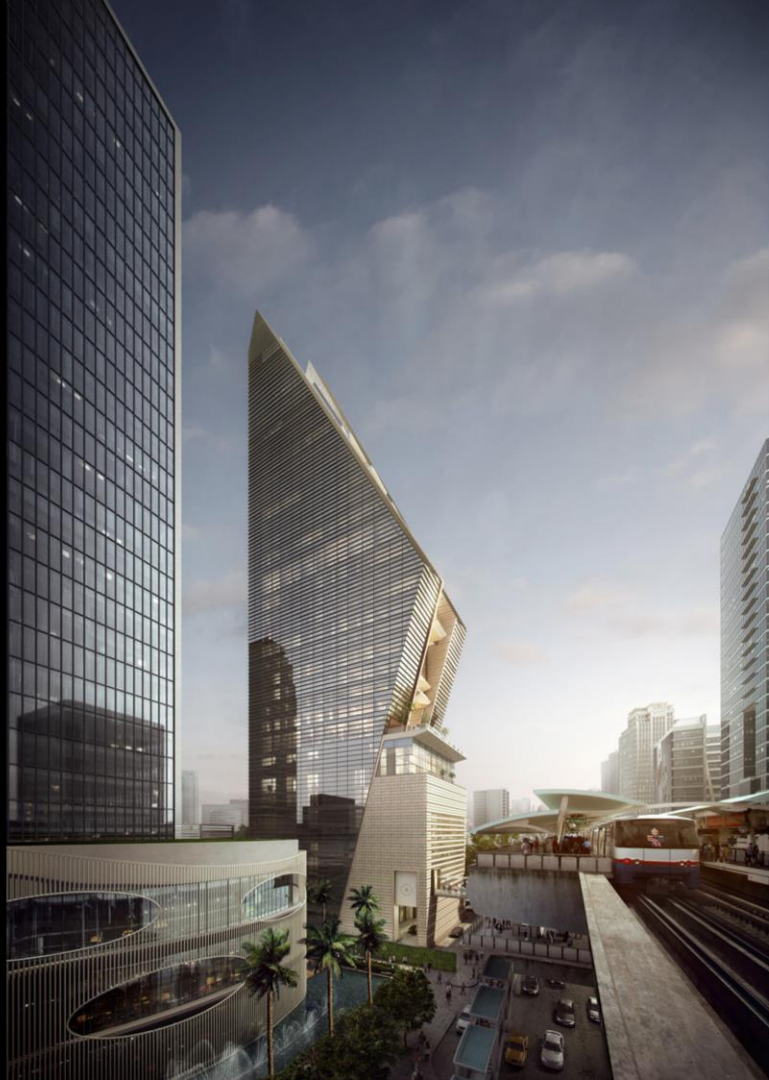






Abu Dhabi International Airport
Abu Dhabi

Rosewood Bangkok
Bangkok



KPF



Hudson Yards
New York

KPF

Lotte World Tower
Seoul



KPF

Unilever House
London



KPF



Nanning International Airport
Nanning



One vanderbilt
New York



Petersen Automotive Museum
Los Angeles



Riverside 66
Tianjin



Centra Metropark
Iselin, NJ



One Jackson Square
New York

MICHAEL KORS

MICHAEL KORS

MICHAEL KORS

MICHAEL KORS

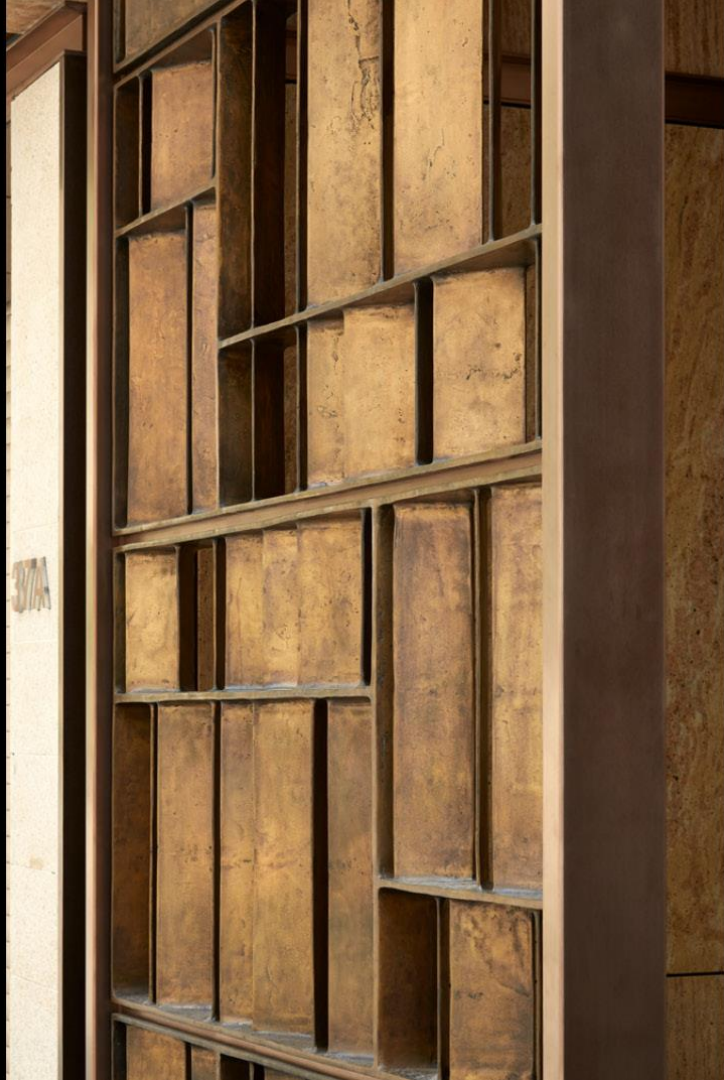


Michael Kors Jing An
Shanghai



Lotte World Tower
Seoul

23-39 Blue Pool Road
Hong Kong



Alphabet

Tencent 腾讯



TP-LINK®

lenovo



JPMorganChase



Morgan Stanley



MIZUHO



LOTTE



ADIA



GANNETT

Time Warner



PINGAN



01 | KPF Overview

B: Workflow – Realtime Analysis and Collaboration

1: 9 KPF Locations

2: External Partners

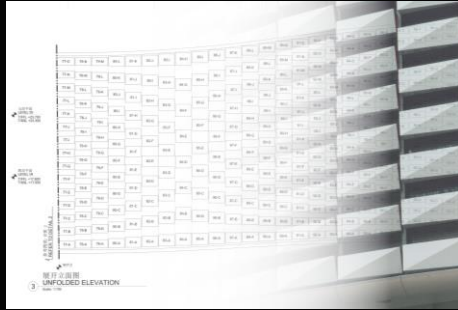
3: Client Collaboration

4: Fabricators + Vendors

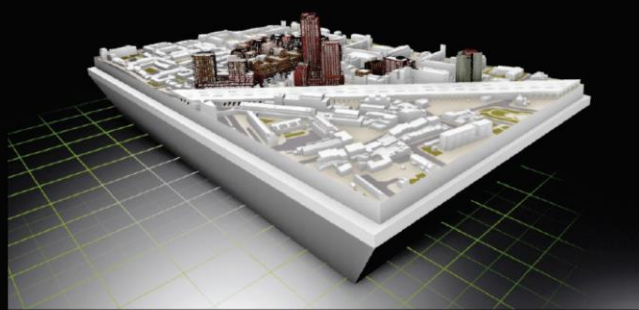
01 | KPF Overview

C: 5 Digital Areas of Focus

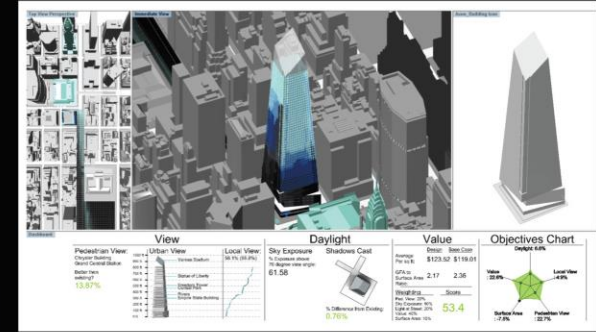
1: Digital Practice



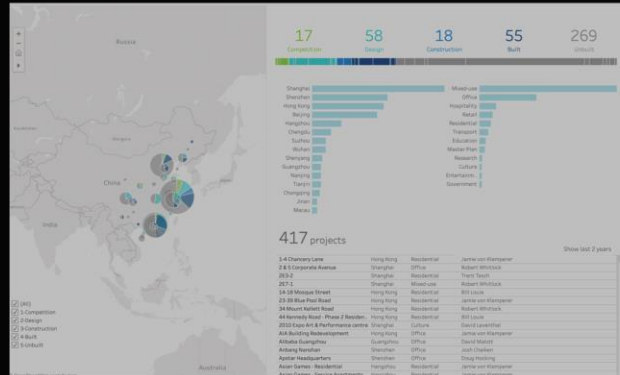
2: Applied Research



3: KPFui



4: Data Analytics + Visualization



5: Global Infrastructure



01 | KPF Overview

D: Core Technologies

KPF FRAME / DESKTOP



Please choose the site that is the closest to your current location



● Data Centers



01 | KPF Overview

E: Collaboration Expectations

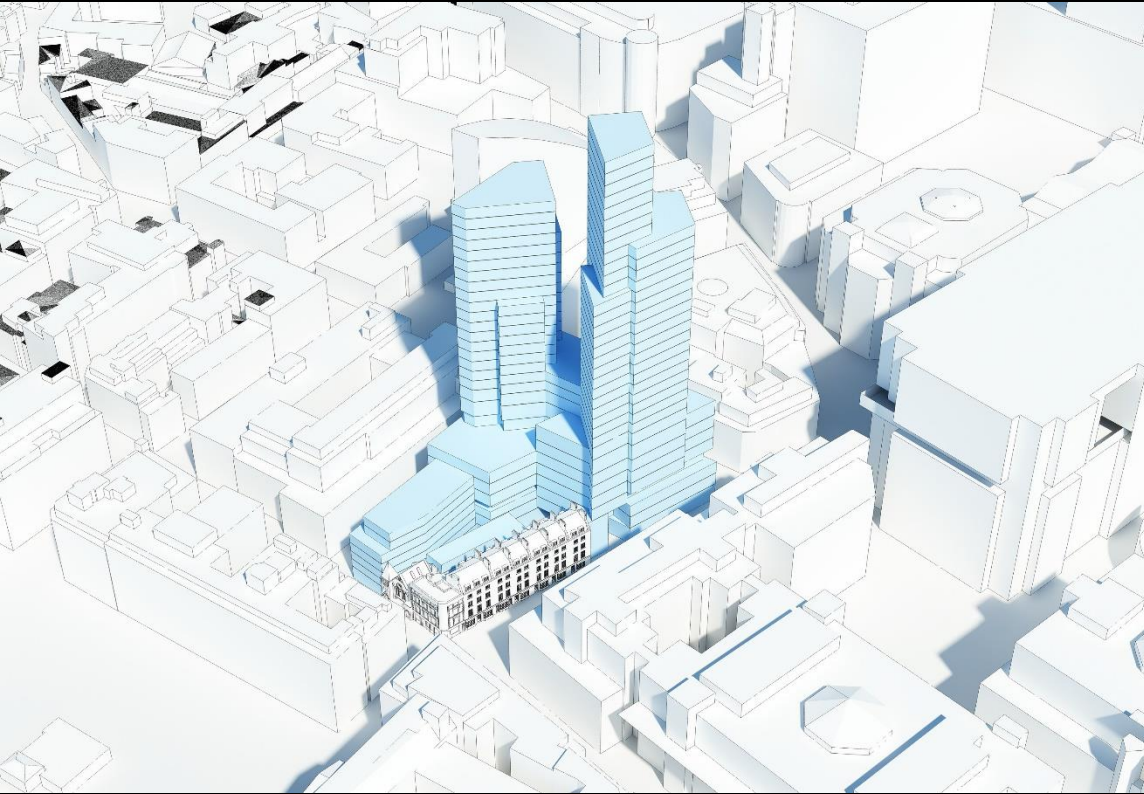
- Sharing Digital Models Among Multiple Constitutes
- Realtime Immersive Experiences for Design Communication
- 24 Hour/Multiple Time Zone Realtime Collaboration

01 | KPF Overview

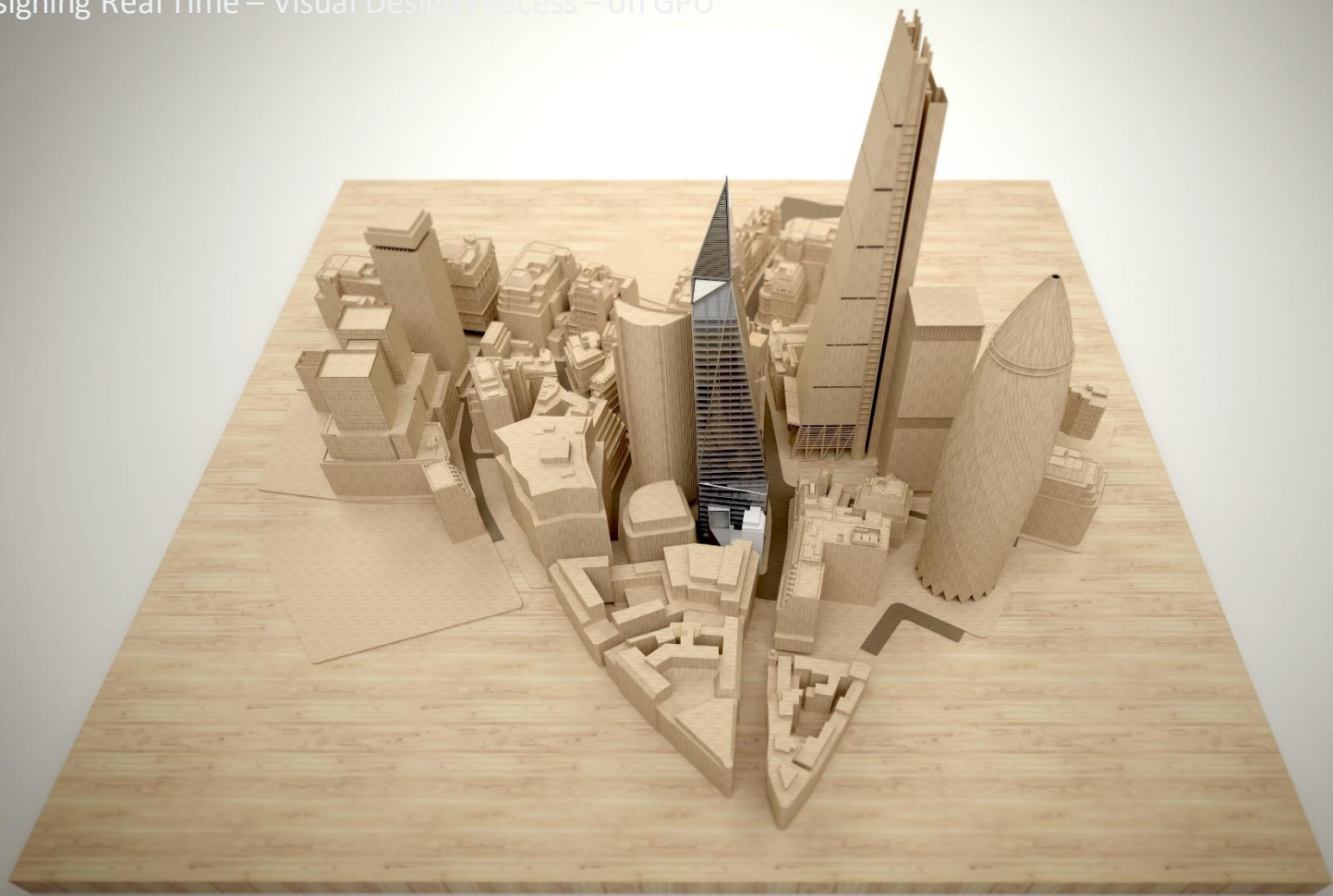
02 | Designing Real Time

03 | Collaborating Real Time

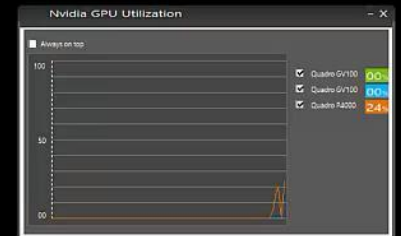
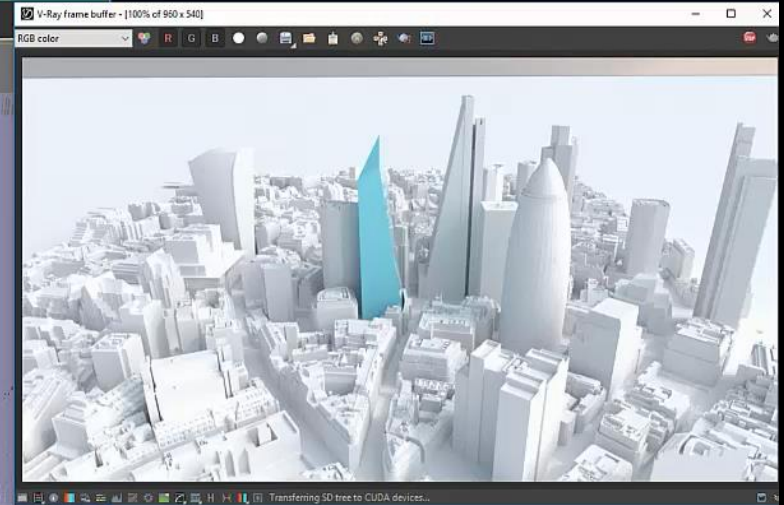
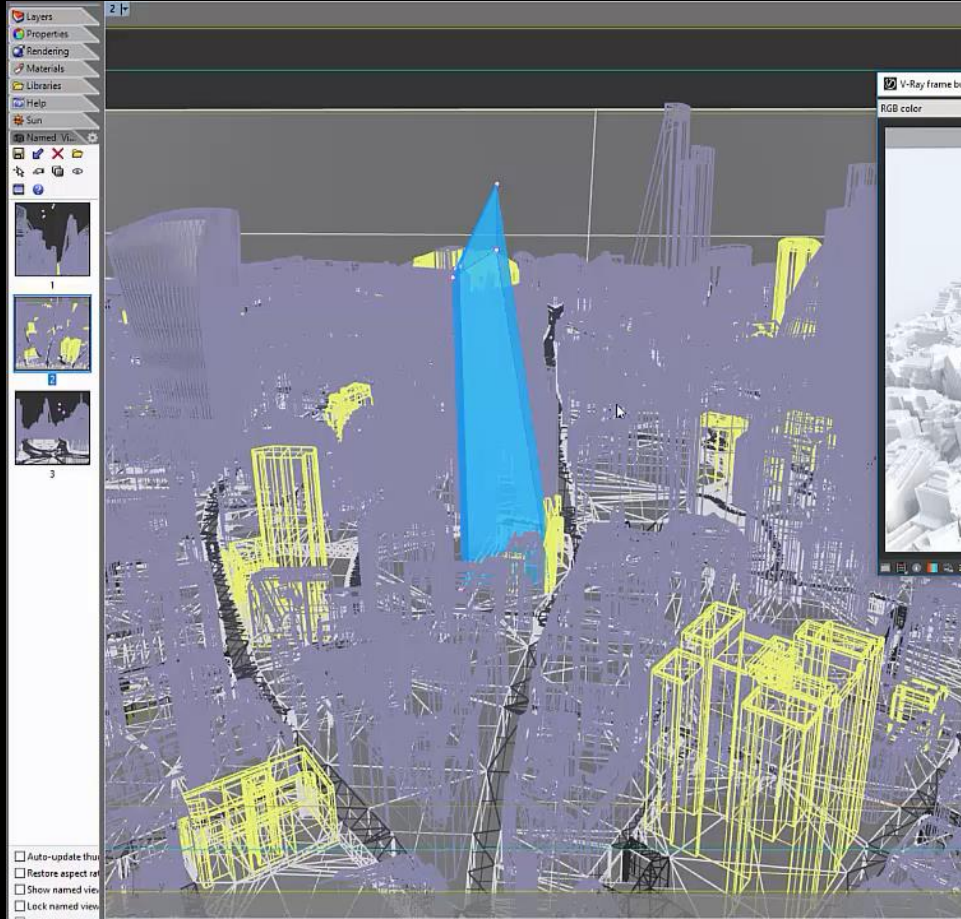
04 | KPF 10th Office



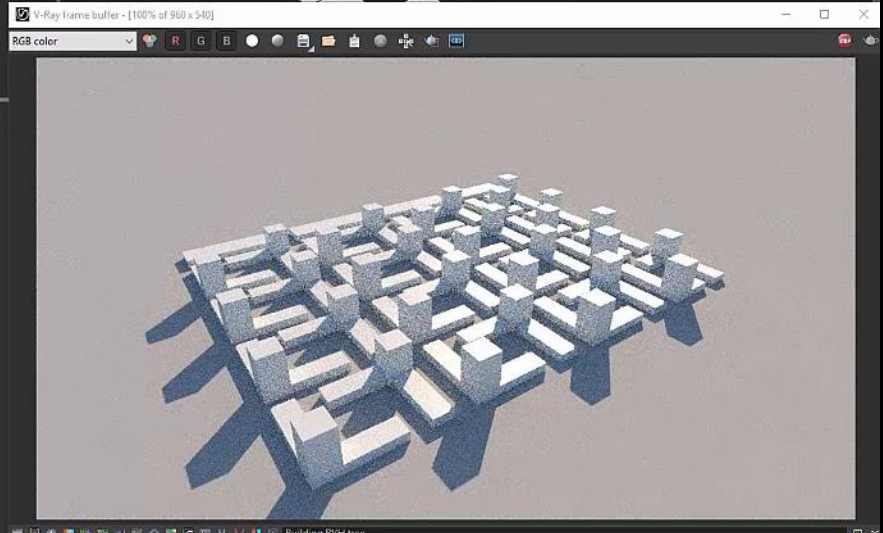
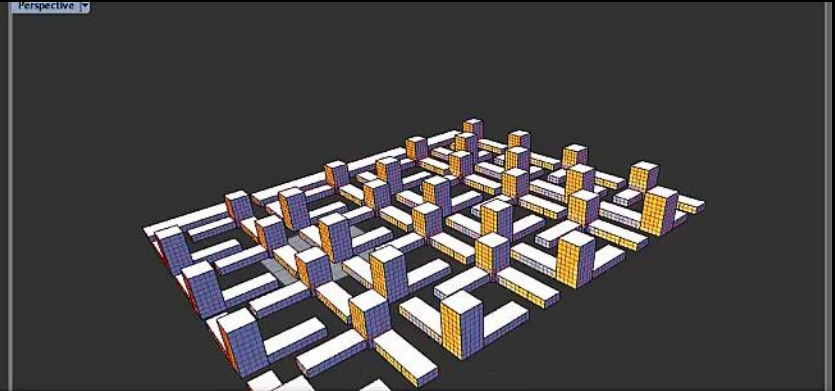
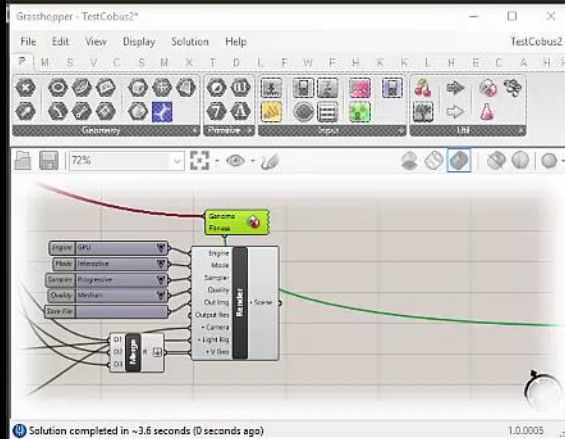
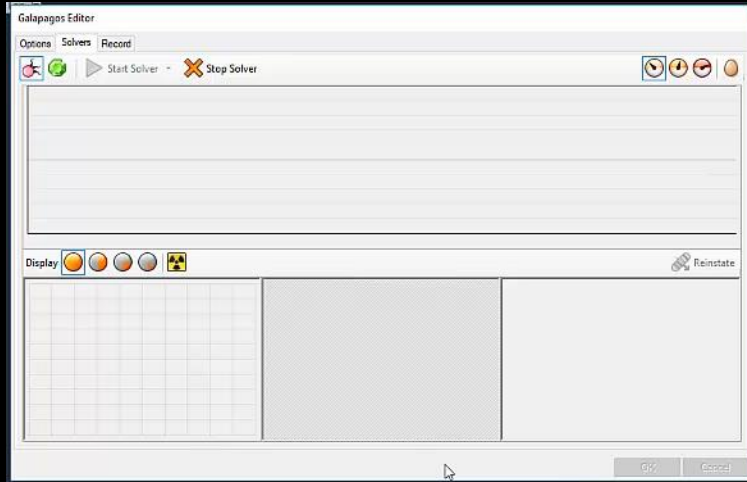


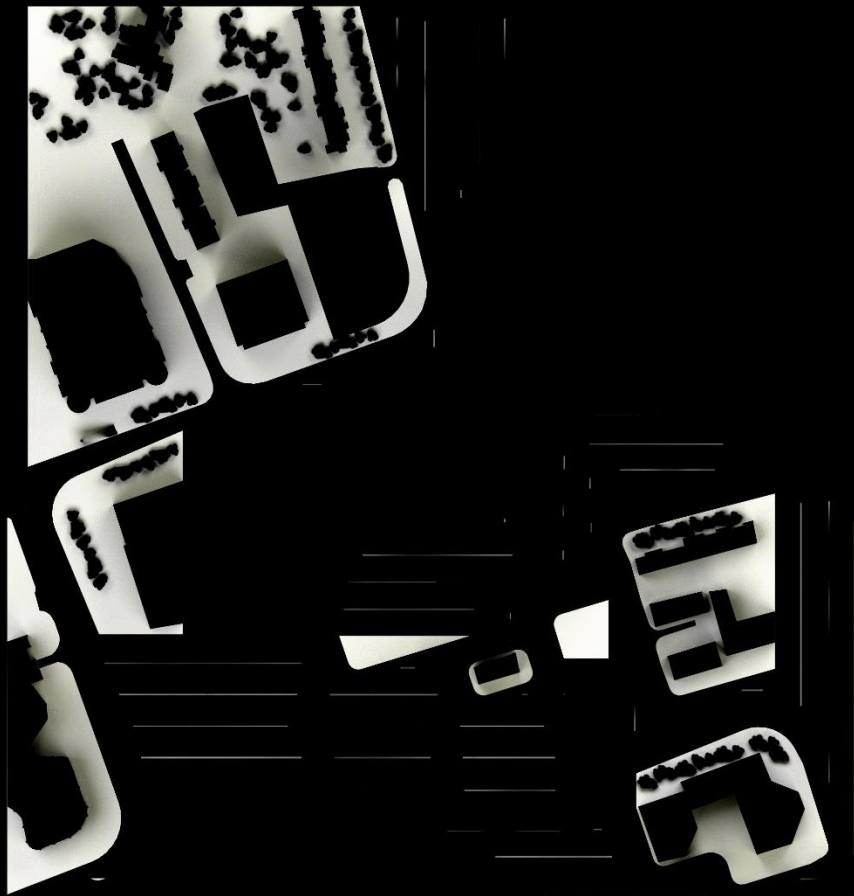


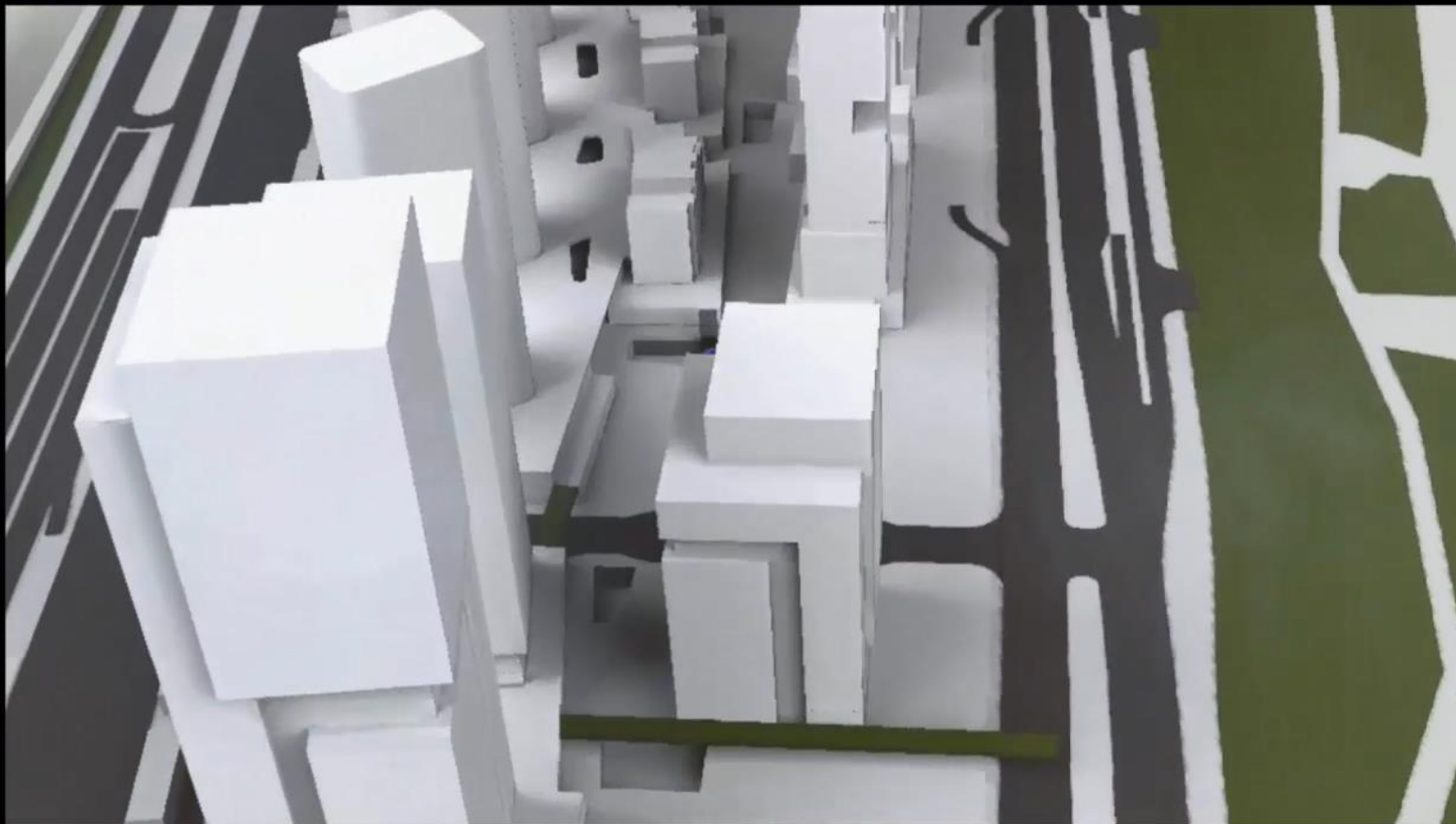
02 | Designing Real Time – Computational Design using GPU



02 | Designing Real Time – Computational Analysis using GPU









Vray on 3D Max – 4K render on GPU only

NVidia Quadro P4000	= 25m 21s
NVidia Quadro P6000	= 15m 13s
NVidia Quadro RTX4000	= 13m 9s
NVidia Quadro RTX6000	= 8m 22s

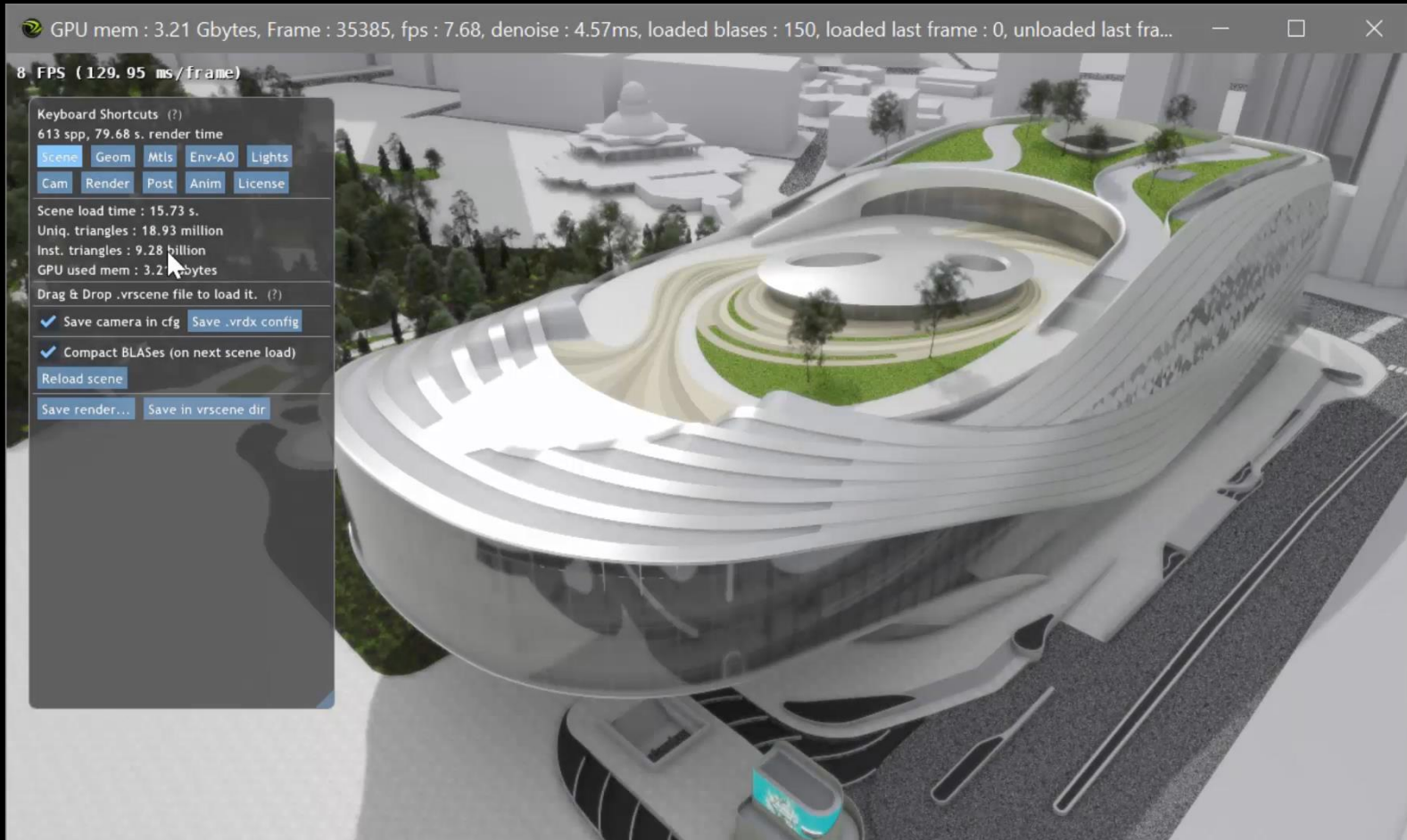


Vray on 3D Max – 4K render on GPU only

NVidia Quadro VCA P6000 (X8) = 3m 17s

NVidia Quadro GV100 (X2) = 3m 31s

02 | Designing Real Time – GPU Visual Computing for CGI on RTX









KPF

TRAFFIC CAMERAS

The traffic camera tool enables you to visualise the current state of the traffic around London. The feed, as provided by TfL, is updated every 10 minutes.

Lambeth Plc Rd/Royal St

watch



BACK

Accucities

KPF

PTAL Overlay

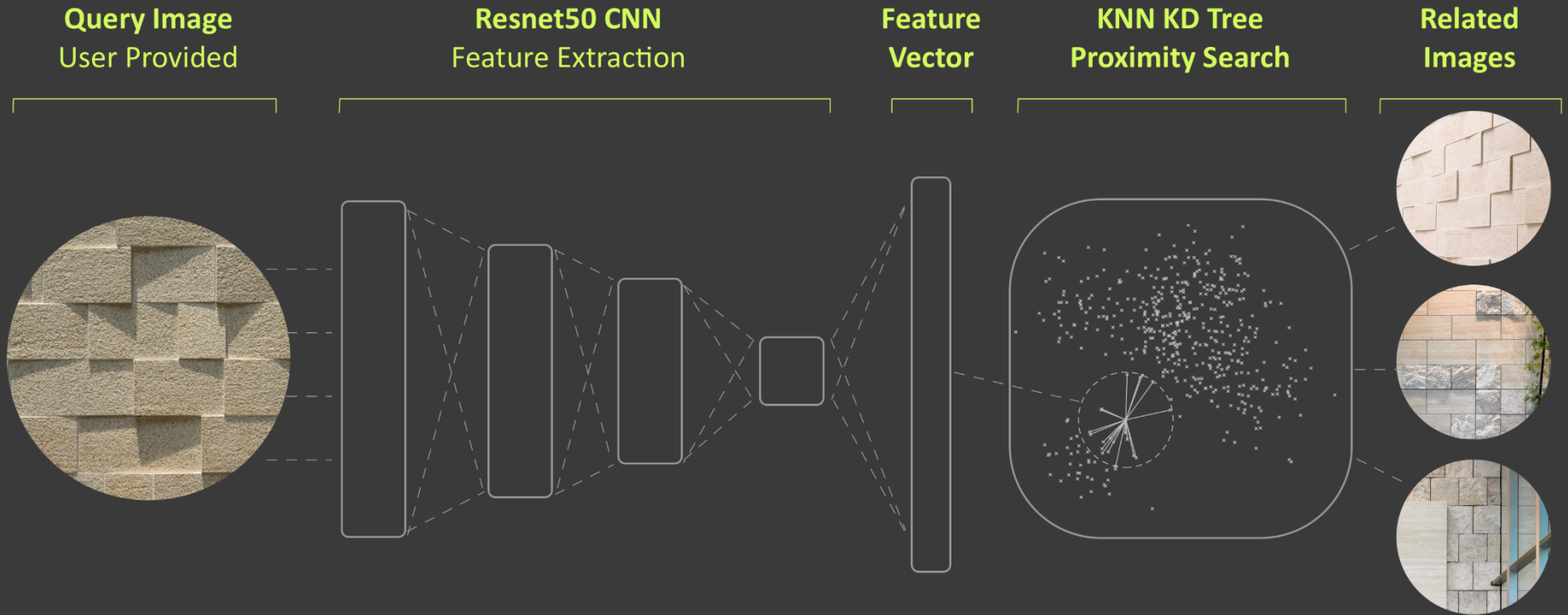
PTAL data - short for "Public transport accessibility level" - stands as the method used in UK transport planning to assess the access level of geographical areas to public transport. Click the button below to visualise this data on top of our model.



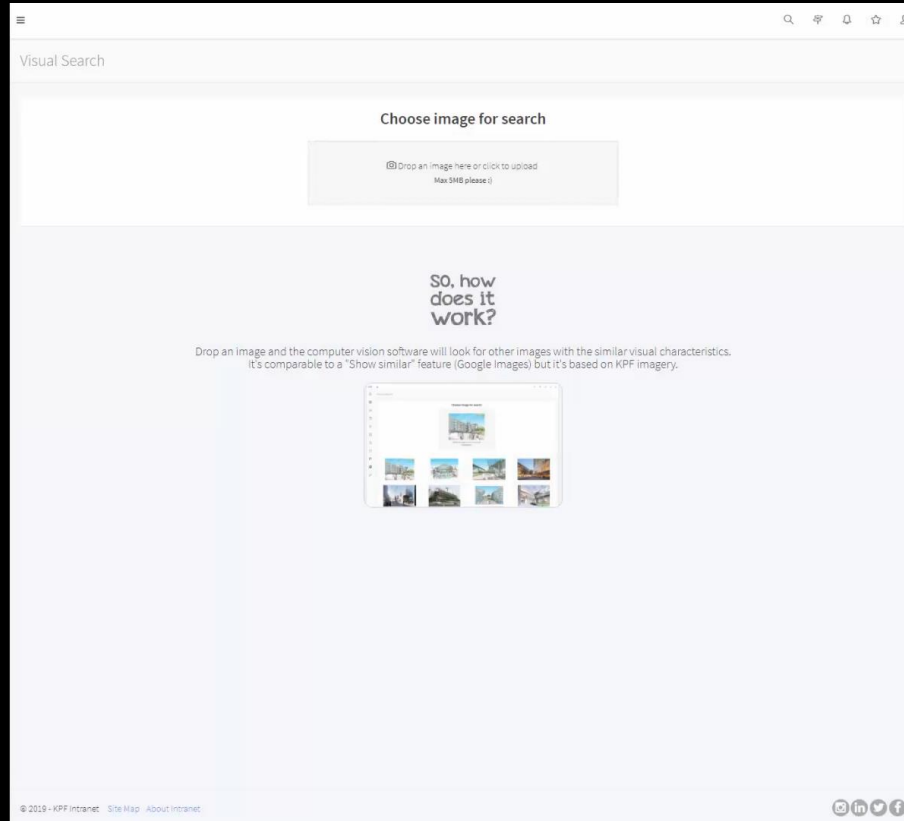
PTAL data on / off:

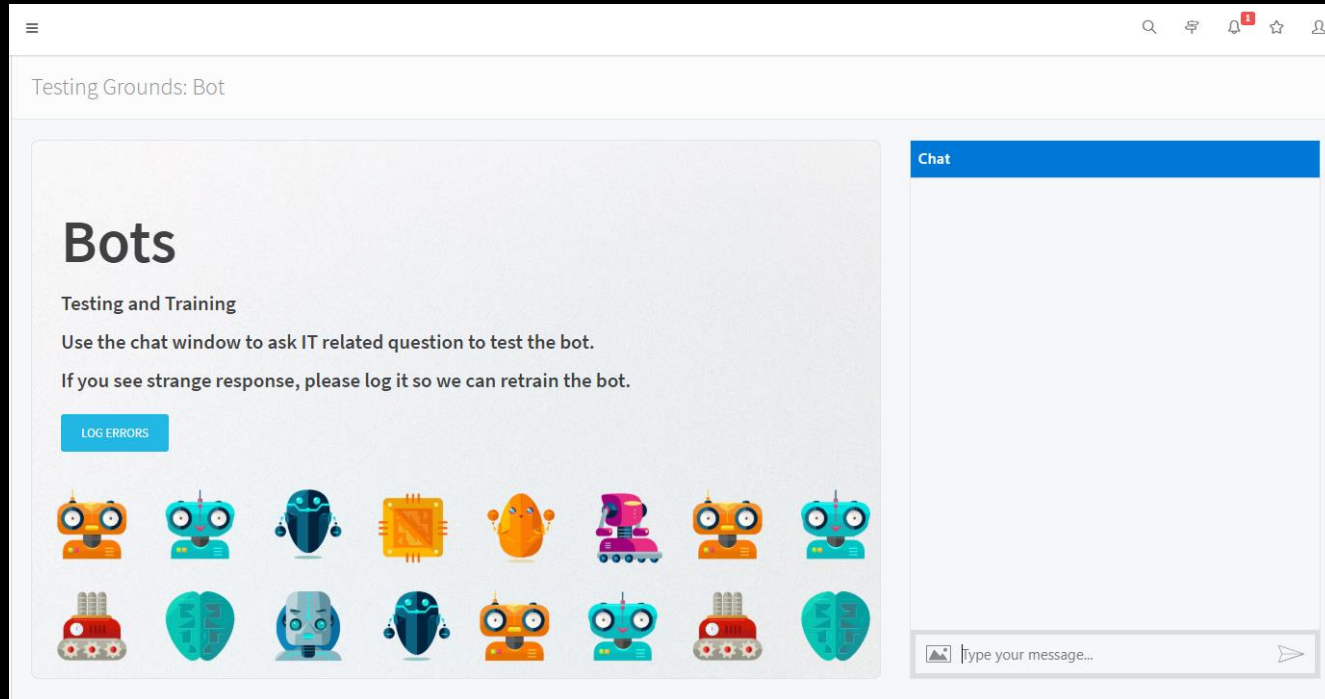
BACK





02 | Designing Real Time – Machine Learning for Knowledge Sharing



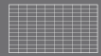


Generative Design

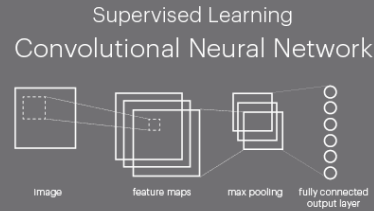
generate



evaluate

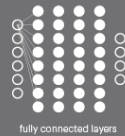


Machine Learning



Unsupervised Learning

Deep Neural Network

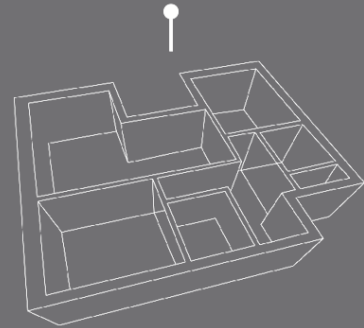


trained neural network



Immersive Evaluation

Immersive Human Evaluation
real-time

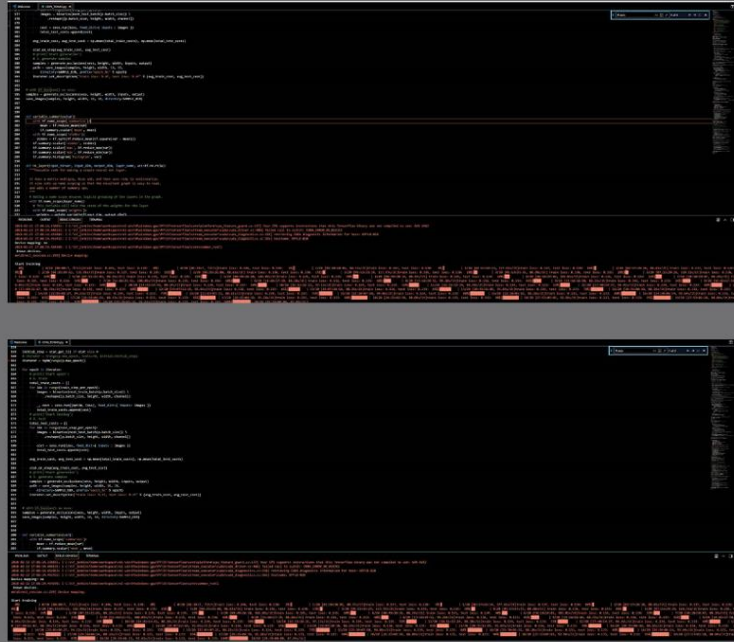


02 | Designing Real Time – Machine Learning for Design Exploration

Generative Design Base on Spatial Characteristics

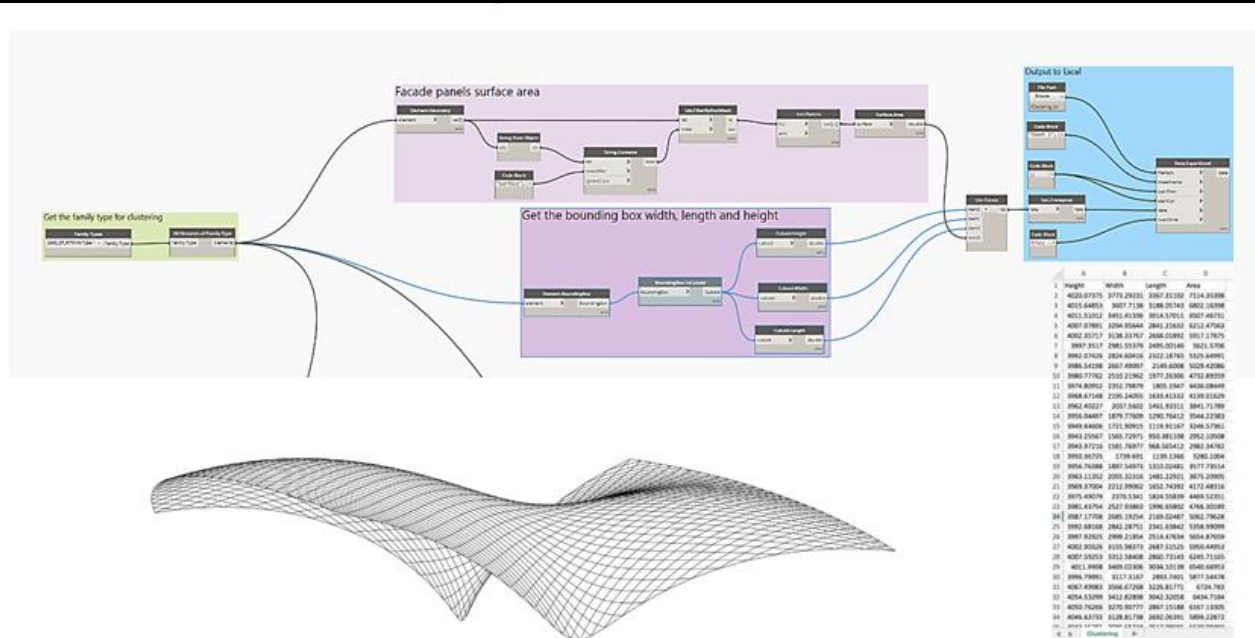


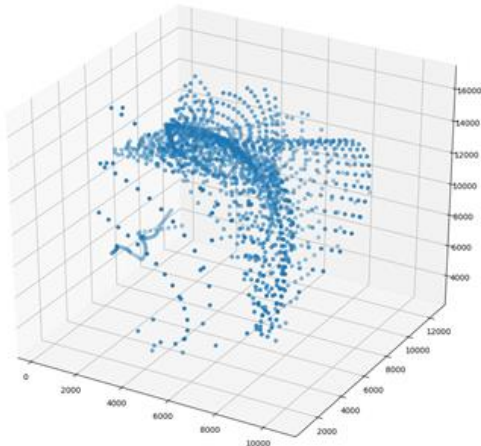
Machine Learning - Supervised and Un-Supervised



Immersive Evaluation of layouts for verification



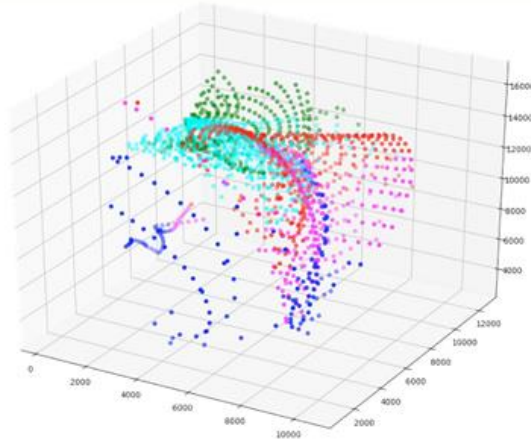




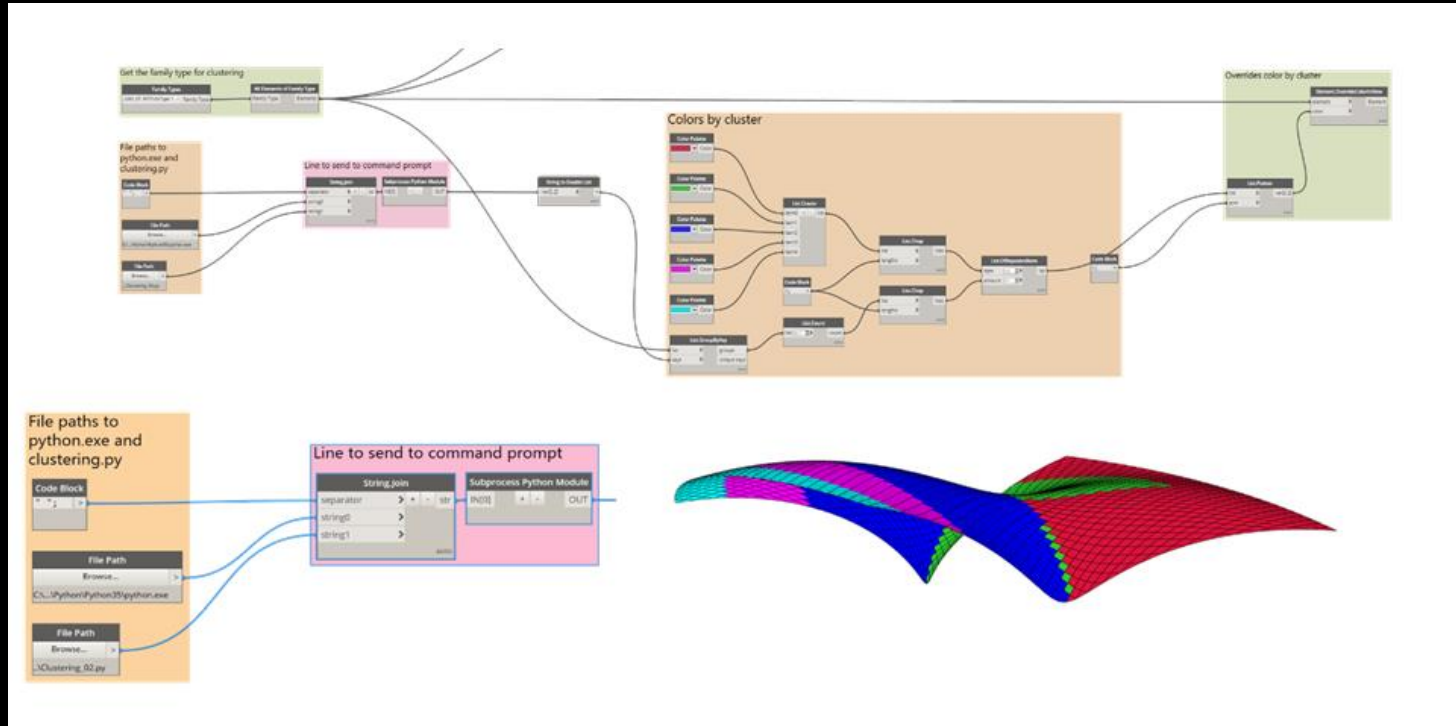
```
# WE ARE GOING TO VISUALISE PART OF THE DATA
X = dataframe.Height
Y = dataframe.Width
Z = dataframe.Length

# USE MATPLOTLIB TO VISUALISE 3-D SCATTERED DATA
ax = Axes3D(plt.figure())
ax.scatter(X, Y, Z)
plt.show()
```

```
# VISUALISE THE OUTPUT
if assignments is None:
    assignments = [0] * len(X)
fig = plt.figure(figsize=(14,8))
cmap = ListedColormap(['red', 'green', 'blue', 'magenta', 'yellow'])
ax = Axes3D(plt.figure())
ax.scatter(X, Y, Z, c=assignments, cmap=cmap)
plt.show()
```



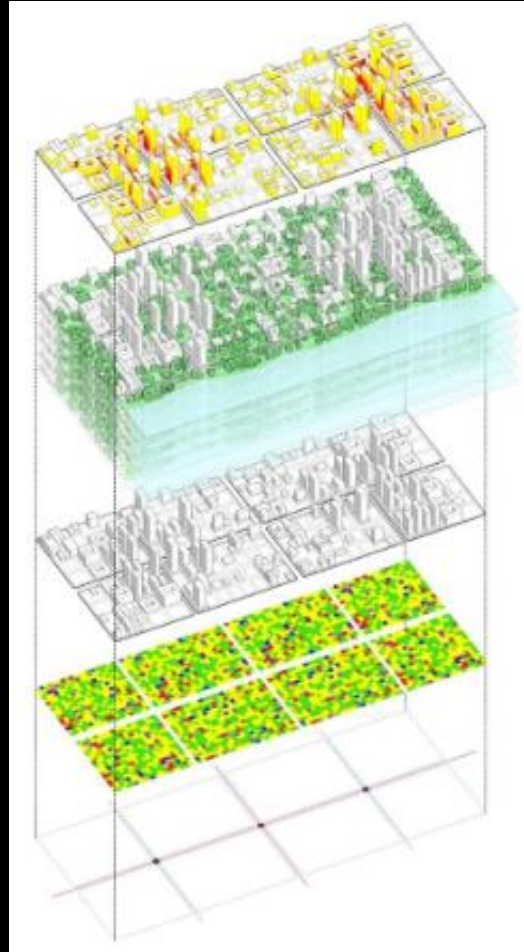
02 | Designing Real Time – Machine Learning in BIM



EVALUATE

DESIGN

DATA



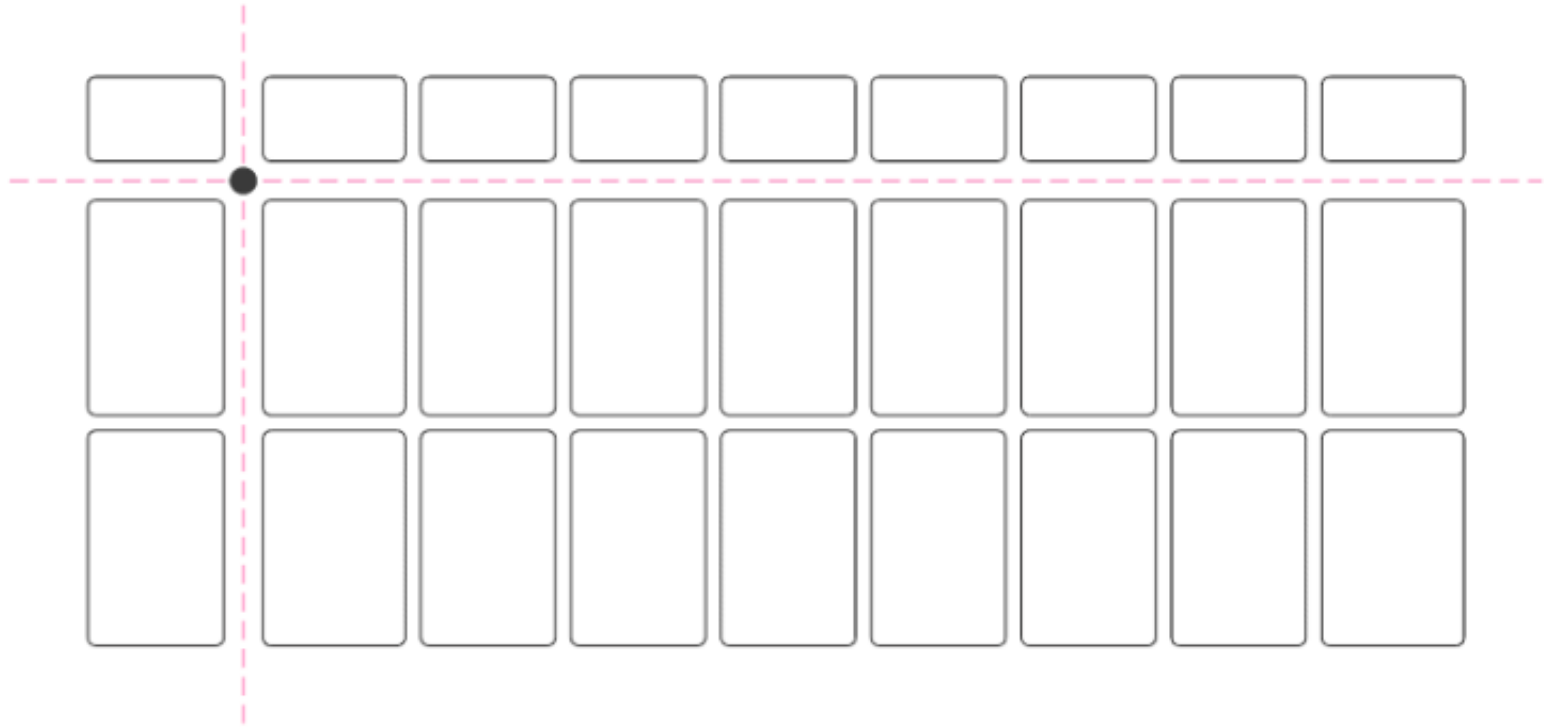
Analysis

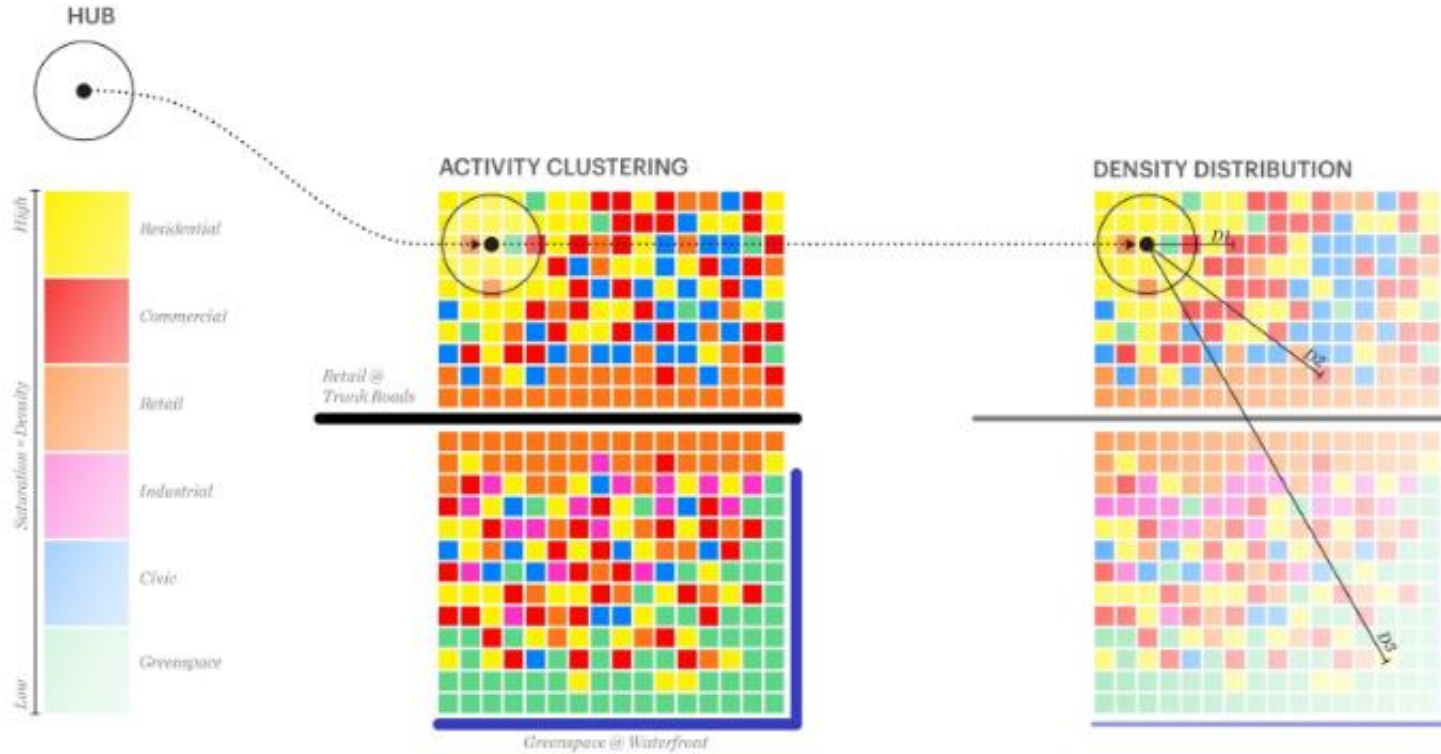
Iterations

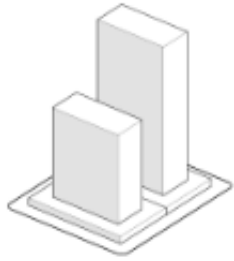
Procedural Rules

Activity Use

Streets







High Density

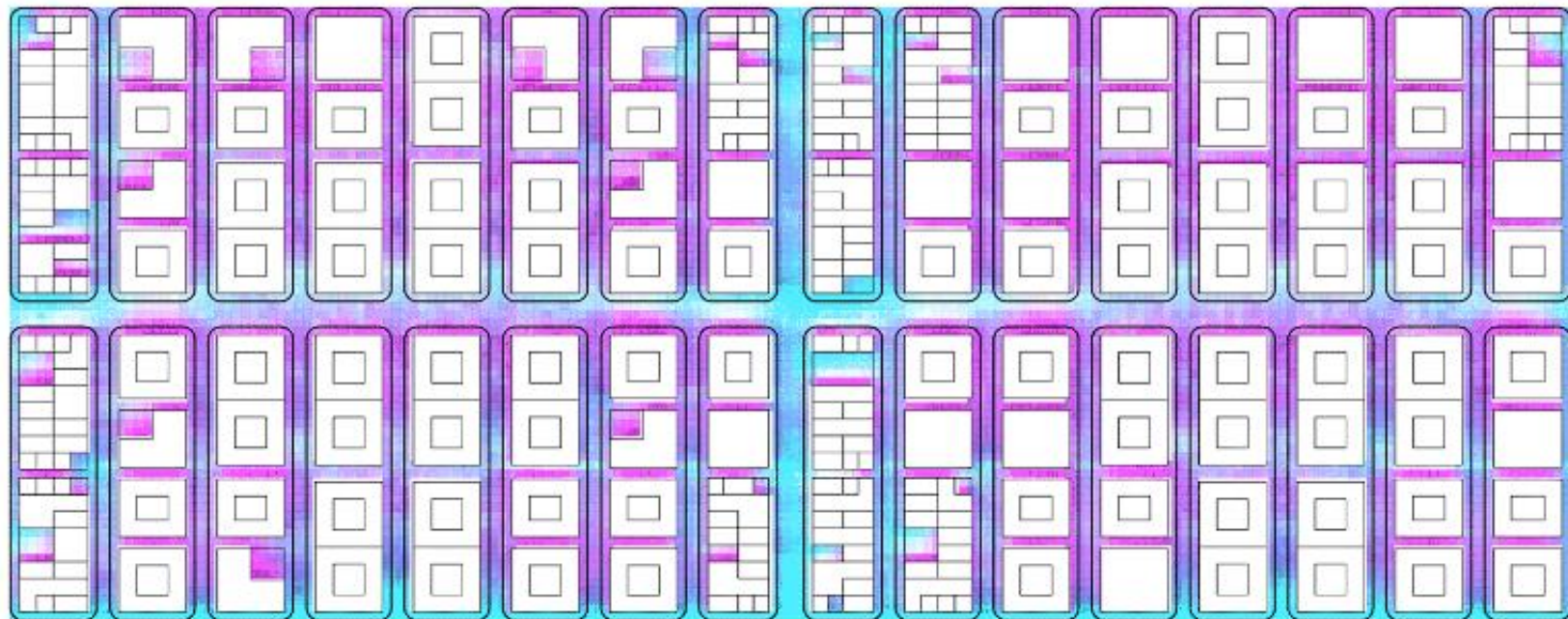


Mid Density

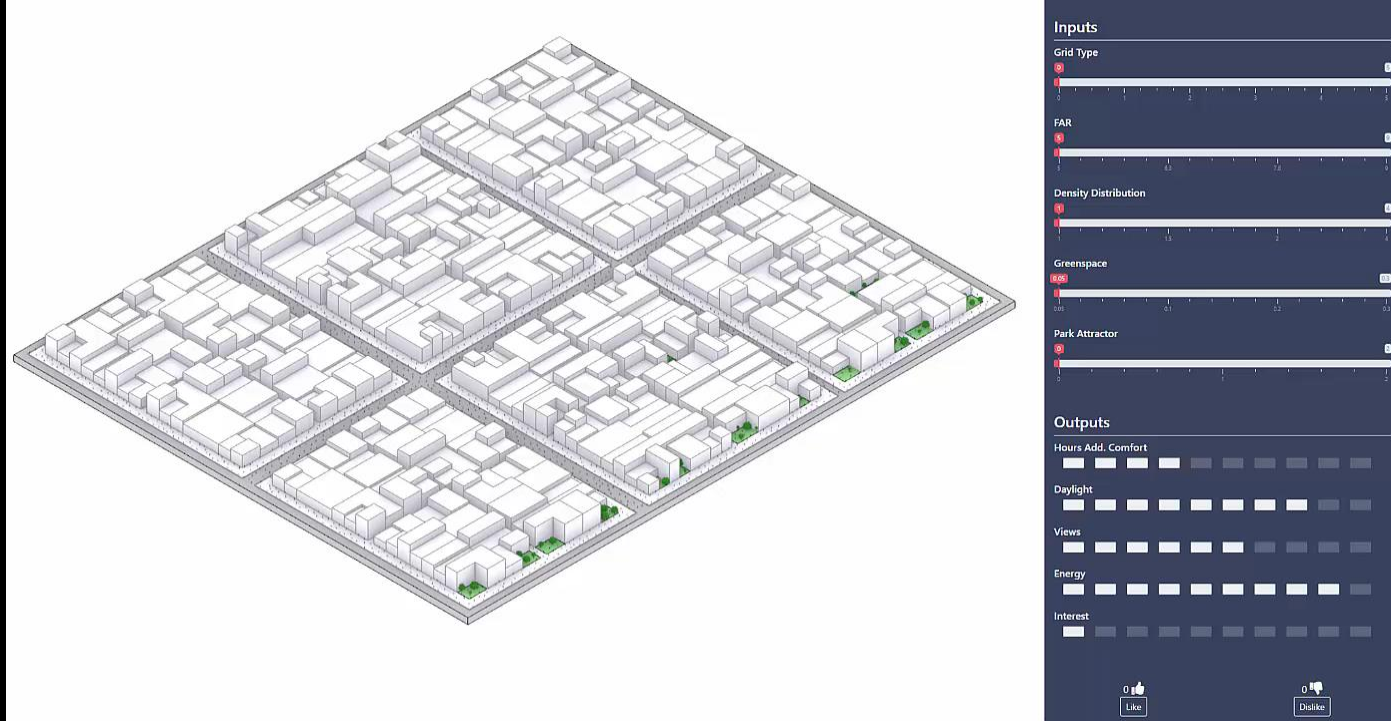


Low Density





Annual Comfort Improvement: -3.5%



PLANNING

DESIGN

ANALYSIS

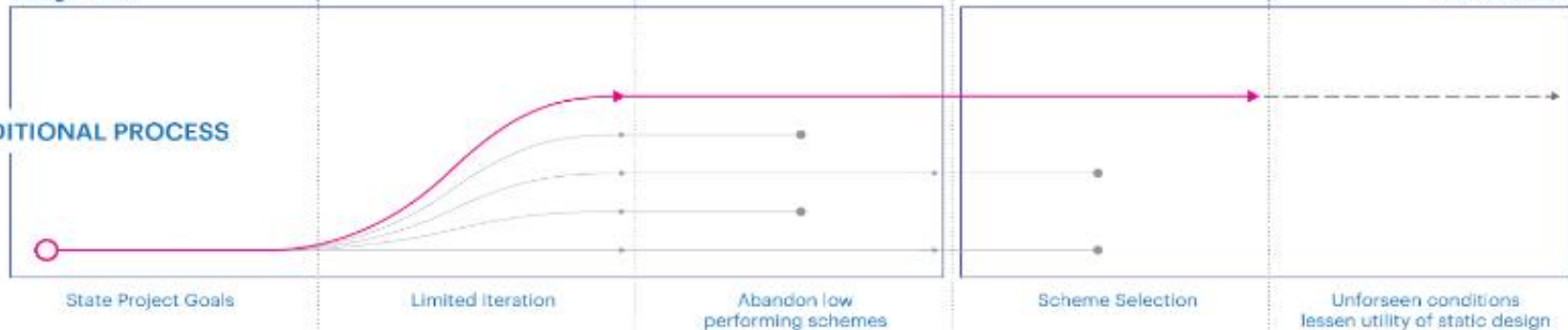
DELIVERY

EXECUTION

Design Team

Stakeholders

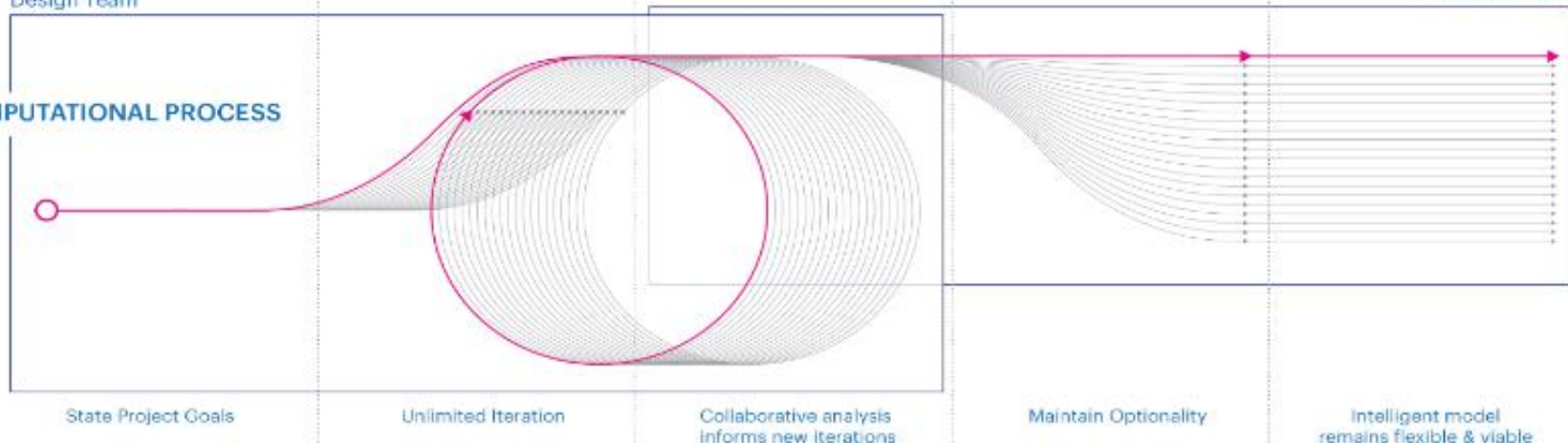
TRADITIONAL PROCESS



Design Team

Stakeholders

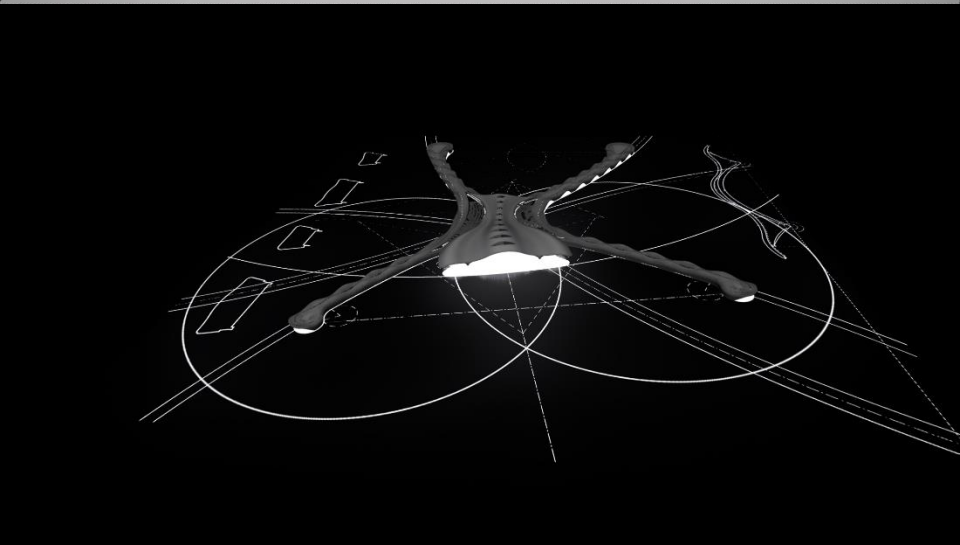
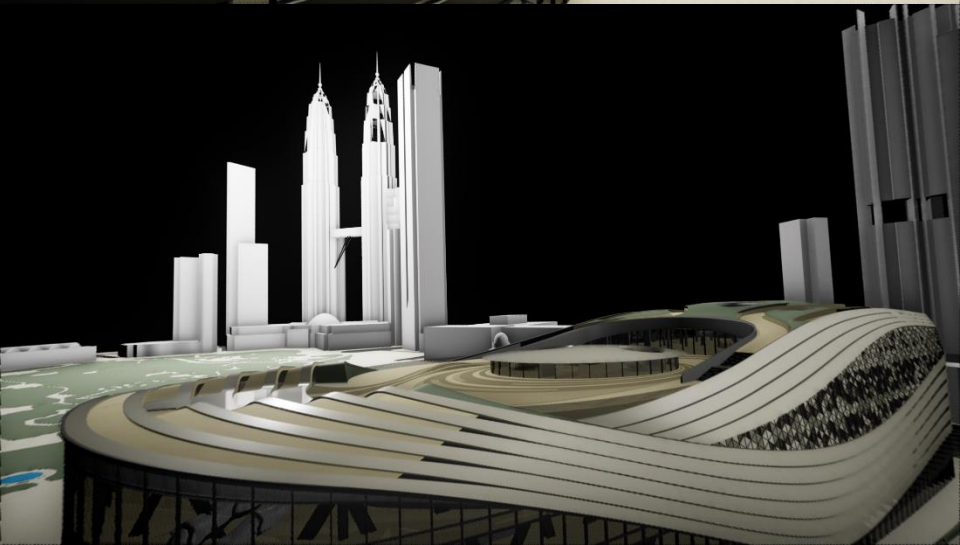
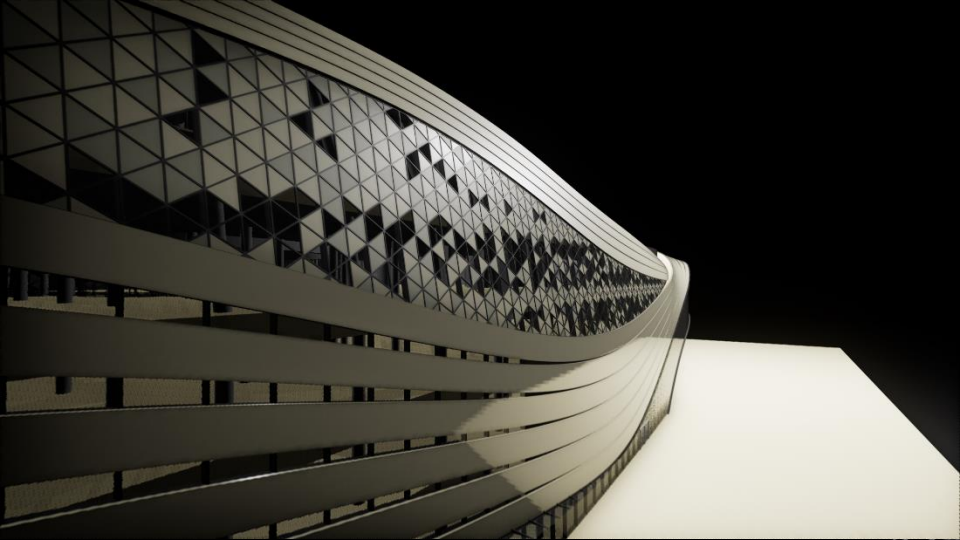
COMPUTATIONAL PROCESS

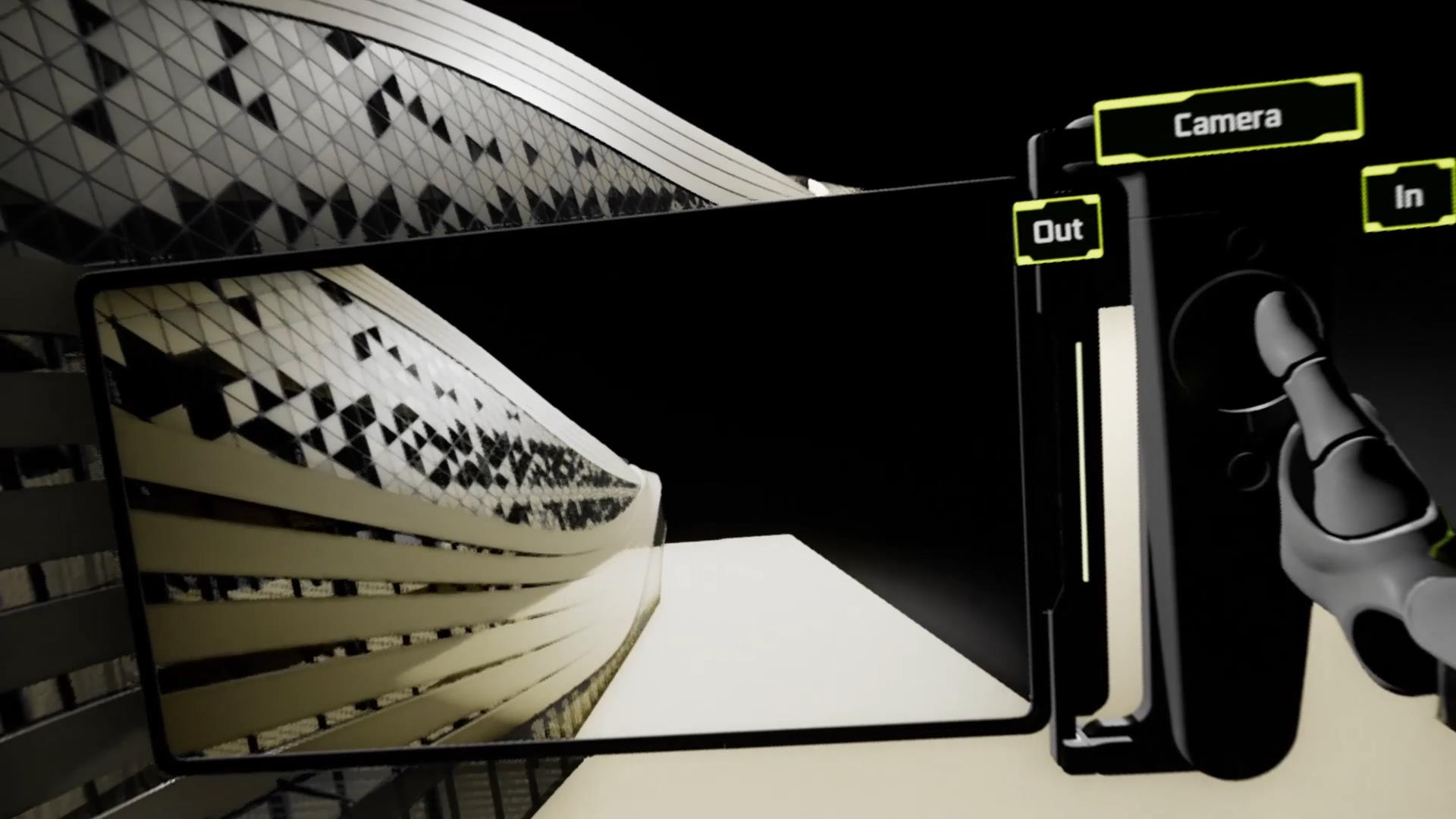


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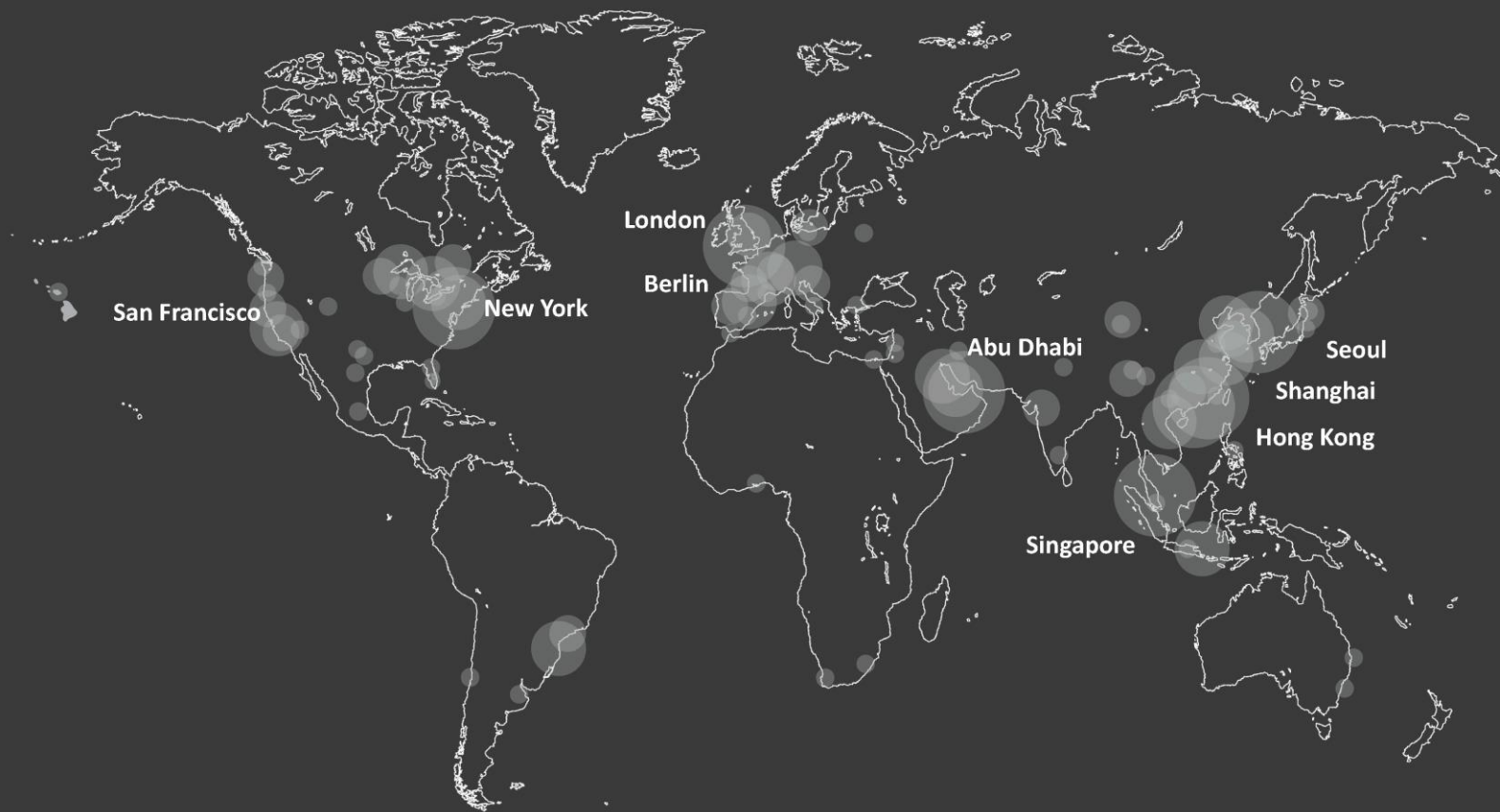








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Virtualise



Infrastructure



Real Time



Collaborative

Thank you