



# IoT in Action

#IoTinActionMS



# Smart Infrastructure Through Digital Twin

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**IoT** in Action



# Agenda

Intro José Antonio Ondiviela

Guest Speakers:

John Baekelmans, IMEC

Ton de Vries, Bentley Systems

Pim Spierenburg, Siemens



# AZURE DIGITAL TWINS



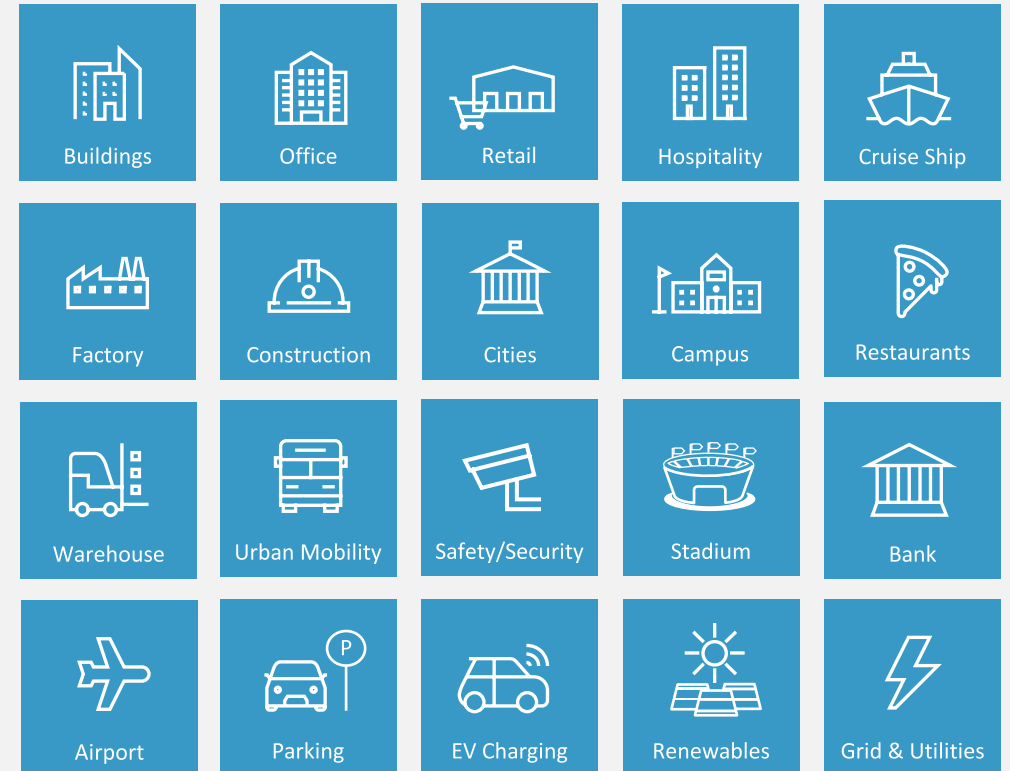
## Build next generation IoT solutions with Azure Digital Twins

Virtually represent the physical world with a digital twin that **models the relationships between people, places and devices.**

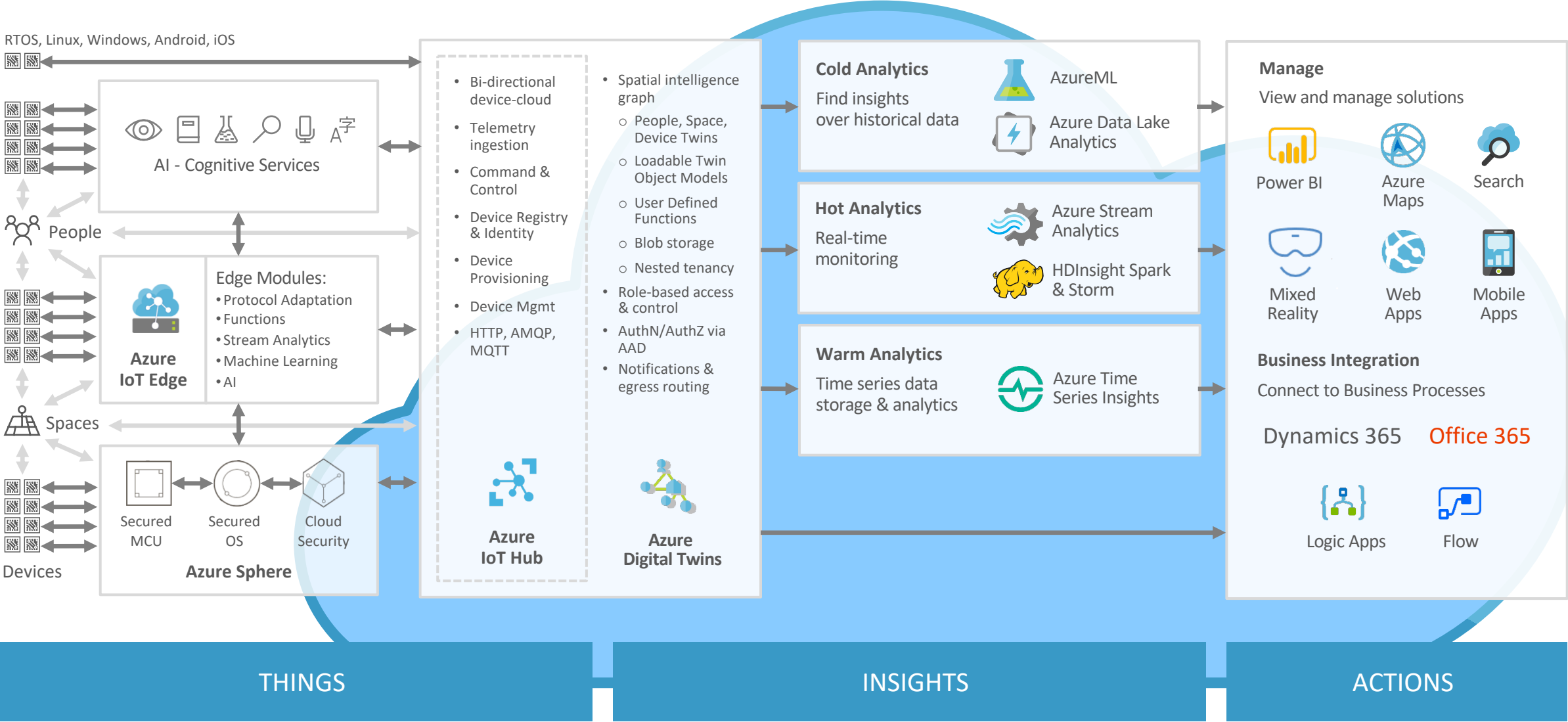
Leverage predefined and **extensible Twin Object Models** to build contextually-aware solutions uniquely attuned to your industry domain.

**Automate actions in a space with custom functions** that send events and /or notifications to endpoints based on incoming telemetry.

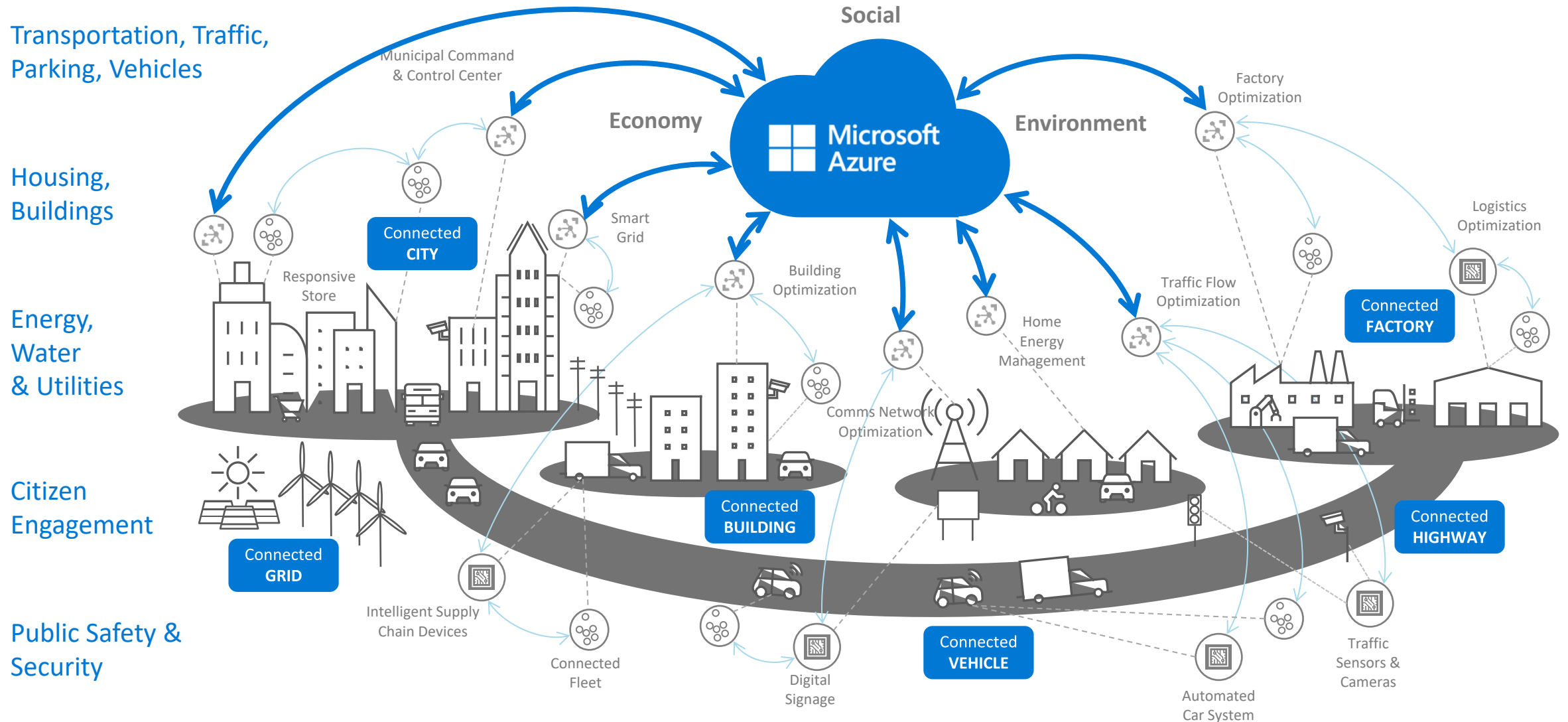
Securely replicate solutions across multiple tenants through **built-in multi- and nested-tenancy.**



# MODEL & INTERACT WITH THE REAL WORLD



# Azure City Digital Twin





- The Predictive Government -  
Simulation cockpit for authority decision makers

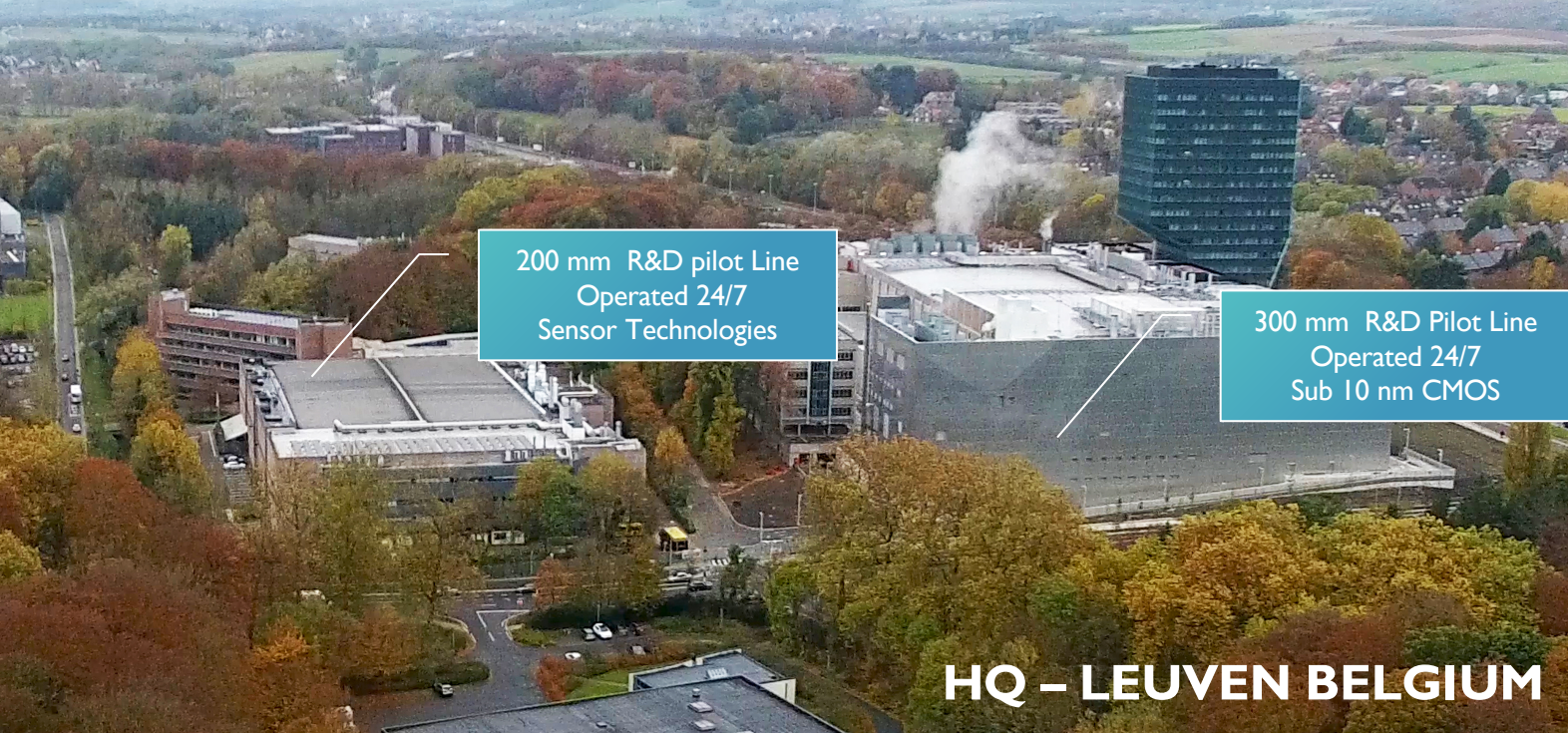


# Digital Twins powering the City of Things

John Baekelmans, VP imec

**IoT** in Action





# IMEC

- ▶ World-leading R&D in **nano-electronics & digital technology**
- ▶ **4000+** international R&D top talents
- ▶ Unique **€ 2.5B** leading-edge semiconductor fabs
- ▶ Delivering **industry relevant technology** solutions serving ICT, IOT, Healthcare and Energy markets serving 500+ companies
- ▶ **€ 600M** revenues: **70%** industry, **20%** regional gov't, **10 %** EU & regional programs
- ▶ Created **40 spin-off** companies and incubated **100+ start ups**
- ▶ **8** sites worldwide

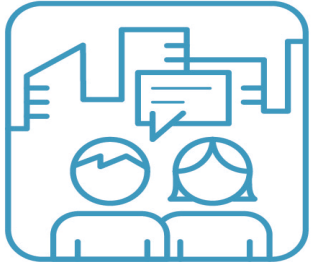


# Let's design a smarter city together.

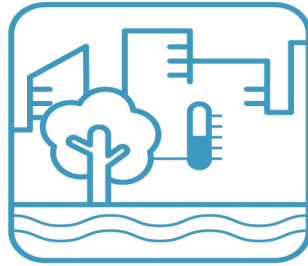


CITY  
OF  
THINGS

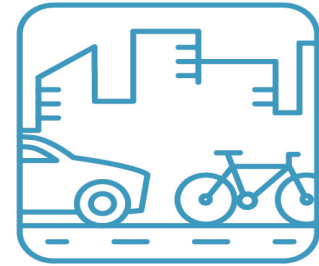
mec



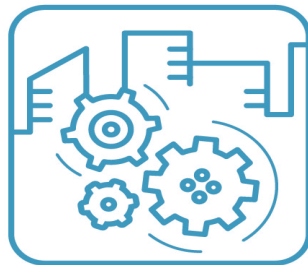
**PEOPLE**



**ENVIRONMENT**



**MOBILITY**



**SMART CITY  
ARCHITECTURE**

# Air quality imec approach



## Any City/ Government

### Needs

Reduce emission → Comply with the EU and WHO Levels

- Where is pollution coming from?
- Which intervention to prioritize?
- Where and when are the hotspots?
- How effective are my interventions?
- New cost-effective policies

## Any AQ Sensor

- Reference Stations
- Existing sensors (no vendor lock-in)
- **Citizen Science Sensors**
- **Mobile Sensors**



## IMEC Air Quality stack

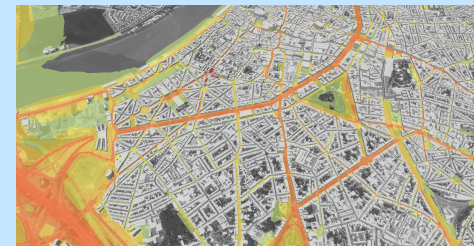
### Data Quality

- Calibration Algorithms
- Quality Label

### Analytics

- Prediction
- Hotspot detection
- Historical Analytics and trend analysis

### Accurate fine-grained real-time map

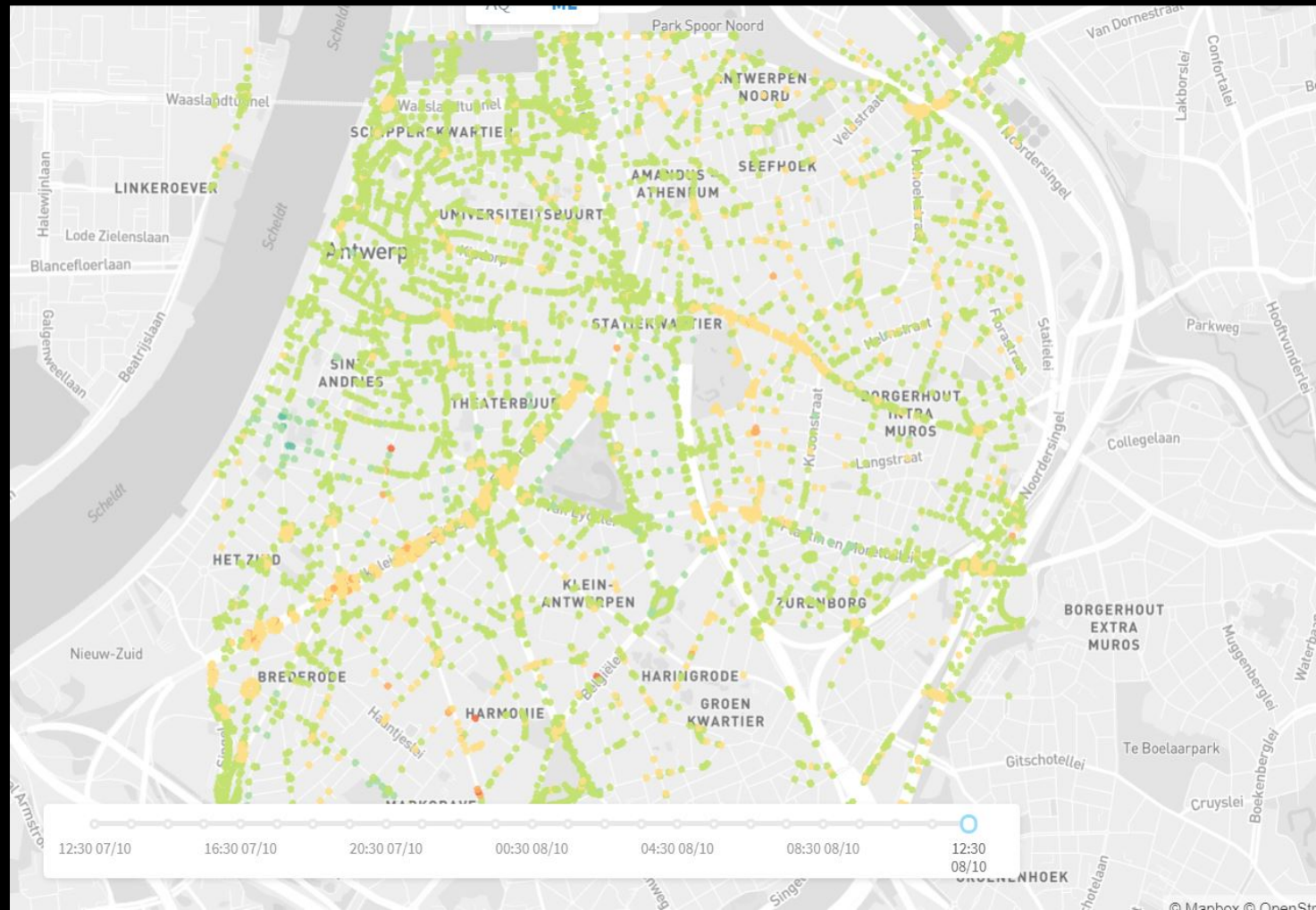


INSIGHTS



# imec AI hyperlocal interpolation program

FROM FEW MOBILE/FIXED SENSORS  
→ TO FULL MAP

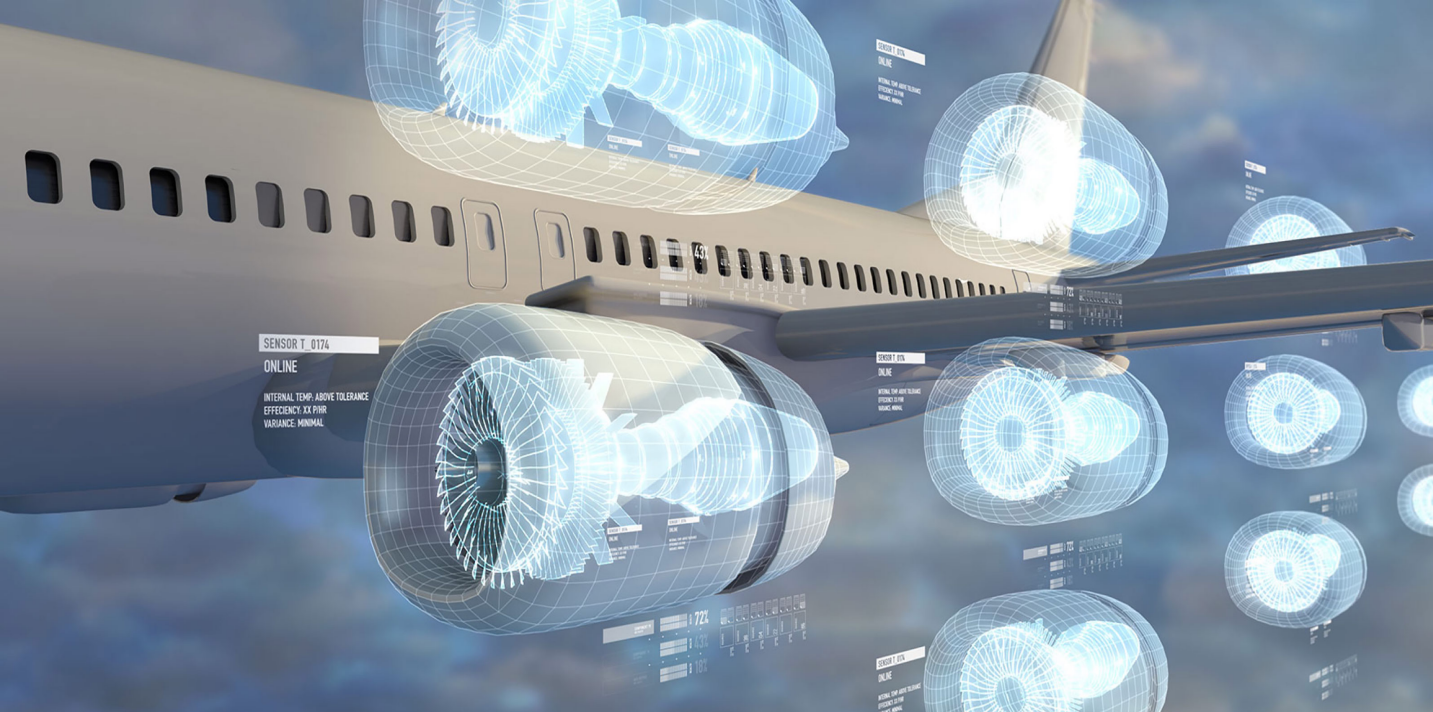


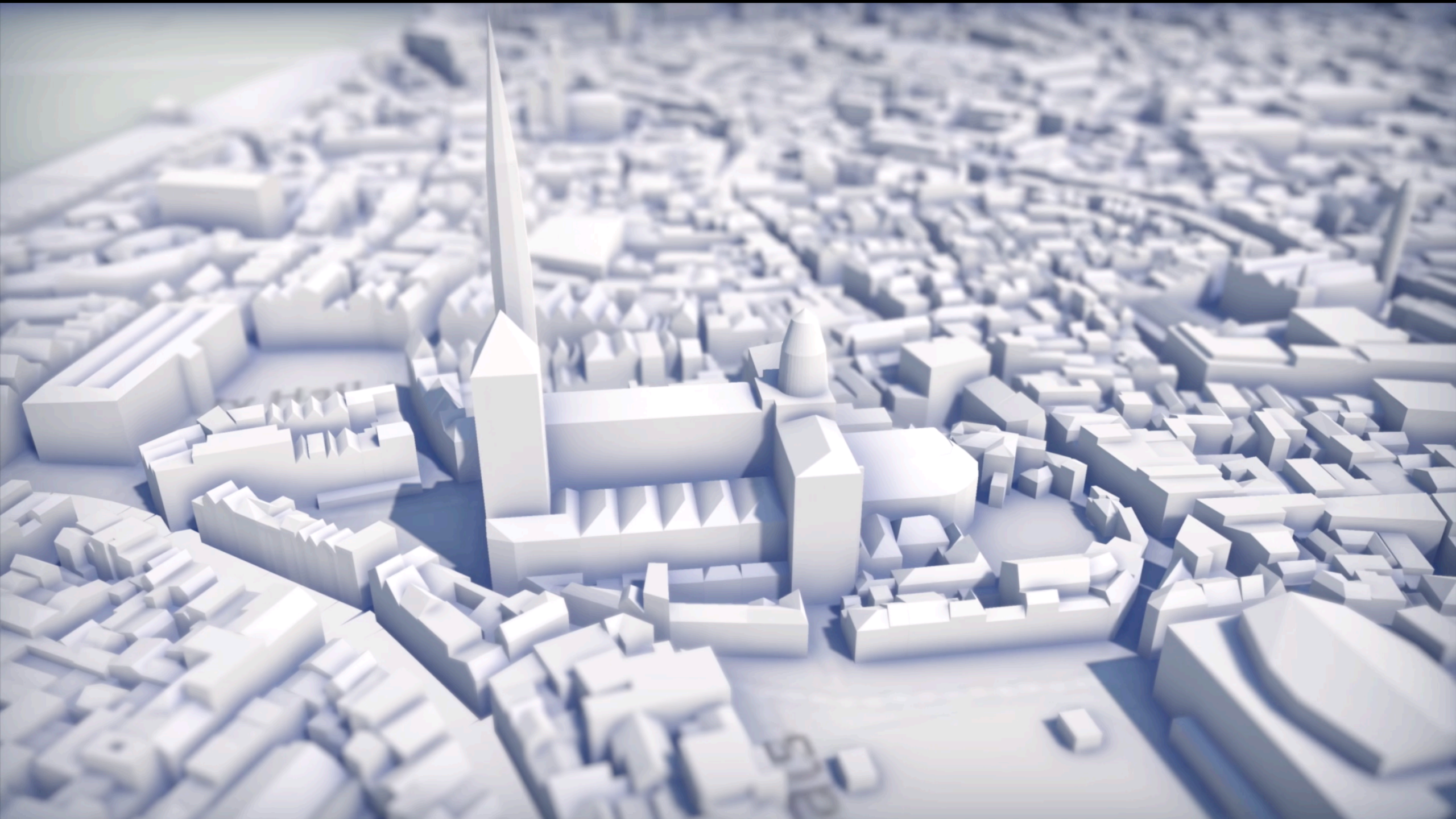
# Predicting and avoiding floods.



CITY  
OF  
THINGS

imec









Thank you



# Smart Infrastructure Through Digital Twin

**Ton De Vries**

Senior Director of Digital Cities,  
Bentley Systems

[ton.devries@bentley.com](mailto:ton.devries@bentley.com)

**IoT** in Action



# What is a Digital Twin

An iTwin enables you to visualize the asset, track change, and perform analysis to better understand and optimize asset performance.



## Engineering

- Specs
- Drawings
- Documents
- Models
- Analyses
- Geotech
- OEM specs

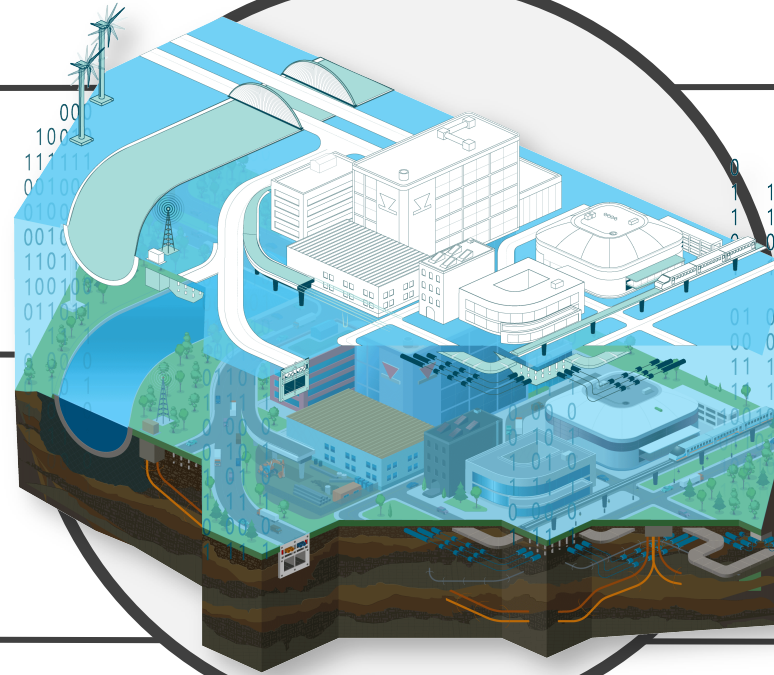
## Operations

- IoT feeds
- Sensors
- Drones
- Cameras
- LiDAR
- Point clouds

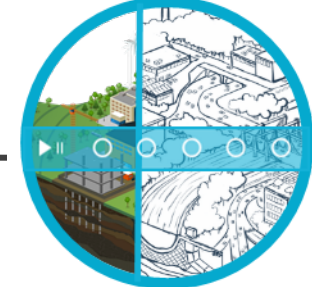
## Information

- Asset tags
- Work orders
- Maintenance records
- Inspection records

# Digital Twin



**3D/XR**  
Immersive  
Visualization



**4D**  
Timeline of  
Change



**AI/ML**  
Analytics  
Visibility

iTwins are continuously updated with data from the physical asset. This data is used to understand and model the asset's performance.

# FEDERATED, OPEN



Operations/IoT  
Data



Engineering  
Data



Surveying and  
Mapping Data



3rd Party  
Infrastructure Data



3rd Party  
Developer Data



Emergency  
Services Data

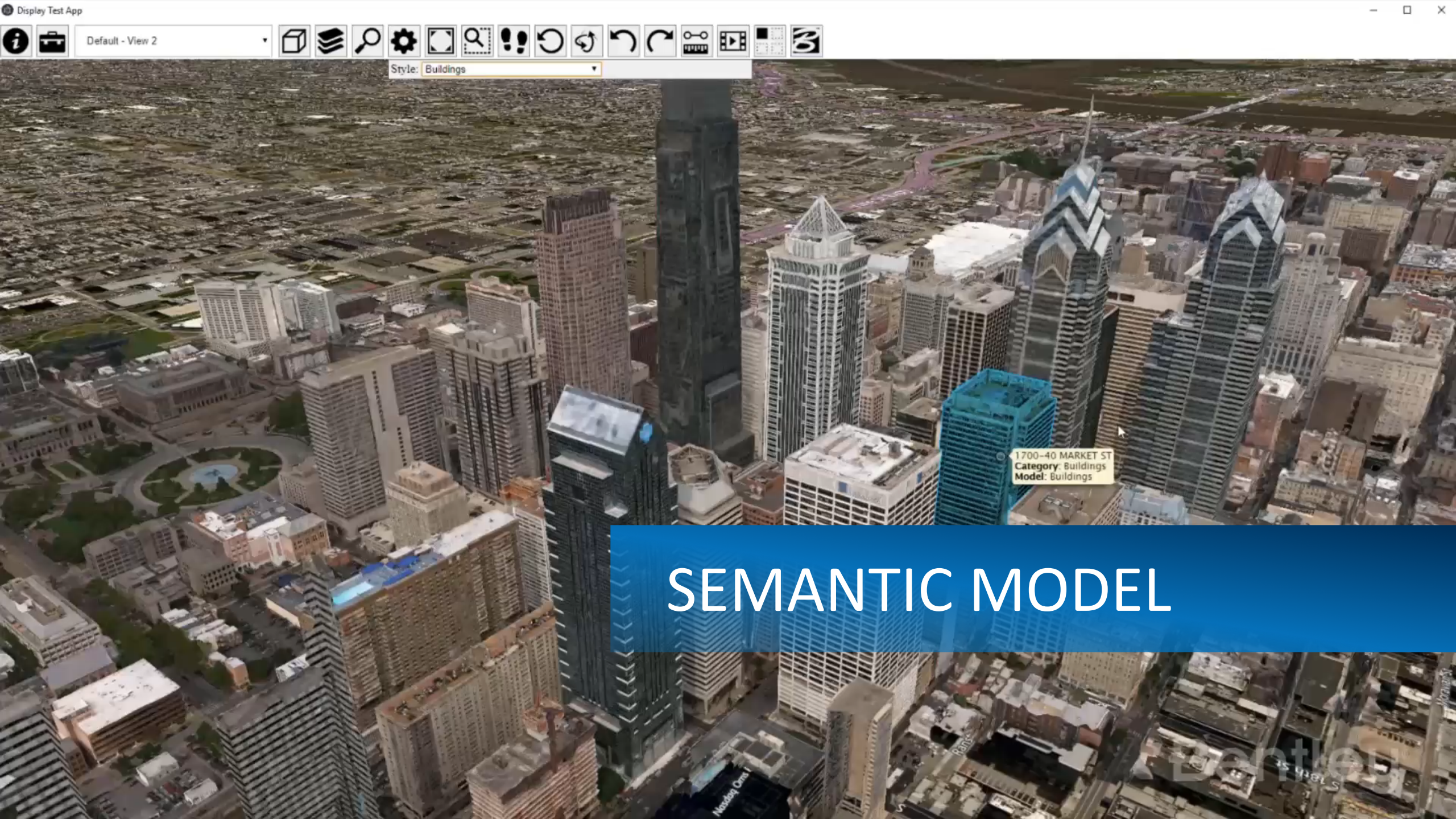


Other  
Data



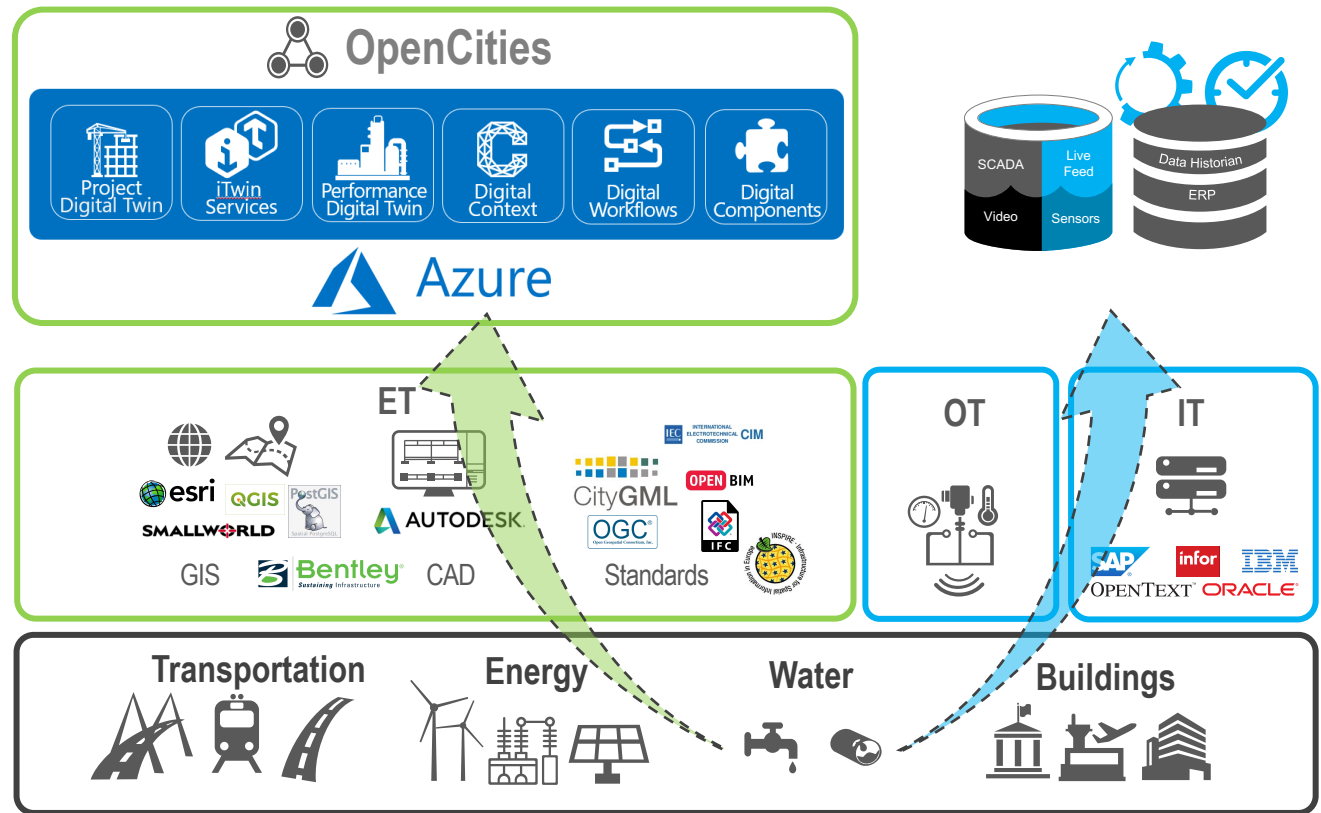


ABOVE & BELOW GROUND



# SEMANTIC MODEL

1700-40 MARKET ST  
Category: Buildings  
Model: Buildings



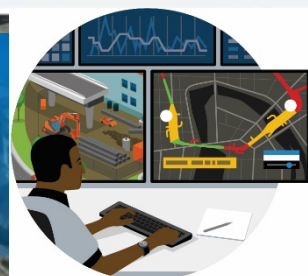
Göteborgs Stad  
Stadsbyggnadskontoret

STATION CENTRALEN



Centralstationen

Vid Centralstationens norra del planeras för en ny station för Västlänken. Detta område är också en självklar punkt för stadsutveckling. Stadsutvecklingen bygger på att platsen är en regional knutpunkt med goda förutsättningar för handel, kontor, mötesplatser för kultur samt torg och mindre parker. Inom cirka tio minuters gångavstånd från de tänkta stationsuppgångarna vid Station Centralen bor det idag ungefär 3 500 människor – men framför allt har runt 45 000 sin dagliga sysselsättning i området. En stor del av omgivningarna berörs också av Göteborgs Stads vision Älvstaden, där områden längs älvstranden bebyggs för att knyta ihop staden över vattnet. Det är trångt på Göteborg Central. Både för människor och tåg. Med den nya stationen skapas utrymme för fler tågpendlare vilket ger mindre biltrafik och bidrar till minskad klimatpåverkan. Fler kommer att kunna pendla snabbare, enklare och med färre byten när tågen kan passera vidare genom staden. Den nya stationen, med sina två plattformar och fyra spår, byggs strax norr om nuvarande Göteborg Central. Tack



# PLANNING & VISUALIZATION

- STARTVIEW
- STATION CENTRALEN
- STATION HAGA
- STATION KORSVAGEN
- VÄSTLÄNKEN UPPIFRÅN
- INFORMATIONSPUNKT
- ILLUSTRATION 2014

## VÄSTLÄNKEN, GOTHENBURG

8 km / 5M tunnel under central city areas

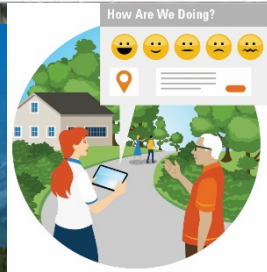


PROJEKT  
INFO



PROJECT  
CONTENT

# STAKEHOLDER ENGAGEMENT



KOM MED SYNPUNKTER OM DETTA PROJEKT



ÖVRIGT

BOSTAD

NATUR & PARK

SERVICE

GATA & TRAFIK

AKTIVITET

FAVORITPLATS

OTRYGG PLATS



ANGE POSITION



RITA LINJER



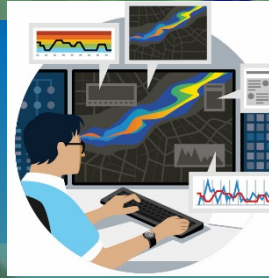
RITA YTOR



BESKRIV DINA SYNPUNKTER HÄR



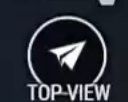
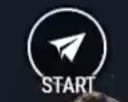
## URBAN VISION, NORRKÖPING

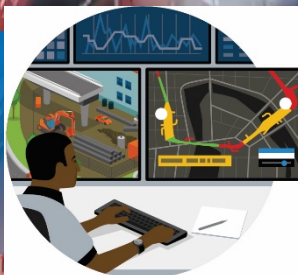


# INFRASTRUCTURE RESILIENCE



# SIMULATION & MOBILITY





## SIMULATION & MOBILITY

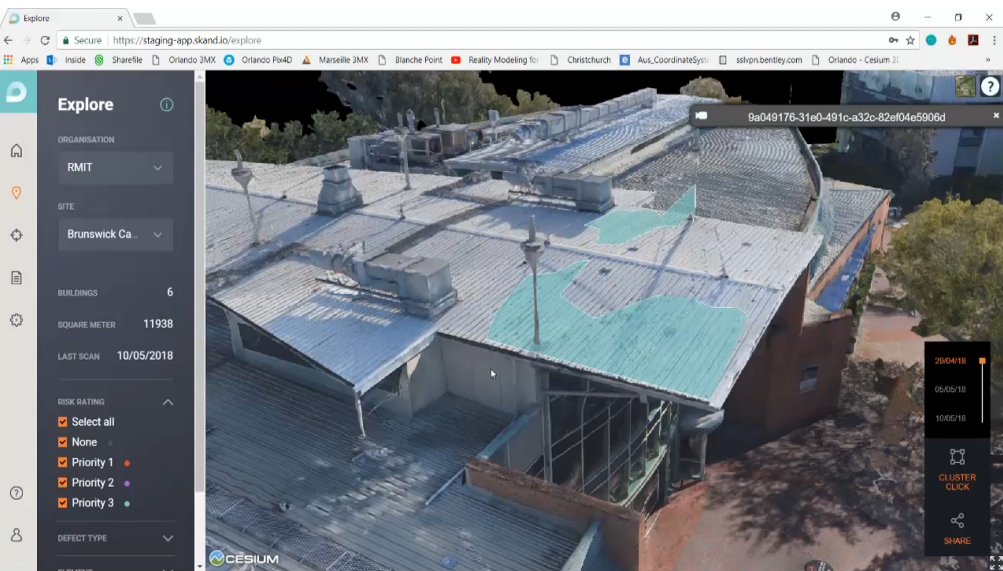
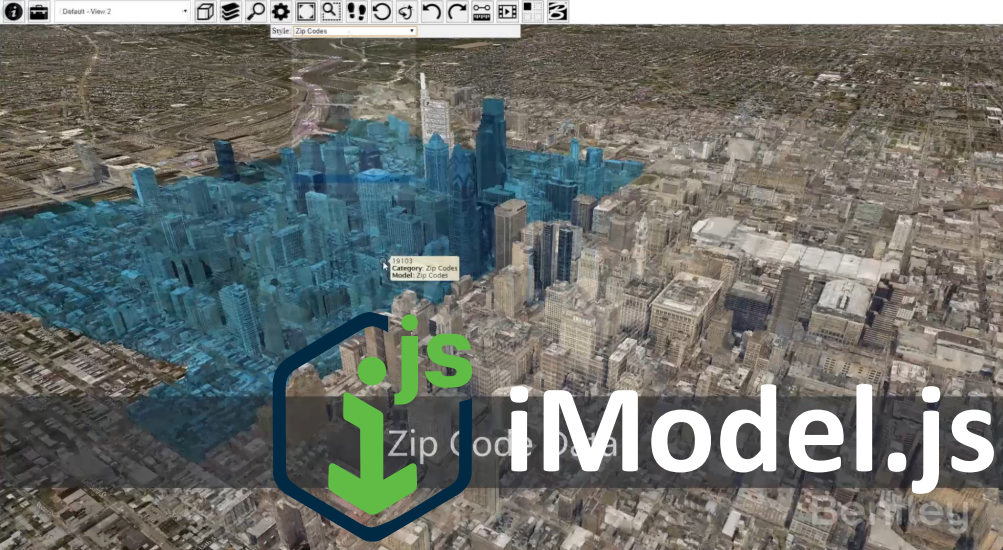
Occupancy: 2  
Home: Brooklyn Heights

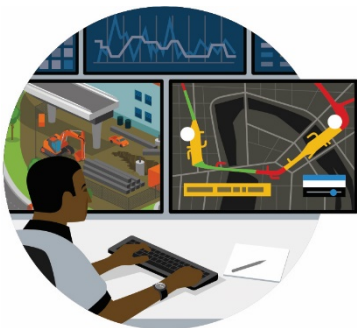
### BILLBOARD VIEWS

Total Views:  
Unique Viewers:  
Home: Residents Visitors

Pedestrians Per Hour  
3178

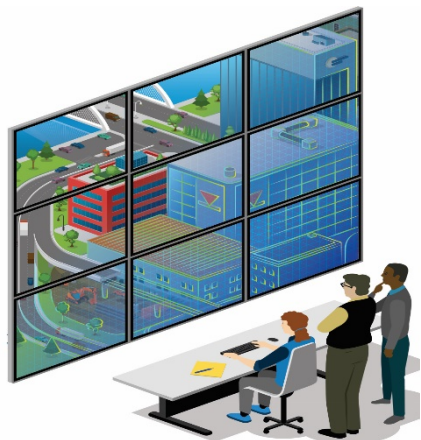
Pedestrians Per Hour  
2521





## Model, analyze and simulate to improve performance & predict outcomes

- Planning and visualization
- Stakeholder engagement
- Infrastructure resilience



Create and visualize digital twin at city-scale



Support smart city initiatives with digital city operations



# Smart Infrastructure Through Digital Twin

**Jan Schoenig**

Director,  
Digital Cities & Infrastructure  
Siemens AG  
IoT SOL

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# MindSphere City Graph

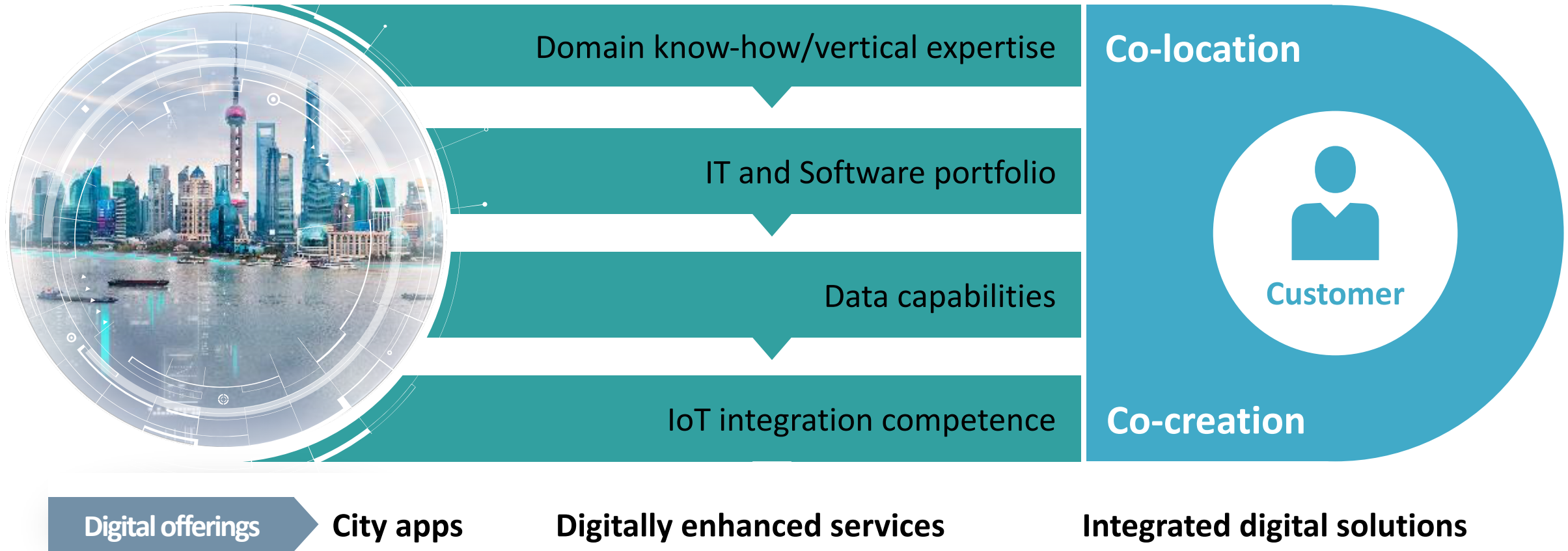
# Market view IoT Platform for Cities

Extract of current discussion with city stakeholders

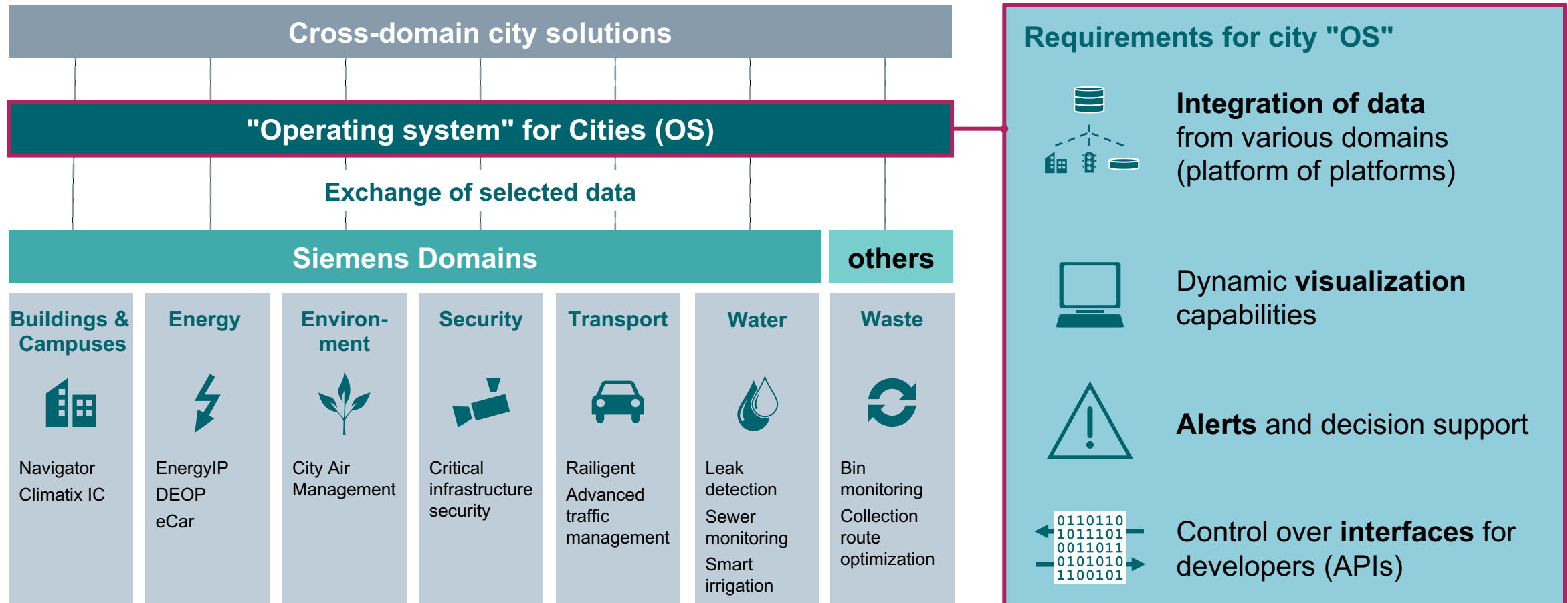
- **Human-centric approach**, smart city is not all about technology. The citizens are in the center of attention.
- Cities are broken down to **communities, districts or campuses** – but we see also a trend in **integration of multiple smaller cities, communities**.
- Instant **interoperability** among devices and platforms as the IoT connects more diverse technologies to ever growing network fabrics. Single use cases had been realized already.
- **Convergence** of IT and OT solutions to IOT
- **Multi-Platform approach**, user driven, not „one-size fits all“, a lot Start-Ups
- Discussion on-premise versus **cloud** respectively hybrid solution
- **Monetizing** of data
- Potential of **neuronal networks** are discovered in city context
- Open systems request, no „**vendor lock-in**“
- **Shortage on experts**



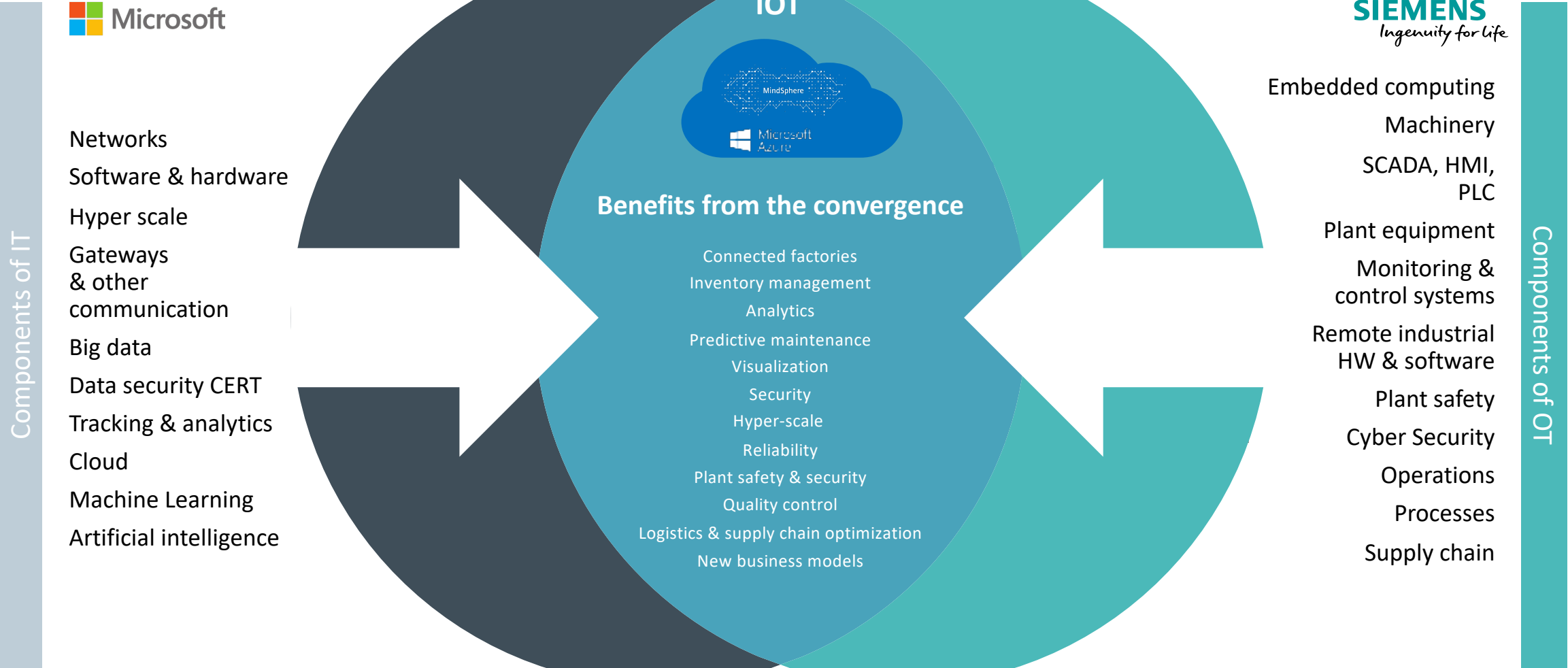
# How to turn data into value?



# Demand for a domain-overarching city "operating system" is emerging



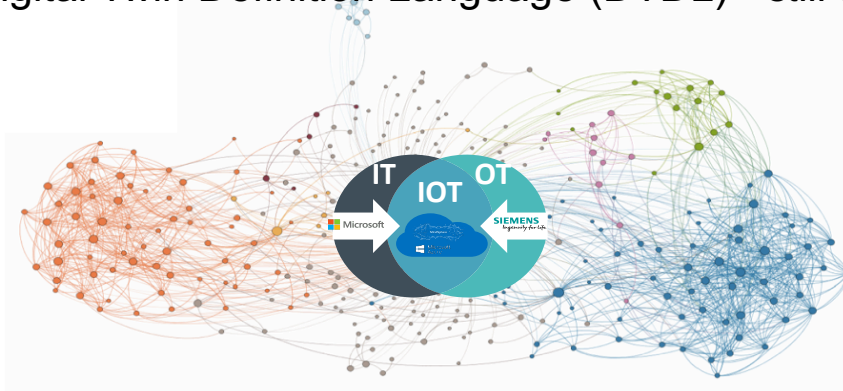
# Collaboration with Microsoft



# Microsoft and Siemens

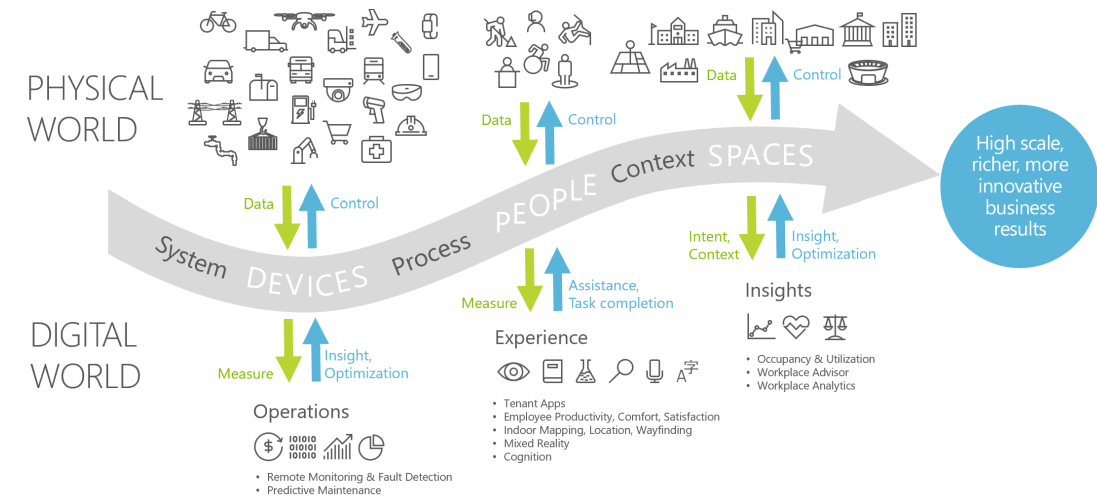
## Joint offering for Cities and Smart Districts

Traditional IoT systems have a device centric view, connecting an IoT device is not enough. Graphs model a business view and have context. The data will be modeled in the City Graph, which will be based on the new Microsoft Azure IoT Digital Twin Definition Language (DTDL) - *still to be released*.



**SIEMENS**  
*Ingenuity for life*

## FUSING PHYSICAL AND DIGITAL



## MindSphere City Graph

Collaboration between Microsoft and Siemens to target the needs of cross vertical data integration and analysis within cities, communities, districts or campuses. An Open Urban Platform based on MindSphere hosted on Microsoft Azure enabling a digital model of a city. It is planned to integrate legacy systems and optimizing smart city operations step-by-step through IoT and advanced analytics.



Microsoft

**SIEMENS**

*Ingenuity for life*

**Collaboration is Key**



