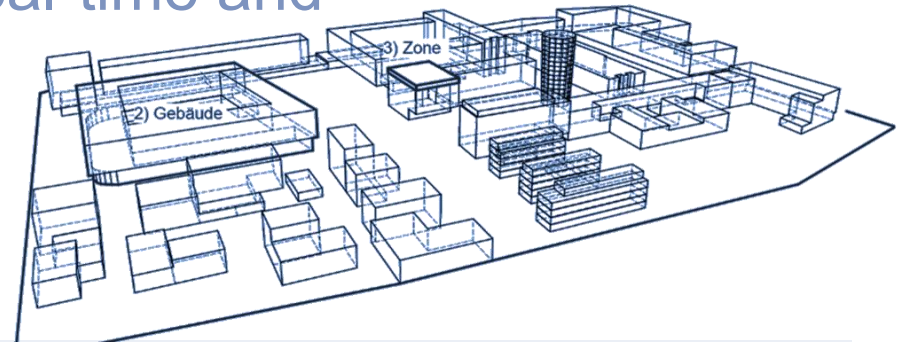


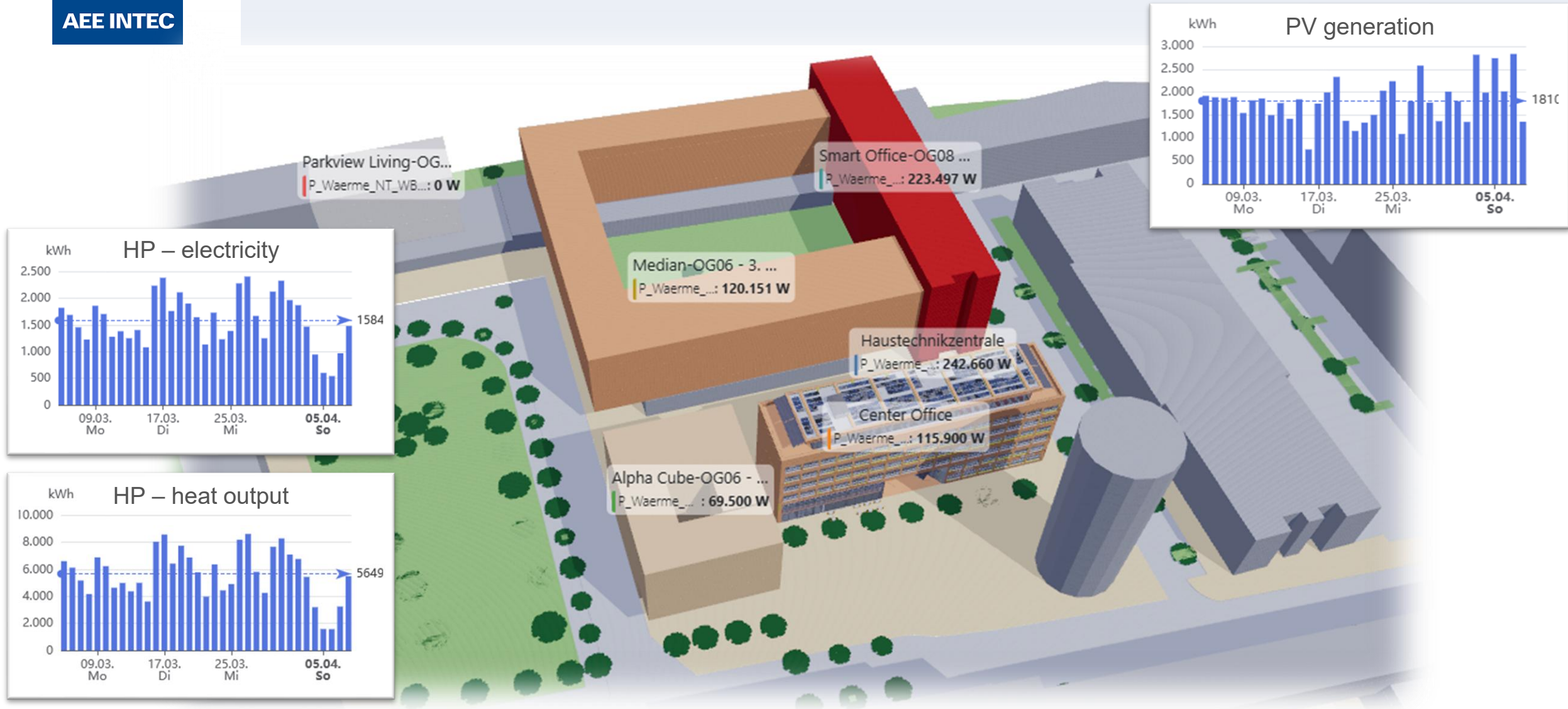
# Towards A Smart City Digital Twin

BIM based 3D visualization of real-time and aggregated district data



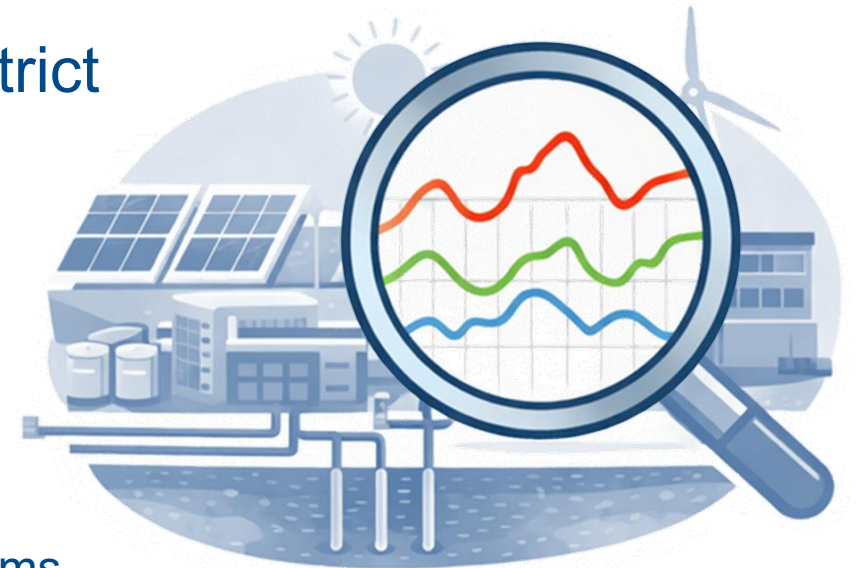
Andreas Riffnaller-Schiefer, Tobias Weiss

# BIM based Digital Twin



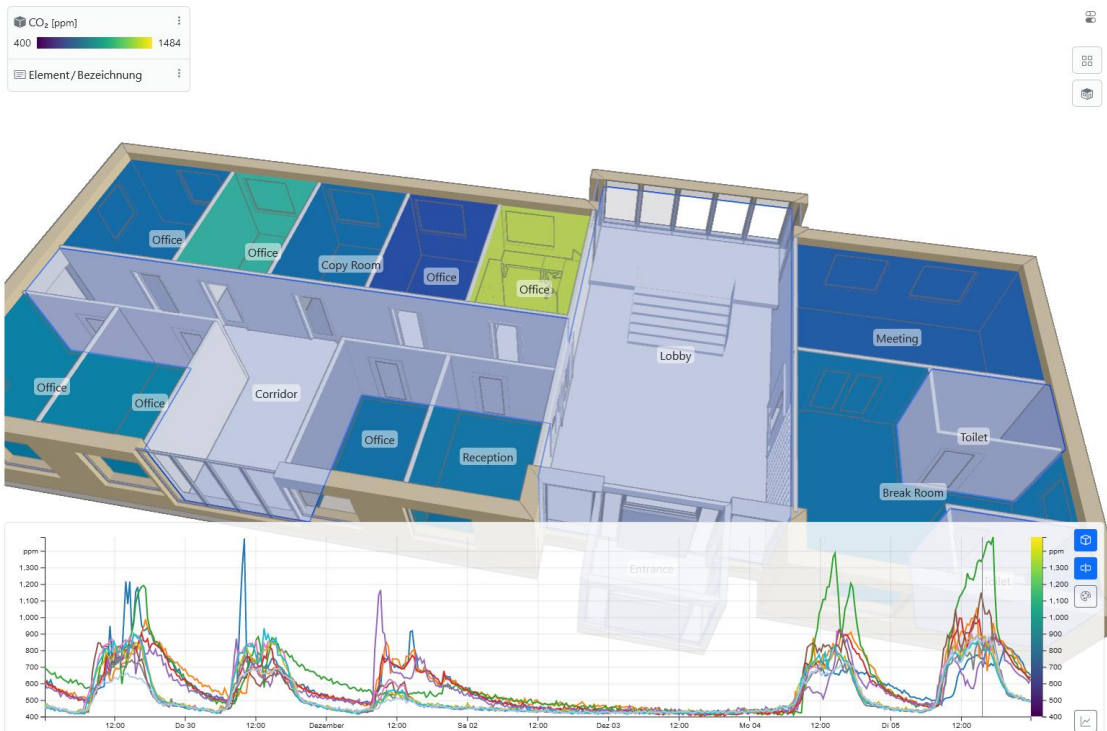
# Modern urban districts / neighborhoods

- Shared interconnected energy infrastructure
  - Geothermal wells, heat pumps, district heating/cooling network, photovoltaics, EV charging infrastructure, ...
- Efficient operation requires insight into complete district energy usage
- **But required data is difficult to access, performance often not evaluated**
  - Multiple building owners and operators
  - Data requirements from various scattered sources
    - e.g. heat pumps, PV, smart meter, building heating/cooling systems, ...
  - No single entity has all required data

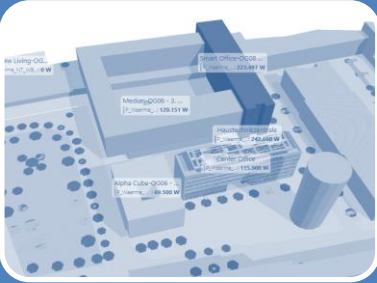


# Why BIM based?

- Reuse of already existing planning data for operational phase
  - Individual buildings are already planned with 3D BIM models
- Localized visualization of measurements
  - Assigned to buildings, zones or even individual components
- Visual recognition of spatial relationships in measurements
- Relevant additional information is readily available



# Main Challenges



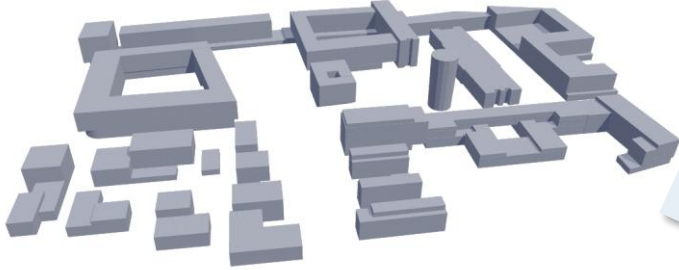
Creating a unified 3D model of the district for the digital twin



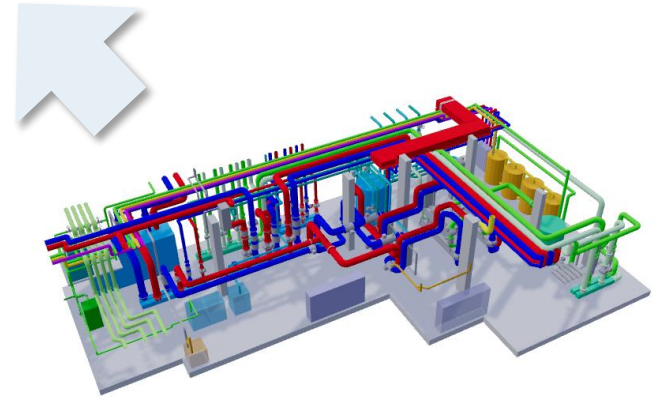
Acquiring and linking data from distributed sources

# Building a federated district-level digital twin

IFC – city planning



IFC – detailed building model

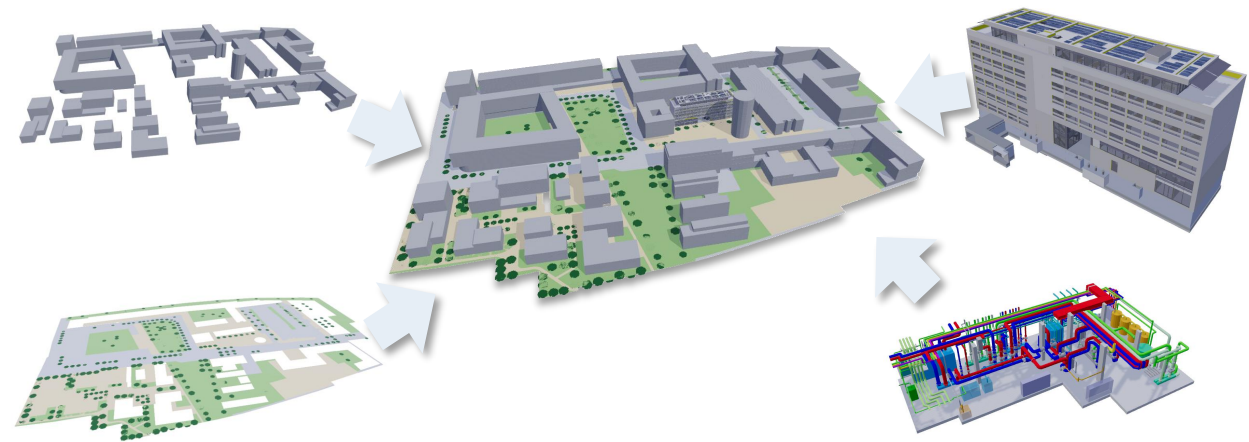


2D DWG / GIS – open areas, landscape planning  
(converted to IFC)

3D DWG – technical building services  
(converted to IFC)

# Advantages of a federated district-level digital twin

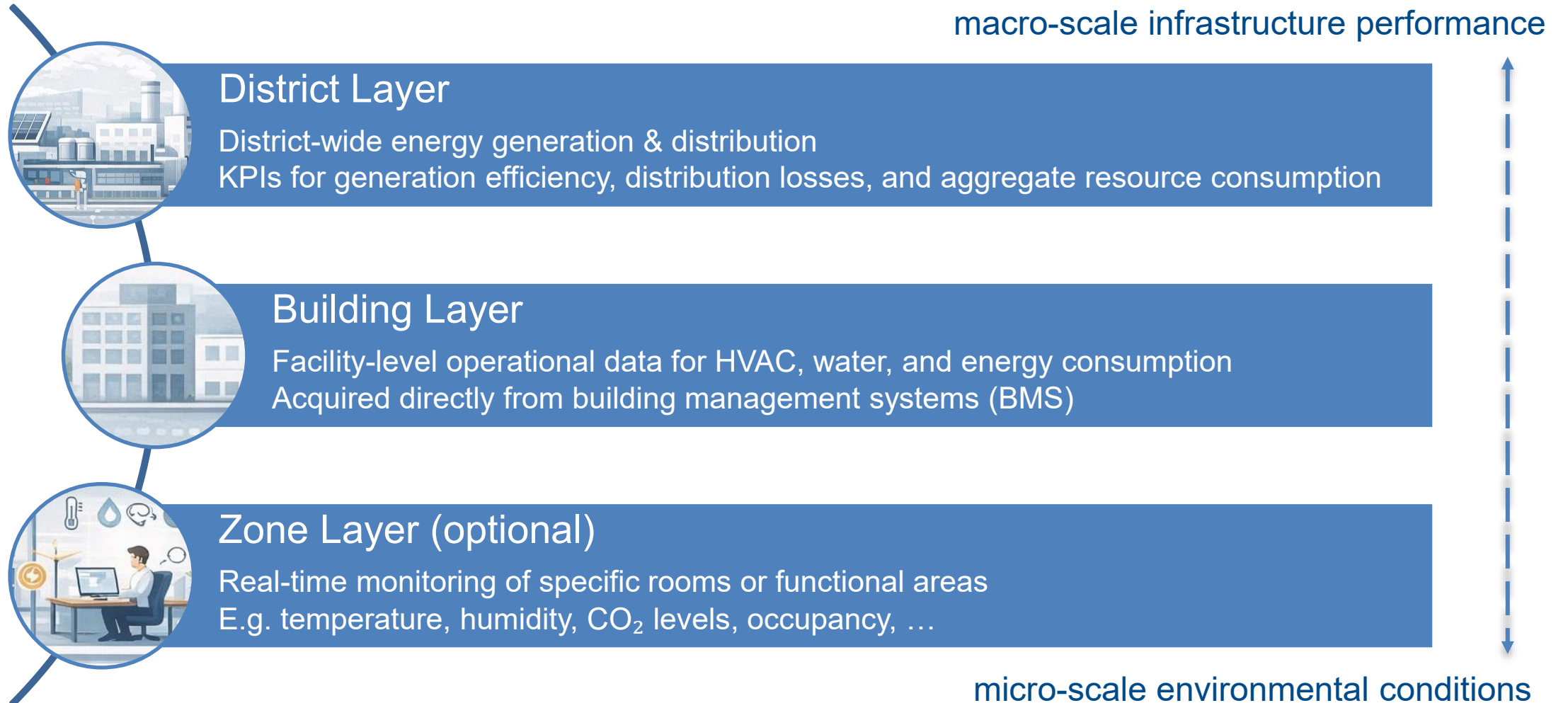
- No new models need to be created
  - Existing planning data is reused
- Federated model preserves autonomy of individual BIM datasets
  - Each model keeps all its data and can be updated individually
- All BIM attributes are readily available in the digital twin
  - Seamless queries across all district data
- Unified visualization and navigation



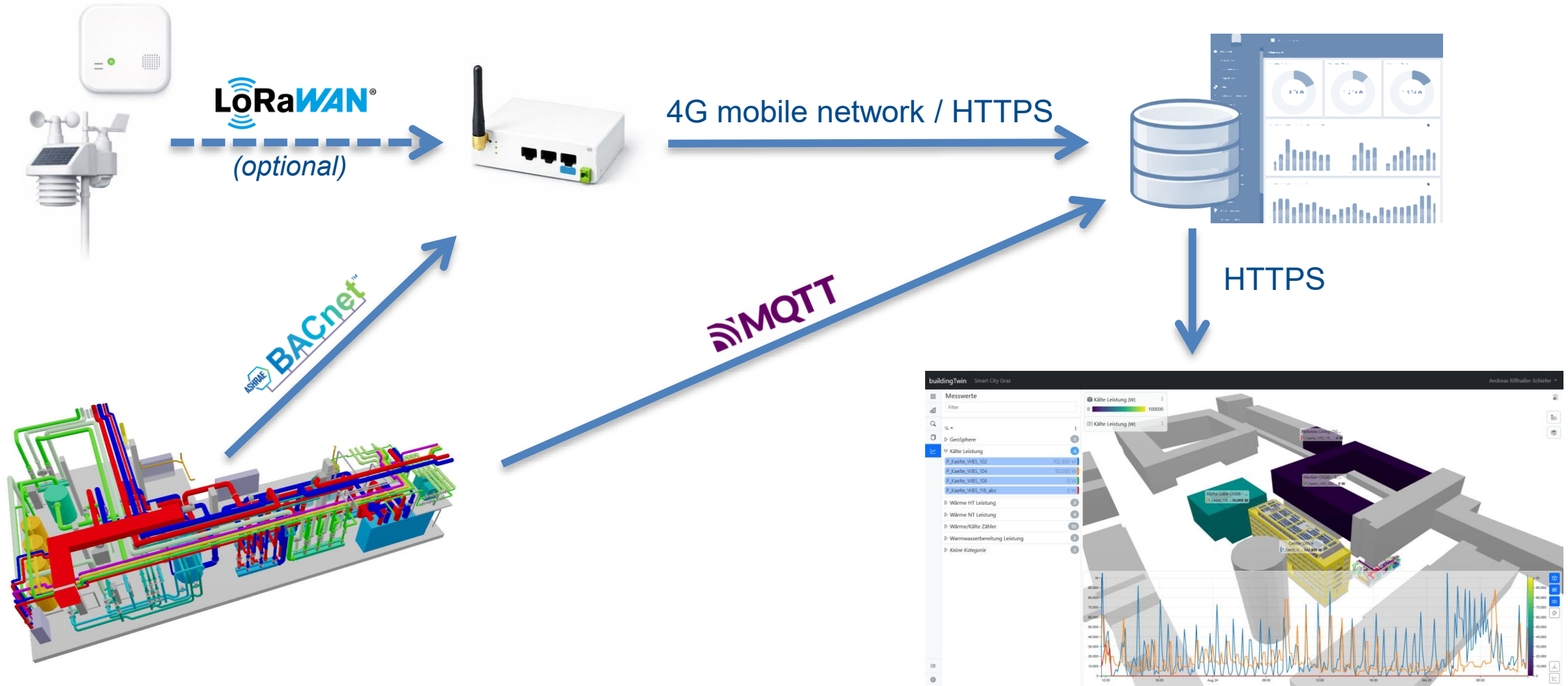
# Unified BIM data visualization across models



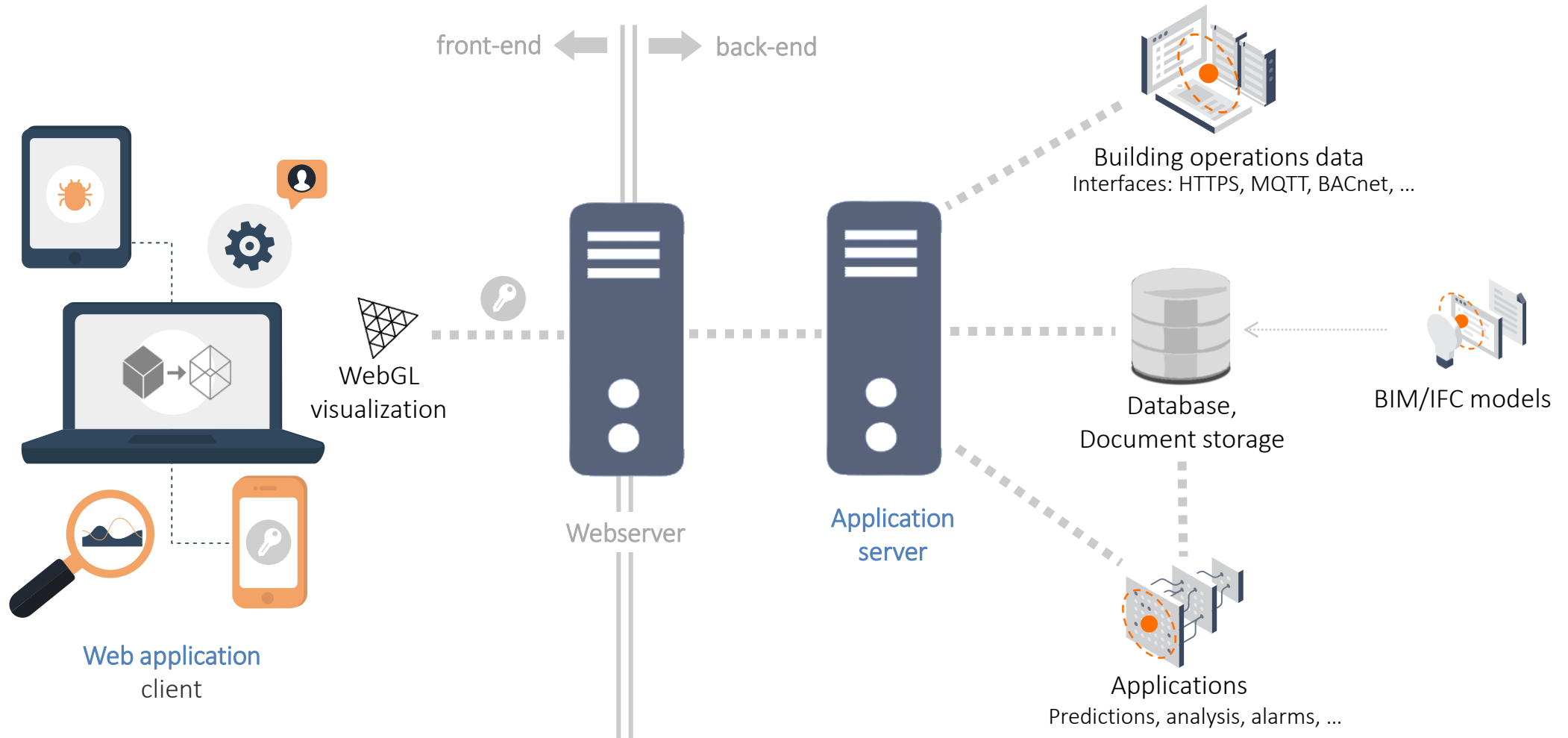
# Three-layer district data monitoring



# Collecting distributed district data



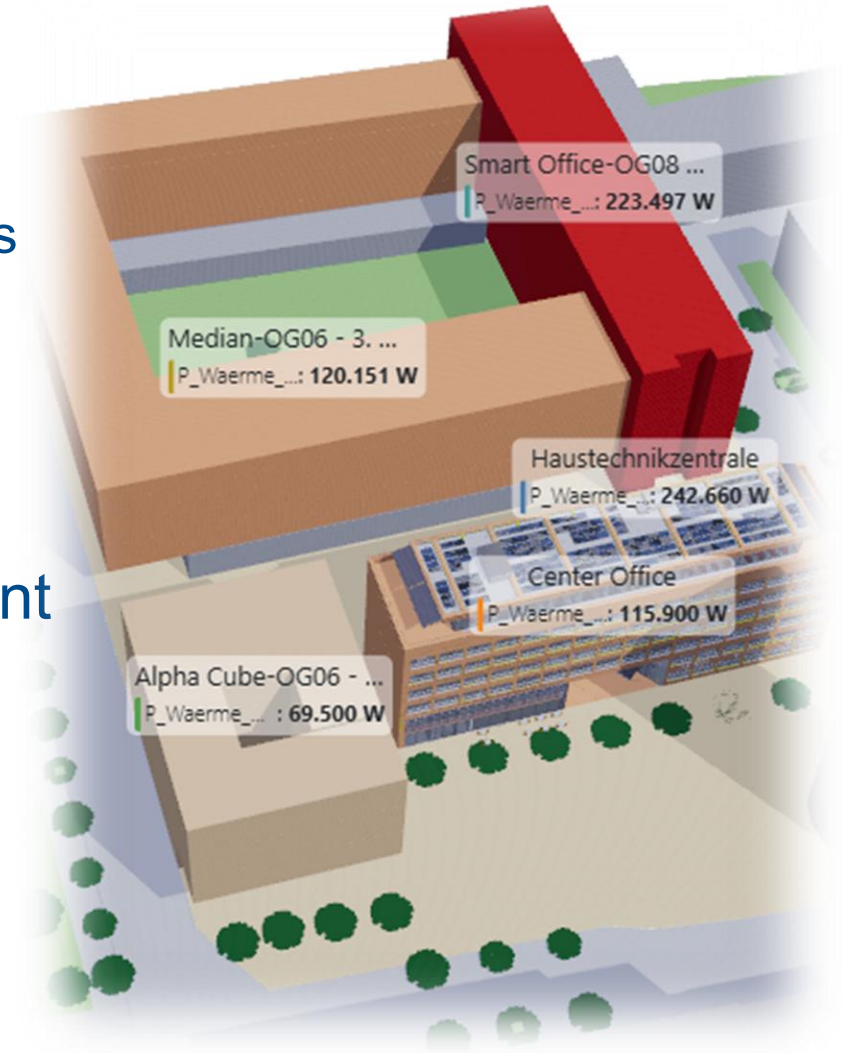
# Platform Architecture





# Smart City Digital Twin - Summary

- Unified district-level digital twin
  - Easily accessible without special software
  - Observability for different stakeholders based on permissions
- Modular architecture
  - Based on existing, federated IFC models
  - Flexible integration of data sources
- Robust foundation for data-driven urban management
  - Live operational data
  - Long term aggregated overview
  - Central interface for additional tools (e.g. simulations)





**AEE INTEC**

**IDEA TO ACTION**

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# Platform Demo

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