AI: The Next Frontier for Irish Construction

CitA | TECHLIVE 2024
AI in Construction

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AI meets digital twins: Innovations at the intersection

Why digital twins?

Digital twin technology presents a compelling opportunity to accelerate digital transformation.

They are the pipeline for AI to operate on the physical world

Twin your world

Anything physical can be twinned. Equipment, systems, processes, and related human interactions in the built or natural environment.

Transform your processes

Bridge the physical – digital divide, compose applications that allow AI systems to understand and interact with your world to simulate, predict, optimize, and automate it.

Unlock business value

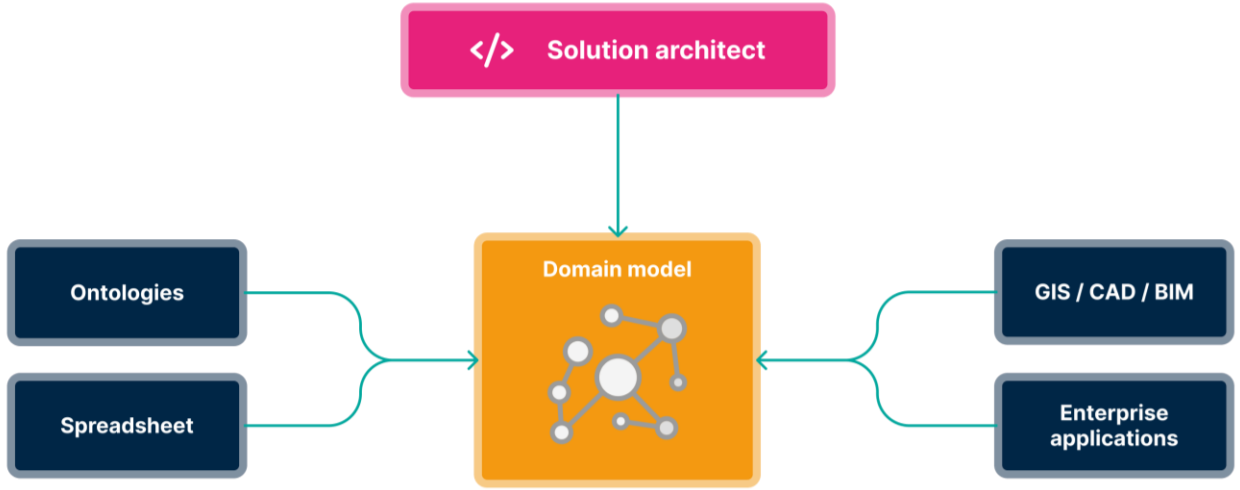
Drive revenue growth, cost efficiency and customer satisfaction, while achieving your Environmental, Social, Governance and Resilience (ESG+R) goals.

How are digital twins built?

Step 1: Define your world as a domain model

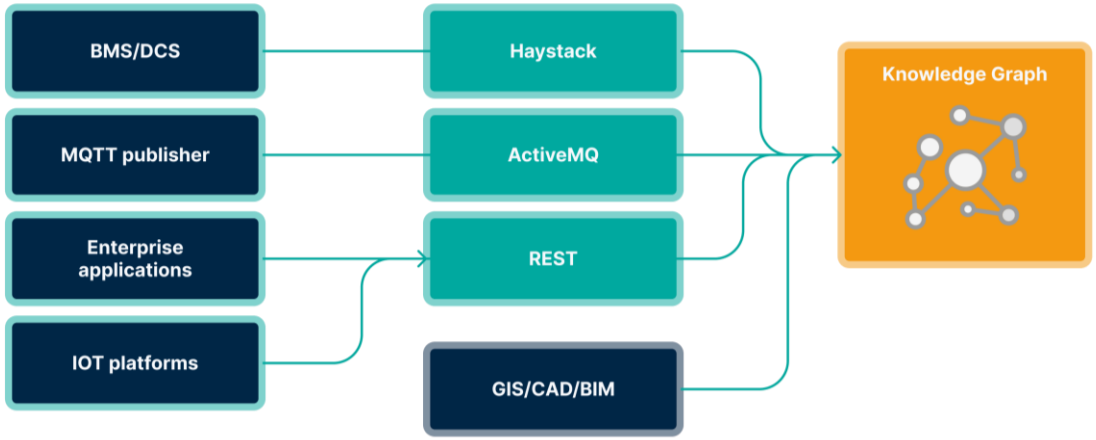
The domain model describes the structure of the things you care about in your world.

Relevant entities, relationships between entities their respective behaviors, and related properties that describe the entities and their dynamic states.



How are digital twins built?

Step 2: Generate a knowledge graph of how your world is structured and how it works.

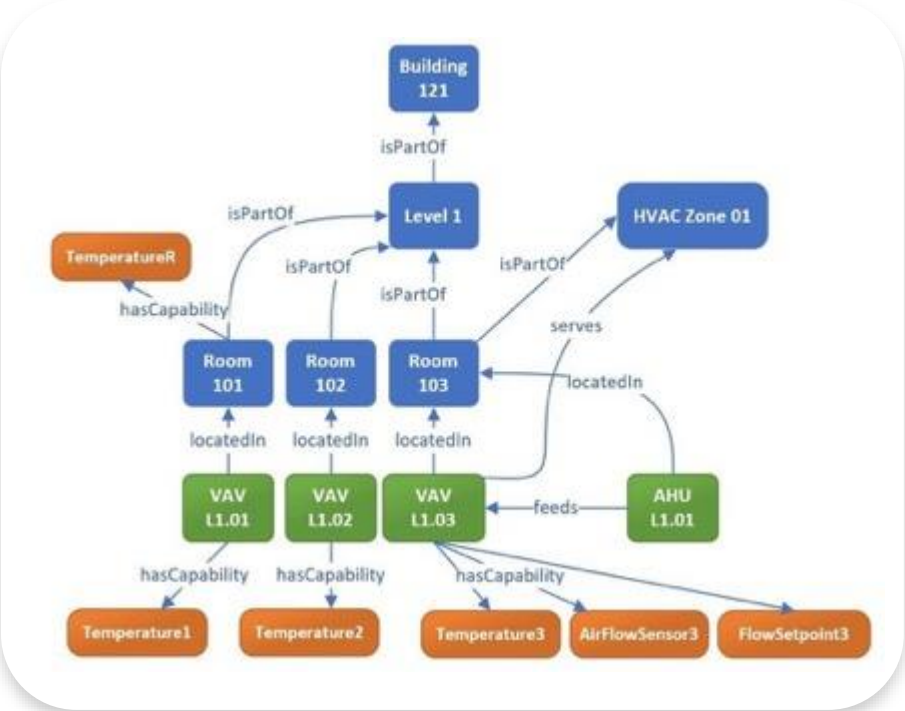


Bring the domain model to life. Associate data from enterprise systems, design systems, and real time systems.

The knowledge of your world is now represented as a graph, becoming the single source of truth for your applications.

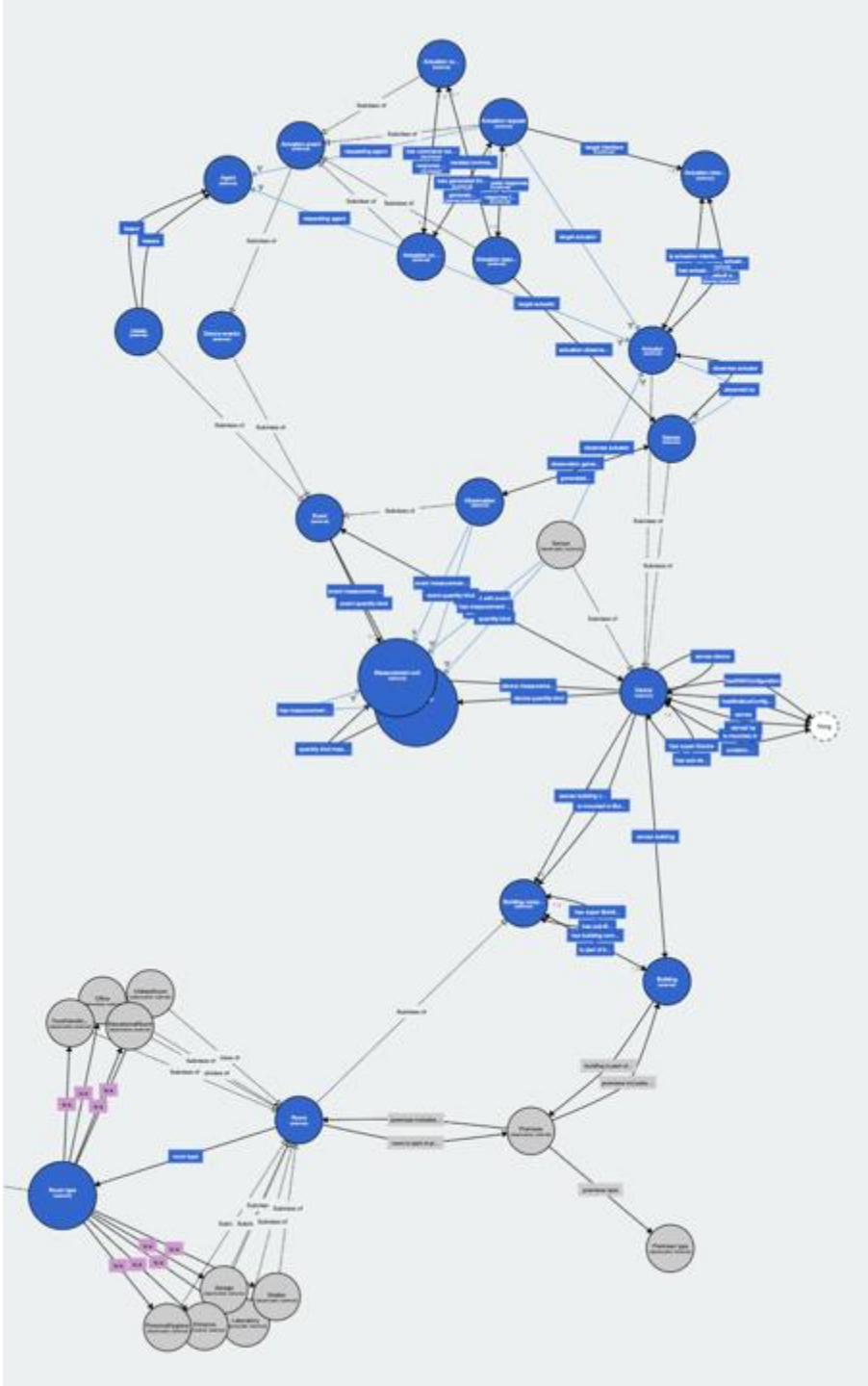
Smart building example

Illustrating Steps 1 + 2



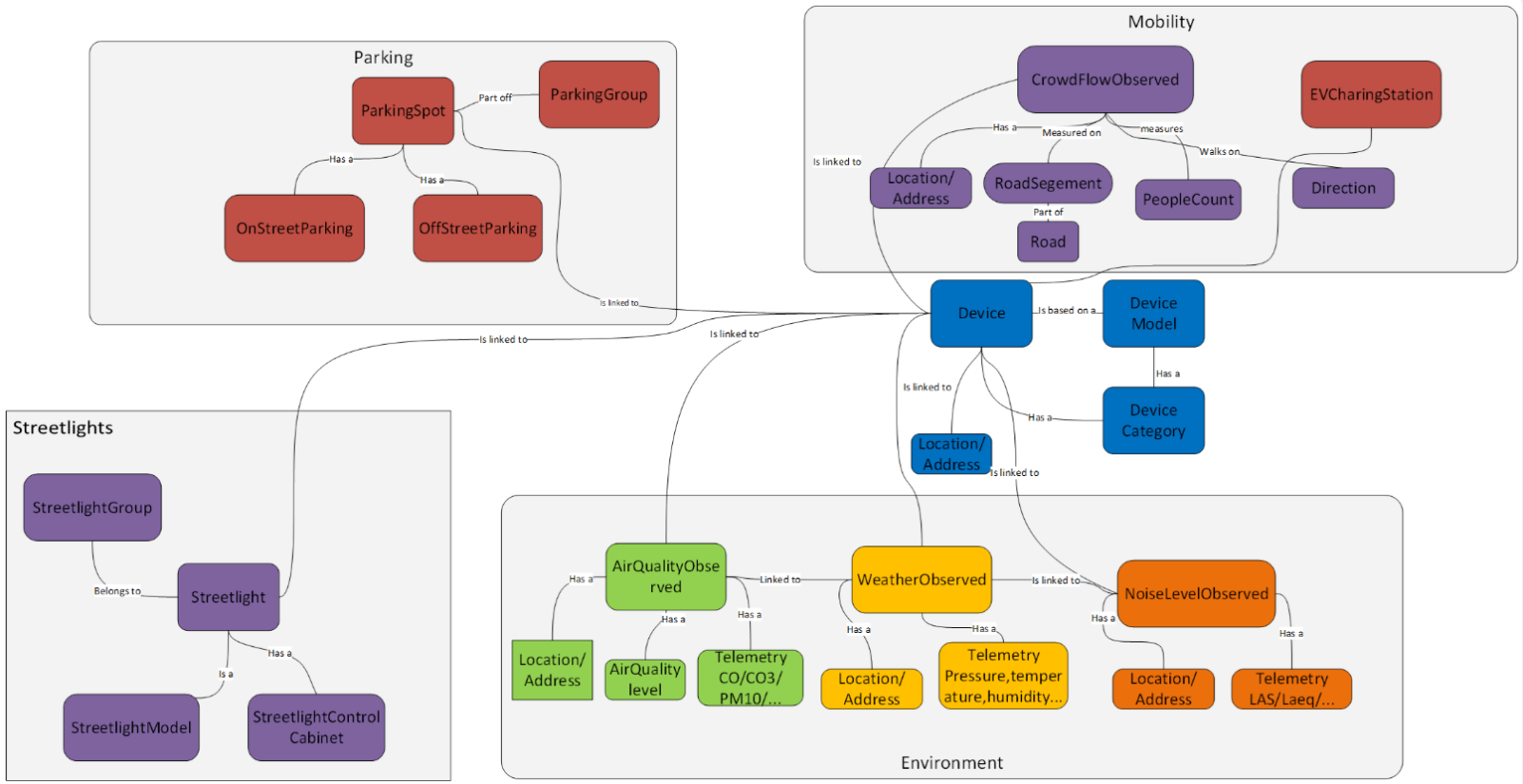
Ontologies represent entities that are relevant to a domain, and their relationships.

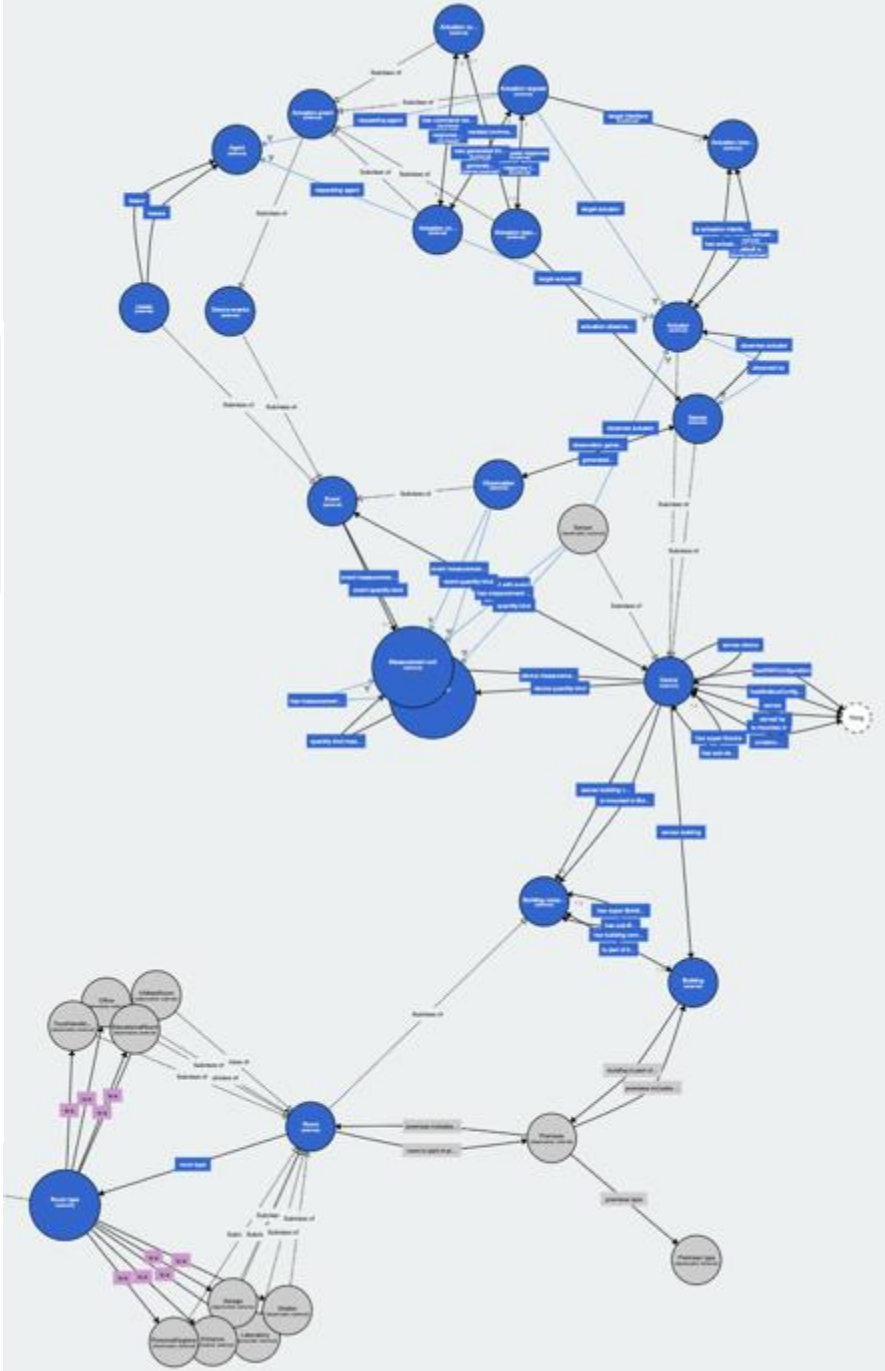
Knowledge Graphs provide a graph representation of the domain model - its entities, relationships between entities, and data associated with such entities.



Smart city example

Illustrating Steps 1 + 2



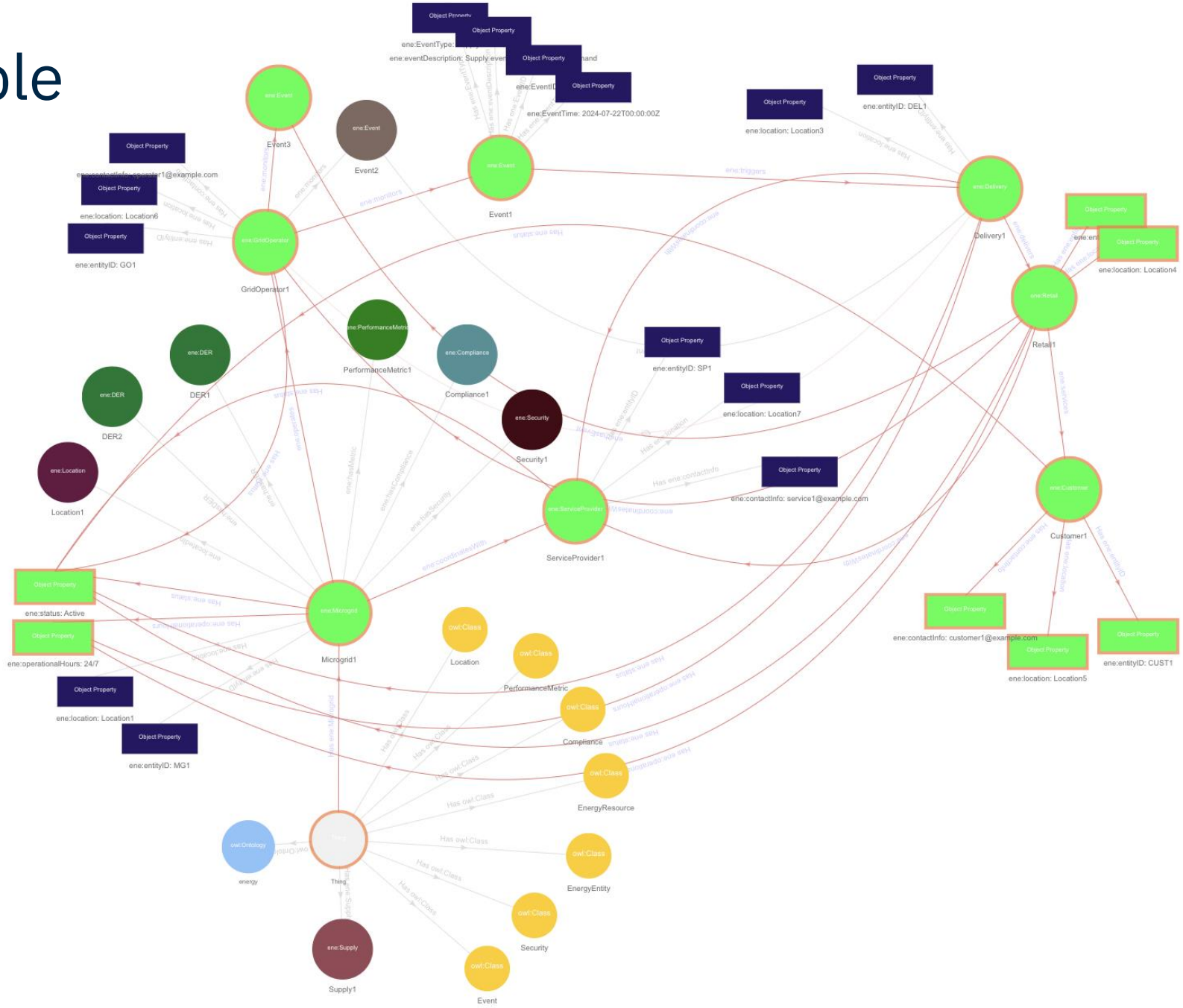


Energy sector example

Illustrating Steps 1 + 2

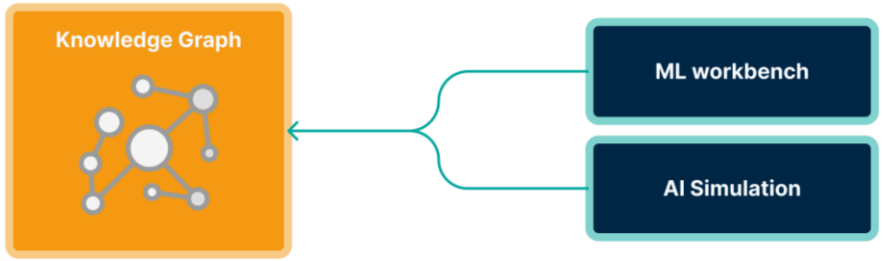
The transition from a linear to a circular energy system with multiple microgrids, grid operators and Distributed Energy Resources pose a significant challenge to Grid visibility.

By leveraging digital twins, energy utilities can make data-driven decisions, orchestrate events horizontally across the entire system, improve service delivery, and effectively manage the energy transition.



How are digital twins built?

Step 3: Integrate ML for predictive analytics, AI for simulations

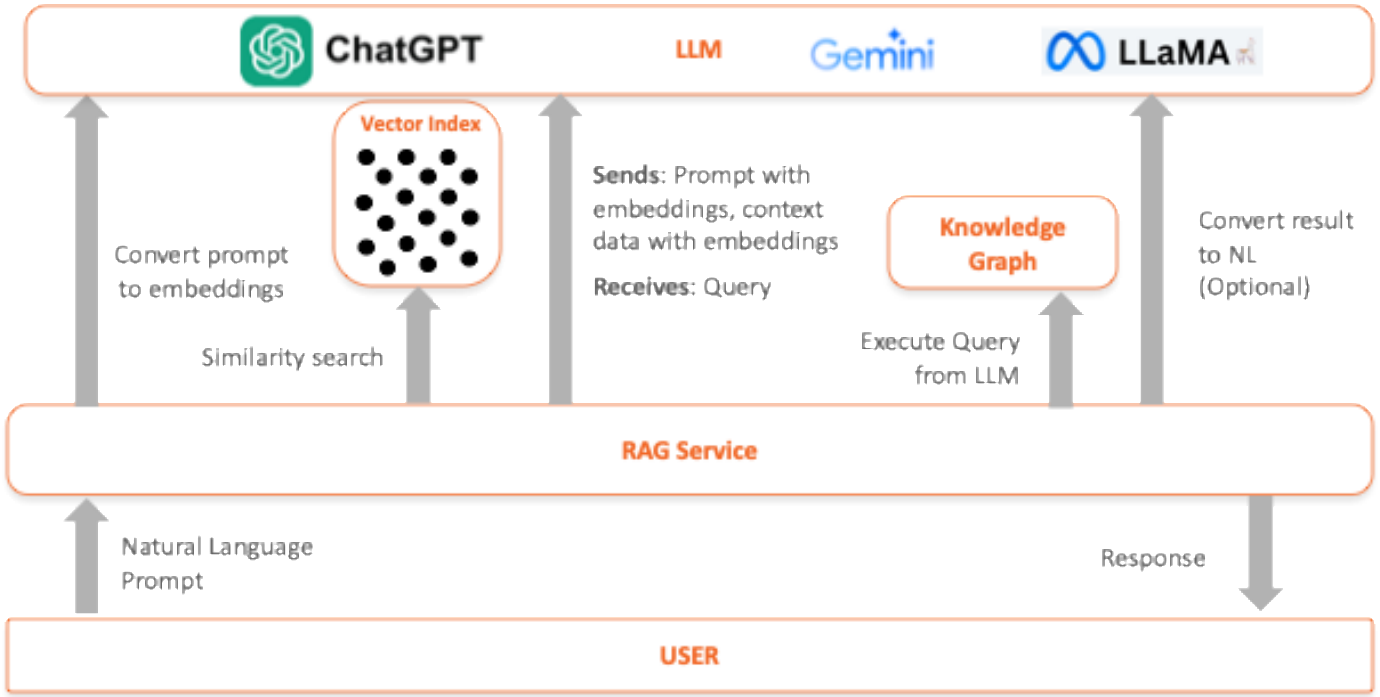


A knowledge graph organizes data into structured, interconnected relationships, providing richer context, improved feature extraction, enabling ML models to better understand dependencies and patterns for enhanced predictive performance and decision-making.

They also power "What-if" simulations, Agent based simulations, Optimization and Risk impact assessments.

Conversational AI and Digital Twins

Powered by RAG (retrieval augmented generation)



Natural language interaction with digital twins is transformational, shortening time to decision making.

Knowledge graphs organize data into interconnected entities and relationships, creating a framework that ensures that the responses generated by RAG are accurate and contextually relevant.

Anand Mecheri

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