



Digital Twins

From Connected Network to Living Digital Twin | 2026

Our Industries

Are Facing Extraordinary Challenges



... Threatening our ability to Deliver Essential Services

... Impacting Everything

Delivering Outcome-Based Digital Twins



ENVIRONMENT TWIN

- monitor environmental conditions
- environmental vulnerabilities (e.g., heat, flooding, drought, air quality)
- Communicates complex environmental insights clearly to stakeholders.



DESIGN & CONSTRUCTION TWIN

- 3D Design and Planning
- Integrates BIM, GIS, schedules, and field data into a unified, accurate project view.
- Captures as-built data to improve Digital Delivery



NETWORK TWIN

- Connectivity Model & Network Topology
- Real Time Network Analysis
- Single Source of truth for the Network from the field to office.



PLANNING TWIN

- Evaluate land-use, zoning, and development impacts
- Data-driven scenario planning
- Enhances public engagement



EMERGENCY MANAGEMENT TWIN

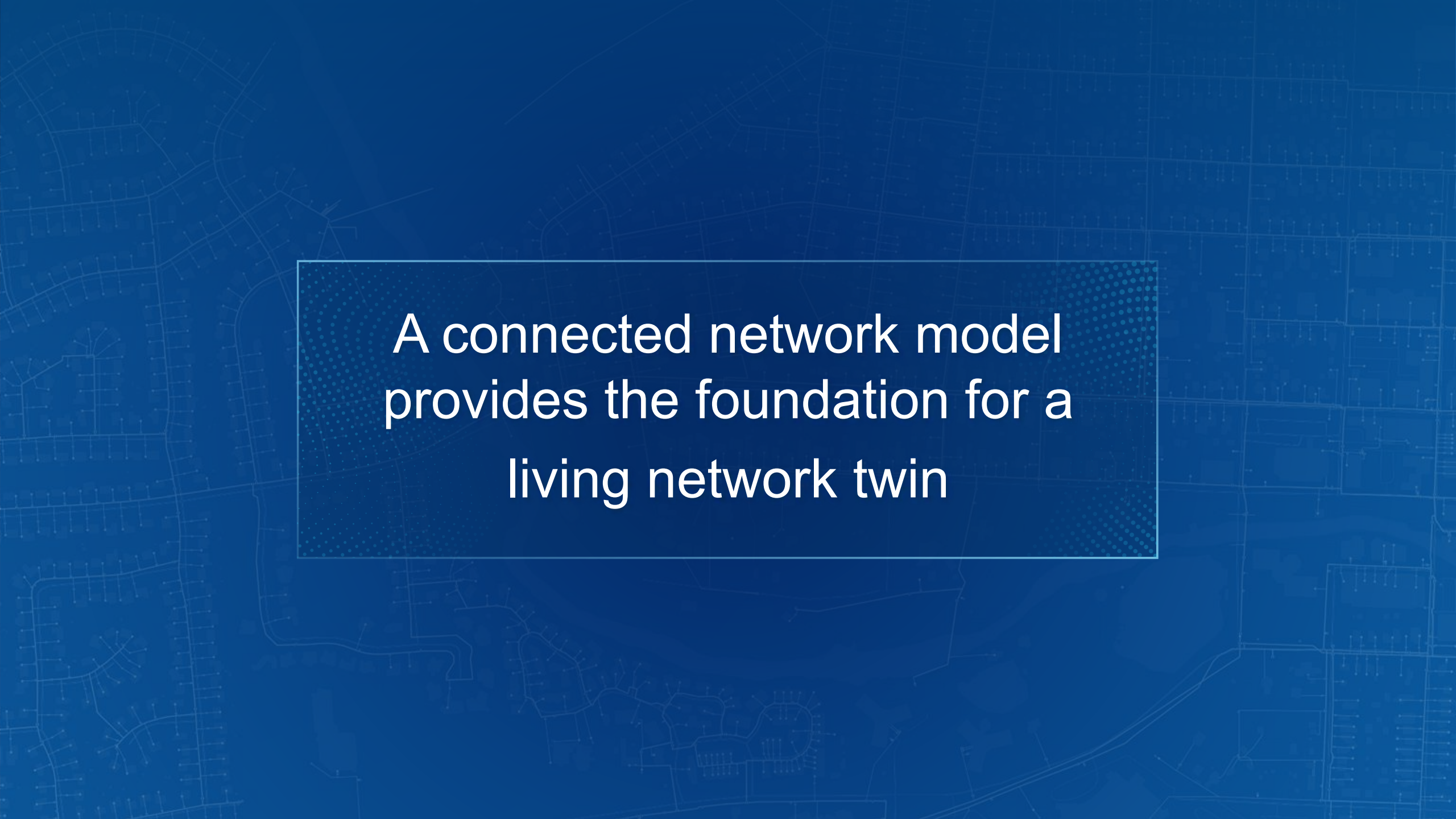
- Plan, Respond and Recover
- Common Operating Picture
- Customer & Community Engagement



OPERATIONS TWIN

- Real-Time visibility and Situation Awareness
- Rapid response and incident management
- Connect operational systems with other enterprise systems in geospatial context



The background of the slide is a dark blue map of a city street grid. The grid is composed of numerous thin, light blue lines representing streets, which are interconnected in a complex pattern. The lines vary in thickness and orientation, creating a dense network of paths across the entire frame. The overall effect is a technical, urban planning-style map.

A connected network model
provides the foundation for a
living network twin

Intelligent Infrastructure

Requires Geospatial Intelligence



Design

What should be — planning, engineering, project delivery



Earth

The environment — imagery, elevation, terrain, climate, hazards



Asset

What you own — inventory, condition, lifecycle, performance



Operations

What is happening — crews, situation awareness, real-time



Network

How it connects — relationships, connectivity, topology, data



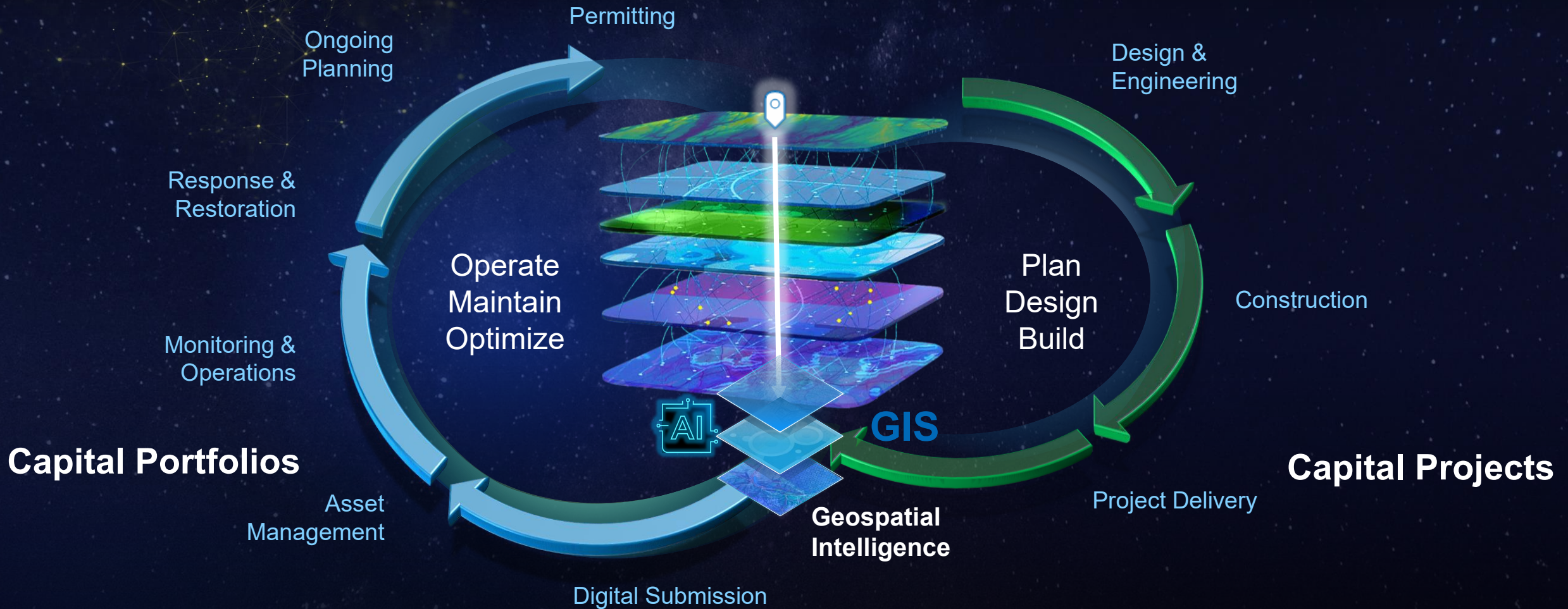
Business

Organizational Knowledge — processes, experience, strategies

The Common Language of our Collective Intelligence

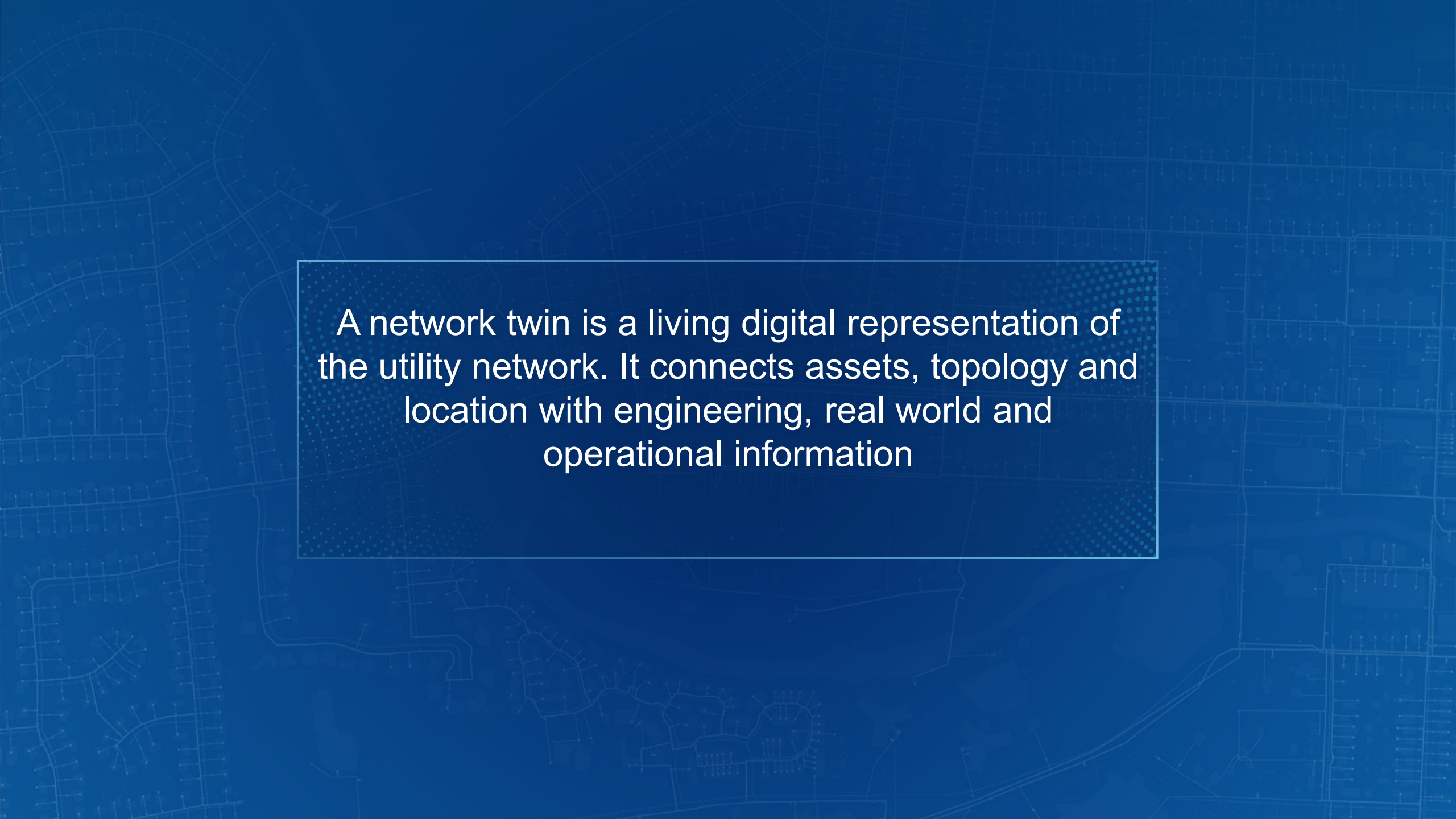
GIS supports the Infrastructure Lifecycle

Integrating and Connecting Enterprise System Data and Workflows



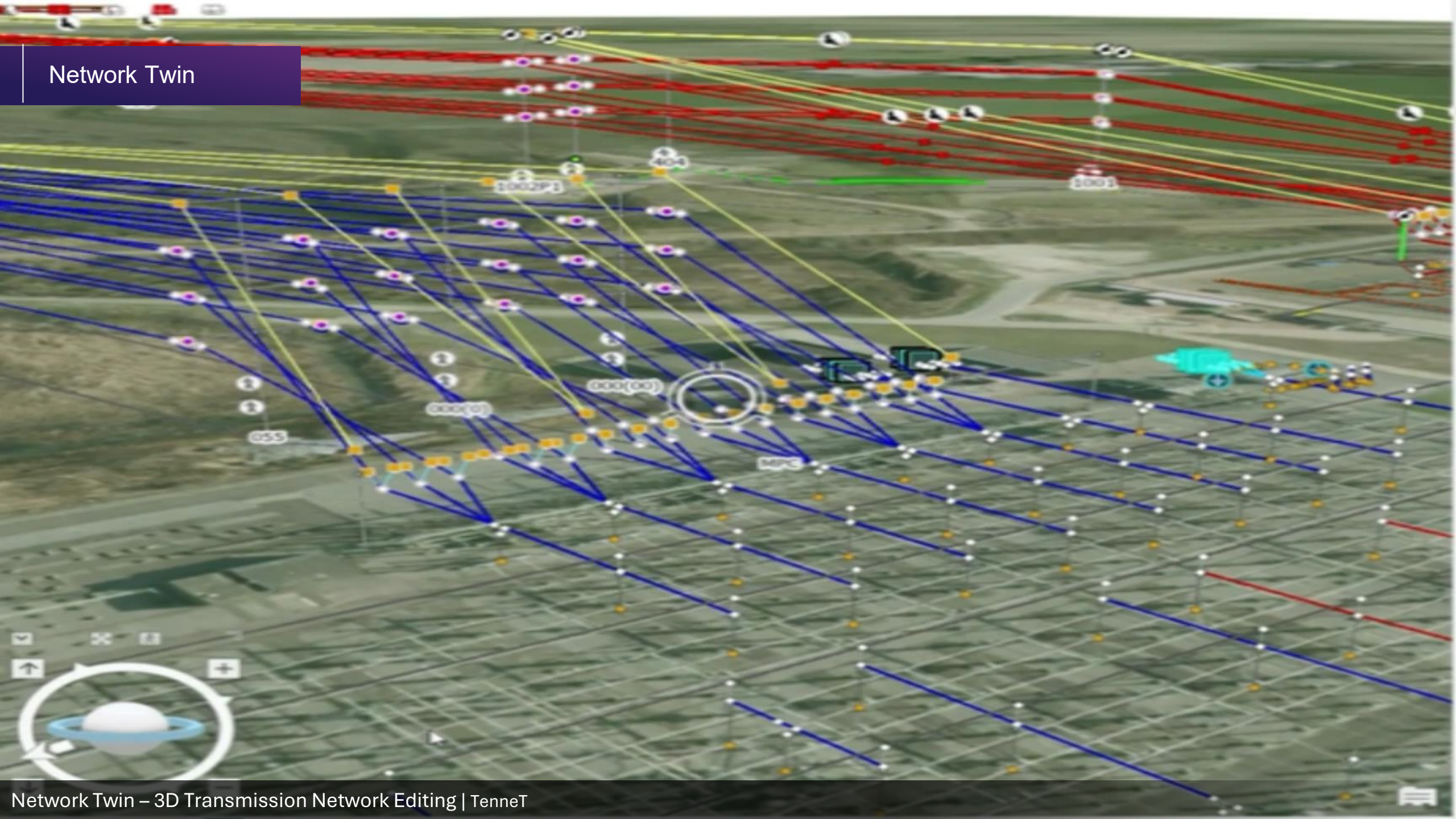
DIGITAL TWINS



The background of the slide is a dark blue map showing a complex utility network. The network consists of numerous small, interconnected nodes and lines, representing a grid-like structure of pipes, cables, or roads. The lines are thin and light blue, while the nodes are small circles or dots. The overall pattern is dense and intricate, covering the entire background.

A network twin is a living digital representation of the utility network. It connects assets, topology and location with engineering, real world and operational information

Network Twin

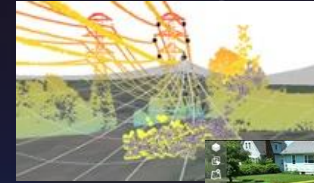


The background is a dark blue map with a light blue grid pattern. A white dotted rectangle is centered on the map, containing the text.

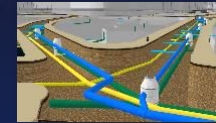
Better digital handover from
projects (BIM) into the operational
networks

GIS Interconnects Information Models

Networks (NIM)



Utilities / Telecom



Pipelines



Roads and Highways

Cities (CIM)



Smart City



Planning



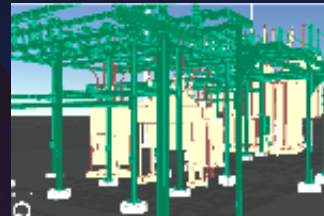
Digital Twin



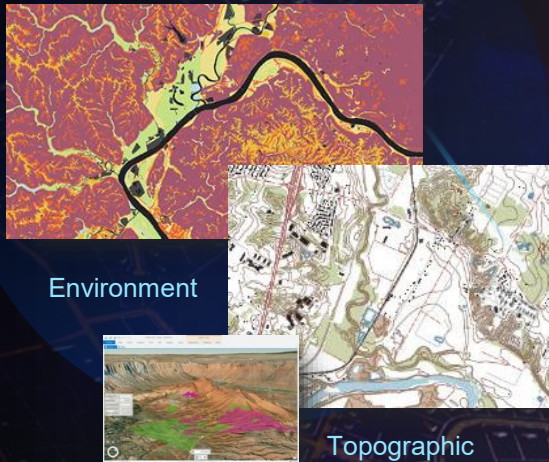
Facilities or Buildings (BIM)



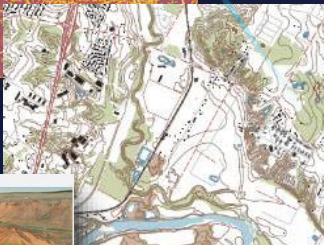
Plants / Structures



Landscapes (LIM)

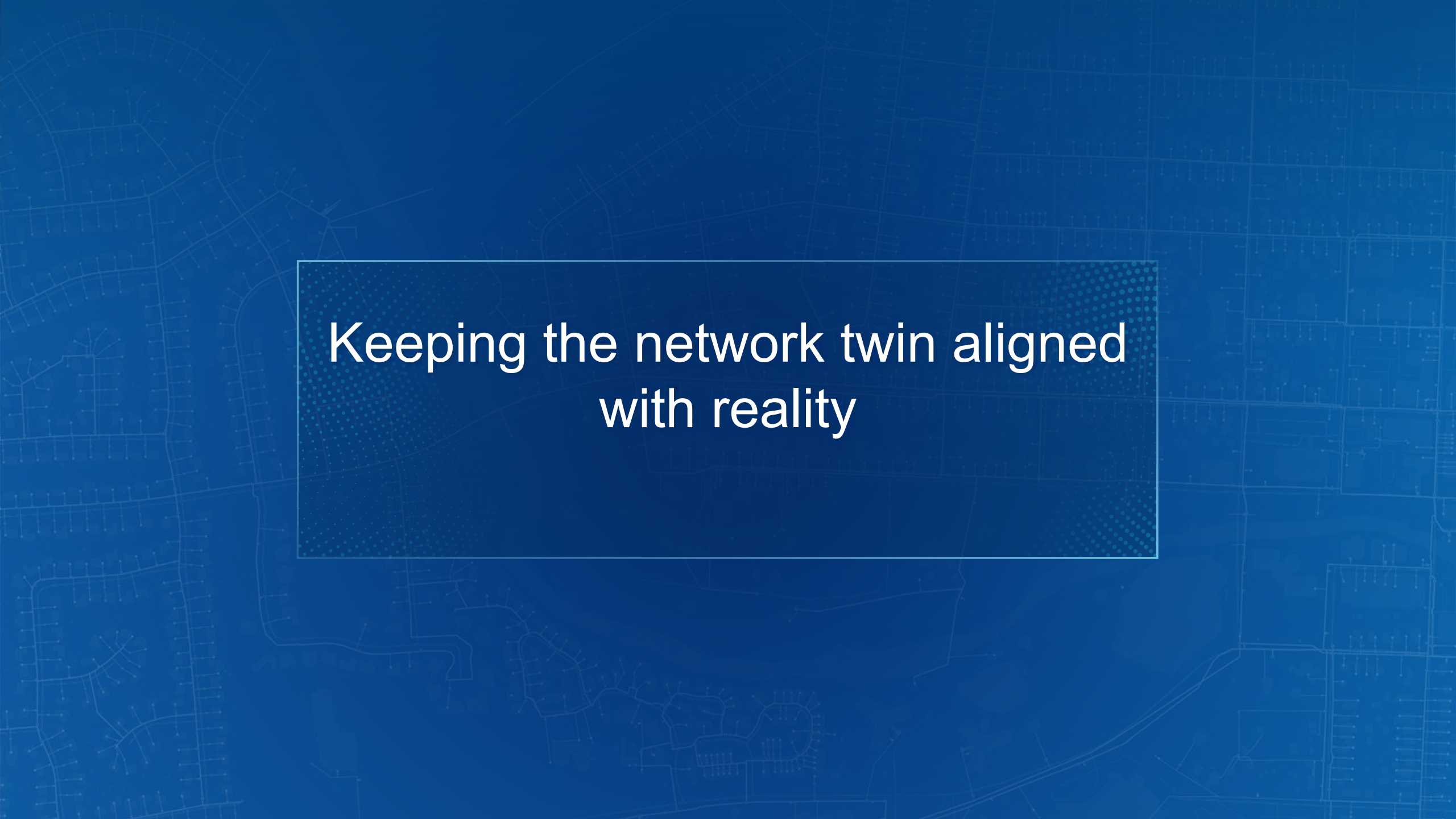


Environment



Topographic

*GIS is the Framework for . . .
. . . Creating & Integrating Twins*

The background of the slide is a dark blue color with a faint, light blue network map overlay. The map shows a complex web of lines and nodes, representing a geographical network like roads or utilities. A central rectangular area is highlighted with a darker blue background and a white border, containing the main text.

Keeping the network twin aligned
with reality

Reality Mapping for GIS

Creates Accurate Representations

... Using Drone, Aerial & Satellite Imagery



Satellite

Outputs

- 3D Meshes
- True Orthos
- Orthomosaics
- Surface Models
- Point Clouds
- **Gaussian Splats (New)**



Aerial



Drone

Drone — San Jose, California

Courtesy of PG&E



Aerial — Prague, Czech Republic

Courtesy of IPR Praha



Supporting Local to National Scales

*Modernizing photogrammetry
... fueling 3D digital twins*

3D GIS

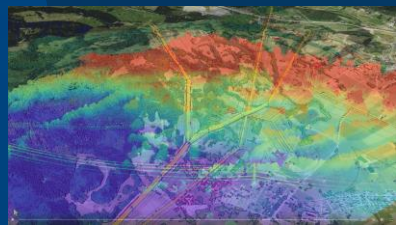
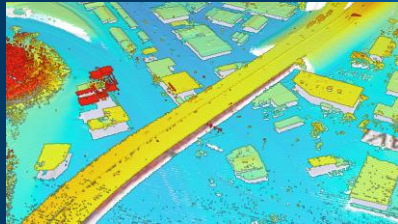
Enabling Living Digital Twins

Analytics

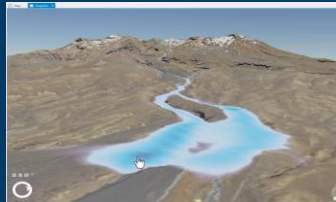
Volume Measurement



Advanced Point Cloud Processing



Surface Analysis



Flood Simulation

Multiple 3D Data Types



Visualization

Urban Digital Twin



Immersive



Mobile



Global Visualization



Flow Renderer



XR Viewer

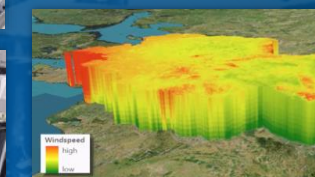
Data Management

Mesh & BIM



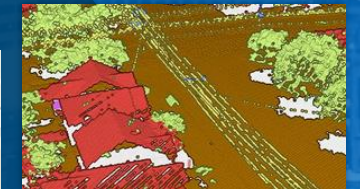
3D Feature & Building Layers

3D Editing



Voxel Layer

Point Cloud

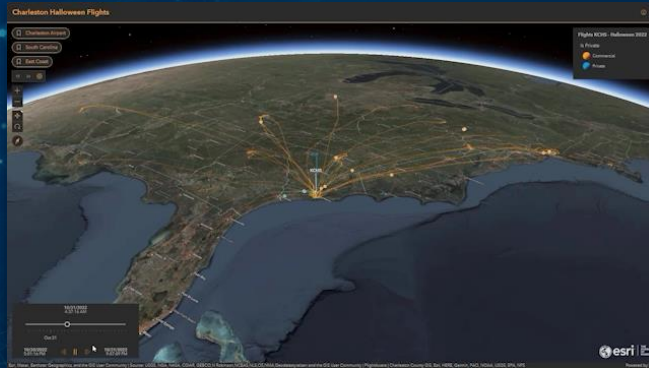


Gaussian Splat

Real-Time

Integrating Sensors & Dynamic Data

FlightAware Aircraft Positions



On-Time Transit Performance

Velocity
SaaS & Software

GeoEvent Server
Software

Analysis

Visualization

Ingestion

Alerting
& Actuation

Data
Management

New & Improved

- **Velocity for ArcGIS Enterprise**
- Ready-to-Use Feeds
- Notifications & Automation
- Industry-Focused Solutions

Supporting operations &
improving decision-making

Field Operations

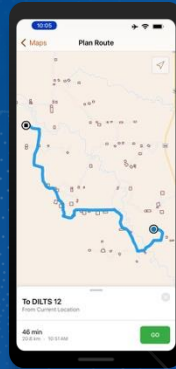
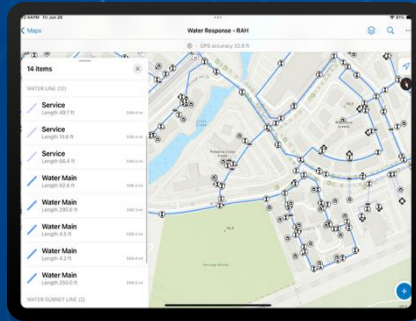
Transforming Mobile Workflows

Data Collection & Editing
Enterprise Data Access
Situational Awareness

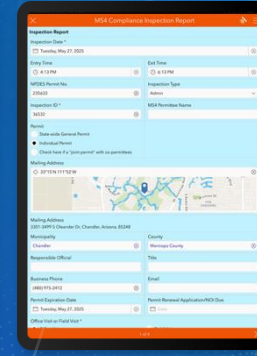
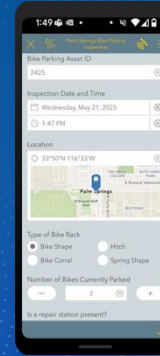
Connected &
Disconnected

Survey123

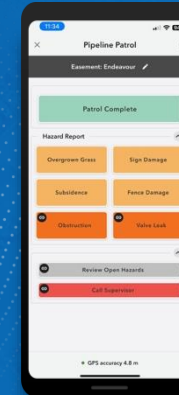
Field Maps



Navigator



QuickCapture



Plan, Task and
Coordinate Work



Connecting the field
... to the enterprise

Digital Twin

Maturity



01. DESCRIPTIVE

Virtual representations of the physical assets or networks

Reality Mapping

Virtual Model (Static)

2D/3D Data

02. INFORMATIVE

Real-time connection to sensors from multiple sources

IoT Sensors

Analytics

Connected Data Environments

Virtual Model (Dynamic)

03. PREDICTIVE

Capable of predicting outcomes

AI / ML

Forecasting & Simulations

Advanced Analytics

04. COMPREHENSIVE

Scenarios of outcomes to make recommendations

Scenario Based Modeling

Remote Controlled Inspections

05. AUTONOMOUS

Self learning and decision making with no human interaction

Autonomous Operations

Adaptive

Agentic AI

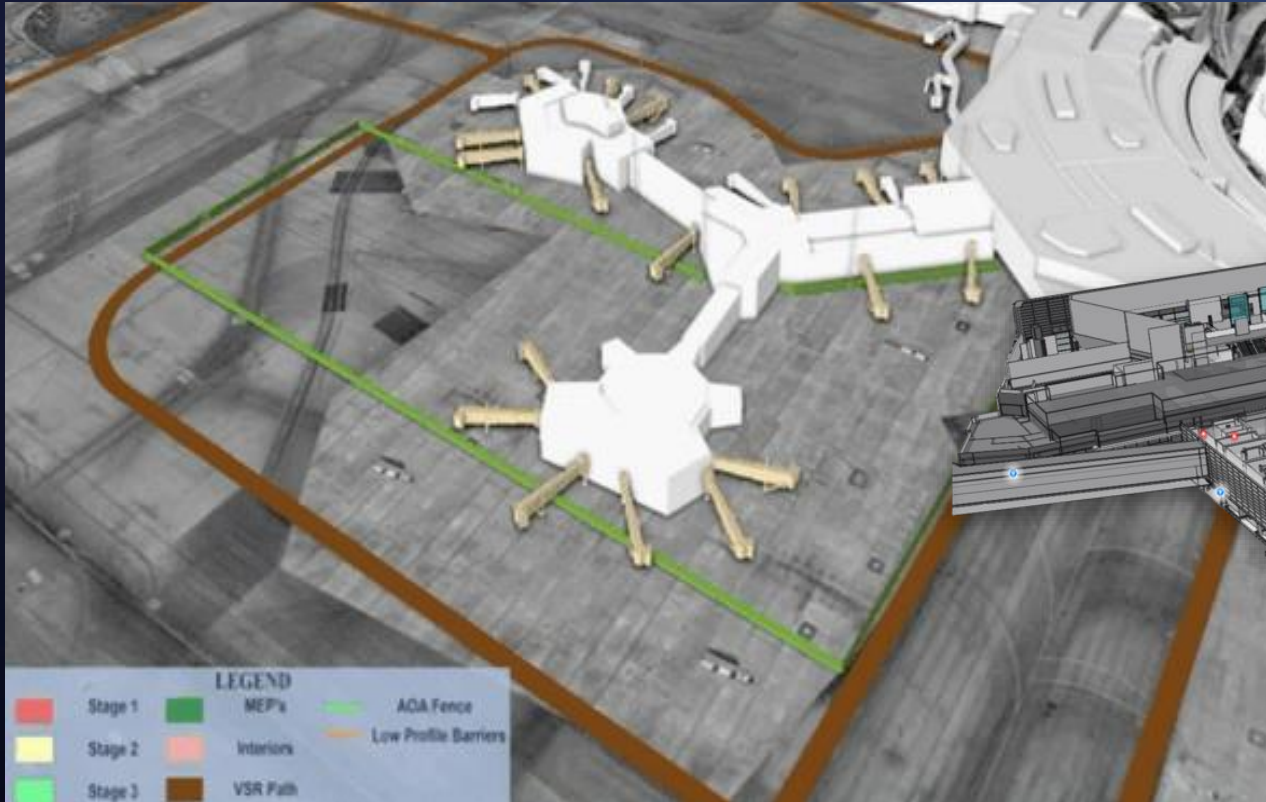
Living Digital Twin

From Descriptive...

Laying the Foundation: Reality Mapping and Digital Models for Operational Clarity



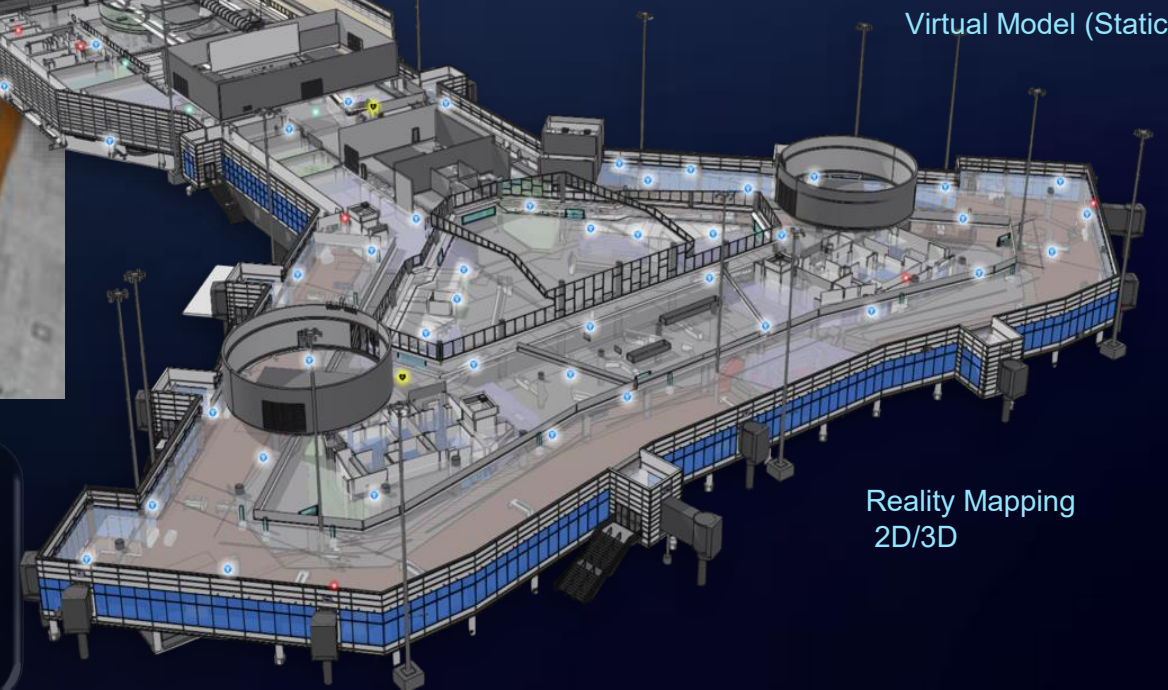
SAN FRANCISCO
INTERNATIONAL AIRPORT



BIM & GIS
Integration



Virtual Model (Static)



Reality Mapping
2D/3D

“A Complete digital transformation of Operations and Asset management with a GIS team of 3”.

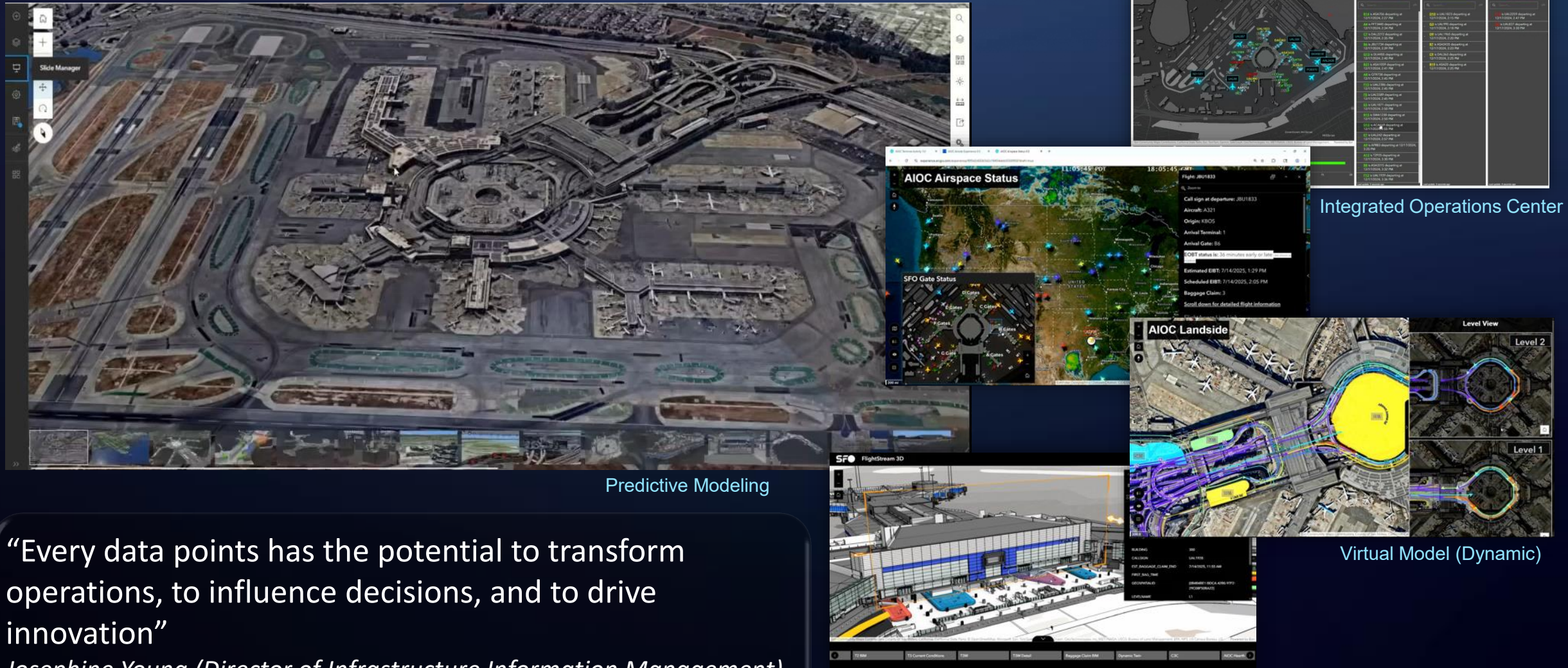
Hanson “Guy” Michael (GeoSpatial Systems Principal)

...to Informative and Predictive

Empowering Decision Making: Dynamic Models, Real-Time Data, and Predictive Insights



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INTERNATIONAL AIRPORT





Digital Twins

From Concept to Reality | 2026