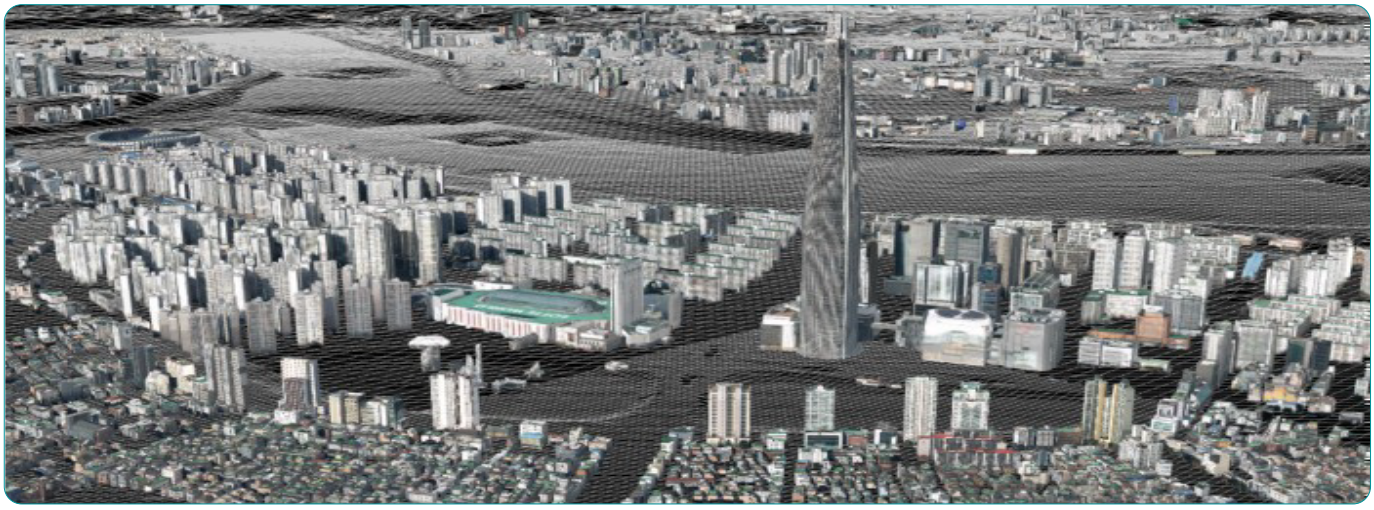
# Mega City-Scale Digital Twin

## Mega City-Scale Digital Twin technology creates a three-dimensional model of an entire metropolis, reflecting its physical traits. Urban planners use simulation analyses and predictive insights from this digital environment to make better city operations decisions.

By leveraging aerial photography and photogrammetry, this system generates a detailed 3D landscape, forming core infrastructure maps for diverse urban applications such as autonomous vehicles and disaster management. Real-time data integration enables scenario modeling, enhancing resilience and public safety.



▲ Smart Seoul Map (S-MAP), Seoul's three-dimensional digital space built using digital twin technology.

### Issues to Tackle

- ☑ High-precision 3D spatial data is essential for implementing new mobility innovations, such as autonomous robots and autonomous cars within cities.
- ☑ A 3D digital simulation infrastructure is needed to address urban environmental changes and prepare for disasters and safety incidents that are difficult to manage in real-world scenarios.

### Expected Benefits ☑

- ☑ Establishing a foundation for new industries, such as autonomous vehicles and outdoor delivery robots by utilizing a 3D digital space integrated with urban spatial information.
- ☑ Proactively responding to disasters such as floods and landslides while deriving solutions to urban issues, such as energy consumption and carbon emissions based on simulation results.

### Key Services

· Providing real world models and information based on Digital Twin technology.

· Replicating and matching physical objects with virtual models.

· Integrating and linking fundamental data.

· Conducting spatial and predictive analysis through simulations.

· Adding weather and surrounding environmental data essential for virtual models.

### Use Cases

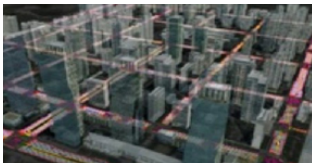
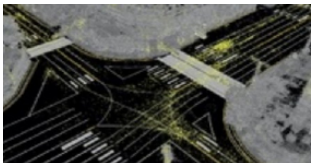
· In 2020, Seoul collaborated with Naver Labs to create a 3D spatial model known as the "Smart Seoul Map." Using approximately 25,000 aerial photographs covering an area of 605 km², this model includes 600,000 buildings and integrates urban information for environmental, administrative and safety management.

· In 2021, the Korea Land and Housing Corporation (LH) developed the "LH Urban Digital Twin" service for the "third-phase," new towns such as Incheon Gyeyang and Hanam Gyosan. This service enables people to virtually assess urban landscapes, vistas, and sunlight availability, for example.

· From 2023, Naver and Naver Labs have been constructing a cloud-based 3D digital twin platform for five cities in Saudi Arabia, including Riyadh, Medina, Jeddah, Dammam, and Mecca.* The Saudi Arabian government plans to utilize Digital Twin technology for urban planning, monitoring, and flood prediction.

## Key Components

### Configuration

| Satellite/Aerial/Drone/Robot Surveying | Intelligent Spatial Information System | High-Precision Spatial Data Integration |
|---|---|---|
| 3D Modeling Maps | Mega-city Digital Twin 3D Spatial Data | Mega-city Digital Twin Spatial System |
|  |  |  |
| 3D spatial data applicable for AR and urban planning simulators | High-precision ADAS HD maps integrated with Digital Twin technology building management. | Foundational data for future Digital Twin smart cities. |

### Key Technologies

#### 1. 3D Spatial Data Collection and Modeling

- Analyzing and aligning satellite/aerial images and photogrammetry data using AI.
- Converting data into mega-city Digital Twin data to create a comprehensive 3D city model.
- Modeling to integrate with Digital Twin mega-city simulators and smart city operation management platforms.

#### 2. Precision Road Information Collection and Layout Creation

- Utilizing AI technologies such as deep learning and computer vision to automatically extract road symbols and lane information.
- Generating road and building information for the entire city.

#### 3. Spatial Data Alignment and Standardization

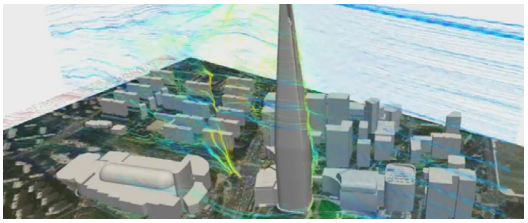
- Combining location information extracted from 3D models with MMS (Mobile Mapping System) data to significantly shorten high-precision data collection and post-processing workflows.

#### 4. Future Spatial Data Collection and Modeling Using Indoor and Outdoor Mapping Automation Robots

- Utilizing custom-designed mapping robots and wearable mapping devices to support seamless data collection, processing, and application in complex environments, including indoor and outdoor spaces, vertical and horizontal structures, flat surfaces, and stairs.

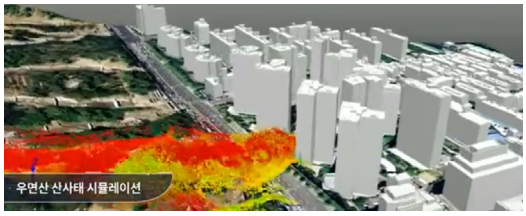
#### Digital Twin for The World Tower's Wind Path

- Simulating airflows to analyze and predict wind speed, direction, and patterns based on building placement and height.



#### Simulation of Landslides in Umyeon Mountain

- Utilizing rainfall, topography, and soil data to predict the scale of potential damage.

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