NAVER LABS

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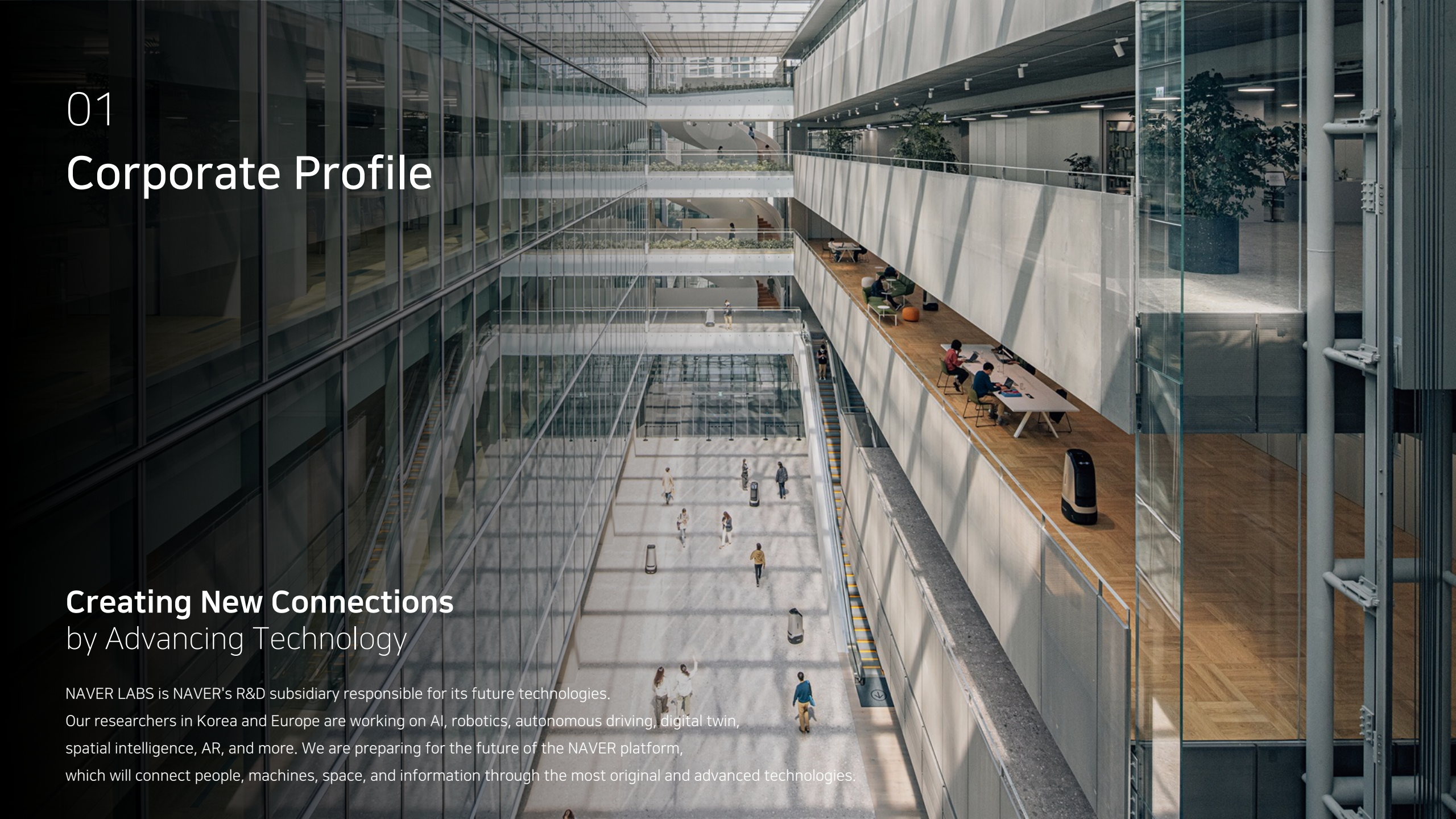


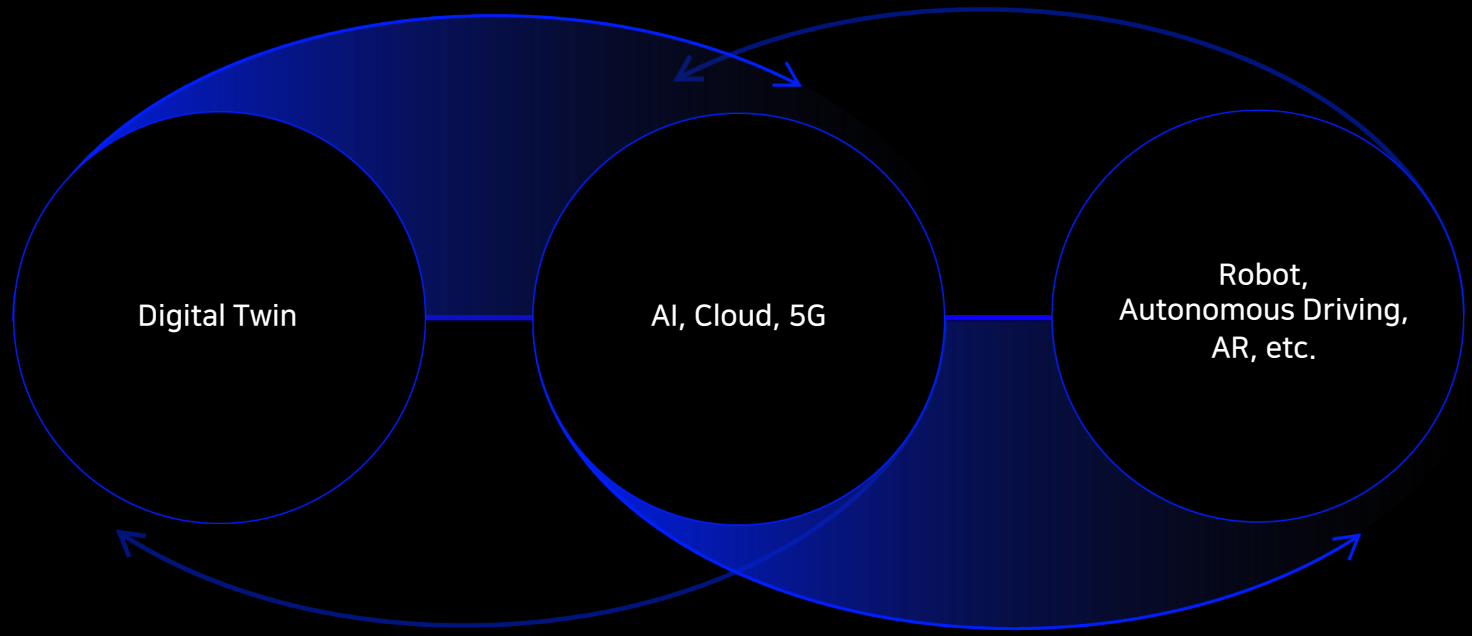
01
Corporate Profile

Creating New Connections
by Advancing Technology

NAVER LABS is NAVER's R&D subsidiary responsible for its future technologies.
Our researchers in Korea and Europe are working on AI, robotics, autonomous driving, digital twin,
spatial intelligence, AR, and more. We are preparing for the future of the NAVER platform,
which will connect people, machines, space, and information through the most original and advanced technologies.

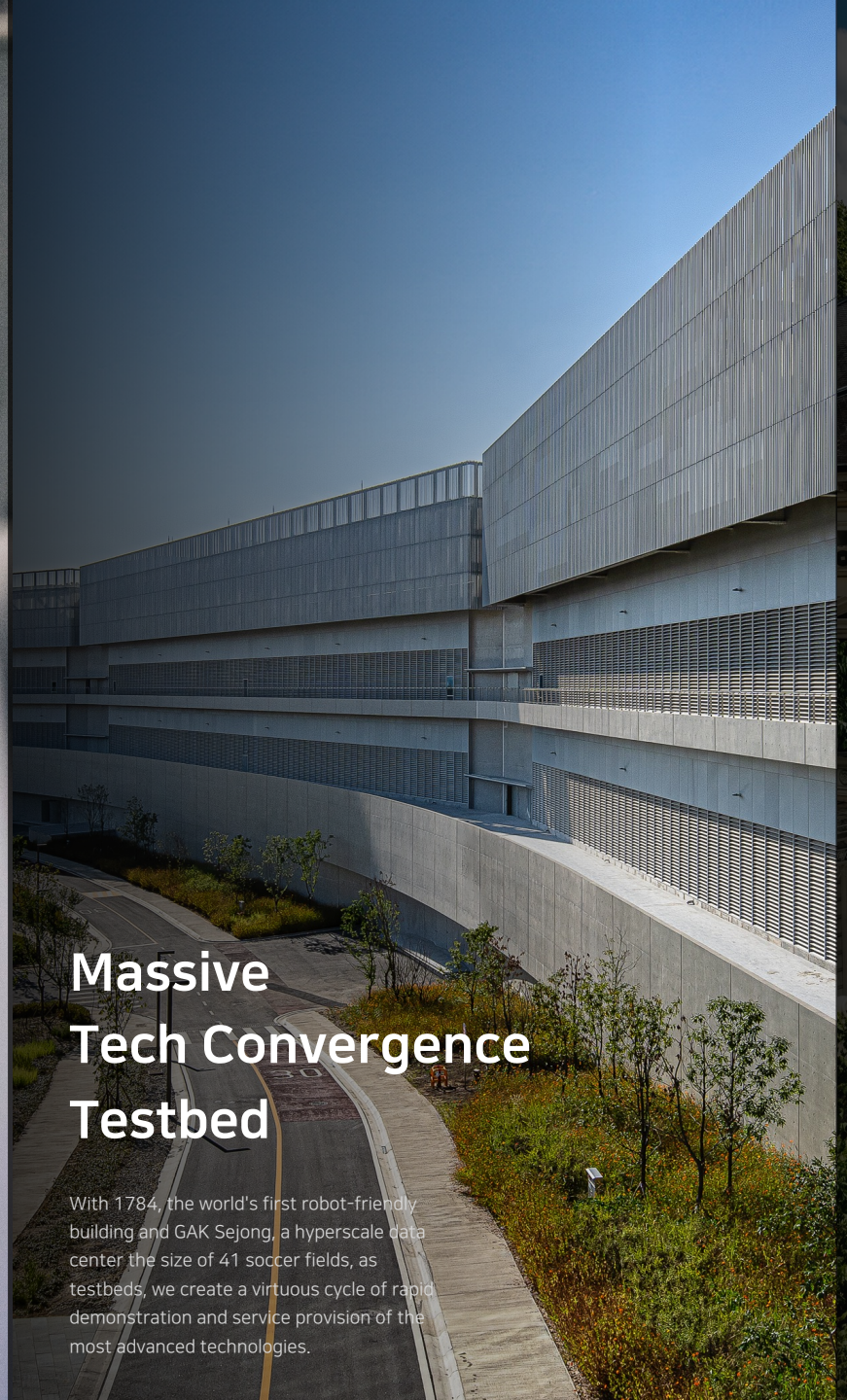
Technological Convergence

Convergence is our key R&D strategy and competitive edge.
NAVER LABS is creating a new future space by organically connecting different domains such as
digital twin, AI, cloud, 5G, robotics, autonomous driving, and AR, and breaking down the boundaries between them.



From research to commercialization, **End-to-End Solutions**

We provide highly complete solutions from research on core technologies, demonstrations and updates using testbeds, and to cloud commercialization. Our solutions contain both the robotics, digital twin, AI, and 5G technologies and the developmental and operational know-how for services.

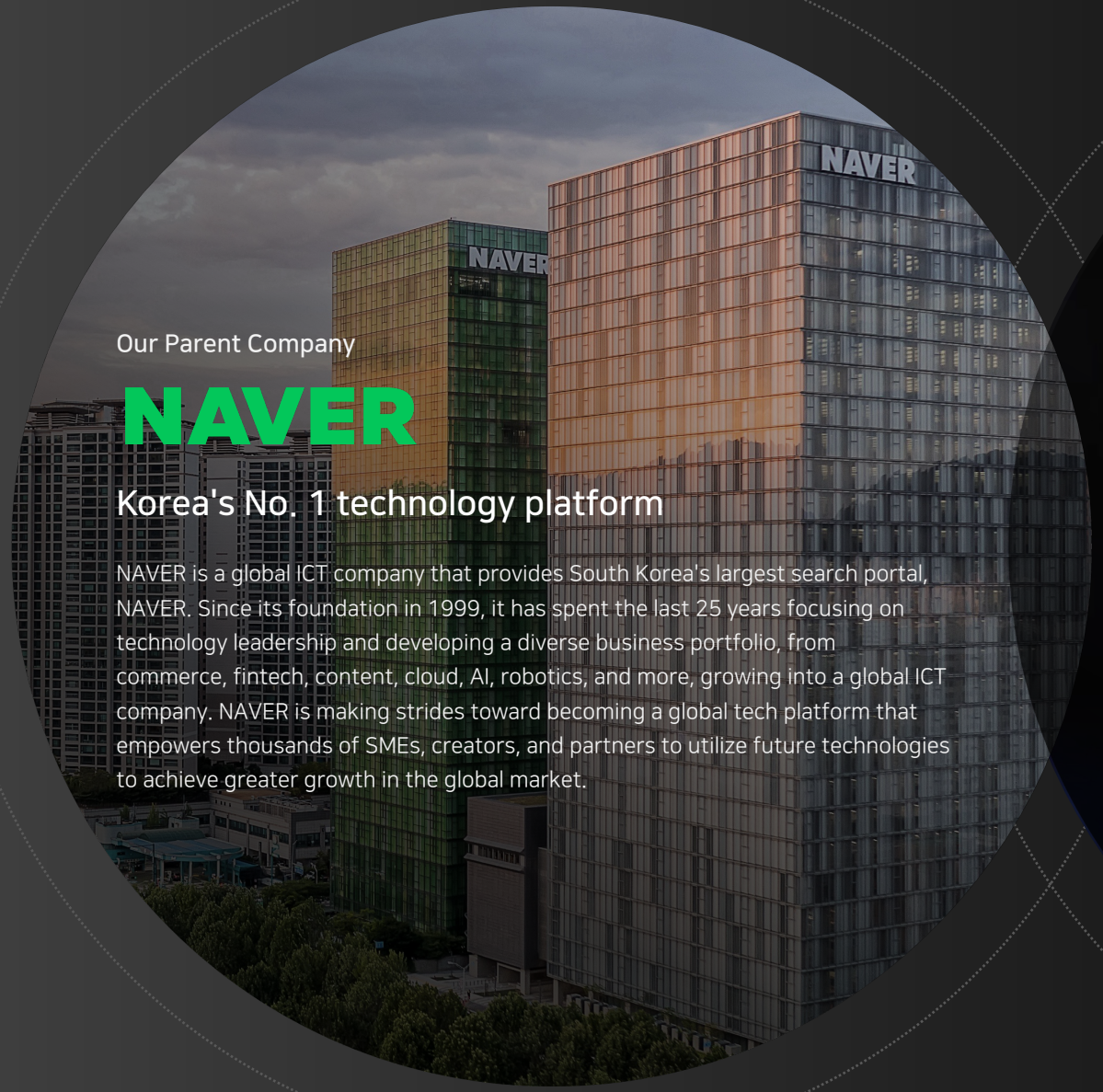


Massive Tech Convergence Testbed

With 1784, the world's first robot-friendly building and GAK Sejong, a hyperscale data center the size of 41 soccer fields, as testbeds, we create a virtuous cycle of rapid demonstration and service provision of the most advanced technologies.

Between Korea and Europe, **AI R&D Network**

Excellent developers and researchers from Korea and Europe form a global research network. Brilliant minds from more than 26 countries come together to collaborate on a wide range of technologies, including AI, robotics, vision, and more.



Our Parent Company

NAVER

Korea's No. 1 technology platform

NAVER is a global ICT company that provides South Korea's largest search portal, NAVER. Since its foundation in 1999, it has spent the last 25 years focusing on technology leadership and developing a diverse business portfolio, from commerce, fintech, content, cloud, AI, robotics, and more, growing into a global ICT company. NAVER is making strides toward becoming a global tech platform that empowers thousands of SMEs, creators, and partners to utilize future technologies to achieve greater growth in the global market.

Our Partner Company

NAVER Cloud

Global cloud & infrastructure builder

NAVER Cloud is a hyperscale technology company leading digital innovation. They offer innovative technologies as a cloud-based B2B service and operate the 'GAK' data centers with their own technology, based on years of IT service experience.

Starting with the cloud, the foundation of digital innovation, HyperCLOVA X, a hyperscale AI, and NAVER WORKS, a global collaboration tool, they provide all necessary foundations to the growth of their business partners.

02

R&D

We research future technologies such as AI, robotics, autonomous driving, digital twin, spatial intelligence, AR, and more.

Digital Twin

Robotics

Vision

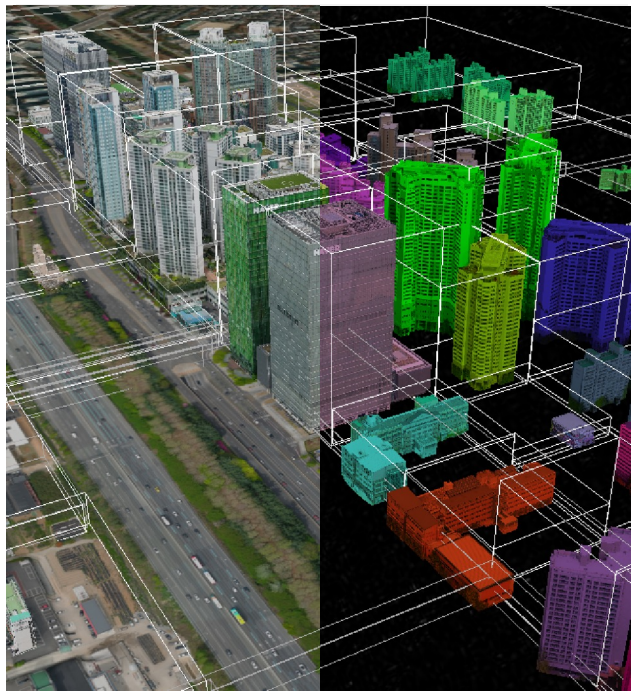
Autonomous Driving

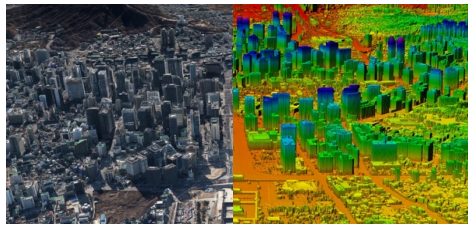
Digital Twin

We develop original digital twin technology that replicates the city-scale world in a digital environment. From indoors, outdoors, and to entire cities, we are internalizing mapping devices and solutions to create digital twin data of large spaces.

Megacity-Scale Digital Twin

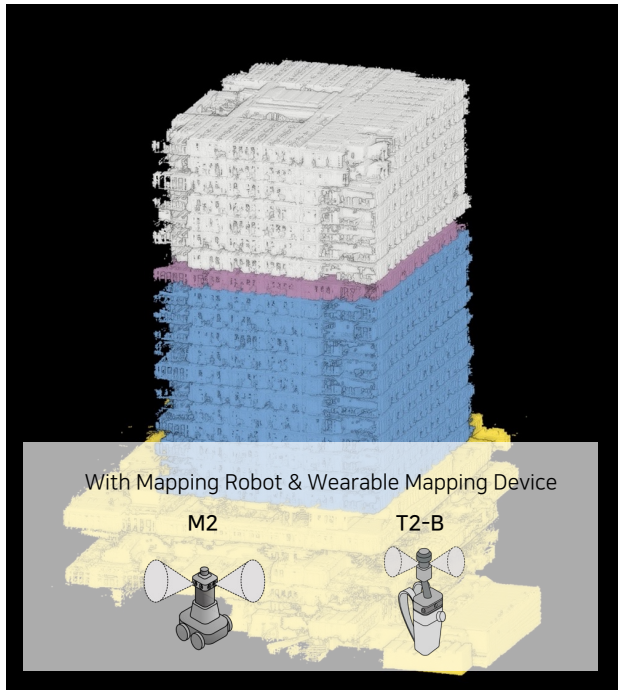
Quickly and efficiently creates digital twin data of large-scale cities. Using aerial imagery and AI allows the creation of 3D models, road layouts, and HD maps of entire cities, which are key data for innovative industries such as smart cities, autonomous driving, service robots, and AR/VR.

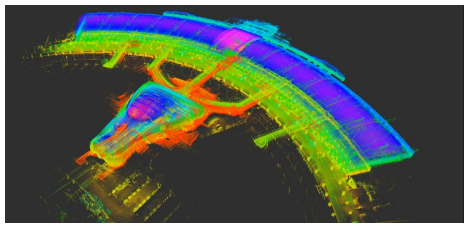




Smart Building Digital Twins

We create digital twins of large-scale indoor and outdoor spaces through our own mapping devices and original mapping and 3D reconstruction technologies. We are able to seamlessly connect complex environments such as indoors and outdoors, vertical and horizontal, flat surfaces and stairs, and continue to advance our technology through various domestic and international reference sites.





Digital Twin
For Better Experiences

Research on digital twin-based services and content, including VR · AR, 3D panorama and visual effects, to create a wide range of information and experiences based on data realistically replicated from the physical world.

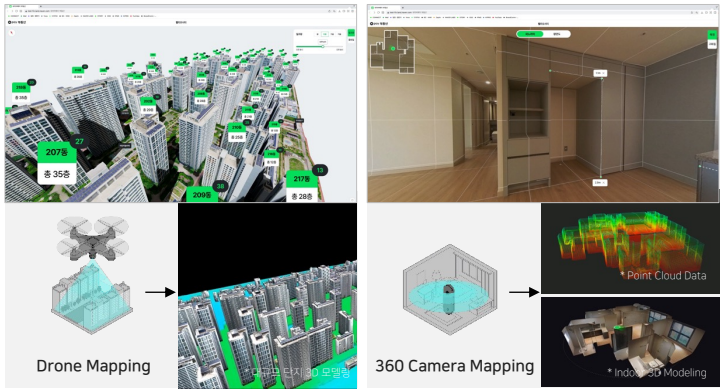
VR · AR

Digital twin data is used to create reality-based services for outdoor and indoor everyday spaces.

■ VR Tour | N pay 부동산

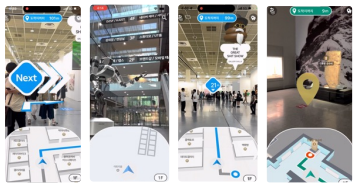
VR Apartment Tour *screenshot

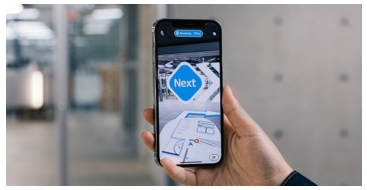
VR House Tour *screenshot



Explore apartments and residential complexes with the NAVER Real Estate VR Tour service. The service uses digital twin technology to replicate spaces into 3D experiences from the comfort of your home.

■ AR Navigation





3D Panorama

The Street View 3D service implemented in 3D panoramic format becomes more realistic with precise spatial data acquired from across the entire city.

■ Street View 3D | N 지도

NAVER Map presents 'Street View 3D' for seamless 3D navigation and information store names. The service uses NAVER LABS "P1", a digital twin-creation device that collects high-quality urban data.

P1, Panoramic Mapping System

Panoramic Stitching & 360 Mesh

Panoramic 3D Rendering

Visual Effects

Enhanced visual effects produce a more expansive and realistic 3D city experience. Our urban 3D models are created with digital twin technology based on aerial photography.

■ TV Series VFX (Sweet Home | Season 2)

The ALIKE solution of NAVER LABS was used to build a 3D model of Jamsil city, one of the main locations in Season 2 of the Netflix series "Sweet Home" adapted from an original NAVER Webtoon. The digital twin of the cityscape was used to improve accuracy and efficiency when layering the background.

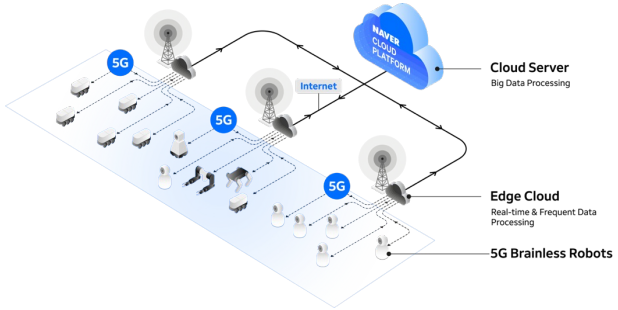
ALIKE Solution to Build Digital Twin Data of Seoul

Robotics

We accelerate the popularization of robots by researching robot technologies for natural coexistence with humans.

5G Cloud Robotics

This technology utilizes the ultra-low latency characteristics of 5G communication to allow the cloud to replace the role of the robot's brain. NAVER LABS successfully demonstrated the world's first 5G brainless robot at CES 2019 and has been applying it in its second headquarters, 1784.



Advantages of the Cloud Robot

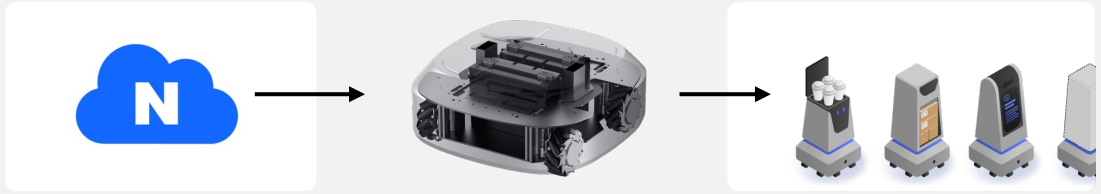
Multi-robot simultaneous control

Reduce power consumption

High-performance, High-precision control

AROUND Platform

An autonomous robot platform that provides a variety of services in everyday spaces. With the cloud replacing the robot's brain, we can enable natural autonomous driving with only the basic functions.



Cloud Server

AROUND Platform

Autonomous Service Robots

AMBIDEX

A dual-armed robot with an innovative mechanism developed for safe coexistence with humans. Based on an innovative cable structure, it is designed to be both strong and stable.

Rookie

An autonomous service robot powered by NAVER Cloud Platform and 5G. The robot provides various services to people at NAVER's second headquarters, 1784.

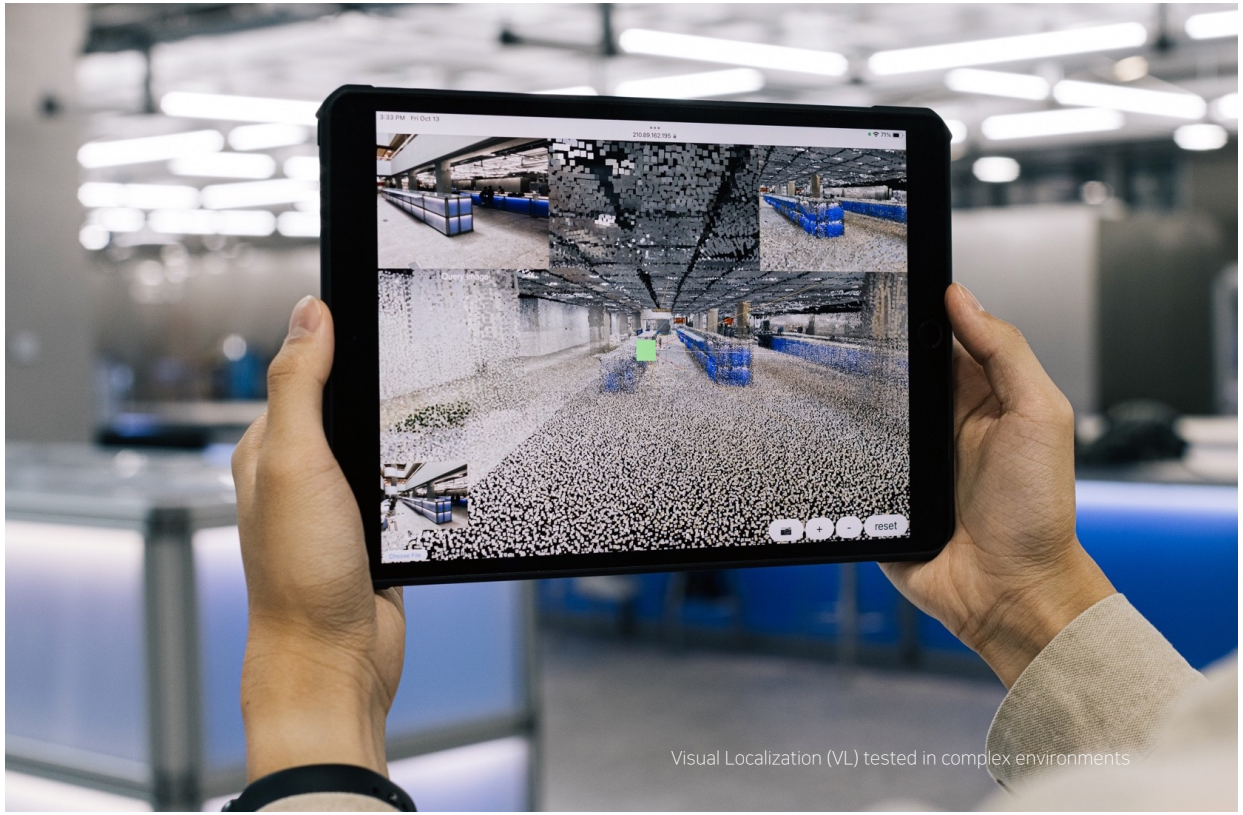
R&D

Vision

AI to explore spaces as accurately as the human eye and quickly adapt to complicated situations and changing environments.

Visual Localization

Visual Localization is a vision-based AI technology that accurately identifies a location by analyzing as little as a single image. Its camera pose estimation with 6-DoF (Degrees of Freedom) can be extremely precise even indoors where GPS is unavailable. This technology is essential for applications in robotics, autonomous driving, AR and more.



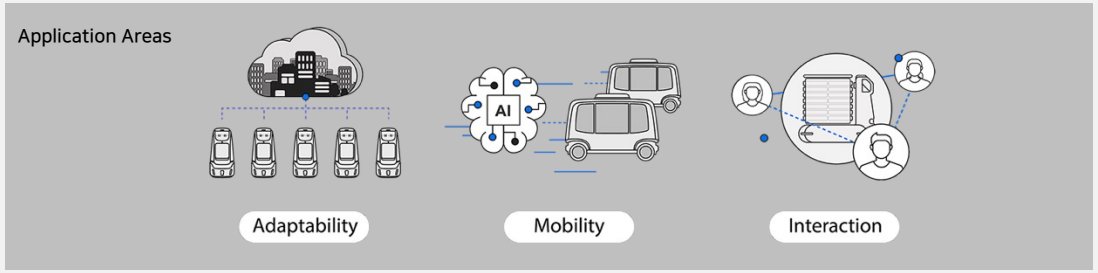
Visual Localization (VL) tested in complex environments

3D Vision Foundation Model

We research 3D Vision Foundation Models to enable AI to solve a broader range of everyday problems compared to models that are specific to single tasks. By training these models on extensive datasets, the model can be fine-tuned to make powerful applications in areas such as robotics and digital twins.

CROCO

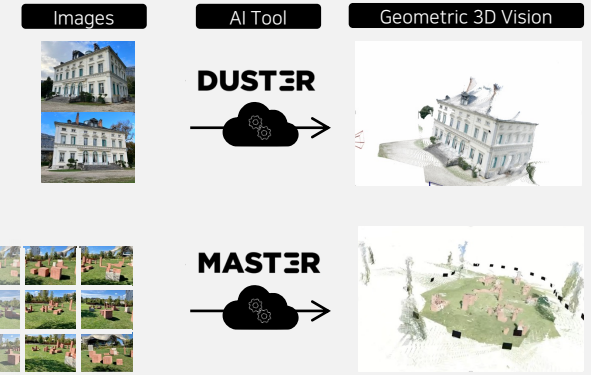
CROCO is a Vision Foundation Model that uses AI trained to understand our 3D world with image pairs of scenes taken from different perspectives. This model can be fined-tuned and applied to increase robots' adaptability, explore spaces and interact with humans.



DUSt3R & MASt3R

DUSt3R, a CROCO-based AI tool, creates 3D reconstructions from 2D images in a single step solution. Its 3D generation method is extremely robust and more efficient compared to traditional methodologies.

MASt3R, an upgraded large-scale version with an improved retrieval algorithm, can process thousands of images providing increased accuracy and expanding areas of application.



Autonomous Driving

We are advancing natural and safe autonomous driving in complex urban environments.
With our original HD mapping technology, we have internalized all on-road autonomous driving technologies including localization, perception, planning, and control.

ALT Project

We utilize our own full-stack autonomous driving technologies to create and advance a variety of autonomous robots for on-road environments.

ALT Platform

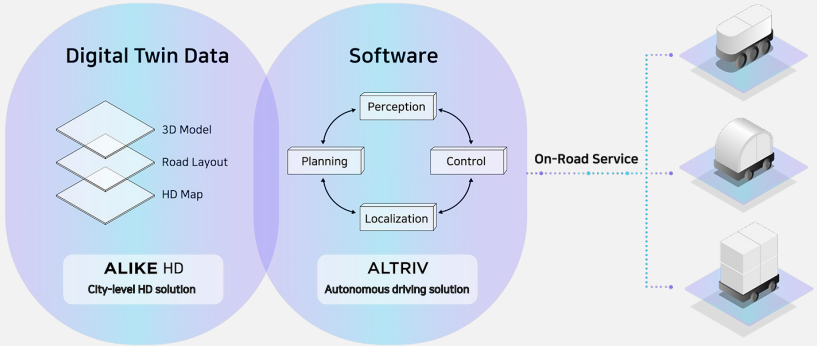
An on-road autonomous robot platform that can be customized for a variety of purposes. Based on the core autonomous driving technology and data, it can be transformed into many forms to provide various services.

ALT-B

An unmanned autonomous shuttle that connects key locations in the data center using full-stack autonomous technology. A variety of sensors provide precise detection of surrounding environments and enables safe driving.

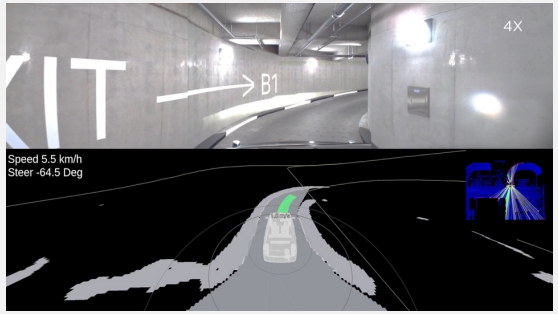
ALTRIV

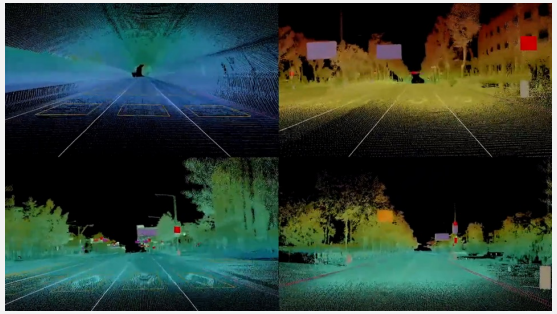
Autonomous driving software that reliably responds to various environmental changes in complex urban centers. It integrates technologies essential to autonomous driving, including localization, perception, planning, and control.



Urban Localization

Grafting our digital twin and visual localization technologies both outdoors and indoors, we enable safe autonomous driving not only on roads, but also on narrow ramps and in underground parking lots where GPS coverage falls short.

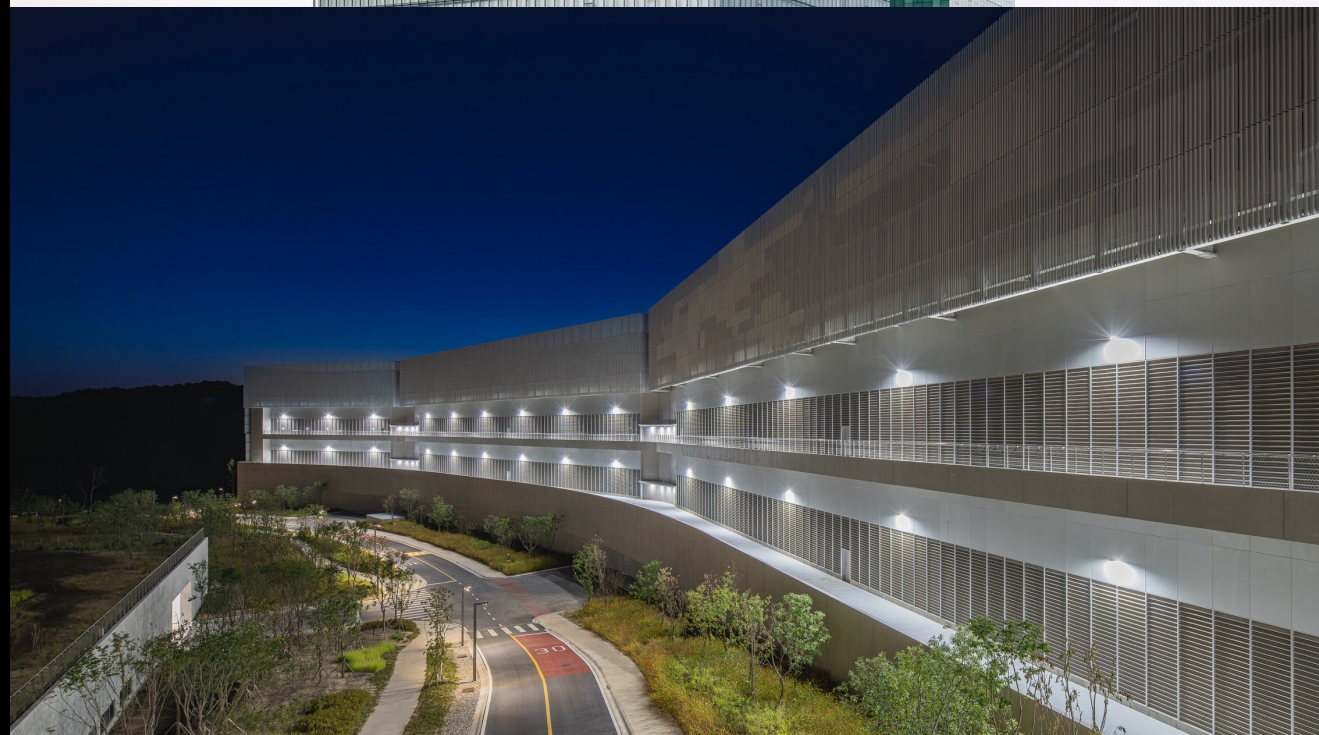




03

Our Testbeds

With the world's first robot-friendly building '1784' and hyperscale data center ' GAK Sejong' as testbeds, we create a virtuous cycle of rapidly demonstrating and servicing the most advanced technologies.

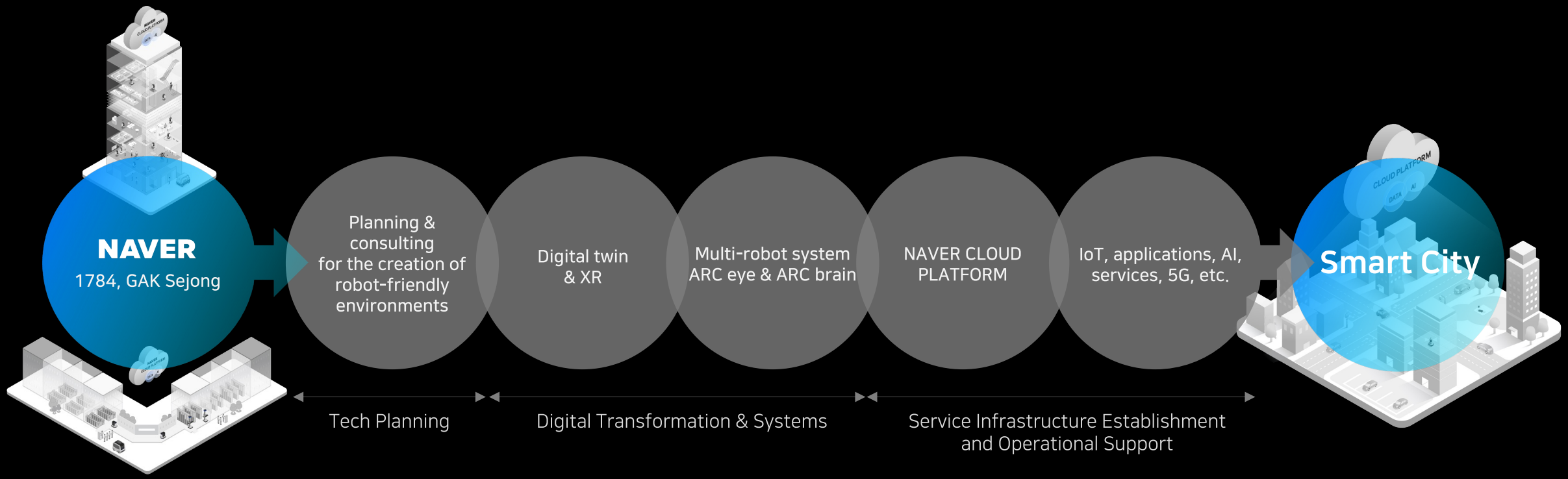


1784

GAK Sejong

Tech convergence solution for **future smart cities**

NAVER LABS is proving its technological competitiveness in smart cities to the world
by internalizing the core technologies required to create future buildings, advanced infrastructure, and solutions-as-a-service.
With the technology and tech convergence know-how accumulated through 1784 and the data center, we will create new connections in various smart cities.



Our Testbeds

1784 The world's first robot-friendly building

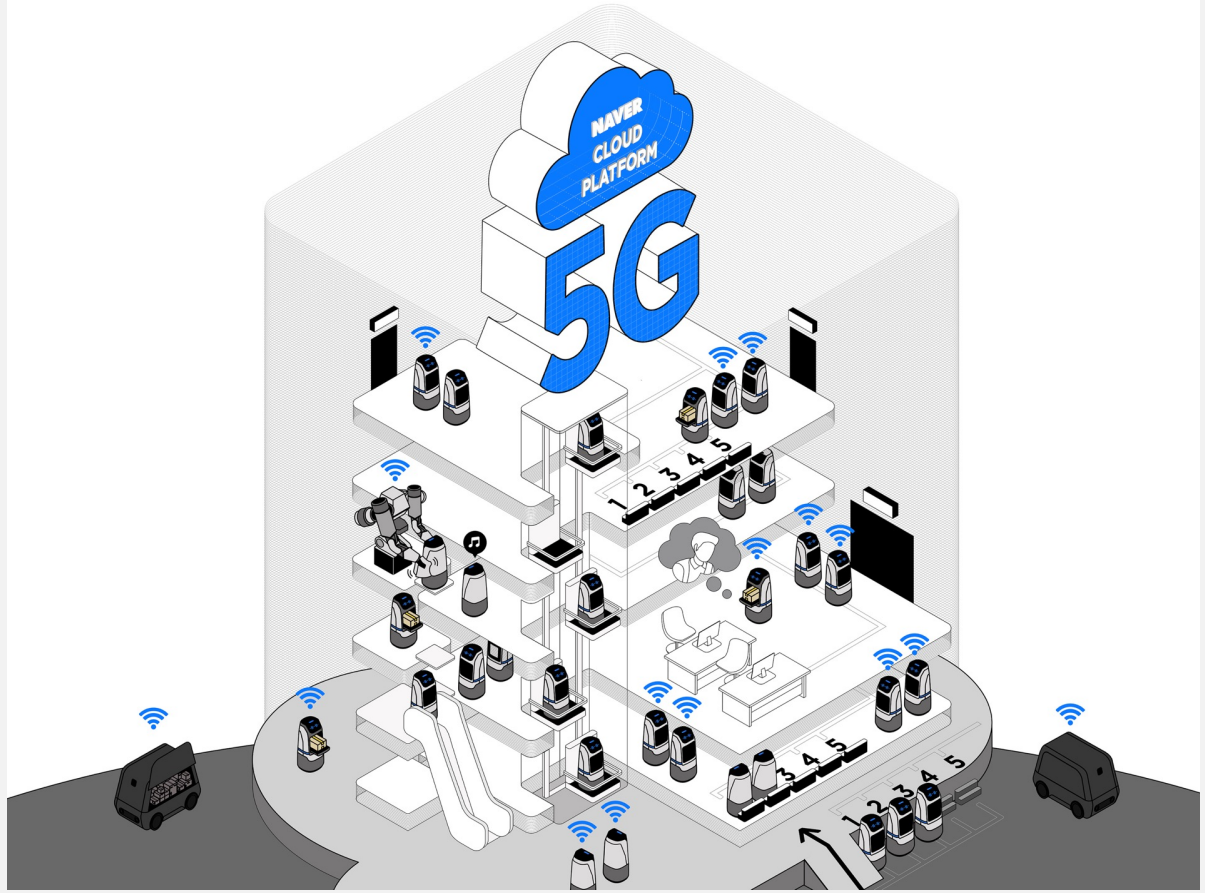
NAVER's second headquarters, 1784, is a tech convergence building where technologies such as robotics, autonomous driving, AI, 5G, and cloud come together.
The key solutions for the most advanced buildings of the future are applied in every location.

Our Testbeds

1784

5G Robot & Cloud System

1784 operates about 100 service robots that are connected to the cloud via 5G. A cloud system named ARC controls all of these robots to provide a variety of services, including package, drink, lunch, and convenience store delivery.

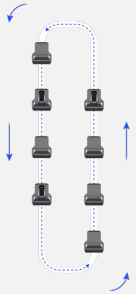


Human-Friendly Robot Interaction

We conduct research for the coexistence between humans and robots. We have codified our findings at 1784 into a set of guidelines called Natural Human-Robot Interaction (NHRI).

ROBOPORT

The world's first robot-only elevator allows robots to move freely between floors. It runs across all floors, from the second basement level to the rooftop, maximizing vertical movement speed and efficiency for robots in the 1784 building.



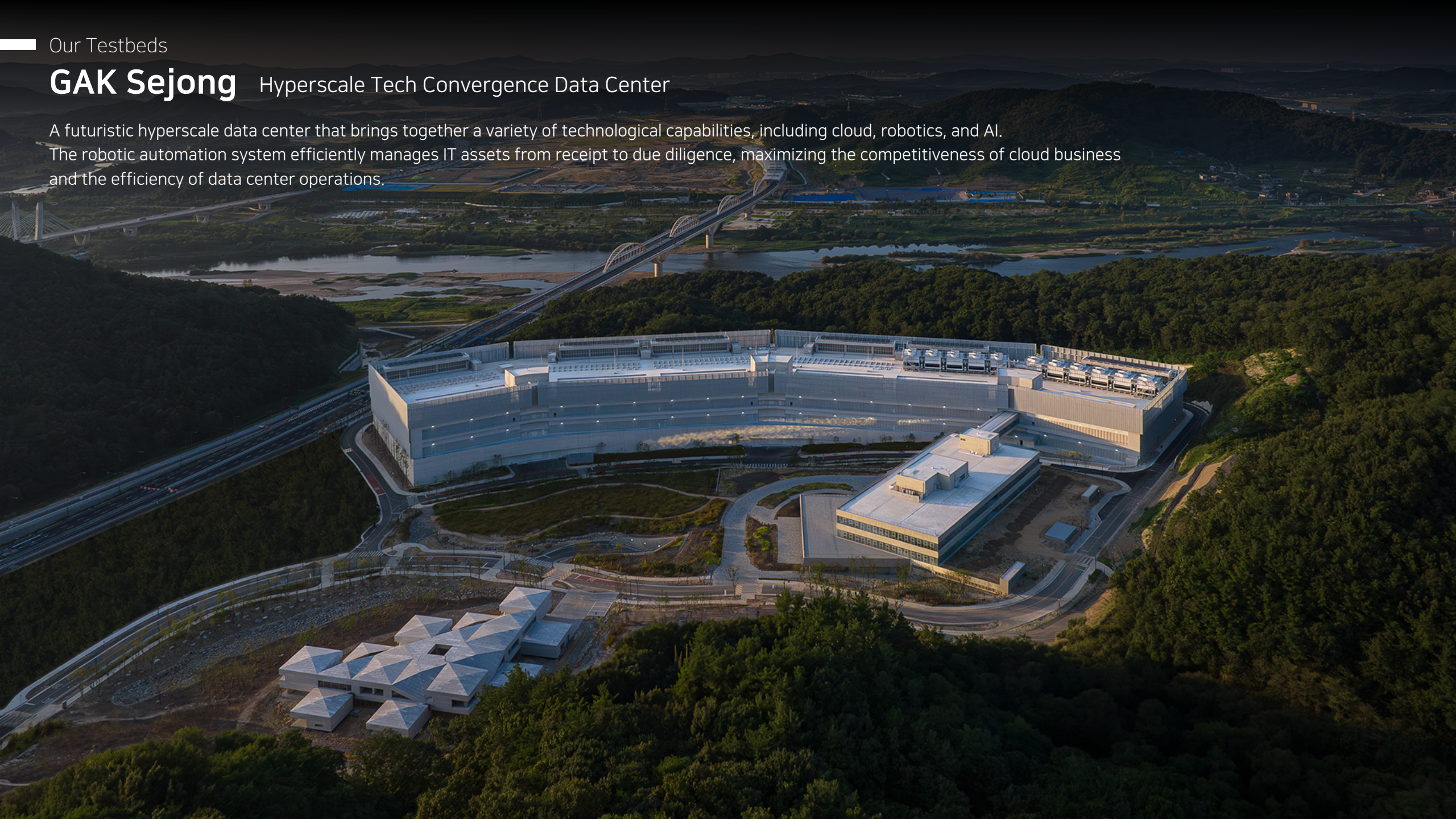
Ten carriers circulate on 128-meter-high rails that move vertically, with horizontally moving devices in the top and bottom rails.

Collision avoidance, robot-integrated predictive queuing systems, navigation path algorithms, and more are applied to the ROBOPORT.

Our Testbeds

GAK Sejong Hyperscale Tech Convergence Data Center

A futuristic hyperscale data center that brings together a variety of technological capabilities, including cloud, robotics, and AI.
The robotic automation system efficiently manages IT assets from receipt to due diligence, maximizing the competitiveness of cloud business and the efficiency of data center operations.

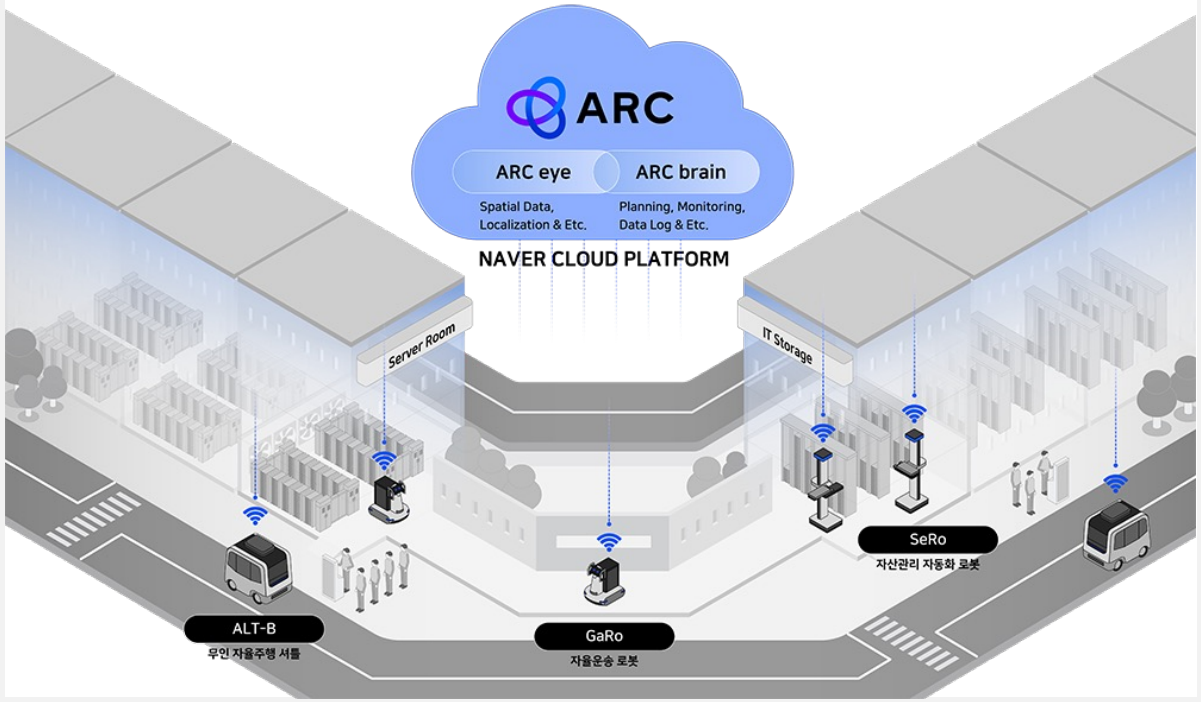


Our Testbeds

GAK Sejong

The epitome of tech convergence, following 1784

If 1784 is a testbed for smart buildings where the most advanced technologies converge, GAK Sejong is a testbed for smart campuses for future industrial sites. Through automated systems, robots at GAK Sejong transport heavy assets, manage asset history, and improve the efficiency and productivity of data center operations. As a global outpost of smart city solutions, NAVER LABS is constantly updating innovative operations systems for future spaces based on unprecedented technologies and the data from GAK Sejong.



GaRo

Autonomous transportation robot that moves heavy servers and assets around the data center. It can carry loads of up to 400 kg and move quickly at a speed of 2 m/s.


SeRo

Asset management automation robot developed to safely and efficiently manage key assets in data centers. With precision control of 2-5mm, it can safely load assets without human intervention.


ROBOSTATION

A workstation where humans and robots can collaborate safely. People and the asset management automation robot 'GaRo' can safely exchange assets in separate areas to flexibly respond to changes in tasks.


ALT-B

A driverless, autonomous shuttle that connects key locations in the data center with full-stack autonomous technology. It precisely detects the surrounding environment with various sensors and drives safely.


04

PLATFORM & PRODUCT

We provide companies and organizations aiming to develop new innovative services with digital twins of large-scale spaces through the NAVER Cloud Platform. Our clients can receive the latest digital twin-based technologies without being restricted by initial development costs or facing pressure due to the pace of technological change.

NAVER TwinXR Platform

ALIKE Solution

ARC eye

ARC brain

ARC mind

NAVER TwinXR

Platform Info >

Integrated platform for our digital twin solution and various spatial intelligence technologies.

By creating a virtual world that replicate the real-world and by providing solutions in which the two worlds interact, NAVER TwinXR supports the development of innovative services such as AR/VR/MR, robotics, autonomous driving, and smart cities.

Use

Smart City | Robot | Autonomous Driving | AR/VR/MR | Smart Glasses | VFX

Solutions

- **ALIKE** — Digital Twin Solution
- **ARC eye** — Vision Based Localization
- **AR SDK** — AR Service Development Kit

Spatial Data

Mapping Robot & Device


M series


T series


R series


P series

Tools

- Data Editing Tools
- Map Authoring Tools
- Object Scanning Apps
- SDK, etc.

Foundation Model

- CROCO
- DUSt3R, MASt3R, etc.

Tech

Digital Twin | Computer Vision | Machine Learning | Robotics | Cloud Computing | & etc.

ALIKE Solution

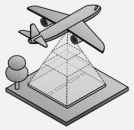
Product Info >

Megacity-scale digital twin creation solution

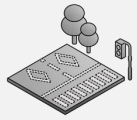
We provide the core technology for developing citywide 3D spatial data through NAVER Cloud Platform.
Using AI and aerial photography, we can quickly and efficiently create 3D models of various spaces throughout the city.

■ ALIKE Solution

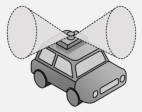
With Aerial Photos & Mobile Mapping System (MMS)



ALIKE 3D
City 3D Model



ALIKE RD
2D/3D Road Layout

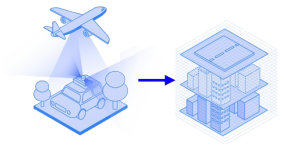


ALIKE HD
HD Map for Autonomous Driving

■ Key Features

Moving the real world to the digital world

We create 3D models of the entire city through ALIKE, a digital twin creation solution developed by NAVER LABS. The models can be used to create innovative services such as service robots, autonomous driving, AR/VR, smart buildings, and smart cities, by building digital worlds identical to the real world.



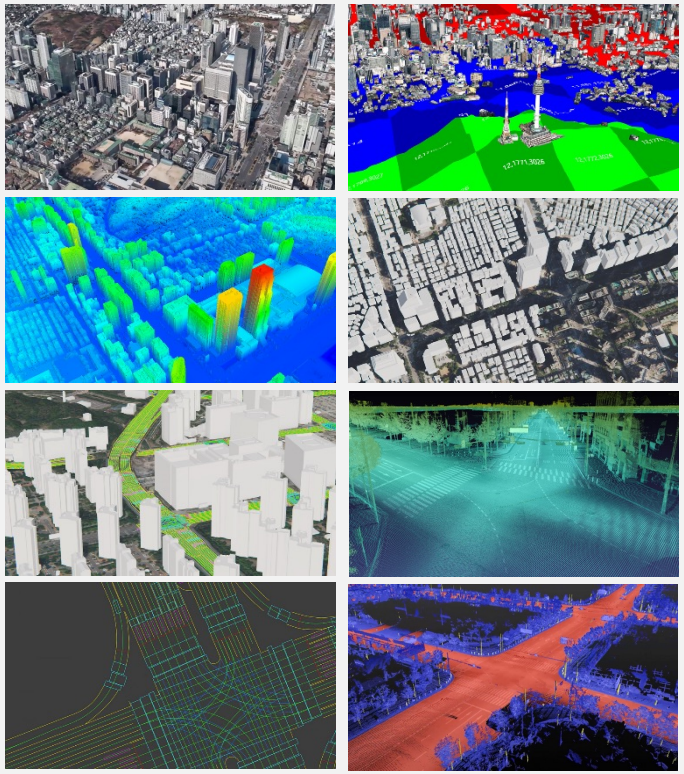
A unique and efficient way to create data

We collect and process data of the entire city through a unique method that utilizes aerial imagery, AI, and MMS. The integrated production of key data, such as 3D models of cities, road layouts, and HD maps, dramatically reduces production time and process while increasing accuracy and efficiency.

High scalability based on NAVER Cloud Platform

Digital twin data creation, processing, and API creation, are all fully managed in the cloud. This reduces the need to make large investments in the initial stages of a new digital twin-based business while allowing clients to access the most up-to-date equipment, algorithms, and web-based console despite paying only for the resources used.

■ Outcomes



ALIKE Solution

Product Info >

■ 3D / HD Mapping Devices

A series of mapping devices developed in house that can scan spatial data in various environments of different sizes.

M series

A high-precision 3D mapping robot. With its unique hardware and sensor structure, it builds digital twin data of large indoor spaces in an accurate and efficient manner.

T series

A wearable mapping device for creating digital twin data of complex spaces, such as staircases. Based on excellent scalability, the device connects spatial data from different environments, from indoor environments to outdoor sidewalks, most effectively.

R series

A vehicle-type mobile mapping system (MMS). The 2D and 3D data collected while traveling on the road are used to create HD maps.

P series

A street view vehicle-based panoramic mapping system for building digital twins as large as entire countries.

ARC eye

Product Info >

Image-based localization system development and large-scale in/outdoor digital twin creation service

We offer AI localization technology that can be used to build indoor and outdoor digital twins and can be applied to AR, robots, smart buildings, etc. as a NAVER Cloud Platform product. Using the service enables users to create digital twin data of large indoor spaces, such as large malls, buildings, and airports, as well as nearby outdoor spaces accessed on foot.

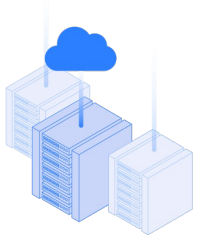
■ Key Features

AI-powered precision localization

We provide precise location information using AI-based localization APIs needed to build digital twin data and a variety of mapping devices. The data collected is seamlessly and accurately connected to form a massive digital twin world.

Fully managed in the cloud

We offer fully managed services to build and utilize digital twin data, from spatial mapping to data processing to API creation.



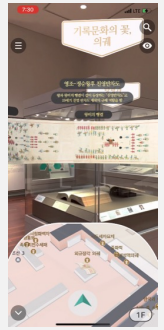
Responding to large-scale services

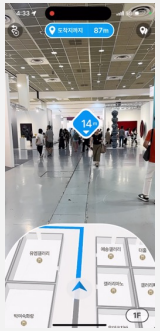
Cloud computing provides the flexibility to respond to large-scale data storage, changing API usage, and more.

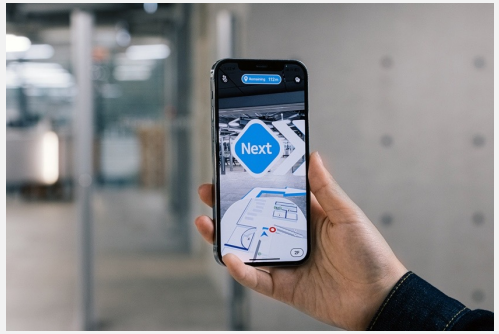
■ Applications

Autonomous Service Robot Indoor Localization System

Indoor AR Navigation







ARC brain

CBT Ongoing

Cloud-based multi-robot control, management, monitoring service

A multi-robot platform for controlling/managing/monitoring multiple heterogenous robots moving inside a large space, in real-time.
ARC brain takes over the movement, planning, and processing of robots and can integrate with facilities such as elevators to provide reliable robot service.

■ Key Features

Multi-robot control system

Provides a control system to reliably and efficiently operate a large number of robots in a smart building or large commercial space. Allows users to monitor and manage the status of robots, facilities, services, and more in real-time.

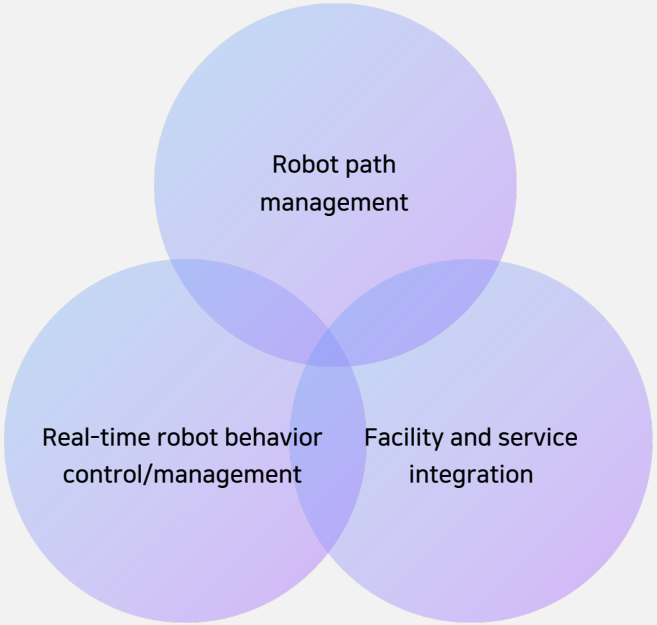
Robot development API·SDK

We provide APIs and SDKs for connecting various types of robots. The behavior of new robots can easily be defined by integrating them with ARC brain.

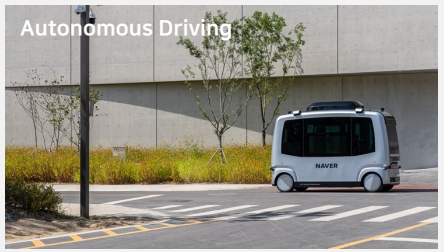
Robot simulator

Provides a robot simulator to test detailed robot behavior, including movement, in a virtual environment. Enables more efficient stability validation in robot function development and change.

■ Key Features



■ Applications



ARC mind

CBT Ongoing

Web Platform-Based Robot OS

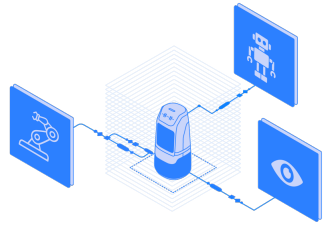
ARC mind is an OS that provides an environment for web developers to easily develop robotic services. It features a highly scalable development environment based on a web platform, robot-specific web APIs for hardware control, and various solutions from the NAVER Cloud Platform.

■ Numerous robot services with a combination of web applications

■ Key Features

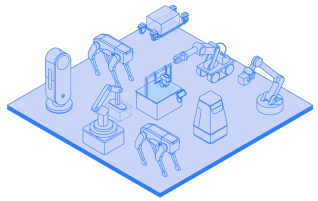
Developing a variety of services

Until now, we had to develop individual services for each robot. But from now on, we can connect countless web applications with robots around the world.



Web API for robots

In order for the numerous software on the web platform to be successfully integrated into robot services, some factors are necessary: web APIs specialized for robot perception, motion, and movement, which ARC mind faithfully provides.



High compatibility

Based on the excellent compatibility of the web platform, ARC mind can provide compatibility between multiple robots, different types, and even robots from different manufacturers.

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