SUPERMAP COMMUNICATIONS

May 2022 Issue 04
www.supermap.com

SuperMap GIS Solutions for

SMART PARKS

Who is SuperMap?

SuperMap was founded in 1997, focusing on the research, development and application services of GIS related software technology. It consists of SuperMap Software (parent company, stock code: 300036), wholly owned subsidiaries, and holding subsidiaries, as well as domestic branch offices and agencies. The total staff number of SuperMap is more than 4,000 and the annual revenue reached 260 million USD (1.7 billion RMB).

1997
Founded

How has SuperMap Performed So Far?

As a GIS software manufacturer, SuperMap has made a great effort on the development of GIS platform. It has two business lines of platform software and application software, and more than 1,000 ecological partners to empower the informationization of governments and enterprises in industries. Now, SuperMap ranks 1st in Chinese GIS market and has developed distributors and partners in over 50 countries and SuperMap GIS end users in over 100 countries.

100+
Countries'
Users

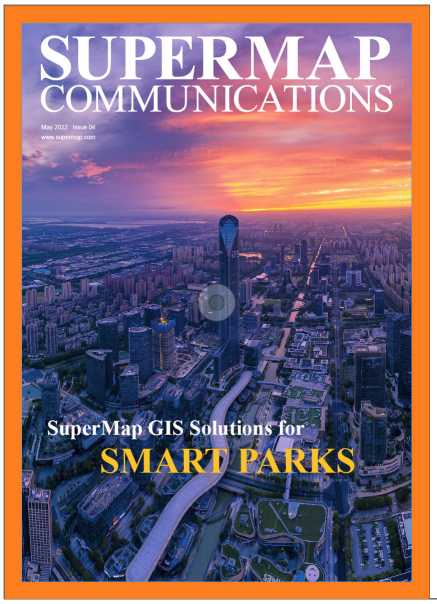
What will SuperMap be?

With "Innovate IT Value with Geo-intelligence" as the mission and "Create Cutting-edge Technologies constantly, Light up Every Corner of the Planet with Geo-intelligence" as the vision, SuperMap will keep providing advanced GIS technologies and products to more global users.

1000+
Partners

4000+
Employees

SuperMap



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FOCUS

CASE STUDY

Supermap GIS Solutions For Smart Parks

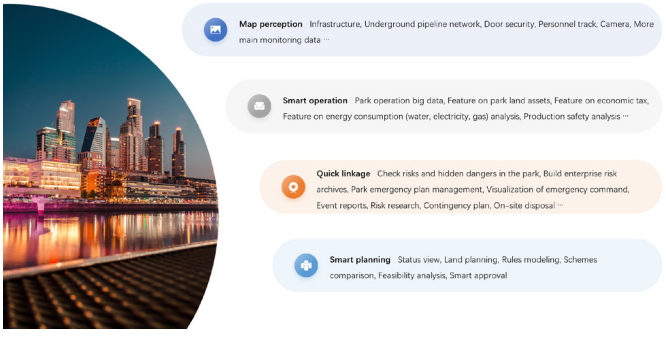
Source: SuperMap Smart Park Engineering Center

Over recent years, the flourishing “smart” products have drastically changed human life. Smart parks are considered the epitome of smart cities. The Smart Park is a new concept and model facilitating the planning, construction, management and service of the park using plentiful new-generation information technologies such as IoT, cloud computing, big data, and geographic information integration. It enables the park to upgrade, which will allow parks and enterprises to gain an increase in profits, and thus achieve sustainable development of the park.

These burgeoning technologies led to a comprehensive management service platform for the “smart park” (industrial parks, Hi-tech parks, free trade areas, etc.).

The Comprehensive Management Platform for Smart Parks developed by SuperMap can get through the data resources process, mine data value, and provide information services for park design, building, and maintenance. Relying on these key technologies and enhancing IoT big data management capabilities, the Comprehensive Management Platform for Smart Parks provides a BIM-based platform integrating the planning, building, management, and operation of the park. The platform can provide all-around application services ranging from park planning and construction, investment promotion, and operation supervision, to security command and dispatch for park managers, decision-makers, and park planning departments, which are conducive to industrial transformation and upgrading.

Types of smart parks



Application scenarios

Framework

The platform is developed based on SuperMap GIS. It is a standard-based, open, extensible, and sharing platform. The system architecture follows SOA and is composed of six layers: software and hardware infrastructure layer, data layer, platform and service layer, application layer, business layer, and display layer. The platform supports the visualization of park overview, query, statistics, and analysis based on the data service and analysis service.

Functions of the platform

1. Comprehensive Management Platform for Parks

It provides 2D-3D integrated geographic information services, resource catalogs, and asset ledger services for an integration of ground, underground, and total factors of the park, and query and statistical analysis services for various utilities in the park.

2. Comprehensive Operation Visualization System

This system can classify and display various assets in the park through the resource catalog tree, and it has the functions of 2D-3D integrated display, query, statistics, analysis, and summary of various assets.

3. Underground Pipeline System It provides real and accurate comprehensive pipeline information, with functions of quick query and statistics, positioning, auxiliary analysis, and decision-making, and provide a reliable basis for the design and construction of the park's pipeline network, daily management after completion, pipeline network maintenance, analysis and statistics, and planning decisions, forming a comprehensive pipeline information system for centralized management and distributed applications.

Comprehensive Operation Visualization System

Park Display System for Investment Attraction

4. Security&Emergency Response Management System

It is an integration of command and dispatch information system, video and image monitoring system, vehicle positioning system, personnel positioning system, emergency plan system, and emergency equipment management system.

5. Commercial Lease Management System

This system supports managing leases of buildings, houses, shops, storefronts, advertising spaces, etc. in the park through 2D-3D integration, and registration as well as filing of lease contracts of merchants, and supervision and management of business activities.

6. Inspection Management System

Using GIS, GPS, or indoor WIFI positioning technology to provide staff with a visual inspection management system to allow hierarchical management of the entire park utilities. The system digitizes all facilities resources involved, allowing managers to be aware of the layout, construction, and maintenance of the overall facility, and allowing inspectors to collect information on the geographic locationand related attributes of resources through handheld terminals, allowing managers to view the playback of inspection personnel's movement information, historical trajectory, and maintenance records.

7. BIM-based Construction Registration and Drawings Management system

This system manages the building project approval process and the construction process carries out the association and storage of designing information, construction drawings, construction process, and data changes of each plot, building, and component.

8. Aiding Planning Management system

The system supports simulating and making decisions on the planning, design, and operation of spatial engineering in the park employing BIM+GIS digital twin technology.

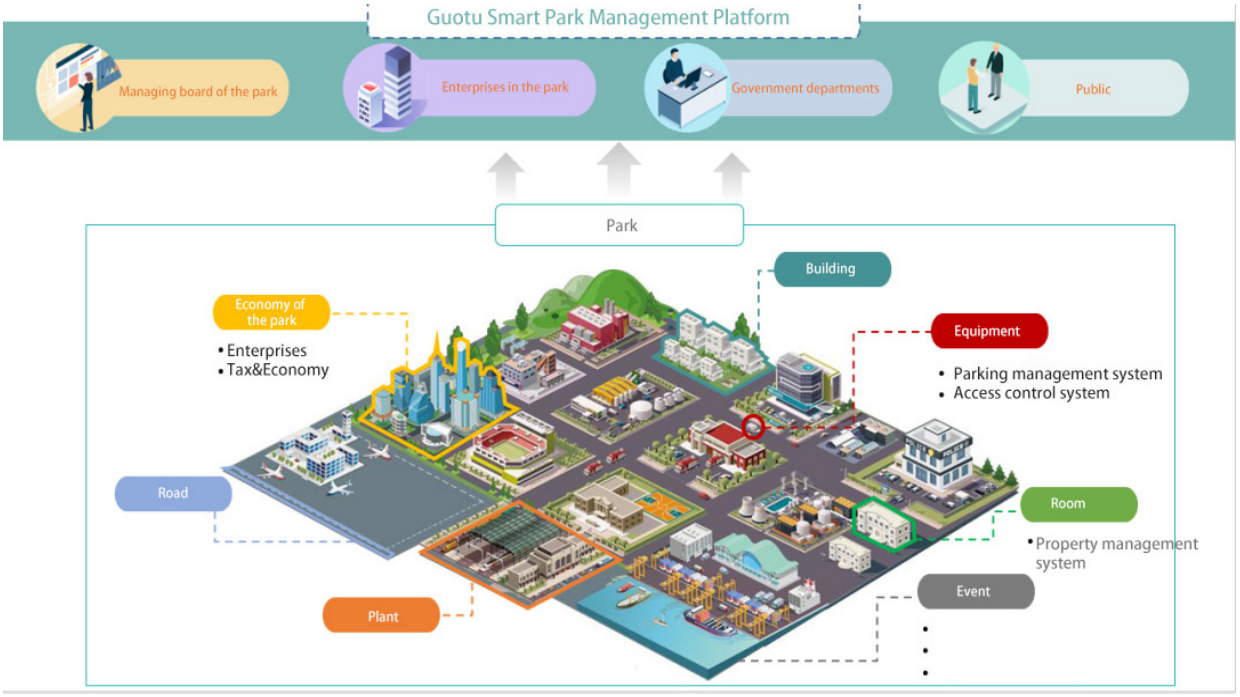
9. Park Display System for Investment Attraction

This system can exhibit the overall situation of the park in a 2D-3D integrated way to fully display the features of each park including development strategies, investment attraction policies, and shop lease announcements through multimedia.

Integrate Geo-intelligence and IT to Innovate the Management of Smart Parks

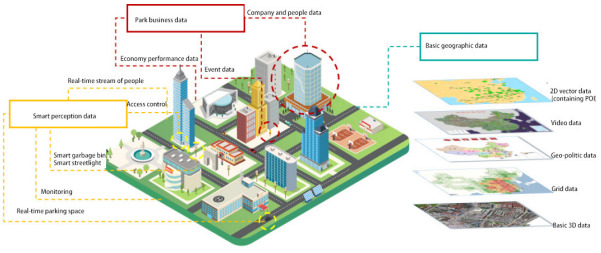
Author: Ji Jingling, Guotu Information

Guotu information (a subsidiary of SuperMap) has been involved in the intelligent application software industry for many years. With integration, map perception, quick linkage, smart operation as the core, it has formed a set of smart park solutions with full coverage, high practicability and strong flexibility, serving the management committee, enterprise groups and visitors of the park. In this solution, the economic park centers more on intelligent operation, that is, comprehensive management and overall operation of the park, while the chemical park focuses more on quick linkage, that is, production safety, risk monitoring and management, emergency response, etc.



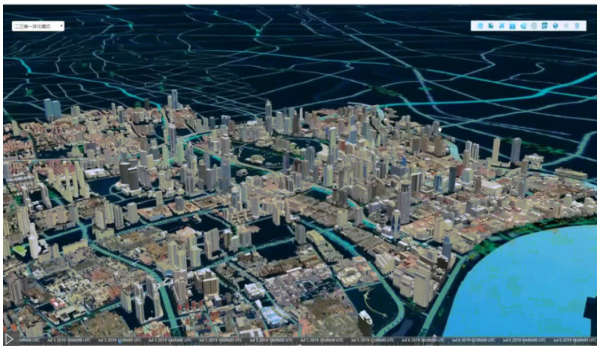
Integration: Park management on “One Map”

There are a lot of data in the process of park operation, such as basic geographic data, special topic data of park operation, dynamic monitoring and perception data, etc. They are scattered in various departments and are collected and exported in isolation from each other. How to break the gap between data and effectively connect these data to serve the operation of the park is a basic problem that the smart park platform must solve. Based on all kinds of existing data and using maps as the carrier, we formulated a unified space-temporal datum. Through data aggregation, sorting and fusion, we finally formed a multi-dimensional unified full-space space-temporal resource pool to get a clear picture of the park’s background. Based on the space-temporal resource pool, the platform manages the park resources as a whole.



Space-time resource pool of the park

The 2D and 3D scene is the macro expression of the park. It integrates the 2D, 2.5D, and 3d data (stretched model, fine model, oblique photography, laser point cloud, etc.) of the park in the same scene through the 2D and 3D integration technology, to integrate the information of the park, including land, buildings, vehicles, equipment assets, events and other information on the map. It provides data basis for subsequent map perception, quick linkage, and smart operation.



Integrated 2D-3D scenes

The gate and smart exhibition hall of the park can be connected to the 2D&3D integrated large screen to display the basic information and landscape of the park. The operation and control center can also be connected to the geographic dashboard system to monitor events in the park and respond to emergencies quickly.

Map perception: Management of smart facilities on the map

Through the access of various intelligent devices in the park, such as location, device information, and real-time perception data, the location and operation parameters of various sensing devices are marked on the map to quickly perceive the status of the park. The perceived data includes the facilities of the park, the state of the underground pipeline network, access control, personnel tracking, cameras, and other key monitoring data. Smart perception provides more valuable data information for data collision and top-level business applications in smart parks.

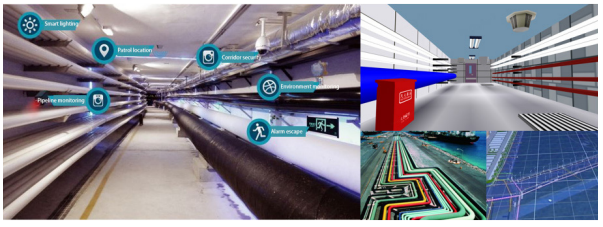
Basic perception includes the infrastructure of the park, the state of the underground pipeline network, access control, and personnel tracking.

Monitoring of infrastructure

Application of face recognition, intelligent detection, Internet/Internet of things technology to access smart equipment support the personnel and vehicle access control, security alarm, information query, and other functions of the access control management, to provide support for the safety of the park. The personnel and vehicles entering the park are identified, and the behavior trajectory is constructed within the viewable range of the park probe.

Access control monitoring

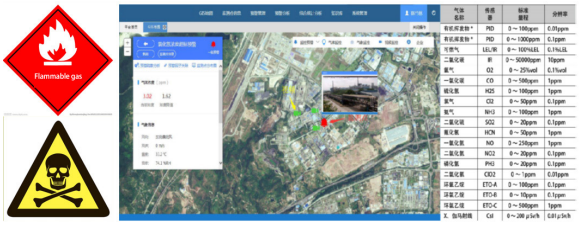
Monitor pipeline safety in the pipeline corridor and the status of the pipeline corridor space and auxiliary facilities in real time, timely response to emergencies, such as pressure, temperature changes, automatic alarm message, support remote opening or closing of emergency equipment.



Underground corridor monitoring

Key monitoring mainly includes three modules: hazard sources, pollution sources, and primary defense and protection, centering on visual presentation and monitoring of main hazard sources, pollution sources, and key protection targets.

Monitoring of high-risk gas: The platform can access the gas monitoring data of the park, and display the monitoring data of the dangerous gas perimeter of key enterprises and the whole gas perimeter of the park. When the monitoring data reaches a critical amount, the early warning function is provided to conduct multi-gas monitoring and early warning, and security monitoring and early warning at the perimeter of key areas.



High-risk gas monitoring

Monitoring of vehicles carrying hazardous chemicals: Information review and real-time monitoring can be carried out on hazardous chemicals vehicles entering the park. When the vehicle enters the park, check the vehicle information and driver information. If the information is inconsistent with the pre-reported information, a warning will be given. If the hazardous chemicals vehicle equipped with GPS fails to drive according to the route or stop in the designated parking area in the park, the alarm will be triggered.

Monitoring of major hazards: Hazardous chemical storage facilities, transformers, etc. Support abnormal state alarm, historical state backtracking, which renders it easy to find the cause.

As regards video surveillance, the platform visualizes the point position and distribution of cameras to carry out the full-service functions of video surveillance, including list synchronization, real-time preview, video/playback, capture, status display, etc. It supports GPS terminal scan on the map and automatically opens and closes the peripheral camera. It can adjust the map position. In the long view (zoom out), the overall camera data statistics of each area can be displayed. In the close view (zoom in) of the local map, the location information of specific video surveillance points can be viewed and the camera can be turned on.

At the same time, to reduce the workload of personnel and improve the early warning response capability, the system can use the function of AI video analysis to automatically

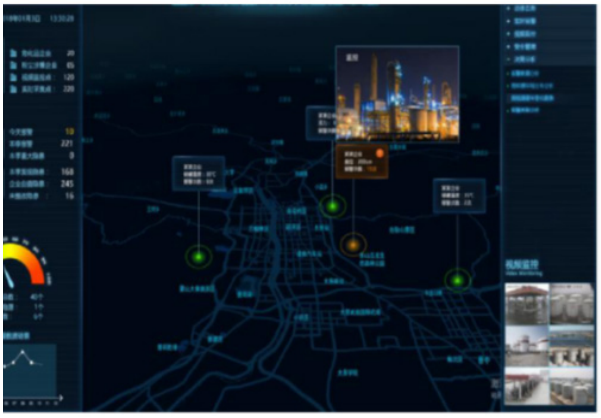
High-risk gas monitoring

identify and alarm abnormal phenomena such as flame, smoke and personnel intrusion around the pipe corridor, and remind the personnel on duty to respond immediately.

To project the video stream of the monitoring equipment in the outdoor and key indoor scenes of the park into the 3D scene, spatially integrate the video data and 3D scenes data, which can change the traditional model of the map application that can only be displayed statically, and control the overall monitoring area in real time instead, so as to guarantee the security of the park.

Quick linkage: Emergency response to remove hidden dangers

The system can both function in scenarios of “normal monitoring” and “wartime dispatching”. While the former is used for daily communication, park operation monitoring, and management, the latter is in case of a major or comprehensive event after a quick shift.

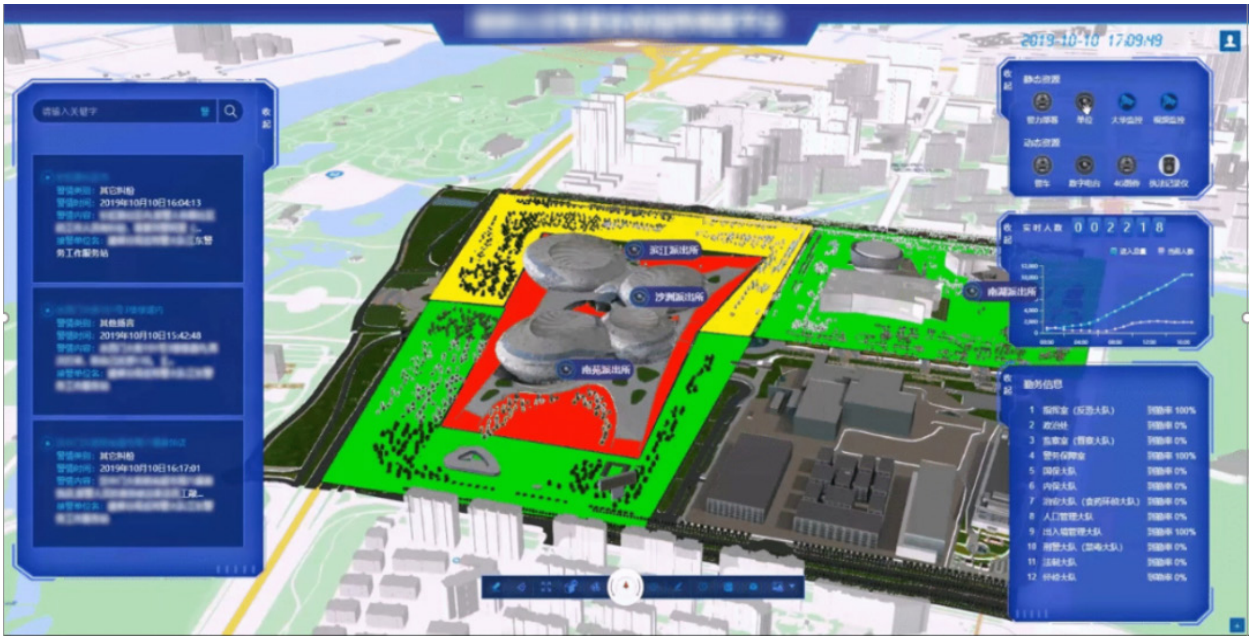


Event response and emergency plan

Counting and analysis of the risk and hidden danger information of each unit in the park. For enterprises with numerous potential dangers, an inspection order will be generated, and professional personnel will visit to check the relevant equipment according to the hidden danger category, generate a risk hidden danger report, and order rectification.

Create risk files for enterprises in the park for analysis and judgment. Generate enterprise holographic files to record risk hidden dangers, previous warnings, previous accidents etc., in enterprises.

Build an emergency drill management system, render normalized virtual drills and process assessment in typical accident scenarios automatic, support flexible editing and implementation of plans and drill scripts, support the tracking management and evaluation of the whole process of drills, and facilitate sand table emergency drills. A variety of plans are formed at the center of the exercise process, and the plans are visualized. The impact degree of the event and the content of the relevant plan documents are visualized in the plan. When an event occurs, the plan related to the event can be displayed on the map, showing the plan type, the degree of impact of the event, and the plan handling process.



Emergency plan management

Display warning information, event level, event location, security personnel location, fire facilities location, contingency plan display, and support automatic alarm to the public security, fire alarm, simultaneous scene alarm, and monitoring. It is convenient for managers to understand the progress of the situation, and provide intelligent decision support for park managers to realize the functions of park public security management, security prevention, and emergency public security incident control.

The park rescue command system is the application scenario of "wartime dispatch". Relying on the planning process, the command center's handling of emergencies is the core to visualize the whole business process of the emergency handling mode. Relying on the integration of communication dispatching capabilities and the close integration of command and rescue services, the visualization of the entire business process of command and rescue under the emergency handling mode is enabled, and the event task handling nodes are presented in a time-axis manner, so as to quickly connect command and coordinate the handling of rescue in a unified manner.

The disposal system is based on the event disposal process and time tasks, mainly including modules of "event reporting", "dangerous situation analysis", "emergency plan", "on-site disposal" etc.

Smart management: Promote the park's development

Digitally empower the daily investment operation of the park and the operation of enterprises in the park, and establishes the geographic grid operation analysis of the park's big data. The platform conducts

unified standards, mining, and analysis of data, and park managers will learn the real-time status of park personnel, resources, and events at any time, and comprehensively control the operation of the park. Once emergencies occur, cross-departmental, cross-regional, and cross-system collaboration will be enabled, resources can be dispatched uniformly, and rapid response and disposal can be conducted. The smart operation has vitalized data of the park which is also given to full play.

Graphically manage the usage of geographic information service resources in the park and the access status of various smart devices, perform statistical analysis on the reliability of the signal sources of each device in the park, and provide efficient, comprehensive, and complete one-stop services for the park through the big data chart of the operation, demonstrate the park’s operation condition in the portal or operation analysis module.

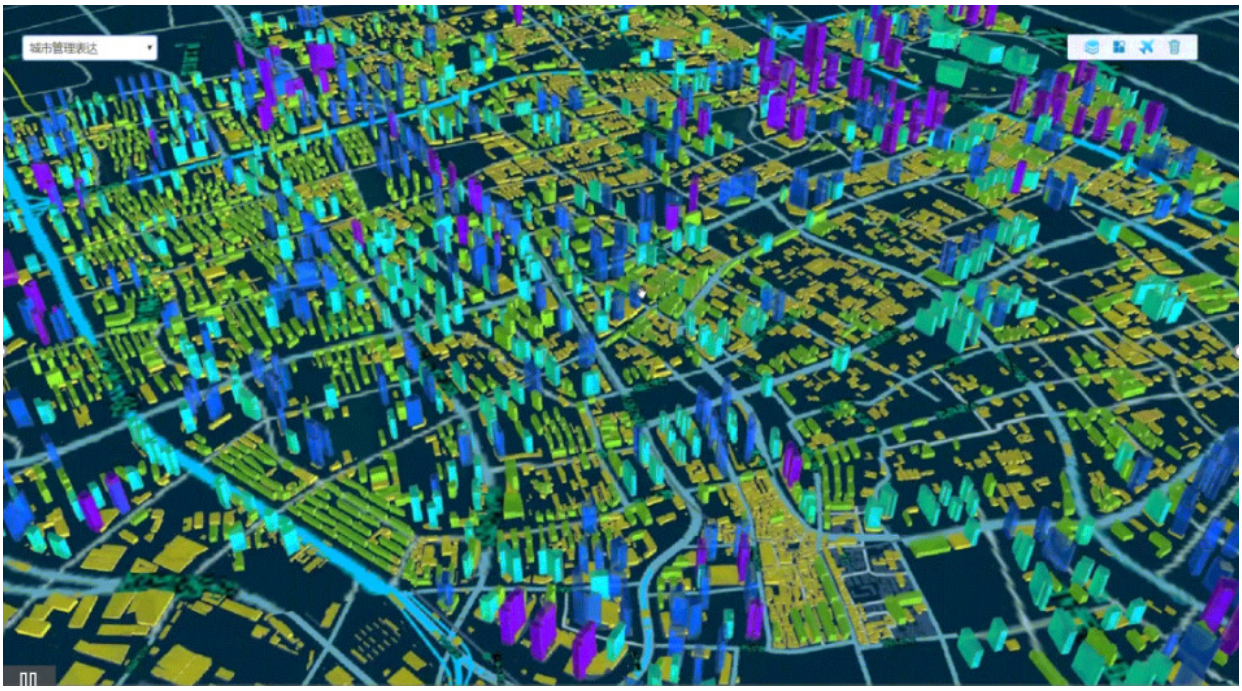
Analyze and evaluate real estate assets such as park land, factories, and buildings, find out the assets of the park, analyze the efficiency of land use, and guide the optimization of park land use and the planning of industrial land use in the new area.

According to the economic benefits and tax information of enterprises and production units in the park, the efficient industries and high-contribution economic models in the park are analyzed, which is convenient for decision-making reference for the park's sustainable development of excellent industries and production re-expansion.

Efficient energy management in the park is an important support for the operation and service of the park. Energy such as water, electricity, and gas need to be managed. The consumption of various energy sources, peak and trough values, general patterns, and abnormal usage in

Park’s operation big data

Feature on land assets in the park



Feature on analysis of park' s energy consumption (water, electricity and gas)

various areas of the park buildings are calculated. Sub-regional and sub-category analysis in the system is conducted to give managers information on the management and optimization of efficient and green use of energy in the park to reduce energy consumption, save operating costs, and thus decrease the overall operating costs of the park.

Considering accidents in the park over the years, a big data honeycomb map of the safety production in the park is formed. The existing safety hazards and safety gaps in the park are analyzed, linked with the emergency plan, and high-risk operation areas are marked in red on the map for key prevention and control of safety hazards.

Analysis of park' s production safety

Summary of solutions

As different regions and industries continue to pay attention to smart parks, the construction and upgrading of smart parks are imperative. Based on integration and assisted by map perception, diversified solutions are given to different types of parks through both quick interaction and smart management. Meanwhile, in the development and management of future cities, smart cities can also draw on the construction experience of smart parks to combine building smart parks and optimizing industrial chains for a win-win result.

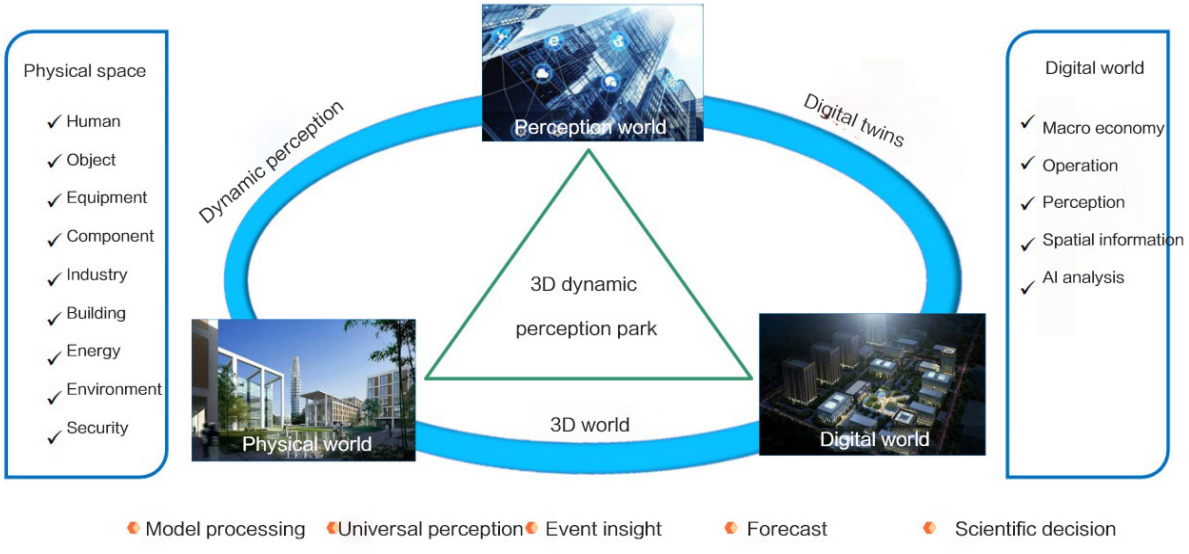
The Digital Twin Platform for Smart Parks

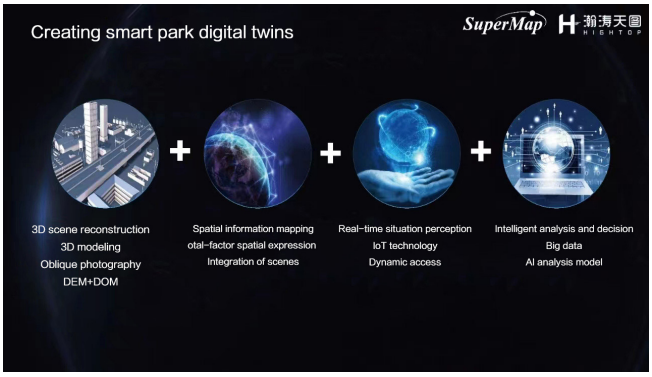
Source: HIGHTOP

The digital twin platform for smart parks, based on the digital twin concept, builds a comprehensive service middle platform oriented towards applications, data, and AI analysis. It forms a digital environment in the smart park that supports the planning, construction, management and operation of the smart park.

By means of the capabilities of data, analysis, sustaining applications of this platform, SuperMap and its partner HIGHTOP (GIS service provider) combined the overall needs of park planning, construction, operation, management and investment promotion, built a scene-oriented integrated solution facing industrial parks, tourism areas, factories, characteristic towns, urban new regions, etc., and formed a product line that supports the open eco-system of smart parks.

The digital twin in the smart park is to build a digital twin world oriented to the smart park, so as to achieve the inspection, management and traceability of all elements such as the situation of the park, equipment operation and maintenance, property management, operation service, security and prevention and control, and collect, recognize, make decisions and coordinate information of different dimensions in the digital twin world.





Park planning

To present the park planning from three perspectives: land use, project and industry, show the park planning results according to the current situation of the park, compare and select planning schemes, so as to comprehensively and intuitively understand the construction and development trend of the park.

It includes:

Display of project planning

Display of land use planning

Display of industrial planning

Display of planning results

Comparison and selection of planning scheme

Park construction

To manage and control the progress, safety, construction environment monitoring, quality and other aspects of the project construction and site construction in a visual way, assist the management of the construction process of the park, improve the safety of the park construction, and control the quality of the park construction.

It includes:

Project on “One Map”

Project progress

Image progress

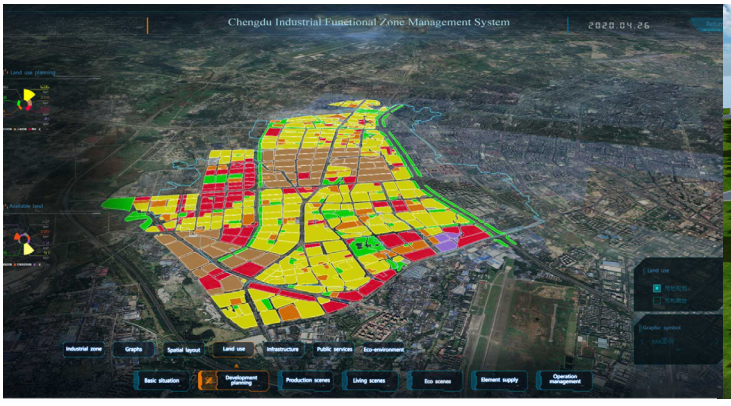
Project Panorama

Video inspection

Site monitoring

BIM cooperation

Engineering data



Park publicity and investment promotion

To interpret the park investment policy, analyze industrial chain matching degree, enhance the attraction of the investment for the park, optimize the investment management process, improve investment service quality based on the park location advantages, park positioning, development planning, resource supporting and other favorable factors.

It includes:

Location advantage

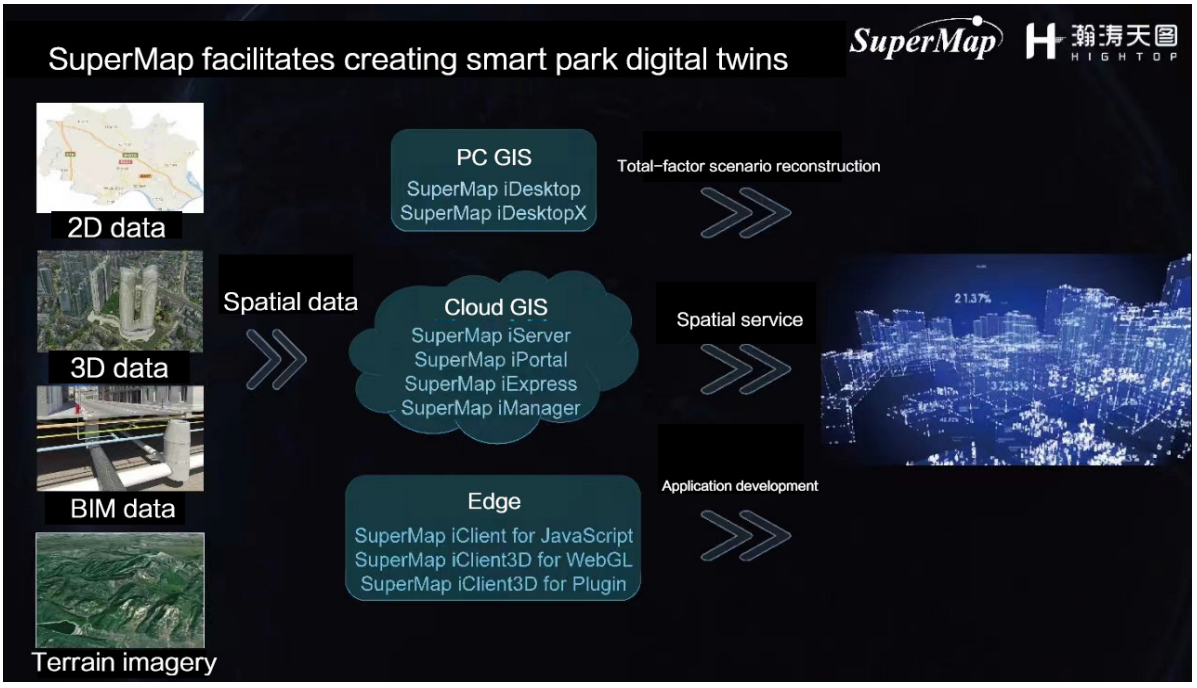
Development planning

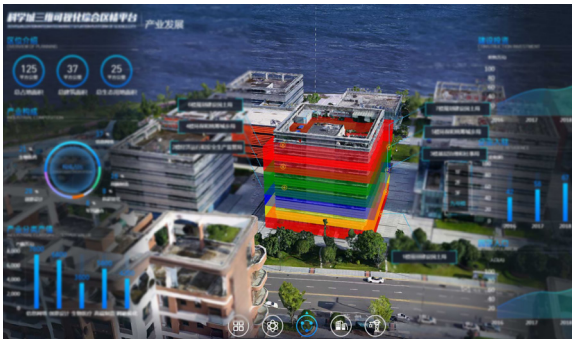
Factor supply

Interpretation of Investment policy

Investment promotion project management

Display of investment promotion achievements





Park operation management

Centering on the assets, enterprises, energy consumption, environment, transportation and other daily operation and management business of the park, the platform conducts the intelligent management of the park’s industries, enterprises, production, energy, environment, etc., optimizes the management process, improves management efficiency, and drives the sustainable development of the park.

It includes:

Enterprise management

Production management

Energy consumption monitoring

Equipment monitoring and management

Traffic management

Asset management

Environmental monitoring and management

Underground pipeline network monitoring and management

Park safety management

An overall park safety management is conducted through visualization and smart management to improve the management ability of fire-fighting, vehicles, personnel, epidemic situation, perimeter and key areas in the park.

It includes:

Pandemic prevention and control

AR cloud proofing

Personnel management

Alert management

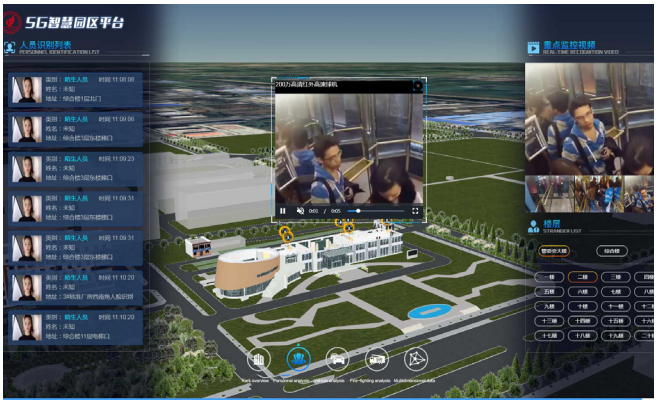
Vehicle management

Fire safety management

Elevator safety management

Perimeter management

Key area management



Park emergency management

Formulate emergency plans, manage emergency resources, and improve the park’s ability to respond to emergency events, command emergency response and coordinated dispatching.

It includes:

Emergency response plan

Emergency command

Emergency resource management

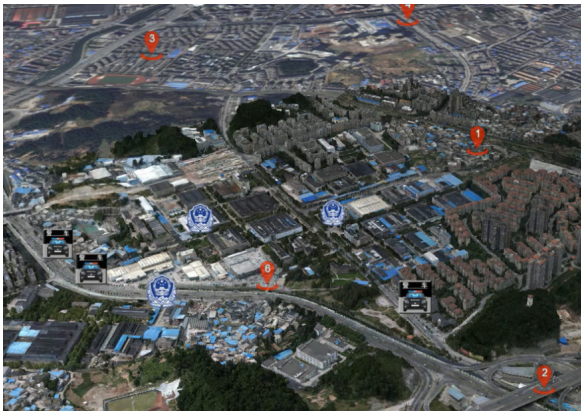
Collaborative scheduling

Emergency drill

Risk monitoring

Emergency linkage

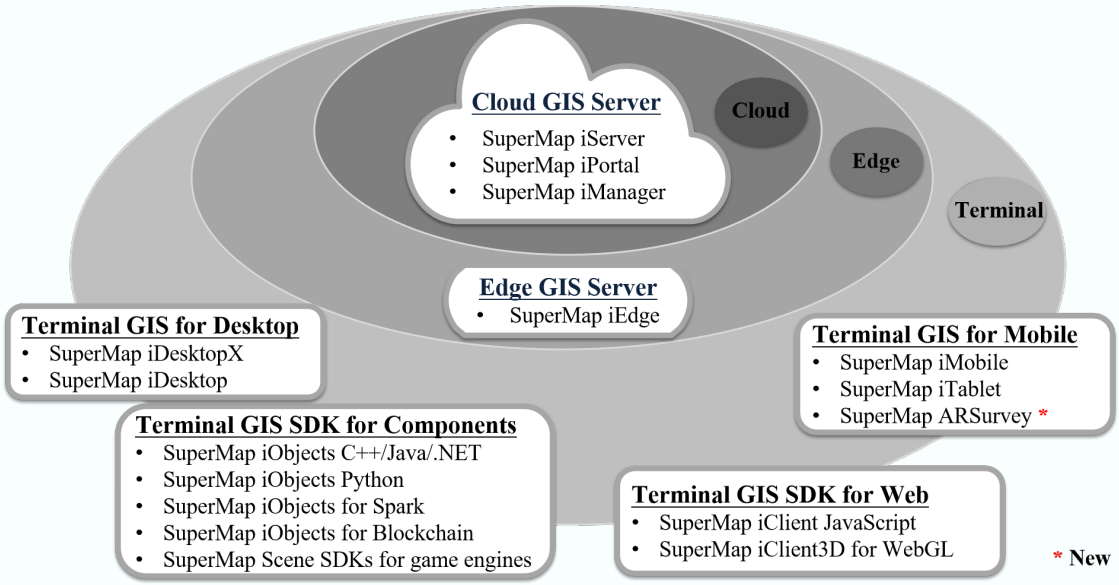
Emergency response



Products:

What is SuperMap GIS

SuperMap GIS is developed by SuperMap Software Co., Ltd. It is a complete package of GIS platform software, including Desktop GIS, Service GIS, Component GIS, Mobile GIS platforms, spatial data production, processing and management tools. Furthermore, it is a good GIS software brand with full angles and strong functions which can meet different requirements for a wide range of industries.



SuperMap iServer: Full-featured Application Server for Cloud GIS

SuperMap iPortal: Portal for Cloud GIS

SuperMap iManager: Operation Manager for Cloud GIS

SuperMap iEdge: Server for Edge Computing GIS

SuperMap iObject: Full-featured Components GIS SDKs

SuperMap iDesktop: Full-featured Customizable Desktop GIS

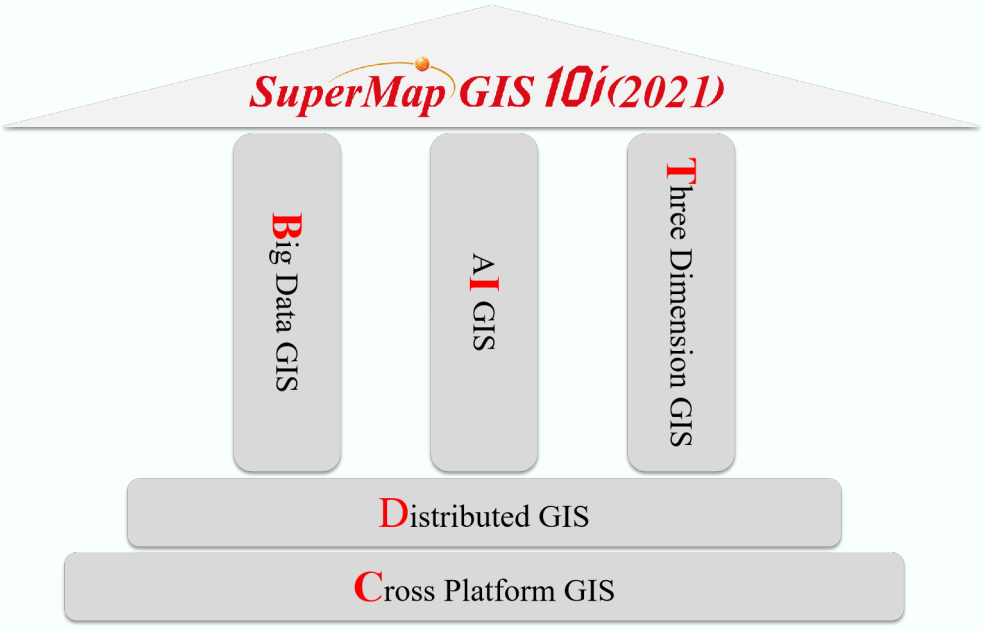
SuperMap iMobile: Native SDKs for Mobile GIS

SuperMap iTablet: Native App for Mobile GIS

SuperMap iClient: Web GIS APIs for Browsers

Technologies:

SuperMap GIS 10i(2021) integrates AI GIS technology, and further innovates Big Data GIS, 3D GIS, Distributed GIS and Cross Platform GIS to establish a five key technologies system of “BitDC” for GIS platform software.



Big Data GIS:

Supports distributed technologies, Spark distributed computing architecture and streaming data processing and analysis

AI GIS:

The integration of AI and GIS

3D GIS:

Integrates new IT technologies, such as WebGL, VR, AR, and 3D Printing, brings a more realistic and convenient 3D experience

Distributed GIS:

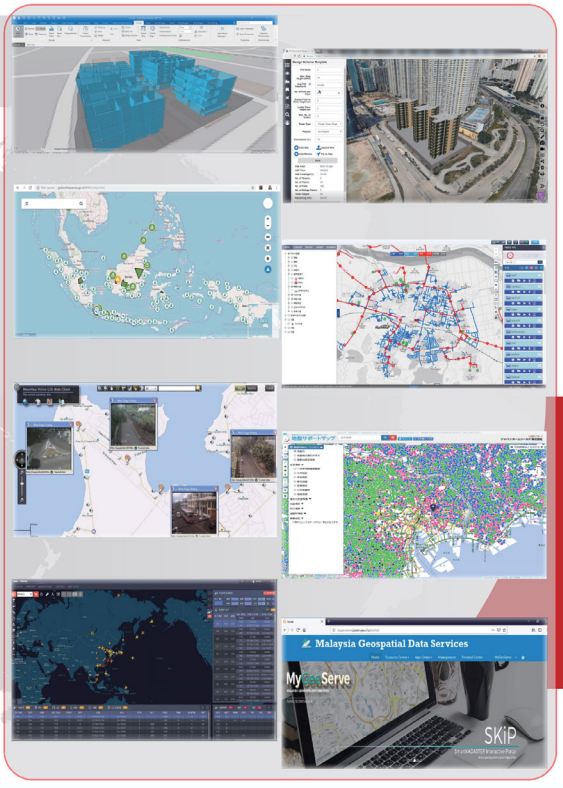
Builds a new distributed collaborative model of cloud, edge and terminal integrated GIS

Cross Platform GIS:

Supports multiple CPU architectures and operating systems

Application Cases:

- *Municipality GIS for Nyköping, Sweden*
- *3D Underground Pipeline Management System, Germany*
- *3D Cadastral Project, Turkey*
- *Mobile AI Recognition of Water Meter, South Africa*
- *National Police GIS, Mauritius*
- *Land Property Management System, Egypt*
- *House Decision Support System, Malaysia*
- *Geospatial Data Services Portal, Malaysia*
- *Global IOT Management System of HITACHI, Japan*
- *One Map of Ground Strength of National Residence, Japan*
- *Mobile Mapping Solution for Foreclime, Indonesia*
- *Big Data Spatial for Secure BaseMap System in BSSN, Indonesia*
- *Nature Reservoirs Locating System, Thailand*
- *Smart Agriculture Real-time Soil Monitoring System, Thailand*
- *Pipeline Analysis Solution, South Korea*
- *Forest Disaster Management System, South Korea*
- *Flight Monitoring System for Asiana Airline, South Korea*
- *Mountain Development Support System, Cuba*
- *Epidemic Surveillance System, Laos*



Digital Sand Table System&Smart Park Regulation System for A National Agricultural Science and Technology Park

Source: SuperMap Smart Park Engineering Center

"Agricultural Science and Technology Park" Digital Sand Table System

VR Global Vision Corp (VRGV) and SuperMap jointly developed a Digital Sand Table System and Smart Park Management System for Nanchong national agricultural science park.

Digital Sand Table (DSB) is a digital representation of a traditional physical sand table. It features multi-dimensional terrain simulation, intelligent dynamic display, overall function control, comprehensive deduction training, easy operation, and wide application.

A modern agricultural digital sand table is the digital representation of a traditional physical sand table. It features multi-dimensional terrain simulation, zoning 3D display, basic information data display, multi-perspective roaming, planning assistant IoT data integration.

The modern agricultural digital sand table technology is based on the multi-dimensional information theory with the unique core engine of VR processing and GIS, 3D and VR (Virtual Reality) integration technology. It achieves a breakthrough from plane layout to spatial planning, from a static display to dynamic simulation, from one-direction guidance to multi-direction interaction, and from abstract description to intuitive deduction. It provides users with a convenient and interactive system for regional agricultural industry development planning, park management, big data statistics of agricultural products, and agricultural production and management. It mainly includes the following aspects:

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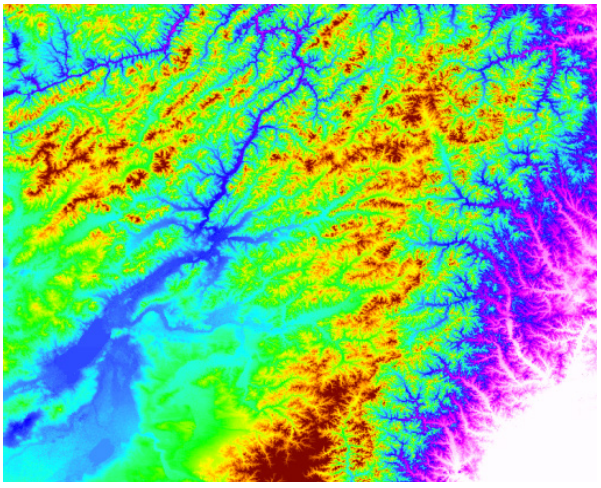
Geographic Information Integration

The system strengthens the application of various basic information, such as geographic information, remote sensing image and current agricultural resources information. From the traditional simple reference to absolute support, it improves the scientific accuracy of the planning process and results.

Take the vector data collected or investigated from administrative boundaries, type of land use, roads, and water conservancy as an example: By collecting data, the storage, processing, analysis, retrieval and display of spatial data can be conducted to provide a beneficial platform for decision-making, recording and information exchange in agricultural regional planning.

It integrates land resource data, crop yield data, soil and water resource data as well as multi-conditional data statistics, queries, filtering, etc.



3D restoration of topography and geomorphology in the core area

To restore the image maps of the core area at 1:2000 and 1:200 with different precision, and to restore the real terrain status by combining the terrain height. It can visually and stereoscopically display the images of mountains, rivers, towns and traffic.

Integration of land properties

Query, statistics, and analysis application support for agricultural basic information data, with arbitrary overlay and mixed display. It provides favorable geographic data support in the planning system.

The integration of administrative information

Based on the national image of terrains, the system can superimpose the vector data of city boundaries.

The integration of vector information of water, electricity and road network

The importing of the vector data and the superimposing of city traffic hubs and rivers can reflect the power and water environment of the park, as well as interpret the geographical advantages of the park.

The integration of IoT data and controlling

A part of the typical agricultural IoT monitoring signal of the agricultural IoT application project being carried out in the park is introduced into the digital sandbox system, such as the monitoring video, temperature, humidity, etc. in the shed, which is visualized in the system for visual management and performance, thus forming a demonstration of the typical application of IoT.

In the digital sand table system, clicking on the "Associated Network" module in the task menu, the digital sand table will display the IoT “monitoring” and “controlling” operation panel. Monitoring: data collection and analysis of soil, moisture, air, light, etc. Controlling: remote operations of shading, watering, video monitoring, etc. It is a combination of a digital sand table and IoT system as well as 2D data and 3D spatial construction and real-time monitoring data.

The platform applies the virtual simulation technology and multi-source data fusion technology, which makes the traditional planning and construction change from 2D to 3D and static display to dynamic simulation. At the same time, a large number of industrial data, administrative information, basic natural data and other resources are distributed on the 3D terrain according to the actual situation. It supports multi-scene segmentation and dynamic loading and integrates GIS layer data, basic information data, 3D scene model data and IoT detection data.

“Agricultural Science and Technology Park” Smart Park Management System

In terms of park management, there are many security and property management subsystems in each park that were built at different times, which triggers operational inefficiency, security hazards, and high energy consumption.

The park project is targeted at practical problems, resolving difficulties in security management, operation efficiency, energy-saving and emission reduction and personnel experience in the park, and establishing the operation management system of the whole park. Based on the innovation of New ICT technology, it supports the management which is visual, green and intelligent. The park carries various service data through a unified GIS platform to support the construction of smart services in each park.

It is the three-dimensional space management involving both the management of the inner field of the building and the management of the outer field of the park.

In this three-dimensional space, numerous relatively static data and dynamically changing data are managed, including the basic building information of the park, the basic BIM information of facilities such as water and electricity pipeline networks, BA building control information such as air conditioning, plumbing and fire protection, property information such as assets,

personnel and vehicle management, information on the safe operation status of the park, ICT infrastructure distribution and usage information, and performance data information of the park operation, etc. The information is carried by different subsystems respectively. For park managers, how to achieve decentralized control and centralized management of each subsystem, and have a comprehensive understanding and perception of the overall operation of the park, so as to render it: observable (IoT perception), visible, manageable (manage the system or people), traceable is very important.

To achieve:

1. Visible management

Build the GIS platform of the park to provide GIS service for the park management system to achieve the visualization management of the operation.

2. Improvement in staff service quality and efficiency

2.1 Navigation, public resources finding such as meeting rooms, office cubicles, printers for employees.

2.2 Location seeking such as buildings, fire points, accidents sites and navigation for security personnel.

“One Map” Solution for Campus—3D Underground Pipeline System

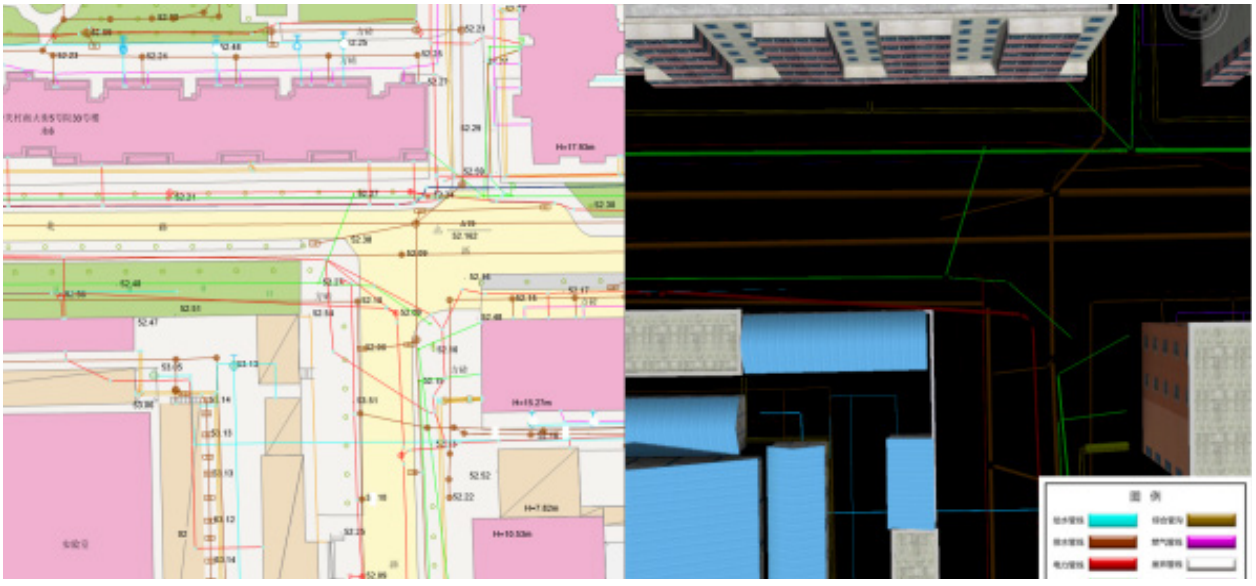
Source: Beijing Bolue

SuperMap GIS, Beijing Bolue company, and Tsinghua Tongheng Planning and Design Institute have built a strong strategic partnership in the GIS application to smart campus. Concerted efforts have been made in GIS solutions for underground pipelines informatization on the campus, and GIS education with the characteristic of integrating teaching and practice for students majoring in tourism, urban planning, architecture, civil engineering, etc.

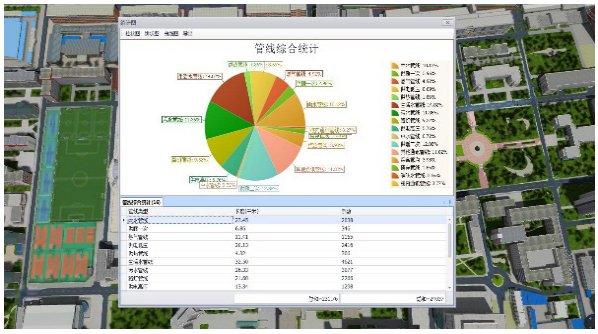
A 3D underground pipeline system is established after on-site investigation and data collation. The system manages data utilizing sensing technology and implements the visual management and dynamic monitoring of underground pipelines on the campus.

The 3D Underground Pipeline System, in conjunction with the APP system, can provide accurate and detailed data, and location information at the construction site to avoid construction accidents and repeated construction, thus saving resources and time, and greatly facilitating supervisors’ work.

The system is attached with functions of digital campus exhibition and decision aids, which give play to school publicity, new students welcome, available classroom (exam room) inquiry, real estate management, greening&cleaning, fire drill, school field planning&construction, etc.Browsing: The system supports hot spot navigation, above-ground (underground) browsing, road excavation browsing, 2D-3D integrated browsing, etc. (in layers)



Query&statistics: The system can query and locate the attributes of the pipeline, such as category, diameter, material, date of embedding, characteristics, and facilities, and make statistics and export according to these attributes.



Platform connection: The system has an open interface, and can be connected with the existing energy platform or other relevant platforms.

Analysis: The system supports section analysis, soil analysis, pipeline burst analysis, flow analysis, collision analysis, net distance analysis, tracking analysis, etc., which can facilitate the construction and maintenance of the campus.

Pipeline tracking analysis:

Pipeline flow analysis:

Analysis of building electricity consumption: Data analysis of various dimensions is carried out based on smart electricity meter data, and big data analysis of the platform is conducted for visualization management.

Side leak check: According to the intelligent monitoring of the water supply network and the analysis of the data returned by the Internet of things equipment each day, the location of water leaks can be predicted.

Drawing management and updates: The system contains 2D CAD drawings which can be exported, and 3D pipelines can be directly altered in the system, which is easy to operate and update.

Accident maintenance: The system can analyze the scope of pipeline accidents and record damages and repairs.

Measurement&labeling: The system can calculate the length, area, and elevation of 3D data; it can mark pipe diameter, buried depth, and elevation of pipelines.

Publicity: The real 3D scenes on the ground in the system can be linked to the school website.

Building real estate management: Combined with the 3D model, the real estate is integrated with complex attribute data, and CAD drawings to implement queries, statistics, etc., of real estate resources.

Auxiliary planning: The system supports school building planning and design through buildings management, sunshine analysis, shadow analysis, dynamic visual range analysis, etc.

New students welcome: Freshmen can register by themselves after installing the Welcome APP, which serves dormitory search, one-card handling, etc.

Greening management: Collect the information about all trees and meadows in the school, and make inquiries and statistics through the system to combine information and graphics.

Indoor pipeline network analysis system: BIM modeling for building supports the integrated management of above-ground and underground pipelines and the integrated management of indoor and outdoor pipelines. It also has functions of viewing, checking, statistics, and analysis of indoor scenes.

Smarter 3D Utility Management in Germany with SuperMap GIS

Author: Zhang Xiaoyu, SuperMap International

1. Background

Urban underground utilities are a big part of urban infrastructure. Its stable operation is vital to the normal operation of a city. Germany is one of the countries with early urbanization development, whose urban pipelines are characterized by density and complexity of spatial locations and varieties, including water supply, drainage, gas, heat, electricity, communication, etc. The traditional 2D underground utility management mode is comparatively less intuitive and cannot meet the current practical needs of 3D expression, spatial analysis and application of urban underground utility. Therefore, a 3D GIS system for integrated management of urban underground utility is now showing its necessity for a modern city.

2. Objectives of the system

The system integrates the data of various pipelines in the Döteberg region of Germany and conducted a unified information management, which digitalizes the underground utility network and achieves the 2D-3D integrated management.

The system is built based on the following objectives:

· Improve the management ability and efficiency of relevant management departments for underground pipelines

· Provide information resources for urban planning, construction and management

· Provide data support for smart city construction

· Provide decision support for urban sustainable development and disaster prevention and reduction

3. Key technologies

3.1 Rapid development of component products based on SuperMap iObjects .NET

The system adopts SuperMap iObjects .NET component development platform. As a service-oriented enterprise GIS platform product, it enables users to quickly build professional and powerful application software. SuperMap iObjects .Net is equipped with rich GIS functions, and the granularity of function modules is reasonable, so that users can obtain customized functions tailored for their own business through modular combination according to their actual needs. (See Figure 1)

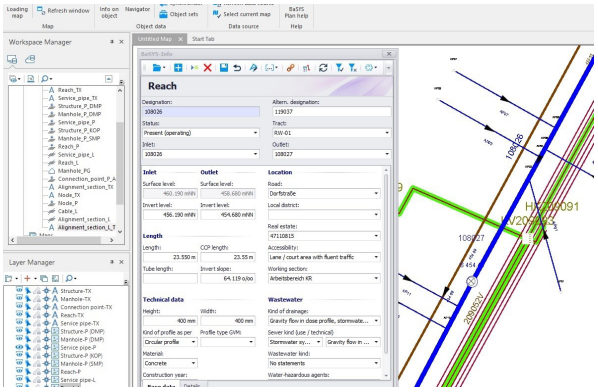


Figure 1

3.2 Efficient pipeline data processing flow

Pipeline data usually comes from construction design drawings, geophysical prospecting data and underground surveying. SuperMap GIS platform supports a variety of mainstream data formats and different data import modes, so as to meet the needs of data processing in actual business and improve data processing efficiency. SuperMap GIS also provides rich pipeline data inspection and processing tools, such as format conversion, topology checking, coordinate conversion, object editing, etc., which can quickly implement the preprocessing of pipeline data.

3.3 Comprehensive application of 2D and 3D integration technology

In terms of rapid construction and application analysis of 3D pipelines, SuperMap provides a fast, efficient, perfect and practical technical scheme. Thus, it can integrate data management, application development, 2D and 3D expression, symbol system and analysis and application functions. In particular, it is widely used in urban planning, engineering facilities management, etc., providing decision support for multi-industry applications in smart cities.

3.4 Multi-source data integration technology

The 3D pipeline scene involves the organization and management of multi-source data. The multi-source 3D data integration technology based on SuperMap supports oblique photogrammetry model data, architectural design model data, point cloud, underground 3D pipeline, terrain and other data. This technology breaks through the technical bottleneck of loading and managing massive 3D data, and provides an open, standard and universal data foundation for 3D spatial data sharing and interoperability between different application systems. At the same time, it is also compatible with a variety of software and hardware environments, which greatly reduces the costs of construction, management and maintenance of the 3D GIS application system.

3.5 Customized 3D pipeline symbol library

SuperMap innovatively developed 3D pipe point, pipeline symbol and adaptive pipe point symbol technology based on 2D and 3D integration technology, and provided users with a rich default symbol library to help users quickly build 3D pipeline scenes. (See Figure 2)

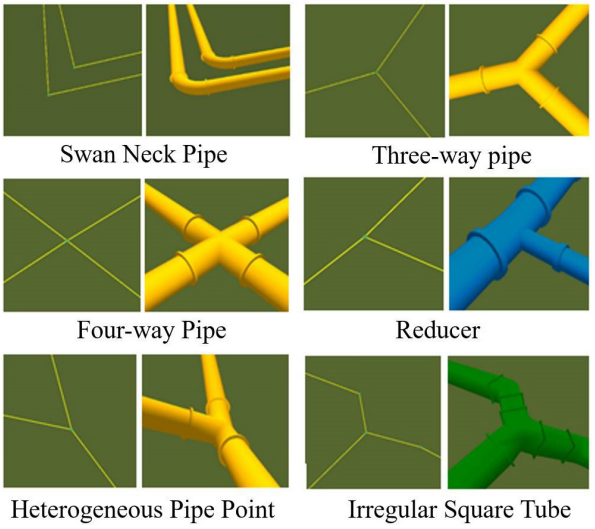


Figure 2

3.6 3D special effect based on high-performance particle system

SuperMap GIS not only supports a variety of 3D special effects, but also provides a high-performance particle system, which can be great support for the construction of high realistic 3D scenes. It can be used to simulate natural phenomena such as flame, fountain, rain and snow. SuperMap particle special effect system has been widely used in emergency relief, meteorological simulation, etc. (See Figure 3)

Figure 2

Figure 3

3.7 Ability to visualize massive data

SuperMap GIS provides a variety of technologies to improve rendering performance, including engine rendering technology, LOD technology, batch rendering technology, texture compression technology, large file storage and other technologies. LOD multi-level of detail technology also ensures the rendering effect and the stability of massive data loading, so as to successfully solve the technical problems such as the display and management of massive 3D pipeline data.

4. Functions of the system

4.1 2D and 3D integrated display

This function supports browsing different pipeline data and aboveground and underground space data. It can load and remove pipeline layers in maps and scenes by checking the tree menu node in the layer control, and provide users with intuitive 2D and 3D data browsing functions. (See Figure 4)

4.1.1 Transparency control of underground pipeline

This function can control the visible and hidden effects of underground pipelines by adjusting the transparency of the surface, so as to meet the needs of a variety of visual effects. (See Figure 5)

4.1.2 Overlay display with oblique photogrammetry data

When the pipeline is damaged and burst, this system can quickly locate the position and address of underground pipelines through the combination of oblique photogrammetry data. At the same time, it can also analyze the impact range and other information that may be brought to the surrounding areas, so as to carry out rapid visual guidance and accurate data analysis, and provide data and technical support for the rapid formulation of emergency decision making. (See Figure 6)

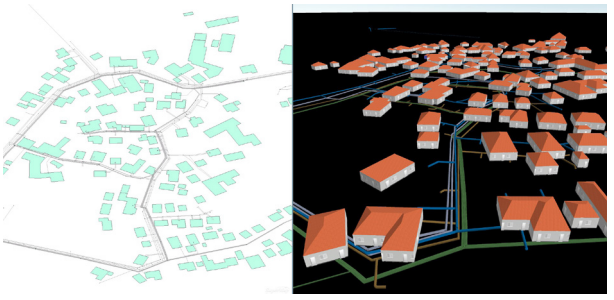


Figure 4

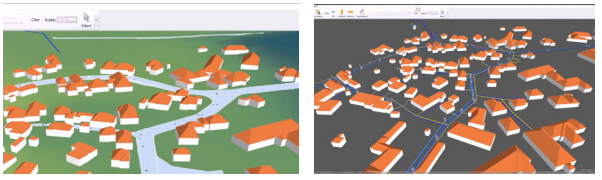


Figure 5

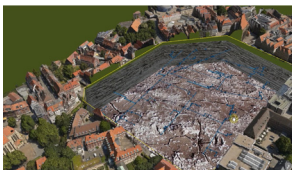


Figure 6

4.2 Pipeline information query

4.2.1 Attribute association query

By clicking and selecting pipeline facilities in a 2D map or 3D scene, the query of pipeline category, pipe diameter, material, embedding date, characteristics and other information can be implemented, and the attribute information can be modified. Meanwhile, the query results can also be exported into required forms or different types of statistical charts.(See Figure 7)

4.2.2 3D model or drawing association query

The associated query can be carried out by associating the original pipeline and facility drawings or 3D models, so as to facilitate users' view of the original status information of pipeline and facilities. (See Figure 8)

4.3 3D measurement of pipeline

The spatial measurement function enables users to quickly calculate the distance between pipelines or the area of the ground area to be excavated. This function includes distance measurement and area measurement. "Distance measurement" supports the measurement of pipeline space distance and pipeline distance according to the ground. "Area measurement" refers to area measurement based on land area and object area.(See Figure 9)

4.4 3D pipeline facilities analysis

SuperMap 3D pipeline technology provides facilities network analysis functions, including connectivity

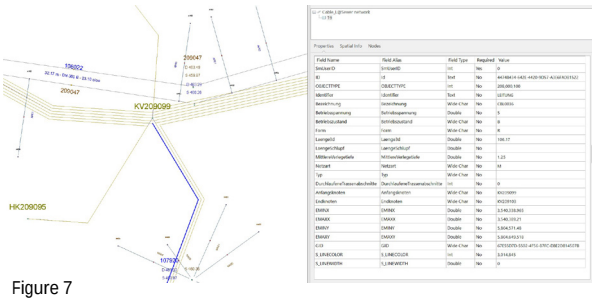


Figure 7

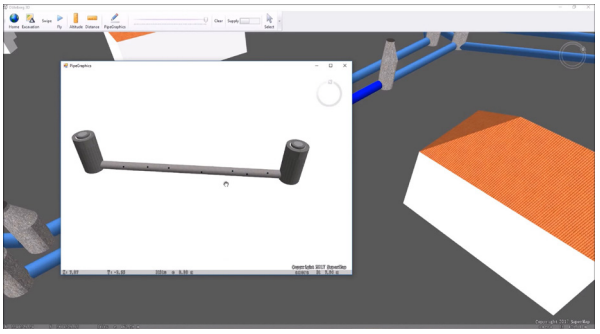


Figure 8

analysis, tube burst analysis, tracking analysis, etc. It can achieve the rapid positioning of pipeline facilities and emergency disposal, and analyze the information of surrounding affected areas and population, so as to provide a guarantee for urban emergency rescue and auxiliary decision-making.

4.4.1 Connectivity analysis

Connectivity analysis can judge the connection relations between specified two points in the pipeline, and can be analyzed based on parameters such as the location, connection quantity and flow direction of the pipeline. For example, it can be used to judge the connectivity between two specified valves in underground pipelines.

4.4.2 Tube burst analysis

According to the spatial topological relationship of the pipeline at the accident site, the tube burst analysis can quickly query the upstream valves to be closed and the affected downstream pipelines. Also, the valve to be closed and the user information affected by water cut-off can be output into a form.

4.5 Aided decision making based on 3D spatial analysis

SuperMap GIS 3D spatial analysis supports buffer zone analysis, excavation analysis, pipeline cross-section analysis, etc., in 3D pipeline management.

4.5.1 Buffer analysis

Buffer analysis can be used to view the information of pipe points, pipelines and other facilities within the specified range of the object. For example, when reconstructing a designated area, information about the surrounding affected pipelines is required.

4.5.2 Excavation analysis

The terrain or oblique photogrammetry model can be excavated in the 3D scene, so as to view the distribution of the underground pipeline. This function helps users evaluate the effects and possible impacts of different excavation ranges and depths. (See Figure 10)

4.5.3 Cross section analysis

Cross section analysis can generate the section view of the pipeline at any position according tothe pipeline data, so as to view the spatial position relations and attribute information between pipelines. (See Figure 11)

Figure 9

5. Summary&Significance of the project

The 2D and 3D integrated pipeline management system based on SuperMap 3D GIS has been proved that it meets the evolving requirements of development of urban utilities. By integrating urban multi-source basic geographic information data and underground pipeline data, this system can implement all-round supervision of various underground pipeline facilities, standardizes pipeline management more and increase its safety, and also, reduces the cost of pipeline construction, maintenance and operation and maintenance management.

This system is regarded to have played a positive role in urban scientific decision-making, efficient service, low-carbon operation, etc. Building smart cities is really gaining momentum. There will be more such systems developed based on geographic information technologies such as SuperMap GIS being applied to different industries and drive the development of modern cities.

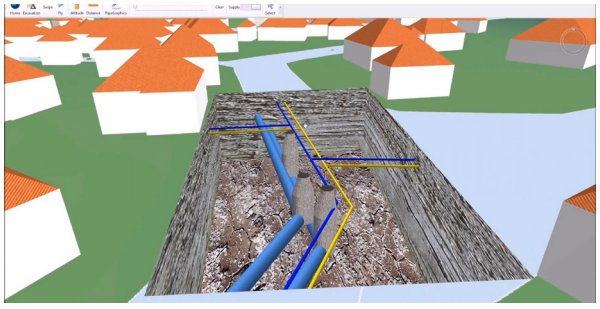


Figure 10

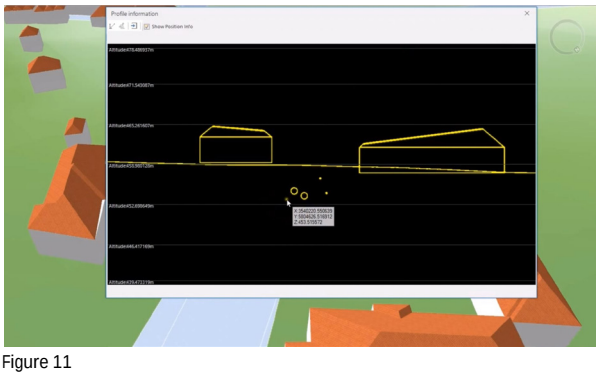
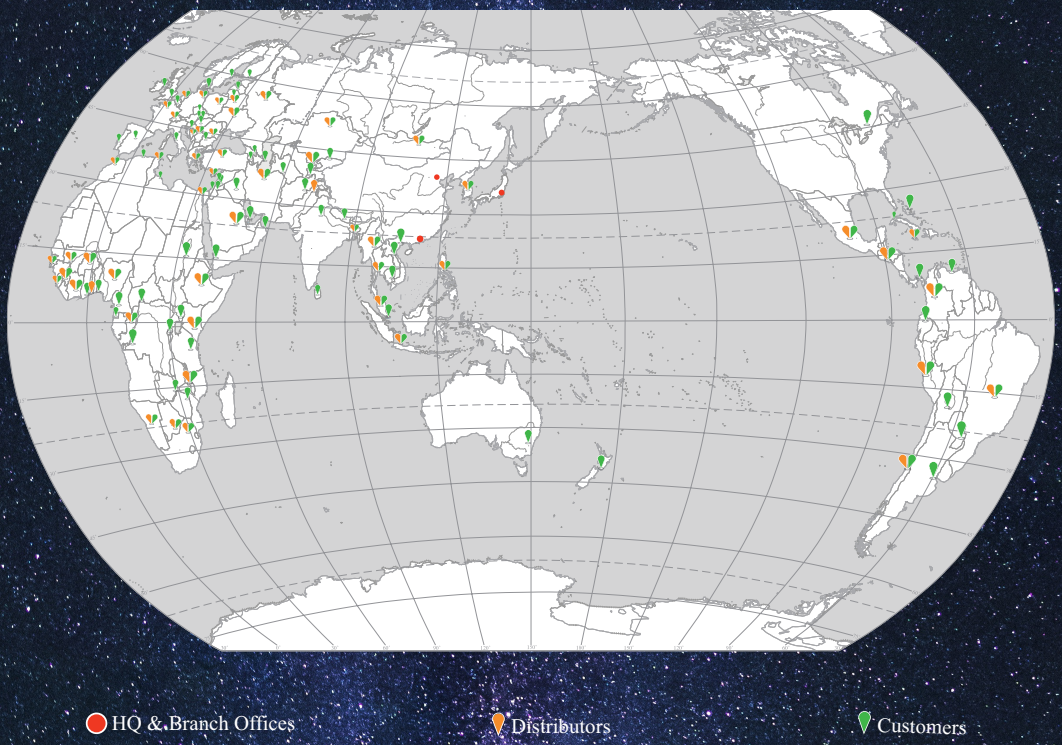


Figure 11

Global Distributors and Users



SuperMap has developed distributors and partners in more than 50 countries and SuperMap GIS end users in over 100 countries .We are looking for more partners from all over the world to build a global partner eco-system.