SUPERMAP COMMUNICATIONS

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SuperMap 3D Digital Base Application

Municipal Drainage Network Information System Using SuperMap GIS

Who is SuperMap?

SuperMap was founded in 1997, is a platform software and application software manufacturer focusing on Geographic Information Software (generalized GIS) and Geospatial Intelligence (GI), and a key player in Information Technology Application Innovation Industry, Spatio-Temporal Big Data, Artificial Intelligence, and Virtual Reality. It consists of SuperMap Software (parent company, stock code: 300036), wholly-owned subsidiaries, and holding subsidiaries, as well as domestic branch offices and agencies. In 2022, the total staff number of SuperMap is more than 4,300 and the annual revenue reached 232 million USD (1.6 billion RMB).

1997
Founded

How has SuperMap performed so far?

Together with more than 3,000 Independent Software Vendor (ISV) partners and hundreds of thousands of developers, SuperMap empowers the informatization of governments and enterprises in nearly 100 industries. It has developed distributors and partners in over 50 countries and SuperMap GIS end users in over 100 countries. Now, SuperMap ranks 1st in the GIS software market in Asia and 2nd globally.

100+
Countries'
Users

What will SuperMap be?

With “Innovate Geospatial Intelligence, Elevate IT Value” as the mission and “Light up Every Corner of the World with Geospatial Intelligence” as the vision, SuperMap will keep providing advanced GIS technologies and products to more global users.

1000+
Partners

4300+
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SuperMap

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FOCUS

CASE STUDY

Interview

The 3D Digital Base Empowering Natural Resource Management and Serving the Construction of Ecological Civilization

Building a 3D land space basic information platform based on a 3D digital base enables 4D natural resource data management in the whole domain, all space and throughout the whole process with whole elements of 3D, serving land space planning, use control, ecological restoration and natural resources investigation and monitoring, confirmation and registration of rights, asset management, development and utilization, etc. It will facilitate natural resources informatization to enter the 3D world.

The establishment of the Ministry of Natural Resources of the People's Republic of China with the main responsibility of exercising "two unifications" marks that China's natural resource management has entered the "Natural Resource Age" from the "National Land Era". Natural resources including land, minerals, water, forest, mountains, grassland, wasteland, mud flat are distributed in different spatial dimensions. The comprehensive and integrated management of natural resources urgently needs to transform from 2D to 3D, and the business systems related to natural resources need to be upgraded from 2D, which focuses on spatial management to 3D, which enables digital space construction so that refined management of natural resources under the ground, on the surface and above the ground can be realized.

SuperMap's 3D digital base makes full use of 3D GIS, BIM, IoT and other Digital Twin technologies to gather and integrate multi-source 3D information models of cities to support the construction of 3D spatial governance applications at different levels such as cities, parks, and buildings.

The 3D land space basic information platform based on the SuperMap 3D digital base will enable 4D natural resource data management in the whole domain, all space and the whole process with all 3D elements.

It will serve land space planning, use control, ecological restoration and natural resources investigation and monitoring, confirmation

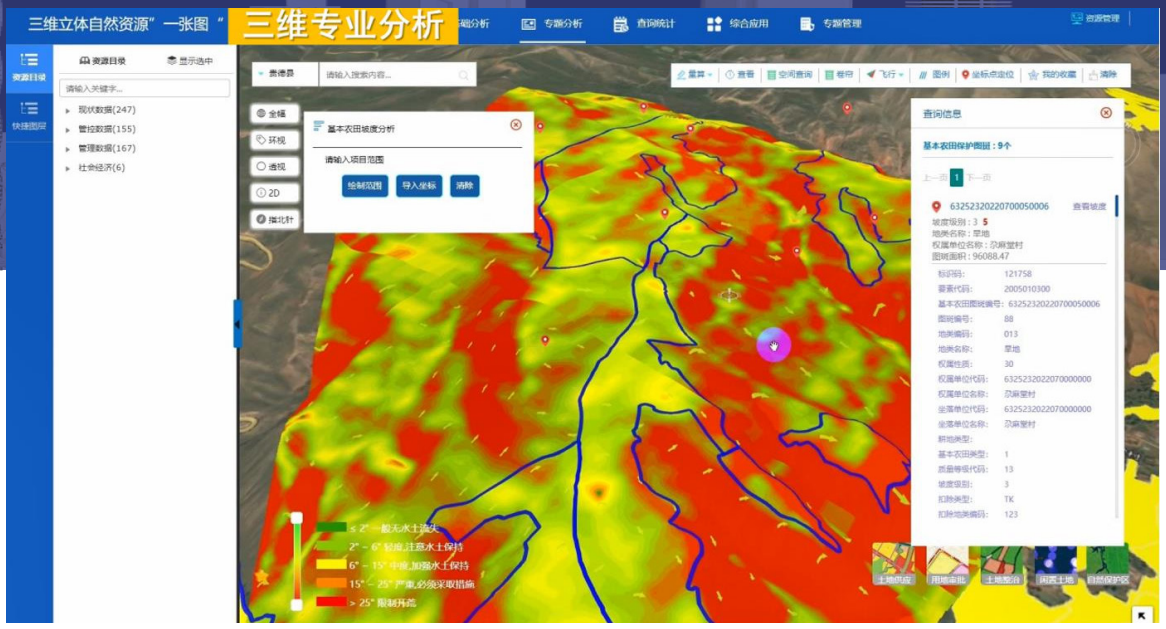


Figure 1. 3D “one map” of natural resources: 3D slope aspect analysis and classification of agriculturally suitable resources

and registration of rights, asset management, development and utilization, etc. facilitating natural resources informatization enter the 3D world.

SuperMap has undertaken the construction of a 3D map of natural resources of China’s Ministry of Natural Resources, the 3D spatio-temporal database of natural resources of China’s National Geographic Information Center, and dozens of provincial-level key projects in Henan Province, Liuzhou City, and Xianning City, etc. Among them, the 3D map of natural resources is the most typical case. We’ll give a detailed introduction below.

A 3D map of the Ministry of Natural Resources

The Information Center of China’s Ministry of Natural Resources and SuperMap jointly build a national 3D map of natural resources, supported by safe and efficient "one network", 3D "one map", and independent controllable "one platform". Based on SuperMap 3D GIS technology of new generation, the map empowers the dimensional upgrade of the life community of natural resources, and realizes the in-depth integration of data of full domain and full elements, data of multiple source, multiple scale, and multi-dimensional massive heterogeneous data. Taking the information system of the Ministry of Natural Resources for investigation and evaluation,

regulation and decision-making, and government services into consideration, the map comprehensively enhances the 3D dynamic monitoring of natural resources and awareness capabilities of situations, comprehensive supervision and scientific decision-making capabilities, and "one-stop" and opening and sharing capabilities for government affairs. It has also improved the integration, refinement, and intelligence of above-ground and underground natural resource management.

The construction results, main services and application results of the Ministry of Natural Resources' 3D one map are as follows:

• Construction Results

The "one map" has formed a unified 3D natural data resource system that covers resources both at land and in the sea. The project uses the digital surface model as the skeleton, high-resolution images as the covering background, natural resource survey and monitoring results as the base, land and space planning data as the bottom line of control, and natural resource management data as the business core to build a natural resource "one map" version 2.0. The project also upgraded 3D national land space basic information platform. In the project, an informatization mechanism that supports data resource system management and application service has been formed to provide a data and technical basis for the establishment of the land space planning system, use control and ecological restoration, natural resource rights registration and other land space development, utilization and protection patterns in the new era.

At present, a 3D "one map" data resource system covering the whole country has been built, including more than 5,000 layers of underground resources, surface substrate, base, surface cover, planning control, management, and society and economy, more than 11 billion elements in total. The map has provided 700 data services, 168 data products, and 169 application services, realizing integrated storage and management of multi-source heterogeneous data, and 3D visual expression and analysis functions.

• Main Service

1. Data services

At present, the data service includes 4 categories of data, including status quo, management and control, management, and social economy. The platform provides service browsing, application, and data download for these data services, which can meet the needs of users for data and services.

2. Thematic services

Functional services include general application services and big data services, such as spatial analysis services, query services, sharing services, Big Data comprehensive analysis services, etc., which can meet the application needs of users for Big Data analysis or traditional analysis.

3. Data products

The platform has the ability to independently process and generate data products, and can finally generate data products through online analysis, online smart maps, dynamic addition of services, and free combination of various basic functions. Data products can be browsed and shared.

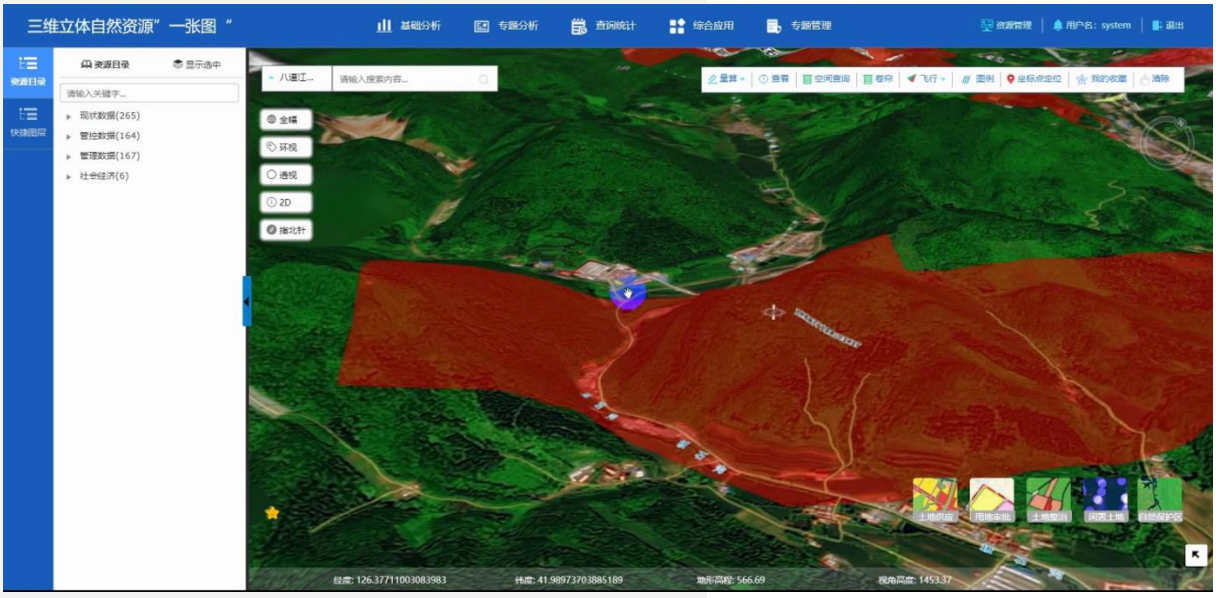


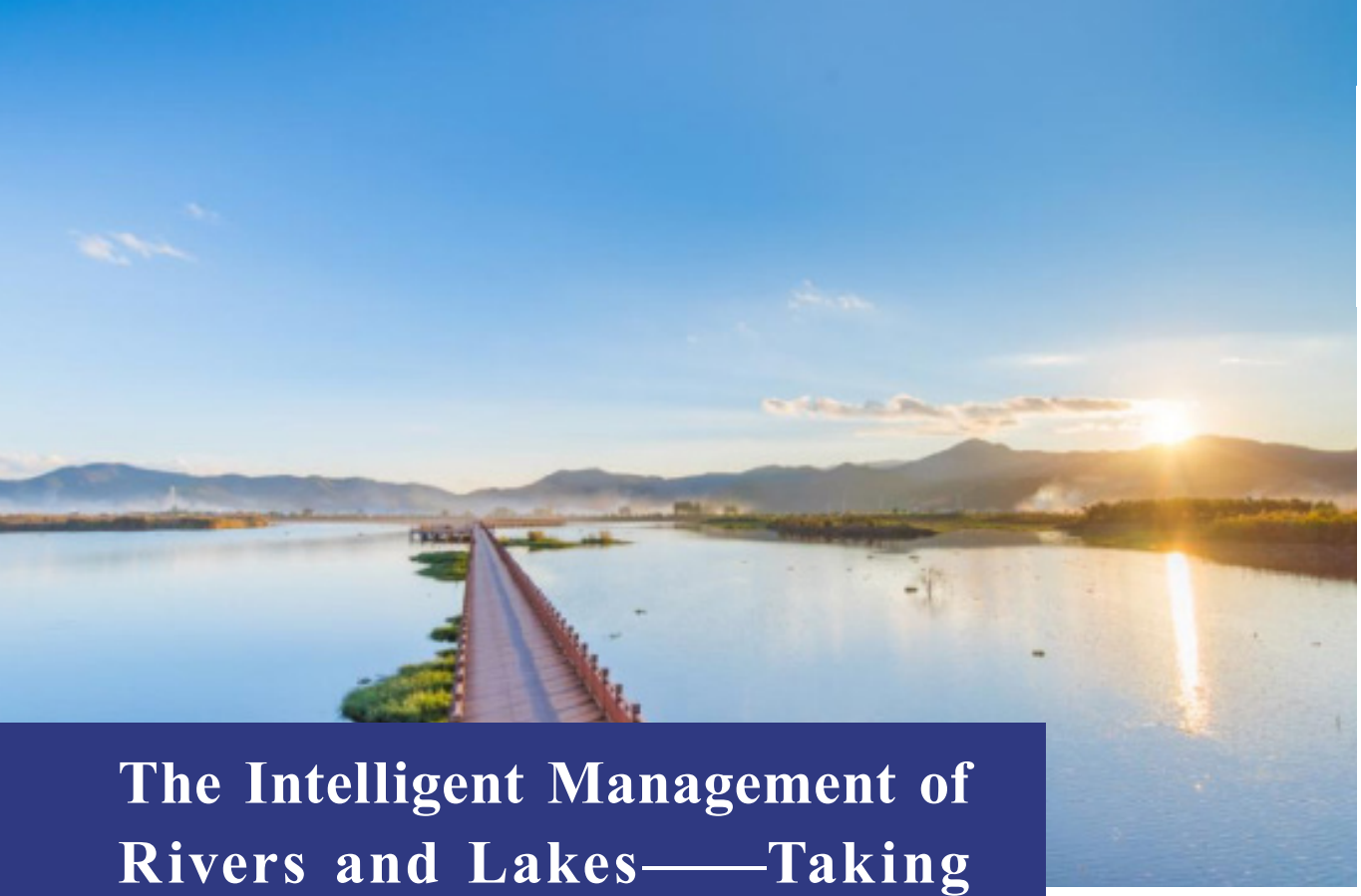
Figure 2. 3D “one map” of natural resources: 3D panorama serving mine governance and mine supervision

• Application Effectiveness

At present, the project is practicing and exploring in the aspects of full-space 3D natural resource intelligent perception management, full 3D support for intelligent approval and government affairs management with 3D assisted decision-making, 3D assisted geological disaster management application, and 3D mineral resource management application.

Combined with the customized 3D analysis of natural resource management business, the project provides comprehensive Big Data analysis capabilities, including basic farmland slope analysis, land use occupation analysis in the third national land resource survey, natural reserve occupation analysis, planning site selection and construction land approval analysis, etc. For example, based on the 3D slope and aspect analysis, we can use the slope analysis function of the project to analyze suitable agricultural land resources in the current natural resources, so as to analyze whether the existing and newly transferred basic farmlands meet China’s national basic requirements; the project can also be used to supervise the conversion of farmland to forestry, and conversion of farmland to grassland, so as to avoid the violation of the overall plan for land use in the name of returning farmland to forestry in some areas.

In addition, it can also serve mine governance and mine supervision functions based on the 3D panorama of the project, conduct quarterly comparative analysis of mines, monitor if the mining is conducted cross-border or exceeds the scope of approval planning, and whether a mine is over exploited, etc.



The Intelligent Management of Rivers and Lakes——Taking Yilong Lake as an Example

Yunnan Provincial Institute of Geological Surveying and Mapping cooperated with SuperMap and other units, and built a smart monitoring platform for the protection of the Yilong Lake basin on the basis of the digital monitoring platform for Yilong Lake Basin protection with advanced technologies integrated including AI, Big Data, cloud computing, water environment intelligent decision-making support models, and video maps.

Yilong Lake is one of the nine plateau lakes in Yunnan. It is a typical plateau shallow lake and a national 4A-level scenic spot. Although the ecological environment of Yilong Lake has been effectively treated for many years, it still faces severe challenges due to the close proximity to the urban construction area and serious damage to the ecological environment in the early years. Traditional management methods can no longer solve the problem.

To address the problem, Yunnan Provincial Institute of Geological Surveying and Mapping cooperated with SuperMap and other units, and built a smart monitoring platform for the protection of the Yilong Lake basin on the basis of the digital monitoring platform for Yilong Lake Basin protection with advanced technologies integrated including AI, Big Data, cloud computing, water environment intelligent decision-making support models, and video maps. Based on the construction results of the digital monitoring platform for Yilong Lake Basin protection, a lake monitoring and early warning system and data sharing system have been built to improve the comprehensive perception and real-time monitoring and early

warning capabilities against various water environment elements such as water quantity, water quality, meteorology, and sewage discharge, as well as various pollution sources, which will promote the construction of "smart lakes".

The platform is committed to providing the whole-process decision support and environment management of the lake basin. According to the "precise pollution control" requirement, and following the idea of "intelligent perception, intelligent management, intelligent decision-making, and intelligent control", the platform establishes an intelligent lake monitoring system and data center. It realizes the unified management, release and sharing of data on environmental factors such as water volume, hydrology, water quality and pollution sources of Yilong Lake. The platform uses the IoT, AI, and Big Data technology as the carrier to form an intelligent management platform with application functions such as data management, automatic control, intelligent lake patrol, and intelligent decision support to provide water environment protection and management for Yilong Lake with intelligent, scientific and refined technical support.

The establishment of the platform will further support the digital economy of Yilong Lake, improve the water quality management capabilities and the ecological environment of the Yilong Lake basin. It will further help promote water pollution control, water ecological restoration and water resource protection during the 14th Five-Year Plan period in China, realizing the transformation from green water and green mountains to gold and silver mountains.

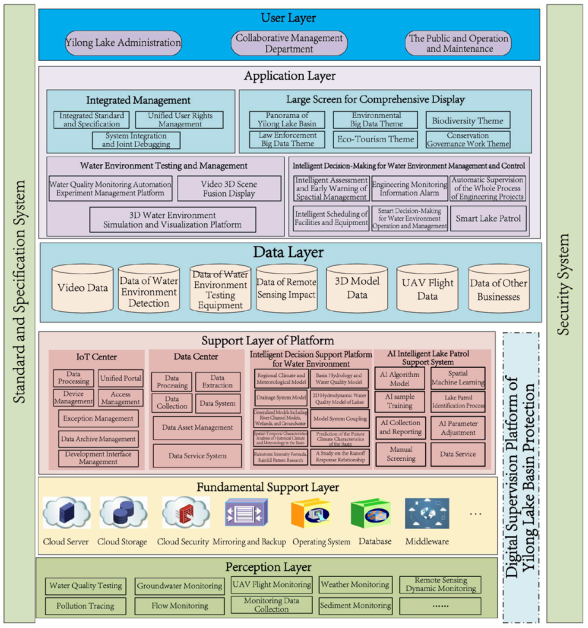


Figure 2. System structure

"Six Modernizations" Enabling Intelligent Supervision

• 3D Perception of Water Environment

Traditional manual monitoring methods have many problems such as low frequency, high time consumption, and slow analysis. Unable to achieve real-time collection, real-time analysis, and real-time application, they are incapable to support intelligent water environment decision-making analysis. The platform adopts the idea of "manual + automatic" monitoring. Based on the original monitoring system of Yilong Lake, it expands automatic monitoring modules including water quality, hydrology, pollution sources, meteorology, groundwater, video monitoring, intelligent sluice gates, and drones to build a complete water environment intelligent monitoring system. This helps realize the 3D perception and automatic control of space, sky and ground within the watershed. Through the comprehensive integration of water

environment monitoring and perception data information in the middle platform of the IoT, the environmental data in the basin can be transmitted to the application layer in real time, allowing users to understand and control the real-time status of the water environment in the basin in details.

• Data Resource Integration

The Yilong Lake basin involves data from different industries such as ecological environment, meteorology, water conservancy, natural resources, agriculture and forestry, as well as data information such as foundation, space, monitoring, models, and business. This brings about many problems including various data formats, large volumes, inconsistent standards, and multiple sources of data storage media. Relying on the foundation of the Big Data cloud platform, the data center makes use of the hybrid storage architecture of it. On the basis of fully combining national standards and industry standards, the Yilong Lake data center was designed and built with the application of different business levels taken into consideration to improve data storage standard system. According to the data application, the source layer, the data warehouse layer, the label layer and the application layer are constructed respectively. Members in the project adopted the micro-service architecture model, and used the data resources in the data center as the carrier to integrate data resources, unify data governance, and mine water environment data for wisdom, which has provided various functional services such as data query analysis, data lineage, and water environment theme analysis.

In order to realize the unified management and operation of Yilong Lake data resources, an asset management system has been built in the platform, which is managed through visual interfaces such as asset view, data standard, data quality, data lineage, data label, and data map. This helps business personnel to quickly and conveniently query, count and analyze data assets to improve data management, sharing and operation capabilities.

• Intelligent Space Management

Due to a series of unreasonable development and utilization of the local environment brought about by human activities and social and economic development, the ecological environment of Yilong Lake has deteriorated. Based on the overall planning and requirements of spatial management and control, the platform formulated project access review rules according to spatial planning and control indicators such as three-life space, ecological protection red line, and red line and blue line protection area. It created a unique intelligent evaluation and early warning system for project implementation. It has also generated comprehensive evaluation results related to space inspection, environmental capacity inspection, and land use inspection, and generated evaluation reports, which realizes the management and control of river and lake shorelines, ecological space management and total pollution land management in the Yilong Lake Basin, and ensured the spatial distribution of ecological environment resources. All these would help form a good environment of water ecology, promote the sustainable development of the river basin, and improve the ability to protect the water ecological environment and the efficiency of river and lake supervision and management.

Figure 3. Intelligent space management: subsystem of spatial management

• Intelligent Water Quality Analysis

Traditional pollution control is still at the stage of "treating the pollution as soon as it is seen". Though after years of treatment in Yilong Lake, the water quality and ecology of the lake are still in an unstable state for a long time. It is necessary to establish the relationship between protection measures and the response of the lake's water quality in a scientific way.

The water quality analysis of the platform is based on real-time monitoring data and meteorological forecast data and comes from the monitoring of the status quo of the water environment and pollutants forecast. By establishing a "meteorological-land-water coupling" model system, short-term early warning and prediction of lake water quality can be realized, providing decision makers with the spatial distribution and concentration trend of nitrogen, phosphorus, nutrients, and algae in the lake body in the next three days. It has realized the display and analysis of data such as water quality predictions at main points of Yilong Lake, water quality distribution on the lake surface in the next three days, and water quality warnings. Through current data and boundary conditions of the model, it is able to test the rationality of the prediction results of the model. Through intelligent water quality analysis, the perception and prediction of water quality in the basin is realized, water pollution is avoided from the source, and data support is provided for the improvement of the ecological environment of Yilong Lake.

• Scientific Allocation of Water Resources

Yilong Lake is a typical plateau shallow lake. Since there is no inflow of live water sources, it mainly relies on the input of water resources in the outer basin, which makes the development and utilization of water resources extremely

difficult. Therefore, how to scientifically allocate and dispatch water resources is an important research issue for water quality improvement.

The platform displays the status quo of water resources in Yilong Lake through intelligent decision-making support model of the basin water environment and 3D GIS technology, analyzes the distribution of water resources in the basin, and evaluates the impact of water diversion and replenishment projects on water quality. Relying on the IoT monitoring system and the water environment intelligent decision-making support model, it displays the current situation and history of water resources in the Yilong Lake basin and predicts the changes in water resources in a certain period of time in the future. Based on the allocation of water resources in the Yilong Lake basin over the years and the actual results achieved, an optimal analysis model for water resource allocation is established to invert the changes in water level, water quality and pollutants in Yilong Lake, and dynamically simulate the optimization schemes for water resource allocation in different years. Through the optimization of scientific water resources allocation, the progress, timeliness and foreseeable period of Yilong Lake's water resource management will be further improved, so as to provide more scientific, faster and more effective support for scientific governance of Yilong Lake.

• Smart Lake Patrol Process

A smart lake inspection system for the Yilong Lake Administration that integrates intelligent inspection, supervision, and command has been established on the platform. Through drones and cameras, it supervises illegal activities, monitors law enforcement, salvage, and water ecological cycle systems in the lake area in real time, and automaticly analyzes and pushes the results to relevant law enforcement personnel to form law enforcement records. The platform realizes five major

Figure 4. Scientific allocation of water resources: subsystem of water resources allocation

functions of perception, analysis, service, command and supervision, providing a high-tech management platform for scientific management of lakes and scientific law enforcement. At the same time, through the 100 square kilometers 3D oblique photography model in the basin, it is possible to have a preliminary understanding and fix the status quo of each object in the basin and surrounding information, so as to facilitate emergency command and planning management.

The application of dynamic early warning + tracking management platform has achieved initial results

1. Through dynamic early warning of water quality in the whole lake, the new model of "precise pollution control" has achieved results

The platform builds a core intelligent management decision-making model system, integrates multi-source data, and uses spatial Big Data analysis and water environment data analysis model calculation engine to realize dynamic tracking of the whole process from pollutant generation, loss, reduction, emission into the lake, to lake water quality response. This will avoid water pollution from the source, better support the management of the water environment of Yilong Lake, and ensure the stable operation and cyclic restoration of the ecological environment.

2. Tracking and management of river and lake supervision throughout the whole process to build multiple applications of smart lakes

The overall research and development of the platform follows the idea of "intelligent perception, intelligent management, intelligent decision-making, and intelligent control". Through the building of water environment monitoring system, basin environment intelligent decision-making support model system and smart monitoring application platform, the application system of "forecasting-dynamic evaluation-early warning-decision support-scientific dispatching - smart lake patrol" is built to fully support the environment supervision ability of the Yilong Lake Administration.

3. Construction on the cloud, operation and maintenance on the cloud, and service construction on the cloud

Relying on the Yunnan geological Big Data service platform, using the platform's computing resources (IaaS), data resources (DaaS) and platform resources (PaaS), supported by the distributed spatial computing architecture, the lake model is in efficient operation, greatly improving the model computing performance. In this way, the cloud service application (SaaS) of the private cloud platform is realized.

To protect the ecological environment is to protect productivity, and to improve the ecological environment is to develop productivity. In response to the development concept of "green water and lush mountains are gold and silver", SuperMap integrates years of experience in water conservancy, environmental protection, meteorology and other industries, and is committed to research in the fields of river and lake ecological protection and restoration. With "one monitoring system, two middle stations and multiple applications", the original supervision system has been broken and a new model of intelligent supervision of rivers and lakes has been built.

In the future, SuperMap will keep adhering to the concept of "cooperation and collaborative development". With "intelligence and wisdom" as the driving force, it will use geographic information to empower ecological environment construction and restore green water and green mountains.

Municipal Drainage Network Information System Based on SuperMap GIS

In the Linzhang County Municipal Drainage Pipe Network Geographic Information System Project, a safe, reliable, powerful, friendly interface, and easy-to-operate information application system is built with the help of GIS technology featuring spatial visualization and graphic visualization. This helps manage complex and valuable drainage network resources in a more convenient and timely manner.

With the advancement of science and technology and the development of the times, the process of urbanization in China has been accelerated, and the construction of urban drainage pipe network systems also develops rapidly. The urban drainage pipe network system has a large coverage area and a large number of equipment, which bring a heavy workload to the daily maintenance and repair of the urban drainage pipe network, as well as increasing management problems in the drainage pipe network. Therefore, the municipal drainage pipe network information system was born.

Focusing on practicability, conciseness, flexibility, convenience and efficiency, and based on computer technology and database technology, the municipal drainage pipe network information system is built into a safe, reliable, powerful, easy-to-operate information application system with the help of GIS technology featuring space visualization and graphic visualization. The system manages complex and valuable drainage network resources in a more convenient and timely manner, which realizes timely update and real-time maintenance of pipeline data

to ensure the accuracy of pipeline data. It also realizes functions including dynamic management, planning and design, query and statistics, maintenance and update, analysis and optimization, flood control and drainage, and information sharing.

The project adopts SuperMap GIS. Its powerful 2D and 3D integration technology help realize the compatibility of different types of spatial data, which provides support and application expansion for the municipal drainage pipe network information system.

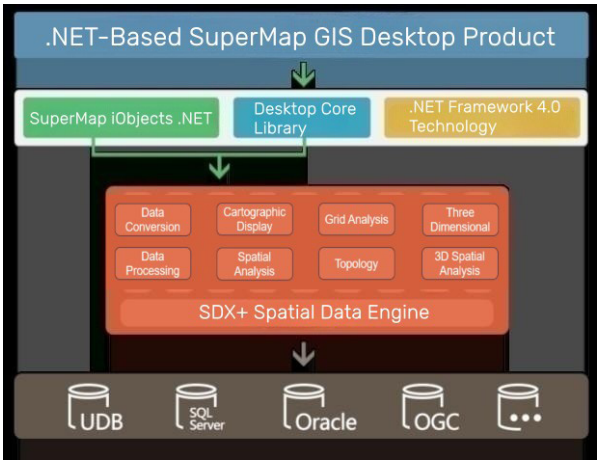


Figure 1. Schematic diagram of SuperMap iDesktop framework

Main Functions of the System

Linzhang County Municipal Drainage Network GIS Project has realized the following functions:

• Drainage Network Data Management

The data management system is designed based on the C/S architecture and provided to authorized users. The C/S structure is mainly used in departments that require data maintenance, such as pipeline network operation and maintenance, scheduling, planning, and design, to provide data browsing and query, spatial measurement, statistical reports, pipeline network data editing, topology analysis, data maintenance management, historical data management, data backup and recovery, update and other functions.

The data management system is developed in accordance with the standards of China's Ministry of Housing and Urban-Rural Development on the general survey of drainage and waterlogging prevention facilities, providing standard and convenient data management and database building solutions for the information management of urban drainage facilities.

• Unified Geographic Information Service

The unified geographic information service platform will integrate various geospatial information resources, and provide vertically multi-level and horizontally multi-database geospatial information data. Through GIS spatial data engine, it provides standard multi-type (WMS, WFS, ECWP, etc.) etc.) geographic information service interface, transforming the geographic information service mode from data provision to online service. As a result, it will help realize separate construction and sharing, collaborative service, and linkage update, providing unified and standardized geospatial information services for the development of various application systems, including graphic browsing service, mapping service, overlay analysis service, positioning service, map query service, layer management service, graphic measurement service, etc.

• One Stop Portal

As the "one-stop" entrance of the pipeline network information system, the one-stop portal website provides users with a simple, fast and low-cost way to discover, share, publish and use spatial data.

The one-stop portal will provide functions such as registration and login, basic GIS functions, information query and positioning, resource directory query, service release, service discovery, service routing, data subscription, service aggregation, offline service, website operation and maintenance, etc. Users can access the data service and functional service interface provided by the platform through the portal website to obtain various information.

• Pipe Network Operation Management

Through the integrated application with the SCADA system, the dynamic supervision of the operation status of the pipeline network and the facilities can be realized, the abnormal conditions can be pre-warned and warned, and the defects and alarms of the facilities and equipment can be found in time, so that the corresponding disposal can be carried out to reduce the loss.

By integrating with the SCADA system, the platform can obtain the real-time data such as pressure, flow, and liquid level of the pipeline network, and master the dynamic changes of the pipeline network and monitoring equipment. It can store, analyze, count and process the collected data to realize the monitoring, scheduling and management of the pipeline network.

• Pipe Network Maintenance and Management

Combined with the workflow engine technology, the system establishes a data connection channel between the management department and outdoor staff to form a unified workflow of electronic dispatch and elimination of orders, and realize business flow and standardized management including daily inspection and daily maintenance of pipe network and other work.

1. Pipe network inspection

By reasonably dividing the inspection area of the pipeline network, formulating standardized inspection content with the pipeline network facilities or inspection area as the object, the system automatically generates the inspection plan. Inspectors can use mobile smart terminals to provide timely feedback on problems or defects found during inspection.

2. Daily maintenance

Taking pipe network equipment and facilities as objects, the system formulates maintenance standards and operating procedures, and automatically generate maintenance plans. The entire process from plan review, work order generation to maintenance execution can all be handled in the system to standardize pipe network maintenance.

3. Emergency rescue

By using the pipeline network space linear asset information database as the ledger, following the relevant maintenance standards, and taking the submission, approval and execution of work orders as the main line, the system tracks the operation and maintenance of pipeline network assets in accordance with various modes such as defect maintenance, planned maintenance, and emergency repair. It manages the pipe network equipment throughout the full life cycle of recommissioning, decommissioning, change, scrapping, location tracking, operation, and maintenance to improve maintenance efficiency and reduce overall maintenance costs.

It includes defect maintenance, planned maintenance, emergency rescue and other modules.

• Flood Control and Drainage Management

Using GIS as a comprehensive display platform, and adopting the method of real-time monitoring data empirical

prediction and drainage model prediction, the system predicts and evaluates future rainfall and urban waterlogging.It includes real-time monitoring and early warning, model analysis and prediction, and early warning information release management.

The drainage network model is the mapping of the actual drainage system on the computer. It can not only reproduce the past operation of the drainage system, but also predict the future operation performance of the system. It can be used in many aspects such as planning, design, control, management, etc., and can better manage the drainage network in a scientific way.

• Manhole Safety Monitoring and Early Warning

Through the IoT terminal equipment installed inside the manhole cover, the system can monitor manhole cover opening and closing events in real time. It can also monitor whether there is a water leakage accident underground through environmental sensors. The terminal monitoring information is reported to the management platform in real time through the mobile network, so that the management department can monitor the manhole cover situation in real time.

• 3D Visualization Management

The system display entities including aboveground/ underground pipelines, equipment and aboveground buildings in 3D visualization. When roaming in the 3D scene, the interaction between 3D vector and raster data can be realized. It provides functions including zoom-in, zoom-out, fly-around, query statistics, pipe network analysis, 2D and 3D linkage.

A pipeline cross-section or longitudinal section can be formed based on arbitrary pipeline section line to timely learn about the relative position relationship and direction parameters of the underground pipeline. At the same time, the attribute information of the pipeline and the section point can be queried through the system, so that the buried depth or slope of the pipeline underground can be learnt.

• Big Data Technology

The system adopts Big Data technology. Through integrated data and system data analysis, it comprehensively displays the real-time attribute information of the pipeline network across the whole county, improving the management ability of the macroscopic operation status of the pipeline network in Linzhang County, and realizing the informatization of the municipal drainage pipeline network.

Taking advantage of visualization, and graphic visualization, Linzhang County Municipal DrainageNetwork Geographic Information System Project provides a safe, reliable, powerful and easy-to-operate information application system with user-friendly interface. It manages complex and valuable drainage network resources in a more convenient and timely manner to realize timely update and real-time maintenance of pipeline data in daily management and ensure the accuracy of the data. It can also realize functions such as dynamic management and planning of drainage network, planning and design, query and statistics, maintenance and update, analysis and optimization, flood control and drainage, and information sharing so that compatibility with different types of spatial data and support for digitized pipe network data can be realized.

One of the functions of underground pipeline informatization is that it has changed the traditional underground pipeline management method and improved work efficiency as well as management level. In the era before informatization, the status of urban underground pipelines is not clear and data is missing and inaccurate, which make the operation of underground pipelines very difficult. Under the influence of today's informatization, the digitization management of information has been realized, which has promoted the scientific and standardized management of underground pipelines.

The second function is to produce significant economic, environmental and social benefits. Through the establishment of underground pipeline information database and information system, it can provide accurate and perfect services to support urban construction and construction in a timely manner to avoid and reduce various accidents of excavated or non-excavated pipelines, and exert a positive impact on improving urban appearance at the same time. This will help create conditions for the construction of digital cities, take new steps to eliminate pipeline information islands, and lay a good foundation for dynamic updates of pipeline information and pipeline information resource sharing.

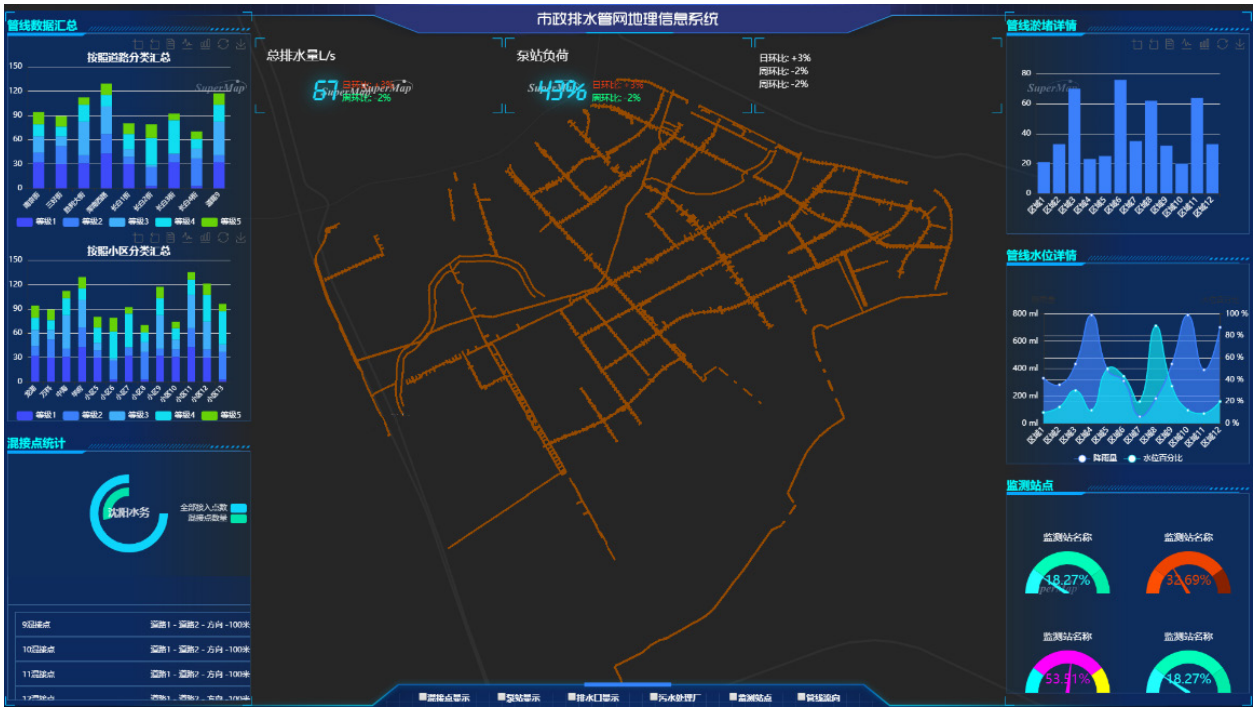
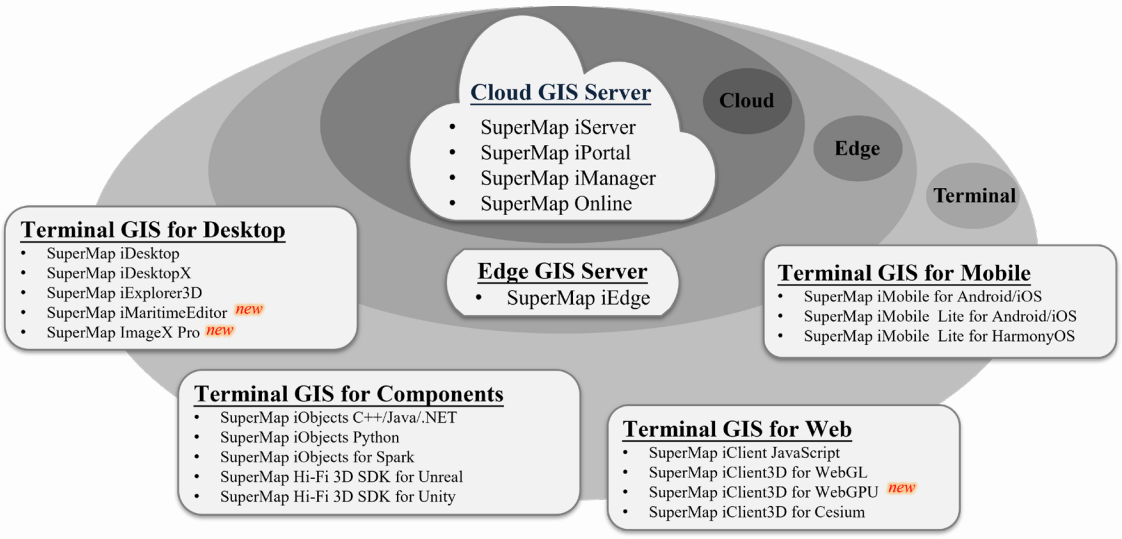


Figure 3. Visualization of pipe network in Linzhang County

Products

What is SuperMap GIS

SuperMap is devoted to developing and providing the most innovative Geographic Information System (GIS) platforms and solutions for global customers. SuperMap product line includes a full range of GIS platforms, including Desktop GIS, Server/Web GIS, Mobile GIS, and Online GIS, which makes SuperMap GIS known as one of the most complete GIS software platforms.



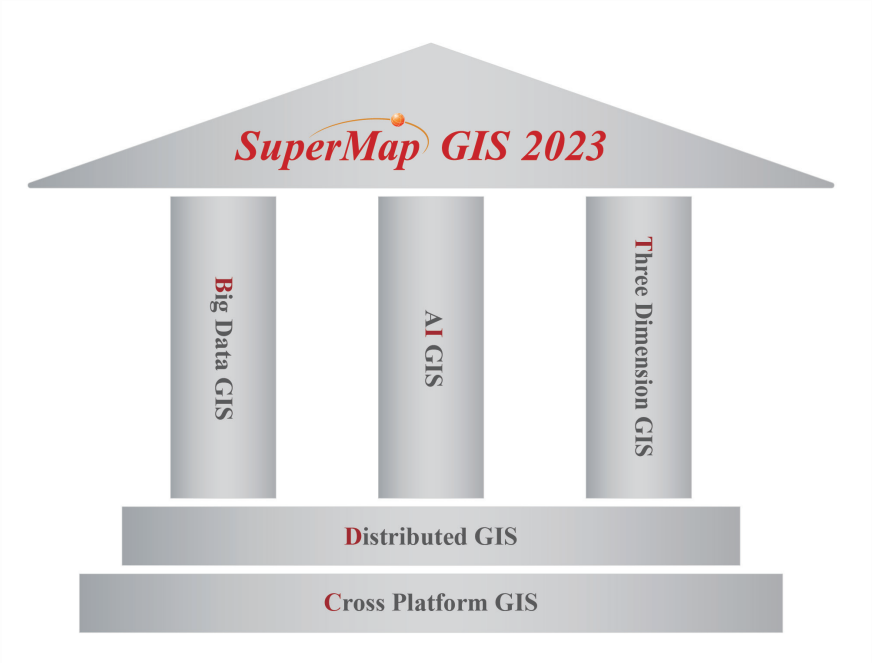
SuperMap GIS 2023 Product Architecture

SuperMap iDesktop: Full-featured Customizable Desktop GIS
SuperMap iDesktopX: Full-featured Customizable Cross Platform Desktop GIS
SuperMap iExplorer3D: 3D Scene Browsing Software
SuperMap iObjects: Full-featured Components GIS SDKs
SuperMap iTablet: Native App for Mobile GIS
SuperMap ARSurvey: AR field surveying tools for Mobile GIS
SuperMap UAV Survey: UAV field survey and annotation software
SuperMap iMobile: Native SDKs for Mobile GIS
SuperMap iServer: Full-featured Application Server for Cloud GIS
SuperMap iPortal: Portal for Cloud GIS
SuperMap iClient: Web GIS APIs for Browsers
SuperMap iManager: Operation Manager for Cloud GIS
SuperMap iEdge: Server for Edge Computing GIS

Application Cases

Technologies

In SuperMap GIS 2023, SuperMap has further improved the five key technologies system (BitDC) of GIS platform software, they are big data GIS, AI (artificial intelligence) GIS, new 3D GIS, distributed GIS and cross-platform GIS technology, which enriched and innovated GIS theory and technology, and empowered the informatization of various industries.



Interview

SuperMap iDesktopX User Experience ——Interview with Professor Carlos

Carlos Roberto Tzompantzi Macías, professor of Monterrey Institute of Technology and Higher Education.

By chance, we heard that Professor Carlos had used SuperMap iDesktopX before. This time we had the honor to invite him to talk about his experience and the application value of SuperMap products in environment management and treatment.

1.By what coincidence did you start using SuperMap GIS products?

It was during the pandemic, towards the end of 2021, that a SuperMap associate in Mexico invited us to a Zoom demonstration, it would be close to midnight given that person's presence. I must say that it was close for me to decline such an invitation, but the GIS theme always moves something in my brain and in my guts. I thought to myself "probably another demo". For having given so many demos in my life, I knew well that things always go well there. However, during the demonstration there were several things about the software that caught my attention: the rediscovery of the GIS began. First of all, I was able to observe that within the menus of the iDesktopX 10i version of SuperMap there are many options that I knew from other software but as independent modules and that caused me to conceive SuperMap as a comprehensive software.

2.How long have you been using SuperMap iDesktopX and what attract you to become a continuous user?

I have been a SuperMap User for almost a year, and I can say that it is an easy-to-understand program with a set of extremely useful tools in the development of many professions that require a map, like the architect, the engineer, the appraiser, the road and railway builder, the marketer, the urban planner, the landscaper, the surveyor, the agricultural technician and so on.

I am convinced, because I have experienced it. SuperMap's technical support is efficient and of good quality, even despite the limitations that we have due to different language and time zone from China. I was able to verify this with a problem we had during a training course in the iDesktop 10i at the Monterrey Institute of Technology and Higher Studies (Instituto

Tecnológico y de Estudios Superiores de Monterrey or Tec de Monterrey for short). It was right in the middle of a training session when a problem appeared, apparently of compilation in the translation from Chinese to English. In less than 24 hours the issue was resolved by the SuperMap technicians in Beijing, an experience that I had never experienced with any other platform even when the technicians were in Mexico City.

Another of the reasons that lead me to become a continuous user of this software is the ease of use of the tools. What on some other platforms I needed to develop in hours before, now only need minutes on SuperMap because everything is in the same place, in the same environment and also with a simplification of steps that make the complicated look very easy.

3.What kind of convenience does SuperMap iDesktop brings to you and what are the most commonly used tools for you or your students?

I must say that within SuperMap product the organization of the information is really new, the concept of Workspace, Datasource and Dataset come to allow the development of an orderly project, in which the information is not lost. You save a group of data and its expression in one or several maps, in such a way that when adding new information you know exactly which part of the project it corresponds to and it can be used many times while maintaining its integrity. In the same way recording and changing projection is as easy to do and understand almost as cutting and pasting.

The most common tools in the classroom are those from the Spatial Analysis and Raster Analysis menu where we build DEMs and carry out analysis of the surfaces quickly extracting isolines of value not only for topographic aspect but also for temperatures, population, income from the population, land values among others.

On the other hand, the Traffic Analysis menu becomes a very useful tool for traffic engineering, analyzing routes, stations and network topology. There are some points we are still developing and exploring.

4.What kind of value do you think SuperMap products will provide for talent development in the field of environment management?

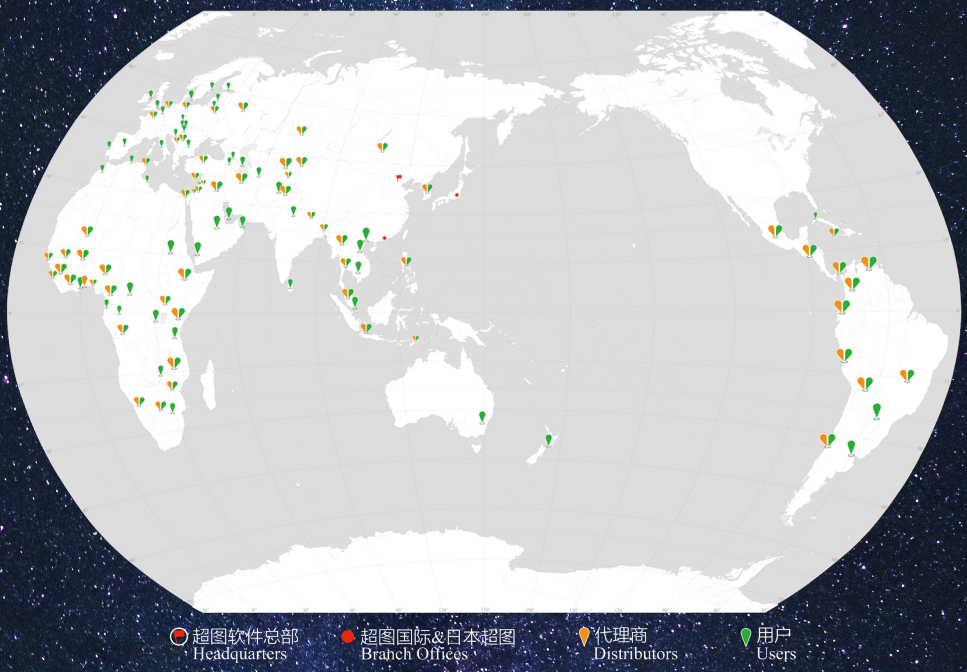
One of the main topics for development and research for the next PhD the ITC will institutionally open in Construction Sciences is the environmental aspect, and of course it has to do with the use of the potential that SuperMap has in 3D to create scenarios of possible flooding in the face of meteorological phenomena in the hurricane season, quantifying the impact both in urban areas and in those of agricultural development. The Hydrology Analysis tools provide the investigator with elements for the creation of references from DEMs to oblique photographs on flat and spherical scenes.

The exciting world of GIS has a natural ally in SuperMap and together they form a synergy with researchers from different academic degrees. I see with great pleasure how young people from the degree in Engineering and Architecture are eagerly looking for that communication of traditional BIM tools with GIS; the applicants for the Master in Construction approach the topics of geology, edaphology and route selection with impressive ease and finally the members of the PhD academic faculty plan to insert the SuperMap GIS in future research projects related to the environment and the sustainability.

5.Do you have any other feelings to share with us?

I end this brief conversation emphasizing that I am a relatively new user of SuperMap, continue my learning process because until today I do not see the end of the applications, the same could be said about Cadastre, Electoral Processes, Marketing, Design Urban and even more. Therefore, thanks SuperMap!

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.