

The Geospatial Advantage: Architecting a Future-Proof Technology Stack

ArcGIS is the secure, integrated platform that enriches data utilization, bolsters IT support for core business priorities, and drives digital transformation.



Overview

The pressure is on for IT leaders. Technology plays an outsized role in the success of an organization. Tech no longer supports the business. The tech *is* the business. Whether that means improving the customer experience, navigating risk in a smarter way, or boosting operational efficiency—modernizing technology is often the answer.

Data analysis has a way of sparking new ideas and driving better decisions. Today, the big challenge for decision-makers is to squeeze impactful insights from the sheer volume, velocity, and variety of data streaming into the enterprise.

In typical organizations, teams value the data that emerges from their own domain and disregard or discount the rest. But unlocking the true potential of data requires them to expand their awareness beyond their sphere of influence.

That's why leading organizations are using geospatial technology—it unlocks this potential. It connects enterprise data through the context of location, allowing deeper insights to surface and creating value across the enterprise. Geographic information system (GIS) technology makes this possible. It empowers teams across the organization to simplify the visualization, analysis, and sharing of enterprise data.

For example, consider the strategic insights gained from correlating consumer behavior data with an organization's physical asset distribution. While traditional analysis reveals customer data and reach capacity, integrating this into a GIS platform transforms abstract relationships into intuitive, visual-based intelligence. The resultant smart maps and geospatial representation serve as a dynamic decision-making framework, enabling real-time scenario modeling, performance monitoring, and greater operational alignment across the enterprise.

Maps are the original data visualization tool. GIS smart maps, enhanced by advanced data management and analytic capabilities, reveal remarkable insights. On the back end, GIS is a powerful, secure database that brings the entire scope of enterprise data together for analysis. This makes GIS primed for running AI-powered automations, creating digital twins, and advancing your organization's digital transformation.



The Power of *Where*

Esri's ArcGIS is the foremost technology in GIS. Think of ArcGIS as the geospatial engine in the tech stack.

In an era of ever-multiplying digital tools, ArcGIS stands out as a unifying and comprehensive platform. It fuses the power of other enterprise tools—integrating data from ERP, CRM, EAM, and BI systems—and enriches them with the power of location-based intelligence.

Through GIS, organizations gain a lens for magnifying trends, patterns, and relationships hidden among datasets. Decision-makers in government and industry use these analytical frameworks to validate hypotheses, identify challenges, capitalize on strategic opportunities, and mitigate potential risks.

ArcGIS is used by most of the world's largest public and private organizations: 70 percent of the largest global companies, 95 percent of the largest national governments, and 80 percent of the largest cities.

This section examines the strategic impact of integrating geospatial context into enterprise-wide data analytics and visualization, highlighting key transformations in decision-making and operational efficiency. These examples draw from sectors in government and industry around the world. They often start by asking the critical but often overlooked question: *Where?*

GIS Maps and Spatial Analysis Make Sense of Enterprise Data

Data is only as valuable as the insights we gain from it. Turning data into actionable insights—that can be shared across departments—transforms how an organization operates. ArcGIS magnifies the value realized from data and information assets in three key ways:

1 Geography contextualizes data and pulls it together. Any type of data—from sources ranging from spreadsheets to sensor streams to satellites—can be mapped and integrated into dynamic dashboards and maps, giving stakeholders the power to visualize what's happening, where, and why.

ArcGIS fuses data from other enterprise analytics tools and platforms into a single, secure framework for a new way to approach the biggest challenges that organizations face.

2 Everyone understands a map. Maps are a universal language. ArcGIS smart maps convey massive amounts of data to tell a story instantly, when that very same data would be nearly incomprehensible if presented via traditional methods.

By overlaying information from multiple datasets—such as geospatial data, demographics, and sales trends—onto the same map, hidden patterns, connections, and impacts become clear and can be easily shared among teams.

3 Insights unlock strategic competitive advantages. Strategically applying insights gives organizations a competitive edge. This may involve collecting real-time sensor data to optimize delivery routes or using the latest environmental reports to predict where extreme weather might disrupt supply chains.

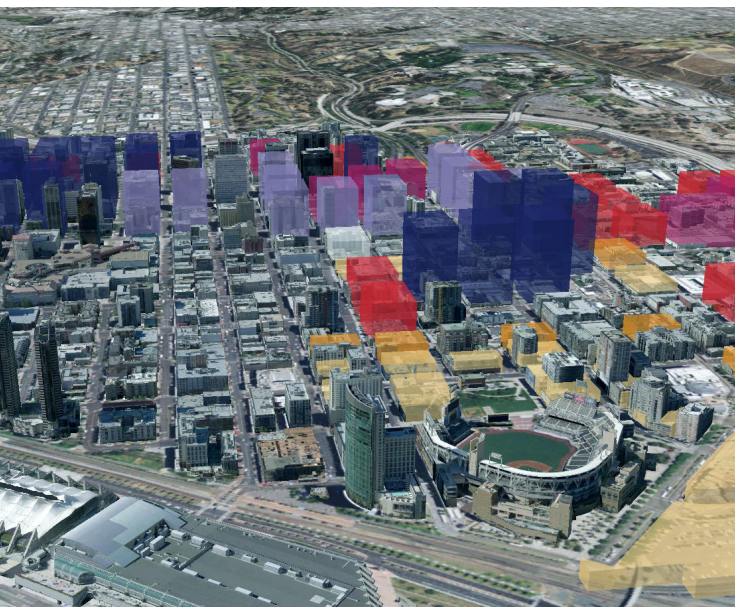
While competitive advantage might look different for every industry, the results achieved with ArcGIS are consistent: better understanding, better decision-making, better outcomes.

Global Construction Firms Add GIS to Their Toolbox

The construction industry is still adapting to new technologies to increase efficiency and reduce errors. Construction site managers consult paper blueprints that don't reflect current progress, while project members share files in ad hoc emails.

But for top firms, digital transformation happens by way of GIS. Smart maps and dashboards deliver data-driven insights and visualizations in real time. Various sources of project information—building information modeling (BIM) files, drone images, data for operations and suppliers—integrate into a geospatial context. This enables stakeholders to identify and remedy bottlenecks before they become costly.

When Skanska UK, one of the world's largest construction firms, adopted geospatial technology, it achieved time savings of up to 40 percent throughout the project life cycle and cut millions in spending. Now [digital twins](#)—dynamic, virtual representations reflecting real-time data inputs—can provide awareness about everything happening on a construction site.



5D Models, Exceptional Insights

By factoring in datasets related to time and cost, GIS digital twins add new dimensions to the standard spatial elements involved in 3D models. An example of this at work is when supplier data is displayed on GIS dashboards in the context of the overall construction project. This helps managers make better choices for orchestrating the arrival of materials and equipment.

HNTB, a global project management firm, uses a digital twin for scenario planning. Staff avoided costly errors by visualizing the interplay of subsurface utility lines [when designing a new airport concourse](#). Using similar GIS techniques, managers can also anticipate a project's environmental regulatory compliance. Layering datasets such as terrain, air quality, and climate risk on a map provides a holistic picture of environmental impact.

“Layering datasets such as terrain, air quality, and climate risk on a map provides a holistic picture of environmental impact.”

Channeling all job-related data into GIS technology enables project teams, clients, and other stakeholders to view real-time progress in astonishing visual detail and context.

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GIS Powers Offshore Windfarms

Danish sustainable energy company Ørsted has used GIS technology to aid in the construction and operation of offshore wind farms for over 10 years. The multistage wind farm development process—involving diverse contractors, datasets, and workflows—presents significant integration challenges that can impact project efficiency and data continuity.

The installation of turbine foundations, for instance, requires specialized vessels. Any disruption in their availability slows the timeline of the project. To make sure vessels are where they need to be, GIS technology integrates real-time data on vessel locations and availability as well as on weather and sea conditions.

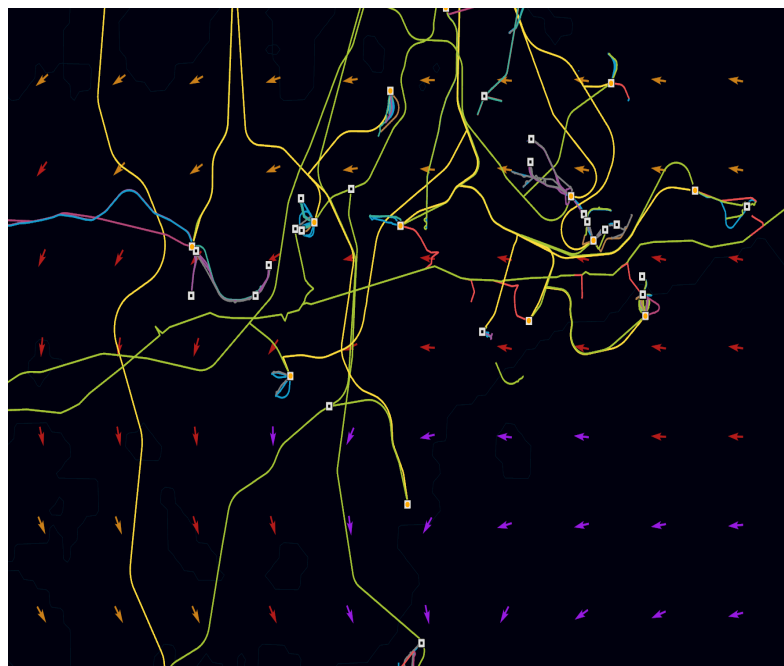
“This reduces costly vessel time and helps us meet critical deadlines,” said Georgina Smith, senior GIS specialist at Ørsted.

The cables running to the foundations require precise calculations to drill a secure attachment. “Previously, we had to manually calculate the angle for each hole,” Smith explained. A custom tool built with ArcGIS takes turbine and cable layout data and outputs a spreadsheet of calculated angles for construction teams. “This has helped bring uniformity to our process.”

Another critical step in wind farm construction is the burial of subsea cables. It is a labor-intensive process that stretches over miles of ocean. Ørsted uses ArcGIS to create a dashboard that monitors the process’s accuracy and progress as well as to what extent a contractor has buried the cable beneath the seabed.

One Source of Truth

To monitor each step of wind farm construction, Ørsted built a centralized GIS infrastructure called WindGIS.



“Our goal is to turn our ArcGIS Enterprise geodatabase into Ørsted’s one source of truth.”

Georgina Smith

Senior GIS Specialist, Ørsted

It contains datasets pertaining to each stage of development—design, construction, operation, and maintenance. Each stage has unique data and considerations, and it is contingent on the completion of other stages.

Every piece of data is in one place for stakeholders to reference. “Our goal is to turn our ArcGIS Enterprise geodatabase into Ørsted’s one source of truth,” Smith said.

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“We try to connect all the tools so the data can be pushed automatically to the map, and so there is no need to do the same job twice.”

Carine Stolz

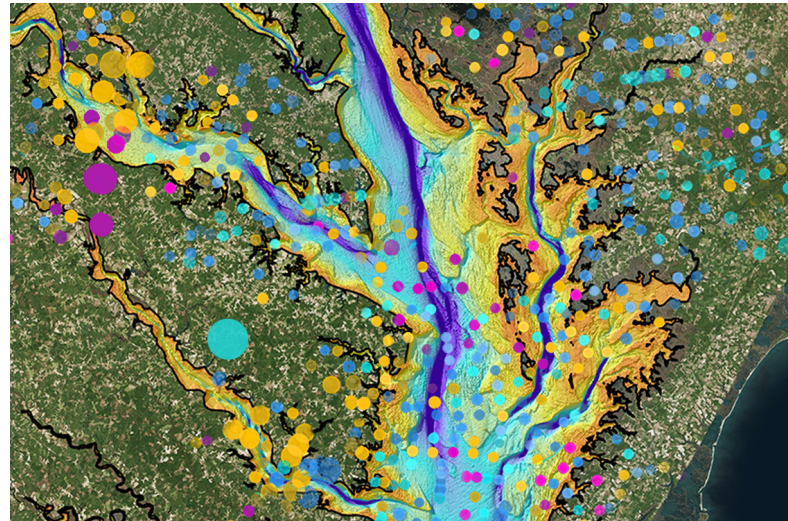
Information Systems Product Line Manager
of Geology and Mining Services, Eramet

French Mining Company Advances Sustainability with Smart Maps

In Senegal, one of the world’s largest titanium and zirconium mines is in constant motion. The French mining company Eramet negotiates the mobile mine around farms and through forests along a 100-kilometer swath. The mobile mine covers an impressive distance of up to 13 kilometers per year.

Understanding where to mine next—responsibly—demands a special kind of map. “With this GIS platform, all the data is shared and we can anticipate every impact to manage,” said Davin Beukes, chief technical officer at Eramet’s Senegalese subsidiary, Eramet Grande Côte. Eramet applies circular systems thinking with the goal to be not just sustainable but also regenerative—extracting minerals and restoring land and livelihoods.

Eramet Grande Côte collaborates locally to clear vegetation, build roads, install electricity infrastructure, and replant the land. GIS shows where each of these activities must take place and helps different teams coordinate the sequence of the work. “We have 50 eyes watching the same thing every day,” Beukes said. “We understand each other’s pain points and collaborate better.”



Eramet has signed on to many sustainability frameworks to protect the lives of the people, economies, and environments around its mines. This includes pledges to the [United Nations Global Compact](#), [Act4nature](#), and the [Responsible Minerals Initiative](#). Each of these commitments requires a steady flow of data from GIS and other systems to meet reporting requirements for the company as a whole and at each mine.

Agile IT for Shifting Business Needs

Inspired by the Paris Agreement, Eramet has changed many aspects of its operations, pledging to reach the goal of zero carbon emissions by 2050. Eramet sold its smelting business and began targeting the minerals that fuel the clean energy transition. In just six years, Eramet has repositioned itself as a sustainable mining and clean energy player.

Carine Stolz, information systems product line manager of geology and mining services at Eramet, and her team created GIS apps that automate reporting workflows. These apps connect to other enterprise systems that report safety conditions, environmental incidents, and more. “We try to connect all the tools so the data can be pushed automatically to the map, and so there is no need to do the same job twice,” Stolz said.

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An Analytics Whiz Learns the Language of Business

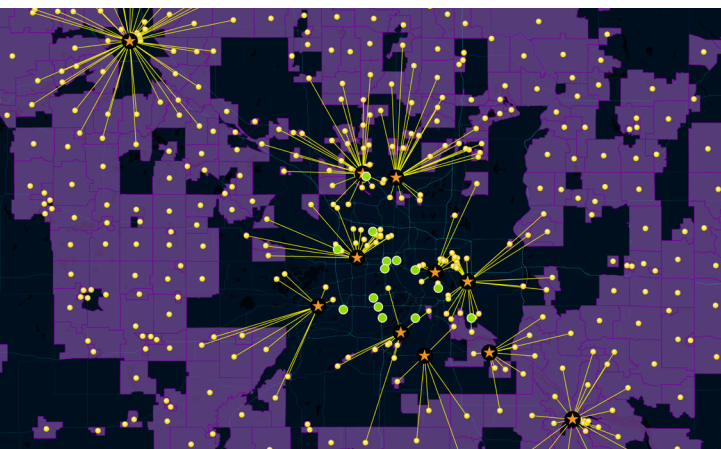
When Kwaku Baa was first introduced to GIS technology, he was working full-time for a transportation company mapping sales territories across the US. As he learned of the technology's capabilities, he immediately sensed the impact GIS could have on this work.

Prior to implementing GIS, the company's analysts spent six months each year analyzing and structuring the territories. Where one manager's territory ended and another's began hinged on a matrix of manual calculations involving drive times, competitor locations, fuel costs, and more.

Baa reduced the six-month job to a single day's work.

Today, Baa applies his ArcGIS acumen at Penske Truck Leasing, a logistics leader with a fleet of more than 440,000 trucks—the literal engines of the economy—that the company leases to commercial and retail customers in North America. There he automates the analysis and mapping of sales territories at the nearly 1,500 sites Penske operates.

As director for customer experience analytics, Baa believes the best insights often emerge from a marriage of data science and the data management and analysis facilitated by GIS technology.



"I started my career in classic analytics, using advanced statistical tools to solve business problems," he explained. "I consider GIS as a natural growth of the tools and capabilities we need to solve complex business problems that have location components."

Location Intelligence Creates Value Across the Enterprise

When the COVID-19 pandemic hit, Baa and his colleagues began using GIS analysis to show Penske executives the daily state of the business. Data-rich maps revealed areas of risk exposure as well as opportunities for business growth. Once the threat of COVID-19 receded, interest in GIS spread across the enterprise at Penske, a company [deeply rooted in innovation and analytics](#).

“Everybody who sees and hears about the GIS and what it can do wants a piece of it.”

Kwaku Baa

Director for Customer Experience Analytics, Penske Truck Leasing

"Everybody who sees and hears about the GIS and what it can do wants a piece of it," Baa said.

The analysts have integrated their asset management system into GIS, drawing data from lighting systems, paving history, ownership records, work order status, square footage, and other sources.

They are working on ways in which GIS technology can [monitor security](#) across the company, as well as analyzing [regional labor trends](#) for human resources.

Looking forward, Baa sees GIS as a tool to democratize information throughout Penske.

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The Best Wine in the World Receives Care and Correction Guided by Smart Maps

In the Douro River Valley in Portugal, Symington Family Estates produces some of the top port wines in the world. While the company can't control the weather—especially now with the extreme conditions brought on by climate change—it can refine its processes. “We’re always looking for the top science in agriculture to produce a better product,” said Pedro Leal da Costa, head of viticulture at Symington Family Estates.

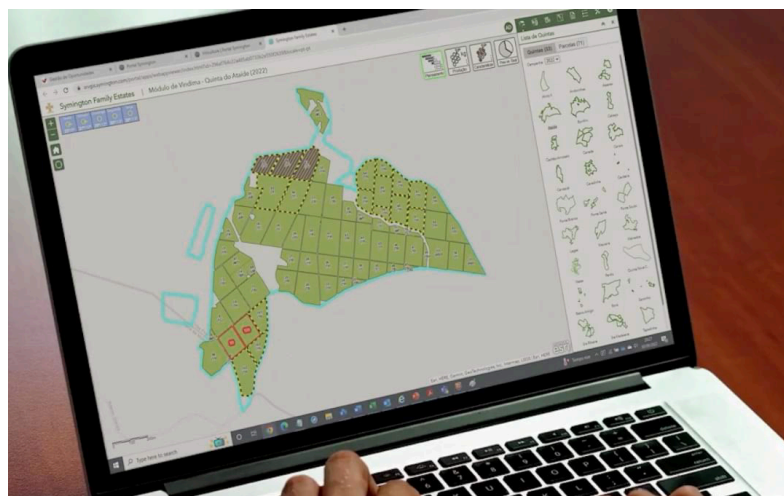
The rocky schist soils of the region have low levels of organic matter and are too acidic for grapes to thrive unattended. With GIS, Symington monitors and nurtures grape and soil health at each of the family's 27 estates.

Grapes are monitored, sampled, tasted, and chemically analyzed to determine the right time for harvest. This involves many trips back and forth to the vines, and maps guide the work showing the winemakers where and when to harvest.

“We have a map of the phenological stages of the grapes,” Leal da Costa explained. The maps integrate close-up photos of grape clusters and high-resolution aerial imagery for both the micro scale of each vine and the macro scale of each winery. Analysis of the samples and images of grapes’ size and color helps determine where the highest-quality grapes are at that moment.

Adapting to the Location and Conditions

Altitude, temperature, and river-proximity datasets are important for connecting the viticulture—the cultivation of the grapes—to the enology, the winemaking. By understanding how each of these factors contributes to the final sensory profile, GIS technology helps winemakers go beyond the usual limits of precision in blending.



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Cultivation approaches vary between sites that are too humid or too dry and among different soil profiles. Detailed management plans are adapted for each location. The maps inform the outdoor work. “We can see where problems are, where we have advanced ripeness, and where we should slow down because we’re going too fast,” Leal da Costa said.

GIS is a perfect fit for an organization that emphasizes quality over volume. “We can do an excellent job using this microscopic viticulture in big areas,” Leal da Costa said.

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Inside One of Europe's Largest Urban Development Projects—Aspern Seestadt

Vienna, the capital of Austria and home to almost two million people, is one of the largest and fastest-growing cities in the European Union. To keep up with the increasing demand for housing, Vienna's leadership envisions a new pattern of neighborhood planning and placemaking—a city within a city.

Built in a reclaimed brownfield, aspern Seestadt embraces new urban ideals while retaining the classical aesthetic of old Vienna. Its balance of sustainability and livability makes the community a template for European smart city initiatives. The swimmable lake in the town center is where there once was a derelict airport. Excavating that area created the gravel base for road building throughout the community. This technique [saved more than 280,000 truck trips and 6,000 tons of emissions](#).

GIS technology helps execute these types of clean energy and low-emission strategies, aiding in long-range planning and day-to-day implementation.

GIS has become a powerful, integrated tool for city planners and architects alike.

Digital Twin Supports Comprehensive Planning

In the early days of planning and construction, Wien 3420 AG, the development agency responsible for overseeing aspern Seestadt's development, primarily used GIS to print updated maps displaying the project's progress.

As aspern Seestadt has evolved, GIS has become a powerful, integrated tool for city planners and architects alike. GIS provides a common virtual meeting space for project-related data and creates a foundation for including detailed infrastructure CAD drawings and building information models.

Over time, planners have developed a geospatial digital twin, or virtual model, of the town. The digital twin documents the past and present while helping town leaders prepare for the future. The town aims to minimize its carbon footprint and implement heat-mitigation strategies. Using the digital twin, planners can make data-driven decisions and predictions that help them reach these goals.

Digital twins also allow planners to adjust tactics based on lessons learned from earlier project phases. For example, if stricter energy efficiency standards were applied to an upcoming development phase, the twin could visually communicate those changes and quantify efficiency gains.

Every member of Wien 3420 AG can see a holistic picture, including completed buildings, the primary plan, and architectural projects that are being refined, making collaboration easier and more valuable across the agency.

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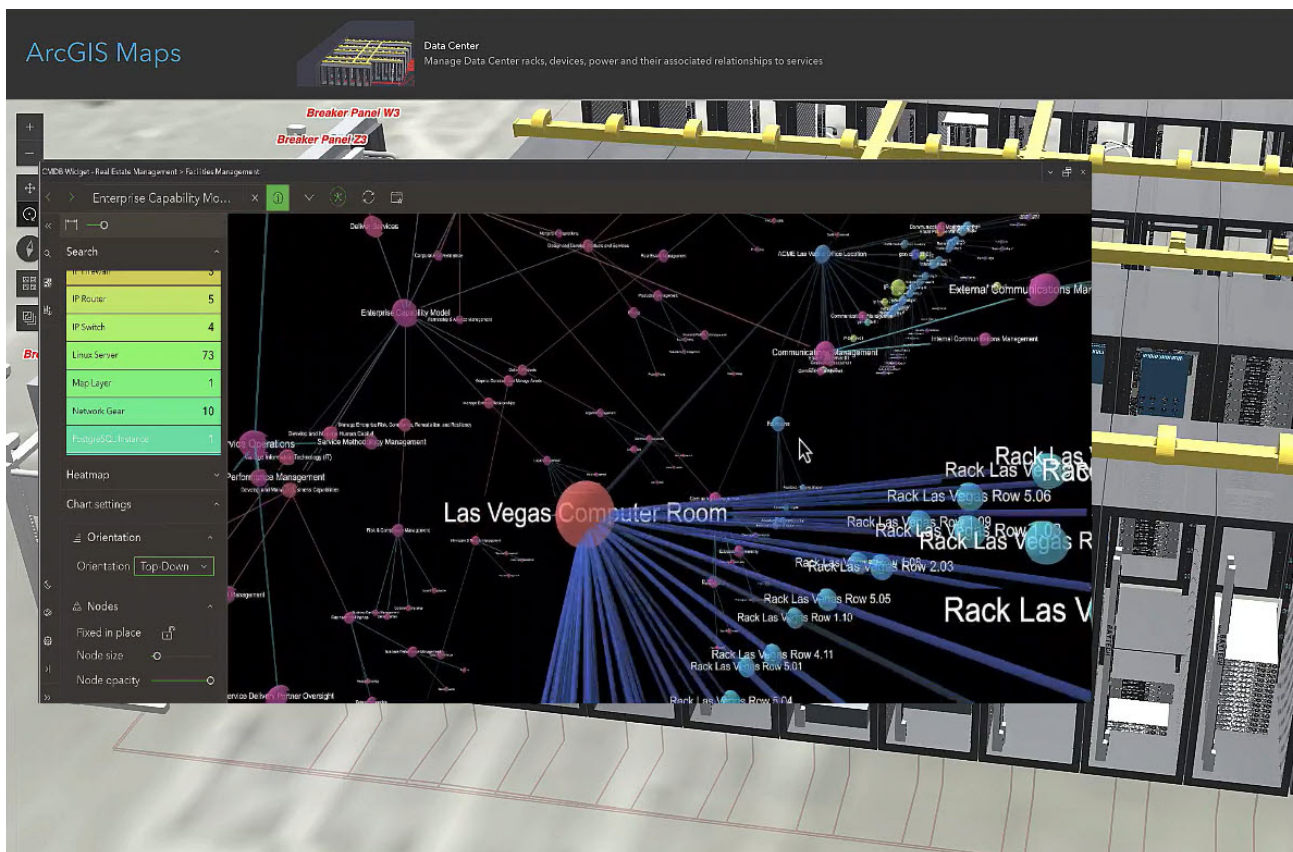
Conclusion

Architecting an optimal technology stack requires strategic vision aligned with organizational objectives. This approach prioritizes long-term business outcomes over short-term fixes, emphasizing scalable solutions that drive enterprise-wide value creation.

Key to this strategy is the integration of disparate data silos across the organization. By leveraging GIS technology as an integration layer, organizations can synthesize data from ERP, CRM, EAM, and BI systems through the powerful lens of a unified geospatial context. The result is a data ecosystem that promotes informed decision-making, enhances operational efficiency, and drives strategic advantage across all business units.

For years, strategic decision-makers in both public and private sectors have understood that location-based intelligence is critical in addressing an organization's most vital challenges and opportunities. Most of them rely on Esri's ArcGIS geospatial platform.

By integrating advanced geospatial analytics into enterprise data strategies, the ArcGIS platform uncovers otherwise hidden patterns and trends across diverse organizational datasets. This location-centric approach empowers executives and decision-makers to optimize business processes, elevate customer experiences, streamline operations, and foster sustainable growth.





Contact Esri

380 New York Street
Redlands, California 92373-8100 USA

1 800 447 9778

T 909 793 2853

F 909 793 5953

info@esri.com

esri.com

Offices worldwide

esri.com/locations



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