Title: Spatial Data and Infrastructure Modernization

Award Category: Information Communications Technology Innovations

State: Indiana

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Project Initiation: February 2020

Project Completion: Ongoing

Executive Summary

The State of Indiana is a leader in utilizing geospatial data and thinking to solve problems innovatively. Indiana was the only state to receive an "A" rank in the latest Geospatial Maturity Assessment by the National States Geographic Information Council in 2021. The Maturity Assessment is completed every two years and is designed as a way for state governments to reflect on and check their geospatial operations, health, and strategy.

In recent years, Indiana has modernized its geospatial infrastructure, platforms, and strategy to continue providing Hoosiers with high-quality data, encourage geospatial thinking, and foster a community that can make a difference. Geographic information systems (GIS) in Indiana are used in many state agencies and hold a robust public presence through programs like IndianaMap and the Statewide Data Harvest. The Indiana Geographic Information Office (IGIO) has housed a library with hundreds of spatial datasets used by the public and government employees. These libraries were reaching the limit of what the hardware could handle and would soon fall short of the advanced analysis tools and the broad open data needs ahead.

To best support these programs, as well as state agency workflows and business processes, the IGIO engaged in a modernization effort designed to overcome the office's technical obstacles and account for future innovations to be undertaken by the office. The modernization included a new server infrastructure, data hosting and storage methods, delivery of services, data governance, user and license management, deployment tools and platforms and an upgrade to new GIS solutions. Through this modernization, Indiana can continue leading the country in providing free and open geospatial data to all from a secure and performant environment.

Idea

The Indiana Geographic Information Office (IGIO), for the past 15 years, has managed a robust geospatial information system (GIS) that has grown to more than 300 spatial datasets for access and use by state government employees and the public. With the great position within the Indiana Office of Technology (IOT), the enablement of partners and engagement with technology leaders has created a stable and predictable structure. The hosted datasets and applications are a product of collaborations and partnerships and have helped Indiana set a precedent for providing open geospatial data to the public.

Traditionally the datasets have been hosted on two on-premises servers and were accessed by users through hundreds of services. This, in combination with high volumes of traffic of people accessing the data, pushed the hardware to the limits. In addition, the projects our office helped to support were growing with improved workflows, tools, and services that required a more robust infrastructure. As a result, our partnership became more reactionary than proactive.

When these challenges were being acknowledged within the office, we also noticed changes in our external partners and the environment. Our council and user group, the coordinating body for GIS in Indiana, and partner organizations saw their own shifts in funding, priorities, and technology. From COVID-19 to shifting workforces, the entire community was impacted.

A solution was needed for the office to continue to provide high-level service and allow room for new ideas to flourish with a supported, modern infrastructure. This solution would also allow us to stop living in a reactionary state and instead live in a proactive world. The need for this kind of solution pushed the IGIO to engage with the community in depth and develop a comprehensive strategic plan. The strategic plan provided an opportunity for us to strengthen our partnerships to mature our infrastructure, services and opportunities for growth in an intentional way. The role of the IGIO became more defined and clarified what kind of collaborations and architecture was needed for an environment, a spatial data infrastructure, to enable everyone to think geospatially.

Implementation

With a more transparent lens of the aging infrastructure and technology, the IGIO and IOT connected with internal and external partners to discuss options for the ideal infrastructure. This process considered several factors, including the Indiana Office of Technology's Cloud and Storage strategies and best practices. The IGIO engaged geoConvergance, a Bloomington, IN-based geospatial and cloud services firm, to develop a plan to modernize the infrastructure. The core group of strategists determined the solution would need to factor in several key criteria:

- o Scalability
- o Accessibility
- o Performance
- o Security
- o Capacity

For a solution to optimize in all these areas, the IGIO made a series of decisions for a new solution. Although complicated at first, the puzzle pieces came together with the cloud infrastructure design that not only solved the current obstacles faced by the IGIO but also accommodated future innovations such as hosting an open data portal on IndianaMap, creating a performant environment to meet IOT's needs and improving collaboration with state agencies.
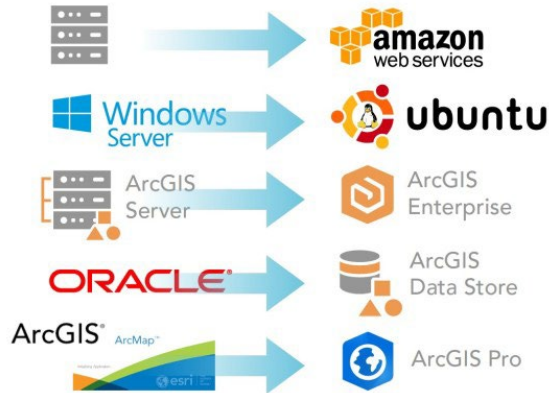
The IGIO decided to move from on-premises servers and host the ESRI ArcGIS server in the Amazon Web Services (AWS) cloud. This cloud infrastructure has ESRI ArcGIS Enterprise installed, which allows for connections to Azure AD for security and single sign-on access. It was also determined that cost savings could be realized and performance enhanced by utilizing an ArcGIS Data Store, eliminating the need for Oracle and enterprise geodatabases.
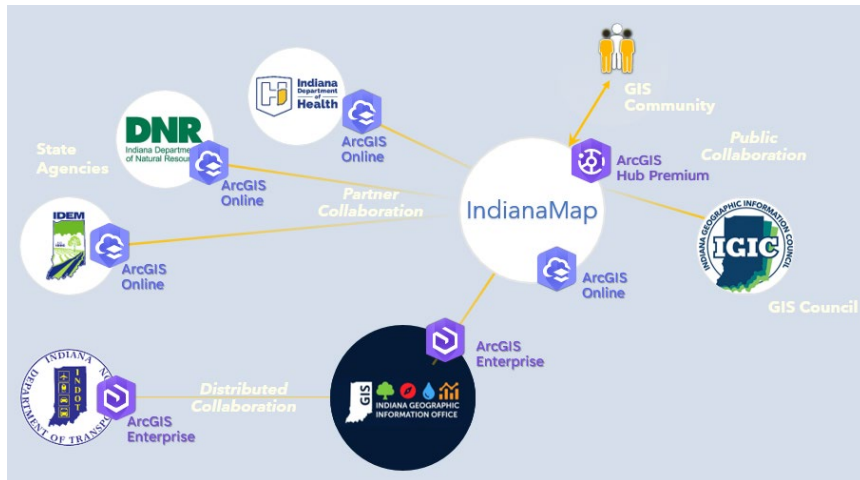
In addition to the data setup, the IGIO partnered with ESRI to adopt and accelerate our use of ESRI solutions such as Hub, Online, Enterprise and Portal, and Configurable applications.

This modern infrastructure has set the IGIO up for clear workflows that are sustainable and more cost-effective. This new environment also serves our staff, state agencies, and the public in a highly visible, responsible, and reliable fashion. Everyone across all systems can use location systems to make better decisions, solidifying GIS as a true enterprise solution.

Impact

Infrastructure modernization has impacted the IGIO and GIS community in many ways – from cost savings to project support to our collaborations at all levels. In the months since the full deployment, the IGIO has benefited from a solution that reduces the monthly server costs by 50%.

The infrastructure choices made for our servers directly provide the IGIO and other state agencies monetary savings and savings in people hours. The new structure is agile and scalable, creating a highly responsive environment with an effective disaster recovery plan. This environment also provides the most stable option for upgrading our software in the future from ArcMap to ArcGIS Pro. By allowing state employees to access the wealth of data Indiana has through ESRI Enterprise Portal, we are prepared to enable them to access their software without VPN anywhere – ensuring greater flexibility and capability for employees to complete their work.

The programs the IGIO supports have also been directly impacted by the modernization effort. IndianaMap, the state's open data portal, has been made possible through the modernization. Without this upgrade, we could not have accepted the responsibility of managing, growing and maintaining the IndianaMap. Now we can provide more than just a stable viewing environment. We provide the ability for the community to use the data through different community

engagement opportunities, starting with the ability for users to create a free ArcGIS Online account, enabling them to create maps and applications at no cost and without heavy application installation. In addition, the Data Harvest and Orthoimagery programs can now deliver data through IndianaMap. This was impossible in the old environment and has eliminated duplication of effort to support, host, and serve this critical data. This has saved time for both data stewards and consumers. These programs and their advancements made possible by the modernization have solidified Indiana as a leader in spatial data accessibility in the United States and tie back to goals outlined in the strategic plan for the IGIO.

Collaboration has been vital in the modernization and has been impacted in many ways. From the beginning of the development of the strategic plan, the IGIO has relied on its partnerships with stakeholders and enablers to guide the change. The discussion was brought into new light, centering around how we supported other's operations and how they supported ours. The decision to involve our stakeholders in the creation of a strategic plan and the modernization that followed gave the entire GIS community of Indiana a stake and commitment in what we do.

The office's collaboration with other state agencies has been enhanced by switching from on premises servers to cloud. Only through our partnerships with the agencies and their ability of them to explain workflows, clearly articulate their business needs, and the desire to continue delivering next-level service to Hooisers and beyond were we able to shift to a cloud environment. A new level of trust and community has been reached, and the foundation has been laid to continue fostering an enterprise environment that is collaborative and proactive.

Our partners at the local and federal levels have also reaped the benefits of the modernization. Data is now more readily available to be shared from local to state and state to federal, as well as the opposite loop. Stakeholders have access to more up-to-date data and can access it at a central location through IndianaMap. The open data platform has over 400 new external community users and has supported several hundred unique maps created per week.

Members of the GIS community now engage not only with the IGIO but with other data stewards as well as the upgraded solutions we are now able to fully utilize because of the enhanced infrastructure. This is an area the IGIO is leaning into as we finish the more technical portion of the modernization.

Enablement

The future looks bright as the IGIO continues to progress with the modernization. With the full deployment of the cloud environment complete and the new updated data solutions deployed, the IGIO will complete the retirement of the few remaining on-premise servers. Now the IGIO continues to enable more users to apply geospatial strategies with the migration from legacy ArcMap Desktop applications to the fully supported and user-friendly ArcGIS Pro platform.

The new modern platform and solutions will advance the popular and award-winning Statewide Data Harvest by supplying all 92 Indiana counties with the tools and platform to conduct heightened data review and improvement processes with quality checks on their locally owned critical data layers. This will improve the quality of data for the county and larger initiatives like NextGen9-1-1, economic development and planning, statewide transportation initiatives, Broadband coverage and improvements, and disaster response.

Collaborations and partnerships will continue to be built and enhanced at all levels. We have begun work to improve our workflows and reduce duplication of effort with our partners at the US Department of Transportation, the US Census Bureau, the US Geological Survey, and more. The future will hold things like real-time spatial data and collaborative editing environments allowing us to improve data discoverability and increase accessibility for all Indiana citizens and businesses or organizations working with Indiana.

Engagement, support, and collaboration are at the heart of the next frontier for the modernization. We see many opportunities to empower the community with spatial data and to encourage spatial thinking. This will be accomplished with continuing enhancements to IndianaMap, the next phase of the Data Harvest, and the partnerships we build and maintain with our stakeholders.