



A ROAD MAP FOR GEOSPATIAL INFORMATION SYSTEM APPLICATIONS ON VBLOCK™ INFRASTRUCTURE PLATFORMS

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WHITE PAPER

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Executive Overview

The world of information technology (IT) has been experiencing a dramatic shift from traditional data centers, in which a single application sits on a dedicated server, to a new IT model in which resources are pooled and shared across the organization – *converged virtualized infrastructure*. This technology is having a resoundingly positive effect on functional areas like Geographic Information Systems (GIS). Many organizations, both in the private and public sector, are facing increased pressure from the business segment to use virtualized GIS applications to take advantage of these changes – to lower costs, improve services, and gain higher IT efficiencies.

CIOs and CTOs, however, realize that there are numerous challenges to adopting a converged infrastructure model to provide the GIS services and applications that business demands dictate. These challenges include:

- Meeting governance, risk management and compliance requirements
- Integrating and maintaining interoperability with other enterprise applications
- Improving time to market with agile application development, testing and deployment
- Providing an improved user experience with outstanding application performance
- Adhering to organizational security policies

VCE, the Virtual Computing Environment Company formed by Cisco and EMC with investments from VMware and Intel, understands the challenges facing organizations using GIS today. A new model is needed to meet their growing requirements while addressing the challenges above, lowering operational costs, and gaining IT efficiencies. VCE's Vblock™ Infrastructure Platforms allow organizations to run enterprise GIS solutions like industry leader Esri's ArcGIS platform with the predictability, dependability, and security of best-in-class, pre-integrated, rapidly deployed platforms. For more information of deploying ArcGIS to leverage the power of Vblock platforms, please see *Leverage Vblock™ Infrastructure Platforms to Transform Geospatial Information Systems*, at VCE.com.

Advances in GIS Technology and Increasing Availability

A Geographic Information System (GIS) captures, stores, analyzes, manages, and presents geographic location data, thereby allowing users to make decisions informed by highly accurate and detailed geographic information. A recent example is the Deepwater Horizon oil spill in 2010. Organizations like the Louisiana National Guard and US Fish & Wildlife Service mapped the location of sandbags that were deployed to help limit oil flow on Gulf Coast shores and document the areas where wildlife was most affected by the spill.

GIS technology has been evolving over the last 40 years. Historically, these systems were only utilized by a small group of professionals in specific industries such as government or utilities. With evolving technology and increased consumer demand, however, GIS solutions are expanding to industries like real estate, insurance, and retailing. VCE's Vblock™ Platform Infrastructure assists leading GIS providers such as Esri with the capability to deliver a platform of GIS solutions called ArcGIS. Examples of how Esri's ArcGIS solution can support industries include:

- **Workflow Management** – Improve user productivity by automating activities and improve user productivity by automating common and redundant GIS processing activities.
- **Logistics** – Track mobile assets and implement green initiatives for saving fuel.
- **Market Analysis** – Understand markets in your area for improved business decisions about customer service offerings.
- **Collaborative Platform** – Display and share information on interactive maps with one of the fastest growing and leading collaboration solutions.

- **Mobility** – Enable the mobile workforce with applications suited for platforms like Apple iOS, Google Android, and Windows Phone 7 to collect, provide, and report data and perform GIS analysis – ultimately expanding the benefits of GIS to a broader audience.

Emerging Mobile GIS Market for Smartphones & Mobile Devices

New opportunities for GIS solutions are rapidly growing with the rise of smartphones. Analysts project that in 2011 smartphones will pass conventional mobile phones in the marketplace. A 2010 comScore study indicates 14% of smartphone users (33.5 million) use mobile mapping applications, a 44% increase from 2009. This number is expected to grow further through 2011-12.

Maps are the visualization layer for GIS. As consumers continue to demand new mobile applications with mapping technology, GIS solutions allow developers to integrate GIS data analysis, management, and display into new mobile applications. As development becomes easier, supply and demand in this ecosystem will grow synergistically, as new applications spawn new users, and new users demand new and increasingly sophisticated applications. Companies are building applications and APIs (application programming interfaces) that support mobile operating systems Apple iOS, Google Android, and Windows Phone 7.

Organizations in numerous industries can use platforms like ArcGIS on a converged IT infrastructure to develop, test, and deploy smartphone applications that increase operational efficiency by improving workflows and allowing business users to make more timely and accurate decisions.

Growing Consumer Demands in the Public Sector

The public and non-profit sectors are increasingly using GIS solutions at the local, state and federal level, where GIS can provide a key platform for collaboration, participation, transparency, and accountability between government and citizens. Examples include:

- Recovery.gov uses GIS applications to provide taxpayers a user-friendly way to view government Recovery Act spending by allowing third party organizations to combine GIS maps with government spending data.
- EPA's MyEnvironment (<http://www.epa.gov/myenvironment/>) uses GIS applications to allow consumers to view environmental indicators in their neighborhood, such as air quality and surface water conditions.
- Data.gov uses GIS applications to increase sharing and interagency coordination by mapping raw government data in a user-friendly fashion for local access.

These government-sponsored and third-party *mashups* of raw data with GIS mapping transform data that was once overwhelming and incomprehensible to the average citizen in an actionable, localized format that facilitates participation, accountability, and government transparency. With the current administration's emphasis on improving government transparency, GIS applications are becoming as important a customer service offering in the public sector as they are in private enterprise. GIS software and data are becoming more open and available to users, which is changing the future of mapping and how geospatial information is deployed, presenting significant opportunities for citizens and government to collaborate to meet twenty-first-century problems. As this data sharing continues to grow, companies like Esri and VCE are providing a common model and platform for GIS solutions.

Requirements for a GIS Solution on Converged Infrastructure

GIS providers need an IT solution that can support critical business objectives while providing the advantages of a converged infrastructure.

Governance, Risk Management, and Compliance

Any time there is a shift from the traditional way of providing a service, organizations must consider governance, risk management, and compliance (GRC). Organizations migrating to a converged infrastructure need an IT solution that supports the four basic components of GRC: *strategy, processes, technology, and people*. Senior management must have access to critical management information to direct and control organizational strategies and tactics in accordance with the organization's risk tolerance and in compliance with government regulations and legal guidelines.

Integration and Interoperability

The ability to integrate a GIS solution with other enterprise applications is necessary for organizations to realize efficiencies and cost savings. For example, San Diego recently integrated Esri ArcGIS with its SAP Enterprise Resource Planning (ERP) software. Prior to this integration, the street services division was dispatched on work orders without accurate information. This integration provides detailed map information for the SAP work order, which saves time, increases productivity, and reduces fuel consumption. IT and GIS platforms must provide easy integration with other enterprise applications.

Time to Market

Competition is constantly driving organizations to build, test, and deploy new applications and integrate them with other applications. While the traditional approach to application development and testing required separate dedicated computing and storage resources, which was costly and created long delays, organizations today must respond quickly to meet user demands and stay competitive. They require a quick and nimble platform to provide a converged environment for application development, testing, and deployment.

Customer Service and Performance

User experience within GIS solutions is crucial. The ability to provide a superior user experience relies on the ability to manage GIS data and provide a platform that meets customer SLAs. Organizations must manage the following to provide quality user experience:

- **Elasticity** – The demand for GIS data can quickly rise and fall due to uncontrollable events like sudden weather conditions such as a hurricanes or tornados. The GIS IT environment must be able to expand and contract, as these demands require.
- **Storage** – As technology advances increase the amount of available GIS data, data storage requirements also increase. A converged infrastructure solution must be able to scale easily and cost effectively to meet these data demands without straining CAPEX and OPEX budgets.
- **Compute** – As available GIS data increases, so also do the requirements to process this data for actionable information. GIS IT must be able to add compute capability as needed to keep up with market demand without significant CAPEX or OPEX.
- **Reliability** – A GIS converged infrastructure solution must provide ample availability and redundancy for fail-over protection.

Organizational Security Policies

To ensure data security, many organizations are considering a private converged infrastructure solution that complies with the organization's security policies while avoiding the CAPEX and OPEX typically associated with private solutions.

Vblock™ Infrastructure Platforms Provide an IT Solution That Supports GIS

With Vblock platforms, VCE delivers the industry's first completely integrated IT offering that combines best-in-class networking and compute components from Cisco; storage, security, and management technologies from EMC; and virtualization capabilities from VMware. Seamless support assures end-to-end vendor accountability. This pre-integrated, converged infrastructure enables rapid virtualization deployment so customers quickly see a return on investment. Vblock platforms offer varying storage capacities and processing and network performance, and they support such capabilities as enhanced security and business continuity.

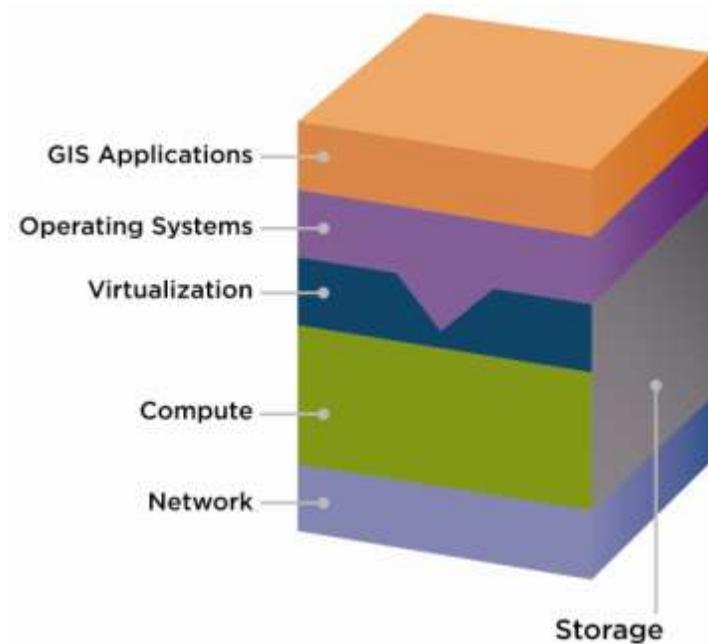


Figure 1. Vblock Infrastructure Platforms running GIS applications

Simplifying Governance, Risk Management, and Compliance

Vblock platform utilizes Unified Infrastructure Manager (UIM) for the orchestration of the converged infrastructure. UIM provides simplified management including provisioning, configuration, and compliance management; and aggregated event and alert consoles. By managing the Vblock platform as a single entity, organizations dramatically reduce operational expenses and integrate management for the Vblock platform network, compute, and storage resources. With UIM, an organization running GIS on the Vblock platform is provided an operations management tool that helps organizations create and maintain processes to meet government regulations and industry standards.

Providing Integration and Interoperability



GIS solutions continue to realize a larger user base, and integration and interoperability between different applications are a requirement for today's IT environment. Vblock platform provides an infrastructure where multiple mixed workloads, such as GIS and ERP, can run in a secure and compliant multi-tenant environment. These applications can securely run independently, or Vblock platforms can provide a seamless path for organizations that want to combine data from multiple sources to create a new service offering. For organizations that integrate directly with Vblock platforms, VCE offers APIs with UIM and VMware vSphere.

Reducing Time to Market

Vblock platforms reduce the cost and duration of test and development by leveraging virtualization with virtual machine cloning technology. An organization can easily scale a GIS solution and switch from test to production using virtualization technology. Working in a virtualized environment lowers the cost for organizations as they can build and remove new servers as needed to meet new application and business initiatives.

Managing Customer Service with Reliable Performance

As data center needs grow to meet GIS demands, Vblock platforms are easily scalable, while maintaining uninterrupted, reliable performance to ensure great customer service. Industry leading virtualization technology ensures that workloads running on physical hosts are distributed to cluster members with available CPU and memory resources. Vblock platforms are comprised of architectures that are pre-tested, fully integrated, and scalable, with:

- Repeatable units of construction based on matched performance, operational characteristics, and discrete requirements of power, space, and cooling
- Repeatable design patterns that facilitate rapid deployment, integration, and scalability
- An architecture that can be scaled for the highest efficiencies in virtualization and workload re-platforming
- An extensible management and orchestration model based on industry standard tools, APIs, and methods
- A design that contains, manages, and mitigates failure scenarios in hardware and software environments

Adhering to Organizational Security Policies

RSA solutions are commonly deployed with Vblock platforms to help organizations meet security needs. Data security and access control capabilities can be enforced system-wide with RSA solutions that meet the most stringent security standards, supporting standard features like malware detection systems, vulnerability detection, disposal logs, and patch compliance. This ensures the confidentiality, integrity, and availability of the environment at every layer using technologies like identity management and access control, encryption and key management, firewalls, malware protection, and intrusion prevention.

- Security Information and Event Management (SIEM) provides centralized storage and analysis of logs of network logs and events.
- Data Loss Prevention (DLP) identifies, monitors, and protects data in use (e.g. endpoint actions), data in motion (e.g. network actions), and data at rest (e.g. data storage) through deep content inspection, contextual security analysis of transaction (attributes of originator, data object, medium, timing, recipient/destination, and so on) within a centralized management framework.
- Strong, two-factor, adaptive authentication provides robust authentication.

Conclusion



More than ever, public sector and enterprise organizations are creating and operating GIS solutions to combine the increasing stream of GIS data with other information to make exciting new consumer applications. These new mashups make data that was once hard for the average person to access and understand accessible, meaningful, and actionable on a wide range of desktop and mobile devices.

To support these applications, organizations need IT transformations that can meet that meet the challenges of adopting a converged infrastructure model while providing the GIS services and applications that business demands dictate:

- Meeting governance, risk management and compliance requirements
- Integrating and maintaining interoperability with other enterprise applications
- Improving time to market with agile application development, testing and deployment
- Providing an improved user experience with outstanding application performance
- Adhering to organizational security policies

VCE answers these challenges, and Vblock platforms support GIS applications and their operational requirements. Working with VCE, GIS organizations can adopt a best-of-breed, pre-integrated, predictable, and reliable platform that offers streamlined management tools and seamless support.

Next Steps

To learn more about this and other solutions, contact a VCE representative or visit www.VCE.com.

ABOUT VCE

VCE, the Virtual Computing Environment Company formed by Cisco and EMC with investments from VMware and Intel, accelerates the adoption of converged infrastructure and cloud-based computing models that dramatically reduce the cost of IT while improving time to market for our customers. VCE, through the Vblock solution, delivers the industry's first completely integrated IT offering with end-to-end vendor accountability. VCE's prepackaged solutions are available through an extensive partner network, and cover horizontal applications, vertical industry offerings, and application development environments, allowing customers to focus on business innovation instead of integrating, validating and managing IT infrastructure. For more information, go to www.vce.com.



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