

VMware vFabric GemFire for Defense and Government Agencies

AT A GLANCE

The Department of Defense and other U.S. Government agencies face unprecedented data management challenges caused by the increasing distribution and volume of data and a shrinking decision-making window. Traditional database-centric architectures have reached their limitations, lacking the speed to deliver data in real-time while proving difficult to scale and extremely costly to manage and maintain. VMware vFabric™ GemFire® addresses these challenges with a modern data management approach that delivers elastic scalability and high speed data processing.

KEY BENEFITS

- **On demand elastic scalability and reduced costs**—Leverage virtual infrastructure, public and private cloud architectures, and commoditized x86 hardware to scale dynamically and in precise increments. Add more computing capacity as needed, gaining in organizational agility while minimizing RDBMS instances and related license fees.
- **Event-driven, real-time updates**—Deliver data to modern applications, anytime and anywhere, with unparalleled speed.
- **Single, consistent view of enterprise-wide data**— Provide real-time, synchronized updates across all repositories as soon as changes to data elements occur. Deploy locally or as a global data backbone.
- **Reduced mainframe dependencies and related costs**—Offload mainframe data to minimize MIPS rates, eliminate batch jobs that deliver data too late, and reduce the time and cost of application development.

Providing High-Speed Data and Elastic Scale for the Modern Application Era

Data Management Challenges

The ability of an organization to make better decisions based on timely and accurate data is essential at all levels of government – either in the executive, judicial and legislative branches, or across law enforcement, homeland security, defense and the intelligence community. But discovery of such information – and quickly making sense of it – has become an ever more daunting challenge due to the increasing distribution of data, as well as the sheer volume and velocity of information flowing through government enterprises. Confronted with a shrinking decision-making window, this situation has created the “perfect storm” that can have dire consequences if the wrong action is taken, or if no one responds at all.

Traditional data architectures – many of which were implemented decades ago – have reached their maximum potential. For example, building data warehouses that hold massive amounts of historical data requires implementing and managing ever larger relational database management systems (RDBMS) that remain monolithic in nature. Not only is this antiquated approach difficult and costly to scale, it can provide a limited view of data that is sometimes a day or more out of date. It is incapable of processing data fast enough to provide real-time situational awareness.

Transform Data Management

Today’s applications require a new approach to data management. This includes providing real-time data for accurate situational awareness, superior decision-making, and immediate response to potential threats. To meet these demands, a modern data management approach calls for processing and storing data in-memory to enable high-speed data access and achieve elastic scalability. VMware vFabric GemFire creates a virtual data “fabric” deployed across datacenters and private/public clouds. As a global data backbone spanning geographical boundaries, vFabric GemFire enables a single, consistent view of distributed data that is constantly changing. GemFire also reduces costs by scaling incrementally using commoditized x86 hardware while mitigating the need for expensive RDBMS licenses.

Real-time Situational Awareness

Timely distribution of information can mean the difference between success and failure, but nowhere are the consequences more critical than during a military operation. Without complete, up-to-the minute operational information, the wrong decision can be made in crucial life and death battlefield situations. For example, complex sensor networks generate massive quantities of information such as data that is reflective of battlefield imaging, combat troop identification, and ground movement target tracking.

Whereas data that is written to disk can immediately be out of date, vFabric GemFire processes data at high speeds, in-memory, and can provide real-time updates within a fraction of a millisecond of the event actually occurring. For example, GemFire’s event-driven architecture can monitor changes occurring on the battlefield, and disseminate up-to-the-minute intelligence, surveillance, reconnaissance, logistics and supply chain information to war fighters and their coalition partners. GemFire can then initiate processes in response to these events and generate real-time alerts, while providing a single, continuous view of constantly changing data that enables superior decision-making abilities through real-time situational awareness.

ENABLING DISA TO DELIVER
VIEW OF MILITARY ACTIVITY
IN REAL-TIME WORLDWIDE

The U.S. Defense Information Systems Agency (DISA) is using vFabric GemFire to enhance the delivery of command-and-control software to the Global Command and Control System - Joint Program Office (GCCS-J). In partnership with Northrop Grumman Corporation, vFabric GemFire is providing data management capabilities to arm government agencies - including U.S. Military Commands, Joint Task Forces, the Pentagon and other vital information-reliant agencies - with up-to-the-minute visibility and situational awareness of military actions wherever they occur.

The U.S. military relies on data to make the decisions that impact national security. To make these crucial security decisions, the military requires immediate and ongoing access to the maximum amount of information possible. Any downtime or delay in obtaining vital security data may lead to a slowdown in military response time and, consequently, the compromise of missions and operations necessary to ensure national well-being.

The Agile Client, an alternative to the standard GCCS-J client, provides three-dimensional views of geographic referenced data. The vFabric GemFire data fabric, with its robust, built-in distributed data management functionality, provides lightning-fast caching, support for disconnected operations, continuous querying and real-time analysis to speed the delivery of this vital data to users' desktops anywhere, at any time.

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Overcoming RDBMS Scale and Cost Issues

Government agencies are deluged with an overwhelming amount of information generated by their internal operations and external constituents—by some estimates increasing 60% year-over-year. The limitations of traditional database-centric architectures have become painfully apparent as government enterprises struggle to meet this challenge. Because monolithic databases cannot partition data, they can only be scaled vertically in very large chunks by installing yet bigger machines. This antiquated approach not only lacks agility, but also adds significant hardware and license costs to IT budgets.

vFabric GemFire uses an innovative memory-disk hybrid approach that delivers both speed and reliability, with the flexibility of writing data to disk only if desired. GemFire also enables enterprises to scale incrementally by leveraging commoditized x86 hardware. This greatly reduces the cost of both hardware and software by adding more computing capacity as needed while minimizing RDBMS instances and related license fees. On-demand elasticity is also achieved by leveraging virtual infrastructure to scale dynamically (up and down) and across private or public clouds. Furthermore, by delivering the same reliability and quality of service as a traditional database (fault tolerance, transactional integrity, backup/restore, disk durability, etc.), GemFire can serve as the operational data store. This modern approach to data management can in effect relegate legacy databases to more of an archival and analytic reporting role - two important services for which the RDBMS is ideally suited.

Global Data Backbone

Whether used by the military, intelligence or civilian agencies, the data that is consumed by analysts and key decision makers is most often widely distributed geographically. The challenges of presenting a single, consistent view of streaming data flowing across regional and nationwide boundaries is enormous, particularly when much of that data is constantly changing and writing data to disk is too slow.

GemFire can be deployed locally or as a global data backbone, and can manage data stored in disparate repositories located worldwide. It provides a single view of globally distributed data with real-time synchronized updates across all repositories as soon as changes to data elements occur. These real-time updates are also driven by relevant events using GemFire's event-driven architecture, coupled with its high-speed, in-memory data processing technology. Providing unparalleled speed, GemFire can process tens of thousands of data updates per second with sub-millisecond response time. Data replication across all nodes ensures no updates are lost in case of system failure - all without the expense of cumbersome and brittle replication technologies.

Reduce Cost of Mainframe Applications

Increased transaction rates and data volumes are driving up costs of mainframe applications. Batch jobs that take hours to complete provide data that may already be out of date. Worse yet, making changes to these mainframe applications can be both expensive and painful.

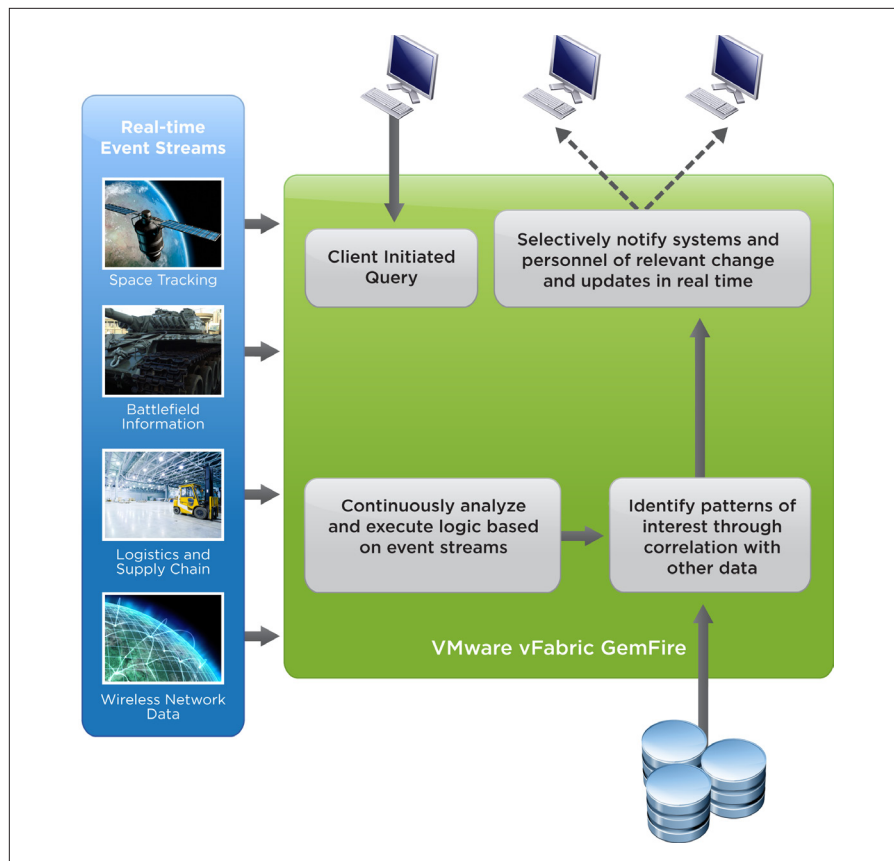
When using vFabric GemFire as the data management layer, you can mitigate mainframe dependencies and bottlenecks. It can be used to offload data from mainframe responsibility for both online transactions and batch processing while making data readily available for new applications. By processing and storing data in GemFire's virtual data fabric - and not just copying data - requests don't even need to touch the mainframe. This not only lowers MIPs rates, which can add tens of millions to hundreds of millions of dollars in annual costs, but batch jobs that used to take hours can now be completed in less than a minute. Furthermore, by using GemFire as the foundation for a modern data model, changes to mainframe applications are easier and faster for added agility.

The GCCS-J software, in conjunction with vFabric GemFire, has proven instrumental in arming the GCCS-J Program Office to provide data awareness, reduce network bandwidth utilization and help to support disconnected operations for the Combatant Commands. GemFire is also used to increase application performance to help reduce the number of servers required to deploy a GCCS-J instance.

Summary of Features and Benefits: VMware vFabric GemFire and vFabric SQLFire

VMware vFabric GemFire provides the foundation for a new generation of elastic, in-memory database technologies built for the cloud era. The latest addition to this modern data management approach includes VMware vFabric SQLFire. Whereas the original GemFire is well suited for Java developers, SQLFire is better equipped to support structured data using a sophisticated SQL query engine. IT organizations can now easily leverage existing DBA skill sets and tools, while anyone with relational database experience will find the SQLFire configuration and deployment model simple and intuitive to use. Deployed either separately or together, GemFire and SQLFire provide the following key benefits:

- **High speed data processing:** can perform database computation ranging from data transformation to transactional processing. The memory-based design drives GemFire's high performance; data items are delivered at memory access speeds, rather than being constrained by disk I/O performance.
- **An operational data store:** can be configured as a distributed database running over large and small clusters, as well as other grids, while providing the persistence layer for in-memory operations.
- **A global data backbone that spans regional boundaries:** through the use of WAN gateways, organizations can connect multiple distributed systems located in different geographical regions to orchestrate 24x7 global workflows; each location owns and manages its regional chunk of data and distributes it accordingly to the other regions.
- **Real-time data synchronization for consistent, single view of globally distributed data:** changes to data at one location are immediately reflected in all other locations where the data element is used.
- **Real-time event detection:** can monitor sudden changes in data to detect certain types of events (e.g., location of opposing troop movements) and alert/update reporting and analytic mechanisms.
- **Guaranteed messaging:** built-in messaging engine propagates event data with guaranteed delivery.
- **Rapid data access via session replication and L2 caching:** GemFire manages HTTP session state for application servers, such as Apache Tomcat, in memory. It can also serve as a highly scalable level 2 cache for persistence/ORM (e.g., Hibernate), thereby reducing network traffic and the RDBMS bottleneck by reducing database reads.
- **Self-managing/self-repairing capabilities for high availability and elastic scalability:** even when distributed over hundreds of nodes, GemFire provides high availability by managing a node's sudden outage through data redundancy, with the ability to failover in-flight requests to another node. Elastic scalability is also achieved by initializing new nodes dynamically in response to variable demand.
- **Failover reliability with a unique "shared-nothing" architecture:** any given node can fail unexpectedly and all in-process transactions that were accessing that node are redirected to other nodes that contain the same data. Since nothing is shared between the nodes, the risk that a specific node will corrupt a data entry or record is eliminated.
- **Cloud ready:** you can extend GemFire's capabilities to include rapid development and deployment of cloud-based applications that are easily portable across private and public clouds. For example, with vFabric's seamless integration with Spring, the most popular Java development framework, you can declaratively configure GemFire data infrastructure from Spring and connect it directly to Spring-based applications.



VMware vFabric GemFire's event-driven architecture automatically updates systems and alerts personnel for real-time situational awareness.

Modernize Your Data Management Now

Learn more about how VMware vFabric solutions can modernize your approach to data management and transform your organization by achieving real-time situational awareness and elastic scalability while also reducing costs. Visit: vmware.com/go/vfabric.

Find Out More

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