

Bringing the US Department of Defense from PC to the Enterprise

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ABSTRACT

A US Department of Defense (DoD) agency with over USD 40 billion in sales and revenue, 25,000 employees, and 5.3 million parts to source, partnered with SAS® to turn its disparate PC-based analytic environment into a modern SAS® Grid Computing server-based architecture. This presentation discusses the challenges of under-powered desktops, data sprawl, outdated software, difficult upgrades, and inefficient compute processing, and the solution crafted to enable the agency to run as the Fortune 50 company that its balance sheet (and our nation's security) demand. In the modern architecture, rolling upgrades, high availability, centralized data storage, and improved performance enable more accurate forecasting, which means getting our troops the supplies that they need—when and where they need them.

INTRODUCTION

Our DoD had a problem. Requests to increase force-readiness were mounting amid dwindling budgets. For its logistics arm, this meant predicting the DoD's inventory needs, running its supply chain, and addressing audits and inquiries with greater speed and accuracy yet fewer resources.

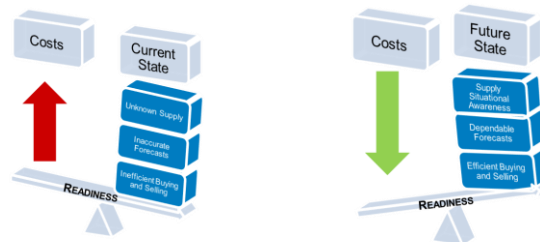


Figure 1. Goal: Reduce Costs While Improving Situational Awareness, Forecasts, and Procurement Efficacy

The mission need was clear—e.g., get soldiers supplies, tanks gas, and peace-keeping efforts food. The question was, “How do we address these needs with an IT environment that was not set up for big data inventory optimization or high-risk procurement identification?”

The existing environment was riddled with multiple and duplicative data silos and few analytic tools. Analysts:

1. **Extracted:** Moved data from multiple repositories onto their desktops for cleansing, joining, and exploring. This overwhelmed the network and increased job run time.
2. **Prepared:** Addressed data quality according to individual proclivities. This compromised reliability and integrity.
3. **Modeled:** Developed predictive models on data samples. This reduced accuracy and missed critical outliers.
4. **Reported:** Produced static Microsoft Excel reports. This caused a lack of agility and the inability to efficiently address ad hoc queries.

The IT setup was impeding the agency's ability to accurately procure and place the 5.3 million items our troops needed.

OPTIMIZING THE WORLD'S MOST COMPLEX SUPPLY CHAIN

Addressing issues of domestic and international security, the DoD is one of the largest and most complex supply chain organizations in the world. Its ability to accurately forecast supply needs has the ability to

change the outcome of wars and save lives. Although missions might differ, the IT challenges impeding the DoD's ability to get our troops the items that they need are strikingly similar to those of most large commercial manufacturers—data access, reliability, processing latencies, and limited analytics.

KEY CHALLENGES

The DoD is data rich. It has detailed repositories of orders, stock, maintenance logs, and more. The challenge is bringing those repositories together, standardizing on common keys, and then empowering analysts to access, analyze, and model on the aggregate data.

When asked about its greatest obstacles, the Logistics' IT and Functional departments came together to identify the following:

1. **Data Movement and Proliferation:** The IT department complained of analysts trying to bring gigabytes of data across the network, which created throughput bottlenecks and data sprawl. From a functional perspective, this meant retrieving data was slow (with stories of analysts kicking off jobs and then heading to lunch...or home for the night). Then, once extracted, data was saved outside the systems of record, filling up both local and shared storage. Heavily manipulated extracts further compounded the issue, frequently rendering conflicting and unreliable results.
2. **Limited Analytics:** Analysts noted that, unless they were programmers, they had few options for extracting and exploring data and building reports. Self-service explorations, visualizations, and advanced analytics were at the heart of the analysts' requests. They could not rely on a minority of programmers to run an insatiable number of queries. The business needed the ability to explore the data on its own, especially because reviewing a report often led to additional questions such as, "How many of that part failed?" "Which manufacturer did it come from?" "What other manufacturers make a similar part?" In addition to the need for user-friendly drag-and-drop visualization and reporting tools, analysts needed the ability to use more advanced modeling techniques to enable forecasting and inventory optimization. The mission demanded the ability to answer questions like, "When do we anticipate the peace-keeping effort to run out of water?" "Which manufacturer should the water be sourced from to reduce the wait time?" and "What are the costs?". Analysts need advanced scenario planning to determine drivers and influence outcomes, not just to report on what happened.
3. **Simplify System Maintenance and Contracting:** In a predominately PC-based environment, the IT shop had a full-time job just trying to upgrade the hundreds of licenses that it had on thousands of computers...individually. Meanwhile, Contracts bemoaned having to keep-up with not only multiple vendors, but 10 to 15 contracts per vendor (in many cases, each branch had its own licensing agreement). The agency was not realizing maintenance or licensing economies of scale. A major request of IT and Contracts was license consolidation and a transition to a scalable platform for centralized maintenance. The business would benefit by receiving the latest software releases more quickly, consolidating compute resources, and freeing-up capital.
4. **Leverage Existing Investments:** The agency has been investing in IT solutions for decades. It did not want to throw all its efforts out in the name of modernization. In particular, it was important to the DoD that it continue to leverage its experience and investment in SAP Business Objects for operational reporting and, moreover, SAP HANA as its new enterprise data warehouse. Any modernization had to not only be able to feed data to Business Objects, but also to take advantage of the data centralization and robust processing power of SAP HANA.

THE SOLUTION

The modernized environment needed to build on existing investments while addressing processing inefficiencies, reducing data movement and proliferation, offering self-service reporting and advanced modeling, and reducing the maintenance burden on IT and Contracts. The resulting solution included two principal components, an analytic and a supporting platform.

THE ANALYTIC PLATFORM

The analytic platform was designed to provide data exploration, visualization, reporting, and advanced analytics via code, Microsoft Office, and a drag-and-drop web interface. The principal solution was comprised of four complementary modules:

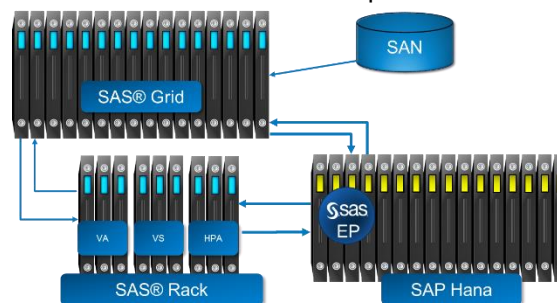
1. **SAS® Office Analytics**: Provides analytics to end users who might not be programmers through an interface most analysts are already comfortable with—Microsoft Office. Integrated with Microsoft Word, PowerPoint, Excel, etc., SAS Office Analytics reduces data movement and proliferation by rendering source data within Microsoft via SAS. To facilitate collaboration between programmers and analysts, the SAS Office Analytics bundle includes coding products (e.g., Base SAS®, SAS/GRAPH®, SAS/STAT®) and SAS® Enterprise Guide®.
2. **SAS® Visual Analytics**: This in-memory product offers fast and agile self-service data exploration, reporting, and analytics in an intuitive drag-and-drop interface. It goes beyond business intelligence to advanced analytics (e.g., predictive modeling, decision trees, correlation matrices, word clouds, etc.), enabling forecasting and scenario planning alongside trend analysis. Although SAS Visual Analytics does not require programming experience, SAS code can be deployed within it, taking advantage of programming skills within the organization.
3. **SAS® Predictive Modeling Workbench**: Facilitates data preparation and modeling. This sophisticated bundle enables descriptive and predictive model development through SAS® Enterprise Miner™, model management and performance monitoring through SAS® Model Manager, and in-database scoring for rapid execution of models within SAP HANA. This offering takes advantage of the agency's investment in SAP HANA by taking the work to the data and harnessing the processing power of SAP HANA to run SAS models inside it. The outcome is improved time to results, reduced data movement and redundancy, and improved model accuracy. This enables the DoD to respond to Congressional inquiries in a more timely and reliable fashion.
4. **SAS® Inventory Optimization Workbench**: Optimizes processes and addresses management science challenges with enhanced operations research methods, including mathematical optimization, discrete event simulation, and project and resource scheduling. SAS Inventory Optimization Workbench is designed for the operations researchers in the organization.



These products create an integrated analytic platform. Code can be pushed into visualization tools (i.e., SAS Office Analytics and SAS Visual Analytics) and visualization tools can be used to quickly hone-in on the variables relevant for model creation in the SAS Predictive Modeling Workbench and the SAS Inventory Optimization Workbench. Together, these products offer a sophisticated business analytics environment, enabling coders, statisticians, and business analysts to work together and build off one another's findings.

THE SUPPORTING PLATFORM

To support the robust analytic platform and the data volumes affiliated with the new enterprise data warehouse, the modernization effort needed to include a high-powered highly scalable supporting platform. The supporting platform was designed to transition the agency from disparate PC licenses to an enterprise application that was integrated with SAP HANA. In addition to processing data quickly in its own right, the platform was selected based on its ability to run SAS jobs within SAP HANA, decreasing processing times, data movement, and data sprawl. At the heart of this architecture is SAS Grid Computing.



SAS Grid Computing is the most scalable infrastructure available today. It leverages commodity hardware and multiple nodes to compute SAS workloads. Eliminating the need for PC SAS licenses, it is recommended for organizations growing in data volumes, jobs, or job complexity with many SAS users. It offers:

1. **Commodity Hardware:** Both affordable and available, this can reduce the barriers to entry when data volumes or capacity necessitate platform expansion.
2. **Resource Allocation:** It offers workload management, queuing, scheduling, and job suspension, enabling the organization to set priorities and efficiently use resources.
3. **Continuity:** When it comes to mission systems, up-time is critical. SAS Grid Computing has built-in fail-over, offering high availability and rolling upgrades.
4. **Scalability:** SAS Grid Computing enables organizations to scale-up by adding compute workload, rather than additional stand-alone servers. This means that not only is the procurement less costly, but there is no net-new installation, configuration, or maintenance involved with the expansion – a new blade assumes the configuration of the existing stack.
5. **Performance:** At its core is increased throughput via parallelization. Jobs are broken into units of work and pushed across all available nodes for efficient processing. With an organization concerned about 18-hour runtimes, this can offer query results in less time than it takes to fill a coffee of cup.

CONCLUSION

For an organization making decisions that impact the outcomes of wars and lives, time and accuracy are paramount. National security and tax-payer efficacy mandate an IT infrastructure that supports the Fortune 50-sized organization that our DoD logistics is akin to.

The former architecture was complex, siloed, unscalable, and maintenance intensive. Queries timed-out before returning results, analysts struggled with record return limitations, models were built off samples, trend analysis lacked historical data, data silos limited the ranges and scope of queries, and advanced analytics was nearly nonexistent. The result was limited computing power, excessive data movement and replication, a lack of standardization and governance, and excessive time spent on data access and preparation over analysis.

The modernized solution provides this DoD agency with self-service data exploration, visualizations, and analytics on a scalable enterprise platform. The solution speeds up the development of analytic models by using the power of multiple processors in parallel. It brings together three complementary architectural approaches to provide the agency with its most salient information faster.

1. **SAS® In-Memory Analytics:** SAS Visual Analytics is an in-memory product that provides user-friendly drag-and-drop data exploration and analytics. It is inherently faster because in-memory alleviates the need to constantly pull data from a database to perform analysis.
2. **SAS® In-Database Analytics:** The SAS® Scoring Accelerator takes advantage of in-database processing. It takes the work (i.e., SAS jobs) to the data (i.e., SAP HANA). Computations are run in SAP HANA, saving the time that would have been spent moving and converting the data and freeing up the network throughput, while reducing data movement and proliferation.
3. **SAS Grid Computing:** For SAS work not processed in-database, SAS Grid Computing is there to balance and manage it. It uses resources to their full extent for increased productivity and performance.

The modernized environment addresses the businesses' needs for greater access to aggregated data and the tools to explore, report, and model it, while simultaneously providing IT and Contracts with simplified data storage, processing, licensing, and maintenance at reduced total cost of ownership. A platform for operational efficiency, enhanced supply chain decision support, and analytic maturation is key to enabling any large organization to accurately forecast demand and mitigate risks. In the case of

the DoD, getting this right is not just about the bottom line, it about the safety and security of our nation and its people.

CONTACT INFORMATION

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