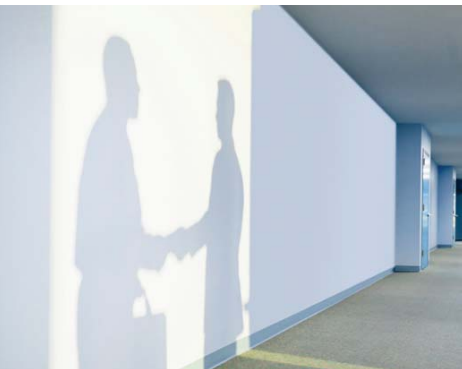


Motorola Engineers Highly Available Grid Data Integration Infrastructure with Informatica PowerCenter

CASE STUDY



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In the wireless world, reliability isn't just about whether a cell phone user can find service. The demand for reliability extends far back in the wireless supply chain—to the data integration processes that make it possible for one of the world's largest suppliers of wireless network components to engineer and deliver solutions that make networks work.

Motorola Inc., the \$35 billion communications giant based in Schaumburg, Illinois, is in the vanguard of enterprises transitioning to multi-node grid computing solutions for improved reliability, cost savings, greater performance and scalability, and the ability to rapidly add new servers to support increased data volumes and changing business demands.

In its migration to grid computing, Motorola's 14-member Engineering Data Management (EDM) team is taking advantage of Informatica® PowerCenter®, a single, unified enterprise data integration platform that allows companies of all sizes to access and integrate data from virtually any business system, in any format, and deliver that data throughout the enterprise at any speed. With robust grid computing capabilities, PowerCenter is helping Motorola ensure 24x7 availability of data integration processes that support a data warehouse used by more than 5,000 Motorola engineers and managers in about 20 countries worldwide. Failover to a backup node guards Motorola against downtime that could trigger costly interruptions in time-sensitive engineering and customer support functions. Figure 1 shows how the grid computing capabilities of PowerCenter work to ensure high availability.

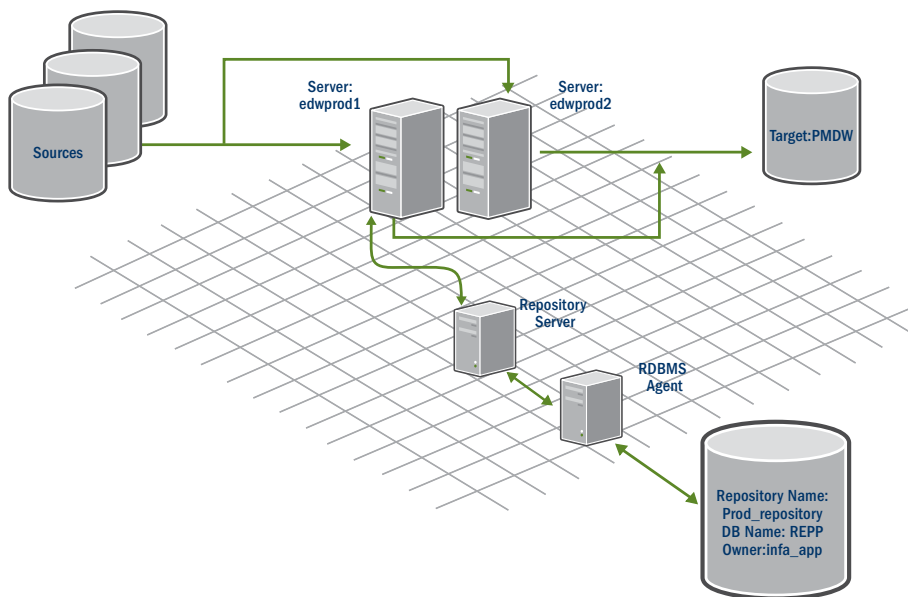


Figure 1: PowerCenter's Robust Grid Computing Capabilities Work to Ensure High Availability for Motorola's Engineering Data Warehouse

ENTERPRISE DATA INTEGRATION PLATFORM DELIVERS MEASURABLE BENEFITS

Nearly 3x Improvement in Data Load Performance

With PowerCenter, load time to a test management data mart took just 90 minutes, compared to 4 hours and 20 minutes. Load time to a change management data mart was cut in half, from 5 hours to 2 hours and 30 minutes. PowerCenter moves about 8 GB a day to the warehouse, accommodating greater data volumes, increased load frequency, more data sources, and improved data freshness.

Three-Year ROI of \$2.5 Million in Reduced Development Time

With PowerCenter's prebuilt mappings and reusable component-based mappings, Motorola has reduced development and maintenance time by at least 15 percent, as compared to custom-coding alternatives. Over three years, Motorola estimates ROI of more than \$2.5 million from three of the largest data marts, for change management (\$870,000), test management (\$1.27 million), and inspections (\$409,000).

Motorola's Engineering Data Warehouse includes seven data marts and serves as a vital foundation for coordinated cross-functional engineering, quality assurance (QA) testing, defects tracking and resolution, and other activities that bear directly on product quality, customer satisfaction, and the bottom line in the brutally competitive wireless marketplace.

Based on Informatica PowerCenter and an Oracle 9i database, the 200 GB warehouse is one of several data management initiatives that support the rapid growth of Motorola's Networks & Enterprise Business, which supplies end-to-end network software, hardware, and services to wireless service providers, such as Verizon, Nextel, China Mobile, and Japan's KDDI, in 27 countries. In 2004 Networks & Enterprise Business accounted for 17 percent of Motorola's sales.

Beyond helping to ensure high availability, the Motorola EDM team estimates that its use of PowerCenter is delivering a three-year ROI of about \$2.5 million, primarily due to reduced data integration development time compared to custom-coding alternatives. Looking to capitalize on this success, Motorola's is using PowerCenter in other lines of business, including a Networks data warehouse.

The Grid Computing Model: Lower Costs, Higher Performance

In an earlier iteration, the warehouse was based on a single Enterprise™ 450 symmetric multiprocessing (SMP) server from Sun Microsystems. Like many organizations, Motorola's EDM team foresaw high costs in adding more memory, disk, and proprietary Sun UltraSPARC™ processors to support increased data processing demands as data volumes and the number of source systems, concurrent sessions, and end users grew.

In 2004, Motorola transitioned its PowerCenter/Oracle 8i warehousing environment to a two-node production grid with a pair of four-CPU Sun Fire™ V440 servers, relatively low-cost commodity machines (entry-level price about \$14,000). An identical two-node grid was deployed for development and testing. Besides the cost savings compared to its single SMP machine, Motorola envisioned:

- High availability assurance (failover to a secondary node)
- Cost-effective flexibility to add nodes to meet changing demands
- Load balancing and partitioning for optimized resource allocation
- Greater scalability and performance
- Zero downtime during maintenance

"Initially, we became interested in the grid model from an economic point of view," said Kiyoka Takahashi, Data Warehouse Engineer. "Now, though we've never had a hardware failure, we have the peace of mind in knowing our systems would fail over to a secondary node because of the high availability. And we've got the flexibility to change parameters and do maintenance without any downtime."

In the transition, Motorola also upgraded to Informatica PowerCenter 7 and PowerCenter Server Grid, Partitioning, and Team-Based Development Options. Built-in support for the grid model eliminated the need for Motorola to custom-code data integration processes across multiple servers, or to rely on costly third-party grid framework software. And with partitioning, Motorola had the option to divide data processing in subsets running in parallel among available CPUs to accommodate increased data volumes and numbers of concurrent sessions.

A Nearly 3x Improvement in Data Load Performance

With its upgrade to PowerCenter 7 and turbocharged grid deployment complete in late 2004, Motorola realized remarkable performance improvements. Load time to a test management

data mart was nearly three times faster—just 90 minutes compared to 4 hours and 20 minutes. Load time to a change management data mart was cut in half, from five hours to two hours and 30 minutes.

Given its power boost, Motorola has increased from five to 200 the number of concurrent PowerCenter sessions to help accommodate greater data volumes, increased load frequency, more data sources, and improved data freshness. In all, PowerCenter moves about 8 GB a day to the warehouse, with frequencies that range from once every 30 minutes to once a month.

“In the past, load times were simply too long, and customers were complaining about the freshness of data,” Takahashi said. “Performance has improved dramatically, even though the sheer volume of data and the number of data sources have increased. Initially we were skeptical, but it is running about 200 concurrent sessions, and we are really happy.”

Because performance is well within comfortable margins, Motorola has not fine-tuned the load balancing and partitioning level mechanisms in PowerCenter. “I don’t think we’re using Informatica PowerCenter to the fullest yet,” Takahashi said. “Session logs, workflow logs, server logs we don’t really look at unless there’s a problem. I’m sure there are some other things we can do, but right now we’re just scratching the surface.”

The global distribution of Motorola’s engineering workforce—from the North American to the Middle East to Asia—demands that the Engineering Data Warehouse be available 24x7 across intercontinental time zones. An interruption could grind to a halt time-sensitive troubleshooting for a blue-chip customer, or handicap service representatives that rely on a customer support data mart to handle inquiries.

Meanwhile, the fast-paced wireless industry and time-to-market pressures in delivering third-generation (aka 3G) wireless network solutions known by such acronyms as CDMA2000 and UMTS ahead of rivals Siemens, Nokia, Lucent, and others only heighten the mandate for “always-on,” data-driven engineering.

To help ensure high availability and failover to a secondary node if a primary node suffers a hardware failure or is removed from service, Motorola improvised with a set of homegrown shell scripts that enable an administrator to manually move data integration processes to the backup node and minimize disruption to engineering. Combined with its use of the Oracle 9i database Real Application Clusters, Motorola has implemented data integration and warehousing technology designed to ensure business continuity.

The release of PowerCenter 8 offered a High Availability Option that automates high availability functionality and is designed to ensure the reliability of session and workflow for data integration and metadata repository services. Takahashi said Motorola wanted to explore the PowerCenter 8 High Availability Option and its three unique capabilities:

- Resilience. Automated reconnection attempts data sources and among PowerCenter components
- Failover. Automated resumption of PowerCenter services on a secondary node
- Recovery. Resumption of running PowerCenter sessions on a new node from the point of failure

“That is very interesting,” Takahashi said. “With our shell scripts, there’s nothing automatic—we would still have to manually restart on another machine. The only thing automatic is that we’ve set it up to page us if something fails.”

In addition, sophisticated load balancing technology built into the PowerCenter 8 Enterprise Grid Option would enable both workflows and sessions to be evenly distributed across Motorola’s two nodes based resource utilization criteria such as CPU usage, available memory, and disk speed for an additional performance boost.

The Motorola EDM team’s evolution to a highly available grid computing data integration infrastructure is the latest in a series of initiatives that has expanded the role of PowerCenter and Motorola’s Engineering Data Warehouse to support the development of next-generation wireless software, hardware, and services for radio base stations, base site controllers, mobility soft switching, application platforms, and third-party switching technologies.

Sourcing from about a dozen homegrown and packaged engineering applications, most based on Oracle 9i databases, PowerCenter supplies and supports a number of data integration processes, including data cleansing, validation, normalization and mapping, and application of common transformations and business rules.

Three-Year ROI of \$2.5 Million in Reduced Development Time

With PowerCenter’s prebuilt mappings and reusable component-based mappings, Motorola’s EDM programmers have reduced by at least 15 percent time spent on development and maintenance compared to the alternative of custom-coding, Takahashi said.

Over three years, Motorola estimates ROI of more than \$2.5 million from three of the largest data marts, for change management (\$870,000), test management (\$1.27 million), and inspections (\$409,000). Most of the savings and cost avoidance result from reduced development time enabled by PowerCenter as compared to custom-coding alternatives.

With a manual approach, Motorola faced difficulties in defining user requirements and managing changes to them, Takahashi said. “And the changes fail to be captured via mapping due to the fact that manual changes to the source are not in the requirement,” she said.

For the Change Management Data Mart, one of the warehouse’s most critical, PowerCenter extracts and loads three times a day from four source applications, including IBM Rational® ClearQuest® and Lucent Technologies Sablime® applications.

“The data warehouse has to be available, and the data load has to go through,” Takahashi said. “That information is required to finish the final product that goes out the door. Or if a defect is found in software that we ship to a base station, that data must be tracked and entered into our defect tracking system and the data warehouse.”

Over several years, the Engineering Data Warehouse has been instrumental in improving the accuracy, consistency, management, and speed of complex engineering processes that span multiple units and data domains. Its benefits have included:

- Complete, accurate, and cost-effective data management for engineering
- Consistency in processes, data definitions, tools, and business rules
- Data-driven decision-making that minimizes redundancies across teams
- Uniformity in customer, change and test management, code inspection, and other processes
- Metrics and reporting through Crystal Enterprise™ and PL/SQL

According to Takahashi, Motorola's EDM team expects to grow the warehousing environment further in the coming months and years. It plans to incorporate additional data sources and add new data marts to support specific engineering functions.

To support the growth, Motorola is likely to add additional nodes to its two-server production grid, and is examining PowerCenter's change data capture technology to move only data updated since the last load to accelerate performance and minimize the impact on bandwidth and operational systems. "I think the data warehouse will grow to two or three times the size we have now," Takahashi said.



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