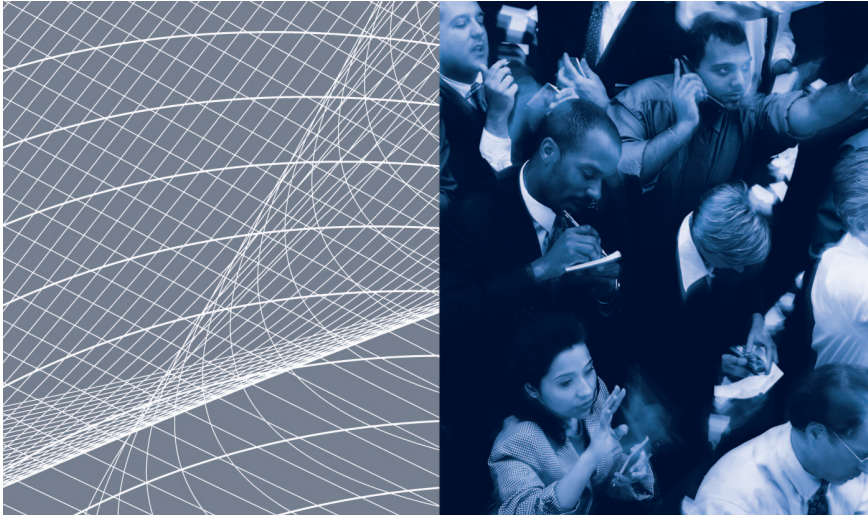


IBM Grid Offering for Analytics Acceleration: Risk Management and Compliance in Capital Markets and Retail Banking



Highlights

- *Improves risk and compliance application performance by accelerating time to results, allowing for more sophisticated analytics*
- *Helps improve the use of compute and storage resources across an organization, reducing infrastructure operating costs*
- *Offers an affordable, flexible and resilient IT environment that supports a wide range of packaged and custom analytical applications*

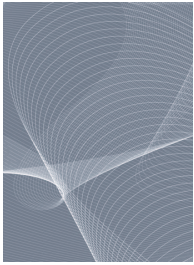
The challenges facing risk and compliance managers

Today's climate of increased economic and regulatory challenges is driving financial services firms to reevaluate their approaches to risk management and compliance.

Looking beyond market risk, these firms are examining credit, liquidity, operational risks and other risks. For instance, the movement from market to credit risk greatly increases the complexity of computations because:

- *Longer time frames with more steps are involved; market risk typically has a 24-hour hold period, whereas credit risk can have as much as a 10-year hold period.*
- *Credit mitigants affect credit exposures, including netting and collateral agreements, and must be modeled as part of the exposure.*
- *Complex corporate relationships must be understood to examine the exposure to any given entity.*
- *Some decisions cannot be considered in isolation—a whole portfolio of decisions must be optimized.*
- *Decisions must not be automated at the expense of business agility—these decisions must be able to evolve and change over time.*

The complexity of products and portfolios requires more value-at-risk versus Monte Carlo calculations and scenario simulations. In addition, financial services risk managers need their analyses to move from overnight to intraday and even to near real time for incremental value-at-risk calculations, price equilibrium models, pre-deal credit limit checking and other



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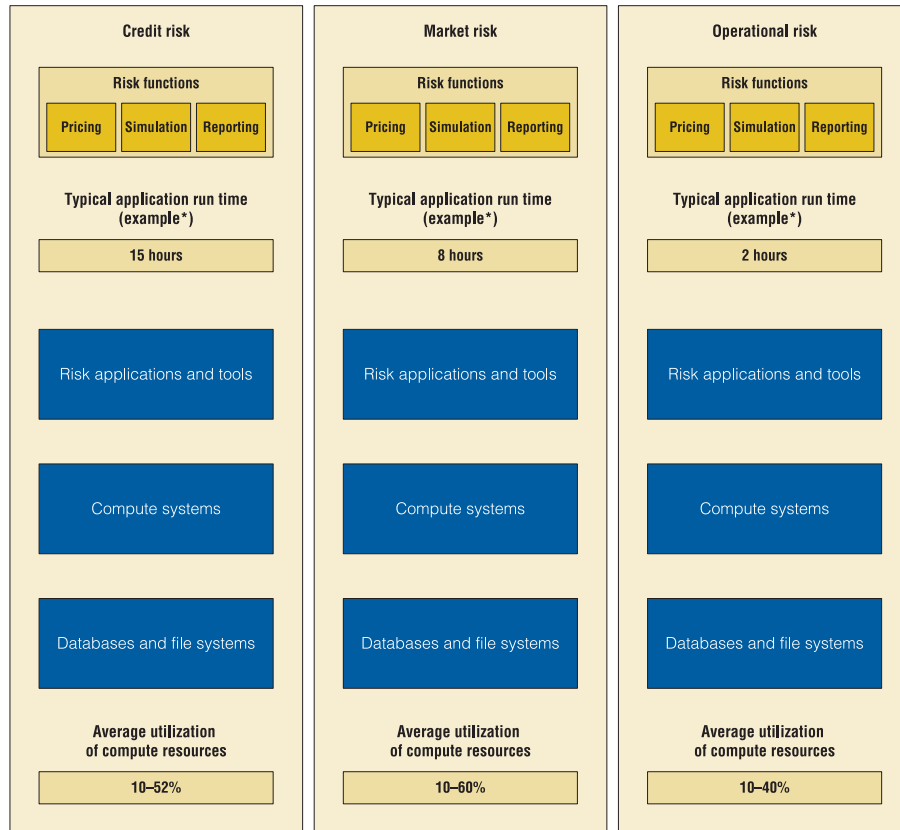
functions. Companies have large volumes of historical data, but the data can be leveraged only if models can be deployed to the point of decision and executed within the time a transaction occurs.

Regulations and recent examples of noncompliance are demanding firms to place significantly greater emphasis on compliance reporting for things like anti-money laundering and transaction monitoring for insider trading, fraud detection in retail banking and risk compliance for statutes such as Sarbannes-Oxley and the Basel

Capital Accord (Basel II). Effectively tracking and analyzing potential high-risk activities can be challenging, given the increasing complexity of financial products, vast amounts of real-time and historical data to mine and larger trading and transaction volumes. To prevent abuses before they can occur, firms are looking for a more systematic and real-time means for identifying patterns of activity.

The greater volume and complexity of data has spurred an unrelenting demand for additional processing power and speed, stretching IT resources well beyond their current capabilities. Few firms can make the capital expenditures required to address these computing requirements—especially given the immense pressure on costs these firms are facing today. Risk and compliance managers need real-time, accurate results without sacrificing cost, liquidity or competitiveness.

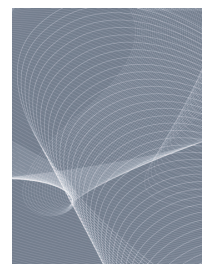
Current State of Risk Management Infrastructure (example)

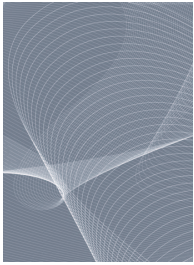


Legacy stove pipes

*Based on IBM Scorpion studies and in-market experience

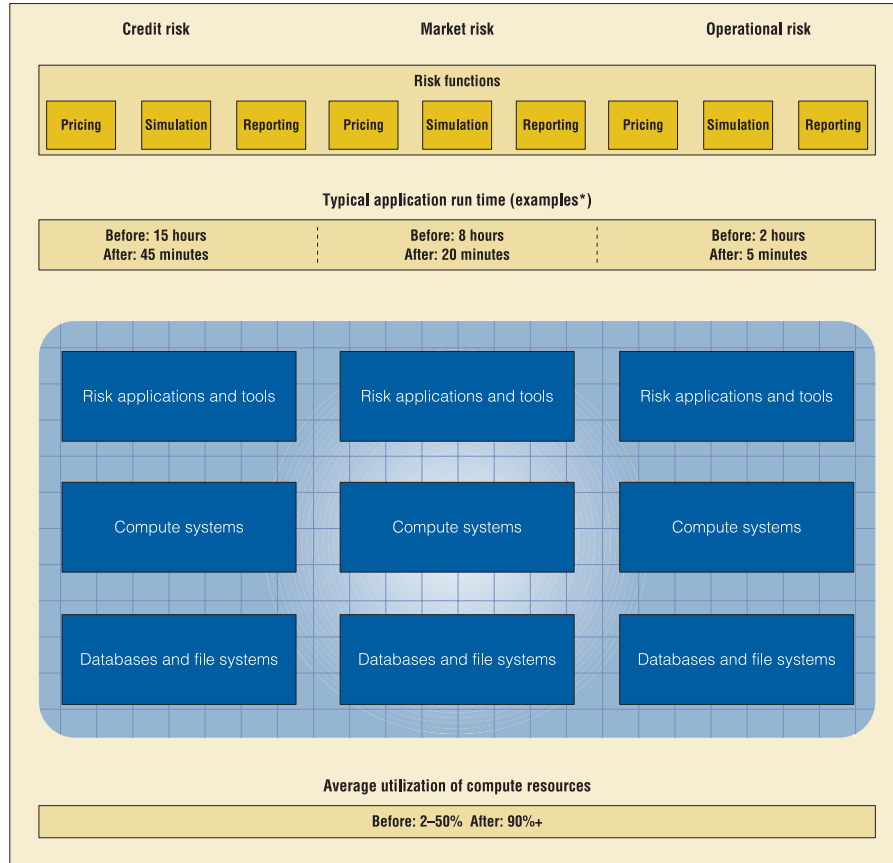
Figure 1. Current state of risk management infrastructure: fragmented, heterogeneous, inefficient





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Risk Management Infrastructure After Grid Enablement (example)



Grid middleware

*Based on IBM Scorpion studies and in-market experience

Figure 2. Single view of computing resources, storage resources and central scheduling control for grid-enabled applications, with an easy growth path and significant efficiency gains

The impact of Basel II on risk management

Basel II will require firms to have a single risk architecture across the entire organization, thus presenting an integrated and auditable picture of a firm's risk. To successfully implement this architecture, financial institutions must incorporate financial data and the risk management process into the firm's complete business outlook. Current infrastructures and risk models must include credit, liquidity and operational risk. To obtain this integrated view of risk, firms must operationalize whatever approach to risk they take for credit risk calculations in Basel II (for example, Standardized, Foundation internal ratings-based (IRB) or Advanced IRB), along with the underlying technology, to deploy integrated decision engines behind all applications, thus ensuring consistent operational decision making.

This integration poses a significant challenge to completing comprehensive and accurate risk reporting across the banking and trading books of an organization. The IBM Grid Offering for Risk Management and Compliance can help financial institutions efficiently integrate their risk management processes while improving analytical performance and regulatory compliance.

IBM Grid Offering for Risk Management and Compliance

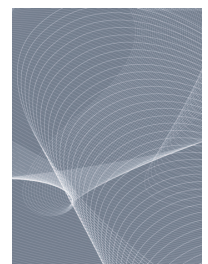
The IBM Grid Offering for Risk Management and Compliance provides an efficient, scalable and standards-based solution to the most

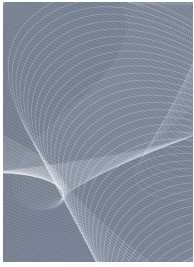
pressing issues facing risk and compliance managers today. Teaming with DataSynapse, IBM has created an integrated technology and service offering that can help risk managers implement a grid infrastructure to

support near real-time credit limit monitoring. The offering can also form the foundation for a credit risk application infrastructure that helps clients comply with Basel II (see sidebar "The impact of Basel II on risk management" for more information), and can help financial firms to comply more efficiently with the Patriot Act, the Sarbanes-Oxley Act and NYSE Rule 92.

The IBM Grid Offering for Risk Management and Compliance allows firms to run their existing analytics applications and tools, whether custom-built management systems, best-of-breed commercial applications or a combination thereof. The offering's open, flexible infrastructure supports a wide range of packaged and custom analytical applications, including software from Algorithmics, Fair Isaac, SunGard, SAS, Moody's KMV and many more.

The IBM offering centers around grid computing, an architectural approach that enables distributed computing





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over the Internet, an intranet, a virtual private network or some combination thereof. This approach can help aggregate disparate IT elements such as compute resources, data storage and filing systems to create a single, unified system and to address fluctuating application workload requirements. One clear advantage of a distributed environment for risk management operations is the ability to run several risk scenarios in parallel to generate an optimal solution as quickly as possible, without sacrificing increased accuracy and performance.

As required by risk and compliance managers' analyses, the grid makes additional compute capacity available on a full-time or part-time basis. It helps banks leverage available, underutilized compute capacity within their existing IT infrastructures, thus helping them to reach end results far more rapidly than within conventional

computer environments. And compared to a non-grid solution, the required compute resources are fewer and easier to manage—contributing to reduced total cost of ownership (TCO). The IBM offering also provides high levels of resiliency at the application level to help guarantee workload execution.

The IBM offering provides a cost-effective computing model for acquiring, deploying and managing resources. Because the existing infrastructure that supports the business of managing risk does not need to be replaced, firms can leverage their existing infrastructure and application investments, optimizing the efficiency of their risk management business and applications while migrating to a higher performance, lower cost, standards-based infrastructure. In addition, this grid infrastructure can be used for a wide array of analytical

functions including trading systems, fraud detection in retail banking and credit cards, customer analytics and segmentation, and more.

Real world, real successes

IBM is the industry-leading supplier of grid solutions, services and expertise to the scientific and technical communities, as well as to the financial services sector. Leveraging its considerable experience in implementing commercial grids worldwide, IBM has created targeted grid offerings customized to meet the unique grid computing needs of the financial services industry. IBM Grid Computing is currently engaged with more than 20 major financial institutions in North America, Europe and Japan, and more than 100 organizations worldwide.

Wachovia worked with IBM and DataSynapse to enhance the processing speed of trading analytics in

the financial services company's fixed income derivatives group. Before implementing a grid solution, profit and loss reports and risk reports took as long as 15 hours to run; now, grid solution in place, Wachovia can turn around mission-critical reports in minutes on a real-time, intraday basis. Moreover, trading volume increased by 400 percent, and the number of simulations by 2,500 percent. As a result, the group can book larger, more exotic and more lucrative trades with more accurate risk taking.

Use case: improving reporting and modeling capabilities through grid computing

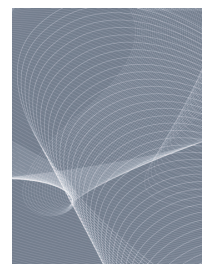
A bulge-bracket, multinational financial services firm was faced with requirements from its business and regulatory compliance forces to address major factors related to an inability to complete overnight risk

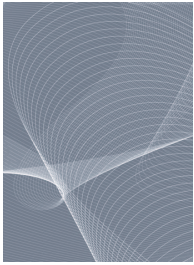
analysis reporting; a requirement for real-time, predeal credit limit monitoring; and a need to differentiate its business by incorporating intraday analysis to assess sensitivity and better leverage capital allocations. The firm also sought to meet future growth requirements in a near flat-line cost basis and to build a scalable infrastructure for risk management applications.

The firm worked with a joint IBM and DataSynapse team to assess the applications and infrastructure supporting its risk management platforms. To determine bottlenecks, they identified productivity barriers related to risk modeling and reporting and matched these barriers with application and infrastructure performance barriers.

A phased approach to implementing and achieving the risk operating environment was the most effective means to reach the desired performance and operational state. An architecture was created with a top-down focus, incorporating business process drivers, application infrastructure, management services and core infrastructure that would meet the quality of service, performance and resiliency requirements of a real-time risk analytics infrastructure.

The firm's risk analytics application and components were enabled to leverage computational services by using the DataSynapse GridServer™ Cluster Services application enablement layer. This interface mechanism provides a Web service interface that





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enables the application to request and consume the capabilities of GridServer to parallelize and service application requests so that they effectively scale when distributed across an available infrastructure. The solution implemented the policy-driven management functions of GridServer to handle application workload servicing, resiliency and service provisioning. The grid infrastructure leveraged Linux-based IBM **@server**™ xSeries® clusters to provide the performance, scalability and systems management integration requirements, while adhering to the bank standards of Intel® architecture and Linux.

IBM **@server** Cluster Systems Manager was integrated with GridServer to create an on demand, dynamic provisioning capability that could assure the right resources were available at the right time to meet the run-time servicing requirements of the risk applications. To implement an autonomic management environment, the firm leveraged its existing IBM Tivoli® Systems Management Framework, which was connected with the pre-built integration of Cluster Systems Manager and DataSynapse GridServer.

By migrating risk applications to the grid computing paradigm, the firm experienced an 80 percent improvement in reporting time and 100 percent increase in granularity and scale of analytic modeling functions, all while reducing TCO by more than 40 percent. The first-phase success led the firm to begin implementing this approach across all lines of business to encompass both trading and banking books.

Application Architecture

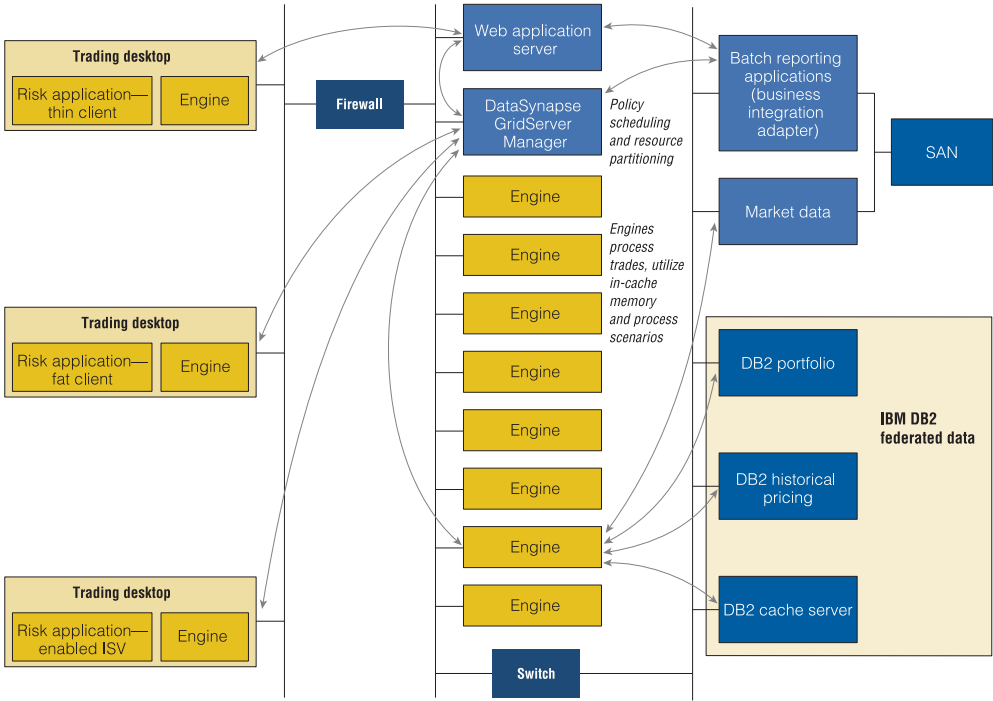
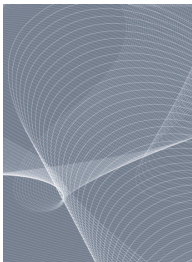
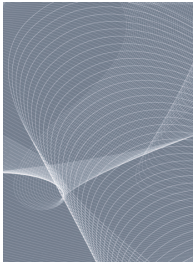


Figure 3. Application architecture for the IBM risk analytics grid system





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Systems Management Architecture

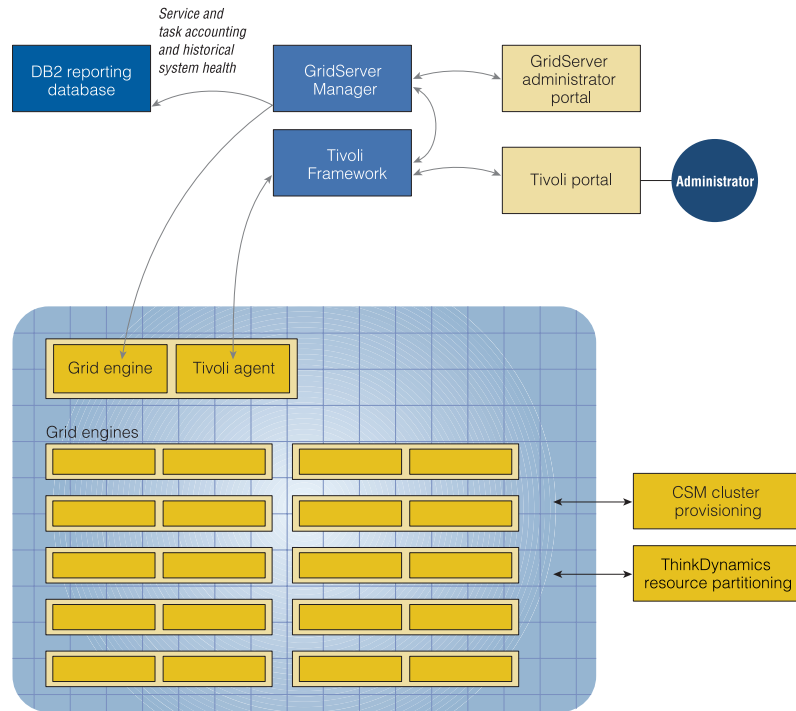


Figure 4. Systems management architecture for the IBM risk analytics grid system

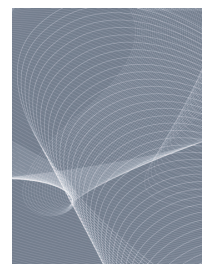
Improving productivity and efficiency through a multistage implementation

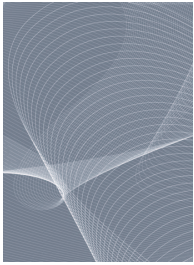
Financial services firms can take an existing inefficient infrastructure for risk management and compliance and gradually grow it into an integrated, highly efficient grid system. As shown in Figure 1, an existing infrastructure may comprise stove pipes of legacy applications—disparate islands of applications, tools and compute and storage resources with little to no communication among them. A firm can start by enabling one application—a simulation application for credit risk modeling, for example—to run faster by using grid middleware to virtualize the compute and storage resources supporting that application.

The firm can extend the same solution to another application, for example, a simulation application used to model market risk. Compute and storage resources for both simulation applications are virtualized by extending the layer of grid middleware; thus both applications can share processing power, networked storage and centralized scheduling. Resiliency is achieved at the application level through failover built into the DataSynapse GridServer. If failure occurs or the need to prioritize particular analyses arises, one application can pull unutilized resources that are supporting the other application. This process also facilitates communication and collaboration across functional areas and applications to provide a better view of enterprise risk exposure.

Alternatively, a firm can modernize by grid-enabling a particular decision engine. A decision engine, such as one developed with Fair Isaac's tools, can deliver the agility of business rules and the power of predictive analytic models while leveraging the power of the grid to execute decisions in record time. This approach guarantees that only the compute-intensive components are grid-enabled while simultaneously migrating these components to technology specifically designed for decision components.

Over time, all applications can become completely grid-enabled or can share a common set of grid-enabled decision engines. All compute and data resources become one





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large resource pool for all the applications, increasing the average utilization rate of compute resources from 2 to 50 percent in a heterogeneous architecture to over 90 percent in a grid architecture (Figure 2).

Based on priorities and rules, DataSynapse GridServer automatically matches application requests with available resources in the distributed infrastructure. This real-time brokering of requests with available resources enables applications to be immediately serviced, driving greater throughput. Application workloads can be serviced in task units of milliseconds, thus allowing applications

with run times in seconds to execute in a mere fraction of a second. This run-time reduction is crucial as banks move from online to real-time processing, which is required for functions such as credit decisions made at the point of trade execution. Additionally, the run time of applications that require hours to process, such as end-of-day process and loss reports on a credit portfolio, can be reduced to minutes by leveraging this throughput and resource allocation strategy.

IBM services to support grid computing

IBM Global Services provides world-class, worldwide support for all elements of the grid architecture—servers, storage, operating systems, middleware and networks—with a full range of grid-related services. As a first step towards grid implementation, IBM Global Services offers assessment services that help identify whether an application qualifies, and what it will take, for grid enablement. An assessment will look at historical resource consumption by identified applications, the application architecture and the supporting infrastructure platform. In addition, the IBM grid valuation tool, IBM Grid At Work, can

perform a high-level cost-benefit analysis on the migration to a grid computing platform—and helping customers quantify the value of grid in terms of expenses and revenue.

IBM Global Services creates a comprehensive implementation plan, which includes architectures and designs for application enablement, data modeling, grid middleware, infrastructure and management tools, grid management process and support-organization skill requirements. IBM Global Services, working with IBM Business Partners, then tests and installs the various components of the grid system, including DataSynapse GridServer, IBM @server systems and IBM TotalStorage products. In addition, IBM Global Services will enable existing hardware and aid in skills transfer.

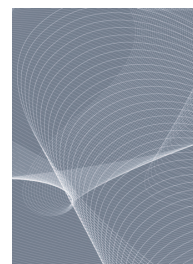
Technologies powering the grid

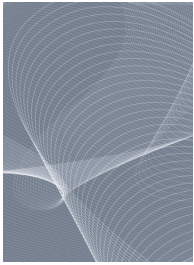
The workhorses of the IBM grid infrastructure are the grid engines—desktop PCs, workstations or servers that run the UNIX®, Microsoft® Windows® or Linux operating systems (Figure 3). These compute resources execute various jobs submitted to the grid, and have access to a shared set of storage devices.

The IBM Grid Offering for Risk Management and Compliance relies on grid middleware from DataSynapse to create distributed sets of virtualized resources. The production-proven, award-winning DataSynapse GridServer application infrastructure platform extends applications in real time to operate in a distributed computing environment across a virtual pool of

underutilized compute resources. GridServer application interface modules allow risk management and compliance applications and next-generation development of risk management and compliance application platforms to be grid-enabled.

IBM DB2® Information Integrator enables companies to have integrated, real-time access to structured and unstructured information across and beyond the enterprise. Critical to the grid infrastructure, the software accelerates risk and compliance analytics applications that process massive amounts of data for making better informed decisions. DB2 Information Integrator provides transparent access to any data source, regardless of its location, type or platform.





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IBM as a leader in grid computing

IBM is committed to open standards and is working with The Globus Alliance open source development community and the Global Grid Forum (GGF) to promote the adoption of open standards and accelerate the availability of grid technology.

IBM is a strong supporter of The Globus Alliance, a multi-institutional research and development effort to address the technical and business challenges of grid computing. Founded by a team of technicians and researchers, The Globus Alliance has defined an open source grid reference architecture and a set of tools to assist grid deployment. IBM works very closely with partners such as

DataSynapse to ensure that commercial technology such as GridServer incorporates support and interoperability of the Globus tool kit and Open Grid Services Architecture (OGSA) standards.

IBM Design Centers use the latest grid technologies, including OGSA, which merges the open protocols used for grid computing with the protocols used for Web services. IBM Design Centers provide access to the latest software from leading grid software companies, such as DataSynapse, and the latest open source grid technologies from The Globus Alliance.

A strong foundation for successful risk management and compliance

In an ongoing effort to support the establishment of open standards, IBM is designing its systems to participate in grid computing. Leveraging the breadth and depth of the company's wide array of products and services—as well as its multiplatform expertise—IBM is taking an integrated and comprehensive approach to this new computing paradigm. For example, the IBM **@server** pSeries®, IBM **@server** xSeries and IBM **@server** zSeries® servers can form a solid platform for a grid infrastructure. The IBM **@server** Cluster Systems Manager, IBM Director and IBM Tivoli systems management software packages deliver autonomic

computing functions to grid systems (Figure 4), giving the ability to self-configure, self-heal, self-optimize and self-protect—especially important in real-time trading environments, fraud detection in a real-time transaction environment and other real-time risk applications.

Years of experience and solid expertise enable IBM Global Services to help financial services firms adapt grid computing to serve their unique business environments. IBM Global Services has trained grid computing technology experts in the Americas, Asia Pacific and Europe, allowing companies worldwide to take advantage of a comprehensive range of IBM assessment, design, implementation, optimization and support services.

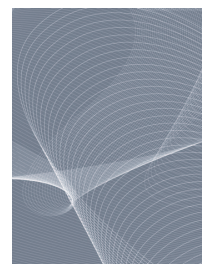
In addition, IBM has established strong working relationships with the providers of grid-enabling middleware solutions, including DataSynapse, and with leading vendors of risk management and compliance applications, including Algorithmics, SunGard, Fair Isaac, SAS, Moody's KMV and more. Thanks to these relationships, IBM can provide financial services firms with a full set of tools and capabilities to enable a grid solution.

Backed by IBM, financial services firms worldwide are discovering how grid computing offers an answer to

specific problems today while providing the foundation for an automated solution that can help mitigate and avoid risk exposure across the enterprise.

For more information

To learn more about grid computing for risk management and compliance in capital markets and retail banking, contact your IBM representative or IBM Business Partner, or visit **ibm.com/grid**. Alternatively, customers in the United States and Canada may call 1-800-IBM-7777 (please reference Priority Code 103C3017).





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