J2EE APPLICATION PERFORMANCE:
BEYOND THE BEAN

A White Paper and Case Study prepared for Integrated Research
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Featuring:
· Case study – Bank-Verlag, Germany
· Top-10 requirements for J2EE performance management
· Overview of PROGNOSIS® for J2EE performance monitoring

ENTERPRISE MANAGEMENT
A S S O C I A T E S

EXECUTIVE SUMMARY

Nearly every Global Fortune 500 enterprise today uses the Java 2 Enterprise Edition (J2EE) to supply business-critical applications to its users, which typically comprise internal users as well as external customers and partners. One critical success factor in deploying J2EE applications is being able to monitor and manage these applications, and until recently, there was a shortfall in the quantity and quality of J2EE management solutions. Historically, management solutions have treated the J2EE virtual machine, or JVM, as a "black box," providing no visibility into the inner workings of the JVM.

Fortunately, management vendors have caught up with the J2EE management challenges, and it is now possible to purchase enterprise-class J2EE management solutions. In fact, so many vendors rushed J2EE management solutions to market, that there is now a dizzying array available. While the sudden glut of management technologies is not necessarily a bad thing, it does make the selection of one vendor difficult.

There are a number of key criteria to consider when purchasing a J2EE management solution. These include rapid deployment, support for multiple levels of visibility into the J2EE environment, scalability to hundreds or thousands of managed servers, resilience to network outages, low management overhead, multiple platform support, support for enabling technologies such as database servers, comprehensive notification and reporting capabilities, and service level management capabilities. In addition, the J2EE management solution should be capable of true management: command-and-control over the managed systems, including script- and policy-based corrective actions. While there are a number of small "point solutions" on the market that solve individual pieces of the J2EE management puzzle, they fall short of providing a complete set of management capabilities.

When all of these criteria are evaluated in the context of prospective vendors, the solution set shrinks to just a few. One of the companies that can meet these criteria is Integrated Research. This company has been providing real-time monitoring solutions under its PROGNOSIS brand for more than 16 years, supporting many platforms including Windows, UNIX, Linux, and HP NonStop. Integrated Research recently released two additions to the PROGNOSIS suite aimed at providing J2EE application performance monitoring: PROGNOSIS Application Server Management for Windows, UNIX, and Linux; and PROGNOSIS J2EE Application Performance Monitor for HP NonStop. These products, built on the existing PROGNOSIS foundation, provide deep visibility into the J2EE application environment as well as the supporting technologies, enabling businesses to measure the real-time performance of their J2EE applications against established service levels.

While the PROGNOSIS J2EE products are new, the brand and reputation of Integrated Research is not. EMA spoke with one customer in Germany, Bank-Verlag, which is using the core PROGNOSIS products to monitor its UNIX and NonStop servers. The bank has also recently deployed PROGNOSIS to monitor its J2EE applications, and already has two production servers being monitored by the product. The bank reports good success with the product, and plans to continue its production rollout.

Integrated Research's reputation, combined with the recommendation of Bank-Verlag, leads EMA to conclude that Integrated Research has produced another strong management product that is worthy of consideration by IT managers that need to gain visibility into the performance and availability of J2EE applications.

INTRODUCTION

Application development using the J2EE language continues to grow at an astounding rate. Initially relegated to adding functionality to static Web pages, J2EE has grown to become a mainstream development platform. Today it is safe to assume that every Global Fortune 500 company has business-critical J2EE applications in production.

Unfortunately, the adoption of J2EE performance management technologies has lagged behind the production deployment of the applications. The reasons for this are many and varied, including a lack of focus on performance issues and a lack of robust management tools. The former is an extremely unsound practice fraught with danger, and the latter is simply no longer the case.

In the beginning, J2EE performance management was simple because Web application architectures were simple. Now, a typical production J2EE application is comprised of multiple tiers, including front-end load balancers, Web servers, J2EE application servers, Java

Virtual Machines (JVMs), and database servers. This increase in architectural complexity has spawned an entire segment of management tools; however, many companies today have yet to leverage these technologies to ensure the performance of their mainstream business systems.

It is time for IT to realize that until deep visibility into the environment is available, the entire J2EE application delivery mechanism is really just a "black box"—a dangerous situation to bet your business on. Enterprises today need to acknowledge the potential business losses that can result from improper management of the J2EE equation.

One example of an organization that has taken this to heart is Bank-Verlag (http://www.bank-verlag.de/), based in Cologne, Germany. Bank-Verlag is the official services and IT competence provider for over 300 private banks in Germany. Since the bank is a service provider to other banks, which depend on Bank-Verlag for data such as credit ratings and the ability to check on the status of inter-bank transfers, the availability and performance of these systems is critical to their success. The Bank chose to standardize on J2EE for these systems, using an IBM On Demand UNIX platform to provide high availability. The Bank realized that without a comprehensive management solution, it ran the risk of not being able to provide contractually agreed-upon service levels to its customers—an unacceptable level of risk to the business.
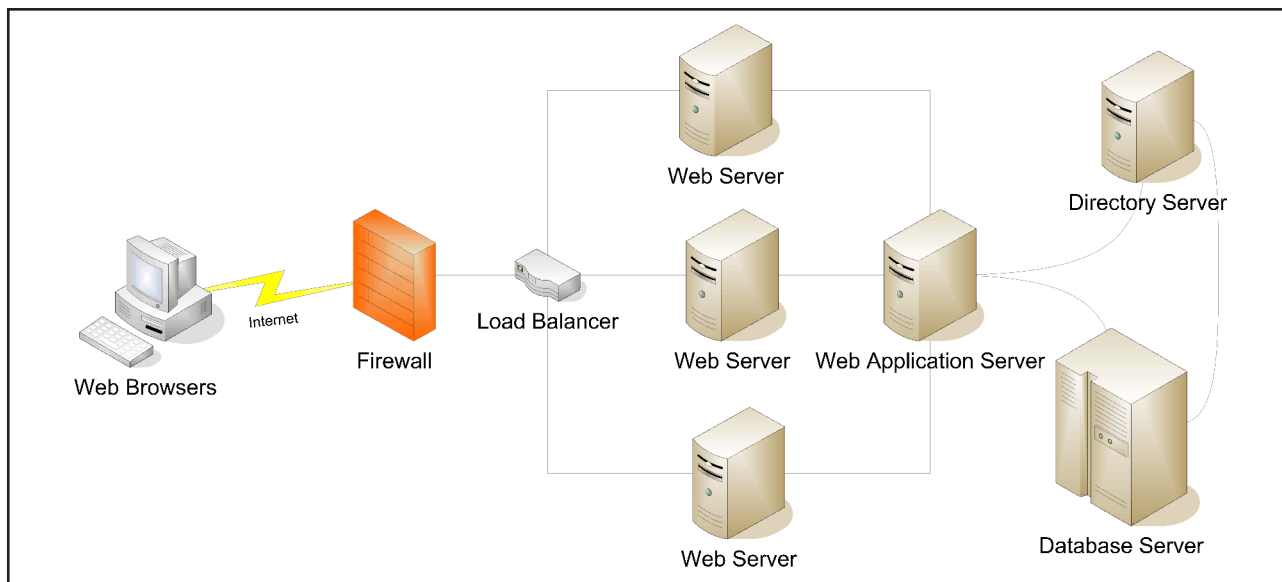

Figure 1: Example production J2EE application architecture

The Justification for J2EE Performance Management

J2EE applications provide critical customer-facing, high visibility, revenue-bearing applications. The impact of outages is the most compelling justification for performance management. Consider the impacts of an outage to Bank-Verlag: the 300+ customer banks that rely upon Bank-Verlag to provide customer credit rating information cannot approve loans without this information being readily available, 24x7. If Bank-Verlag cannot provide guaranteed levels of service, they face financial penalties, and their customers cannot transact business. When the overall impact from such an outage is considered, the potential losses from just one system outage could be millions of Euros.

When justifying an investment in J2EE management, it is necessary to quantify the potential business losses from system outages. These losses vary widely, but Enterprise Management Associates (EMA) research has shown that losses due to outages of critical systems can range from US $50,000 to over $1 million per hour in large enterprises. Assuming that the cost of a management solution that could prevent outages is $100,000, the payback period for such an investment ranges from six minutes to two hours of prevented downtime—a compelling business case, even for only one application. For businesses with multiple applications, economies of scale can drastically increase the ROI.

There are several other compelling points that justify a J2EE management solution. Consider the sheer complexity of many J2EE deployments today such as that depicted in Figure 1 which include at least four tiers, spanning multiple platforms and technologies. A holistic management solution is needed that can span these tiers, delivering multiple dimensions of visibility, including top-down, end-user performance monitoring and bottom-up elemental performance metrics. Such a solution would increase the productivity and respon-siveness of IT personnel and decrease time-to-market for business applications by simplifying quality assurance and deployment processes. The right solution can also aid in regulatory compliance initiatives by allowing IT to tightly control and audit changes to the production environment.

Justification for investment in any management technology boils down to two factors: cost and benefit. If the benefits far outweigh the costs, then the investment is a good one.

Advantages of J2EE Performance Management

It is crucial to understand that traditional approaches to application performance management, designed in the client/server era, do not translate well to the Web/J2EE world. Existing tools, which can provide some visibility into the J2EE infrastructure, lack the depth necessary to be truly useful in a production environment.

Likewise, many pre-deployment testing tools that provide extremely deep visibility into J2EE performance are unsuitable for production use due to high levels of overhead and limited scalability. A production-quality J2EE performance management solution needs to provide deep visibility into the application without sacrificing performance.

There are two classes of application problems that any enterprise-class management system should be able to address—static and dynamic:

Static Application Problems

Static problems are generally those that, once fixed, do not reoccur; examples include memory leaks and other code bugs. Static problems can generally (although not always) be solved with a pre-deployment testing tool. While static problems are significant, they comprise the minority of production issues since many of them are fixed during the quality assurance and deployment phases (or can be detected and corrected in a test environment even after the application is placed into production).

Dynamic Application Problems

Dynamic application problems are more severe and are characterized by transience—in other words, these problems rarely reoccur the same way. The reasons for this are many, including unpredictable user loads and concurrent activity, combined with contention caused by multiple applications hosted on a single server. Secondary problems caused by environmental

variations and configuration errors may also only occur on a small subset of the servers that support an application, making troubleshooting difficult.

Compounding the problem are virtualization technologies—devices such as load balancers can cause individual server problems that are nearly impossible to track down. Dynamic problems are also known to disappear after a system reboot. As one might expect, these problems comprise the vast majority of production-level problems, and provide the biggest challenge when determining root-cause. They are also the most expensive and impactful to fix.

In addition to aiding in the troubleshooting process for static and dynamic problems, J2EE performance management solutions must address the world beyond the J2EE environment, since many failures occur outside of the J2EE application server or JVM.

PERFORMANCE IMPACTS BEYOND J2EE

Numerous external factors beyond the J2EE environment can affect application performance. J2EE management solutions should be able to monitor and troubleshoot across the greater J2EE infrastructure. Examples of situations that can affect J2EE application performance include network issues, storage problems, resource contention, database problems, and even security issues like denial-of-service attacks. The holy grail of J2EE performance management must be to rapidly determine the source of performance problems, regardless of tier, and then aid IT in repairing the problem as quickly as possible.

It is important to realize that each step in the J2EE architecture is a critical point of failure, and that J2EE applications tend to have the most "moving parts" of any production application. It is critical that the system chosen to manage these applications is capable of monitoring and correlating problems across tiers, and that it can understand the relationship between the tiers. An ideal monitoring solution should be able to monitor a variety of server types and applications in addition to the core J2EE monitoring function.

REQUIREMENTS FOR THE IDEAL J2EE MANAGEMENT SOLUTION

A holistic J2EE management solution must provide more than just J2EE monitoring. There are literally dozens of J2EE point products designed to solve specific, narrowly focused problems. While useful, these products provide limited utility on an enterprise-wide basis, particularly if they do not easily integrate with other management systems. Purchases of point products should be limited to those that have a specific, easily quantified value proposition and that address specific problems not covered by other management systems.

Ideal J2EE management solutions should include the following Top 10 key features and functions. Note that a solution that provides all of these functions probably does not exist, but this list can be used as an aid in scoring a vendor's current and planned capabilities in the J2EE space.

Top 10 features and functions scorecard:

- Rapid deployment in less than a week with minimal customization and services required from the vendor

- Support for various levels of visibility into the J2EE environment, from high-level to low-level

- Scalability to hundreds or thousands of managed servers with minimal management server investment required

- Resilience to network outages—message-based architecture is preferable

- Low overhead requirements on managed servers—less than 5% of total resources and dynamic throttle-management overhead on busy systems

- Ability to monitor and span multiple tiers and platforms, including Windows, UNIX, and Linux

- Support for enabling platforms such as database servers, load balancers, etc.

- Comprehensive notification and reporting capabilities

- Support for service level management, including monitoring of service level objectives

- Command-and-control capabilities beyond basic monitoring, such as script- and policy-based corrective actions

INTEGRATED RESEARCH
PROGNOSIS® PERFORMANCE MONITORING

Integrated Research has been providing real-time performance monitoring solutions under its PROGNOSIS brand for more than 16 years. Many of the world's largest organizations use PROGNOSIS and the company has an impressive customer base, particularly in its traditional, high-availability HP NonStop market.

Two New Additions to the PROGNOSIS Suite

Integrated Research recently released two additions to the PROGNOSIS suite aimed at providing J2EE application performance monitoring: PROGNOSIS Application Server Management for Windows, UNIX, and Linux; and PROGNOSIS J2EE Application Performance Monitor for HP NonStop.

From the J2EE application server and JVM perspective, the two products are identical. The main difference between the two is that the Windows/UNIX/Linux product includes base server operating system monitoring in addition to J2EE application server and JVM monitoring; whereas the HP NonStop version includes only the J2EE application server and JVM components. This is due to architectural differences between the PROGNOSIS HP NonStop and Windows/UNIX/Linux offerings— HP NonStop products are highly modular and many of these customers already own the server-level monitoring module.

These PROGNOSIS products enable businesses to measure the performance of their J2EE applications against established service levels, as the service is delivered. Servlet response times are mapped against service level objectives in real-time, enabling the immediate measurement of performance in terms of ideal, acceptable, poor, and breach service levels. PROGNOSIS enables precision tuning down to the servlet, allowing different service levels to be specified for different processes. For example, an SLA for login may be set to 5 seconds, a search or add-to-cart SLA set to 3 seconds, while checkout is set to 15 seconds.

PROGNOSIS provides performance information of the J2EE constructs, including EJB pooling, commit and rollback rates, JMS queue status and length, JDBC pool, and query time. This detailed insight provides for measurement and optimization of the J2EE infrastructure, including the behaviors of pools and transactions in live production environments.

Strengths of the PROGNOSIS J2EE Solution

The PROGNOSIS platform has much strength in and of itself that adds to the total value proposition of the J2EE products. These advantages include excellent support, low implementation costs, and a reasonable, easy-to-understand pricing structure that scales well. The PROGNOSIS architecture is innately fault tolerant and provides real-time as well as historical metrics. For more information on specific value points of the PROGNOSIS solution, please refer to EMA's white paper entitled "Systems Management: The Real ROI is Time to Value and Total Cost of Ownership" (September 2003).

Integrated Research's J2EE products build on the advantages of the core PROGNOSIS platform by adding deep J2EE domain expertise such as detailed JVM performance information including memory consumption, garbage collection, method invocations and CPU time. This information is useful for the rare occasions when algorithmic performance breaks down in a production environment and visibility at the programmer's level is required. PROGNOSIS also includes the ability to sample JVM performance, to minimize the impact on production systems.

These products, which can operate independently or in conjunction with other members of the PROGNOSIS family, satisfy a high percentage of the ideal requirements outlined earlier in this document.

Weaknesses of the PROGNOSIS J2EE Solution

Like many entries into the J2EE performance management market, Integrated Research's J2EE products are new. This is not necessarily a bad thing, given the evolution of the J2EE market in general.

Prospective customers will need to take a bit of a leap of faith with these products, as Integrated Research does not currently have many reference customers that have deployed these products in a production environment. Bank-Verlag, described previously in this document, has successfully deployed the PROGNOSIS J2EE products in a production environment. However, since the core PROGNOSIS solution has been proven repeatedly in the marketplace for over 16 years, EMA believes that Integrated Research's J2EE solutions will follow the pedigree of the rest of the product line, delivering high value for a very reasonable price.

Case Study: Bank-Verlag

As discussed previously, the success of Bank-Verlag is dependent on the availability and performance of its J2EE applications. The bank has been a user of the core PROGNOSIS solution for UNIX for some time now, and currently manages over 60 production systems using the product. When the bank began searching for a J2EE management solution, they naturally approached Integrated Research to see if PROGNOSIS could satisfy their requirements.

Bank-Verlag has a number of business-critical BEA WebLogic J2EE applications running on

UNIX equipment, front-ended with Apache Web servers and back-ended with IBM DB2 database servers. Due to the requirements for high availability, these applications run in two physically separate data centers, using two different ISPs for redundancy. The systems must be available to their customers 24x7x365. The bank also has SLAs with customers requiring that 97% of all transactions are executed in less than four seconds. Failure to meet these SLAs can result in financial penalties to the bank.

EMA spoke with Stefan Breschinski, who is responsible for Bank-Verlag's J2EE applications. Stefan indicated that they are pleased with the PROGNOSIS solution and have near-future plans to increase the number of production servers monitored by PROGNOSIS. Additionally, Stefan made particular reference to Integrated Research's willingness to work with the bank in adding functionality to the products that enables Bank-Verlag to meet its requirements.

> "We are extremely dependent on our J2EE applications, which we use to deliver critical business functionality to over 300 of our customers. Because of our satisfaction with Integrated Research's PROGNOSIS software, we approached the company with our J2EE management requirements, which included using one tool to manage all of the different tiers of the application including the underlying server and operating system. PROGNOSIS now fulfills our needs for J2EE performance monitoring, saving us a lot of time and money."
> – Stefan Breschinski, Bank-Verlag

Stefan also indicated that PROGNOSIS has been very helpful in reducing the amount of time it takes for his personnel to find and correct J2EE performance issues, which is critical to meeting and proving compliance with the SLAs. By using PROGNOSIS to monitor J2EE applications from multiple perspectives, including outside of the firewall, Bank-Verlag is able to rectify performance problems when they occur.

EMA's Perspective

EMA has tracked Integrated Research for a number of years and has confidence in the company's ability to deliver on its J2EE performance management vision. Integrated Research's customers are highly satisfied and very loyal, praising the company for its excellent service and support. They are also very pleased with the overall cost of PROGNOSIS, reporting that Integrated Research's solutions typically are a fraction of the cost of competitive products. In particular, Bank-Verlag praised Integrated Research's flexible approach to both technical and financial requirements. In the same way that the product functionality was specifically adapted to meet their needs, a pricing structure was also tailored to better match Bank-Verlag's financial dynamics.

While Integrated Research is new to the J2EE performance management market, it is worth noting that even the most senior J2EE management products have been on the market for only a few years. What is significant, in EMA's opinion, is the maturity, reputation, and vision of the company providing the products, and Integrated Research excels in all of these areas.

Clearly, PROGNOSIS J2EE products are in the early stages of their development. For initial release products, however, they have much of the same functionality provided by competitive products that have been on the market much longer—at a lower overall total cost of ownership. Add the core benefits of the PROGNOSIS platform to the J2EE value proposition, and the solution becomes even more compelling. Assuming Integrated Research delivers on its vision for the PROGNOSIS J2EE products, the company could very well become a dominant player in the J2EE management market, directly competing with management vendors including HP, IBM, and Computer Associates.

EMA recommends that IT managers tasked with ensuring the performance of business-critical J2EE applications take a hard look at PROGNOSIS. Integrated Research has an excellent record of delivering high value at a reasonable price, and EMA believes that the PROGNOSIS J2EE products will not be an exception to the rule.

About Integrated Research

As a result of the global success of the PROGNOSIS family of products, Integrated Research has become the world's largest supplier of systems and application management solutions for HP NonStop systems.

The company has extended its true fault tolerant software design to Windows, UNIX and Linux platforms, creating comprehensive solutions that simplify the management of distributed systems and applications.

These solutions manage servers, networks, desktops, and applications ranging from Microsoft Exchange to complex e-business applications, financial transaction processing systems, and more.

A truly global player, Integrated Research has sales and support offices in the USA, Europe, and Australia. With the assistance of an international network of distributors and marketing partners, Integrated Research markets its solutions to over 60 countries.

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