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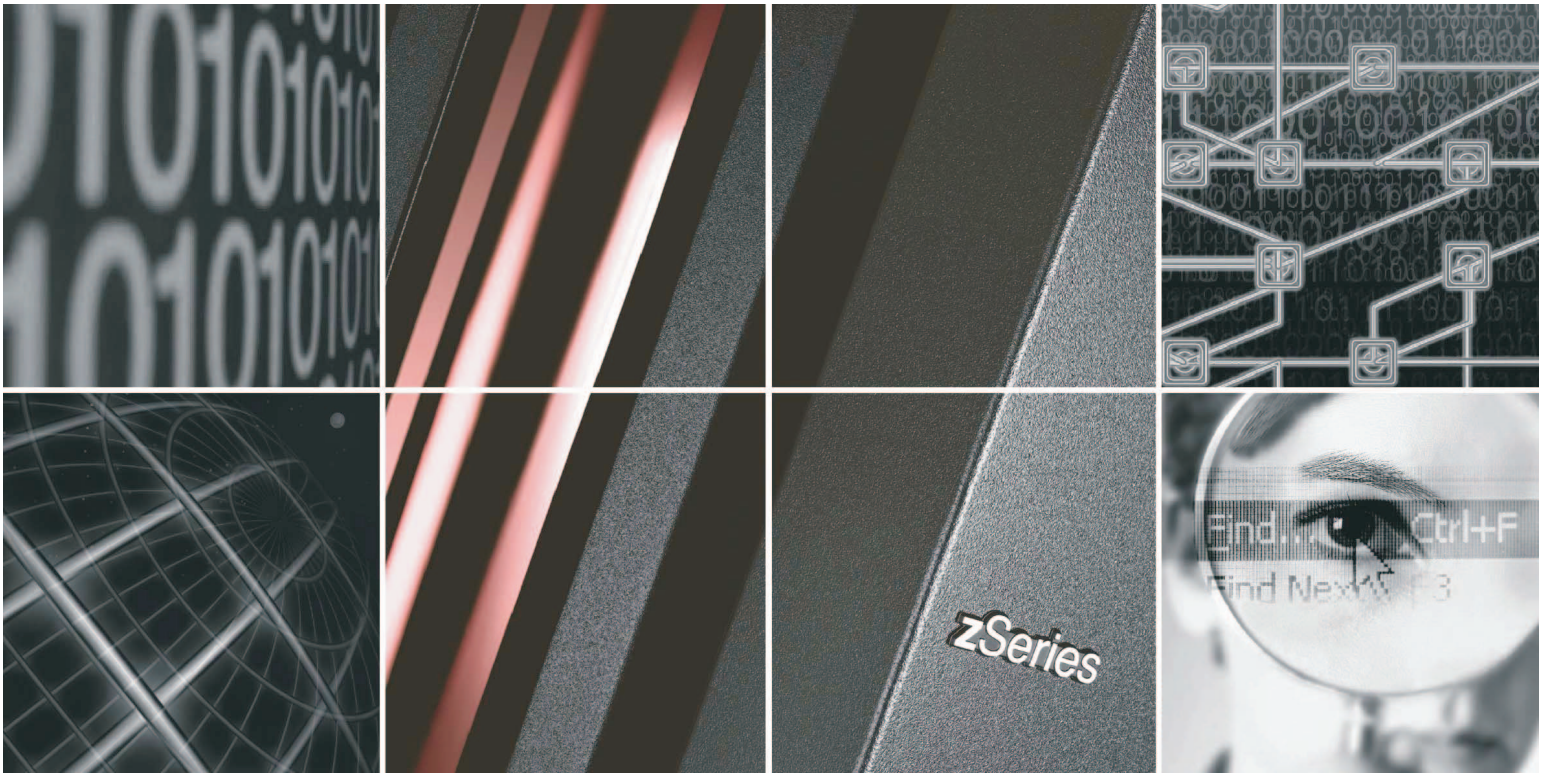
Systems Management: The Key zSeries Benefit



A zSeries marketing bulletin for use with your sales and marketing efforts.

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Systems Management: The Key zSeries Benefit


Responding to Business Needs: zSeries, z/OS and Utilization


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Systems Management: The Key zSeries Benefit

Welcome to the Systems Management edition of the IBM® eServer™ zSeries® *Marketing Buzz*. You should understand from the beginning that this will be more than a mere *Buzz*, it will be a roar generated by comprehensive Systems Management solutions that start at the very heart of the zSeries hardware and move outward to encompass the IT infrastructure to help manage the smooth flow of business processes and information throughout the enterprise.

We'll start by looking at zSeries servers running z/OS® and z/VM® and examine the leading edge Systems Management functions they provide. Then we'll move beyond the basics to the IBM Tivoli® portfolio of Systems Management solutions which not only enhance the management capabilities of zSeries systems, but extend their reach to the other servers in the enterprise. We'll finish by looking at zSeries role in the IBM Virtualization Engine™ and how it will tie together Systems Management functions across the enterprise. It's a story your competitors would love to tell but they can't, *you're the only ones with the complete IBM solution!* So read on, and find out how you can help your customers better manage their resources in an on demand world.

What is Systems Management?

"Consider this: at current rates of expansion, there will not be enough skilled IT people to keep the world's computing systems running. Unfilled IT jobs in the United States alone number in the hundreds of thousands. Even in uncertain economic times, demand for skilled IT workers is expected to increase by over 100 percent in the next six years."

from the Autonomics Manifesto
(**http://www.research.ibm.com/autonomic/manifesto/**)

What do many of those skilled IT workers do? They are called Systems Administrators or Systems Programmers, and they manage the systems that support the flow of information and business processes throughout the enterprise. But what exactly does Systems Management mean? What does it mean to you? The more important issue is what Systems Management means to your customer. If you let your competitor provide the definition, the answer may well be managing the utilization of a given asset; which is a part of Systems Management to be sure, but only a small part of the total picture.

From the zSeries point of view, Systems Management means managing the flow of information and business processes throughout the IT infrastructure, giving the user the ability to focus on one asset at a time when necessary, or addressing the IT infrastructure as a whole.

IBM offers a complete set of mainframe tools, integrated to provide the utilities you require to develop, test, deploy, transact, monitor and manage applications, databases and the underlying infrastructure resources according to business goals and workload performance. Tools that we are continuing to invest in for leadership function, with over 1,000 developers.


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It doesn't matter what your server utilization is, if your server isn't doing what's important for your business.

"It's time to design and build computing systems capable of running themselves, adjusting to varying circumstances, and preparing their resources to handle most efficiently the workloads we put upon them."

from the Autonomics Manifesto

Everything that runs on a server does not share equal importance to the business. Internet sessions that support customer browsing are more than likely not as important as those that support customer purchases. Internal use applications like file print serving will usually be viewed as less critical than applications that are available to customers externally.

The question is, how can you control your IT assets to respond to what's important to your business in an efficient, timely and cost effective manner? Today's on demand computing environments place extreme demands on Systems Management. The relationships of various transaction types, the interdependencies and connections and the speeds at which they change make manual management too complex for people.

zSeries responds to these challenges by allowing users to set policy driven goals for the types of work that moves through the zSeries environment. With z/OS Workload Management (WLM), users define performance goals and assign a business importance to each goal. Users can define the goals for work in business terms, and the system decides how much resource, such as processor and storage, should be given to it to meet the goal. The z/OS Workload Manager will constantly monitor the system and adapt processing to meet the goals.

z/OS Systems Management works to minimize IT management issues by:

- Eliminating the need to take management actions
- Automating as many management actions as possible
- Providing easy to use and intuitive management applications that handle anything else that has not been automated or eliminated
- Providing integrated and end-to-end management solutions


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Systems Management and fiscal management – Yes there's a link!

zSeries takes this approach to Systems Management for a number of reasons. First, it's not just all about saving money. It's also about not losing it. If there is no linkage between IT priorities and business priorities customers may be kept waiting, orders may be unfulfilled, and business could be lost. Second, zSeries servers are known for their high levels of utilization. Processor average utilization rates of over 80% are not uncommon, as opposed to single digit utilization rates commonly found in distributed stand-alone servers (Source: *Taurus – A Taxonomy of the Actual Utilization of Real UNIX and Windows Servers* GM-13-0191). As pointed out earlier, the relationships of transaction types, interdependencies, connections, and business variables would make manual management very difficult, if not impossible, even for very large groups of administrators.

Third, a great strength of the mainframe has been its ability to run large amounts of diverse work with a relatively small administrative staff. As the Gartner Group pointed out in 2004, *"Since we published our last high-level perspective of the ratio between MIPS and head count in 2001, the largest z/OS installations have more than doubled their 'MIPS to head count' ratio."* (L. Mieritz, M. Willis-Fleming - Gartner 2004) Simply put, that means staffing levels, and therefore staffing costs, do not have to grow in proportion to mainframe computing power.

Fourth, consider the simple economy of centralizing work on a highly manageable zSeries server to simplify the IT infrastructure. This can result in savings not only in administrative costs, but also savings in hardware, floor space, heat/light/power, software licensing, networking hardware, and UPS capacity.


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Putting resource where it's needed, when it's needed

zSeries servers respond to business goals as a result of innovation in hardware as well as software. At the heart of this is the Intelligent Resource Director (IRD), a feature of zSeries hardware and the z/OS operating system. IRD is designed to give customers an enhanced ability to dynamically move resources to their most important work. IRD can help customers handle unexpected workload spikes, and improve their system's efficiency and availability. It can also reduce the Systems Management skills and time required to define the I/O configuration.

IRD's LPAR CPU management is designed to let the z/OS Workload Manager distribute processor resources across an LPAR cluster by dynamically adjusting the LPAR weights in response to changes in the workload requirements. When important work processing is not meeting its goals due to CPU constraints, WLM raises the weight of the partition where that work is running and lowers the weight of another partition in the cluster with less important work, thereby giving the more important work more processing power.

IRD establishes a more synergistic relationship with the Workload Manager (WLM) component of z/OS and the zSeries hardware.

zSeries hardware contribution to Systems Management

Let's start by looking at what zSeries hardware contributes to workload management. The ability to partition zSeries hardware logically is a good place to begin. Logical partitioning is a function supported by the IBM Processor Resource Systems Manager™ (PR/SM™). PR/SM currently supports the creation of up to 30 logical partitions on a single zSeries server. Each of these logical partitions is fully capable of running a supported operating system independently.

PR/SM allows granular levels of zSeries resource allocation. Storage can be assigned to logical partitions in increments of 1 to 128 megabytes. I/O channel paths can be shared by logical partitions and Fiber Connection (FICON®) channels. The PR/SM dynamic reconfiguration capability offers allocation of additional resources to partitions with demanding workloads without disruption to the workloads in the logical partitions.

PR/SM management of zSeries central processor (CP) resources allows for the use of either dedicated or shared processors. Although processors can be dedicated to logical partitions, the real power is in the effective use of shared processors. With shared processors, when a workload in one partition goes idle, the available processing time is automatically redistributed to other partitions with no intervention.

Logical partition processor weights are a priority policy for logical partitions based on a user's dispatching priorities. They are specified when allocating the resources of the machine to its workloads. Each logical partition is treated as a


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separate workload, managed against the processor weight policy. The policy can be dynamically updated, with changes taking effect immediately.

zSeries Software Systems Management – z/OS Workload Manager (WLM)

A number of benefits arise from the z/OS WLM philosophy of goal-oriented performance management. The most obvious of these benefits is the simplification in defining performance objectives and initialization states to the system.

At the outset, the system administrator does not have to understand low-level technical controls. There is no need to adjust dispatch controls. For example, the system administrator does not have to understand tradeoffs for setting dispatch priorities when a machine has a single very fast processing engine or a single slower engine or multiple slower engines or even multiple very fast engines. The system administrator is able to specify business objectives directly to the system in business terms. Instead of specifying low-level controls to tune system resources, WLM gives the system administrator the capability to specify goals for work in the system in business terms.

The operative principle is that the system should be responsible for intelligently implementing resource-allocation algorithms that allow these goals to be met. Today's systems supporting multiple diverse mission critical workloads may require attention and re-prioritization of workloads far more often, and more rapidly, than a person is able to cope with. z/OS WLM is unique in offering externals that capture business importance and goals and implement them automatically on behalf of the system administrator with no manual intervention.

z/OS WLM goal mode allows a system administrator to state goals for the work in the system, and WLM is responsible for allocating computing resources to meet these goals. z/OS WLM provides the ability to partition work requests into mutually disjointed groups, called service classes. This partitioning, referred to as classification, is based on the attributes of an individual work request, which might include the userid that submitted the request, related accounting information, the transaction program to be invoked or the job to be submitted, the work environment or subsystem to which the request was directed, and so forth. Each service class represents work requests with identical business performance objectives.

To address the fundamental problem that the resource demands of most work requests are unknown at the outset and can vary depending on parameters that may be known only at execution time, there is a need to allow the business objectives to change on the basis of the resource demands of the work request. There are other implementations that require resource demands to be known "up front", which obviously cannot provide the advantages that the dynamic nature of service classes managed by WLM provides. The goal types provided by WLM are response time, discretionary, and velocity.

Response time goals indicate a desire for internal elapsed time to be, at most, a certain value. "Internal" refers to the fact that the time is measured from the


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point at which the work request is recognized by the system to the point at which the work request is considered complete.

The second goal type, discretionary, indicates that there is no business requirement for the work to complete within a certain predetermined elapsed time, and the system should use its discretion in giving resources to such work when it is ready to run.

The third goal type is velocity. Work requests that are not considered discretionary and do not have a set response time objective may nevertheless need further control to reflect the degree of delay that is tolerable once the work request becomes ready to run. Such work requests may be long running (possibly "never ending") and want to run periodically or intermittently, during which time the work request must have access to resources. Velocity goals address this category of work requests.

Getting data to processors and users

"All CPUs wait at the same speed" Ken Harvey, CSP

What good is having work processes managed to a fine degree when those same processes may be starved for data, or forced to wait to output data due to resource contention? To help overcome this problem, WLM includes a function for Dynamic Channel Path Management (DCM).

DCM allows z/OS to dynamically change channel path definitions to ESCON® director-attached DASD control units in response to changing workloads, moving channel resources to the control units where they are required.

IBM z/OS Resource Measurement Facility (RMF)

The IBM z/OS Resource Measurement Facility™ (RMF™) is IBM's strategic product for z/OS performance measurement and management. It is the base product to collect performance data for z/OS and sysplex environments to monitor systems' performance behavior and allows users to optimally tune and configure their systems according to their business needs.

RMF is designed to ease the management of single or multiple system workload and to enable faster reaction to system delays. Detecting a possible bottleneck early means that corrective actions can be taken earlier. System delays are avoided or at least remedied at an early stage. RMF is shipped with every release of z/OS at the current level of support. It is integration tested with z/OS and includes the enhancements available with every new release.

System programmers are supported by several reports which ease their work, helping them to tune their system optimally. Consequently, this leads to fewer workload problems and, most important, increases system and operator productivity, a fact that makes the company as a whole more effective at less cost.


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RMF provides its benefits through the operation of Post-processing and Online Monitoring functions. They are based on a set of data gatherers and data services which enables access to all performance relevant data in a z/OS environment. The four components are RMF Data Gatherer, RMF Sysplex Data Services, Historical Data Reporting and Online Monitoring with RMF.

- **The RMF Data Gatherer** – The RMF Data Gatherer collects long-term and short-term performance data of z/OS systems. The data is saved in SMF records and for online reporting in VSAM datasets.
- **RMF Sysplex Data Services** – The RMF Sysplex Data Services allow RMF and other IBM and vendor products to access and process the collected z/OS performance information within a sysplex environment. RMF uses this function intensively with its historical and online reporting function, thus providing a single system image for performance management of a sysplex of z/OS systems.
- **Historical Data Reporting** – The RMF Postprocessor is the central part for Historical Data Reporting on RMF data. It runs as a batch program and processes the SMF data collected by the RMF data gatherer functions to create interval, duration, summary and overview reports. Furthermore it allows customers to combine SMF data from all systems in a sysplex and generates sysplex-wide reports for shared device utilization, coupling facility activity and workload activity. The RMF Postprocessor has also been extended with the RMF Spreadsheet Reporter, that gives your customer the ability to extract reports from RMF Postprocessor output to convert them into a common spreadsheet format and allows spreadsheet applications to use the RMF data. This helps customers to integrate RMF data easily into their business process, thus enhancing productivity and efficiency.
- **Online Monitoring with RMF** – RMF online reporting functions support real-time snapshot monitoring and short-term performance analysis. RMF Monitor II gives customers an immediate picture of the current resource consumptions and workload utilization of their zSeries system, while RMF Monitor III provides short-term analysis on the most current as well as historically saved system status by the RMF Monitor III data gatherer. Customers can easily zoom into any system and navigate freely between systems. If your customer wishes to take a closer look, he or she can point and click to analyze any resource or workload behavior. Both monitors are highly integrated and work together to ease system performance analysis.

  RMF online monitoring functions may also be used from a workstation. With RMF PM, customers can monitor continuously their z/OS systems from a central point. It runs on a Microsoft® Windows® workstation and allows customers to monitor all their z/OS systems anywhere in the world from one central location. RMF online monitoring today enables customers to control their zSeries systems running z/OS systems in any situation – and gives them the confidence to run their business at optimal speed.


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Hardware Configuration Manager (HCM) and Hardware Configuration Definition (HCD)

HCD is an integrated part of the z/OS operating system. It provides an interactive interface that allows customers to define the hardware configuration for both the channel subsystem and the operating system.

HCM extends the scope of configuration management provided by HCD. The PC-based graphical user interface allows customers to easily navigate through the configuration diagrams to make changes in the configuration, and it also enables customers to manage the physical aspects to complete the picture of their configuration.

Today's enterprise environment offers more power and flexibility to configure hardware and z/OS operating system to best suit customer business needs. A customer may, for example, have several processors with logical partitions running multiple operating systems connected through shared I/O equipment. The challenge in configuration management is the complexity of maintaining both the logical and physical configuration data. Filters and color choice options allow the customer to tailor the configuration view to suit their needs. For example, a customer might choose to display logical and physical connections in different colors to call attention to configuration mismatches.

System Display and Search Facility (SDSF)

SDSF provides a powerful and security-rich way to monitor, manage and control a z/OS sysplex. Its easy-to-use interface lets users control

- jobs and output
- devices, such as printers, readers, lines, and spool offloaders
- system resources, such as WLM scheduling environments, the members of JES2 MAS, and JES2 job classes
- system log and action messages

With SDSF panels, there is no need to learn or remember complex command syntax. SDSF's action characters, overtypeable fields, action bar, pull-downs, and pop-up windows allow users to select available functions.


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zSeries servers running Linux

A key strength of zSeries servers is their adoption of industry and open standards. One of the newer open standards adopted by zSeries is the ability to run Linux on zSeries systems. Linux is able to reap the benefits of running on a highly reliable, scalable and security-rich hardware platform when it's running on zSeries – and – it's also able to take advantage of some unique Systems Management functions when running on a zSeries server with z/VM.

When most people think of z/VM and Linux they tend to think about the ability to scale horizontally, that is the ability to create virtual servers in minutes. However, creation of virtual servers is only a part of the job. Each server, or group of servers, may be running diverse workloads, and it's a good bet that not all of them will be equally important. Providing the functions necessary to manage and maintain those virtual servers is a key element in running a highly efficient and successful simplified infrastructure.


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IBM has been providing virtualization solutions to customers since the mid-1960s, and IBM has also used those same virtualization solutions to build the operating systems, middleware, and other software that made IBM a leader in systems software over the years. The z/VM of today is the product of over 35 years of constant innovation and refinement, and substantial parts of that effort have gone into the building of Systems Management functions that z/VM delivers today.

The z/VM Virtual Machine Resource Manager (VMRM)

VMRM, introduced in z/VM V4.3 and subsequently enhanced in V4.4 and V5.1, provides z/VM with self-managing capabilities similar to a subset of the capabilities available with the Intelligent Resource Director (IRD) in z/OS. VMRM functions dynamically tune z/VM systems and manage workloads to customer-defined CPU and/or DASD velocity goals. A group of virtual machines can also be defined to comprise a workload, which VMRM can then manage to defined goals. Multiple workloads (groups of virtual machines) can each be managed to different goals. The VMRM establishes autonomic capabilities to automatically adjust performance parameters when virtual machines contend for resources. In addition, the VMRM allows exploitation of I/O priority queueing on behalf of VM-based workloads, including guest OSs such as z/OS, which also supports I/O priority queueing.

Based on the definition of workloads, goals and priorities in the configuration file, the VMRM service virtual machine can:

- Compute achievement levels of interest for each workload
- Select one workload to adjust for each goal type (CPU and DASD) based on the customer-supplied importance value
- Adjust virtual machine tuning parameters to achieve defined goals

I/O management facilities added to VMRM enable z/VM to exploit the hardware I/O priority queueing facility on zSeries to prioritize guest and host I/O operations. I/O priority queueing is a method to favor disk I/O of one virtual server over another, which helps avoid channel contention to improve I/O performance. Users can set and manage virtual I/O priority queueing based on data that the z/VM MONITOR function collects. Issuing the SET IOPRIORITY command and changing real I/O priority queueing settings produces new MONITOR records.

Recent enhancements to VMRM provide improved support for managing multiple virtual machines, serviceability improvements, dynamic updating of a VMRM configuration and workload goal information delivery to applications such as Performance Toolkit for VM using application monitor data. VMRM is one of the autonomic capabilities created to improve the zSeries value proposition and self-managing capabilities while helping lower computing costs.


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Systems Management Application Programming Interfaces (APIs)

Systems Management APIs simplify management of many virtual images (guests) within a single z/VM image and provide a basic set of functions that applications may call to allocate and manage resources for virtual images running in z/VM virtual machines. The Systems Management APIs are designed so that customers or solution providers can write client applications to help administrators, especially those lacking in-depth VM knowledge, to manage multiple virtual images.

API security provisions include authentication and server functions. The APIs are designed so customers or Solution Providers can write client applications to help administrators, especially those lacking in-depth VM knowledge, manage large numbers of virtual images. The Systems Management APIs are an integrated function in z/VM 4.4. Their functions can be used to:

- Create new virtual images on demand, in a variety of operating environments, including Linux®, z/OS, z/VM, VSE/ESA™, TPF, and CMS
- Allocate and manage resources for virtual images
- Add or delete devices and disks to a virtual image's configuration
- Manage shared storage on virtual machines through the z/VM shared physical segment functions
- Dynamically define a storage segment that can be shared among virtual machines
- Obtain information about system data files or delete the system data files contained in saved storage segments
- Add, remove or query restricted access to a shared storage segment
- Activate and deactivate individual or multiple virtual images
- Manage connectivity between virtual images
- Establish or end a connection between two virtual images through a virtual channel-to-channel adapter (CTCA)
- Add or remove a virtual network adapter (network interface card [NIC]) in a virtual image's configuration
- Connect or disconnect a virtual image to a guest LAN
- Define a virtual switch and connect or disconnect a virtual image's virtual network adapter NIC to the virtual switch

To allow appropriate security, users performing Systems Management functions for virtual images must authenticate themselves with a valid user ID and password on the z/VM system to which they will be sending Systems Management requests.


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The Systems Management APIs not only support improvements to autonomic capabilities of the zSeries server but also open VM to non-IBM solution developers or the open-source community to leverage open standards and common structures and provide IBM customers with a community that provides technology and support to extend their capabilities. On-Stage from Aduva and Levanta, from Levanta Inc. are good examples of ISV Systems Management solutions using z/VM APIs.

Performance Toolkit for VM

Performance Toolkit for VM – introduced in z/VM V4.4 as a priced, optional feature derived from the FCON/ESA program (5788-LGA), includes functional equivalence to the RealTime Monitor (RTM) and the Performance Reporting Facility (PRF) and provides enhanced capabilities for a z/VM systems programmer, operator or performance analyst to monitor and report performance data. Performance Toolkit for VM is a strategic performance monitoring and reporting tool for z/VM. The toolkit's primary capabilities consist of:

- Immediate view of system performance – The performance monitoring functions can be used in machines authorized to access CP monitor data. Special performance monitoring mode includes displays for monitoring:
  - General CPU performance
  - System and user storage utilization and management
  - Channel and I/O device performance, including cache and seek analysis data
  - Detailed I/O device performance, including information on the I/O load caused by specific minidisks on a real disk pack
  - General user data such as resource consumption, paging information, IUCV and VMCF communications, wait states and response times
  - Detailed user performance, including status and load on virtual devices
  - Summary and detailed information on Shared File System (SFS) and Reusable Server Kernel (RSK) servers
  - Configuration and performance information for TCP/IP server

In addition to analyzing VM performance data, the toolkit processes Linux performance data obtained from the Resource Measurement Facility (RMF) Linux performance gatherer, rmfpms, which can be viewed and printed in a manner similar to that of VM data.


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Threshold/exception monitoring

The toolkit performance monitor collects and displays detailed information about the current load on the CPU and I/O equipment, as well as on the users creating that load, providing more information than is currently provided by RTM. This is vital information for an experienced operator or a systems programmer who must analyze an existing bottleneck.

Accessing performance data

Performance Toolkit for VM provides remote access to the performance data collected for any specific machine and can allow a user to monitor many remote VM systems from one central point of control. The remote performance monitoring facility is designed to allow:

- Efficient central performance monitoring for many remote systems by displaying on a single screen the information on any exceptions found
- Concurrent multiple access to the central monitor machine's data
- Performance data retrieval from local and remote Performance Toolkit for VM monitoring machines and display of the data in a manner similar to native performance monitoring mode in the respective monitoring machine

An integrated Web browser interface provides a GUI based on standard Web browsers, allowing easier access to performance monitoring data.

Licensing

Performance Toolkit for VM is offered as a priced, optional feature of z/VM V4.4 and V5.1. The toolkit can increase your ability to account for allocation and use of zSeries resources while providing you with the tools necessary to monitor and tune for optimum systems performance. With its GUI, flexibility and customization capabilities, the Performance Toolkit for VM provides many ease-of-use features new to VM.


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While each zSeries operating environment includes Systems Management function like Intelligent Resource Director, VMRM, and z/OS Workload Manager, there still exists the need to extend the scope of Systems Management beyond what the zSeries operating environment offers. Customers need to understand the performance implications of key subsystems like DB2® UDB, WebSphere, and IMS, and they need to understand how the entire IT infrastructure composed of various operating environments is responding to the challenges of On Demand Business.

IBM Tivoli products for zSeries (**http://www-306.ibm.com/software/tivoli/**) include a comprehensive suite of IBM Tivoli OMEGAMON® Extended Edition (XE) solutions that include products to monitor and manage zSeries operating systems and subsystems such as z/OS, z/VM, UNIX® System Services, CICS®, DB2, IMS, zSeries networks, storage, WebSphere Application Server (WAS), WebSphere Integration Brokers and WebSphere MQ. All of the OMEGAMON XE products use a common, flexible and easy-to-use browser interface that allows users to quickly isolate and resolve potential performance problems. This common OMEGAMON user interface enhances the productivity of users, and reduces training requirements.

Managing I/O subsystems with IBM Tivoli OMEGAMON XE for Storage on z/OS and IBM Tivoli Allocation Optimizer for z/OS

IBM Tivoli OMEGAMON XE for Storage on z/OS is Tivoli's monitor for I/O subsystem performance and storage availability. IBM Tivoli OMEGAMON XE for Storage on z/OS combines comprehensive storage performance monitoring with a flexible, easy-to-use browser interface that helps you be more productive, more clearly understand storage conditions and ensure optimal performance.

IBM Tivoli OMEGAMON XE for Storage on z/OS is designed to manage the performance and availability of mainframe attached storage – including DASD and tape devices – and the datasets that reside on them. It also features in-depth analysis of two important IBM storage software components: Data Facility Systems Managed Storage, which manages the service levels and priorities of datasets based on user created storage goals; and Data Facility Hierarchical Managed Storage, which manages backup of data based on usage patterns. IBM Tivoli OMEGAMON XE for Storage for z/OS features an easy-to-use browser based interface, online trending and historical information, and the ability to monitor user created groups of DASD volumes.

IBM Tivoli Allocation Optimizer for z/OS is designed to help provide higher availability by proactively enabling z/OS applications to heal themselves when out-of-space conditions occur. IBM Tivoli Allocation Optimizer for z/OS automatically optimizes allocation requests to help provide more effective use of resources.


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Managing data with IBM Tivoli OMEGAMON XE for DB2

Application performance means more than making adequate processor and memory resource available. Database software is a key component in the performance of applications, and it has to be observed, managed, and tuned like any other resource in order to provide optimum performance. IBM Tivoli OMEGAMON XE for DB2 on z/OS is the next evolution in OMEGAMON performance and availability solutions designed to help you proactively manage your DB2 mainframe environment and tune for optimal performance. IBM OMEGAMON XE for DB2 on z/OS provides this robustness by tapping into DB2 V8 features, such as 64-bit above-the-bar virtual addressing and long SQL statements, while advancing distributed thread tracking, workload monitoring, historical reporting, and more.

Its Web interface provides a single interface at the big picture and granular levels, including interaction between DB2 and other applications. IBM Tivoli OMEGAMON XE for DB2 on z/OS helps customers identify performance spikes and anomalies that might otherwise go unseen, take action in real time and automate repetitive DB2 operations.

Some of the features provided by IBM Tivoli OMEGAMON XE for DB2 on z/OS are:

- An intuitive Web browser interface that supports monitoring the interaction of DB2 systems with CICS, IMS, and other systems within a single interface from any location
- A situation editor that enables customers to move beyond simple thresholds and helps easily define complex thresholds, situations and alerts.
- An application trace facility that enables customers to track every step of a DB2 transaction to investigate poor performance. Object analysis reveals detailed information on I/O, wait time and busy time for each DB2 thread.
- Near-Term History that lets customers see recent performance spikes, trends or anomalies that might otherwise go undetected
- An integrated TN3270 component lets customers access information from the OMEGAMON II and classic interfaces

Managing CICS with IBM Tivoli OMEGAMON XE for CICS

IBM Tivoli OMEGAMON XE for CICS on z/OS helps customers proactively manage complex CICS systems – including CICS in an IBM Parallel Sysplex® environment – to achieve high performance and to avoid costly downtime. With a flexible easy-to-use browser interface, Tivoli OMEGAMON XE for CICS on z/OS lets customers clearly see and understand application and system events. Customers can monitor and manage CICS transactions at the big picture and granular levels, as well as interaction with other applications, within a single interface. Tivoli OMEGAMON XE for CICS is designed to enable detection of problems quickly and support taking action in real time to speed problem resolution.


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IBM Tivoli OMEGAMON XE for CICS includes functions that:

- Proactively manage performance and availability of IBM CICS systems from a single, integrated interface
- Monitor transactions to understand how resource usage and performance affect internal users and customers
- Identify tasks waiting for specific resources and pinpoint excessive wait times to resolve issues quickly
- Monitor virtual storage access method (VSAM) files, identify record level sharing locks and facilitate rapid resolution to maximize availability
- Correlate CICS log streams with associated facility structures to fine-tune CICS systems for optimal performance
- Integrate information from other IBM Tivoli OMEGAMON XE monitors across multiple and third-party software into a single view

Managing production workloads with IBM Tivoli Workload Scheduler for z/OS

IBM Tivoli Workload Scheduler for z/OS provides leading-edge solutions to problems in production workload management. It can automate, plan, and control the processing of an enterprise's entire production workload, not just the batch subset. The suite functions as an "automatic driver" for production workloads to maximize the throughput of work, and optimize resources, but also allows intervention manually as required.

When the suite interfaces with other Systems Management products, it forms part of an integrated automation and Systems Management platform for an IT operation. Tivoli Workload Scheduler for z/OS is a production management system that manages all work running on any system and in virtually any operating environment. It helps plan, manage, and automate the production workload.

Among the functions of the IBM Tivoli Workload Scheduler for z/OS are:

- Job run length resolutions that lowers job scheduling management to seconds
- Integration with Removable Media Manager (RMM) – works with restart and cleanup to assist with the management of datasets
- Integration with IBM Tivoli Business Systems Manager – IBM Tivoli Workload Scheduler for z/OS has been enhanced to support monitoring from IBM Tivoli Business Systems Manager


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Managing networks with IBM Tivoli OMEGAMON XE for Mainframe Networks and IBM Tivoli NetView

What good is managing the performance of an IT infrastructure if the network doesn't respond at peak efficiency? e-business is based upon communication between customers and business. To help your customer manage their SNA and IP networks efficiently, IBM offers IBM Tivoli Omegamon XE and IBM Tivoli NetView.

IBM Tivoli OMEGAMON XE for Mainframe Networks gives your customer the ability to monitor and manage the health of crucial TCP/IP connections – in addition to the traditional VTAM and NCP operations – within IBM z/OS and OS/390® environments.

IBM Tivoli OMEGAMON XE for Mainframe Networks is designed to analyze TCP/IP performance among CICS, DB2, IMS and other key systems to identify resource loss and unstable connections. The power to monitor the end-user experience lets your customer fine-tune TCP/IP performance before application stakeholders and customers complain. And users migrating from VTAM to TCP/IP can easily manage both protocols from a single browser interface.

As important as the mainframe-based components in a network are, they don't do the job alone. They may be joined by an Intel®-based platform or RISC-based systems, all of which must be working at optimum velocity. IBM Tivoli NetView extends traditional network management to ensure the availability of critical business systems and to provide rapid resolution of problems.

IBM Tivoli NetView discovers TCP/IP networks, displays network topologies, correlates and manages events and SNMP traps, monitors network health, and gathers performance data. Tivoli NetView meets the needs of managers of large networks by providing the scalability and flexibility to manage critical business environments.

IBM Tivoli NetView accomplishes this through functionality that:

- Provides a scalable distributed management solution
- Quickly identifies the root cause of network failures
- Builds collections for management of critical business systems
- Integrates with leading vendors, such as CiscoWorks2000
- Maintains device inventory for asset management
- Measures availability and provides fault isolation for problem control and management
- Reports on network trends and analysis


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Automating zSeries operation with IBM Tivoli System Automation for z/OS and IBM Tivoli AF/Operator

IBM Tivoli System Automation for z/OS plays an important role in building the end-to-end autonomic computing solution. The unique functions of Tivoli System Automation for z/OS help customers with single z/OS systems and Parallel Sysplex clusters to ease management, reduce costs, and increase availability.

System Automation for z/OS is designed to automate the system's Input/Output, processor and systems operations. It offers high availability for critical business applications through policy-based self-healing. System administrators can define a "desired state" of the system and the software will monitor and launch the appropriate response (based on user-defined policies) in case the systems deviates from that "desired state". It includes out-of-the-box automation for IMS, CICS, Tivoli Workload Scheduler, IBM DB2, mySAP and WebSphere.

IBM Tivoli AF/Operator on z/OS is a robust console automation solution that helps protect z/OS or OS/390 mainframe environments by reducing human error and increasing control over system resources. IBM Tivoli AF/Operator on z/OS ensures timely completion of critical but repetitive tasks and quick response to system events on the enterprise console, without the need for human intervention.

IBM Tivoli System Automation for z/OS is the primary IBM Tivoli automation product for building an end-to-end autonomic computing solution. The AF products are available for customers primarily focused on mainframe console automation, integration with IBM Tivoli OMEGAMON data, and outboard automation.

Capacity planning with the IBM Tivoli Performance Modeler for z/OS and IBM Tivoli Decision Support for z/OS

Managers and systems analysts need tools that have the ability to predict what happens to resource usage and workload performance as environment changes. They also require a tool that will help manage day-to-day performance as well as long-term capacity planning requirements.

The IBM Tivoli Performance Modeler for z/OS is a Systems Management tool for performance modeling and capacity planning that runs under Microsoft Windows on a PC. The Performance Modeler can model the performance characteristics for an individual workload or many workloads on a z/OS or OS/390 mainframe computer. Systems programmers or operations professionals can use the performance modeling – or capacity planning – tools to simulate the actual performance behavior of the zSeries computer. They can predict the output of these complex mainframe systems and also the impact of changing hardware or software. With this data, your customers can proactively manage their z/OS and OS/390 systems.


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IBM Tivoli Decision Support for z/OS is a flexible reporting tool that can correlate systems performance data to help improve the economic performance of the IT investment.

With its centralized data-store for host and distributed system performance data, it provides easy access to enterprise-wide IT information to help gain the following Systems Management advantages:

- Addresses performance reporting, capacity management, resource availability management, and accounting and chargeback needs in an enterprise
- Collects, organizes in DB2 database, and converts raw standard Systems Management data into business-relevant information that can help improve operational planning, cost management, responsiveness, and decision-making processes in an organization
- Generates customized reports for communicating and exchanging valuable information between different departments in an enterprise
- Enabled to add new data sources to the collection and data-consolidation process, as needed
- Helps in maintaining centralized control and performance-reporting efficiency
- Working with the Tivoli Data Warehouse technology, Tivoli Decision Support for z/OS consolidates and organizes z/OS subsystem data in order to feed your business process solutions

Managing Linux workloads on zSeries servers with IBM Tivoli OMEGAMON XE for Linux on zSeries

IBM Tivoli OMEGAMON XE for Linux on zSeries lets your customer manage consolidated servers from a single point of control to increase availability and control costs. Your customer can view Linux applications – and their interaction with mainframe and distributed systems – on a single screen. Detailed metrics and side-by-side comparisons of applications provide the insight you need to tune for higher availability. The solution also boosts staff productivity by letting systems administrators quickly and intuitively drill down to the source of poor performance.

Tivoli OMEGAMON XE for Linux on zSeries supports comparison of Linux operations side by side with detailed performance metrics from other important systems – and see their interdependencies. The ability to track performance information such as CPU usage, I/O statistics and network performance across multiple platforms and systems quickly alerts administrators to bottlenecks and other problems. Tivoli OMEGAMON XE for Linux monitors Linux workloads to detect runaway processes and track resource use to help make more insightful decisions.

With IBM Tivoli OMEGAMON for z/VM, administrators can easily monitor multiple Linux images on z/VM, potentially eliminating much of the effort in managing hundreds of Linux servers. This can mean significant reductions in hardware, space and related environmental costs. The solution also helps get the most out of existing hardware with the highest server utilization possible.


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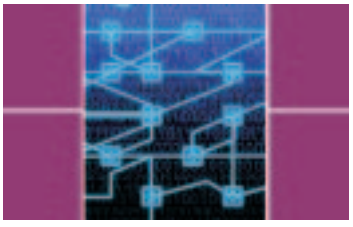

zSeries and VE: Managing Workloads Across the Enterprise

The IBM Virtualization Engine (VE)

While zSeries servers have long provided leading-edge management functions, data centers do not live by zSeries alone. In today's environment, it is increasingly common for customers to have multiple servers and storage devices running a variety of operating systems and middleware products. With each server or IT resource comes a unique Systems Management solution and the potential for a separate operation console, each with a different look and feel for each solution deployed. With all of this flexibility comes the potential for increased complexity which can lead to IT inefficiencies and compromised business objectives. Left unchecked, this variety of server types, storage subsystems and networking technology can easily become a collection of inefficient "silos" each adding to the complexity and manageability of the infrastructure.

The IBM Virtualization Engine is designed to address the special needs of the modern IT environment by helping manage applications and resources ranging from a single hardware box, to a collection of homogeneous servers, to a heterogeneous collection of servers and storage devises running multitiered, mixed application workloads. Virtualization Engine introduces IBM support for virtual systems and consolidated Systems Management capabilities across the entire spectrum of IT environments. It promises to help businesses evolve existing silos of stand-alone systems to a virtual system environment where IT resources are applied "on demand" to the customer business problems at hand.

While the IBM server platforms have been positioned to support virtual environments for many years, the application of virtualization technologies is now being accepted across the industry as a means for handling the explosive growth of the number of systems required to satisfy customer application growth. Interest in virtualization as a solution centers on four specific issues:

- the need to *simplify management of the IT infrastructure*,
- to satisfy the desire to *increase the effective utilization of IT resources*,
- *to alleviate future growth constraints* due to environmental issues such as power, space, and cooling,
- and to *reduce the human cost* managing hundreds, or even thousands, of individual systems.

Behind each of these customer issues is a single theme, "contain the cost of growth". From an IBM perspective, virtualization and Systems Management are key elements of addressing each of these customer pain points. The IBM family of systems will help customers consolidate existing silos of hardware into virtual,


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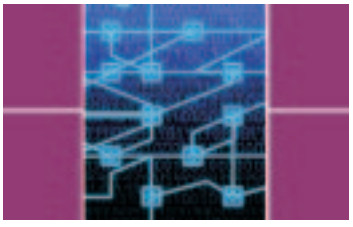

flexible system platforms, they will eliminate constraints imposed by the physical partitioning of existing high-capacity servers, and they will lead customers toward a more dynamic infrastructure that can adapt as their needs evolve.

For many customers, the promise and value of Virtualization Engine is clear: an environment of fewer physical server instances running at higher utilization levels, a reduction in IT administration costs, and an environment that is more flexible, allowing real-time redirection of resources to satisfy customer business needs and objectives.

IBM zSeries customers are already acclimated to the concepts of virtualization, the management of mixed workloads on a server, and flexible allocation of system resources. Customers that prefer UNIX tend to deploy one operating system image per physical server or physically partition a large server into multiple operating system images having static resource assignments; while less frequent than on zSeries, customers do occasionally run multiple workloads on a single UNIX instance, depending upon the type of applications being hosted. Finally, some applications are best suited to the Windows or Linux environments, where each OS instance tends to support a single application environment; for these environments the virtualization concept applies to the pairing of an operating system with the application that that operating system hosts.

Regardless of the situation, the potential value of virtualization to the customer is the same: reducing the number of physical hardware images required, which reduces power, space, and cooling demands, and increasing the overall utilization level of physical resources, thereby decreasing the total cost of the environment. In addition, it addresses the customer requirement for a reduction in the human costs of managing the environment, as well as proving to be more flexible, adaptable, and responsive to their business needs

The role of zSeries and the IBM Virtualization Engine

zSeries plays a significant part in what is being delivered with the Virtualization Engine since it will build on many of the technologies developed for the mainframe to provide a consolidated point of Systems Management and begin to extend many of these advanced virtualization capabilities throughout other IBM eServer product lines, helping your clients create a unified approach to enterprise-wide virtualization and Systems Management.

However, while the IBM Virtualization Engine is beginning to replicate some elements of mainframe technology extending them to UNIX and Intel processor-based platforms, the IBM eServer zSeries remains the premier platform for world-class, on demand computing and will continue to represent the leading edge of advanced system technology for IBM by playing a central role in enterprise-wide infrastructure management.


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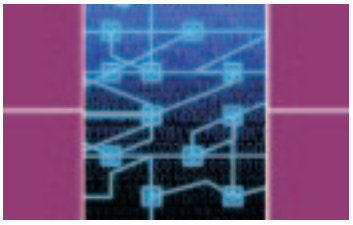

zSeries technologies (e.g., IRD, LPAR, VMRM, HiperSockets, z/OS WLM, etc.) are specifically designed to provide advanced capabilities and world-class support for workloads running within the zSeries architecture. However, as business units of work traverse multiple operating environments, the IBM Virtualization Engine promises to extend these capabilities to allow businesses to manage applications and resources across heterogeneous computing environments. The zSeries platform's inherent strengths, will play a key role as a hub for managing these cross-system resources.

The zSeries microprocessor, instruction set and microcode will continue to provide the basis for a security-rich, high volume transaction environment that includes a level of virtualization with extreme granularity and dynamic management for integrated workloads within an IT environment. Unique, " strength" I/O adapters that support the rich heritage of a highly reliable, fault tolerant connectivity structure will continue on zSeries, while adopting key emerging standards that are common across the industry. In addition, architectural extensions, new instructions and code, and associated feature sets are expected to be added to increase the overall availability characteristics of the zSeries platform.

The first of the IBM Virtualization Engine functions for the zSeries platform is the Enterprise Workload Manager for z/OS (EWLM). EWLM is a breakthrough technology that can bring further self-optimization, in the form of performance and response time management, to an entire Virtualization Engine-enabled IT environment. EWLM allows system administrators to define business-oriented performance objectives for workloads running across different platforms, and then view actual performance compared to those objectives. EWLM and z/OS WLM can run simultaneously; EWLM monitoring does not affect z/OS management and monitoring. A z/OS customer can continue z/OS management and use EWLM to see how the work relates to transactions that exist within a network of different platforms, such as AIX®, OS/400®, Linux, or Windows.

For customers requiring legendary availability, reliability, and security, and the intrinsic advantages of economy of scale, zSeries may be the ideal platform for providing the management hub for expansive Virtualization Engine-enabled infrastructures.

Core competencies like virtualization, business continuity, advanced Systems Management, autonomic functionality, and the ability to process secure transactions are capabilities that put the mainframe in a class of its own. Leveraging zSeries and Virtualization Engine to manage sophisticated and extensive networks will become a natural extension of these core capabilities.


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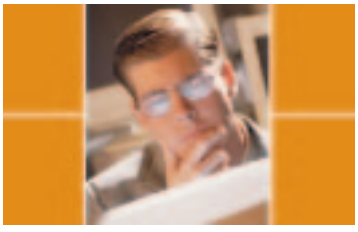

Did you know?

Did you know that IBM has over 1,000 programmers working on Systems Management solutions?

According to IDC (Source: IDC, On-Demand Enterprises and Utility Computing: A Current Market Assessment and Outlook, IDC #31513, July 2004.) 15 years ago 70% of IT costs were attributed to hardware acquisition. Today, 70% to 80% of IT costs have shifted to maintaining the operation of the data center.

According to the Gartner Group - 2004, *"Since we published our last high-level perspective of the ratio between MIPS and head count in 2001, the largest z/OS installations have more than doubled their 'MIPS to head count' ratio."* Simply put, that means staffing levels, and therefore staffing costs, do not have to grow in proportion mainframe computing capacity.

Workloads running on mainframes using the Linux operating system may also derive the benefits of mainframe workload management when running under z/VM.

Chargeback information can be collected for workloads running on mainframes – both under z/OS or Linux and z/VM, so departments can be billed accurately, for resources they consume instead of a flat fee which is usually not indicative of actual work performed.

Did you know that IBM's mainframe virtualization solution, z/VM provides Systems Management functions and tooling for Linux guests? It's called the Virtual Machine Resource Manager, and it's built into z/VM. It's a good example of the rich function built into mainframe virtualization for over 35 years.

Did you know that Independent Software Vendors provide Systems Management and performance reporting functions for mainframes? So does IBM, and IBM solutions may provide your customer with a financial advantage, as well as putting money in your pocket.

According to Arcati Research, software and maintenance costs over five years for the mainframe is $4,500 per user; PCs are nearly twice as expensive at $8,000 per user. If the numbers of users are doubled, the costs jump 125% on a non-mainframe, and only 90% on a mainframe. (Arcati Research, 2005)


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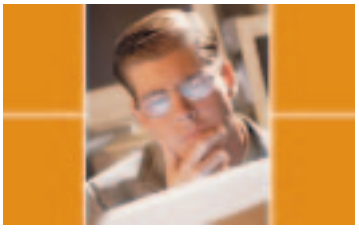

From our so-what's-to-manage file:

Did you know that according to Businessweek*, March 2004 in an article by Steve Hamm, "Even today, a decade after pundits declared the mainframe dead, more than 70% of the world's digital information resides on the machines."*

Did you know that all of the OMEGAMON XE products use a common, flexible and easy-to-use browser interface that allows users to quickly isolate and resolve potential performance problems?


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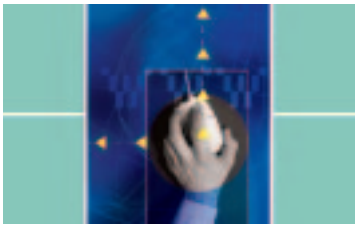

Getting Started: Health Checker

Based on what you've read so far, you can see that Systems Management is no small task, and customers running zSeries servers today are more than likely using some of the techniques and products that have been mentioned in the document so far. However, there is a good chance that opportunities for improvement through the use of IBM products and services exists. Here are a few hints and tips that may help you be of more help to your customer.

Check the health of z/OS with the IBM Health Checker for z/OS and Sysplex

Imagine being able to get your customer a tool that helps to identify potential problems on their system before they impact availability, or in worst cases, cause outages. Such a tool should check current, active settings on a z/OS system and compare those values to either IBM suggested values or values that your customer set. The tool would be easy to set-up and use. And, this tool should be available free of charge. The tool is IBM Health Checker for z/OS and Sysplex, and it is available for downloading to your customers workstation from the z/OS downloads page (**ibm.com/zseries/zos/downloads**). There is also a pointer to the z/OS downloads page in the resources section later in this document.

Your customer can run the tool on all z/OS releases. With IBM Health Checker, we did not limit our focus (or *health checks*) to only to the most complex areas of the system. Our analysis has shown that the simple things are also likely to cause availability problems. Also, while many of our checks are related to sysplex configurations, quite a few are applicable to a single systems as well.

The IBM Health Checker performs checks that can help your customer isolate and correct problems that may occur with system consoles, Sysplex consoles, global resource serialization (GRS), storage checks and mapping, and more.

Many customers have been able to download the tool and run it in less than 30 minutes. It's a simple batch process that provides output in report form. Once the tool has been run, your customer can review the recommendations and values provided by the tool. So far, more than 2,000 people have registered to use IBM Health Checker for z/OS and Sysplex. With the comments we've received and our growing numbers of users, we have the catalysts we need to plan for bigger and better things in the future.

If z/OS is healthy, shouldn't the network and key subsystems be healthy too?

What good is it to have an operating system that's running effectively only to have users let down by networking or subsystem problems? Earlier in this document, a host of solutions from IBM Tivoli for managing networks and examining and tuning key subsystems were discussed. Your customers may be running some of them already, or they may be running solutions from competitors. Contact your IBM Tivoli Software Rep and review your customer's situation. You may have an opportunity to increase the IBM presence at the account, as well as improving your customer's ability to manage the IT infrastructure.


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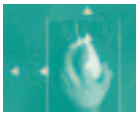
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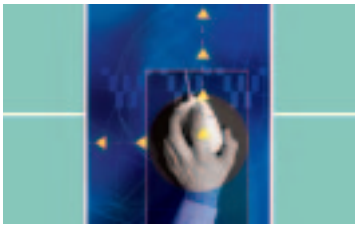

Is your customer planning or considering a Linux on zSeries deployment?

If your customers are planning to deploy a Linux application on a zSeries server, make sure that they will have the correct tools to manage the application. As you've seen earlier in this document, z/VM contains a suite of functions to help customers manage multiple virtual Linux instances running on a single zSeries server. If your customers aren't using z/VM, this would be an excellent time to illustrate the flexibility and power that z/VM can bring to a centralized Linux solution. In addition to the tools for regulating the consumption of resource by virtual Linux servers, the z/VM Performance Toolkit brings customers an easy to use way to collect performance information about their systems and virtual machines for tuning and capacity planning purposes.


Systems Management: The Key zSeries Benefit


Responding to Business Needs: zSeries, z/OS and Utilization


Building Blocks of zSeries Systems Management


zSeries, Linux and Systems Management


The Role of Virtualization in Systems Management


Solutions from IBM Tivoli


zSeries and VE: Managing Workloads Across the Enterprise


Did You Know


Getting Started: Health Checker


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Sales Aids and Resources:

z/OS

Obtain checks for IBM Health Checker for z/OS

Checks for the IBM Health Checker for z/OS are delivered both as an integrated part of a z/OS release or separately, as PTFs. Many new and updated checks will be distributed as PTFs, so that they are not dependent on z/OS release boundaries and can be added at any time. To identify checks that have been provided in PTFs, use the Enhanced Preventive Service Planning Tool, available at: **http://techsupport.services.ibm.com/390/psp_main.html**

The Intelligent Resource Director Web Page

The Intelligent Resource Director Web Page includes a lot of useful information about IRD, including an animated presentation on Intelligent Resource Director basics. You'll also find success stories, FAQs, and other useful information for you and your customers.

z/OS Customer Success Stories

Examples of customer success with z/OS can be found at: **http://www-306.ibm.com/software/success/cssdb.nsf topstoriesFM?OpenForm&Site=eserverzseries**

IBM Tivoli Animated Software Demonstrations

A demonstration of Tivoli Systems Management solutions can be found at: **http://www-306.ibm.com/software/tivoli/library/demos/zseries-infrastructure-mgmt.html**

IBM Tivoli Web Page

The IBM Tivoli Web page can be found at:
http://www-306.ibm.com/software/tivoli/

Customer reference animation for OMEGAMON on **ibm.com**:
Go to **http://www-306.ibm.com/software/os/zseries/testimonials/** and click on *Stadtsparkasse Munich*

Sales people can download the standalone exe from: **http://w3-03.ibm.com/software/sales/salesite.nsf/salestools zSeries+software$zSeries_More_Reference_Materials** and click on *"SSKM"* to download.

New zSeries Infrastructure Management demo:
http://www-306.ibm.com/software/tivoli/library/demos/zseries-infrastructure-mgmt.html

For questions or help with IBM Tivoli Software contact:
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z/VM Web Page

The IBM z/VM page can be found at: **http://www.vm.ibm.com/**

The Autonomics Manifesto

The Autonomics Manifesto is a call to action, created with the input of scientists and industry experts in the IBM Research headquarters in New York. Published in October of 2001, it contains an overview of autonomic computing systems along with their eight defining characteristics. In it you will find examples of this concept at work in the real world. In other words, it demonstrates how autonomic computing will affect you and the world of business. It can be found at: **http://www.research.ibm.com/autonomic/manifesto/**


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