Gaining efficiency and business value through effective management of your IT infrastructure

*Eight challenges to overcome for optimal service delivery and cost savings*
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Introduction
Managing today’s complex server environments, networks and IT infrastructures is challenging. Most organizations have tools and disciplines in place to provide basic availability management including hardware and software monitoring capabilities. However, your staff may not have the skills or time to support and implement notification handling, performance and capacity management, security management, configuration management and automation. With the pressure to do more with less, how can you balance the need to drive down costs and also improve delivery of system administration, information access, remote access and problem and change management?

This paper surveys the challenges and solutions for effective management of your server infrastructures and network devices. We discuss important disciplines such as availability management and the tools you need to support a complex IT environment. Use of outsourcing and managed services is demonstrated as a strategic way to drive efficiency and create business value. You may choose to use this paper as a tool or checklist to evaluate and improve your in-house handling of infrastructure management or to evaluate potential services providers.

Understand key challenges of infrastructure management
An infrastructure typically consists of a broadly heterogeneous collection of elements such as servers, virtual machines, logical partitions, routers, switches, wireless appliances, disks, processors, operating systems, middleware and database instances, and batch jobs. All of these elements can be mapped, more or less, into a simple framework as shown in Figure 1.
The management of your distributed and complex IT infrastructure is often a significant portion of your total cost of ownership. Getting costs under control while also meeting your service-level commitments requires a focus on the following eight areas of infrastructure management challenges:

*Detecting and handling incidents and problems:* Incidents and problems are a way of life for systems that involve hardware, software and people. Detecting and handling problems effectively is simply not easy. Handling problems requires discipline, imagination and experience.

*Handling changes with minimal impact on availability:* Change is frequently required in today’s highly complex systems. Dealing with change while striving for minimum downtime requires a variety of skills.
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Preventing security problems: Security challenges are ongoing and constantly changing. Your management solution should incorporate plans to address the threats to your systems and information in the form of both Web-based attacks and hackers.

Using emerging or challenging technologies effectively: New technologies hold great promise for businesses by enabling cost reductions and flexibility. Even so, the benefits from these technologies can be elusive due to the learning curve that users face in understanding them and effectively dealing with their complexity.

Maintaining server software and firmware: Applying emergency security fixes or even routine software changes can be a daunting task for your staff. To avoid negative impacts on your application availability and performance requires planning and careful execution, including provisions for backing out failed updates.

Having indicators of status and trends for specific infrastructure and activities: Information on the status of systems and applications is important in infrastructure management, especially in problem situations. This information is also needed for capacity planning. However, obtaining and analyzing operational and trend information is time consuming and complex.

Having the right tools for the job: There are many tools, from commercial products to home-grown tools, which can be used to manage IT infrastructures. Having just the right toolset for your environment requires balancing human aspects, types of tools, number of tools, level of integration and secure use. Lack of such balance reflects itself in ineffective support for business goals or unduly high software or staff operations costs.

Deploying infrastructure and tools rapidly with the proper level of ongoing management: The fast pace of change in today’s business environment requires the need to rapidly deploy systems and the tools to provide ongoing support, especially for the mission-critical components of your IT infrastructure. These activities can be routine, but are important for meeting service-level commitments and supporting new business initiatives.
Plan for effective infrastructure management

As you evaluate your current infrastructure management capabilities and consider outsourcing and managed services providers, focus on solutions that address the above key challenges. A focus on value should shape your goals, with cost and complexity playing a major factor in your evaluation and consideration. With this focus, you can then determine the best approach to achieving your goals in the context of specific tactics, as shown in Figure 2.

Figure 2. Strategy framework for an effective IT management solution.
Based on this framework, consider the following recommendations for solutions to address the eight key challenges we have previously identified:

**Detecting and handling incidents and problems**

In addressing this challenge, the goal should be to provide robust incident and problem handling, resulting in the smoothest possible operation. If possible, this solution should use preemptive actions to prevent failures.

The proven tactics to achieve this goal include proactive and passive monitoring to detect incidents and problems. Using technology to automatically handle incidents, open problem records and assign priority is also important to reduce labor costs. The use of innovative tools to anticipate and correct problems before they occur is another labor-saving approach. It is also useful to provide automated software support that makes it easier for a system administrator to resolve incidents and problems. Assigning support personnel based on the severity of the incident or problem to improve response time is a proven way to prioritize work in conjunction with using a service-level agreement (SLA). An example SLA is one that has the goal of resolving 90 percent of Severity 1 problems in under four hours. Following rigorous problem handling and management steps to ensure effective problem resolution is also important. So is involving a specialized service manager and a multidisciplinary team.

The business value of effective detection and handling of incidents and problems is reflected in higher availability of IT resources, resulting in infrastructure and applications that function better for the company.

**Handling changes with minimal impact on availability**

In addressing this challenge, the goal should be to manage change in a manner that results in highly predictable outcomes.
To achieve this goal, one proven tactic is to have the team participate at least weekly in change-management planning. Prepare for change by planning activities and estimating the time required. Test changes prior to their implementation and prepare backout activities in the event of a failed change to restore the system to its previous condition. Using a skilled change manager to benefit from experience of successful and failed changes is a proven way to improve the quality of change success.

As shown in the previous example, the business value of handling changes with minimal impact on availability is reflected in higher availability of IT resources, resulting in systems and applications that function better for the company.

**Preventing security problems**

In addressing this challenge, the goal should be services and support that effectively manage security risk while maintaining the necessary business agility.

To achieve this goal, one proven tactic is to use information security controls based on an industry standard and explain them in a living document. Implement key security variables such as password length and update frequency early in the process and perform security remediation as required for servers and other devices to refresh and update your security posture. Look for security exposures during the ongoing support period. For a closed-end process, specify the frequency of these analyses with monthly reporting on key security attributes and activities related to servers and other devices.

The business value of preventing security problems is the reduced financial risk associated with security breaches.
**Using emerging or challenging technologies effectively**

In addressing this challenge, the goal should be a focus on emerging and challenging technologies such as virtualization and high availability configurations, resulting in sustained benefits from the use of this technology. Virtualization provides flexibility to achieve rapid change and high utilization of your existing IT resources. High availability technology supports business resiliency and your requirements for continuous application availability.

To achieve this goal, one of the proven tactics is to focus on skills support for virtual machines and logical partitions, using change windows to make dynamic changes to production servers—like adding processor or memory resources to an image. Develop the skills of your staff in a variety of high availability software, including MC/ServiceGuard, IBM HACMP®, Linux® HA or Red Hat Cluster Suite, Microsoft® Cluster Services, Sun Cluster or Veritas Cluster Services and VMware HA.

The business value of using these technologies includes lower costs, higher application availability and improved business flexibility as compared to obsolete technology approaches.

**Maintaining server software and firmware**

In addressing this challenge, the goal should be a balanced collection of proactive and reactive activities supported by effective software products and tools.

To achieve this goal, one of the proven tactics is to proactively monitor servers as well as to use monitoring software. Startup tasks may involve refreshing operating system processes, establishing startup sequences and changing priorities as appropriate. Other server support activities involve a range of activities including patching, configuration and log file maintenance, using remote tools to perform operational procedures, server security activities for identity and access and support for virtualization software.
The business value of server monitoring and management is a more reliable server operation that proactively monitors systems, resulting in higher availability through early detection of incidents and problems. In addition, comprehensive management results in fewer software incompatibility issues. Finally, remaining current with software patches and levels ensures support is available when necessary for the software supplier.

**Having indicators of status and trends for specific infrastructure and activities**

In addressing this challenge, the goal should be a dynamic reporting capability as well as monthly reports that provide a good way to understand the activities and performance of the service. An operational or business dashboard is also useful if you can justify the high cost of information integration.

To achieve this goal, one of the proven tactics is to post reports on a portal for easy access. Also, make use of tools that focus on server resource management and generate performance and capacity reports to help you analyze trends. It is also important to generate and post reports that focus on security management.

A portal can also be used to enter problem records and change notifications while also providing links to other needed tools, portlets and services that support ongoing activities.

The business value of useful reporting is to provide feedback on the effectiveness of the service that is being provided and to report on elements that may have been missed during the daily operation. An example is servers with out-of-date signature or antivirus files. Dynamic reporting is also useful to support functional disciplines such as performance and capacity management.

**Having the right tools for the job**

In addressing this challenge, the goal should be to use mature tools and processes that deliver optimal service and support your SLAs.

To achieve this goal, the proven tactics include the use of tools that support disciplines or activities that need to be carried out, such as the following.
Availability management
The focus of basic availability management is determining the up or down status of a device or resource. An example of a tool that supports this capability is IBM Tivoli® NetView®, which provides basic availability monitoring as well as smart logic to minimize the occurrence of false alerts. The logic performs multiple checks to determine if a device is truly unavailable.

Hardware monitoring
The purpose of hardware monitoring is to pay special attention to system events that affect hardware. These events might include power failure, tampering, temperature changes and voltage irregularities. IBM Systems Director is an effective tool for both hardware monitoring and software monitoring of server resources.

Software monitoring
Software monitoring of server resources is aimed at periodically querying key system elements to determine irregularities, if any. The presence of these incidents, even if intermittent, usually indicates a loss of IT service quality. Monitored system elements include processor workload, processor status, processor consumption and system thrashing. IBM Tivoli Monitoring is a tool that makes such monitoring possible.

Notification handling
Notification handling aims at informing a systems administrator that an event has occurred or a threshold has been exceeded. The notification can take a number of forms—e-mail, short message or page text. TelAlert from NSAi is an example of a tool that can be used in this manner to notify teams or individuals of problems.

Performance and capacity management
Performance and capacity management involves the gathering of and reporting on data that is specifically focused on the performance characteristics of devices and their capacity over time. An IBM proprietary tool called Server Resource Management (SRM), for instance, is a valuable tool to assist with server performance and capacity trend analysis. Figure 3 shows a sample performance report from SRM on virtualized partitions.
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Figure 3. Performance report on virtualized partitions.

Security management

The focus of security management is both internal and external. Three important areas for security are within a local system, among distributed processes and in data and over networks and communications.

Examples of security management tools are Fusion, an internal IBM security compliance tool, and IBM Vulnerability Management Service, a comprehensive program designed to help organizations implement the tools, methodologies and best practices required to address today’s dynamic vulnerability landscape. Fusion helps improve efficiency through centralized server management. Some Fusion functions are operating system security patch management, antivirus status checking, security log management, compliance checking and workflow remediation, systematic attack detection and server information. IBM’s delivery compliance administration support team uses Fusion as well as other tools to help manage efficient server security-audit compliance based on the contracted security policy and Operating System Authorized Program Analysis Reports (OS APAR).

IBM Vulnerability Management Service analyzes your IT infrastructure through the following processes:

- **Vulnerability discovery**
- **Prioritization of assets**
- **Delegation of remediation tasks**
- **Dynamic protection**
- **Verification**
- **Customized reporting**
**Configuration management**

The focus of configuration management is to identify, capture, organize and maintain configuration information for use by other processes. A key challenge associated with configuration management is supporting the dynamic nature of systems, networks and applications.

Configuration tools vary greatly in scope—from keeping a basic inventory of the items to utilizing a full data model that employs dynamic discovery capabilities. One such tool is the IBM internal Configuration Management Integrator, which uses a configuration management database to maintain configuration information about supported features and devices.

**System administration**

The focus of system administration is to perform tasks that support devices, especially servers. The system administrator installs and maintains software products and tools, patches software and performs problem determination, participates in change-management activities and supports application programmers as necessary—in short, performs most activities associated with keeping servers up and running. An example of a system administrator tool is Service Delivery Portal (SDP), which is an IBM internal, Web-based information integration platform for server system administrators. SDP consolidates operational data from client environments. SDP is a single dashboard that standardizes and simplifies the user interface, achieving centralized and consistent execution of tasks.

**Information access**

The aim of information access is to provide easy access to reports, an operational dashboard and tools and related subsystems. Information access is important because it can serve as a window into the infrastructure management service.

Typically, access to information is provided by way of a portal. IBM Services Connection, as shown in Figure 4, is a primary interface for organizations to access reports and tools. It also supports information access for IBM Remote Managed Infrastructure Services.
Automation

The automation functional perspective, or discipline, is complex to describe, because it is both a standalone function and one that is embedded in other functional perspectives, such as operations and problems. For example, Parity is an IBM internal tool that is used to proactively and automatically solve problems. Parity checks when a process or communication of a software client is not working properly. If the process is not working due to a dependent component on a different client, Parity uses known recovery methods to restore the functionality of the dependent client.
EnVision, another IBM internal automation tool, can automatically open problem records for access and handling. Developed by an IBM team responsible for enterprise systems management (ESM) tools integration, the EnVision tool is a single sign-on, front-end Web portal to access and manage multiple problem management systems. Near-real-time information from disparate systems is organized and consolidated into a centralized Web portal for easy access and manageability. The EnVision integration tool collectively organizes problem tickets, details, priorities and statuses from multiple problem management systems into a single-access Web portal.

**Remote access**
Remote access tools such as RemotelyAnywhere by LogMeIn and OpenSSH, an open source tool for secure access, can assist with reaching infrastructure elements such as servers in a secure and productive manner. OpenSSH is integrated into base systems such as OpenBSD, FreeBSD, BSDi BSD/OS, NetBSD, Computone, Stallion, Cygwin, e-smith server and gateway, Mac OS X Version 10.1, HP Procurve Switch 4108GL 2524/2512, IBM AIX®, and SunSHH in Sun Solaris 9.

**Problem and change management**
Managing problems is important because users expect timely correction and resolution. Change management is closely linked to problem management because change can introduce risk to the stability of your systems environment. An important consideration for change management is the need for written backout procedures and a process to reduce the risks of failed changes.

ManageNow, another internal IBM Web-based tool, supports problem and change management and uses enterprise systems management to store and manage problem and change information.

The business value of having the right tools is measured in terms of the effectiveness of the service at a manageable and sustainable cost. Table 1 summarizes all the tools listed in this section, organized by activity or discipline.
Table 1. Tools in context

<table>
<thead>
<tr>
<th>Activity or discipline</th>
<th>Tool example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic availability management</td>
<td>NetView</td>
</tr>
<tr>
<td>Hardware monitoring</td>
<td>IBM Director</td>
</tr>
<tr>
<td>Software monitoring of resources</td>
<td>IBM Tivoli Monitoring</td>
</tr>
<tr>
<td>Notification handling</td>
<td>TelAlert</td>
</tr>
<tr>
<td>Performance and capacity management</td>
<td>Server Resource Management (SRM)</td>
</tr>
<tr>
<td>Security management</td>
<td>Fusion</td>
</tr>
<tr>
<td>Configuration management</td>
<td>Configuration Management Integrator</td>
</tr>
<tr>
<td>System administration</td>
<td>Service Delivery Portal and Knowledge Base</td>
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<tr>
<td>Information access</td>
<td>IBM Services Connection</td>
</tr>
<tr>
<td>Automation</td>
<td>Parity and EnVision</td>
</tr>
<tr>
<td>Remote access</td>
<td>RemotelyAnywhere and Open SSH</td>
</tr>
<tr>
<td>Problem and change management</td>
<td>ManageNow and enterprise systems management</td>
</tr>
</tbody>
</table>

**Deploying infrastructure and tools rapidly with a proper level of ongoing management**

In addressing this challenge, the goal should be rapid deployment through pre-engineered and solid ongoing support using a service manager.

The proven tactics for deployment to achieve this goal include using a model project plan that is based on prebuilt components with a project manager to ensure that your deployment goes smoothly. A delivery architect—a specialized role—helps to serve as a technical complement to the project manager.
The proven tactics for ongoing support are to use well-defined ongoing support activities using desk procedures to help provide your enterprise with an optimum degree of ongoing management. While a specialized service delivery manager can help ensure that the ongoing support goes smoothly, you could also consider using other specialized roles, such as security specialists, change managers and duty managers.

The business value of deploying infrastructure with a proper level of ongoing management is more rapid deployment (time value of money) and more reliable and predictable outcomes.

**Focus on service areas of growing importance**

Three areas of growing importance include batch processing, backup and restore, and middleware and database support services.

*Batch processing*

Planned, batch workloads are growing in significance in midrange systems. It is important to handle this workload in a planned fashion using an automated tool. This way, as batch windows decrease in duration, you can plan for and automate batch workloads.

*Backup and restore*

Backup and restore, like batch processing, is an instance of a time-critical service that is subject to a shrinking or nearly nonexistent time window. Make the best use of backup windows by using technology to leverage automated approaches. Also, use backup-while-active when possible. For a rapid restore of the operating system and environment in the event of a disk failure, backups should be independent of incremental copies.

*Middleware and database support services*

With the dominance of databases and middleware, managed services providers have begun offering support for products in this category. Middleware and database services are not new, but extensive adoption by companies worldwide is making them more relevant.
The business value of middleware and database support services is help with the daily activities of software management as well as the skill of experienced personnel who come along with the service. This results in the ability to better deploy existing support personnel, improve handling of problems and changes, and more rapidly deploy new systems and applications.

**Consider outsourcing and managed services**

Using outsourcing and managed services is a strategic way to drive efficiency and create business value. These services can offer:

- **Broad and deep skills needed to support a heterogeneous computing environment.** *It is obviously more difficult for you to employ these skills at an affordable cost.*
- **Redeployment of your key human resources to more strategic activities rather than maintaining existing systems.** *Even as you use service providers to manage your infrastructure, your employees can build the future of your company.*
- **Experience with processes and tools.** *This experience is particularly deep because these providers serve many clients, all of whom look for cost-efficient services.*
- **Lower cost for a higher level of service.** *Economies of scale make significant process improvements more affordable.*

This is not a comprehensive list of reasons, but a compelling list, all the same for you to seriously consider using an outsourcing or managed services provider.

**Summary**

Supporting a dynamic business and resilient IT environment requires effective management of your server infrastructure and network devices. By focusing on the activities or disciplines and tools necessary to carry efficient support and delivery services, you can improve your own management capabilities and evaluate the capabilities of potential outsourcing and managed service providers.
Infrastructure management checklist

Use the following table as a checklist to help you evaluate your infrastructure management effectiveness.

Table 2: Infrastructure management effectiveness checklist

<table>
<thead>
<tr>
<th>Detecting and handling incidents and problems</th>
<th>Maintaining server software and firmware</th>
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<tbody>
<tr>
<td>• Monitoring to detect incidents and problems?</td>
<td>• Proactively administering servers as well as using monitoring software?</td>
</tr>
<tr>
<td>• Using technology to automatically handle incidents, open problem records and assign priority?</td>
<td>• Managing server platform support activities like patching and log file maintenance?</td>
</tr>
<tr>
<td>• Using tools to anticipate and correct problems before they occur?</td>
<td>• Performing server security administration for identity and access?</td>
</tr>
<tr>
<td>• Providing automated support for system administrator to resolve incidents and problems?</td>
<td>• Providing specific focus and support for virtualization?</td>
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<tr>
<td>• Assigning support personnel based on the severity of the incident or problem?</td>
<td>• Providing high availability software support including periodic testing?</td>
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<tr>
<td>• Using Service-level Agreements?</td>
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<tr>
<td>• Following rigorous problem handling and management steps to ensure effective problem resolution?</td>
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<tr>
<td>• Utilizing a specialized service manager and a multidisciplinary team as needed?</td>
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</table>

<table>
<thead>
<tr>
<th>Handling changes with minimal impact on availability</th>
<th>Having inflexible indicators of status and trends for specific infrastructure and activities</th>
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<tbody>
<tr>
<td>• Implementing team participation in change-management planning?</td>
<td>• Posting reports on a portal for easy access?</td>
</tr>
<tr>
<td>• Preparing for change by planning activities and estimating time required?</td>
<td>• Providing tools that focus on server resource management and generate performance and capacity reports to analyze trends and manage security?</td>
</tr>
<tr>
<td>• Testing changes prior to their implementation and preparing backout activities in the event of a failed change?</td>
<td>• Setting up a portal to enter problem records and change notifications?</td>
</tr>
<tr>
<td>• Using a skilled change manager to benefit from experience of previous changes?</td>
<td>• Providing links to other needed tools, portlets and services that support ongoing activities?</td>
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<tr>
<td>Preventing security problems</td>
<td>Having precise tools for the job</td>
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<td>------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>• Using information security controls based on an industry standard?</td>
<td>• Support for availability management?</td>
</tr>
<tr>
<td>• Implementing key security variables such as password length and update frequency early in the process?</td>
<td>• Hardware monitoring?</td>
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<tr>
<td>• Performing security remediation as required for servers and other devices?</td>
<td>• Software monitoring of key computer resources?</td>
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<tr>
<td>• Looking for security exposures during the ongoing support period and specifying the frequency of these analyses?</td>
<td>• Flexible notification handling?</td>
</tr>
<tr>
<td>• Reporting monthly on key security attributes and activities related to servers and other devices?</td>
<td>• Support for performance and capacity management?</td>
</tr>
<tr>
<td>• Performing security remediation as required for servers and other devices?</td>
<td>• Support for security management?</td>
</tr>
<tr>
<td>• Support for availability management?</td>
<td>• Support for configuration management?</td>
</tr>
<tr>
<td>• Support for system administration?</td>
<td>• Support for system administration?</td>
</tr>
<tr>
<td>• Easy access to information?</td>
<td>• Standardized remote access?</td>
</tr>
<tr>
<td>• Automation of routine processes?</td>
<td>• Support for problem and change management?</td>
</tr>
<tr>
<td>• Reporting monthly on key security attributes and activities related to servers and other devices?</td>
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<tr>
<th>Using emerging or challenging technologies effectively</th>
<th>Deploying infrastructure and tools rapidly</th>
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<tbody>
<tr>
<td>• Focusing on skills support for virtual machines and logical partitions?</td>
<td>• Use of a model project plan that is based on prebuilt components?</td>
</tr>
<tr>
<td>• Using change windows to make dynamic changes to production servers?</td>
<td>• Use of a project manager to ensure that your deployment goes smoothly?</td>
</tr>
<tr>
<td>• Developing skills in a variety of high availability software like IBM HACMP and VMware HA?</td>
<td>• Use of a delivery architect?</td>
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<tr>
<td>• Well-defined ongoing support activities using desk procedures?</td>
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<tr>
<td>• Use of a service delivery manager?</td>
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<tr>
<td>• Use of security specialists, change managers and duty managers?</td>
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<tr>
<td>Focusing on service areas of growing importance</td>
<td></td>
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<tr>
<td>• Use of planned batch processing?</td>
<td></td>
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<tr>
<td>• Use of technology to make best use of backup windows?</td>
<td></td>
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<tr>
<td>• Specialized support for middleware and database?</td>
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For more information
To learn more about IBM Remote Managed Infrastructure Services, please contact your IBM marketing representative or IBM Business Partner, or visit the following Web site: ibm.com/services/server

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