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# Simplifying the Management of IBM i Environments

Achieving Effective and Cost Efficient  
Administration

An Executive Overview

## An IBM Power server running the IBM i operating system is one of the most integrated, easy-to-use systems on the market, but it can't manage or optimize itself.

Companies choose IBM i servers because they are easy to manage and use. But they can't read minds. Nor can they optimize themselves. Over the years, resource usage patterns change, possibly creating processing bottlenecks and unacceptably slow response times for critical business applications. In addition, storage space is wasted and performance declines further as logically deleted records continue to occupy physical space and obsolete objects remain on disk drives well beyond their usefulness.

IBM i provides a wealth of data to help analyze performance and storage usage. This information can be employed to liberate wasted space and tune the system. The problem is that, using IBM i administration tools alone, much of this information is cumbersome to access and, in many cases, its existence is far from obvious. Thus, putting the information to full advantage requires third-party system management tools. This executive overview explores the requirements for these tools and reviews one of Vision Solutions' offerings in this area, Vision Director.

### Storage Housekeeping

*IBM i provides a wealth of valuable system management information, but third-party tools are required to put it to effective use.*

As time goes by, organizations accumulate data that has become obsolete or, while still valid, is no longer required for day-to-day operations. Worse, some of it should never have been stored at all. Keeping this data in place adds to storage costs while bogging down applications and system utilities that must wade through it.

Examples of obsolete data and objects are numerous:

- User profiles for employees who left the company years ago that still remain on the system.
- Sales data that is not deleted, even though it is so far out of date it is no longer useful for marketing analysis or ongoing business transactions.
- Temporary files, or files that were supposed to be temporary, such as save files, which contain saves of libraries and objects, assume permanence as they are carelessly left in place.

These are just a few examples of the superfluous data and objects that tend to accumulate on disk drives. And careful reviews often reveal data that should never have been placed on company storage in the first place. For example, one company discovered that one of its employees had stored several gigabytes of his personal music collection on their Power server's Integrated File System (IFS).

This discussion illustrates two of the primary requirements for effective system management tools:

1. The ability to catalog, cross-reference, sort and select comprehensive information about all objects and files, thereby allowing system administrators to easily find obsolete and unwanted data and objects among the vast store of valid items on the system.
2. The ability to easily delete unwanted data and objects after, when appropriate, archiving them so they will still be available for regulatory or other purposes.

*Many organizations no longer have any time for downtime. Thus, the ability to tune and administer systems while users remain active is now mandatory.*

Data records deleted from within files present another requirement for storage housekeeping. That data is deleted only logically. It continues to occupy space until the file is reorganized. In addition, these still-present “deleted” records slow down applications and system utilities as they are pulled into buffers along with the still-valid data, but then must be subsequently filtered out during processing. Reading deleted records, only to ignore them later, unnecessarily consumes disk I/O bandwidth and processing resources.

IBM i does allow you to examine how much space is wasted in this way, but the included reorganization process that physically deletes the logically deleted records is typically very disruptive. During the reorganization process, applications usually must either be halted or they become so heavily burdened as to make them unusable for all practical purposes. In the past, database administrators overcame this problem by running reorganizations when the business was shut down at night or on a weekend. This is no longer an option for most companies. Competitive pressures, globalization and e-business have resulted in the shrinking or total elimination of the maintenance windows that used to exist for these sorts of tasks.

This suggests two more features that system management tools should provide:

3. Efficient reorganize-while-active capabilities that have negligible impact on business applications.
4. The ability to break the reorganization process into smaller tasks that can be scheduled to run when business activity levels are usually low, thereby further reducing the impact on the business.

## Regulatory and Audit Compliance

*SOX and other regulations prohibit many of the on-the-fly system administration procedures of the past. All actions that alter business data in any way must now be rigorously logged.*

The requirements of regulatory compliance, not to mention prudent business practices, sometimes conflict with the desire to delete obsolete data. Some data that is no longer required for ongoing operations must continue to be available—although not necessarily in primary storage—to comply with regulations or to satisfy the company’s auditors. A comprehensive archiving tool can help with this.

To reduce online storage costs and improve query and other application performance, while simultaneously maximizing staff productivity and continuing to adhere to regulations and audit requirements, a system management solution should offer rules-based automation that can archive data and then delete it from main storage based on the company’s archiving policies.

These archiving policies are not always straightforward. For example, consider two purchase orders (POs): The first PO covers a single item that is shipped immediately. The second PO covers goods or services that will be provided over the course of multiple fiscal years. A simple rule that says “delete all purchase orders more than two years old” will be acceptable for the first PO, but it may delete the second PO while it is still active or subject to accounting review. Therefore, to be effective, any archiving tool must allow for complex rules that take into account a number of characteristics about the data items under consideration for archiving. For instance, in this PO example, in order to determine whether the PO is truly ready for archiving, the tool must be able to evaluate the PO’s creation date; whether all items on the PO have been shipped; and the date of the last shipment.

Regulatory compliance imposes other burdens on system administrators. Sarbanes Oxley (SOX) and other regulations require that any changes to critical business data must leave an audit trail. Consequently, some of the file clean-ups that administrators used to perform through the IBM i command line are no longer allowed under SOX because command line functions aren't logged. Thus, companies require tools that allow administrators to perform the functions that they used to perform through the command line, but such a tool must also rigorously log all such activity so it can be audited.

## Comprehensive Monitoring and Analysis

All of the data you need to keep your IBM i server well tuned is available in the system. The challenge is accessing it in a way that allows you to put it to good use. You need, but IBM i does not provide, an easy way to answer questions such as the following:

- How do critical business application response times vary throughout the day?
- As a corollary to the above, are there times when your IBM i servers are overloaded?
- What percentage of the system resources are consumed by each of the business applications running during the busy times?
- What are the trends in resource usage? (If you are not encountering bottlenecks now, is this a near- or medium-term threat?)

Ideally, the system management tool you use should make this information available in two forms:

- Tabular — with full sorting, selection and drill-down capabilities, which allows you to dig down into the data to analyze issues.
- Graphical — which allows you to spot trends that are not readily apparent when looking at a large volume of data displayed in tabular format.

***A complete solution must provide dynamic monitoring of relevant statistics and activity for all types of IBM i server storage, including the IFS, ASPs and iASPs.***

In addition to providing answers to the simpler questions about “what,” “how many,” “how big” and “how fast”, any system management tool you employ should also be able to give you the bigger picture—a complete report on the health of your system. Such health reports can serve a variety of purposes. For example, you can use them to:

- Monitoring compliance with Service Level Agreements.
- Take before-and-after system-health snapshots when performing system optimization, to ensure that your efforts fulfilled their objectives (you should be able to use your system management tool's health reports to verify the success of its own optimization processes).
- Monitor your system's health after an upgrade to ensure that the upgrade was successful and that your upgraded system will be able to adequately serve the demands of your business.

## Include All IBM i Server Storage

Data and objects accessible by today's IBM i servers can reside in a number of places, including attached storage, the Integrated File System (IFS), Auxiliary Storage Pools (ASP) and Independent Auxiliary Storage Pools (iASP). To offer optimal value, a system management tool must be able to report on and manage all types of storage. And, for productivity reasons, it should do so from a single user interface.

The tool should also be able to work with the logical files that system administrators often set up to make data access easier and faster for users. Logical files use indexes to provide various access paths into the files. In a large company, these indexes may number in the thousands and consume considerable storage space. On IBM i servers, one way to achieve storage space reductions is by sharing keys when multiple indexes use the same keys. However, many programmers don't know how to do this properly.

Sharing indexes is a complex process and the skill is not readily available in many IT departments, but it is not magic. The process can be precisely defined, and anything that can be precisely defined can be automated. Thus, a system management tool can provide considerable value by providing this capability.

## Vision Director: Automate IBM i Management Best Practices

Vision Director is a highly integrated set of applications that proactively monitors, manages, and optimizes IBM i servers, databases and application environments. Specifically, it allows you to:

*Think of Vision Director as IBM i mission control. Part flight tracker, part autopilot, part caretaker and part mission specialist, Vision Director is a highly integrated set of applications that proactively monitors, manages, and optimizes IBM servers, databases and application environments.*

### **Optimize and Manage Files and Objects**

- Map every object on IBM i servers.
- Reorganize all physical data.
- Optimize all logical file usage.
- Compress, clear and resize objects.
- Generate complete object cross-referencing.
- Receive a complete analysis of object growth.
- When used in conjunction with Vision Solution's Data Manager, set and use rules for the automated archiving and deleting of old data. The rules can be as complex as necessary to implement your company's archiving policies.

### **Simplify the Management of System Resources and Objects**

- Manage message queues, out queues and job queues automatically.
- Manage spool files, with advanced functionality for saves, restores and archiving.
- Manage domains, using a range of functionality – from the grouping of libraries at a high level to the granular management of specific objects at the lowest level.

### **Simplify Activity Management**

- Analyze resource usage and non-usage.
- Analyze response times.
- Track, monitor and report on jobs and users.

### **Simplify Database Management and Performance**

- Reorganize in-place to remove unused space and improve performance.

Vision Director maintains a complete, dynamic object cross-reference; tracks and analyzes object growth; analyzes resource usage and non-usage; analyzes response times; tracks, monitors and reports on jobs and users; monitors, tracks and manages system inefficiencies; and more. In addition, Vision Director lets administrators group libraries into multiple domains and report on and monitor growth across these domains. Change Analysis goes further to identify how the system changed over any period at the Domain, Library, Object or Profile levels.

Director also offers reports and graphical charts that increase productivity significantly by presenting easy-to-understand views of the health of your system. They can be printed for use as part of IT operations, Service Level Agreements or other reporting requirements, and are beneficial for comparison, documenting progress or capacity planning.

## System Health Reports

*“Vision Director is an invaluable tool for delayed system reporting. Using the Advanced Option module, it is both quick and easy to group libraries into data sets and report size and growth periodically.”*

—Fischer Rosemont

In addition to its extensive detailed query and reporting features, Vision Director offers a customizable Health Report, which provides a comprehensive, detailed snapshot of the health of your IBM i servers. In addition to a summary of key metrics, it provides detail pages that provide extensive insight into all current operating characteristics of your IBM i servers.

The health report can be scheduled or run on-demand. The results can be viewed in Vision Director’s GUI or downloaded as a Microsoft Excel format IFS file.



## Automated Optimization

*Automated, while-active maintenance increases productivity, improves system performance and reduces storage usage, while virtually eliminating the potential for human error.*

After Vision Director is installed and has assembled the necessary information, it recommends “best courses of action” to enhance performance, reduce disk usage and improve CPU utilization. You can accept, reject or modify the recommendations in real-time, make decisions and execute specific corrective tasks, all while users are online and active.

Optionally, Vision Director can automatically execute the program recommendations—or user-defined actions—to perform required systems management functions while the systems remain active. And you can set “wakeup” periods when Vision Director will wake itself up and perform its optimization tasks, thereby minimizing impacts on production systems. For example, if a database needs to be reorganized, Vision Director can recognize that and automatically begin the reorganization process during one of its wakeup periods. If necessary, it breaks the process into smaller chunks that fit into the specified maintenance periods. The results will be better allocated resources, optimized CPU utilization, freed up DASD and improved overall health and performance of your IBM i servers.

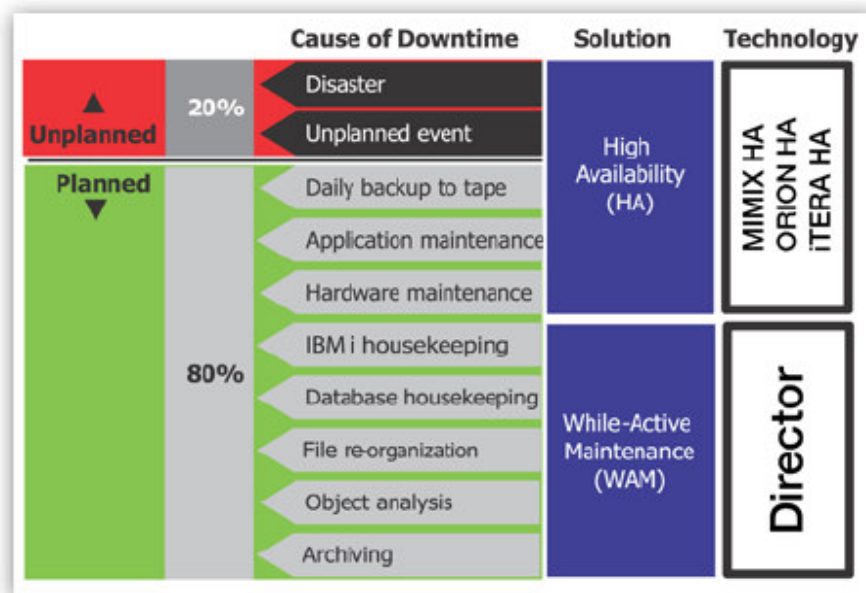
## The Ultimate Result: ROI

As with any IT purchase, you need to project the ROI of Vision Director to justify your investment in it. The following factors should be included in your ROI forecast:

### **Downtime Reductions**

Vision Director allows many housekeeping tasks to be performed without requiring users and jobs to be removed from the system. This can add many hours of extra uptime each week. The value of an hour of uptime can be quantified and, therefore, real ROI can be calculated based upon this benefit.

*“We have realized in excess of 20% improved performance and gained visibility of jobs and objects, previously thought impossible.”*  
—Rockwell International



### **Maintenance Risk Reduction**

Every change to a live production environment represents a risk. Poorly executed or omitted maintenance procedures can result in unplanned downtime or, in extreme cases, cause data loss. These risks are significantly increased when, as is often the case, manual maintenance procedures use ad-hoc programs written in IBM i control language (CL). These ad-hoc CL procedures typically receive only minimal testing before they are run in a production environment.

Vision Director is subject to extensive software quality procedures and controls that ensure that every maintenance procedure is thoroughly tested on multiple systems and with multiple versions of IBM i and its predecessor, i5/OS. In addition, Vision Solutions engineers have a close technical relationship with IBM Rochester. This helps to ensure that the latest IBM i guidelines and recommendations are correctly understood and followed. What’s more, unlike procedures written by in-house staff for a single company, Vision Director is field-proven by the hundreds of companies that use it.

**Multifaceted ROI:**

- *Less downtime*
- *Less risk*
- *Improved management and operator productivity*
- *Lower storage costs*
- *Better application performance*
- *Higher HA and DR process performance*
- *Greater system reliability*
- *Stronger regulatory auditing compliance*

**Management Productivity Enhancement**

Running ad-hoc maintenance procedures can involve significant staff time. Each ad-hoc procedure must be developed and tested, its run-time duration must be calculated or estimated and then its execution must be scheduled. Many organizations already have very tight IT schedules. Consequently, maintenance tasks often cannot be scheduled for weeks or months because of conflicts. Then, managers may have to spend significant time rearranging schedules when jobs over-run or fail.

Vision Director facilitates while-active maintenance (WAM) and allows maintenance tasks to be restricted to specific durations. Once your Vision Director schedule has been set up, maintenance tasks continue automatically. This can free up a great deal of management time, not to mention relieve a management headache. The number of management labor hours saved can be estimated, and therefore a financial return on investment can be calculated.

**Operator Productivity Enhancement**

Operators have different levels of IBM i and i5/OS experience. The ones with the most experience usually are the ones with the highest demands on their time. Creating and testing ad-hoc maintenance routines can take a significant percentage of an operator's time. This includes reading documentation, writing, testing and maintaining ad-hoc code and investigating errors. In larger or more sophisticated environments, this quickly becomes a full-time job.

Vision Director does not require any code to be written. All necessary routines are included. It can be configured quickly and runs with little or no operator supervision. A financial value can be derived for the estimated saving in skilled operator labor time.

**Disk Utilization Reductions**

Many IBM i servers run with high disk utilization (over 75%) because they fill up with non-essential data. This can lead to premature disk upgrades and, in some cases, emergency situations where operators urgently hunt and delete objects because disks have exceeded the critical threshold (90%) and threaten a system crash. And, as the number of objects stored grows, it becomes more difficult to identify non-essential objects manually.

Vision Director simplifies and automates this process. The result is that systems run with only essential data. The benefit is that disk upgrades can be delayed and disk growth is predictable and manageable. This saving in premature disk hardware upgrades can also be quantified as a financial value.

**Application Performance Improvements**

A Power server running IBM i is a database machine. Applications running on IBM i primarily retrieve and manipulate data. A significant factor affecting application performance is the time it takes to read and update data. Files that have been reorganized are faster to read. Duplicate indexes (access paths) that have been removed also make updating data faster. Disk utilization levels below 75% provide the best performance. In short, keeping disk storage organized can significantly improve application performance. Improvements in performance or the prevention of deterioration in performance can be estimated and a financial value derived.

**HA & DR Performance Improvements**

Many organizations use high availability (HA) and disaster recovery (DR) technologies to replicate data from a production system to a recovery system. It makes sense to optimize production systems before mirroring data, to ensure that no unnecessary data is mirrored.

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This positively impacts the utilization of system resources (eliminating unnecessary data, stored twice) and reduces the use of precious communications band-width. The value of improving HA and DR performance can certainly be included in ROI estimates.

### **System Reliability Improvements**

A non-optimized system contains many non-essential and duplicate objects. Test or temporary libraries and objects that exist on production systems can, in some cases, interfere with the reliability of live business applications. Vision Director makes it easier to identify and remove or archive non-essential, duplicate, test and temporary libraries and objects. This benefit can be estimated as a financial value.

### **System Security Improvements**

Many organizations restrict access to the IBM i OS command line for security reasons. This is also a requirement for Sarbanes Oxley compliance. Command lines allow potentially any CL command to be executed. Some CL commands have a profound impact on the system. Consider, for example, the results of PWRDWN SYS (power down the system) or DLT LIB (delete library).

In conflict with the need to maintain security, many system optimization tasks require a high level of command authority, authority that not all operators should have. With Vision Director, system optimization is automated, so fewer personnel require full command line authority, helping to eliminate a systems security weakness found in many organizations.

### **The Benefits of Optimization**

It is common sense that tuning and optimizing your IBM i server naturally results in improved system performance and reduced storage utilization. But system optimization doesn't just happen. Nor can it be approached as a one-time project. It needs to be done regularly, consistently and correctly every time. Done manually, it takes considerable time, research and knowledge to perform and, even in the most skilled hands, is still subject to human error.

With Vision Director, the initial reduction in data storage requirements that results can sometimes justify your investment by itself, by allowing you to defer upgrading your storage capacity or by breaking through a performance bottleneck that is hindering your business. But the real benefit to be gained from using Vision Director to continuously optimize and manage your System i is an ongoing improvement in business results.

Vision Director automates many critical IBM i server administration and management tasks and allows them to be run while users remain active on the system. Considerable, tangible ROI can be achieved through faster application response times, reduced storage costs and higher IT staff and management productivity. And because Vision Director continues to automatically review and manage your system, the storage and server performance benefits continue to accrue long after initial implementation.

*For more white papers  
and other information  
about IBM i management,  
high availability and disaster  
recovery, please visit the  
Vision Solutions Web site:  
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