



# The Mainstream

An article from the IBM @server zSeries software newsletter

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## Autonomic monitoring and management of z/OS storage resources.

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The performance, capacity and reliability of mainframe disk storage devices have improved dramatically over the past forty years. New storage hardware, new storage software—smaller and smaller, faster and faster—constantly being able to do more with less.

While the cost of per megabyte storage has decreased, the requirements to retain vast amounts of data continues to increase. New hardware devices often necessitate changes to existing storage administration utilities. In some cases an entirely new set of utilities must be developed, implemented and administered.

Storage needs are growing at an annual rate of 60-100%. Have you been adding IT staff at a similar rate to keep up? I didn't think so.

The mainframe just celebrated it's 40th birthday. Congratulations! Gee, that must mean that the real experts who have been monitoring and managing your storage resources must be getting close to retirement. How are you going to capture their knowledge? How are you going to manage your storage assets with a technical force that has grown up with point-and-click instead of ISPF panels and JCL?

*IBM Tivoli Storage Optimizer for z/OS* was designed specifically to address these concerns.

IBM® Tivoli® Storage Optimizer for z/OS® (ITSO) provides unattended discovery, monitoring and management of z/OS storage resources with the ability to respond automatically to site-specified storage-related thresholds and exceptions.



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ITSO operates in the background, unattended, and monitors what you want when you want it. As exceptions are detected, ITSO can automatically carry out maintenance procedures as defined by your existing storage experts.

ITSO operates at machine speed instead of people speed—keeping an eye on changes to your every increasing number of storage devices, tracking changes over time and providing drill-down into specific problem areas on an as needed basis through an intuitive Java™-based graphical user interface.

### **New solution to an old problem**

Monitoring and managing the various aspects of different storage devices from different vendors is often an expensive operation. Whether you are performing this work manually, with home-grown applications, or with old technology from an existing ISV it's expensive both in people and computing resource time. ITSO was designed to reduce costs and automate the procedures involved in data collection, tracking and resolving problems before they affect your business. ITSO uses a three tier architecture which can be deployed in your existing infrastructure whether it's wintel or Linux-based. ITSO components are:

- *Agent* – unattended service used to gather storage metrics, runs on the z/OS platform
- *Server* – unattended service used to establish monitoring and exception rules and procedures, instructs the Agent on what metrics to collect and when to do it
- *Client* – Java application used by storage administrators and end-users to monitor the storage environment and interact with the Server

### **Discover, monitor and manage**

ITSO was developed to be used in a “set and forget it” mode. Storage administrators simply specify the hostname or IP address where the Agent(s) are installed and the product automatically discovers all storage-related hardware devices, storage arrays, devices, SMS configuration and capacity metrics.

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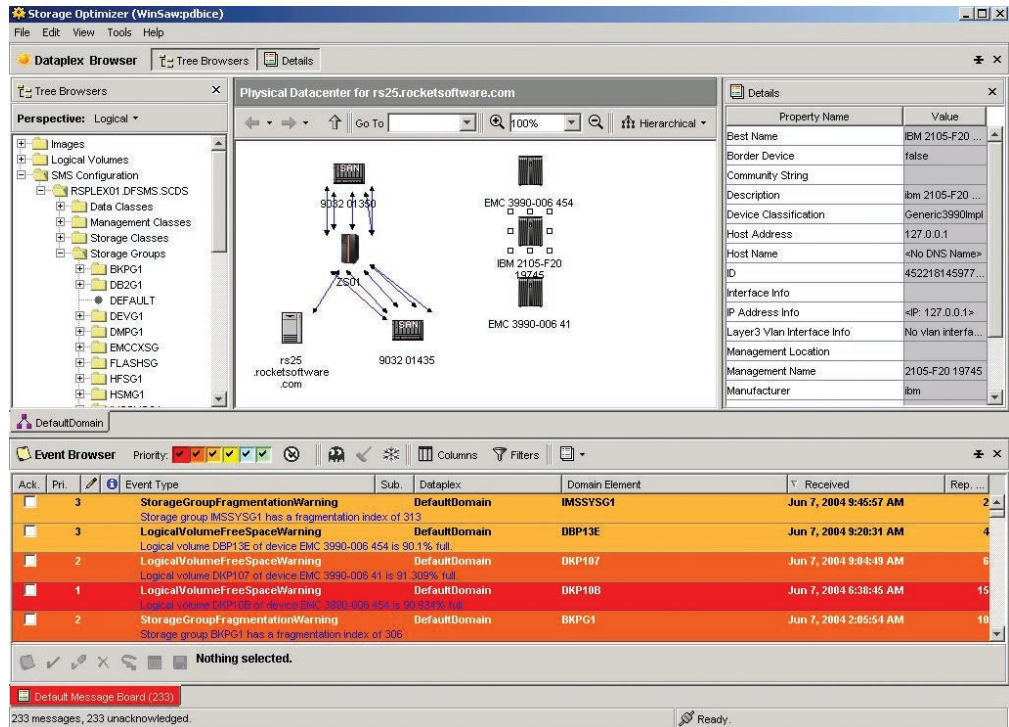


Figure 1

Figure 1 illustrates the primary interface to ITSO. Four windows are displayed which can be resized, minimized or rearranged according to user needs.

The top left window illustrates the tree browser representation of the storage environment. Various “perspectives” are built-in to provide a hardware (physical) view, logical view, SMS constructs, or user-defined views (including “Favorites”).

The top center window varies based upon user needs. In this example a graphical representation of the various system images, ESCON channels and storage arrays are illustrated. This display dynamically changes to a tabular display when viewing, for example, the volumes in a storage group.

The top right window shows details for the specific object which has been selected by a mouse click. Details are also available via right click operations on various object.

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The bottom window is the “Event Browser”. ITSO automatically posts alerts and exceptions to this window based upon site-specified parameters. While exceptions can be posted as site-defined WTOs, the Event Browser provides a convenient focal point for insight into storage-related exceptions.

Note that the ITSO GUI (the client) need not be active for the product to do its work. Simply set it and forget it.

### What you want to see, how you want to see it

With ITSO, the objective is for installations to specify what they consider exceptions and what automated steps are to be performed when these exceptions occur. However, storage administrators also need the ability to view metrics about the environment when needed. Everyone has a slightly different view of what’s important, which columns, in which order, sorted ascending or descending, etc. ITSO facilitates this and much more.

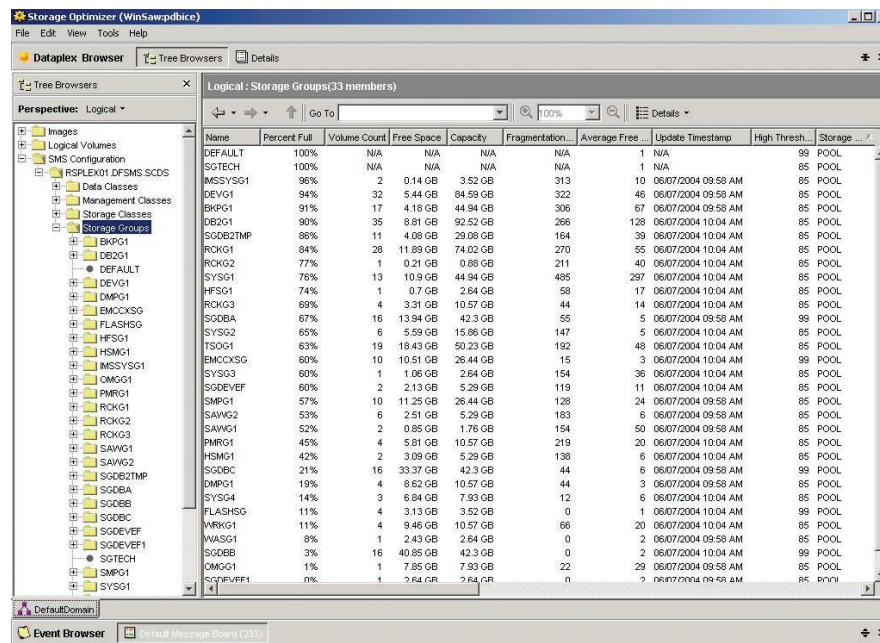


Figure 2

Figure 2 illustrates a tabular display of storage groups. The object “Storage Groups” was selected from the tree view and the list of 33 storage groups are automatically displayed in the right-hand window.

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The user can sort on any column, ascending or descending. They can also “hide” or “show” specific columns and simply drag-and-drop columns to rearrange the display left to right. Capacity-related metrics can be displayed using various indexes—MB, GB, TB, tracks and cylinders, etc.

ITSO provides drill-down as well as drill-up—clicking on an individual storage group, for example, the product can show similar metrics for the logical volumes that make up the specified storage group.

Right-click provides the ability to dynamically carry out site-defined actions in the context of the selected object. For example, right clicking on a data set offers different choices than right clicking on a storage group.

Multi-select operations are fully supported as well.

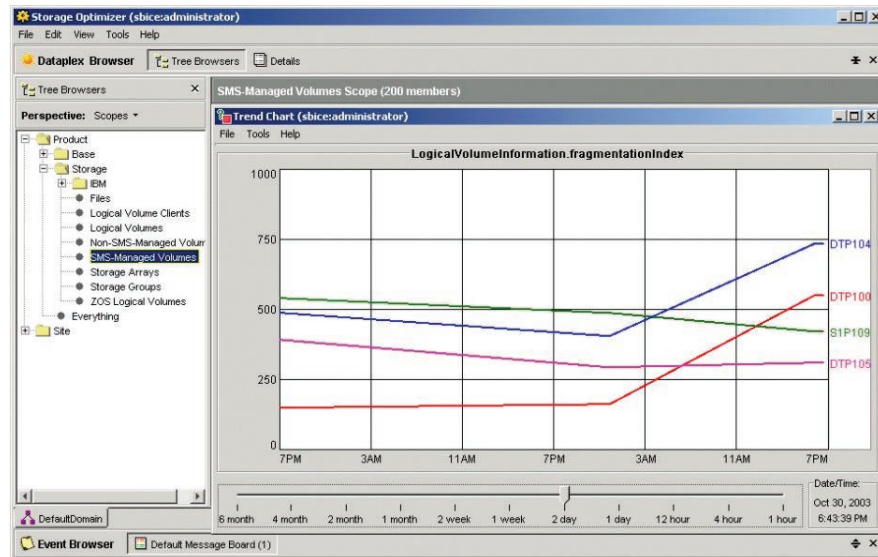


Figure 3

As illustrated in Figure 3, the user selected four separate logical volumes from the table display via multi-select (left click, followed by [Ctrl] left-click) and then requested a trend chart for logical volume fragmentation history.

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Multi-select options are supported for Actions as well. Want to migrate five specific data sets to ML2? Simply select the data sets in question, right click and carry out the appropriate action.

### What to monitor, when to monitor it

It would be silly to assume that you can paint everything with the same broad brush. Certain aspects of your storage environment are more critical to your business than others might be. Perhaps you want to keep a close eye on your production DB2® volumes, occasionally monitor other groups and disregard programmer test volumes altogether. ITSO lets you decide what you want it to monitor and when to do it.

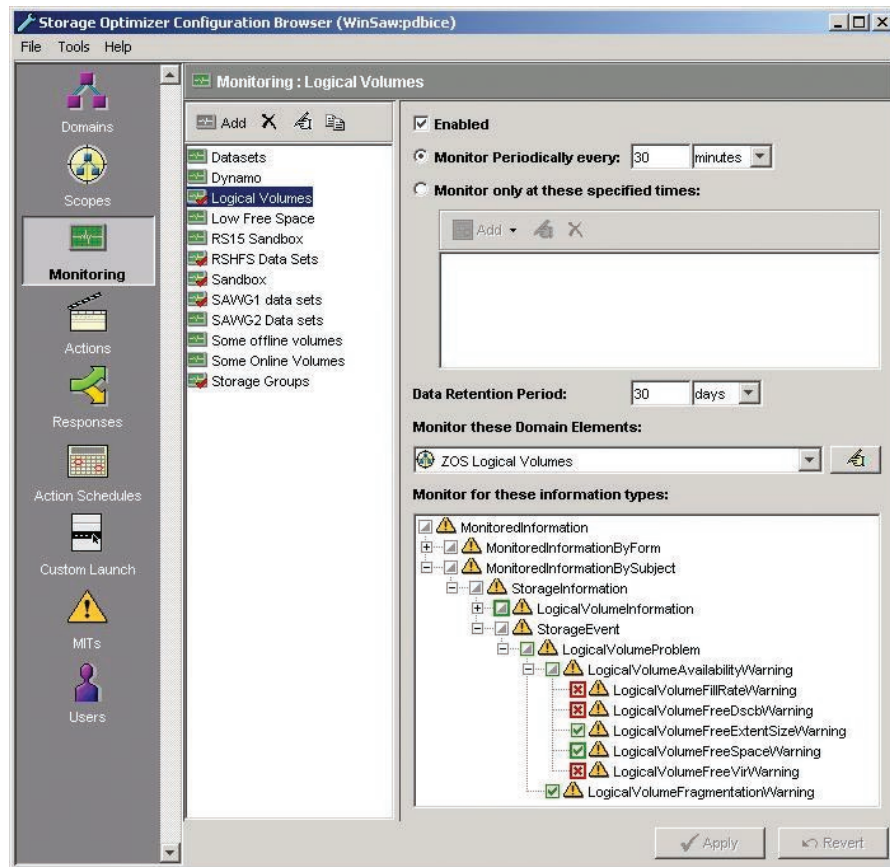


Figure 4

Figure 4 illustrates how this is accomplished. In this example, the user has defined a monitoring configuration entitled “Logical Volumes.” Monitoring is to take place every 30 minutes and the

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data is to be kept for 30 days. The desired information types are selected by green check marks in the lower right hand portion of the window.

ITSO also provides “Action Schedules” which can be used to indicate monitoring that is to take place on specific days of the week or at certain times of the day.

### Monitoring + Actions + Responses = Automated Storage Management

ITSO provides the ability for you to specify what to monitor and when to monitor it. The product provides built-in thresholds for numerous storage-related events such as volumes or storage groups nearing capacity, logical volumes running out of DSCB's or VIRs, logical volumes with high fragmentation indexes, large data sets which haven't been referenced for a long time, sudden jumps in growth (percent change over time), etc.

Collecting these metrics and posting alerts to the Event Browser is one thing but what you really need is a way for corrective actions to be automatically initiated without operator involvement—this is where Actions and Responses come in.

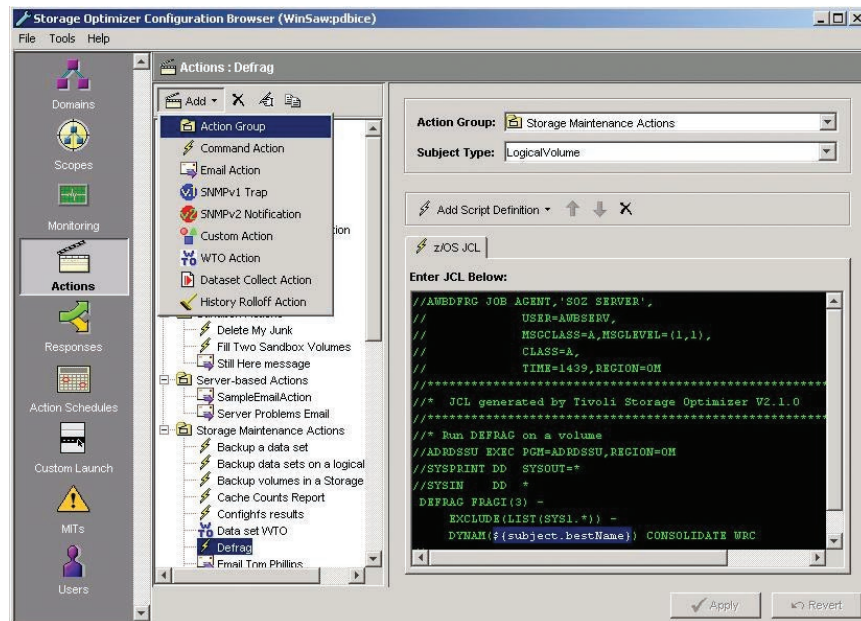


Figure 5

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Figure 5 illustrates ITSO Actions. The Actions carried out by ITSO on your behalf can be as simple as posting a WTO for your automation product or sending an email to the DBA. They can also include the submission and tracking of JCL launched in the context of the object which generated the event as shown in the example above where the VOLSER is dynamically substituted into the JCL.

ITSO Actions can be quite elaborate – launching your own custom-developed Java class, as an example.

While Actions define what to do, Responses define when to do it.

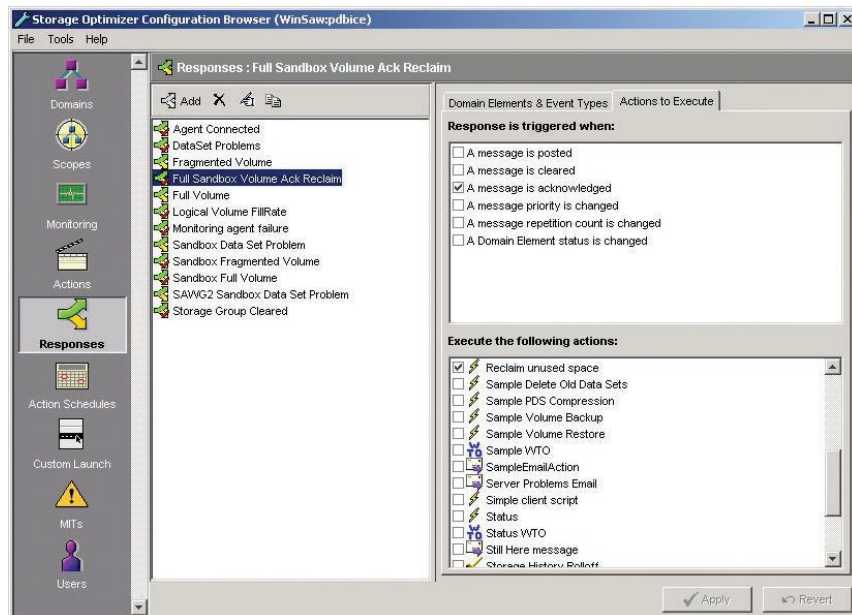


Figure 6

Figure 6 illustrates an example of a Response. In this case, the Action entitled “Reclaim unused space” is automatically carried out by ITSO when the end user acknowledges a message associated with the “Sandbox volumes”. Multiple triggers can be specified; multiple actions can be carried out.



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### Site-specified definition of Exceptions

Most storage-related events are transient—events are raised and then they go away. During execution of a large sort job, for example, free space on a volume may drop suddenly but then resume to normal levels upon job completion. ITSO takes “real world” behavior into account. Events appear when they are detected and then may automatically escalate in priority until they are addressed or until the condition which caused the event to occur no longer exists.

Installations define these “trigger” and “clear” values based on how their normal business processing takes place.

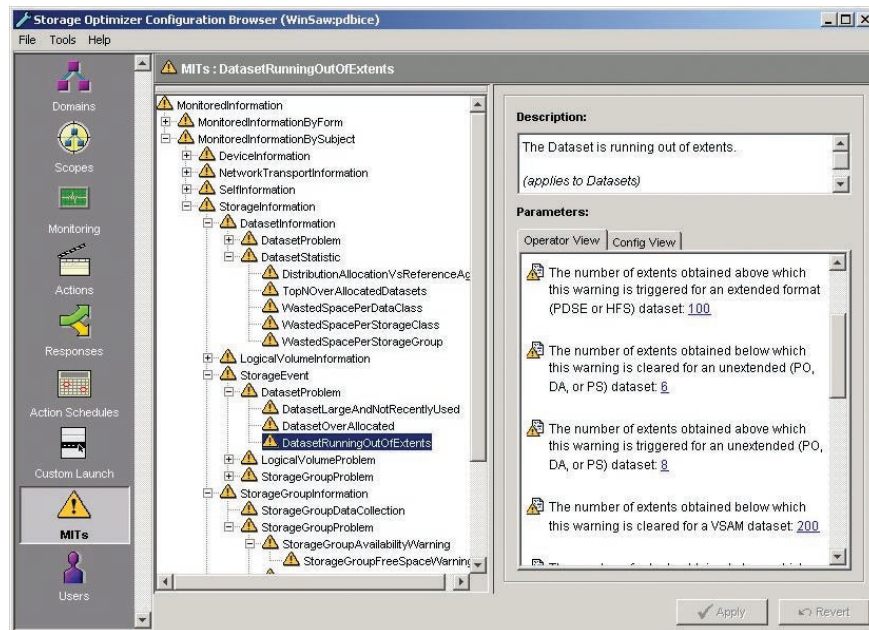


Figure 7

Figure 7 illustrates one example of this – what constitutes an alert associated with data sets running out of extents. In this example an event is triggered when a sequential data set has reached eight or more extents. The event is cleared when the number of extents is six or less.

Installations can specify different values based on their needs, either globally or for specific objects. For example, you might want an alert to be triggered when logical volume percent full



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exceeds 90 but, for certain critical volumes you may want this alert triggered at 80% or even less. This is easily specified by simple point and click operations.

### **Autonomic monitoring and management of z/OS storage resources**

With IBM Tivoli Storage Optimizer for z/OS there is no need to dedicate critical personnel to the task of monitoring storage capacity and performance. Install the product, instruct it to discover the environment, specify what you consider exceptions and let ITSO do the rest of the work on your behalf.

With ITSO's distributed architecture, expensive mainframe resources are utilized for running your business. With its Java-based graphical user interface, storage administrators can be productive on day one—no learning curve required because the interface is familiar and intuitive.

Collect all of the various storage-related maintenance procedures that have been developed, in-house, over the years and turn them over to ITSO. Let ITSO automate your storage monitoring and maintenance needs so your IT personnel can concentrate on other ways to improve your business.

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