



System i  
Systems Management  
Working with Management Central monitors

*Version 6 Release 1*







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**Note**

Before using this information and the product it supports, read the information in "Notices," on page 19.

This edition applies to version 6, release 1, modification 0 of IBM i5/OS (product number 5761-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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## Working with Management Central monitors

Management Central monitors can be used to check your system performance, your jobs and servers, your message queues, and changes to selected files.

You can specify thresholds for various metrics on these monitors, and then specify actions to be taken whenever a monitor detects that a threshold has been triggered. For example, you can run an i5/OS® command or start a program when the threshold is triggered. For specific examples that describe how you can use these monitors, see the related concept Scenarios: Performance.

You can use a *system monitor* to see detailed graphs that monitor the real-time performance of multiple i5/OS operating system. In the Graph History window, you can see a graphical view of the metrics that have been collected for an extended period of time by Collection Services. You can contrast this data with the real-time data for the last hour shown in a System Monitor window.

You can monitor your jobs and servers with a *job monitor*. For example, you might want to monitor a job's CPU usage, job status, or job log messages. For each of those metrics, you can specify a threshold and actions to take when that threshold is triggered. For example, you could set up your monitor to send a message to the system operator whenever the CPU usage exceeds a certain threshold. In addition to the i5/OS commands, you can use the Advanced Job Scheduler Send Distribution using JS (SNDDSTJS) command. This command notifies someone by e-mail that the threshold is exceeded, if the Advanced Job Scheduler (5761-JS1) licensed program is installed on the endpoint system.

You can create a *message monitor* to take action on a list of messages that are important to you. For example, when the message monitor detects CPI0953 (threshold of a disk pool is exceeded), you could specify to run a command that deletes objects that you no longer need from the disk pool.

You can use a *file monitor* to monitor for a specified text string or for a specified size. Or, you can monitor for any modification to one or more selected files. You can select one or more files to be monitored, or you can select the History log option, which will monitor the i5/OS history log (QHST).

**Note:** Integrated file system treats QSYS physical files as directories, with the physical file members actually treated as files.

You can use a *B2B activity monitor* to view a graph of active transactions over time, and you can run commands automatically when thresholds are triggered. You can search for and display a specific transaction as well as view a bar graph of the detailed steps of that specific transaction.

In System i® Navigator, or on your PC. You can choose to be informed by an audible or visible alarm on your PC when important thresholds are reached. The monitor continues to run and perform any threshold commands or actions you specified. Your monitor runs until you decide to stop it. You can view all your monitors, as well as all your Management Central tasks, remotely with System i Access for Wireless.

In the Management Central properties, you can specify whether you want the central system to automatically attempt to restart your monitors on endpoint systems where they failed to start. If you select to have the system automatically attempt to restart your monitors, you may also specify how long you want the central system to keep trying to restart the monitors and how often you want the system to try during that time period. For example, if you want the system to try to restart monitors every five minutes for a period of 3 hours, you can select **Automatically restart monitors on failed systems**, and then specify 180 minutes for **How long to attempt restart** and 5 minutes for **How often to attempt restart**.

The steps to create and run a monitor are basically the same for whichever type of monitor you choose to run.

To view or download a PDF version of this topic, select Working with Management Central monitors (about 194 KB)

#### **Related information**

Monitor concepts

Scenarios: System i Navigator monitors

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## **Management collection objects**

Collection Services stores data for each collection in a single collection object from which you can create as many different sets of database files as you need. This introductory topic explains the management collection object, when it is created, and how the available Collection Services settings affect these objects.

A *management collection object* (also known as \*MGTCOL) serves as an efficient storage medium to hold large quantities of performance data. Once you have configured and started Collection Services, performance data is continuously collected and stored in these objects. Then, when you need to work with performance data you can use the data that is stored in these objects to populate performance database files.

Each \*MGTCOL object has one of these attributes:

#### **\*PFR (detailed data)**

\*MGTCOL objects that have the \*PFR attribute can become quite large. Their size depends on the number of active jobs in the system, performance metrics being collected, and the collection interval. Data in this type of object support the IBM® Performance Management for System i5® (PM for System i5) performance metrics and reflect all of the requested system performance data. The **Location to store collections** field that is located on the Collection Services Properties window displays the library in which the \*PFR objects are located. The job QYPSPFRCOL collects and stores this data in this object.

The collection is cycled (a new \*PFR object is created) at least once in a 24 hour period and the QYPSPFRCOL job writes the performance data into the new object. You can schedule this to happen more frequently.

When PM for System i5 is running, the \*PFR objects are placed in the QMPGDATA library. If you are not using PM for System i5, then the \*PFR objects are placed in the QPFRDATA library. These are default settings.

**Note:** If you use the Create Database Files Now option you can specify a different library, however this does not change the default setting. All subsequent files will be written to the QMPGDATA (or the QPFRDATA) library.

#### **\*PFRDTL (graph data)**

Graph history and system monitors use \*MGTCOL objects that have the \*PFRDTL attribute. These objects are stored in the QMGTC2 library. The \*PFRDTL object supports second and third level detail for the top twenty uses of the metric and the data retains the same interval by which it was collected.

The collection is cycled (a new \*PFRDTL object is created) at least once in a 24 hour period and the job QYMEPFRCVT writes the data to a new object. The naming convention for \*PFRDTL objects is Q0yyddd00, where yy is the year and ddd is the Julian day of the year. For best results when using the graph history function, you should retain a minimum of seven days of \*PFRDTL objects.

#### **\*PFRHST (summary data)**

Graph history also uses \*MGTCOL objects that have the \*PFRHST attribute. These objects are stored in the QMGTC2 library. When the collection is cycled, the QYMEARCPMA job adds the data to the existing \*PFRHST object. No detail data or properties data is available. You must start PM for System i5 to enable the summary data fields. The default retention period is one month. The summary data is summarized in one-hour intervals and does not support second and third level details.

## Setting the retention period

You can set the retention period for these objects from the Collection Services Properties window.

1. From the System i Navigator, expand **Management Central** → **Endpoint Systems** → *your system* → **Configuration and Service**.
2. Right-click **Collection Services** and select **Properties**.

## Viewing collection objects

Viewing collection objects through **System i Navigator**

You can use System i Navigator to view \*MGTCOL objects with the \*PFR attribute.

From the System i Navigator, expand **Management Central** → **Endpoint Systems** → *your system* → **Configuration and Service** → **Collection Services**.

You can also use this method. From the System i Navigator, expand **My Connections** → *your system* → **Configuration and Service** → **Collection Services**.

Each object that is listed under the Collection Name is a different management collection object. You can right-click the object to see its status and data summary.

Viewing collection objects through **Character-based interface**

The following command can be used to view objects for the \*PFRHST and the \*PFRDTL type collection objects in the library QMGTC2:

```
WRKOBJPDM LIB(QMGTC2) OBJTYPE(*MGTCOL)
```

---

## Job monitors and Collection Services

In order to avoid creating a negative performance affect on your system, you should understand how the different metrics in the job monitor uses Collection Services.

The metrics that are available for a job monitor are:

- Job count
- Job log message
- Job status
- Job numeric values
- Summary numeric values

The data for the job numeric and summary numeric values metrics come from Collection Services. The overhead for obtaining this data is minimal and is not affected by the number of specific jobs that are being monitored. It takes two intervals of Collection services data before the first point or data metric value can be calculated. For example, if the collection interval is 5 minutes it will take more than 5 minutes before the first metric value is known.

The overhead for the job log message and job status metrics is much more costly in terms of the CPU resources required to obtain the information. Additionally, the number of jobs that are being monitored as well as the collection interval, affect the amount of CPU overhead that is required. For example, a job Monitor with a 5 minute interval will have six times the amount of overhead process to complete versus if the collection interval was set to 30 minutes.

## The QYRMJOBSEL job

For every job monitor that runs, a QYRMJOBSEL job starts. This topic explains the purpose of the QYRMJOBSEL job and what causes it to end.

The QYRMJOBSEL uses the information that is specified in the General page of the Job Monitor definition (**Management Central** → **Monitors** → **Job** → **Right-click a monitor and click Proprieties**) with Collection Services data (QYPSPFCOL) to determine what specific jobs need to be monitored. These jobs are then shown in the bottom half of the Job Monitor status window.

Even if only one job is running, QYRMJOBSEL still examines all of the active job data from Collection Services to determine how many jobs are running, if new instances have started or if instances that were running during the previous interval have ended. The QYRMJOBSEL job does this analysis at each interval. Thus, the amount of CPU resource that is needed for QYRMJOBSEL to complete this function is determined by how many active jobs are on the system. The more active jobs, the more jobs for QYRMJOBSEL to analyze.

Additionally, the QYRMJOBSEL job registers with Collection Services the needed probe data, but it cannot provide the notification interval. So it is always at the lowest interval at which Collection Services is running. Thus, a smaller collection interval means that this processing is performed more frequently.

For example, suppose the job monitor server starts a job monitor at 5 minute collection intervals. Then another monitor that is using Collection Services starts, but uses a smaller interval. As a result, the QYRMJOBSEL receives the data at the smaller or more frequent interval. If the smaller interval is 30 seconds, there will be a 10 time increase in the amount of data QYRMJOBSEL processes, thereby increasing the need for CPU resources.

When the job monitor is stopped, its associated QYRMJOBSEL job receives an ENDJOB immediate and terminates with a CPC1125 Completion 50 severity. This is the normal way that the QYRMJOBSEL is removed from the system.

**Note:** For QYRMJOBSEL to work properly, the Java™ time zone must be correctly set. This is done by setting the QTIMZON system value.

## QZRCRSVS jobs and their affect on performance

Job monitors connect to a QZRCRSVS job for each job that is being monitored for the Job Log Messages and the Job Status metrics. The more jobs that are being monitored for these metrics, the more QZRCRSVS jobs are used.

QZRCRSVS jobs are not Management Central jobs. They are i5/OS TCP Remote Command Server jobs that the Management Central Java server uses for calling commands and APIs. In order to process the API calls for the Job Log Messages and Job Status metrics in a timely fashion within the job monitor's interval length, the APIs are called for each job concurrently at interval time.

When both metrics are specified on the same monitor, two QZRCRSVS jobs are started for each job. For example, if 5 jobs are monitored for Job Log Messages, 5 QZRCRSVS jobs are started to support the monitor. If 5 jobs are monitored for Job Log Messages and Job Status, then 10 QZRCRSVS jobs are started.

Thus, it is recommended that for standard systems, when you are using the Job Log Message and Job Status metrics, you limit the number of jobs monitored on a small system to 40 jobs or less. (With larger

systems more jobs may be monitored. However, you need to have a clear understanding of the resources that are used when monitoring more jobs and determine the affordable number to monitor. ) Also, severely limit using these two metrics for monitoring subsystems, as doing so can cause a large number of QZRCSRVS jobs to run. (A job monitor that uses just the other metrics and does not use Job Status or Job Log Message, does not use QZRCSRVS jobs.)

## Tuning QZRCSRVS jobs

For jobs that pass work to the QZRCSRVS jobs, the subsystem that is specified on the QWTPCPUT API determines where the QZRCSRVS jobs run. QWTPCPUT is called during the processing of the QYSMPUT API. This API retrieves the subsystem information from the QUSRSYS/QYSMSVRE \*USRIDX object and uses it on the QWTPCPUT call. As shipped, QZRCSRVS jobs are prestart jobs that run in the QUSRWRK subsystem and this is where the connections are routed.

If you end the prestart jobs in QUSRWRK with the ENDPJ command, then the QZRCSRVS jobs start as batch-immediate jobs in the QSYSWRK subsystem whenever a connection is requested. No jobs start in advance of the connection.

You can configure your system so that prestart jobs can be run from any subsystem. You can also configure your system to prevent batch-immediate jobs from being used at all. If the job monitor server jobs are calling Java Toolbox functions to pass work to QZRCSRVS, then they are using the QYSMPUT API, and the work must run in whichever subsystem is stored in the user index.

## QZRCSRVS cleanup

A cleanup thread runs once an hour to determine whether a QZRCSRVS job is still being used by a Job Monitor. It determines if the job was used at least twice within the maximum job monitor interval length. If the job is not used during the previous two hours, it is ended. Java time stamps are used for this comparison, so it is imperative that the time zone value used by Java is correct (system value QTIMZON).

QZRCSRVS jobs are automatically removed two hours after the job it supports ends. Likewise QZRCSRVS jobs will end if the Job Monitor that created them stops, or if Management Central ends.

**Note:** Since the Management Central Job Monitor monitors active jobs, you might see messages like "Internal job identifier no longer valid" in the QZRCSRVS job. This normally happens when a monitored job with Job Log Messages or the Job Status metric ends while the monitor is running.

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## Special considerations

When working with Management Central monitors, you need to consider these special points.

### Special considerations when working with job monitors

- The Job Count metric monitors the number of active jobs that match the job selection criteria during a collection interval.
- The Job Monitor window (**Management Central** → **Monitors** → **Job** → **Right-click a job monitor** → **Open**) shows jobs that meet the criteria even if the jobs are no longer active at the end of the interval. Collection services provides information that determines the job count as well as the jobs to display in the window. This data contains information about all of the jobs that are active during that interval. Nevertheless, it is possible that if a job uses negligible CPU, then information about that job is not passed to the job monitor and so it does not appear in the count or the detail status display.
- For the metrics Job Status and Job Log Message if a job monitor triggers it continues to display those jobs that created the condition even if a job has ended and is not active during the interval. For this condition the job displays with a gray icon, and continues to be displayed until the trigger resets or the monitor restarts.

## Special considerations when working with file monitors

- The Text metric monitors for a specific text string. When you use this metric, the File Monitor obtains a shared read lock on the files that it is monitoring. Programs which obtain a shared update lock can update files without interfering with the monitor. However, users, programs and commands (such as the Work with Objects using Programming Development Manager (WRKOBJPDM) command or the Start Source Entry Utility (STRSEU) command) that obtain an exclusive lock will interfere with the file monitor and might cause it to either fail or to not be able to monitor the criteria during each interval.
- A file monitor uses an integrated file system to access the information that it needs about the files that it is monitoring. Integrated file systems treat QSYS physical files as directories. Only the physical file members are actually treated as files. If you want to monitor the size of the entire contents of the QSYS physical file you must monitor all of the members that it contains (typically a single file member).  
For example, to monitor the size of the database file QAYIVDTA in the QMGTC library enter `/qsys.lib/qmgtc.lib/qayivdta.file/qayivdta.mbr` in the Files To Monitor field (**Management Central** → **Monitors** → **File** → **Right-click a monitor** → **Properties** → **General tab**). You can view the size of the database file from within the System i Navigator File System.
- The Text metric is the only valid metric when monitoring the QHST file.

## Special considerations when working with system monitors

The V5R3 PTF SI18471 introduced the ability for the central system to try to restart a system monitor regardless of the reason. (Before this PTF, the central system would only restart a system monitor if the failure was due to a connection failure with the endpoint and if the monitor was still in a started status. This meant that only monitors with multiple endpoints that suffered connection failures were restarted.) To use this feature the following conditions must be met:

- The central system must be running release V5R4 or later. (This capability is also available on V5R3 central systems provided the PTF SI18471 is installed.)
- The keyword &RESTART is in the name of system monitor.
- The Management Central property **Automatically restart monitors on failed systems** is checked. (**Right-click Management Central** → **Properties** → **Connection tab**)

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## Creating a new monitor

Creating a new monitor is a process that begins at the New Monitor window. In System i Navigator, expand Management Central, expand **Monitors**, right-click the type of monitor you want to create (for example, **Job**), and then click **New Monitor**.

After you have given your new monitor a name, the next step is to specify what you want to monitor. If you are creating a job monitor, you will select which jobs you want to monitor. Be careful to monitor the smallest number of jobs that will give you the information you need. Monitoring a large number of jobs may have a performance affect on your system.

You can specify the jobs to monitor in these ways:

### Jobs to monitor

You can specify jobs by their job name, job user, job type and subsystem. When specifying job name, job user and subsystem, you can use an asterisk (\*) as a wildcard to represent one or more characters.

### Servers to monitor

You can specify jobs by their server names. Select from the list of **Available servers** on the **Servers to monitor** tab. You can also specify a custom server by clicking the **Add custom server** button on the New Monitor or Monitor Properties - General page under the **Servers to monitor** tab. To create a custom server, use the Change Job (QWTCHGJB) API

When multiple job selection criteria are specified, all jobs matching any of the criteria are monitored.

## Selecting the metrics

For each type of monitor, Management Central offers several measurements, known as *metrics*, to help you pinpoint different aspects of system activity. A metric is a measurement of a particular characteristic of a system resource or the performance of a program or a system.

For a *system monitor*, you can select from a wide range of available metrics, such as CPU utilization, interactive response time, transaction rate, disk arm utilization, disk storage, disk IOP utilization, and more.

For a *message monitor*, you can specify one or more message IDs, message types, severity levels. You can also select from a list of predefined sets of messages that are associated with a specific type of problem, such as a communications link problem, a cabling or hardware problem, or a modem problem.

For a *file monitor*, you can select to monitor files across multiple endpoint systems for a specified text string or for a specified size. Or, you can select to trigger an event whenever a specified file has been modified. You can select one or more files to be monitored, or you can select the **History log** option, which will monitor the i5/OS history log (QHST).

For a *job monitor*, available metrics include job count, job status, job log messages, CPU utilization, logical I/O rate, disk I/O rate, communications I/O rate, transaction rate, and more.

The Metrics page in the New Monitor window allows you to view and change the metrics that you want to monitor. To access this page, click **Monitors**, right-click the type of monitor you want to create (for example, **Job**), and then click **New Monitor**. Fill in the required fields, and then click the **Metrics** tab.

Use the online help to assist you in selecting your metrics. Remember to specify threshold values that allow you to be notified and to specify actions to be taken when a certain value (called the trigger value) is reached.

## System monitor metrics

Metrics that you can use in a system monitor include the following:

Table 1. System monitor metric definitions

Name	Description
CPU Utilization (Average)	The percentage of available processing unit time that is being consumed by all jobs, threads of a job, and Licensed Internal Code tasks on the system. Click any collection point on the graph to see a Details chart that shows the 20 jobs or tasks with the highest CPU utilization.
CPU Utilization (Interactive Jobs)	The percentage of available processing unit time that is being consumed on the system for all jobs which include the following: <ul style="list-style-type: none"><li>• A 5250 workstation that includes a Twinax attached remote line and local area network (LAN) line</li><li>• Systems Network Architecture (SNA) attached line that includes SNA display station pass-through</li><li>• All Telnet sessions, for example, LAN, IBM Personal Communications, System i Access PC5250, and other SNA or Telnet emulators</li></ul> Click any collection point on the graph to see a Details chart that shows the 20 interactive jobs (5250 jobs) with the highest CPU utilization.

Table 1. System monitor metric definitions (continued)

CPU Utilization (Interactive Feature)	The percentage of available interactive capability. The model number of your server (and for some models, the optional interactive feature card) determines the interactive capability of your system. It is possible to operate at greater than 100% of your available interactive capability. However, optimal system performance is achieved by maintaining an interactive workload that does not exceed the 100% level for extended periods. A recommended range should be approximately equal to or less than 70%. Click any collection point in the graph to see a Details chart that shows the 20 jobs with the highest CPU contributing to this workload.
CPU Utilization Basic (Average)	The percentage of available processing unit time that is being consumed by all jobs on the system. This metric includes the same work as CPU Utilization (Average) but does not include active job details. No additional data is available for this metric. You save system resource by not tracking the more detailed information.
CPU Utilization (Secondary Workloads)	The percentage of available processing unit time that is being consumed by secondary workloads running on your dedicated server. For example, if your system is a dedicated server for Domino®, Domino work is considered the primary workload. CPU Utilization (Secondary Workloads) shows the available processing unit time that is being consumed by any work other than Domino work on your server and can include WebSphere® Java and general Java servlets that run as Domino applications. No additional data is available for this metric.
CPU Utilization (Database Capability)	The percentage of available database capability that is being consumed by i5/OS database functions on your system, which includes file I/O, SQL, and general query functions. The model number and features of your system determine the amount of CPU available for database processing on your system. A recommended range should be approximately equal to or less than CPU Utilization (Average). Click any collection point in the graph to see a Details chart that shows the 20 jobs with the highest database CPU utilization.
Interactive Response Time (Average)	The average response time, in seconds, being experienced by 5250 interactive jobs on the system. Click any collection point on the graph to see a Details chart that shows the 20 jobs with the highest response time.
Interactive Response Time (Maximum)	The maximum response time, in seconds, that has been experienced by any 5250 interactive job on the system during the collection interval. Click any collection point on the graph to see a Details chart that shows the 20 jobs with the highest response time.
Transaction Rate (Average)	The number of transactions that are being completed per second by all active jobs on the system. Click any collection point on the graph to see a Details chart that shows the 20 jobs with the highest transaction rate.
Transaction Rate (Interactive)	The number of transactions that are being completed per second on the system by active 5250 jobs, which include the following: <ul style="list-style-type: none"> <li>• A 5250 workstation that includes a Twinax attached remote line and local area network (LAN) line</li> <li>• Systems Network Architecture (SNA) attached line that includes SNA display station pass-through</li> <li>• All Telnet sessions, for example, LAN, IBM Personal Communications, System i Access PC5250, and other SNA or Telnet emulators</li> </ul> Click any collection point on the graph to see a Details chart that shows the 20 jobs with the highest transaction rate.

Table 1. System monitor metric definitions (continued)

Batch Logical Database I/O	The average number of logical database input/output (I/O) operations being performed per second by all non-5250 batch jobs on the system. A logical I/O operation occurs when data is transferred between the system and application I/O buffers. This metric indicates how much work your batch jobs are performing during any given interval. Click any collection point on the graph to see a Details chart that shows the 20 batch jobs with the highest number of logical database I/O operations per second.
Disk Arm Utilization (Average)	The average percentage of all disk arm capacity that was utilized on the system during the collection interval. This metric shows how busy the disk arms on the system are during the current interval. Click any collection point on the graph to see a Details chart that shows the utilization of each disk arm.
Disk Arm Utilization (Maximum)	The maximum percentage of capacity that was utilized by any disk arm on the system during the collection interval. This metric shows how busy the disk arms on the system are during the current interval. Click any collection point on the graph to see a Details chart that shows the utilization of each disk arm.
Disk Storage (Average)	The average percentage of storage that was full on all disk arms during the collection interval. This metric shows how full the disk arms on the system are during the current interval. Click any collection point on the graph to see a Details chart that shows the percentage of storage that was full on each disk arm.
Disk Storage (Maximum)	The maximum percentage of storage that was full on any disk arm on the system during the collection interval. This metric shows how full the disk arms on the system are during the current interval. Click any collection point on the graph to see a Details chart that shows the percentage of storage that was full on each disk arm.
Disk IOP Utilization (Average)	The average utilization of all the disk input/output processors (IOPs) during the collection interval. This metric shows how busy the disk IOPs on the system are during the current interval. Multifunction IOPs can perform both Disk and Communication I/O work and can therefore be reported under either or both categories. If they performed work in both areas, the division of utilization is unknown and is reported fully under each category. Click any collection point on the graph to see a Details chart that shows the utilization of each input/output processor (IOP).
Disk IOP Utilization (Maximum)	The maximum utilization of any disk input/output processor (IOP) during the collection interval. This metric shows how busy the disk IOPs on the system are during the current interval. Multifunction IOPs can perform both Disk and Communication I/O work and can therefore be reported under either or both categories. If they performed work in both areas, the division of utilization is unknown and is reported fully under each category. Click any collection point on the graph to see a Details chart that shows the utilization of each input/output processor (IOP).
Communications IOP Utilization (Average)	The average utilization of all the communications input/output processors (IOPs) during the collection interval. This metric shows how busy the communications IOPs on the system are during the current interval. Multifunction IOPs can perform both Disk and Communication I/O work and can therefore be reported under either or both categories. If they performed work in both areas, the division of utilization is unknown and is reported fully under each category. Click any collection point on the graph to see a Details chart that shows the utilization of each input/output processor (IOP).

Table 1. System monitor metric definitions (continued)

Communications IOP Utilization (Maximum)	The maximum utilization of any communications input/output processor (IOP) during the collection interval. This metric shows how busy the communications IOPs on the system are during the current interval. Multifunction IOPs can perform both Disk and Communication I/O work and can therefore be reported under either or both categories. If they performed work in both areas, the division of utilization is unknown and is reported fully under each category. Click any collection point on the graph to see a Details chart that shows the utilization of each input/output processor (IOP).
Communications Line Utilization (Average)	The average amount of data that was actually sent and received for all non-LAN lines that are active during the time you collect data. Line utilization is an approximation of the actual amount of data transmitted compared with the theoretical limit of the lines based on the line speed settings in the line descriptions. The communication lines included on this monitor are one of the following line types: Bisync, Async, IDLC, X25, LAPD, SDLC, or PPP. This metric shows how actively the system is using its communication lines. If you have communications lines, such as fax lines, that are very busy much of the time, you may want to exclude these heavily utilized lines from the system monitor graph. Click any collection point on the graph to see a Details chart that shows the utilization of each line on the system.
Communications Line Utilization (Maximum)	The maximum amount of data that was actually sent and received for all non-LAN lines that are active during the time you collect data. Line utilization is an approximation of the actual amount of data transmitted compared with the theoretical limit of the line based on its line speed setting in the line description. The communication lines included on this monitor are one of the following line types: Bisync, Async, IDLC, X25, LAPD, SDLC, or PPP. This metric shows how actively the system is using its communication lines. If you have communications lines, such as fax lines, that are very busy much of the time, you may want to exclude these heavily utilized lines from the system monitor graph. Click any collection point on the graph to see a Details chart that shows the utilization of each line on the system.
LAN Utilization (Average)	The average amount of data that was actually sent and received on all local area network (LAN) lines in the system, compared with the theoretical limit of the lines based on the line speed settings in the line descriptions. The LAN lines included on this monitor are one of the following line types: token-ring or Ethernet. This metric shows how actively the system is using its LAN lines. Click any collection point on the graph to see a Details chart that shows the utilization of each line on the system.
LAN Utilization (Maximum)	The maximum amount of data that was actually sent and received on any local area network (LAN) line in the system, compared with the theoretical limit of the line based on its line speed setting in the line description. The LAN lines included on this monitor run one of the following line types: token-ring or Ethernet. This metric shows how actively the system is using its LAN lines. Click any collection point on the graph to see a Details chart that shows the utilization of each line on the system.
Machine Pool Faults	The average number of faults per second that occur in the machine pool of the system during the time you collect the data. Only Licensed Internal Code runs in the machine pool. This metric shows the level of faulting activity in the system's machine pool. Click any collection point on the graph to see a Details chart that shows the number of faults per second in the system's machine pool.
User Pool Faults (Average)	The average number of faults per second occurring in all of the user pools on the system during the time you collect the data. This metric shows how much faulting activity is occurring in the system's user pools. Click any collection point on the graph to see a Details chart that shows the number of faults per second in each auxiliary storage pool.

Table 1. System monitor metric definitions (continued)

User Pool Faults (Maximum)	The maximum number of faults per second occurring in all of the user pools on the system during the time you collect the data. This metric shows how much faulting activity is occurring in the system's user pools. Click any collection point on the graph to see a Details chart that shows the number of faults per second in each auxiliary storage pool.
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## Job monitor metrics

You can use any metric, a group of metrics, or all the metrics from the list to be included in your monitor. Metrics you can use in a job monitor include the following:

Table 2. Job monitor metric definitions

Name	Description
Job Count	Monitor for a specific number of jobs matching the job selection.
Job Status	Monitor for jobs in any selected status, such as Completed, Disconnected, Ending, Held while running, or Initial thread held. <b>Remember:</b> Metrics for job status can affect performance. Limit the number of jobs that you are monitoring to 40.
Job Log Messages	Monitor for messages based on any combination of Message ID, Type, and Minimum severity.

## Job numeric values

Table 3. Job numeric values definition

Name	Description
CPU Utilization	The percentage of available processing unit time used by all jobs that are included by this monitor on this system.
Logical I/O Rate	The number of logical I/O actions, per second, by each job that is being monitored on this system.
Disk I/O Rate	The average number of I/O operations, per second, performed by each job that is being monitored on this system. The value in this column is the sum of the asynchronous and synchronous disk I/O operations.
Communications I/O Rate	The number of communications I/O actions, per second, by each job that is being monitored on this system.
Transaction Rate	The number of transactions per second by each job that is being monitored on this system.
Transaction Time	The total transaction time for each job that is being monitored on this system.
Thread Count	The number of active threads in each job that is being monitored on this system.

Table 3. Job numeric values definition (continued)

Page Fault Rate	The average number of times, per second, that an active program in each job that is being monitored on this system refers to an address that is not in main storage.
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## Summary numeric values

Table 4. Summary numeric values definition

Name	Description
CPU Utilization	The percentage of available processing unit time used by all jobs monitored on this system. For multiple-processor systems, this is the average percent busy for all processors.
Logical I/O Rate	The number of logical I/O actions, per second, by all jobs monitored on this system.
Disk I/O Rate	The average number of I/O operations, per second, performed by all jobs monitored on this system. The value in this column is the sum of the asynchronous and synchronous disk I/O operations.
Communications I/O Rate	The number of communications I/O actions, per second, by all jobs monitored on this system.
Transaction Rate	The number of transactions per second by all jobs monitored on this system.
Transaction Time	The total transaction time for all jobs monitored on this system.
Thread Count	The number of active threads for all jobs monitored on this system.
Page Fault Rate	The average number of times, per second, that active programs in all jobs monitored on this system refer to an address that is not in main storage.

## Specifying the threshold values

Setting a threshold for a metric that is being collected by a monitor allows you to be notified and, optionally, to specify actions to be taken when a certain value (called the *trigger value*) is reached. You can also specify actions to be taken when a second value (called the *reset value*) is reached.

For example, when you create a system monitor, you can specify an i5/OS command that stops any new jobs from starting when CPU utilization reaches 90% and another i5/OS command that allows new jobs to start when CPU utilization falls to less than 70%.

For some metrics, it is appropriate to specify a reset value, which resets the threshold and allows it to be triggered again when the trigger value is reached. For those thresholds, you can specify a command to be run when the reset value is reached. For other metrics (such as the File Status metric and the Text metric on file monitors, and any message set on a message monitor), you can specify to automatically reset the threshold when the trigger command is run.

You can set up to two thresholds for each metric that the monitor is collecting. Thresholds are triggered and reset based on the value at the time the metric collection is made. Specifying a higher number of collection intervals in the Duration field helps to avoid unnecessary threshold activity due to frequent spiking of values.

You can also choose to add an event to the Event Log whenever the trigger value or the reset value is reached.

On the New Monitor - Metrics page, the threshold tabs provide a place for you to specify a threshold value for each metric that you have selected to monitor. For example, if you are creating a job monitor, you can set your threshold values in the following ways depending on the type of metric you have selected:

Job Count	<p>When you define a threshold, you can specify a command to run on the endpoint system when the threshold is triggered. For example, selecting <b>25 jobs</b> will trigger the threshold whenever the monitor detects more than 25 jobs running during the number of collection intervals you specify for <b>Duration</b>.</p> <p>You can then specify a command to be run on the endpoint system when the monitor detects more than 25 jobs. Enter the command name and click <b>Prompt</b> for assistance in specifying the parameters for the command. For more detailed information and examples of specifying commands to be run when thresholds are triggered, see the performance scenarios topic.</p> <p><b>Enable reset</b> is optional, and cannot be selected until a trigger is defined. You can also specify a command to be run on the endpoint system when the threshold is reset.</p>
Job Log Message	<p>You must select <b>Trigger when any of the following messages are sent to the job log</b> before you can specify the conditions to trigger a threshold. You can specify messages to monitor for based on any combination of Message ID, Type, and Minimum severity. Each row in the Job Log Message table shows a combination of criteria that must be met for a message to trigger a threshold. A threshold will be triggered if it meets the criteria in at least one row. Use the online help to specify the conditions to trigger a threshold.</p> <p>Be careful to monitor the smallest number of jobs that will give you the information you need. Monitoring a large number of jobs for job log messages may have a performance affect on your system.</p> <p>You can specify a command to be run on the endpoint system when the threshold is triggered. Enter the command name and click <b>Prompt</b> for assistance in specifying the parameters for the command.</p> <p>Be sure to click the Collection Interval tab to specify how often you want the monitor to check for job log messages.</p> <p>A message trigger can only be manually reset. You can specify a command to be run on the endpoint system when the threshold is reset. When you reset the monitor, you always have the option to reset without running the specified command.</p>
Job Status	<p>On the <b>Metrics - General</b> tab, select the statuses that you want to monitor for. Click the <b>Metrics - Status Threshold</b> tab to specify the conditions to trigger a threshold. You must select <b>Trigger when job is in any selected status</b> before you can specify the conditions to trigger a threshold. The threshold is triggered whenever the monitor detects that the job is in any selected status for the number of collection intervals you specify for <b>Duration</b>.</p> <p>You can then specify a command to be run on the endpoint system when the threshold is triggered. Enter the command name and click <b>Prompt</b> for assistance in specifying the parameters for the command.</p> <p><b>Reset when job is not in selected statuses</b> is optional, and cannot be selected until a trigger is defined. You can specify a command to be run on the endpoint system when the threshold is reset.</p>

Job Numeric Values	<p>When you define the threshold, you can specify a command to run on the endpoint system when the threshold is triggered. For example, selecting <b>101 transactions per second</b> for the Transaction Rate metric will trigger the threshold whenever the monitor detects more than 101 transactions per second on any of the selected jobs during the number of collection intervals you specify for <b>Duration</b>.</p> <p>You can then specify a command to be run on the endpoint system when the monitor detects more than 101 transactions per second. Enter the command name and click <b>Prompt</b> for assistance in specifying the parameters for the command.</p> <p><b>Enable reset</b> is optional, and cannot be selected until a trigger is defined. You can also specify a command to be run on the endpoint system when the threshold is reset.</p>
Summary Numeric Values (total for all jobs)	<p>When you define a threshold, you can specify a command to run on the endpoint system when the threshold is triggered. For example, selecting <b>1001 transactions per second</b> for the Transaction Rate metric will trigger the threshold whenever the monitor detects more than 1001 transactions per second on all of the selected jobs during the number of collection intervals you specify for <b>Duration</b>.</p> <p>You can then specify a command to be run on the endpoint system when the monitor detects more than 1001 transactions per second. Enter the command name and click <b>Prompt</b> for assistance in specifying the parameters for the command.</p> <p><b>Enable reset</b> is optional, and cannot be selected until a trigger is defined. You can also specify a command to be run on the endpoint system when the threshold is reset.</p>

For more information about these and other Management Central tasks and topics, refer to the detailed task help that is available from the System i Navigator window. Click **Help** from the menu bar and select **System i Navigator overview** → **Management Central**.

## Specifying the collection interval

When you are setting thresholds for the metrics you have selected to monitor, you should consider how often you want the data to be collected.

Click the **Collection Interval** tab to select whether to use the same collection interval for all metrics, or to use different collection intervals for each metric type. For example, you may want to collect job count data every 30 seconds, but you may want to collect the job log message data every 5 minutes because job log message data typically takes longer to collect than job count data.

If you want to monitor numeric and status metrics for less than 5 minutes, you must select **Use different collection interval**.

**Note:** The job count, job numeric values, and summary numeric values metrics must have an equal or lesser collection interval than the collection interval for the job status metric.

To specify the number of collection intervals for each threshold, click the **Metrics** tab and indicate the number of intervals in the **Duration** field.

## Specifying threshold run commands

A *threshold* is a setting for a metric that is being collected by a monitor. *Threshold commands* run automatically on your endpoint system when threshold events occur. Threshold commands are different from any threshold actions you may have set. Threshold actions happen on your PC or central system, while threshold commands run on your endpoint systems.

## Using threshold commands

Threshold settings are used to automate any i5/OS command you want to run when thresholds are triggered or reset. For example, suppose you are running a job monitor and a certain batch job that is supposed to complete before the first shift begins is still running at 6:00 a.m. To accomplish this, you can set up Threshold 1 to send a page command to a system operator to look at it. You can also set up Threshold 2 to send a command to end the job if it is still running at 7:00 a.m.

In another situation, you might want to notify your operators with a page command when the job monitor detects that the wait time values for the FTP and HTTP servers have reached a median level. If the FTP server jobs end, you can restart the server with a start server command (such as STRTCPSVR \*FTP). You can set thresholds and specify commands to automatically handle many different situations. In short, you can use threshold commands in any way that makes sense for your environment.

## How do I set threshold commands?

On the New Monitor-Metrics page, click the **Thresholds** tab to enable your thresholds. Before you can set any threshold commands, you must turn your thresholds on by selecting the **Enable trigger** (or similarly named) option. You can then use this window to enter any commands you want to run when the threshold trigger value is reached. Select the **Enable reset** (or similarly named) option if you want to specify a command to run when the threshold reset value is reached.

Management Central monitors allow you to specify any batch commands to run on the server when the threshold is triggered or reset. You can enter an i5/OS command name and click **Prompt** (or press F4) for assistance in specifying the parameters for the command. You can even use replacement variables (such as &TIME or &NUMCURRENT) to pass information to the command, such as the time and actual value of the metric.

## Specifying event logging and actions

When you have specified the threshold values for your monitor, you can click the **Actions** tab to select event logging and the PC actions to be taken when a threshold is triggered or reset.

Some of the actions you can select are:

*Table 5. Actions that you can select*

Action	Description
Log event	Adds an entry to the event log on the central system when the threshold is triggered or reset. The entry includes the date and time the event occurred, the endpoint system being monitored, the metric being collected, and the monitor that logged the event.
Open event log	Displays the event log when an event occurs.
Open monitor	Displays a list of systems that are being monitored for the specified metrics and a list of the values for the specified metrics as they are collected for each system.
Sound alarm	Sounds an alarm on the PC when the threshold for the monitor is triggered.
Run i5/OS command	If you have specified a server command to run when the threshold for this monitor is triggered or reset, those commands run only during times that actions are applied. This option cannot be changed from the Actions page. If you do not want the command to run, you can remove the command from the Metrics page. Whenever you manually reset a threshold, you can select whether to run the specified reset command.

When you have specified the actions that you want to take when a threshold value is reached, you are ready to specify when to apply the thresholds and actions you have selected.

## How to read the event log

The Event log window displays a list of threshold trigger and reset events for all of your monitors. You can specify on the Monitor Properties - Actions page for each monitor whether you want events added to the Event Log. To see the Properties pages for any monitor, select the monitor in the Monitors list and then select Properties from the File menu.

The list of events is arranged in order by date and time by default, but you can change the order by clicking on any column heading. For example, to sort the list by the endpoint system where the event occurred, click System.

An icon to the left of each event indicates the type of event:

Table 6. Icons and meanings they indicate

Icon	Description
	Indicates that this event is a trigger event for which you did not specify a server command to be run when the threshold was triggered.
	Indicates that this event is a trigger event for which you specified a server command to be run when the threshold was triggered.
	Indicates that this event is a threshold reset event.

You can customize the list of events to include only those that meet specific criteria by selecting **Options** from the menu bar and then selecting **Include**.

You can specify which columns of information you want to display in the list and the order in which you want the columns to be displayed by selecting **Options** from the menu bar and then selecting **Columns**.

You can view the properties of an event to get more information about what triggered the event log entry.

You can have more than one Event Log window open at the same time, and you can work with other windows while the Event Log windows are open. Event Log windows are updated continuously as events occur.

## Applying thresholds and actions for a monitor

When you have specified your threshold values and chosen to log events, you can select whether to always apply these thresholds and actions, or to apply them only on the days and times you choose.

**Note:** Because system monitors run continuously, the following information does not apply.

If you select to apply thresholds and actions during specified times, you must select the starting time and the stopping time. If the central system is in a different time zone from the endpoint system, you should be aware that the thresholds and actions will be applied when the starting time is reached on the endpoint system that you are monitoring. You must also select at least one day that you want the thresholds and actions to apply. The thresholds and actions apply from the selected starting time on the selected day until the next occurrence of the stopping time on the endpoint system.

For example, if you want to apply your thresholds and actions overnight on Monday night, you can select 11:00 p.m. as the **From** time and 6:00 a.m. as the **To** time and check **Monday**. The actions that you specified occur whenever the specified thresholds are reached at any time between 11:00 p.m. on Monday and 6:00 a.m. on Tuesday.

Use the online help to finish creating your monitor. The online help also contains instructions on starting your monitor.

For more information about these and other Management Central tasks and topics, refer to the detailed task help that is available from the System i Navigator window. Click **Help** from the menu bar and select **System i Navigator overview** → **Management Central**.

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## Viewing monitor results

When you have specified when to apply the thresholds and actions you have defined for your monitor, you are ready to view your monitor results.

Double-click the monitor name to open the Monitor window. In the Monitor window, you can see the overall status of the monitor and a list of the target systems that the monitor is running on.

For job, message and file monitors, a list of the target systems (Summary Area) in the upper pane shows the status of the monitor on each system and the date and time that the monitor data was last collected. The Summary Area also shows additional information related to the specific metrics being collected.

After you select a system, detailed information about what is being monitored on that system is shown in the lower pane. For example, if you are viewing a Job Monitor window, the list of jobs in the lower pane shows the triggered events, the last event that occurred, and the actual values for the specified metrics.

You can select **Columns** from the Options menu to display additional columns of information. Click **Help** on the Columns window to see a description of each column.

From the list in the lower pane, you can right-click any item and select from a menu of actions that can be performed. For example, if you select a job, you can select reset triggered events, display job properties, hold, release, or end a job.

For system monitors, detailed information displays as graphs that you can save and print.

You can view all your monitors, as well as all your System i Navigator systems management tasks, remotely with System i Navigator for Wireless.

### **Related information**

System i Navigator graph history

Viewing graph history

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## Resetting triggered threshold for a monitor

When you are viewing the job monitor results, you can reset a triggered threshold.

You can choose to run the server command that was specified as the reset command for this threshold, or you can choose to reset the threshold without running the command.

You can also choose to reset thresholds at the job level, the summary level, the system level, or the monitor level:

- Job level      Select one or more jobs in the Job Area of the Job Monitor window. Select **File**, select **Reset with Command** or **Reset Only**, and then select **Jobs**. The thresholds for the selected jobs will be reset. Other thresholds that have been triggered for this monitor remain in the triggered state.
- Summary level      Select one or more systems in the Summary Area of the Job Monitor window. Select **File**, select **Reset with Command** or **Reset Only**, and then select **Summary**. The thresholds for job count, job numeric values metrics, and summary numeric values metrics will be reset. Other thresholds that have been triggered for this monitor remain in the triggered state.
- System level      Select one or more systems in the Summary Area of the Job Monitor window. Select **File**, select **Reset with Command** or **Reset Only**, and then select **System**. All thresholds for this monitor on the selected systems will be reset. Thresholds for this monitor that have been triggered on other systems remain in the triggered state. Any selections you have made in the Job Area are ignored.
- Monitor level      Select **File**, select **Reset with Command** or **Reset Only**, and then select **Monitor**. All thresholds for this monitor on all systems will be reset. Any selections you have made in the Summary Area or the Job Area are ignored.

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