

# Best Practices for Monitoring JMX

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## What is JMX?

Java Management Extensions (JMX) is a set of specifications for application and network management. They provide a way for you to connect to remote clients and monitor applications running in a Java Virtual Machine (JVM). You can monitor JMX by querying managed objects called Managed Beans (MBeans).

MBeans are resources like applications, devices, or any other properties running inside a JVM. An MBean provides data on the configuration and usage of a particular resource or application. This can include performance metrics, statistics on total resource usage, and issues with the resources.

When you use JMX to monitor applications running in JBoss®, WebLogic, and WebSphere®, you might encounter issues involving these components:

- Application or server
- JVM
- Operating system

## What Do You Need to Monitor?

Monitoring JMX with a comprehensive [server monitoring](#) tool provides better options for application management.

If you're using multiple JVMs and want to ensure that there are no service outages, you can monitor certain key components of JMX.

**Detect Memory Leaks:** You should monitor and investigate instances involving unusual memory sizes. These instances will show the field name, field type, and field values. The values in a specific instance will indicate where the memory leak is occurring.

- **Garbage Collection:** Monitoring garbage collection can indicate if there are memory leaks by displaying your applications so you can assess the proper usage of objects.
- **Memory Heap:** You can detect memory leaks by tracking the memory heap usage. This reveals how much memory is consumed by a JVM over a period of time. Connect the memory heap with the garbage collection cycles to determine how often memory is retrieved by your JVM.
- **Memory Pool Size:** Monitoring memory pool size tells you if your application is experiencing a memory leak.

**Monitor Threads:** If applications use multiple threads, monitor their performance and availability. It's useful to know if a thread has been running for longer than it's supposed to or if it is stuck in a loop and consuming memory.

It's also necessary to monitor thread dumps because the performance of an application can be unpredictable—making troubleshooting difficult. Therefore, monitoring thread dumps can be useful when assessing JVM performance and its applications.

**Monitor JVM:** You can monitor the JVM to improve its overall performance and applications functionality. Key metrics to monitor in a JVM include:

- **JVM Memory:** The performance of applications depends on the amount of allocated memory. You can also monitor objects and how much memory heap they consume.
- **CPU Usage:** Monitor the CPU usage to determine whether the CPU load is within the threshold.
- **MBean:** Monitor the application information that is exposed to an MBean. You should be able to query and report an MBean from your application in order to gain visibility on performance issues.

You should also monitor metrics like response time, packet loss, server details, and the number and health of applications running in the JVM.

#### Other key metrics:

- **Database Performance:** Monitor database performance and check for bottlenecks. You'll know how frequently users are querying the database and checking for availability. This way you can guarantee that response time is within the threshold.
- **Monitor Transactions:** Identify processes and transactions that consume JVM resources and cause slowdowns such as thread pool, database connection pool, and transaction response time.

It's important to monitor the overall health of the hardware and its components, the underlying operating systems, and the virtual infrastructure. A basic fault or a failure in the hardware or operating system will affect the performance of JMX.

## Monitor JMX using SolarWinds Server & Application Monitor (SAM)

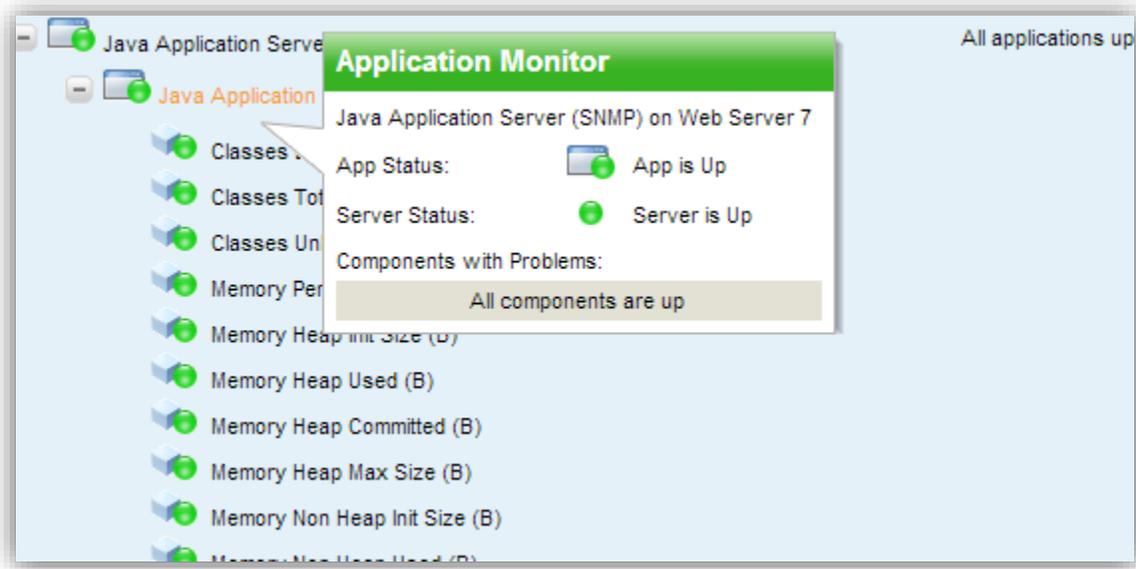
SolarWinds® [Server & Application Monitor](#) (SAM) is an agentless server and application monitoring tool that monitors over 150 applications in your IT environment. With SAM you can comprehensively monitor the status and performance of JMX.

Server & Application Monitor lets you:

- Measure JMX performance from an end-user perspective.
- Gain access to out-of-the-box JMX templates to monitor JBoss, WebLogic, and WebSphere.
- Set threshold values to JMX components and proactively receive alerts before the component reaches a critical stage.
- Group your JVMs based on individual business service.

### *JMX Performance Monitoring*

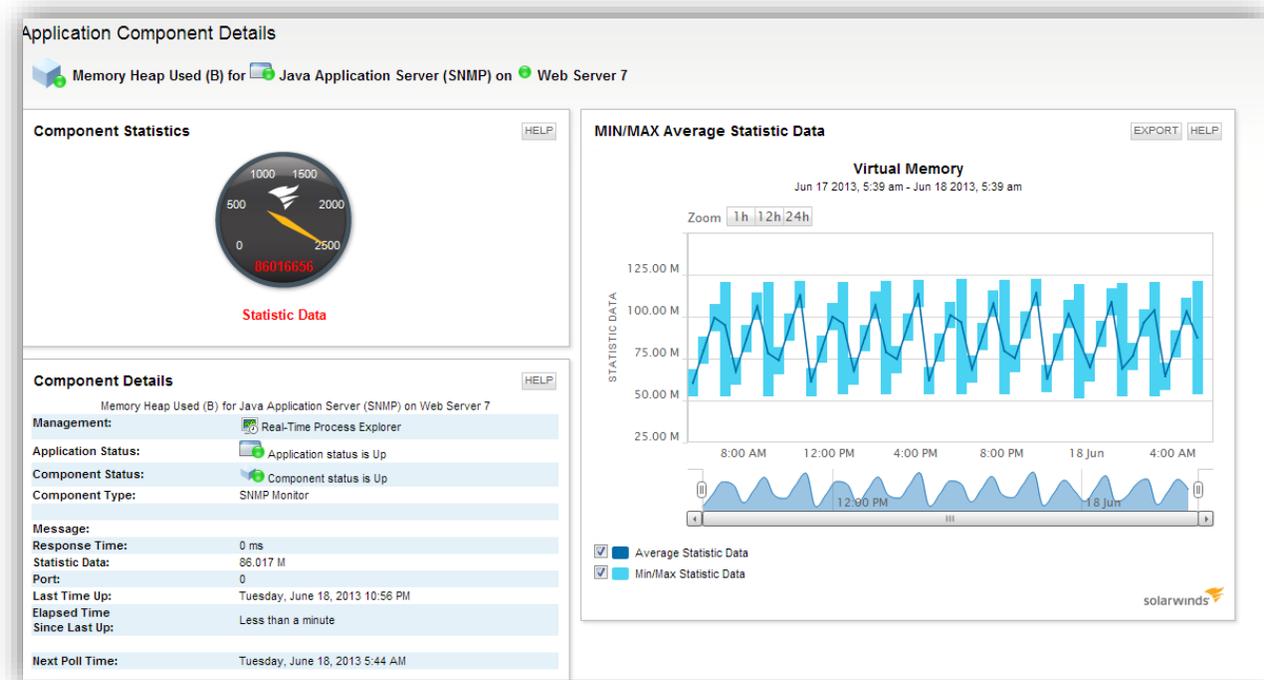
SAM offers deeper insight into the performance of JMX and its components. Using SAM, you can identify the nodes in which the JMX application is installed. By mousing over the application you'll be able to check its availability, overall status, component issues, and whether the app's node is fully functioning.



*Check the status of the application before drilling down to the application and its components*

After selecting the application, drill down to the application details page that displays the availability statistics and details of the application, its node, and its components.

SAM displays the performance metrics in the form of graphs and charts. You can see the status of each component which can then be further analyzed by drilling down to see the actual metric.



*Monitor critical components and assess their performance*

The application details page, the components details page, and the dashboard are completely flexible and customizable. You can structure and save your preferred views for charts, graphs, and tables. You can edit them at any point to retrieve critical performance metrics and counter as required.

### JMX Templates and Component Monitors

SAM comes with built-in templates to monitor JMX and its components. A template in SAM consists of a set of pre-defined component monitors for monitoring the JMX applications running in your environment. You can create new templates or modify existing templates and their components within SAM, then you can assign them to a node and start monitoring the application.



*Choose from a range of component monitors from SAM's templates*

| JMX Performance Monitoring Counters |                            |
|-------------------------------------|----------------------------|
| Classes Loaded Count                | Garbage Collection Time    |
| Classes Total Loaded Count          | Memory Pool Used           |
| Classes Unloaded Count              | Memory Pool Size           |
| Memory Pending Final Count          | Current Thread Count       |
| Memory Heap Used                    | Thread Total Started Count |
| Memory Heap Size                    | Runtime Uptime             |
| Memory Heap Committed               | Compiler Time              |
| Garbage Collection Count            | Active Thread Count        |
| Total Memory                        | Free Memory                |
| Available Processes                 | Current Thread CPU Time    |
| Current Thread User Time            | Memory Pool Peak Used      |
| Memory Pool Peak Committed          | Memory Pool Peak Max Size  |

You can select any of these components within a template and edit their thresholds before assigning them to the node you want to monitor.

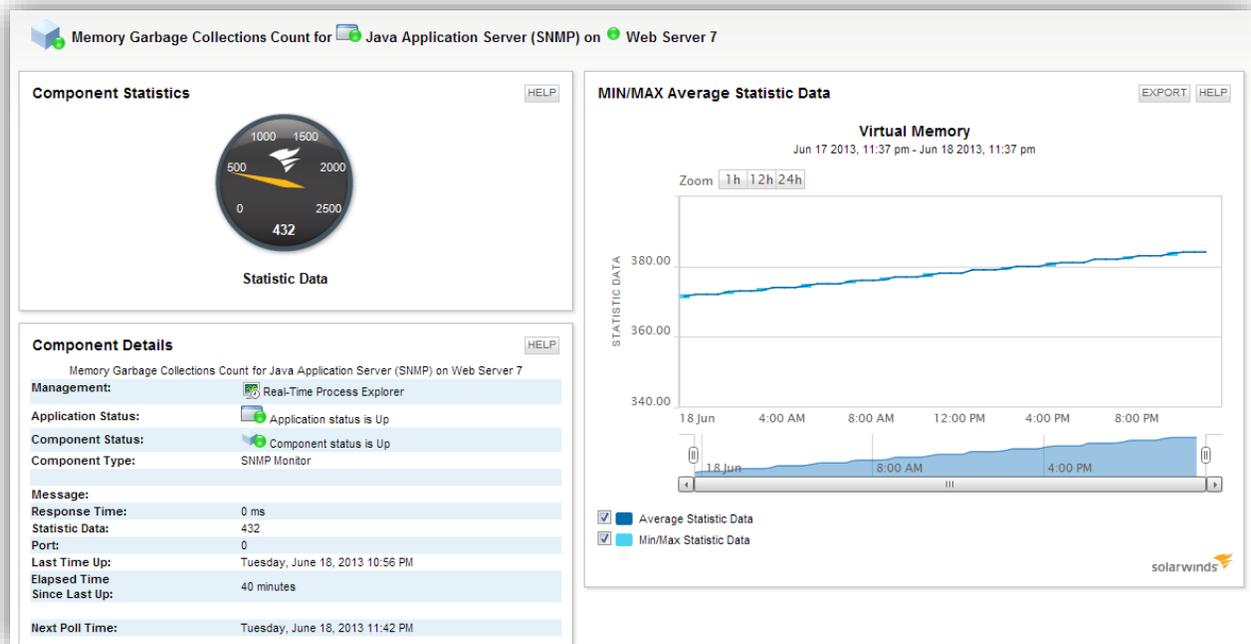
### Templates on thwack

In addition to SAM templates, you can use various templates on [thwack](#) to monitor JMX applications. Here, you have access to plenty of customized templates created by users to help other users and admins. You can also find templates for monitoring applications, nodes, and volumes.

### Monitoring Java Virtual Machines & Hosts Where JMX is Running

Because Java Virtual Machines (JVM) are an integral part of JMX, Server and Application Monitor lets you discover and monitor applications running on your JVM.

- Get deep visibility into the performance of the JVM and discover where latencies are occurring.
- Monitor your resources like CPU and memory and understand how applications use the resources.
- Visualize and map JVM dependencies.
- Track and monitor memory leaks in your JVM and identify the root cause in minutes.
- Find and fix bottlenecks that occur during business transactions.
- Monitor the health of your JVMs by looking at critical metrics such as response time, garbage collection time, and more.
- Receive notifications and alerts about performance issues.



*Understand component statistics and performance in your JVM*

You can leverage SAM's intuitive interface to see performance metrics by using simple drag-and-discover charts and customizing your JVMs.

SAM also monitors the performance of VMware ESX/ESXi and Microsoft® Hyper-V®. You can drill down from your data center to individual VM and monitor key metrics such as CPU consumption, network traffic, and memory consumption.

## Additional Functionalities for Comprehensive JMX Monitoring

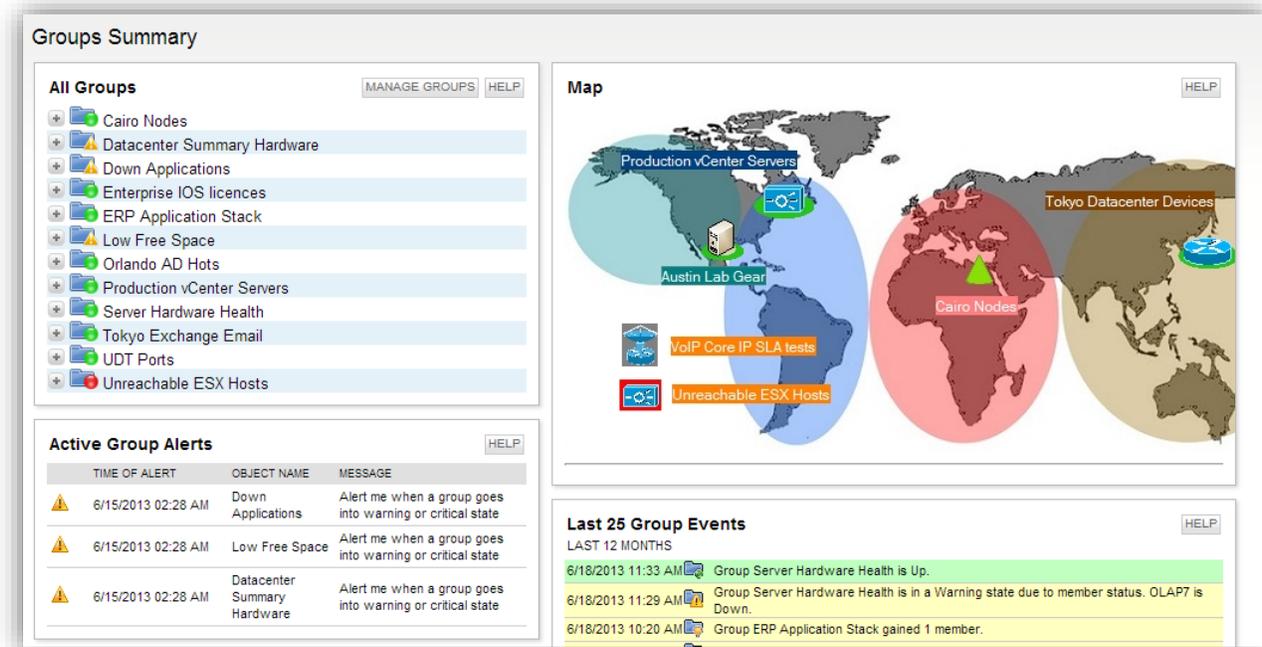
### Alerting & Reporting

Using SolarWinds Server and Application Monitor, you can set intelligent JMX alerts to notify you when the performance metrics meet custom thresholds. Additionally, you can leverage SAM's advanced functionalities to further customize alerts. SAM's advanced reporting functionality empowers you to schedule and generate reports showing JVM, resource, hardware availability, and their respective performance history. SAM lets you easily modify and generate custom reports.

### Creating JMX and JVM Groups

The Grouping tab in Server & Application Monitor lets you create customizable groups to aggregate all your JMX applications and JVMs in a single window. You can group and monitor applications and JVMs that are location specific or application specific. Monitoring your JMX applications is easy because SAM allows you to perform all the availability and performance diagnostics from the same Web console.

You can also look into groups that have problems, view all active alerts within a group, and note various events within them. The customizable group tab in SAM allows you to choose what you want to display.



**Groups Summary**

**All Groups** MANAGE GROUPS HELP

- Cairo Nodes
- Datacenter Summary Hardware
- Down Applications
- Enterprise IOS licences
- ERP Application Stack
- Low Free Space
- Orlando AD Hots
- Production vCenter Servers
- Server Hardware Health
- Tokyo Exchange Email
- UDT Ports
- Unreachable ESX Hosts

**Map** HELP

Production vCenter Servers  
Austin Lab Gear  
VoIP Core IP SLA tests  
Unreachable ESX Hosts  
Cairo Nodes  
Tokyo Datacenter Devices

**Active Group Alerts** HELP

| TIME OF ALERT      | OBJECT NAME                 | MESSAGE                                                   |
|--------------------|-----------------------------|-----------------------------------------------------------|
| 6/15/2013 02:28 AM | Down Applications           | Alert me when a group goes into warning or critical state |
| 6/15/2013 02:28 AM | Low Free Space              | Alert me when a group goes into warning or critical state |
| 6/15/2013 02:28 AM | Datacenter Summary Hardware | Alert me when a group goes into warning or critical state |

**Last 25 Group Events** HELP

LAST 12 MONTHS

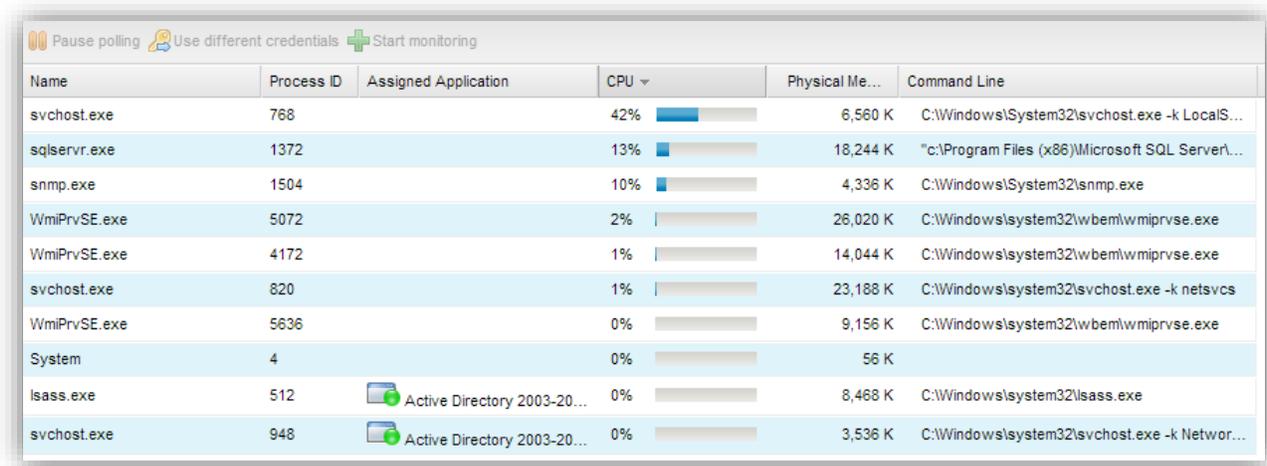
- 6/18/2013 11:33 AM Group Server Hardware Health is Up.
- 6/18/2013 11:29 AM Group Server Hardware Health is in a Warning state due to member status. OLAP7 is Down.
- 6/18/2013 10:20 AM Group ERP Application Stack gained 1 member.

*Get alerts specific to a location, application, or resource type*

## Real-time Process Explorer

Gain real-time insights about critical processes and their performance. With the Real-time Process Explorer, you can identify processes that have been assigned to applications and kill those that are negatively affecting a node's performance. Also, you can now monitor the performance of all nodes running JMX.

- Remotely manage processes without being physically present.
- Login and retrieve vital statistics about processes.
- View information for both monitored and unmonitored processes.
- Monitor processes and services such as
  - CPU utilization
  - Memory utilization
  - Virtual memory utilization
  - Disk I/O

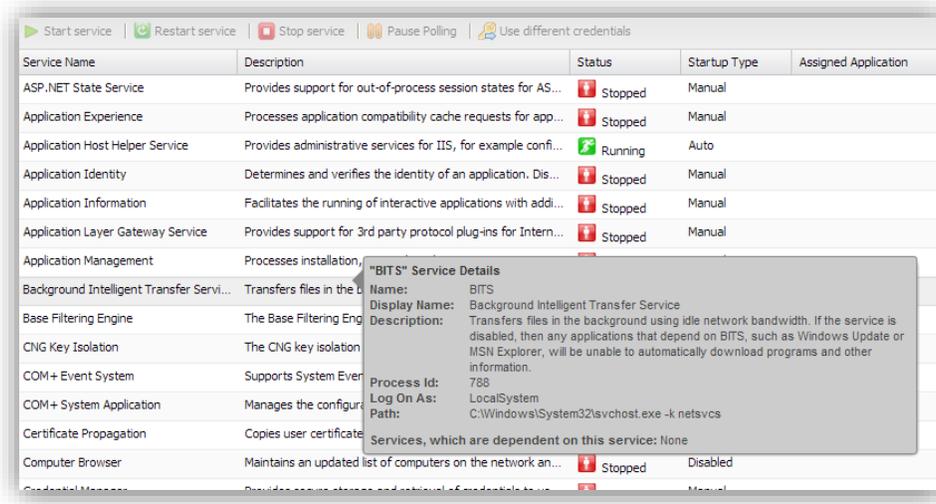


| Name         | Process ID | Assigned Application        | CPU | Physical Me... | Command Line                                     |
|--------------|------------|-----------------------------|-----|----------------|--------------------------------------------------|
| svchost.exe  | 768        |                             | 42% | 6,560 K        | C:\Windows\System32\svchost.exe -k LocalS...     |
| sqlservr.exe | 1372       |                             | 13% | 18,244 K       | "c:\Program Files (x86)\Microsoft SQL Server\... |
| snmp.exe     | 1504       |                             | 10% | 4,336 K        | C:\Windows\System32\snmp.exe                     |
| WmiPrvSE.exe | 5072       |                             | 2%  | 26,020 K       | C:\Windows\system32\wbem\wmiprvse.exe            |
| WmiPrvSE.exe | 4172       |                             | 1%  | 14,044 K       | C:\Windows\system32\wbem\wmiprvse.exe            |
| svchost.exe  | 820        |                             | 1%  | 23,188 K       | C:\Windows\system32\svchost.exe -k netsvcs       |
| WmiPrvSE.exe | 5636       |                             | 0%  | 9,156 K        | C:\Windows\system32\wbem\wmiprvse.exe            |
| System       | 4          |                             | 0%  | 56 K           |                                                  |
| lsass.exe    | 512        | Active Directory 2003-20... | 0%  | 8,468 K        | C:\Windows\system32\lsass.exe                    |
| svchost.exe  | 948        | Active Directory 2003-20... | 0%  | 3,536 K        | C:\Windows\system32\svchost.exe -k Networ...     |

*Remotely manage processes and obtain vital statistics about your applications*

## Service Control Manager

The Service Control Manager is similar to the Real-time Process Explorer. You can manage the services of the monitored Windows nodes. The Service Control Manager gives you information on the services that are currently running and that are not on the monitored node. You can also start and stop services that are assigned to applications as needed.



*Remotely start, stop, and restart critical services*

## 5 Reasons to Download Server & Application Monitor

- Monitors Windows, Linux®, Solaris®, HP-UX® and over 150 commercial applications.
- Supports hardware monitoring for Dell® PowerEdge™ and blade chassis, HP ProLiant®, and IBM® System x.
- Automatically scans and discovers your server infrastructure.
- Offers a Web-based and agentless monitoring platform.
- Deploys and allows you to start monitoring in less than an hour.

SolarWinds (NYSE: SWI) provides powerful and affordable IT management software to customers worldwide - from Fortune 500 enterprises to small businesses. The company works to put its users first and remove the obstacles that have become “status quo” in traditional enterprise software. SolarWinds products are downloadable, easy to use and maintain, and provide the power, scale, and flexibility needed to address users’ management priorities. SolarWinds’ online user community, <http://thwack.com>, is where tens of thousands of IT pros solve problems, share technology, and participate in product development for all of the company’s products. Learn more today at <http://www.solarwinds.com>.

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