The Basics of JMX

JMX is an acronym for Java Management Extensions and allows remote clients to connect to a Java Virtual Machine (JVM).

Using JMX, you can manage and monitor running applications in a JVM environment. Using Java, management of applications in a virtual machine is done through the use of Managed Beans or MBeans.

MBeans are the soul of JMX. MBeans are the controllable end-points of an application where remote clients can watch application activity as well as control them. The MBean represents a resource running in the JVM, such as an application. They can be used for collecting statistics like performance, resource usage, problems, and so on.

To monitor a Java Virtual Machine through JMX, add the following argument into the java command that publishes the platform MBean server to your local environment for monitoring.

Dcom.sun.management.jmxremote

After that, your JVM can now be monitored.

JConsole

A common tool used to monitor a JVM is JConsole. JConsole is a free GUI based monitoring tool used to monitor JVMs, which can be found here: [http://sourceforge.net/projects/jconsole/](http://sourceforge.net/projects/jconsole/)

JConsole is not necessary to use the JMX component monitor within SAM. The information provided here concerning JConsole is an introduction to using Java as a means of monitoring. Detailed information on how to use JConsole can be found by navigating to the following link:


Once you have downloaded and installed JConsole, you can run it by navigating to the folder where it was installed. Typically, the JConsole.exe is located at:

C:\Program Files\Java\jdk1.7.0_02\bin\JConsole.exe

Double-click JConsole.exe to start the program.
4 Configuring and Integrating JMX

Following is a screenshot of JConsole running, before being logged in:

![JConsole Screenshot]

To login to JConsole:

1. Select either the **Local Process** option or the **Remote Process** option.
2. Highlight your option by clicking on it.
3. Complete the credential fields (**Username** & **Password**).
4. Click **Connect**.

After you are successfully logged in, click on the tab entitled **MBeans**. Clicking the **MBeans** tab brings you to this screen:

![MBeans Screenshot]

From here, you can drill down to any MBean you want by expanding the folder tree in the left pane of the window. Select any MBean (file in the tree) to have information about it displayed in the right pane. These MBeans are what SolarWinds SAM uses when polling information from the JVM.
Adding a JMX Component Monitor to SAM

Creating a standard template for this monitor is not practical because of the amount of variables in any one specific environment. However, adding a JMX monitor to your environment has been made simple with the use of a wizard driven interface. The wizard will automatically reveal the MBeans available for monitoring.

To add a JMX Monitor to a node using the wizard, perform the following steps from the SAM web console:

1. Click **SAM Settings**.
2. Click **Component Monitor Wizard**.
3. Select **JMX Monitor** from the dropdown list.
4. Click **Browse** to find the node you want to monitor.
5. Choose a credential from the Credential Library or create a new one using the **Username** and **Password** fields.

   **Note:** For step 6, the defaults are sufficient for most environments. If they are not, you can change them to suit your environment.

6. Add the **Port** number, **Protocol** type, **URL path**, and **Credentials** for the remaining fields.

```plaintext
Server IP Address: [Browse]
Port: [8888]
Protocol: [rmi]
URL Path: [/jmxremote]
Target Endpoint URL: [For URL preview, a Server IP address must be selected from above.]

Credential To Use:
Choose Credential: [None]
Credential Name: [None]
User Name: [None]
Password: [None]
Confirm Password: [None]

Platform: [32bit]
```

```
```
7. Click Next. The following MBean selection screen appears:

Note: Only values that return numerical data can be monitored. String data is not supported at this time. Non-numerical data will be shown without a check box when selecting MBeans to poll from within SAM, as illustrated below:

Select one or more MBeans to monitor
Browse the tree on the left to find MBeans

8. Expand the folders by clicking the arrows (or [+] to expand the tree-view folder structure. From here you can drill down to select the attributes you want by checking them.

9. Click Next.

Now you are able to edit the JMX Component Monitor properties. Following is an illustration of how polled MBeans will look when successfully added and implemented within SAM:

<table>
<thead>
<tr>
<th>COMPONENT NAME</th>
<th>STATISTIC</th>
<th>MESSAGE</th>
<th>RESPONSE TIME</th>
<th>PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>java.lang::Memory::NonHeapMemoryUsage::committed</td>
<td>101.88</td>
<td></td>
<td>0 ms</td>
<td>N/A</td>
</tr>
<tr>
<td>java.lang::Memory::NonHeapMemoryUsage::committed</td>
<td>304.00</td>
<td></td>
<td>0 ms</td>
<td>N/A</td>
</tr>
<tr>
<td>java.lang::Memory::NonHeapMemoryUsage::used</td>
<td>101.49</td>
<td></td>
<td>0 ms</td>
<td>N/A</td>
</tr>
</tbody>
</table>
If you choose not to use the wizard, you must manually enter values for each JMX monitor, as shown in the illustration below. Entering the correct information can be complicated and cumbersome. This method is best suited for an administrator who is very familiar with the Java environment.

For more information, refer to the following sections:

- Configuring Java Applications Server for JMX
- Configuring Java Virtual Machines for SNMP
- Configuring a Standalone Java Virtual Machine
- Configuring Apache Tomcat (tested on version 7.0)
- Configuring JBoss (tested on versions 5.0.1, 5.1, and 6.0)
- Configuring GlassFish (tested on version 3.1)
- Configuring IBM WebSphere (tested on version 7.0)
- Configuring Oracle WebLogic (tested on version 10.3.4.0)