



IBM Software Group

IBM® WebSphere® Application Server V6

Generating an IBM Heap Dump



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This presentation will focus on generating an IBM heap dump in WebSphere Application Server V6.

Goals

- Explain how to generate an IBM heap dump in WebSphere Application Server V6



The goal of this presentation is to explain how to generate an IBM heap dump using WebSphere Application Server V6. The behavior is slightly different than in previous versions of WebSphere Application Server.

Platform Support

- IBM heap dumps can only be generated by Java™ Virtual Machines (JVMs) that are built for WebSphere Application Server
 - ▶ IBM JVM on Linux®, AIX®, z/OS® and Windows®
- Heap information for platforms using the Sun JVM can be obtained using the built-in HPROF profiler
 - ▶ The Heap Analysis Tool (HAT) from Sun can be used to analyze the heap information



IBM heap dumps can only be generated by JVMs that are built by IBM for use with WebSphere Application Server. This includes the IBM JVM running on Linux, AIX, z/OS and Windows. The information in this presentation does not apply to any other platforms.

IBM Heap Dump

- Prints a record of all objects in the Java heap to a text file
- Displays size, address, and references for each object
- Garbage collection is forced before a dump
 - ▶ This is a recent enhancement, added in JVM 1.4.1 SR1
- Compare heap dumps over time to determine if memory is leaking



Heap dump capability is a feature of the IBM JVM that prints a record of all objects in the Java heap to a text file. The size and address of each object are recorded, as well as the addresses of all objects that it references. This information can help you understand which objects are responsible for taking up large amounts of memory.

Recently, the JVM was enhanced to trigger a garbage collection before dumping the heap information. This makes the dump more accurate, because only “live” objects (that is, objects that still have references to them) will appear in the dump.

By taking multiple heap dumps and comparing object sizes over time you can determine if a particular object is not being dereferenced properly, which could result in a memory leak.

Note that Heap dumps are a feature of the IBM Java Virtual Machine. To diagnose memory problems on platforms that do not use the IBM JVM, you will need to use a Java Virtual Machine Profiling Interface (JVMPPI) profiler, such as Hprof.

Default Heap Dump Behavior

- IBM heap dump is created in /tmp when an OutOfMemoryException is thrown
- Can be disabled with an environment variable
 - ▶ IBM_HEAPDUMP_OUTOFMEMORY=false



By default, WebSphere Application Server will generate a heap dump in the /tmp directory whenever an OutOfMemoryException is thrown. To disable this behavior, create an environment variable called "IBM_HEAPDUMP_OUTOFMEMORY" with a value of "false".

Generating an IBM Heap Dump Manually

- **IBM_HEAPDUMP=true**
 - ▶ Enables heap dump
 - ▶ Heap dump is in .phd (Portable Heap Dump) format
 - .phd is a more compact format used by some of the newer memory tools
- **IBM_JAVA_HEAPDUMP_TEXT=true**
 - ▶ Enables text heap dumps (classic heap dump format)
 - ▶ Can be triggered with wsadmin

```
> set jvm [$AdminControl completeObjectName type=JVM,process=servername,*]  
> $AdminControl invoke $jvm dumpThreads
```



As in previous versions of WebSphere Application Server, IBM-built JVMs can be configured to dump the contents of the Java memory heap on command by setting the “IBM_HEAPDUMP” environment variable to “true”. Unlike previous versions, the generated file will be in a more compact binary format known as a Portable Heap Dump file. With this environment variable set, a heap dump can be generated using wsadmin, using the dumpThreads command as shown here. To enable heap dumps in the classic text format, you also need to set the variable “IBM_JAVA_HEAPDUMP_TEXT” to “true”.

Portable Heap Dump Format

- New versions of memory tools support .phd
 - ▶ IBM Rational® Application Developer V6
 - ▶ HeapRoots
 - Version 2.0.5 supports .phd
 - <http://www.alphaworks.ibm.com/tech/heaproots>
 - ▶ HeapAnalyzer
 - <http://www.alphaworks.ibm.com/tech/heapanalyzer>



Older versions of memory analysis tools do not support the new Portable Heap Dump format. The new tools that support the PHR format are listed here. HeapRoots, which also supports z/OS® svcdumps, is available for free from IBM AlphaWorks. Versions 2.0.5 and newer support the Portable Heap Dump format. HeapAnalyzer is also freely available from Alphaworks.

Summary

- Generation of an IBM heap dump is slightly changed in WebSphere Application Server V6
 - ▶ Default heap dump format is Portable Heap Dump
 - ▶ Text heap dumps can still be enabled



In summary, this presentation has focused on the slight modifications to the IBM heap dump capability in WebSphere Application Server V6. While text heap dumps can still be enabled, the default format is a new binary format called a Portable Heap Dump.

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