WebSphere Application Server for z/OS: Helping Customers Help Themselves

SHARE Winter 2011
Anaheim, CA
Wednesday, March 2, 2011

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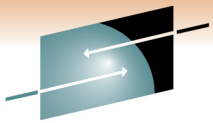
WebSphere Application Server Sessions



Room	Day	Time	Title	Speaker
208B	Monday	11:00	Lab	Multi
201A	Monday	11:00	The Value of the WebSphere Application Server Job Manager	Loos
205A	Monday	4:30	WebSphere Application Server for z/OS -- I am No Longer a Dummy but...	Hutchinson
205B	Tuesday	9:30	Performance Tuning for WebSphere Application Server for z/OS - Practical Advice	Follis
205A	Wednesday	4:30	WebSphere Application Server for z/OS: Tools and Tricks (Potpourri)	Loos and Co.
205A	Wednesday	6:00	WebSphere Application Server for z/OS: Helping Customers Help Themselves	Stephen
206B	Thursday	8:00	Securing WebSphere Application Server for z/OS	Kearney
206B	Thursday	9:30	Application Improvement and Savings Through Simplification	McCorkle
206B	Thursday	11:00	WebSphere Application Server for z/OS: Batch	Bagwell
206A	Thursday	12:15	WebSphere Application Server 101	Stephen
206B	Thursday	1:30	WebSphere Application Server for z/OS: Availability Considerations	Bagwell
206B	Thursday	3:00	WebSphere Application Server: z/OS Exploitation/Differentiation	Follis
206B	Thursday	4:30	Performance Tuning for WebSphere Application Server for z/OS - WAS and WLM Interactions and Concepts	Follis

Outline: *ISA Tools for WebSphere on z/OS*

Garbage Collection analysis:
- **GC and Memory Visualizer (GCMV) ****
- **Pattern Modeling Tool for Java GC (PMAT)**

Dump analysis:
- **Memory Analyzer (MAT) ****
- **Dump Analyzer ****
- **HeapAnalyzer**
- **Memory Dump Diagnostic for Java (MDD4J)**
- **Thread & Monitor Dump Analyzer for Java (TMDA)**

Trace analysis:
- **Trace and Request Analyzer for WAS**
- **Log Analyzer**

Real-time analysis: **Health Center ****

Configuration analysis: **Visual Configuration Explorer (VCE)**

Appendix
- Installing the IBM Support Assistant
- Other Diagnostic Tools for WebSphere on z/OS
- Working with Dumps & Traces
- Testing Tools & Sample Applications
- Documentation, Help & Web Resources

Comments:
- Many work on z/OS,
- Some do not..
- Some are Deprecated
- Some are "Tech.Preview"
- *Analysis vs. Visualization*

*** "IBM Monitoring and Diagnostic Tools for Java™"*

Diagnostic Data from WAS on z/OS

TSO/SDSF
- Browse logs
- MVS Modify cmds
- Turn tracing on
- Display WAS Servers

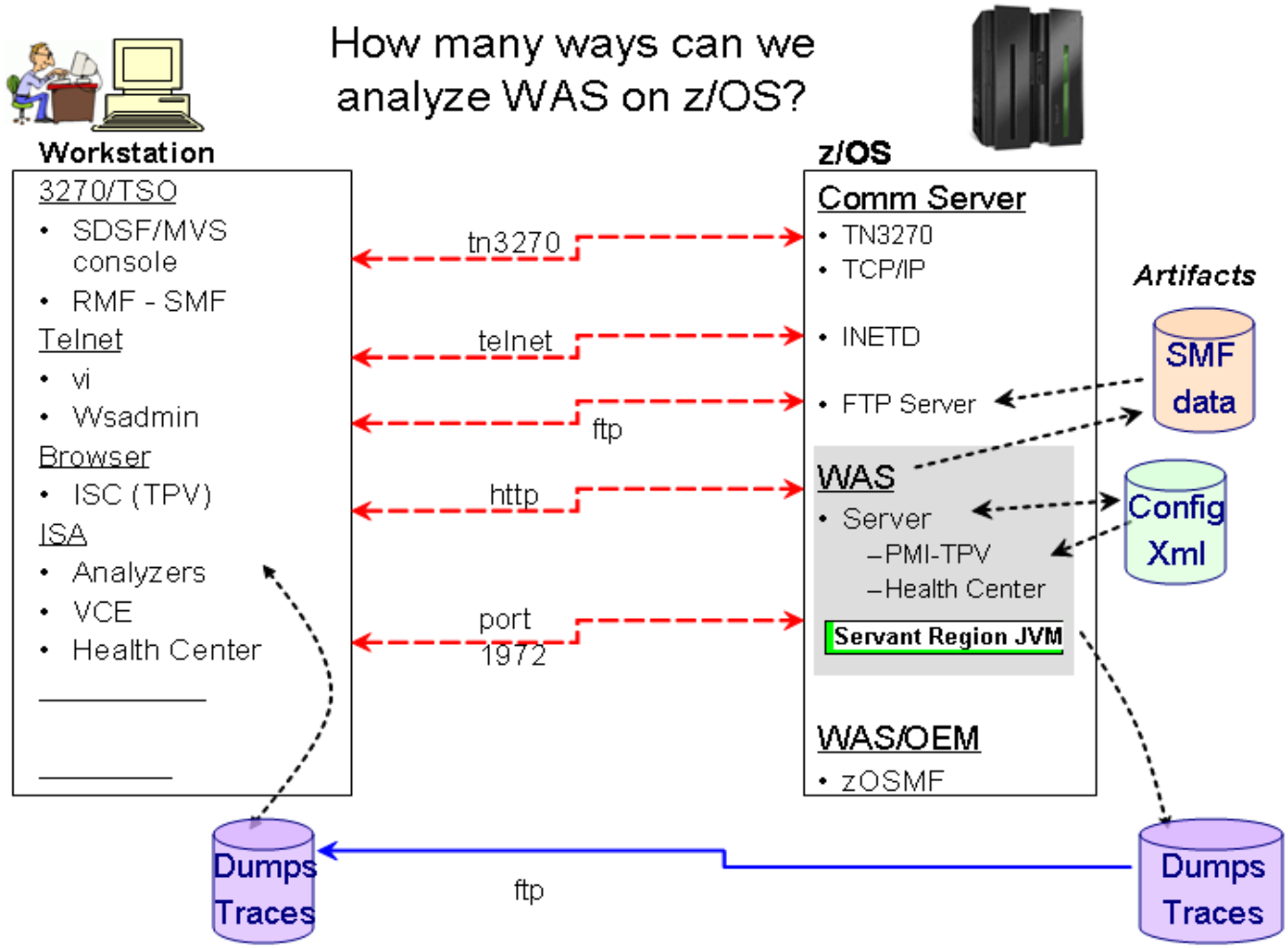
Other TSO/ISPF Apps
- RMF Monitors
- IPCS
- DB2 Admin

Telnet Client
- View logs
- UNIX commands
- *FTP*

Java tools
- *Jextract, . . .*

Web Browsers
- ISC - TPV
- z/OSMF Inc.Log Mgr

ISA Tools
- **Health Center**
- **GC analyzers**
- **Dump analyzers**
- **Log Analyzers**
- **VCE**

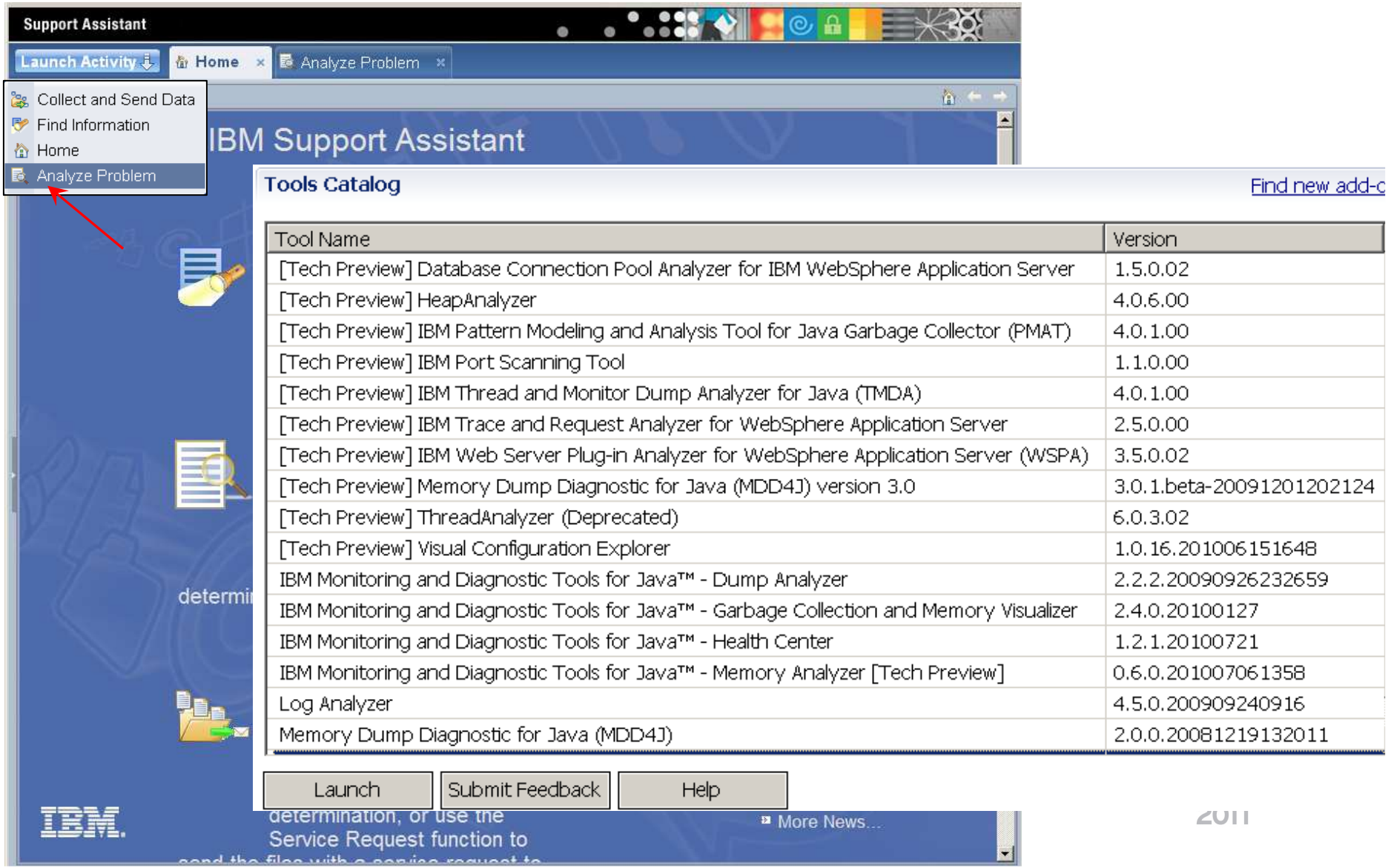


Which Tools for which Artifacts?

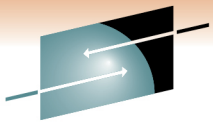
Artifact	*Tool*
GCverbose xml (SYSOUT)	GCMV PMAT
Javacore	TMDA
Heapdump	Memory Analyzer MDD4J HeapAnalyzer
System Dump (jextracted)	Memory Analyzer Dump Analyzer
Logs & Traces	TRA Log Analyzer
Real Time Running Server	Health Center
Configuration XML files	VCE

Use "Launch Activity" pull-down > "Analyze Problem"

IBM Support Assistant (ISA) - Launch pad:



GC Visualization and Analysis



```
<af type="tenured" id="13" timestamp="Jul 30 17:33:20 2009" intervalms="1.601">
  <minimum requested_bytes="24" />
  <time exclusiveaccessms="0.132" meanexclusiveaccessms="0.063" threads="4" lastthreadtid="0x43FA5200" />
  <refs soft="249" weak="11193" phantom="2" dynamicSoftReferenceThreshold="0" maxSoftReferenceThreshold="32
  <tenured freebytes="0" totalbytes="536870400" percent="0" >
    <soa freebytes="0" totalbytes="536870400" percent="0" />
    <loa freebytes="0" totalbytes="0" percent="0" />
  </tenured>
  <gc type="global" id="17" totalid="17" intervalms="1.684">
```

1. Enable verbose GC in your ISC:
   - AppServer -> Process defs -> Servant -> JVM, click on “Verbose garbage collection”.
   - Click “OK”, Save the changes, and re-start server.
2. Verify the verbose GC setting using SDSF
   - Look for <af> & <gc> xml structures in servant’s log.
3. Drive an application in your server.
   - Use your own, or sample apps provided.
   - Jmeter, MS Web AppStress tool or your own to drive load.
4. Copy verboseGC output from SYSOUT to ASCII file (on your workstation)
5. Launch GC verbose visualizers (GCMV or PMAT) and browse to the file you uploaded.

GC Tuning Suggestions

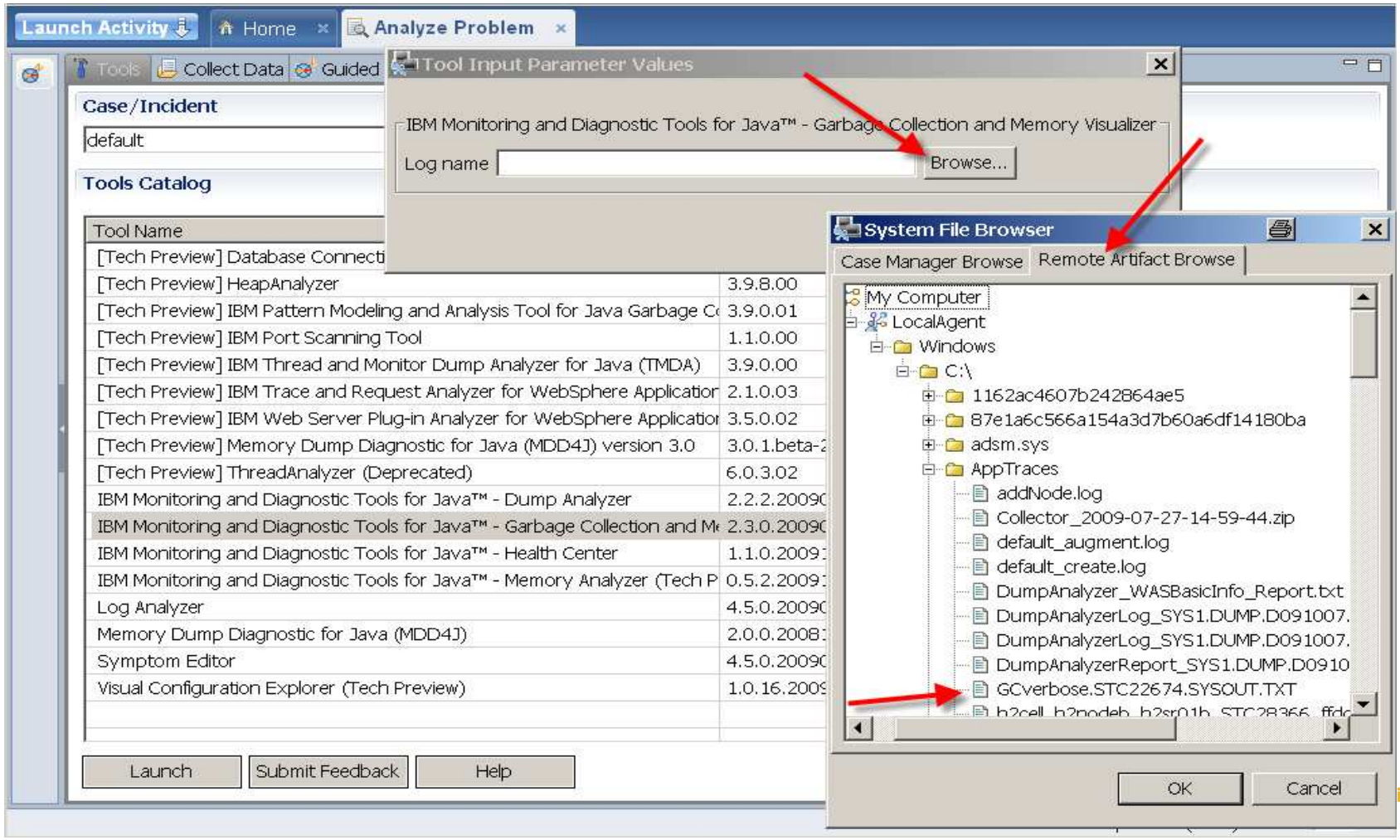
Do this before putting your applications into Production:

1. Install the application, test it.
2. Set JVM heap min/max size, & enable Verbose GC
3. Use a load driver to drive a representative, but constant load. (Consider using a “peak” load.)
4. Extract verbose GC statistics and study with a visualizer.
5. Under peak load, the time between GCs should be:
   - Constant, and about once every 10 seconds or more.
6. Look for Memory leaks – times between GC shorten.
7. Tune by experimenting independently with different heap sizes and GC policies.
8. To study the JVM contents, take a heap, core, or SDump, and use one of the Dump analysis tools.

(Don’t forget to also analyze your applications with a profiler such as JinsightLive for System z.)

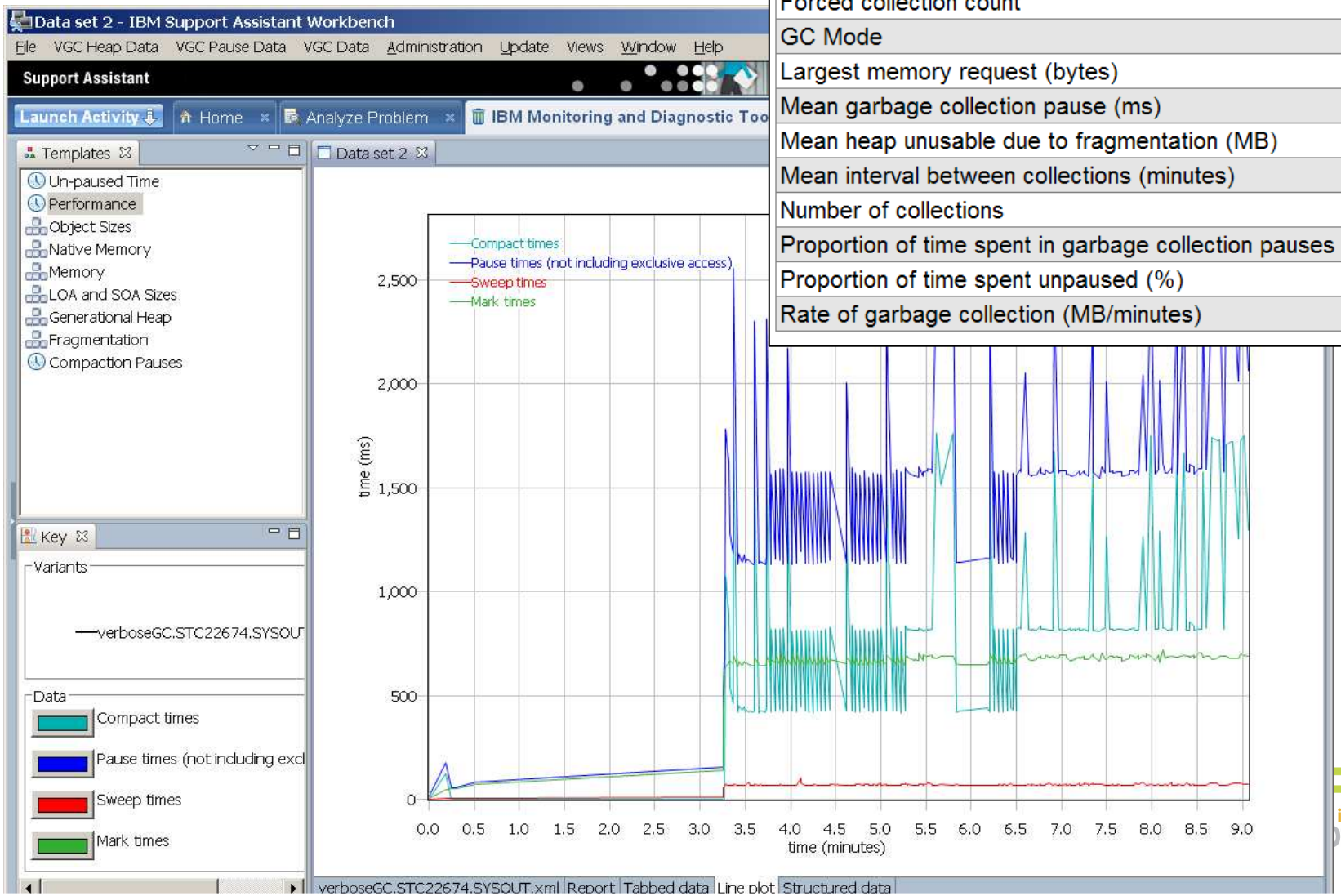
GC Visualization and Analysis tools

Launch one of the GC verbose visualizers (GCMV or PMAT) and browse to the file you uploaded.



GC and Memory Visualizer (GCMV) - *IMDTJ*

Uses verbose GC (xml doc)



Summary

Allocation failure count	137
Forced collection count	3
GC Mode	optthruput
Largest memory request (bytes)	19496
Mean garbage collection pause (ms)	1514
Mean heap unusable due to fragmentation (MB)	0.0
Mean interval between collections (minutes)	0.04
Number of collections	209
Proportion of time spent in garbage collection pauses (%)	57.9
Proportion of time spent unpaused (%)	42.1
Rate of garbage collection (MB/minutes)	126

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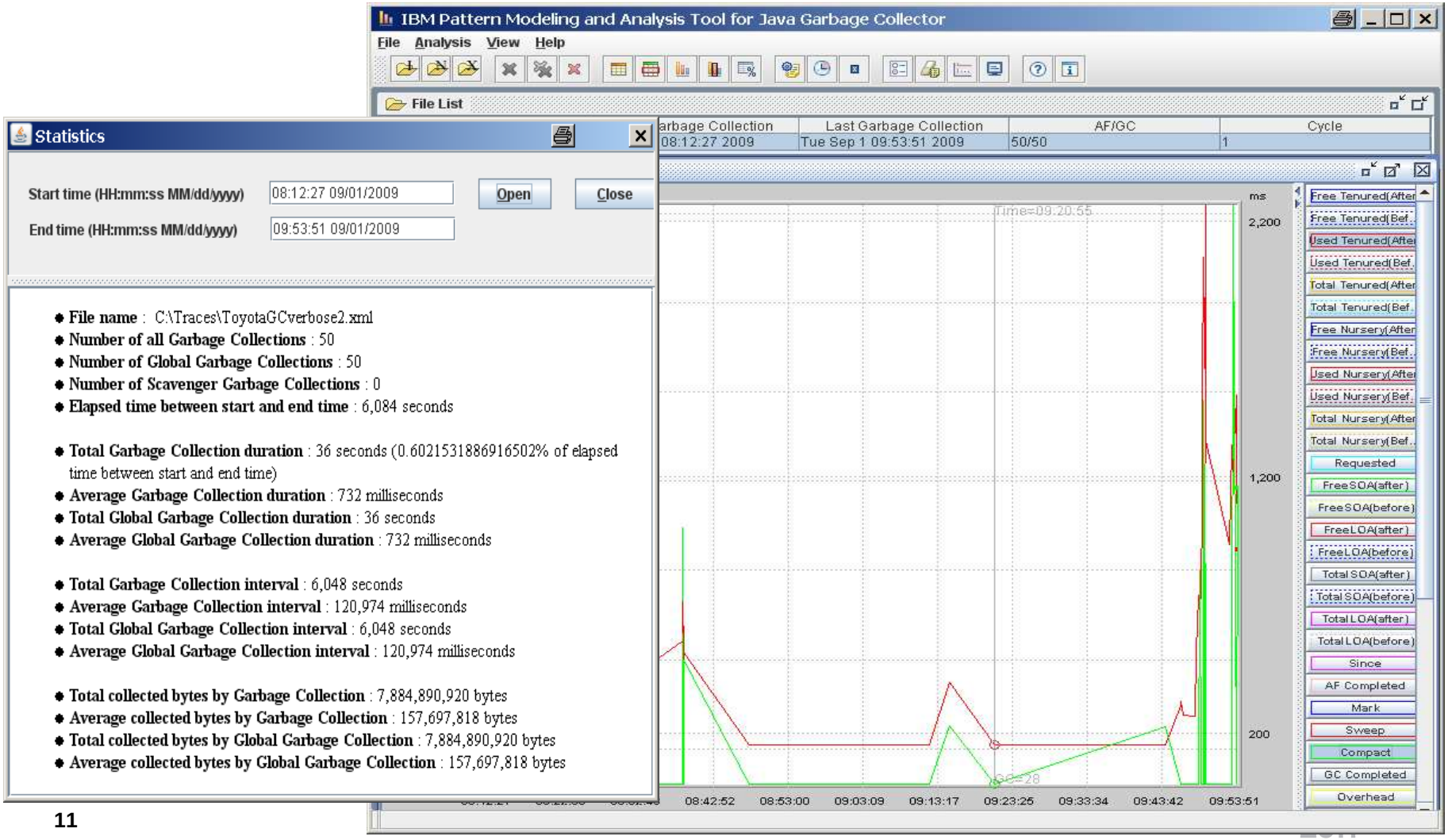
Pattern Modeling & Analysis Tool for Java GC (PMAT)

Different perspective than GCMV - PMAT does not run in the ISA workspace. When you click Next, a separate display appears.



JVM Dumps - Many kinds . . .

- **Java Dumps** > /var/home/…
  - Heap
  - JavaCore
  - JVM TDUMP:
- SVC Dumps, ABEND Dumps, SYSABENDs
- CEE Dumps

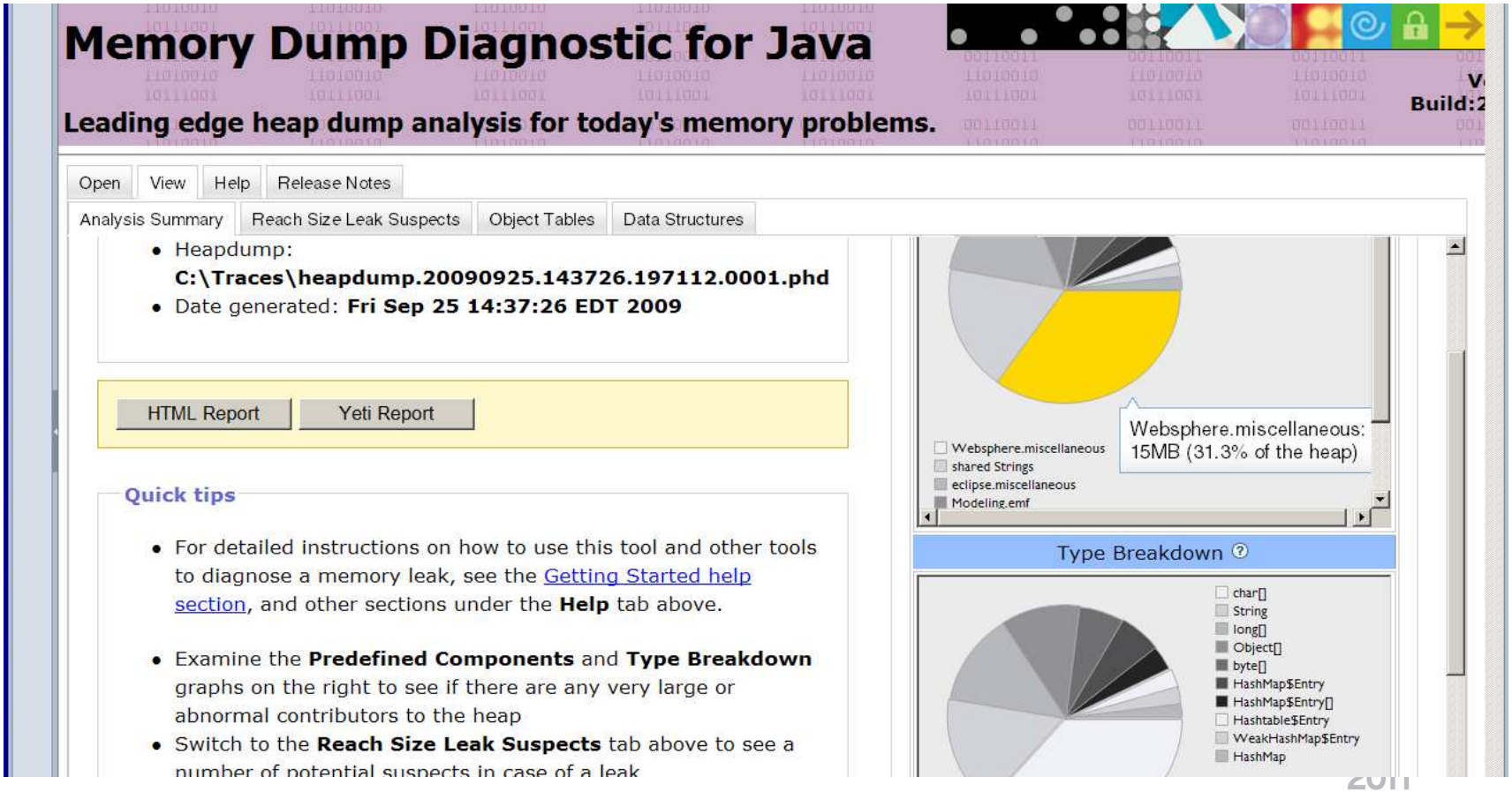
Analysis Tools:

- MDD4J – high level – good for “Leak Suspects”
- Memory Analyzer – More detailed
- Dump Analyzer
- Heap Analyzer
- Thread & Monitor Dump Analyzer for Java (TMDA)

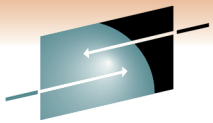
See “Analyzing Dumps” in appendix for more details.

Memory Dump Diagnostic for Java - V3 (MDD4J)

- **Focus on data structures that may cause memory related problems.**
- **Analyze heap dumps:**
  - "Baseline" heap dump – take when application is started.
  - "Primary" heap dump – when a problem occurs.
  - "Comparative" heap dumps – analyze differences.



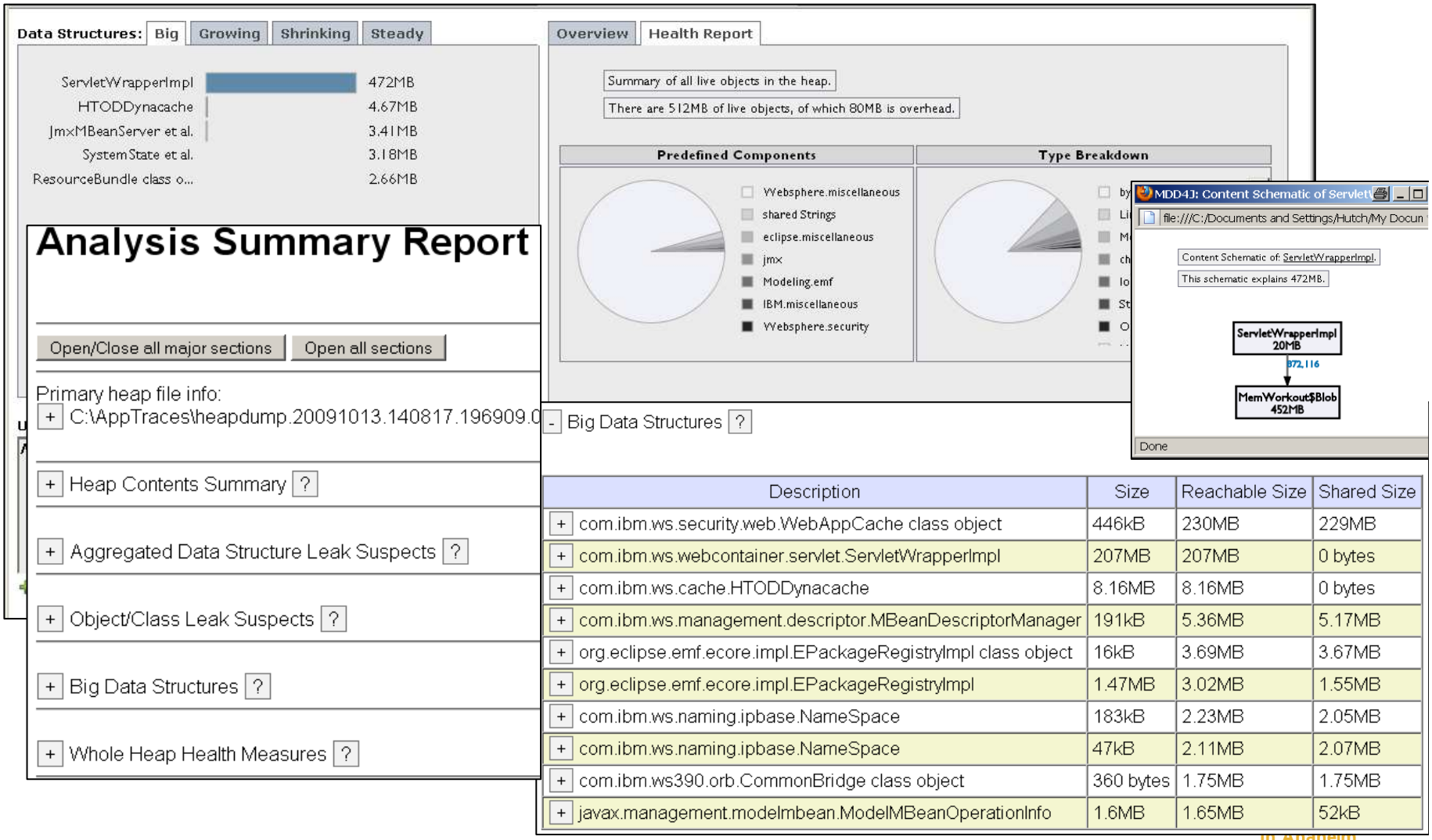
MDD4J analysis (cont'd)



- **Guided Activity Assistant**
  - "Summary" – Basic Heap Info & Contents Summary.
  - "Reach Size Leak Objects" – Cumulative size of all objects.
  - "Object/Class" leak suspects.
  - "Data Structures view" – Understand relations & Track Changes.
    - Big/Growing/Shrinking/Steady
- **Yeti Reports:** (HTML or Yeti zip file)
  - Save as HTML file, or Yeti analysis zip file – extract & open `index.html` file.
  - Analysis engine based on "Yeti" technology.
    - Overview
    - Health Report
    - Content Graphs – Type & Field layout views
- Additional documentation:
  - Techdoc WP101612 – "Getting started with GC, Heapdumps and Javacores for WebSphere on z/OS"
  - DeveloperWorks Summary doc: www.ibm.com/developerworks/websphere/techjournal/0909_supauth/0909_supauth.html

Yeti Reports (from MDD4J)

Extract zip file created by MDD4J, & launch index.html



Memory Analyzer (IMDTJ)

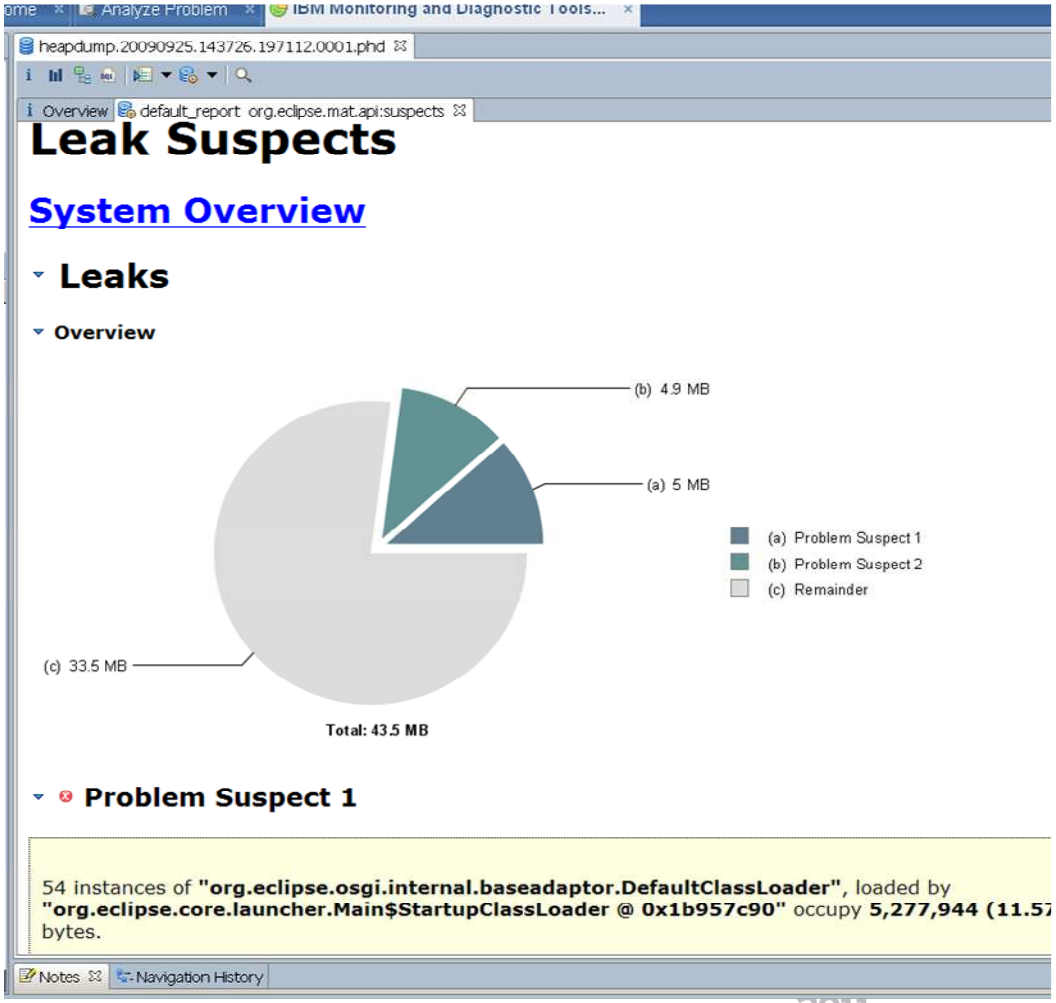
- Based on open source M.A.T. + DTFJ - www.eclipse.org/mat
- For java heapdumps, System Dumps (jextracted) & javacore*

Getting Started wizard:

- **Overview ----------→**
- **Leak report**
- **Component reports**

Navigate: (TOC, Fly-over, Click)

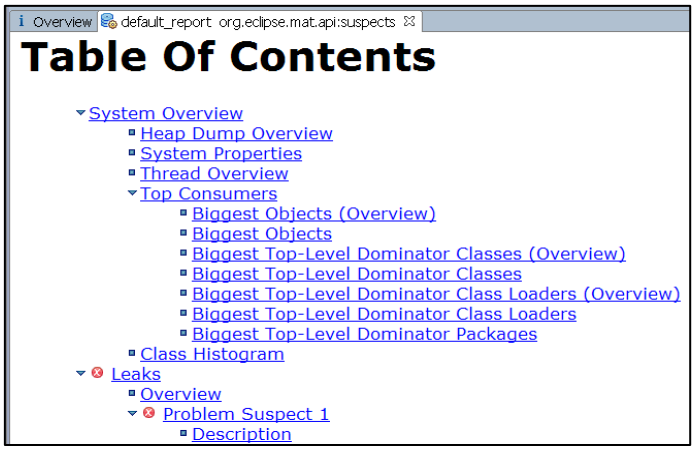
- **Histogram (tables)**
- **Context (In, Out Refs)**
- **Group (Pkg, Class, Loader)**
- **Dominator Tree**
  - Objects keeping others
- **Path to GC roots**
- **Leak reports**

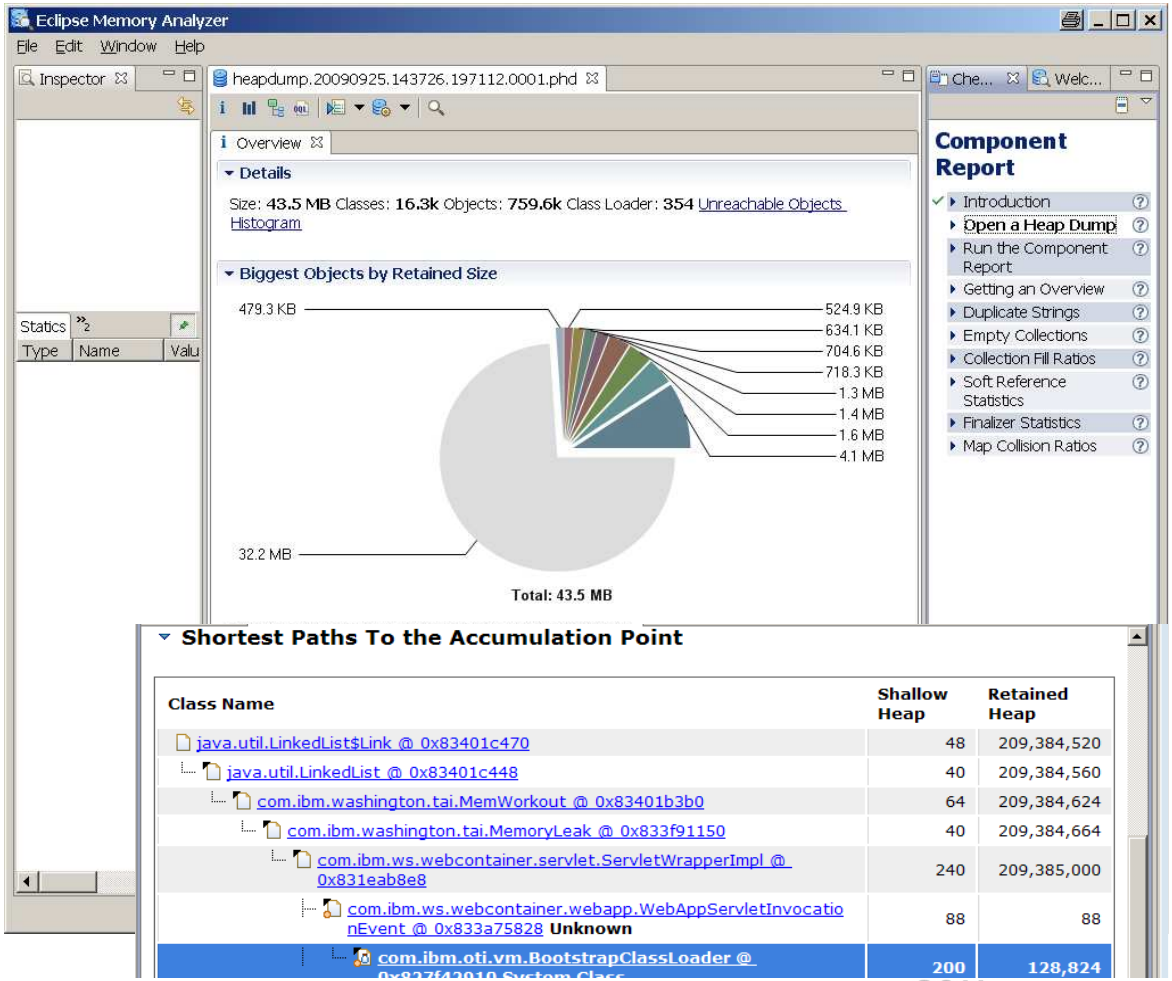


Memory Analyzer samples

Navigate: (TOC, Fly-over, Click)

- **Histogram (tables)**
- **Context (In, Out Refs)**
- **Group (Pkg, Class, Loader)**
- **Dominator Tree**
  - Objects keeping others
- **Path to GC roots**
- **Leak reports**

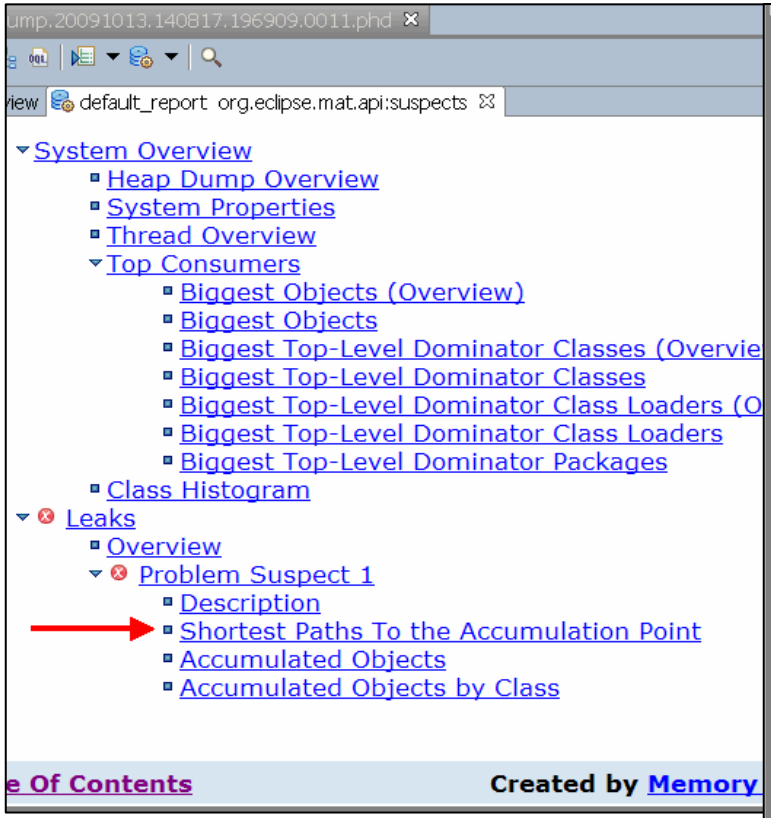


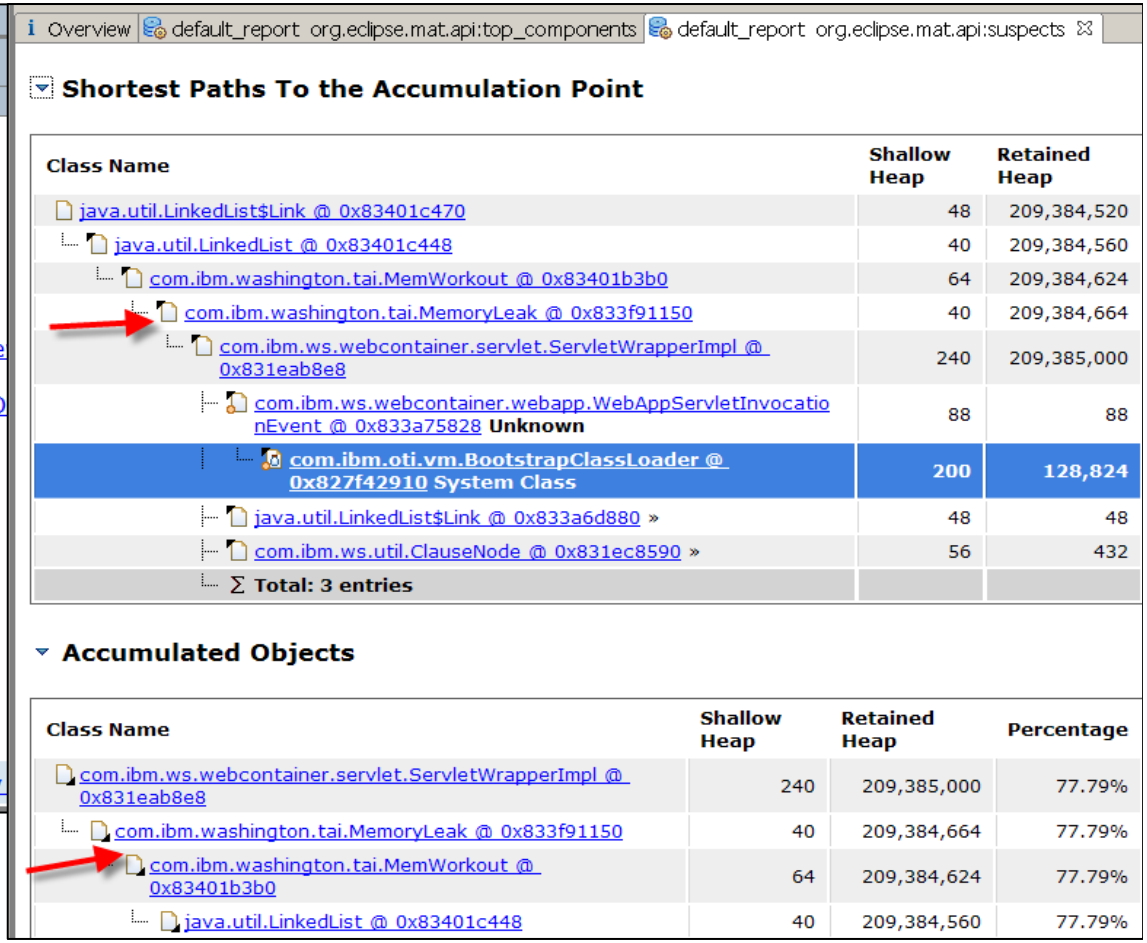


Memory Analyzer sample use case

File>Open Heap Dump > Leak Suspects Report > Problem Suspect1 > “Shortest Paths To the Accumulation Point” and “Accumulated Objects”

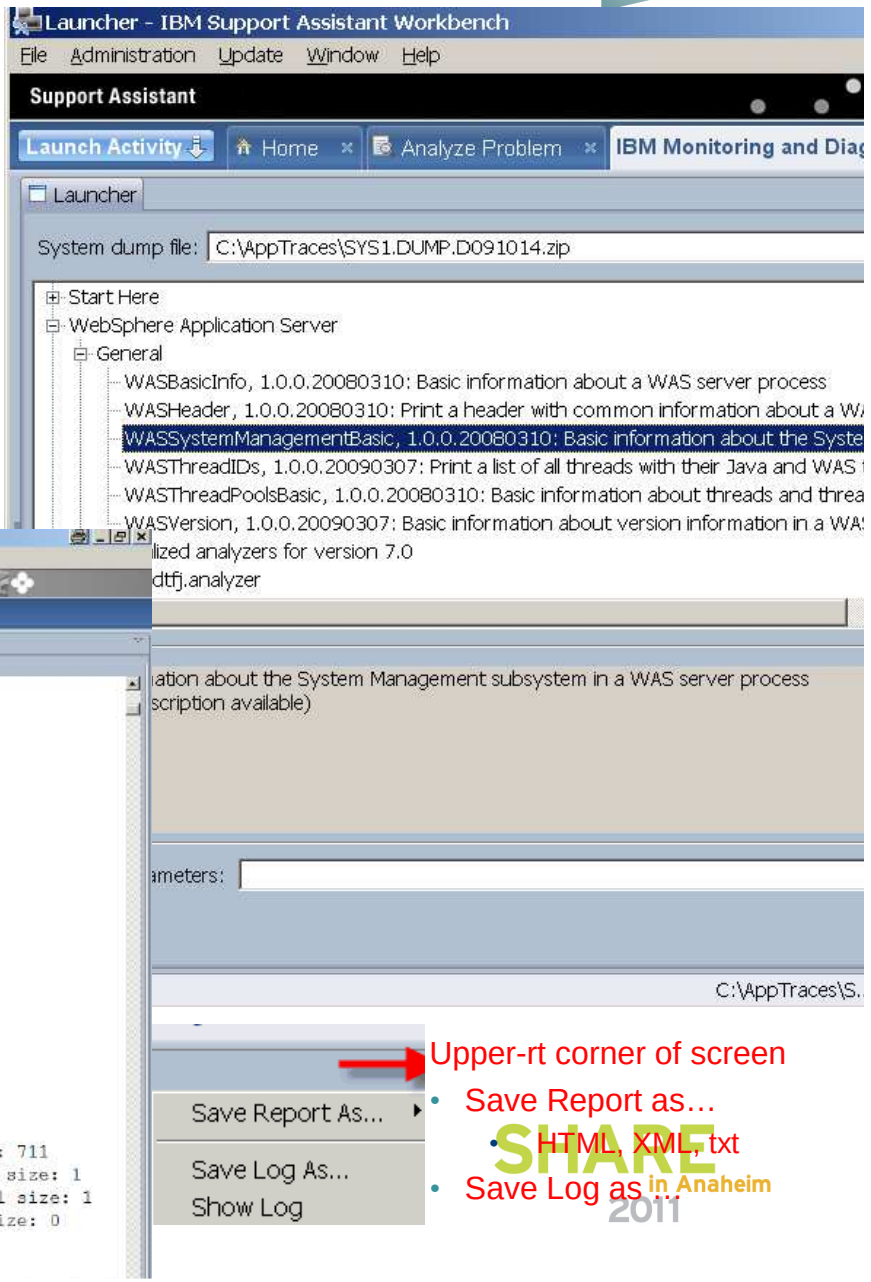
- There we found the suspect “MemoryLeak.”

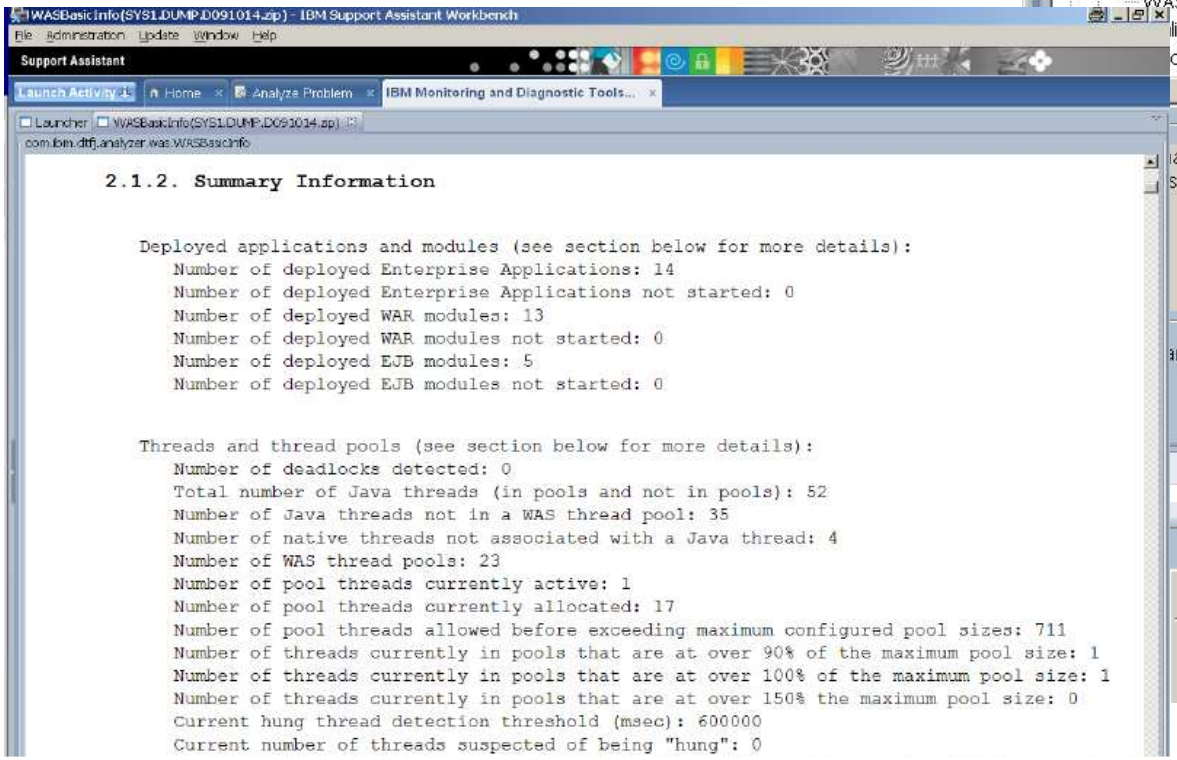




Dump Analyzer - *IMDTJ*

- Based on JVM's **`jdmpview`** tool
- System dumps processed by jextract
- FTP to workstation (binary)
- Import dump – "Browse"
- Select report, "Analyze"
  - Click on WASBasicInfo . . . or . . .



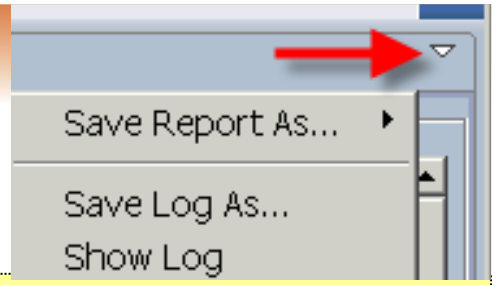


Upper-rt corner of screen

- Save Report as…
  - HTML, XML, txt
- Save Log as…

Dump Analyzer – Analysis Reports

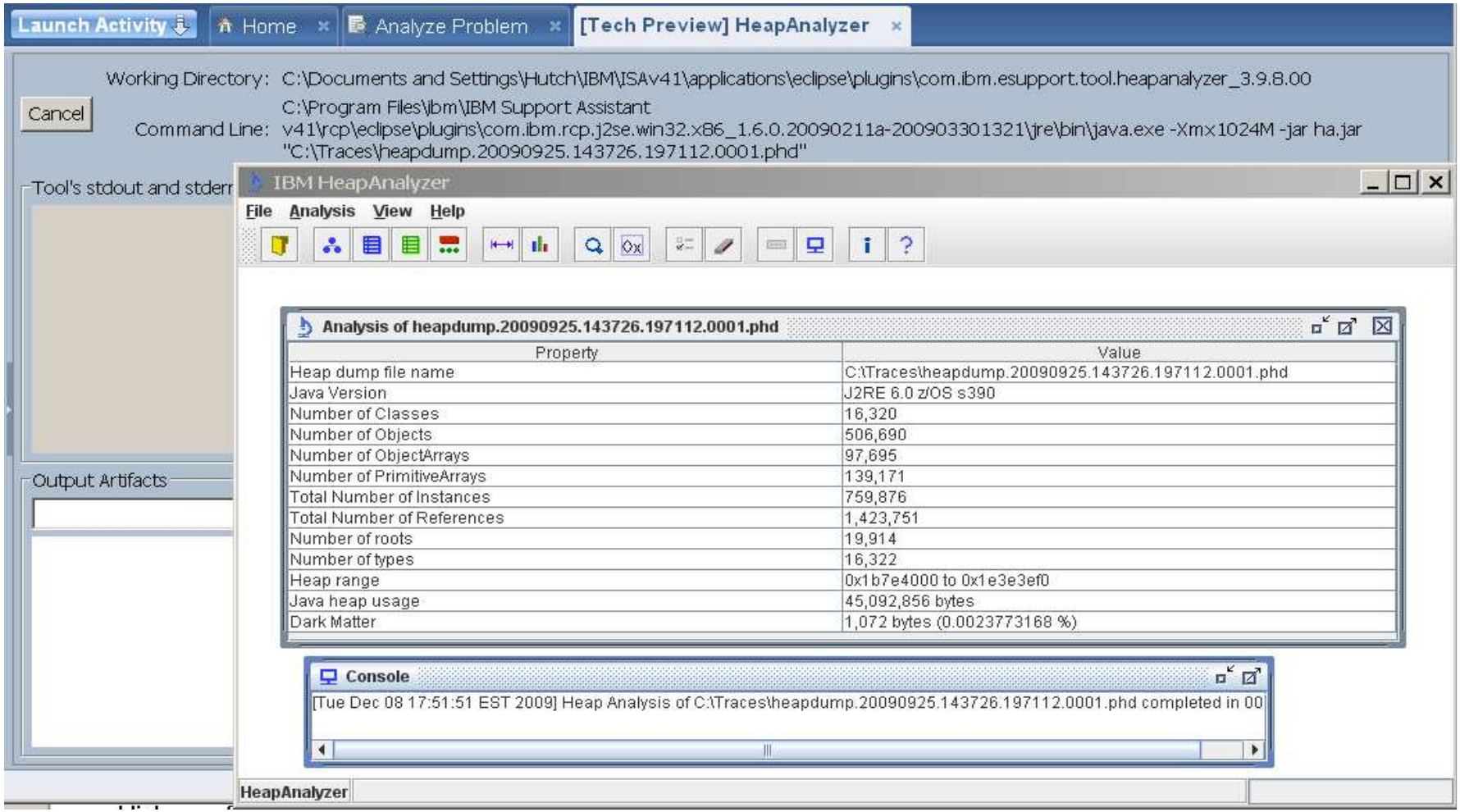
- Save Report As: html, xml, or txt files
- Default Dump Report:




```
2. Analysis results
     DumpAnalyzer V:2.2.2.20090926232659 : Start analysis of C:\AppTraces\SYS1.DUMP.D091014.zip

2.1. Results from Analyzer=com.ibm.dtfj.analyzer.jvm.DefaultDumpReport_Standard
               Analyzer full name: com.ibm.dtfj.analyzer.jvm.DefaultDumpReport_Standard
               Analyzer version: 1.3.0.20070812
               Analyzer description: Report basic information from this JVM image (similar to javacore) - Standard version

2.1.1. Image and runtime information
               Now reporting on runtime: 0.0.0
     Image: (no identity)
               Time of dump: Wed Oct 14 02:28:14 EDT 2009
               System Type: z/OS                    System SubType: 01.10.00
               Processor Type: s390x                Processor SubType:
               Number of Processors: 2
               Installed Memory: 6442450944
               Host Name: wsc2
               IP address: /9.82.24.70
               This Image contains: 1 address spaces; 1 processes; 1 runtimes

     Process: PID:0x30208
               Executable: main
               Command line: [<null>]
               Pointer size (bits): 64
               Signal that triggered this dump: 0 ((no signal info available, or dump was not triggered by a signal))
               Current Thread: 0x14b06000

     Java Runtime: JavaVM@0x000000080B178548
               Java Version: Java(TM) SE Runtime Environment(build pmz6460sr5ifx-20090623_02 (SR5)) IBM J9

2.1.2. JVM Initialization Arguments
               JNI ignoreUnrecognized: False
               JNI version: 65540
                         -Xthr:tw=HEAVY          ExtraInfo=0x00000000
```

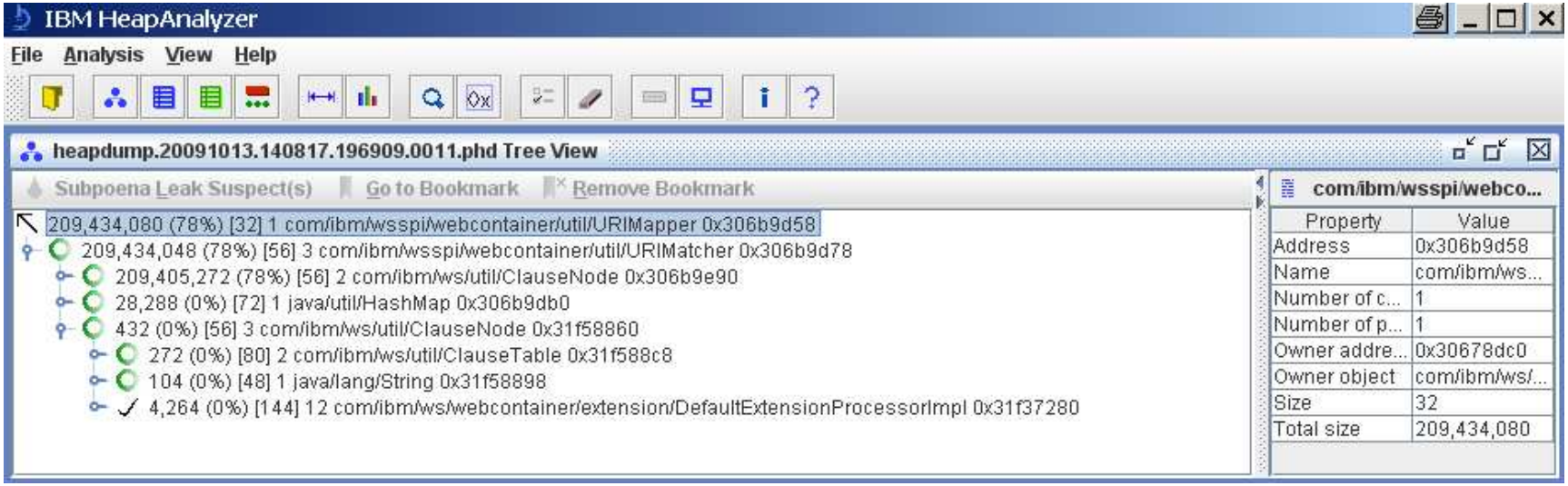
HeapAnalyzer

- Originally provided on AlphaWorks
- Graphical analysis of javacores (heapdumps)
- Creates tables & graphs
- Heuristic engine to find memory leaks and excessive heap usage.



HeapAnalyzer (cont'd)

- Analysis Views:
  - Tree view
  - Objects List
  - Types List
  - Root List
  - Gaps by size



See detailed information of a node; search for total size drop between parent and child.

- Tree node format: **`TotalSize(Size/Heap%)[ObjSize] #ChildObj (# root obj) Name Addr`**
- Select a node and right click to find an address.

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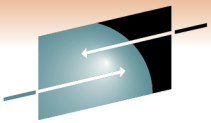
Thread & Monitor Dump Analyzer for Java (TMDA)



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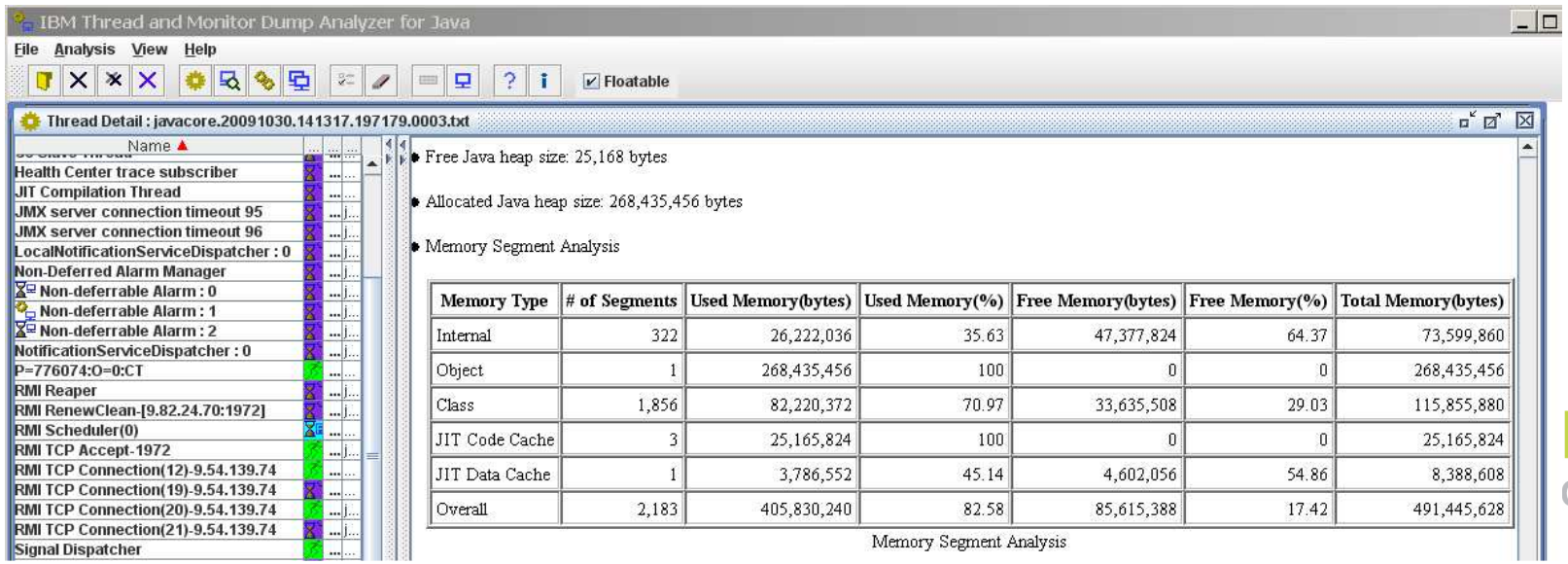
TMDA for Java analyzes javacore dumps and helps you find hangs, deadlocks, resource contention, and bottlenecks in Java threads. (Tech preview.)

Webcast & Foils: ibm.com/support/docview.wss?uid=swg27011855

Status	Number of Threads : 59	Percentage
Deadlock	0	0 (%)
Runnable	16	27 (%)
Waiting on condition	39	66 (%)
Waiting on monitor	0	0 (%)
Suspended	0	0 (%)
Object.wait()	0	0 (%)
Blocked	3	5 (%)
Parked	1	2 (%)

Features provided & Color coding:

- Summary of Javacore
- Thread detail view
- Monitor detail view
- List of hang suspects
- Thread compare view
- Thread comparison summary
- Monitor lock compare view
- Garbage collector statistics for IBM JVM



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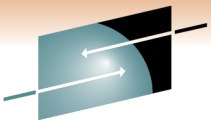
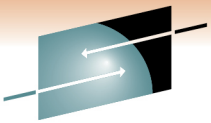
Working with Traces from WAS on z/OS



- **STDOUT & STDERR** traces usually go to JES logs
  - Keep them off SYSLOG by specifying separate DD files
  - May be re-directed to HFS files – TD103695
  - Not suited for ISA trace analysis tools
- **java tracing** - enable dynamically:
  - Modify (F) MVS commands:
    - F server,tracejava='com.ibm.*=all'
    - F server,tracedetail=(3,4)
    - F server, TRACEINIT
- **ffdc** logs – automatically generated
- **wsadmin**.sh tracing – modify **`wsadmin.properties`** file
- **JDBC** tracing – **`db2.jcc.override.traceFile=`** in **`DB2JccConfiguration.properties`** file

TRA - Trace and Request Analyzer for WAS



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- Here's a Gap Analysis for the addNode.log:

(Works with trace files from wsadmin logs.)

IBM Trace and Request Analyzer for WebSphere Application Server

File Analysis Customized Analysis View Help

Trace Gap Analysis

Time(...	Trace	Line Num...	Fi...
72,494	[9/8/08 15:12:38:376 EDT] 00000000 AdminTool A BBOO0222I: ADMU0022I: Node Agent launched. Waiting for initialization status.	107	a...
	[9/8/08 15:13:50:870 EDT] 00000000 AdminTool A BBOO0222I: ADMU0030I: Node Agent initialization completed successfully. Process id is: 000002ac00000002	108	a...
55,457	[9/8/08 15:11:12:337 EDT] 00000000 AdminTool A BBOO0222I: ADMU0120I: isclite on BLA will not be uploaded since it already exists in the target repository.	38	a...
	[9/8/08 15:12:07:794 EDT] 00000000 AdminTool A BBOO0222I: ADMU0016I: Synchronizing configuration between node and cell.	39	a...
29,879	[9/8/08 15:12:07:794 EDT] 00000000 AdminTool A BBOO0222I: ADMU0016I: Synchronizing configuration between node and cell.	39	a...
	[9/8/08 15:12:37:673 EDT] 00000000 AdminTool A BBOO0222I: ADMU0018I: Launching Node Agent process for node: h2nodeb	105	a...
29,249	[9/8/08 15:10:34:944 EDT] 00000000 AdminTool A BBOO0222I: ADMU0009I: Successfully connected to Deployment Manager Server: wsc2.washington.ibm.com:24010	21	a...
	[9/8/08 15:11:04:193 EDT] 00000000 AdminTool A BBOO0222I: ADMU0505I: Servers found in configuration:	22	a...
6,967	[9/8/08 15:12:27:595 EDT] 00000001 FileRepositor A BBOO0222I: ADMR0011I: Document cells/h2cell/PolicySets/WS-I RSP/policySet.xml is deleted.	102	a...
	[9/8/08 15:12:34:562 EDT] 00000001 NodeSyncTask I com.ibm.ws.management.sync.NodeSyncTask doSync ADMS0003I: The configuration synchronization completed su...	103	a...
4,920	[9/8/08 15:10:25:076 EDT] 00000000 ModelMgr I BBOO0222I: WSVR0801I: Initializing all server configuration models	18	a...
	[9/8/08 15:10:29:996 EDT] 00000000 SSLConfigMana I BBOO0222I: CWPKI0027I: Disabling default hostname verification for HTTPS URL connections.	19	a...
4,503	[9/8/08 15:10:29:996 EDT] 00000000 SSLConfigMana I BBOO0222I: CWPKI0027I: Disabling default hostname verification for HTTPS URL connections.	19	a...
	[9/8/08 15:10:34:499 EDT] 00000000 AdminTool A BBOO0222I: ADMU0001I: Begin federation of node h2nodeb with Deployment Manager at wsc2.washington.ibm.com:...	20	a...
3,266	[9/8/08 15:11:05:883 EDT] 00000000 AdminTool A BBOO0222I: ADMU0015I: Backing up the original cell repository.	27	a...
	[9/8/08 15:11:09:149 EDT] 00000000 AdminTool A BBOO0222I: ADMU0012I: Creating Node Agent configuration for node: h2nodeb	28	a...
1,279	[9/8/08 15:11:04:293 EDT] 00000000 AdminTool A BBOO0222I: ADMU2010I: Stopping all server processes for node h2nodeb	24	a...
	[9/8/08 15:11:05:572 EDT] 00000000 AdminTool A BBOO0222I: ADMU0512I: Server h2sr01b cannot be reached. It appears to be stopped.	25	a...
768	[9/8/08 15:11:10:527 EDT] 00000000 AdminTool A BBOO0222I: ADMU0014I: Adding node h2nodeb configuration to cell: h2cell	32	a...
	[9/8/08 15:11:11:295 EDT] 00000000 AdminTool A BBOO0222I: ADMU0120I: WebSphereWSDM on CU will not be uploaded since it already exists in the target repository.	33	a...
693	[9/8/08 15:11:09:149 EDT] 00000000 AdminTool A BBOO0222I: ADMU0012I: Creating Node Agent configuration for node: h2nodeb	28	a...
	[9/8/08 15:11:09:842 EDT] 00000000 AdminTool A BBOO0222I: ADMU0120I: WebSphereWSDM.ear will not be uploaded since it already exists in the target repository.	29	a...
686	[9/8/08 15:12:21:688 EDT] 00000001 FileRepositor W BBOO0221W: ADMR0114W: The system is overwriting document cells/h2cell/variables.xml by request.	48	a...
	[9/8/08 15:12:22:374 EDT] 00000001 FileRepositor A BBOO0222I: ADMR0010I: Document cells/h2cell/variables.xml is modified.	49	a...
669	[9/8/08 15:12:37:707 EDT] 00000000 AdminTool A BBOO0222I: ADMU0020I: Reading configuration for Node Agent process: nodeagent	106	a...
	[9/8/08 15:12:38:376 EDT] 00000000 AdminTool A BBOO0222I: ADMU0022I: Node Agent launched. Waiting for initialization status.	107	a...
575	[9/8/08 15:12:25:886 EDT] 00000001 FileRepositor A BBOO0222I: ADMR0010I: Document cells/h2cell/cus/ibmasyncrsp/cver/BASE/cu.xml is modified.	88	a...
	[9/8/08 15:12:26:461 EDT] 00000001 FileRepositor A BBOO0222I: ADMR0009I: Document cells/h2cell/PolicySets/WS-I RSP ND/policySet.xml is created.	89	a...

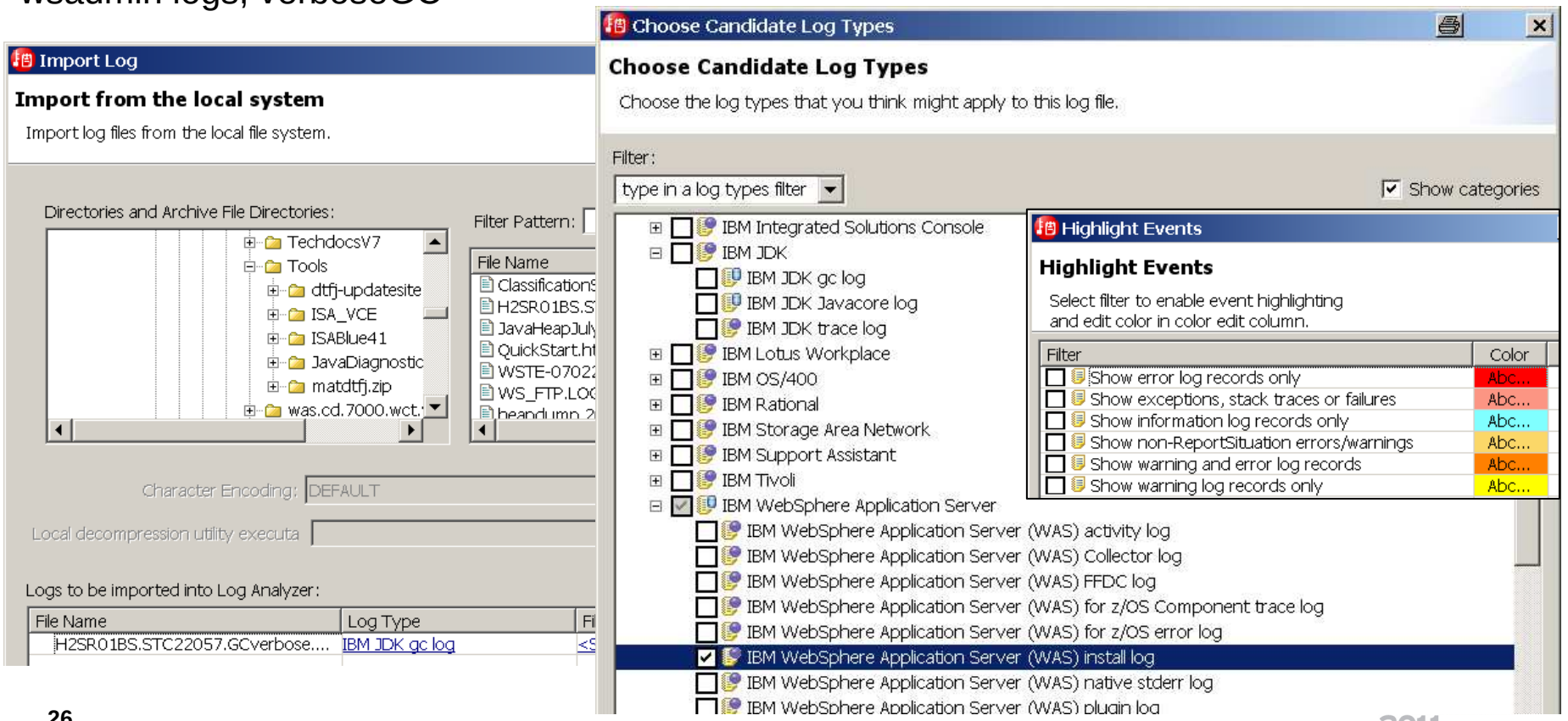
Log Analyzer – Importing Logs

Tivoli Log Analyzer opens in a new window

Click on File → Import Log from local system

Select log file → Symptom Catalog (WAS V.7) → Finish

wsadmin logs, verboseGC



Health Center:

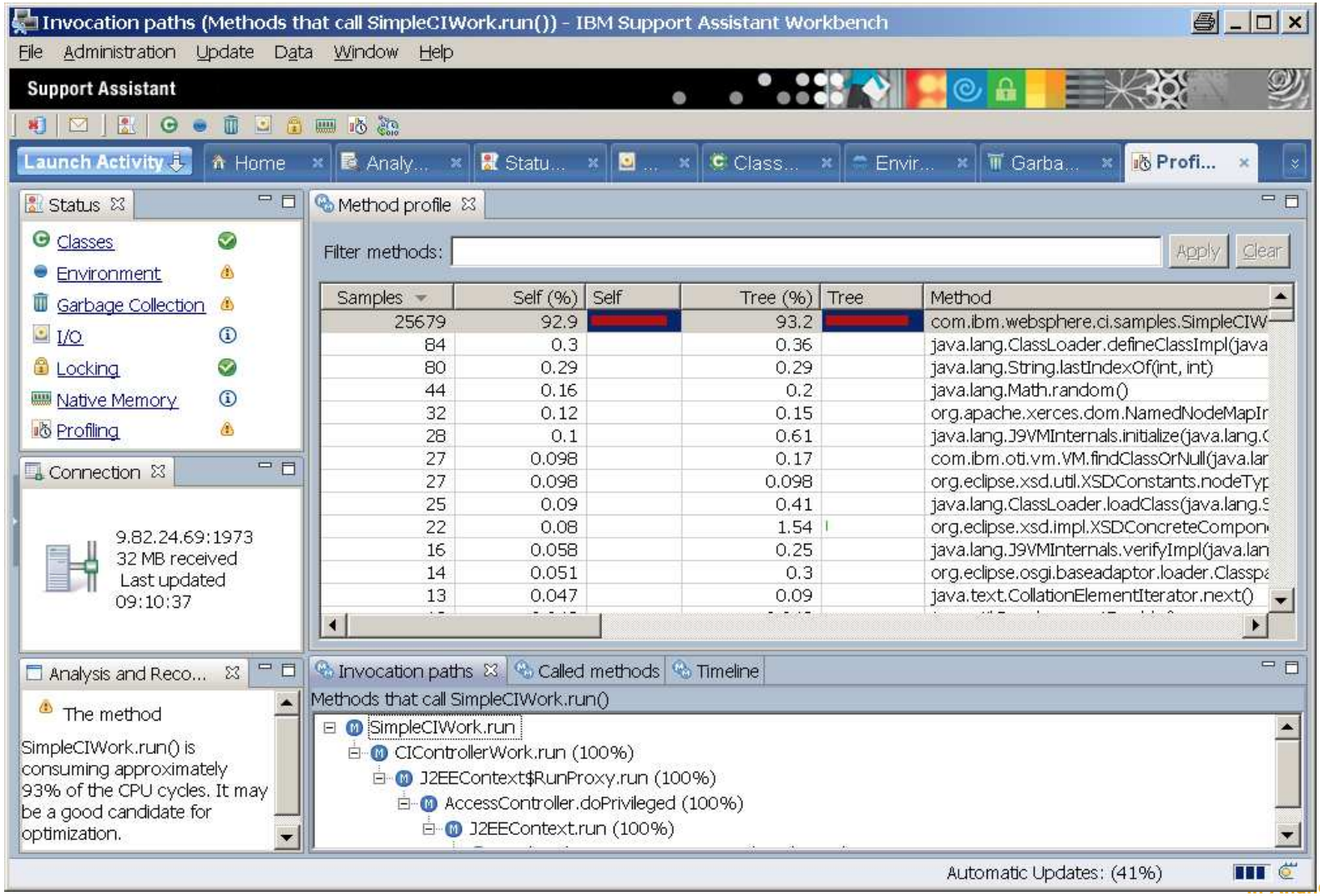
Real-time Monitor with low overhead

- **YouTube** videos
  1. **Overview of Health Center features**
     www.youtube.com/watch?v=5Tcktcl0qxs
  2. **Install IBM Support Assistant and Health Center**
     www.youtube.com/watch?v=6WjE9U0jvEk
  3. **How to enable a Java application for live monitoring by the Health Center**
     www.youtube.com/watch?v=Hdp0mJ13NLQ
- **Enabling a server** *(very easy!):*
  - Add **`-Xhealthcenter`** to servant JVM properties
- **Updating the healthcenter.jar file**
  - Download, unpax & copy the z/OS agent pkg **(mz64.pax) from ISA Help**
- **Using:** Launch from ISA with host & port (1972)
- **Views:**
  - Classes
  - Environment
  - Garbage Collection
  - I/O (New!)
  - Locking
  - Native Memory
  - Profiling

See also SHARE 113 (Denver) Presentation – Session 1153

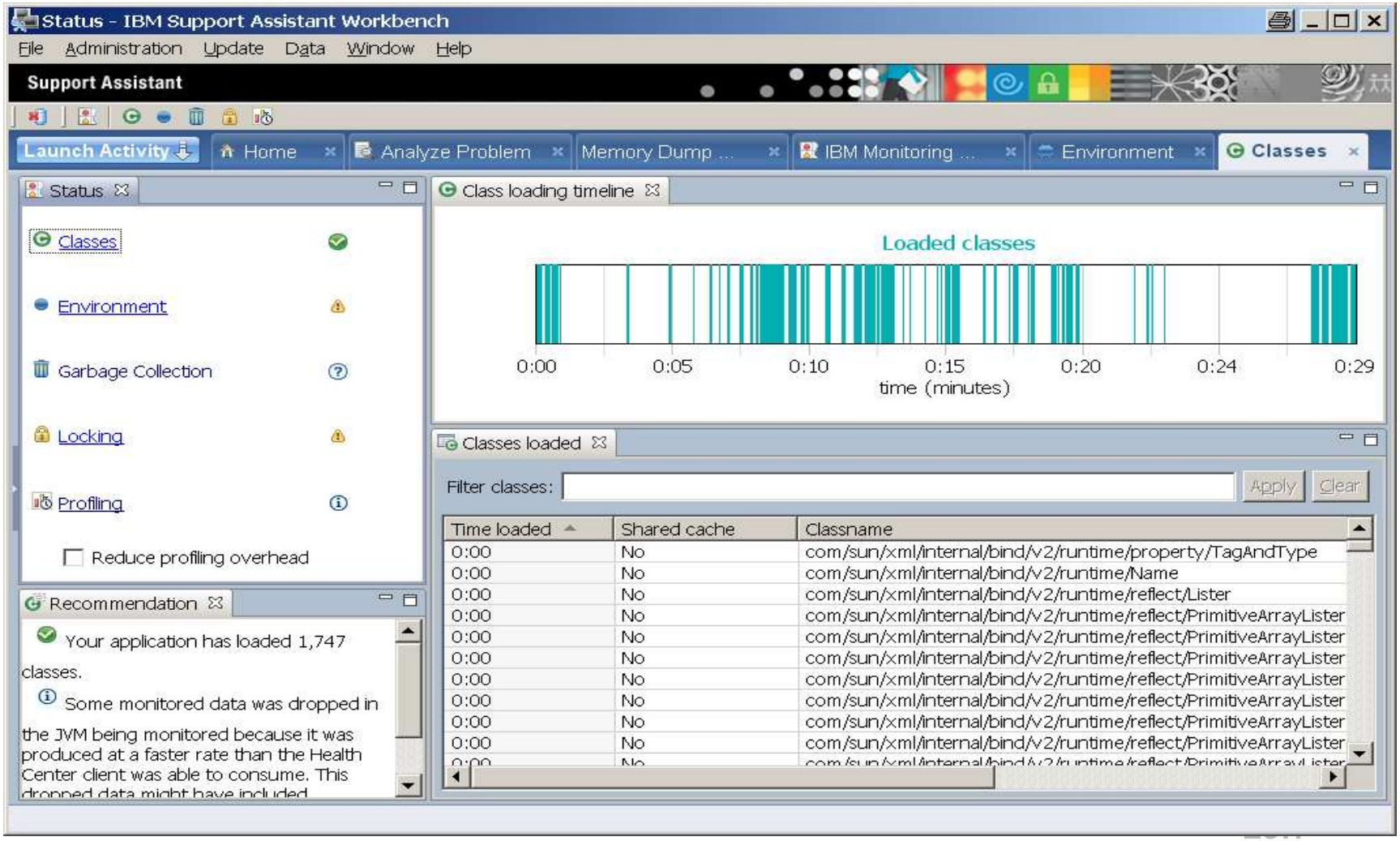
Health Center - Profiling

- Lower overhead *than Jinsight Live for z, but not as rich.*



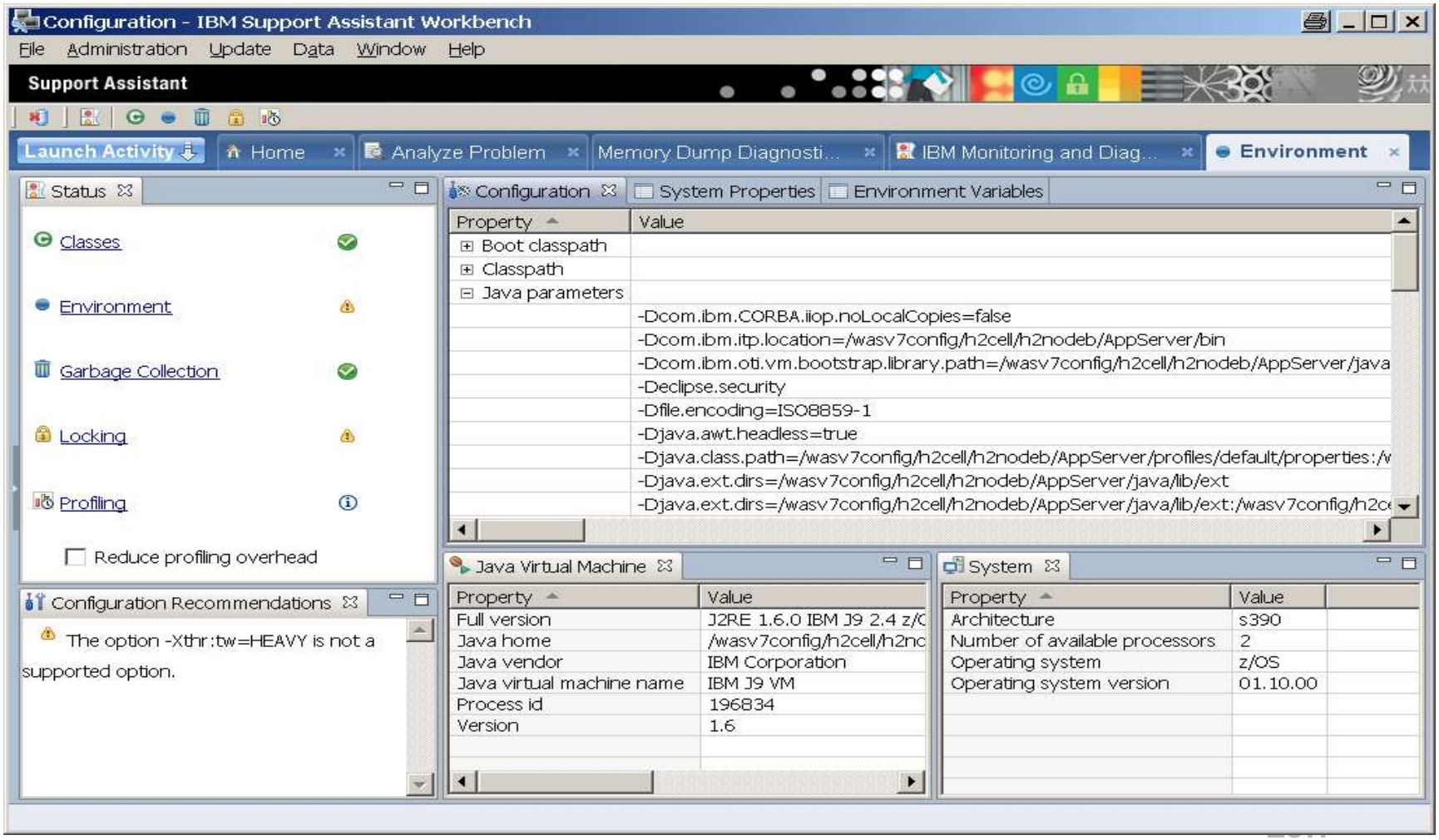
Health Center - Classes

- Timeline shows Class Loading frequency



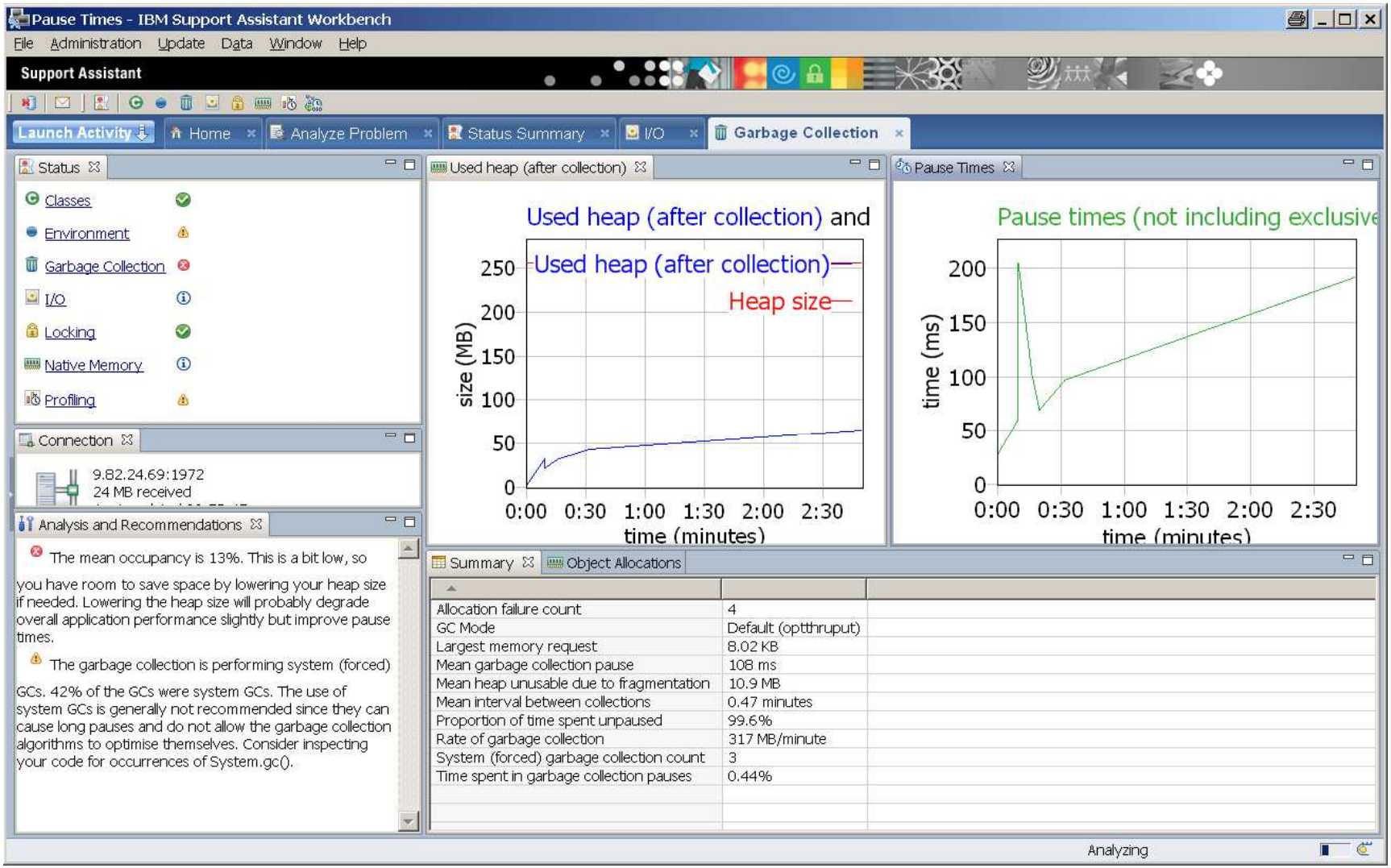
Health Center - Environment

- Verify environmental variables, and Classpath setting



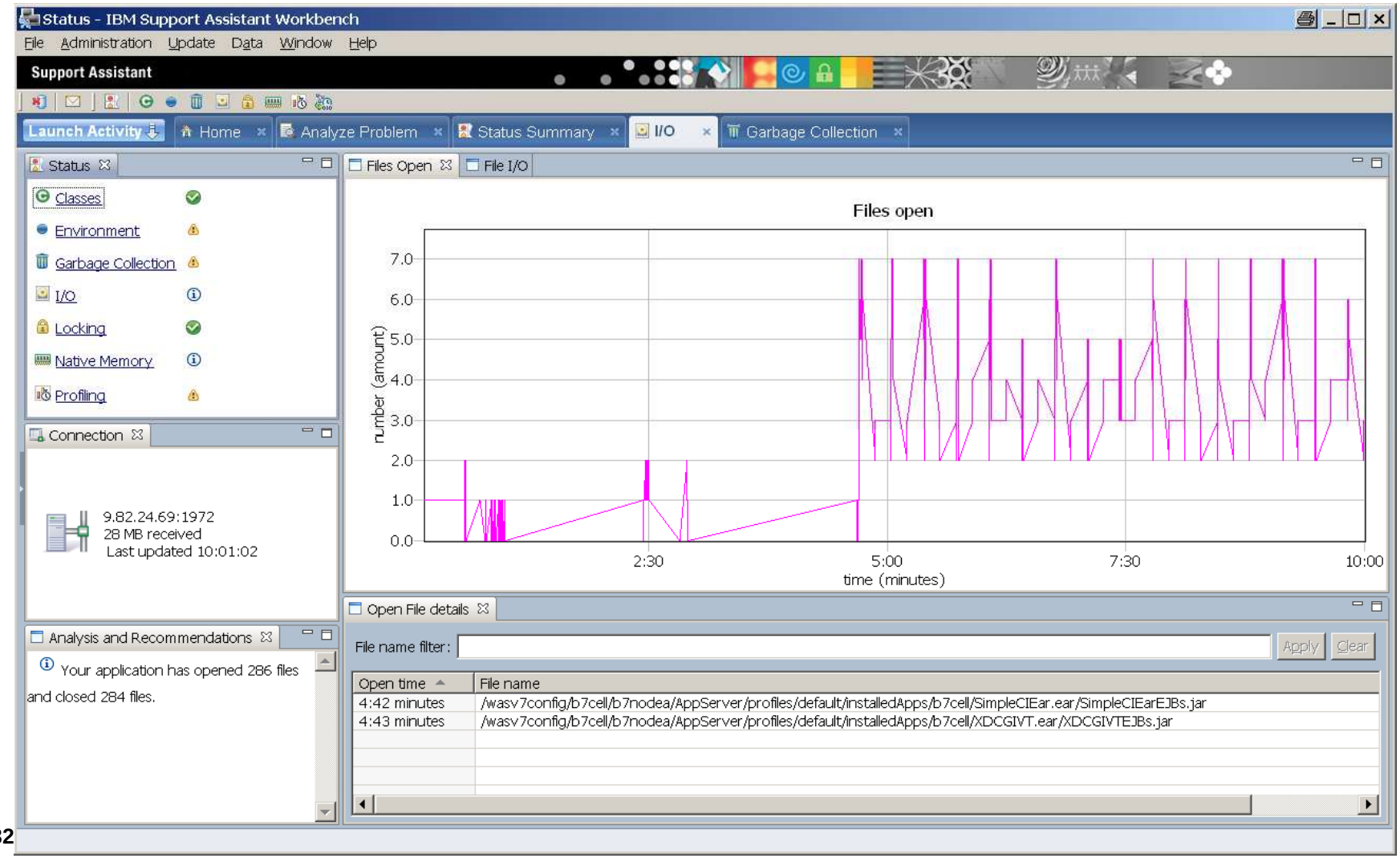
Health Center – Garbage Collection

- Graph shows Heap Use, Size, and Pause Times



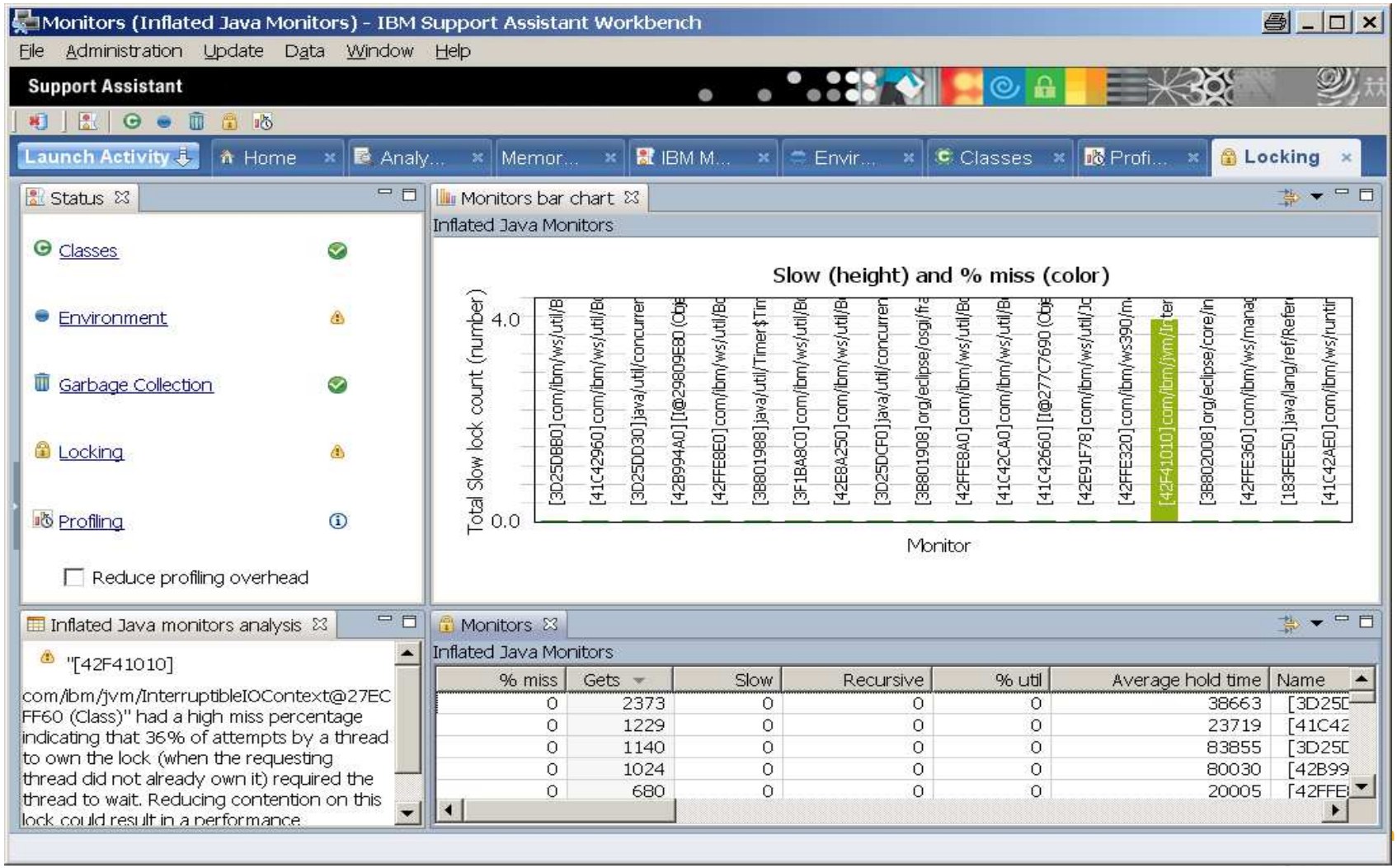
Health Center – I/O View

- Graph shows Number of Files Open over Time



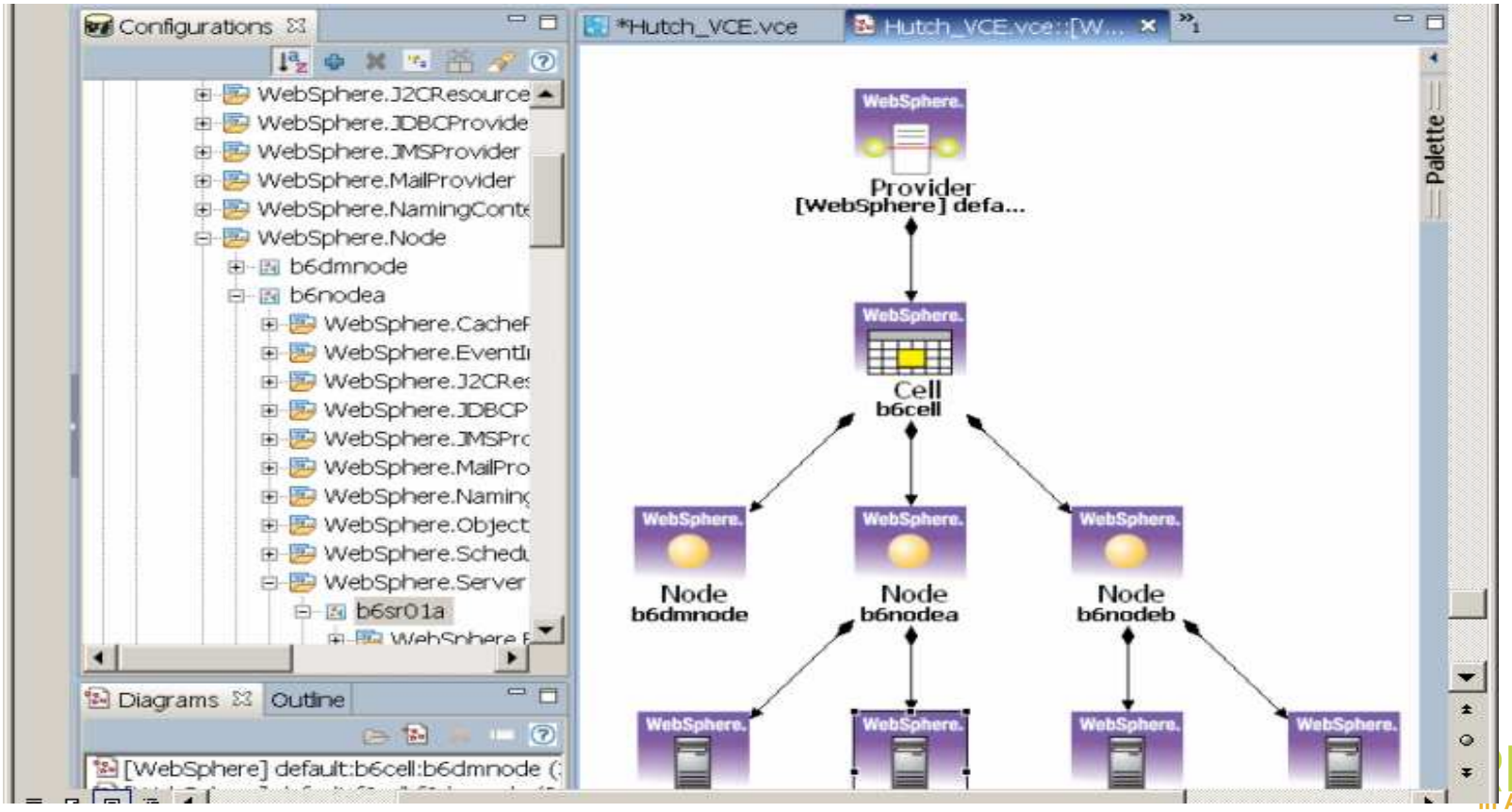
Health Center - Locking

- Identify Lock Contention and avg. Lock Hold Times



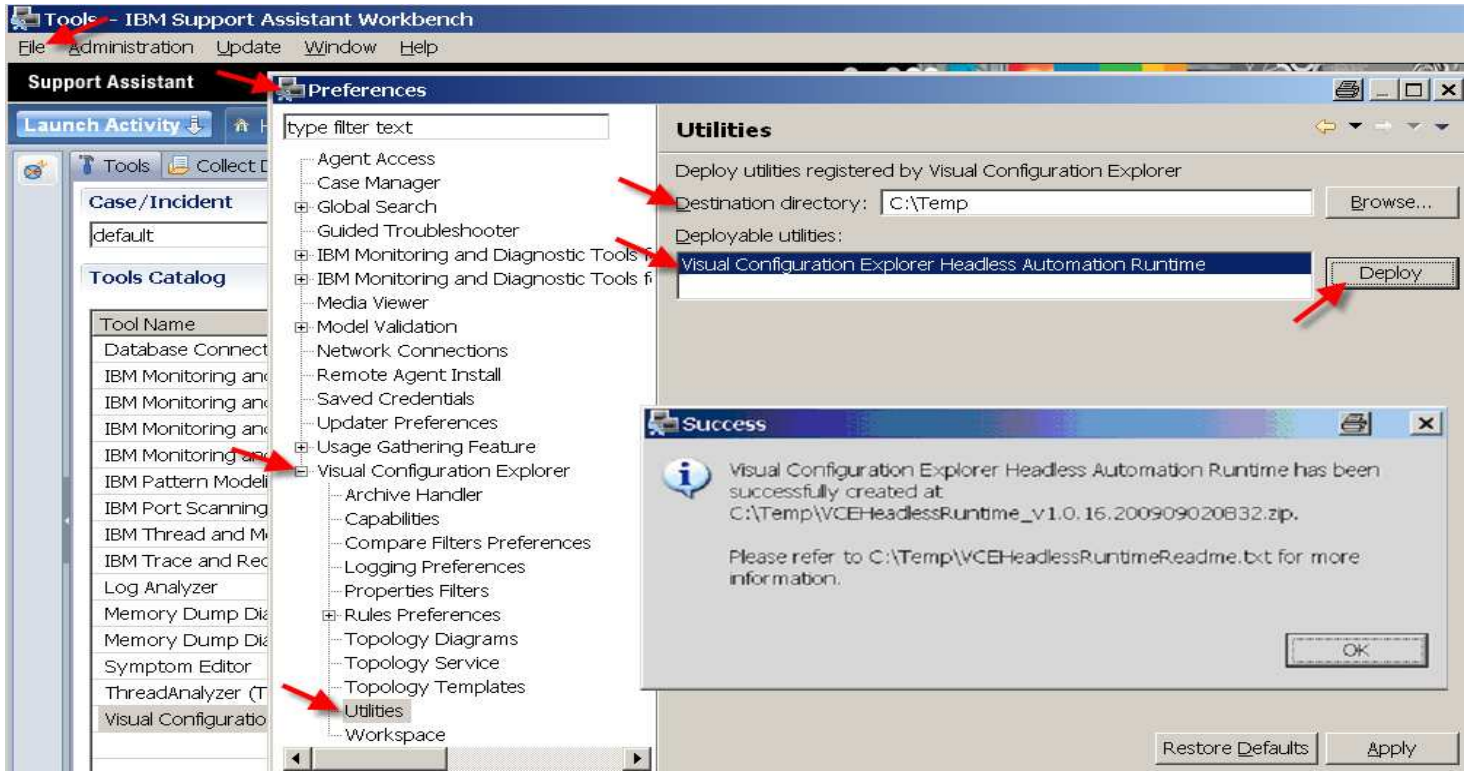
Visual Configuration Explorer (VCE)

Visualize, explore, and analyze configuration information
Correlate configuration information between different products
Collaborate with others during problem analysis
Also see SHARE 113 Session 1153 for more examples…



ISA VCE “Headless Installation”

Click on File → Preferences → VCE → Utilities → “Deploy” to create **`VCEHeadlessRuntime_V1.0...zip`** file



Transfer zip file to your USS working directory, and unzip to ./vce dir.

```
jar –xvf VCEHeadlessRuntime_V1.0.15.20090624.0925.zip
```

Run the exporter from ./vce/ directory after setting WAS_HOME:

```
java jar startup.jar -buildfile wasexporter/wasexport.xml -Dwas.root=$WAS_HOME
```

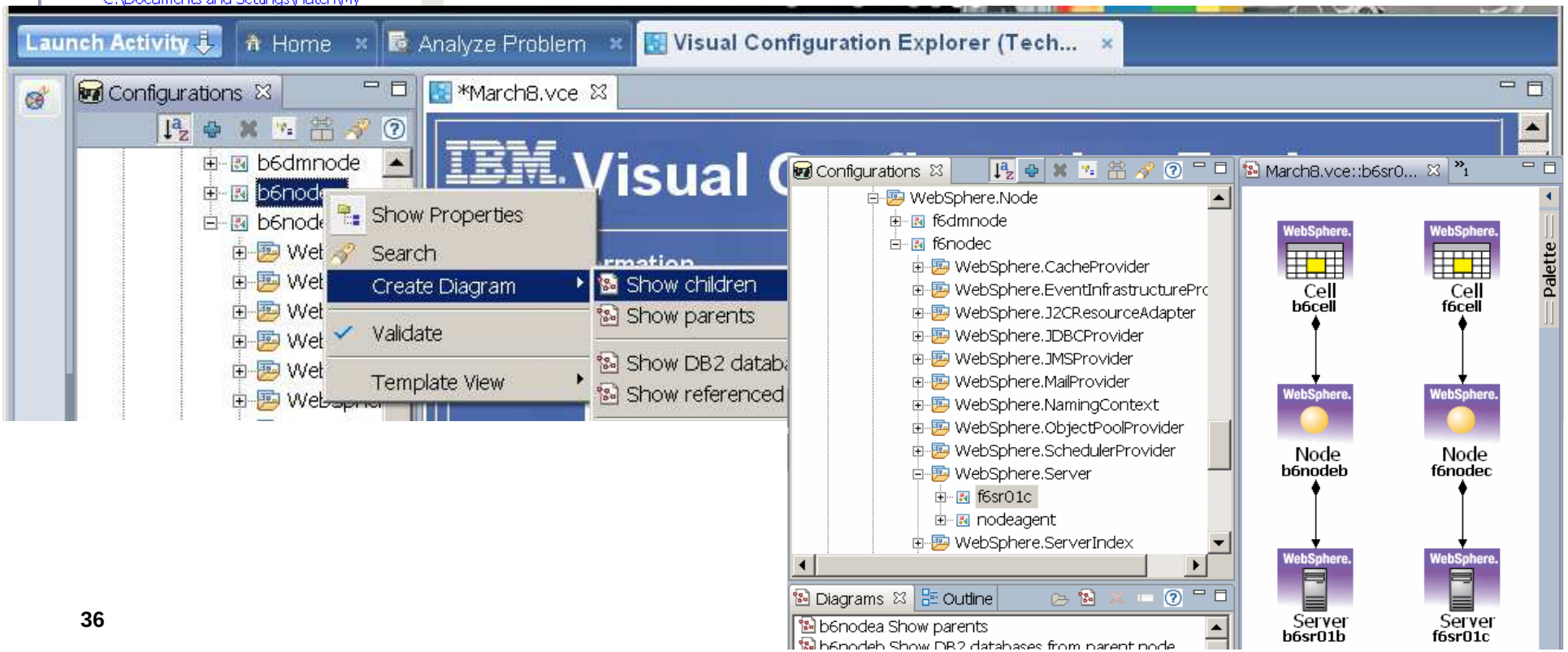
FTP the `wasexport.xml` configuration file to your workstation and re-name it.

VCE Quick Start

- Create Workspace
- Add Configuration(s)
- Create New Diagram
- Drag objects to diagram
- Show Parents or Children

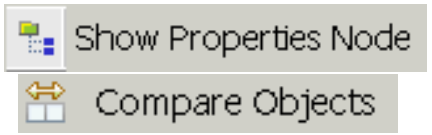
Add Configuration tool

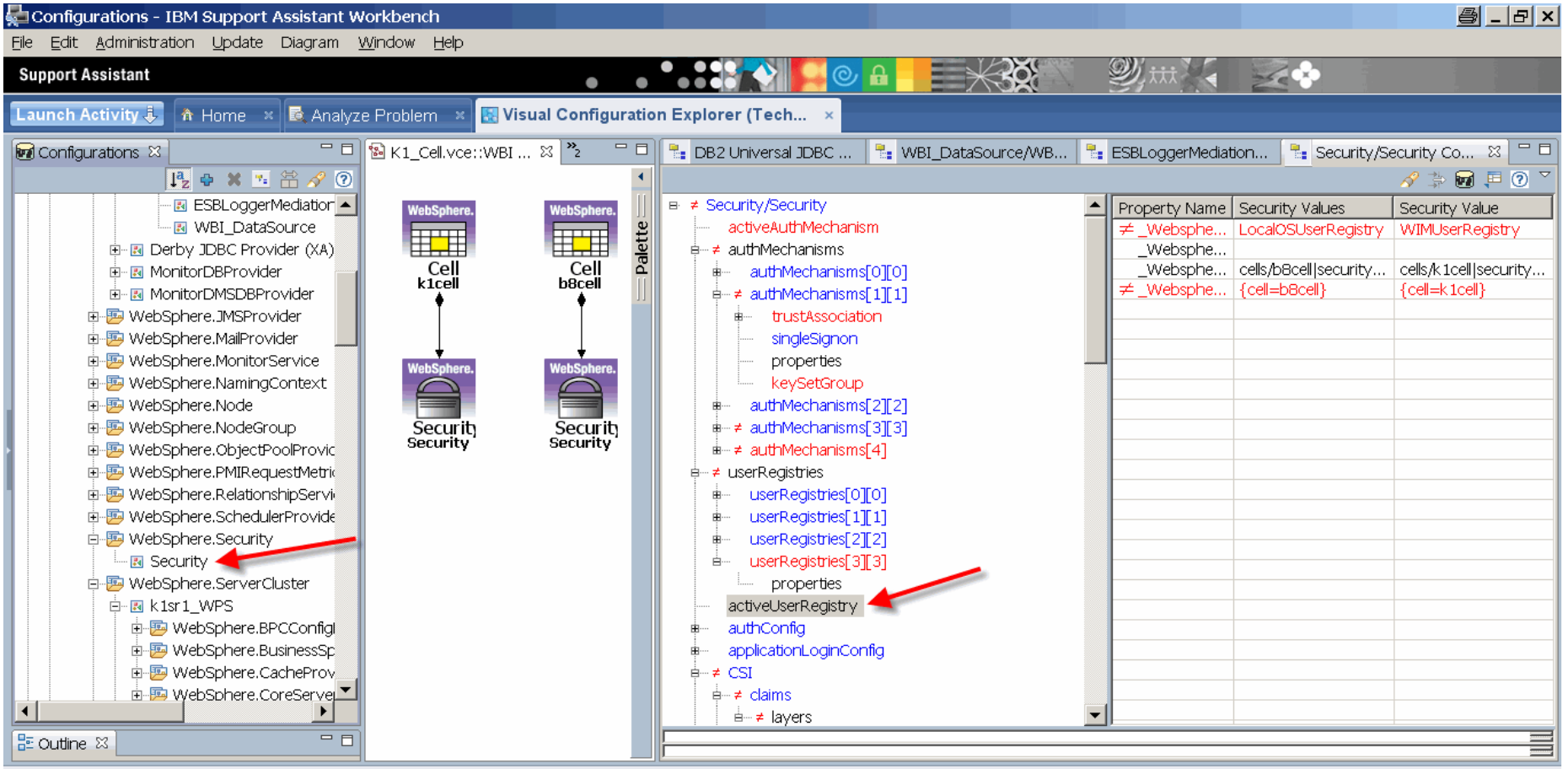
New Diagram tool



Comparing Object Properties

- Right-Click on “Show Properties Node”
- Right-Click on “Compare Objects”





Appendix

- **Installing the ISA**
- **Other Diagnostic Tools for WebSphere on z/OS**
  - MVS Modify (F) commands
- **Working with Dumps & Traces**
  - Triggering dumps & Traces
  - Extracting system dumps for ISA tools
- **Testing Tools & Sample Applications**
- **Documentation, Help & Web Resources**

Installing the IBM Support Assistant (ISA)

- Download & Install ISA
  - http://www.ibm.com/software/support/isa/
  - See IEA (IBM Education Assistant) for tutorials:
    - http://publib.boulder.ibm.com/infocenter/ieduasst/v1r1m0/index.jsp?topic=/com.ibm.iea.selfassist/selfassist/ISAv41_Task.html
  - Install Product Add-ons: (100's)
    - ISA: Update > Find New… > Tools Add-ons
    - http://www.ibm.com/support/docview.wss?uid=swg27013279

Other Diagnostic Tools for WebSphere

- WebSphere “built-in” tools (See InfoCenter)
  - Display server - MVS Modify commands
  - Trace Dynamically - MVS Modify (F) commands
  - Performance Monitor (PMI) & Viewer
  - threadmonitor (WAS V7)
  - dumpNameSpace
  - wsadmin
  - ISC
- Other:
  - JinsightLive for IBM System z
    http://www.alphaworks.ibm.com/tech/jinsightlive

The all-powerful MVS Modify command

F <server_name>,HELP

- TRACEALL - Set overall trace level
- TRACEBASIC - Set basic trace components
- TRACEDETAIL - Set detailed trace components
- TRACESPECIFIC - Set specific trace points
- TRACEINIT - Reset to initial trace settings
- TRACENONE - Turn off all tracing
- JAVACORE - Generate jvm core dump
- HEAPDUMP - Generate jvm heap dump
- JAVATDUMP - Generate jvm tdump
- TRACEJAVA - Set java trace options

F <server_name>,DISPLAY,HELP

- LISTENERS - Display listeners
- CONNECTIONS - Display connection information
- TRACE - Display information about trace settings
- JVMHEAP - Display jvm heap statistics
- WORK - Display work elements
- ERRLOG - Display the last 10 entries in the error log
- THREADS - Display thread status

Working with Dumps

- Java Dumps > /var/home/… MVS console commands
  - **Heap**: MVS command: `F <server_name>,HEAPDUMP`
  - **Core**: `F <server_name>,JAVACORE`
  - JVM **TDUMP**: `F <server_name>,JAVATDUMP`

  Heapdumps (and javacore) written to home dir
  `(Default = /var/WebSphere/home/cell/<servant Group ID>`
- WebSphere ABEND dumps >/var/home/…
- SYSABEND & CEE Dumps > JES SPOOL
- SVC Dumps, ABEND Dumps > SYS1.DUMP.Dyy
  - Setup Dump Options:

    ```
    CD SET,SDUMP=(RGN)
    D DUMP,O
       SDUMP- ADD OPTIONS (LSQA,RGN,TRT)
    ```
  - MVS Dump console command:

    ```
    Dump COMM='title'
    R nn,jobname=H7SR01AS
    ```

`jextract` - Convert SVC dump for Dump Analyzer

- jextract is shipped with the IBM JVM in the ../java/bin/ directory
- Point directly to the Dump dataset:

```
/shared/zWebSphere/V7R0/java64/J6.0_64/bin/jextract SYS1.DUMP.D091014.T102814.SYSB.S00003
Loading dump file...
Read memory image from SYS1.DUMP.D091014.T102814.SYSB.S00003
Set debug scratch space size to 8 MB
VM set to 000000080B178548
Dumping JExtract file to SYS1.DUMP.D091014.T102814.SYSB.S00003.xml
<!-- extracting gpf state --> <!-- 5ms -->
<!-- extracting host network data --> <!-- 9ms -->
<!-- extracting classes --> <!-- 183200ms -->
<!-- extracting monitors --> ..<!-- 188234ms -->
<!-- extracting threads --> .<!-- 195727ms -->
<!-- extracting trace buffers --> <!-- 195740ms -->
<!-- extracting roots -->.<!-- 199500ms -->
<!-- extracting objects --> .<!-- 268266ms -->
Finished writing jextract XML file in 268268ms
Warning: found 14 inconsistencies in the dump file. Further information has been written to the jextract XML
    file
Creating archive file: SYS1.DUMP.D091014.T102814.SYSB.S00003.zip
Adding "SYS1.DUMP.D091014.T102814.SYSB.S00003"
Adding "SYS1.DUMP.D091014.T102814.SYSB.S00003.xml"
Adding "/shared/zWebSphere/V7R0/java64/J6.0_64/lib/TraceFormat.dat"
Adding "/shared/zWebSphere/V7R0/java64/J6.0_64/lib/J9TraceFormat.dat"
jextract complete..
```

- FTP the resulting .zip file to your workstation.
- May have to specify these arguments:

```
export J9DBGEXT_SCRATCH_SIZE=8
jextract  -J-DJavaio.tmpdir=/u/hutch/largezfs-Xmx1024 SYS1.DUMP.D091014.
```

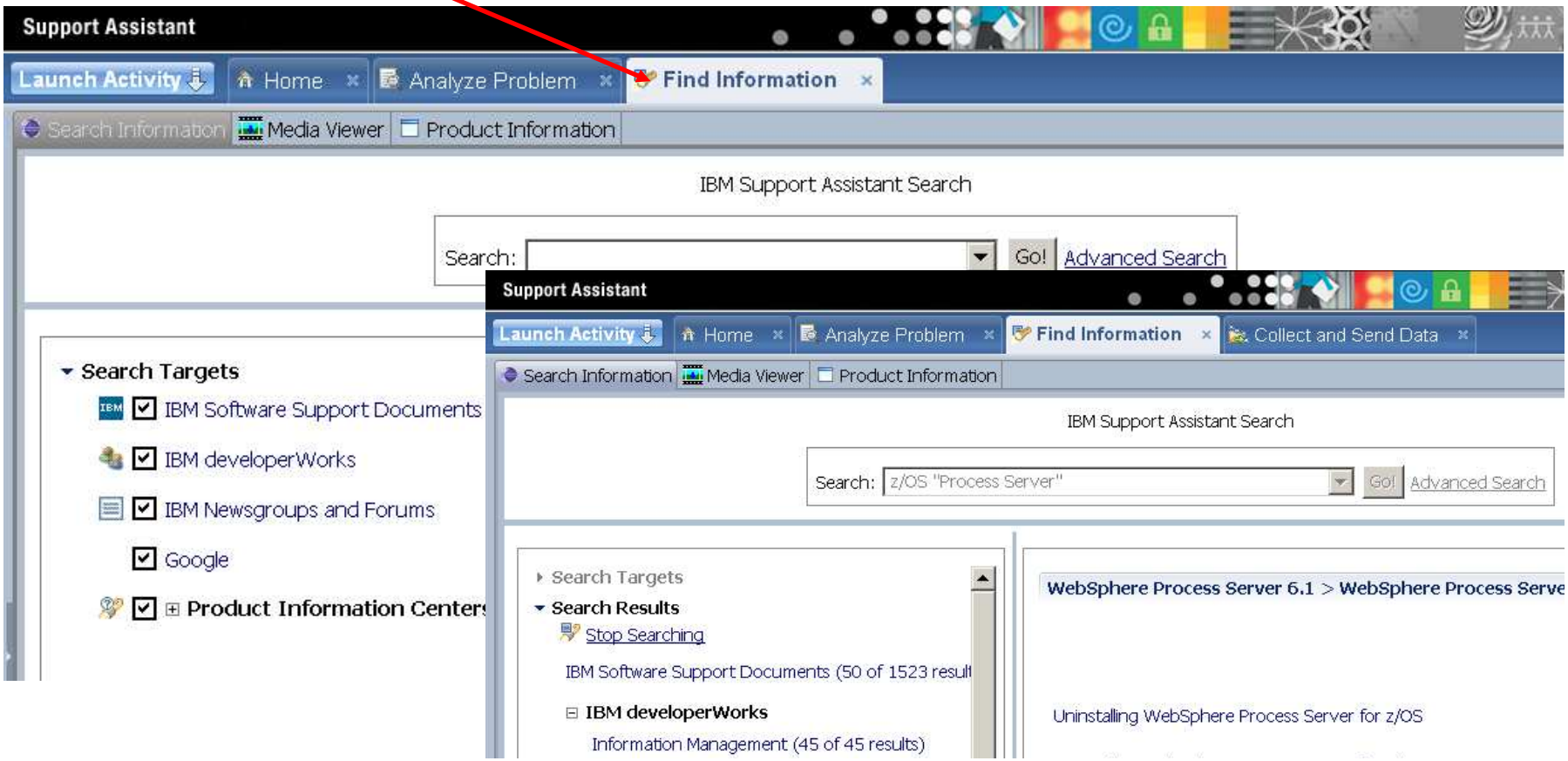
`jdmpview` - Replaced by the ISA Dump Analyzer or Memory Analyzer?

Testing Tools

- Load Drivers
  - JMeter
  - Microsoft ™ Web Application Stress Tool
  - LoadRunner, Silk, …
- Sample Applications
  - Techdoc WP101612 “Getting started with analysis of GC, Heapdumps and Javacores For WebSphere on z/OS”
    - PD Application Tools: causeOutOfMemory, Sleeper

ISA Built-in Documentation (local eclipse):

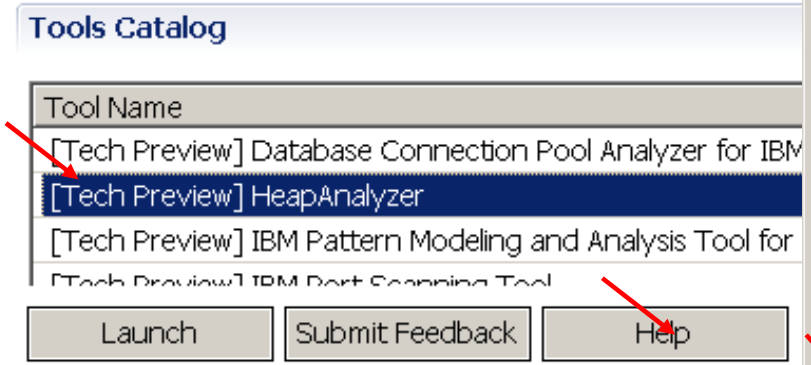
“Find Information” - Search

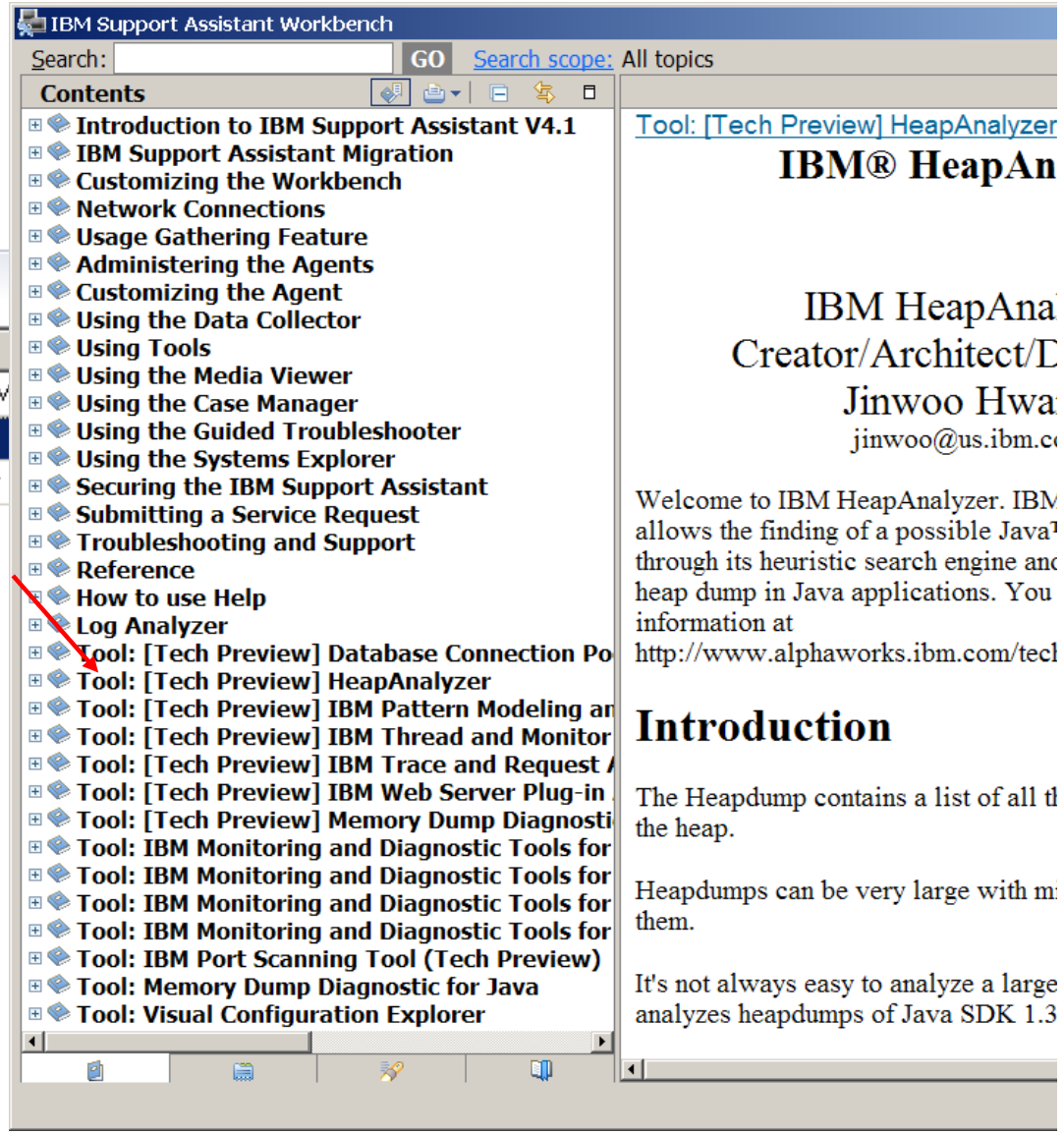


ISA Help

http://localhost:1260/help/index.jsp

- Highlight a tool
  (e.g., HeapAnalyzer)
- Click on the “Help” tab:





ISA Resources

ISA website:

www.ibm.com/support/docview.wss?rs=3455&uid=swg27012682

www.ibm.com/support/docview.wss?rs=3455&context=SSLLVC&q1=vce&uid=swg27013116

ISA Download website www.ibm.com/software/support/isa/download.html

ISA V4.1.1 ReadMe www.ibm.com/support/docview.wss?uid=swg27016886

IBM Support Assistant Team www.ibm.com/software/support/isa

ISA Forum www.ibm.com/developerworks/forums/forum.jspa?forumID=935

Comments/feedback to: IBMSA@us.ibm.com

IBM Education Assistant (IEA) tutorials:

publib.boulder.ibm.com/infocenter/ieduasst/v1r1m0/index.jsp?topic=/com.ibm.iea.selfassist/selfassist/ISAv41_Task.html

IBM Diagnostics Guides www.ibm.com/developerworks/java/jdk/diagnosis/index.html

IBM Techdocs at www.ibm.com/support/techdocs: WP101575 & WP101612