Debug 101-Using ISA Tools for Apps in WebSphere Application Server z/OS

Session 17363
Mike Stephen - msteff@us.ibm.com
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Intro to ISA V5
Modes of Support Interaction

- Product or System self-healing
- Client Self-assist using electronic means
- Interact with IBM Support through electronic means
- Standard “phone” support
- Accelerated Value Program
- Critical Situations – “SWAT” teams
- Special IBM Services Engagements

Complete your session evaluations online at www.SHARE.org/Orlando-Eval
Key Components of the Serviceability Strategy

- **Serviceability Framework / Delivery Platforms**
  - Web-based eSupport resources, Support Portal, **IBM Support Assistant (ISA), ISA Data Collector**, Fix Central, Archive Explorer, …

- **Knowledge and Education**
  - Technotes, Knowledge Engineering, IBM Education Assistant, WAS Support Technical Exchange, dW Answers, Problem Determination Courses, …

- **Problem Determination Tools**
  - Java Health Center, Memory Analyzer, Automated Analysis, Cross-component Trace Viewer, Trace and Request Analyzer, WebSphere Config Visualizer, …

- **Serviceability features in the product**
  - Log/trace, FFDC, hung thread detection, serviceability defect process, …

- **Metrics and PMR Causal Analysis**
  - RETAIN statistics, OPC, Aged PMR reviews, SWAT debriefs, ad-hoc PMR reviews, …

Many deliverables are the result of collaboration between many different teams – they are all discussed here without regard to origin.
Some Notes about Problem Determination Tools

- **The development of Problem Determination tools within IBM is not centralized**
  - Various product teams, support teams and individuals create their own tools
  - The Serviceability Tools Team coordinates these various offerings and manages the platform
  - Trying to centralize as many tools as possible in IBM Support Assistant or integrated in a Product

- **Sometimes there will be several tools with overlapping functions**
  - Various individuals may have their preferences for one tool over another
  - The Serviceability Tools Team will help clarify and designate the tool(s) that are officially “preferred” by IBM for its Clients

- **Tools evolve over time**
  - Today’s “best-of-breed” tool may be replaced by an even better one someday
  - The Serviceability Tools Team manages the orderly deprecation and withdrawal of older tools when appropriate

- **The current strategic push is towards server-based tools**
  - To facilitate deployment in cloud-type environments, such as IBM Support Assistant 5.0
IBM Support Assistant 5

- **What is IBM Support Assistant 5?**
  - Application targeted toward users responsible for diagnostics and root cause analysis
  - A long-range strategy to produce a **collaborative problem determination platform**
  - A **convergence** and **next generation** of several tools

- **Benefit Focus areas**
  - **Cost avoidance** through reduction in time to resolution and PMR avoidance
  - **Saves time** installing/updating client software: click “refresh” to get the latest version
  - **Saves time, ensures completeness and consistency** when trudging through large volumes of diagnostic data to find that “needle in a haystack”
  - **Saves desktop resources** by off-loading heavyweight tools to shared servers
  - **Saves time** communicating with customers and collaborating between Support Engineers
IBM Support Assistant 5.0 – Deployment options

**Team Server**
- Single install
- Multiple end users
- Leverages resources of ISA server system
- Shared investigation

**Standalone**
- Single user
- Local install
- User administered

**Cloud (future?)**
- Zero install
- Multiple end users
- Leverages resources of ISA at ibm.com
- Shared investigation

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IBM Support Assistant 5.0 – Installation options

**Recommended**
- Managed install, uninstall and update
- Selective install of tools
- All-in-one solution – includes lightweight runtime

**Compressed zip**
- Easy startup
- Unzip and go
- All tools included
- No update capabilities

**Installation Manager**

- Small runtime (WAS 8.5 Liberty profile)

- ISA App
- Tools

**WebSphere Application Server at mycompany.com**

- EAR:
  - Deploy into existing Application Server
  - Tools deployed as JEE web modules

- ISA EAR
- Tool X WAR
Want ISA to run on z/OS?

▪ There is an RFE open
  

▪ Go and add comments and ‘vote’ for it

Description: Please add support for the ISA Team Server to run on z/OS

Use case: Currently have to load ISA Team server to a Linux or Windows server. Would like to run it on z/OS WebSphere server

A unique URL that you can bookmark and share with others.

You have not voted for any requests.

Vote

My votes

Voting rules:

▪ You can only vote once for an individual request.

▪ You cannot vote for requests that have a “Delivered” status.

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- **New Java8 Language Features**
  - Lambdas, virtual extension methods
- **IBM z13 exploitation**
  - Vector exploitation and other new instructions
  - Instruction scheduling
- **General throughput improvements**
  - Up-to 17% better application throughput
  - Significant improvements to ORB
- **Improved crypto performance for IBMJCE**
  - Block ciphering, secure hashing and public key
    - Up-to 4x improvement to Public Key using ECC
    - CPACF instructions: AES, 3DES, SHA1, SHA2, etc
- **Significantly improved application ramp-up**
  - Up-to 50% less CPU to ramp-up to steady-state
  - Improved perf of ahead-of-time compiled code
- **Improved Monitoring**
  - JMX beans for precise CPU-time monitoring
- **Enhancements to JZOS Toolkit for Java batch**

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WAS on z/OS – DayTrader

- Aggregate HW, SDK and WAS Improvement: WAS 6.1 (IBM Java 5) on z9 to WAS 8.5 (IBM Java 7R1) on zEC12

6.6x aggregate hardware and software improvement comparing WAS 6.1 IBM Java5 on z9 to WAS 8.5.5.2 IBM Java7R1 on zEC12

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8/9/2015 (Controlled measurement environment, results may vary)
Java Monitoring and Diagnostic Tooling
Health Center - Installation

• The tool is provided in two parts:
  – An Agent that collects data from a running application
  – An Eclipse-based client that connects to the agent

• The Agent ships with the following vm’s:
  – Java 5sr9 and upwards
  – Java 6sr3 and upwards

• The latest version of the agent is always available from within the Health Center Client
  – Recommended to always update to the latest version of the agent
  – Agent package unzips over the jre directory of the JVM you are using
Java Monitoring and Diagnostic Tooling
Health Center - Enable for Monitoring

- Full instructions are provided within the help shipped with the Health Center Client but in most cases as simple as:

For Java 5 SR10 and later or Java 6 SR5 and later, including Java 7 (can be used in production)
   java –Xhealthcenter HelloWorld

For Java 5 SR9 and earlier, or Java 6 SR4 and earlier (not recommended for use in a production environment)
   java –agentlib:healthcenter –Xtrace:output=healthcenter.out HelloWorld
Java Monitoring and Diagnostic Tooling
Health Center – Advanced Options

• Headless mode for data collection without connecting the GUI
  – Useful for scenarios where firewall blocks connection
  – Configurable to limit disk space used
  – Timed collections
  – Interval based collections
  – Started with
    -Xhealthcenter:level=headless

• Late attach enabled
Java Monitoring and Diagnostic Tooling
Garbage Collector and Memory Visualizer (GCMV)

- Views of GCMV
Java Monitoring and Diagnostic Tooling
Garbage Collector and Memory Visualizer (GCMV)

Graphical Display of Data
• Allows graphing of all available data: pause times, heap size etc
• Allows zoom, cropping and change of axes value and units
• Allows comparison of multiple files

Tuning recommendation

Graphical Display of Data

Analysis and Recommendations
• Provides tuning recommendations based on data and flags errors.
• Analysis can be limited using cropping.
• Values and units used in analysis can be changed by changing axes values and units
Overview:
- Overview of the heapdump including size and total number of objects.
- Provides links to continued analysis

Path to GC Roots:
- Provides the reference chain that prevents an object being garbage collected

Dominator Tree grouped by Class Loader:
- Lists the biggest objects using a “keep alive tree” Grouping by Class
- Loader limits the analysis to a single application in a JEE environment

at www.SHARE.org/Orlando-Eval
Javacore

- Like a “CEEDUMP” for Java
- Generated automatically when JVM exits unexpectedly
- Can be triggered (-Xdump:java)
- Captures JVM configuration and high-level runtime states

- Failure reason (GPF, OOM, etc)
  
  **1TICHARSET** IBM-1047
  **1TISIGINFO** Dump Event "gpf" (00002000) received
  **1TIDATETIME** Date: 2015/02/15 at 07:42:09
Javacore

- Environment information
  - Java version
  - Command line
  - Environment variables
- Memory information (heap and VM/JIT)
- Threads Stacks
- Classes loaded

https://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101612
JIT Verbose Log

- Useful if you suspect a JIT failure while compiling bytecodes to native code.
- `-Xjit:verbose` will show the methods compiled and at what optimization level
  - `+(hot) java/lang/Math.max(II)I @ 0x10C11DA4-0x10C11DDD`
- Determine which methods the JIT considers frequently executed
- To exclude methods due to JIT failures:
  - `-Xjit:exclude={java/lang/Math/*}`

http://www-01.ibm.com/support/docview.wss?uid=swg21294023
Contact Information

Need support or have questions about Team Server?

Visit our forum:

IBM Support Assistant web page
http://www.ibm.com/software/support/isa

Previous SHARE presentation
Anaheim 2014 Session 14709
Need a Support Assistant? Check Out IBM's - ISA
http://www.share.org/p/do/sd/topic=62&sid=9647
Live in ISA 5
(cross fingers here)

WebSphere Application Server Configuration Visualizer

MAT - Memory Analyzer Tool

Health Center