Eclipse Memory Analyzer
Graduation, Move and 1.0 Release Review

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Community Channel:
• mailto:mat-dev@eclipse.org

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Introduction

- Memory Analyzer is a tool for heap dump analysis, which helps in analyzing memory leaks and high memory consumption of Java applications. It works fine with multi-million objects heap dumps and can quickly point to the suspicious objects and who is retaining them in the heap.
- Memory Analyzer is sub-project under the Technology TLP since 2008
  - http://www.eclipse.org/mat
- It was part of the Galileo simultaneous release and is preparing to be part of Helios
Communities

• Contributors and committers
  – 5 committers – 4 from SAP, 1 from IBM
  – Small number of non-committer contributions done via Bugzilla

• Adopters
  – Integrated into SAP NetWeaver CE
  – Integrated into IBM Support Assistant
  – Used as RAP example at several conferences
  – Some additional query and parser plugins are being written as shown by questions on the forum

• Users
  – The standalone RCP application has about 1000 downloads per week over the last year (over 70,000 since the beginning)
  – Part of Galileo update site (downloads not counted)
  – Forums (429 messages in 134 topics) and Bugzilla used as communication channel
Communities – Public Presence

- Eclipse Webinar (May 2008)
- Presentations at Conferences
  - Eclipse Con (2008)
  - Eclipse Summit Europe (2008, 2009)
  - JavaOne (2008, 2009)
  - JAX (2008, 2009)
  - Eclipse Demo Camp Walldorf (May 2009)
  - TheServerSide Java Symposium (October 2009)
  - More ...

Open Source Operation

• After the initial contribution by SAP (2008) the development is ongoing in the Memory Analyzer incubator project under the Technology project

• With the joining of Andrew Johnson (IBM) the team has gone to a more open development process
  – features/changes discussed in Bugzilla (product MAT)
  – announcements and discussion on the mat-dev mailing list
  – user interaction mainly via the Memory Analyzer Eclipse forum

• The project maintains a wiki:
IP Issues

- All plugins contain appropriate license files
- All committers have completed Eclipse Committer Agreements and have been approved by the PMC
- All non-committer contributions are properly marked in Bugzilla
- Approved IP Log available at:
  [http://www.eclipse.org/mat/1.0/Approved_IP_Log.pdf](http://www.eclipse.org/mat/1.0/Approved_IP_Log.pdf), Bug 299253
After graduation the Memory Analyzer project will move from Technology to Tools top-level project

Repositories
- /cvsroot/org.eclipse/www/mat – no change needed
- /svnroot/technology/org.eclipse.mat – should be move/renamed to /svnroot/tools/org.eclipse.mat

CQs
- 3794 | DTFJ: Subject to distribution under this license and no other, any version
  International License Agreement for Non-Warranted Programs | works with
- 3854 | vm.jar from IBM VMs Version: IBM Java 6 | International License Agreement for Non-Warranted Programs | works with

Committers
- No new committers are expected. All current committers should be moved

Web Pages
- Eclipse projects list page has to be updated
  http://eclipse.org/projects/listofprojects.php
Move (page 2/2)

• Bugzilla Products
  – Product: MAT - no change needed
• Newsgroups
  – No change needed
• Mailing Lists
  – mat-dev{at}eclipse.org - No change needed
• Builds
  – The project will need to update its build jobs on the Hudson at build.eclipse.org
Features

- Report memory leak suspects
- Report memory waste – redundant Strings, empty collections
- Calculate retained sizes
- Find who is keeping objects alive
- Query heap with an SQL-like language
- Works with multi GB heap dumps
- Supports various dump formats, e.g. HPROF binary dumps, IBM PHD and system dumps (via IBM’s Diagnostic Tooling Framework for Java)
- Thread stack Information + Java locals
  - Trigger heap dumps from within the tool
  - Compare any two or more table-formatted results
Non-Code Aspects

- Documentation is generated using DITA
  - provided via the help center
- Online documentation via
  - WIKI http://wiki.eclipse.org/index.php/MemoryAnalyzer
  - Webinar http://live.eclipse.org/node/520
  - Blog http://dev.eclipse.org/blogs/memoryanalyzer
- Cheat sheets

Summary: a wealth of material is available, but often brief and not easily accessible to non-domain experts.
The Memory Analyzer provides two major interfaces:

a) The **Snapshot API** provides access to the logical object graph inside the heap. It enables inspections that analyze collections, identify leak suspects etc.

b) The **Parser API** makes reading the raw heap dump format pluggable.

APIs conform with Eclipse Quality Standards.

- **NetWeaver Sessions** (from SAP)
- **Leak suspects, Collections, ...**
- **Snapshot API**
  - (org.eclipse.mat.snapshot.*)
- **Parser API**
  - (org.eclipse.mat.parser.*)
- **HPROF**
  - (org.eclipse.mat.hprof.*)
- **DTFJ Adapter**
  - (org.eclipse.mat.dtfj.*)
- **DTFJ Impl** (PHD, javacore, system dumps)

**MAT © Eclipse.Org**

**Known 3rd Party Extensions**
Architectural Issues

Summary: Architecture is settled and performs well on multi-GB heap dumps
Tool Usability

• The Memory Analyzer tool is very helpful for troubleshooting of OutOfMemoryErrors. It can be also used proactively to analyze and reduce memory consumption.

• The tool provides rich and responsive UI.

• The sheer number of heap inspections can be overwhelming for a novice user.
End-Of-Life

• This is the first release after graduation. No feature is removed

• Changes to the API are documented in bug 299371: MAT API changes for 1.0
  https://bugs.eclipse.org/bugs/show_bug.cgi?id=299371
 BUGZILLA

• Messages statistics
  – Total 152
  • Open 40
  • Closed 112

• Bugzilla used for discussions on new features / modifications

• No major defects open for 1.0
Standards

MAT requires

- Execution Environment **J2SE-1.5**
- **Eclipse Platform 3.4** or higher
- **BIRT Chart Runtime 2.2.0** or higher
UI Usability

- Follow User Interface Guidelines
- Multi-language support
  - UI Strings are externalized via Eclipse NLS
  - Memory Analyzer is part of Babel
- Accessibility was not systematically tested
  - Several fixes for better keyboard support (bug 300655)
Schedule

• Release 1.0.0 (May 2010)
  – Join the Helios release
  – Trigger heap dumps from MAT
  – Comparison of multiple table results

• Release 1.0.1 (TBD)
  – Bugfixes for 1.0.0

• Release 1.1.0 (TBD)
  – Improve comparison features
  – Research analysis techniques based on comparison
  – Provide code samples for MAT queries
Project Plan

Available at

Future Themes

• Research / provide comparison based analysis
• Detect more anti-patterns (e.g. leaks in WeakHashMap where values reference the keys)
• Closer integration into the IDE
• Research possible integration of memory analysis within system tests