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S313337
Advanced Monitoring and Troubleshooting with VisualVM

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Agenda

- VisualVM – a brief overview
- Bringing in extensions
- Powerusers' tips & tricks
- Wrap up

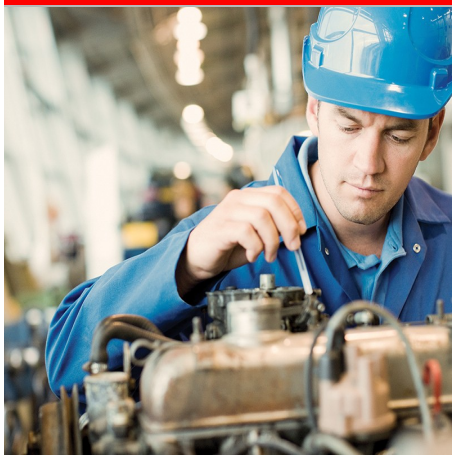
What Is VisualVM?

- Unified access to a bunch of monitoring tools already available in JDK
  - **jps**, **jstat**, **jmap**, **jstack** and **jhat**
- Built on top of NetBeans Platform (RCP)
- Open source project started in 2008
  - http://visualvm.dev.java.net
- Included in Sun JDK distribution since 1.6.0_7
  - the name is **jvisualvm**
  - see https://visualvm.dev.java.net/releases.html for mapping between the tool version and jdk version
- Latest version 1.3.1 (just released)

Built-in Capabilities

- Auto-discovery of JVMs
  - local
  - remote over **jstatd**
- Remote JVMs over **JMX**
- Application args, JVM flags, System properties
- Basic JVM telemetry (CPU, Memory, Threading)
- Generating thread/heap dump (even remotely)
- Application profiling
  - instrumented
  - sampled (*since 1.3*)

Demo



Extensibility

- Modular application built on NetBeans Platform (RCP)
- Cleanly defined APIs
  - datasources
  - views
  - applications
  - preferences
- Plugin center
  - VisualVM 1.3 - 23 tested and verified plugins for
  - any 3rd party plugin center can be added (eg. BTrace)
- Developer starting point
  https://visualvm.dev.java.net/api-quickstart.html

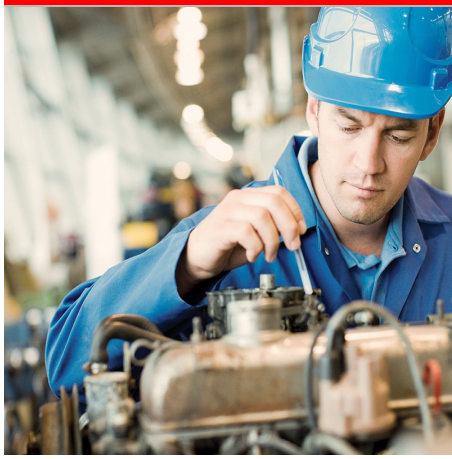
Extensibility: Plugins

- MBeans
  - visual mbeans browser
- Visual GC
- Extensions
  - updates for new JVMs etc.
- Security
  - setting up keystore for SSL
- JConsole
  - JConsole plugins wrapper

Extensibility: Plugins !NEW!

- Threads Inspector
  - enhancing thread behavior analysis
- Tracer
  - displaying various metrics in co-related timeline
  - easily extensible by custom probes
  - readily available probes for
    - Swing: paints, updates, layouts etc.
    - JavaFX: pulses, events etc.
    - JVM internals: JIT, GC etc.
    - jvmstat perf counters
  - not depending on the underlying technology

Demo



Tips and Tricks

- Remote access to **JVM**
- Monitoring JVMs running as Windows services
- Unleashing the power of OQL

Remote Access to JVM

- Run **jstatd**
  - jstatd = remote proxy for jvmstat
- Enable JMX support

Running jstatd

- jstatd tool available in JDK
- Needs security policy in place
  - defined by system property **java.security.policy**
    - Policy file – allow all

```
grant codebase "file:${java.home}/../lib/tools.jar" {
    permission java.security.AllPermission;
};
```

    - Do not forget to customize the permissions
- RMI server host name
  - defined by system property **java.rmi.server.hostname**
  - Necessary for applications on Ubuntu

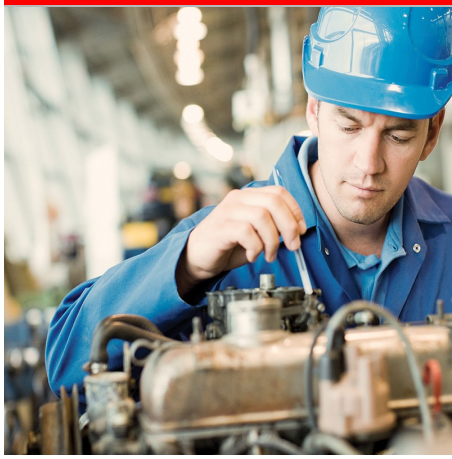
Remote JVM – JMX Setup

- Specify system properties for the application
  - **com.sun.management.jmxremote.port**=<port>
  - **com.sun.management.jmxremote.authenticate**=true/false
  - **com.sun.management.jmxremote.ssl**=true/false
    - value “false” not recommended for production
    - needs more configuration when turned on
  - **java.rmi.server.hostname**=<host name>
    - necessary for applications on Ubuntu

Remote JVM – JMX over SSL

- Generate keystore
  - keytool -genkey -keystore mySrvKeystore -keyalg RSA
- System properties for VisualVM
  - javax.net.ssl.keyStore
  - javax.net.ssl.keyStorePassword
- System properties for application
  - javax.net.ssl.trustStore
  - javax.net.ssl.trustStorePassword

Demo



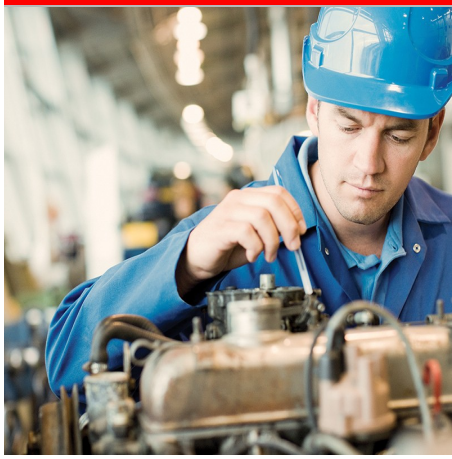
Monitoring JVMs running as Windows services

- Run VisualVM or jstatd as Windows service
  - *instsrv.exe* and *srvany.exe* from eg. **Windows Server 2003 Resource Kit Tools**
  - modify registry to add the declared service
  - use “Local System” account
  - enable **Allow service to interact with desktop**
- Step-by-step guide available
  - http://blogs.sun.com/nbprofiler/entry/monitoring_java_proc...

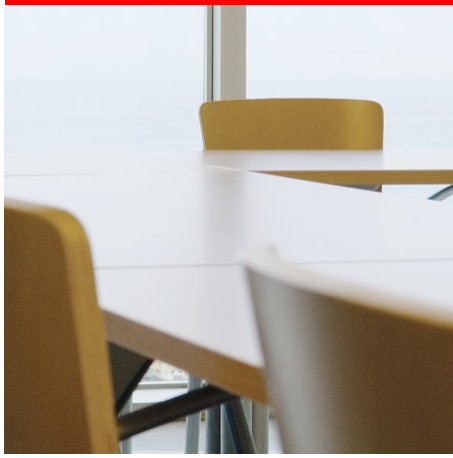
Analyzing Heap with OQL

- OQL = **O**bject **Q**uery **L**anguage
- *select s from java.lang.String s where s.count > 0*
- Not a standardized language – using jHat dialect
  - JavaScript based engine
    - can be extended by custom JavaScript functions
  - provides many extensions for heap analysis
    - https://visualvm.dev.java.net/oqlhelp.html
- VisualVM adds
  - syntax highlighting
  - query persistence
  - integration with heap walker

Demo



Wrap Up



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