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BTrace: Java™ Platform Observability by Bytecode Instrumentation

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Learn how to dynamically trace/observe running Java applications (JDK6+) using BTrace.

GOAL

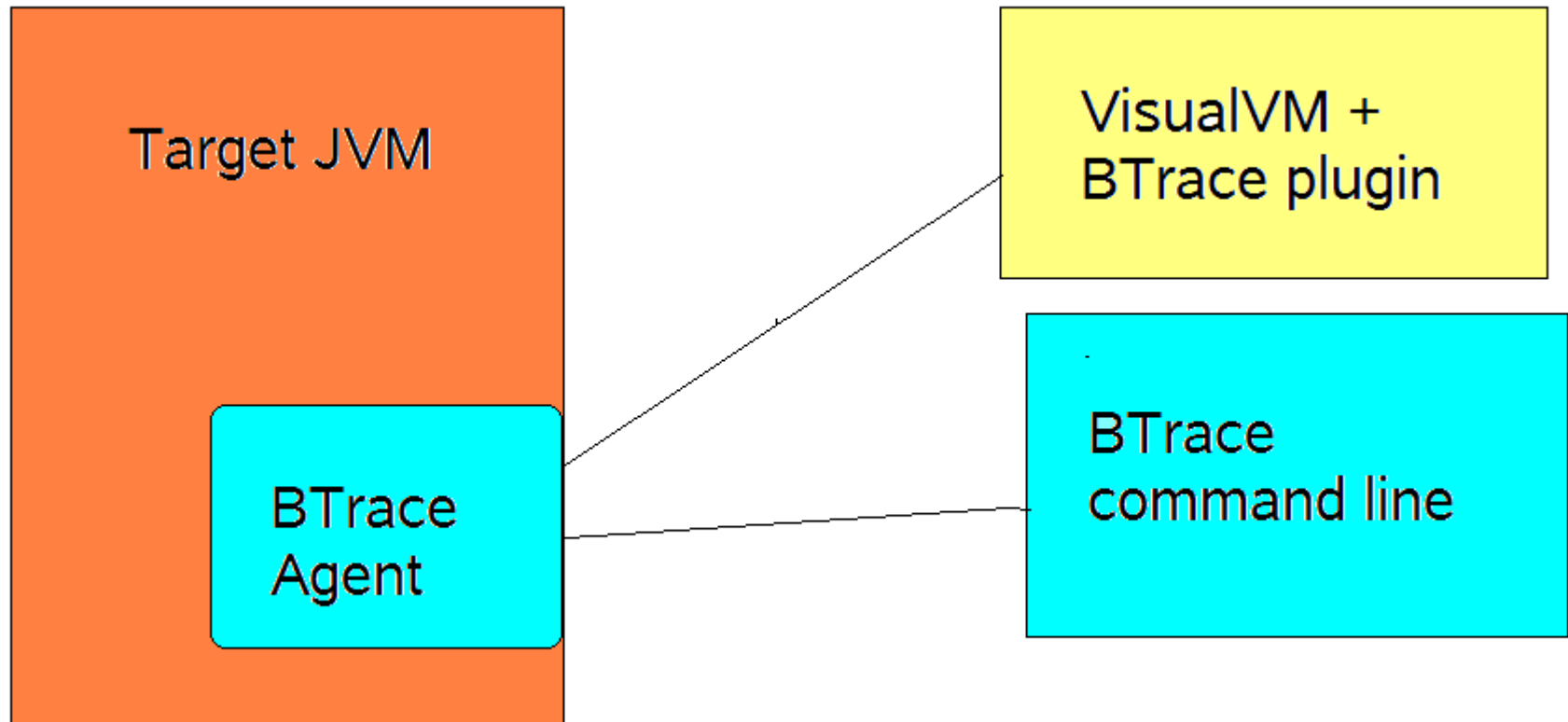
Agenda

- What is BTrace?
- Probes, Actions
- Trace Class
- “Hello World”
- Demo
- DTrace Integration
- Summary
- Related Sessions
- Q & A

What is BTrace?

- Dynamic tracing tool for Java applications
- Safe tracing tool
 - Observe, don't “disturb”
 - Read, but not “write”
 - Bounded tracing actions (no loops etc.)
- Platform independent
 - Works by bytecode instrumentation using ObjectWeb ASM
- Integration with DTrace on OpenSolaris
 - “whole-stack-tracing” possible
- Open source project - <http://btrace.dev.java.net>
- GPLv2 + CLASSPATH Exception
- VisualVM plugin and development-time plugin

What is BTrace? (contd.)



Probes and Actions

- **Probe – location or event in the target application's code**
 - Method entry/exit
 - Exception return from a method
 - Line number
 - Field set/get
 - Method call/return (within specified method(s))
 - Exception throw (before)
 - Synchronization entry/exit
 - Timer
- **Statements executed on probe “fire”**
 - Static methods in trace class
 - Only a “safe” subset of Java allowed inside tracing methods
 - Mostly method calls into BTraceUtils class.

Trace Class

- Annotations in “com.sun.btrace.annotations”
- @BTrace – flags btrace class
- Probe point annotations
 - @OnMethod
 - @OnTimer
 - @OnEvent – event sent by btrace client
 - @OnExit – exiting btrace client
 - @OnError – exception from trace method
 - @OnLowMemory – low memory threshold on specific mem pool
- Probe action methods
 - Public static methods
 - Static fields for trace state
 - Field annotations @TLS, @Export

“Hello World”

```
import com.sun.btrace.annotations.*;
import static com.sun.btrace.BTraceUtils.*;
import java.io.File;

// every time new File(String) is called, print the file name
@BTrace
public class HelloBTrace {
    @OnMethod(
        clazz="java.io.File", method="<init>"
    )
    public static void onNewFile(File self, String name) {
        print("new file ");
        println(name);
    }
}
```


“Hello World” (contd.)

- Start target application

```
java -jar java2demo.jar
```

- Find the process id using “jps”

```
jps
```

- Start btrace client tool

```
btrace <pid> HelloBTrace.java
```

Demo

A large, light blue arrow pointing to the right, positioned behind the word "DEMO".

DEMO

DTrace Integration

- @DTrace and @DTraceRef annotations
 - Run inline/file D-script whenever a specific BTrace script is run
- Raise a DTrace USDT probe from BTrace action method
 - DTraceProbe method in BTraceUtils class.
 - Raises “btrace<pid>:::event” probe in D-script.
- More integration expected with JDK 7.

Summary

- BTrace – safe, dynamic tracing tool for Java
- <http://btrace.dev.java.net> - please join and contribute
- More integration with DTrace (JDK 7+) - better JUSDT integration
- VisualVM (<http://visualvm.dev.java.net>) plugin

Related Sessions

- TS-5716
 - D-I-Y (Diagnose-It-Yourself): Adaptive Monitoring for Sun Java™ Real-Time System
- TS-6000
 - Improving Application Performance with Monitoring and Profiling Tools
- LAB-9400
 - Exposing the Depth of Your JDK™ Release 7.0 Applications with Dynamic Tracing (DTrace)
- TS-6145
 - Using DTrace with Java™ Technology-Based Applications: Bridging the Observability Gap
- BOF-4994
 - End-to-End Tracing of Ajax/Java™ Technology-Based Applications, Using Dynamic Tracing (DTrace)
- BOF-5223
 - VisualVM: Integrated and Extensible Troubleshooting Tool for the Java™ Platform

THANK YOU



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