UML Model Execution via Code Generation

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Model Execution Use Cases

● Interactive debugging
● Automated testing

→ Integration with debug GUI

→ Performance
## Model execution times for processing 10,000 signals (ms)

<table>
<thead>
<tr>
<th>Technology</th>
<th>1000 instances</th>
<th>5000 instances</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Config-1</td>
<td>Config-2</td>
</tr>
<tr>
<td>Interpreter</td>
<td>11,436</td>
<td>7,687</td>
</tr>
<tr>
<td>Generated Java Code</td>
<td>496</td>
<td>354</td>
</tr>
<tr>
<td>JIT to Java</td>
<td>7,295</td>
<td>4,986</td>
</tr>
<tr>
<td>JIT to Bytecode</td>
<td>1,468</td>
<td>1,332</td>
</tr>
</tbody>
</table>
Architecture

EMF-UML2 model

Connection layer

Debug symbols

Generated Java code

Java bytecode

Java Debug Interface

Java Virtual Machine

Papyrus

Moka

Eclipse Debug Framework

Java bytecode

Java Virtual Machine

Eclipse Debug Interface

Connection layer

Debug symbols

Generated Java code

Java bytecode

Java Debug Interface

Java Virtual Machine

Papyrus

Moka

Eclipse Debug Framework

EMF-UML2 model
Animation and breakpoints

Generated Java, instrumented with breakpoints
## JDI Breakpoint Performance

<table>
<thead>
<tr>
<th>Breakpoints</th>
<th>10</th>
<th>100</th>
<th>1 000</th>
<th>10 000</th>
<th>20 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runtime of 100 hits (ms)</td>
<td>8.93</td>
<td>10.25</td>
<td>24.35</td>
<td>169.52</td>
<td>347.41</td>
</tr>
<tr>
<td>Set (ms)</td>
<td>~0</td>
<td>~0</td>
<td>112</td>
<td>1 602</td>
<td>4 965</td>
</tr>
<tr>
<td>Disable (ms)</td>
<td>~0</td>
<td>~0</td>
<td>66</td>
<td>1 750</td>
<td>5 753</td>
</tr>
</tbody>
</table>
User-initiated Termination

- **Terminate JVM?**
  - Cannot close resources, such as log files

- **Send “kill signal”?**
  - Platform specific

- **Communicate through debugger?**
  - Will not work in “run mode”

- **Start control thread and communicate via a socket**
Multiple Object Instances
Thank you!*  

Software:  
modelexecution.eltesoft.hu  

*What is the name of this font? :)