Code Coverage Tool For High Productivity Language – X10

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What is code coverage

- Measure of degree to which the source code of a program is tested by test suite.
- Categories:
  - Line/Statement coverage
  - Branch coverage
  - Method Coverage
# Example Code Coverage

## JaCoCo

<table>
<thead>
<tr>
<th>Element</th>
<th>Missed Instructions</th>
<th>Cov.</th>
<th>Missed Branches</th>
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<th>Missed</th>
<th>Lines</th>
<th>Missed</th>
<th>Methods</th>
<th>Missed</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image" alt="org.jacoco.agent.rt" /></td>
<td>80%</td>
<td><img src="image" alt="org.jacoco.agent.rt" /></td>
<td>86%</td>
<td>32</td>
<td>106</td>
<td>57</td>
<td>262</td>
<td>24</td>
<td>70</td>
<td>7</td>
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<td><img src="image" alt="org.jacoco.core" /></td>
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<td>99%</td>
<td>28</td>
<td>887</td>
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<td>2,087</td>
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<td>515</td>
<td>0</td>
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<td><img src="image" alt="jacoco-maven-plugin" /></td>
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<td><img src="image" alt="jacoco-maven-plugin" /></td>
<td>83%</td>
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<td>105</td>
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<td>136</td>
<td>4,317</td>
<td>52</td>
<td>1,108</td>
<td>7</td>
</tr>
</tbody>
</table>
```java
private String createSessionId() {
    String host;
    try {
        host = InetAddress.getLocalHost().getHostName();
    } catch (final Exception e) {
        // Also catch platform specific exceptions [like on Android] to
        // avoid bailing out here
        host = "unknownhost";
    }
    return host + "=" + AbstractRuntime.createRandomId();
}

// === TAgent Implementation ===

public String getVersion() { return DataCo.VER; }

public String getSessionId() {
    return data.getSessionId();
}

public void setSessionId(final String id) {
    data.setSessionId(id);
}

public void reset() {
    data.reset();
}

public byte[] getExecutionData(final boolean reset) {
    final ByteArrayOutputStream buffer = new ByteArrayOutputStream();
    try {
        final ExecutionDataStream dataStream = new ExecutionDataStream(buffer);
        data.collect(dataStream, reset);
    } catch (final IOException e) { // Must not happen with ByteArrayOutputStream
        throw new AssertionError();
    }
    return buffer.toByteArray();
}

public void dump(final boolean reset) throws IOException {
    output.writeExecutionData(reset);
}
```
X10

• Strongly typed, concurrent, imperative, object-oriented programming language designed for productivity and performance
• X10 runtime – Either deployed as native code in C++ or JVM bytecode by java
• Compile X10 to C++/Java
Problems

- No existing tool for X10
- Usage of existing tools on C++ and Java on generated code is not productive due to massive expansion of source code
- X10 specific features (asynchronous/remote tasks) might not work on existing tools
Hello World

• X10 Hello world code

```java
import x10.io.Console;

public class hello_world {
    public static def main(args: Array[String]) {
        // TODO auto-generated stub

        Console.OUT.println("Hello World!");
    }
}
```
Hello World in Java

```java
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, World!");
    }
}
```
False Negatives on Existing Tools

• Problem with X10 runtime libraries

HelloWorld.java
Plan

• Leverage the existing Java tool, JaCoCo
• Map the output back to X10 code
• Optimize the result, reduce the amount of incompatibilities and allow the specific features of X10 to work
End of Slide

Questions?