Using Java Reflection to Debug Performance Issues

Dr Heinz M. Kabutz

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Javaspecialists.eu
java training

Short Introduction to Speaker

- **Heinz Kabutz**
  - Born in Cape Town, South Africa, now live on Crete
  - PhD Computer Science from University of Cape Town
    - University famous for world's first successful heart transplant
- **Created The Java Specialists' Newsletter**
  - Monthly advanced newsletter for Java professionals
  - http://www.javaspecialists.eu
- **One of the first Java Champions**
  - https://java-champions.dev.java.net/

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Why Crete?

- **The usual reason - wife is Greek :-)**

Reflection is like Opium

- A bit too strong for every day use
  – But can relieve serious pain
- Please do not become a reflection addict!

Modifying/Reading Private/Final Fields

- **We can access private fields by making it accessible**
  - **Requires security manager support**
- **Note: value field is final and private!**

```
import java.lang.reflect.*;

public class PrivateFinalFieldTest {
  public static void main(String... args)
      throws NoSuchFieldException, IllegalAccessException {
    Field value = String.class.getDeclaredField("value");
    value.setAccessible(true);
    value.set("hello!", "cheers".toCharArray());
    System.out.println("hello!");
  }
}
```

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```
cheers
```

Optimization methodology

1. **Load test to identify bottlenecks**
   - **Identify the easiest to fix**
2. **Derive a hypothesis for the cause of the bottleneck**
   - **Create a test to isolate the factor identified by the hypothesis**
     - **This is important, we have often been fooled by profilers!**
3. **Alter the application or configuration**
4. **Test that the change improves the situation**
   - **Also make sure the system still works correctly**

- **Repeat process until targets are met**

Big Gains Quickly

- **Amdahl’s law applies**
  - **Consider an 4 layered application**
    - **Servlet takes 10%**
    - **Business component takes 11%**
    - **EJB takes 23%**
    - **SQL takes 56%**
  - **Scenario 1, tuning Servlet gives 20x improvement**
    - **"Google" says that servlets are slow**
    - **0.10/20 + 0.11/1 + 0.23/1 + 0.56 /1 = 0.905**
  - **Scenario 2, tuning SQL give 2x improvement**
    - **We *measure* and discover SQL is the bottleneck**
    - **0.10/1 + 0.11/1 + 0.23/1 + 0.56/2 = 0.72**

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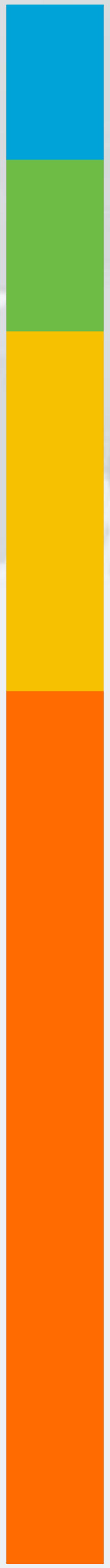

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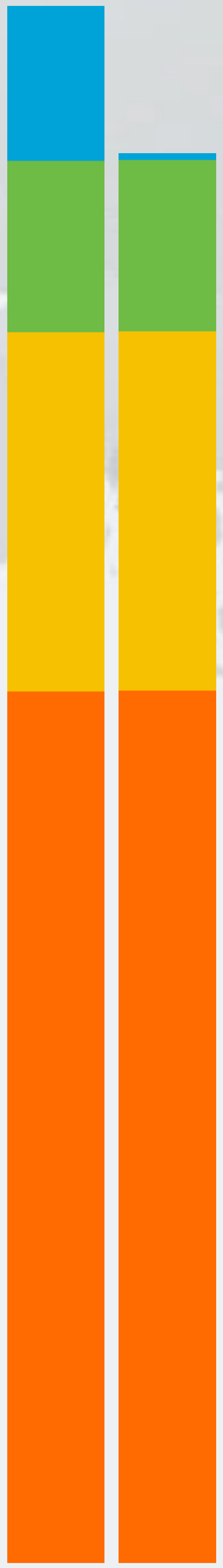

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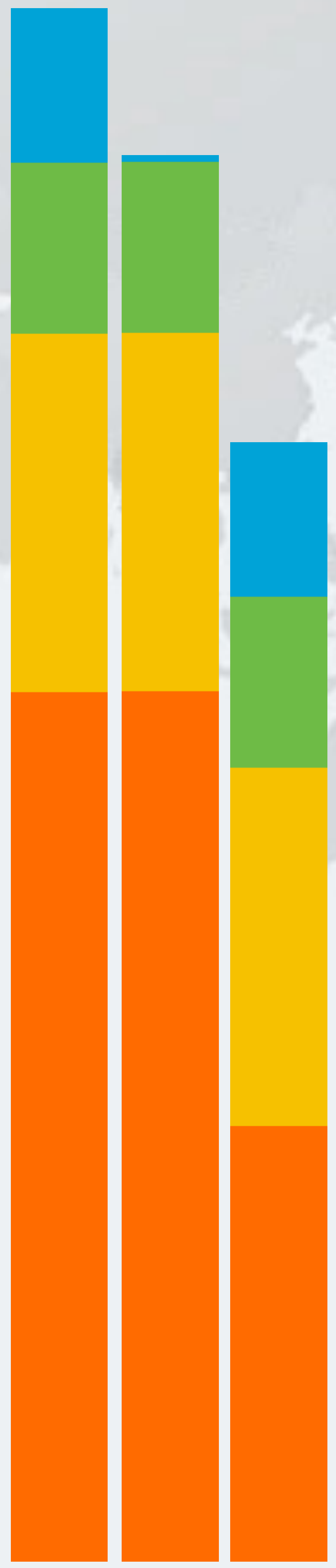
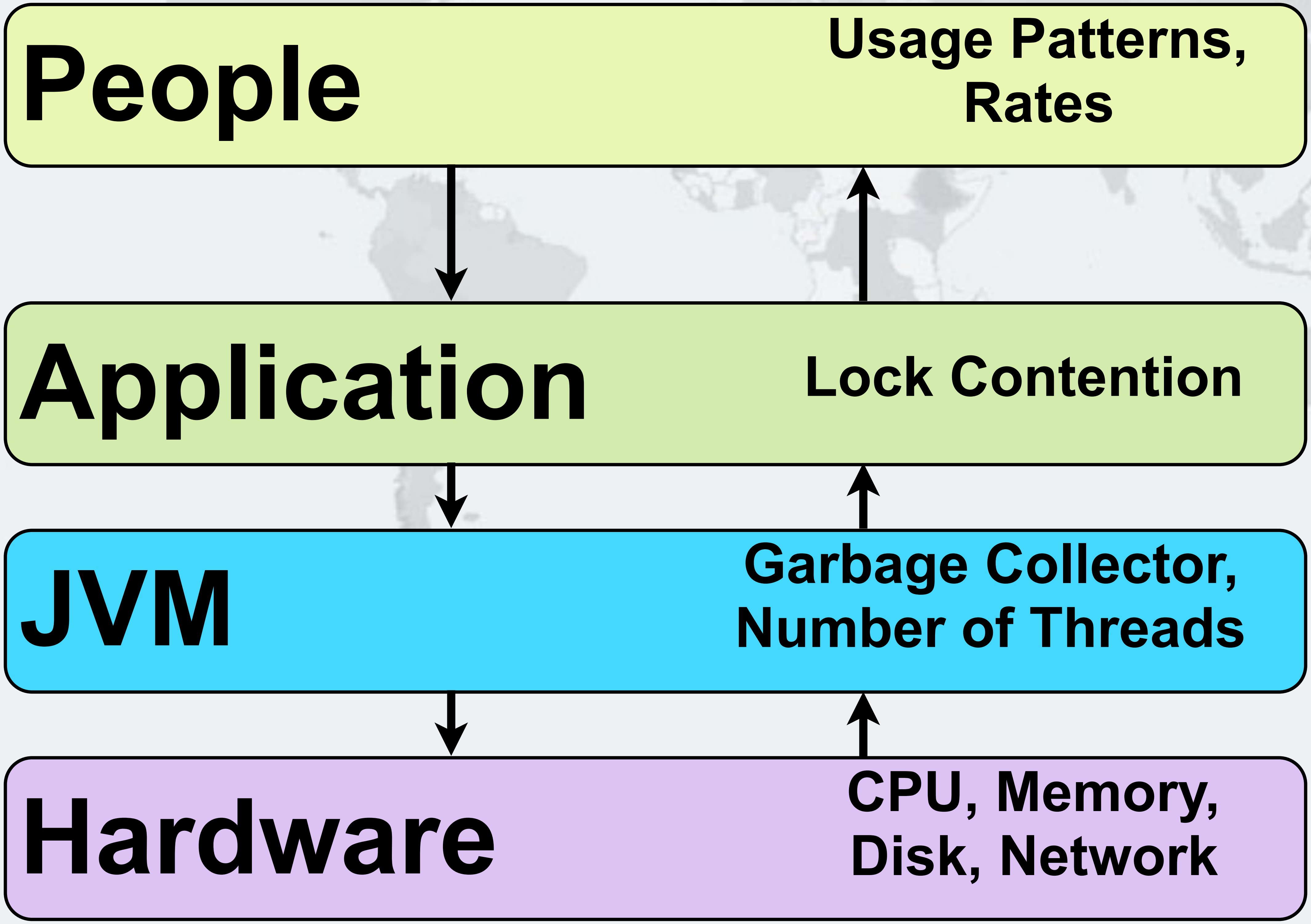


System Overview - The Box



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