Using Java Reflection to Debug Performance Issues

Dr Heinz M. Kabutz

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Javaspecialists.eu
java training

Short Introduction to Course Author

- **Heinz Kabutz**
  - **Born in Cape Town, South Africa, now live in Greece / Europe**
  - **PhD Computer Science from University of Cape Town**
    - **University famous for world's first successful heart transplant**
- **Created The Java Specialists' Newsletter**
  - **Advanced newsletter for Java professionals**
- **Trained thousands of Java programmers**
- **Speaker at various conferences in USA and Europe**
- **One of the first Java Champions**
  - **https://java-champions.dev.java.net/**

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!");
  }
}
```

```
cheers
```

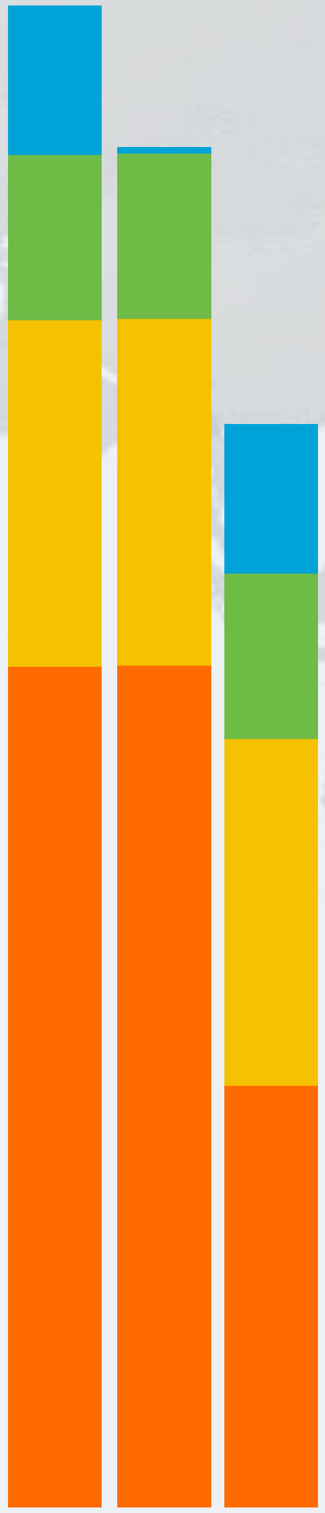
Optimization methodology

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

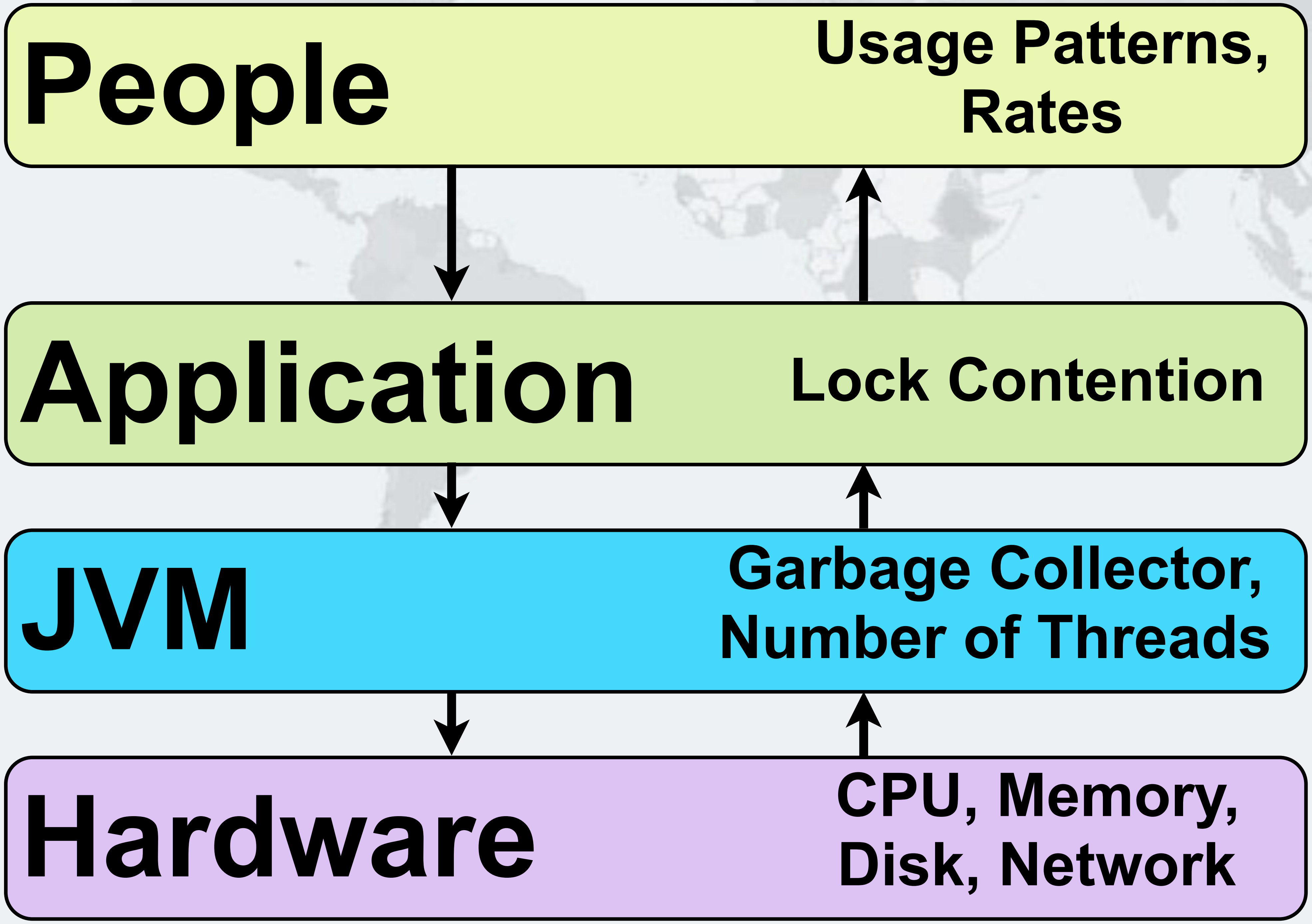
- **Amdahl's law applies**
  - **Consider an 4 layered application**
    - **Servlet takes 10%**
    - **Business component takes 11%**
    - **EJB takes 23%**
    - **SQL takes 56%**
  - **Scenario 1, tuning Servlet gives 20x improvement**
    - **"Google" says that servlets are slow**
    - **0.10/20 + 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**



Tuning Process

- **Best practices get us big performance gains fast**
- **Performance can stress good design practices**
  - **Good design should win over performance**
  - **May require us to de-normalize the design**
  - **Resist temptation to optimize everything**
- **Know where to spend your efforts**
  - **Measure and benchmark**

System Overview - The Box



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