Aspect Oriented Software Development

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Erasmus visit at:

CESI Bordeaux

20 June 2019, Bordeaux, France

My University, My City, Poland

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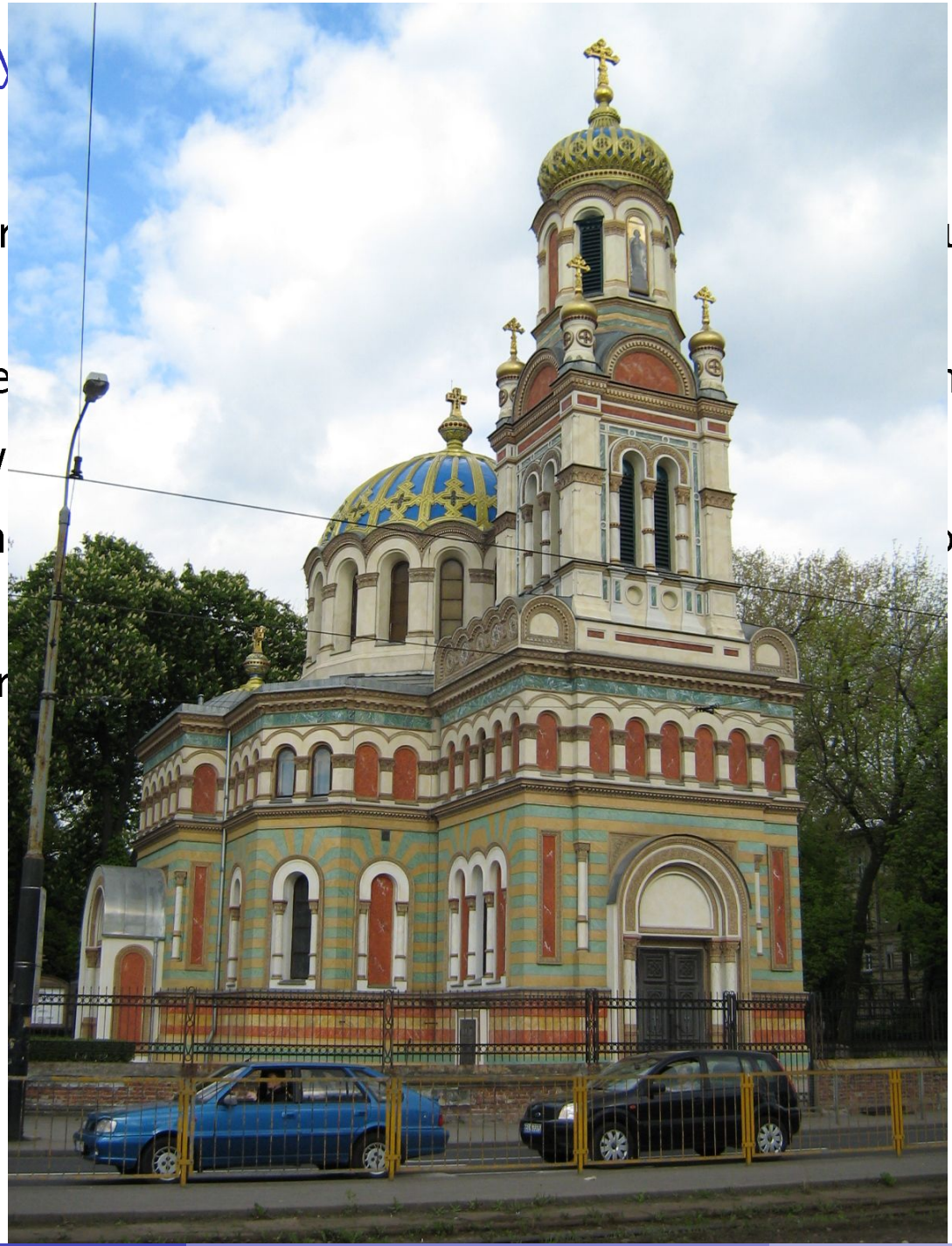

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- Companies of new technologies - IT governs.

Programming paradigms

- High level languages
  - We are not interested in Assembler,
  - At Least Here
- Paradigms

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- Procedural (Little abstraction)
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  - Is that enough ?

Object Oriented Design

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- SOLID
  - Single responsibility principle

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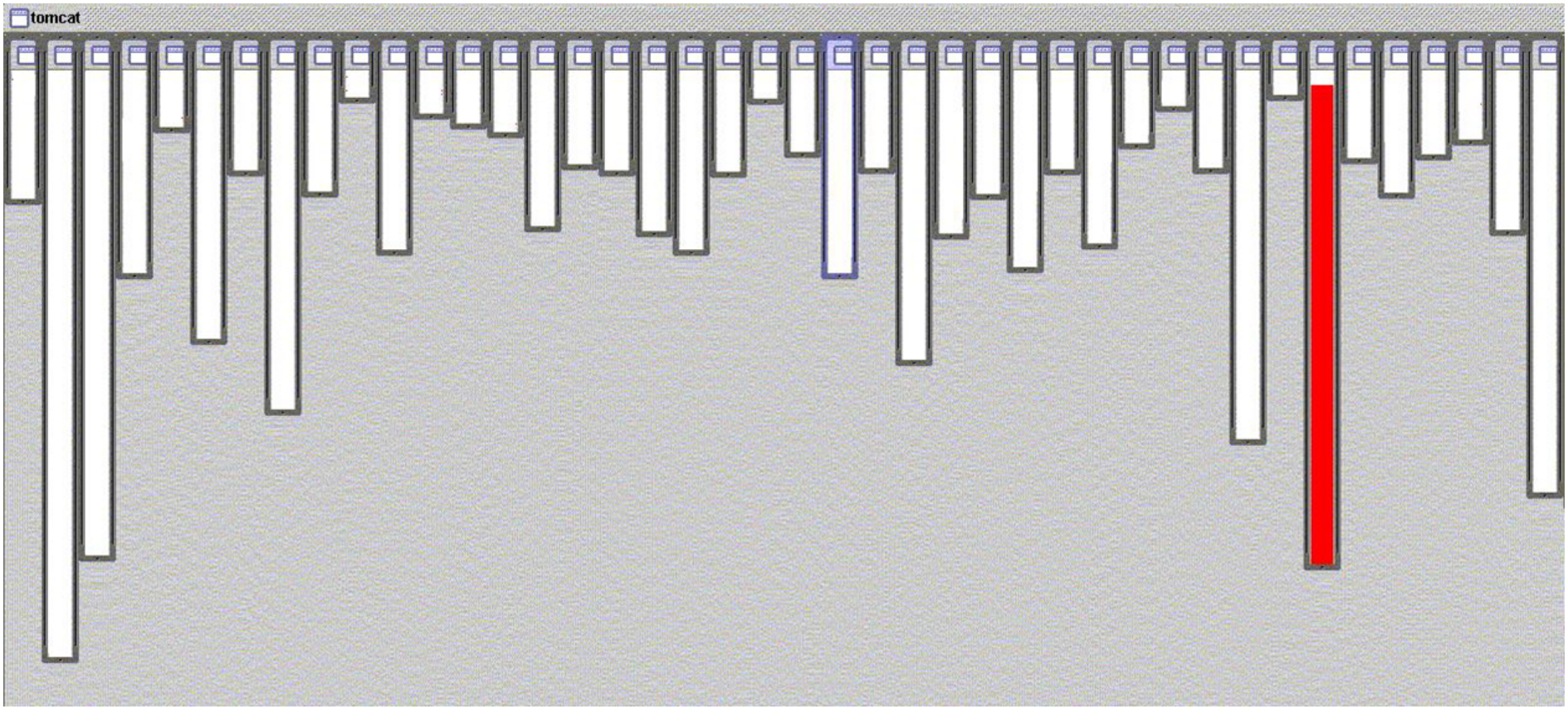
- K.I.S.S (Keep it simple, stupid)
- DRY (Don't repeat yourself)
- and many more rules

OOP and THE BIG PICTURE

Parsing XML in org.apache.tomcat (source aspecj.org)



OOP and THE BIG PICTURE

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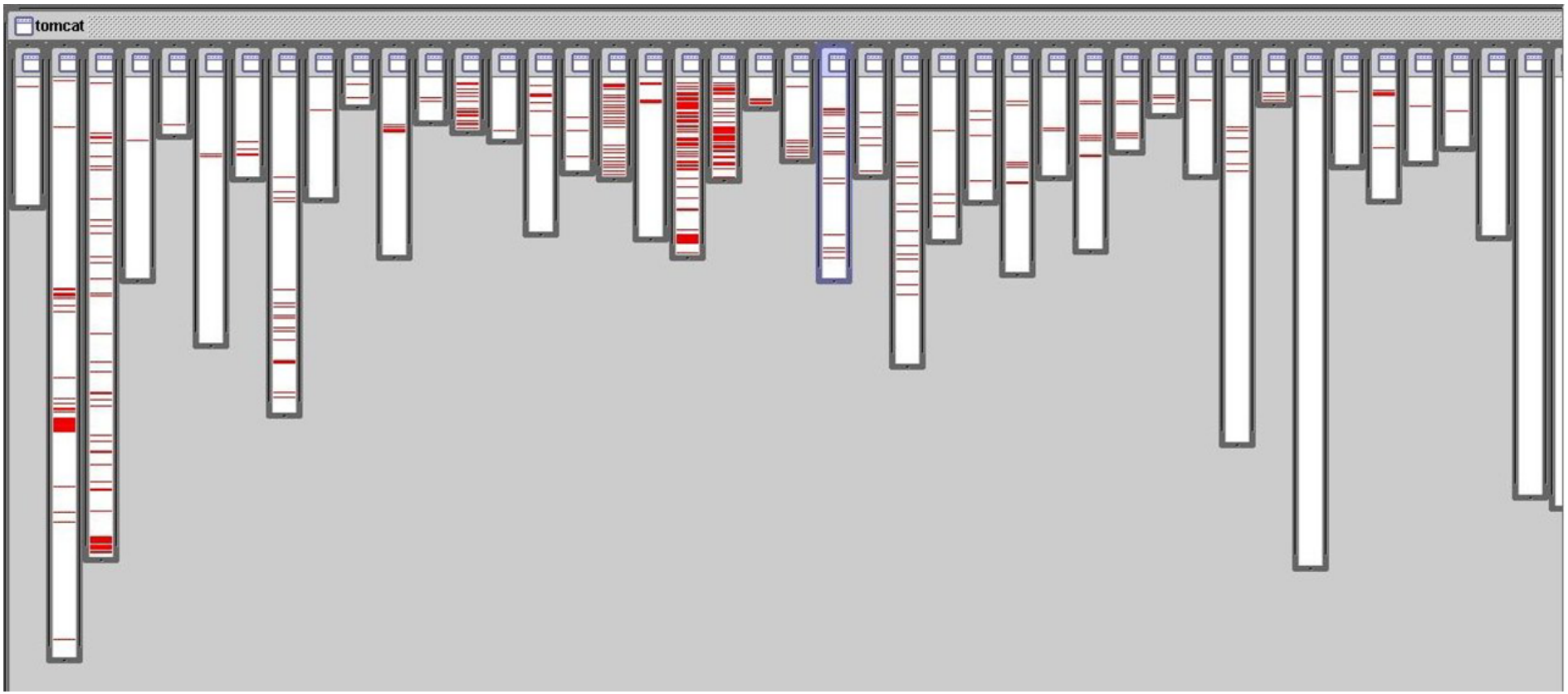

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  - Split your application in domains of interest
    - ★ Each can have many Classes
    - ★ Interaction between them

AOP vocabulary

Basic elements

- Cross-cutting concerns
  - Problems related to many (all) classes in application

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- Advices
  - Additional tasks to do at joint points

Aspect and programming language

Do we have to change programming language ?

Aspect and programming language

Do we have to change programming language ?

- Just a little

Aspect solutions in known languages

C/C++	-	AspectC++,XWeaver,Aspectc,...
C#	-	LOOmNET, ASpect#,...
JavaScript	-	Ajaxpect, jQUery AOP,...
PHP	-	PHPaspect, Seasar.PHP,...
Java	-	AspectJ, Spring AOP, JBoss AOP,...

How it works

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- We add aspects in selected language/frameworkpause
  - Recompile/Rebuild our application
    - ★ Look as native preferred
    - ★ Java + AspectJ => usual bytecode

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How it works

- We have program in preferred language
- We add aspects in selected language/frameworkpause
  - Recompile/Rebuild our application
    - Look as native preferred
    - Java + AspectJ => usual bytecode
  - JVM can't see the differenceChanges in fly
    - Change in Class made during Class Loading

Simple Example

- Logging - usually the flag example of Aspects
  - We will do it later
- Simple HelloWord type Java App

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- All examples are on github
- `https://github.com/kpodlaski/CESI_Bordeaux_2019/tree/AOP`
  - `https://github.com/kpodlaski`
  - Repository : `CESI_Bordeaux_2019`
  - Branch `AOP`

Cut points in details

- Cut-points definitions:

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  - execution
    - ★ Fired when method is executed

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    - ★ This we will cover later
  - logic operators AND, OR

Advices

- We can use the following types of advices:
  - after

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    - ★ Very special one, can replace real method

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Additional useful operation

- thisJoinPoint
  - Reference to joint point in given advice instance

Other Examples

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  - logging example

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- Let's try create access policy.

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- Let's try create access policy.
- ...
- Performance restriction rules

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  - Change the classes/objects

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    - ★ Change hierarchy of inheritance
  - Add additional behaviour
  - Change methods behaviour
  - Create new types/classes

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- Maintain
  - Less work with changes in cross-cutting concerns

AOP in real life

- Spring Framework
  - used in background, developer do not have to know it

AOP in real life

- Spring Framework
  - used in background, developer do not have to know it
- Instrumentation of the code
  - Performance live measurements
  - Faults/flaws detection

The End?

- No
  - Just tip of Iceberg

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- No
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- Literature:
  - Gregor Kichales et al., Aspect-oriented programming, (1997)
  - Jacobson, Ivar, and Pan-Wei Ng, Aspect-oriented software development with use cases, Addison-Wesley Professional, 2004.
  - Colyer, Adrian, et al. Eclipse aspectj: aspect-oriented programming with aspectj and the eclipse aspectj development tools, Addison-Wesley Professional, 2004.
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  - Alshareef, Sohil F., et al., Aspect-oriented requirements engineering: approaches and techniques, Proceedings of the First International Conference on Data Science, E-learning and Information Systems. ACM, 2018.
  - Articles in the Internet

Thank you for your attention