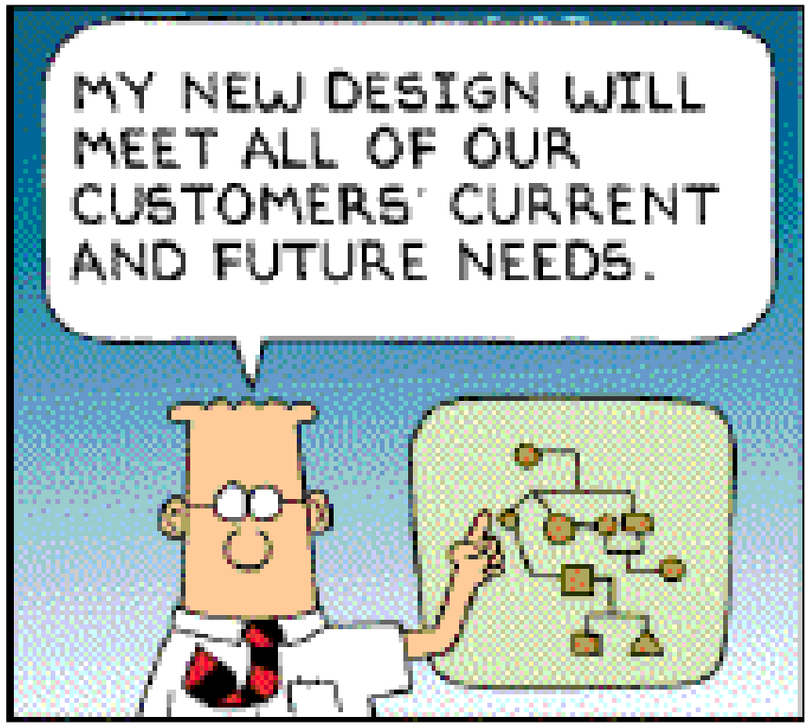


Security and reverse engineering: a prospective vision

http://stephane.ducasse.free.fr
Stéphane Ducasse

Me in a Nutshell: not a security expert

Head of RMOD team (7 permanents, 20 people)

4 years scientific deputee of Inria Lille (300 people)

Wrote several open-source books / ~ 300 articles

~ 15 K citations / H-index~56

One of the leader of the Pharo community

- http://www.pharo.org

Past core dev of Moose data and code analysis platform

- http://moosetechnology.org

Co-founder of http://www.synectique.eu

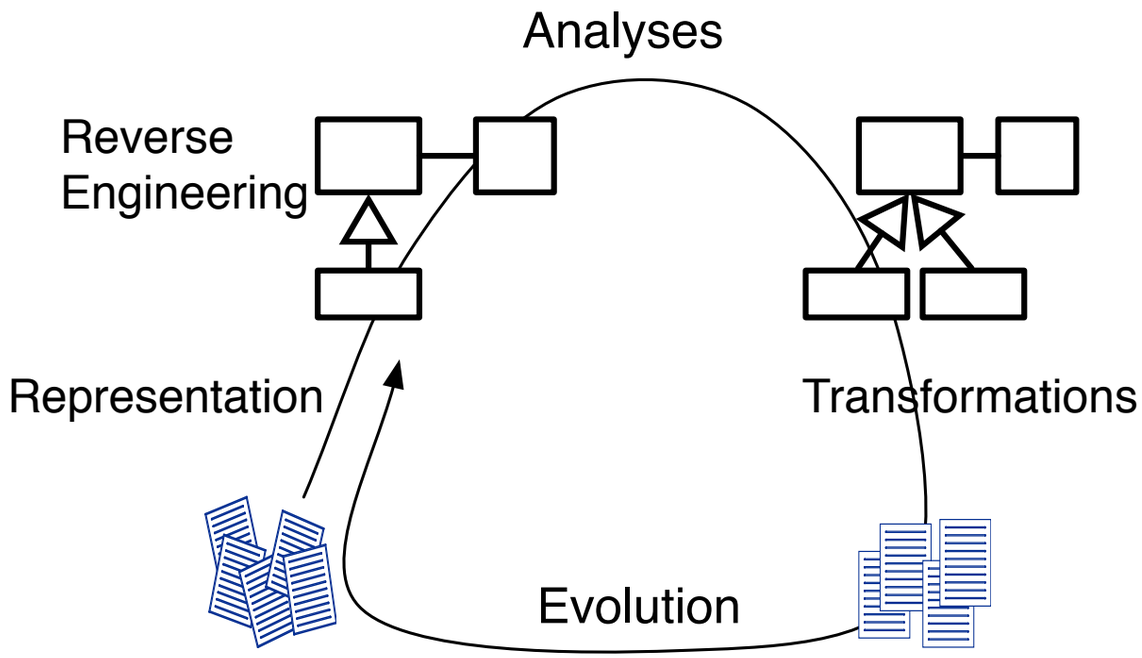
synectique
Inventive Analysis

Inria

RMoD

Bottom up team: interested in problems

code analysis, metamodeling, software metrics, program understanding, ***program visualization***, ***reverse engineering***, evolution analysis, refactorings, quality, changes analysis, commit, dependencies, merging support rule and bug assessment ***semi-automatic migration*** example-based transformations test selection, rearchitecturing blockchains, ***ui-migration***



Collaborations

IMT Douai, Soft (VUB), ENSTA (Bretagne)

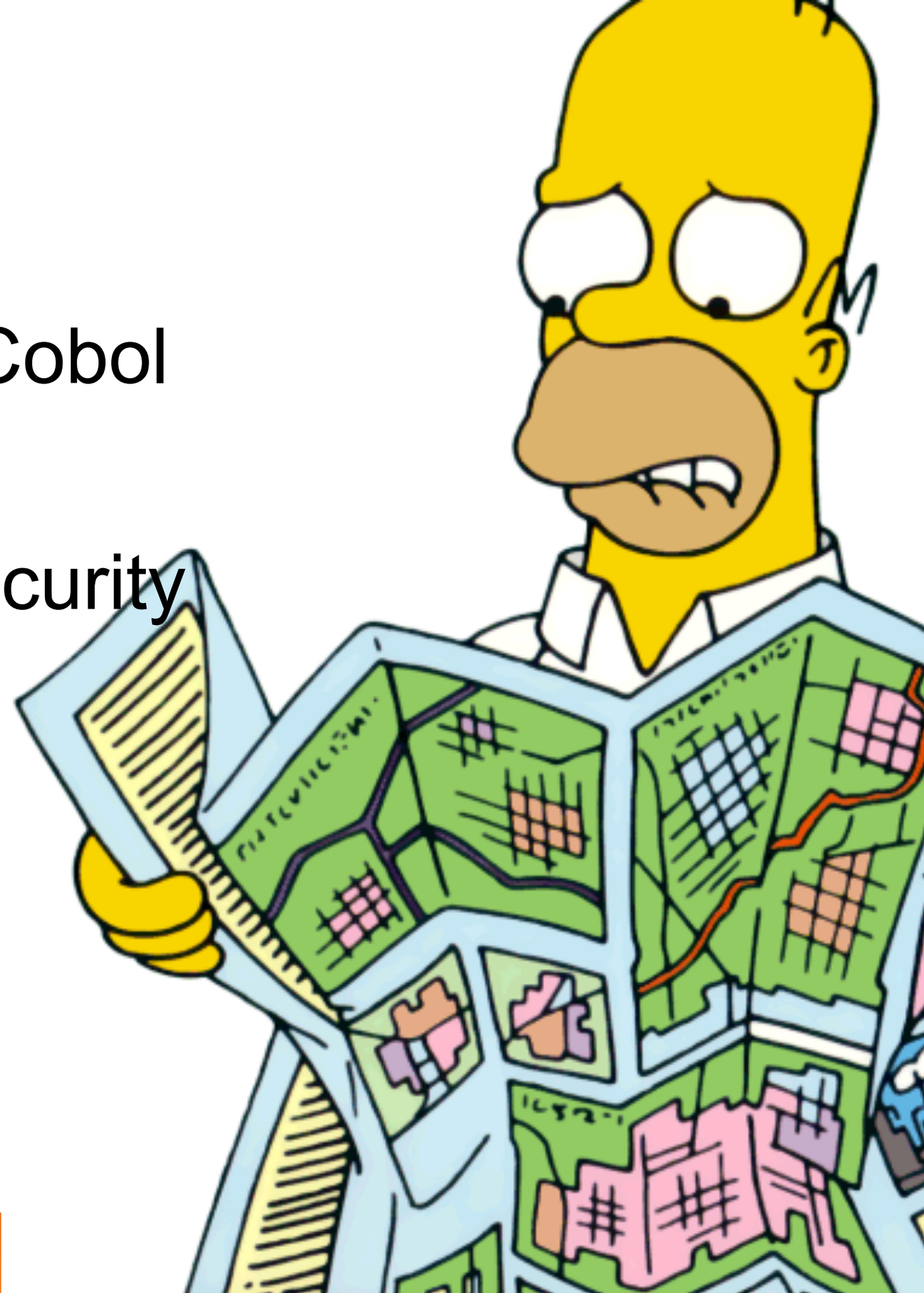
Berger-Levrault, Siemens, Thales, CIM, Arolla, Lifeware, WordLine/ATOS

Roadmap

Legacy is not just Cobol

Software Maps

Dreaming about security



Software is Complex

Laws of software evolution

Continuing change

- A program that is used in a real-world environment must change, or become progressively less useful in that environment.

Increasing complexity

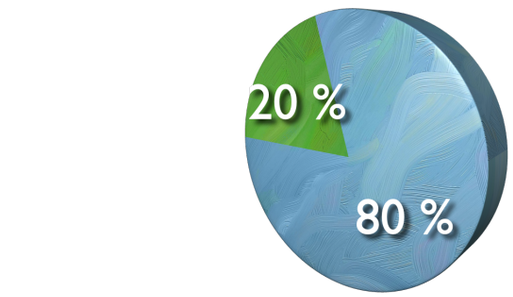
- As a program evolves, it becomes more complex, and extra resources are needed to preserve and simplify its structure.

Software is a living entity...

- Early decisions were certainly good at that time
- But the context changes
- Customers change
- Technology changes
- People change

We only maintain useful successful software

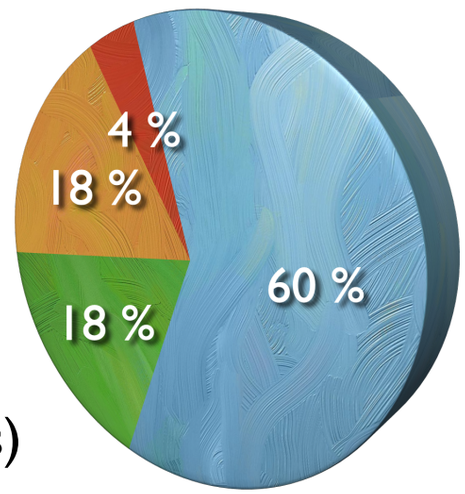
Maintenance is *continuous* Development



Between **70**% and **90**% of ***global*** effort is spent on "maintenance" !

18% Adaptive
(new platforms or OS)

18% Corrective
(fixing reported errors)

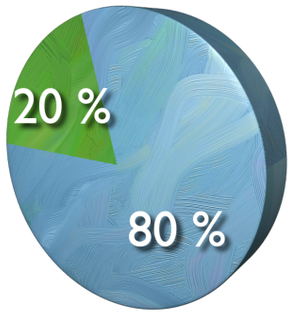


4% Other

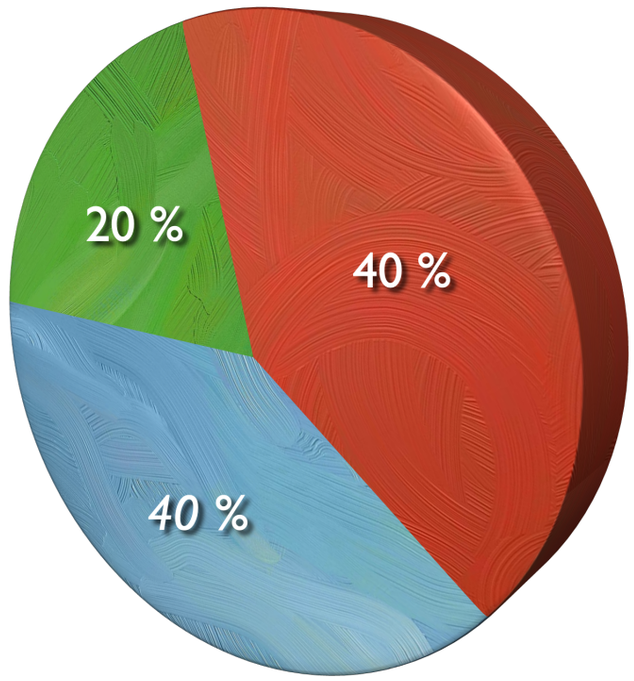
60% Perfective
(new functionality)

"Maintenance"

50% of development time is lost trying to understand code !



Between **50**% and **80**% of the ***overall cost is spent in the evolution***



We lose a lot of time with inappropriate and ineffective practices

Legacy systems exist in ***any*** language

Berger-Levrault by example

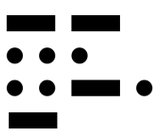
+150 produits

Plusieurs langages

Maintenabilité sur plusieurs décennies

Temps de migration

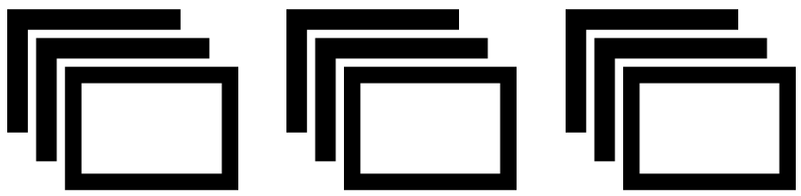
One case



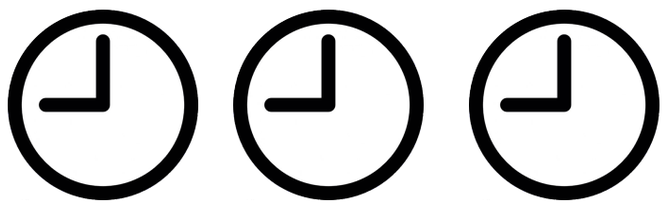
1 MLOCS

21 433 classes

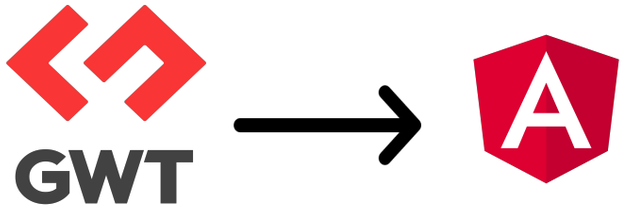
95 164 méthodes



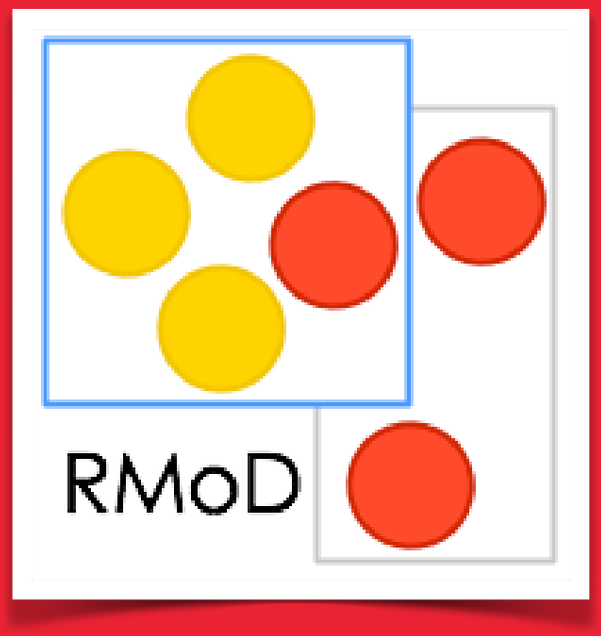
500 pages web



36 ans/homme
de migration

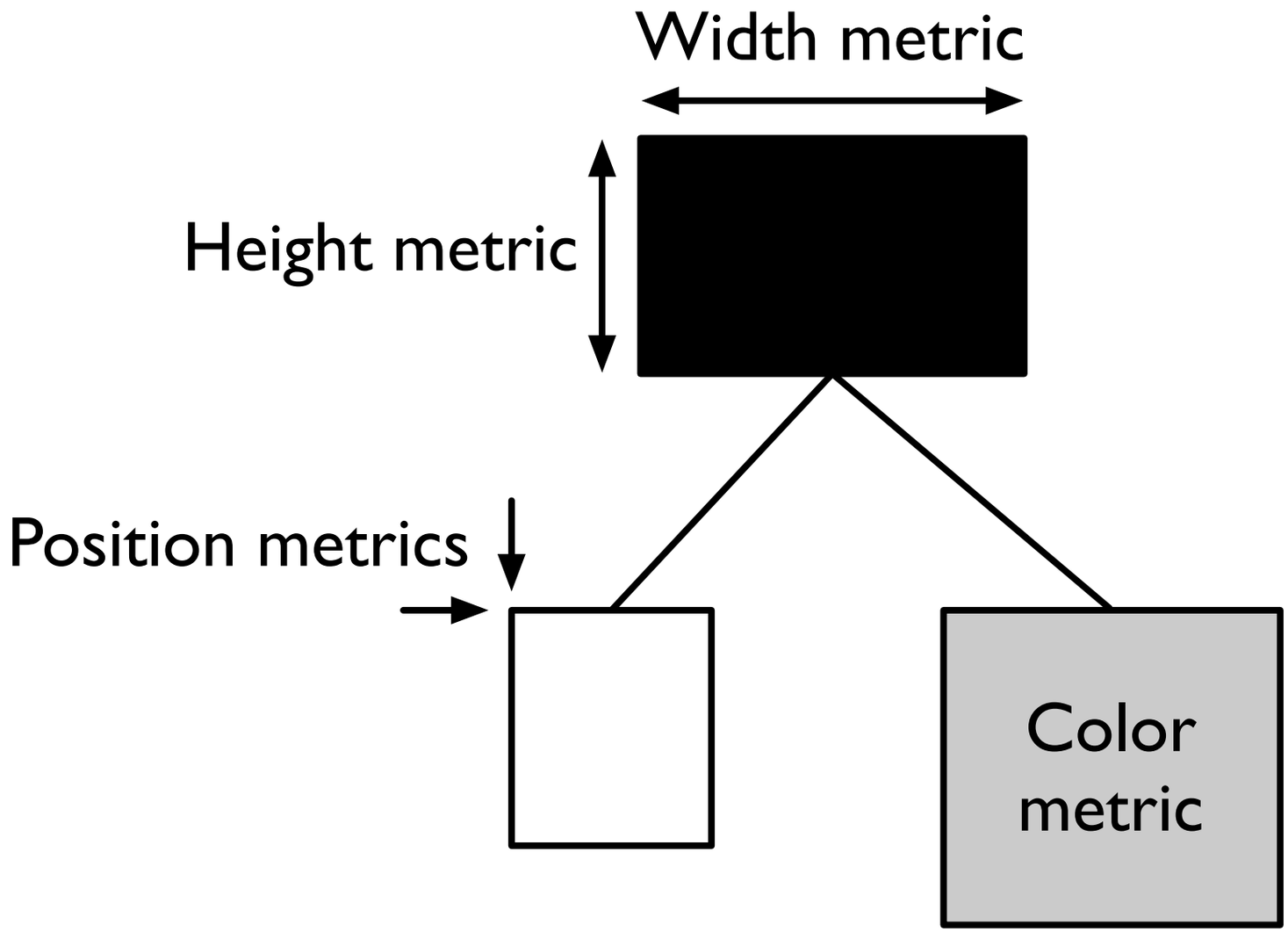


Depuis GWT vers
Angular

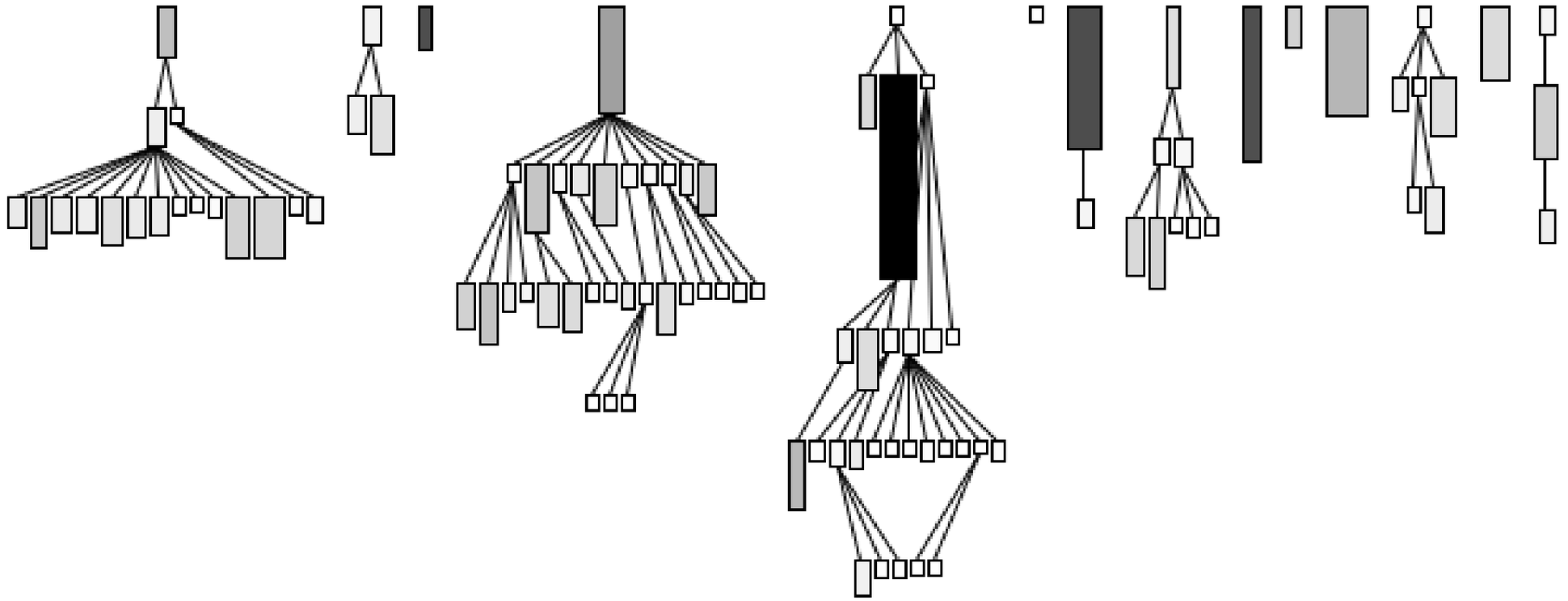


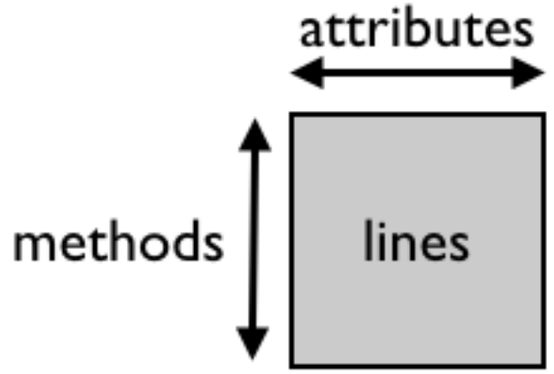
Some selected software maps — to build **yourselves** at home

First glance at large systems: Polymetric views [PhD Lanza]

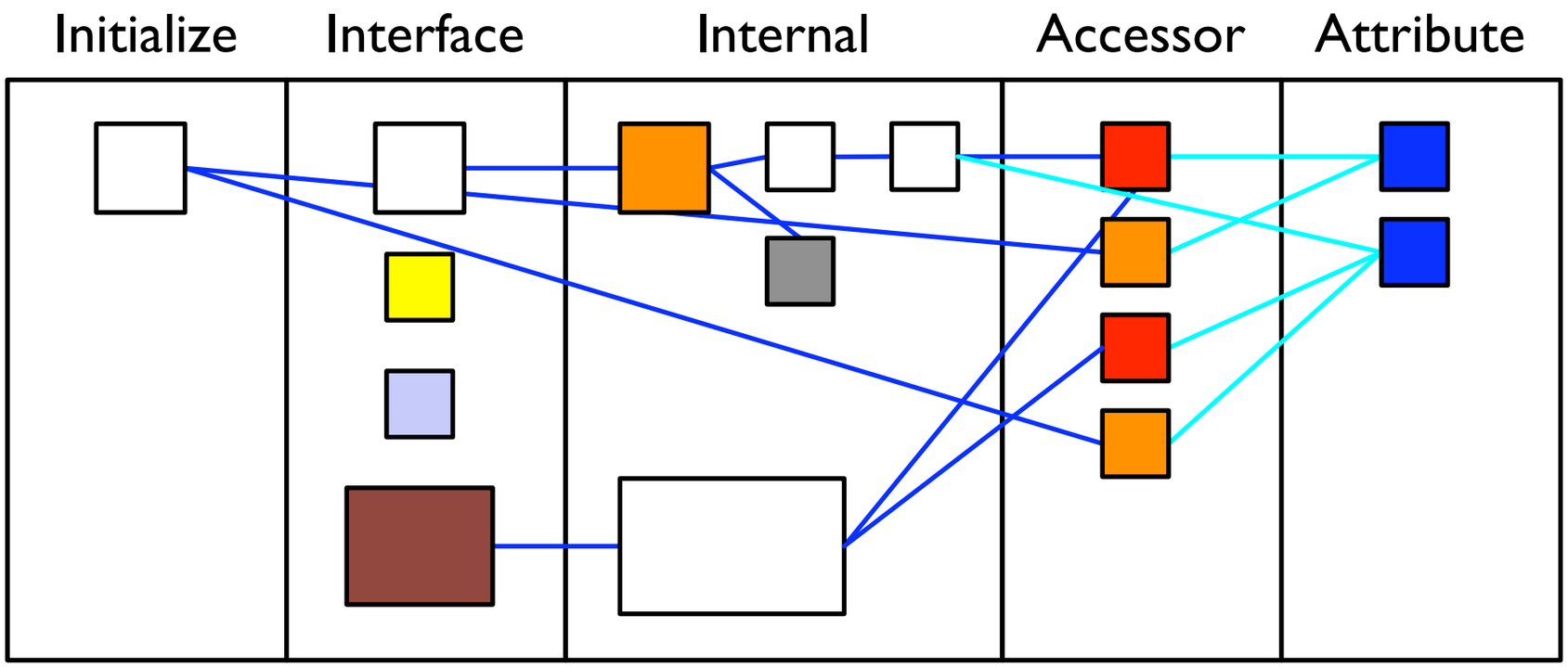


Understanding systems [PhD M. Lanza]

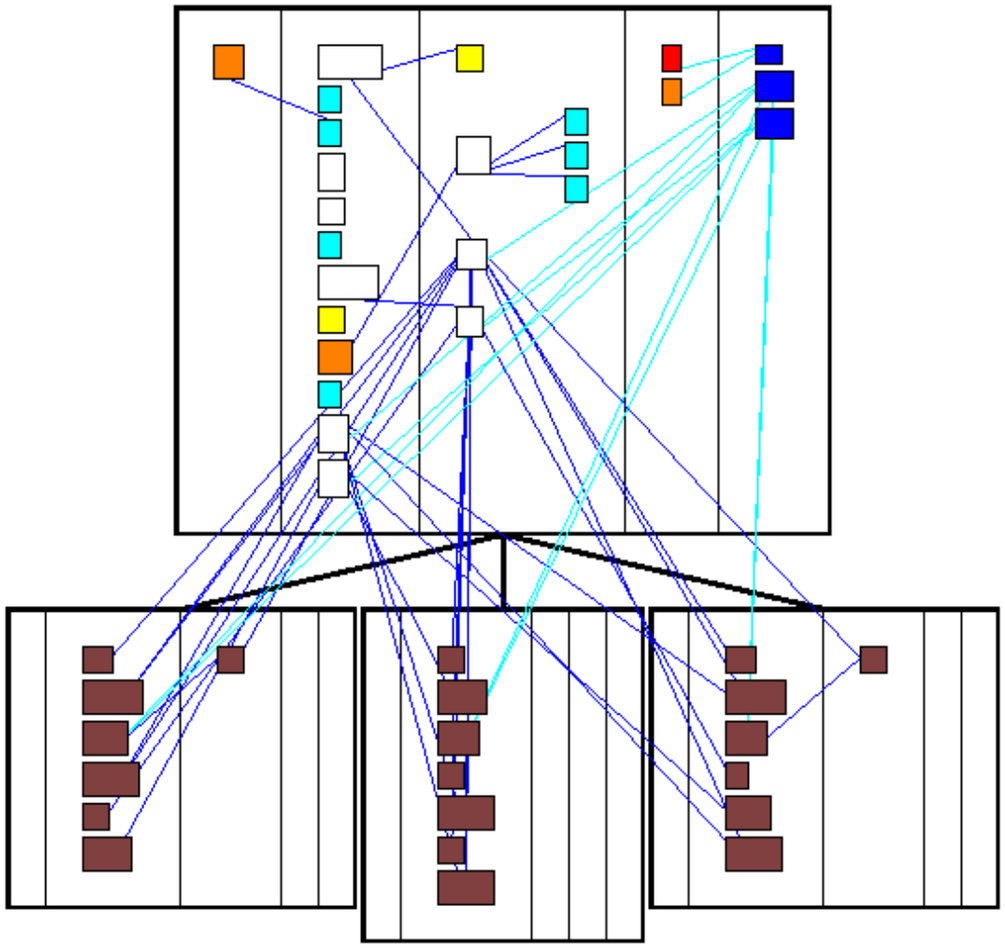


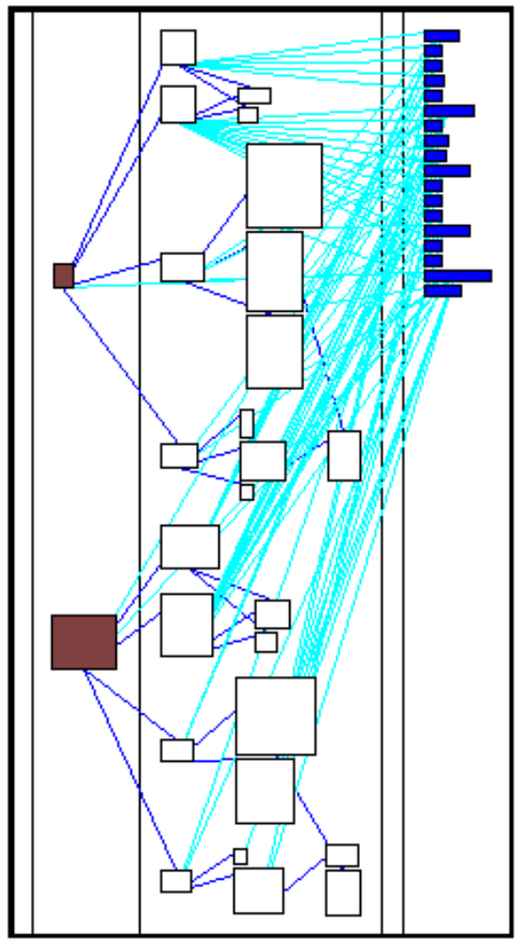


Understanding a single class [PhD M. Lanza]

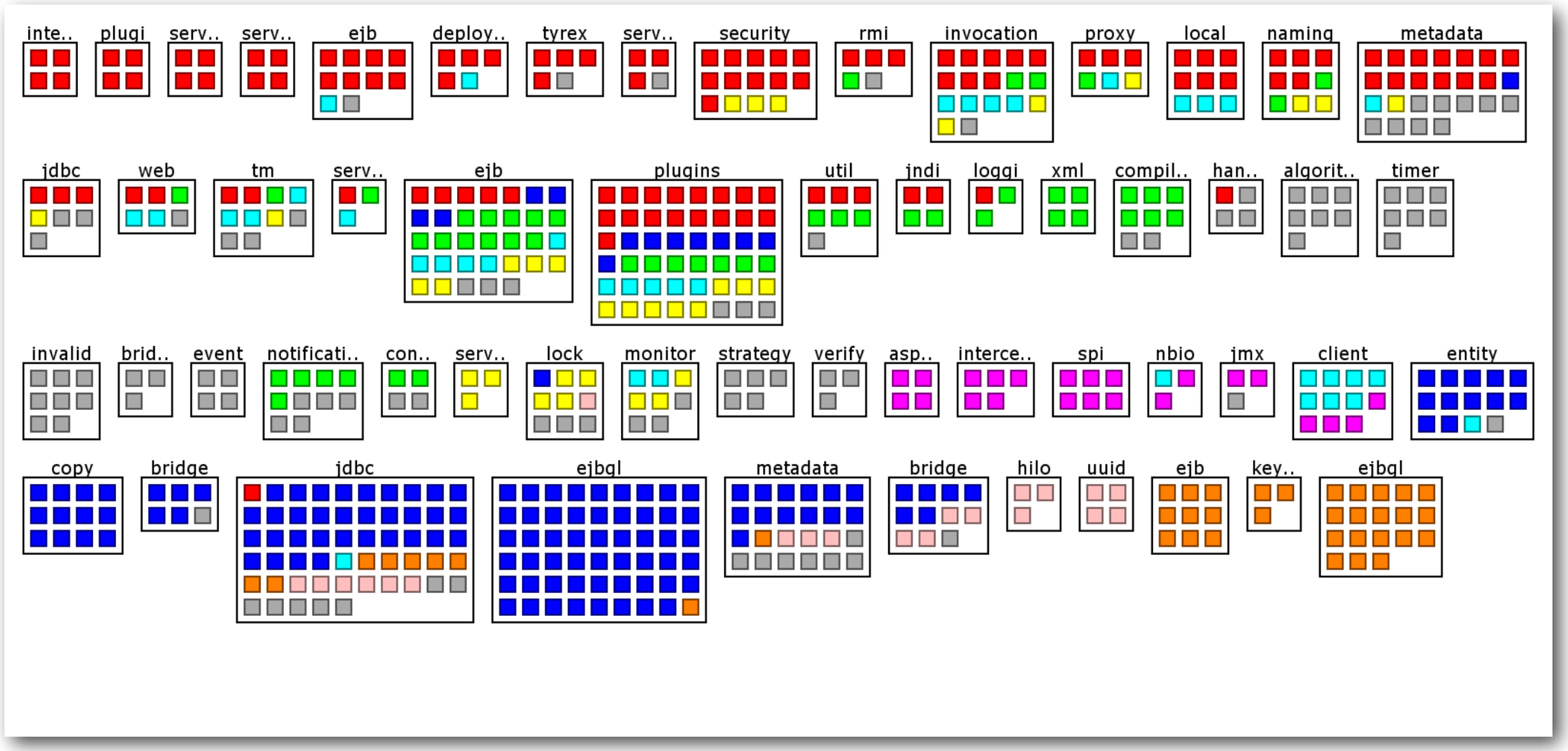


Understanding classes [PhD M. Lanza]

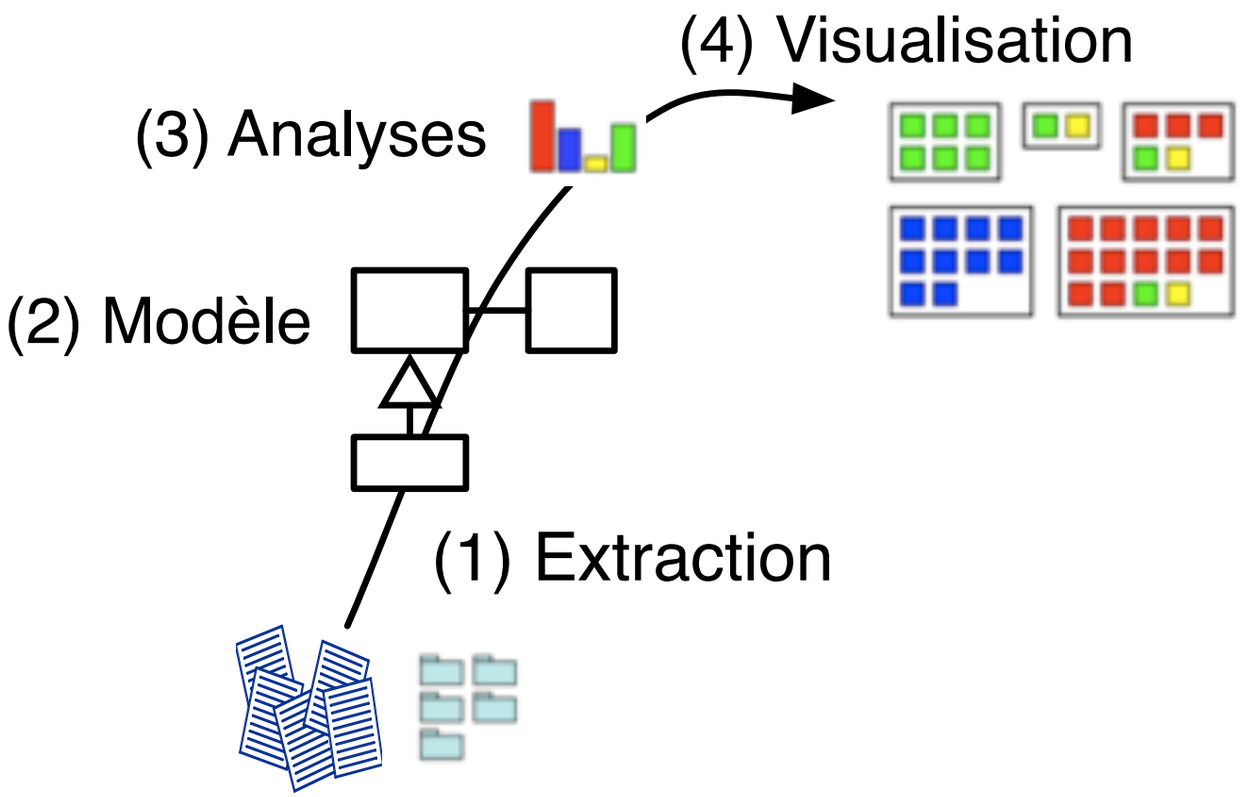




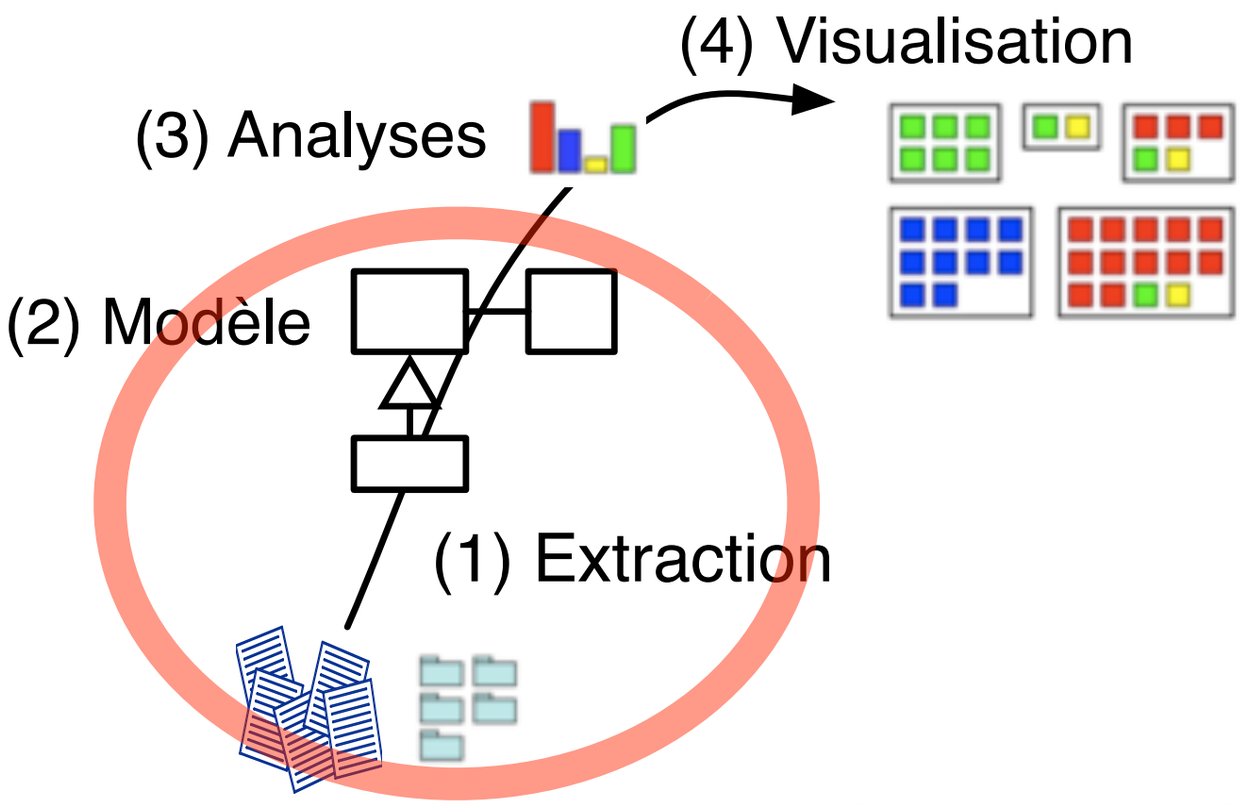
How a property spread on a system?



Example : Who is behind package X ?



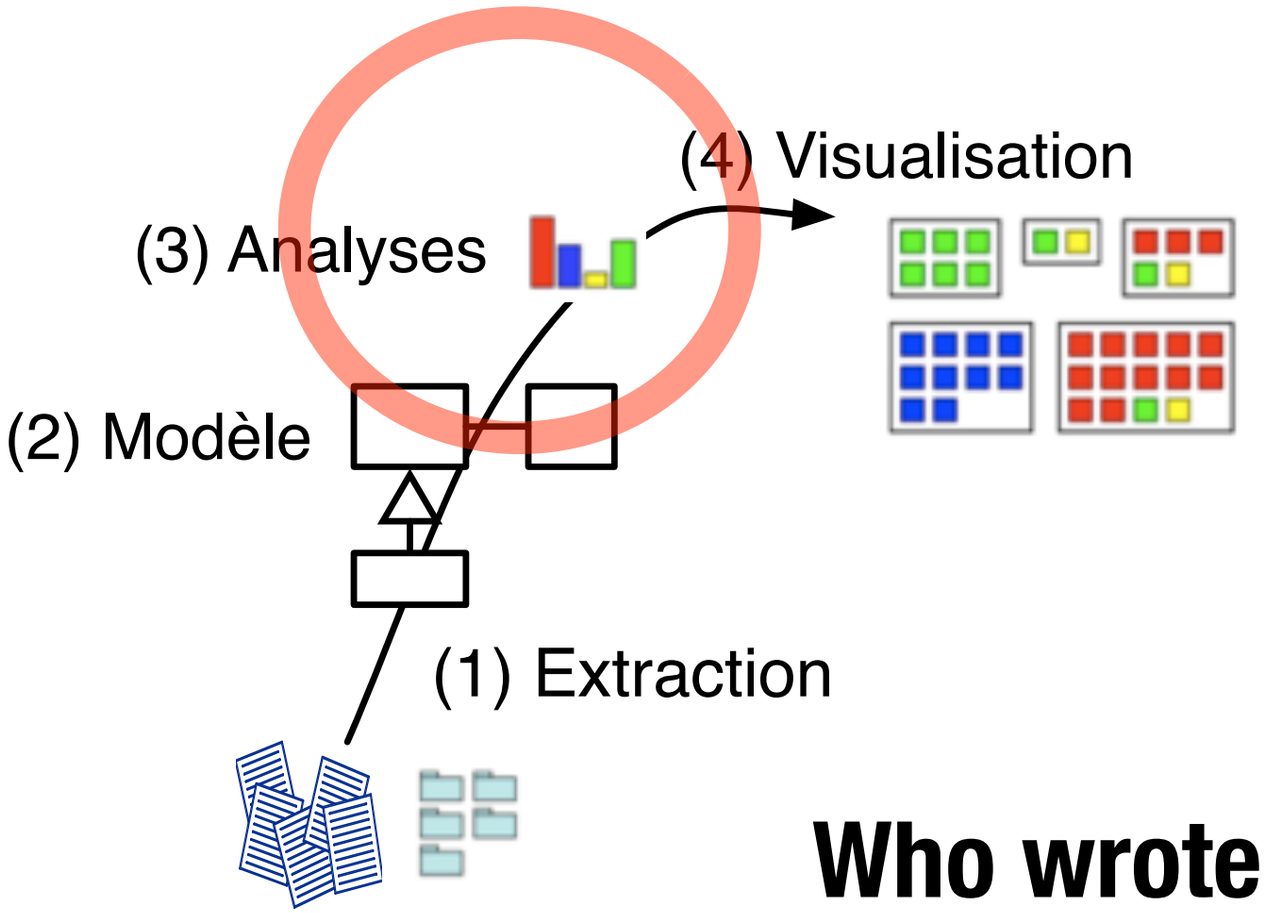
Step 1 - Model Creation/Import



Definition of a model to represent entities

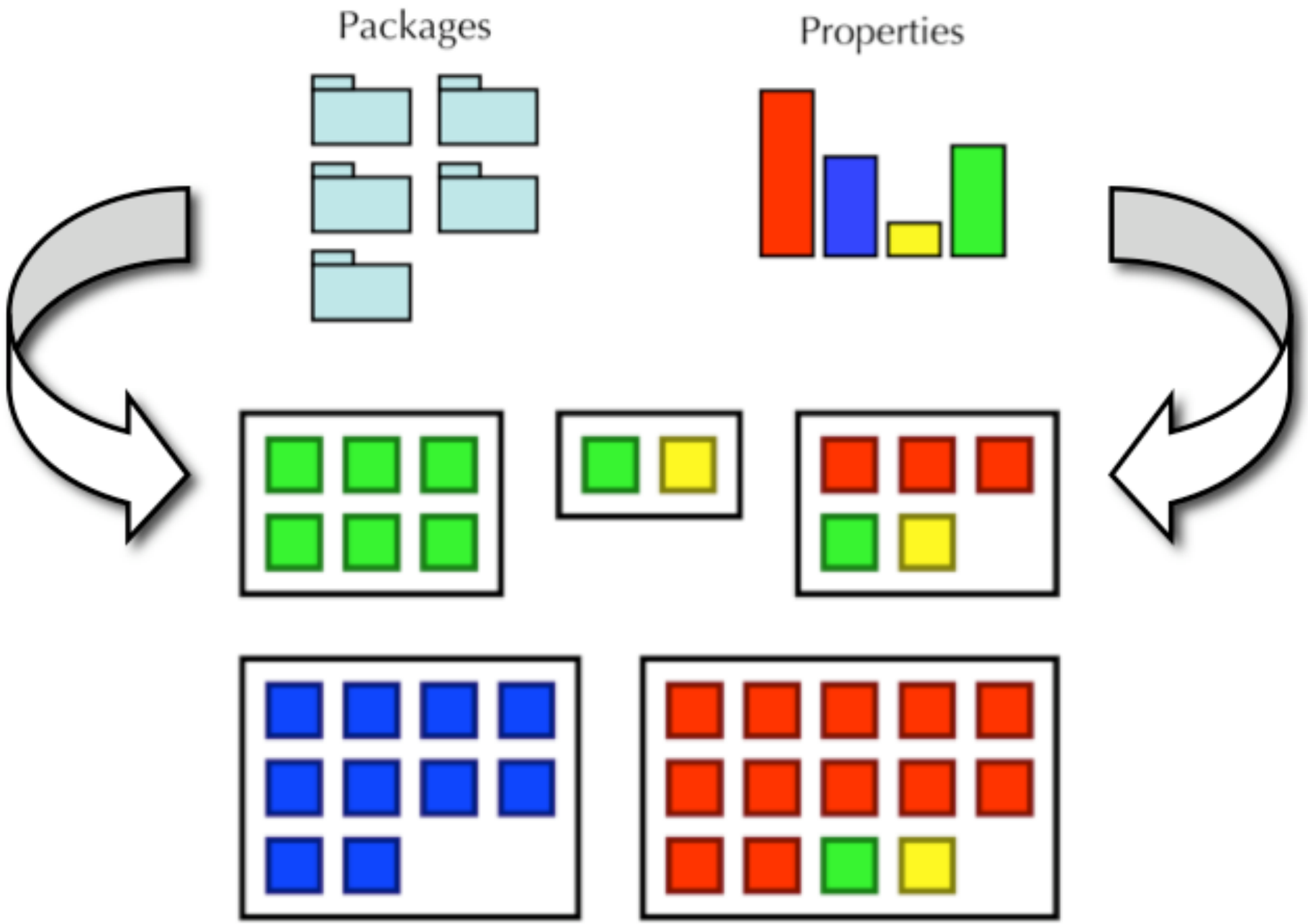
Data Extraction (CVS...)

Step 2 - Analyses



Who wrote how many lines of code?

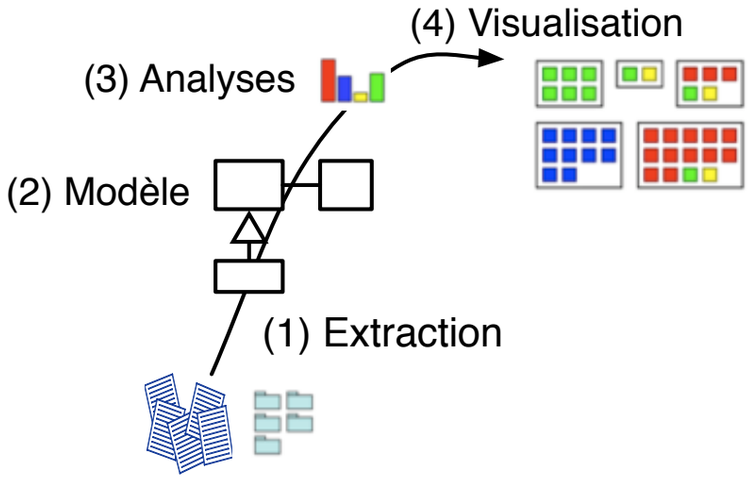
Step : 3 - Creating the Map

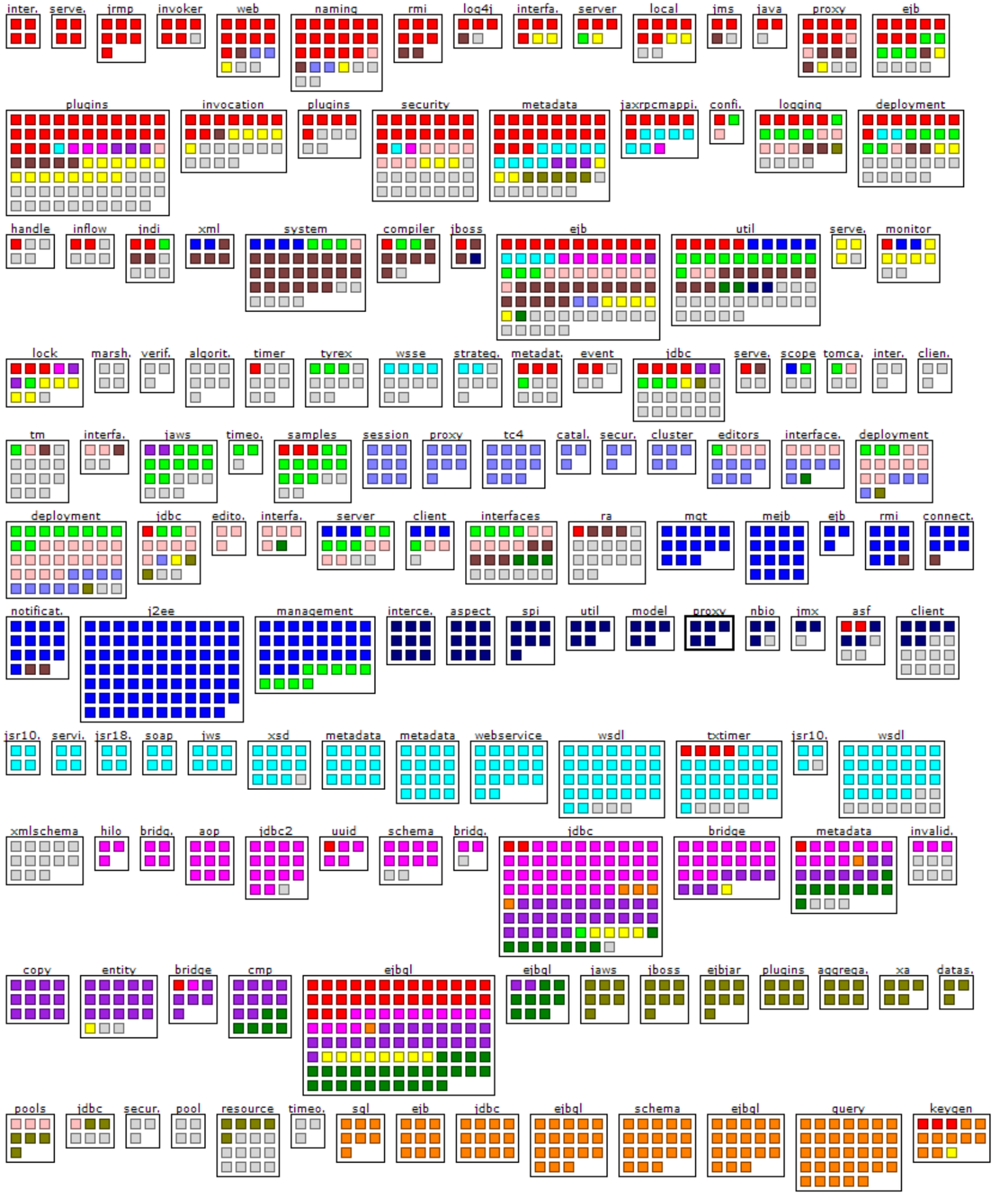


JBoss at a glance

Interactive tool

Data in perspective

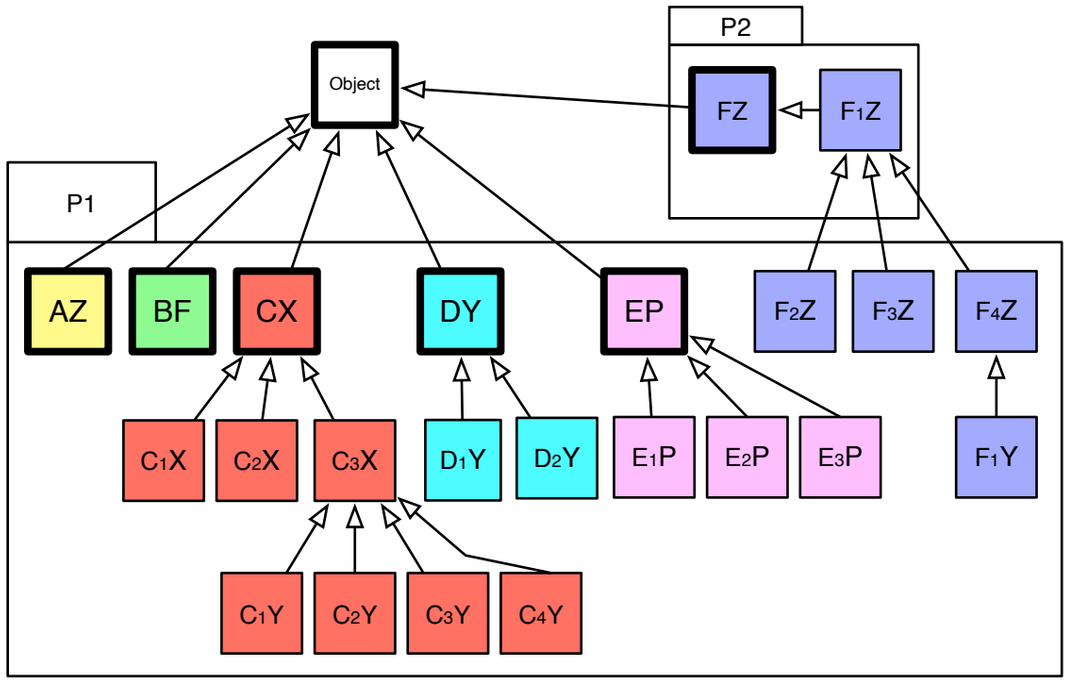




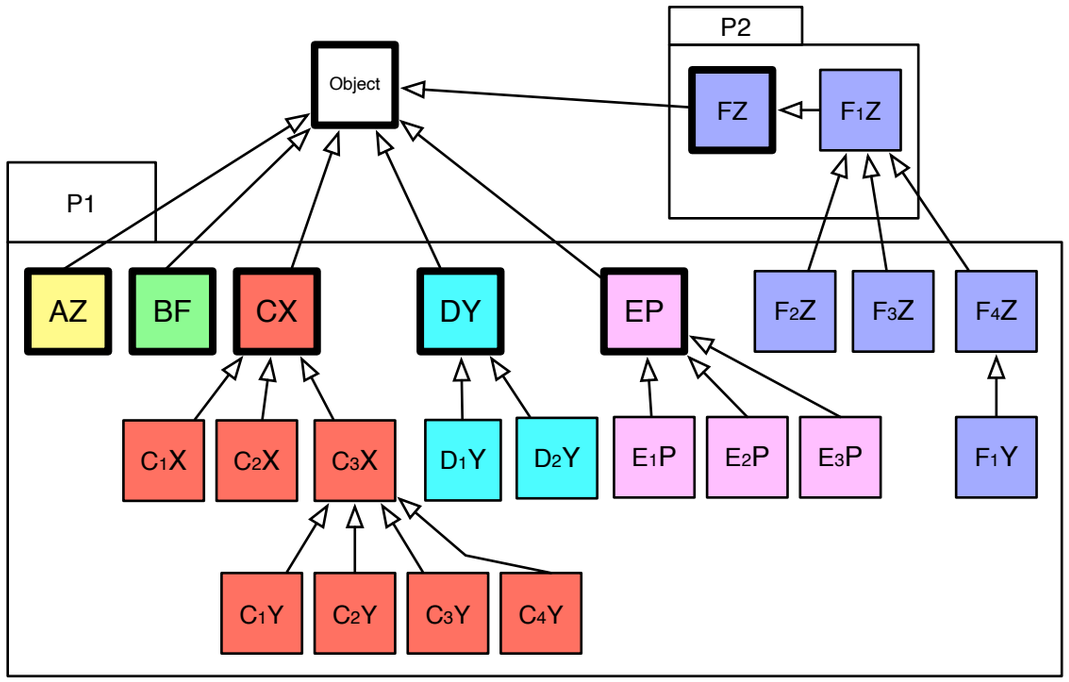
How to support understand classnames? [PhD N.-J. Agouf]

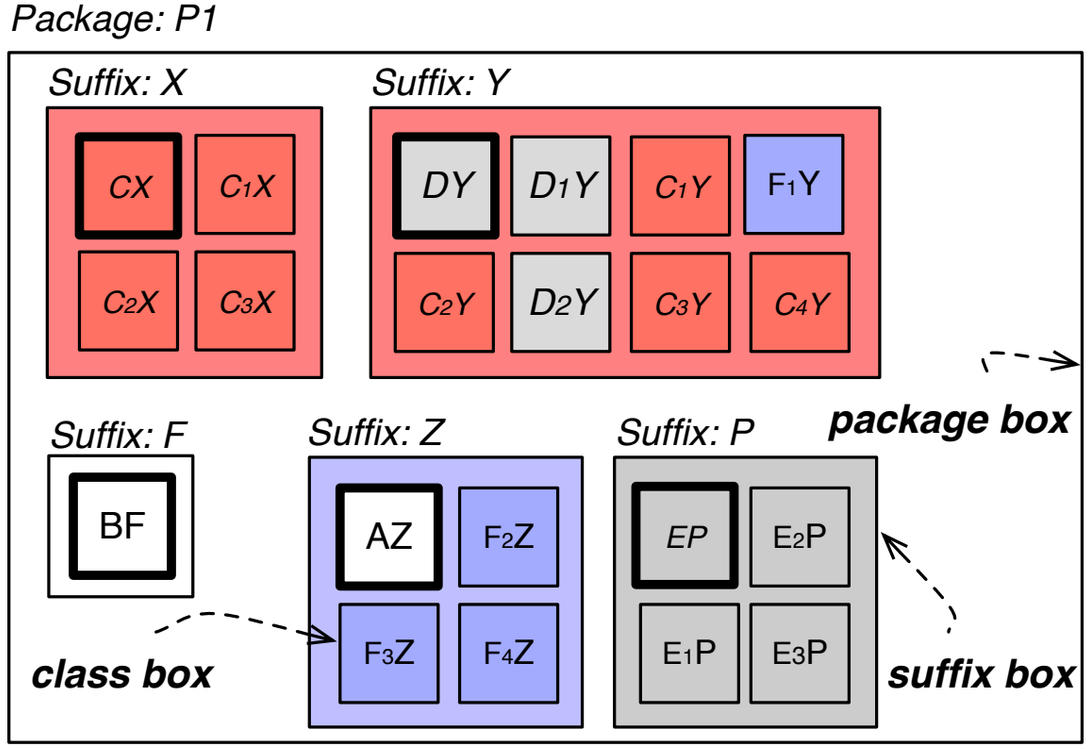
- How class are named?
  - is inheritance conveyed through names
- Is naming consistent?

How to support understand classnames? [PhD N.-J. Agouf]

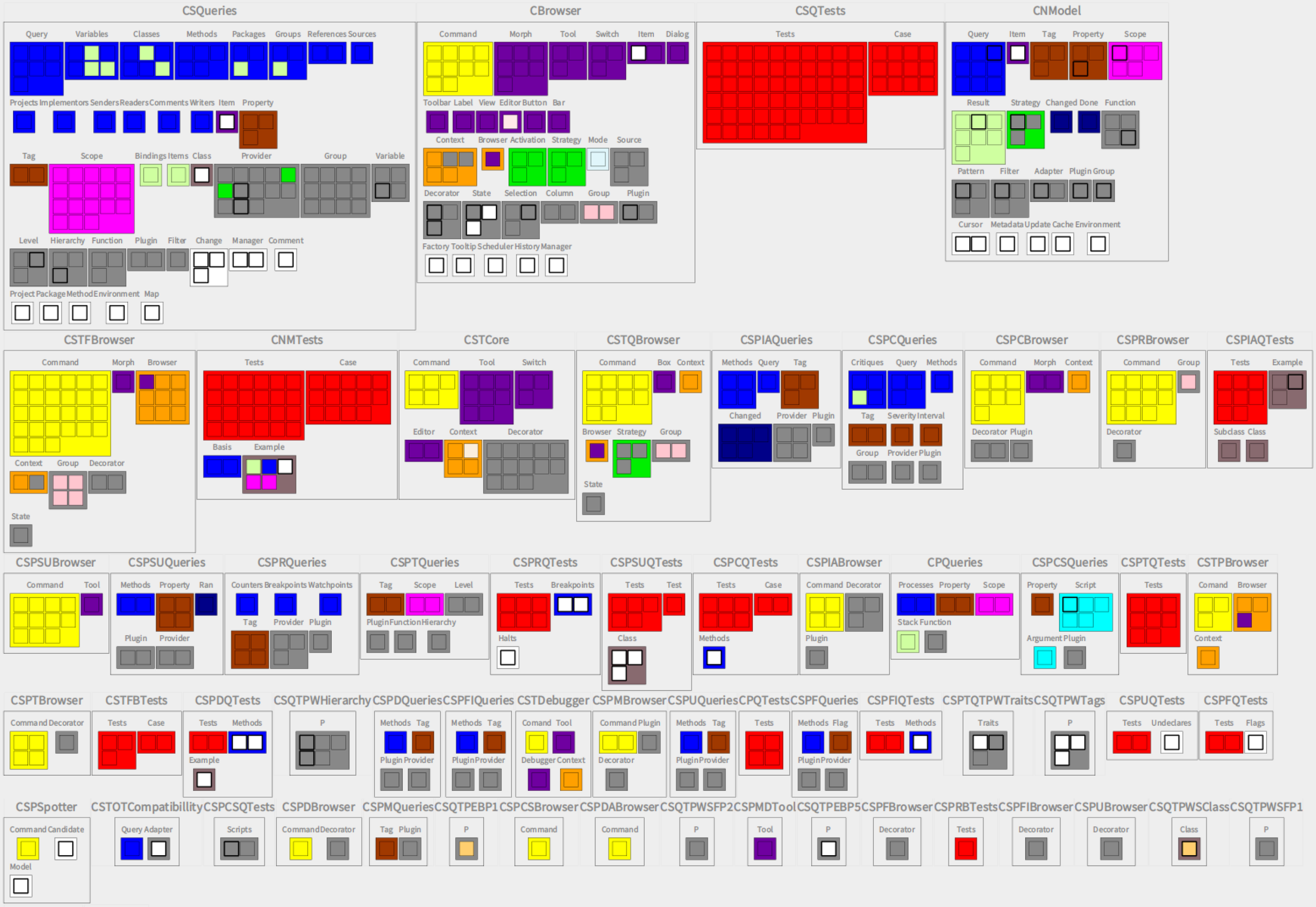


How to support understand classnames? [PhD N.-J. Agouf]





V6


CSQueries
Query Variables Classes Methods Packages Groups References Sources
Projects Implementors Senders Readers Comments Writers Item Property
Tag Scope Bindings Items Class Provider Group Variable
Level Hierarchy Function Plugin Filter Change Manager Comment
Project Package Method Environment Map
CBrowser
Command Morph Tool Switch Item Dialog
Toolbar Label View Editor Button Bar
Context Browser Activation Strategy Mode Source
Decorator State Selection Column Group Plugin
Factory Tooltip Scheduler History Manager
CSQTests
Tests Case
CNModel
Query Item Tag Property Scope
Result Strategy Changed Done Function
Pattern Filter Adapter Plugin Group
Cursor Metadata Update Cache Environment
CSTFBrowser
Command Morph Browser
Context Group Decorator
State
CNMTests
Tests Case
Basis Example
CSTCore
Command Tool Switch
Editor Context Decorator
CSTQBrowser
Command Box Context
Browser Strategy Group
State
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CSPCQueries
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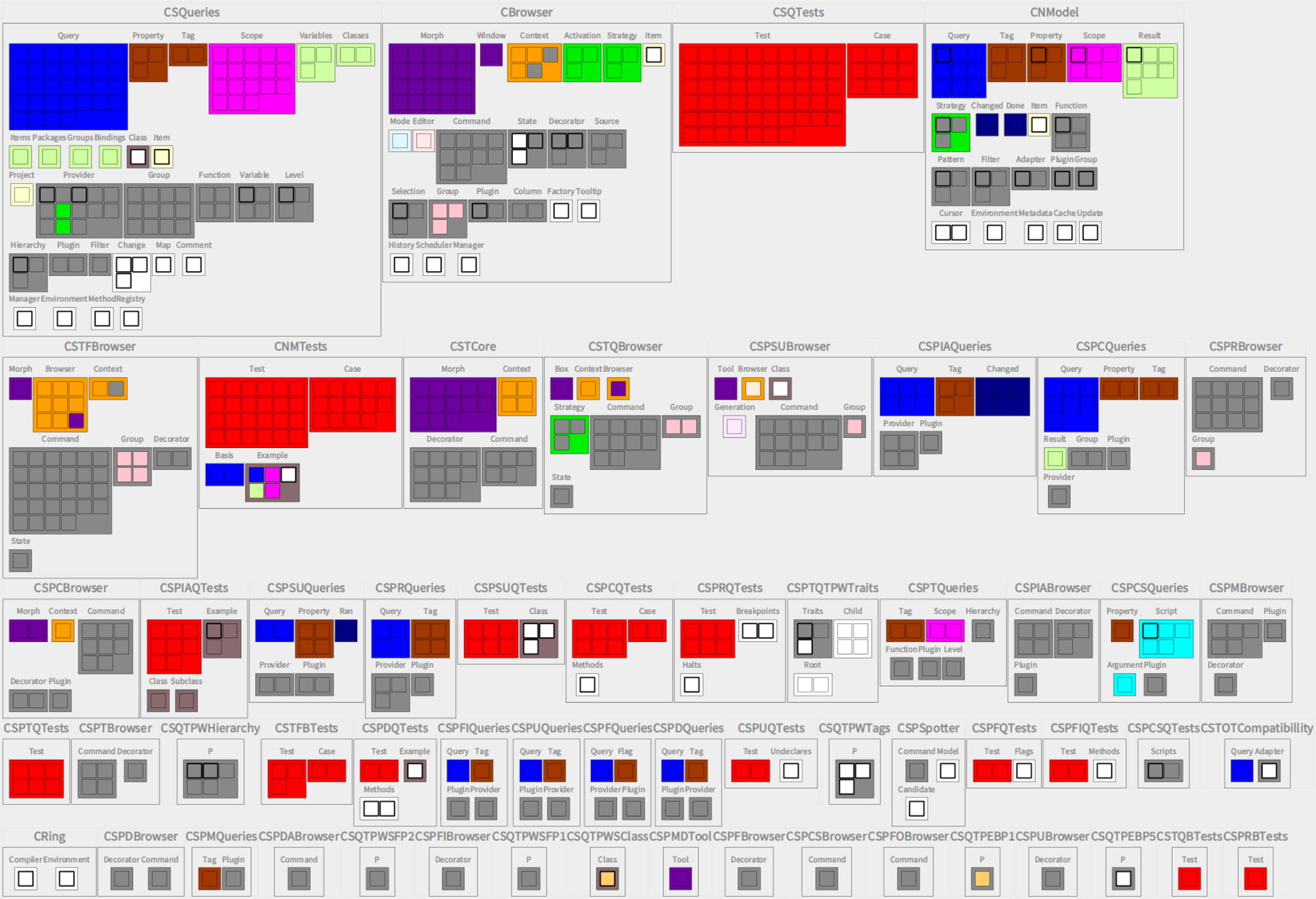
V8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CSPMDTool
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CSPFBrowser
Decorator
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CSPRBTests
Test

V9


CSQueries
Property Tag Result Classes Annotation Item Project
Query Scope Group Provider Function Variable Level
Hierarchy Plugin Filter Change Registry Map Manager
Class Method Environment Comment
CBrowser
Morph Window Activation Annotation Presenter Item
Mode Editor Command Context Decorator Group
Selection State Source Column Plugin Strategy
Manager Factory Scheduler History Action Tooltip
CSQTests
Test Case
CNModel
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CNMTests
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Morph Decorator
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CSTQBrowser
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Provider Plugin
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CSPCBrowser
Morph Command Decorator
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CSPTBrowser
Command Decorator
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Test Mock
CSPDQTests
Test Methods
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CSPUQueries
Tag Plugin
Provider Query
CSPFQueries
Flag Provider
Query Plugin
CSPFIQueries
Tag Provider
Query Plugin
CSPFQTests
Test Flags
CSPUQTests
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CSQTPEBP5
Mock
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Mock
CSPMDTool
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Decorator
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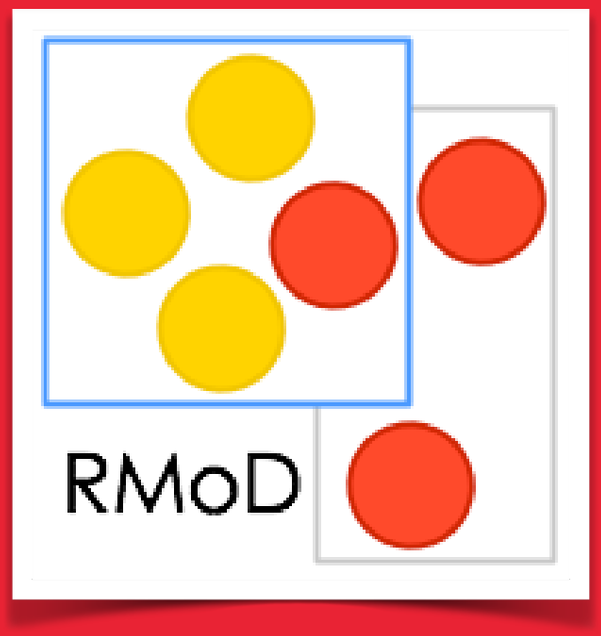
CSPTQTPETrait



What about security?

No solution yet but we are interested …

by your wishes

by your ideas

What are the maps you want to see?

- constructs maps
- “dangerous” expressions?

What are the maps you want to see?

- input places?

What are the maps you want to see?

- previous bugs?
- places not covered by test?
- buggy places covered by tests?

What are the maps you want to see?

- domains?
- symbols used

Code as a database

What are the queries you would like to do to spot problem?

What properties such query engine should have?

Let us dream a bit more…

Can we have security aware refactorings?

Can I refactor a piece of code without breaking a non-functional requirement?

- concurrency
- speed
- security

Ready to collaborate

Interested

- Software Maps for security
- ANR proposal around “qualisecure” (we wrote one already)
- Security-aware refactoring
- And your problems