

# Pragmatic Design Quality Assessment

## Extracted Slides

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University of Bern, Switzerland

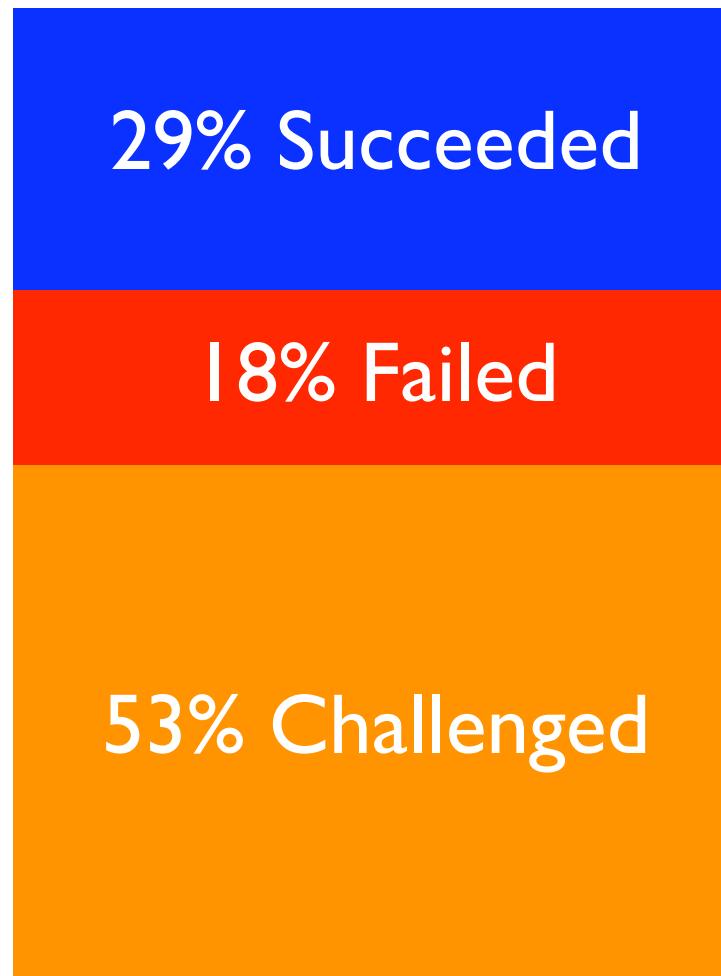
Michele Lanza

University of Lugano, Switzerland

Radu Marinescu

Politehnica University of Timisoara, Romania

# Software is complex.



The Standish Group, 2004

# How large is your project?

1'000'000 lines of code

# How large is your project?

1'000'000 lines of code

\* 2 = 2'000'000 seconds

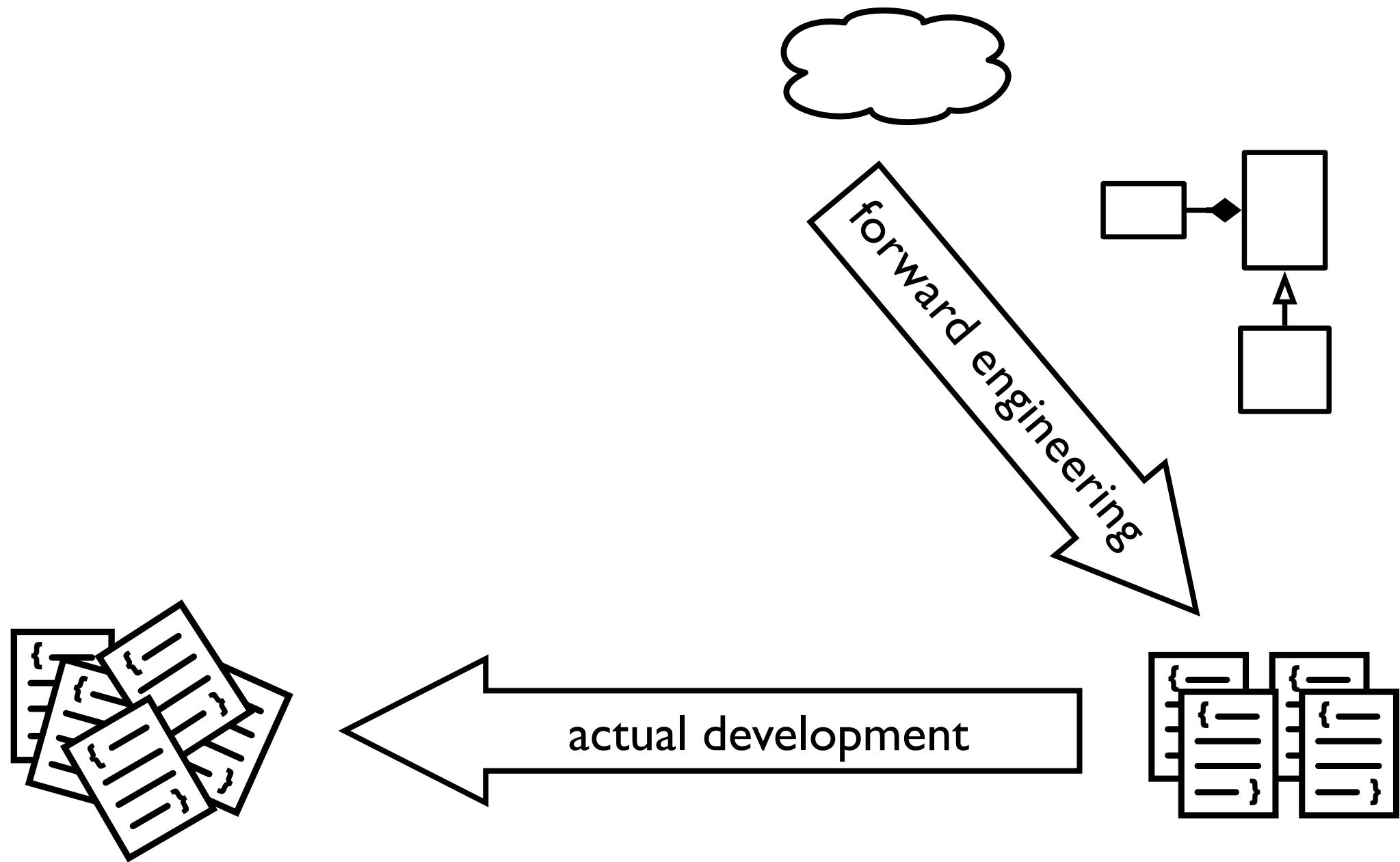
/ 3600 = 560 hours

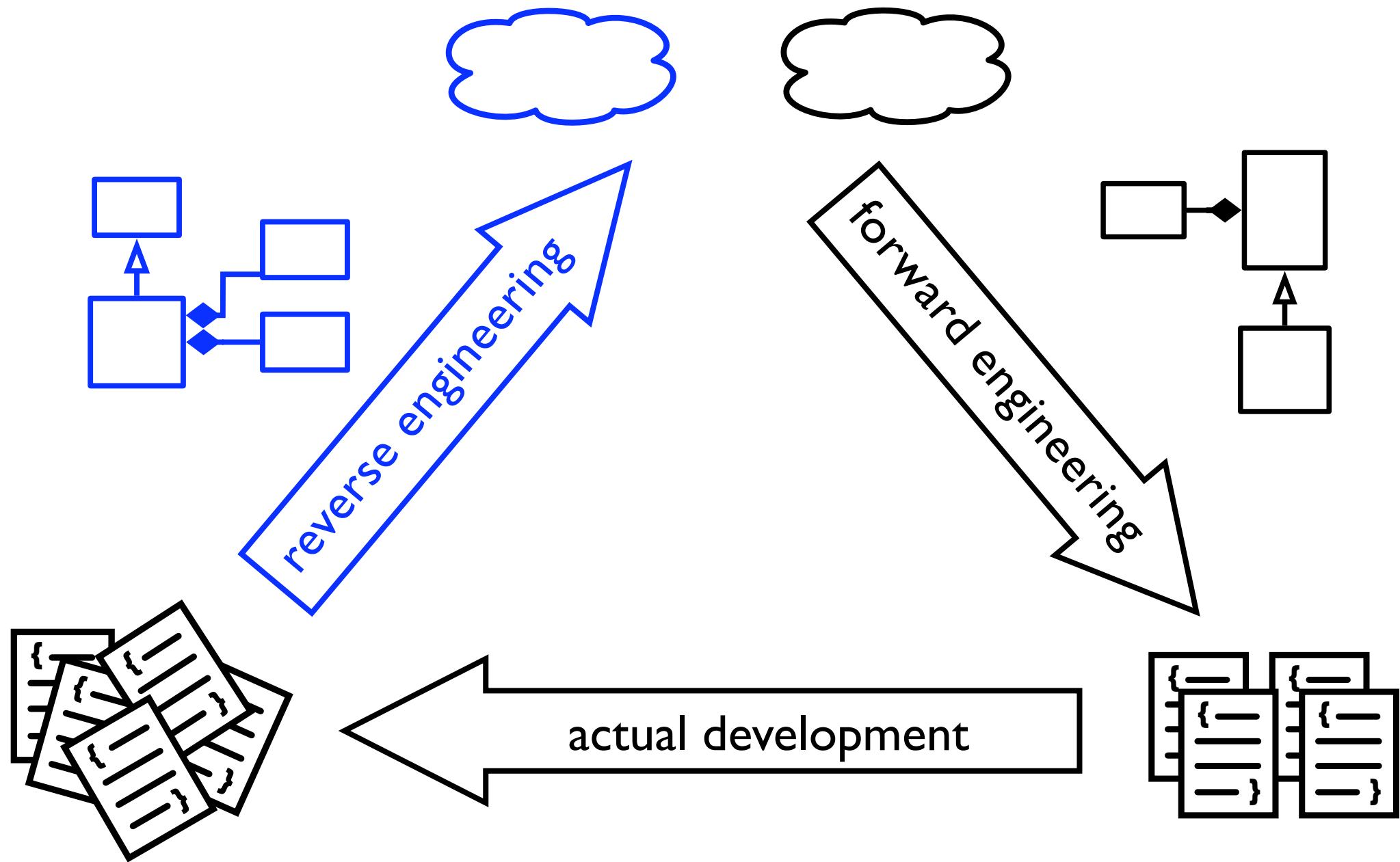
/ 8 = 70 days

/ 20 = 3 months

But, code is for the computer.

**Why** would we ever **read** it?

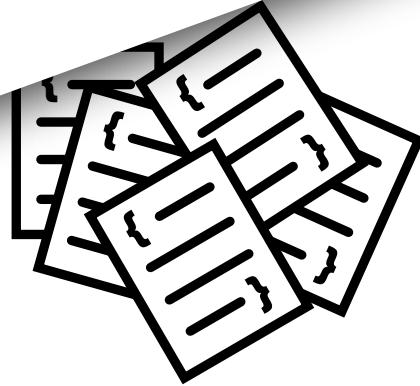




**Reverse engineering** is analyzing a subject system to:  
identify components and their relationships, and  
create more abstract representations.

Chikofky & Cross, 90

How to judge its quality?



A large system contains lots of details.

# Software in numbers



You **cannot control**  
what you **cannot measure.**

Tom de Marco

**Metrics** are functions that assign **numbers** to  
**products, processes** and **resources**.

**Software metrics** are measurements which relate to software **systems, processes** or related **documents**.

Metrics compress system traits into **numbers**.

Let's see some **examples...**

McCabe cyclomatic complexity (**CYCLO**) counts the number of independent paths through the code of a function.

McCabe, 1977

- ✓ it reveals the minimum number of tests to write
- ✗ interpretation can't directly lead to improvement action

Weighted Method Count (**WMC**) sums up the complexity of class' methods (measured by the metric of your choice; usually CYCLO).

Chidamber, Kemerer, 1994

- ✓ it is configurable, thus adaptable to our precise needs
- ✗ interpretation can't directly lead to improvement action

Depth of Inheritance Tree (**DIT**) is the (maximum) depth level of a class in a class hierarchy.

Chidamber, Kemerer, 1994

✓ inheritance is measured

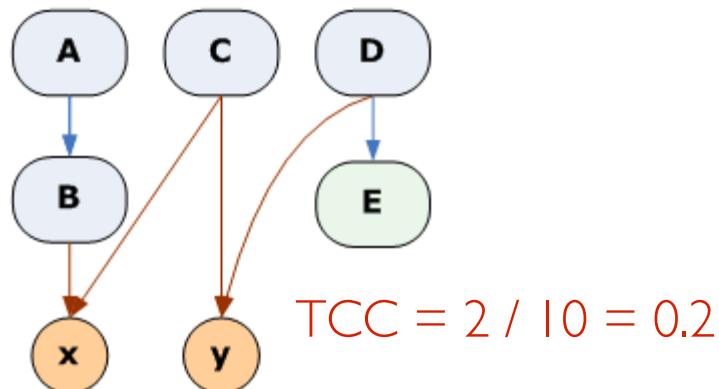
✗ only the potential and not the real impact is quantified

Coupling between objects (**CBO**) shows the number of classes from which methods or attributes are used.

Chidamber, Kemerer, 1994

- ✓ it takes into account real dependencies not just declared ones
- ✗ no differentiation of types and/or intensity of coupling

Tight Class Cohesion (**TCC**) counts the relative number of method-pairs that access attributes of the class in common.



Bieman, Kang, 1995

- ✓ interpretation can lead to improvement action
- ✓ ratio values allow comparison between systems

# Metrics Assess and Improve Quality!

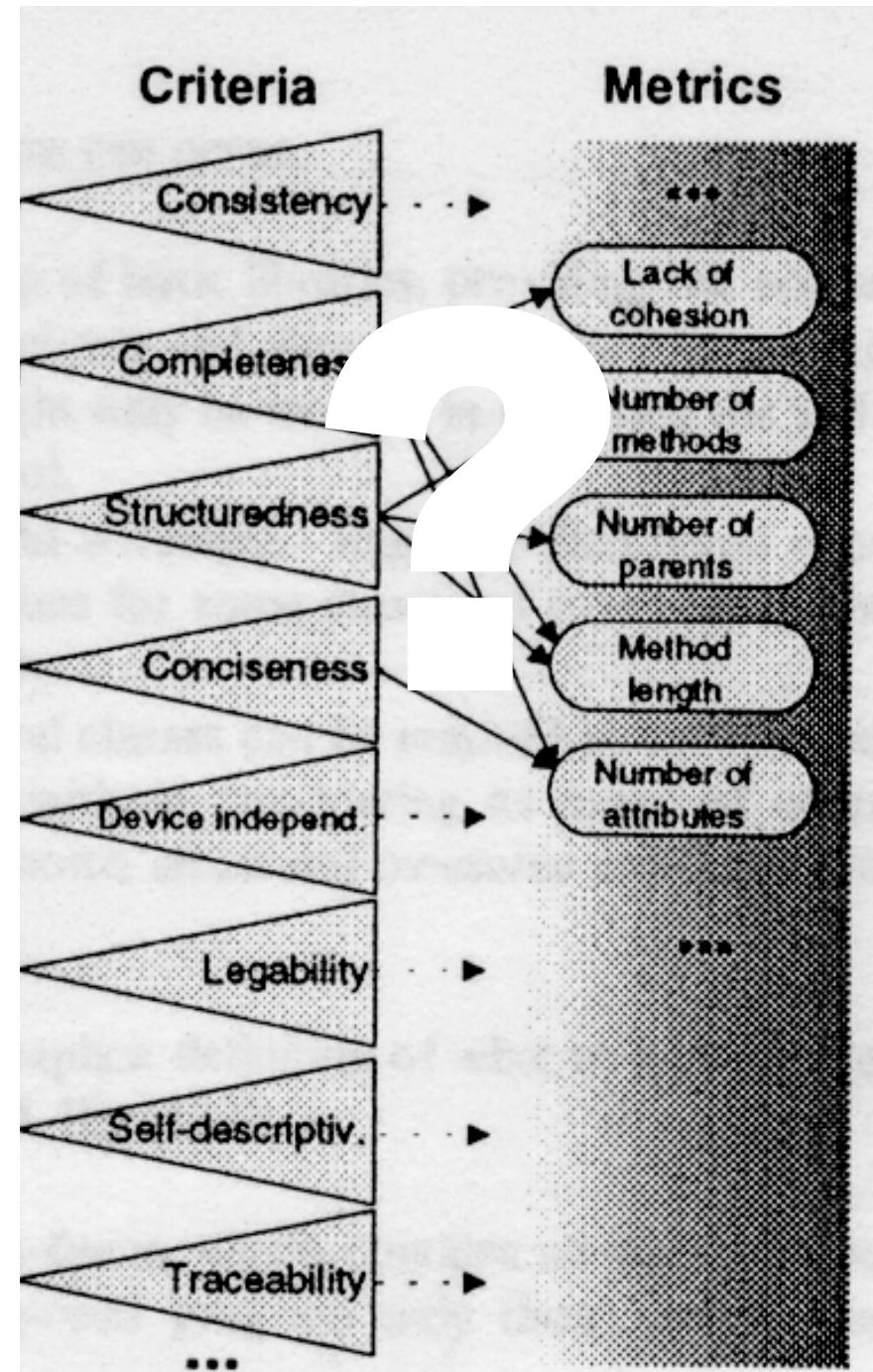
Metrics Assess and Improve Quality!

Really?

# Problem 1: metrics granularity

capture **symptoms**, not causes of problems

in **isolation**,  
they don't lead to **improvement** solutions



# Problem 2: implicit mapping

we don't reason in terms of **metrics**,  
but in terms of **design principles**

# 2

## big obstacles in using metrics:

**Thresholds** make metrics hard to interpret

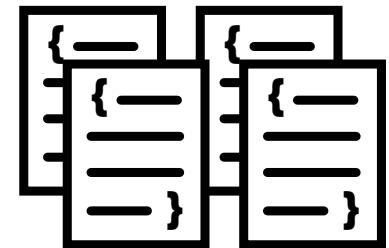
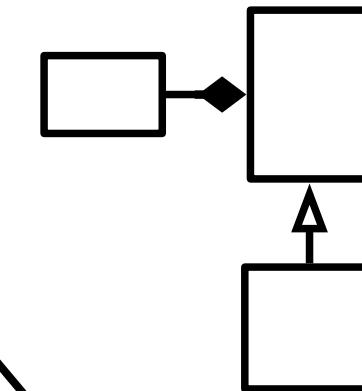
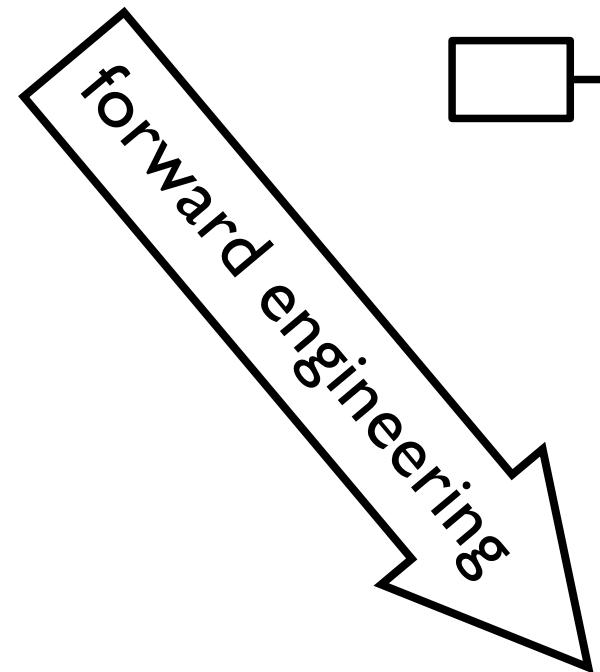
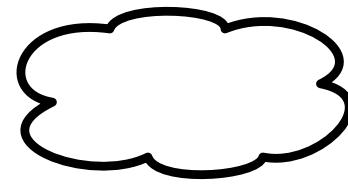
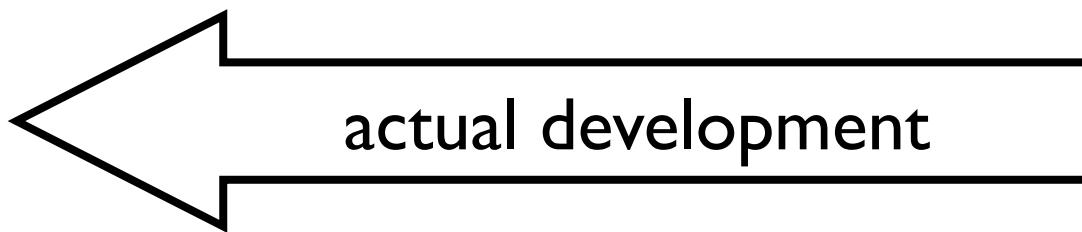
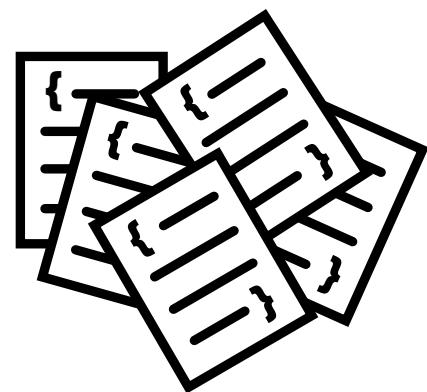
**Granularity** make metrics hard to use in isolation

Can metrics help me  
in what I really care for? :)

How do I understand code?

How do I improve code?

How do I improve myself?

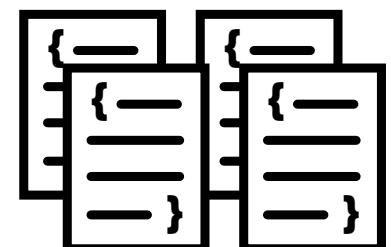
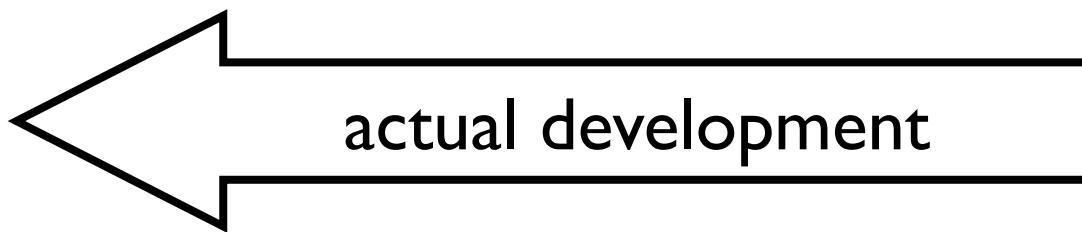
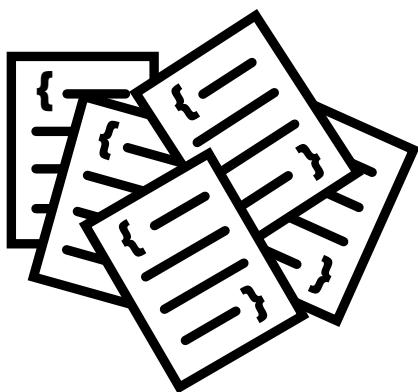
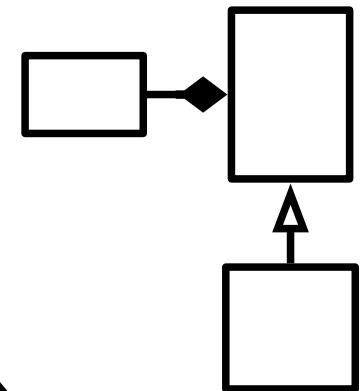
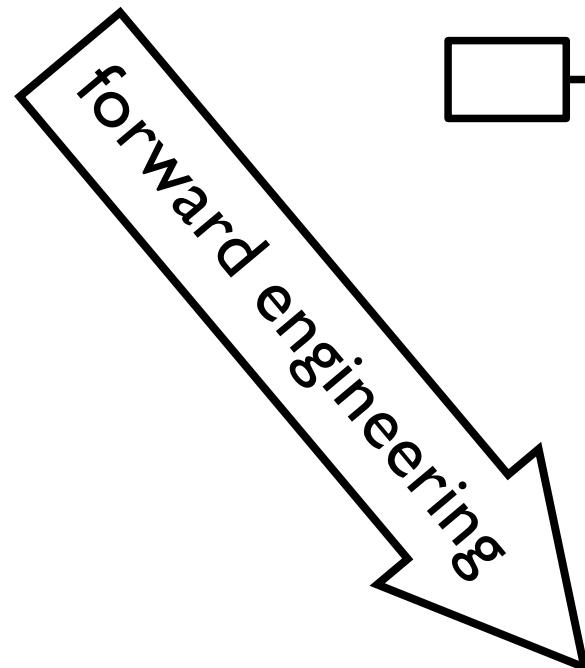


I want nothing to do with metrics!

How do I understand code?

How do I improve code?

How do I improve myself?



How to get an **initial understanding** of a system?

Metric	Value
LOC	35175
NOM	3618
NOC	384
CYCLO	5579
NOP	19
CALLS	15128
FANOUT	8590
AHH	0.12
ANDC	0.31

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Metric	Value
LOC	35175
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FANOUT	
AHH	

And now what?

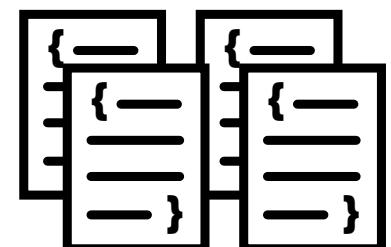
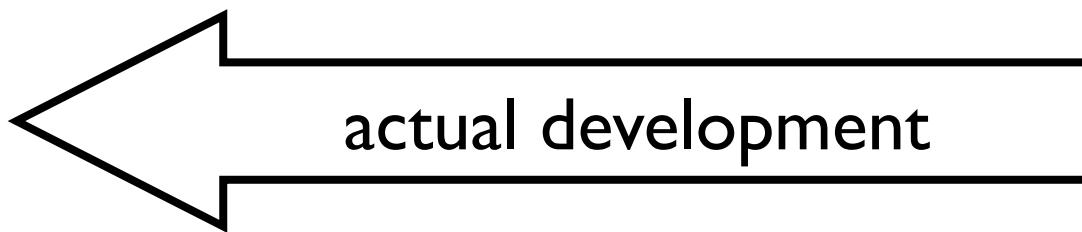
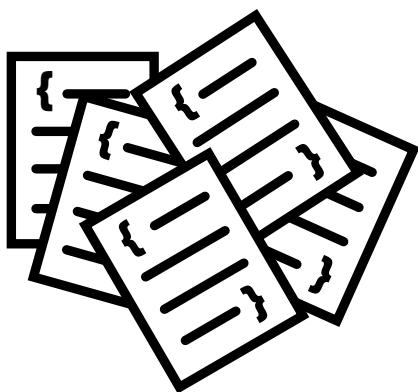
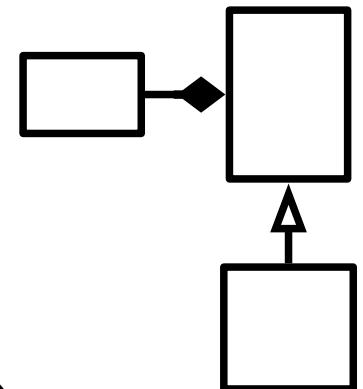
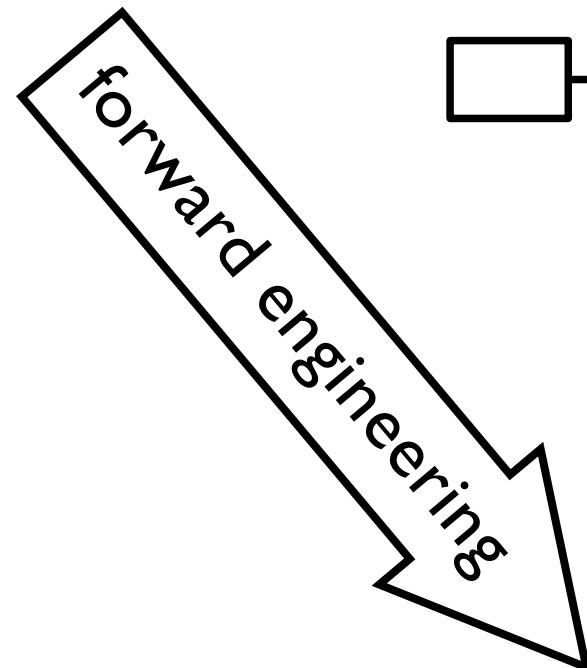
0.31

I want nothing to do with metrics!

How do I understand code?

How do I improve code?

How do I improve myself?



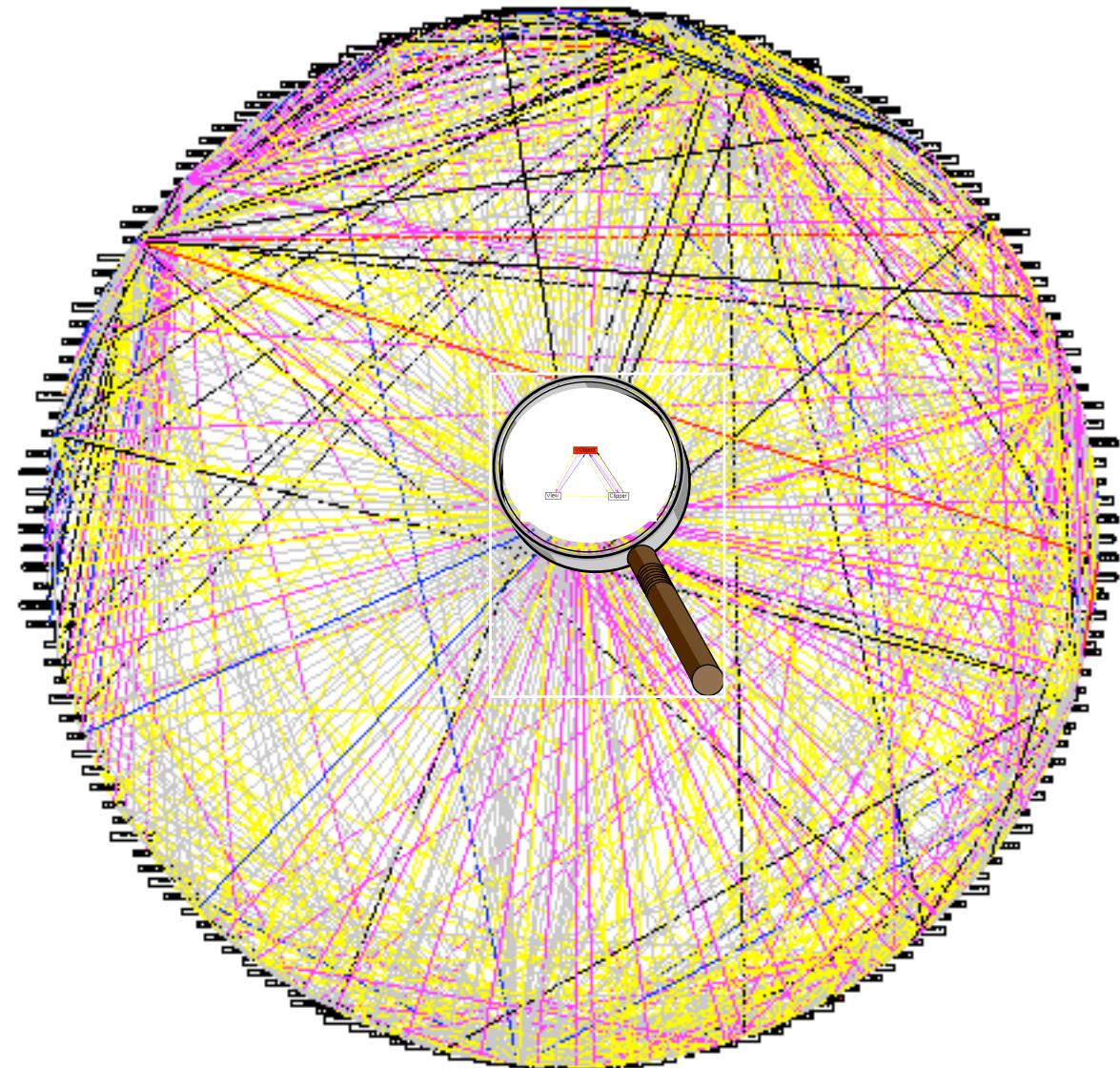
How do I **improve code?**

Quality is **more** than 0 bugs.

Breaking design principles, rules and best practices  
**deteriorates** the code;  
it leads to **design problems**.

Imagine changing just a **small** design fragment

and **33%**  
of all classes  
would require changes



Design problems are **expensive**  
**frequent**  
**unavoidable**

How to detect and eliminate them?

**God Classes** tend to centralize the intelligence of the system, to do everything and to use data from small data-classes.

Riel, 1996

**God Classes** tend  
to centralize the intelligence of the system,  
to do everything and  
to use data from small data-classes.

## God Classes

centralize the intelligence of the system,  
do everything and  
use data from small data-classes.

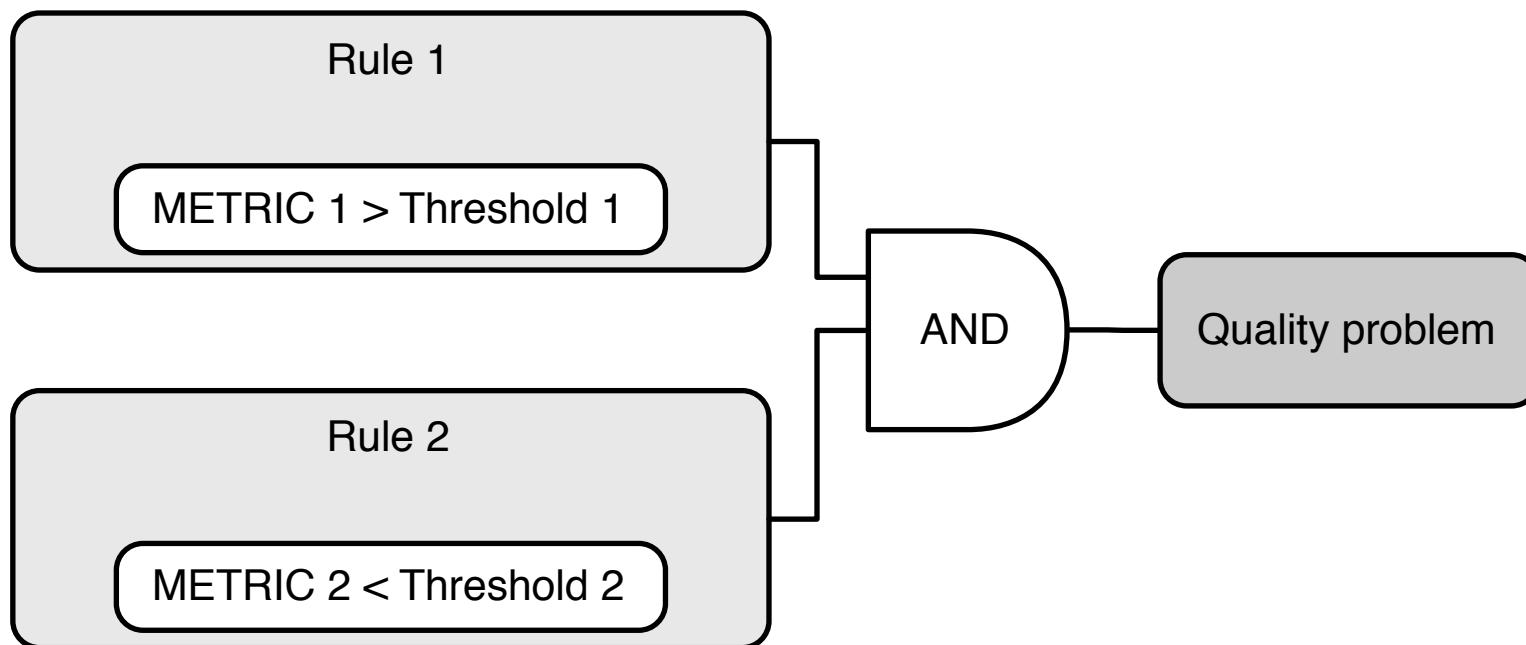
## God Classes

are complex,  
are not cohesive,  
access external data.

Compose metrics into queries using  
logical operators

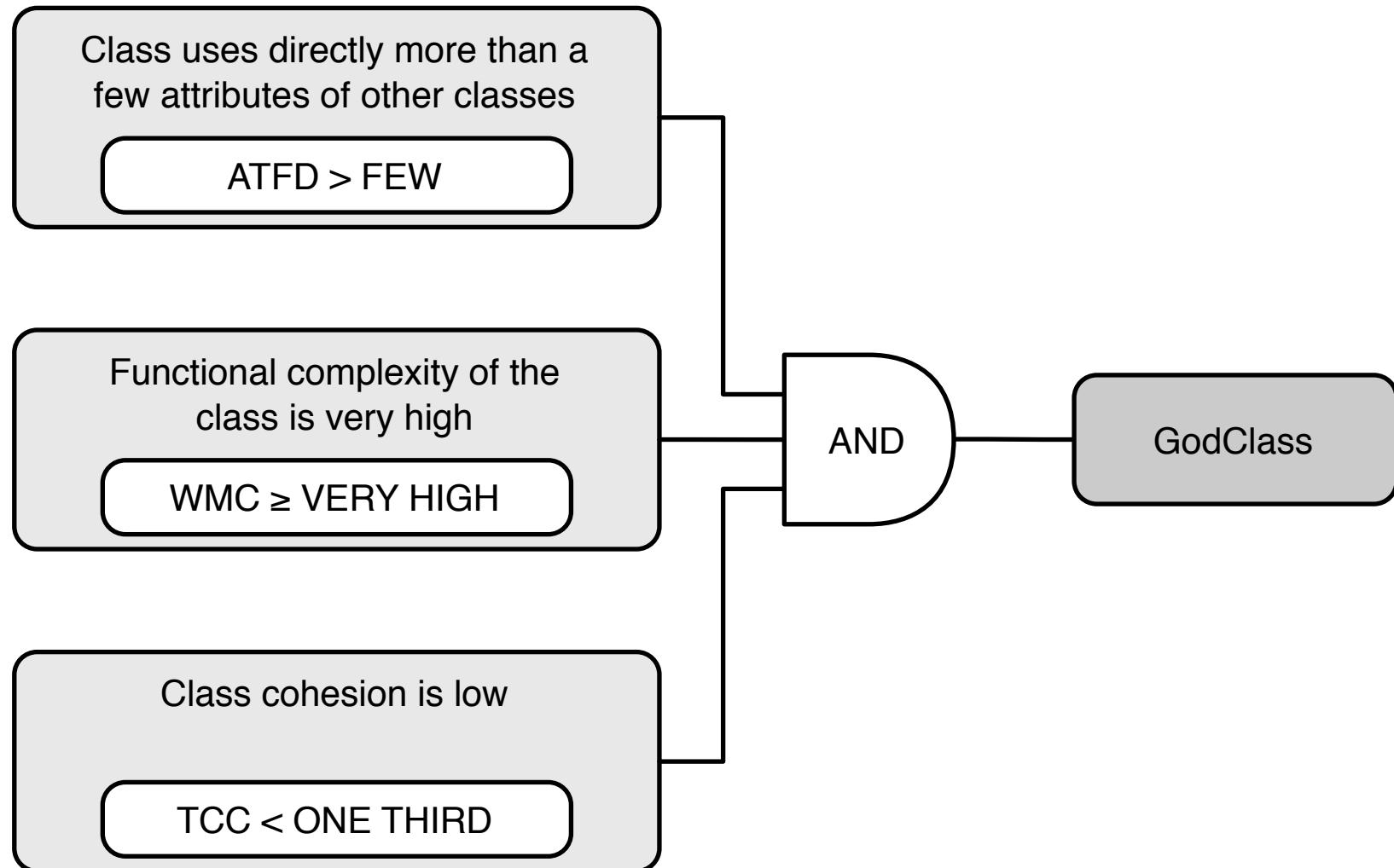
# Detection Strategies are metric-based queries to detect design flaws.

Lanza, Marinescu 2006



# A **God Class** centralizes too much intelligence in the system.

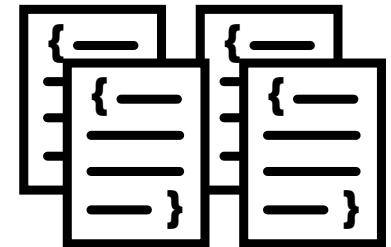
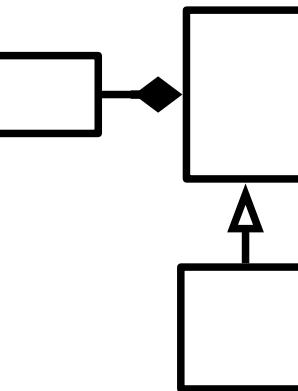
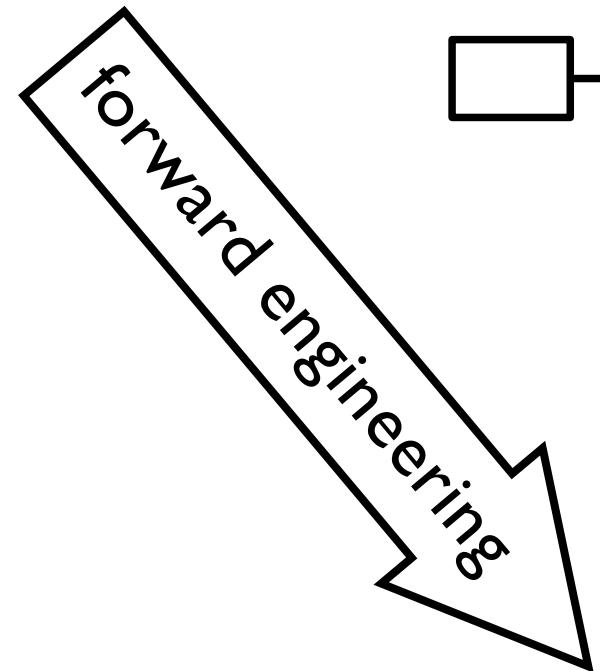
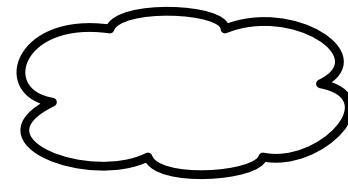
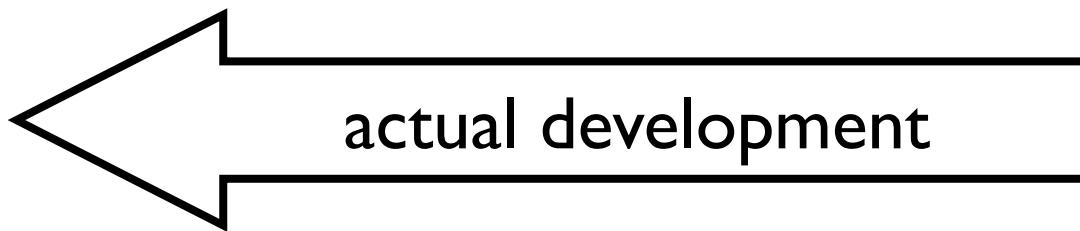
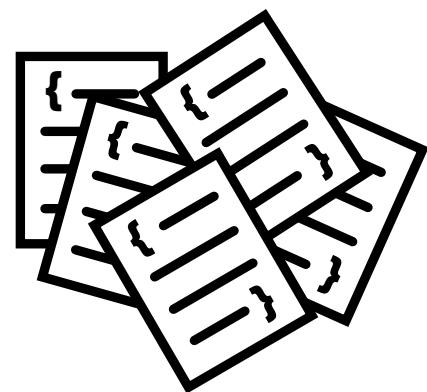
Lanza, Marinescu 2006



How do I understand code?

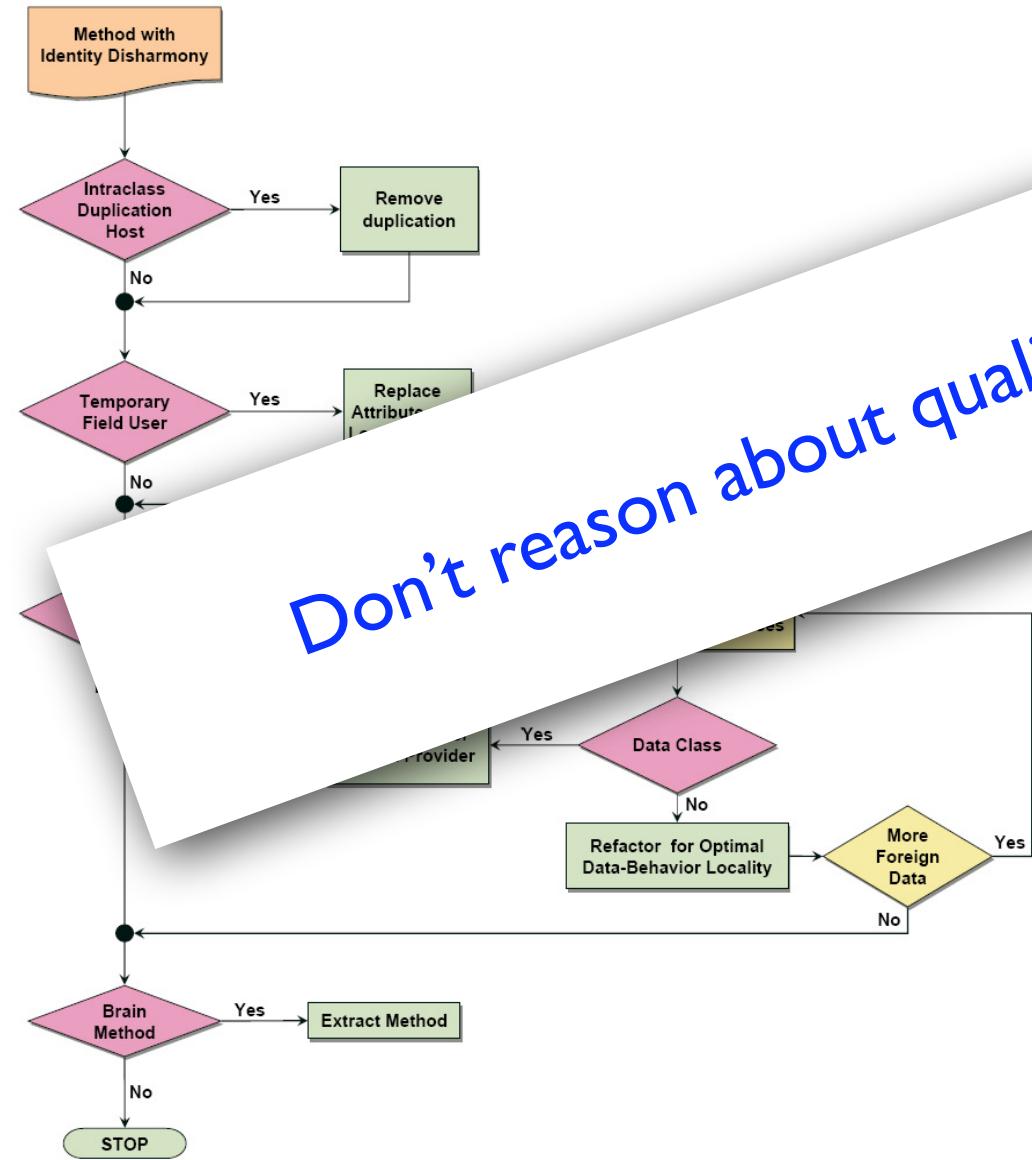
How do I improve code?

How do I improve myself?

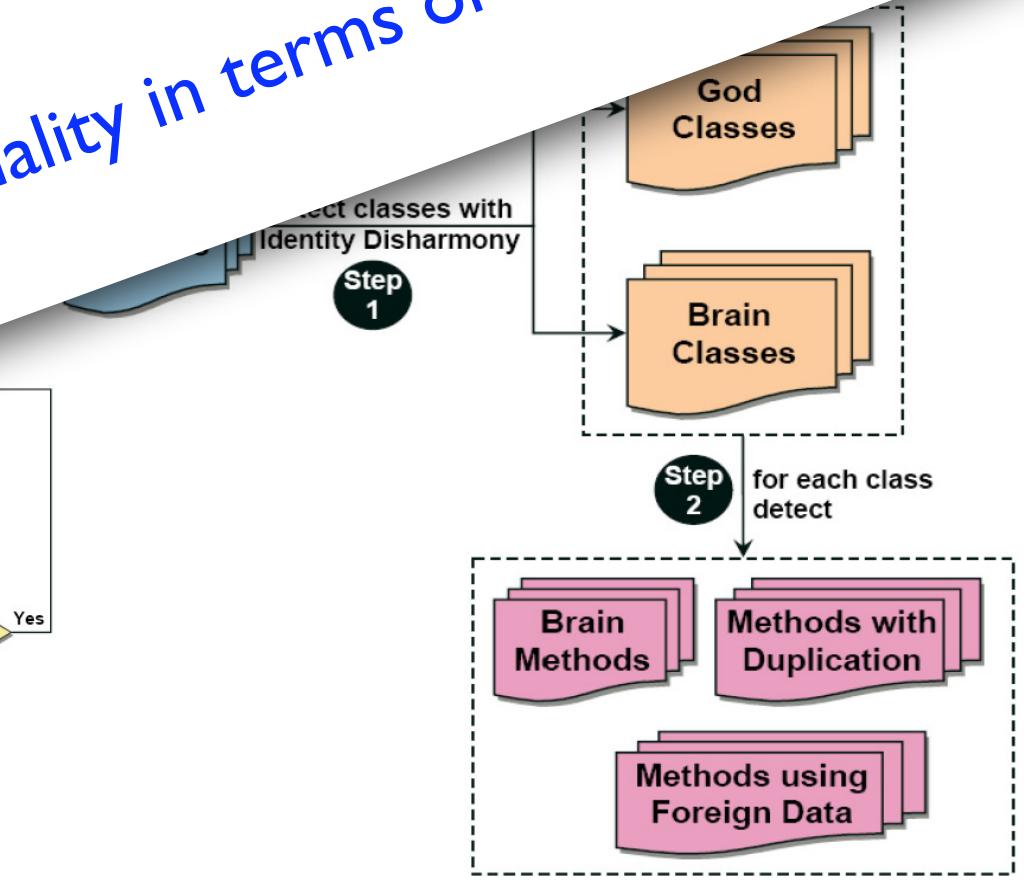


How do I **improve** myself?

# Follow a clear and repeatable process



Don't reason about quality in terms of numbers!



# Software in pictures

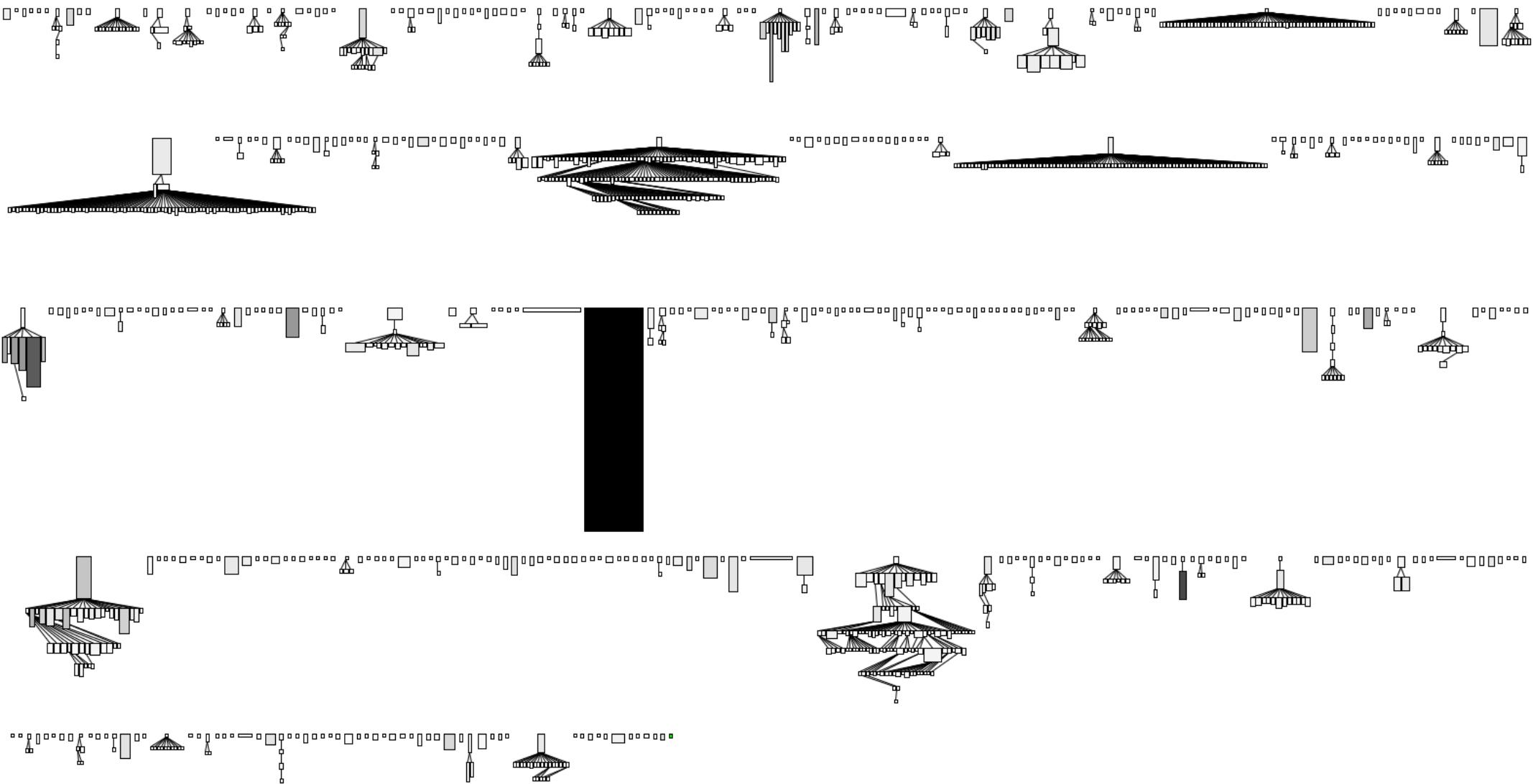
# 1854, London, cholera epidemic



# Numbers..

Metric	Value	Remarks
No. of Lines of Code	223,068	including comments
No. of Source Files	1,209	*.java files
No. of Packages	99	-
No. of Classes	1,393	including 140 inner classes
No. of Methods	9,561	including accessor methods
No. of Attributes	3,358	all variables including static and local variables

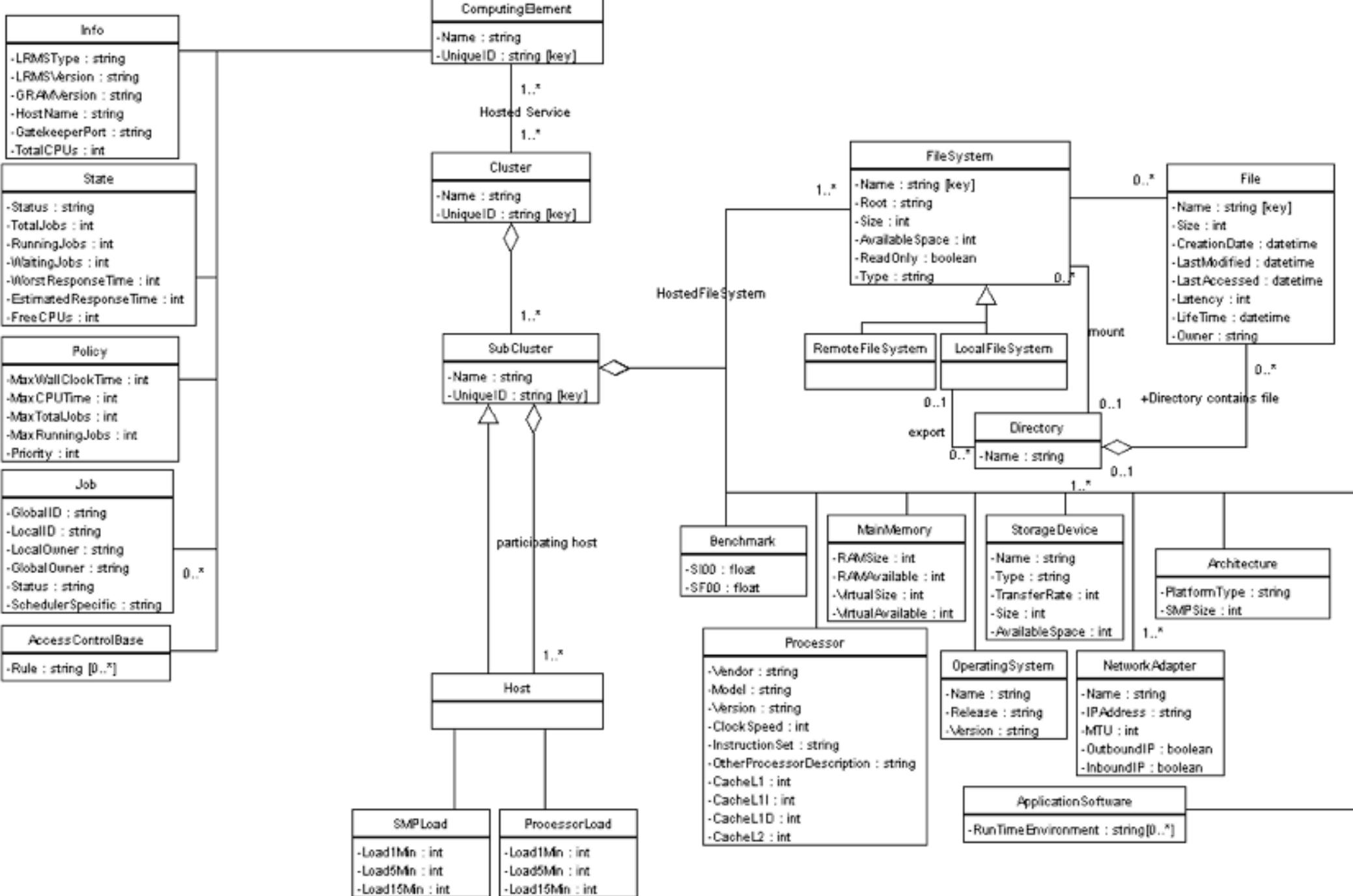
# Visualization compresses the system into pictures.



## Glue Schema

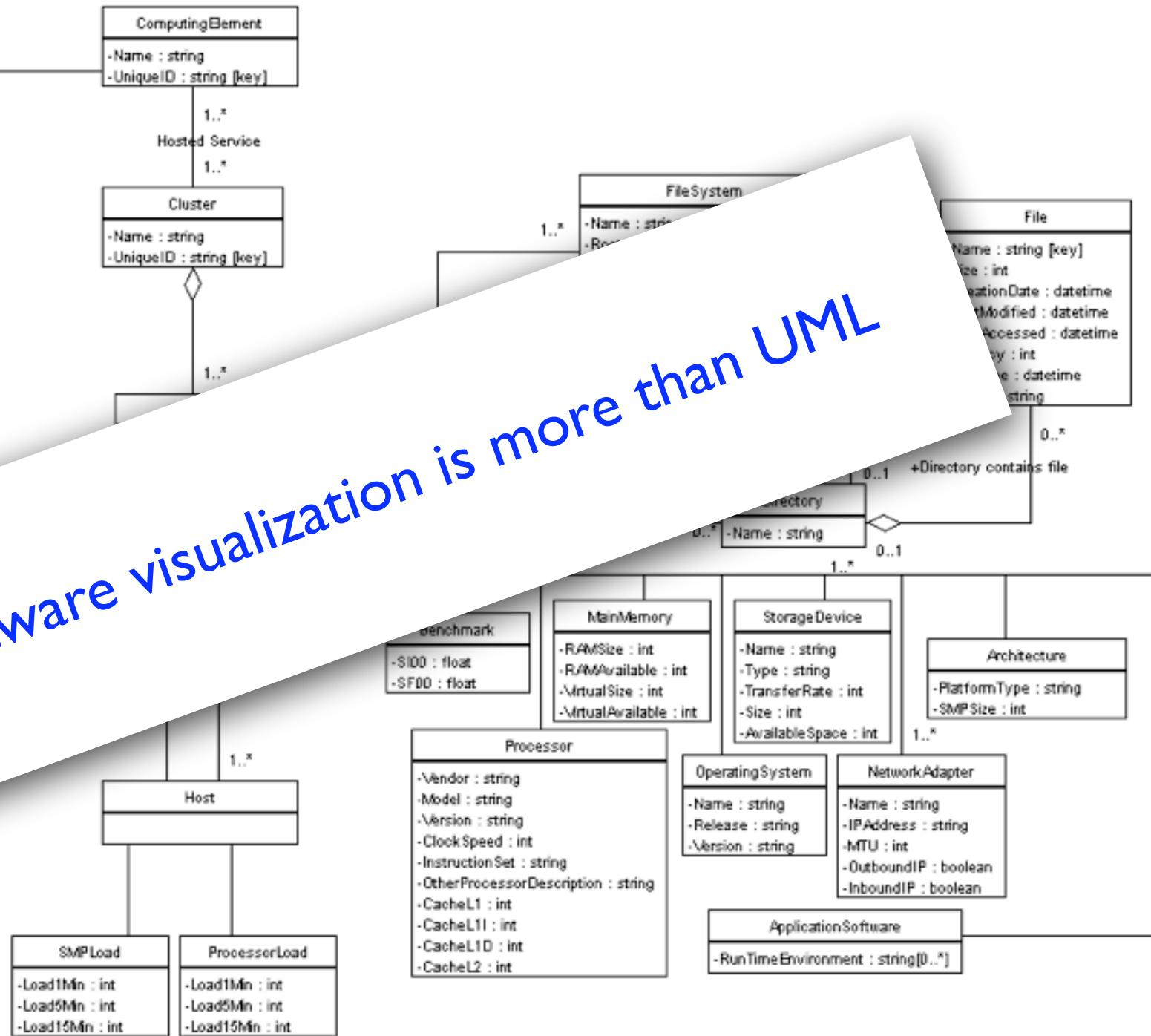
Namespace: Glue

vers. 1.0 - 24/08/2002



Glue Schema  
Namespace: Glue  
vers. 1.0 - 24/08/2002

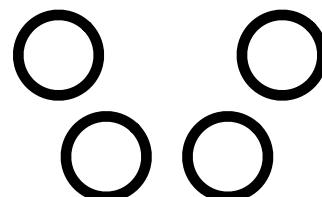
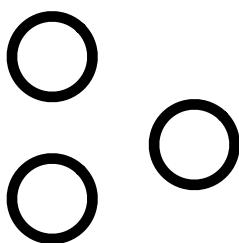
Info
-LRMSType : string
-LRMSVersion : string
-GRAMVersion : string
-HostName : string
-GatekeeperPort : string
-TotalCPUs : int
State
-Status : string
-TotalJobs : int
-RunningJobs : int
-WaitingJobs : int
-WorstResponseTime : int
-EstimatedResponseTime : int
-FreeCPUs : int
Policy
-MaxWallClockTime : int
-MaxCPUTime : int
-MaxTotalJobs : int
-MaxRunningJobs : int
-Priority : int
Job
-GlobalID : string
-LocalID : string
-LocalOwner : string
-GlobalOwner : string
-Status : string
-SchedulerSpecific : string
AccessControlBase
-Rule : string [0..*]



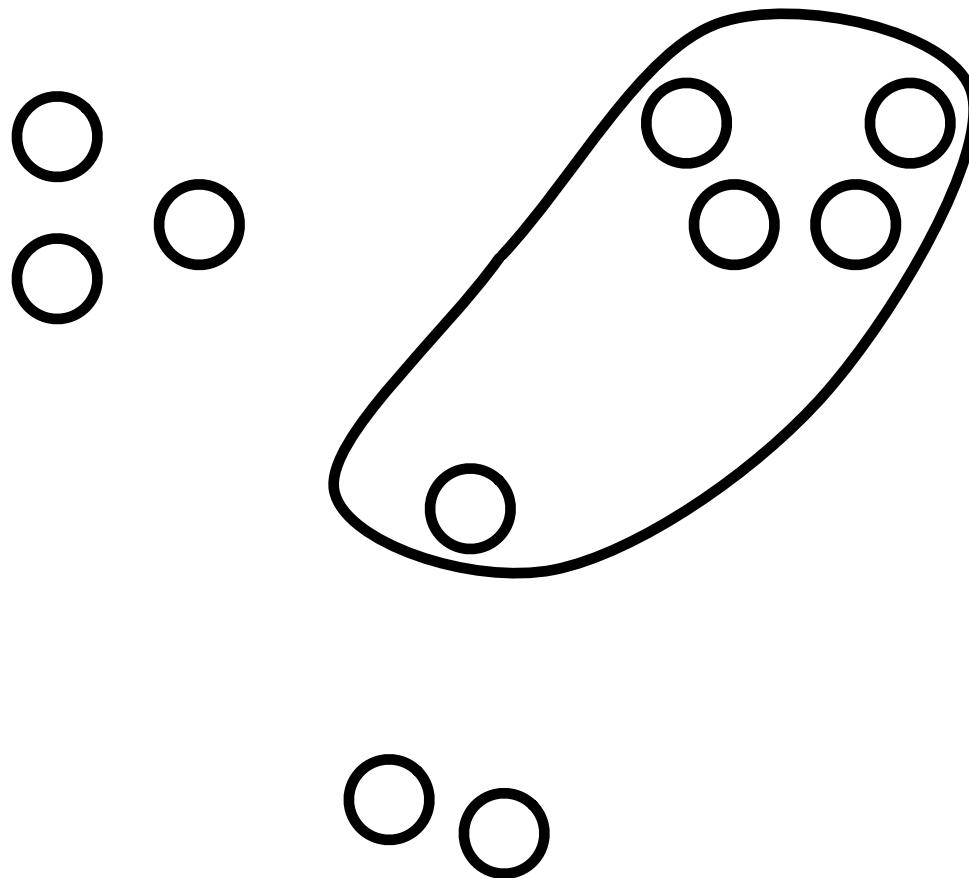
We are  
 visual  
 beings ...  
 ... and we're  
 good at  
 spotting  
 patterns



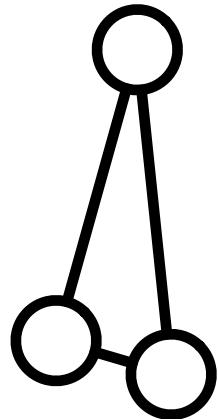
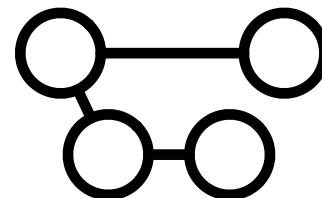
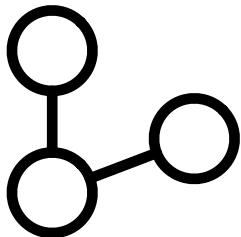
# How many groups do you see?



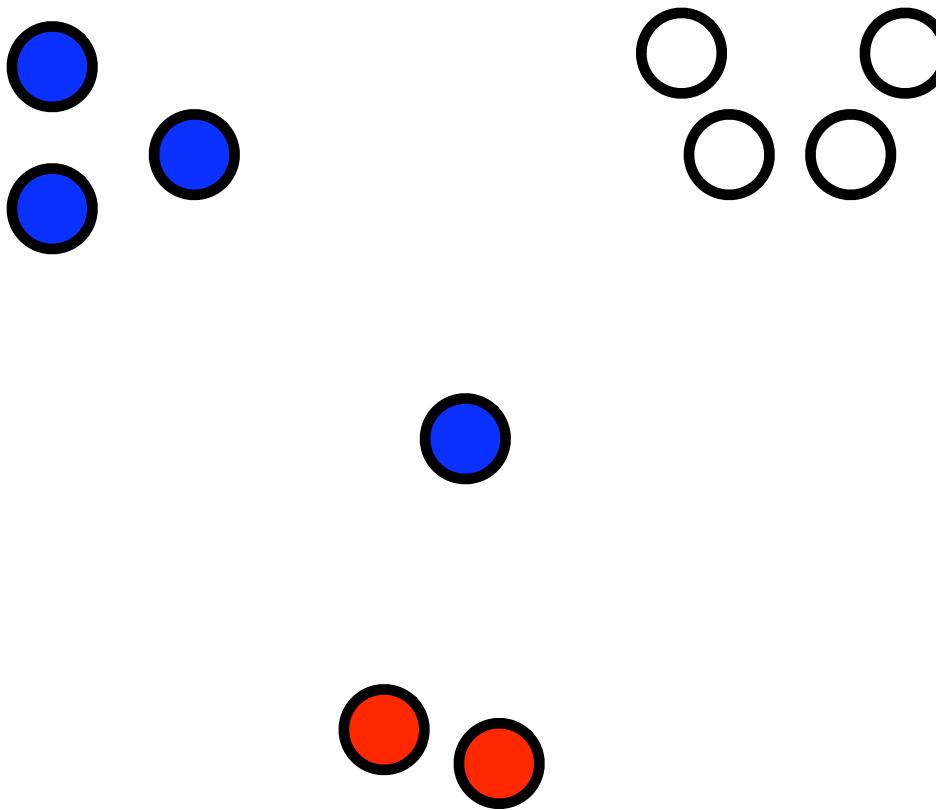
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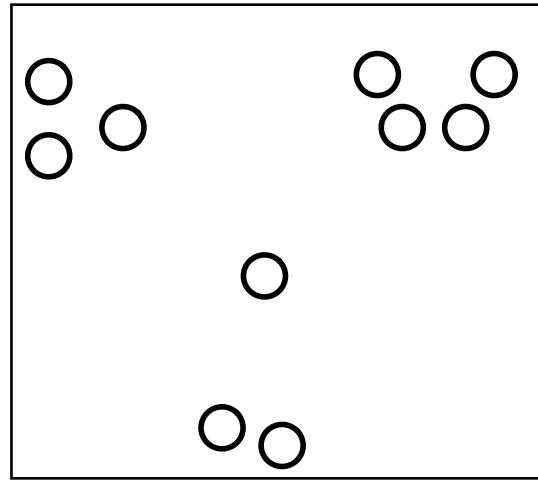


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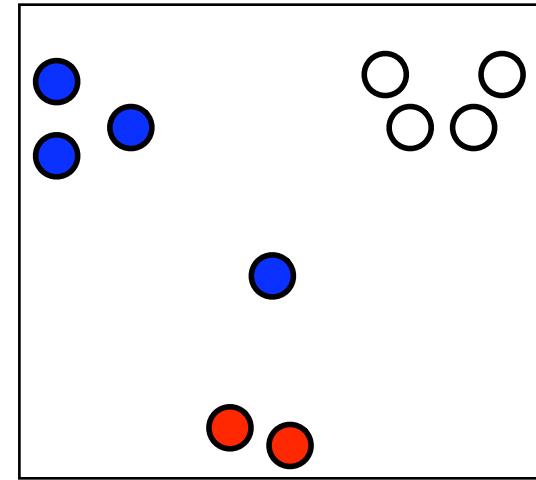


# Gestalt principles

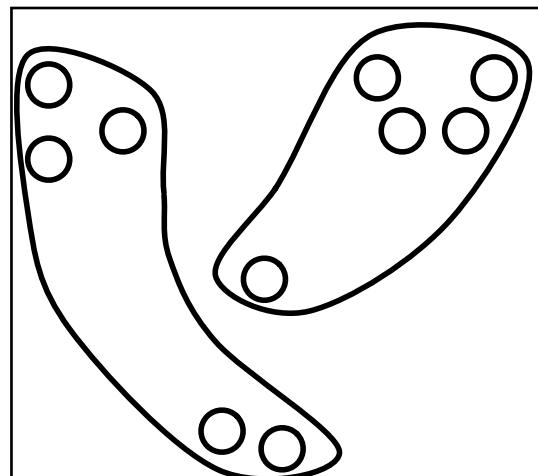
proximity



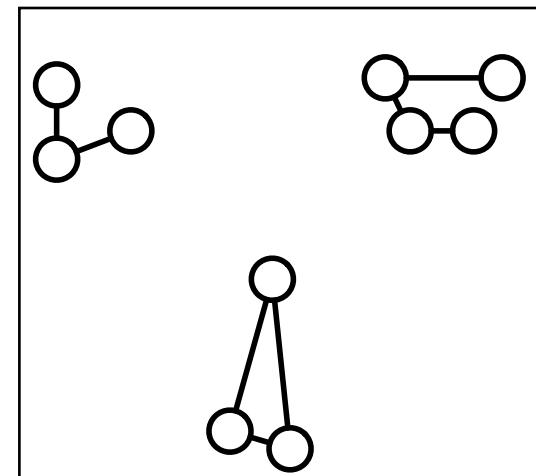
similarity



enclosure



connectivity



# Attributes of Form

Orientation

Line Length

Line Width

Size

Shape

Curvature

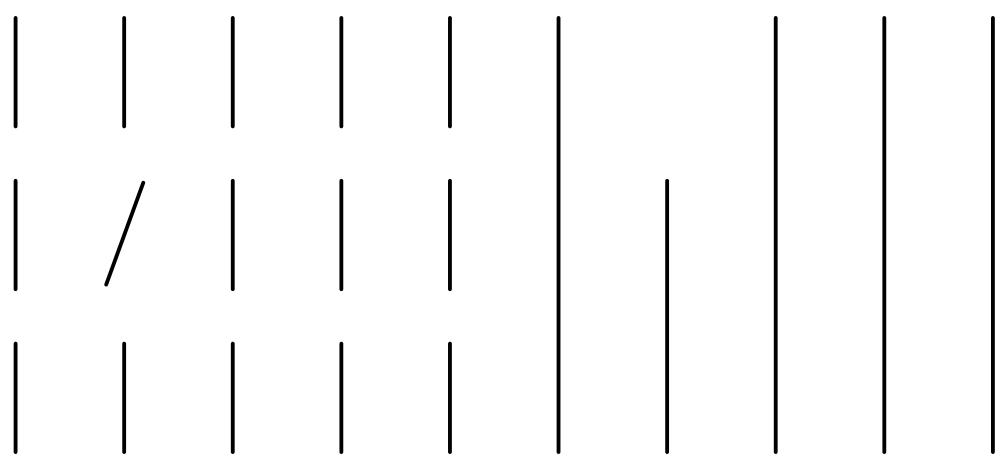
Added Marks

Enclosure

# Attributes of Form

	/				Line Length	Line Width	Size
Shape		Curvature		Added Marks		Enclosure	

# Attributes of Form



# Line Width

# Size

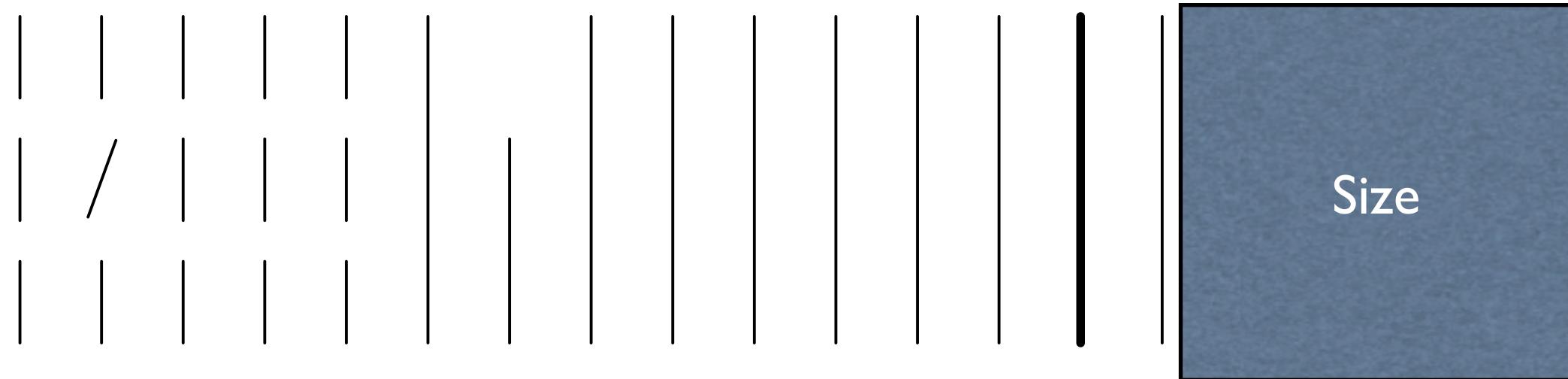
# Shape

# Curvature

# Added Marks

# Enclosure

# Attributes of Form



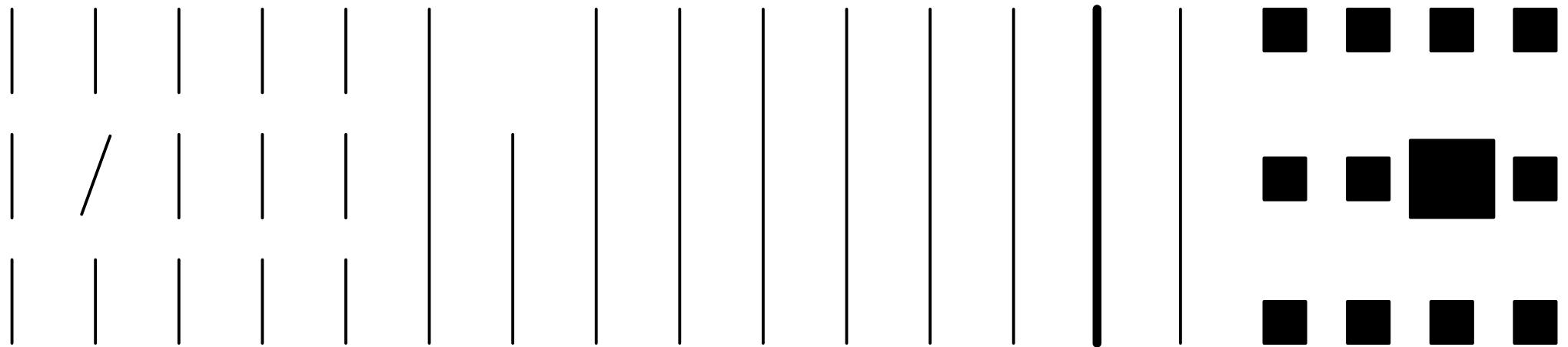
Shape

Curvature

Added Marks

Enclosure

# Attributes of Form



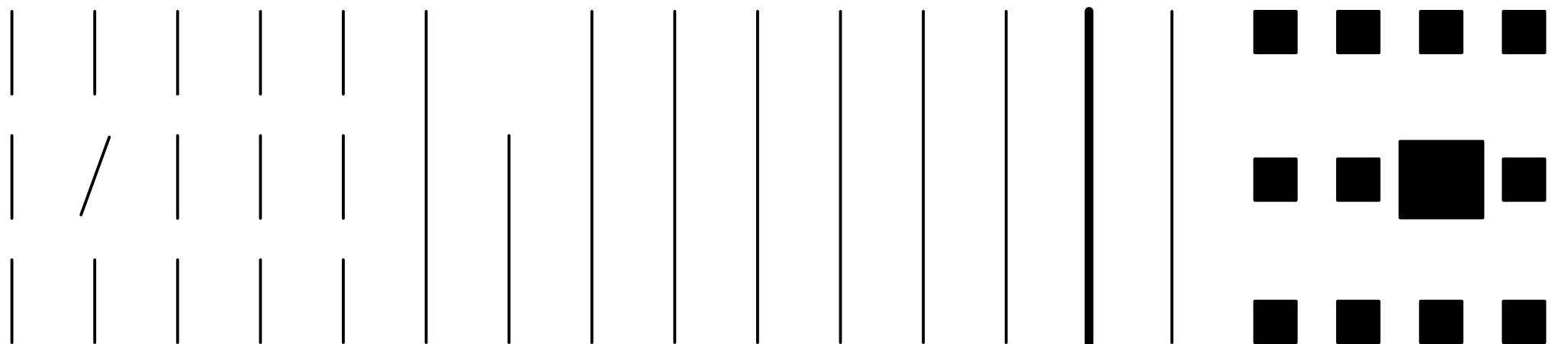
Shape

Curvature

Added Marks

Enclosure

# Attributes of Form

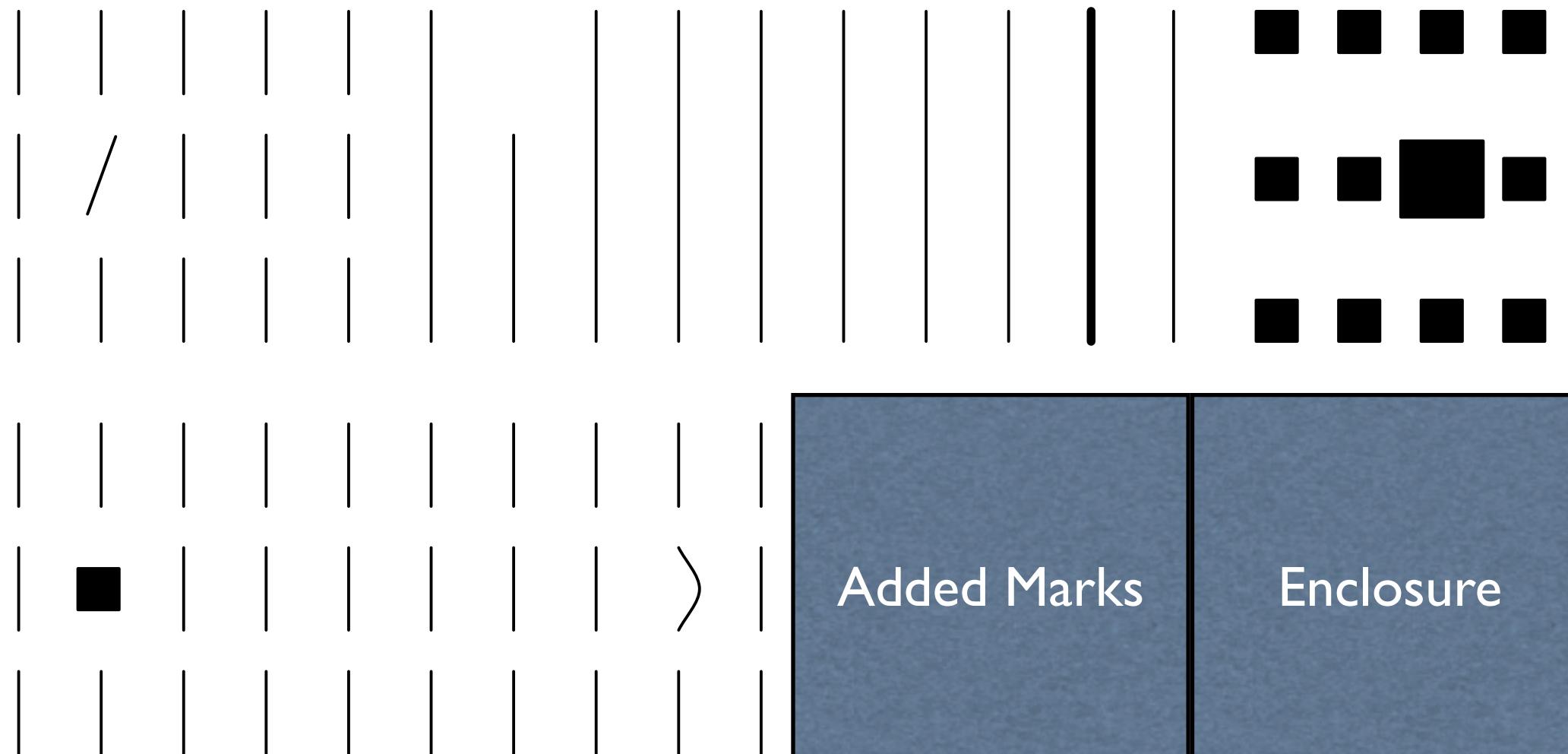


Curvature

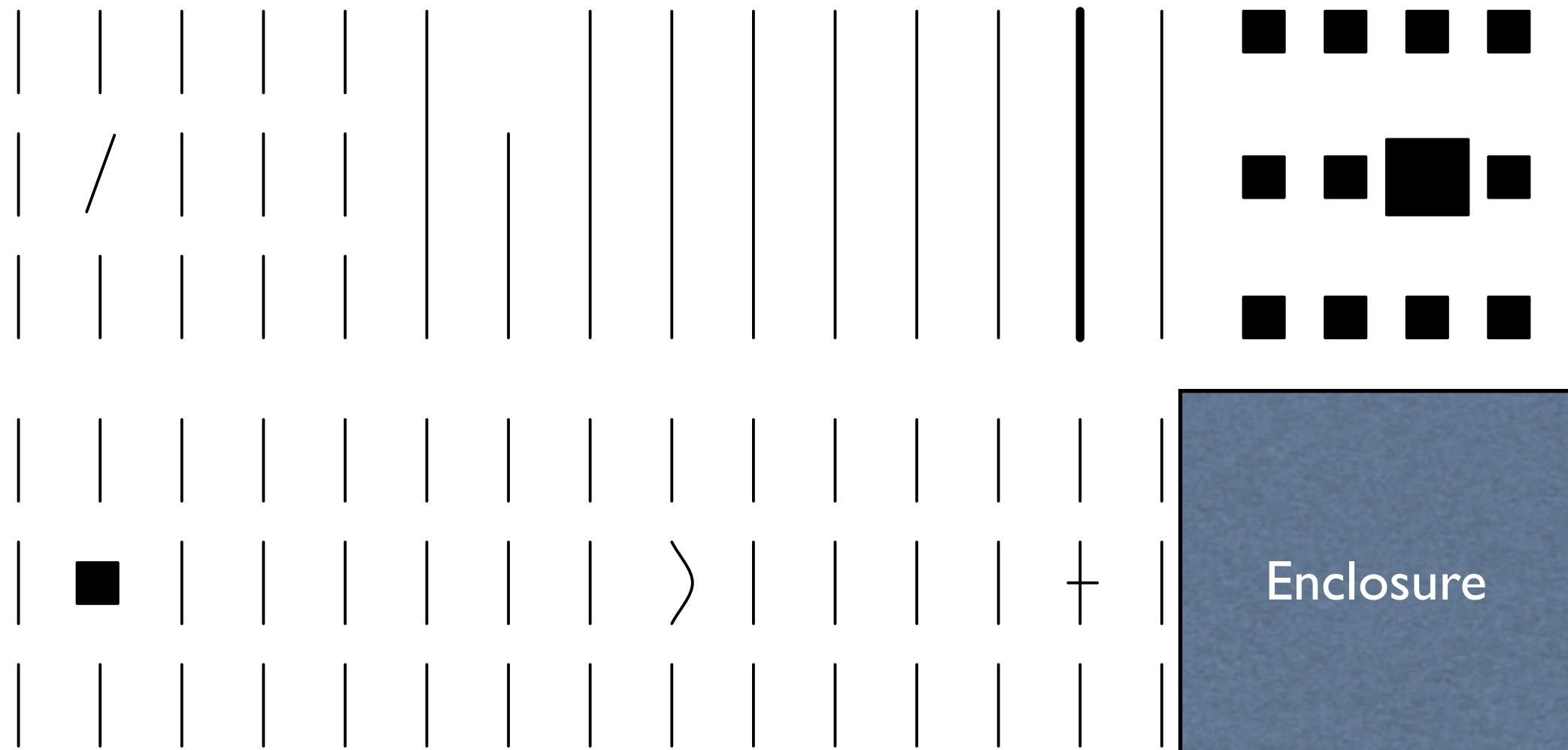
Added Marks

Enclosure

# Attributes of Form

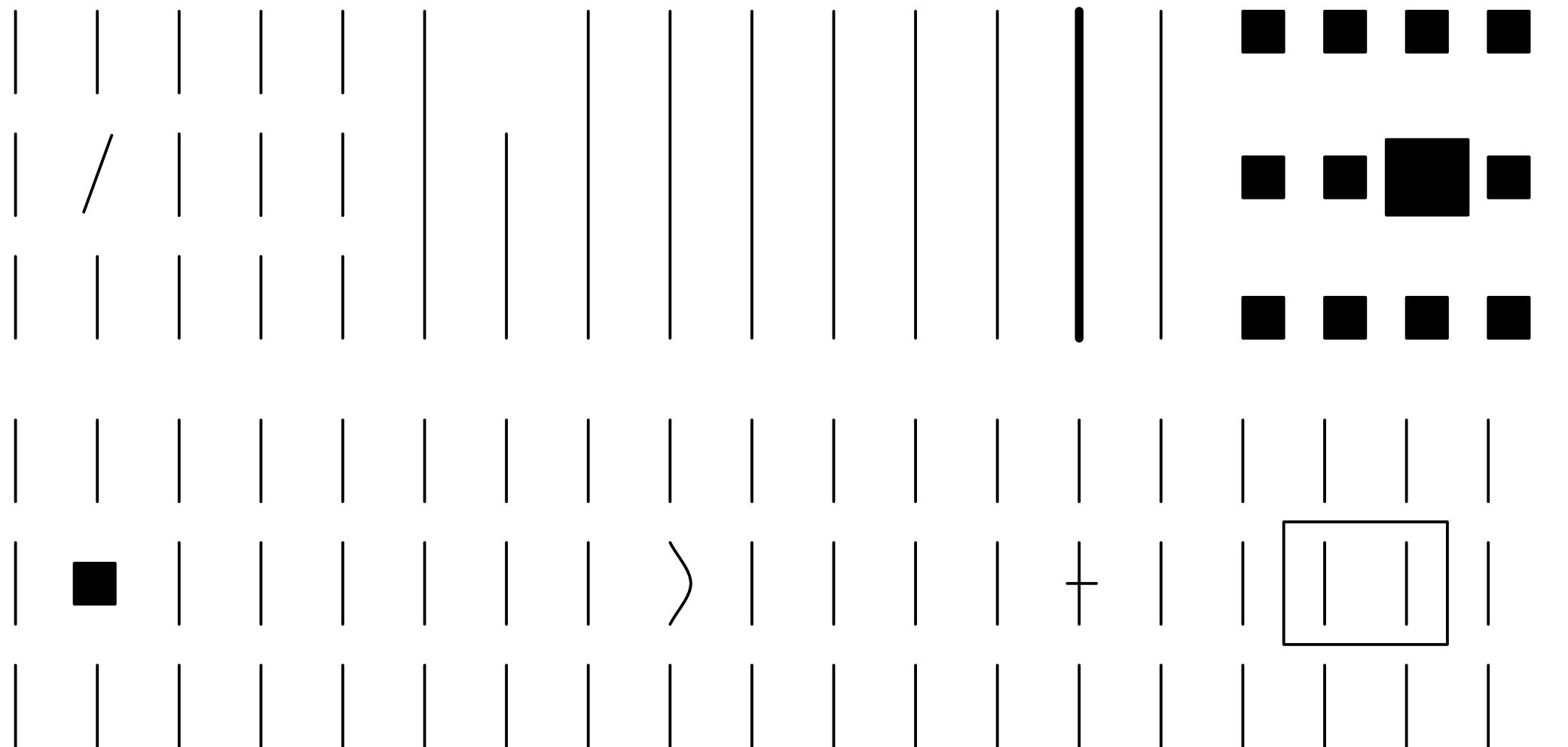


# Attributes of Form



Enclosure

# Attributes of Form



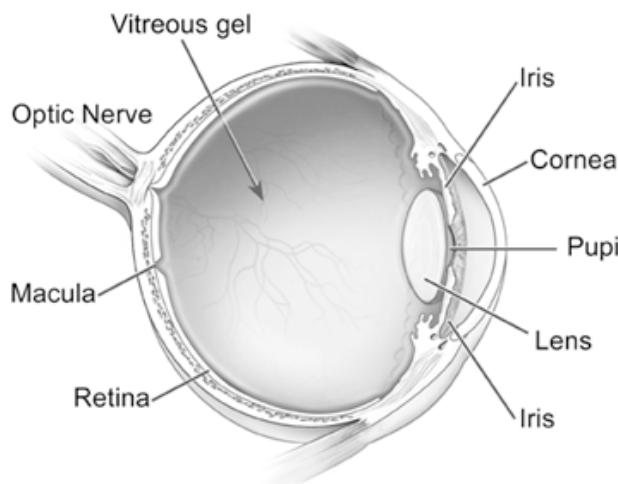
# Exemplifying Preattentive Processing

8789364082376403|28764532984732984732094873290845  
389274-0329874-32874-23|98475098340983409832409832  
049823-098490328|453209481-0839393947896587436598

8789364082376403|28764**5**32984732984732094873290845  
389274-0329874-32874-23|9847**5**098340983409832409832  
049823-098490328|453209481-0839393947896**5**87436598

# 70%

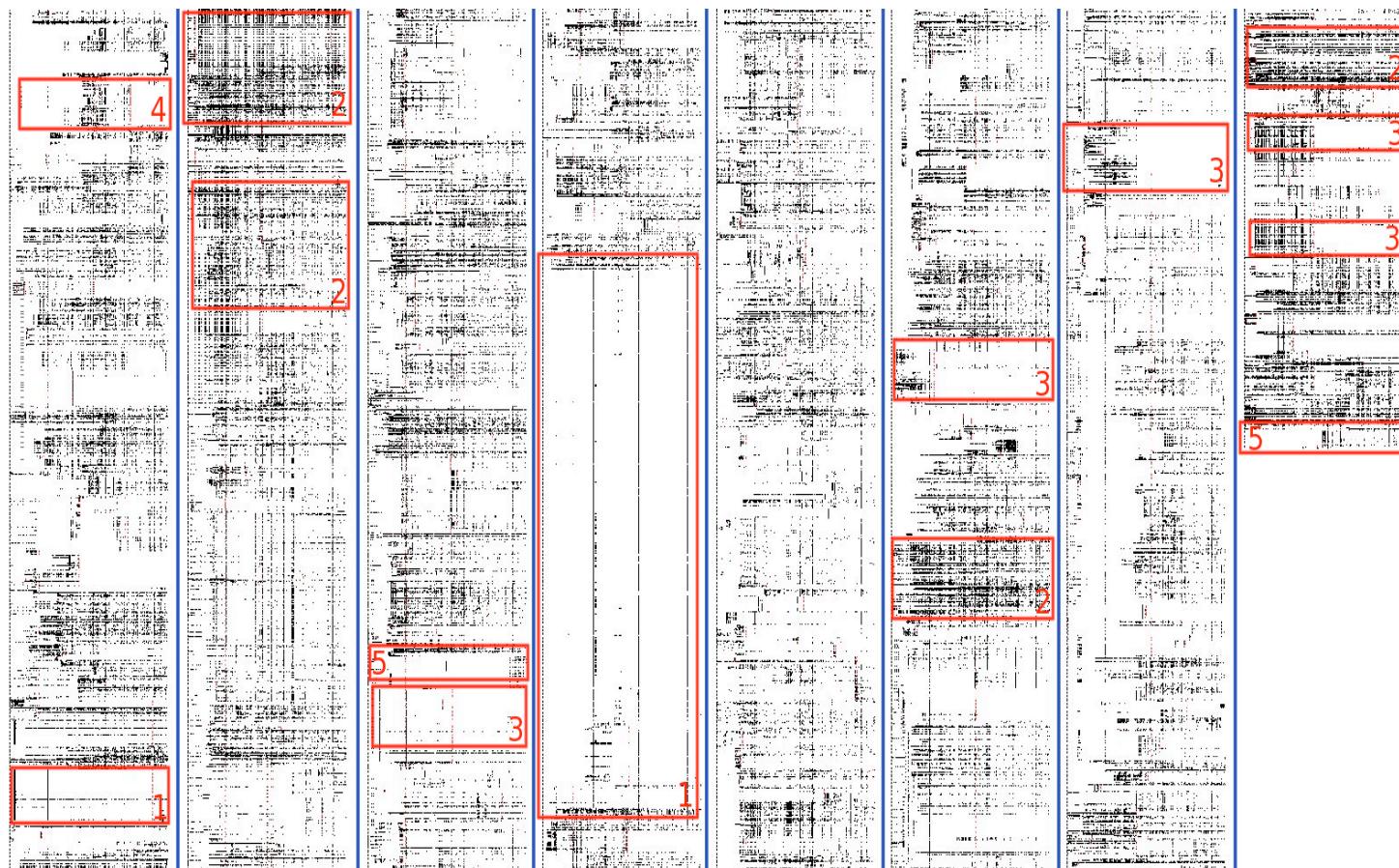
of all external  
inputs come  
through the eyes



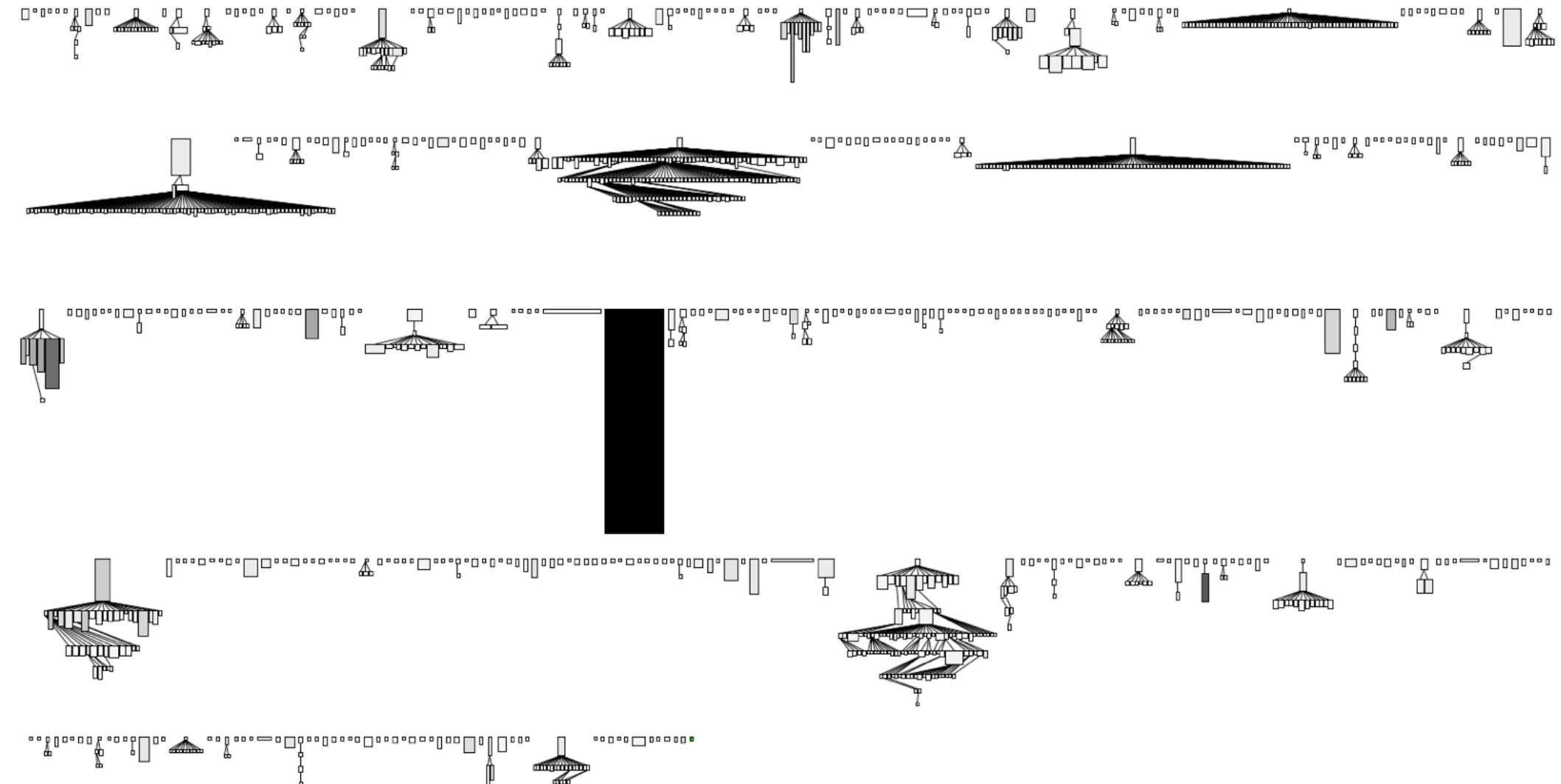
# Software visualization is

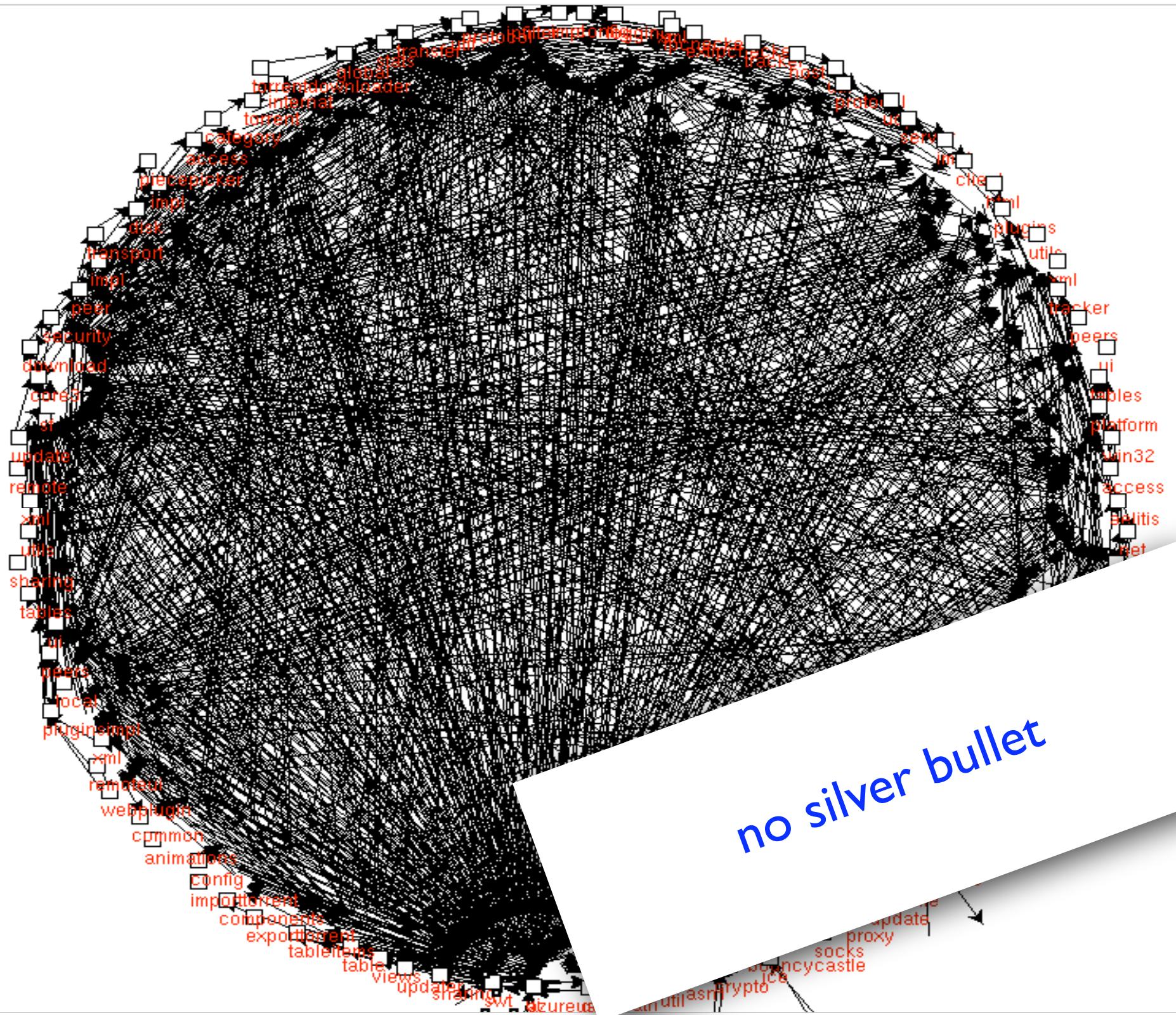
the use of the crafts of typography, graphic design, animation, and cinematography with modern human-computer interaction and computer graphics technology to facilitate both the human understanding and effective use of computer software.

Price, Becker, Small

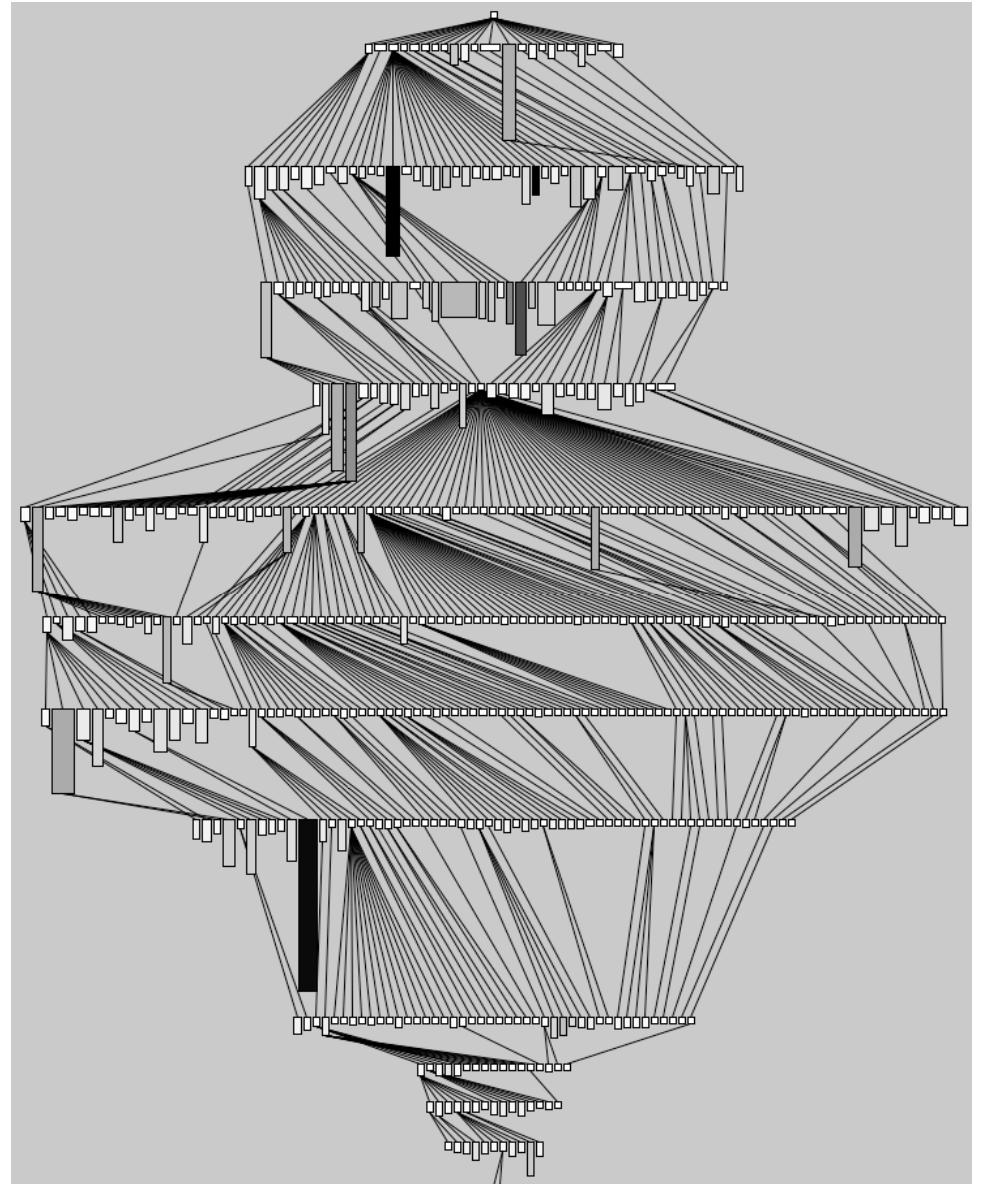
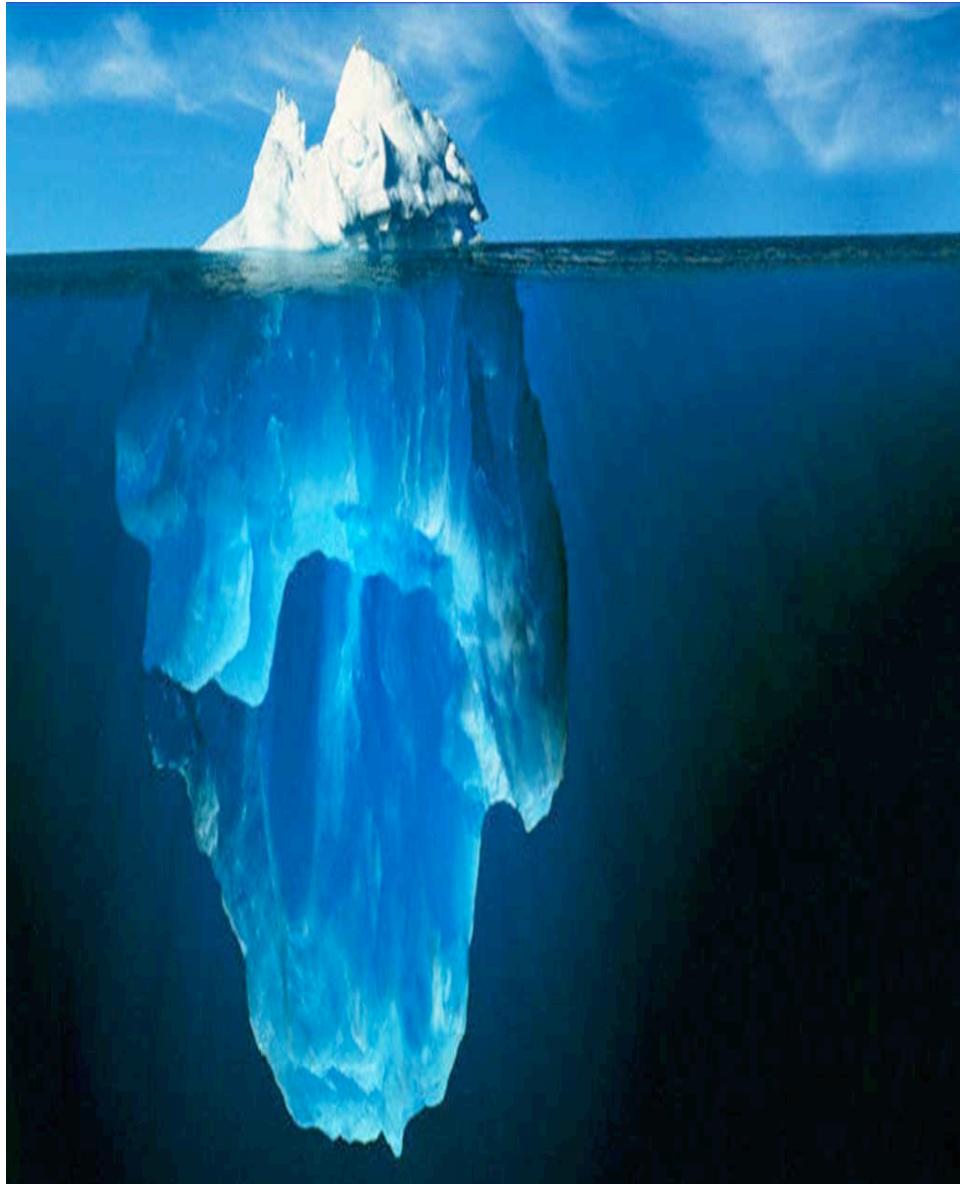


# Static Visualization



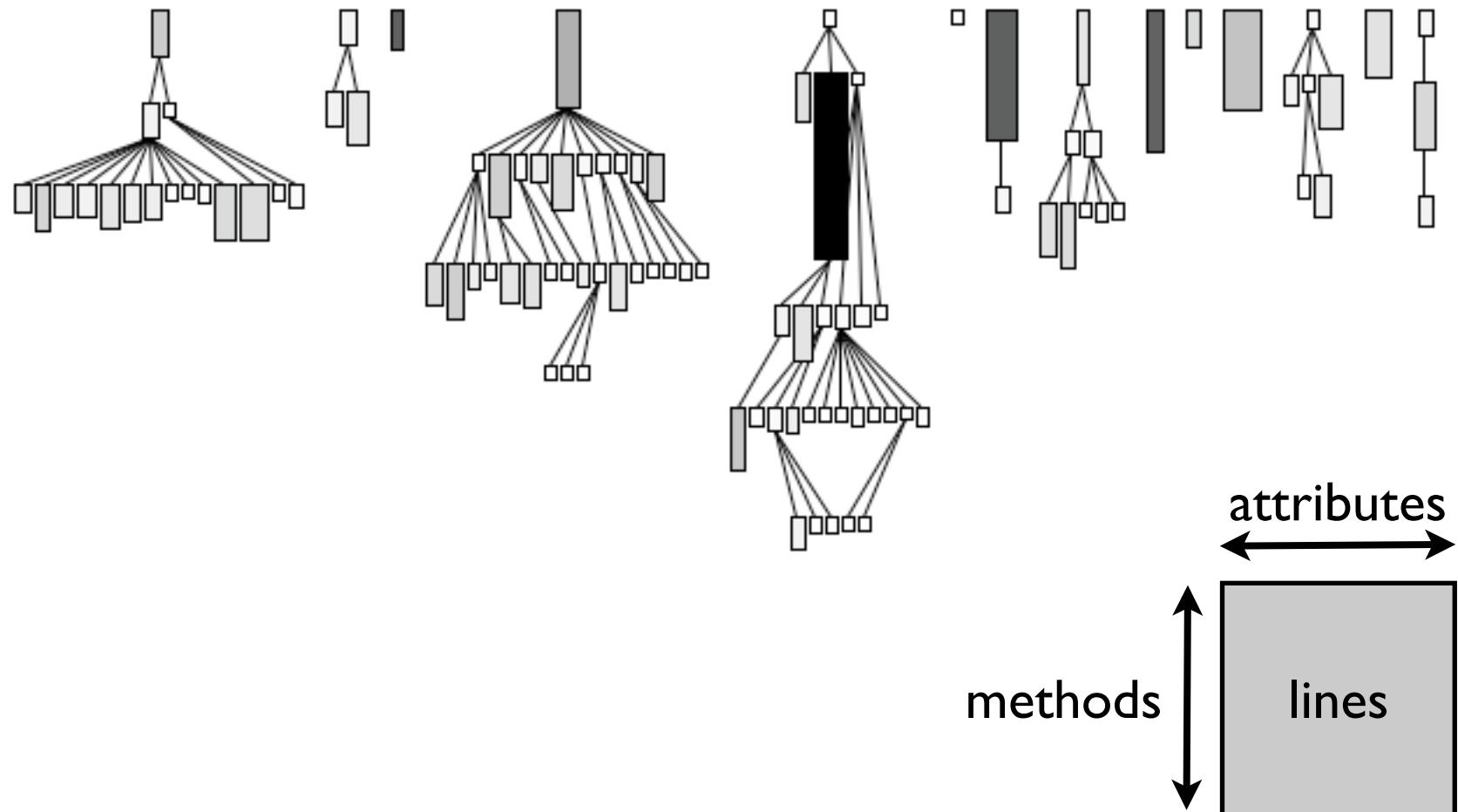


# Software is complex



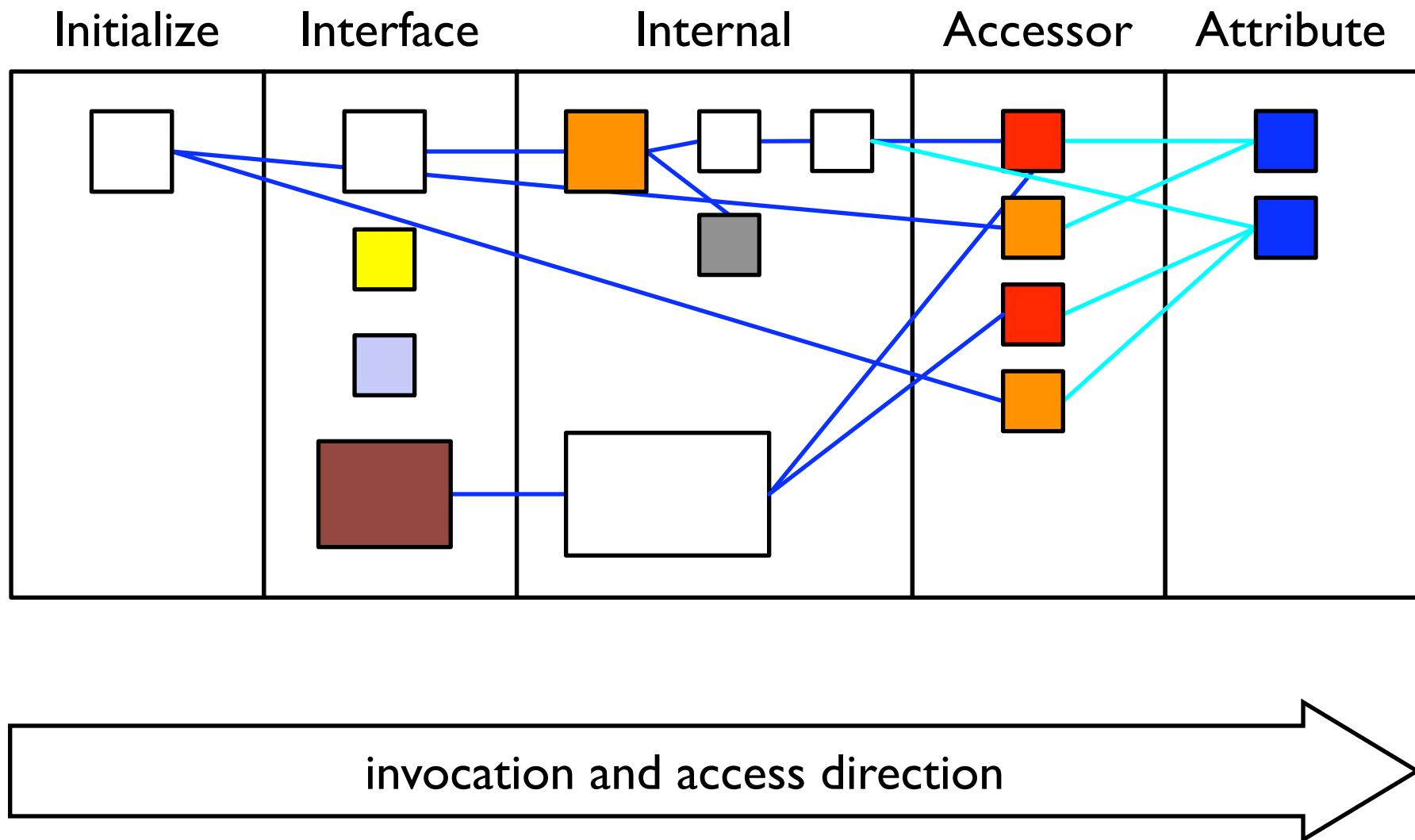
# System Complexity shows class hierarchies.

Lanza, Ducasse, 2003

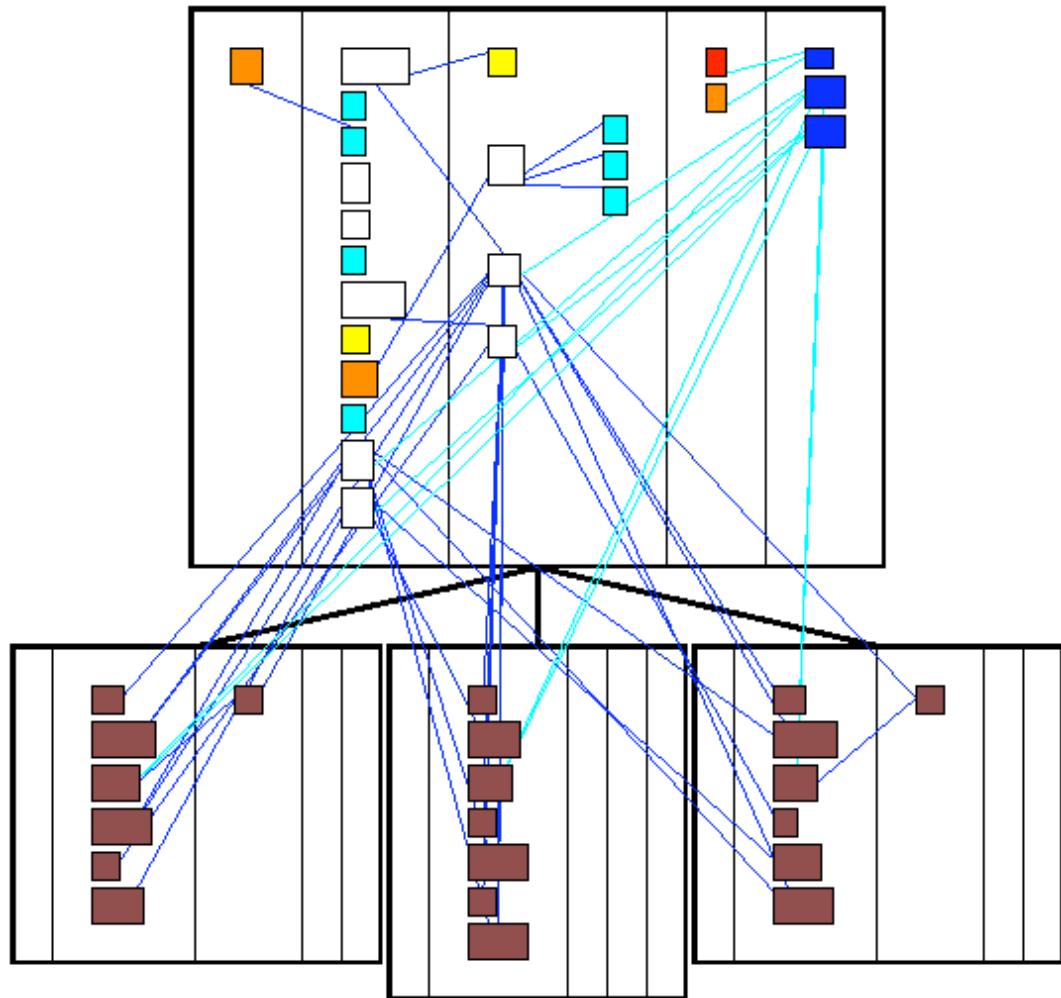


# Class Blueprint shows class internals.

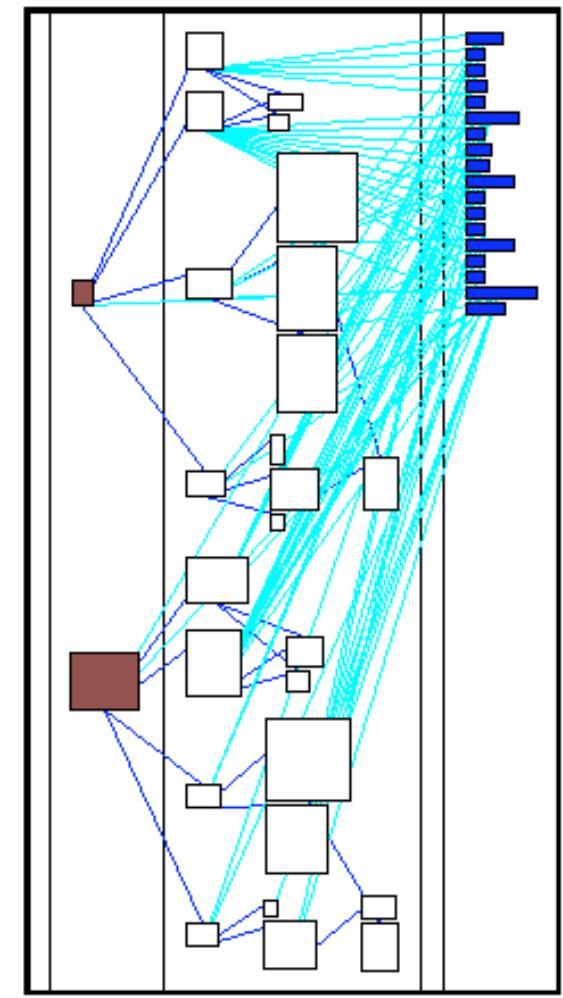
Lanza, Ducasse, 2005



# Class Blueprint reveals patterns.



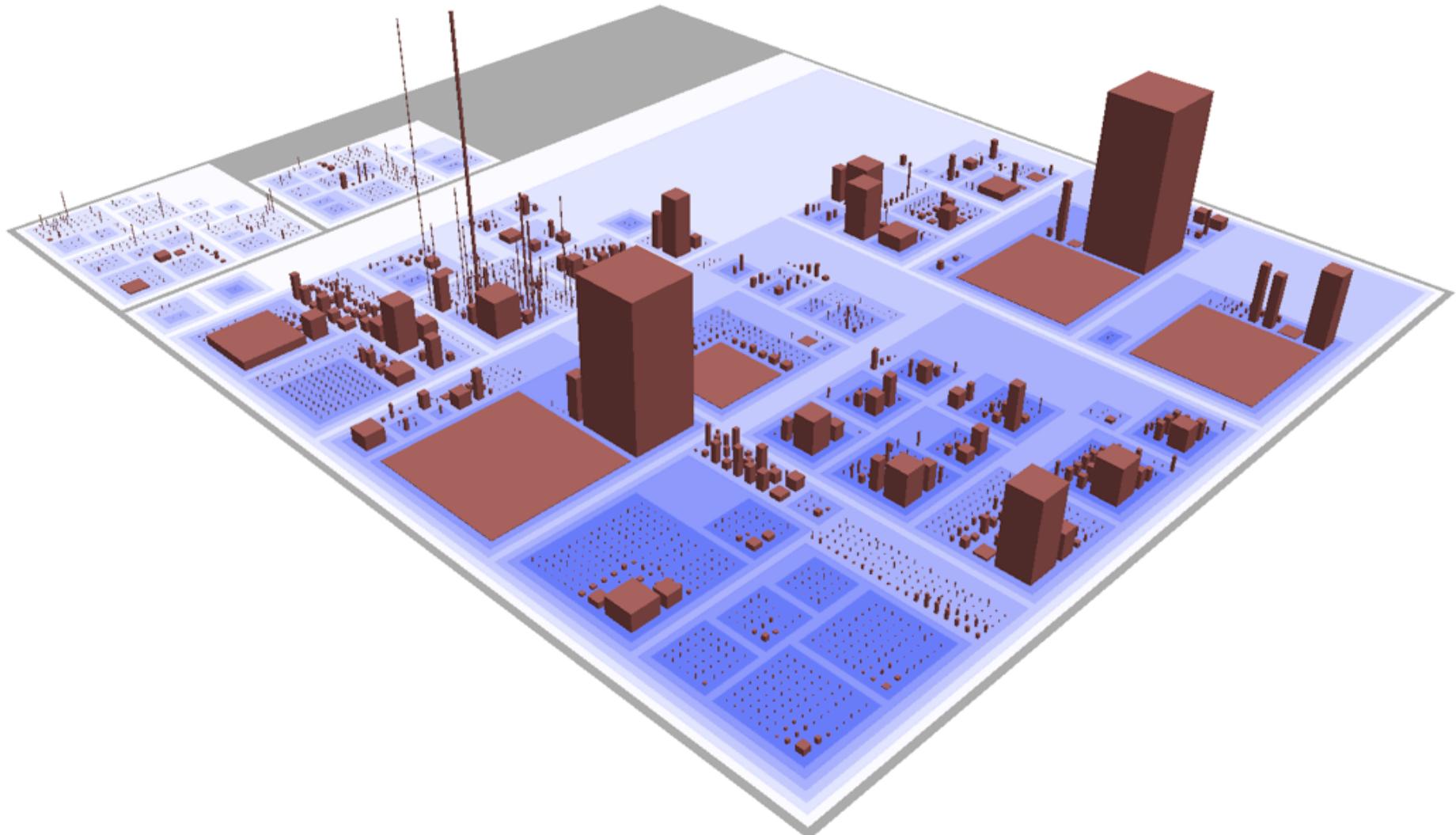
twin classes



schizophrenic class

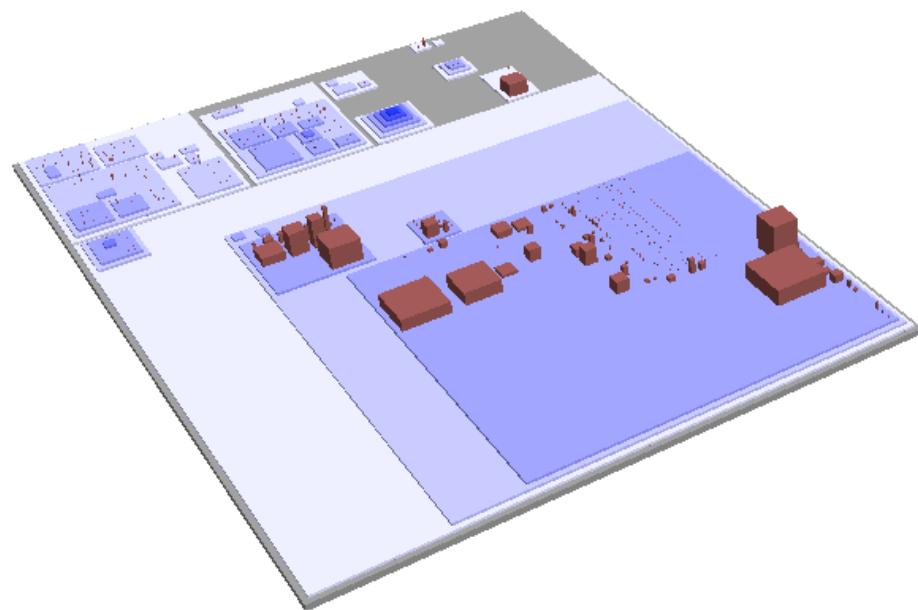
# Code City shows where your code lives.

Wettel, Lanza, 2007

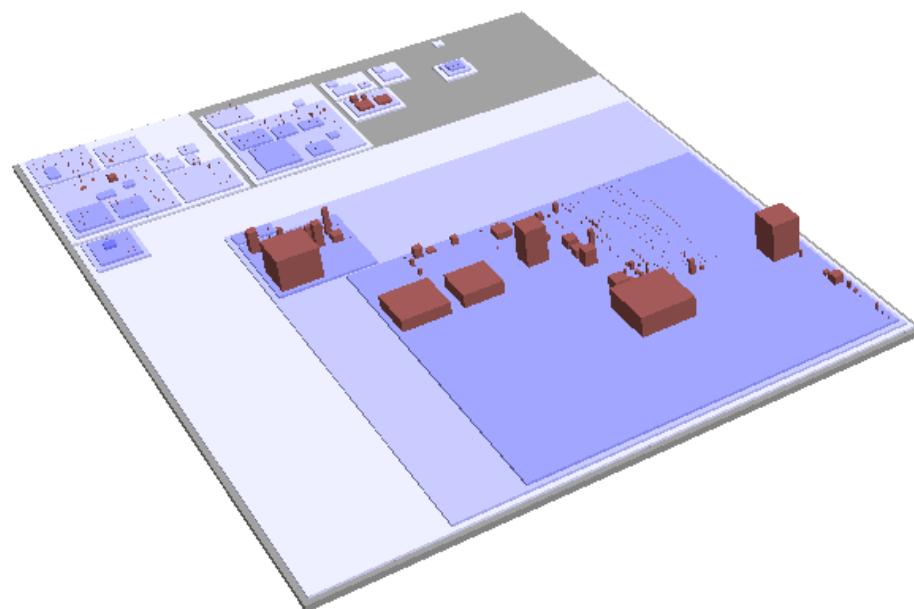


classes are buildings grouped in quarters of packages

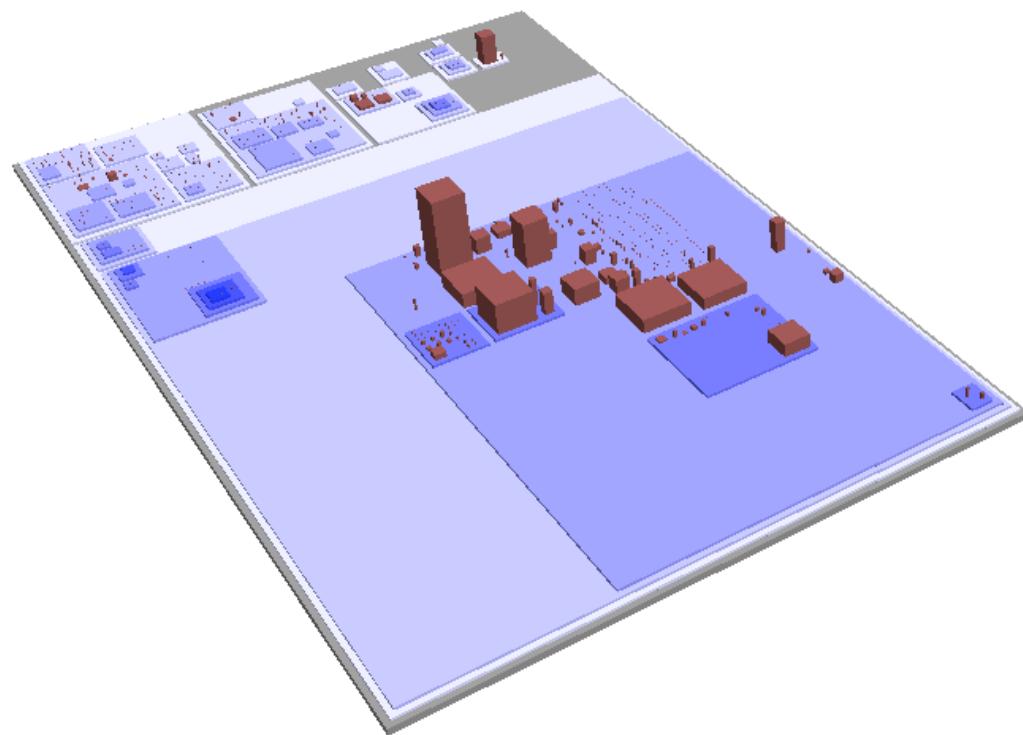
# Jmol - The Time Machine



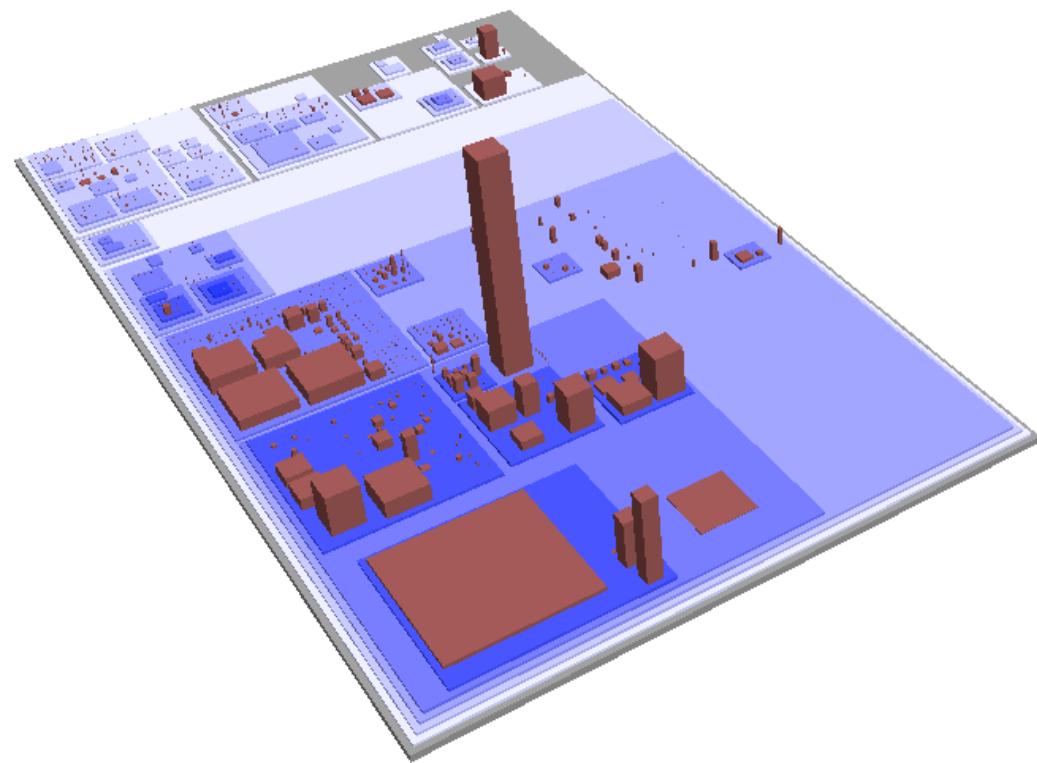
# Jmol - The Time Machine



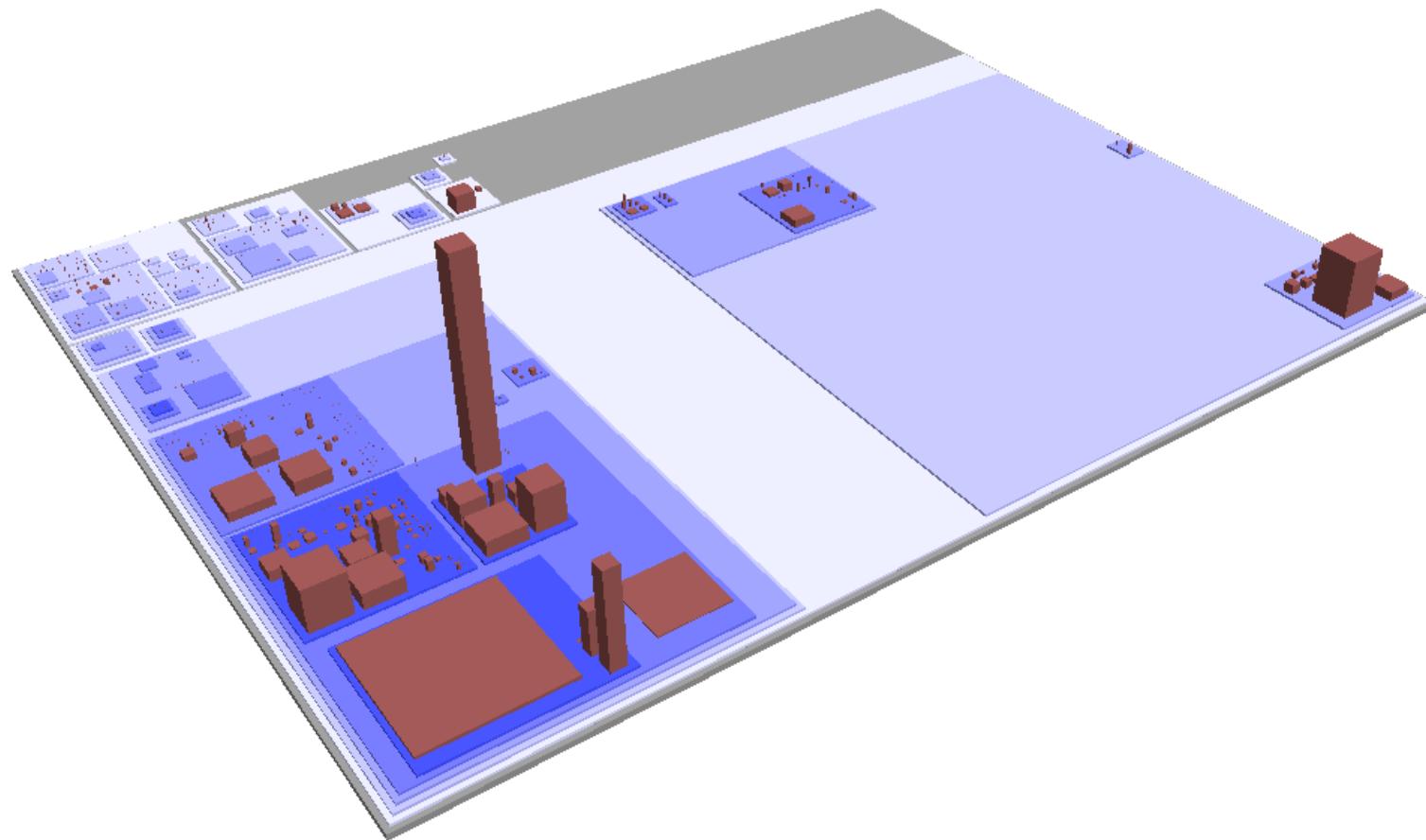
# Jmol - The Time Machine



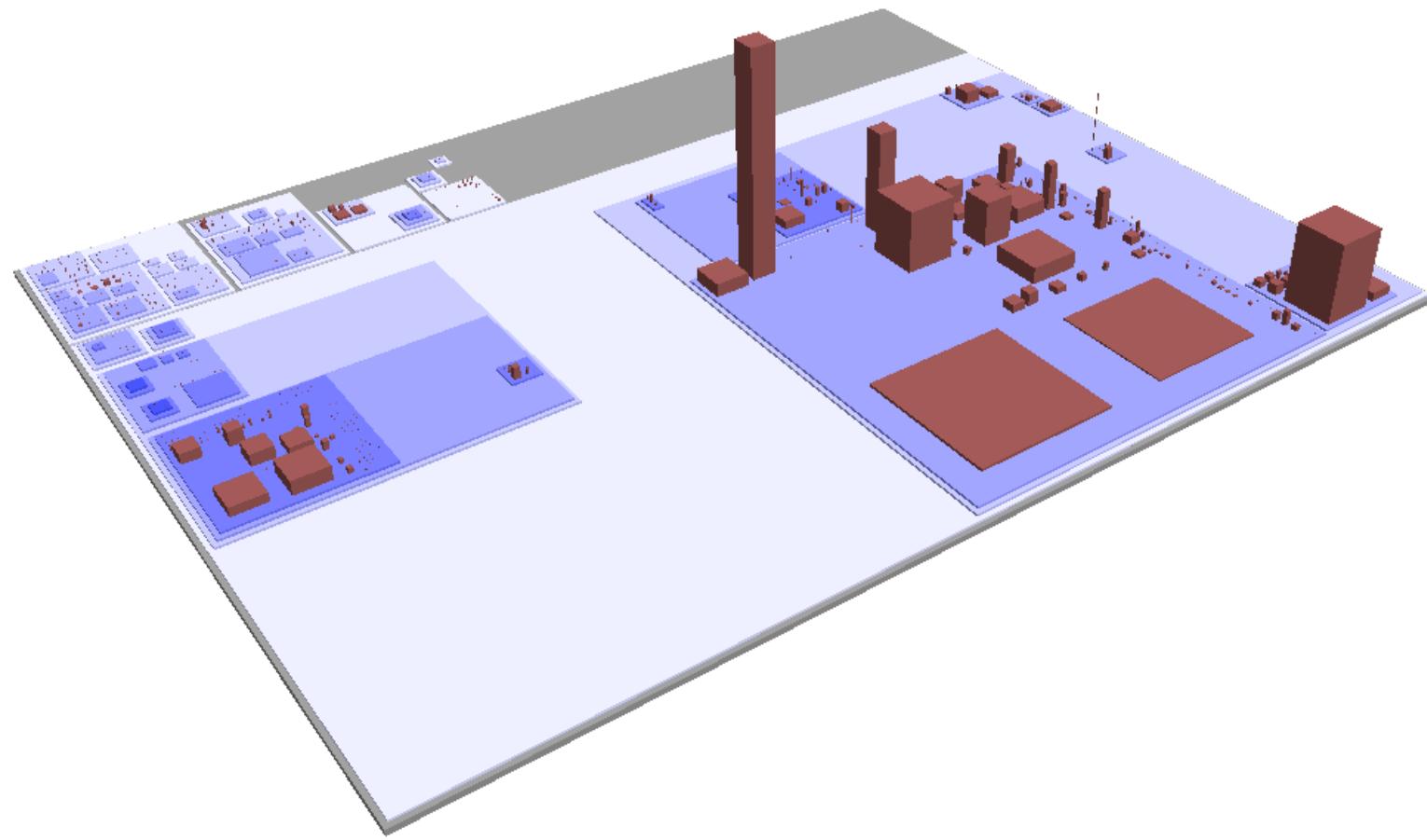
# Jmol - The Time Machine



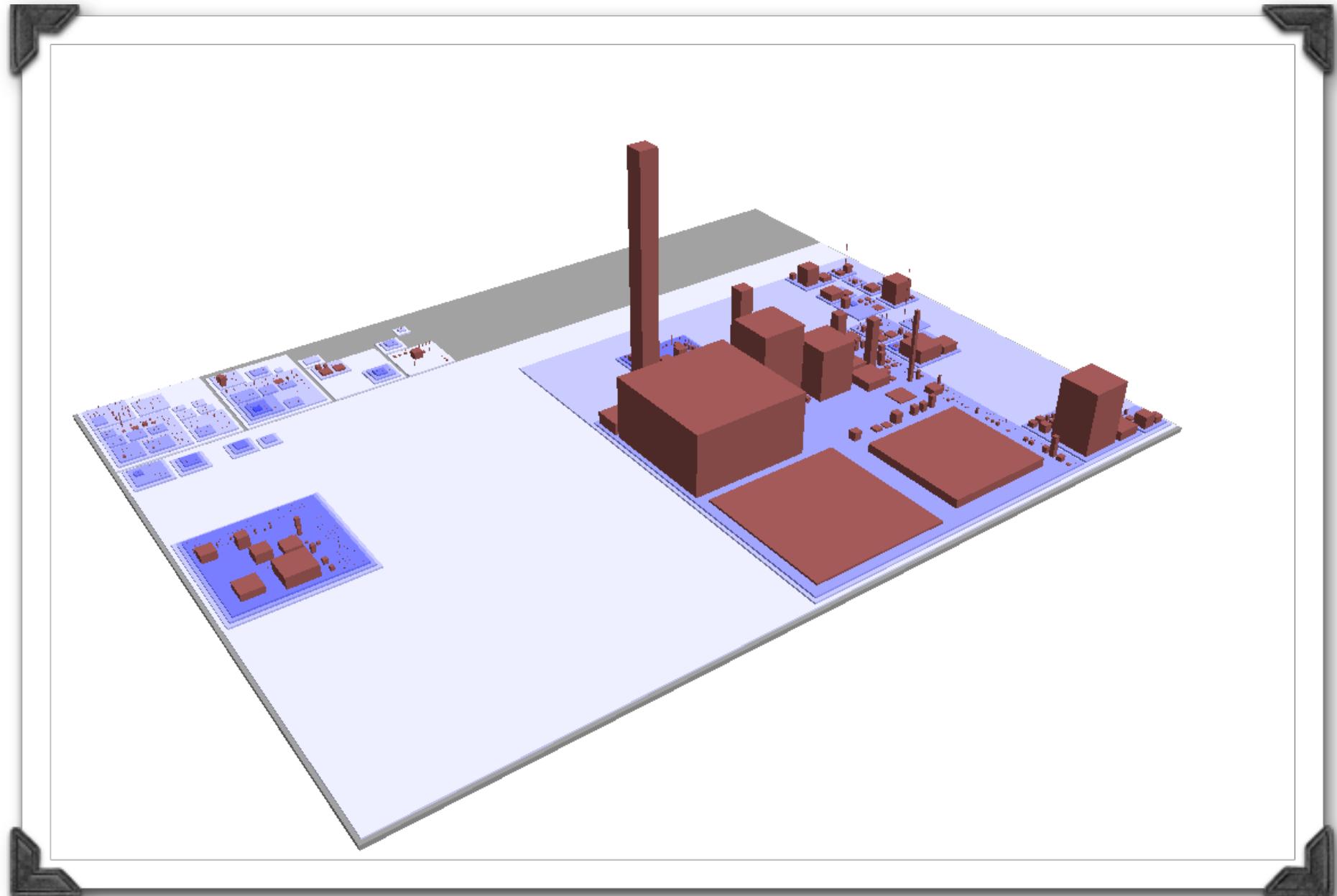
# Jmol - The Time Machine



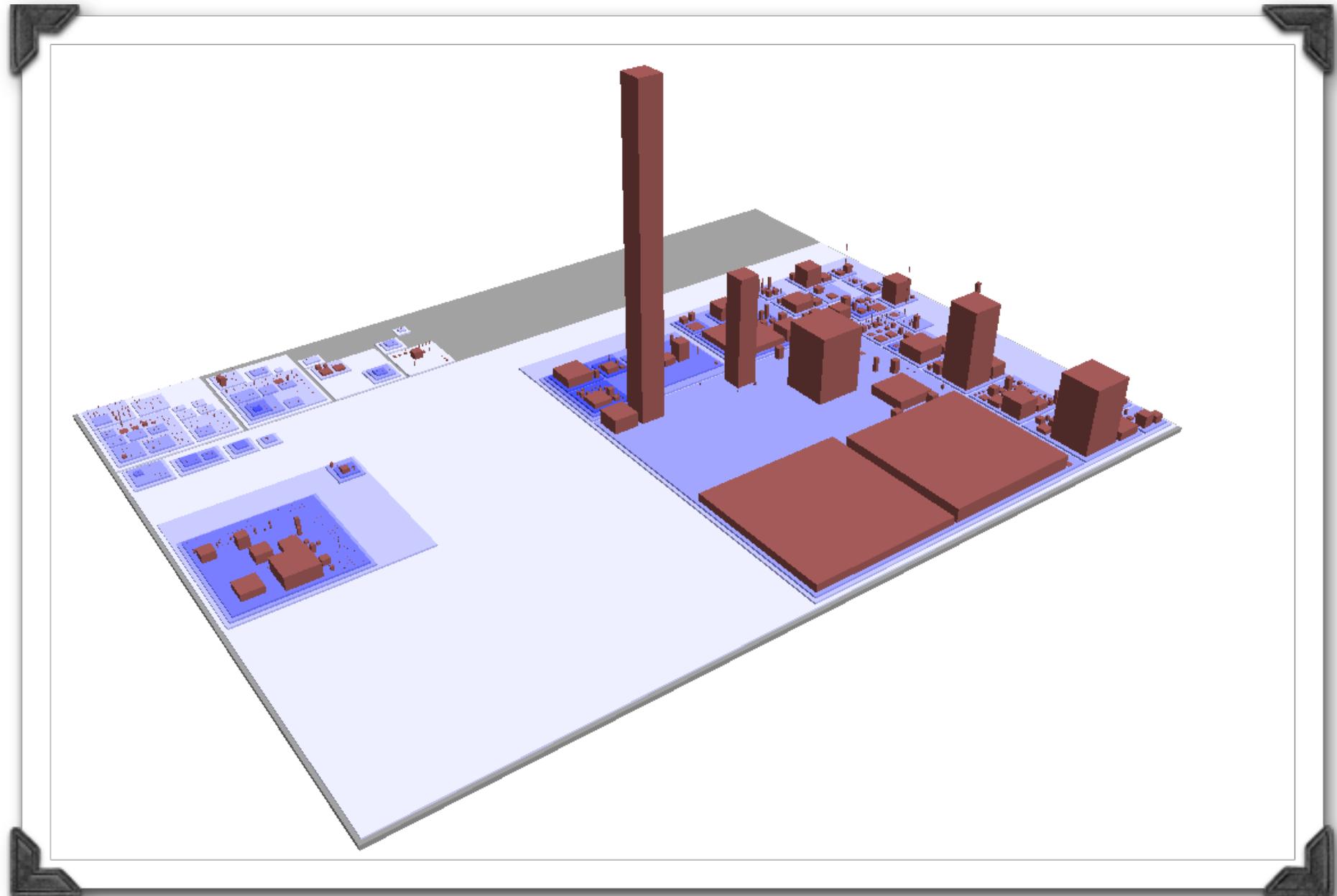
# Jmol - The Time Machine

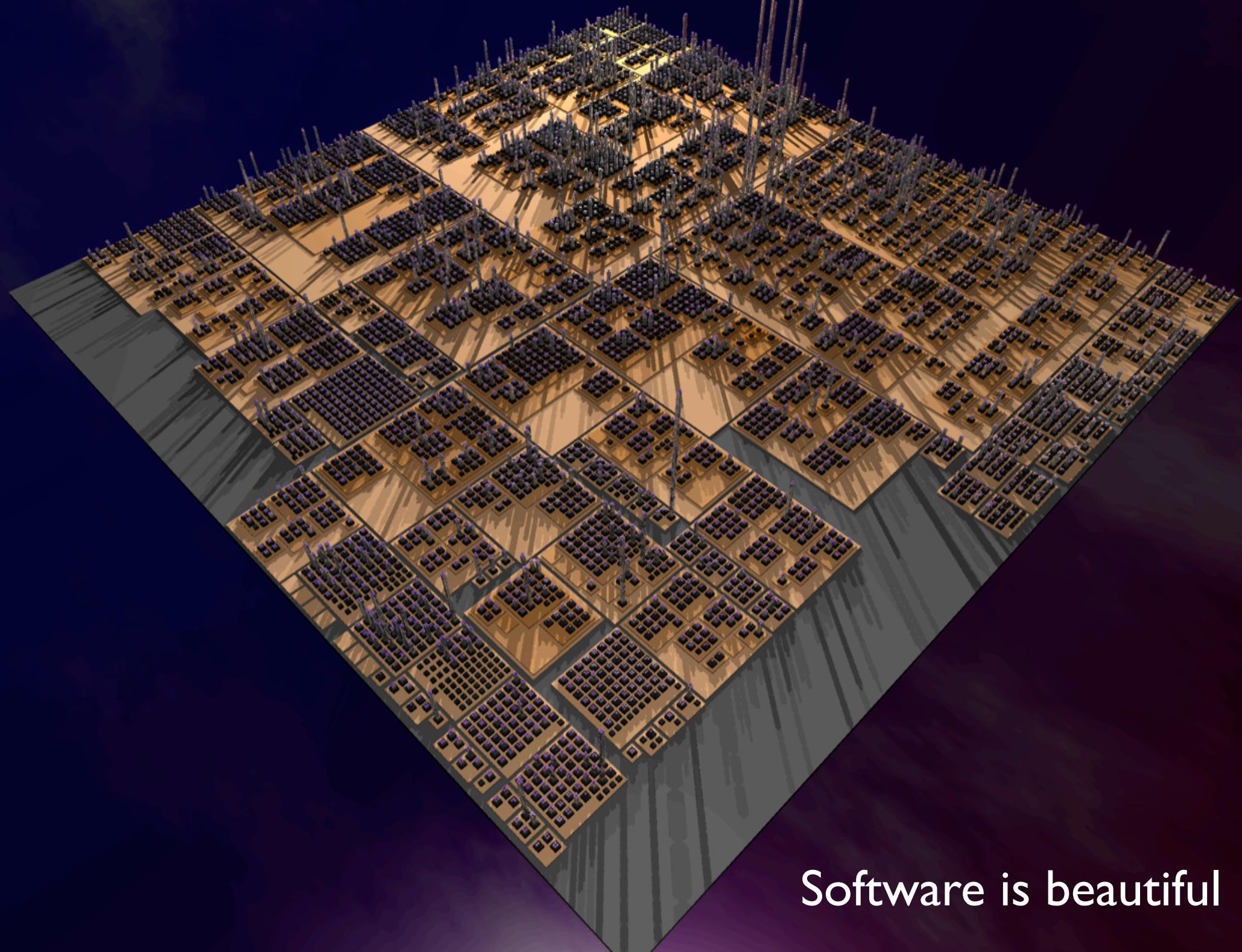


# Jmol - The Time Machine



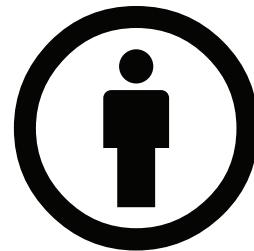
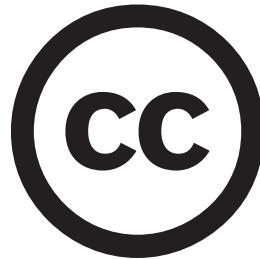
# Jmol - The Time Machine



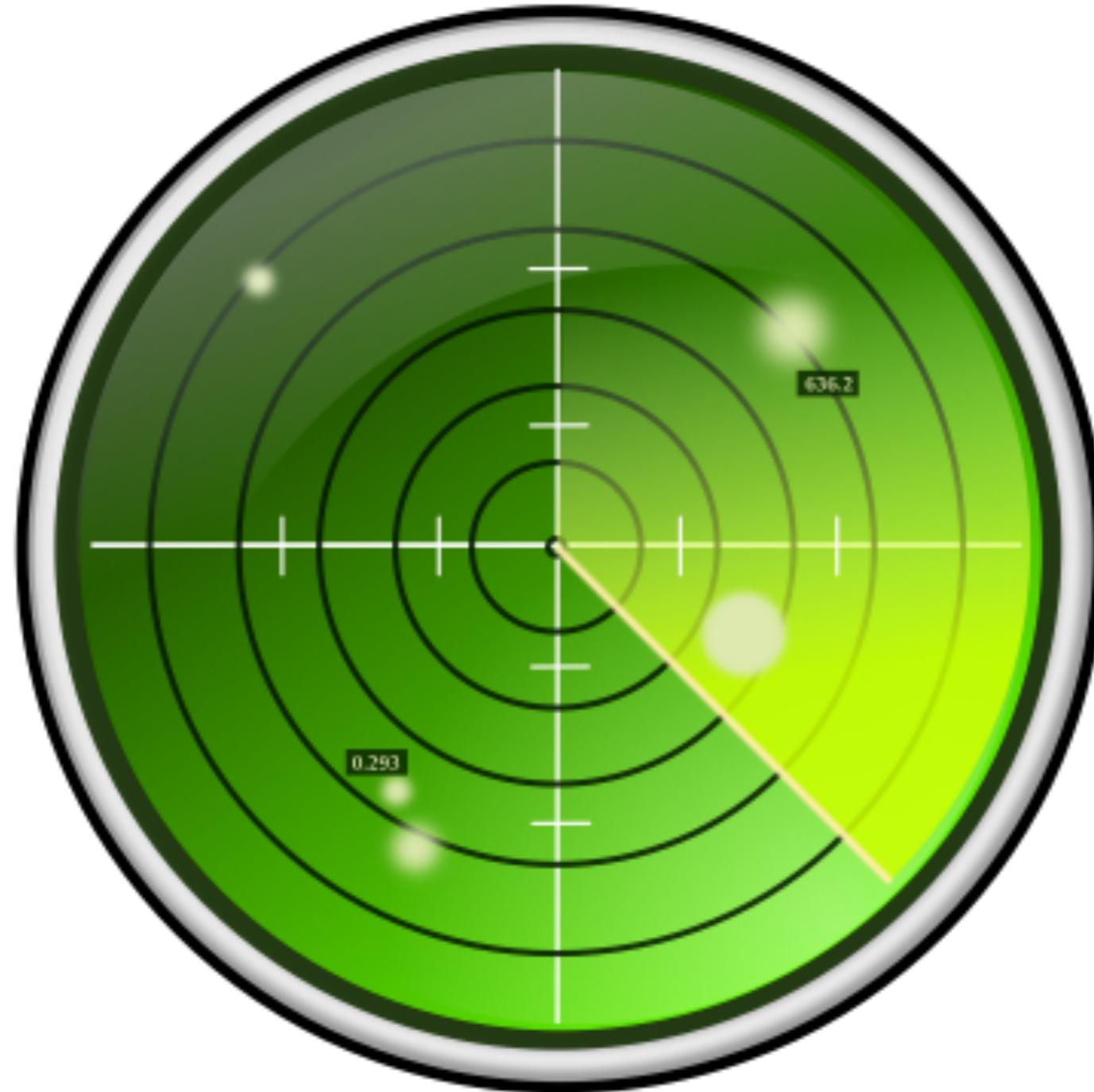


Software is beautiful

Tudor Gîrba, Michele Lanza, Radu Marinescu



<http://creativecommons.org/licenses/by/3.0/>



# Sonar...

QGL - SI3

Philippe Collet

# Sonar

---

- Plateforme Web pour gérer la qualité du code
  - Gérée par la société SonarSource depuis 2008
- SonarSource : outil commercial
- SonarQube : version Open-Source by SonarSource

# Objectifs

---

- Fournir une analyse complète de la qualité d'un projet de développement à partir de métriques
- Evaluer la qualité du code
- En connaître l'évolution au cours du développement

# Dashboard...

[https://sonarcloud.io/dashboard?id=brave\\_brave-core](https://sonarcloud.io/dashboard?id=brave_brave-core)

Brave Software / [brave-core](#)  master 

January 23, 2021, 1:07 PM Version not provided

Overview Issues Security Hotspots Measures Code Activity

Quality Gate  Passed

Reliability Measures

New code: last 30 days

38  Bugs 

started 10 months ago

0  New Bugs

Security Measures

0  Vulnerabilities 

29  Security Hotspots 

0  New Vulnerabilities 

0  New Security Hotspots

Maintainability Measures

8d  Debt 

445  Code Smells 

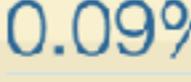
20min  New Debt 

4  New Code Smells

Duplications Measures

1.1%  Duplications 

43  Duplicated Blocks 

0.09%  Duplications on 2.1K New Lines

About This Project

No tags

Lines of Code

TypeScript 26k  
XML 11k  
Python 7.4k  
JavaScript 6.2k  
CSS 2.4k  
HTML 2.3k  
Swift 699

Project Activity

January 23, 2021, 1:07 PM not provided

January 23, 2021, 11:35 AM Project Analyzed

January 22, 2021, 8:20 PM Project Analyzed

Show More

Quality Gate  
(Default) Sonar way

# Sizing

Brave Software / [brave-core](#) master

Overview Issues Security Hotspots Measures Code Activity

January 23, 2021, 1:07 PM Version not provided

Quality Gate Passed

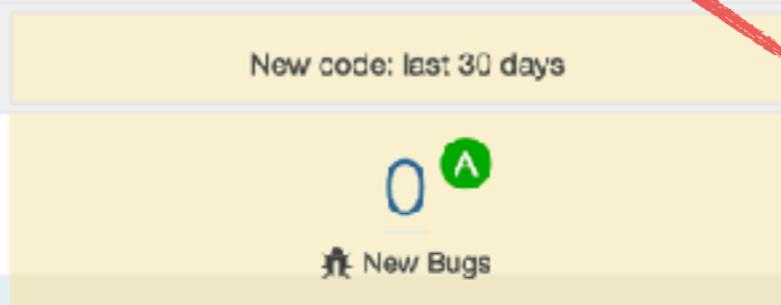
About This Project

No tags

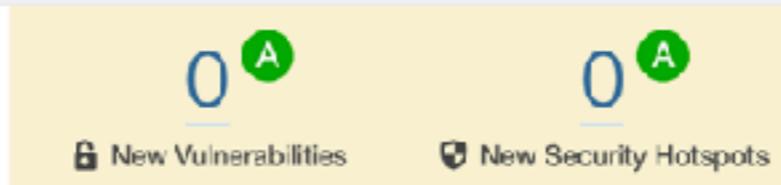
TypeScript	26k
XML	11k
Python	7.4k
JavaScript	6.2k
CSS	2.4k
HTML	2.3k
Swift	699

57k  
Lines of Code

Reliability [Measures](#)



Security [Measures](#)



Maintainability [Measures](#)



Duplications [Measures](#)



Project Activity



not provided

January 23, 2021, 11:35 AM

Project Analyzed

January 22, 2021, 8:20 PM

Project Analyzed

Show More

Quality Gate

(Default) Sonar way

Passed

# Bugs

Brave Software / [brave-core](#) master

January 23, 2021, 1:07 PM Version not provided

Overview Issues Security Hotspots Measures Code Activity

Quality Gate [Passed](#)

About This Project

No tags

TypeScript 26k  
XML 11k  
Python 7.4k  
JavaScript 6.2k  
CSS 2.4k  
HTML 2.3k  
Swift 699

M 57k  
Lines of Code

Reliability [Measures](#)

38 D

Bugs

New code: last 30 days

0 A

New Bugs

Security [Measures](#)

0 A

Vulnerabilities

29 D

Security Hotspots

0 A

New Vulnerabilities

0 A

New Security Hotspots

Maintainability [Measures](#)

8d A

Debt

445

Code Smells

20min A

New Debt

4

New Code Smells

Duplications [Measures](#)

1.1% A

Duplications

43

Duplicated Blocks

0.09%

Duplications on  
2.1K New Lines

Project Activity

January 23, 2021, 1:07 PM

not provided

January 23, 2021, 11:35 AM

Project Analyzed

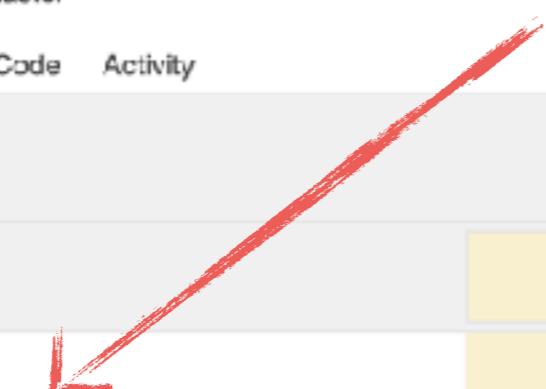
January 22, 2021, 8:20 PM

Project Analyzed

Show More

Quality Gate

(Default) Sonar way





# Bugs

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)[Filters](#)[Clear All Filters](#)[Clear](#)**Type** **BUG**

Bug	185
Vulnerability	117
Code Smell	6.9k

[⌘ + click to add to selection](#)**Severity**

Blocker	7	Minor	39
Critical	1	Info	0
Major	138		

**Resolution****Status****Security Category****Creation Date****Language****Rule****Tag****Directory****File****Assignee**

1 1 to select issues

← → to navigate

1 / 185 issues

3d 6h effort

core/.../java/com/opensymphony/xwork2/ActionChainResult.java

**Change this condition so that it does not always evaluate to "false".** [Why is this an issue?](#)

6 years ago L264 %

Bug Major Open Not assigned 15min effort

No tags

core/.../java/com/opensymphony/xwork2/CompositeTextProvider.java

**Use another way to initialize this instance.** [Why is this an issue?](#)

11 years ago L118 %

Bug Minor Open Not assigned 5min effort

leak

core/.../java/com/opensymphony/xwork2/DefaultActionInvocation.java

**Change this condition so that it does not always evaluate to "false".** [Why is this an issue?](#)

11 years ago L307 %

Bug Major Open Not assigned 15min effort

No tags

**Change this condition so that it does not always evaluate to "true".** [Why is this an issue?](#)

11 years ago L317 %

Bug Major Open Not assigned 15min effort

No tags

core/.../xwork2/config/impl/DefaultConfiguration.java

**Make this method "synchronized" to match the parent class implementation.** [Why is this an issue?](#)

11 years ago L630 %

Bug Major Open Not assigned 20min effort

cert, multi-threading

core/.../xwork2/config/impl/LocatableFactory.java

**Use another way to initialize this instance.** [Why is this an issue?](#)

11 years ago L68 %

Bug Minor Open Not assigned 5min effort

leak

core/.../xwork2/conversion/impl/XWorkConverter.java

**"clazz" is a method parameter, and should not be used for synchronization.** [Why is this an issue?](#)

3 years ago L432 %

Bug Major Open Not assigned 15min effort

cert, cws, multi-threading

core/.../com/opensymphony/xwork2/Inject/ContainerBuilder.java

**Use another way to initialize this instance.** [Why is this an issue?](#)

11 years ago L176 %

Bug Minor Open Not assigned 5min effort

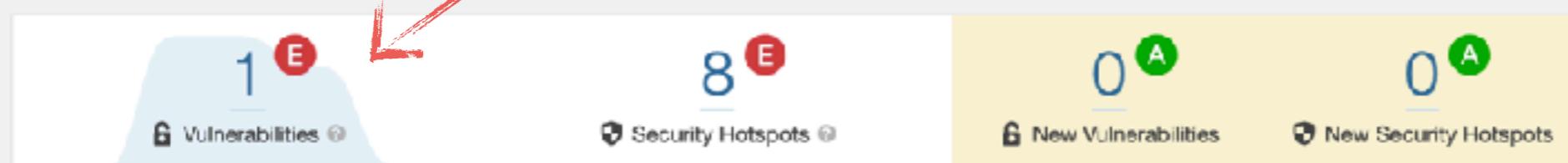
leak

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)Quality Gate Failed**77.24%** Coverage on New Code is less than 80.0%**3.55%** Duplicated Lines (%) on New Code is greater than 3.0%

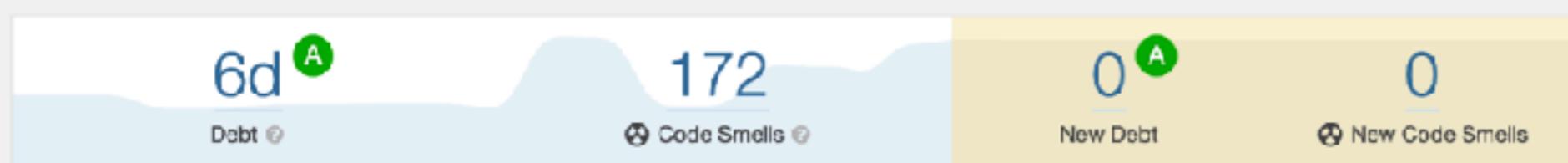
Reliability Measures



Security Measures



Maintainability Measures



Coverage Measures



Duplications Measures



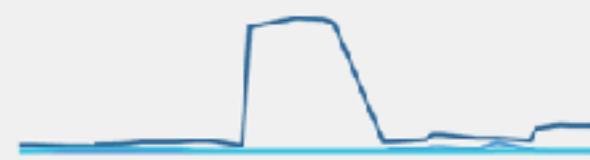
# Security issues

About This Project

No tags

**M** 88k  
Lines of CodeHTML 31k  
Java 29k  
TypeScript 24k  
XML 4.4k  
CSS 98

Project Activity



January 24, 2021, 1:38 PM

1.0

January 24, 2021, 2:42 AM

Project Analyzed

January 23, 2021, 10:40 PM

Project Analyzed

[Show More](#)

Quality Gate

(Default) [Sonar way](#)

Quality Profiles

[\(CSS\) Sonar way](#)  
[\(Java\) Sonar way](#)  
[\(TypeScript\) Sonar way](#)  
[\(HTML\) Sonar way](#)  
[\(XML\) Sonar way](#)

Project Key

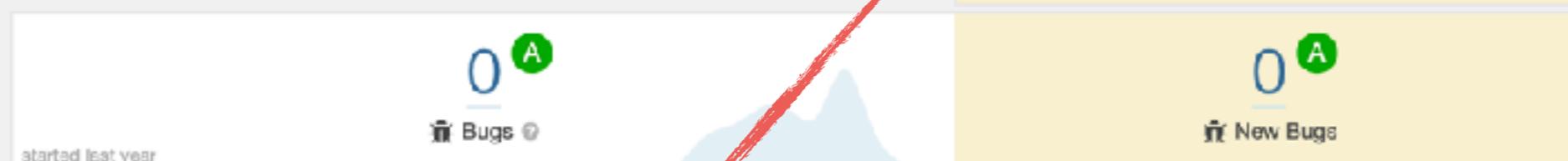
jhipster-sample-application

Organization Key

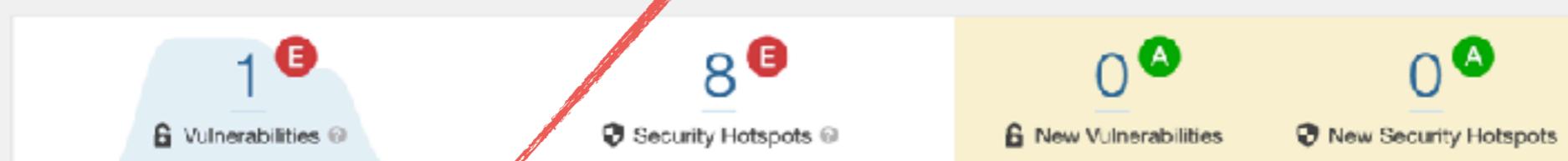
jhipster

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)Quality Gate Failed**77.24%** Coverage on New Code is less than 80.0%**3.55%** Duplicated Lines (%) on New Code is greater than 3.0%

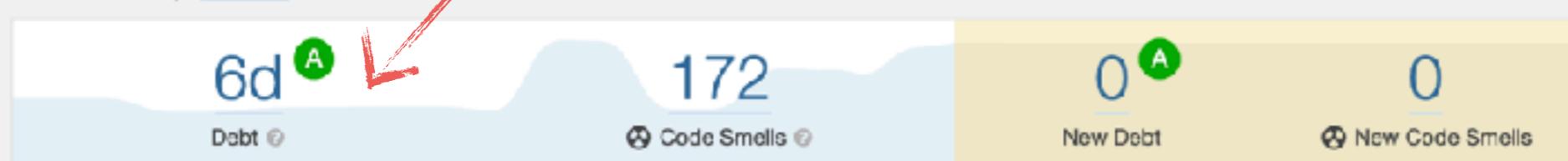
Reliability Measures



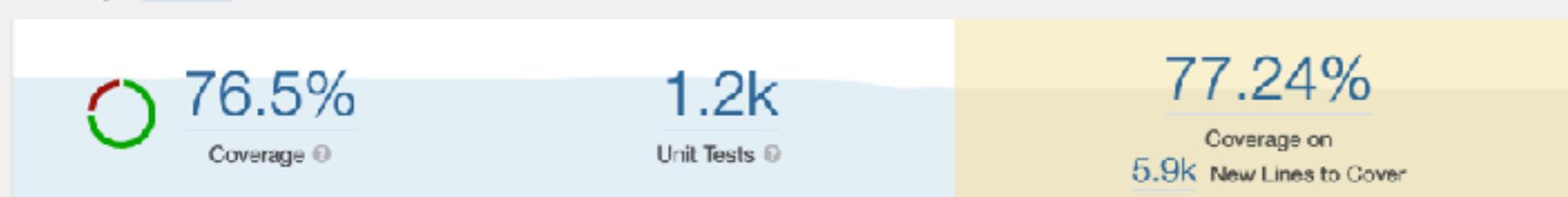
Security Measures



Maintainability Measures



Coverage Measures



Duplications Measures

<https://sonarcloud.io/dashboard?id=jhipster-sample-application>

# Dette technique

About This Project

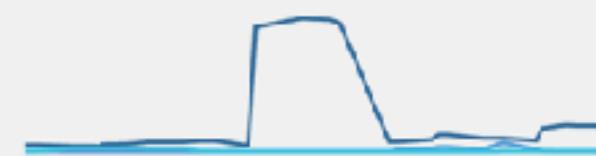
No tags

**M** 88k

Lines of Code

HTML 31k  
Java 29k  
TypeScript 24k  
XML 4.4k  
CSS 98

Project Activity



January 24, 2021, 1:38 PM

1.0

January 24, 2021, 2:42 AM

Project Analyzed

January 23, 2021, 10:40 PM

Project Analyzed

[Show More](#)

Quality Gate

(Default) [Sonar way](#)

Quality Profiles

(CSS) [Sonar way](#)  
(Java) [Sonar way](#)  
(TypeScript) [Sonar way](#)  
(HTML) [Sonar way](#)  
(XML) [Sonar way](#)

Project Key

jhipster-sample-application

Copy

Organization Key

jhipster

Copy

# Dette technique

January 24, 2021, 1:38 PM Version 1.0

Overview Issues Security Hotspots Measures Code Activity

## Project Overview

&gt; Releasability

&gt; Reliability

&gt; Security

&gt; Security Review

▼ Maintainability 0 TECHNICAL DEBT

## Overview

On new code

Code Smells

0

Debt

0

Debt Ratio

0.0%

Rating

A

## Overall

Code Smells

172

Debt

6d 2h

Debt Ratio

0.1%

Rating

A

Effort to Reach A

0

&gt; Coverage

&gt; Duplications

&gt; Size

&gt; Complexity

&gt; Issues

jhipsterSampleApplication gene...

View as

List



to select files



to navigate 1,424 files

Technical Debt: 6d 2h

New code: last 30 days

src/main/java/tech/jhipster/sample/web/rest/errors/EmailAlreadyUsedException.java 5h

src/main/java/tech/jhipster/sample/web/rest/errors/LoginAlreadyUsedException.java 5h

src/main/java/tech/jhipster/sample/web/rest/errors/BadRequestAlertException.java 4h 30min

src/main/java/tech/jhipster/sample/config/CacheConfiguration.java 4h 30min

src/main/java/tech/jhipster/sample/web/rest/FieldTestEntityResource.java 1h 46min

src/main/java/tech/jhipster/sample/web/rest/FieldTestInfiniteScrollEntityResource.java 1h 45min

src/main/java/tech/jhipster/sample/web/rest/FieldTestPaginationEntityResource.java 1h 43min

src/main/java/tech/jhipster/sample/service/FieldTestMapstructAndServiceClassEntityService.java 1h 43min

src/main/java/tech/jhipster/sample/service/FieldTestServiceClassAndJpaFilteringEntityService.java 1h 40min

src/main/java/tech/jhipster/sample/service/impl/FieldTestServiceImplEntityServiceImpl.java 1h 40min

src/main/java/tech/jhipster/sample/service/cito/TestMapstruct.java 1h 30min

src/main/java/tech/jhipster/sample/service/FieldTestServiceClassAndJpaFilteringEntityQueryService.java 1h 9min

src/main/java/tech/jhipster/sample/service/mapper/UserMapper.java 1h

src/main/java/tech/jhipster/sample/service/cito/FieldTestServiceClassAndJpaFilteringEntityCriteria.java 56min

src/main/java/tech/jhipster/sample/domain/TestInfiniteScrollEntity.java 40min

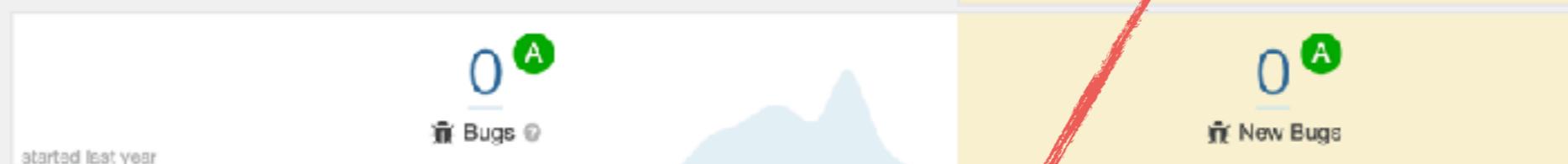
src/main/java/tech/jhipster/sample/domain/TestPaginationEntity.java 40min

src/main/java/tech/jhipster/sample/domain/TestServiceClassEntity.java 40min

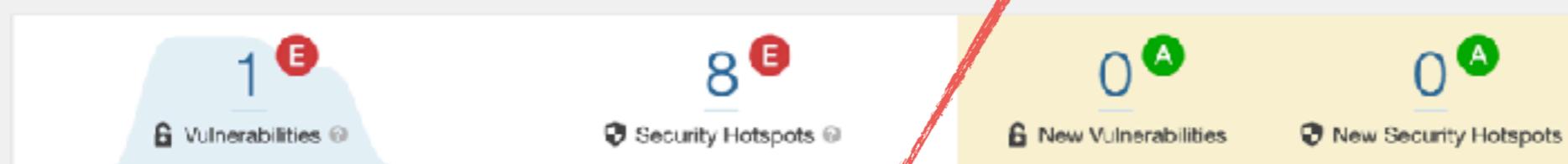
src/main/java/tech/jhipster/sample/domain/TestServiceImplEntity.java 40min

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)Quality Gate Failed**77.24%** Coverage on New Code is less than 80.0%**3.55%** Duplicated Lines (%) on New Code is greater than 3.0%

Reliability Measures



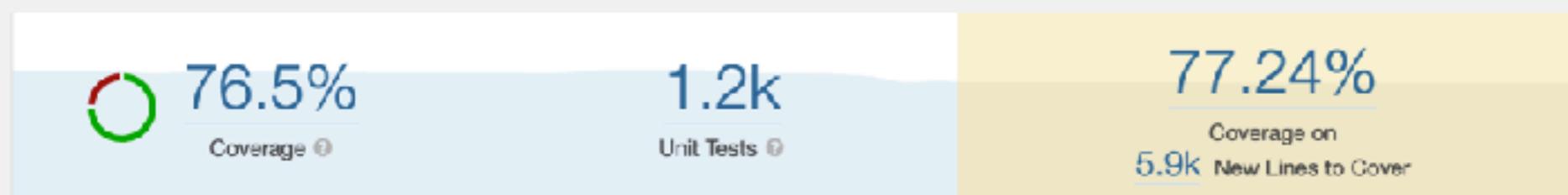
Security Measures



Maintainability Measures



Coverage Measures



Duplications Measures



# Code smells

About This Project

No tags

HTML 31k  
Java 29k  
TypeScript 24k  
XML 4.4k  
CSS 98

Project Activity



January 24, 2021, 1:38 PM

1.0

January 24, 2021, 2:42 AM

Project Analyzed

January 23, 2021, 10:40 PM

Project Analyzed

[Show More](#)

Quality Gate

(Default) [Sonar way](#)

Quality Profiles

(CSS) [Sonar way](#)  
(Java) [Sonar way](#)  
(TypeScript) [Sonar way](#)  
(HTML) [Sonar way](#)  
(XML) [Sonar way](#)

Project Key

jhipster-sample-application

Organization Key

jhipster

# Blocker level

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)

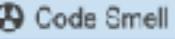
Filters

[Clear All Filters](#)▼ Type **CODE SMELL**[Clear](#)

0



1



20

[⌘ + click to add to selection](#)▼ Severity **BLOCKER**[Clear](#)

20

[Minor](#)

74



26

[Info](#)

0



52

[⌘ + click to add to selection](#)

▶ Resolution

▶ Status

▶ Security Category

▶ Creation Date

▶ Language

▶ Rule

▶ Tag

▶ Directory

▶ File

▶ Assignee

[T](#) [D](#) to select issues [←](#) [→](#) to navigate [⟳](#) 1 / 20 issues 1h 40min effort**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

last month ▾ L8 % T-

src/.../hipster/sample/service/mapper/EntityCustomIdDTOMapsIdMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

last month ▾ L8 % T-

src/.../hipster/sample/service/mapper/EntityCustomIdDTORelMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

last month ▾ L8 % T-

src/.../hipster/sample/service/mapper/EntityUuidIdDTOMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

last month ▾ L9 % T-

src/.../hipster/sample/service/mapper/EntityUuidIdDTOMapsIdMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

last month ▾ L9 % T-

src/.../hipster/sample/service/mapper/EntityUuidIdDTORelMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

last month ▾ L9 % T-

src/.../hipster/sample/service/mapper/EntityWithDTOMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

3 months ago ▾ L8 % T-

src/.../hipster/sample/service/mapper/EntityWithPaginationAndDTOMapperTest.java

**Add some tests to this class.** [Why is this an issue?](#) Blocker  Open  Not assigned 5min effort

3 months ago ▾ L8 % T-

Overview Issues Security Hotspots Measures Code Activity

# Critical level

Filters

Clear All Filters

▼ Type CODE SMELL

Clear



Bug

0 issues

0 assigned

0 unassigned

0 critical

0 major

0 minor

0 info

26 code smells

+ click to add to selection

▼ Severity CRITICAL

Clear

0 blocker

0 major

0 critical

0 info

0 minor

0 warning

74 minor

0 info

0 blocker

26 critical

+ click to add to selection

▶ Resolution

▶ Status

▶ Security Category

▶ Creation Date

▶ Language

▶ Rule

▶ Tag

▶ Directory

▶ File

▶ Assignee

+ - to select issues

← → to navigate

1 / 26 issues 2d effort

src/.../tech/jhipster/sample/config/CacheConfiguration.java

Define a constant instead of duplicating this literal ".testManyToOnes" 6 times. Why is this an issue?

last month L60 % T-

Code Smell Critical Open Not assigned 14min effort

No tags

Define a constant instead of duplicating this literal ".testManyToManyes" 6 times. Why is this an issue?

last month L61 % T-

Code Smell Critical Open Not assigned 14min effort

No tags

Define a constant instead of duplicating this literal ".userManyToManyies" 7 times. Why is this an issue?

last month L62 % T-

Code Smell Critical Open Not assigned 16min effort

No tags

Define a constant instead of duplicating this literal ".manyToOneBacks" 4 times. Why is this an issue?

last month L131 % T-

Code Smell Critical Open Not assigned 10min effort

No tags

Define a constant instead of duplicating this literal ".manyToManyBacks" 4 times. Why is this an issue?

last month L132 % T-

Code Smell Critical Open Not assigned 10min effort

No tags

Define a constant instead of duplicating this literal ".manyToOneMapsIdBacks" 4 times. Why is this an issue?

last month L134 % T-

Code Smell Critical Open Not assigned 10min effort

No tags

Define a constant instead of duplicating this literal ".manyToManyMapsIdBacks" 4 times. Why is this an issue?

last month L135 % T-

Code Smell Critical Open Not assigned 10min effort

No tags

Define a constant instead of duplicating this literal ".manyToManyes" 5 times. Why is this an issue?

last month L137 % T-

Code Smell Critical Open Not assigned 12min effort

No tags

Define a constant instead of duplicating this literal ".manyToManyMapsIds" 4 times. Why is this an issue?

last month L138 % T-

Code Smell Critical Open Not assigned 10min effort

No tags

src/.../tech/jhipster/sample/service/BankAccountQueryService.java

Refactor this method to reduce its Cognitive Complexity from 31 to the 15 allowed. Why is this an issue?

last year L76 % T-

Code Smell Critical Open Not assigned 21min effort

No tags

src/.../tech/jhipster/sample/service/FieldTestMapstructAndServiceClassEntityService.java

Refactor this method to reduce its Cognitive Complexity from 110 to the 15 allowed. Why is this an issue?

4 months ago L59 % T-

Code Smell Critical Open Not assigned 1h40min effort

No tags

← 10 / 26 issues ⏪

...ter/sample/config/CacheConfiguration.java

**Define a constant instead of duplicating this literal ".testManyToOnes" 6 times.**

**Code Smell** +6

**Define a constant instead of duplicating this literal ".testManyToManyics" 6 times.**

**Code Smell** +6

**Define a constant instead of duplicating this literal ".userManyToManyics" 7 times.**

**Code Smell** +7

**Define a constant instead of duplicating this literal ".manyToOneBacks" 4 times.**

**Code Smell** +4

**Define a constant instead of duplicating this literal ".manyToManyBacks" 4 times.**

**Code Smell** +4

**Define a constant instead of duplicating this literal ".manyToOneMapsIdBacks" 4 times.**

**Code Smell** +4

**Define a constant instead of duplicating this literal ".manyToManyMapsIdBacks" 4 times.**

**Code Smell** +4

**Define a constant instead of duplicating this literal ".manyToManies" 5 times.**

**Code Smell** +5

**Define a constant instead of duplicating this literal**

# Proposition de correction

File: jhipsterSampleApplication generated by jhipster /src/main/java/tech/jhipster/sample/service/BankAccountQueryService.java

See all issues in this file

```

73 ... /**
74 * Function to convert {@link BankAccountCriteria} to a {@link Specification}
75 * @param criteria The object which holds all the filters, which the entities should match.
76 * @return the matching {@link Specification} of the entity.
77 */
78 protected Specification<BankAccountEntity> createSpecification(BankAccountCriteria criteria) {
    Specification<BankAccountEntity> specification = Specification.where(null);
    1 if (criteria != null) {
        2 if (criteria.getId() != null) {
            specification = specification.and(buildRangeSpecification(criteria.getId(), BankAccountEntity_.id));
        }
        3 if (criteria.getName() != null) {
            specification = specification.and(buildStringSpecification(criteria.getName(), BankAccountEntity_.name));
        }
        4 if (criteria.getGuid() != null) {
            specification = specification.and(buildSpecification(criteria.getGuid(), BankAccountEntity_.guid));
        }
        5 if (criteria.getBankNumber() != null) {
            specification = specification.and(buildRangeSpecification(criteria.getBankNumber(), BankAccountEntity_.bankNumber));
        }
        6 if (criteria.getAgencyNumber() != null) {
            specification = specification.and(buildRangeSpecification(criteria.getAgencyNumber(), BankAccountEntity_.agencyNumber));
        }
        7 if (criteria.getLastOperationDuration() != null) {
            specification =
                specification.and(
                    buildRangeSpecification(criteria.getLastOperationDuration(), BankAccountEntity_.lastOperationDuration));
        }
        8 if (criteria.getMeanOperationDuration() != null) {
            specification =
                specification.and(
                    buildRangeSpecification(criteria.getMeanOperationDuration(), BankAccountEntity_.meanOperationDuration));
        }
        9 if (criteria.getMeanQueueDuration() != null) {
            specification =
                specification.and(buildRangeSpecification(criteria.getMeanQueueDuration(), BankAccountEntity_.meanQueueDuration));
        }
        10 if (criteria.getBalance() != null) {
    }
}

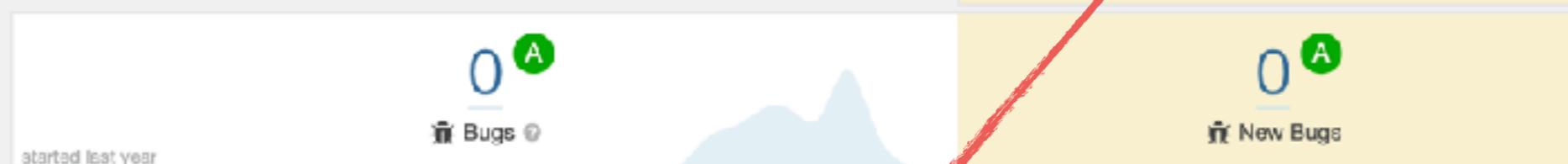
```

Refactor this method to reduce its Cognitive Complexity from 31 to the 15 allowed. [Why is this an issue?](#) Last year - L78 %

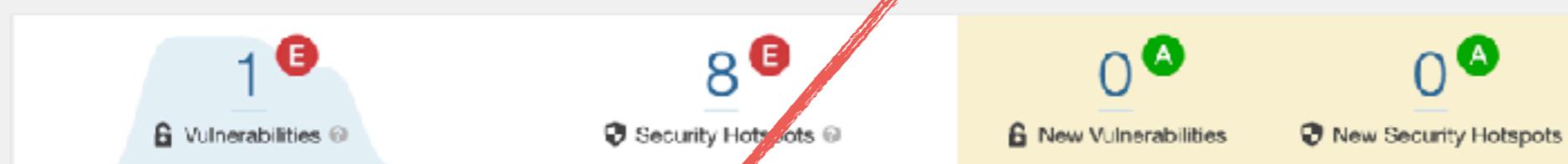
**Code Smell** Critical Open Not assigned 21min effort No tags

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)Quality Gate Failed**77.24%** Coverage on New Code is less than 80.0%**3.55%** Duplicated Lines (%) on New Code is greater than 3.0%

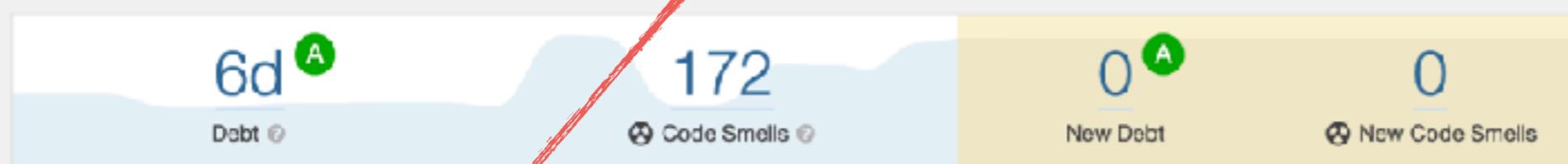
## Reliability Measures



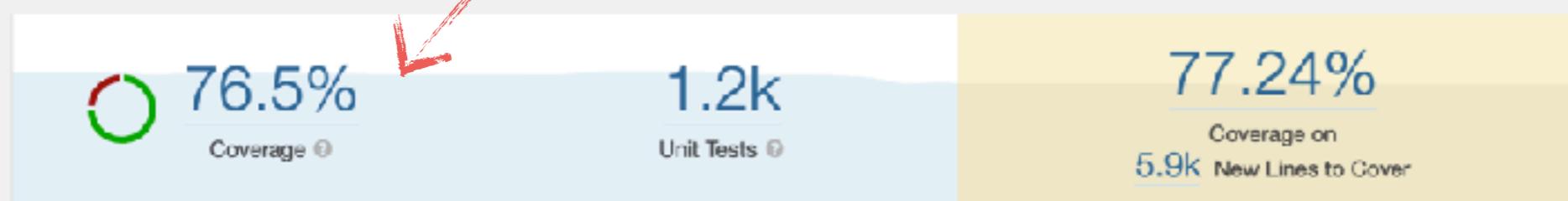
## Security Measures



## Maintainability Measures



## Coverage Measures



## Duplications Measures



# Test coverage

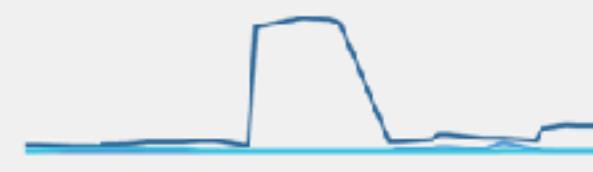
## About This Project

No tags

M 88k Lines of Code

HTML	31k
Java	29k
TypeScript	24k
XML	4.4k
CSS	98

## Project Activity



January 24, 2021, 1:38 PM

1.0

January 24, 2021, 2:42 AM

Project Analyzed

January 23, 2021, 10:40 PM

Project Analyzed

[Show More](#)

## Quality Gate

(Default) [Sonar way](#)

## Quality Profiles

(CSS) [Sonar way](#)  
(Java) [Sonar way](#)  
(TypeScript) [Sonar way](#)  
(HTML) [Sonar way](#)  
(XML) [Sonar way](#)

## Project Key

jhipster-sample-application

[Copy](#)

## Organization Key

jhipster

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## Project Overview

jhipsterSampleApplication gene...

View as

List



to select files



to navigate 745 files

## &gt; Releasability

## &gt; Reliability

## &gt; Security

## &gt; Security Review

## &gt; Maintainability

## ▼ Coverage COVERAGE

## Overview



## On new code

Coverage

77.2%

Lines to Cover

5,857

Uncovered Lines

804

Line Coverage

88.3%

Conditions to Cover

2,495

Uncovered Conditions

1,097

Condition Coverage

58.0%

## Overall

Coverage 76.5%

Lines to Cover 19,807

Uncovered Lines 3,458

Line Coverage 82.5%

Conditions to Cover 5,745

Uncovered Conditions 2,549

Condition Coverage 55.6%

## Tests

Unit Tests 1,245

Errors 0

Failures 0

Skipped 0

Success 100%

Duration 29s

## Test coverage

Coverage 76.5%

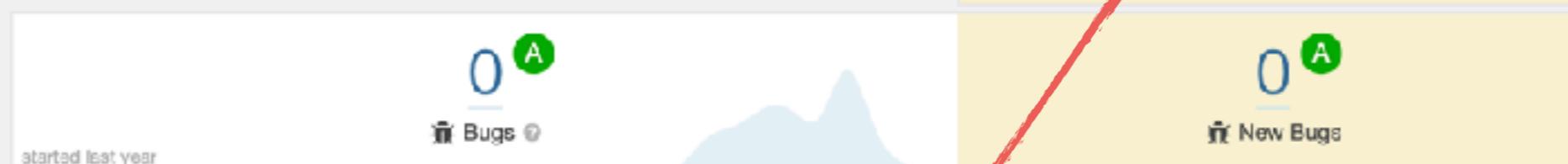
New code: last 30 days

Coverage Uncovered Lines Uncovered Conditions

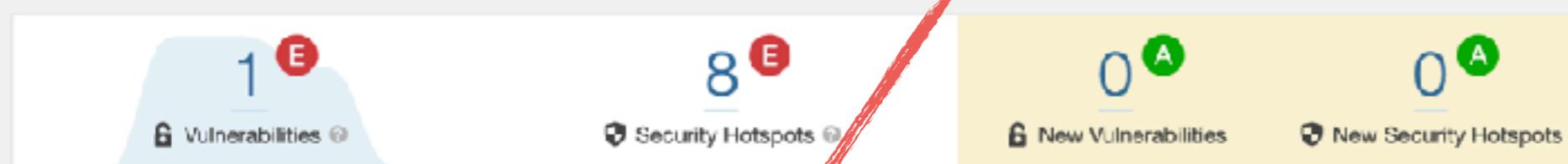
src/main/webapp/app/account/account.route.ts	0.0%	2	-
src/main/webapp/app/account/activate/activate.route.ts	0.0%	1	-
src/main/webapp/app/layouts/navbar/active-menu.directive.ts	0.0%	6	-
src/main/webapp/app/app-routing.module.ts	0.0%	1	-
src/main/webapp/app/app.module.ts	0.0%	5	-
src/main/java/tech/jhipster/sample/ApplicationWebXml.java	0.0%	3	-
src/main/webapp/app/core/interceptor/auth-expired.interceptor.ts	0.0%	5	-
src/main/webapp/app/core/interceptor/auth.interceptor.ts	0.0%	6	-
src/main/webapp/app/entities/test-root/bank-account-my-suffix/route/bank-account-my-suffix-routing.module.ts	0.0%	1	-
src/main/webapp/app/admin/configuration/configuration.route.ts	0.0%	1	-
src/main/webapp/app/config-datepicker-adapter.ts	0.0%	4	-
src/main/webapp/app/config/dayjs.ts	0.0%	3	-
src/main/webapp/app/entities/test-root/division/route/division-routing.module.ts	0.0%	1	-
src/main/webapp/app/admin/docs/docs.route.ts	0.0%	1	-
src/main/webapp/app/shared/date/duration.pipe.ts	0.0%	3	-
src/main/webapp/app/entities/entity-custom-id-dto-maps-id/route/entity-custom-id-dto-maps-id-routing.module.ts	0.0%	1	-
src/main/webapp/app/entities/entity-custom-id-dto-rel/route/entity-custom-id-dto-rel-routing.module.ts	0.0%	1	-
src/main/webapp/app/entities/entity-custom-id-dto/route/entity-custom-id-dto-routing.module.ts	0.0%	1	-
src/main/webapp/app/entities/entity-custom-id-maps-id/route/entity-custom-id-maps-id-routing.module.ts	0.0%	1	-
src/main/webapp/app/entities/entity-custom-id-relationship/route/entity-custom-id-relationship-routing.module.ts	0.0%	1	-
src/main/webapp/app/entities/entity-custom-id/route/entity-custom-id-routing.module.ts	0.0%	1	-

[Overview](#) [Issues](#) [Security Hotspots](#) [Measures](#) [Code](#) [Activity](#)Quality Gate Failed**77.24%** Coverage on New Code is less than 80.0%**3.55%** Duplicated Lines (%) on New Code is greater than 3.0%

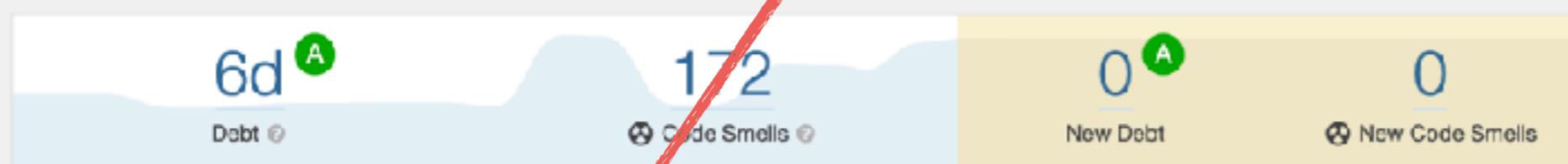
Reliability Measures



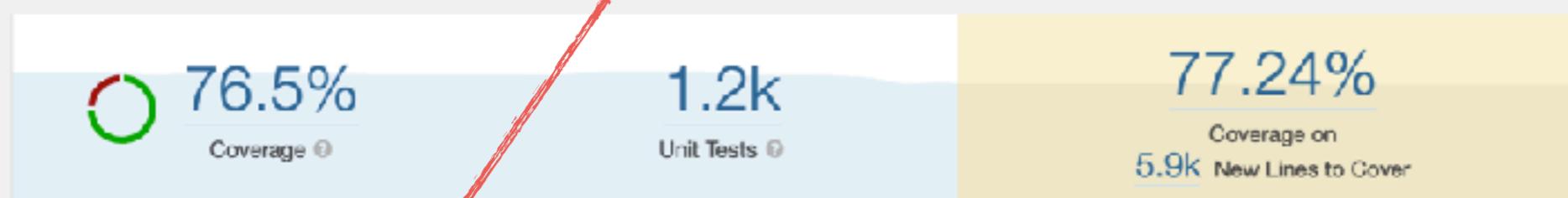
Security Measures



Maintainability Measures



Coverage Measures



Duplications Measures

<https://sonarcloud.io/dashboard?id=jhipster-sample-application>

# Duplication

About This Project

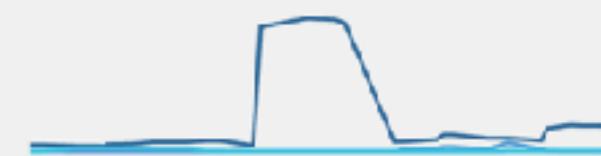
No tags

**M** 88k

Lines of Code

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Java 29k  
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Quality Gate

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(TypeScript) [Sonar way](#)  
(HTML) [Sonar way](#)  
(XML) [Sonar way](#)

Project Key

jhipster-sample-application

[Copy](#)

Organization Key

jhipster

[Copy](#)

# Structure

---

- un runner, qui lance des analyse et compile les résultats
  - Plugin maven, plugin gradle, etc.
  - Runner stand-alone en Java
  - **Attention, tant que le runner n'est pas de nouveau exécuté, la BD n'est pas mise à jour**
- une base de données, qui stocke les analyses des projets étudiés
- un serveur web pour consulter les données
  - Par défaut : <http://localhost:9000>

# Installations possibles

---

- Avec Docker (système de containers légers, incontournable actuellement)

```
docker run -d --name sonarqube -p 9000:9000 sonarqube
```

- (lancement de la dernière image sonarqube = « latest » image = 9.3.0-community)
  - Plus d'info : [https://hub.docker.com/\\_/sonarqube/](https://hub.docker.com/_/sonarqube/)
- 
- Installation stand-alone de SonarQube
    - <https://docs.sonarqube.org/latest/setup/get-started-2-minutes/>

# Configuration Maven avec couverture de tests

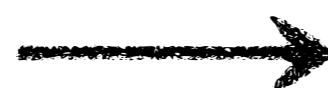
Ajout des plugins du scanner Sonar et de Jacoco (calcul de couverture de tests) dans le pom.xml

**Maven compiler**



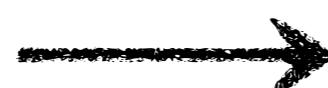
```
<plugin>
    <artifactId>maven-compiler-plugin</artifactId>
    <version>3.8.1</version>
</plugin>
```

**Maven surefire  
(=test) plugins**



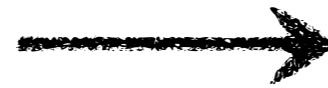
```
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-surefire-plugin</artifactId>
    <version>2.22.2</version>
</plugin>
```

**Scanner Sonar**



```
<plugin>
    <groupId>org.sonarsource.scanner.maven</groupId>
    <artifactId>sonar-maven-plugin</artifactId>
    <version>3.9.1.2184</version>
</plugin>
```

**Plugin Jacoco**



```
<plugin>
    <groupId>org.jacoco</groupId>
    <artifactId>jacoco-maven-plugin</artifactId>
    <version>0.8.7</version>
</plugin>
```

# Configuration Maven avec couverture de tests

Ajout d'un profil pour compiler avec Jacoco dans le pom.xml

**Nom du profil**

**Prepare-agent**

= calcul de couverture pendant la compilation et le passage des tests

**Prepare-agent**

= génération du rapport de couverture  
Jacoco

```
<profiles>
  <profile>
    <id>coverage</id>
    <build>
      <plugins>
        <plugin>
          <groupId>org.jacoco</groupId>
          <artifactId>jacoco-maven-plugin</artifactId>
          <executions>
            <execution>
              <id>prepare-agent</id>
              <goals>
                <goal>prepare-agent</goal>
              </goals>
            </execution>
            <execution>
              <id>report</id>
              <goals>
                <goal>report</goal>
              </goals>
            </execution>
          </executions>
        </plugin>
      </plugins>
    </build>
  </profile>
</profiles>
```

# Configuration Maven avec couverture de tests

Exécution en même temps (ou séparément) que la compilation et les tests

```
$ mvn clean verify -Pcoverage sonar:sonar
```



**Passage des tests et  
exportation des sorties Jacobo**

**Exécution  
du profil**

**Scanner sonar sur le code et  
Récupération du rapport de  
couverture de tests**

```
$ mvn clean verify -Pcoverage
```

```
$ mvn sonar:sonar
```



# Authentification

**Sonar 9.3 (= latest à l'édition de ce cours) force l'authentification par défaut.**

```
$ mvn clean verify -Pcoverage sonar:sonar  
-Dsonar.login=LONG_TOKEN_HERE
```

- Générer dans Administration > Security > Users > Security (attention, vous ne pouvez le copier-coller qu'à la génération)
- <https://docs.sonarqube.org/latest/user-guide/user-token/>

```
$ mvn clean verify -Pcoverage sonar:sonar -Dsonar.login=admin  
-Dsonar.password=<changed_admin_password>
```

- Générer dans Administration > Security > Users > Security (attention, vous ne pouvez le copier-coller qu'à la génération)

# Dans votre projet

---

Solution préférable pour l'instant :

- Faire le setup simple dans le module player
- Exécuter la commande maven/sonar dans le module player



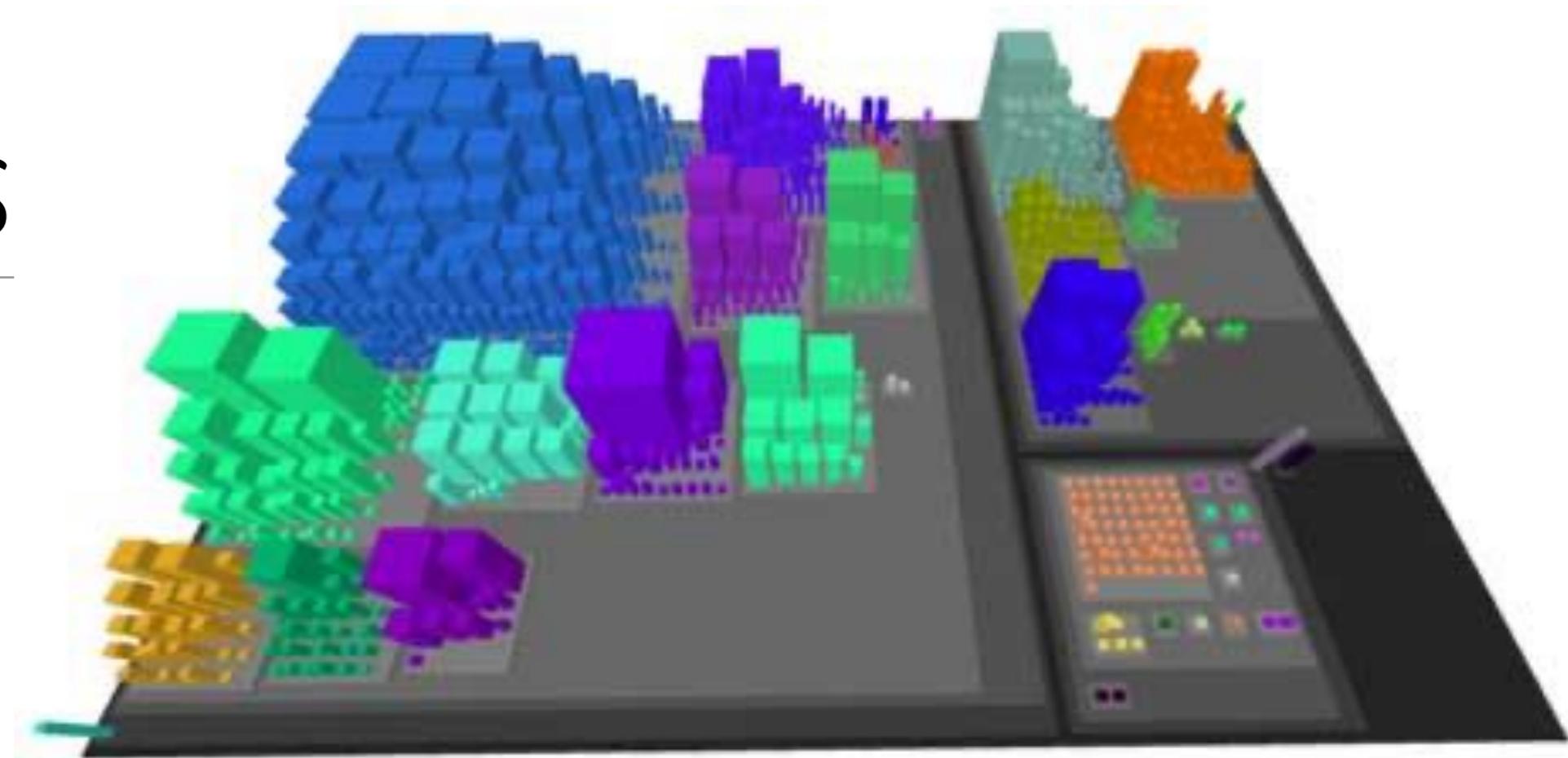
si vous exédez la commande sur le projet global, les classes source du projet tooling seront comptées dans le calcul de couverture  
(et donc le taux de couverture sera a priori plus bas)

# Projets exemples et pom.xml de référence

---

- Projet simple :
  - <https://github.com/SonarSource/sonar-scanning-examples/tree/master/sonarqube-scanner-maven/maven-basic>
- Projet multi-modules (**pour plus tard peut être**)
  - <https://github.com/SonarSource/sonar-scanning-examples/tree/master/sonarqube-scanner-maven/maven-multimodule>

# Plugin dans Sonar...



- SoftVis3D
  - <https://softvis3d.com/#/>
- Installation depuis Sonar : 'Administration -> Marketplace'
  - Attention, cela met à jour l'image Docker si vous utilisez celle-ci...



# Jacoco, maven et JDK 10+

---

- L'appel à jacoco directement en ligne de commande ne marche plus en JDK 10+
  - Incompatibilité entre Maven Surefire, le plugin Sonar, le JDK, etc.

## OBSOLETE :

- **mvn org.jacoco:jacoco-maven-plugin:prepare-agent clean package**
- **mvn sonar:sonar**



# Docker

---

- Client Docker
  - <http://www.docker.com>
  - Sous Linux et Mac, tout va très bien (Docker Desktop sur Mac)
- Sous Windows, il vous faut
  - Soit une version Pro avec HyperV activé (Docker Desktop)
  - Soit une version Home (Docker Desktop + WSL 2 backend)
- <https://docs.docker.com/docker-for-windows/install/>

# Références et démos

---

- <https://docs.sonarqube.org/latest/analysis/languages/java/>
- <https://docs.sonarqube.org/latest/analysis/scan/sonarscanner-for-maven/>
- <https://github.com/SonarSource/sonar-scanning-examples>
- [https://next.sonarqube.com/sonarqube/projects?sort=-analysis\\_date](https://next.sonarqube.com/sonarqube/projects?sort=-analysis_date)
- <https://sonarcloud.io/projects> et entrez des noms de projet ou baladez vous