THE
DEVELOPER'S
CONFERENCE

# Melhorando o design de código através de **Metáforas**

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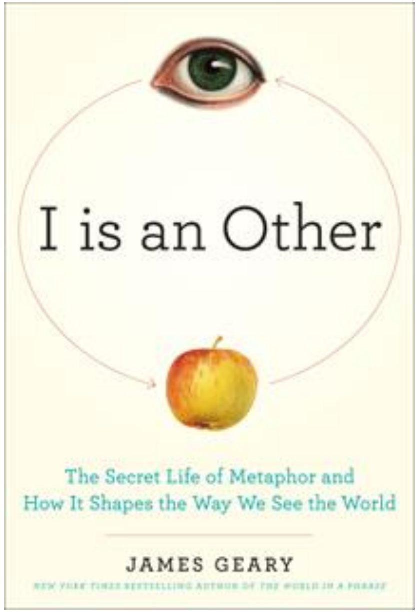
# Quem somos?

“Todas as religiões, artes e ciências são ramos da mesma árvore.”

Albert Einstein

# O que é metáfora?

# O Uso


I is an Other
The Secret Life of Metaphor and
How It Shapes the Way We See the World
JAMES GEARY
NEW YORK TIMES BESTSELLING AUTHOR OF THE WORLD IN A PHRASE

A metáfora não é só uma figura de linguagem

Ela está presente de forma intensa porém imperceptível em tudo que os humanos fazem

# O Uso

**Nós falamos uma metáfora a cada 10 a 25 palavras**

**Ou seja, cerca de seis metáforas por minuto**

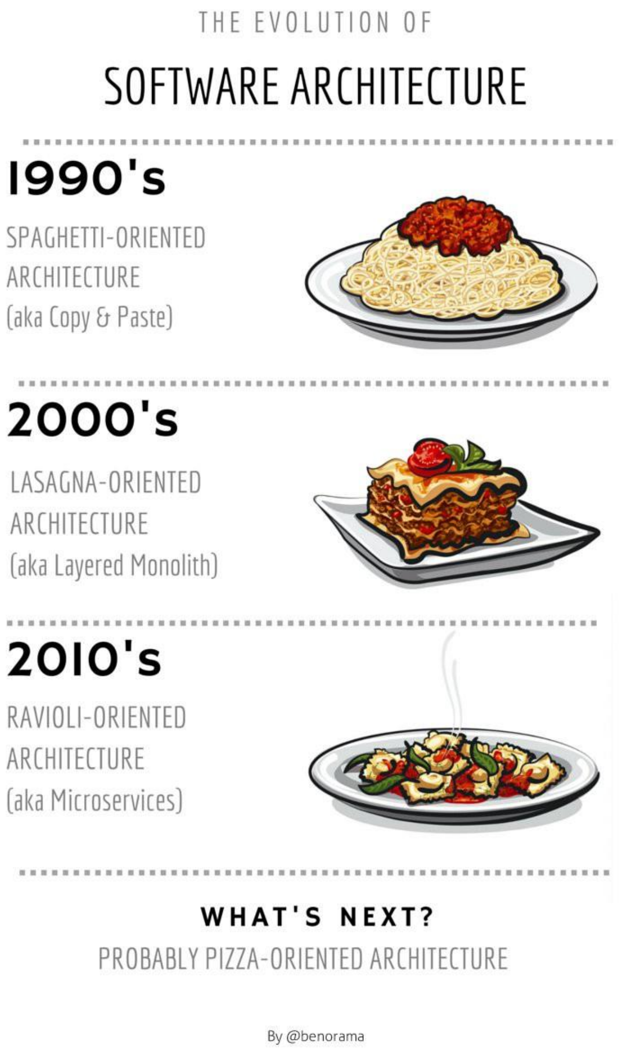
**A metáfora é uma maneira de pensar muito antes de ser um estilo com palavras**

“No silver bullet.”

Fred Brooks Jr.

# Metáforas no desenvolvimento de software

# Metáforas no **Design de Código**



THE EVOLUTION OF

# SOFTWARE ARCHITECTURE

## 1990's

SPAGHETTI-ORIENTED
ARCHITECTURE
(aka Copy & Paste)

## 2000's

LASAGNA-ORIENTED
ARCHITECTURE
(aka Layered Monolith)

## 2010's

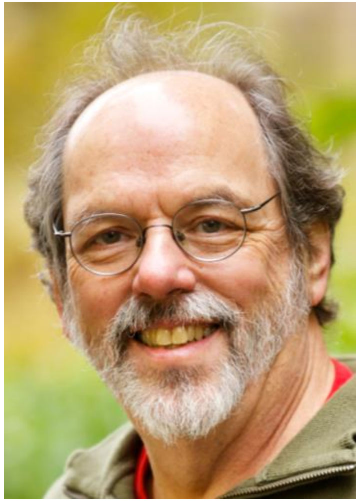
RAVIOLI-ORIENTED
ARCHITECTURE
(aka Microservices)

**WHAT'S NEXT?**

PROBABLY PIZZA-ORIENTED ARCHITECTURE

By @benorama

# Technical Debt

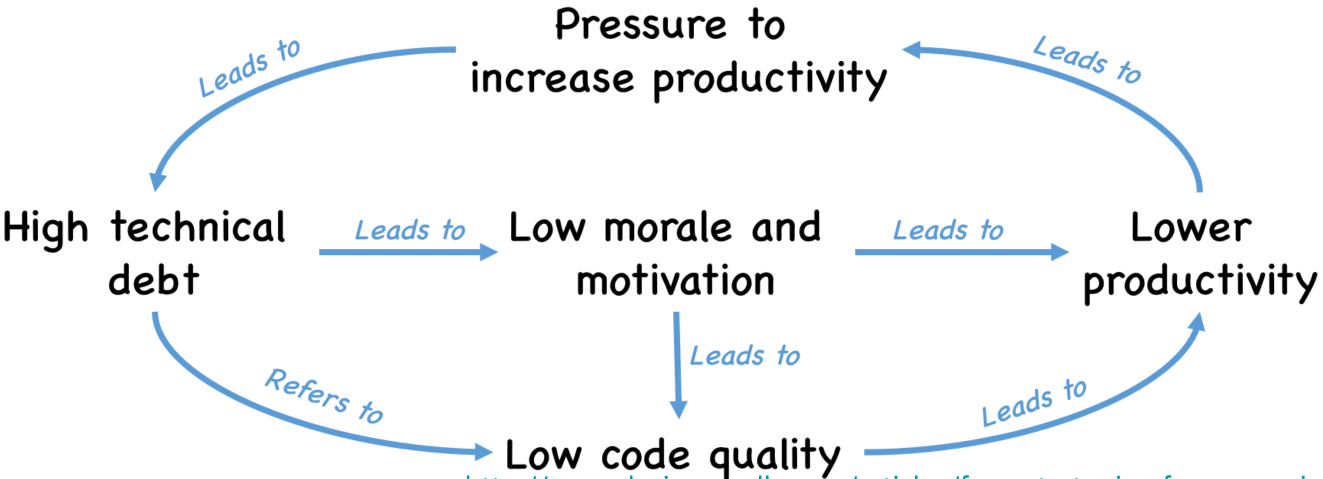


Criada por Ward Cunningham

Originária do setor financeiro

Alguns Tipos

Arquitetura/Design, Código, Testes e Build



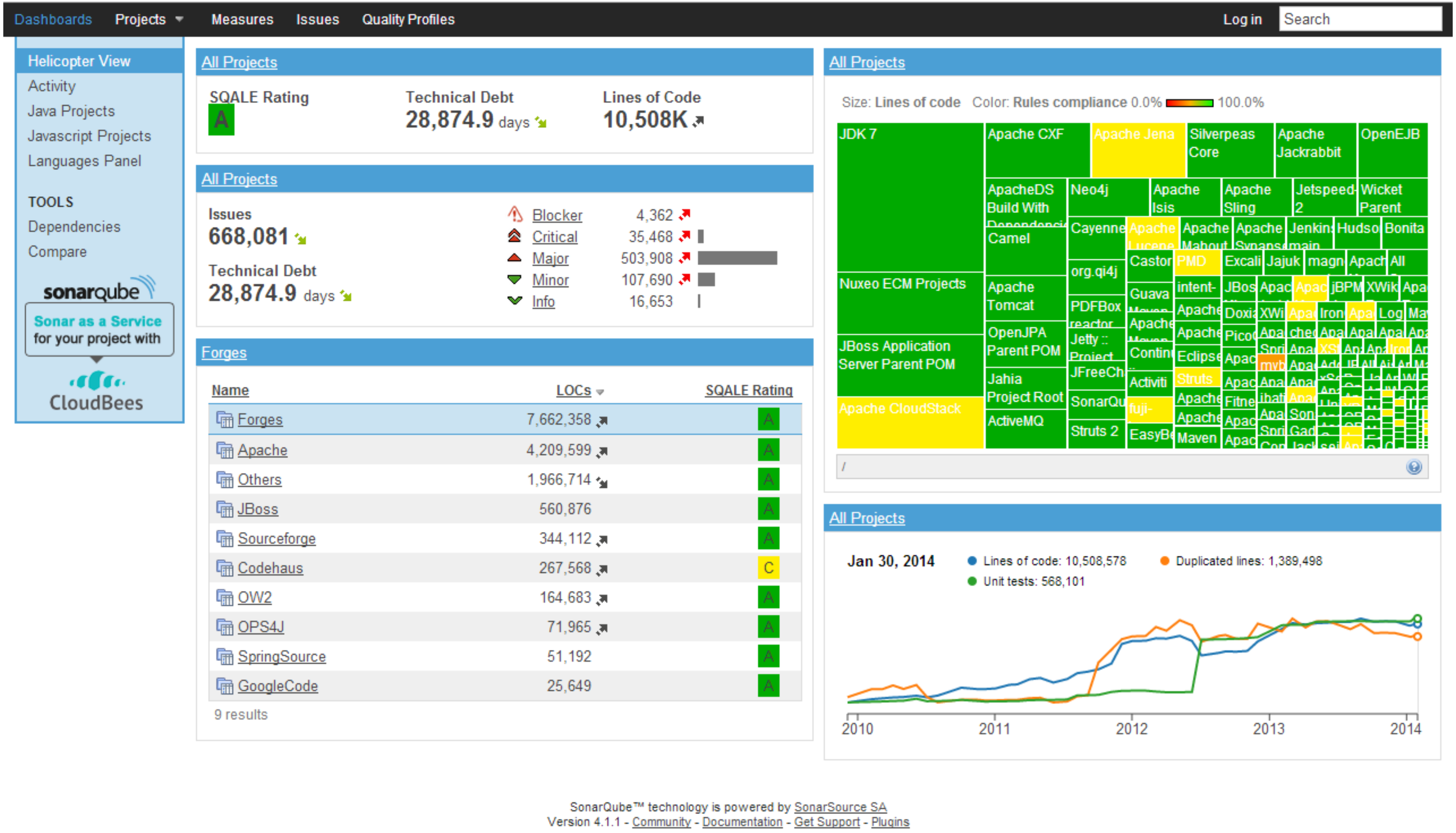
http://www.designsmells.com/articles/four-strategies-for-managing-technical-debt/

## Atividades

Identificação, medição, priorização, monitoramento, pagamento, documentação, comunicação, prevenção

## Ferramentas

SonarQube, Better Code Hub, PMD, Checkstyle, Ndepend, Ndepend, FXCop, Spotbugs



**All Projects**

| SQALE Rating | Technical Debt | Lines of Code |
|---|---|---|
| A | 28,874.9 days | 10,508K |

**All Projects**

Issues
668,081

Technical Debt
28,874.9 days

| Severity | Count |
|---|---|
| Blocker | 4,362 |
| Critical | 35,468 |
| Major | 503,908 |
| Minor | 107,690 |
| Info | 16,653 |

**Forges**

| Name | LOCs | SQALE Rating |
|---|---|---|
| Forges | 7,662,358 | A |
| Apache | 4,209,599 | A |
| Others | 1,966,714 | A |
| JBoss | 560,876 | A |
| Sourceforge | 344,112 | A |
| Codehaus | 267,568 | C |
| OW2 | 164,683 | A |
| OPS4J | 71,965 | A |
| SpringSource | 51,192 | A |
| GoogleCode | 25,649 | A |

9 results

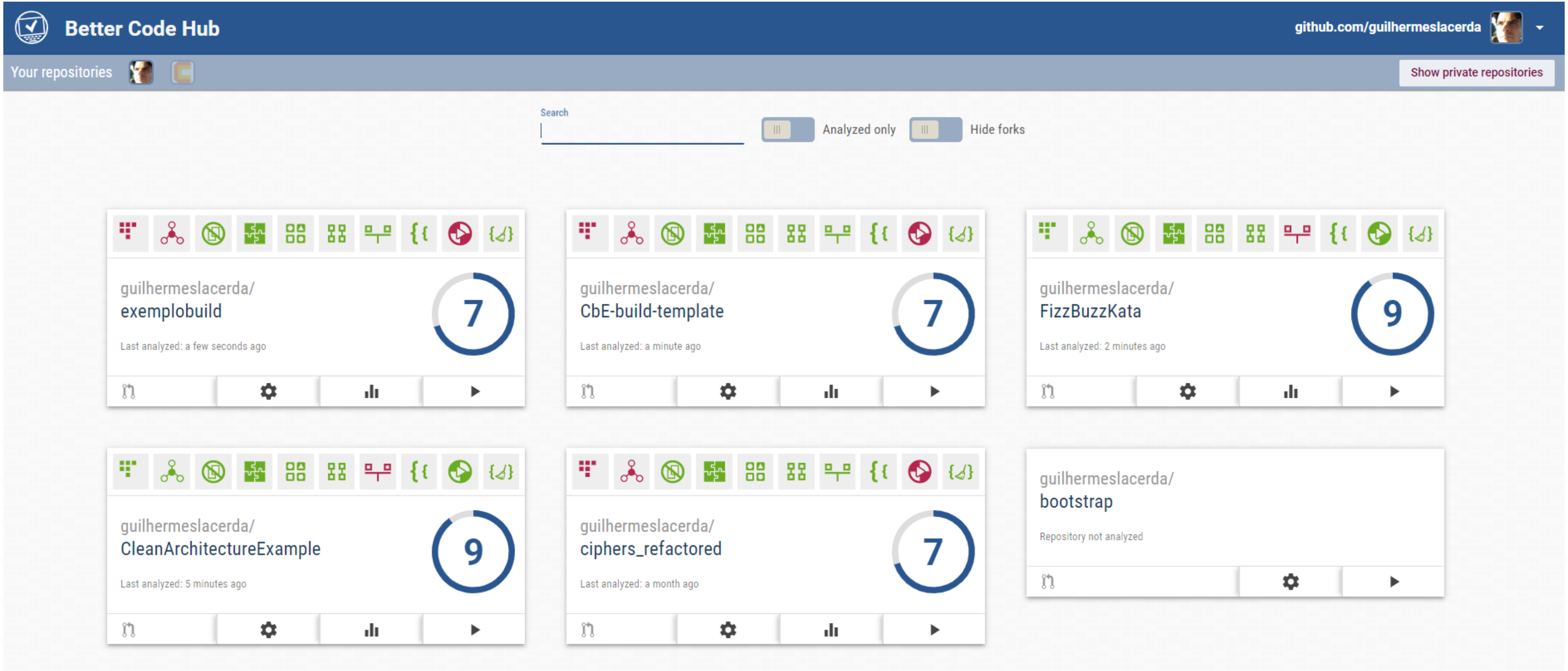
**All Projects**

Size: Lines of code Color: Rules compliance 0.0% 100.0%

**All Projects**

Jan 30, 2014 ● Lines of code: 10,508,578 ● Duplicated lines: 1,389,498 ● Unit tests: 568,101

SonarQube™ technology is powered by SonarSource SA
Version 4.1.1 - Community - Documentation - Get Support - Plugins



guilhermeslacerda/
exemplobuild
7
Last analyzed: a few seconds ago

guilhermeslacerda/
CbE-build-template
7
Last analyzed: a minute ago

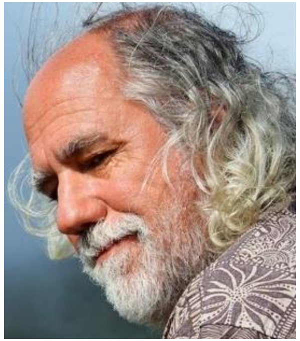
guilhermeslacerda/
FizzBuzzKata
9
Last analyzed: 2 minutes ago

guilhermeslacerda/
CleanArchitectureExample
9
Last analyzed: 5 minutes ago

guilhermeslacerda/
ciphers_refactored
7
Last analyzed: a month ago

guilhermeslacerda/
bootstrap
Repository not analyzed

# Software as a City



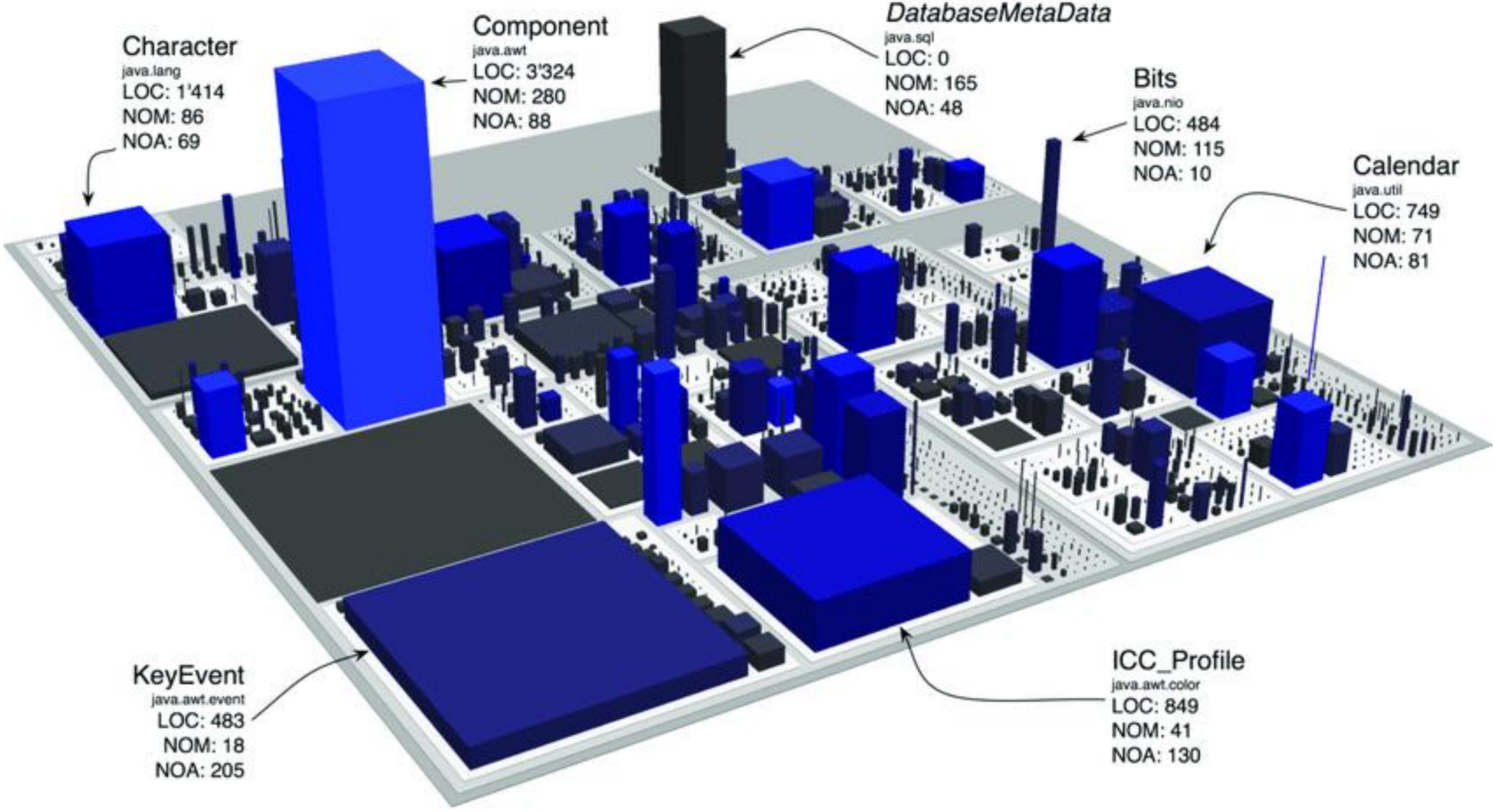
**Definida por** Grady Booch

**Explorada na academia por** Michele Lanza e Richard Wettel

**Evolução do Software como** uma cidade

**Ferramenta**

Code City


Character
java.lang
LOC: 1'414
NOM: 86
NOA: 69
Component
java.awt
LOC: 3'324
NOM: 280
NOA: 88
*DatabaseMetaData*
java.sql
LOC: 0
NOM: 165
NOA: 48
Bits
java.nio
LOC: 484
NOM: 115
NOA: 10
Calendar
java.util
LOC: 749
NOM: 71
NOA: 81
KeyEvent
java.awt.event
LOC: 483
NOM: 18
NOA: 205
ICC_Profile
java.awt.color
LOC: 849
NOM: 41
NOA: 130

# Your Code as a Crime Scene

Criada por Adam Tornhill

Usa técnicas de psicologia forense

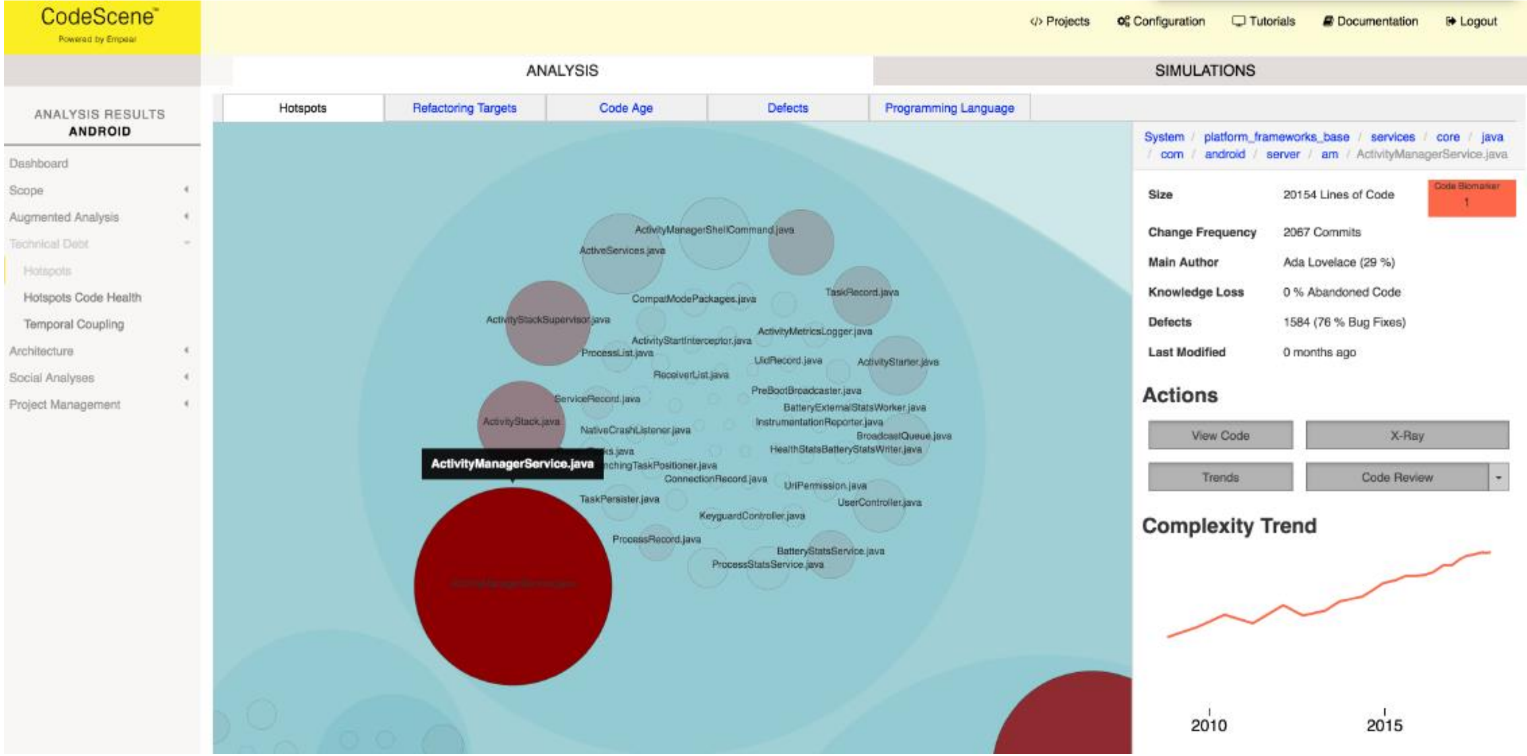
Técnicas

análise geográfica dos crimes, definição de perfil, uso do código como testemunha, mineração de hotspots

Ferramentas

code-maat, Code Scene

```
prompt> maat -l maat_evo.log -c git -a summary
statistic,value
number-of-commits,88
number-of-entities,45
number-of-entities-changed,283
number-of-authors,2
```



| | |
|---|---|
| Size | 20154 Lines of Code |
| Change Frequency | 2067 Commits |
| Main Author | Ada Lovelace (29 %) |
| Knowledge Loss | 0 % Abandoned Code |
| Defects | 1584 (76 % Bug Fixes) |
| Last Modified | 0 months ago |

Actions

Complexity Trend

# Dentistry Metaphor

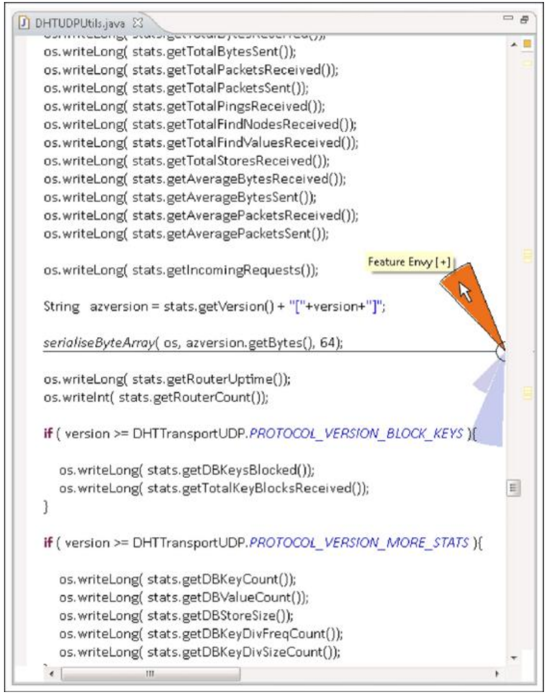
Criada por Emerson Murphy-Hill

Refactorings

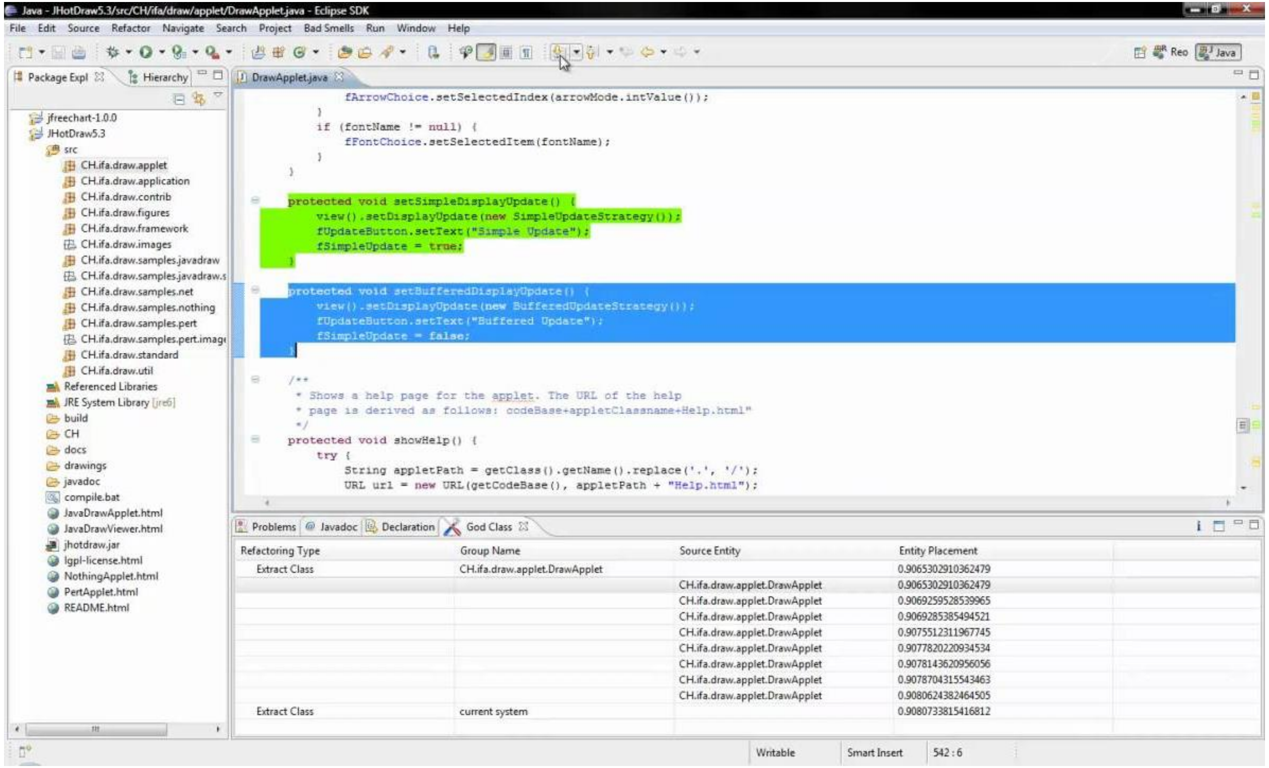
- Root Channel x Floss

Ferramentas

- Stench Blossom
- Jdeodorant, Refactoring Miner (Tsantalis)

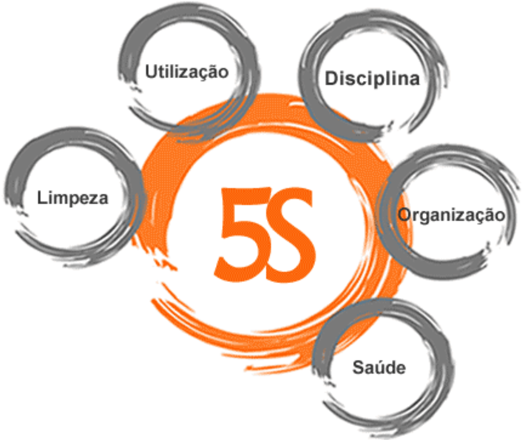


```
os.writeLong( stats.getTotalBytesSent());
os.writeLong( stats.getTotalPacketsReceived());
os.writeLong( stats.getTotalPacketsSent());
os.writeLong( stats.getTotalPingsReceived());
os.writeLong( stats.getTotalFindNodesReceived());
os.writeLong( stats.getTotalFindValuesReceived());
os.writeLong( stats.getTotalStoresReceived());
os.writeLong( stats.getAverageBytesReceived());
os.writeLong( stats.getAverageBytesSent());
os.writeLong( stats.getAveragePacketsReceived());
os.writeLong( stats.getAveragePacketsSent());

os.writeLong( stats.getIncomingRequests());

String  azversion = stats.getVersion() + "["+version+"]";

serialiseByteArray( os, azversion.getBytes(), 64);

os.writeLong( stats.getRouterUptime());
os.writeInt( stats.getRouterCount());

if ( version >= DHTTransportUDP.PROTOCOL_VERSION_BLOCK_KEYS ){

    os.writeLong( stats.getDBKeysBlocked());
    os.writeLong( stats.getTotalKeyBlocksReceived());
}

if ( version >= DHTTransportUDP.PROTOCOL_VERSION_MORE_STATS ){

    os.writeLong( stats.getDBKeyCount());
    os.writeLong( stats.getDBValueCount());
    os.writeLong( stats.getDBStoreSize());
    os.writeLong( stats.getDBKeyDivFreqCount());
    os.writeLong( stats.getDBKeyDivSizeCount());
```



```
                fArrowChoice.setSelectedIndex(arrowMode.intValue());
            }
            if (fontName != null) {
                fFontChoice.setSelectedItem(fontName);
            }
        }

        protected void setSimpleDisplayUpdate() {
            view().setDisplayUpdate(new SimpleUpdateStrategy());
            fUpdateButton.setText("Simple Update");
            fSimpleUpdate = true;
        }

        protected void setBufferedDisplayUpdate() {
            view().setDisplayUpdate(new BufferedUpdateStrategy());
            fUpdateButton.setText("Buffered Update");
            fSimpleUpdate = false;
        }

        /**
         * Shows a help page for the applet. The URL of the help
         * page is derived as follows: codeBase+appletClassname+Help.html"
         */
        protected void showHelp() {
            try {
                String appletPath = getClass().getName().replace('.', '/');
                URL url = new URL(getCodeBase(), appletPath + "Help.html");
```

| Refactoring Type | Group Name | Source Entity | Entity Placement |
|---|---|---|---|
| Extract Class | CH.ifa.draw.applet.DrawApplet | | 0.9065302910362479 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9065302910362479 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9069259528539965 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9069285385494521 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9075512311967745 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9077820220934534 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9078143620956056 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9078704315543463 |
| | | CH.ifa.draw.applet.DrawApplet | 0.9080624382464505 |
| Extract Class | current system | | 0.9080733815416812 |



# 5S em Código

Usada por Guilherme Lacerda

5 sensos japoneses

Seiri, Seiton, Seiso, Seiketsu, Shitsuke

Materiais e ferramentas

www.codingbyexample.org

# Metáfora da Medicina

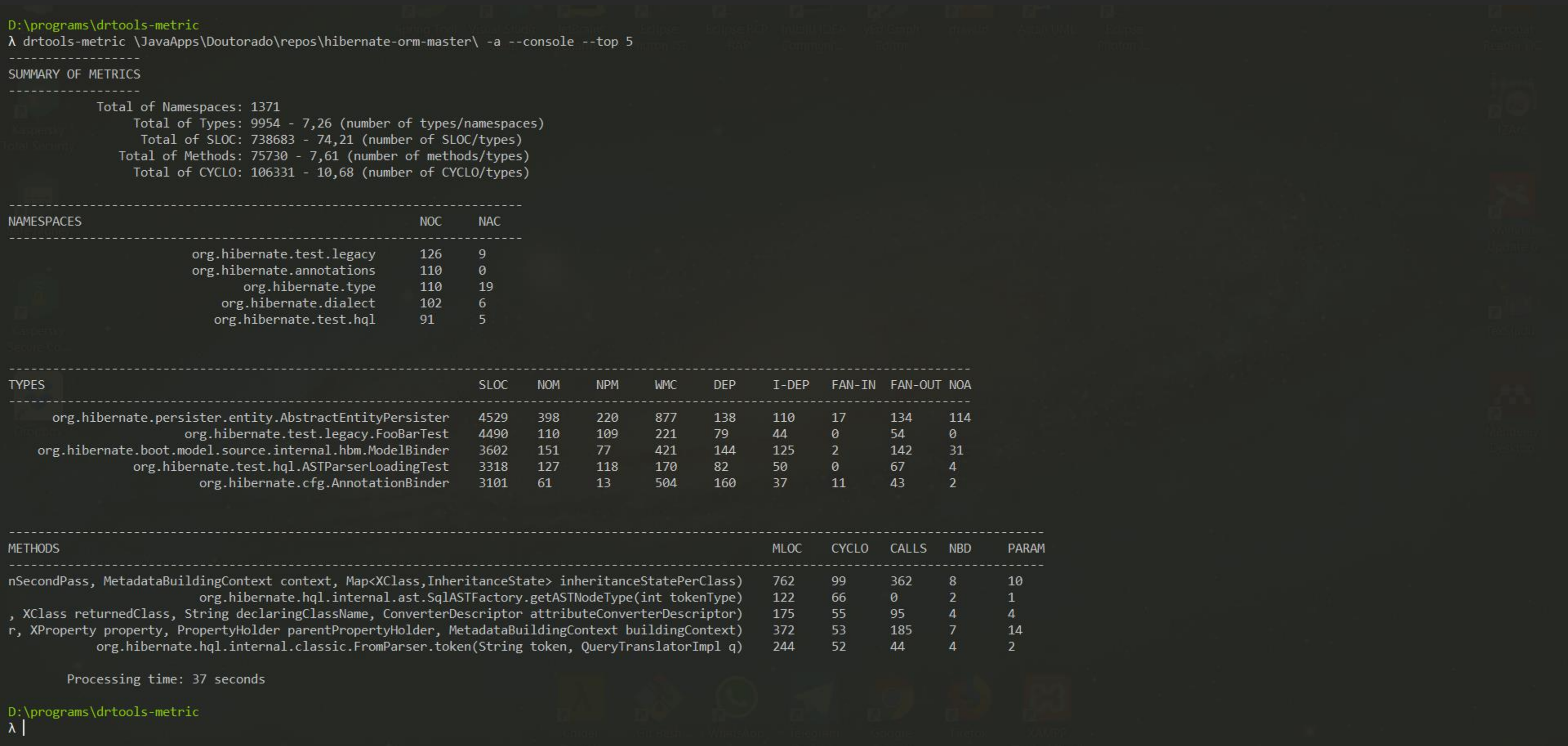
DR-Tools

Definida por Guilherme Lacerda

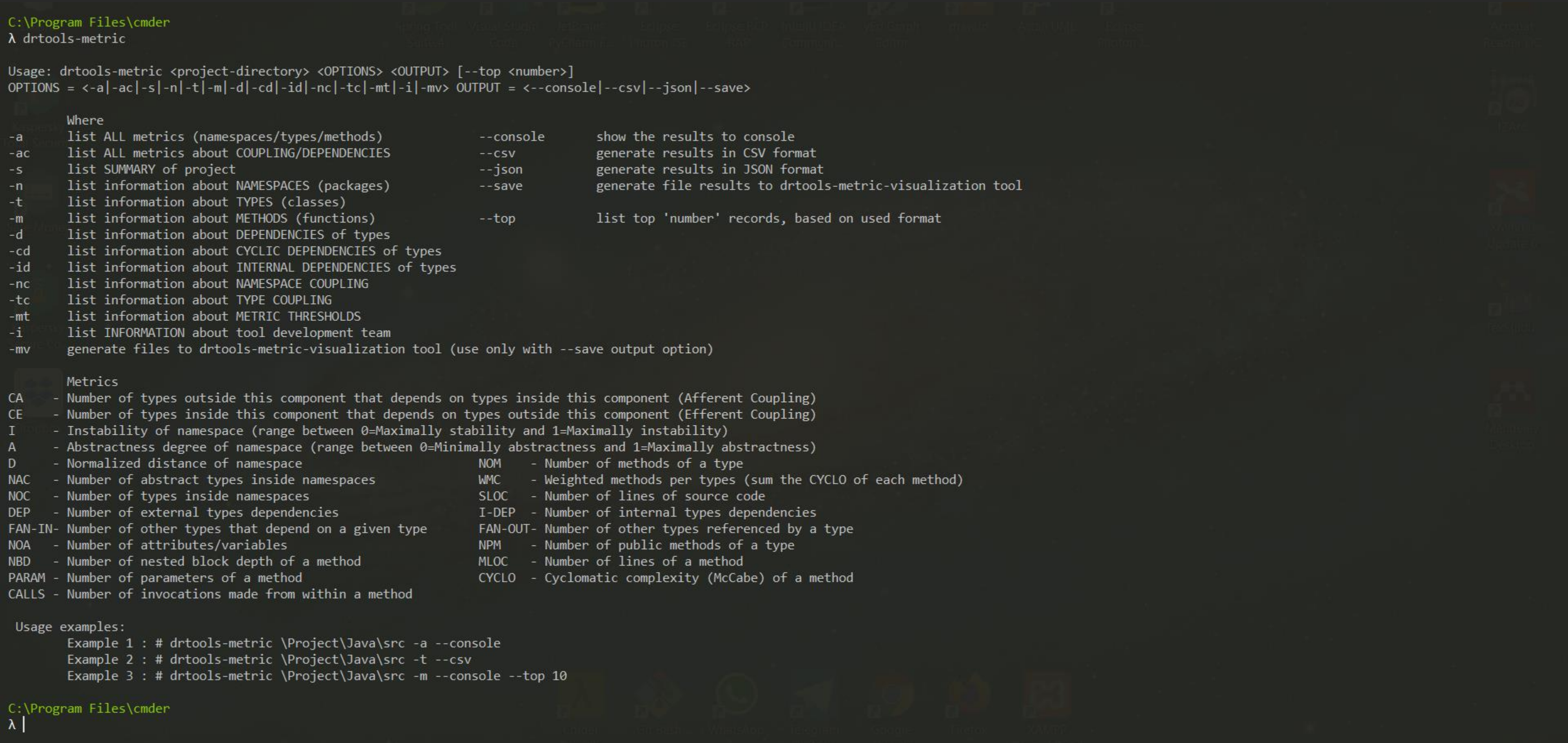
Relação de sintomas no código com doenças e possíveis tratamentos

Ferramentas e materiais

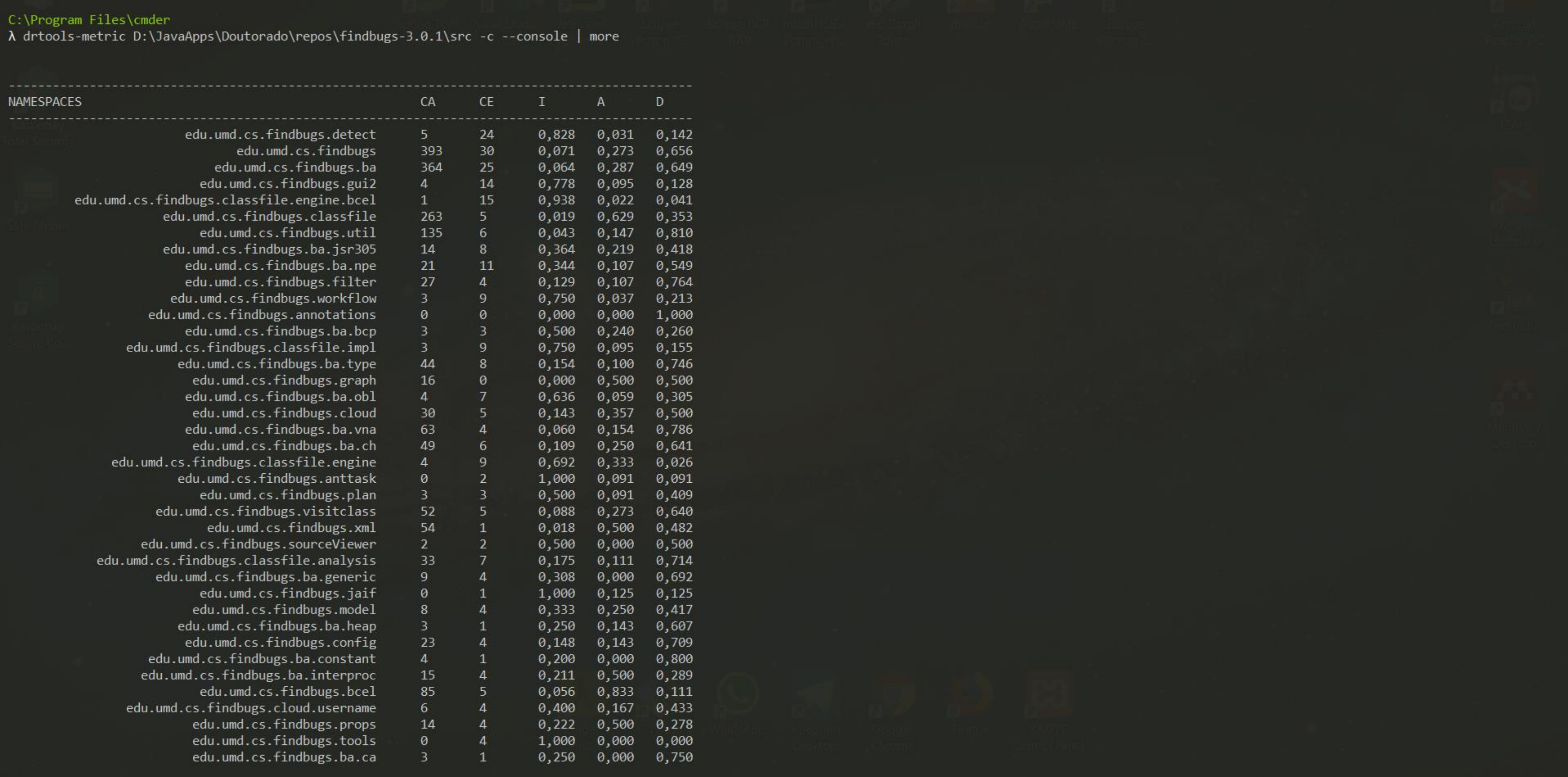
drtools.site



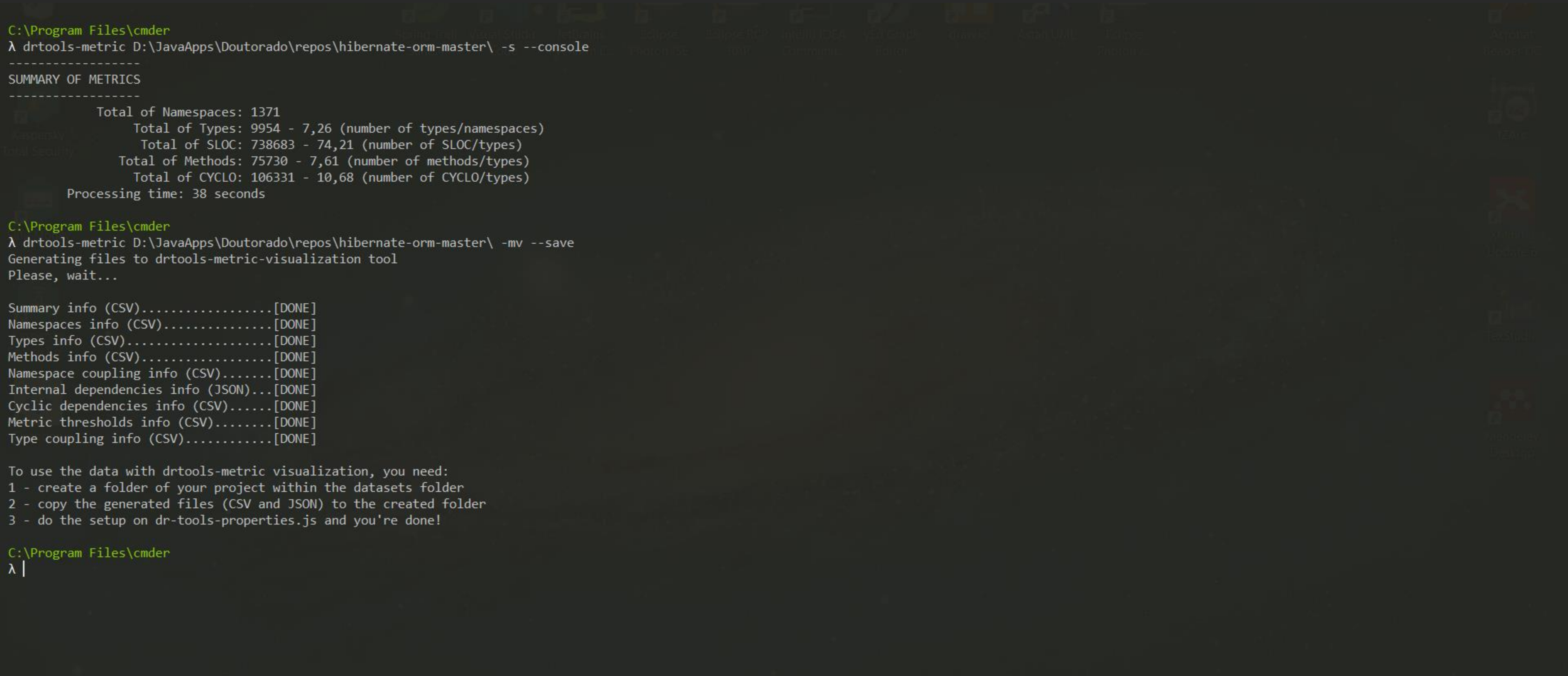
```
D:\programs\drtools-metric
λ drtools-metric \JavaApps\Doutorado\repos\hibernate-orm-master\ -a --console --top 5
------------------
SUMMARY OF METRICS
------------------
            Total of Namespaces: 1371
                 Total of Types: 9954 - 7,26 (number of types/namespaces)
                  Total of SLOC: 738683 - 74,21 (number of SLOC/types)
               Total of Methods: 75730 - 7,61 (number of methods/types)
                 Total of CYCLO: 106331 - 10,68 (number of CYCLO/types)

----------------------------------------------------------------------
NAMESPACES                                              NOC     NAC
----------------------------------------------------------------------
                         org.hibernate.test.legacy      126     9
                         org.hibernate.annotations      110     0
                                org.hibernate.type      110     19
                             org.hibernate.dialect      102     6
                            org.hibernate.test.hql      91      5

-----------------------------------------------------------------------------------------------------------------------------------
TYPES                                                           SLOC    NOM     NPM     WMC     DEP     I-DEP   FAN-IN  FAN-OUT NOA
-----------------------------------------------------------------------------------------------------------------------------------
      org.hibernate.persister.entity.AbstractEntityPersister    4529    398     220     877     138     110     17      134     114
                        org.hibernate.test.legacy.FooBarTest    4490    110     109     221     79      44      0       54      0
    org.hibernate.boot.model.source.internal.hbm.ModelBinder    3602    151     77      421     144     125     2       142     31
                 org.hibernate.test.hql.ASTParserLoadingTest    3318    127     118     170     82      50      0       67      4
                          org.hibernate.cfg.AnnotationBinder    3101    61      13      504     160     37      11      43      2


---------------------------------------------------------------------------------------------------------------------------------------------
METHODS                                                                                                 MLOC    CYCLO   CALLS   NBD     PARAM
---------------------------------------------------------------------------------------------------------------------------------------------
nSecondPass, MetadataBuildingContext context, Map<XClass,InheritanceState> inheritanceStatePerClass)    762     99      362     8       10
                          org.hibernate.hql.internal.ast.SqlASTFactory.getASTNodeType(int tokenType)    122     66      0       2       1
, XClass returnedClass, String declaringClassName, ConverterDescriptor attributeConverterDescriptor)    175     55      95      4       4
r, XProperty property, PropertyHolder parentPropertyHolder, MetadataBuildingContext buildingContext)    372     53      185     7       14
            org.hibernate.hql.internal.classic.FromParser.token(String token, QueryTranslatorImpl q)    244     52      44      4       2

        Processing time: 37 seconds

D:\programs\drtools-metric
λ
```



```
C:\Program Files\cmder
λ drtools-metric

Usage: drtools-metric <project-directory> <OPTIONS> <OUTPUT> [--top <number>]
OPTIONS = <-a|-ac|-s|-n|-t|-m|-d|-cd|-id|-nc|-tc|-mt|-i|-mv> OUTPUT = <--console|--csv|--json|--save>

        Where
-a      list ALL metrics (namespaces/types/methods)             --console       show the results to console
-ac     list ALL metrics about COUPLING/DEPENDENCIES            --csv           generate results in CSV format
-s      list SUMMARY of project                                 --json          generate results in JSON format
-n      list information about NAMESPACES (packages)            --save          generate file results to drtools-metric-visualization tool
-t      list information about TYPES (classes)
-m      list information about METHODS (functions)              --top           list top 'number' records, based on used format
-d      list information about DEPENDENCIES of types
-cd     list information about CYCLIC DEPENDENCIES of types
-id     list information about INTERNAL DEPENDENCIES of types
-nc     list information about NAMESPACE COUPLING
-tc     list information about TYPE COUPLING
-mt     list information about METRIC THRESHOLDS
-i      list INFORMATION about tool development team
-mv     generate files to drtools-metric-visualization tool (use only with --save output option)

        Metrics
CA    - Number of types outside this component that depends on types inside this component (Afferent Coupling)
CE    - Number of types inside this component that depends on types outside this component (Efferent Coupling)
I     - Instability of namespace (range between 0=Maximally stability and 1=Maximally instability)
A     - Abstractness degree of namespace (range between 0=Minimally abstractness and 1=Maximally abstractness)
D     - Normalized distance of namespace                        NOM    - Number of methods of a type
NAC   - Number of abstract types inside namespaces              WMC    - Weighted methods per types (sum the CYCLO of each method)
NOC   - Number of types inside namespaces                       SLOC   - Number of lines of source code
DEP   - Number of external types dependencies                   I-DEP  - Number of internal types dependencies
FAN-IN- Number of other types that depend on a given type       FAN-OUT- Number of other types referenced by a type
NOA   - Number of attributes/variables                          NPM    - Number of public methods of a type
NBD   - Number of nested block depth of a method                MLOC   - Number of lines of a method
PARAM - Number of parameters of a method                        CYCLO  - Cyclomatic complexity (McCabe) of a method
CALLS - Number of invocations made from within a method

 Usage examples:
        Example 1 : # drtools-metric \Project\Java\src -a --console
        Example 2 : # drtools-metric \Project\Java\src -t --csv
        Example 3 : # drtools-metric \Project\Java\src -m --console --top 10

C:\Program Files\cmder
λ |
```



```
C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Doutorado\repos\findbugs-3.0.1\src -c --console | more


---------------------------------------------------------------------------------------------
NAMESPACES                                              CA      CE      I       A       D
---------------------------------------------------------------------------------------------
                        edu.umd.cs.findbugs.detect      5       24      0,828   0,031   0,142
                               edu.umd.cs.findbugs      393     30      0,071   0,273   0,656
                            edu.umd.cs.findbugs.ba      364     25      0,064   0,287   0,649
                          edu.umd.cs.findbugs.gui2      4       14      0,778   0,095   0,128
         edu.umd.cs.findbugs.classfile.engine.bcel      1       15      0,938   0,022   0,041
                     edu.umd.cs.findbugs.classfile      263     5       0,019   0,629   0,353
                          edu.umd.cs.findbugs.util      135     6       0,043   0,147   0,810
                     edu.umd.cs.findbugs.ba.jsr305      14      8       0,364   0,219   0,418
                        edu.umd.cs.findbugs.ba.npe      21      11      0,344   0,107   0,549
                        edu.umd.cs.findbugs.filter      27      4       0,129   0,107   0,764
                      edu.umd.cs.findbugs.workflow      3       9       0,750   0,037   0,213
                   edu.umd.cs.findbugs.annotations      0       0       0,000   0,000   1,000
                        edu.umd.cs.findbugs.ba.bcp      3       3       0,500   0,240   0,260
                edu.umd.cs.findbugs.classfile.impl      3       9       0,750   0,095   0,155
                       edu.umd.cs.findbugs.ba.type      44      8       0,154   0,100   0,746
                         edu.umd.cs.findbugs.graph      16      0       0,000   0,500   0,500
                        edu.umd.cs.findbugs.ba.obl      4       7       0,636   0,059   0,305
                         edu.umd.cs.findbugs.cloud      30      5       0,143   0,357   0,500
                        edu.umd.cs.findbugs.ba.vna      63      4       0,060   0,154   0,786
                         edu.umd.cs.findbugs.ba.ch      49      6       0,109   0,250   0,641
              edu.umd.cs.findbugs.classfile.engine      4       9       0,692   0,333   0,026
                       edu.umd.cs.findbugs.anttask      0       2       1,000   0,091   0,091
                          edu.umd.cs.findbugs.plan      3       3       0,500   0,091   0,409
                    edu.umd.cs.findbugs.visitclass      52      5       0,088   0,273   0,640
                           edu.umd.cs.findbugs.xml      54      1       0,018   0,500   0,482
                  edu.umd.cs.findbugs.sourceViewer      2       2       0,500   0,000   0,500
            edu.umd.cs.findbugs.classfile.analysis      33      7       0,175   0,111   0,714
                    edu.umd.cs.findbugs.ba.generic      9       4       0,308   0,000   0,692
                          edu.umd.cs.findbugs.jaif      0       1       1,000   0,125   0,125
                         edu.umd.cs.findbugs.model      8       4       0,333   0,250   0,417
                       edu.umd.cs.findbugs.ba.heap      3       1       0,250   0,143   0,607
                        edu.umd.cs.findbugs.config      23      4       0,148   0,143   0,709
                   edu.umd.cs.findbugs.ba.constant      4       1       0,200   0,000   0,800
                  edu.umd.cs.findbugs.ba.interproc      15      4       0,211   0,500   0,289
                          edu.umd.cs.findbugs.bcel      85      5       0,056   0,833   0,111
                edu.umd.cs.findbugs.cloud.username      6       4       0,400   0,167   0,433
                         edu.umd.cs.findbugs.props      14      4       0,222   0,500   0,278
                         edu.umd.cs.findbugs.tools      0       4       1,000   0,000   0,000
                         edu.umd.cs.findbugs.ba.ca      3       1       0,250   0,000   0,750
```



```
C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -s --console
------------------
SUMMARY OF METRICS
------------------
            Total of Namespaces: 1371
                 Total of Types: 9954 - 7,26 (number of types/namespaces)
                  Total of SLOC: 738683 - 74,21 (number of SLOC/types)
               Total of Methods: 75730 - 7,61 (number of methods/types)
                 Total of CYCLO: 106331 - 10,68 (number of CYCLO/types)
        Processing time: 38 seconds

C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -mv --save
Generating files to drtools-metric-visualization tool
Please, wait...

Summary info (CSV)..................[DONE]
Namespaces info (CSV)...............[DONE]
Types info (CSV)....................[DONE]
Methods info (CSV)..................[DONE]
Namespace coupling info (CSV).......[DONE]
Internal dependencies info (JSON)...[DONE]
Cyclic dependencies info (CSV)......[DONE]
Metric thresholds info (CSV)........[DONE]
Type coupling info (CSV)............[DONE]

To use the data with drtools-metric visualization, you need:
1 - create a folder of your project within the datasets folder
2 - copy the generated files (CSV and JSON) to the created folder
3 - do the setup on dr-tools-properties.js and you're done!

C:\Program Files\cmder
λ |
```

# Metric Visualization

A tool quality suite to help the developers to maintain health and code evolution

PROJECT SUMMARY

## Findbugs 3.0.1

View Thresholds

58

Namespaces

130364

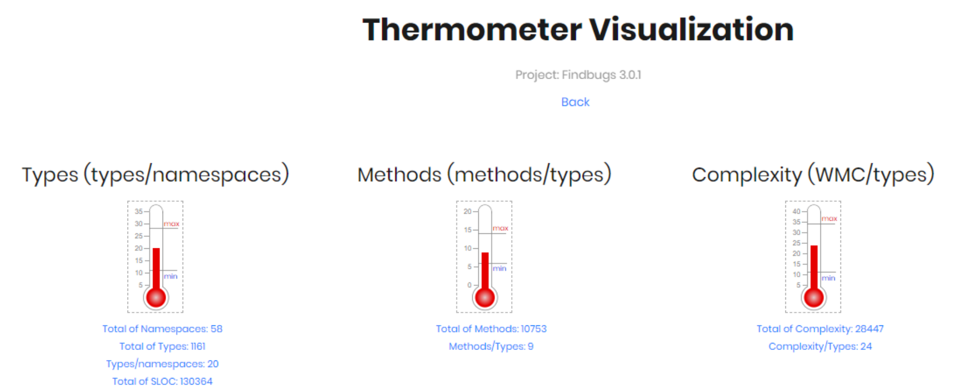
SLOC

1161

Number of Types

10753

Number of Methods



# Thermometer Visualization

Project: Findbugs 3.0.1

Back

Types (types/namespaces)

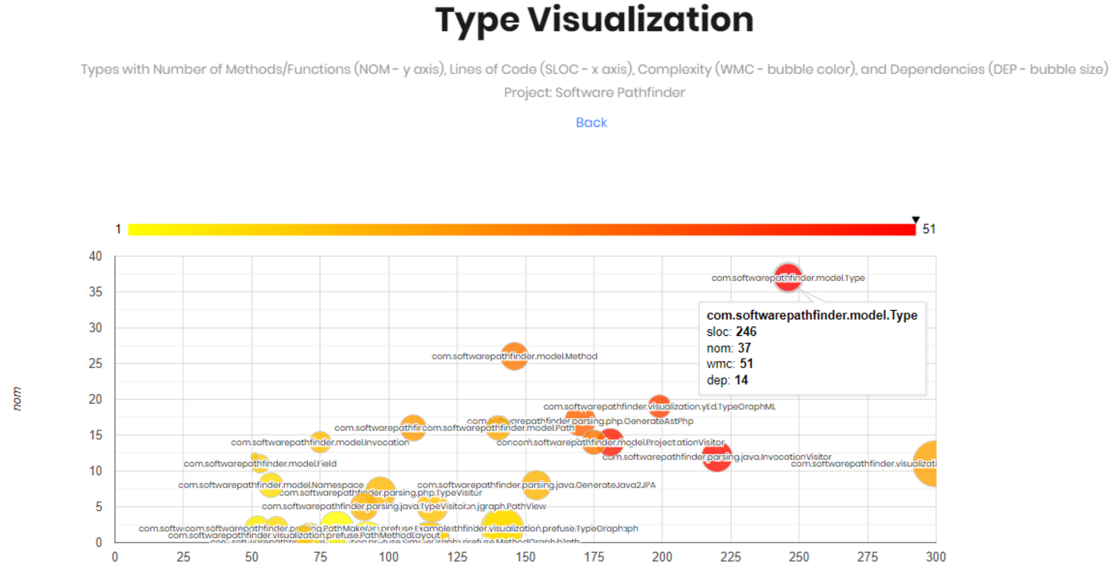
Total of Namespaces: 58
Total of Types: 1161
Types/namespaces: 20
Total of SLOC: 130364

Methods (methods/types)

Total of Methods: 10753
Methods/Types: 9

Complexity (WMC/types)

Total of Complexity: 28447
Complexity/Types: 24



# Type Visualization

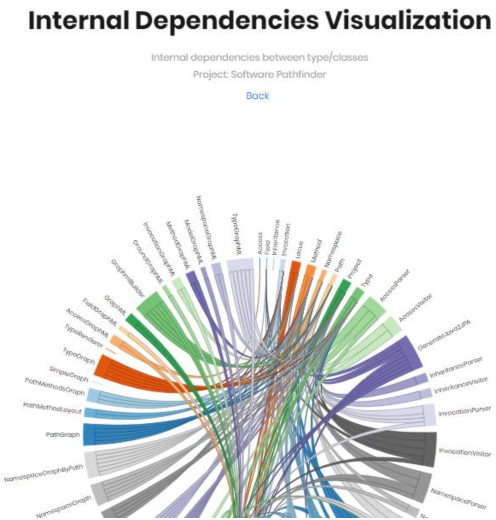
Types with Number of Methods/Functions (NOM - y axis), Lines of Code (SLOC - x axis), Complexity (WMC - bubble color), and Dependencies (DEP - bubble size)

Project: Software Pathfinder

Back

com.softwarepathfinder.model.Type
sloc: **246**
nom: **37**
wmc: **51**
dep: **14**

1
51
nom
40
35
30
25
20
15
10
5
0
0
25
50
75
100
125
150
175
200
225
250
275
300
com.softwarepathfinder.model.Type
com.softwarepathfinder.model.Method
com.softwarepathfinder.visualization.yEd.TypeGraphML
com.softwarepathfinder.parsing.php.GenerateAstPhp
com.softwarepathfircom.softwarepathfinder.model.Path
com.softwarepathfinder.model.Invocation
concom.softwarepathfinder.model.ProjectationVisitor
com.softwarepathfinder.parsing.java.InvocationVisitor
com.softwarepathfinder.visualizati
com.softwarepathfinder.model.Field
com.softwarepathfinder.model.Namespace
com.softwarepathfinder.parsing.php.TypeVisitor
com.softwarepathfinder.parsing.java.GenerateJava2JPA
com.softwarepathfinder.parsing.java.TypeVisitor.n.jgraph.PathView
com.softwcom.softwarepathfinder.parsing.PathMaker.n.prefuse.Examplethfinder.visualization.prefuse.TypeGraphph
com.softwarepathfinder.visualization.prefuse.PathMethodLayout

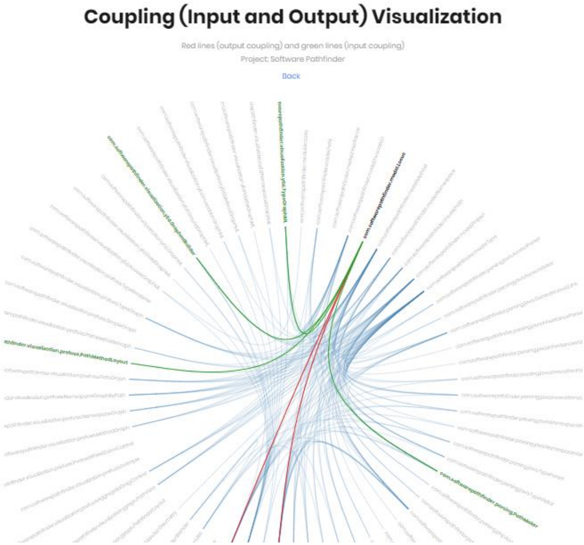


## Internal Dependencies Visualization

Internal dependencies between type/classes

Project: Software Pathfinder

Back



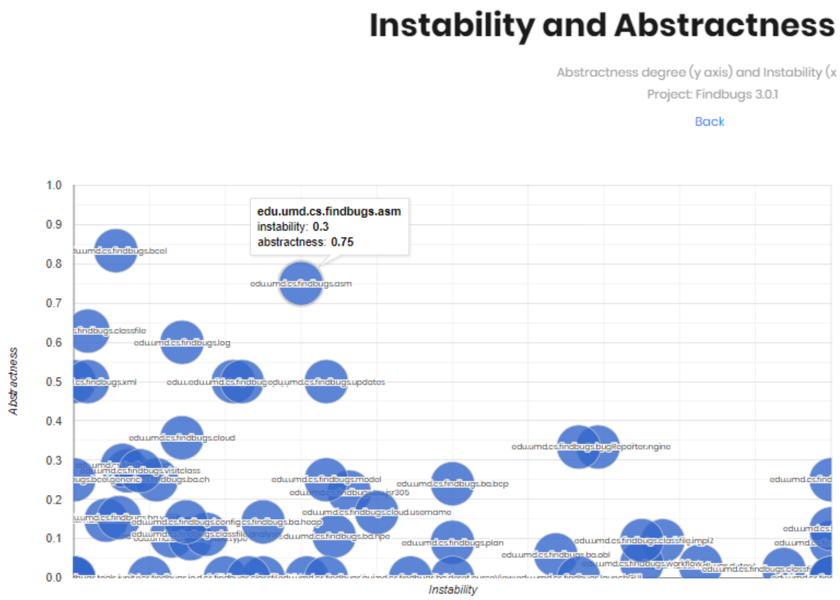
## Coupling (Input and Output) Visualization

Red lines (output coupling) and green lines (input coupling)

Project: Software Pathfinder

Back

com.softwarepathfinder.visualization.yEd.GraphmlBuilder
warepathfinder.visualization.yEd.TypeGraphML
com.softwarepathfinder.model.Locus
thfinder.visualization.prefuse.PathMethodLayout
com.softwarepathfinder.parsing.PathMaker



Instability and Abstractness Visualization

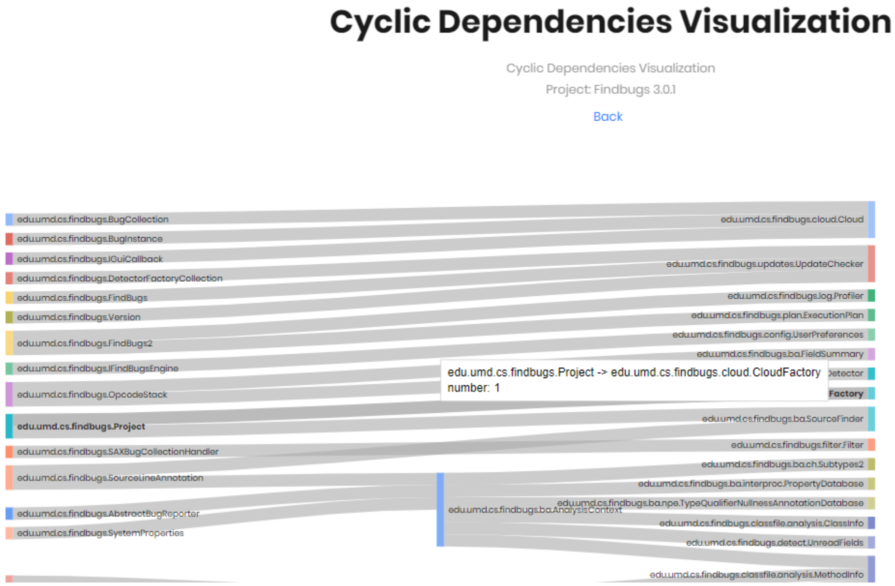
Abstractness degree (y axis) and Instability (x axis)

Project: Findbugs 3.0.1

Back

edu.umd.cs.findbugs.asm
instability: 0.3
abstractness: 0.75

Abstractness
Instability
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
du.umd.cs.findbugs.bcel
edu.umd.cs.findbugs.asm
findbugs.classfile
edu.umd.cs.findbugs.log
cs.findbugs.xml
edu.umd.cs.findbugs.updates
edu.umd.cs.findbugs.cloud
edu.umd.cs.findbugs.bugReporter.ngine
edu.umd.cs.findbugs.visitclass
findbugs.ba.ch
edu.umd.cs.findbugs.model
edu.umd.cs.findbugs.ba.bcp
edu.umd.cs.findbugs.cloud.username
edu.umd.cs.findbugs.config
findbugs.ba.heap
edu.umd.cs.findbugs.ba.npe
edu.umd.cs.findbugs.plan
edu.umd.cs.findbugs.classfile.impl2
edu.umd.cs.findbugs.ba.obl
edu.umd.cs.findbugs.workflow



Cyclic Dependencies Visualization

Cyclic Dependencies Visualization

Project: Findbugs 3.0.1

Back

edu.umd.cs.findbugs.Project -> edu.umd.cs.findbugs.cloud.CloudFactory
number: 1

edu.umd.cs.findbugs.BugCollection
edu.umd.cs.findbugs.BugInstance
edu.umd.cs.findbugs.IGuiCallback
edu.umd.cs.findbugs.DetectorFactoryCollection
edu.umd.cs.findbugs.FindBugs
edu.umd.cs.findbugs.Version
edu.umd.cs.findbugs.FindBugs2
edu.umd.cs.findbugs.IFindBugsEngine
edu.umd.cs.findbugs.OpcodeStack
edu.umd.cs.findbugs.Project
edu.umd.cs.findbugs.SAXBugCollectionHandler
edu.umd.cs.findbugs.SourceLineAnnotation
edu.umd.cs.findbugs.AbstractBugReporter
edu.umd.cs.findbugs.SystemProperties
edu.umd.cs.findbugs.ba.AnalysisContext
edu.umd.cs.findbugs.cloud.Cloud
edu.umd.cs.findbugs.updates.UpdateChecker
edu.umd.cs.findbugs.log.Profiler
edu.umd.cs.findbugs.plan.ExecutionPlan
edu.umd.cs.findbugs.config.UserPreferences
edu.umd.cs.findbugs.ba.FieldSummary
Detector
Factory
edu.umd.cs.findbugs.ba.SourceFinder
edu.umd.cs.findbugs.filter.Filter
edu.umd.cs.findbugs.ba.ch.Subtypes2
edu.umd.cs.findbugs.ba.interproc.PropertyDatabase
edu.umd.cs.findbugs.ba.npe.TypeQualifierNullnessAnnotationDatabase
edu.umd.cs.findbugs.classfile.analysis.ClassInfo
edu.umd.cs.findbugs.detect.UnreadFields
edu.umd.cs.findbugs.classfile.analysis.MethodInfo

# Considerações Finais

As metáforas têm um grande valor

Ampliam o poder de comunicação

Compreensão compartilhada e colaborativa

Uso de alto e baixo nível, diferentes níveis de abstração

Entenda a metáfora, colete material, use a criatividade e use sem moderação (By Émerson Hernandez)

# Questões??

# Exercício de superação do medo…

Um voluntário

THE DEVELOPER'S CONFERENCE

# Melhorando o design de código através de Metáforas

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Guilherme Lacerda
Wildtech - UniRitter
**@guilhermeslac**