



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.”

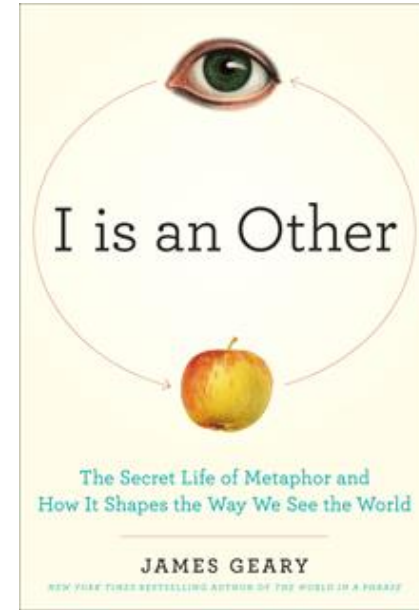
Albert Einstein

O que é
metáfora?

O Uso

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

Technical Debt

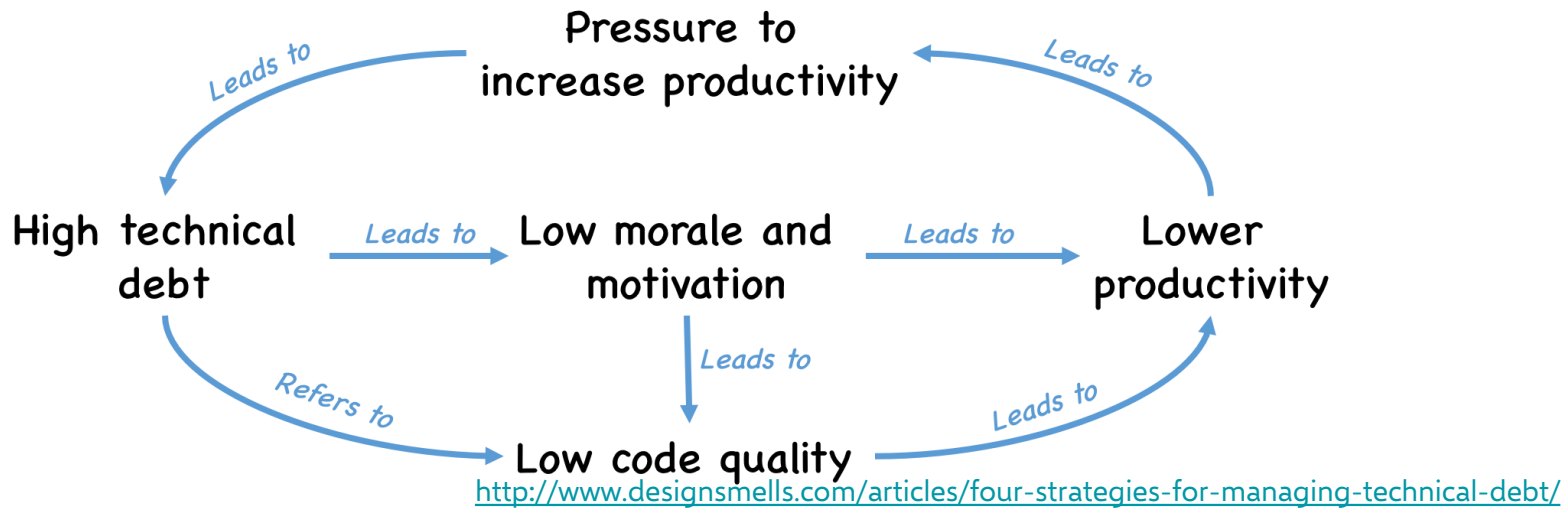
Criada por **Ward Cunningham**

Originária do **setor financeiro**

Alguns Tipos

Arquitetura/Design, Código, Testes e Build





Atividades

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

Ferramentas

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

- Activity
- Java Projects
- Javascript Projects
- Languages Panel

Dependencies
Compare



Sonar as a Service



SQALE Rating

A

Technical Debt
28,874.9 days 

Lines of Code
10,508K ↗

Issues

668,081 

Technical Debt

Technical Debt
28,874.9 days 

 Blocker

4 362 ↗

 Critical

35 468

Major

503.908 ↗

Minor

107.690  Info

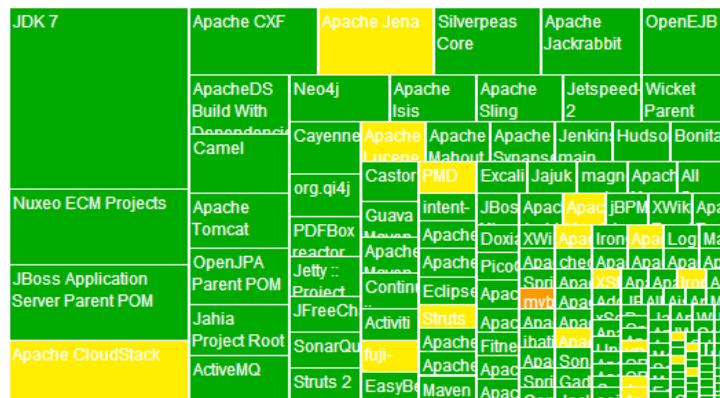
16 653

Forges

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

9 results

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

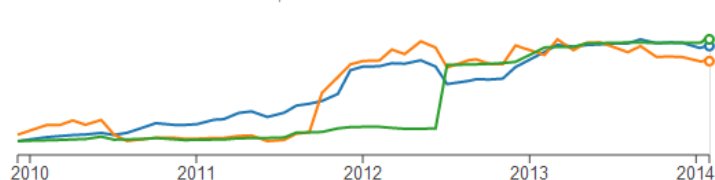
[All Projects](#)

Jan 30, 2014

- Lines of code: 10,508,578

- Duplicated lines: 1,389,498

- Unit tests: 568,101





Search



Analyzed only



Hide forks



guilhermeslacerda/
exemplobuild

Last analyzed: a few seconds ago



guilhermeslacerda/
CleanArchitectureExample

Last analyzed: 5 minutes ago



guilhermeslacerda/
CbE-build-template

Last analyzed: a minute ago



guilhermeslacerda/
ciphers_refactored

Last analyzed: a month ago



guilhermeslacerda/
FizzBuzzKata

Last analyzed: 2 minutes ago

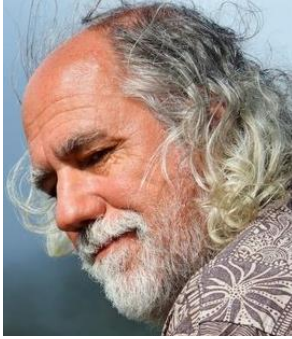


guilhermeslacerda/
bootstrap

Repository not analyzed



Software as a City



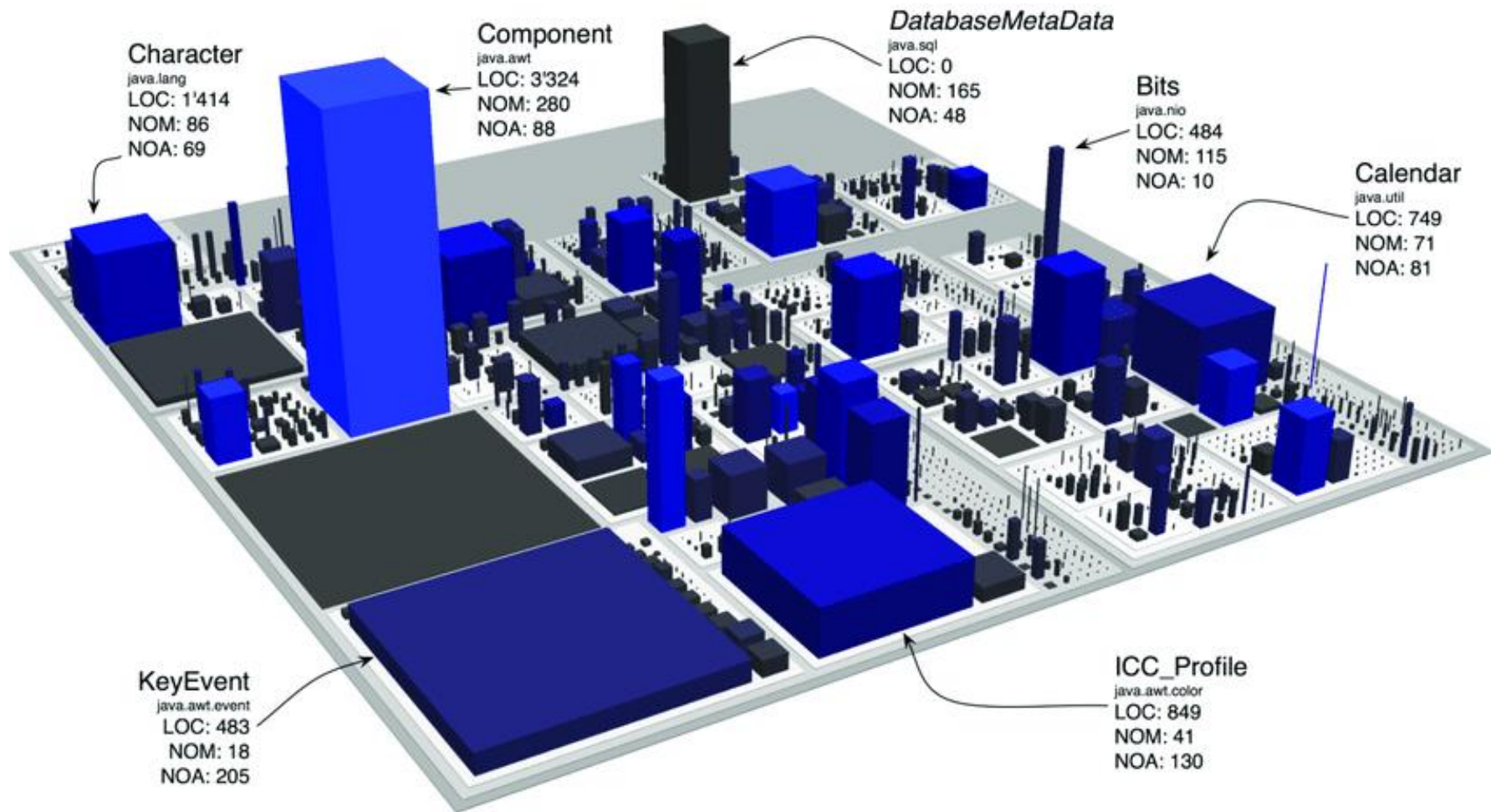
Definida por **Grady Booch**

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

Evolução do Software como **uma cidade**

Ferramenta

Code City



Your Code as a Crime Scene

Criada por **Adam Tornhill**

Usa **técnicas de psicologia forense**

Técnicas

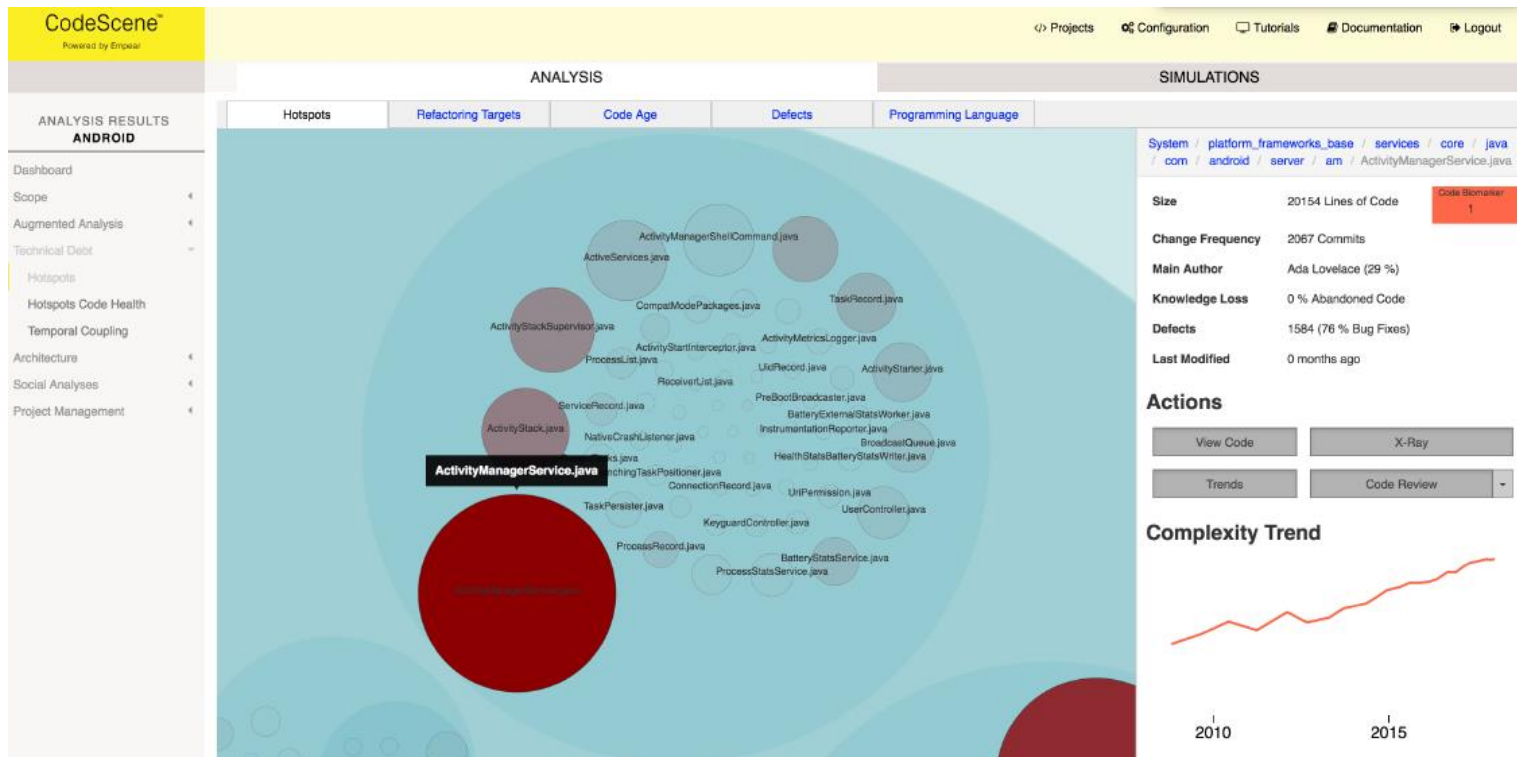
análise geográfica dos crimes, definição de perfil, uso do código como testemunha, mineração de hotspots

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
```



Dentistry Metaphor

Criada por Emerson Murphy-Hill

Refactorings

Root Channel x Floss

Ferramentas

Stench Blossom

Jdeodorant, Refactoring Miner (Tsantalis)



```
DHTUDPUtils.java
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 + "T";

serializeByteArray( 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());

}
```

Java - JHotDraw5.3/src/CH/ifa/draw/applet/DrawApplet.java - Eclipse SDK

File Edit Source Refactor Navigate Search Project Bad Smells Run Window Help

Package Explorer Hierarchy

- ifreechart-1.0.0
 - JHotDraw5.3
 - src
 - CH.ifa.draw.applet
 - CH.ifa.draw.application
 - CH.ifa.draw.contrib
 - CH.ifa.draw.figures
 - CH.ifa.draw.framework
 - CH.ifa.draw.images
 - CH.ifa.draw.samples.javawdraw
 - CH.ifa.draw.samples.javawdraws
 - CH.ifa.draw.samples.net
 - CH.ifa.draw.samples.nothing
 - CH.ifa.draw.samples.pert
 - CH.ifa.draw.samples.pertimagi
 - CH.ifa.draw.standard
 - CH.ifa.draw.util
 - Referenced Libraries
 - JRE System Library [jre5]
 - build
 - CH
 - docs
 - drawings
 - javadoc
 - compile.bat
 - JavaDrawApplet.html
 - JavaDrawViewer.html
 - jhotdraw.jar
 - lgpl-license.html
 - NothingApplet.html
 - PertApplet.html
 - README.html

DrawApplet.java

```
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");
    }
}
```

Problems Javadoc Declaration God Class

Refactoring Type	Group Name	Source Entity	Entity Placement
Extract Class	CH.ifa.draw.applet.DrawApplet	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	CH.ifa.draw.applet.DrawApplet	0.9080733815416812

Writable Smart Insert 542:6



5S em Código



Usada por **Guilherme Lacerda**

5 sentidos japoneses

Seiri, Seiton, Seiso, Seiketsu, Shitsuke

Materiais e ferramentas

www.codingbyexample.org

Metáfora da Medicina



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\cmderr
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\cmderr
λ |
```

```
C:\Program Files\cmdex
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\cmdex
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\cmdex
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\cmdex
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

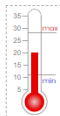
Number of Methods

Thermometer Visualization

Project: Findbugs 3.0.1

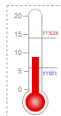
[Back](#)

Types (types/namespaces)



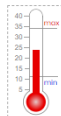
Total of Namespaces: 58
Total of Types: 1161
Types/namespaces: 20
Total of SLOC: 130364

Methods (methods/types)



Total of Methods: 10753
Methods/Types: 9

Complexity (WMC/types)

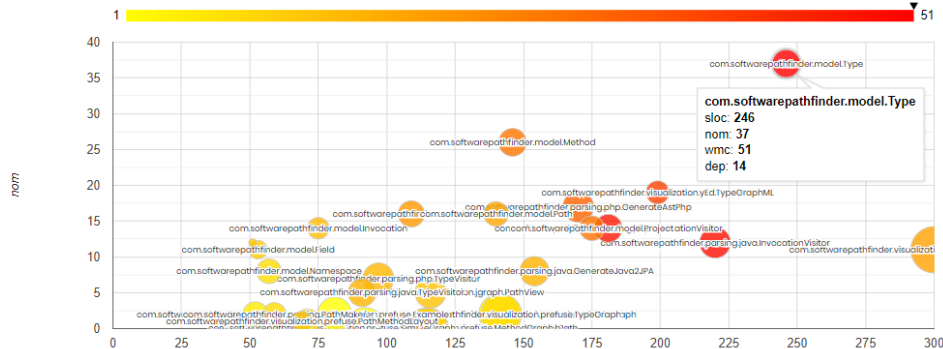


Total of Complexity: 28447
Complexity/Types: 24

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

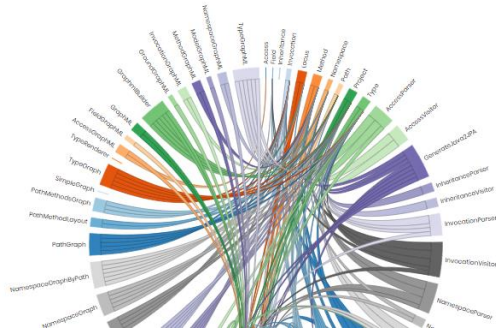
[Back](#)



Internal Dependencies Visualization

Internal dependencies between type/classes

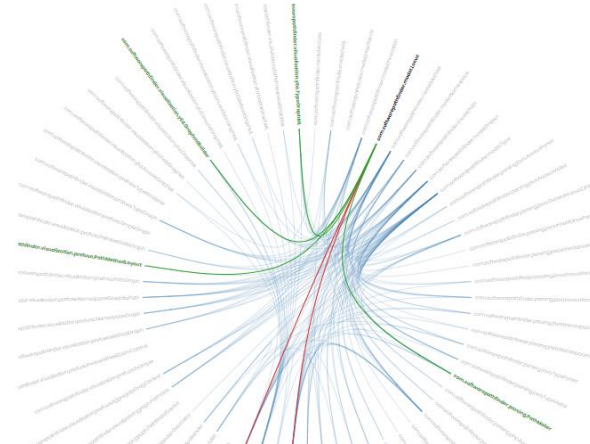
Project: Software Pathfinder

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Coupling (Input and Output) Visualization

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

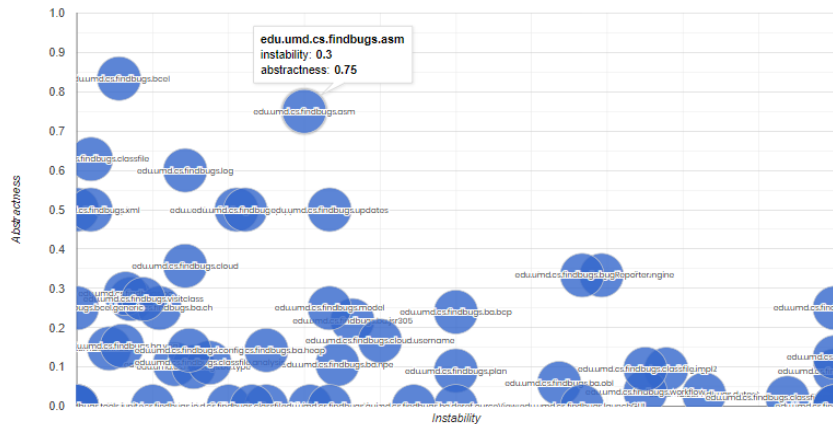
Project: Software Pathfinder

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Instability and Abstractness Visualization

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

Project: Findbugs 3.0.1

[Back](#)

Cyclic Dependencies Visualization

Cyclic Dependencies Visualization

Project: Findbugs 3.0.1

[Back](#)

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**

Questões??

Exercício de superação do medo...

Um voluntário



THE
DEVELOPER'S
CONFERENCE

Melhorando o design de código através de Metáforas

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