



DR-Tools

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

drtools.site



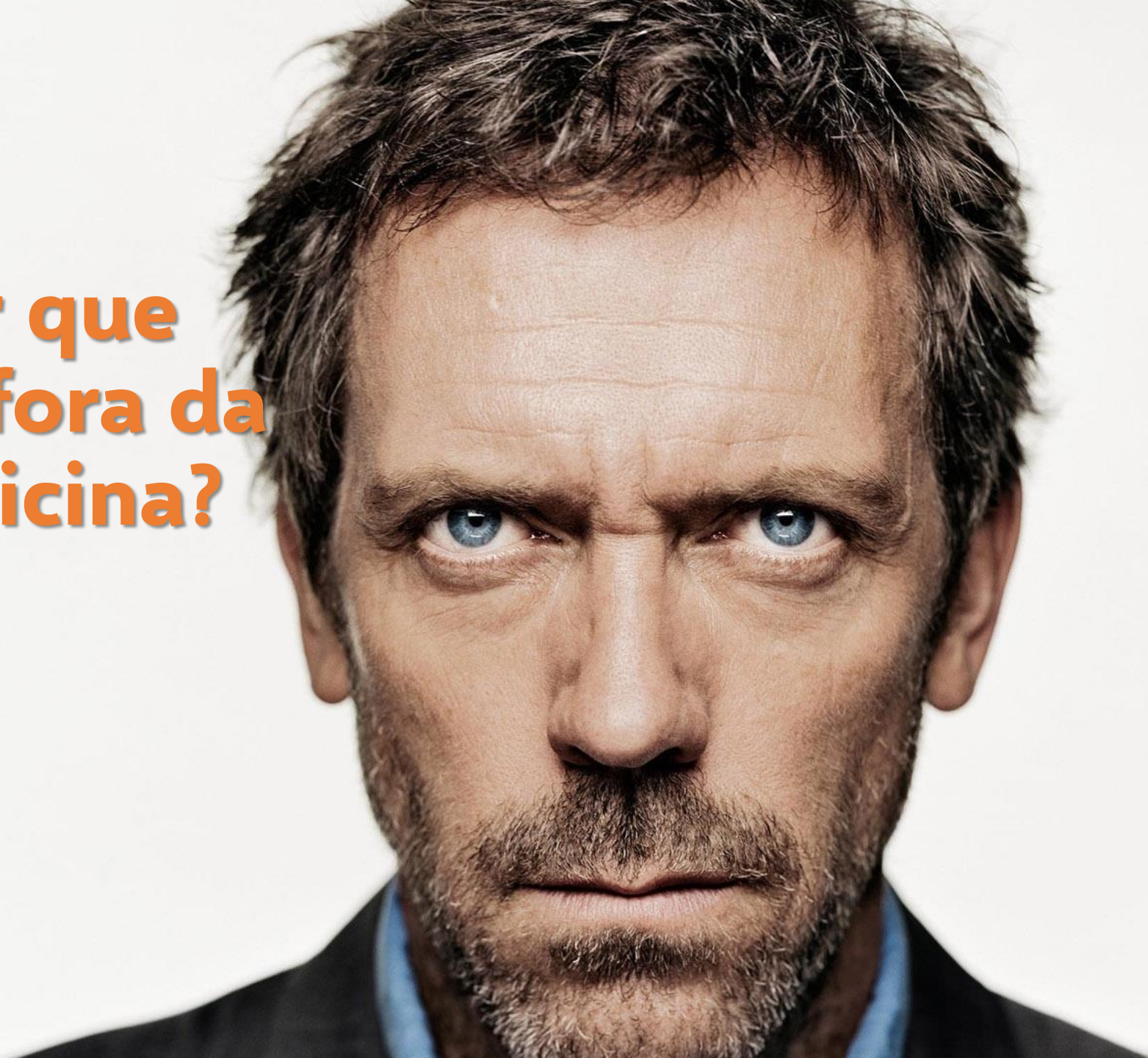
Quem sou eu?

glacerda@wildtech.com.br
@guilhermeslac

- ✓ Mestre e Doutorando em Ciência da Computação (UFRGS)
- ✓ Professor de Graduação e Pós-Graduação (Unisinos)
- ✓ Consultor associado da Wildtech
- ✓ Pioneiro em Metodologias Ágeis no Brasil
- ✓ Fundador do XP-RS/GUMA
- ✓ Membro da ScrumAlliance , IASA, SBC e ACM



**Por que
metáfora da
medicina?**



Família de Produtos DR-Tools

- ✓ **metric**
- ✓ **metric visualization**
- ✓ **smell-detection**
- ✓ **refactoring-recommender (plugin IDE)**
- ✓ **smell-refactoring dashboard**

UNDER
DEVELOPMENT



UNDER
DEVELOPMENT



UNDER
DEVELOPMENT



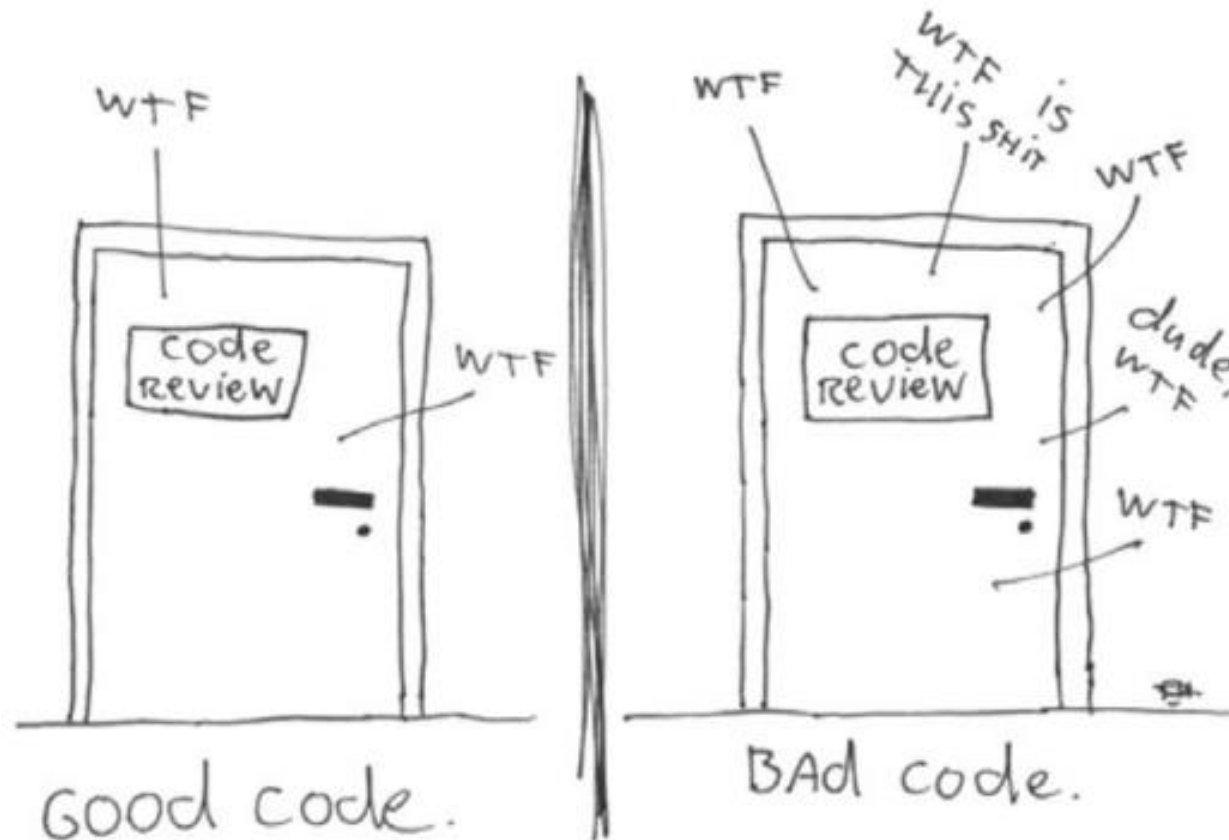
DR-Tools



metric
DR-Tools

Como você mede a qualidade do código?

The ONLY VALID MEASUREMENT
OF CODE QUALITY: WTFs/MINUTE



“ah... Nós temos o SonarQube”

[illegible]

**Se eu baixar um projeto do
GitHub,
onde estão os maiores
problemas?**



Características

- ✓ **Simplicidade, valor do XP**
- ✓ **CLI (*command line interface*)**
- ✓ **Versatilidade**
- ✓ **Download and run! (pré-requisito: JRE 8)**
- ✓ **Seleção de métricas, correlacionadas e ordenadas**
- ✓ **Visualizações usando Google Chart e D3.js**
- ✓ **Atualmente analisa projetos Java**



Funções

- ✓ **Resultados em diferentes formatos**
Console, JSON, CSV
- ✓ **Filtragem dos 'Top X'**
- ✓ **Resultados contextualizados**
Projeto, Namespaces, Classes, Métodos, Acoplamento, Dependências
- ✓ **Várias Estatísticas das métricas**
média, mediana, quartis, desvio padrão, amplitude, identificação de outliers



Métricas Contextualizadas



Sumário do Projeto

Total de Namespaces, Classes, SLOC, Métodos e CYCLO



Namespaces

NOC, NAC



Classes

SLOC, NOM, WMC/CYCLO, DEP, I-DEP/Fan-Out, NPM, NOA, LCOM3



Métodos

MLOC, CYCLO, CALLS, NBD, PARAM



Acoplamento

CA, CE, Instability, Abstractness, Normalized Distance



Dependências

Externas, Internas, Cyclic Dependency



DR-Tools

Uso

```
C:\Program Files\cmdr
```

```
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		
-sn	list the STATISTICS of NAMESPACE metrics		
-st	list the STATISTICS of TYPE metrics		
-sm	list the STATISTICS of METHOD metrics		
-san	list the STATISTICS AND NAMESPACES		
-sat	list the STATISTICS AND TYPES		
-sam	list the STATISTICS AND METHODS		
-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	LCOM3	- Lack of cohesion in methods

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
```

Uso

```
C:\Program Files\cmdr> cd "C:\Program Files\cmdr\plugins\drtools-metric" & set -x & java -jar drtools-metric.jar
```

```
λ drtools-metric D:\JavaApps\Plugins\drtools-metric\src -s --console
```

SUMMARY OF METRICS

```
-----
Total of Namespaces: 11
Total of Types: 45 - 4,09 (number of types/namespaces - median: 3,00 - std dev: 4,14)
Total of SLOC: 3006 - 66,80 (number of SLOC/types - median: 25,00 - std dev: 81,66)
Total of Methods: 418 - 9,29 (number of methods/types - median: 3,00 - std dev: 5,82)
Total of CYCLO: 667 - 14,82 (number of CYCLO/types)
Processing time: 2 seconds
```

```
C:\Program Files\cmdr>
```

```
λ drtools-metric D:\JavaApps\Plugins\drtools-metric\src -mt --console
```

INFORMATION ABOUT METRIC THRESHOLDS

```
-----
Small Project (SMALL)                small project with < 50 KLOC or 200 < classes
Medium Project (MEDIUM)              medium project with (50 KLOC <= project <= 250 KLOC) or (200 <= classes <= 1000)
Large Project (LARGE)                 large project with > 250 KLOC or > 1000 classes
Number of Types/Classes (NOC)         Good: <= 11; Regular: between 11 and 28; Bad: > 28
Number of Abstract Types/Classes (NAC) without references
Type Lines of Code (SLOC)             Bad: > 500
Number of Methods (NOM)               Good: <= 6; Regular: between 6 and 14; Bad: > 14
Weighted Methods per Class (WMC)      Good: <= 20; Regular: between 20 and 100; Bad: > 100
Number of external types dependencies (DEP) Bad: > 20
Number of internal types dependencies (I-DEP) Bad: > 15
Number of other types that depend on a given type (FAN-IN) Bad: > 10
Number of other types referenced by a type (FAN-OUT) Bad: > 15
Number of Public Methods (NPM)        Good: <= 10; Regular: between 11 and 40; Bad: > 40
Number of Attributes/Fields (NOA)     Good: <= 3; Regular: between 3 and 8; Bad: > 8
Lack of Cohesion in Methods (LCOM3)   Good: = 0; Regular: between 0 and 1; Bad: > 1
Method Lines of Code (MLOC)           Good: <= 10; Regular: between 10 and 30; Bad: > 30
Cyclomatic Complexity (CYCLO)         Good: <= 2; Regular: between 2 and 4; Bad: > 4
Number of Invocations (CALLS)         Bad: > 5
Nested Block Depth (NBD)              Good: <= 1; Regular: between 1 and 3; Bad: > 3
Number of Parameters (PARAM)          Good: <= 2; Regular: between 2 and 4; Bad: > 4
Afferent Coupling (CA)                Good: <= 7; Regular: between 7 and 39; Bad: > 39
Efferent Coupling (CE)                Good: <= 6; Regular: between 6 and 16; Bad: > 16
Package Instability (I)                range between 0=Maximally stability and 1=Maximally instability
Abstractness Degree (A)               range between 0=Minimally abstractness and 1=Maximally abstractness
Normalized Distance (D)               range between 0=exactly located in the main sequence and 1=far from the main sequence
```

```
C:\Program Files\cmdr> cd "C:\Program Files\cmdr\plugins\drtools-metric" & set -x & java -jar drtools-metric.jar
```

```
λ |
```


Uso

```
C:\Program Files\cmdr
```

```
λ drtools-metric D:\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 - median: 4,00 - std dev: 10,47)
Total of SLOC: 738683 - 74,21 (number of SLOC/types - median: 40,00 - std dev: 155,79)
Total of Methods: 75730 - 7,61 (number of methods/types - median: 3,00 - std dev: 14,53)
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	LCOM3
org.hibernate.persister.entity.AbstractEntityPersister	4529	398	220	877	138	110	17	134	114	0,87
org.hibernate.test.legacy.FooBarTest	4490	110	109	221	79	44	0	54	0	0,00
org.hibernate.boot.model.source.internal.hbm.ModelBinder	3602	151	77	421	144	125	2	142	31	0,94
org.hibernate.test.hql.ASTParserLoadingTest	3318	127	118	170	82	50	0	67	4	1,00
org.hibernate.cfg.AnnotationBinder	3101	61	13	504	160	37	11	43	2	0,99

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: 51 seconds
```

```
C:\Program Files\cmdr
```

```
λ |
```


Uso

```
C:\Program Files\cmdr
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: 55503 - 5,58 (number of methods/types)
Total of CYCLO: 76955 - 7,73 (number of CYCLO/types)
Processing time: 14 seconds
```

```
C:\Program Files\cmdr
λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -c --console | more
```

NAMESPACES	CA	CE	I	A	D
org.hibernate.test.legacy	2	41	0,953	0,071	0,025
org.hibernate.annotations	7	1	0,125	0,000	0,875
org.hibernate.type	681	29	0,041	0,173	0,786
org.hibernate.dialect	731	51	0,065	0,059	0,876
org.hibernate.test.hql	3	38	0,927	0,055	0,018
org.hibernate.boot.model.source.spi	87	8	0,084	0,876	0,039
org.hibernate.boot.model.source.internal.hbm	7	31	0,816	0,186	0,002
org.hibernate	2047	27	0,013	0,329	0,658
org.hibernate.hql.internal.ast.tree	29	26	0,473	0,333	0,194
org.hibernate.event.spi	139	7	0,048	0,563	0,389
org.hibernate.engine.spi	1099	64	0,055	0,524	0,421
org.hibernate.cfg	851	41	0,046	0,186	0,768
org.hibernate.mapping	294	40	0,120	0,316	0,564
org.hibernate.type.descriptor.java	165	13	0,073	0,113	0,814
org.hibernate.criterion	103	12	0,104	0,196	0,700
org.hibernate.test.annotations.entity	0	12	1,000	0,045	0,045
org.hibernate.userguide.mapping.basic	1	12	0,923	0,023	0,054
org.hibernate.event.internal	11	35	0,761	0,163	0,076
org.hibernate.id	73	33	0,311	0,326	0,363
org.hibernate.test.schemaupdate	1	34	0,971	0,047	0,018
org.hibernate.test.annotations.onetomany	0	13	1,000	0,000	0,000
org.hibernate.test.bytecode.enhancement.lazy.proxy	0	16	1,000	0,125	0,125
org.hibernate.test.criteria	0	17	1,000	0,077	0,077
org.hibernate.internal	374	97	0,206	0,243	0,551
org.hibernate.jpa.test.metamodel	18	4	0,182	0,108	0,710
org.hibernate.type.descriptor.sql	128	6	0,045	0,167	0,789
org.hibernate.boot.model.naming	146	9	0,058	0,657	0,285

Uso

C:\Program Files\cmdr

λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -n --console --top 35

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
org.hibernate.boot.model.source.spi	89	78
org.hibernate.boot.model.source.internal.hbm	86	16
org.hibernate	85	28
org.hibernate.hql.internal.ast.tree	72	24
org.hibernate.event.spi	71	40
org.hibernate.engine.spi	63	33
org.hibernate.cfg	59	11
org.hibernate.mapping	57	18
org.hibernate.type.descriptor.java	53	6
org.hibernate.criterion	51	10
org.hibernate.test.annotations.entity	44	2
org.hibernate.userguide.mapping.basic	43	1
org.hibernate.event.internal	43	7
org.hibernate.id	43	14
org.hibernate.test.schemaupdate	43	2
org.hibernate.test.annotations.onetomany	40	0
org.hibernate.test.bytecode.enhancement.lazy.proxy	40	5
org.hibernate.test.criteria	39	3
org.hibernate.internal	37	9
org.hibernate.jpa.test.metamodel	37	4
org.hibernate.type.descriptor.sql	36	6
org.hibernate.boot.model.naming	35	23
org.hibernate.test.ops	35	1
org.hibernate.cache.spi.support	32	11
org.hibernate.sql	31	4
org.hibernate.test.annotations	31	2
org.hibernate.test.annotations.lob	31	2
org.hibernate.test.annotations.embedded	30	0
rg.hibernate.envers.test.integration.modifiedflags	30	2
org.hibernate.userguide.mapping.identifier	29	0

Processing time: 15 seconds

Uso

C:\Program Files\cmdr

λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -t --console --top 35

TYPES	SLOC	NOM	NPM	WMC	DEP	I-DEP	FAN-IN	FAN-OUT	NOA	LCOM3
org.hibernate.persister.entity.AbstractEntityPersister	4529	398	220	877	138	110	17	134	114	0,87
org.hibernate.test.legacy.FooBarTest	4490	110	109	221	79	44	0	54	0	0,00
org.hibernate.boot.model.source.internal.hbm.ModelBinder	3602	151	77	421	144	125	2	142	31	0,94
org.hibernate.test.hql.ASTParserLoadingTest	3318	127	118	170	82	50	0	67	4	1,00
org.hibernate.cfg.AnnotationBinder	3101	61	13	504	160	37	11	43	2	0,99
org.hibernate.internal.SessionImpl	3031	317	235	535	170	121	18	156	36	0,97
ate.cfg.annotations.reflection.JPAOverriddenAnnotationReader	2709	117	11	552	124	7	3	21	15	0,94
nate.test.querycache.AbstractQueryCacheResultTransformerTest	2256	269	178	95	35	21	2	34	7	0,99
org.hibernate.loader.Loader	2136	106	16	287	86	69	15	79	10	0,96
org.hibernate.userguide.hql.HQLTest	1868	147	143	148	46	17	0	18	0	0,00
org.hibernate.boot.internal.InFlightMetadataCollectorImpl	1861	168	129	376	99	79	2	93	65	0,90
g.hibernate.persister.collection.AbstractCollectionPersister	1855	167	114	287	90	78	8	88	93	0,72
org.hibernate.test.criteria.CriteriaQueryTest	1750	34	32	52	54	29	0	33	1	1,00
org.hibernate.engine.internal.StatefulPersistenceContext	1708	132	113	324	64	42	5	51	27	0,90
org.hibernate.cfg.annotations.CollectionBinder	1567	66	43	289	105	41	6	46	44	0,68
org.hibernate.test.readonly.ReadOnlyProxyTest	1507	44	42	45	19	9	0	12	0	0,00
org.hibernate.internal.CoreMessageLogger	1421	392	392	392	41	15	284	16	0	0,00
hibernate.internal.util.collections.BoundedConcurrentHashMap	1364	157	118	116	20	0	3	30	58	0,83
org.hibernate.query.internal.AbstractProducedQuery	1357	151	104	255	94	40	6	53	22	0,93
org.hibernate.jpa.test.query.QueryTest	1356	60	59	115	39	13	0	18	0	0,00
org.hibernate.test.immutable.ImmutableTest	1353	36	32	39	23	13	0	17	1	1,00
org.hibernate.dialect.AbstractHANA dialect	1316	156	128	168	98	65	59	81	30	0,93
org.hibernate.test.hql.BulkManipulationTest	1301	58	54	67	34	14	0	22	6	0,96
org.hibernate.test.hql.HQLTest	1295	188	181	222	62	40	0	45	0	0,00
org.hibernate.test.readonly.ReadOnlySessionLazyNonLazyTest	1280	19	16	26	18	5	0	7	0	0,00
org.hibernate.internal.SessionFactoryImpl	1269	145	123	214	126	94	11	112	50	0,87
org.hibernate.dialect.Dialect	1198	216	199	251	111	85	312	92	25	0,99
hancement.lazy.proxy.DeepInheritanceWithNonEntitiesProxyTest	1191	47	37	79	24	9	0	17	9	0,91
org.hibernate.test.readonly.ReadOnlyCriteriaQueryTest	1133	19	18	26	25	16	0	18	0	0,00
org.hibernate.cfg.annotations.EntityBinder	1131	68	51	207	87	31	12	40	41	0,75
org.hibernate.test.legacy.ParentChildTest	1126	25	25	37	43	20	0	24	0	0,00
org.hibernate.hql.internal.ast.HqlSqlWalker	1122	93	36	195	88	66	39	79	26	0,89
org.hibernate.boot.internal.SessionFactoryOptionsBuilder	1102	156	150	184	122	37	2	43	80	0,75
org.hibernate.test.readonly.ReadOnlySessionTest	1102	25	25	79	17	6	0	8	0	0,00
org.hibernate.query.criteria.internal.CriteriaBuilderImpl	1098	171	170	226	75	45	69	54	1	1,00

Processing time: 54 seconds

C:\Program Files\cmdr

λ

Uso

```
C:\Program Files\cmdr
```

```
λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -m --console --top 35
```

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
te(String sqlWhereString, String placeholder, Dialect dialect, SQLFunctionRegistry functionRegistry)	209	47	93	5	4
zzToProcess, Map<XClass,InheritanceState> inheritanceStatePerClass, MetadataBuildingContext context)	320	44	151	8	3
entClass persistentClass, EntityPersister persister, final PersisterCreationContext creationContext)	312	42	132	5	3
org.hibernate.hql.internal.classic.SelectParser.token(String token, QueryTranslatorImpl q)	152	40	67	4	2
tadata, ExecutionOptions options, Dialect dialect, Formatter formatter, GenerationTarget... targets)	203	37	81	4	5
l NaturalIdDataAccess naturalIdRegionAccessStrategy, final PersisterCreationContext creationContext)	450	36	253	6	4
org.hibernate.engine.query.spi.ParameterParser.parse(String sqlString, Recognizer recognizer)	143	36	43	5	2
llectionBinding, CollectionDataAccess cacheAccessStrategy, PersisterCreationContext creationContext)	378	35	176	6	3
org.hibernate.cfg.annotations.EntityBinder.bindEntity()	186	31	140	4	0
org.hibernate.dialect.TeradataDialect.getSelectClauseNullString(int sqlType)	44	31	0	0	1
org.hibernate.cfg.annotations.CollectionBinder.bind()	167	30	106	7	0
org.hibernate.test.legacy.FooBarTest.testQuery()	441	30	522	2	0
org.hibernate.spatial.dialect.hana.HANASpatialDialect.supports(SpatialFunction function)	61	29	0	1	1
query.procedure.internal.ProcedureParameterImpl.prepare(CallableStatement statement, int startIndex)	130	28	56	5	2
l NaturalIdDataAccess naturalIdRegionAccessStrategy, final PersisterCreationContext creationContext)	318	28	182	4	4
l NaturalIdDataAccess naturalIdRegionAccessStrategy, final PersisterCreationContext creationContext)	371	27	209	8	4
xt, Ejb3Column[] mapKeyColumns, Ejb3JoinColumn[] mapKeyManyToManyColumns, String targetPropertyName)	215	27	85	4	9
pplyCaching(XClass clazzToProcess, SharedCacheMode sharedCacheMode, MetadataBuildingContext context)	124	27	30	4	3
org.hibernate.tool.hbm2ddl.SchemaExport\$CommandLineArgs.parseCommandLineArgs(String[] args)	96	27	37	3	1
e.internal.StatefulPersistenceContext.deserialize(ObjectInputStream ois, SessionImplementor session)	124	26	60	5	2
ession, final PreLoadEvent preloadEvent, final Iterable<PreLoadEventListener> preloadEventListeners)	188	26	82	4	6
ledFilters, boolean includeAllSubclassJoins, boolean renderSubclassJoins, String withClauseFragment)	173	26	71	4	4
ollectionMetadata(MappingDocument mappingDocument, PluralAttributeSource source, Collection binding)	150	26	118	4	3
tadata, ExecutionOptions options, Dialect dialect, Formatter formatter, GenerationTarget... targets)	123	26	51	4	5
jb3JoinColumn[] columns, SimpleValue value, boolean unique, MetadataBuildingContext buildingContext)	174	25	74	7	6
g.hibernate.hql.internal.ast.tree.SelectClause.initializeExplicitSelectClause(FromClause fromClause)	148	25	59	6	1
ctionProviderInitiator.initiateService(Map configurationValues, ServiceRegistryImplementor registry)	132	25	33	4	2
dLocalSessionContext\$TransactionProtectionWrapper.invoke(Object proxy, Method method, Object[] args)	70	25	41	4	3
org.hibernate.engine.jdbc.internal.BasicFormatterImpl\$FormatProcess.perform()	97	25	45	3	0
org.hibernate.engine.jdbc.ClobProxy.invoke(Object proxy, Method method, Object[] args)	72	25	25	3	3

Processing time: 40 seconds

```
C:\Program Files\cmdr
```

```
λ |
```


Uso

C:\Program Files\cmdr

λ drtools-metric D:\JavaApps\Doutorado\Pathfinder\softwarepathfinder\src\ -d --console --top 2

Type: com.softwarepathfinder.visualization.prefuse.AggregateDemo SLOC: 300 Number of Dependencies: 40

DEPENDENCIES:

com.softwarepathfinder.model.Invocation
com.softwarepathfinder.model.Method
com.softwarepathfinder.model.Path
com.softwarepathfinder.model.Project
com.softwarepathfinder.model.Type
java.awt.Cursor
java.awt.event.MouseEvent
java.awt.geom.Point2D
java.awt.geom.Rectangle2D
java.util.HashMap
java.util.Iterator
java.util.List
javax.swing.JFrame
javax.swing.SwingUtilities
prefuse.Constants
prefuse.Display
prefuse.Visualization
prefuse.action.ActionList
prefuse.action.RepaintAction
prefuse.action.assignment.ColorAction
prefuse.action.assignment.DataColorAction
prefuse.action.layout.CircleLayout
prefuse.action.layout.Layout
prefuse.action.layout.graph.NodeLinkTreeLayout
prefuse.activity.Activity
prefuse.controls.ControlAdapter
prefuse.controls.PanControl
prefuse.controls.ZoomControl
prefuse.data.Graph
prefuse.data.Node
prefuse.render.DefaultRendererFactory
prefuse.render.LabelRenderer
prefuse.render.PolygonRenderer
prefuse.render.Renderer
prefuse.util.ColorLib
prefuse.util.GraphicsLib
prefuse.visual.AggregateItem
prefuse.visual.AggregateTable
prefuse.visual.VisualGraph
prefuse.visual.VisualItem

Uso

```
λ drtools-metric D:\JavaApps\Doutorado\Pathfinder\softwarepathfinder\src\ -id --console --top 5
```

```
-----  
Type: com.softwarepathfinder.visualization.prefuse.AggregateDemo      SLOC: 300      Number of Internal Dependencies: 5
```

```
INTERNAL DEPENDENCIES:
```

```
com.softwarepathfinder.model.Invocation  
com.softwarepathfinder.model.Method  
com.softwarepathfinder.model.Path  
com.softwarepathfinder.model.Project  
com.softwarepathfinder.model.Type
```

```
-----  
Type: com.softwarepathfinder.model.Type SLOC: 246      Number of Internal Dependencies: 2
```

```
INTERNAL DEPENDENCIES:
```

```
com.softwarepathfinder.persistence.jpa.PersistenceManager  
com.softwarepathfinder.utils.Log
```

```
-----  
Type: com.softwarepathfinder.parsing.java.InvocationVisitor      SLOC: 220      Number of Internal Dependencies: 5
```

```
INTERNAL DEPENDENCIES:
```

```
com.softwarepathfinder.model.Field  
com.softwarepathfinder.model.Method  
com.softwarepathfinder.model.Project  
com.softwarepathfinder.model.Type  
com.softwarepathfinder.utils.Log
```

```
-----  
Type: com.softwarepathfinder.visualization.yEd.TypeGraphML      SLOC: 199      Number of Internal Dependencies: 6
```

```
INTERNAL DEPENDENCIES:
```

```
com.softwarepathfinder.model.Field  
com.softwarepathfinder.model.Invocation  
com.softwarepathfinder.model.Locus  
com.softwarepathfinder.model.Method  
com.softwarepathfinder.model.Type  
com.softwarepathfinder.utils.exceptions.ConfException
```

```
-----  
Type: com.softwarepathfinder.parsing.php.InvocationVisitor      SLOC: 181      Number of Internal Dependencies: 3
```

```
INTERNAL DEPENDENCIES:
```

```
com.softwarepathfinder.model.Method  
com.softwarepathfinder.model.Project  
com.softwarepathfinder.model.Type
```

```
Processing time: 708 milliseconds
```


Uso

```
D:\programs\drtools-metric
```

```
λ drtools-metric \JavaApps\Doutorado\repos\hibernate-orm-master\ -tc --console --top 35
```

TYPES	DEP	I-DEP	FAN-IN	FAN-OUT
org.hibernate.persister.entity.AbstractEntityPersister	138	110	17	134
org.hibernate.test.legacy.FooBarTest	79	44	0	54
org.hibernate.boot.model.source.internal.hbm.ModelBinder	144	125	2	142
org.hibernate.test.hql.ASTParserLoadingTest	82	50	0	67
org.hibernate.cfg.AnnotationBinder	160	37	11	43
org.hibernate.internal.SessionImpl	170	121	18	156
ate.cfg.annotations.reflection.JPAOverriddenAnnotationReader	124	7	3	21
nate.test.querycache.AbstractQueryCacheResultTransformerTest	35	21	2	34
org.hibernate.loader.Loader	86	69	15	79
org.hibernate.userguide.hql.HQLTest	46	17	0	18
org.hibernate.boot.internal.InFlightMetadataCollectorImpl	99	79	2	93
g.hibernate.persister.collection.AbstractCollectionPersister	90	78	8	88
org.hibernate.test.criteria.CriteriaQueryTest	54	29	0	33
org.hibernate.engine.internal.StatefulPersistenceContext	64	42	5	51
org.hibernate.cfg.annotations.CollectionBinder	105	41	6	46
org.hibernate.test.readonly.ReadOnlyProxyTest	19	9	0	12
org.hibernate.internal.CoreMessageLogger	41	15	284	16
hibernate.internal.util.collections.BoundedConcurrentHashMap	20	0	3	30
org.hibernate.query.internal.AbstractProducedQuery	94	40	6	53
org.hibernate.jpatest.query.QueryTest	39	13	0	18
org.hibernate.test.immutable.ImmutableTest	23	13	0	17
org.hibernate.dialect.AbstractHANADialect	98	65	59	81
org.hibernate.test.hql.BulkManipulationTest	34	14	0	22
org.hibernate.test.hql.HQLTest	62	40	0	45
org.hibernate.test.readonly.ReadOnlySessionLazyNonLazyTest	18	5	0	7
org.hibernate.internal.SessionFactoryImpl	126	94	11	112
org.hibernate.dialect.Dialect	111	85	312	92
hancement.lazy.proxy.DeepInheritanceWithNonEntitiesProxyTest	24	9	0	17
org.hibernate.test.readonly.ReadOnlyCriteriaQueryTest	25	16	0	18
org.hibernate.cfg.annotations.EntityBinder	87	31	12	40
org.hibernate.test.legacy.ParentChildTest	43	20	0	24
org.hibernate.hql.internal.ast.HqlSqlWalker	88	66	39	79
org.hibernate.boot.internal.SessionFactoryOptionsBuilder	122	37	2	43
org.hibernate.test.readonly.ReadOnlySessionTest	17	6	0	8
org.hibernate.query.criteria.internal.CriteriaBuilderImpl	75	45	69	54

Processing time: 37 seconds

```
D:\programs\drtools-metric
```

```
λ |
```

Uso

```
C:\Program Files\cmdr
```

```
λ drtools-metric D:\JavaApps\Doutorado\repos\findbugs-3.0.1\src\ -mv --save
```

```
Generating files to drtools-metric-visualization tool
```

```
Summary info (CSV).....[DONE]
Code resonance info (JSON).....[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]
Namespaces dependencies info (JSON)...[DONE]
Architectural dependencies info (DOT).[DONE]
Statistics of namespaces info (CSV)...[DONE]
Statistics of types info (CSV).....[DONE]
Statistics of methods 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!

```
Processing time: 18 seconds
```

```
C:\Program Files\cmdr
```

```
λ |
```

Uso

```
C:\Program Files\cmdr
```

```
λ drtools-metric D:\JavaApps\Doutorado\repos\findbugs-3.0.1\src\ -sm --console
```

METRIC	1stQ	3rdQ	Avg	Median	Min	Max	Max-Min	StdDev	U-Fnc	Threshold
MLOC	3,00	12,00	12,02	6,00	0,00	889,00	889,00	25,50	25,50	30,00
CYCLO	1,00	2,00	2,65	1,00	1,00	339,00	338,00	6,71	3,50	10,00
CALLS	0,00	4,00	3,98	1,00	0,00	526,00	526,00	11,46	10,00	5,00
NBD	1,00	4,00	2,73	3,00	0,00	11,00	11,00	1,90	8,50	3,00
PARAM	0,00	1,00	1,01	1,00	0,00	19,00	19,00	1,13	2,50	4,00

Legend:

1stQ=First Quartile | 3rdQ=Third Quartile | Avg=Average | Median=Median | Min=Min value | Max=Max value
Max-Min=Amplitude | StdDev=Standard Deviation | U-Fnc=Upper Fence | Threshold=Metric Threshold

Processing time: 13 seconds

```
C:\Program Files\cmdr
```

```
λ drtools-metric D:\JavaApps\Doutorado\repos\findbugs-3.0.1\src\ -sm --csv
```

```
"metric","1stQ","3rdQ","avg","median","min","max","max-min","stddev","u-fence","threshold"  
"SLOC",21.0,129.0,118.29764065335753,56.0,3.0,3001.0,2998.0,194.99830697265344,291.0,500.0  
"NOM",3.0,11.0,10.127949183303086,5.0,0.0,202.0,202.0,16.384805474039066,23.0,14.0  
"NPM",2.0,9.0,8.642468239564428,4.0,0.0,198.0,198.0,14.713017943069758,19.5,40.0  
"WMC",4.0,27.0,25.754990925589837,11.0,1.0,629.0,628.0,46.229403591192685,61.5,100.0  
"DEP",2.0,13.0,9.748638838475499,5.0,0.0,103.0,103.0,12.38058653011379,29.5,20.0  
"I-DEP",0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0  
"FAN-IN",0.0,0.0,0.0,0.6678765880217786,0.0,0.0,31.0,31.0,2.4313520155682844,0.0,10.0  
"FAN-OUT",1.0,5.0,3.3684210526315788,2.0,0.0,24.0,24.0,3.515898690936485,11.0,15.0  
"NOA",0.0,6.0,4.676950998185118,2.0,0.0,76.0,76.0,7.409649038284947,15.0,8.0  
"LCOM3",0.0,0.9210526315789473,0.560552152379605,0.7486842105263158,0.0,2.0,2.0,0.43752778128106223,2.302631578947368,1.0
```

```
C:\Program Files\cmdr
```

```
λ |
```


Uso

```
C:\Program Files\cmdr
```

```
λ drtools-metric D:\JavaApps\Doutorado\repos\findbugs-3.0.1\src\ -sat --console --top 5
```

METRIC	1stQ	3rdQ	Avg	Median	Min	Max	Max-Min	StdDev	U-Fnc	Threshold
SLOC	21,00	129,00	118,30	56,00	3,00	3001,00	2998,00	195,00	291,00	500,00
NOM	3,00	11,00	10,13	5,00	0,00	202,00	202,00	16,38	23,00	14,00
NPM	2,00	9,00	8,64	4,00	0,00	198,00	198,00	14,71	19,50	40,00
WMC	4,00	27,00	25,75	11,00	1,00	629,00	628,00	46,23	61,50	100,00
DEP	2,00	13,00	9,75	5,00	0,00	103,00	103,00	12,38	29,50	20,00
I-DEP	0,00	6,00	4,48	2,00	0,00	69,00	69,00	6,78	15,00	15,00
FAN-IN	0,00	4,00	5,62	1,00	0,00	218,00	218,00	16,51	10,00	10,00
FAN-OUT	2,00	10,00	7,85	5,00	0,00	75,00	75,00	8,85	22,00	15,00
NOA	0,00	6,00	4,68	2,00	0,00	76,00	76,00	7,41	15,00	8,00
LCOM3	0,00	0,92	0,56	0,75	0,00	2,00	2,00	0,44	2,30	1,00

Legend:

1stQ=First Quartile | 3rdQ=Third Quartile | Avg=Average | Median=Median | Min=Min value | Max=Max value
Max-Min=Amplitude | StdDev=Standard Deviation | U-Fnc=Upper Fence | Threshold=Metric Threshold

TYPES	SLOC	NOM	NPM	WMC	DEP	I-DEP	FAN-IN	FAN-OUT	NOA	LCOM3
edu.umd.cs.findbugs.OpcodeStack	3001	157	104	629	58	22	45	46	76	0,76
edu.umd.cs.findbugs.BugInstance	1673	202	192	420	67	28	218	48	28	0,93
edu.umd.cs.findbugs.detect.FindNullDeref	1375	40	20	228	103	69	0	75	17	0,79
edu.umd.cs.findbugs.detect.DumbMethods	1308	30	21	575	49	29	0	42	33	0,47
edu.umd.cs.findbugs.PluginLoader	1296	53	20	160	62	21	3	36	24	0,78

Processing time: 14 seconds



**metric
visualization**
DR-Tools

Uso



Metric Visualization

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

PROJECT SUMMARY

Software Pathfinder

[View Thresholds](#)

13

Namespaces

4665

SLOC

65

Number of Types

402

Number of Methods



Uso



Thermometer

Summary Visualization



Namespaces

Using NOC and NAC



Types

Using NOM, SLOC, and WMC



Methods

Using CYCLO, MLOC, and CALLS



Internal Dependencies

Internal dependencies of types



Namespace Coupling

Using CA and CE



Type Coupling

Coupling between types (input/output)



Instability/Abstractness/Distance

Using I, A, and D



Instability and Abstractness

Using I and A



Type Coupling

Using DEP, I-DEP, FAN-IN, and FAN-OUT



Cyclic Dependencies

Cyclic dependencies between types



DR-Tools



Metric Thresholds Information

Project: Software Pathfinder

[Back](#)

PROJECT

Acronym	Name	Description
SMALL	Small Project	small project with < 50 KLOC or 200 < classes
MEDIUM	Medium Project	medium project with (50 KLOC <= project <= 250 KLOC) or (200 <= classes <= 1000)
LARGE	Large Project	large project with > 250 KLOC or > 1000 classes

NAMESPACE

Acronym	Name	Description
NOC	Number of Types/Classes	Good: <= 11; Regular: between 11 and 28; Bad: > 28
NAC	Number of Abstract Types/Classes	without references

TYPE

Acronym	Name	Description
SLOC	Type/Class Line of Code	Bad: > 500



DR-Tools

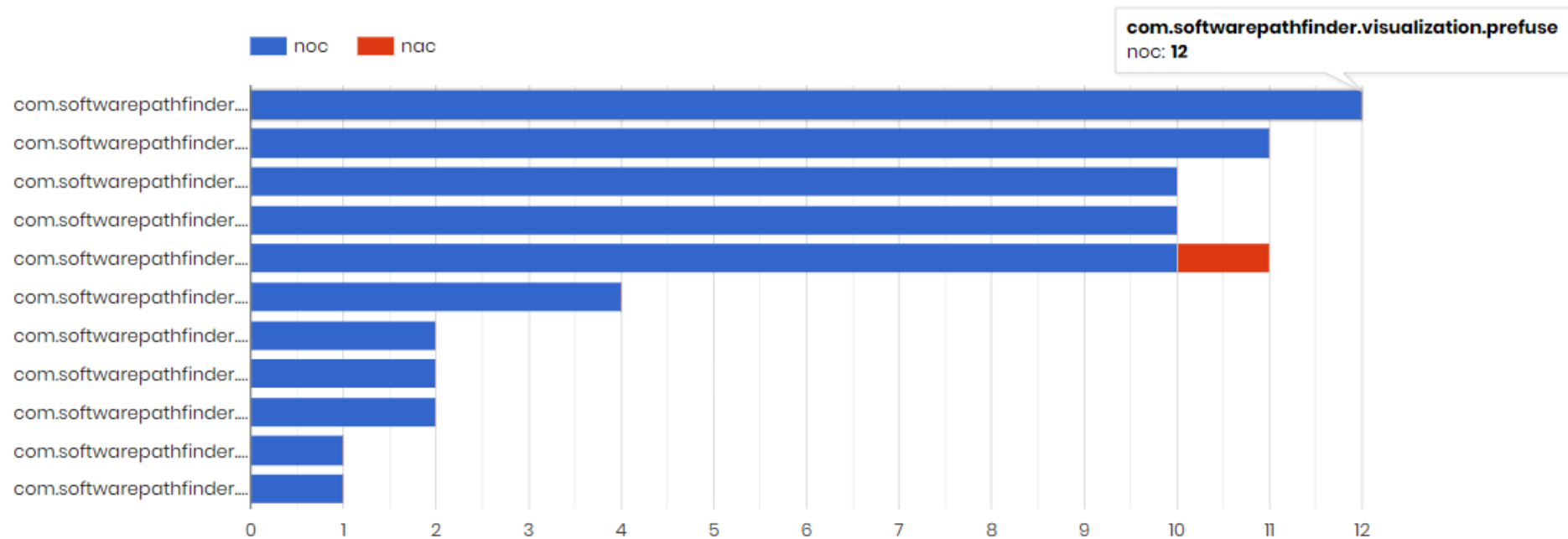


Namespace Visualization

NOC (Number of Classes/Types) and NAC (Number of Abstract Classes/Types)

Project: Software Pathfinder

[Back](#)



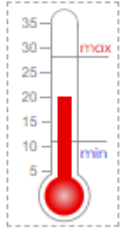
DR-Tools

Thermometer Visualization

Project: Findbugs 3.0.1

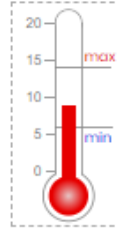
[Back](#)

Types (types/namespaces)



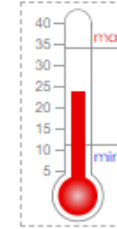
Total of Namespaces: 58
Total of Types: 1161
Types/namespaces: 20
Total of SLOC: 130364

Methods (methods/types)



Total of Methods: 10753
Methods/Types: 9

Complexity (WMC/types)



Total of Complexity: 28447
Complexity/Types: 24

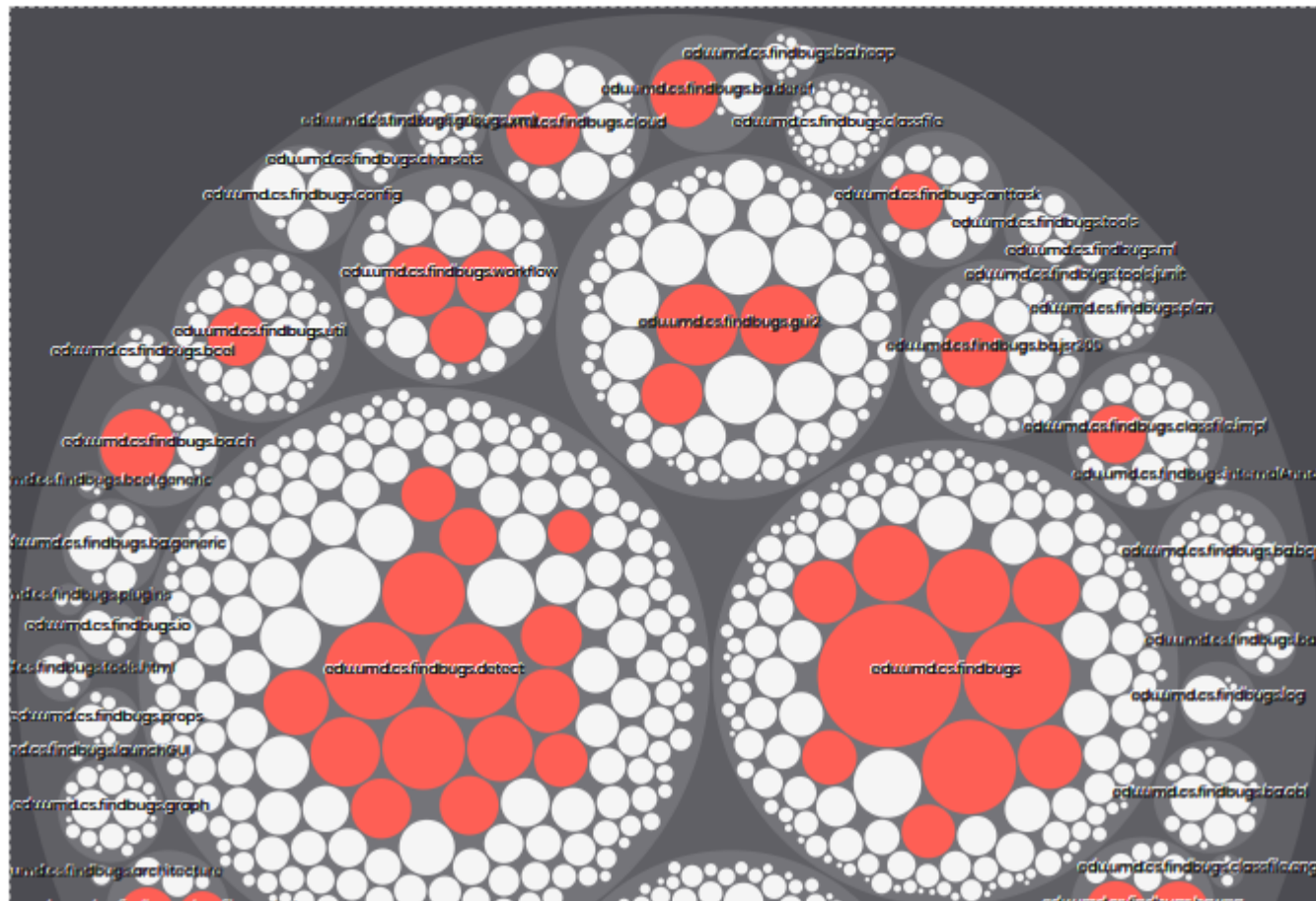


Code Resonance

Bubble Size (SLOC - Lines of Code) and Bubble Color (The most complex classes are red bubbles, with high WMC)

Project: Findbugs 3.0.1

[Back](#)



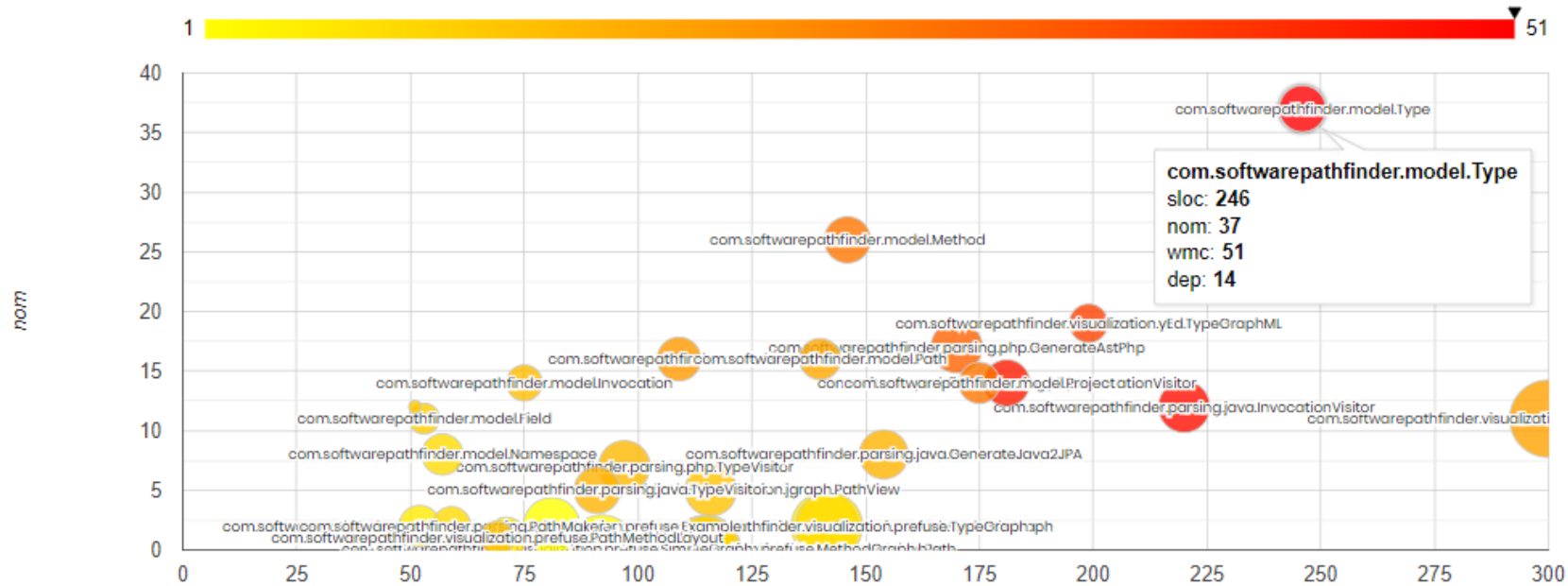
DR-Tools

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](#)



DR-Tools

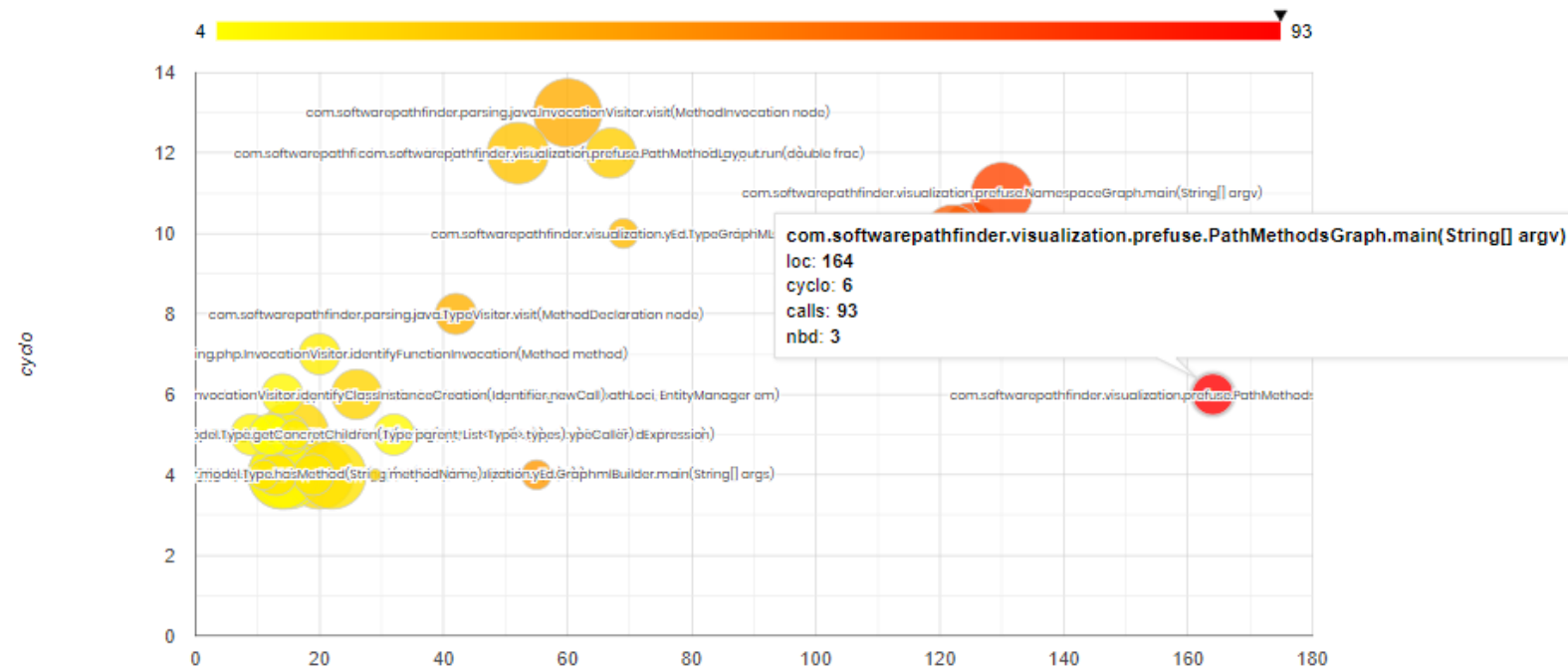


Method Visualization

Methods with Complexity (CYCLO - y axis), Lines of Code (MLOC - x axis), Number of Invocations (CALLS - bubble color), and Nested Block Depth (NBD - bubble size)

Project: Software Pathfinder

[Back](#)



DR-Tools

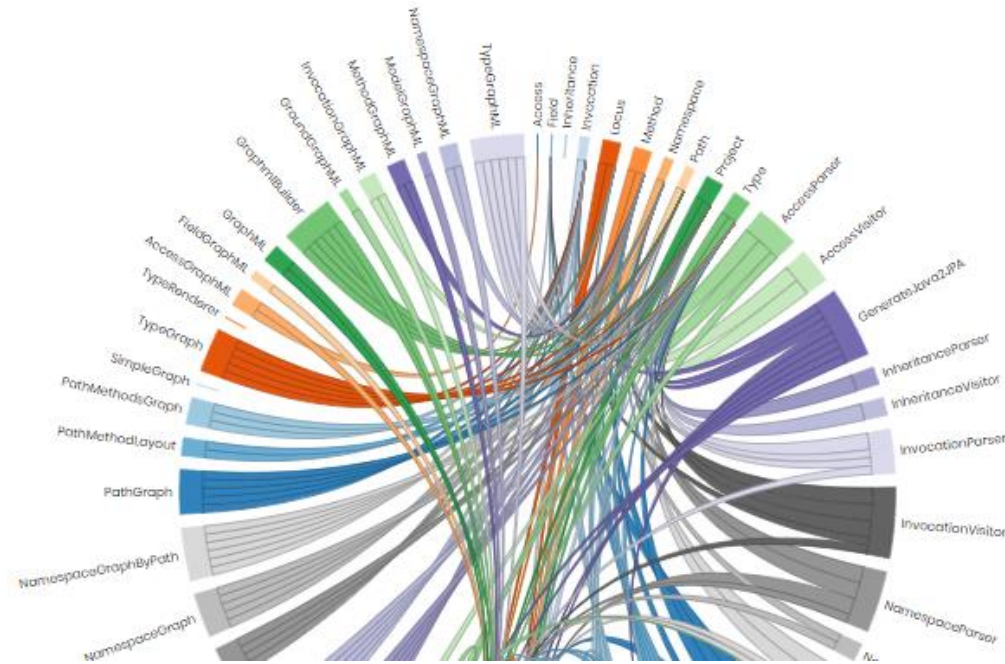


Internal Dependencies Visualization

Internal dependencies between type/classes

Project: Software Pathfinder

[Back](#)



DR-Tools

Coupling (Input and Output) Visualization

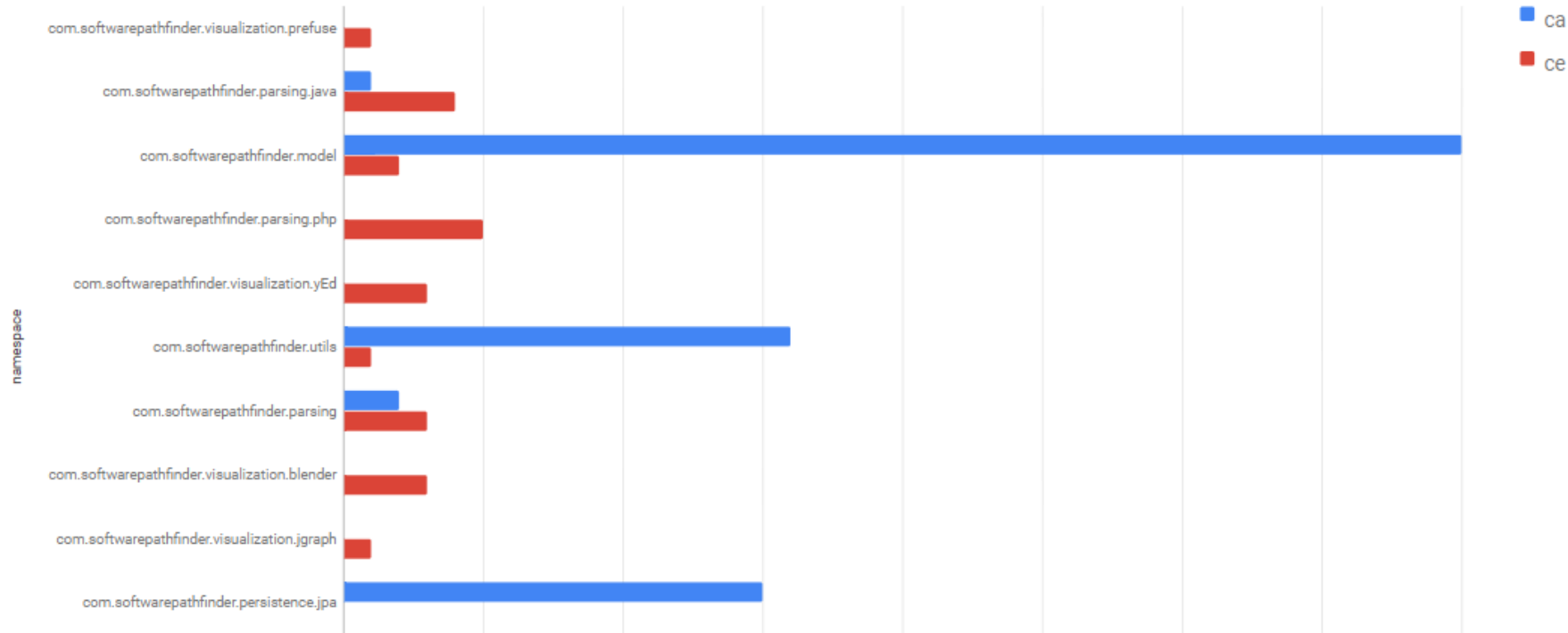
Project: Software Pathfinder



Namespace Coupling Visualization

CA (Afferent Coupling) and CE (Efferent Coupling)
Project: Software Pathfinder

[Back](#)





Instability/Abstractness/Distance Visualization

I (Instability), A (Abstractness Degree), and D (Normalized Distance)

Project: Software Pathfinder

[Back](#)



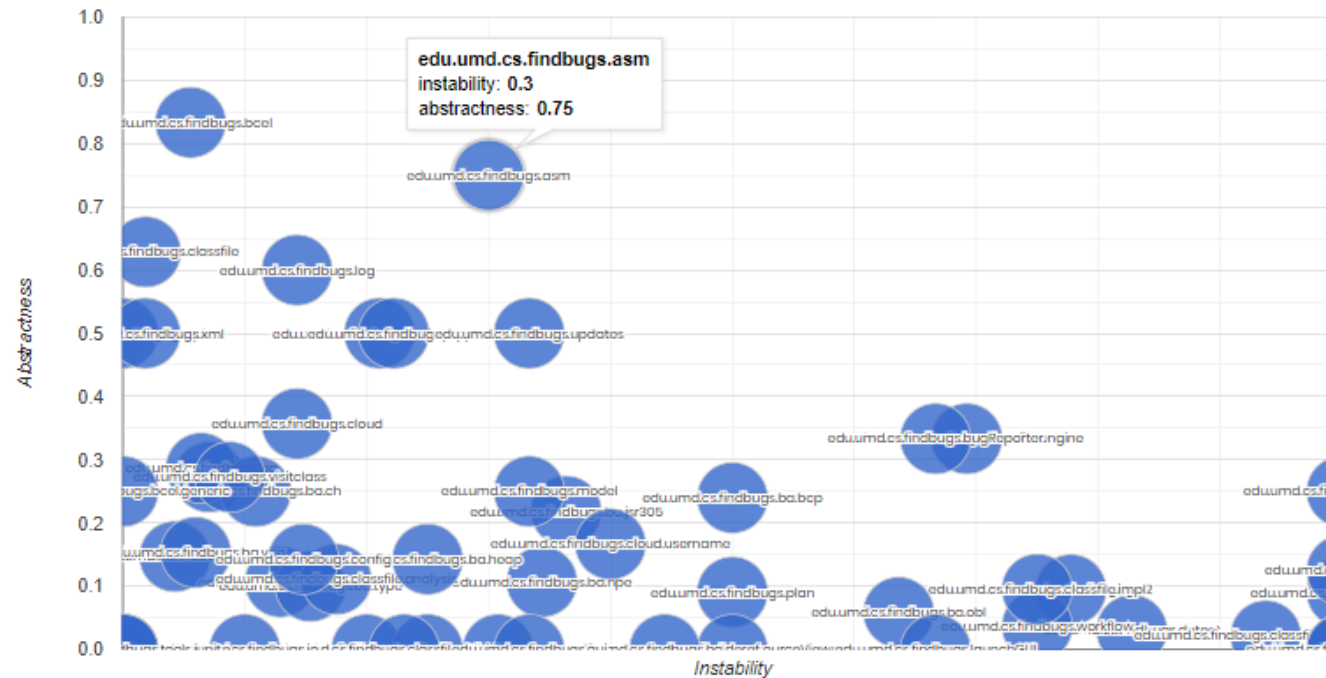
DR-Tools

Instability and Abstractness Visualization

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

Project Findbugs 3.0.1

[Back](#)

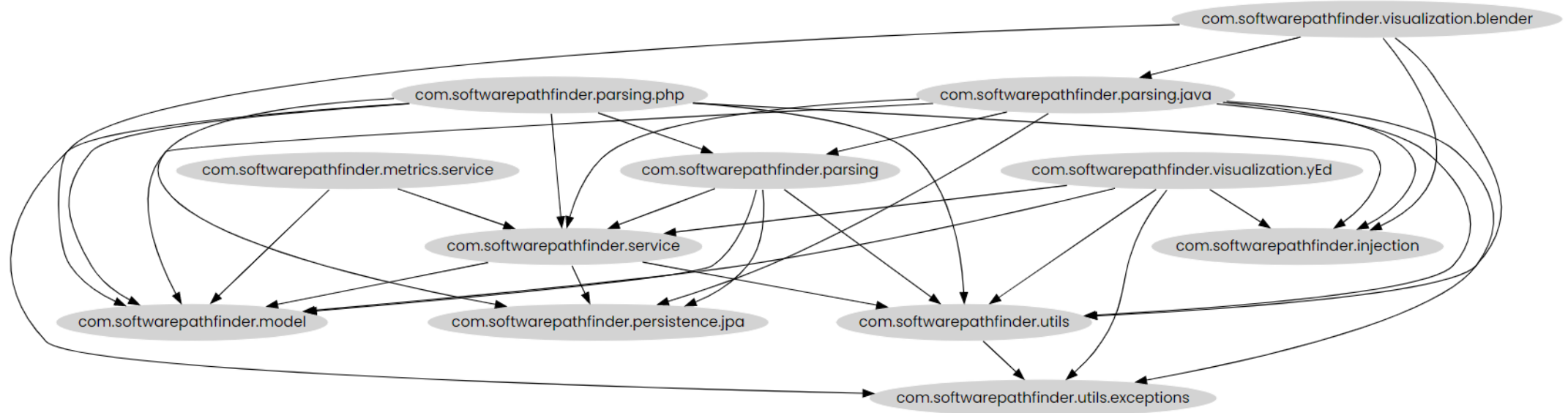


Namespace Dependencies I

Hierarchical dependencies between namespaces

Project: Software Pathfinder

[Back](#)



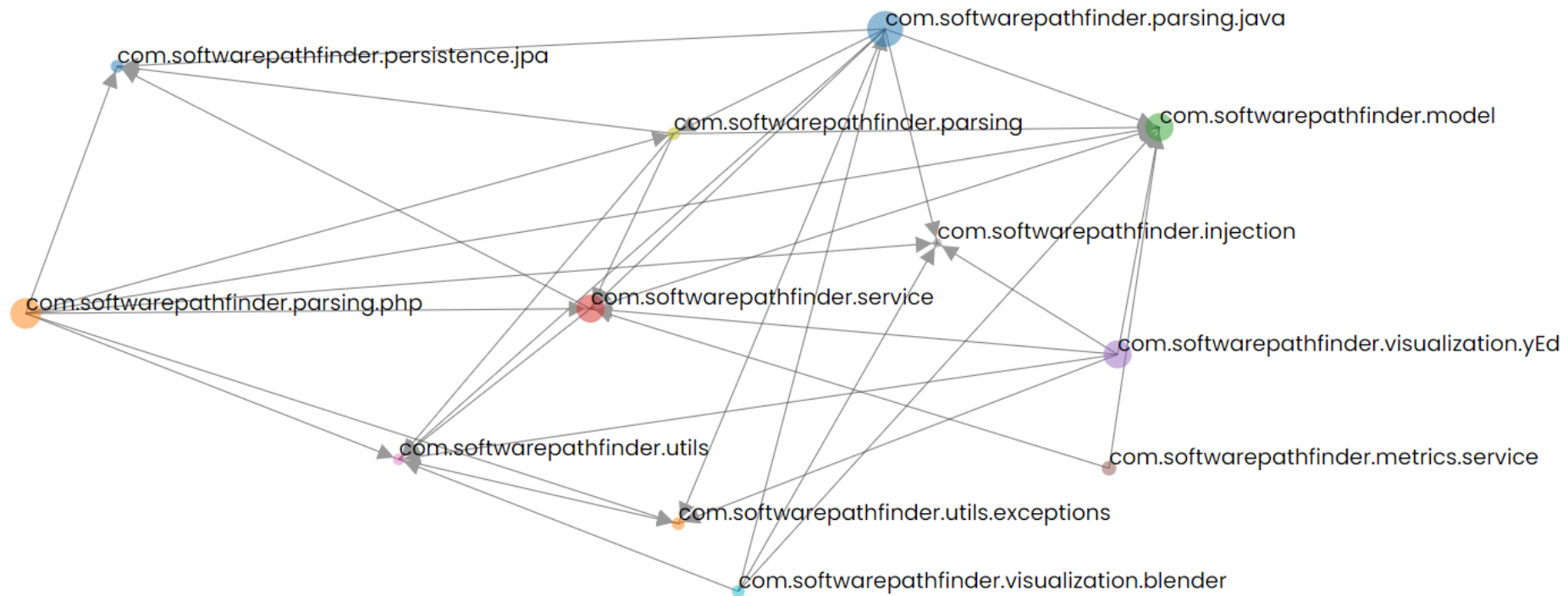
Namespace Dependencies II

Bubble Size (NOC - Number of Classes/Types)

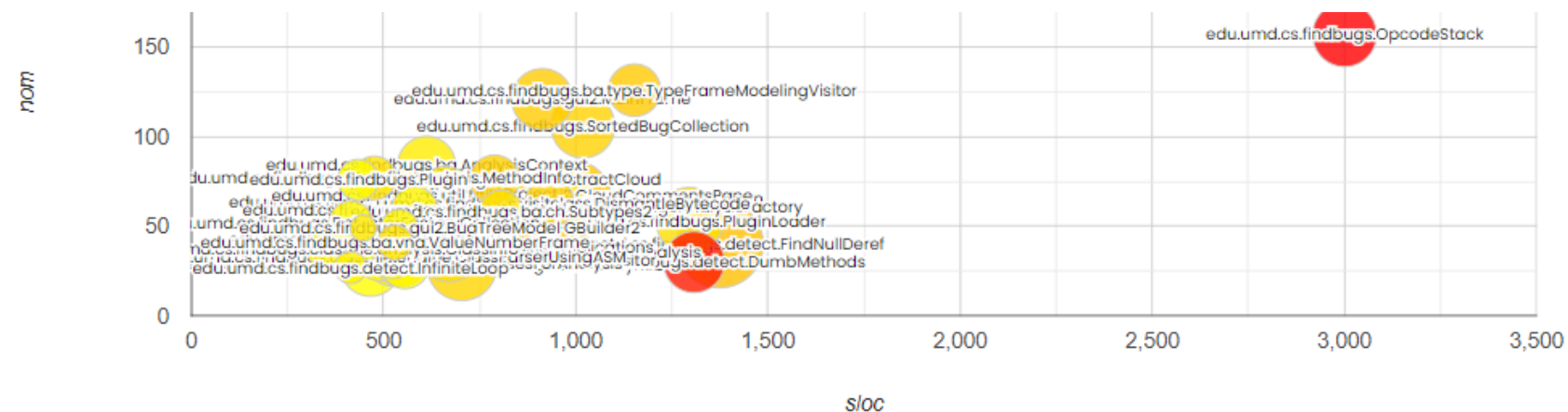
Project: Software Pathfinder

[Back](#)

☐ Disable name of namespaces



Max Value	Amplitude
3001.00	2998.00
202.00	202.00
629.00	628.00
103.00	103.00



Statistics of Metrics

Metric	1st Quartile	3rd Quartile	Average	Median	Min Value	Max Value	Amplitude	Standard Deviation	Upper Fence	Threshold (greater than = bad)
SLOC	21.00	129.00	118.30	56.00	3.00	3001.00	2998.00	195.00	291.00	500.00
NOM	3.00	11.00	10.13	5.00	0.00	202.00	202.00	16.38	23.00	14.00
WMC	4.00	27.00	25.75	11.00	1.00	629.00	628.00	46.23	61.50	100.00
DEP	2.00	13.00	9.75	5.00	0.00	103.00	103.00	12.38	29.50	20.00



DR-Tools



DR-Tools

32 Heurísticas de Análise

drtools.site

Heurísticas - Summary

- 1. Contexto que fornece informações gerais sobre dimensões do Projeto**
Indicativo de filtrar melhor as informações usando a opção '--top X' para ajudar no entendimento (Classificação: SMALL, MEDIUM e LARGE)
- 2. Considere o número médio de classes por namespace**
Indicativo de que as classes não estão distribuídas uniformemente
- 3. Avalie o número médio de SLOC por classes**
Indicativo de classes muito grandes
- 4. Observe a distribuição média de métodos por classes**
Indicativo de muitos comportamentos por classe
- 5. Considere a complexidade média por classes**
Indicativo de como está a complexidade das classes em geral



Heurísticas - Namespaces

6. Observe a distribuição de classes por namespace

Se um namespace tem muitas classes (NOC alto), pode ser um indicativo de 'promiscuous package'

7. Avalie a distribuição de tipos abstratos (classes abstratas, interfaces) por namespaces

Indicativos para extensão e reuso

8. Avalie a relação das métricas NOC e NAC do namespace

Uma diferença muito grande entre eles pode indicar uma má distribuição entre tipos abstratos e tipos concretos



Heurísticas – Types (1)

9. Avalie as métricas além do SLOC

WMC, DEPS (DEP e I-DEP) e NOM/NPM são bons indicativos de como está a classe

10. Classe com NOA alto, mas baixo WMC e NOM alto

Pode ser um indicativo de POJO (Plain Old Java Object)

11. SLOC alto, mas sem muitos métodos (NOM/NPM baixo)

Pode ser um indicativo de 'long methods'

12. SLOC e WMC alto, mas sem muitos métodos (NOM/NPM baixo)

Pode ser um indicativo de 'complex class'

13. NOM/NPM alto pode ser indicativo de classe com muitas responsabilidades

Indica baixa coesão e possivelmente 'god class'



Heurísticas – Types (2)

- 14.** **NOM/NPM alto e NOA baixo pode ser indicativo de classe com muitas responsabilidades**
Pode ser um indicativo de uma classe 'controller'
- 15.** **NOM alto e NPM baixo pode indicar que o comportamento foi dividido**
Indicativo de métodos private/protected/default
- 16.** **NOA alto pode ser indicativo de classe com muitas responsabilidades**
Pode ser um indicativo de baixa coesão, dificultando a manutenção
- 17.** **DEP alto e I-DEP baixo pode indicar uma classe com muitas dependências externas**
Dependências de APIs externas (frameworks, libs)
- 18.** **I-DEP alto (e por consequência DEP alto), pode indicar uma classe com muitas dependências de classe do projeto**
Incidência de alto acoplamento
- 19.** **Alto LCOM3 pode indicar uma classe com baixa coesão**



Heurísticas – Methods

- 20.** PARAM alto pode ser indicativo de método com baixa coesão
Possivelmente é um 'long method'
- 21.** CYCLO alto e MLOC baixo pode ser um 'complex method'
Indicativo de problema de complexidade, legibilidade e entendimento
- 22.** NBD alto pode ser um 'complex/long method'
Indicativo de problema de complexidade, legibilidade e entendimento
- 23.** CALLS alto pode indicar alto acoplamento
Indicativo de problema de várias dependências
- 24.** MLOC alto, CYCLO alto, CALLS alto e NBD alto é forte indicativo de mais de um problema
Pode ser um indicativo de um 'complex/long method'



Heurísticas – Coupling (1)

- 25. Evite dependência cíclicas**
Tornam as mudanças complexas e gera a 'síndrome da compilação total'
- 26. CA alto pode indicar que o namespace é estável**
Se ele mudar, vai fazer com que quem dependa dele seja alterado
- 27. CE alto pode indicar que o namespace é instável**
A incidência de mudança em outros namespaces que ele depende vai fazer com que ele mude
- 28. I indica como está a instabilidade do namespace**
 $I=0$, namespace estável ao máximo; $I=1$, namespace instável ao máximo



Heurísticas – Coupling (2)

- 29.** Se $I=0$, indica que $CA > 0$ e $CE=0$, indica uma estabilidade total
Ele é responsável e independente. Os dependentes tornam difícil alterá-lo e não tem dependência de outros que pode forçar a mudança
- 30.** A indica como está o grau de abstração do namespace
A=0, namespace não tem tipos abstratos; A=1, namespace somente possui tipos abstratos



Heurísticas – Coupling (3)

- 31. Considere namespaces que estão nas zonas de exclusão**

Zone of Pain (namespaces com I e A próximos a 0) e Zone of Uselessness (namespaces com I e A próximos a 1)

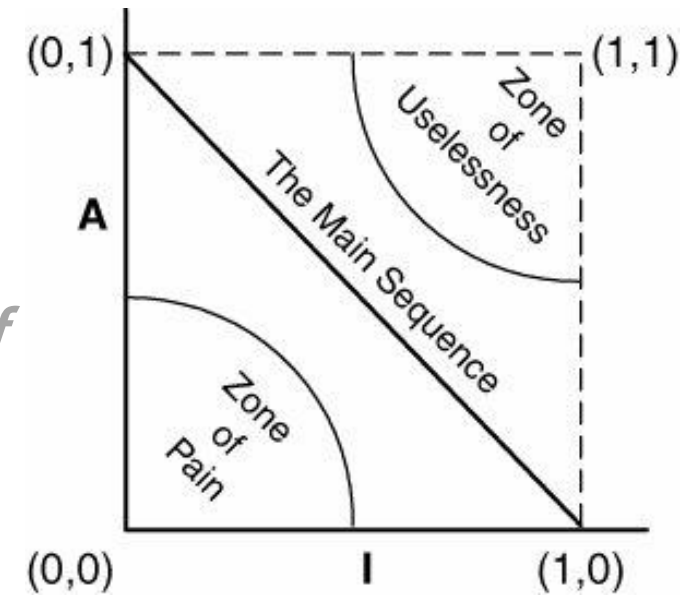
- 32. Namespace situado próximo a sequência principal indica que não é abstrato nem instável demais**

Valor de D (entre 0 e 1) que vai indicar a posição na sequência principal

- 33. D indica o quão longe um namespace está da sequência principal**

D próximo a 0 indica proximidade da sequência principal; D próximo a 1, indica distância da sequência principal

Estes valores (mais próximo a 1) podem indicar quando um namespace está passível de manutenção e menos sensível a mudanças



Live demo!



DR-Tools

Questões??



DR-Tools

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

drtools.site