DR-Tools

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

drtools.site

Quem sou eu?

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

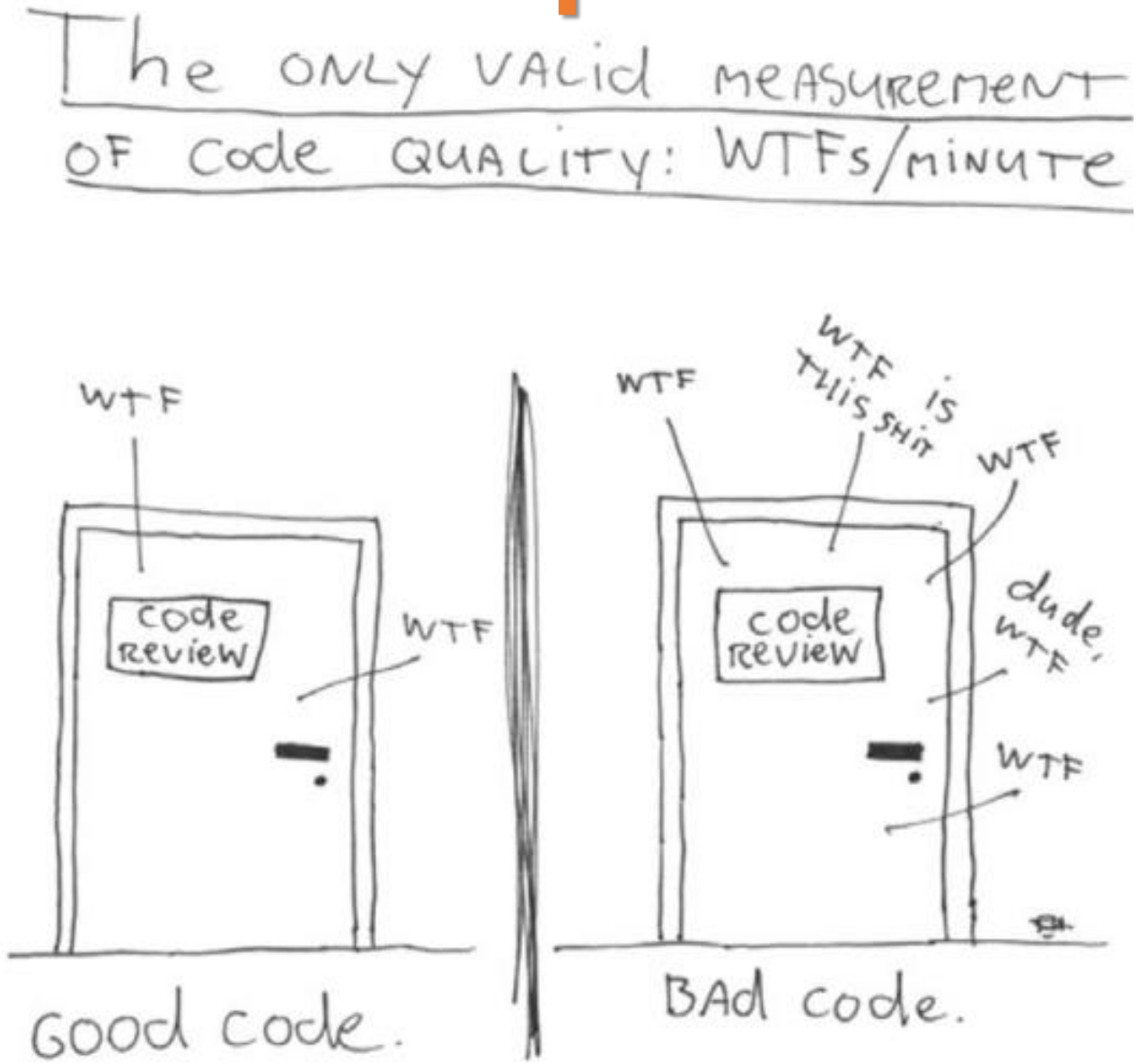
WILDTECH

Por que metáfora da medicina?

metric

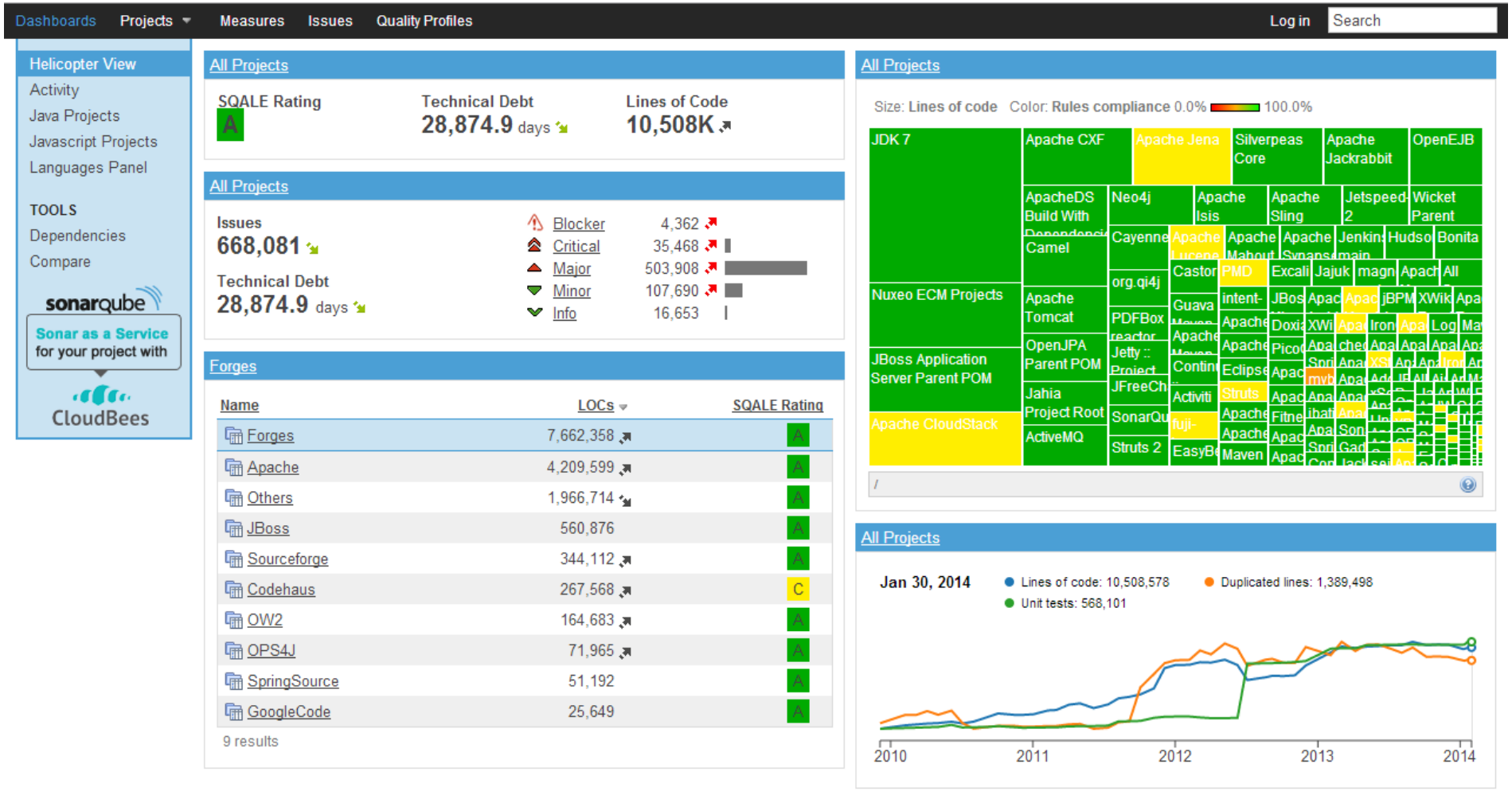
DR-Tools

Como você mede a qualidade do código?



DR-Tools

“ah... Nós temos o SonarQube”



DR-Tools

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

DR-Tools

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**

DR-Tools

Funções

- ✓ **Resultados em diferentes formatos**
  Console, JSON, CSV
- ✓ **Filtragem dos 'Top X'**
- ✓ **Resultados contextualizados**
  Projeto, Namespaces, Classes, Métodos, Acoplamento, Dependências

DR-Tools

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
- ✓ **Métodos**
  MLOC, CYCLO, CALLS, NBD, PARAM
- ✓ **Acoplamento**
  CA, CE, Instability, Abstractness, Normalized Distance
- ✓ **Dependências**
  Externas, Internas, Ciclic Dependency

DR-Tools

Uso

```
C:\Program Files\cmder
λ drtools-metric
drtools-metric - helping you to improve the health of your source code and reduce technical debt!
Developed by Guilherme Lacerda (guilhermeslacerda@gmail.com)

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

        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 a SUMMARY of project                               --json          generate results in JSON format
-n      list information about NAMESPACES                       --top           list top 'number' records, based on used format
-t      list information about TYPES (classes)
-m      list information about METHODS (functions)
-d      list information about DEPENDENCIES of types/classes
-cd     list information about CYCLIC DEPENDENCIES of types/classes
-id     list information about INTERNAL DEPENDENCIES of types/classes
-c      list information about COUPLING of namespaces
-mt     list information about METRIC THRESHOLDS

        Metrics
CA    - Number of types/classes outside this component that depends on types/classes inside this component (Afferent Coupling)
CE    - Number of types/classes inside this component that depends on types/classes 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 from the main sequence
NAC   - Number of abstract types/classes of package/namespace   WMC   - Weighted methods per types/classes (sum the CYCLO of each method)
NOC   - Number of types/classes of package/namespace            SLOC  - Number of lines of source code
DEP   - Number of type/classes external dependencies            I-DEP - Number of type/classes internal dependencies (Fan-Out)
NOA   - Number of attributes/variables                          NOM   - Number of methods/functions of a type
NPM   - Number of public methods/functions of a type            NBD   - Number of nested block depth of a method/function
MLOC  - Number of lines of a method/function                    PARAM - Number of parameters of a method/function
CYCLO - Cyclomatic complexity (McCabe) of a method/function     CALLS - Number of invocations made from within a method/function

 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
```

Uso

```
C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Plugins\DrToolsMetric\src -s --console
------------------
SUMMARY OF METRICS
------------------
          Total of Namespaces: 11
               Total of Types: 39 - 3,55 (number of types/namespaces)
                Total of SLOC: 2106 - 54,00 (number of SLOC/types)
             Total of Methods: 278 - 7,13 (number of methods/types)
               Total of CYCLO: 446 - 11,44 (number of CYCLO/types)
       Processing time: 960 milliseconds

C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Plugins\DrToolsMetric\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/Class Line of Code (SLOC)                  Bad: > 500
Number of Functions/Methods (NOM)               Good: <= 6; Regular: between 6 and 14; Bad: > 14
Weighted Methods per Class (WMC)                Good: <= 11; Regular: between 11 and 34; Bad: > 34
Number of external types/classes dependencies (DEP)    Bad: > 20
Number of internal types/classes dependencies (I-DEP)  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
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)                   without references
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\cmder
λ
```

Uso

```
C:\Program Files\cmder
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)
                  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   NOA
-------------------------------------------------------------------------------------------------------------
      org.hibernate.persister.entity.AbstractEntityPersister    4529    398     220     877     138     110     114
                      org.hibernate.test.legacy.FooBarTest      4490    110     109     221     79      44      0
    org.hibernate.boot.model.source.internal.hbm.ModelBinder    3602    151     77      421     144     125     31
                org.hibernate.test.hql.ASTParserLoadingTest     3318    127     118     170     82      50      4
                        org.hibernate.cfg.AnnotationBinder      3101    61      13      504     160     37      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: 39 seconds

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λ
```

Uso

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

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


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

        Processing time: 40 seconds

C:\Program Files\cmder
λ
```

Uso

```
C:\Program Files\cmder
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\cmder
λ
```

Uso

```
C:\Program Files\cmder
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
```

metric visualization DR-Tools

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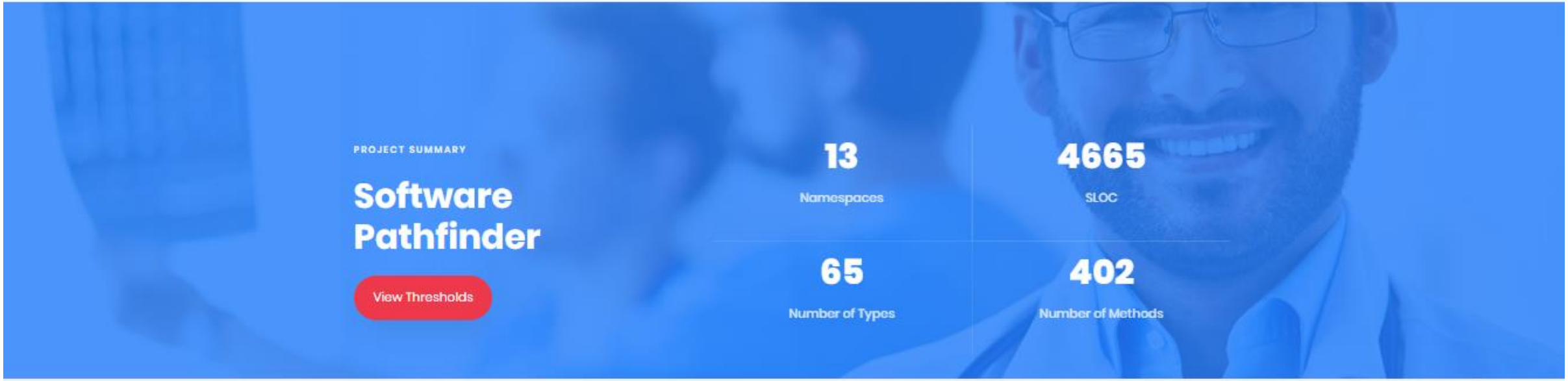
DR-Tools
Metric Visualization
A tool quality suite to help the developers to maintain health and code evolution
PROJECT SUMMARY
Software Pathfinder
View Thresholds
13
Namespaces
4665
SLOC
65
Number of Types
402
Number of Methods

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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/classes	**Type Coupling** Coupling between types/classes (input/output)
Namespace Coupling	**Instability/Abstractness/Distance**	**Instability and Abstractness**

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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

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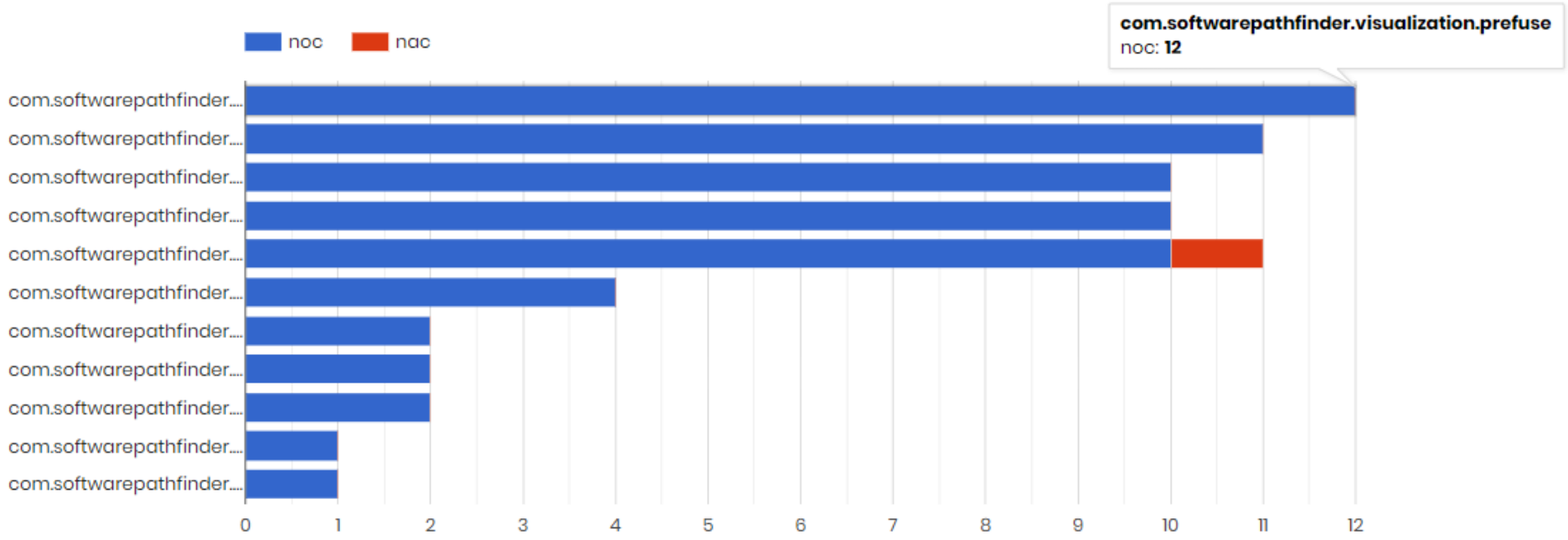
Namespace Visualization

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

Project: Software Pathfinder

Back



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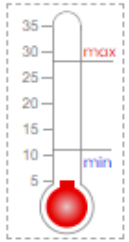
Thermometer Visualization

Project: Software Pathfinder

Back

Types (types/namespaces)



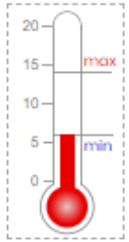
Total of Namespaces: 13

Total of Types: 65

Types/namespaces: 5

Total of SLOC: 4665

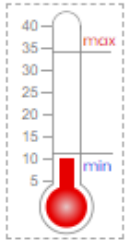
Methods (methods/types)



Total of Methods: 402

Methods/Types: 6

Complexity (WMC/types)



Total of Complexity: 673

Complexity/Types: 10

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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

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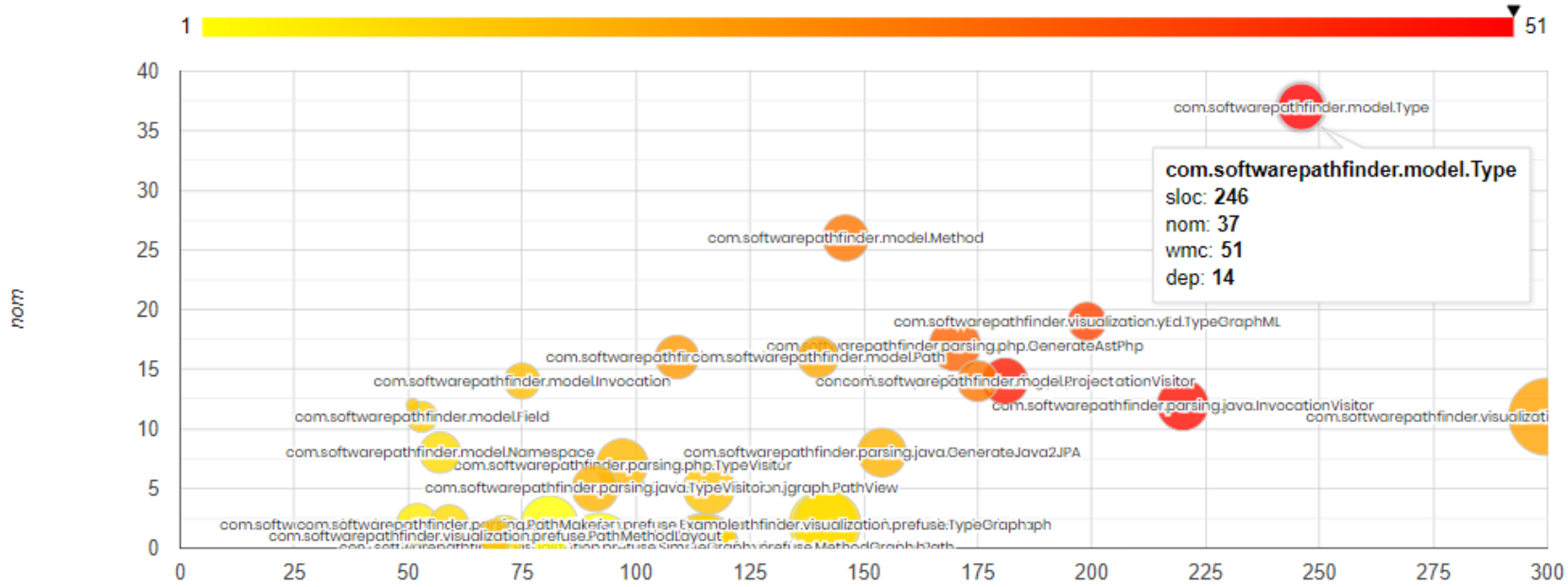

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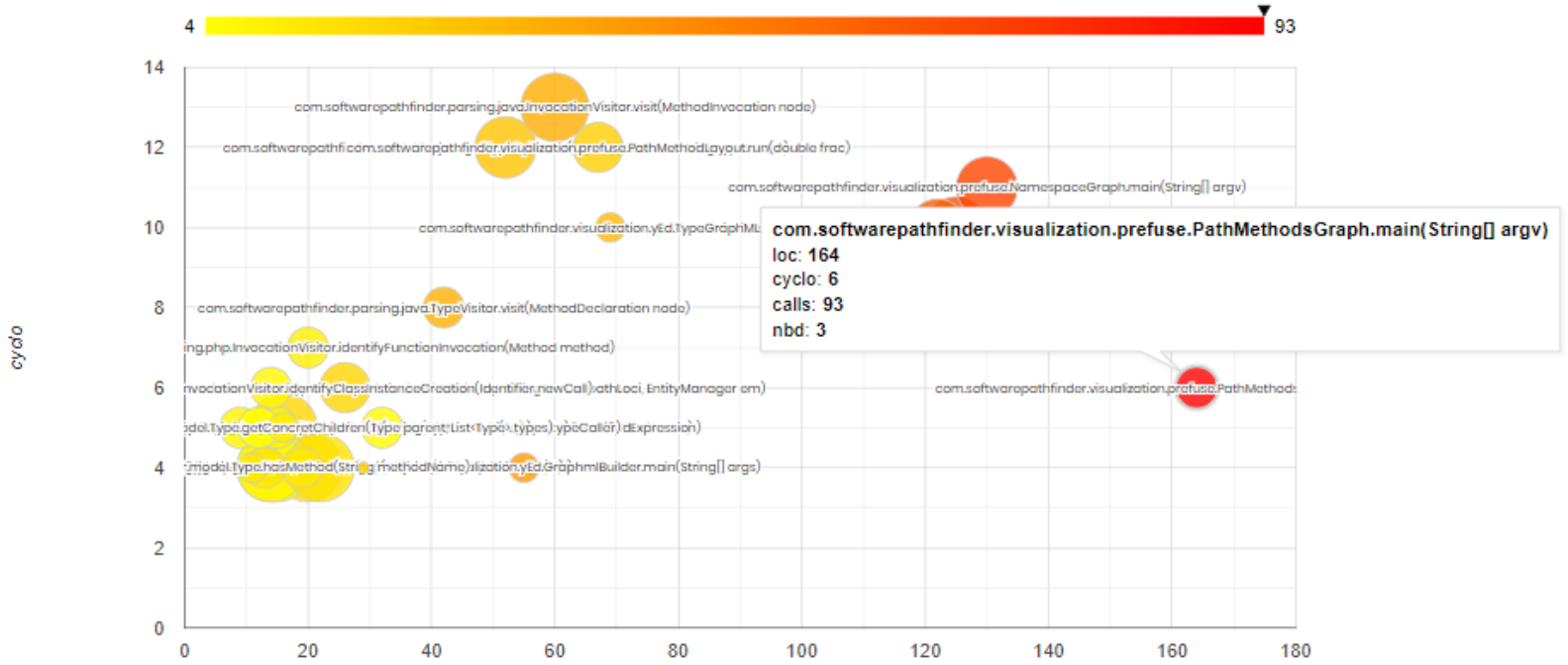
Method Visualization

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



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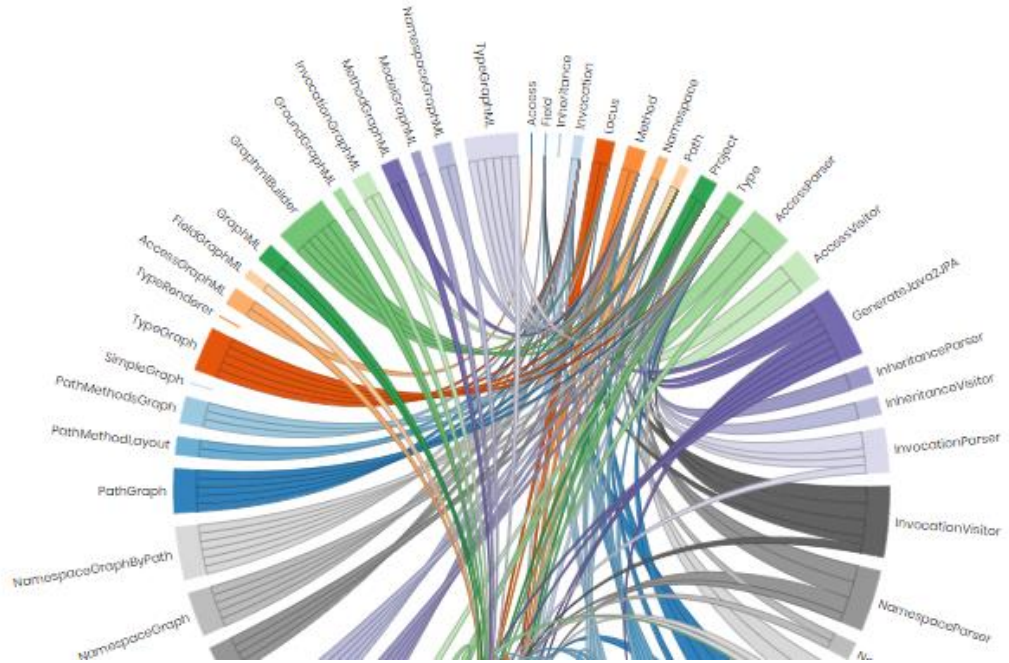
Internal Dependencies Visualization

Internal dependencies between type/classes

Project: Software Pathfinder

Back



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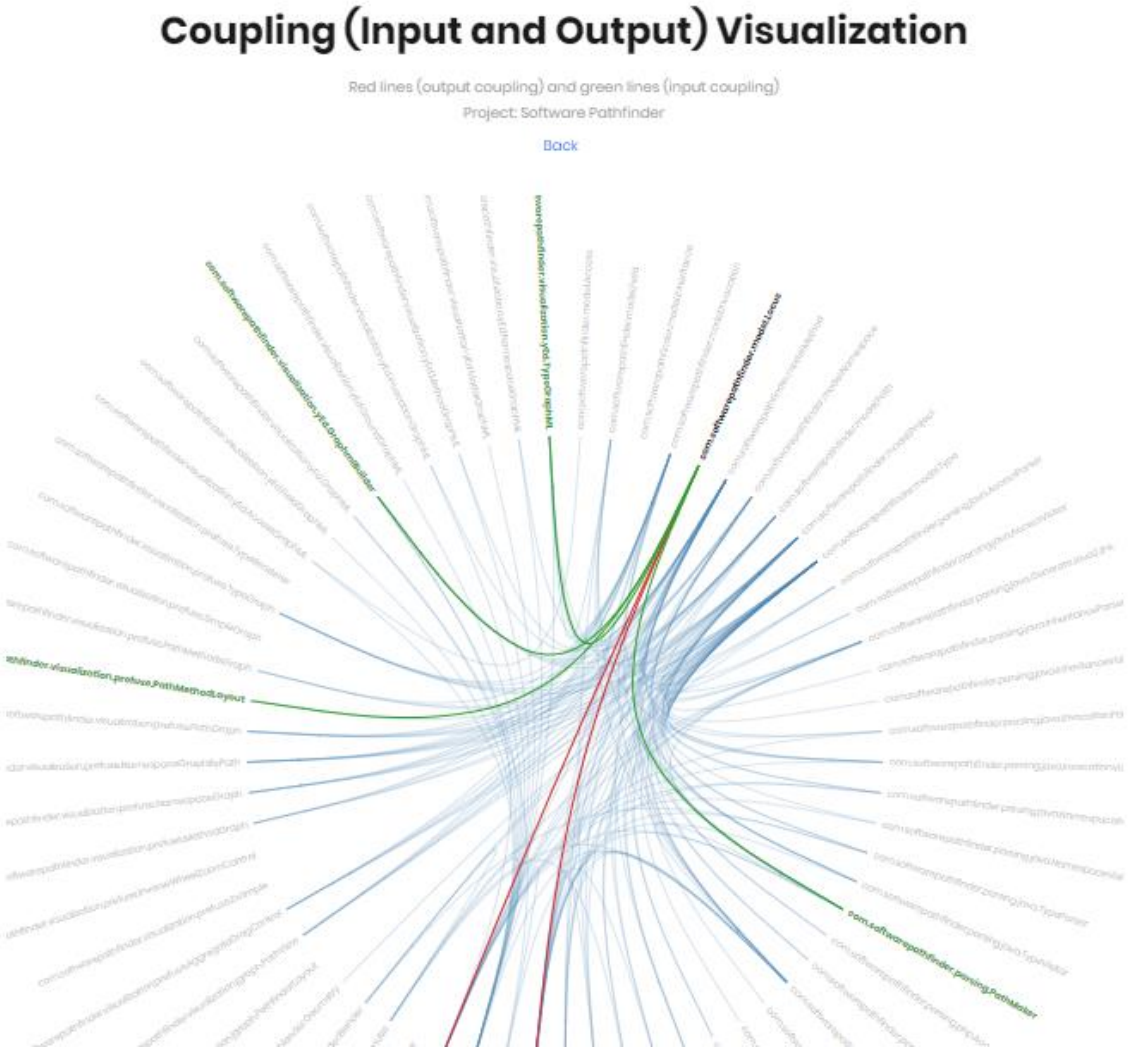
Coupling (Input and Output) Visualization
Red lines (output coupling) and green lines (input coupling)
Project: Software Pathfinder
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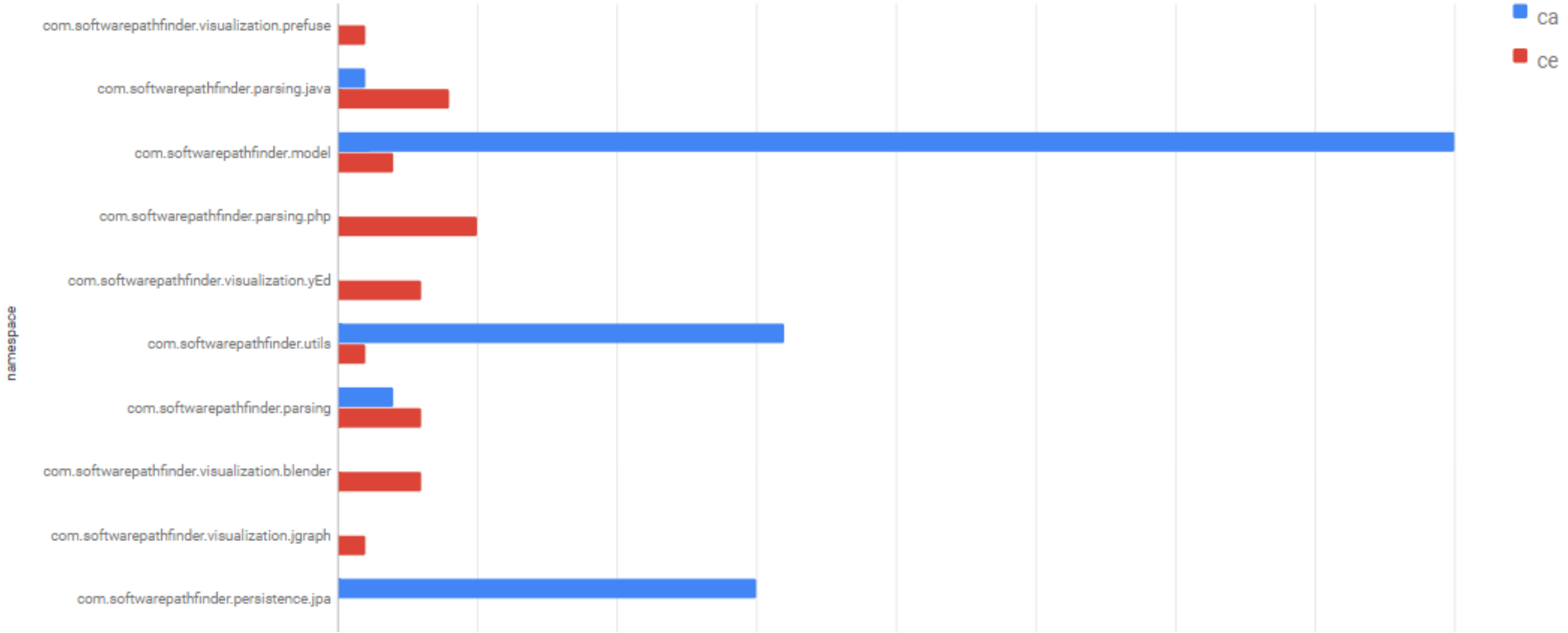
Namespace Coupling Visualization

CA (Afferent Coupling) and CE (Efferent Coupling)

Project: Software Pathfinder

Back



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Instability/Abstractness/Distance Visualization

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

Project: Software Pathfinder

Back

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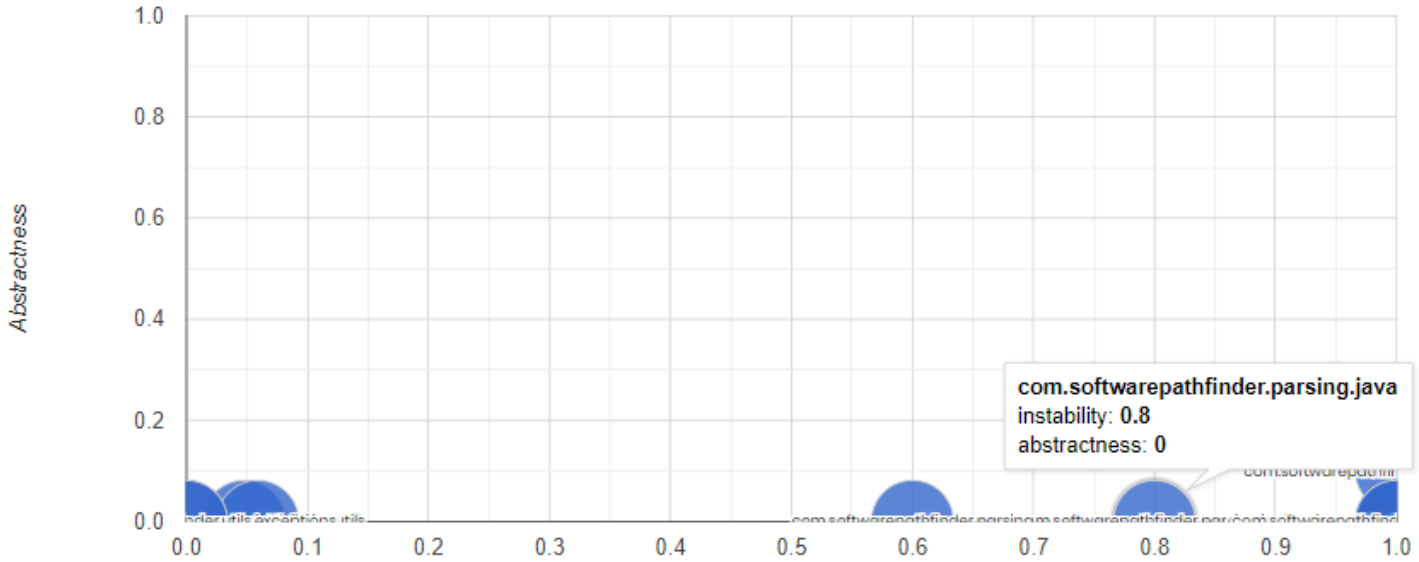
Instability and Abstractness Visualization

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

Project: Software Pathfinder

Back



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32 Heurísticas de Análise

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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

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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

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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

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Heurísticas – Methods

19. **PARAM alto pode ser indicativo de método com baixa coesão**
    Possivelmente é um 'long method'

20. **CYCLO alto e MLOC baixo pode ser um 'complex method'**
    Indicativo de problema de complexidade, legibilidade e entendimento

21. **NBD alto pode ser um 'complex/long method'**
    Indicativo de problema de complexidade, legibilidade e entendimento

22. **CALLS alto pode indicar alto acoplamento**
    Indicativo de problema de várias dependências

23. **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'

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Heurísticas – Coupling (1)

24. **Evite dependência cíclicas**
    Tornam as mudanças complexas e gera a 'síndrome da compilação total'

25. **CA alto pode indicar que o namespace é estável**
    Se ele mudar, vai fazer com que quem dependa dele seja alterado

26. **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

27. **I indica como está a instabilidade do namespace**
    I=0, namespace estável ao máximo; I=1, namespace instável ao máximo

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Heurísticas – Coupling (2)

28. **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

29. **A indica como está o grau de abstração do namespace**

A=0, namespace não tem tipos abstratos; A=1, namespace somente possui tipos abstratos

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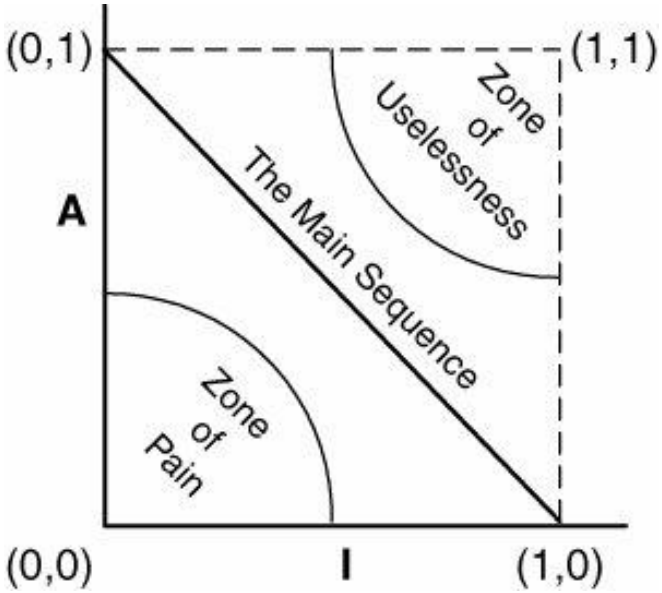
Heurísticas – Coupling (3)



30. **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)

31. **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

32. **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

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Live demo!

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Questões??

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

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