DR-Tools

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

drtools.dev

Quem sou eu?

glacerda@wildtech.com.br
@guilhermeslac

- ✓ 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

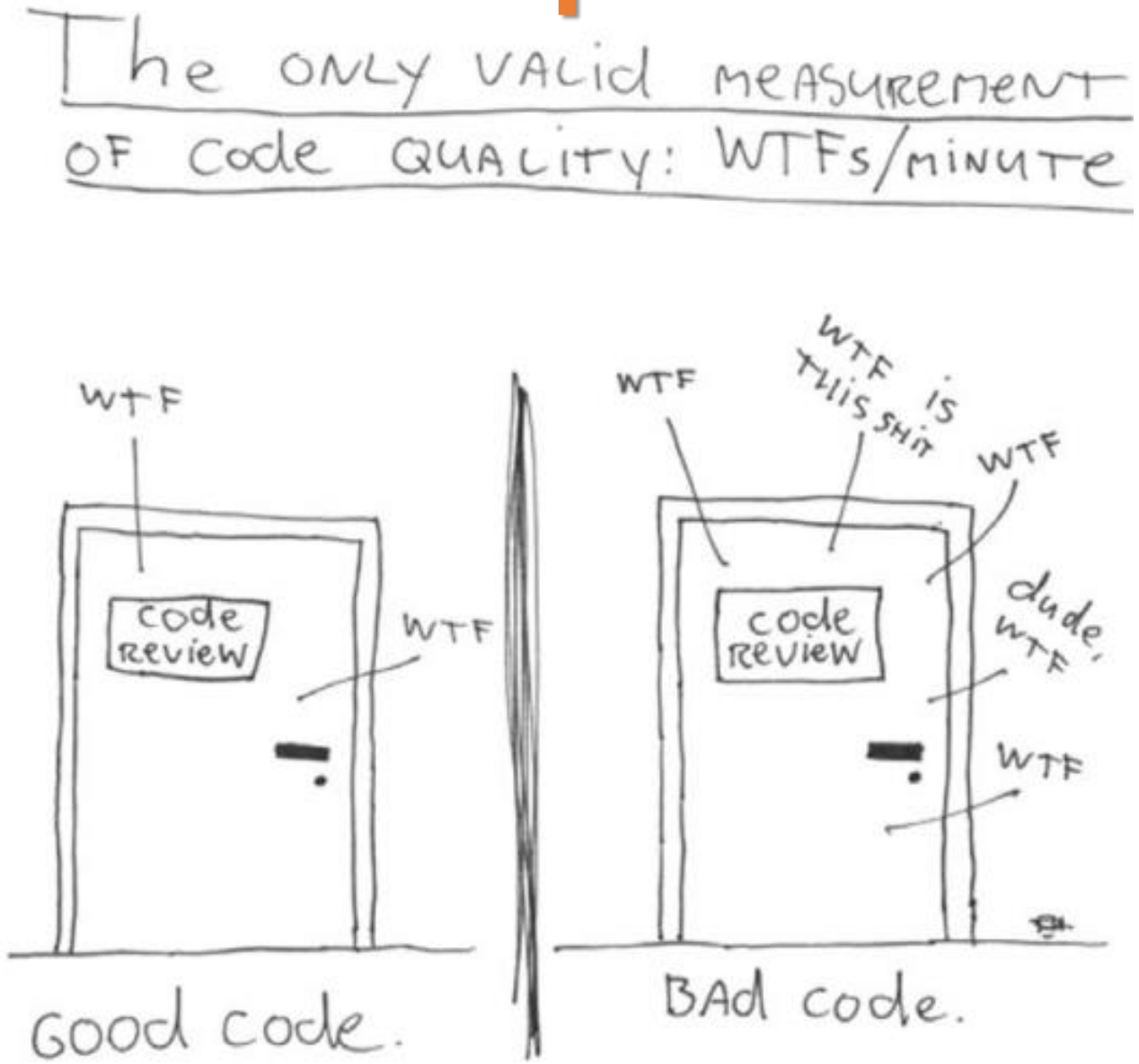
WILDTECH

Por que metáfora da medicina?

metric

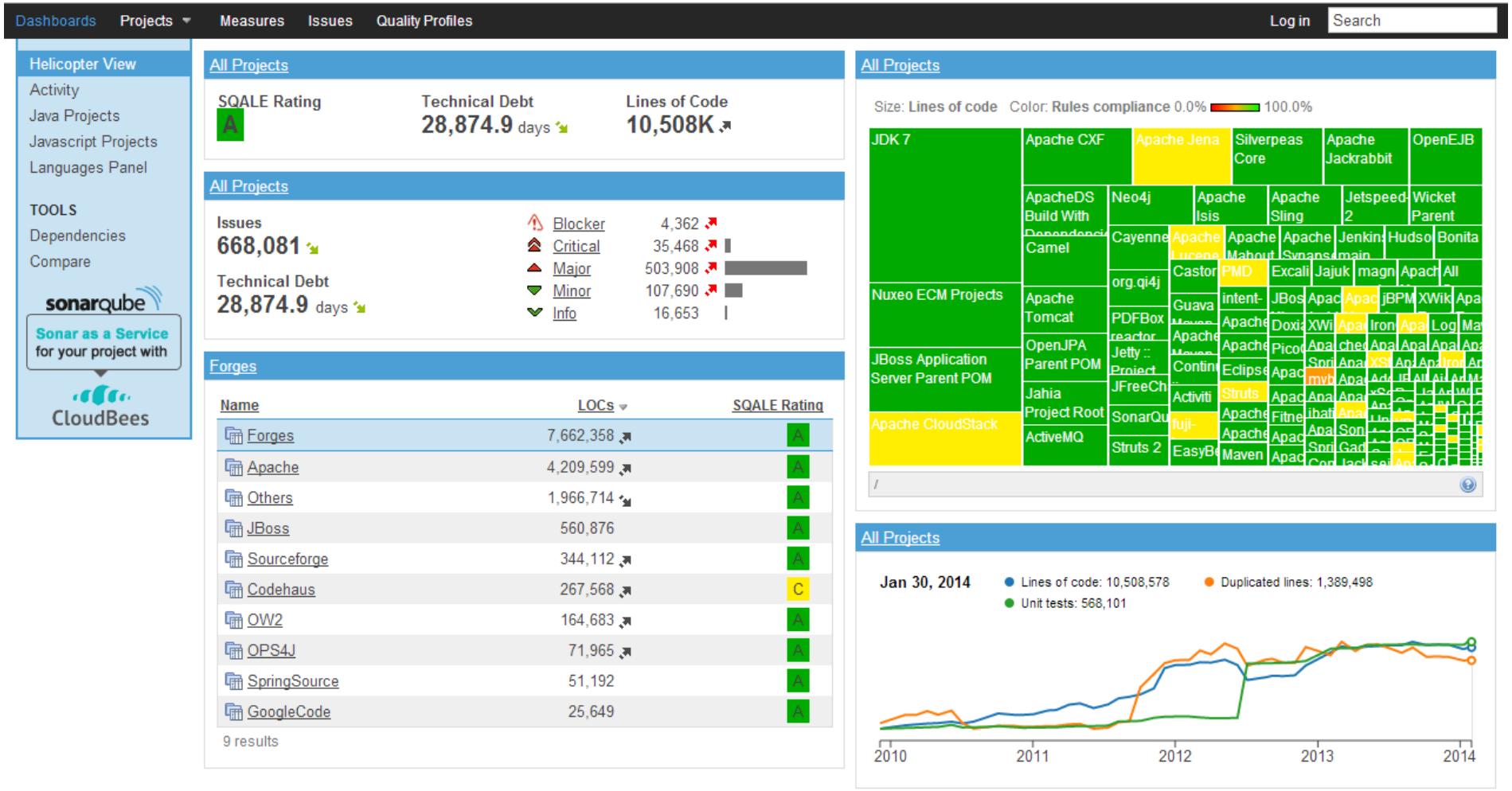
DR-Tools

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

```
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

```
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: 2039 - 52,28 (number of SLOC/types)
             Total of Methods: 269 - 6,90 (number of methods/types)
               Total of CYCLO: 432 - 11,08 (number of CYCLO/types)
      Processing time: 531 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\ -s --console
-----------------
SUMMARY OF METRICS
-----------------
          Total of Namespaces: 1371
               Total of Types: 9954 - 7,26 (number of types/namespaces)
                Total of SLOC: 681725 - 68,49 (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: 24 seconds

C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Doutorado\repos\hibernate-orm-master\ -cd --console | more

------------------------------
Types with Cyclic Dependencies
------------------------------
org.hibernate.Criteria - org.hibernate.criterion.Criterion
org.hibernate.Criteria - org.hibernate.criterion.Order
org.hibernate.Criteria - org.hibernate.criterion.Projection
org.hibernate.boot.MetadataSources - org.hibernate.boot.spi.MetadataBuilderFactory
org.hibernate.boot.model.naming.ObjectNameNormalizer - org.hibernate.boot.spi.MetadataBuildingContext
org.hibernate.boot.registry.StandardServiceRegistryBuilder - org.hibernate.service.spi.ServiceContributor
org.hibernate.boot.spi.MetadataBuilderFactory - org.hibernate.boot.MetadataSources
org.hibernate.boot.spi.MetadataBuildingContext - org.hibernate.boot.model.naming.ObjectNameNormalizer
org.hibernate.bytecode.enhance.spi.interceptor.EnhancementAsProxyLazinessInterceptor - org.hibernate.persister.entity.EntityPersister
org.hibernate.bytecode.enhance.spi.interceptor.EnhancementHelper - org.hibernate.mapping.Property
org.hibernate.cache.cfg.spi.DomainDataRegionBuildingContext - org.hibernate.cache.spi.RegionFactory
org.hibernate.cache.spi.RegionFactory - org.hibernate.cache.cfg.spi.DomainDataRegionBuildingContext
org.hibernate.cache.spi.access.CollectionDataAccess - org.hibernate.persister.collection.CollectionPersister
org.hibernate.cache.spi.access.EntityDataAccess - org.hibernate.persister.entity.EntityPersister
org.hibernate.cache.spi.access.NaturalIdDataAccess - org.hibernate.persister.entity.EntityPersister
org.hibernate.cfg.AnnotationBinder - org.hibernate.cfg.annotations.CollectionBinder
org.hibernate.cfg.Environment - org.hibernate.internal.util.ConfigHelper
org.hibernate.cfg.SetSimpleValueTypeSecondPass - org.hibernate.cfg.annotations.SimpleValueBinder
org.hibernate.cfg.annotations.CollectionBinder - org.hibernate.cfg.AnnotationBinder
org.hibernate.cfg.annotations.SimpleValueBinder - org.hibernate.cfg.SetSimpleValueTypeSecondPass
org.hibernate.collection.spi.PersistentCollection - org.hibernate.engine.spi.SharedSessionContractImplementor
org.hibernate.collection.spi.PersistentCollection - org.hibernate.persister.collection.CollectionPersister
```

Uso

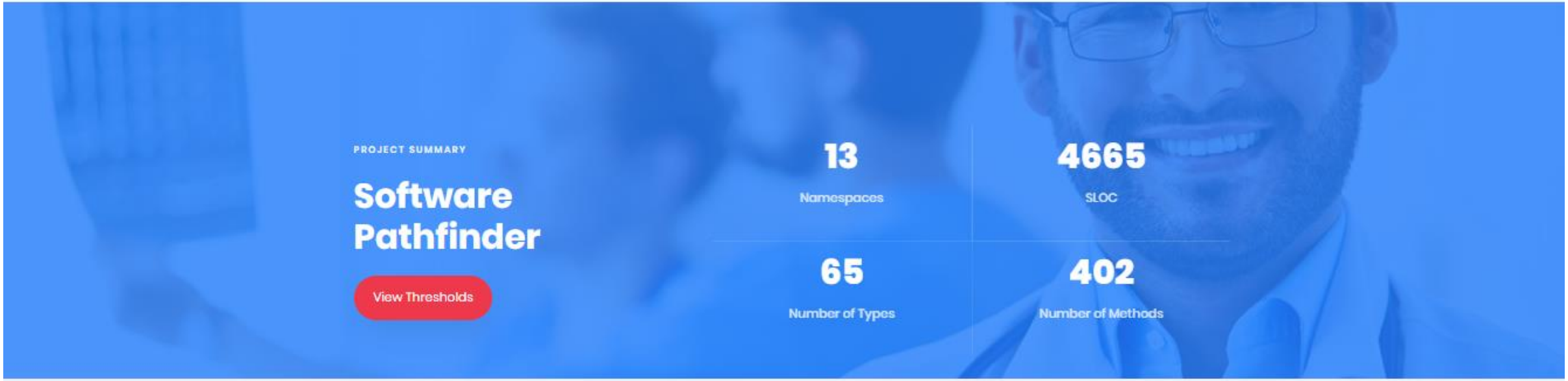
```
C:\Program Files\cmder
λ drtools-metric D:\JavaApps\Doutorado\PathFinder\softwarepathfinder\src\ -t --console --top 30


-------------------------------------------------------------------------------------------------------------
TYPES                                                          SLOC    NOM     NPM     WMC     DEP     I-DEP   NOA
-------------------------------------------------------------------------------------------------------------
om.softwarepathfinder.visualization.prefuse.PathMethodsGraph    141     2       3       6       29      3       0
        com.softwarepathfinder.visualization.jgraph.PathView    116     5       2       13      17      5       4
     com.softwarepathfinder.visualization.yEd.GraphmlBuilder    71      1       1       7       11      6       2
                       com.softwarepathfinder.model.Project     175     14      14      28      11      2       2
       com.softwarepathfinder.visualization.blender.Geometry    51      12      12      12      1       1       6
                        com.softwarepathfinder.model.Field      53      11      11      11      6       0       6
       com.softwarepathfinder.visualization.yEd.TypeGraphML     199     19      9       38      10      6       7
                        com.softwarepathfinder.model.Locus      109     16      16      21      13      2       7
     com.softwarepathfinder.visualization.prefuse.TypeGraph     142     2       3       8       31      5       0
                         com.softwarepathfinder.model.Path      140     16      16      18      11      1       3
        com.softwarepathfinder.parsing.php.InvocationVisitor    181     14      3       46      15      3       5
                    com.softwarepathfinder.model.Namespace      57      8       8       8       12      1       3
 com.softwarepathfinder.visualization.prefuse.NamespaceGraph    114     0       1       11      31      5       0
         com.softwarepathfinder.parsing.java.NamespaceParser    52      2       1       5       11      4       3
om.softwarepathfinder.visualization.prefuse.PathMethodLayout    69      1       1       13      8       2       1
                        com.softwarepathfinder.model.Type       246     37      37      51      14      2       11
      com.softwarepathfinder.visualization.prefuse.PathGraph    92      0       1       2       33      5       0
       com.softwarepathfinder.parsing.java.InvocationVisitor    220     12      10      48      17      5       3
        com.softwarepathfinder.visualization.prefuse.Example    81      2       3       1       22      0       0
                   com.softwarepathfinder.model.Invocation      75      14      14      14      9       1       6
          com.softwarepathfinder.parsing.php.GenerateAstPhp     170     17      1       32      17      12      2
oftwarepathfinder.visualization.prefuse.AggregateDragControl    300     11      8       19      40      5       10
                       com.softwarepathfinder.model.Method      146     26      26      28      14      2       13
oftwarepathfinder.visualization.prefuse.NamespaceGraphByPath    115     0       1       10      32      6       0
    com.softwarepathfinder.visualization.prefuse.MethodGraph    115     0       1       10      31      4       0
            com.softwarepathfinder.parsing.java.TypeVisitor     91      5       5       16      14      5       1
    com.softwarepathfinder.visualization.prefuse.SimpleGraph    80      0       1       2       24      0       2
        com.softwarepathfinder.parsing.java.GenerateJava2JPA    154     8       1       16      16      8       3
                  com.softwarepathfinder.parsing.PathMaker      59      2       1       8       10      7       1
             com.softwarepathfinder.parsing.php.TypeVisitor     97      7       6       15      18      4       4

        Processing time: 899 milliseconds

C:\Program Files\cmder
λ
```

Uso

```
λ drtools-metric D:\JavaApps\Doutorado\PathFinder\softwarepathfinder\src -m --console --top 30

-----------------------------------------------------------------------------------------------------------------------------------------
METHODS                                                                                                  MLOC    CYCLO   CALLS   NBD     PARAM
-----------------------------------------------------------------------------------------------------------------------------------------
                com.softwarepathfinder.visualization.prefuse.NamespaceGraphByPath.main(String[] argv)    125     10      66      6       1
                     com.softwarepathfinder.visualization.prefuse.NamespaceGraph.main(String[] argv)    130     11      69      6       1
.InvocationVisitor.identifyStaticMethodInvocation(Identifier parentReference, Identifier methodName)    13      5       9       3       2
                      com.softwarepathfinder.visualization.prefuse.TypeGraph.main(String[] argv)    151     8       69      5       1
athMaker.calcPath(Type type, Path path, int level, HashMap<String,Locus> pathLoci, EntityManager em)    26      6       19      4       5
                com.softwarepathfinder.model.Project.getTypeByName(Type typeParent, String typeName)    52      12      25      6       2
                     com.softwarepathfinder.parsing.java.TypeVisitor.visit(MethodDeclaration node)    42      8       31      3       1
                com.softwarepathfinder.visualization.prefuse.PathMethodsGraph.main(String[] argv)    164     6       93      3       1
                                    com.softwarepathfinder.visualization.yEd.TypeGraphML.build()    69      10      28      2       0
               com.softwarepathfinder.model.Type.getConcreteChildren(Type parent, List<Type> types)    16      5       10      2       2
                     com.softwarepathfinder.visualization.prefuse.PathMethodLayout.run(double frac)    67      12      21      4       1
               com.softwarepathfinder.parsing.php.InvocationVisitor.visit(FunctionInvocation node)    19      4       12      3       1
     com.softwarepathfinder.parsing.java.InvocationVisitor.visit(VariableDeclarationStatement node)    14      4       10      7       1
      com.softwarepathfinder.parsing.java.InvocationVisitor.visit(ArrayInitializer node)    16      5       18      7       1
           com.softwarepathfinder.parsing.java.InvocationVisitor.visit(Assignment node)    20      4       15      7       1
            com.softwarepathfinder.visualization.yEd.GraphmlBuilder.main(String[] args)    55      4       40      2       1
                                com.softwarepathfinder.model.Type.hasMethod(String methodName)    11      4       12      2       1
                com.softwarepathfinder.visualization.prefuse.MethodGraph.main(String[] argv)    122     10      61      5       1
         com.softwarepathfinder.parsing.java.InvocationVisitor.visit(MethodInvocation node)    60      13      33      7       1
       com.softwarepathfinder.visualization.jgraph.PathView.createEdges(Object pathNode, Path path)    13      4       13      3       2
       com.softwarepathfinder.parsing.java.InvocationVisitor.visit(SuperConstructorInvocation node)    15      4       5       7       1
         com.softwarepathfinder.parsing.java.InheritanceVisitor.makeInterface(TypeDeclaration node)    15      5       8       3       1
            com.softwarepathfinder.parsing.java.InheritanceVisitor.makeParent(TypeDeclaration node)    9       5       8       3       1
     com.softwarepathfinder.parsing.php.InvocationVisitor.identifyFunctionInvocation(Method method)    20      7       10      3       1
m.softwarepathfinder.parsing.php.InvocationVisitor.identifyClassInstanceCreation(Identifier newCall)    14      6       7       3       1
          com.softwarepathfinder.parsing.java.InvocationVisitor.visit(SuperMethodInvocation node)    14      4       7       7       1
                com.softwarepathfinder.model.Locus.getTargets(Invocation invocation, Locus locus)    29      4       18      1       2
 com.softwarepathfinder.parsing.php.InvocationVisitor.doCastNodesOf(Expression identifiedExpression)    32      5       6       3       1
pathfinder.parsing.php.InvocationVisitor.identifyPolymorphicCall(String methodName, Type typeCaller)    12      5       4       3       2
           com.softwarepathfinder.parsing.java.InvocationVisitor.visit(CastExpression node)    22      4       14      7       1

      Processing time: 1 seconds

C:\Program Files\cmder
λ
```

metric visualization DR-Tools

Uso


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

DR-Tools

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

DR-Tools

Uso

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

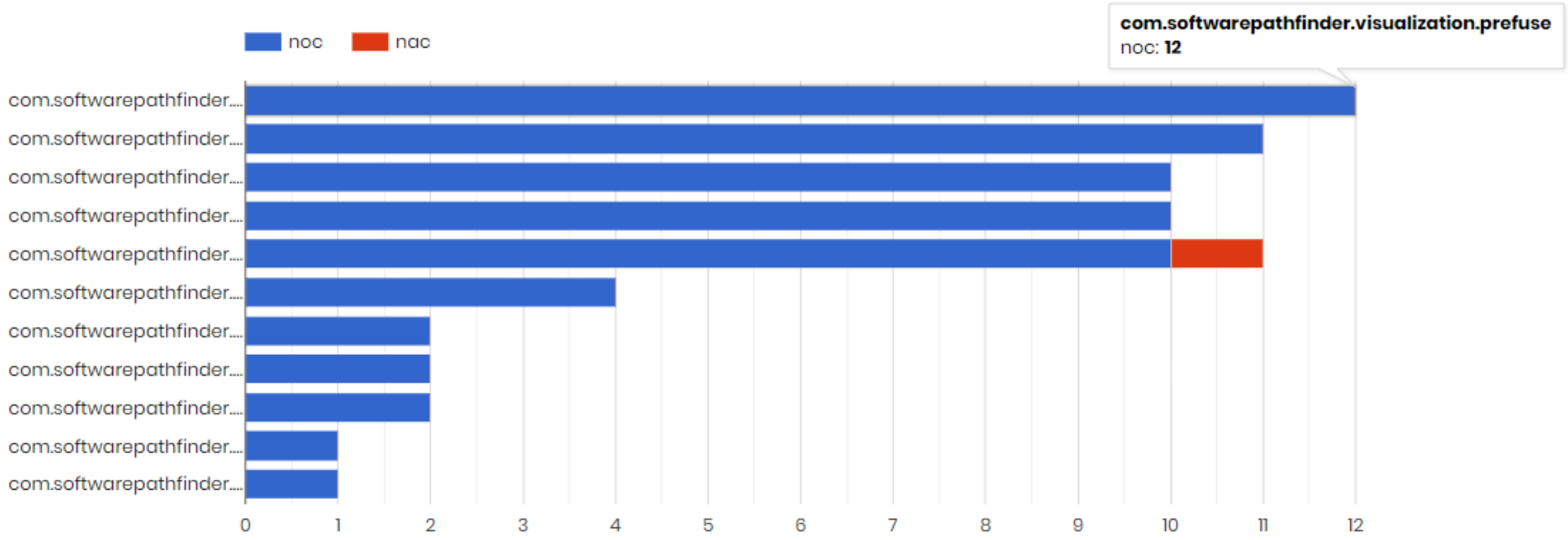
Uso

Namespace Visualization

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

Project: Software Pathfinder

Back



DR-Tools

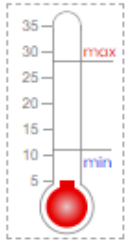
Uso

Thermometer Visualization

Project: Software Pathfinder

Back

Types (types/namespaces)



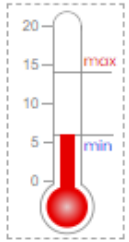
Total of Namespaces: 13

Total of Types: 65

Types/namespaces: 5

Total of SLOC: 4665

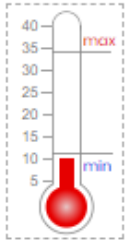
Methods (methods/types)



Total of Methods: 402

Methods/Types: 6

Complexity (WMC/types)



Total of Complexity: 673

Complexity/Types: 10

DR-Tools

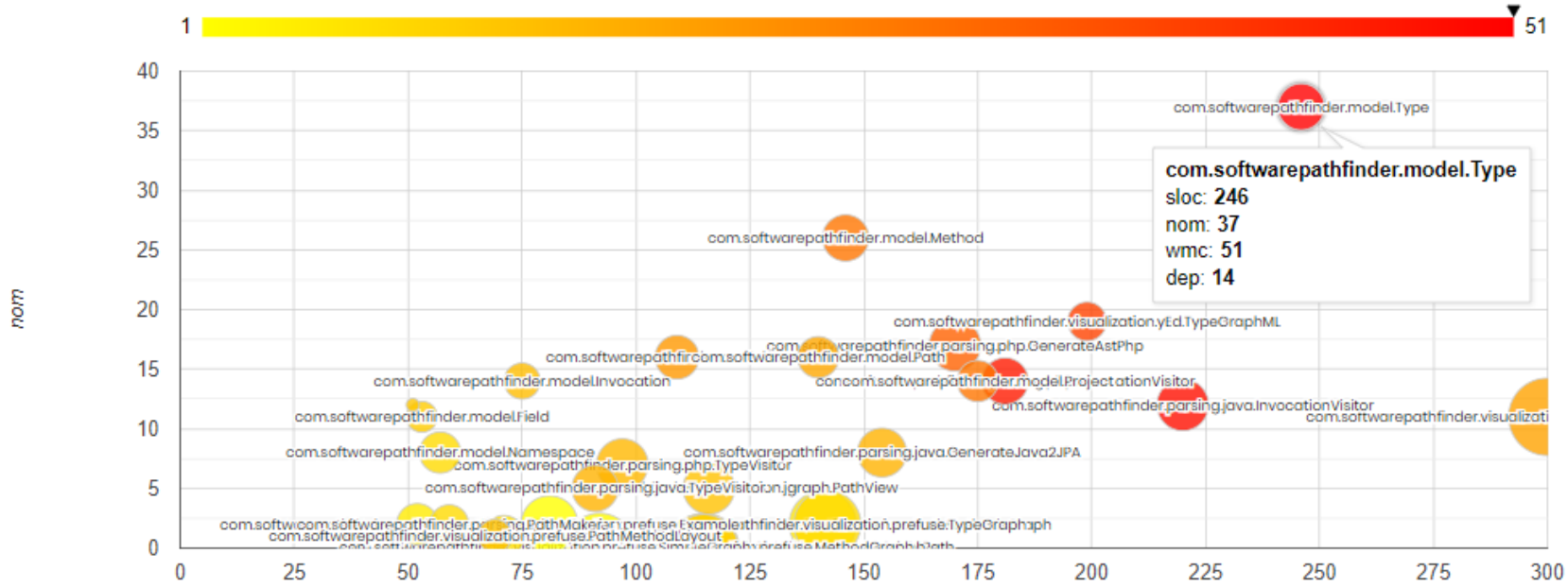
Uso

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

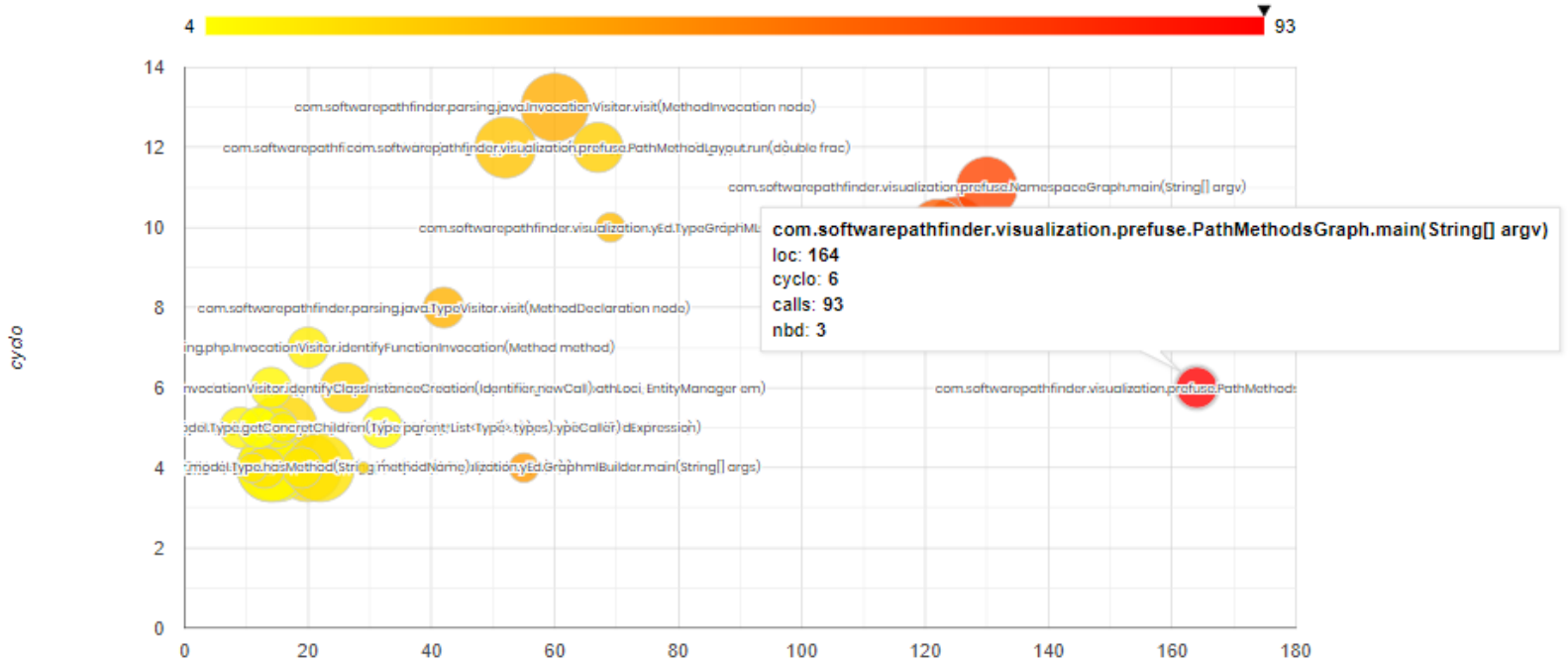
Uso

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

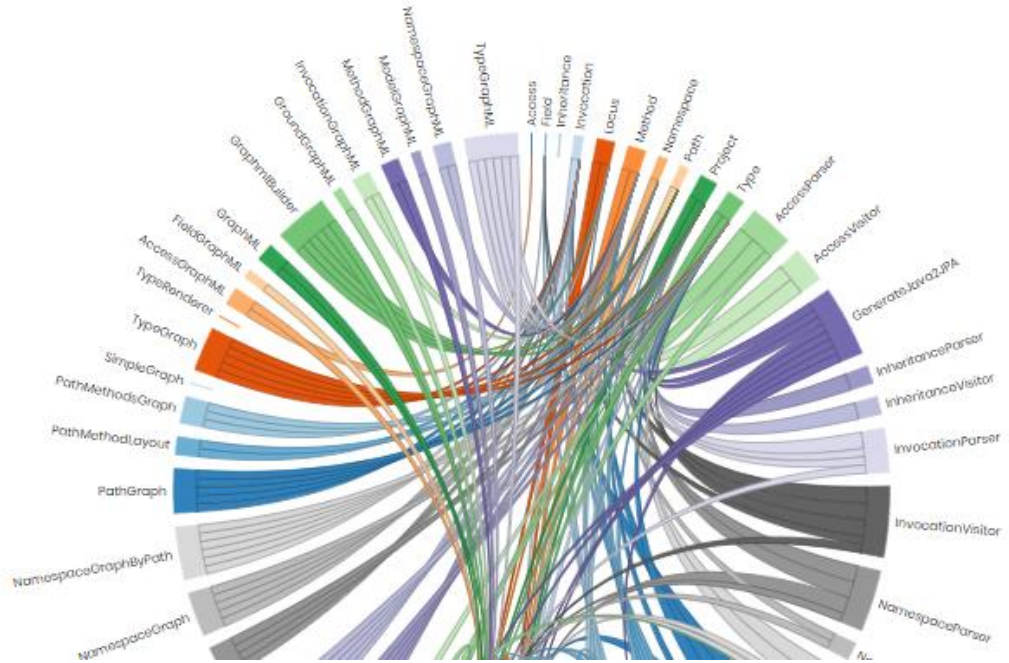
Uso

Internal Dependencies Visualization

Internal dependencies between type/classes

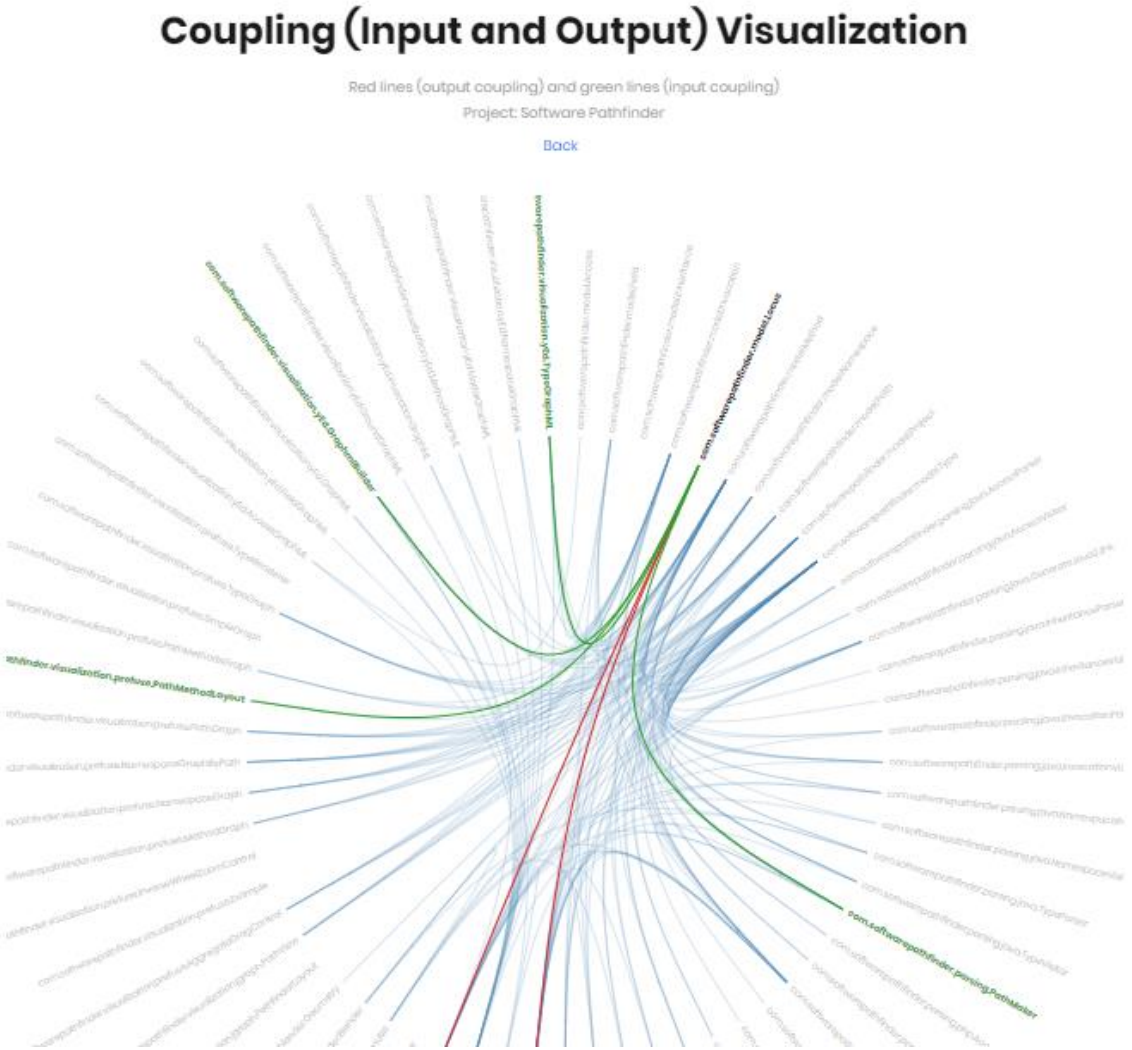
Project: Software Pathfinder

Back



DR-Tools

Uso


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

DR-Tools

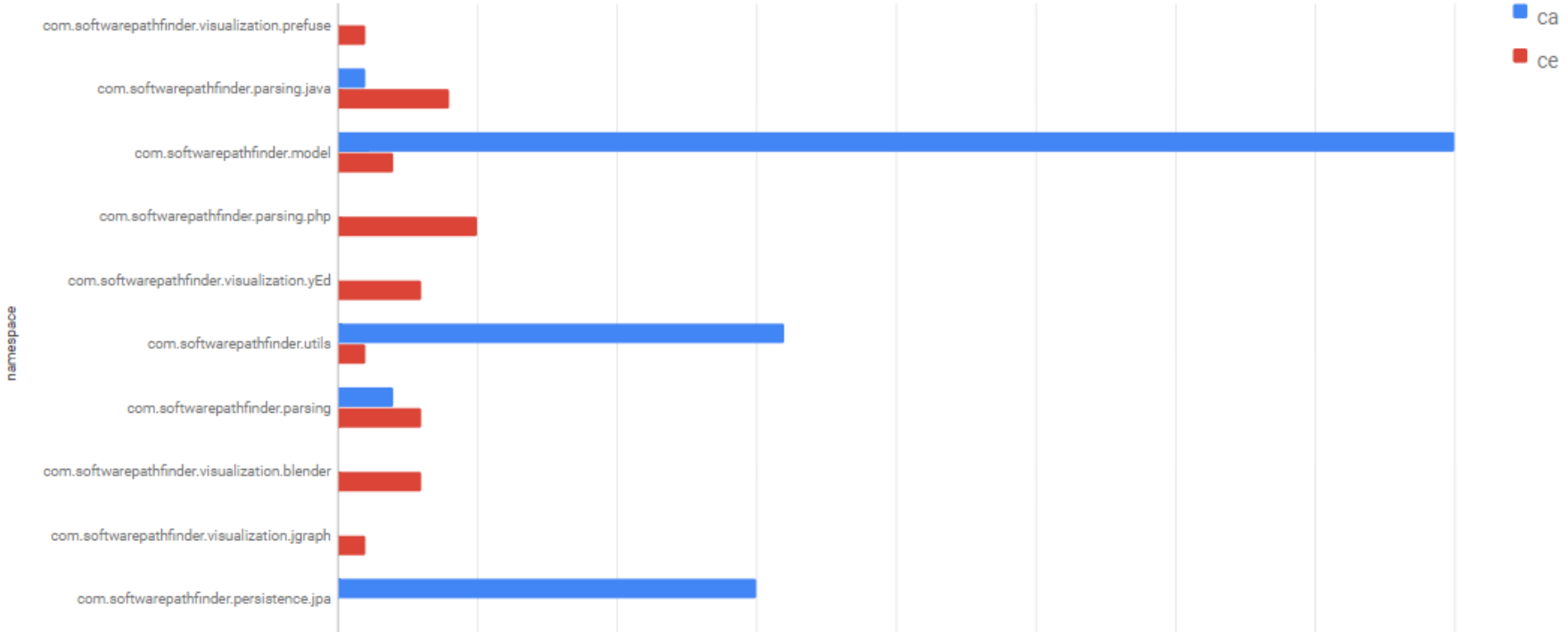
Uso

Namespace Coupling Visualization

CA (Afferent Coupling) and CE (Efferent Coupling)

Project: Software Pathfinder

Back



DR-Tools

Uso

Instability/Abstractness/Distance Visualization

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

Project: Software Pathfinder

Back

DR-Tools

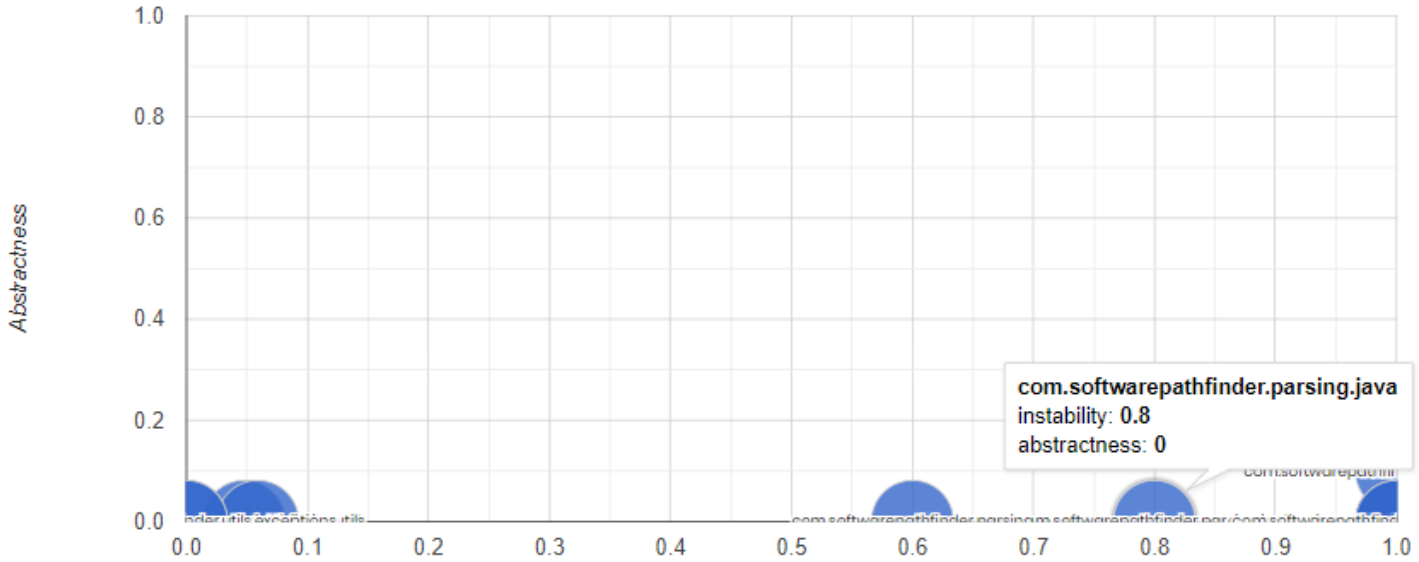
Uso

Instability and Abstractness Visualization

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

Project: Software Pathfinder

Back



DR-Tools

DR-Tools

36 Heurísticas de Análise

drtools.dev

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

DR-Tools

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

DR-Tools

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

DR-Tools

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'

DR-Tools

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

DR-Tools

Heurísticas – Coupling (2)

28. **Se I=0, indica que CA > 0 e CE=0, indica uma estabilidade total**

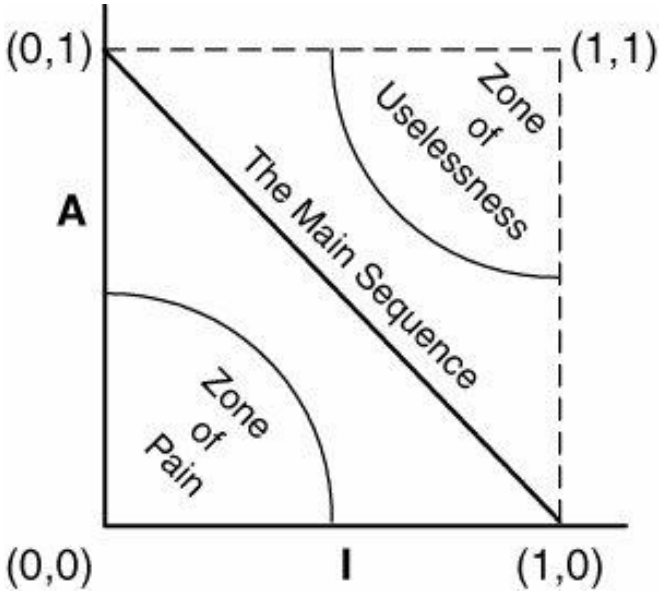
Ele é responsável e independente. Os dependentes tornam difícil alterá-lo e não tem dependência de outros que pode forçar a mudança

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

DR-Tools

Heurísticas – Coupling (3)



30. **Avalie namespaces estáveis e abstratos**

ficam no canto superior esquerdo (I=0; A=1)

31. **Avalie namespaces instáveis e concretos**

ficam no canto inferior direito (I=1; A=0)

32. **Avalie namespaces estáveis e concretos**

ficam no canto inferior esquerdo (I=0; A=0)

Namespaces rígidos, não podem ser estendidos e difíceis de mudar. Exemplos: ORM e utils

33. **Avalie namespaces instáveis e abstratos**

ficam no canto superior direito (I=1; A=1)

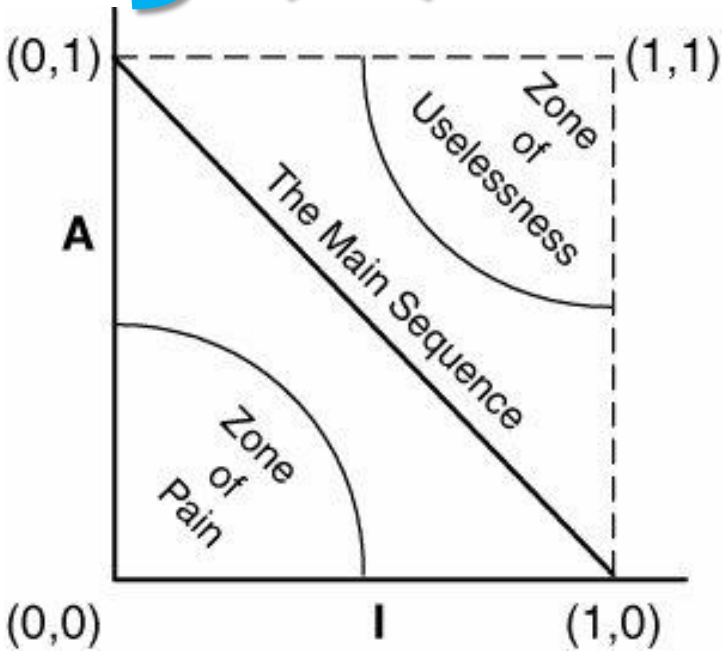
Namespaces abstratos e sem dependentes, sem utilidade

34. **Considere namespaces que estão nas zonas de exclusão**

Zone of Pain e Zone of Uselessness

DR-Tools

Heurísticas – Coupling (4)



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

36. **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 podem indicar quando um namespace está passível de manutenção e menos sensível a mudanças

DR-Tools

Live demo!

DR-Tools

Questões??

DR-Tools

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

drtools.dev