



Analyse und Bewertung von Software Architekturen

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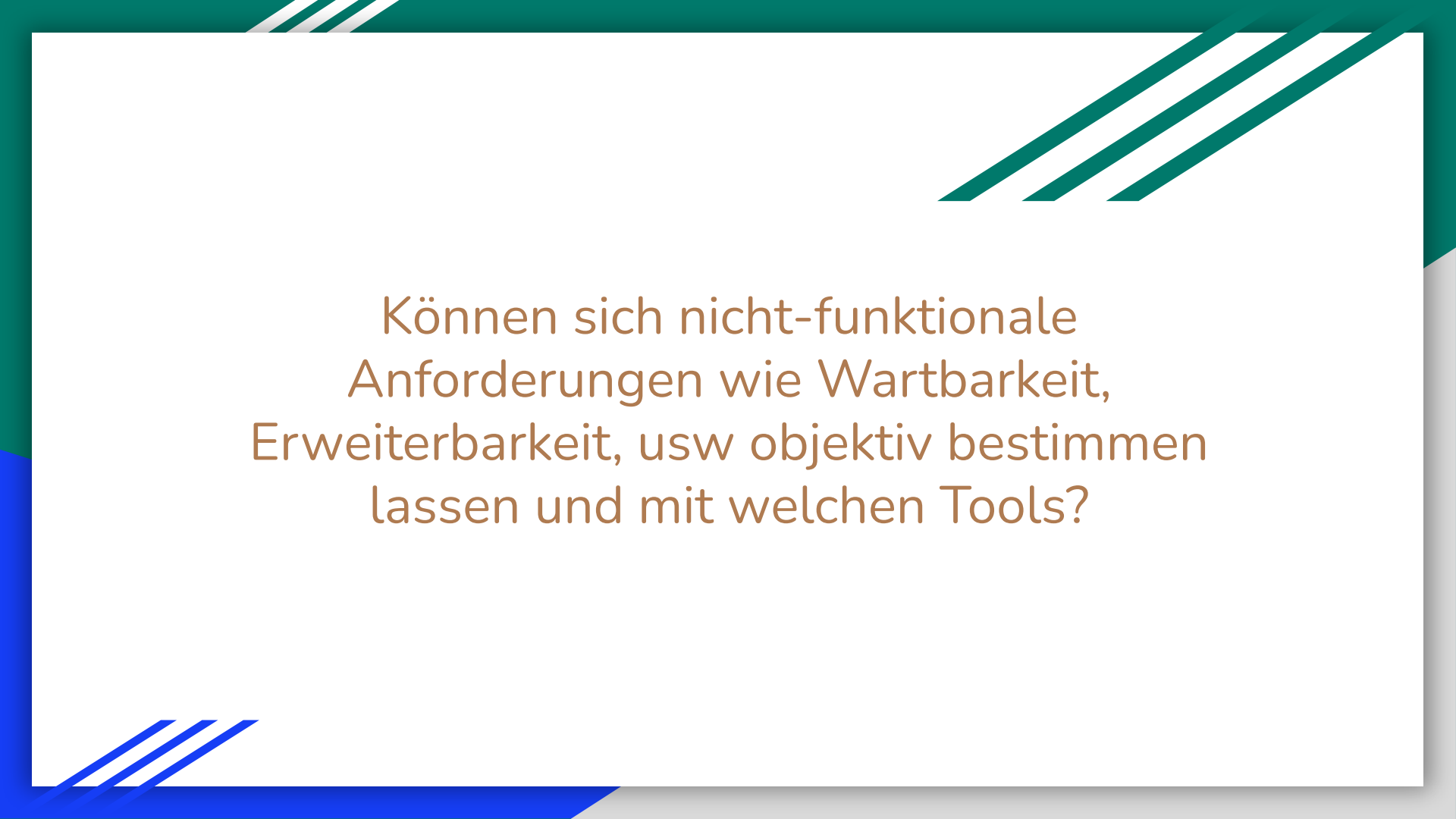


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 - Main sequence line
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 - CodeScene
 - CodeMR
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Ziel und Grundlagen



Können sich nicht-funktionale Anforderungen wie Wartbarkeit, Erweiterbarkeit, usw objektiv bestimmen lassen und mit welchen Tools?

Anforderungen

Funktionale Anforderungen

- Verhalten der Applikation
- Funktionsweise des Benutzers

Nicht-Funktionale Anforderungen

- Qualitätsattribute
- beschwerlichen Benutzer- oder Softwareentwicklererfahrung





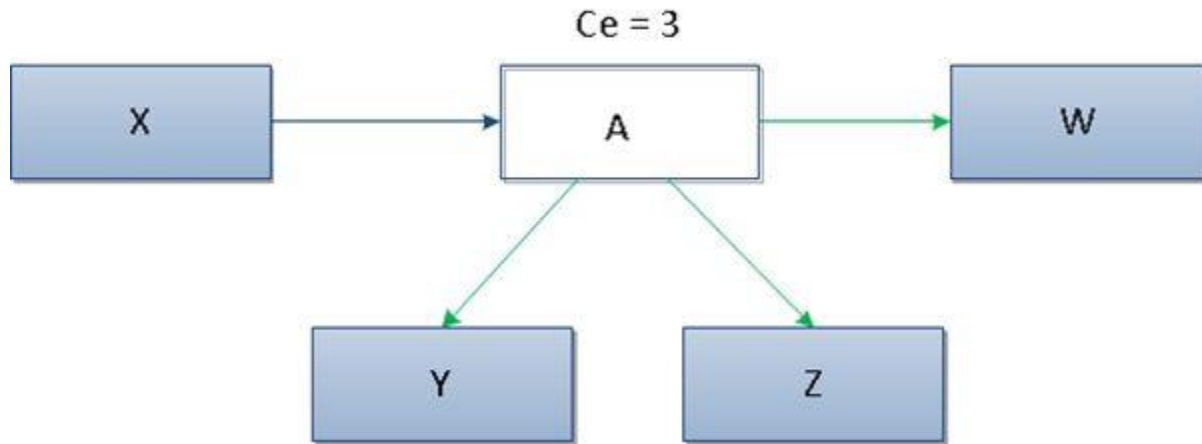


Metriken

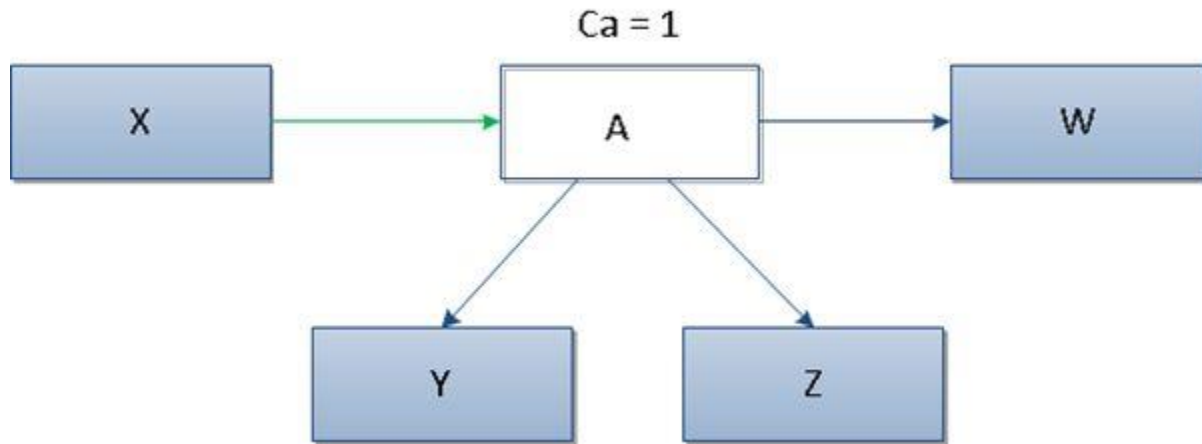
Main sequence line

- Robert Martin
- 1994
- Beziehung zwischen Packages und Klassen

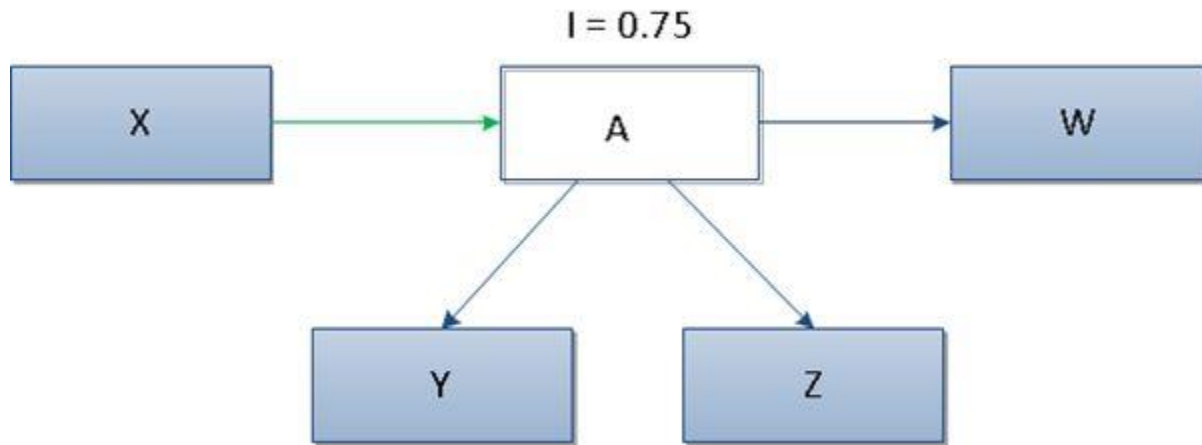
Efferent Coupling



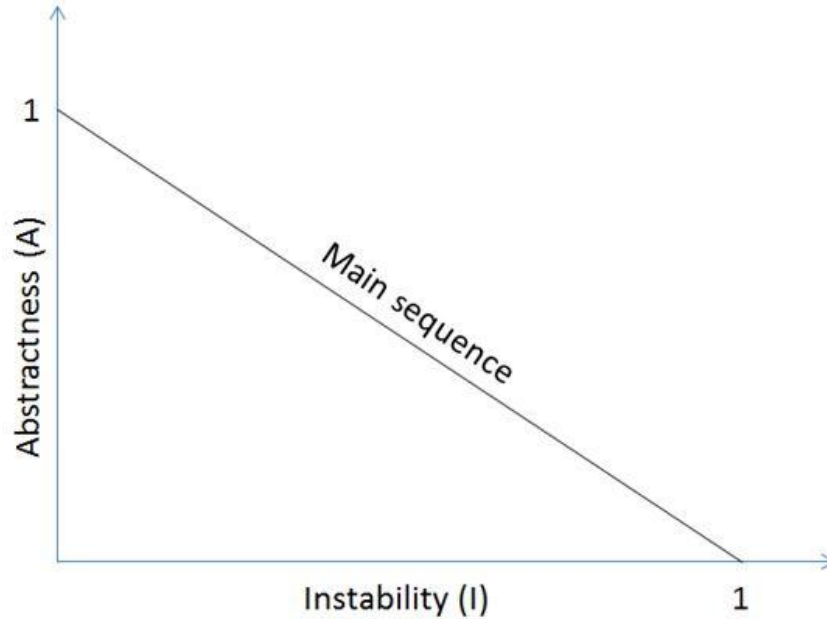
Afferent Coupling



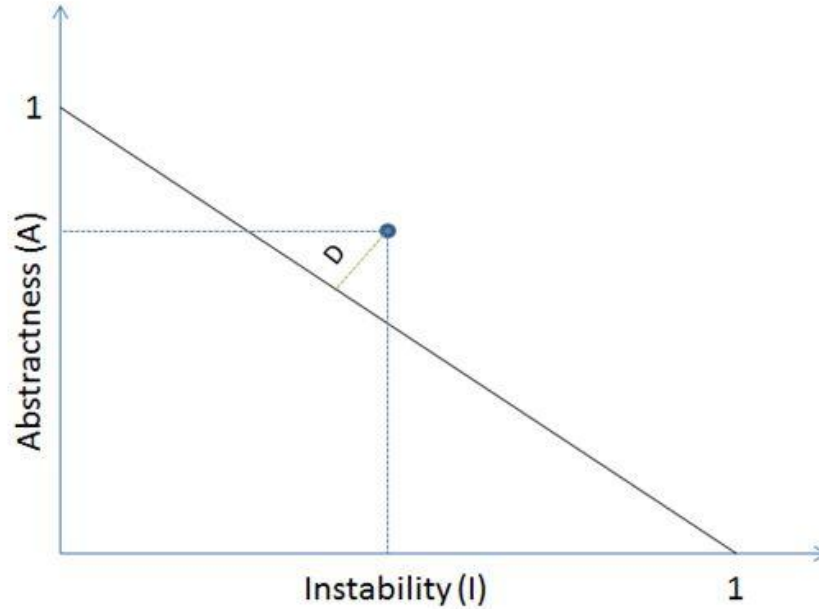
Instability



Abstractness



Normalized Distance from main sequence





Tools

JDepend

- Anzahl Klassen und Interfaces
- Anzahl konkreter Klassen (CC)
- Anzahl abstrakter Klassen (AC)
- Efferent Couplings (Ce)
- Afferent Couplings (Ca)
- Abstractness (A)
- Instability (I)
- Distance from the Main Sequence (D)
- Package Dependency Cycles

JDepend

- UI

The screenshot shows the JDepend application window with the following content:

File

-Depends Upon - Efferent Dependencies (6 Packages)

- epayment.adapters (CC: 2 AC: 0 Ca: 0 Ce: 4 A: 0 I: 1 D: 0)
 - com.abc.epayment
 - com.xyz.epayment
 - epayment.framework
 - epayment.response
 - epayment.framework
- epayment.commands (CC: 5 AC: 0 Ca: 0 Ce: 1 A: 0 I: 1 D: 0)
- epayment.framework (CC: 1 AC: 5 Ca: 5 Ce: 0 A: 0.83 I: 0 D: 0.17)
- epayment.processor (CC: 2 AC: 0 Ca: 0 Ce: 1 A: 0 I: 1 D: 0)
- epayment.request (CC: 1 AC: 0 Ca: 0 Ce: 1 A: 0 I: 1 D: 0)
- epayment.response (CC: 1 AC: 0 Ca: 1 Ce: 1 A: 0 I: 0.5 D: 0.5)

-Used By - Afferent Dependencies (8 Packages)

- com.abc.epayment (CC: 0 AC: 0 Ca: 1 Ce: 0 A: 0 I: 0 D: 1)
 - epayment.adapters
- com.xyz.epayment (CC: 0 AC: 0 Ca: 1 Ce: 0 A: 0 I: 0 D: 1)
- epayment.adapters (CC: 2 AC: 0 Ca: 0 Ce: 4 A: 0 I: 1 D: 0)
- epayment.commands (CC: 5 AC: 0 Ca: 0 Ce: 1 A: 0 I: 1 D: 0)
- epayment.framework (CC: 1 AC: 5 Ca: 5 Ce: 0 A: 0.83 I: 0 D: 0.17)
 - epayment.adapters
 - epayment.commands
 - epayment.processor
 - epayment.request
- epayment.response (CC: 1 AC: 0 Ca: 1 Ce: 1 A: 0 I: 0.5 D: 0.5)
 - epayment.processor (CC: 2 AC: 0 Ca: 0 Ce: 1 A: 0 I: 1 D: 0)
 - epayment.request (CC: 1 AC: 0 Ca: 0 Ce: 1 A: 0 I: 1 D: 0)
 - epayment.response (CC: 1 AC: 0 Ca: 1 Ce: 1 A: 0 I: 0.5 D: 0.5)

epayment.adapters (CC: 2 AC: 0 Ca: 0 Ce: 4 A: 0 I: 1 D: 0)

JDepend

- UI
- XML

```
1 <?xml version='1.0'?>
2 <JDepend>
3   <Packages>
4     <Package name='ch.soobr.cockpit.service.identity'>
5       <Stats>
6         <TotalClasses>7</TotalClasses>
7         <ConcreteClasses>6</ConcreteClasses>
8         <AbstractClasses>1</AbstractClasses>
9         <Ca>2</Ca>
10        <Ce>31</Ce>
11        <A>0.14</A>
12        <I>0.94</I>
13        <D>0.08</D>
14        <V>1</V>
15      </Stats>
16
17      <AbstractClasses>
18        <Class sourceFile='VerificationProvider.java'>
19          ch.soobr.cockpit.service.identity.VerificationProvider
20        </Class>
21      </AbstractClasses>
22
23      <ConcreteClasses>
24        <Class sourceFile='IdentityService.java'>
25          ch.soobr.cockpit.service.identity.IdentityService
26        </Class>
27        <Class sourceFile='IdentityServiceTest.java'>
28          ch.soobr.cockpit.service.identity.IdentityServiceTest
29        </Class>
30        <Class sourceFile='VerificationService.java'>
31          ch.soobr.cockpit.service.identity.VerificationService
32        </Class>
33        <Class sourceFile='VerificationService.java'>
34          ch.soobr.cockpit.service.identity.VerificationService$1
35        </Class>
36        <Class sourceFile='VerificationSmsProvider.java'>
37          ch.soobr.cockpit.service.identity.VerificationSmsProvider
38        </Class>
39        <Class sourceFile='VerificationTotpProvider.java'>
40          ch.soobr.cockpit.service.identity.VerificationTotpProvider
41        </Class>
42      </ConcreteClasses>
43    </Package>
44  </Packages>
45 </JDepend>
```

JDepend

- UI
- XML
- Text

```
-----  
- Package: jdepend.framework  
-----
```

Stats:

```
Total Classes: 35  
Concrete Classes: 31  
Abstract Classes: 4
```

```
Ca: 3
```

```
Ce: 2
```

```
A: 0.11
```

```
I: 0.4
```

```
D: 0.49
```

Abstract Classes:

```
jdepend.framework.AbstractParser  
jdepend.framework.MockAbstractClass  
jdepend.framework.MockInterface  
jdepend.framework.ParserListener
```

Concrete Classes:

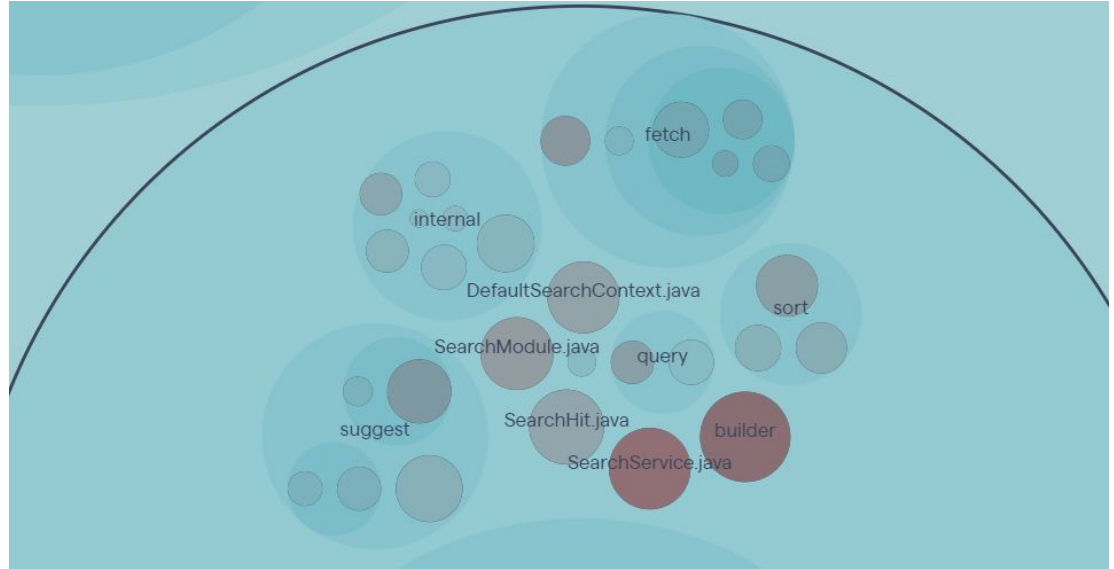
```
jdepend.framework.AllTests  
jdepend.framework.ClassFileParser  
jdepend.framework.ClassFileParser$AttributeInfo  
jdepend.framework.ClassFileParser$Constant  
jdepend.framework.ClassFileParser$FieldOrMethodInfo  
jdepend.framework.ClassFileParserTest
```

CodeScene

- technische und soziale Aspekte
- Mischung diverser Metriken

CodeScene

- Hotspots



CodeScene

- Hotspots
- Code Health



CodeScene

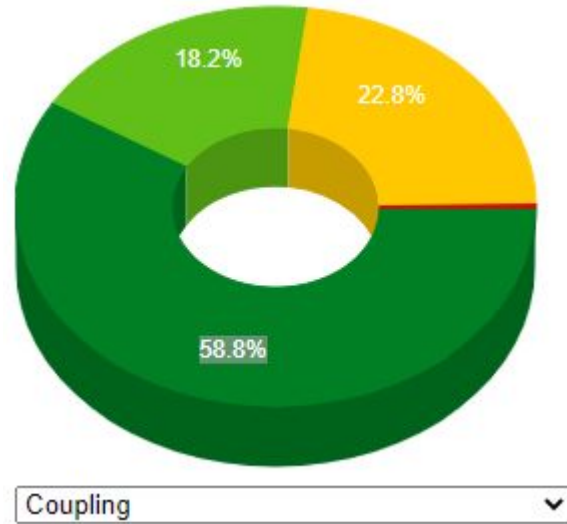
- Hotspots
- Code Health
- Change Coupling
- Knowledge distribution

CodeMR

- Grösse
 - Class Lines of Code (CLOC)
 - Number of Methods (NOM)
- Komplexität
 - Weighted Method Count (WMC)
 - Depth of Inheritance Tree (DIT)
- Coupling
 - Number of Children (NOC)
 - Efferent Coupling (EC)
- Cohesion
 - Lack of Cohesion of Methods (LCOM)

CodeMR

- Verteilung



CodeMR

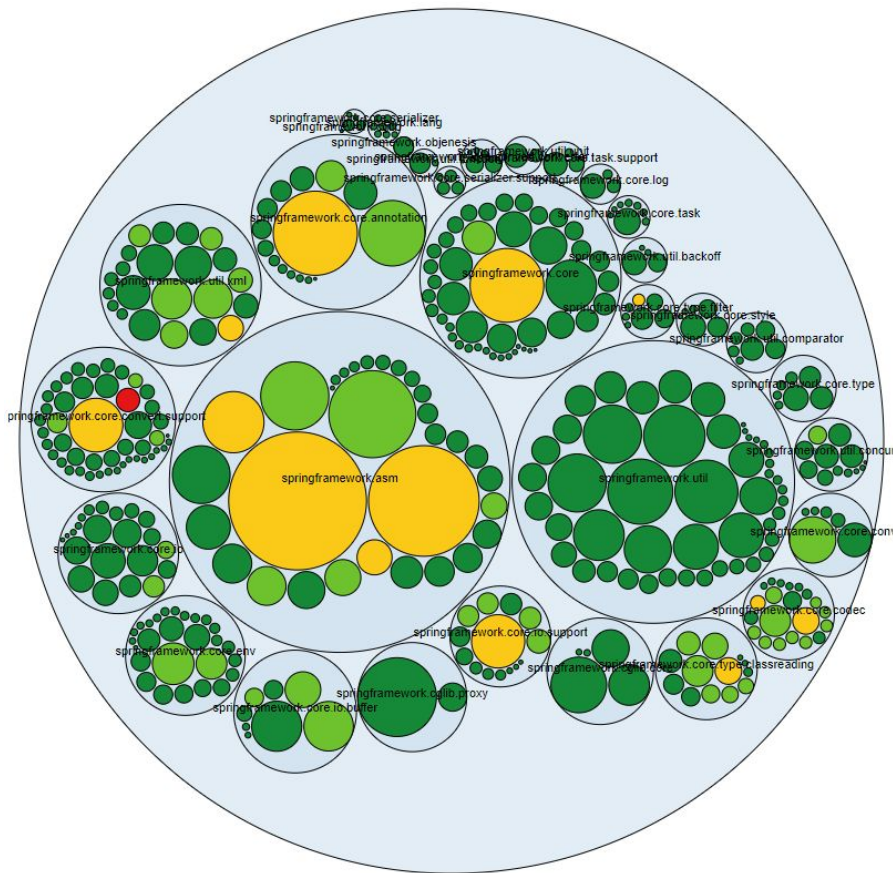
- Verteilung
- Package Übersicht

Metric Selection

Coupling

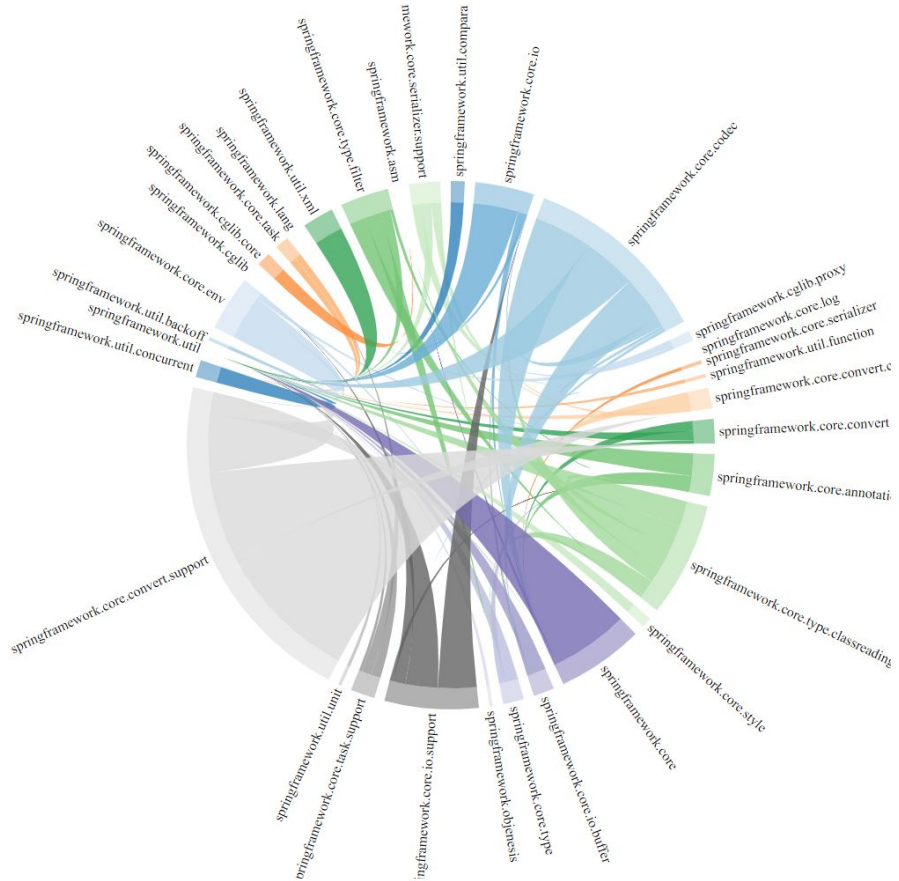


click to zoom, for detailed metrics, press ctrl or ⌘ while hovering



CodeMR

- Verteilung
- Package Übersicht
- Package Dependencies





Fazit

Fazit

- nicht-funktionale Anforderungen bestimmen möglich
- diverse Metriken
 - Main sequence line
 - Chidamber and Kemerer
- Tools
 - JDepend (rudimantär)
 - CodeScene (Vermengung)
 - CodeMR (Visualisierung)



Fragen