

# Test Driven Development und Continuous Integration

Mai 2017





iPoint

# 1. Motivation

Software wird zur Benutzung freigegeben, nicht wenn sie nachweislich korrekt ist, sondern wenn die Häufigkeit, mit der neue Fehler entdeckt werden, auf ein für die Geschäftsleitung akzeptables Niveau gesunken ist.

- *David L. Parnas*

## What's New in Version 2.80

- You can now 3D Touch on the app icon, channel list, and team directory for shortcuts and to both peek \*and\* pop. NB: Only available on phones with 3D Touch. We are not responsible for screens in other dimensions.
- Search Assist is now spiffier and speedier, with extra modifiers to better assist your searching.
- Pinned Items can now be added, removed and, most importantly, viewed while on the move.
- Individual channels can now, mercifully, be muted from their Channel Settings menu.
- In fact, full notifications preferences are now available on iOS, making it easier for everyone to adjust notification levels to suit them, whenever and wherever they like.

- Fixed: You can now long press on items within Starred Items to unstar them, and render them simply "Items", humility is a good thing.
- Fixed: Previously, unacceptably, resending a failed message with a custom emoji broke the custom emoji. We fixed it.
- Fixed: We cleaned up the copy that was displayed when inviting a new user to a channel so the channel name isn't duplicated because attention to detail is important.
- Fixed: Uploading an image using "Use Last Photo Taken" method was generating duplicates in your camera roll, making the last photo taken the next photo too. It no longer does this.
- Fixed: The message input field was playing peekaboo behind the keyboard if you started a search with the keyboard up. Cute, we told it; but not cool. It stopped immediately.

# Grundproblem



- Komplexe Modell
- Komplexe Interaktionen
- Viele Anforderungen
- Wenig Zeit
- Viel Konkurrenz
- Fehler sind kostspielig

- Beweistechniken
- Semantikdefinitionen
- Zeit aufwändig
- Schlecht Abdeckung

Nur bei kleinen Programmen anwendbar



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## 2. Testing

IEEE Std. 610.12-1990:

- (1) An activity in which a system or component is executed under specified conditions, the results are observed or recorded, and an evaluation is made of some aspect of the system or component.
- (2) To conduct an activity as in (1).



Aber...



```
1 public boolean isEven ( byte number ) {  
2     return number % 2 == 0;  
3 }
```

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1 public boolean isEven ( byte number ) {  
2     return number % 2 == 0;  
3 }
```

```
1 public int calcGcd ( int x, int y ) {  
2     return (y == 0) ? x : gcd ( y, x % y );  
3 }
```

Testen kann immer nur die Anwesenheit aber nie die Abwesenheit von Fehlern zeigen.  
- *Edsger Dijkstra*

## Spezifikation

Der GGT von zwei Zahlen 'a' und 'b' ist:

- a, falls  $b = 0$
- $\text{ggT}(b, a \bmod b)$ , sonst

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Zahl A	Zahl B	GGT
10	0	10
10	10	10
69	8	1
77	11	11

## Spezifikation

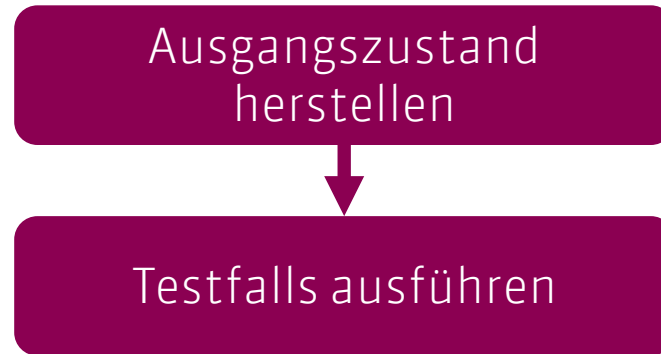
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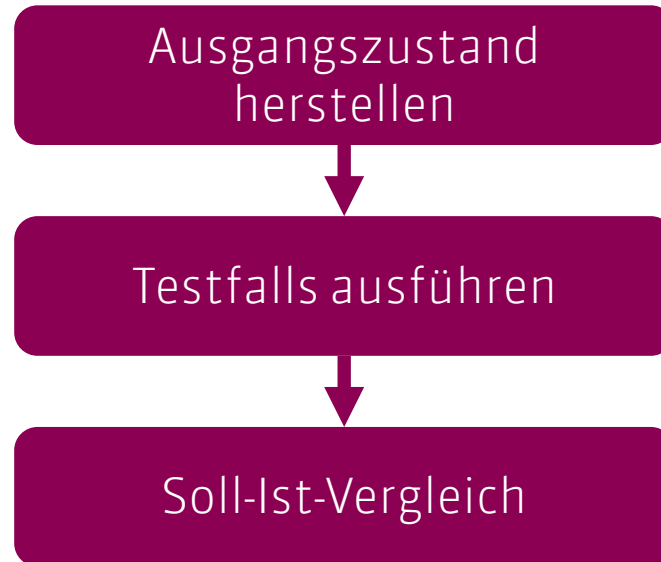
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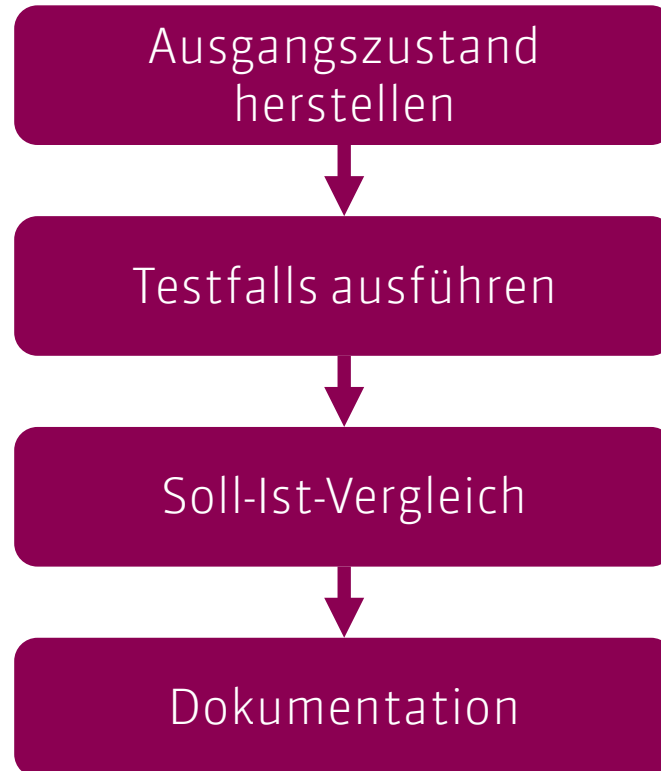
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Ausgangszustand  
herstellen

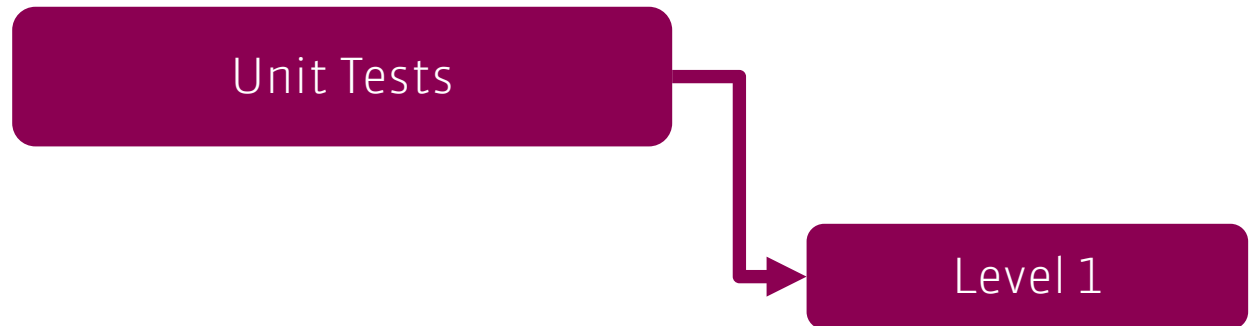


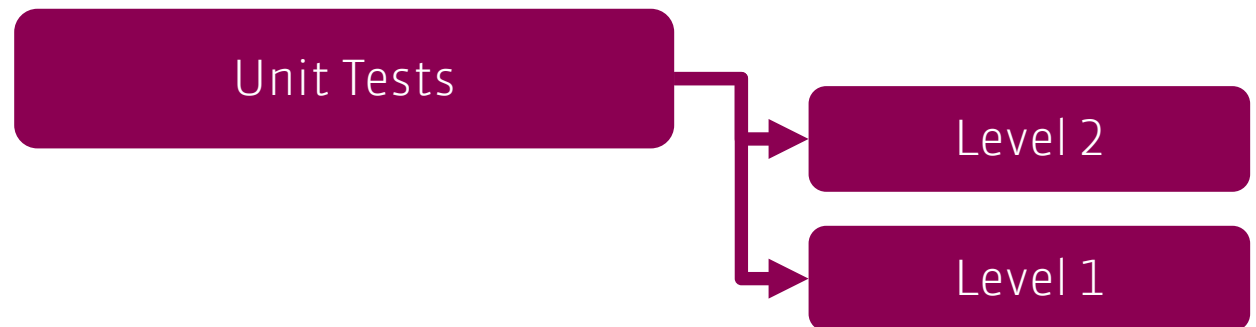


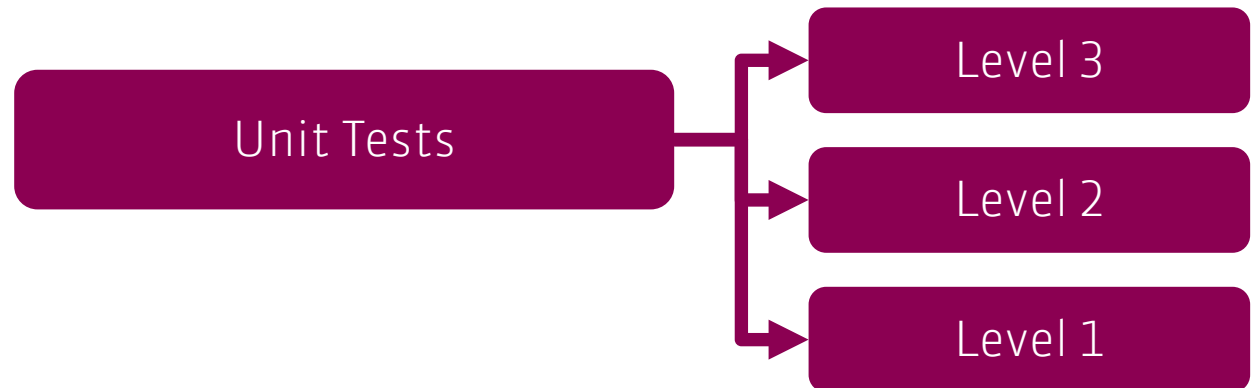


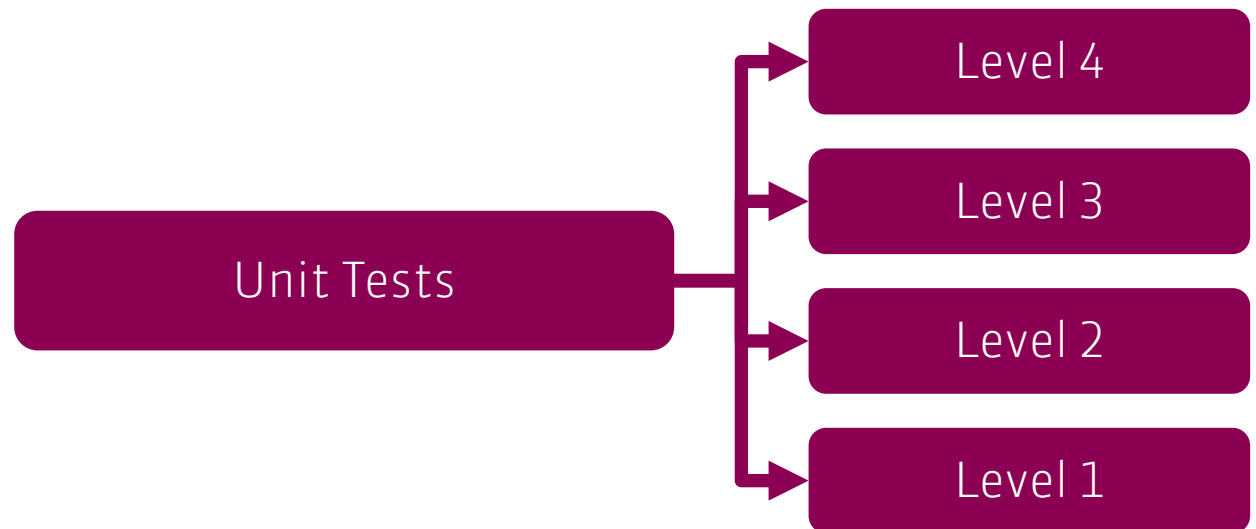


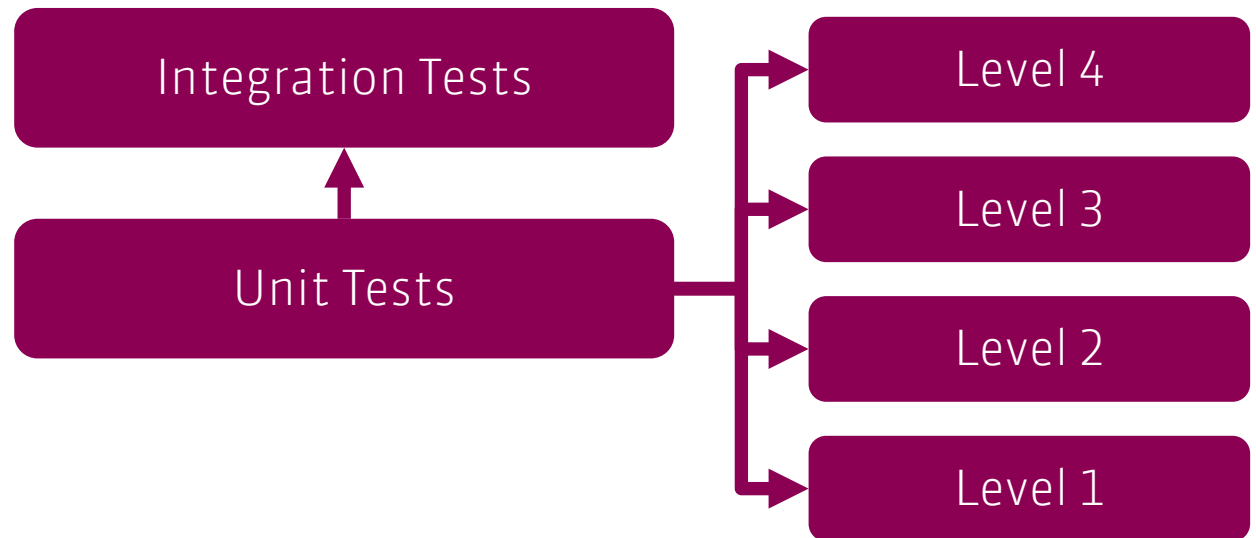
Unit Tests



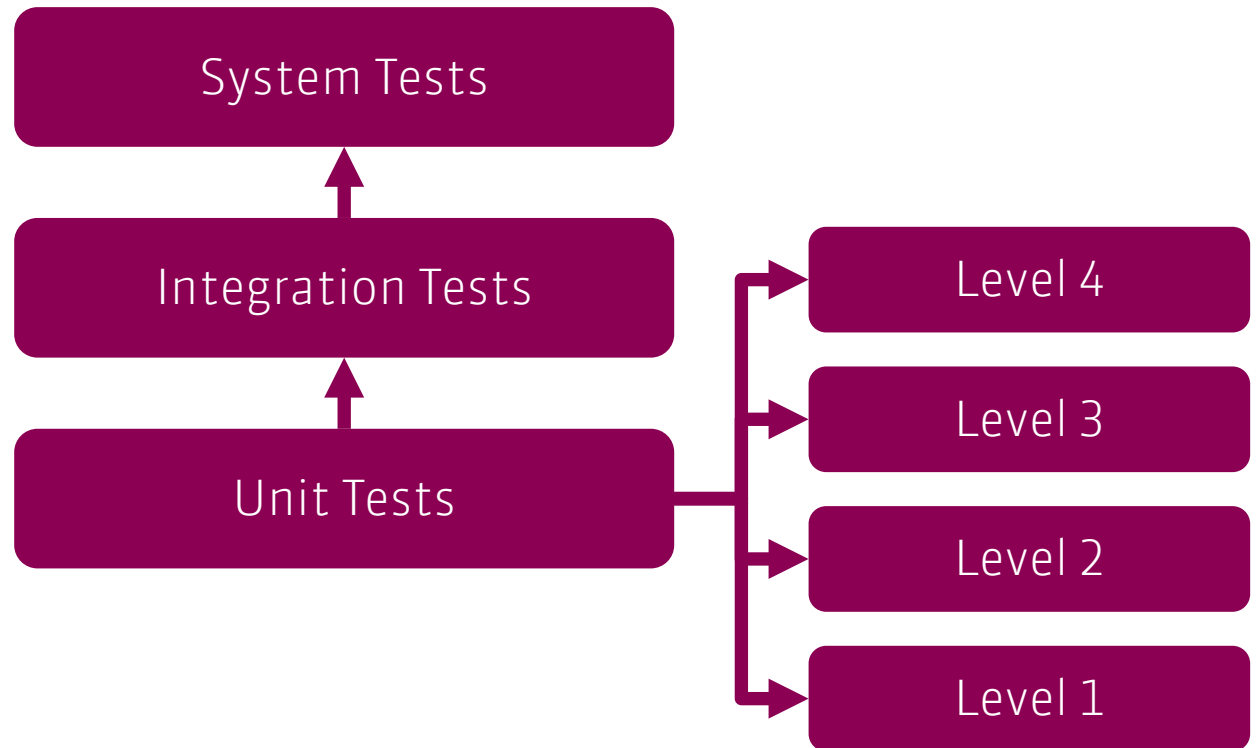


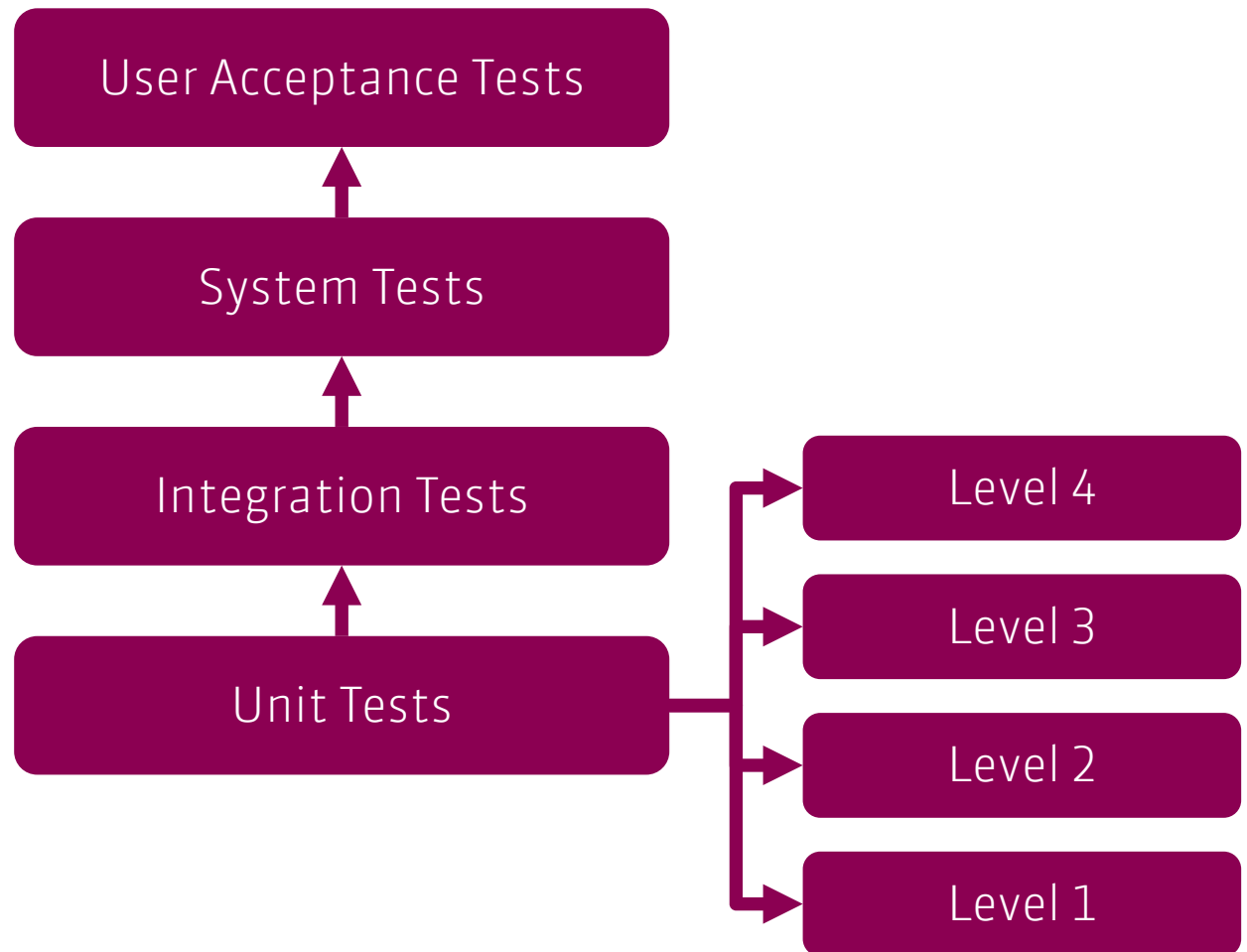










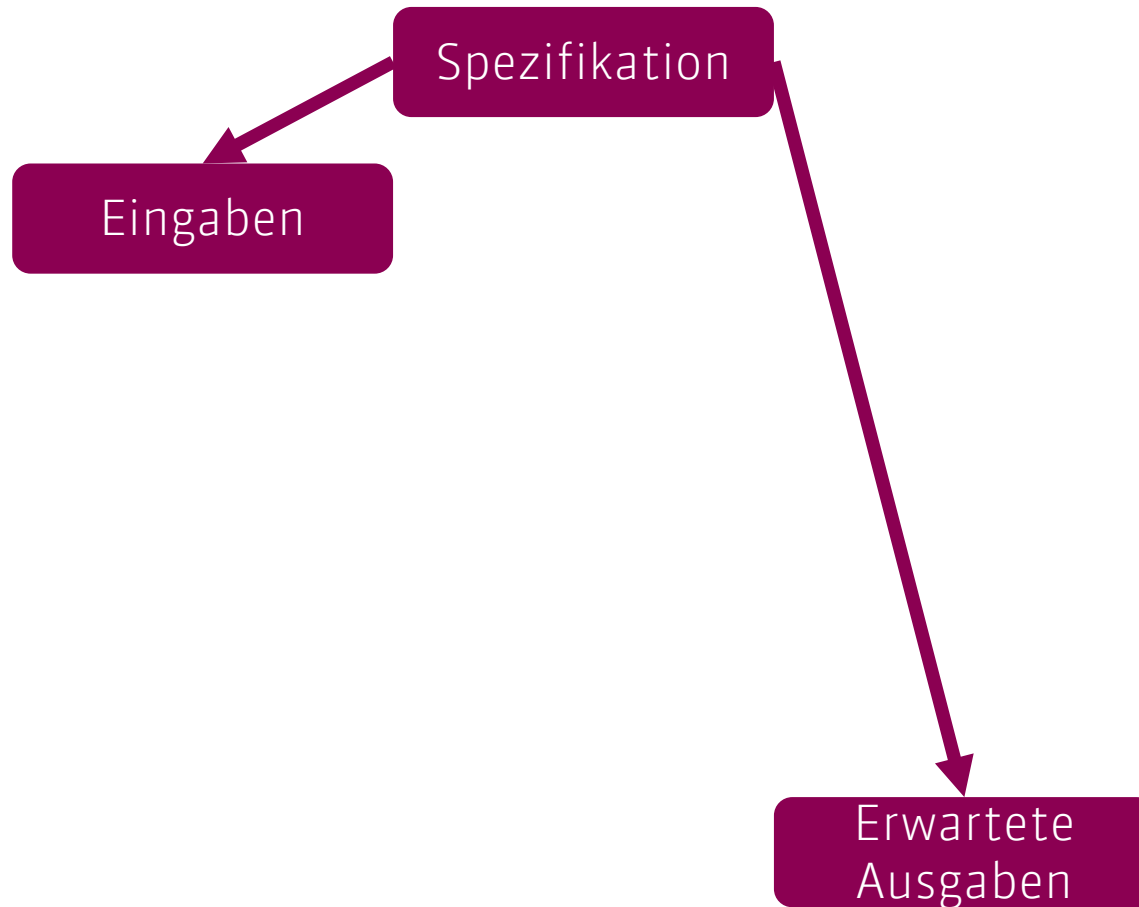


# Tools

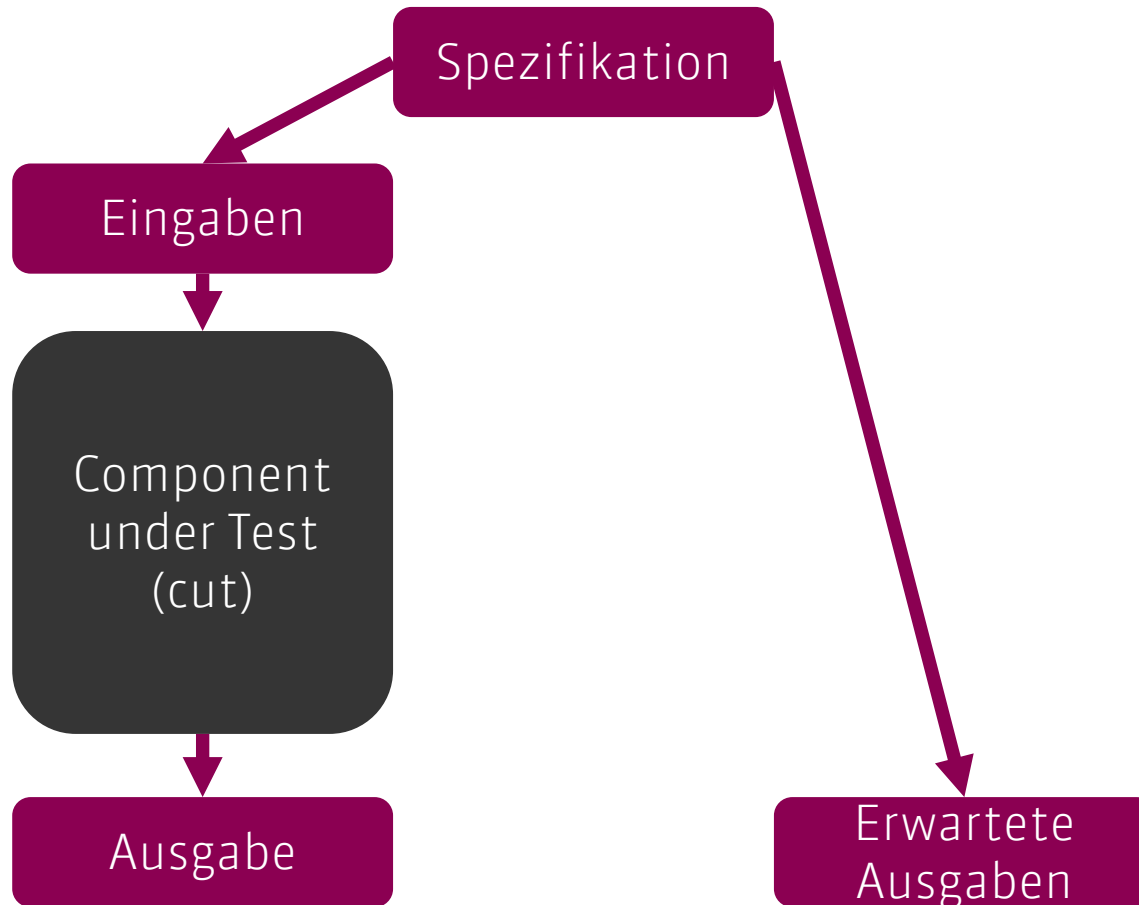


- Unit Test Framework: JUnit 4 + Hamcrest
- Mocking Framework: Mockito
- Code Quality: PMD, Findbugs, Checkstyle
- Code Coverage: Atlassian Clover, JaCoCo

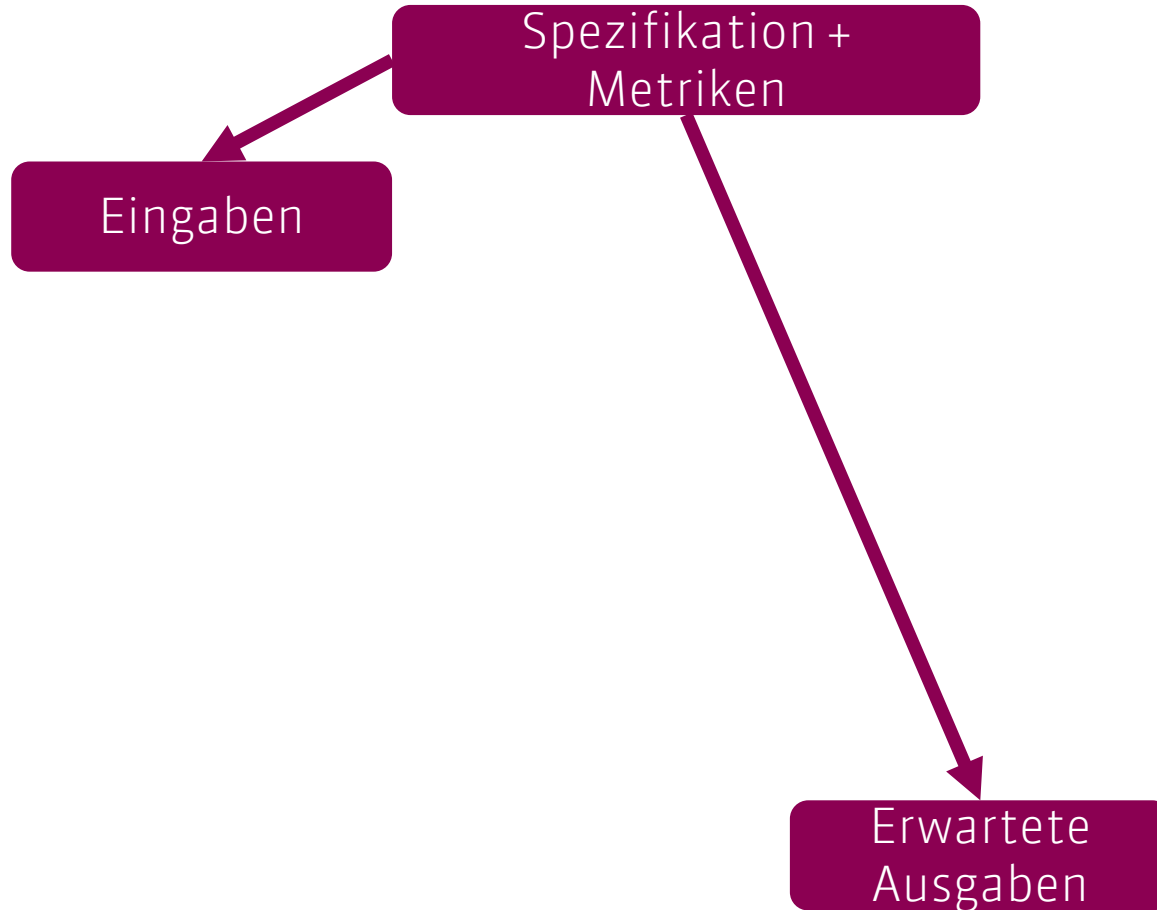
# Black-Box Tests



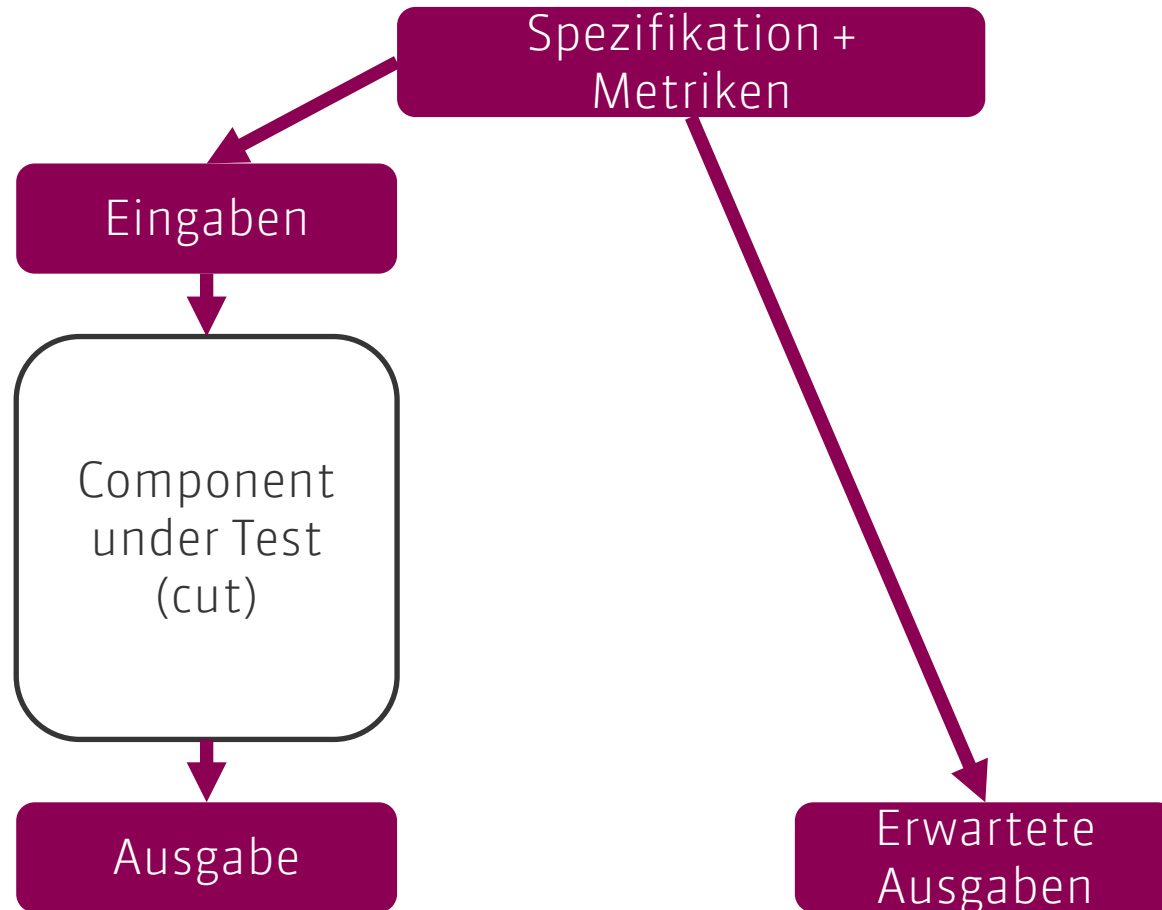
# Black-Box Tests



# Glass-Box Tests



# Glass-Box Tests

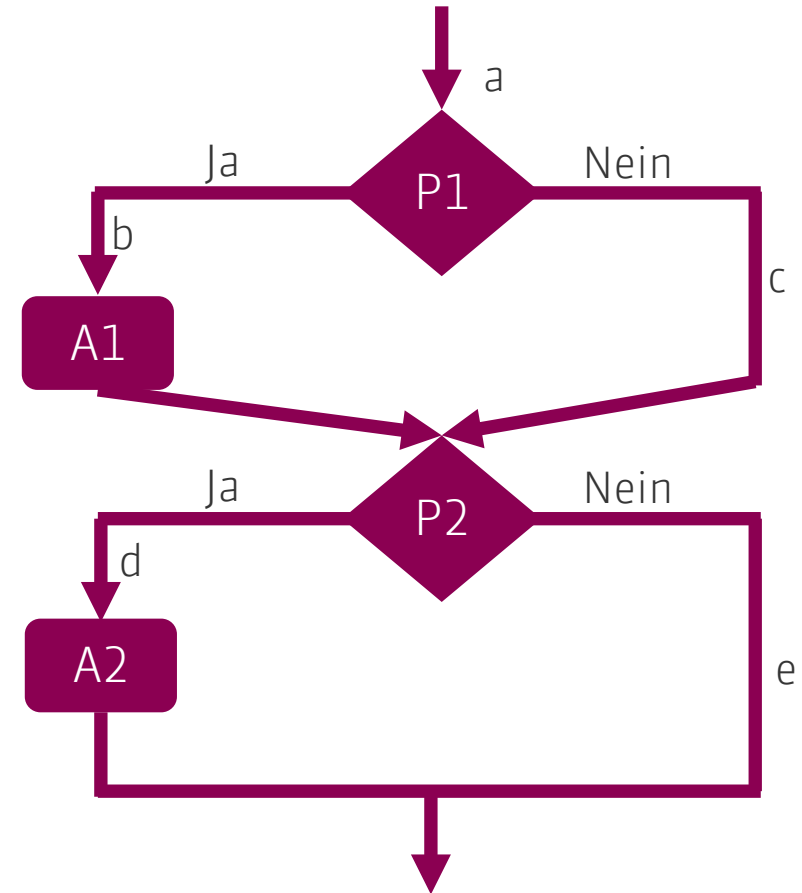


# Anweisungsüberdeckung ( $C_0$ )

- Mind. Einmal pro Anweisung
- Wirksamkeit:

$$\frac{\text{Anzahl der ausgeführten Anweisungen}}{\text{Anzahl der aller Anweisungen}}$$

- Probleme
  - Kontrollflußfehler
  - Dead Code



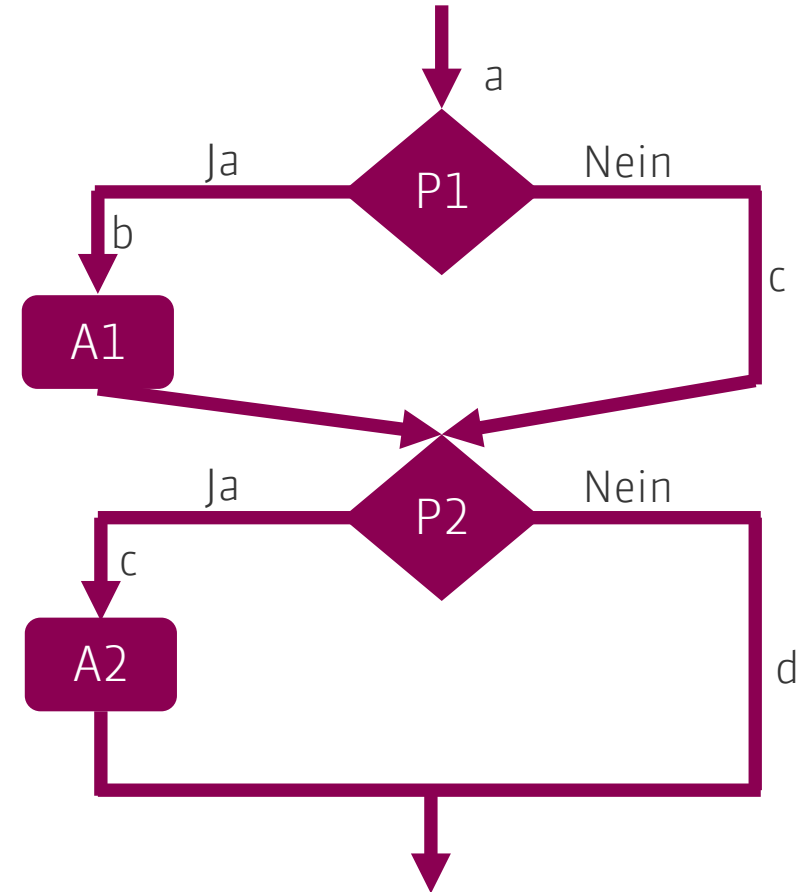


# Zweigüberdeckung ( $C_1$ )

- Mind. Einmal pro Zweig
- Wirksamkeit:

$$\frac{\text{Anzahl der ausgeführten Zweige}}{\text{Anzahl der aller Zweige}}$$

- Probleme
  - Abhängigkeiten werden ignoriert
  - Schleifen
  - Komplexe Entscheidungen

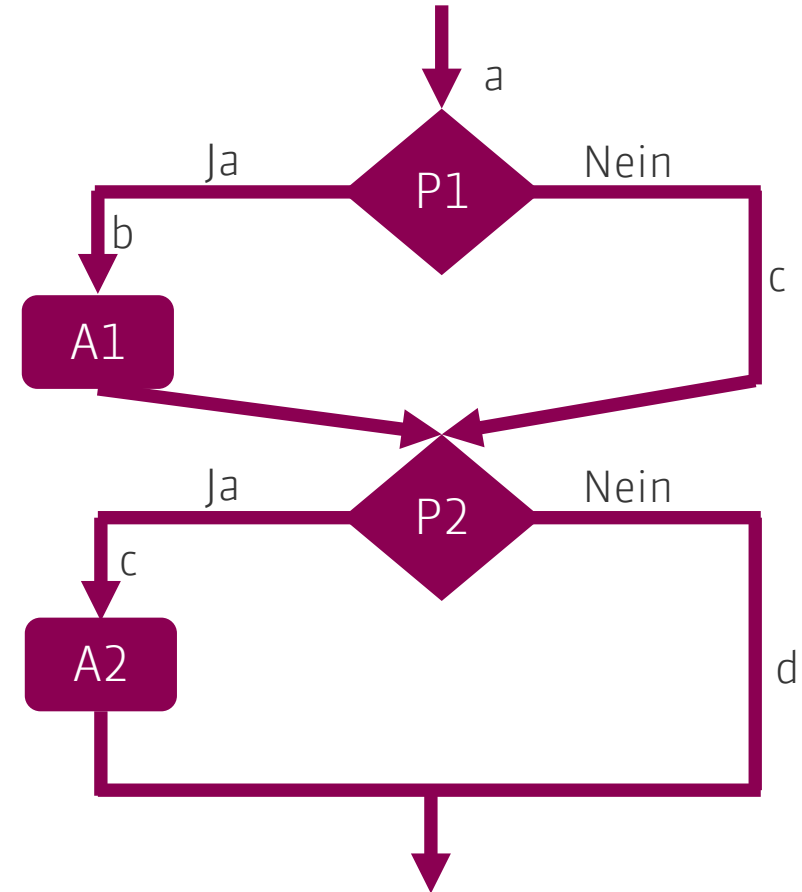


# Pfadüberdeckung (C<sub>2</sub>)

- Mind. Einmal pro Pfad
- Wirksamkeit:

$$\frac{\text{Anzahl der ausgeführten Pfade}}{\text{Anzahl der aller Pfade}}$$

- Probleme
  - Unerreichbare Pfade



# 3. Test Driven Development

# Wie unterscheidet sich TDD?



- TDD beschäftigt sich mit Design
- Gibt Sicherheit
- Ermöglicht Veränderung
- Validiert Design
- Gibt schnelles Feedback
- Benötigt Disziplin

# Ergebnisse



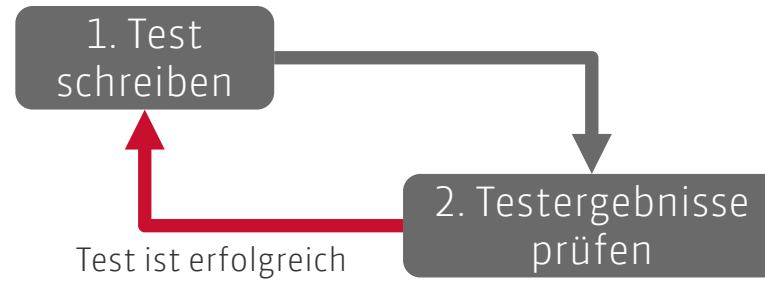
- Gesteigerte Qualität
- Lesbarkeit
- Wartbarkeit
- Simplizität
- Qualität bleibt erhalten
- Gutes Design

# 3 Grundregeln

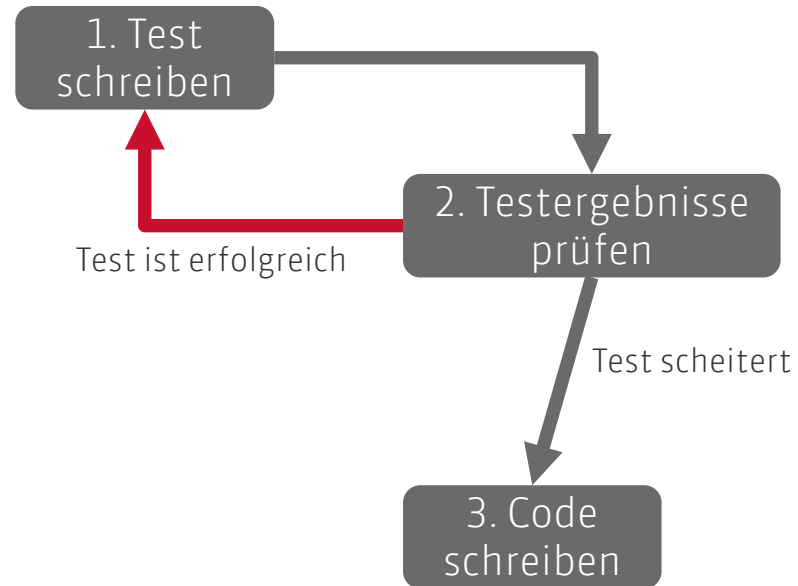


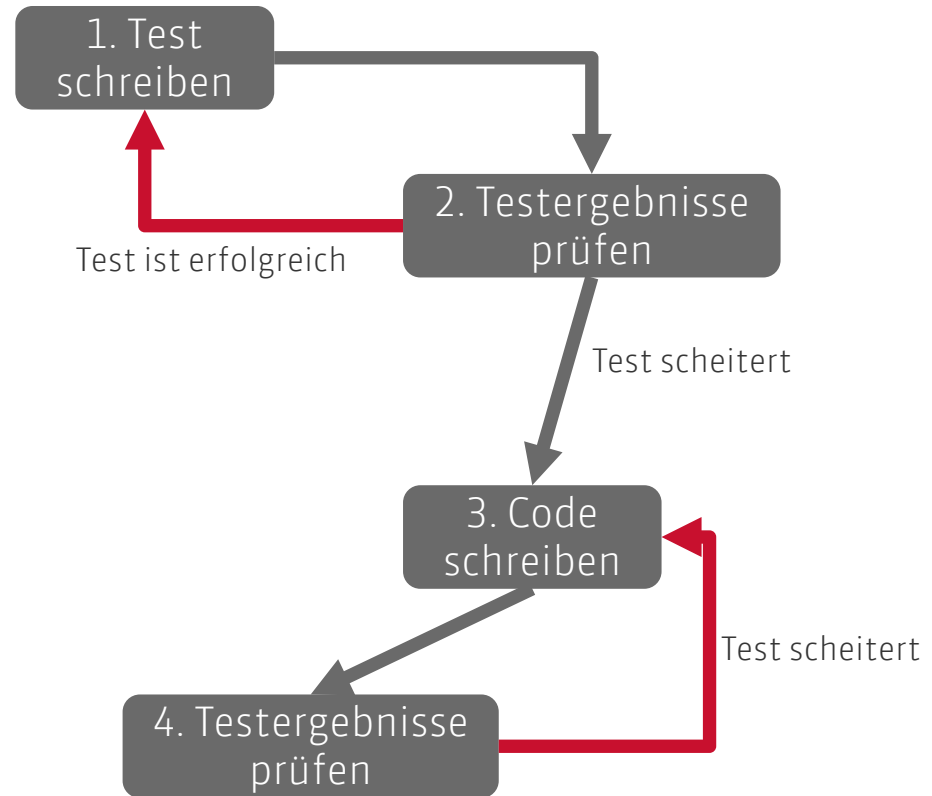
1. Kein Produktionscode ohne einen scheiternden Test
2. Nicht mehr Testcode schreiben als zum Scheitern nötig ist
3. Nicht mehr Produktionscode schreiben als nötig ist, um den Test zu bestehen

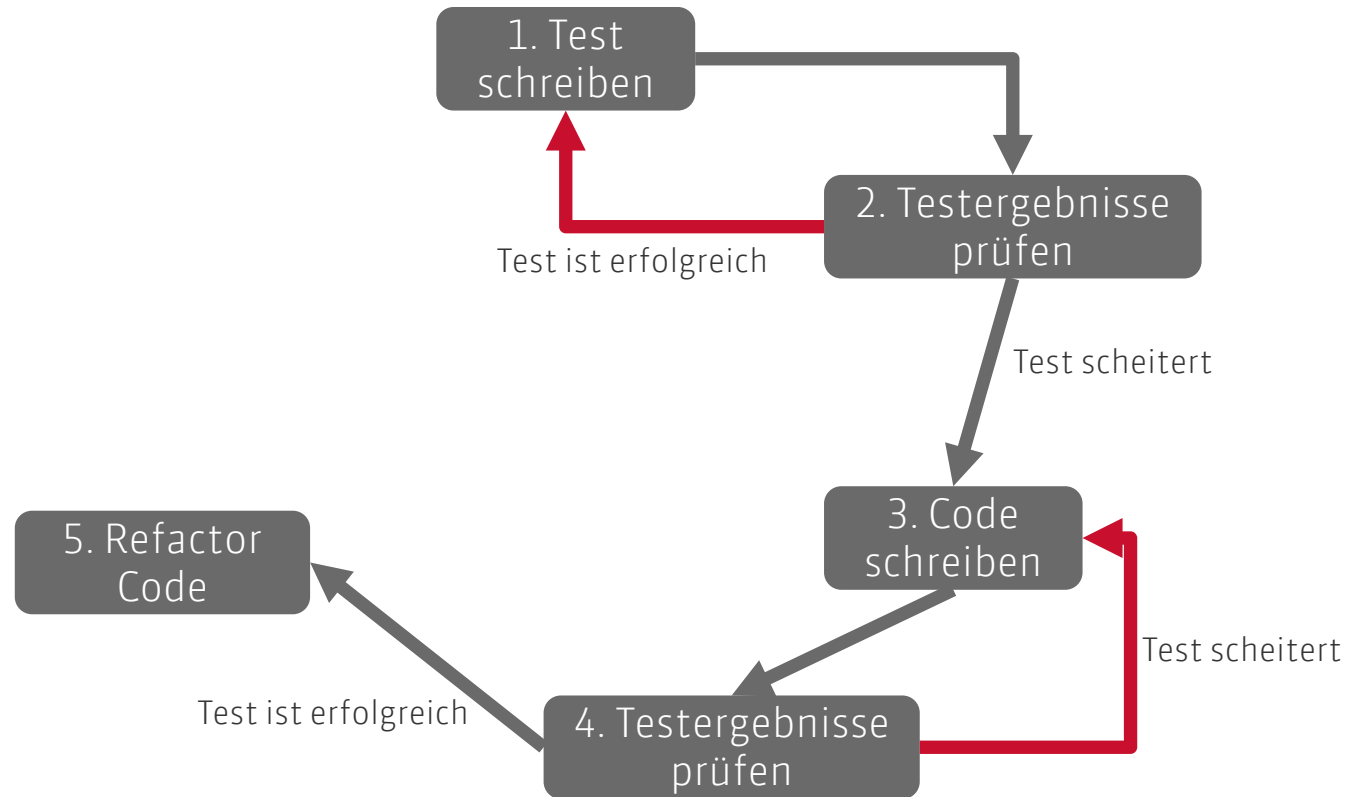
1. Test  
schreiben

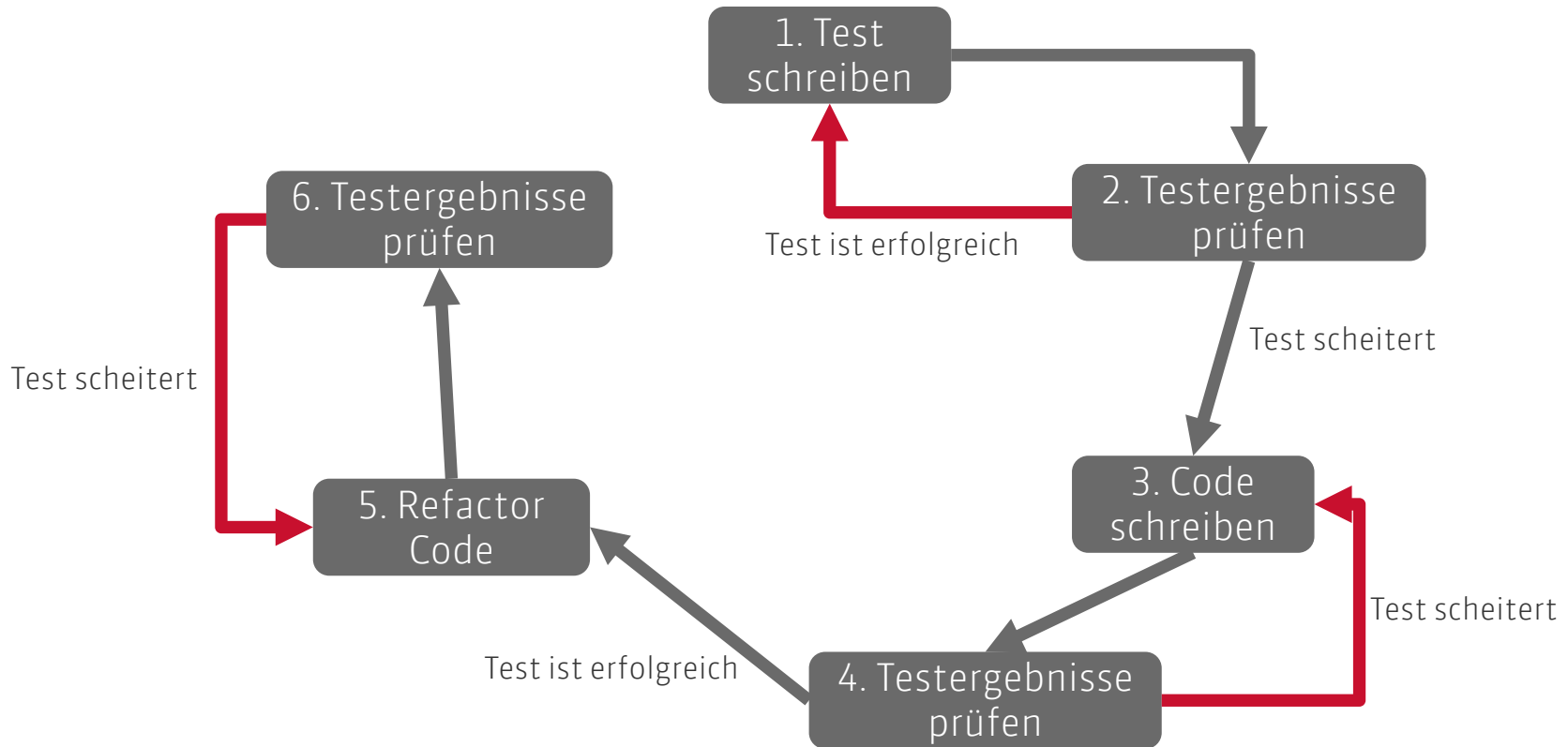


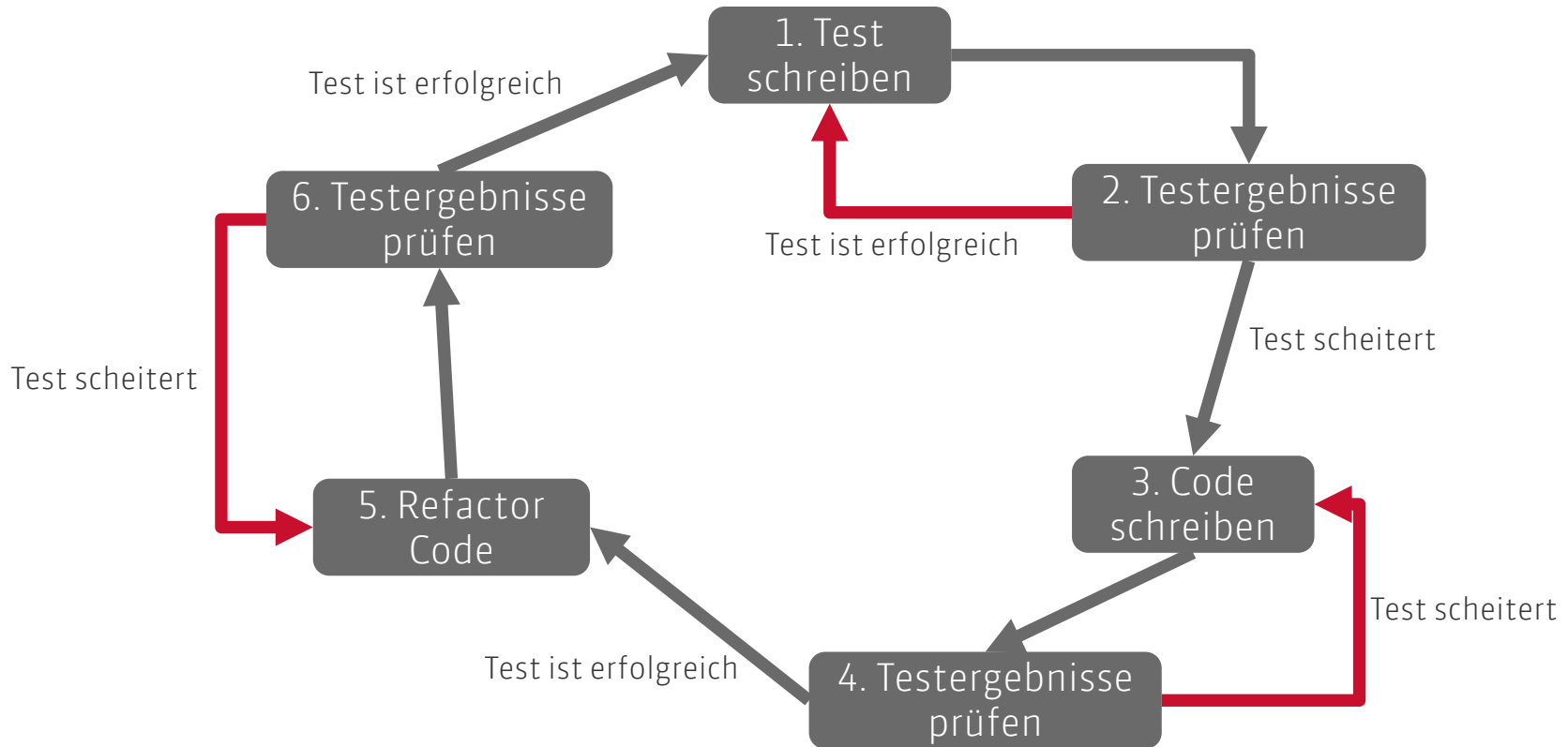












# TDD und Design



- Loose Kopplung, Hoher Zusammenhalt
- Single Responsibility Principle
- Streben nach Einfachheit
- Modularisierung
- Encapsulation
- Duplikate vermeiden

# TDD und Architektur



- Ersetzt nicht Architektur
- Design bleibt erforderlich, aber nicht im großen Stil
- Validiert Design Entscheidungen
- Deckt Schwächen auf

# Vorteile



- Besserer Vorschrift
- Besseres Design
- Bessere Entwickler
- Geringere Langzeitkosten



- Sofortiges Feedback
- Tests müssen schnell sein
  - In-Memory Datenbanken (H2, HSQL)
- Generierte Testdaten
- Testnamen sollten Zweck ausdrücken
- Unabhängige Tests
- Ein Konzept pro Test
- Ein Assert pro Test
- Augenscheinlich triviale Tests sind wichtig

# Herausforderungen



- Disziplin
- Learning Curve
- Schlechte Angewohnheiten
- Wenig Rückenhalt

# 4. Continuous Integration

# Ohne CI...



- Selten Commits
- Schwierige Integration
- Viele Bugs
- Seltene Releases
- Spätes Testen

# Bausteine von CI



- Zentrales Source Code Management
- Regelmäßige Commits
- Build Server
- Automatisierter Build
- Automatisierte Tests
- Codemetriken
- Zentrales Repository
- CI Tool

# Entwicklung mit CI



Stable



# Entwicklung mit CI



# Entwicklung mit CI

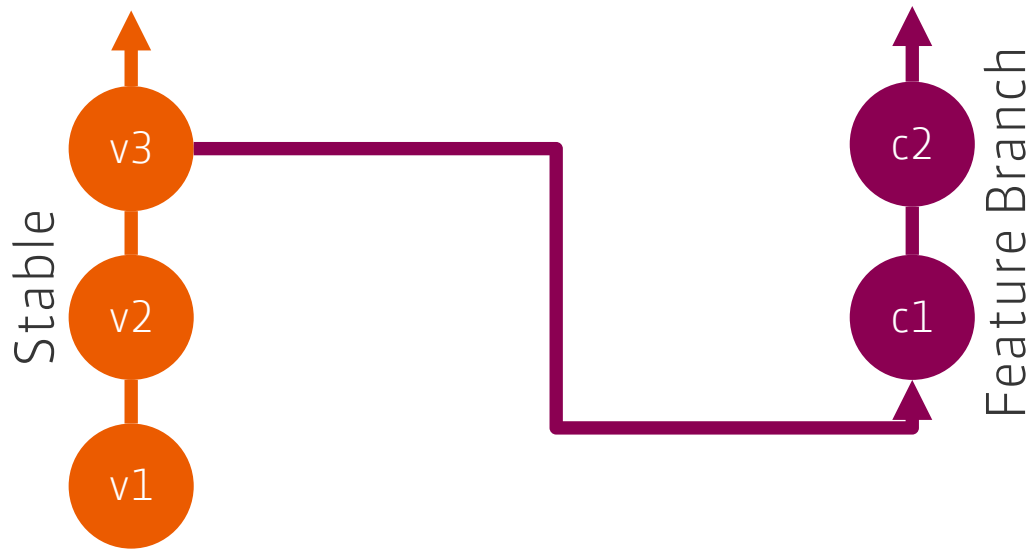




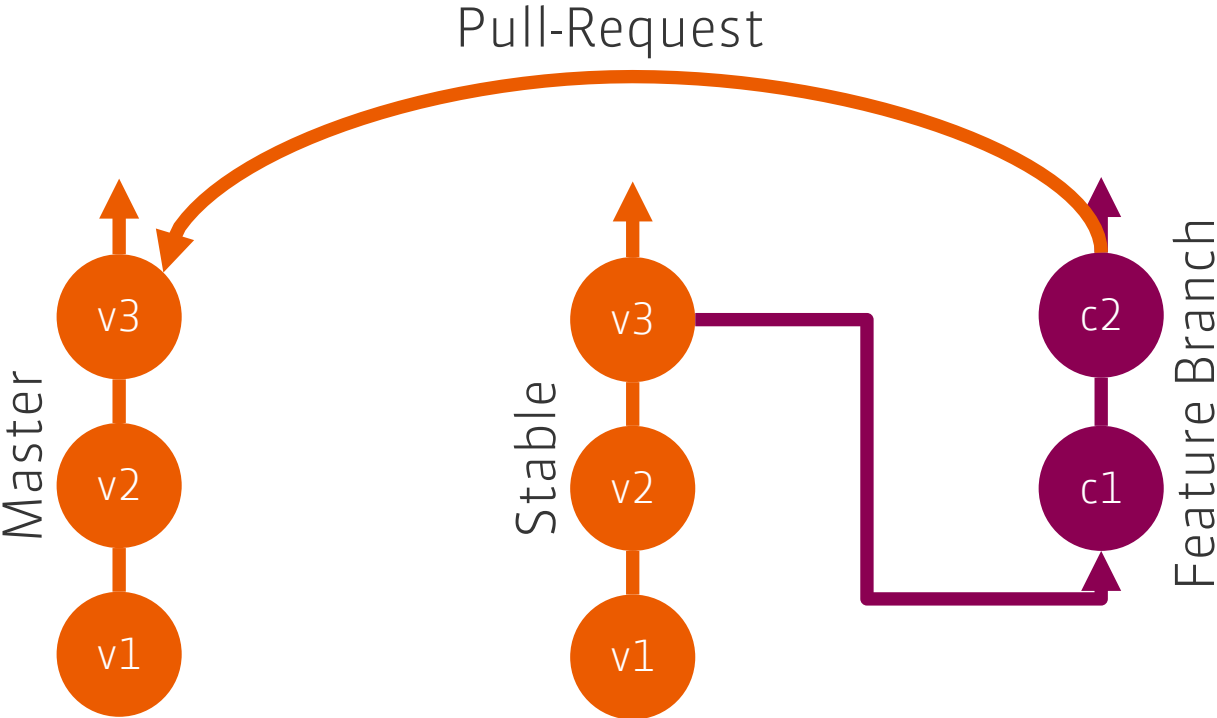
# Entwicklung mit CI



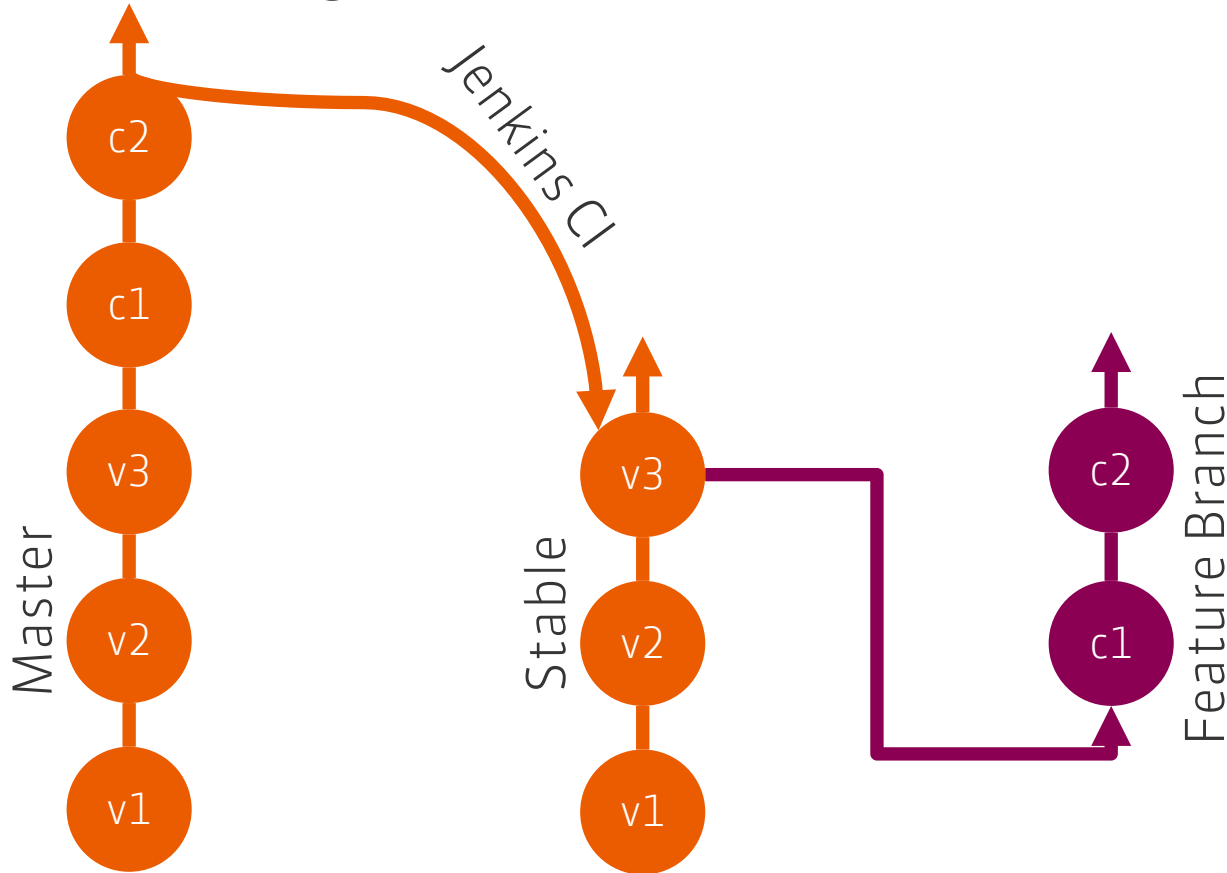
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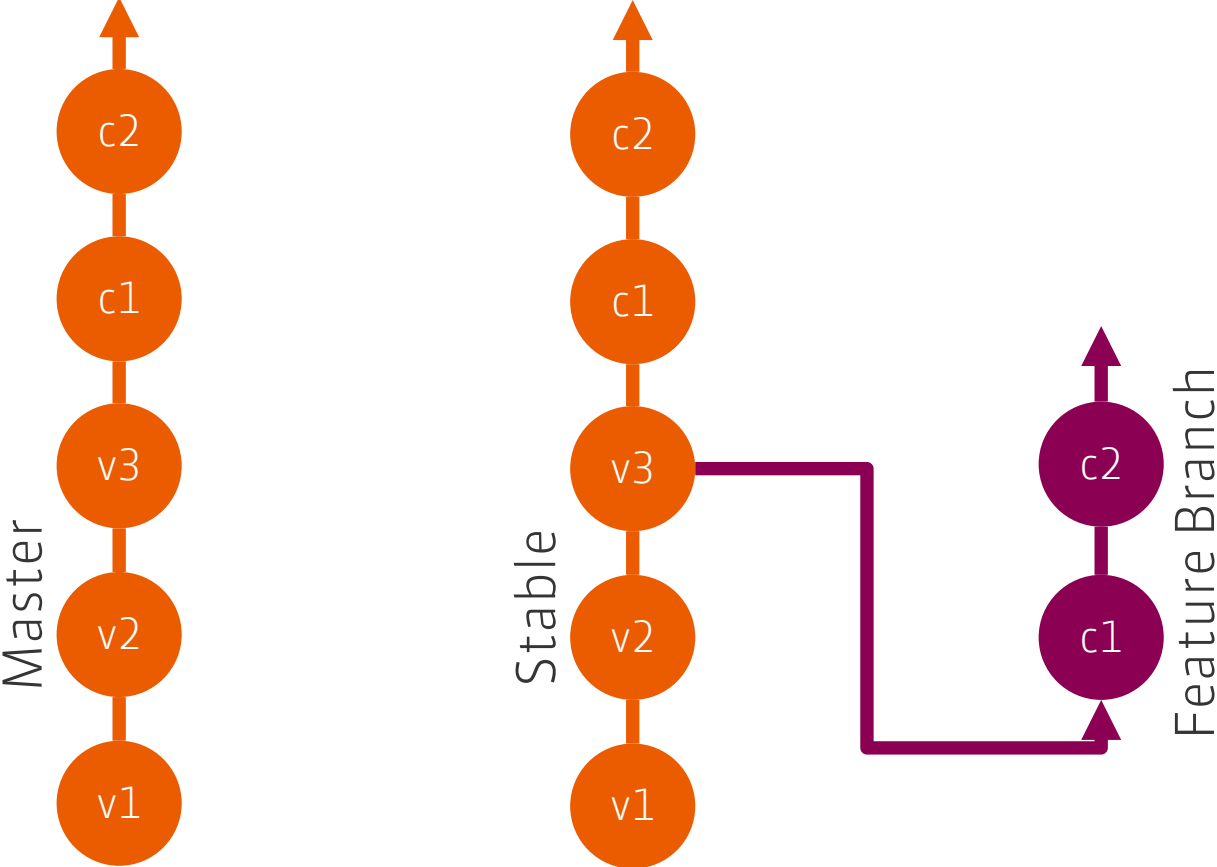
# Entwicklung mit CI



# Entwicklung mit CI



# Entwicklung mit CI



# Pro



- Schnelle Reaktionsfähigkeit
- Vertrauen in Software
- Bessere Zusammenarbeit
- Höhere Qualität

# Contra



- Stabilität hängt von Testabdeckung ab
- Zeitinvestment
- Kulturschock
- Metriken und Monitoring erforderlich



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Fragen??





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