NEXT LEVEL VERSION CONTROL:

NOW IN 3D!

Dr. Jeremias Rößler

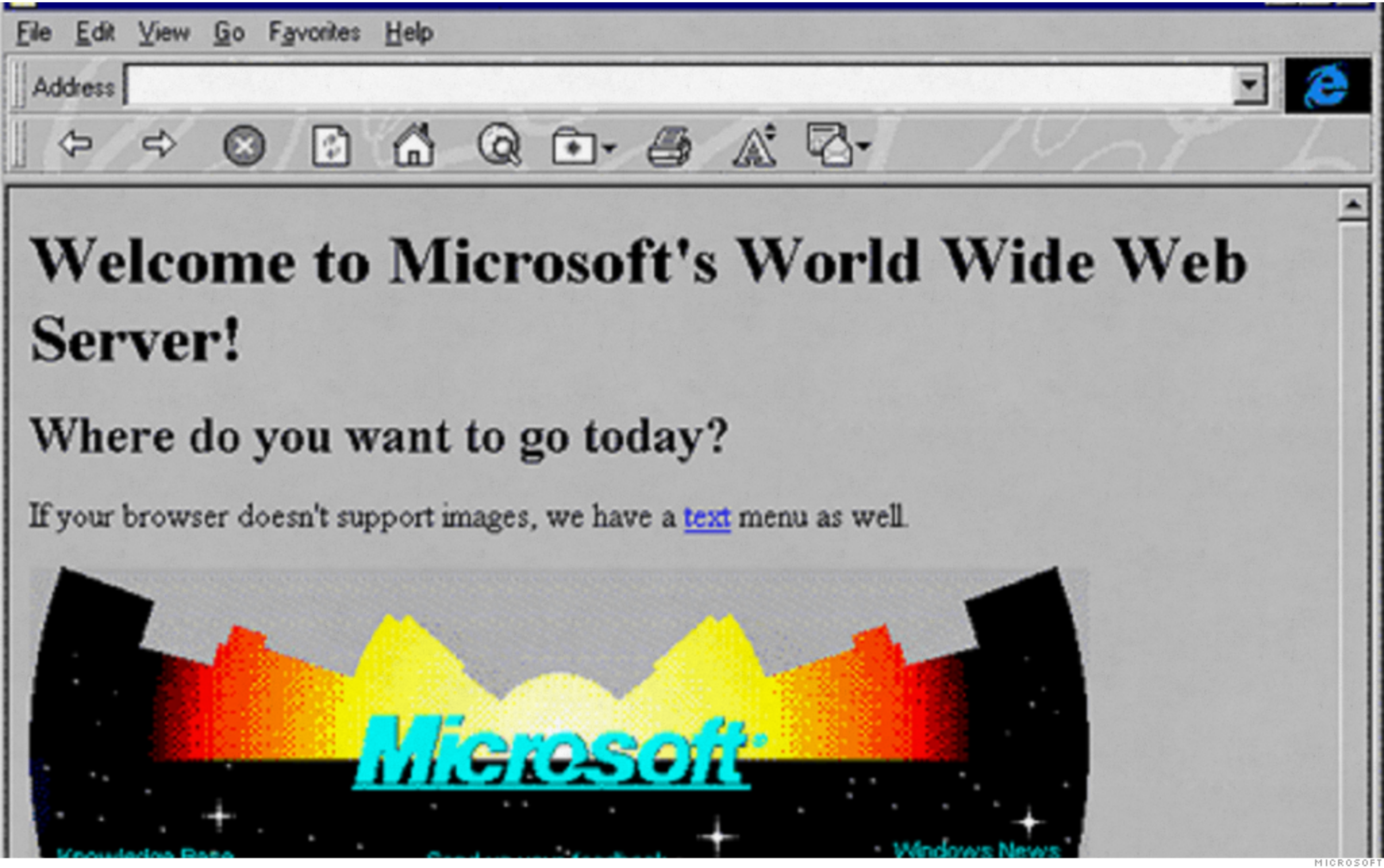
BED-CON 16.09.2016

Wer hat vor
1990
Software entwickelt?

Erinnern Sie sich?

```
Twitter version 2.3 (C)Copyright 1983, 1984, 1985

Press the return key to continue...
```

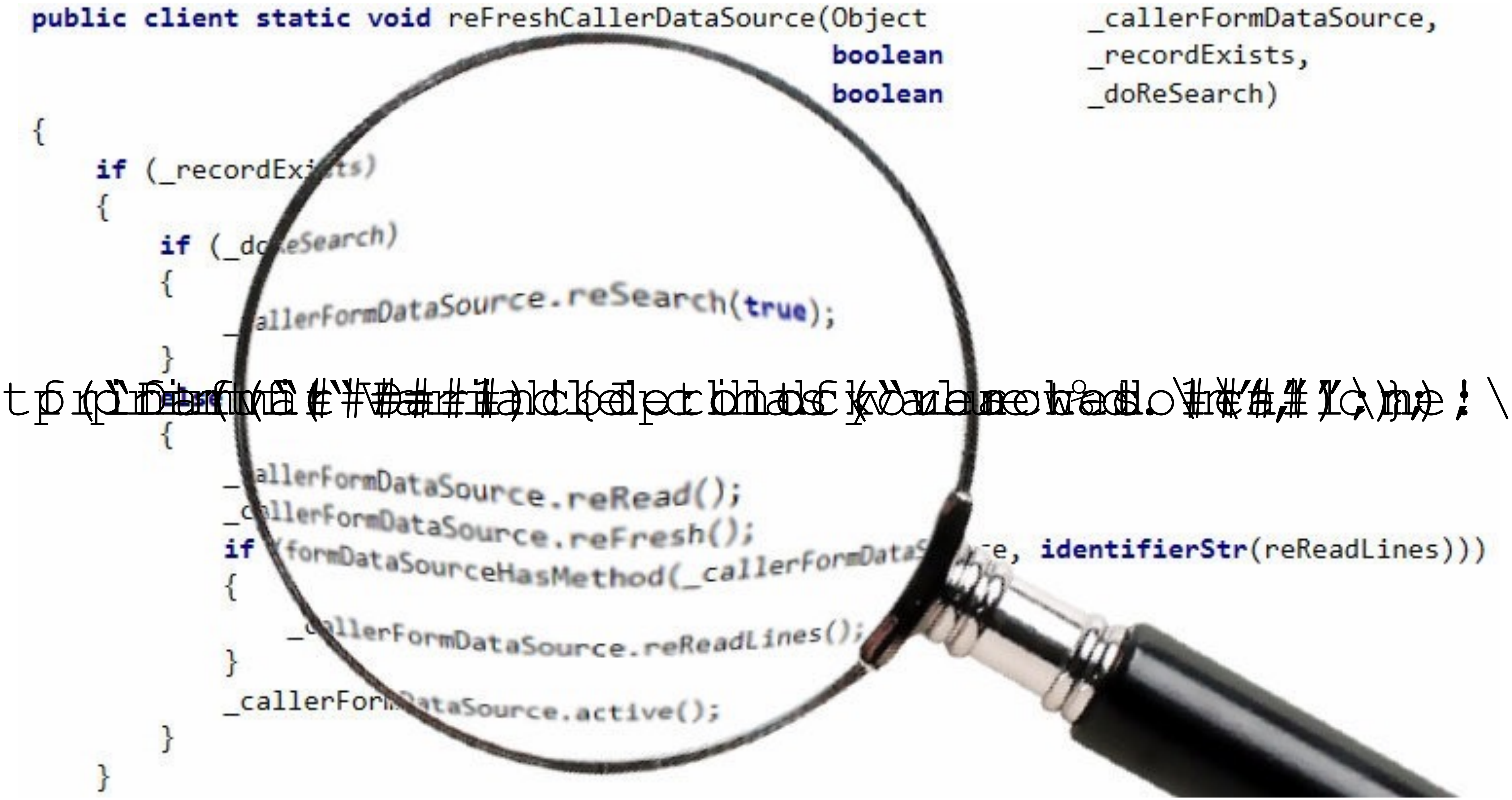


Welcome to Microsoft's World Wide Web Server!

Where do you want to go today?

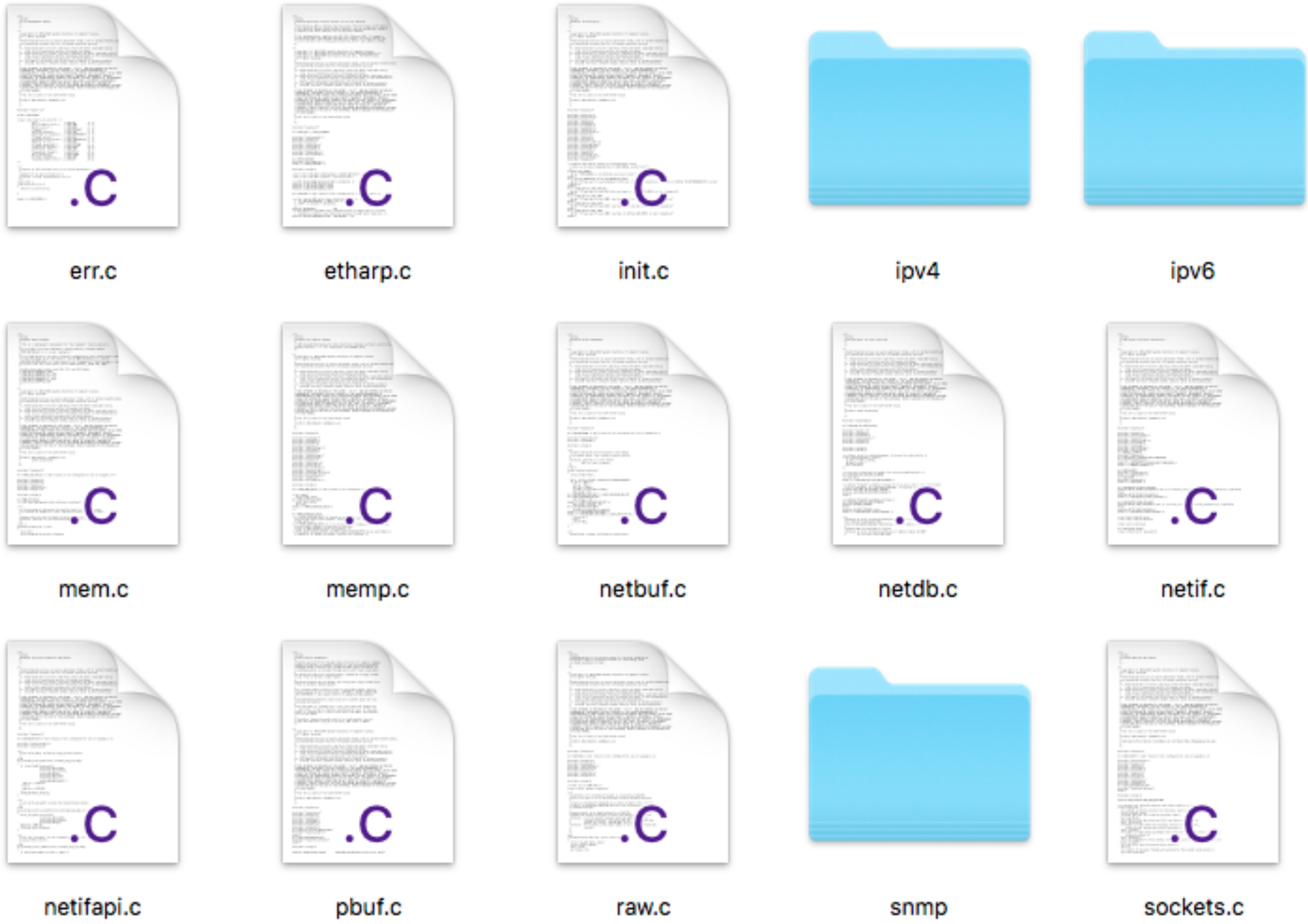
If your browser doesn't support images, we have a text menu as well.

MICROSOFT

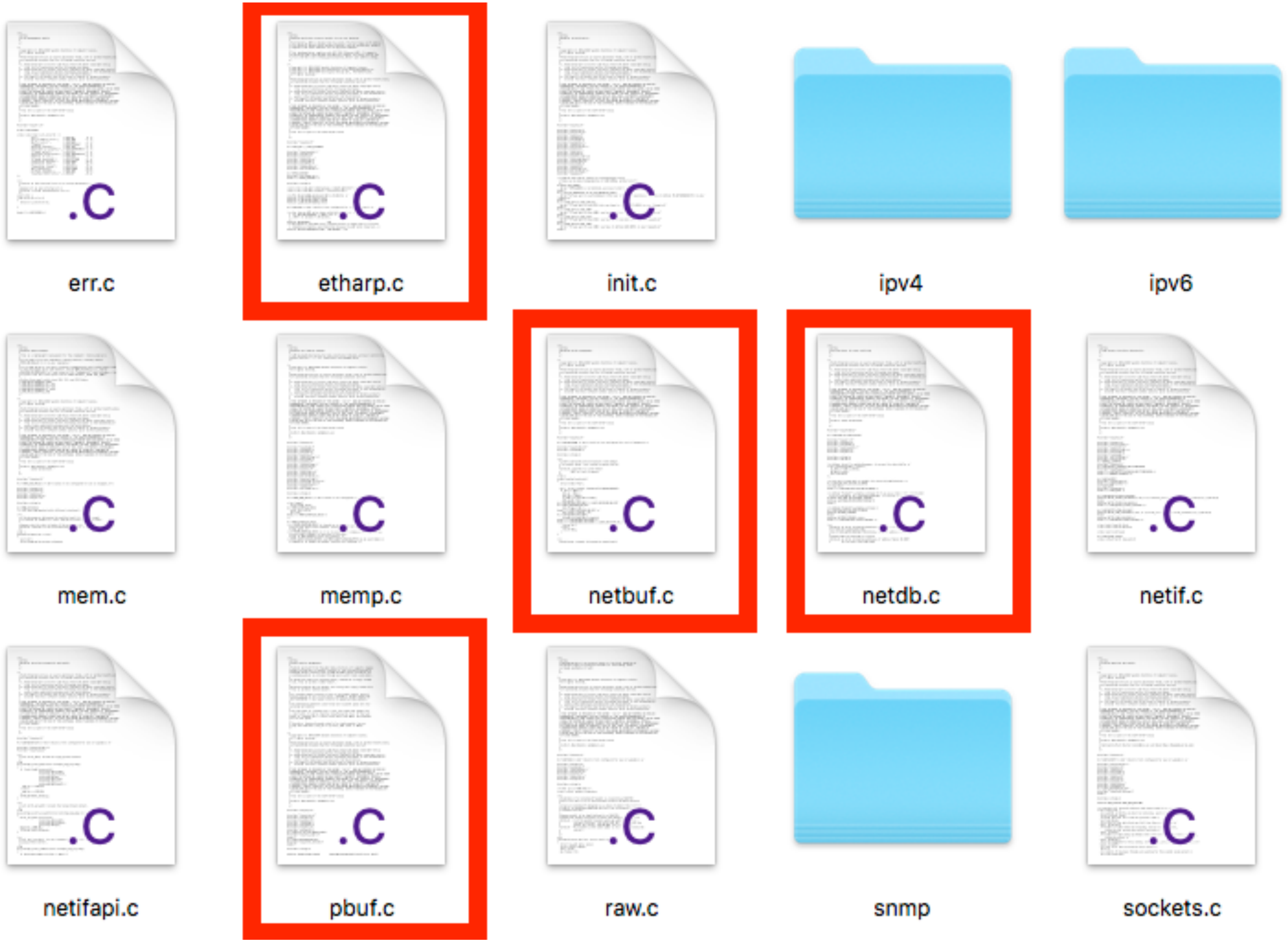


```
public client static void reFreshCallerDataSource(Object          _callerFormDataSource,
                                                   boolean         _recordExists,
                                                   boolean         _doReSearch)
{
    if (_recordExists)
    {
        if (_doReSearch)
        {
            _callerFormDataSource.reSearch(true);
        }
        else
        {
            _callerFormDataSource.reRead();
            _callerFormDataSource.reFresh();
            if (formDataSourceHasMethod(_callerFormDataSource, identifierStr(reReadLines)))
            {
                _callerFormDataSource.reReadLines();
            }
            _callerFormDataSource.active();
        }
    }
```

[illegible]


err.c
etharp.c
init.c
ipv4
ipv6
mem.c
memp.c
netbuf.c
netdb.c
netif.c
netifapi.c
pbuf.c
raw.c
snmp
sockets.c

Gott seit Dank: CVS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etharp.c
init.c
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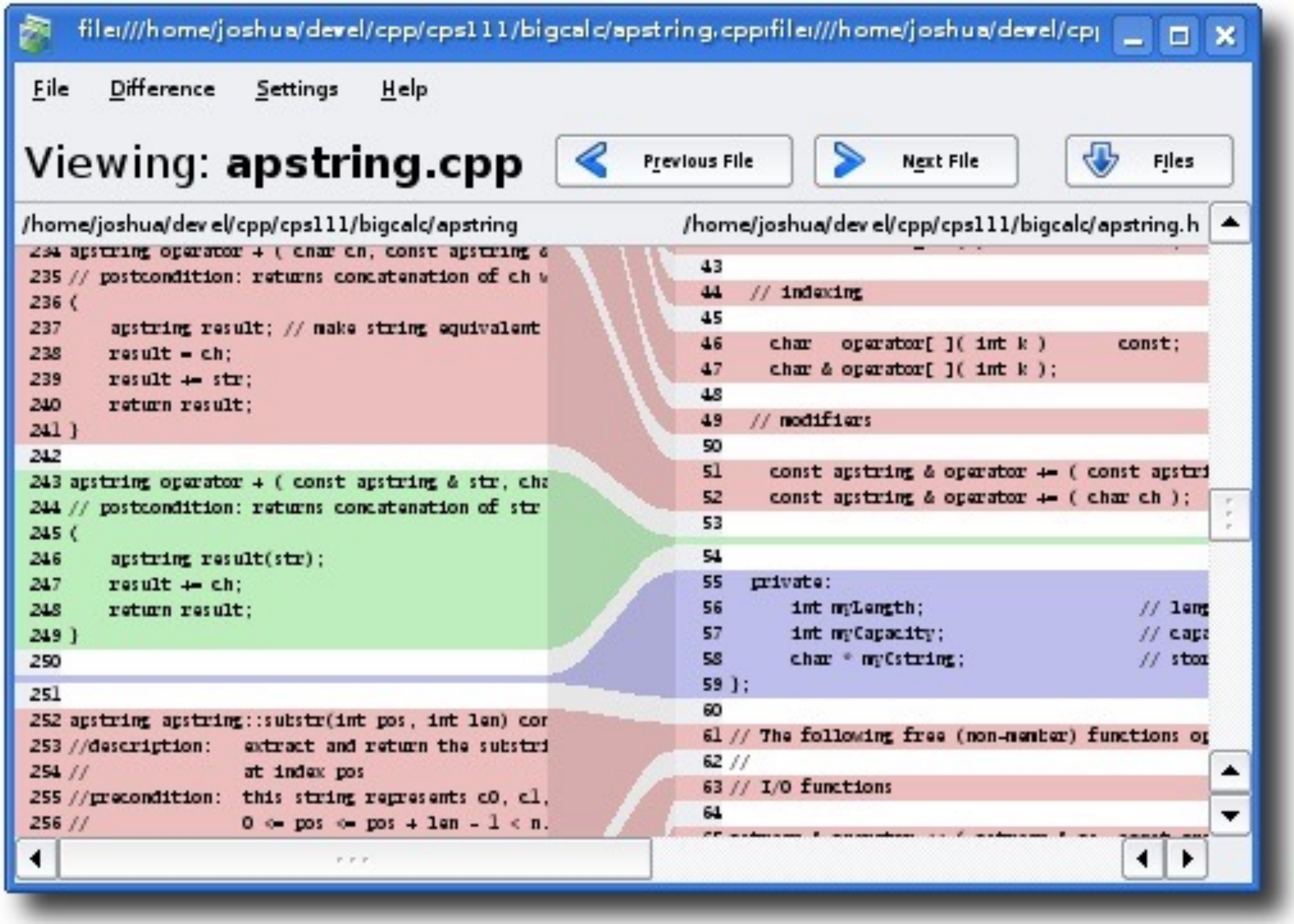

file:///home/joshua/devel/cpp/cps111/bigcalc/apstring.cpp:file:///home/joshua/devel/cpp
File
Difference
Settings
Help
Previous File
Next File
Files

Viewing: **apstring.cpp**

/home/joshua/devel/cpp/cps111/bigcalc/apstring

```
apstring operator + ( char ch, const apstring &
// postcondition: returns concatenation of ch w
{
    apstring result; // make string equivalent
    result = ch;
    result += str;
    return result;
}

apstring operator + ( const apstring & str, cha
// postcondition: returns concatenation of str
{
    apstring result(str);
    result += ch;
    return result;
}


apstring apstring::substr(int pos, int len) con
//description:    extract and return the substri
//                at index pos
//precondition:   this string represents c0, c1,
//                0 <= pos <= pos + len - 1 < n.
```

/home/joshua/devel/cpp/cps111/bigcalc/apstring.h

```

  // indexing

    char   operator[ ]( int k )       const;
    char & operator[ ]( int k );

  // modifiers

    const apstring & operator += ( const apstri
    const apstring & operator += ( char ch );


  private:
      int myLength;                          // leng
      int myCapacity;                        // capa
      char * myCstring;                      // stor
};

// The following free (non-member) functions op
//
// I/O functions

```

Lass uns mal die Version 1.234 auschecken…

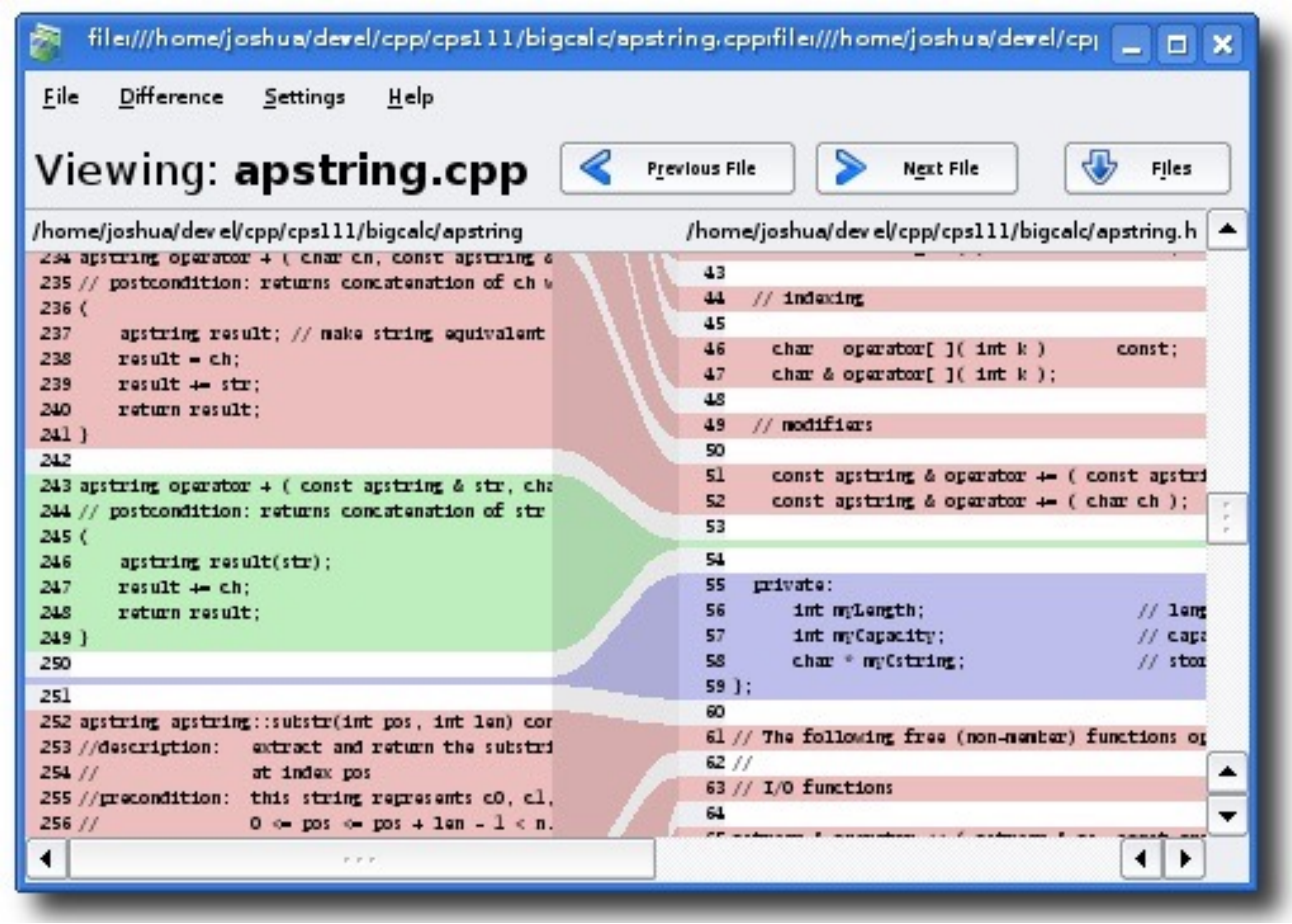
Gott seit Dank: CVS?

Gott seit Dank: SVN

Quiz:
Wer schreibt auf Anhieb fehlerfreien Code?

Gott seit Dank: SVN?

Git seit Dank: DVCS


file:///home/joshua/devel/cpp/cps111/bigcalc/apstring.cpp:file:///home/joshua/devel/cp
File
Difference
Settings
Help
Viewing: apstring.cpp
Previous File
Next File
Files
/home/joshua/devel/cpp/cps111/bigcalc/apstring
/home/joshua/devel/cpp/cps111/bigcalc/apstring.h

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```

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    const apstring & operator += ( const apstri
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      int myLength;                    // leng
      int myCapacity;                  // capa
      char * myCstring;                // stor
};

// The following free (non-member) functions op
//
// I/O functions

```
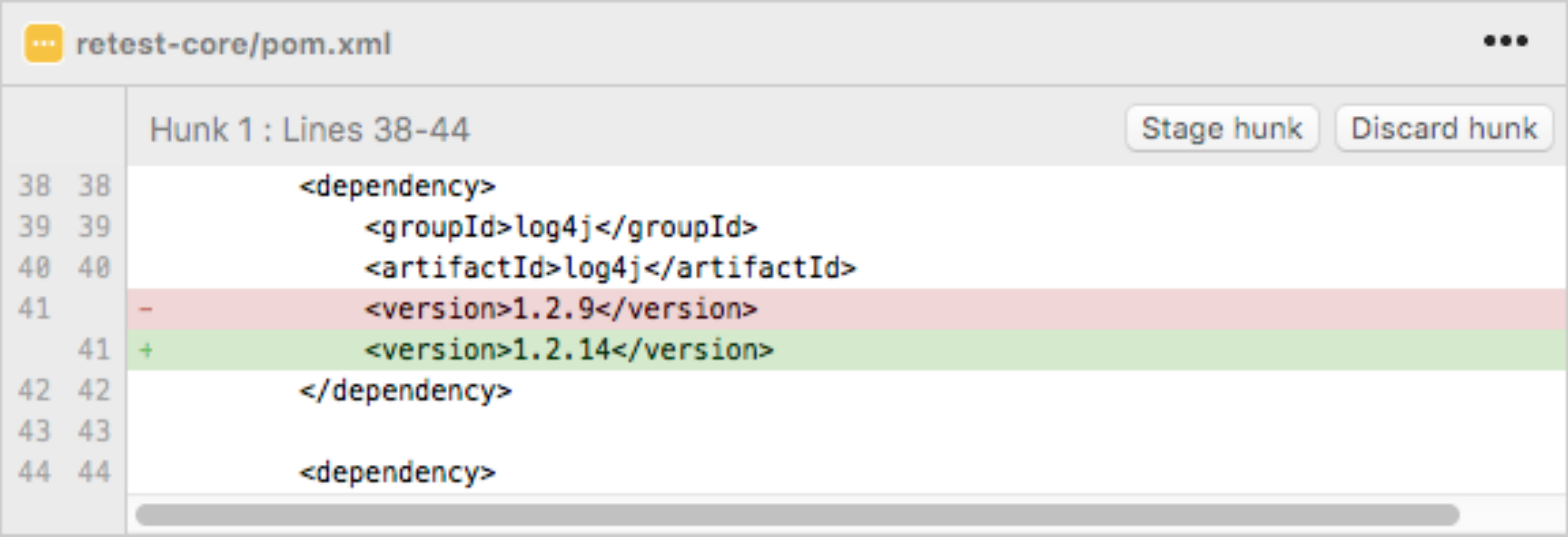

Wo hat sich der

Code *geändert*?

Wo hat sich das

**Programm** *geändert*?



retest-core/pom.xml

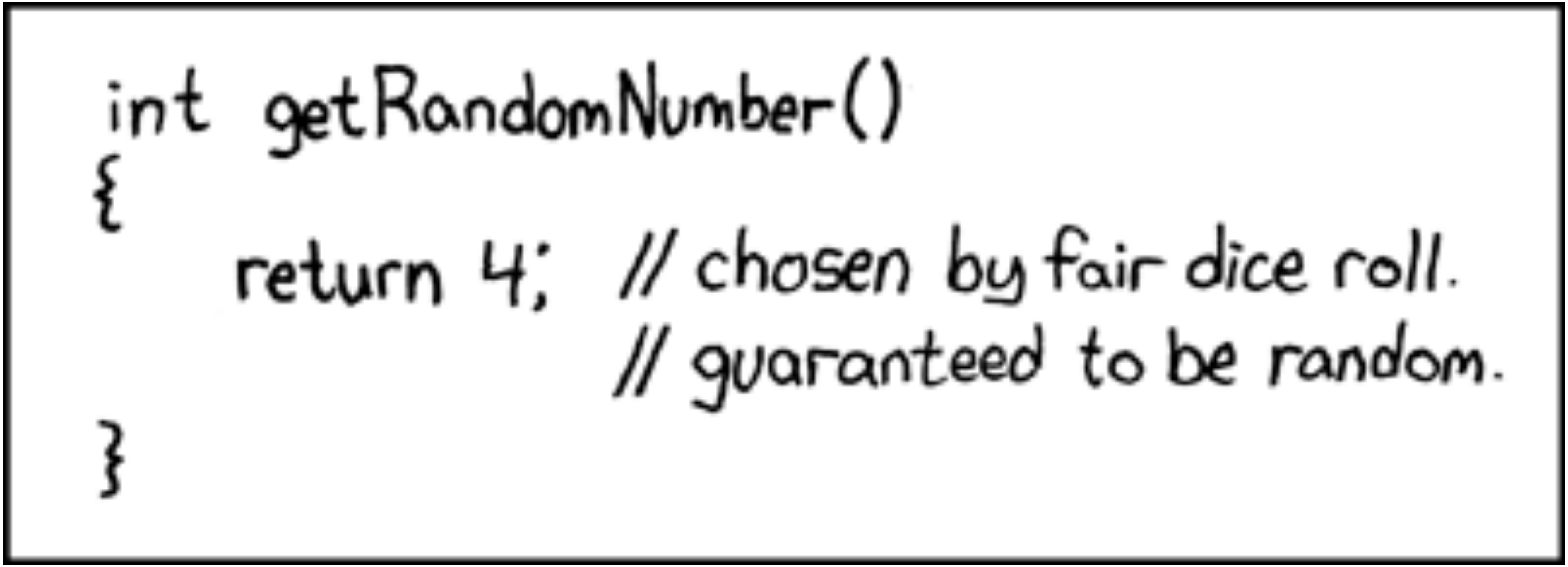
Hunk 1 : Lines 38-44

```
          <dependency>
              <groupId>log4j</groupId>
              <artifactId>log4j</artifactId>
-             <version>1.2.9</version>
+             <version>1.2.14</version>
          </dependency>

          <dependency>
```

see http://articles.qos.ch/thinkAgain.html static

vs.

dynamic

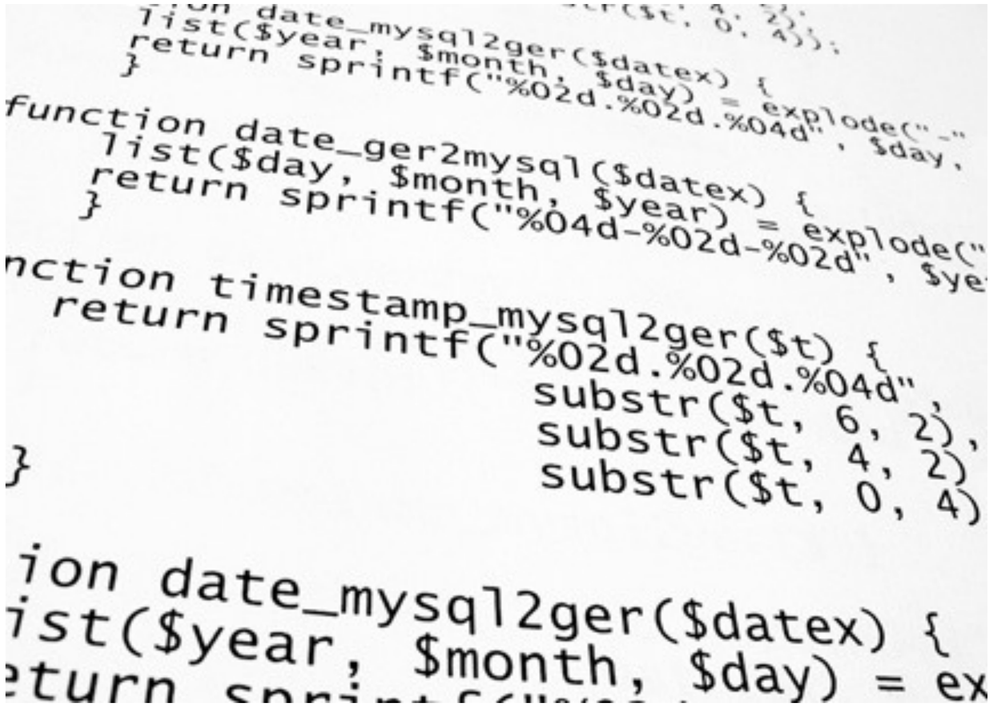


```
int getRandomNumber()
{
    return 4;  // chosen by fair dice roll.
               // guaranteed to be random.
}
```

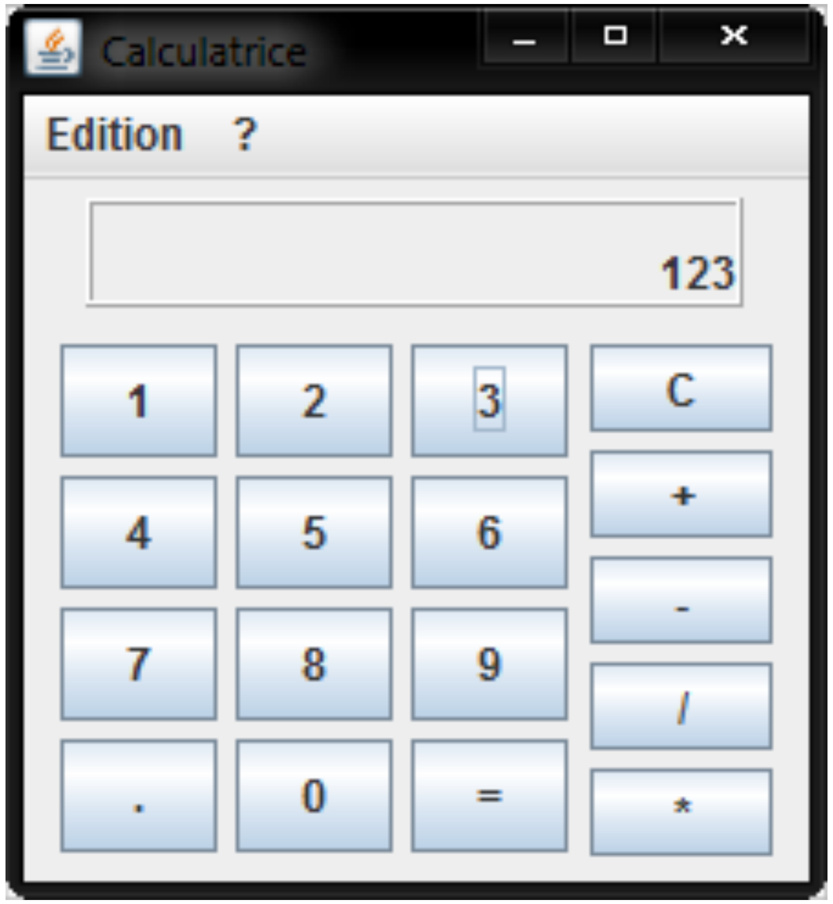
https://xkcd.com/221/

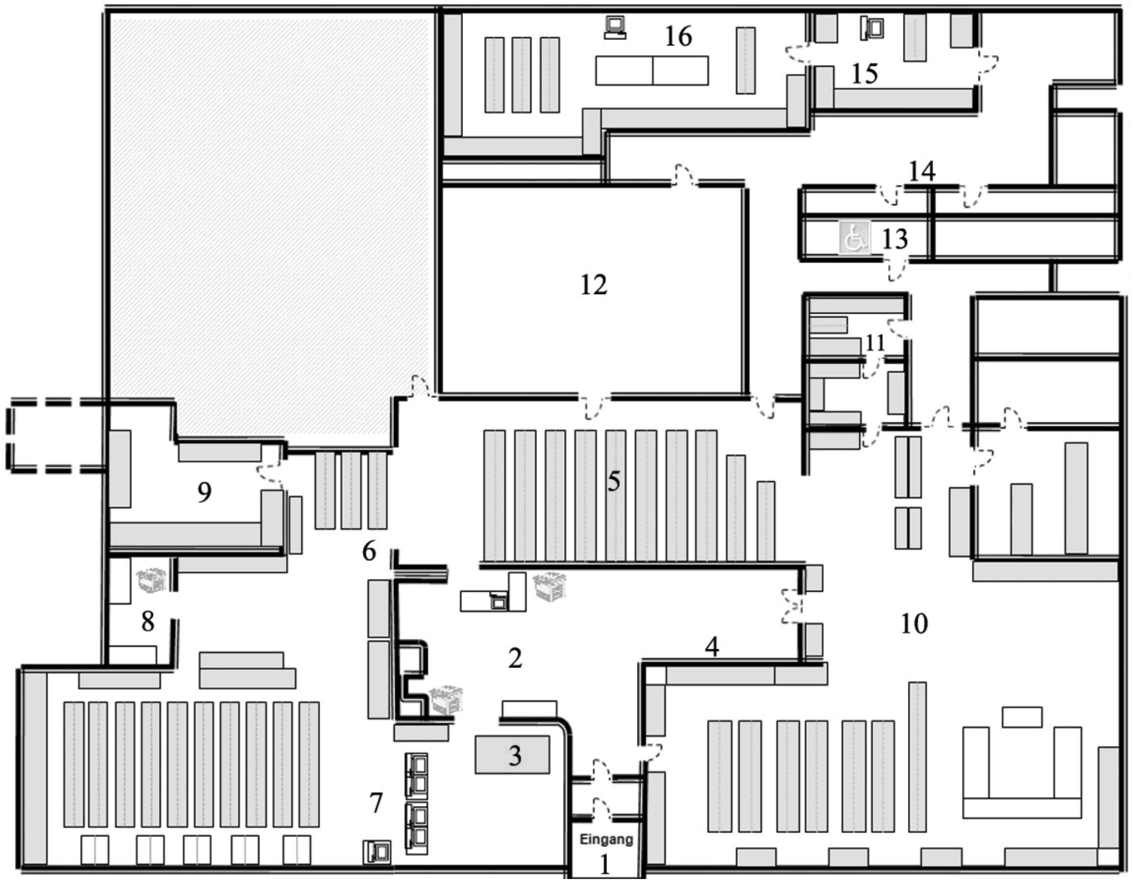
> “Beware of *bugs* in the above code;
> I have only *proved* it correct,
> not *tried* it.

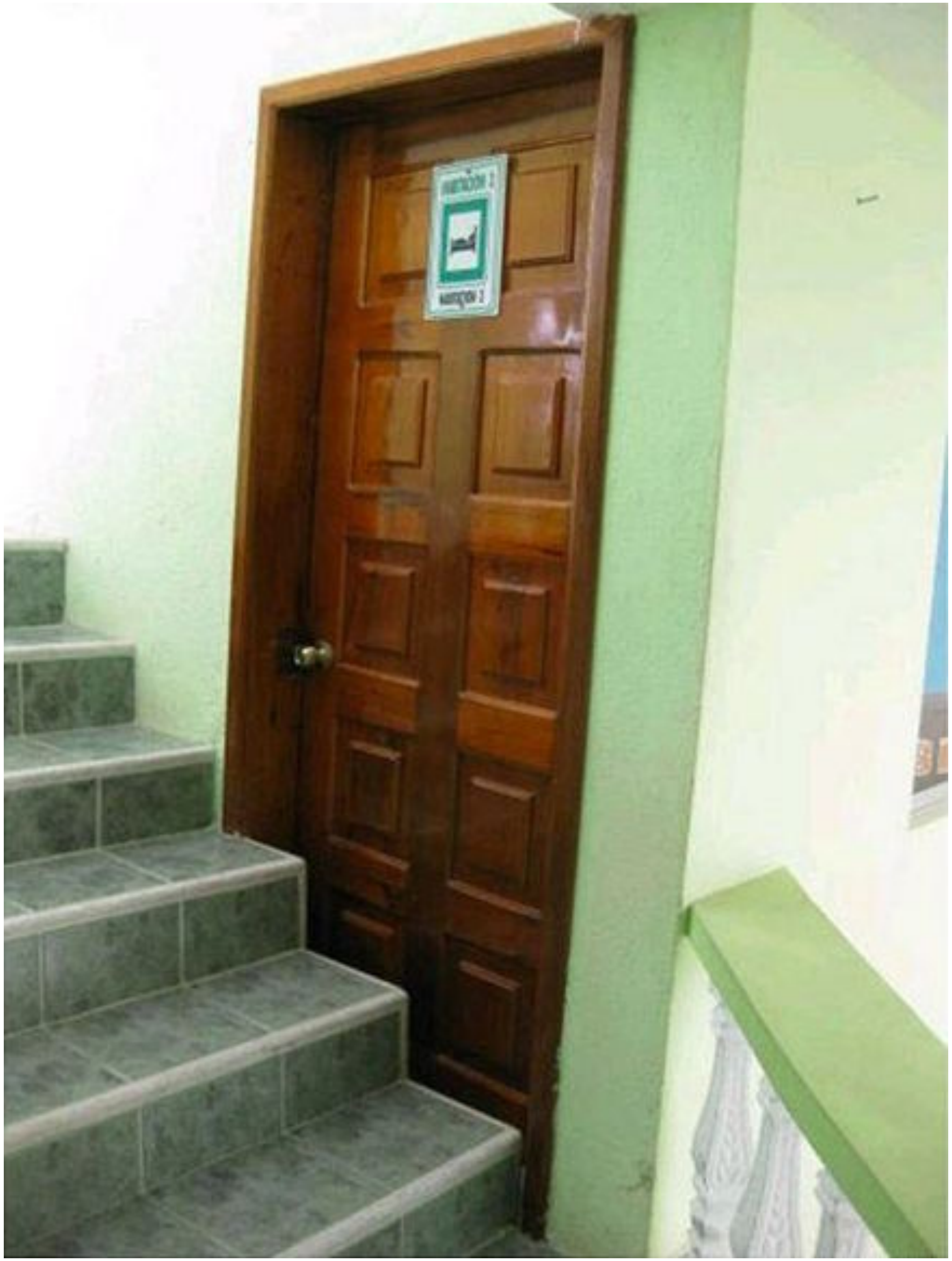
Donald Knuth



```
                               str($t, 4, 2),
                               str($t, 0, 4));
 ion date_mysql2ger($datex) {
   list($year, $month, $day) = explode("-"
   return sprintf("%02d.%02d.%04d", $day,
 }

function date_ger2mysql($datex) {
   list($day, $month, $year) = explode("
   return sprintf("%04d-%02d-%02d", $ye
 }

nction timestamp_mysql2ger($t) {
  return sprintf("%02d.%02d.%04d",
                 substr($t, 6, 2),
                 substr($t, 4, 2),
                 substr($t, 0, 4)
}

ion date_mysql2ger($datex) {
ist($year, $month, $day) = ex
eturn
```




16
15
14
13
12
11
5
9
6
8
2
4
10
3
7
Eingang
1



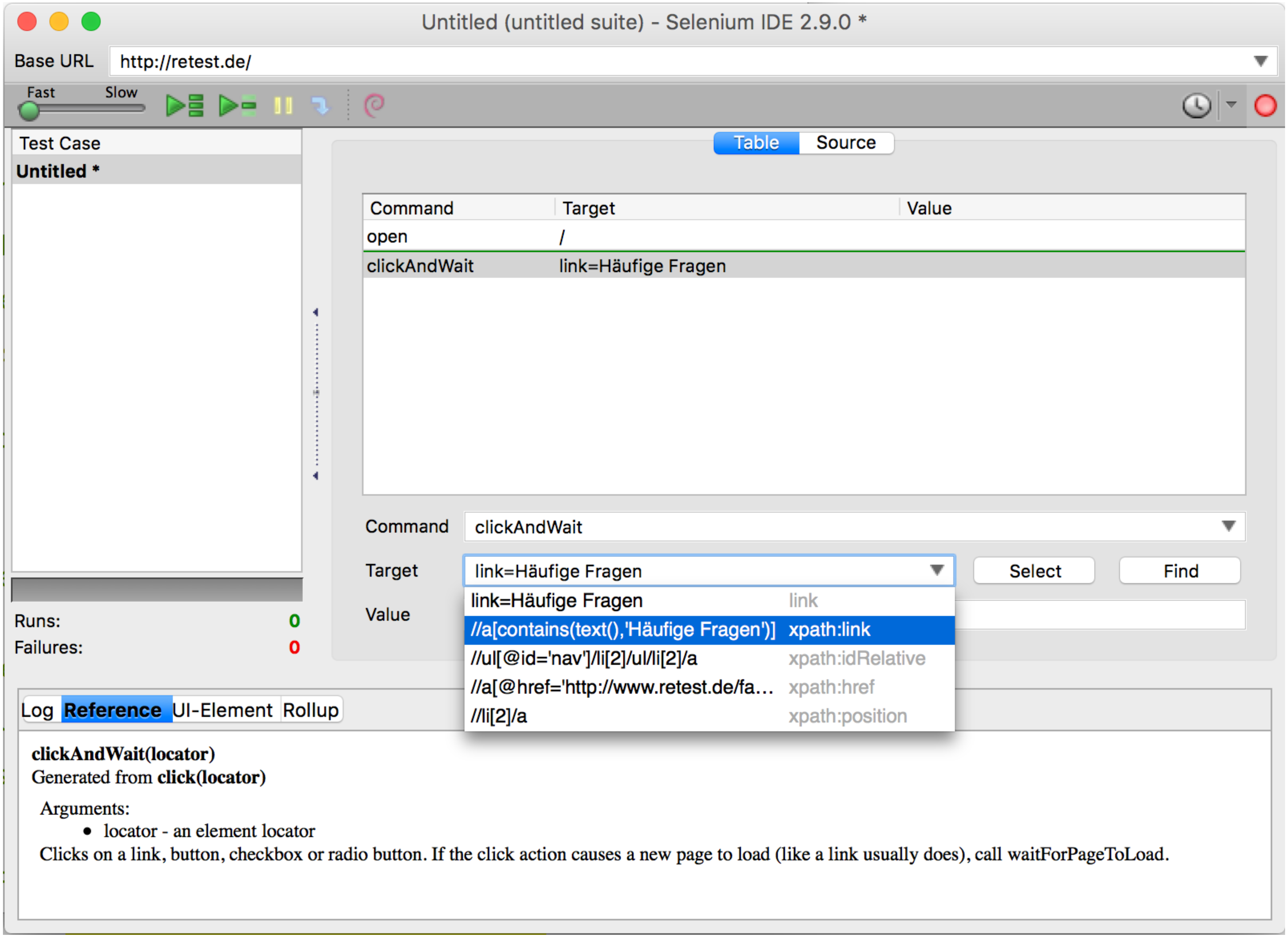
Die Lücke schließen: *automatische* Tests

GUI-Tests

automatisiert?!

1. Generation:

Capture/Replay



Base URL: http://retest.de/

Test Case
Untitled *

Command	Target	Value
open	/	
clickAndWait	link=Häufige Fragen	

Command: clickAndWait

Target: link=Häufige Fragen

Value:

link=Häufige Fragen	link
//a[contains(text(),'Häufige Fragen')]	xpath:link
//ul[@id='nav']/li[2]/ul/li[2]/a	xpath:idRelative
//a[@href='http://www.retest.de/fa…	xpath:href
//li[2]/a	xpath:position

Runs: 0
Failures: 0

clickAndWait(locator)
Generated from **click(locator)**

Arguments:

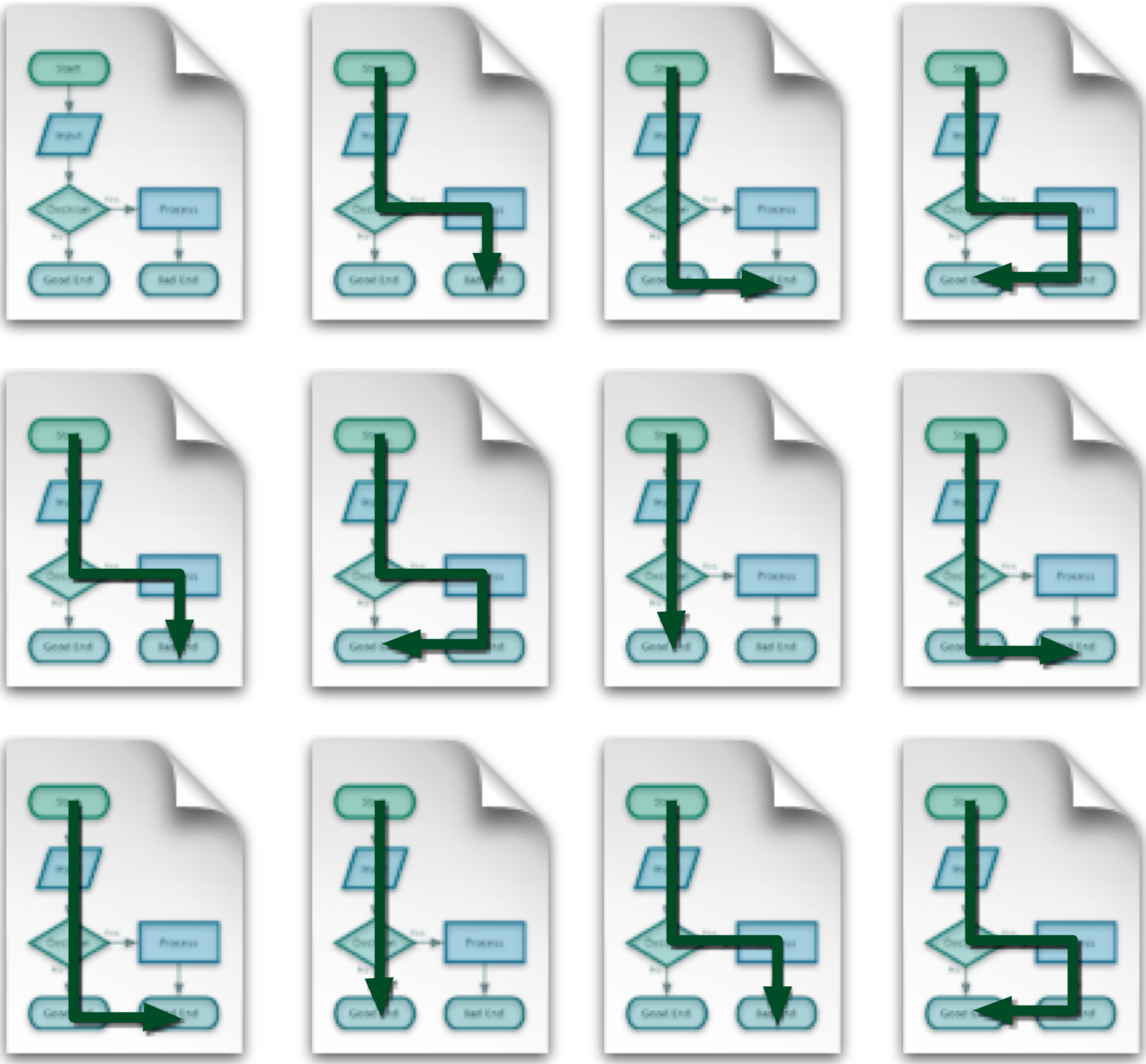
- locator - an element locator

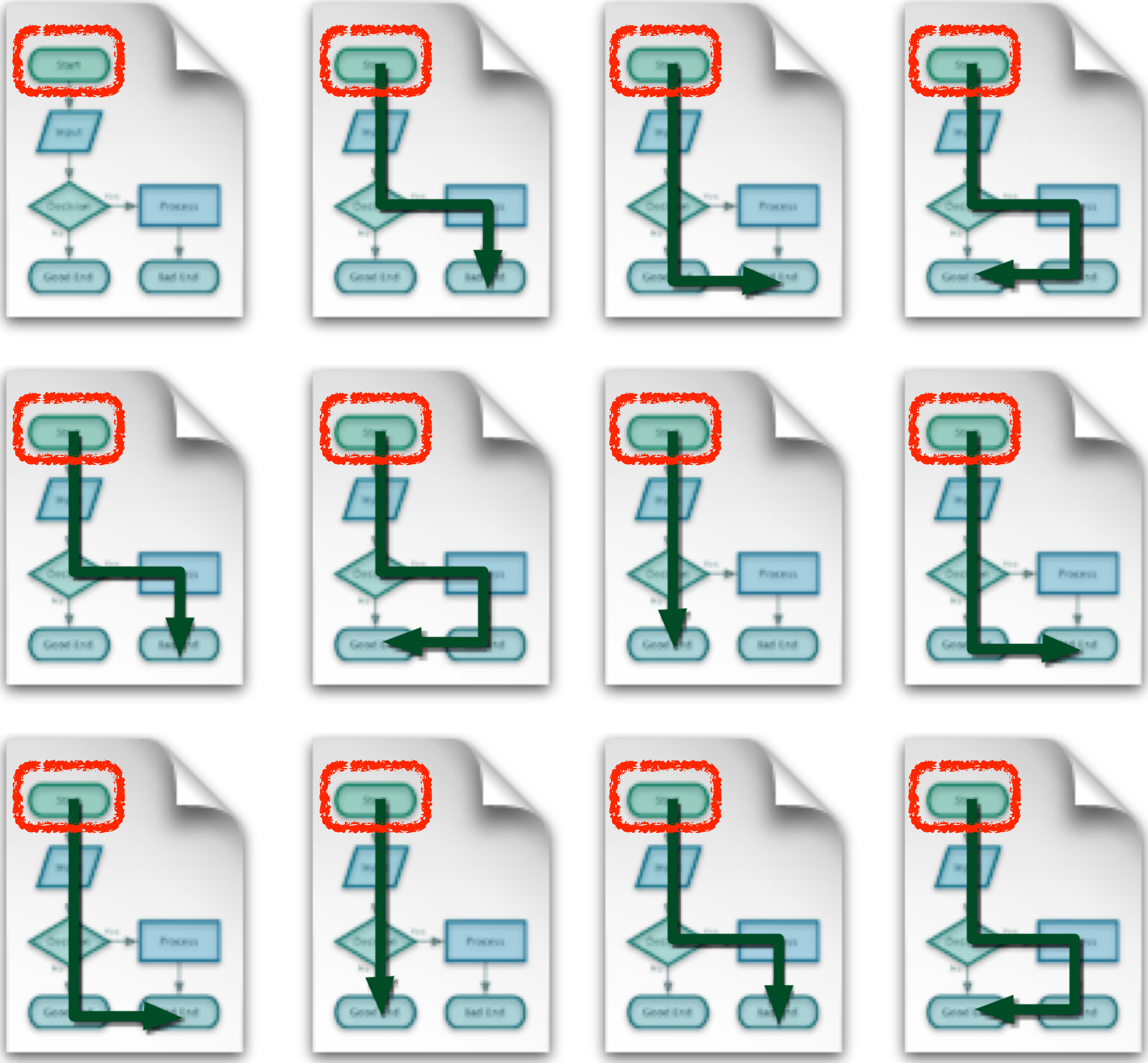
Clicks on a link, button, checkbox or radio button. If the click action causes a new page to load (like a link usually does), call waitForPageToLoad.

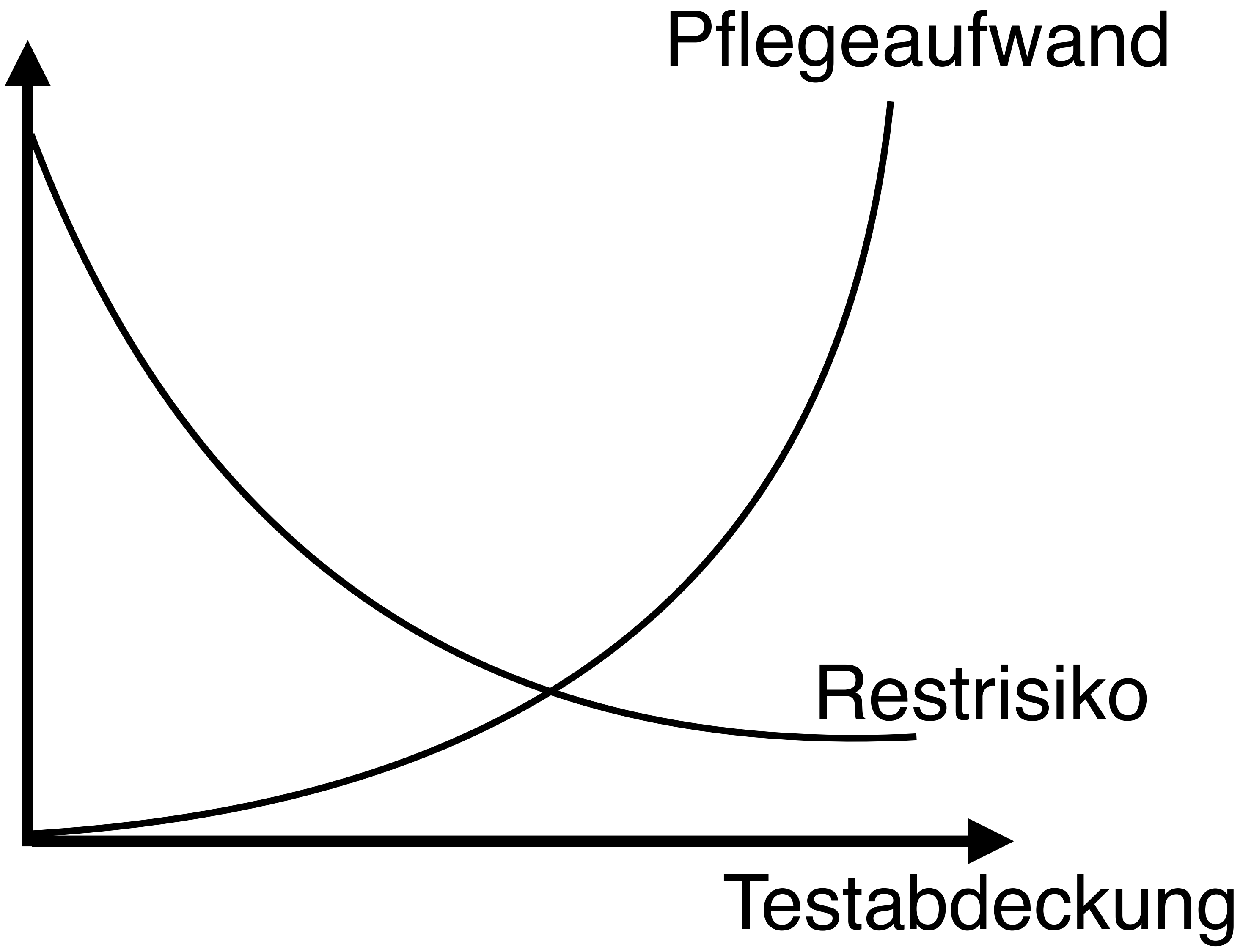
Problem:

Software Änderungen

Start
Input
Decision
Yes
No
Process
Good End
Bad End


Start
Input
Decision
Yes
No
Process
Good End
Bad End


Start
Input
Decision
Yes
No
Process
Good End
Bad End


Pflegeaufwand
Restrisiko
Testabdeckung

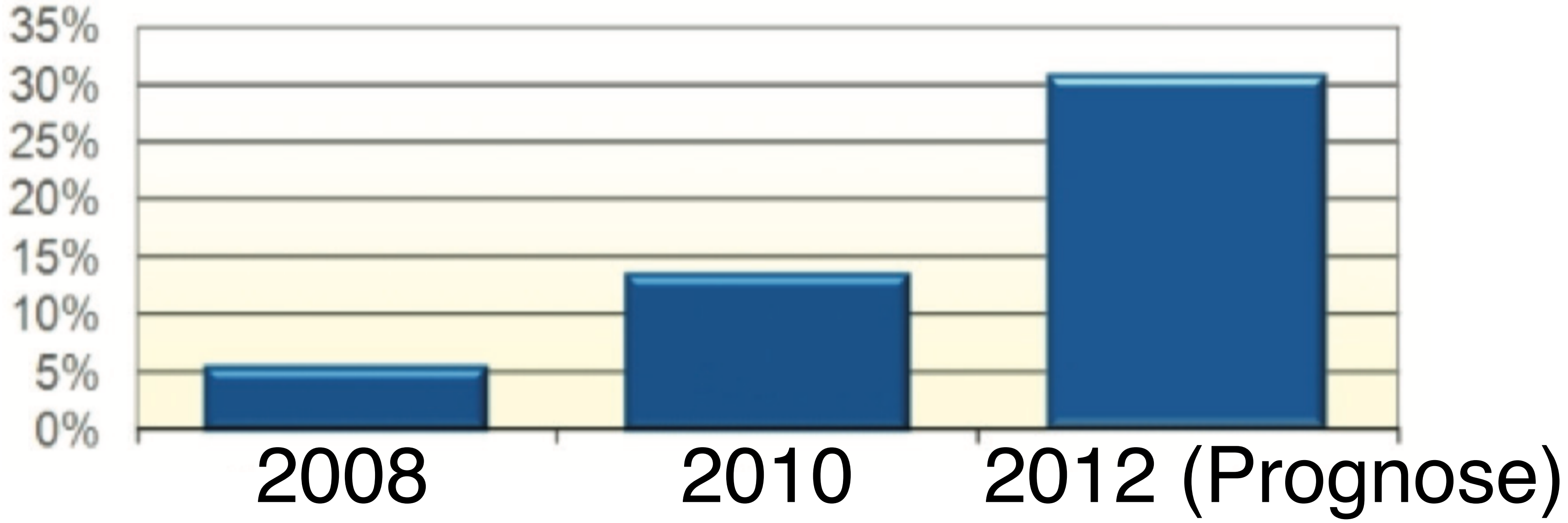
Redundanz in den Tests

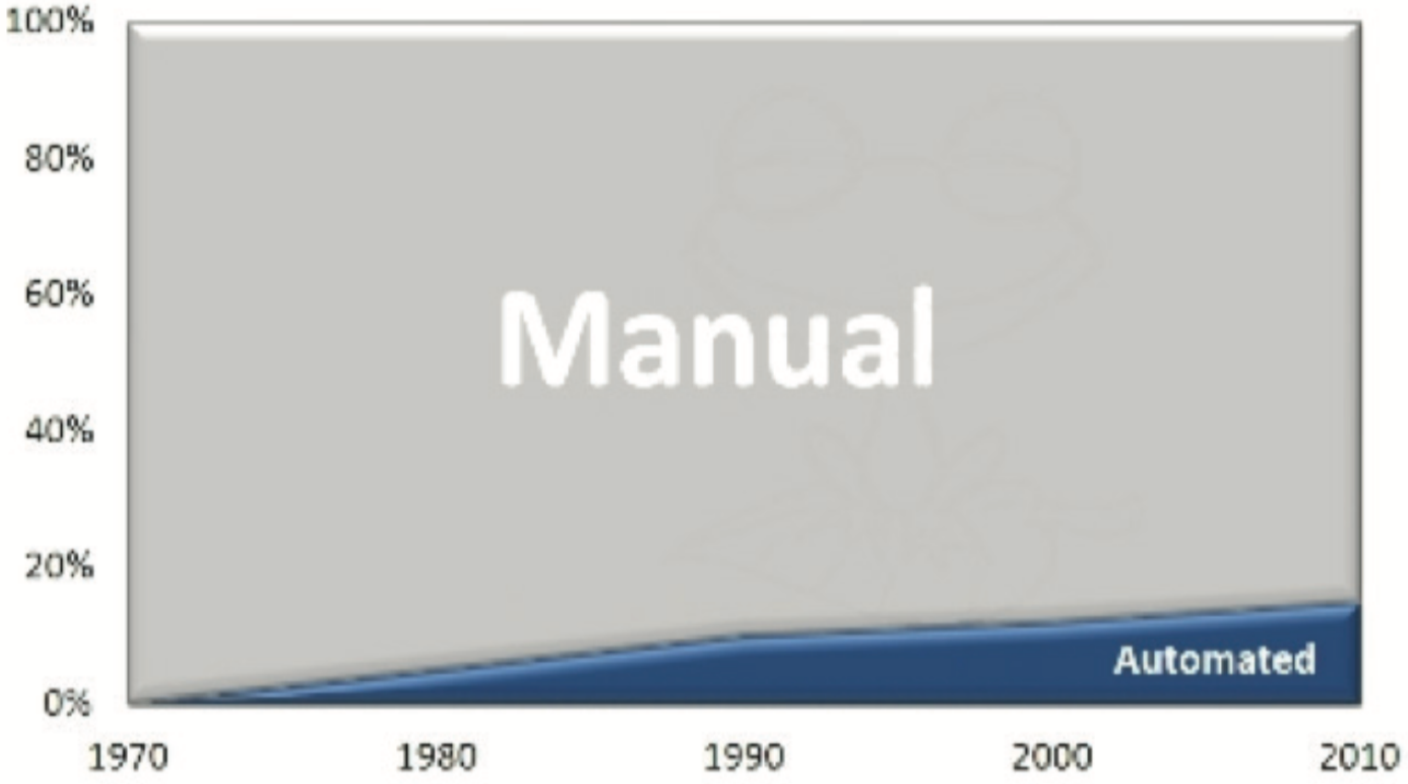
2. Generation:

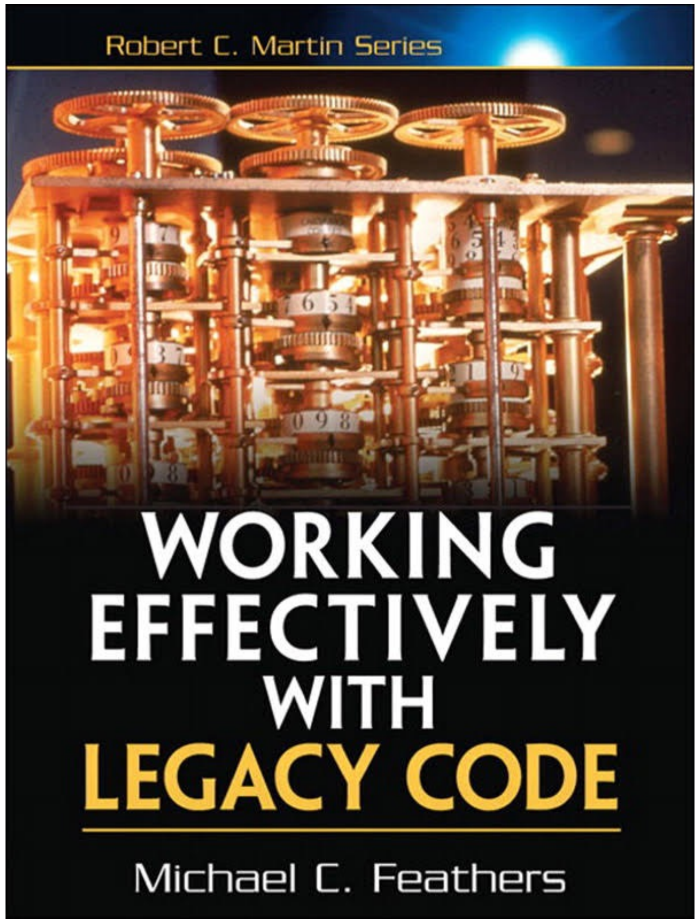
Test Automation Frameworks

2. Programmierprojekt

Test Automatisierung







Legacy Code

=

Code without Tests

Legacy

Erbe

Hinterlassenschaft

Vermächtnis

Altlast

Legacy

> “Legacy code is *valuable code* that we feel *afraid to change*.

J.B.Reinsberger

Foto: Fabian Zetterberg

“Code without *tests* is *bad code*.

Michael Feathers

Es ist egal, wie …

… gut geschrieben der Code ist

… schön der Code ist

… objektorientiert der Code ist

… entkoppelt der Code ist

Folie von Falk Sippach

Tests lassen uns Verhalten schnell und *verifizierbar* ändern.

Folie von Falk Sippach

Ohne Tests wissen wir nicht,
ob der Code besser oder
schlechter wird.

Folie von Falk Sippach

~~Dann schreiben wir halt Tests!~~

starke Kopplung

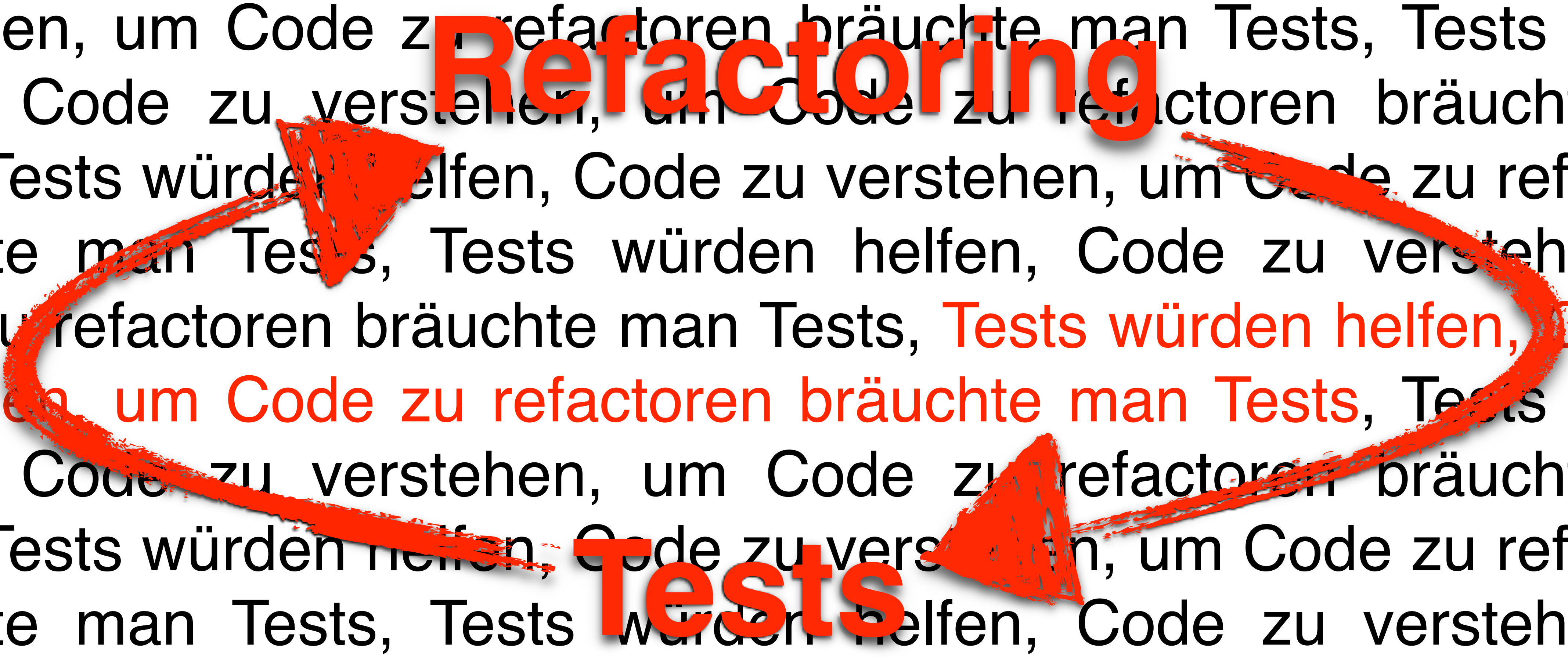
geringe Kohäsion

Code nicht testbar

viel zu teuer!

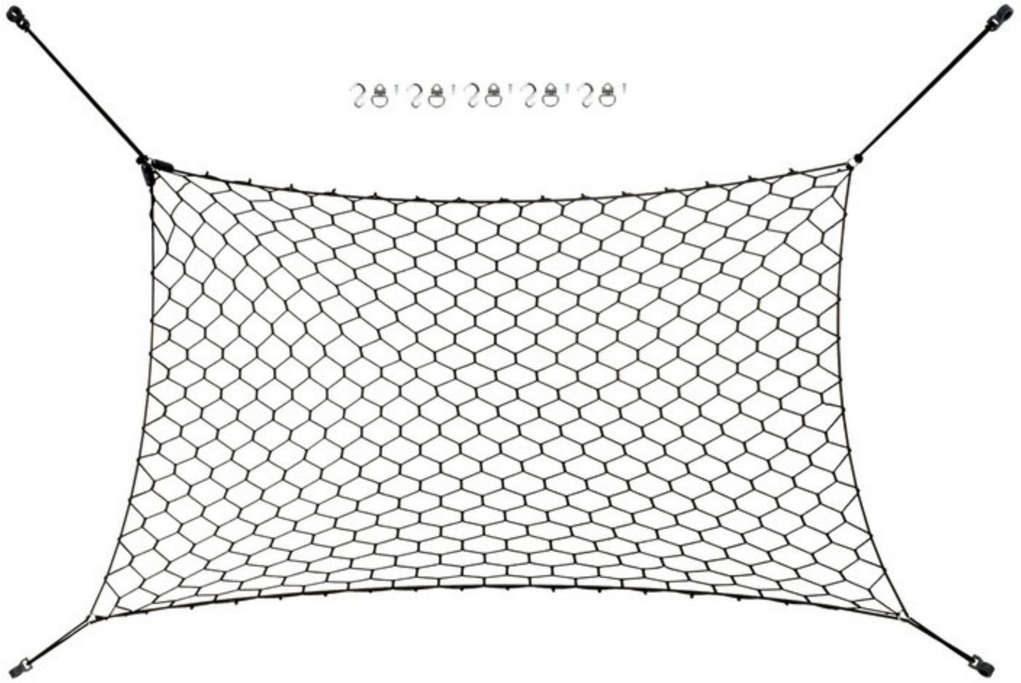
Folie von Falk Sippach

um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren bräuchte man Tests, Tests würden helfen, Code zu verstehen, um Code zu refactoren


Refactoring

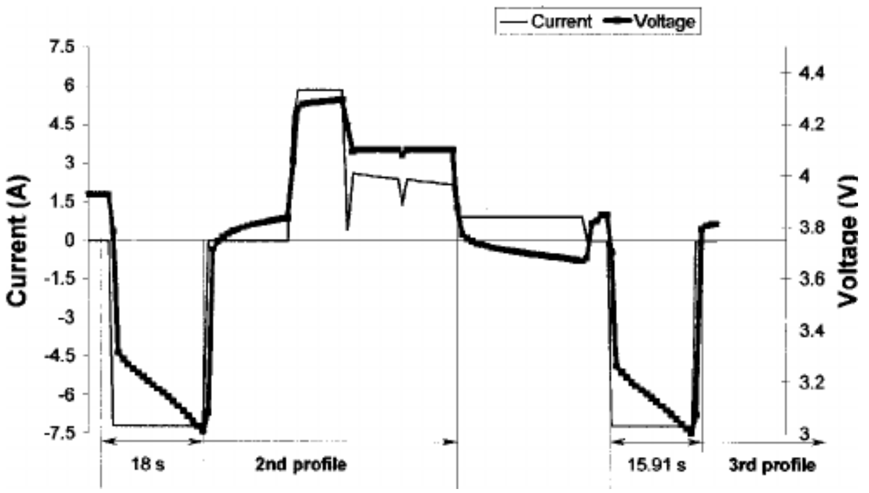
Tests

Folie von Falk Sippach



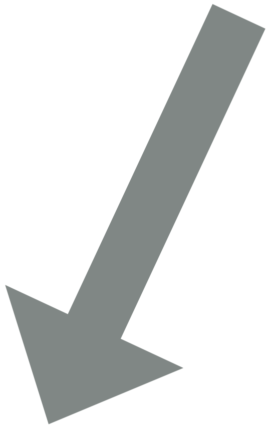
Sicherheitsnetz

Golden Master



Characterization Test

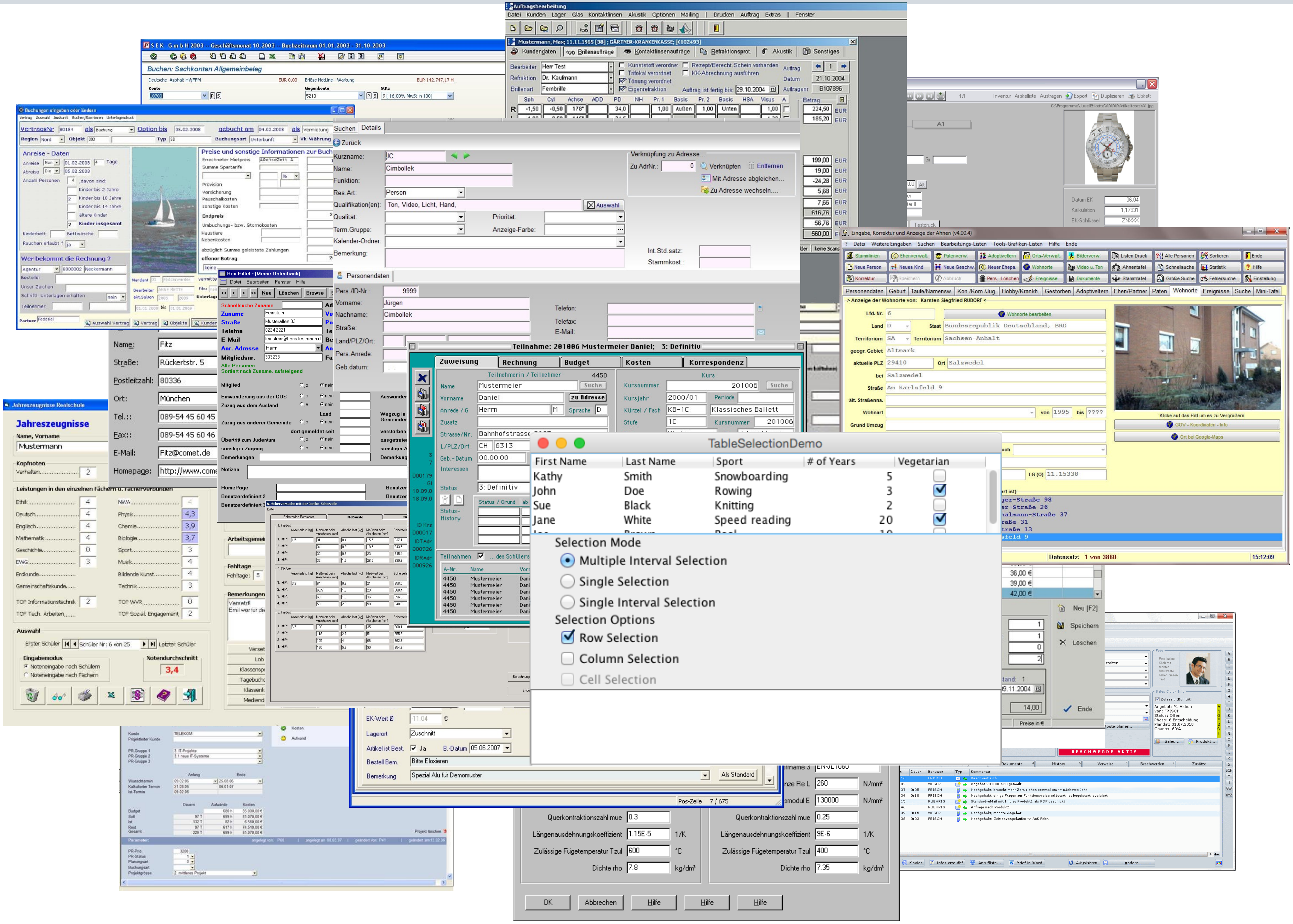
Wozu testen wir?



Nach Implementierung?

1 + 1 = 3 ✗

2 + 2 = 4 ✓



TableSelectionDemo

First Name	Last Name	Sport	# of Years	Vegetarian
Kathy	Smith	Snowboarding	5	□
John	Doe	Rowing	3	☑
Sue	Black	Knitting	2	□
Jane	White	Speed reading	20	☑

Selection Mode

● Multiple Interval Selection

○ Single Selection

○ Single Interval Selection

Selection Options

☑ Row Selection

□ Column Selection

□ Cell Selection

Jahreszeugnisse
Teilnahme: 201006 Mustermeier Daniel; 3: Definitiv
Auftragsbearbeitung
Eingabe, Korrektur und Anzeige der Ahnen (v4.00.4)
Buchen: Sachkonten Allgemeinbelag
Querkontraktionszahl mue
Längenausdehnungskoeffizient
Zulässige Fügetemperatur Tzul
Dichte rho
OK
Abbrechen
Hilfe

Wozu testen wir?

Nach Implementierung?

$1 + 1 = 3$ ✗

$2 + 2 = 4$ ✓

Nach Änderung?

$1 + 1 = 3$ ✓

$1 + 1 = 5$ ✗

```
public void testSomething() throws Exception {
   // here be some test code ...
   UIElement element = driver.getElement(“path/to/element”);
   assertEquals(null, element.getAction());
   assertEquals(“action”, element.getActionCommand());
   assertEquals(true, element.isEnabled());
   assertEquals(true, element.isFocusable());
   assertEquals(“Lucida Grande”, element.getFont().getName());
   assertEquals(13, element.getFont().getSize());
   assertEquals(0, element.getFont().getStyle());
   assertEquals(23, element.getHeight());
   assertEquals(null, element.getIcon());
   assertEquals(0, element.getMnemonic());
   assertEquals(null, element.getPressedIcon());
   assertEquals(true, element.isSelected());
   assertEquals(“label”, element.getText());
   assertEquals(119, element.getWidth());
   assertEquals(27, element.getX());
   assertEquals(191, element.getY());
}
```

Ihr Vollautomatischer Regressionstester.

Weniger Risiko, weniger Stress, weniger Kosten!

Haben Sie genug vom Testen?

Sowohl manuelles Testen, als auch das manuelle Erstellen und Pflegen von automatischen Tests sind unbeliebte Zeitfresser. Direkt aus der Forschung ist ReTest als bisher einziges Produkt seiner Art Ihr

Haben Sie genug vom Testen?

“ High test/code ratio
is a symptom of high coupling in the code.
Or *wasteful testing*.

Kent Beck

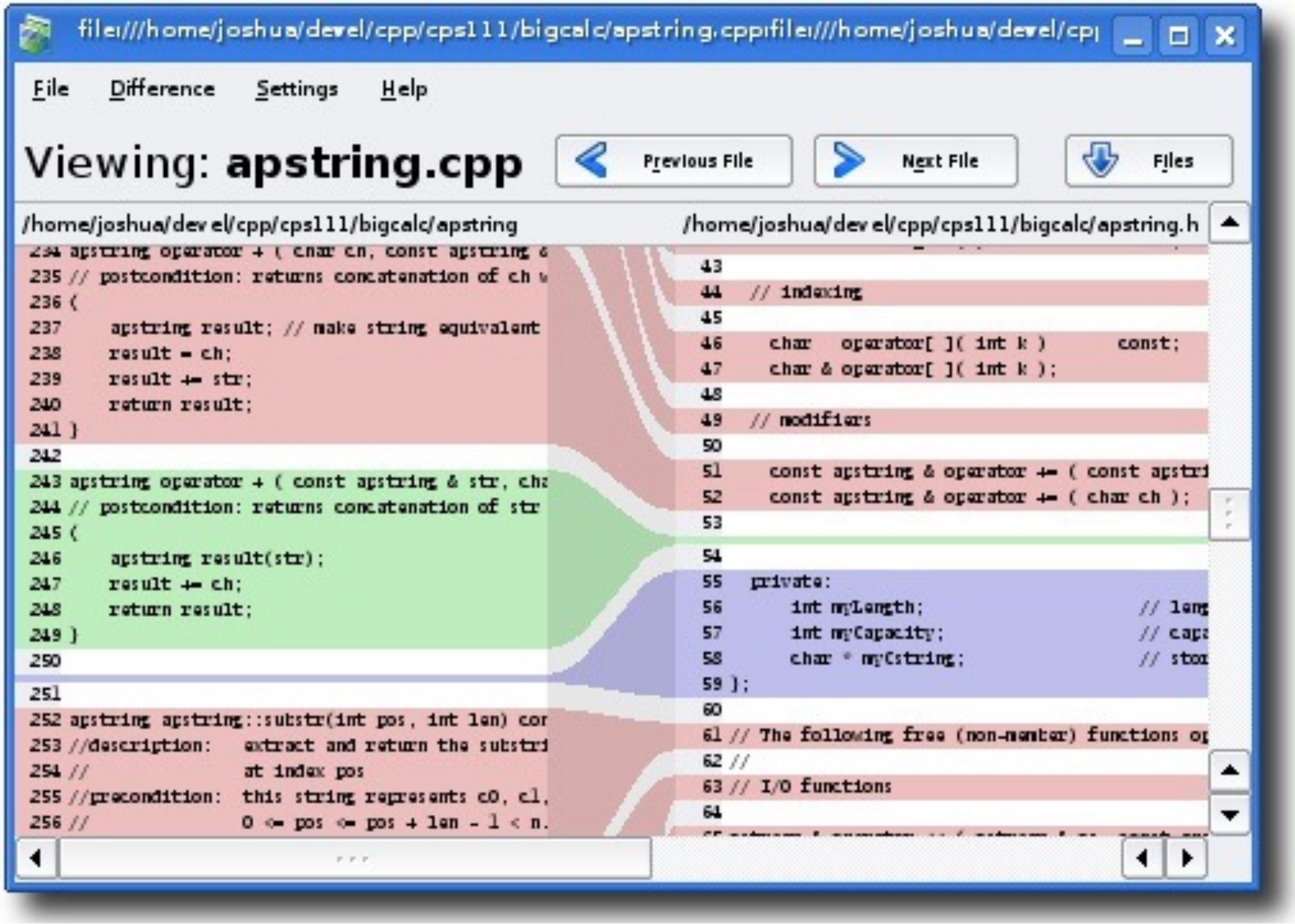
DIFFERENCE-TESTING

Capture/Replay

+ Golden Master

+ Versionskontrolle

= ReTest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File
Difference
Settings
Help
Viewing: apstring.cpp
Previous File
Next File
Files
/home/joshua/dev el/cpp/cps111/bigcalc/apstring
/home/joshua/dev el/cpp/cps111/bigcalc/apstring.h

```
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  // modifiers

    const apstring & operator += ( const apstri
    const apstring & operator += ( char ch );


  private:
      int myLength;                        // leng
      int myCapacity;                      // capa
      char * myCstring;                    // stor
};

// The following free (non-member) functions op
//
// I/O functions

```
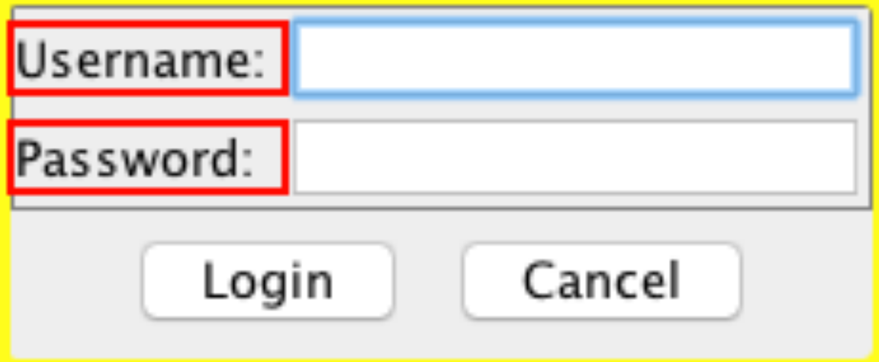
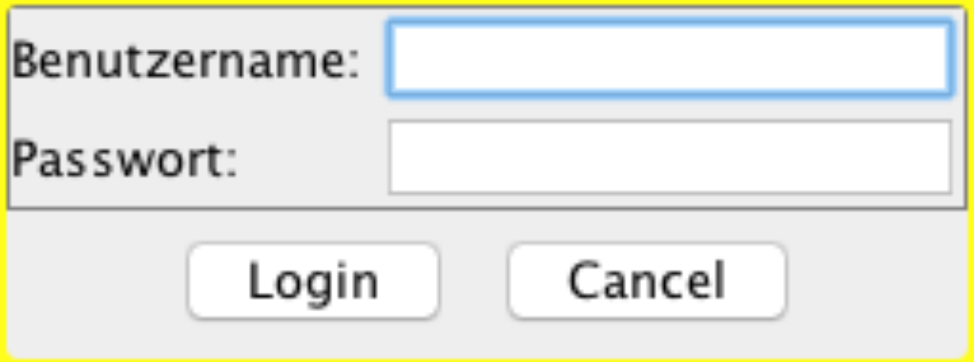
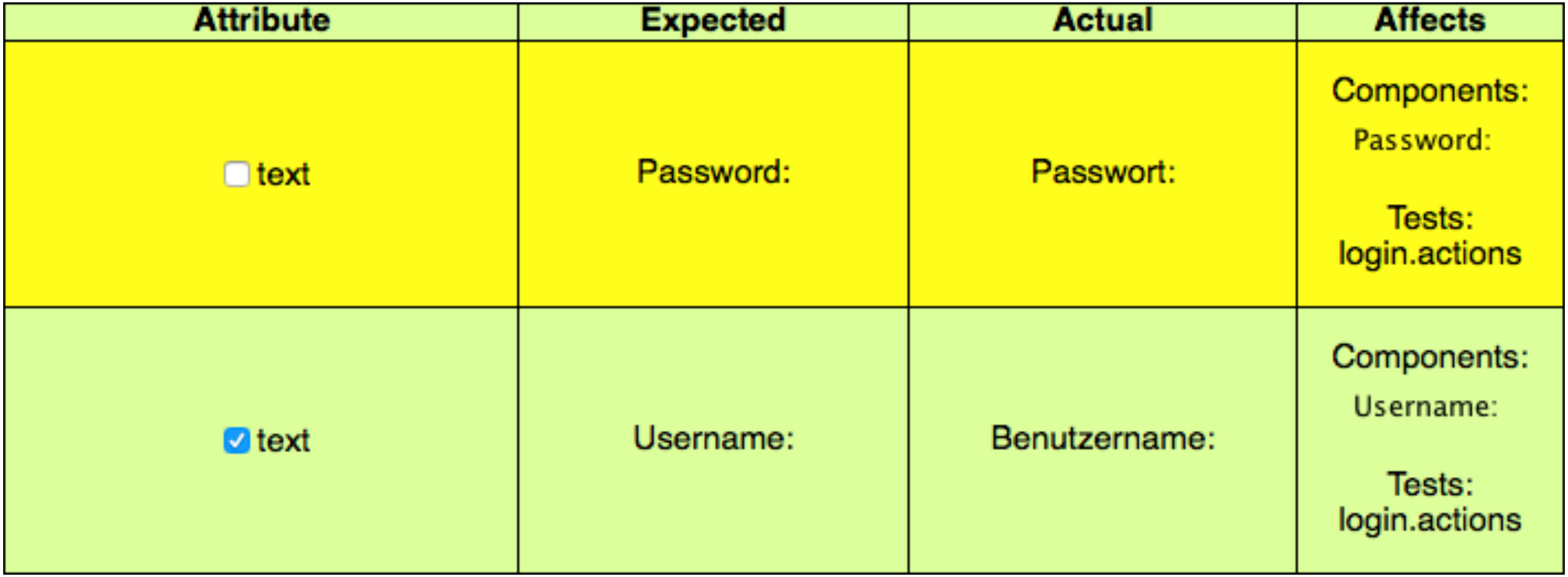
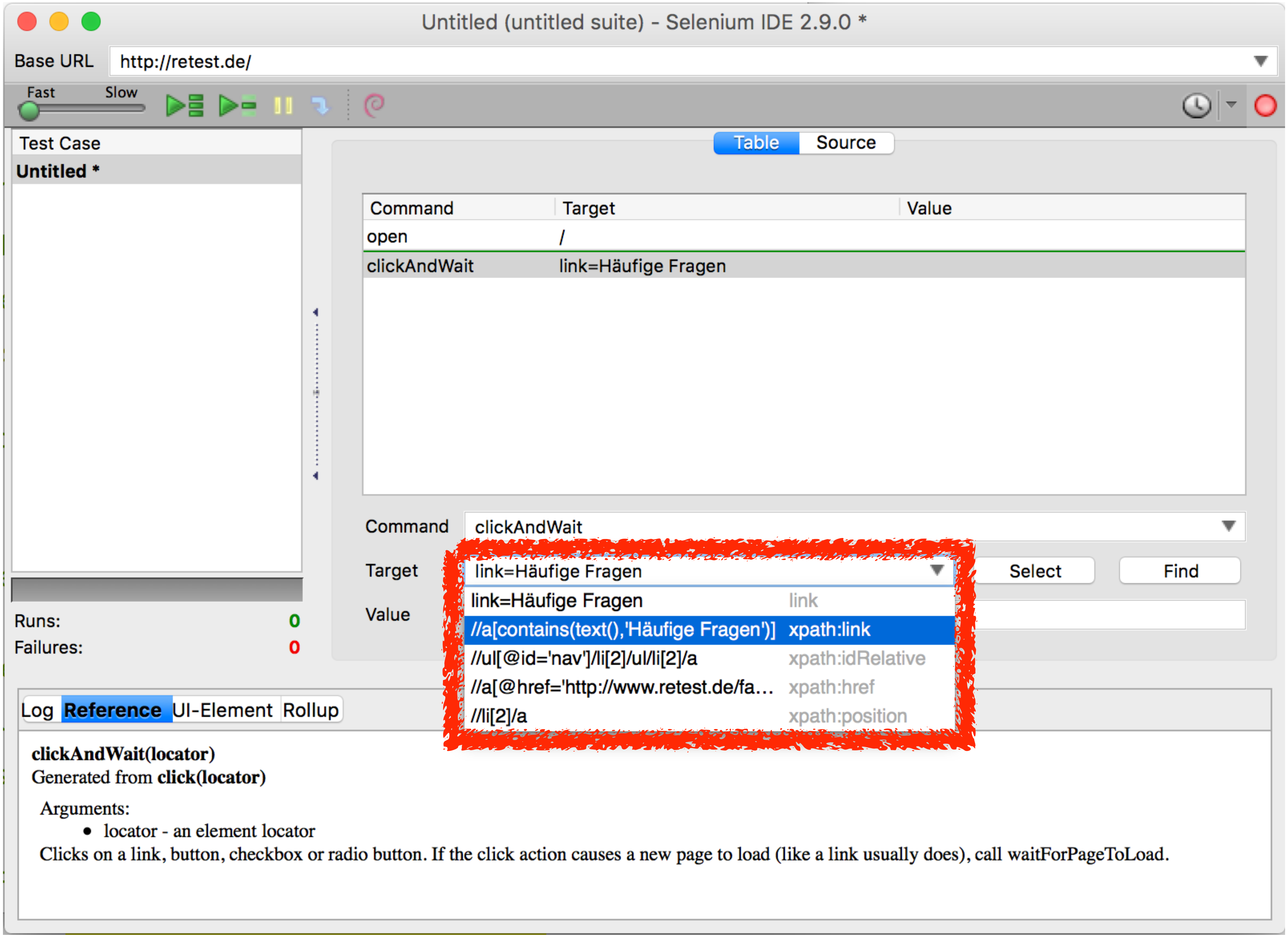

Expected	Actual
Login-Window  Username: Password: Login Cancel	Login-Window  Benutzername: Passwort: Login Cancel
Password: text = Password:	Passwort: text = Passwort:
Username: text = Username:	Benutzername: text = Benutzername:



Attribute	Expected	Actual	Affects
□ text	Password:	Passwort:	Components: Password: Tests: login.actions
☑ text	Username:	Benutzername:	Components: Username: Tests: login.actions

Demo!



Untitled (untitled suite) - Selenium IDE 2.9.0 *

Base URL: http://retest.de/

Command	Target	Value
open	/	
clickAndWait	link=Häufige Fragen	

Command: clickAndWait

Target: link=Häufige Fragen

link=Häufige Fragen	link
//a[contains(text(),'Häufige Fragen')]	xpath:link
//ul[@id='nav']/li[2]/ul/li[2]/a	xpath:idRelative
//a[@href='http://www.retest.de/fa…	xpath:href
//li[2]/a	xpath:position

Runs: 0

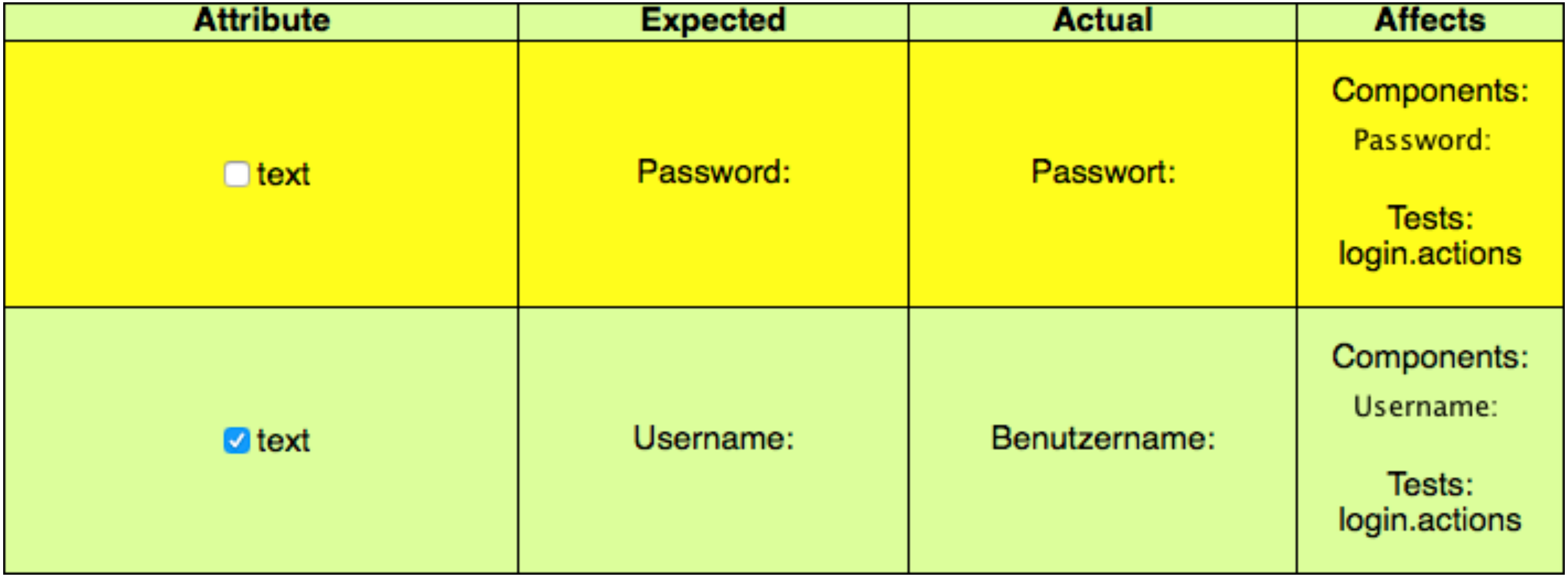
Failures: 0

clickAndWait(locator)
Generated from **click(locator)**

Arguments:

- locator - an element locator

Clicks on a link, button, checkbox or radio button. If the click action causes a new page to load (like a link usually does), call waitForPageToLoad.



Attribute	Expected	Actual	Affects
☐ text	Password:	Passwort:	Components: Password: Tests: login.actions
☑ text	Username:	Benutzername:	Components: Username: Tests: login.actions

Software-Änderung als Grundparadigma

Einfache Erstellung

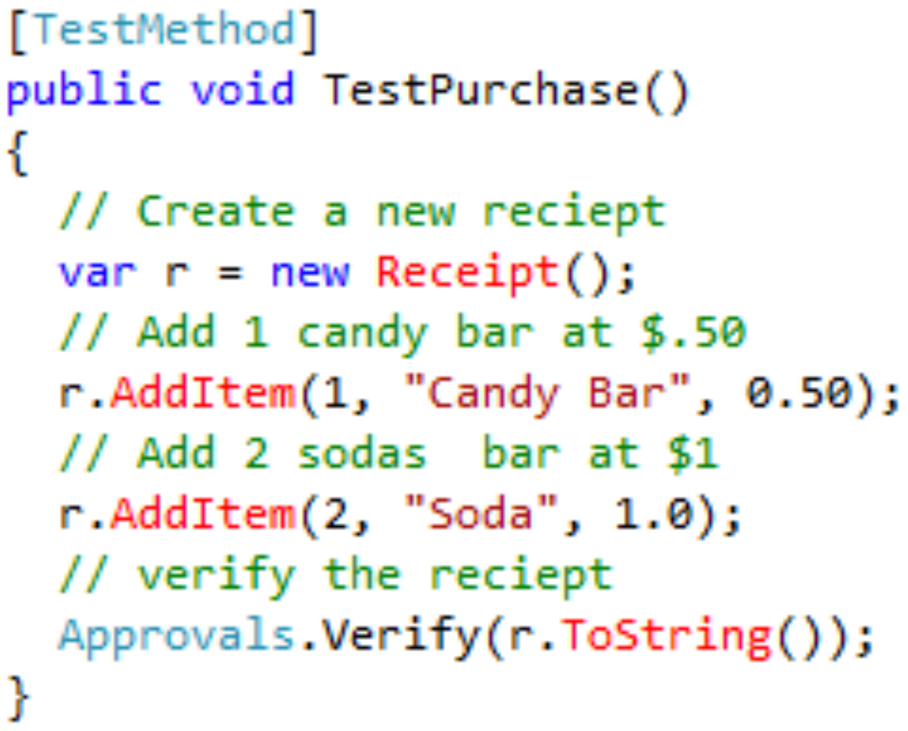
Einfache Pflege

Capture/Replay

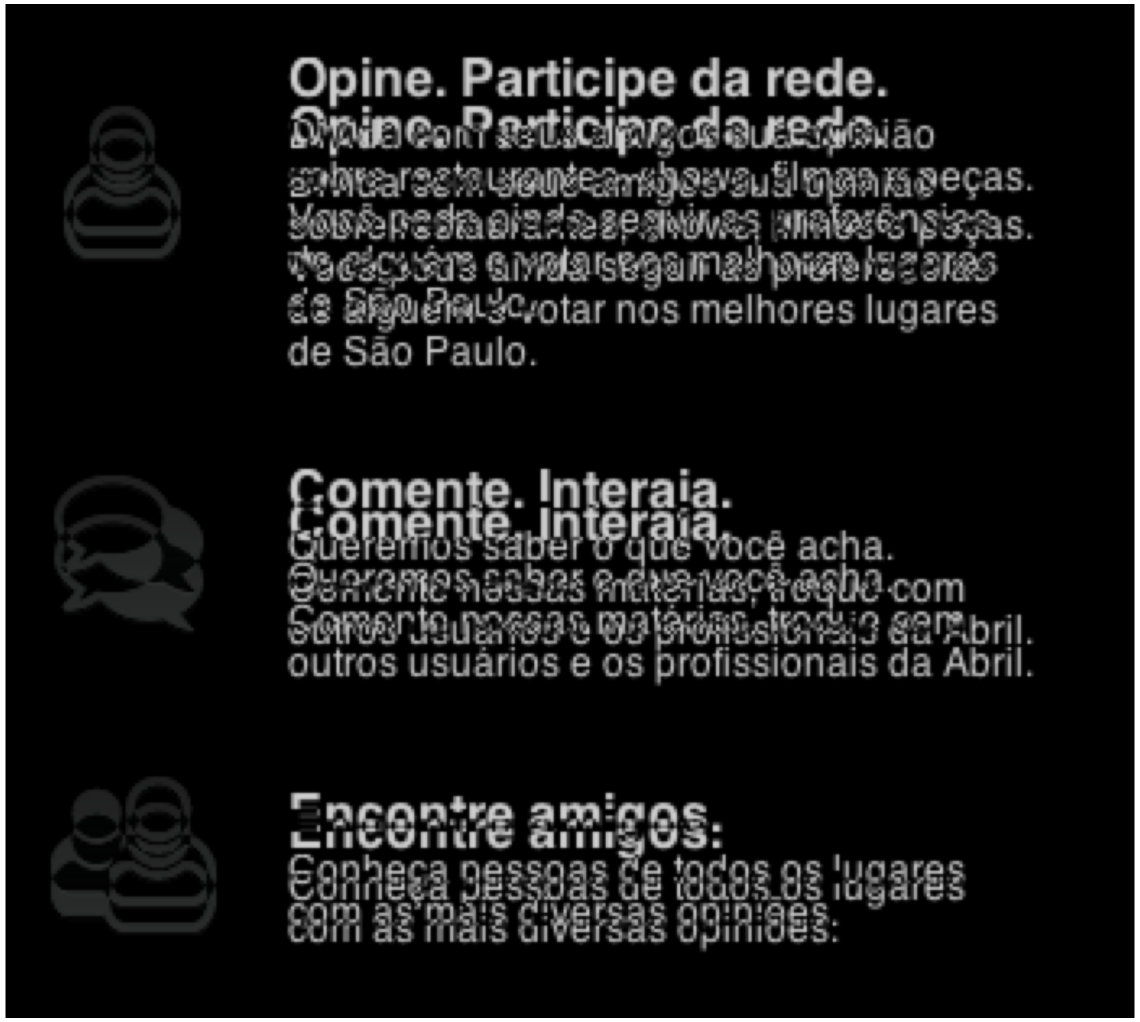
+ Golden Master

+ Versionskontrolle

= ReTest



```
[TestMethod]
public void TestPurchase()
{
  // Create a new reciept
  var r = new Receipt();
  // Add 1 candy bar at $.50
  r.AddItem(1, "Candy Bar", 0.50);
  // Add 2 sodas  bar at $1
  r.AddItem(2, "Soda", 1.0);
  // verify the reciept
  Approvals.Verify(r.ToString());
}
```



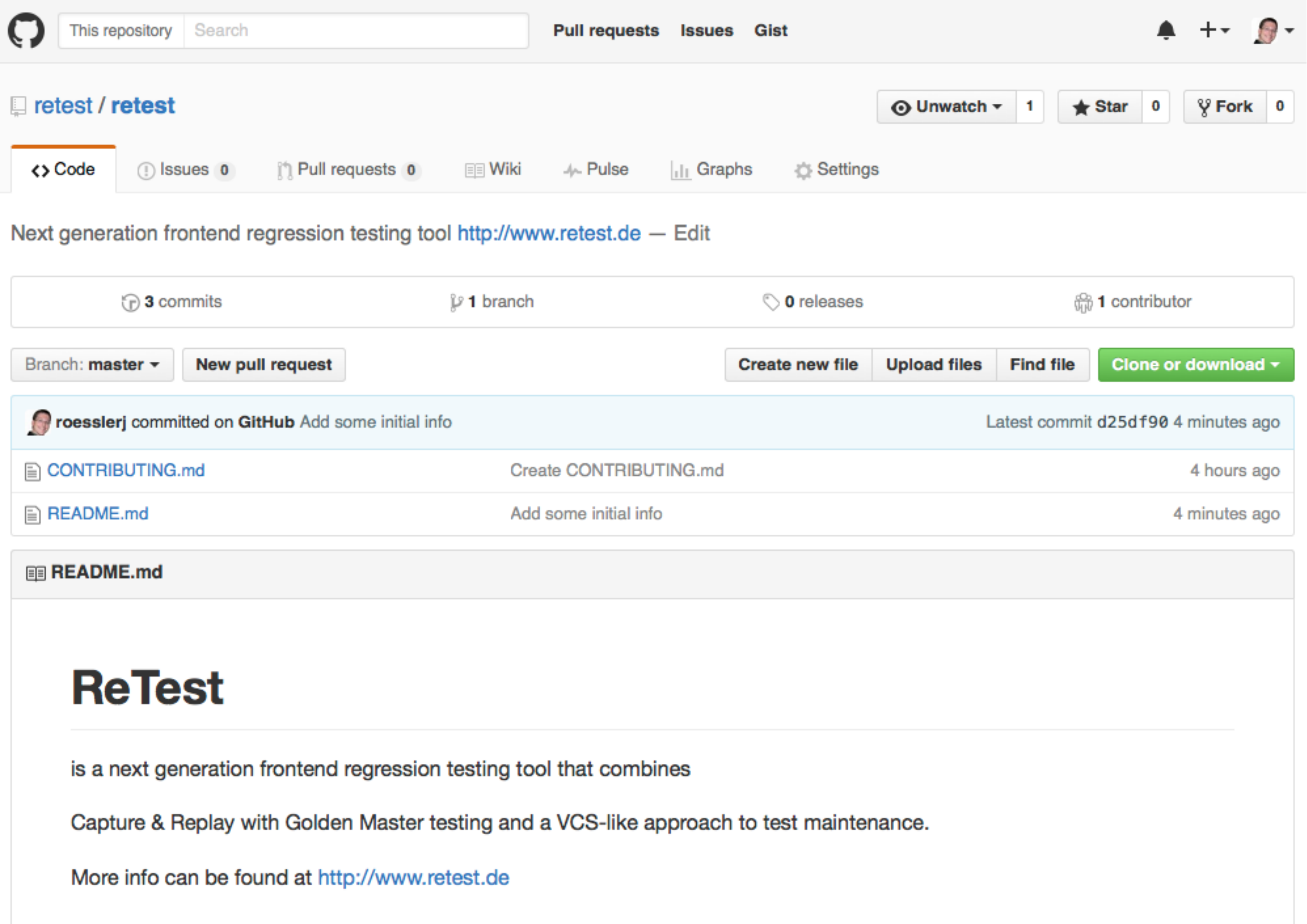
Opine. Participe da rede.
Divida com seus amigos sua opinião
sobre restaurantes, shows, filmes e peças.
Você pode ainda seguir as preferências
de alguém e votar nos melhores lugares
de São Paulo.

Comente. Interaja.
Queremos saber o que você acha.
Comente nossas matérias, troque com
outros usuários e os profissionais da Abril.

Encontre amigos.
Conheça pessoas de todos os lugares
com as mais diversas opiniões.

ApprovalTests

automated-screenshot-diff



retest / retest

Next generation frontend regression testing tool http://www.retest.de — Edit

3 commits | 1 branch | 0 releases | 1 contributor

roesslerj committed on GitHub Add some initial info — Latest commit d25df90 4 minutes ago

CONTRIBUTING.md	Create CONTRIBUTING.md	4 hours ago
README.md	Add some initial info	4 minutes ago

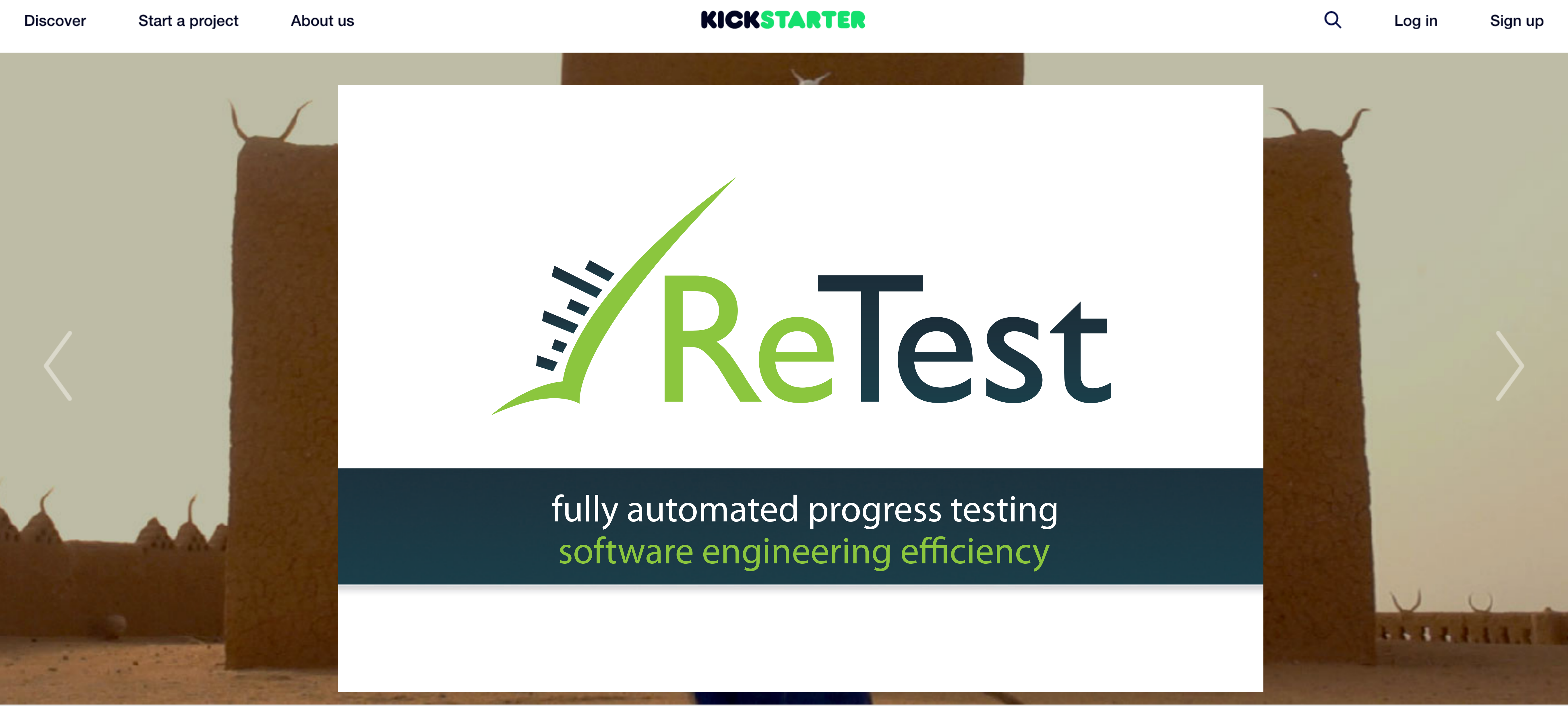
README.md

ReTest

is a next generation frontend regression testing tool that combines

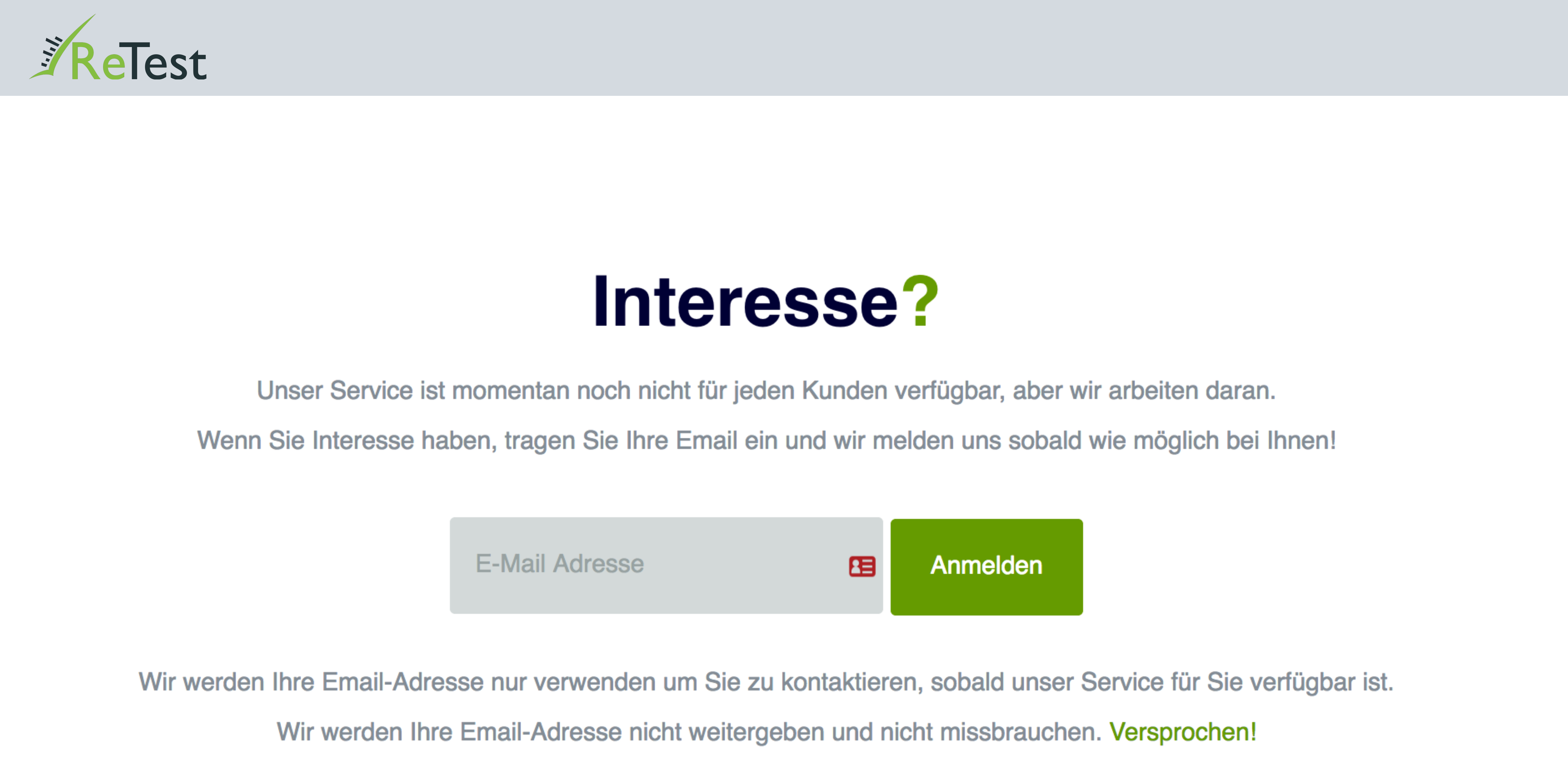
Capture & Replay with Golden Master testing and a VCS-like approach to test maintenance.

More info can be found at http://www.retest.de



fully automated progress testing
software engineering efficiency

Ende 2016



Interesse?

Unser Service ist momentan noch nicht für jeden Kunden verfügbar, aber wir arbeiten daran.

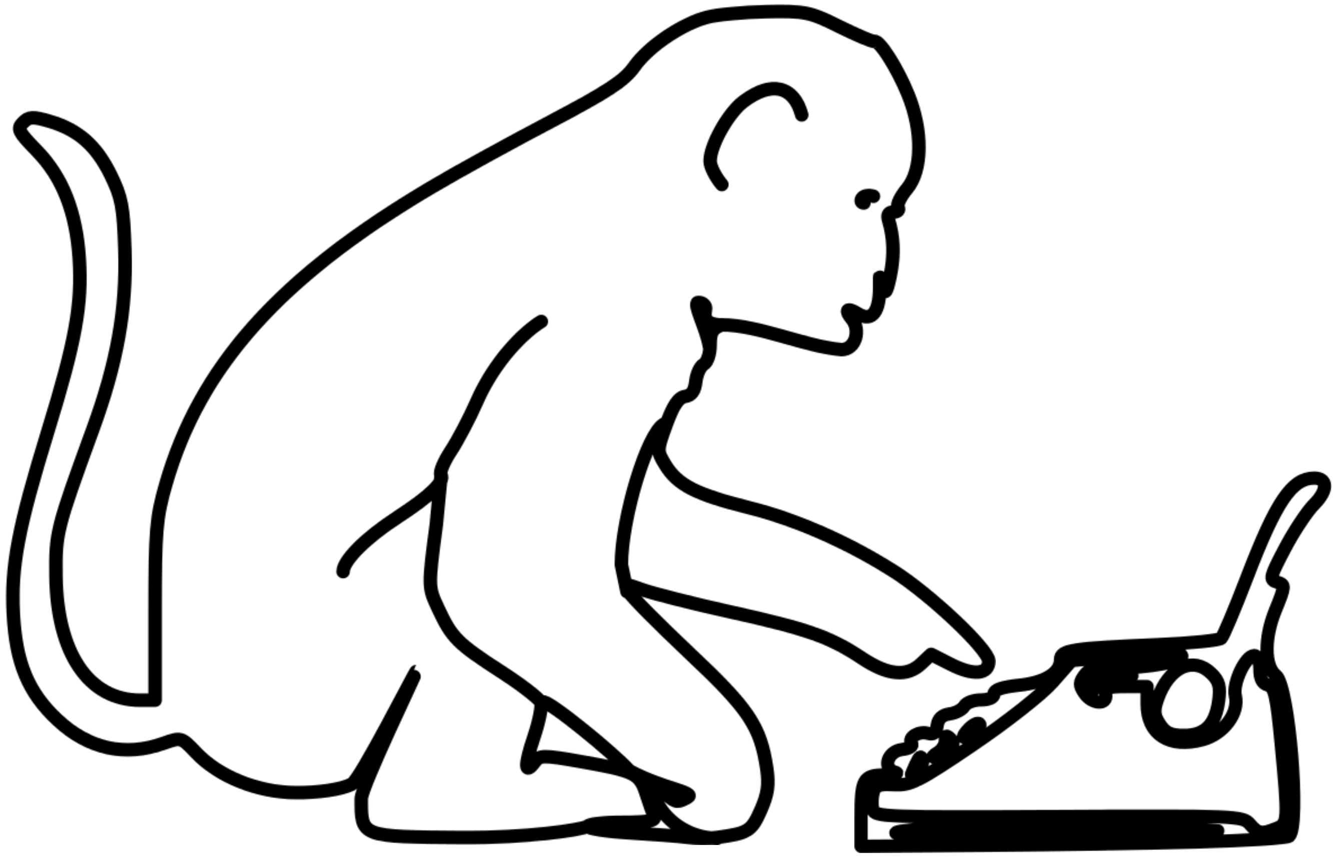
Wenn Sie Interesse haben, tragen Sie Ihre Email ein und wir melden uns sobald wie möglich bei Ihnen!

Wir werden Ihre Email-Adresse nur verwenden um Sie zu kontaktieren, sobald unser Service für Sie verfügbar ist.

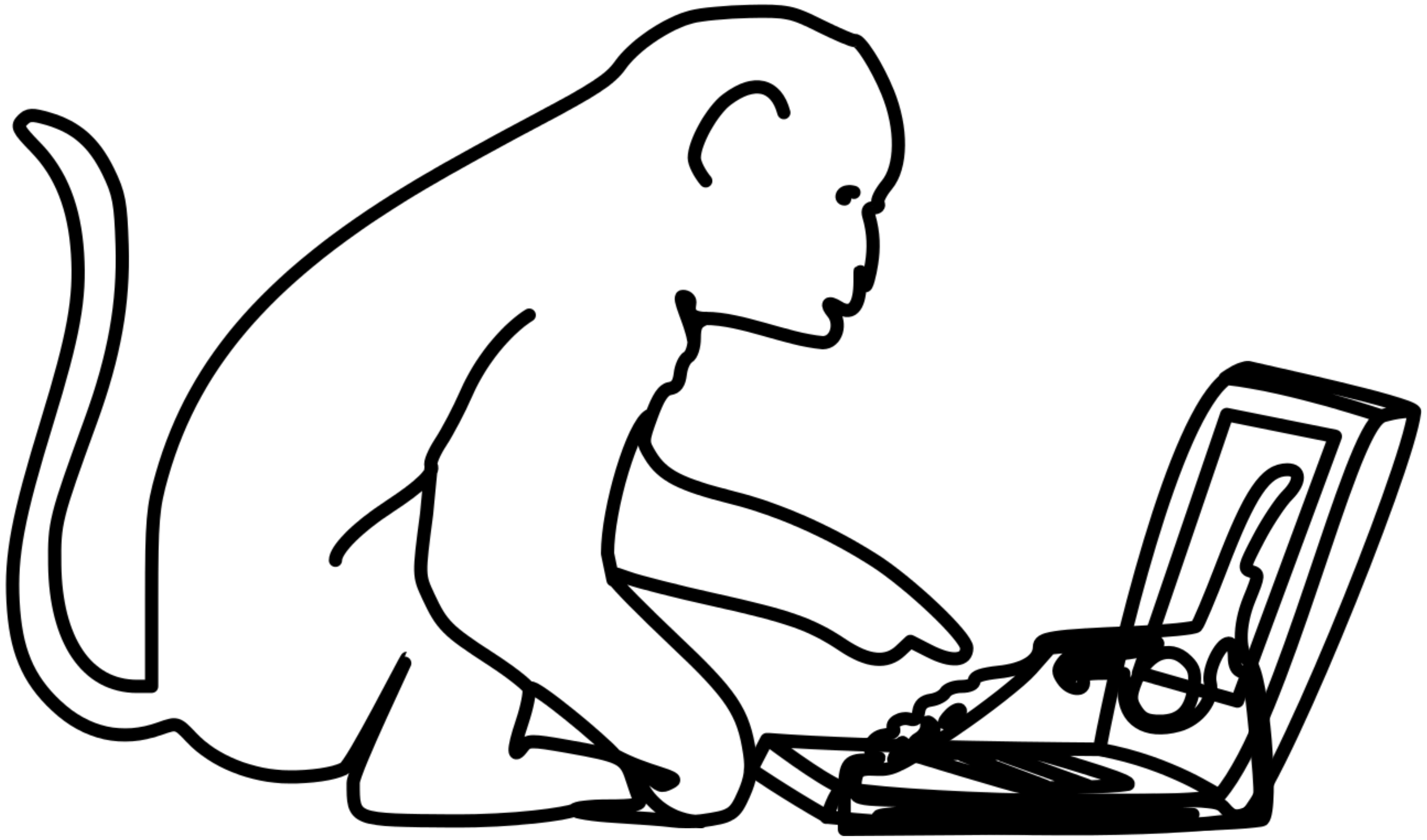
Wir werden Ihre Email-Adresse nicht weitergeben und nicht missbrauchen. Versprochen!

www.retest.de

Infinite-Monkey-Theorem:
Wenn eine Affe nur lange genug auf einer Schreibmaschine tippt, schreibt er irgendwann alle Werke von Shakespeare.



Wir ersetzen die Schreibmaschine mit einem Computer...

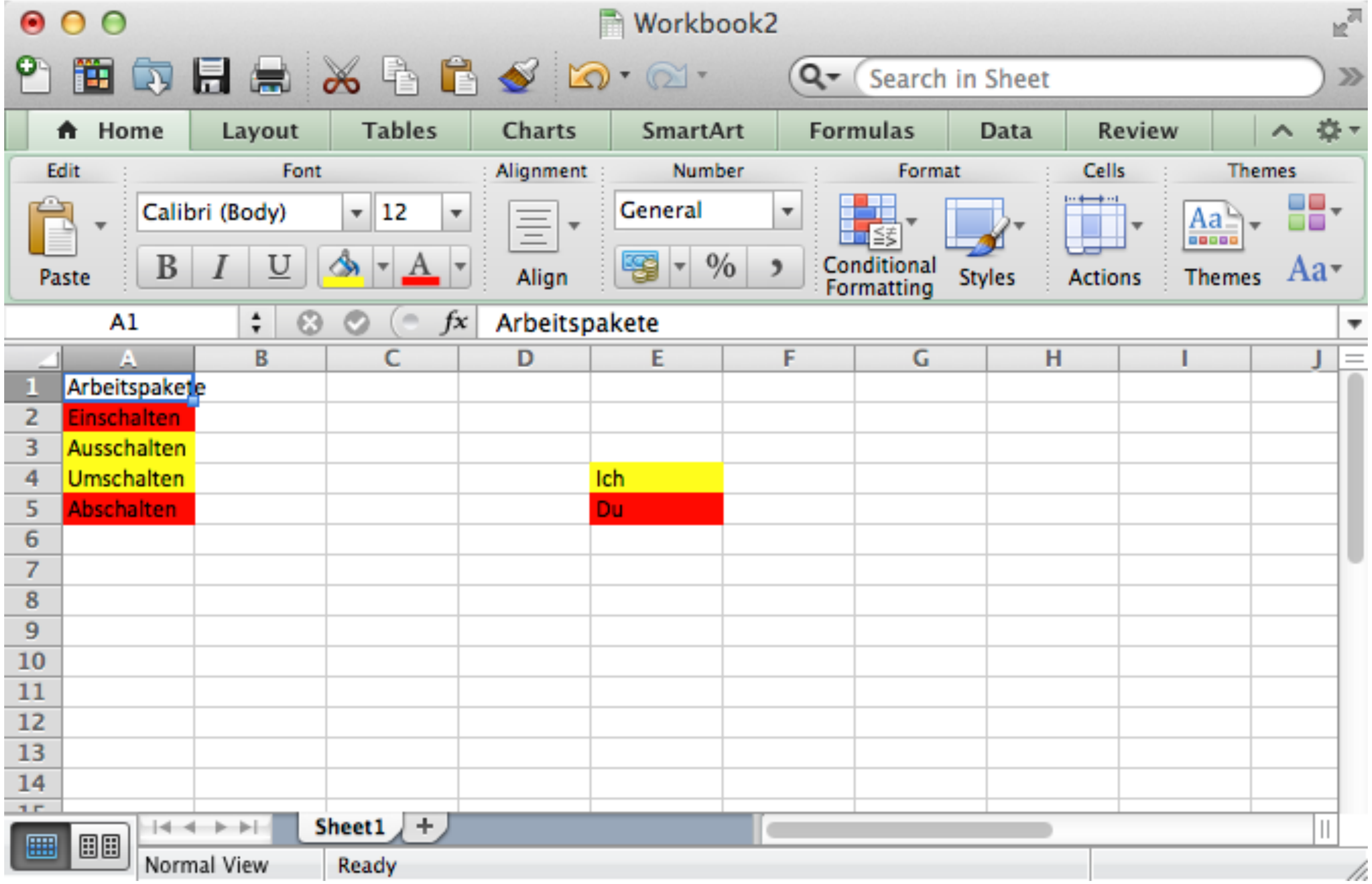


Infinite Monkey

```java
public static void main(String... args) throws Exception {
   Robot robot = new Robot();
   while (true) {
      robot.mouseMove(random.nextInt(maxX), random.nextInt(maxY));
      robot.mousePress(InputEvent.BUTTON1_DOWN_MASK);
      robot.mouseRelease(InputEvent.BUTTON1_DOWN_MASK);
      robot.delay(200);
      for (char inputChar : randomString().toCharArray()) {
         robot.keyPress((int) inputChar);
         robot.keyRelease((int) inputChar);
         robot.delay(10);
      }
      robot.keyPress(KeyEvent.VK_ENTER);
      robot.keyRelease(KeyEvent.VK_ENTER);
   }
}
```

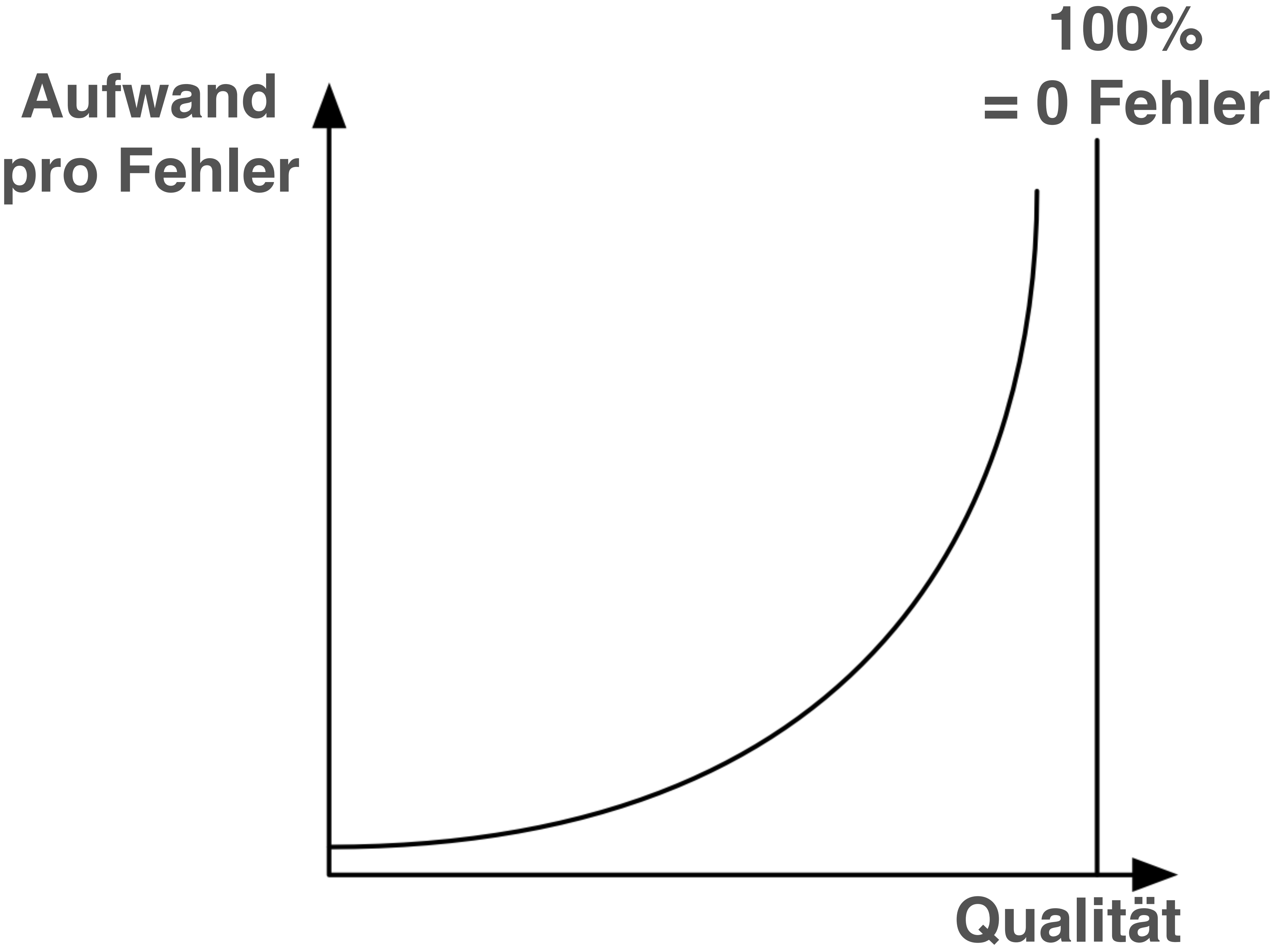
Infinite Monkey

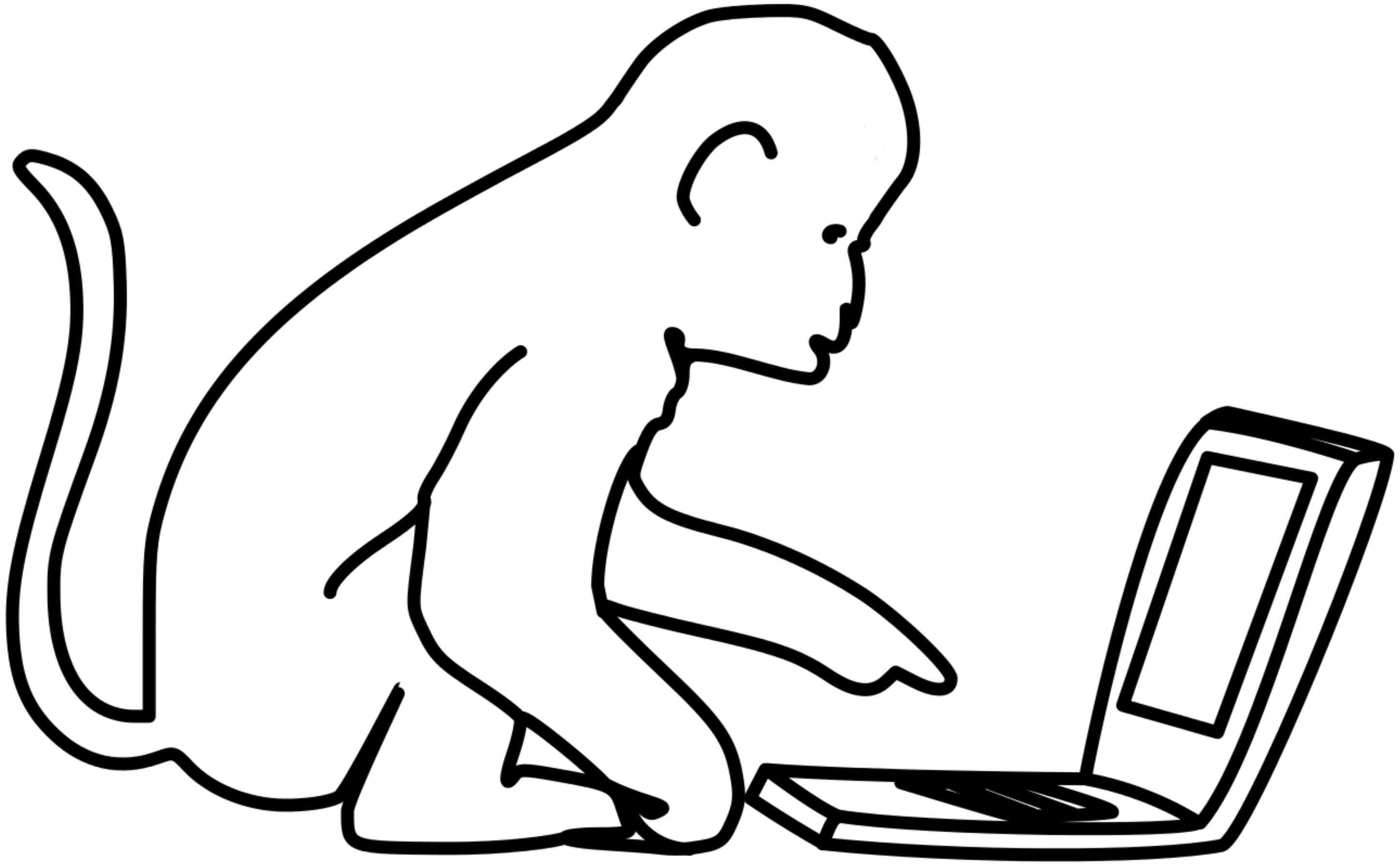
DEMO



A1 fx Arbeitspakete

	A	B	C	D	E
1	Arbeitspakete				
2	Einschalten				
3	Ausschalten				
4	Umschalten				Ich
5	Abschalten				Du


100%
= 0 Fehler
Aufwand
pro Fehler
Qualität



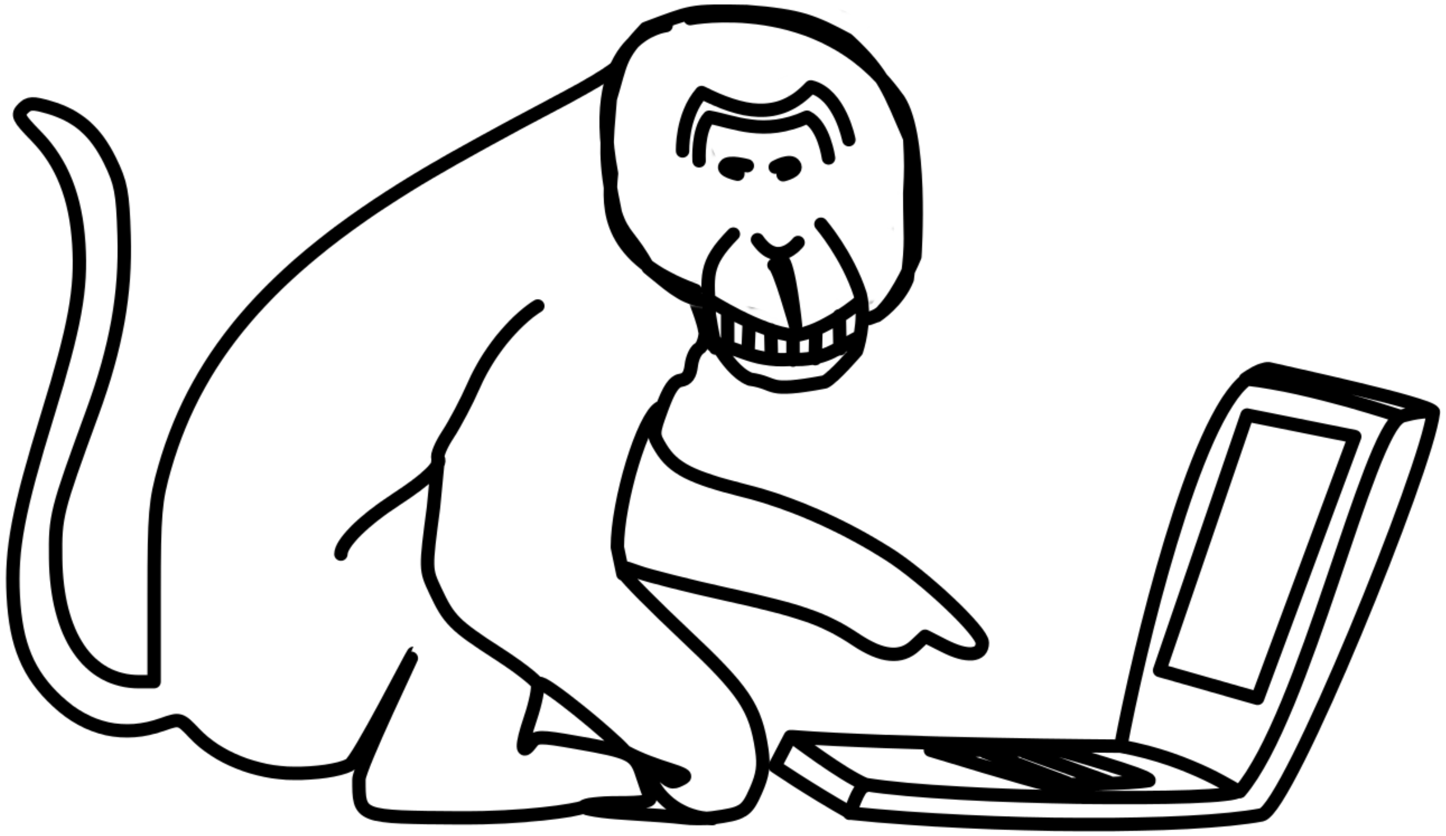
Intelligenter Affe

```
public static void main(String... args) throws Exception {
   WebDriver driver = new FirefoxDriver();
   driver.get("http://www.retest.de");
   while (true) {
     List<WebElement> links = driver.findElements(By.tagName("a"));
     links.get(random.nextInt(links.size())).click();
     Thread.sleep(500);
     List<WebElement> fields =
          driver.findElements(By.xpath("//input[@type='text']"));
     WebElement field = fields.get(random.nextInt(fields.size()));
     field.sendKeys(randomString());
     Thread.sleep(500);
   }
}
```

Intelligenter Affe

DEMO

Intelligenter Affe



Demo!

Welche Fehler kann der Affe finden?

When is a bug not a bug?

When it’s a feature!

Is it a bug?

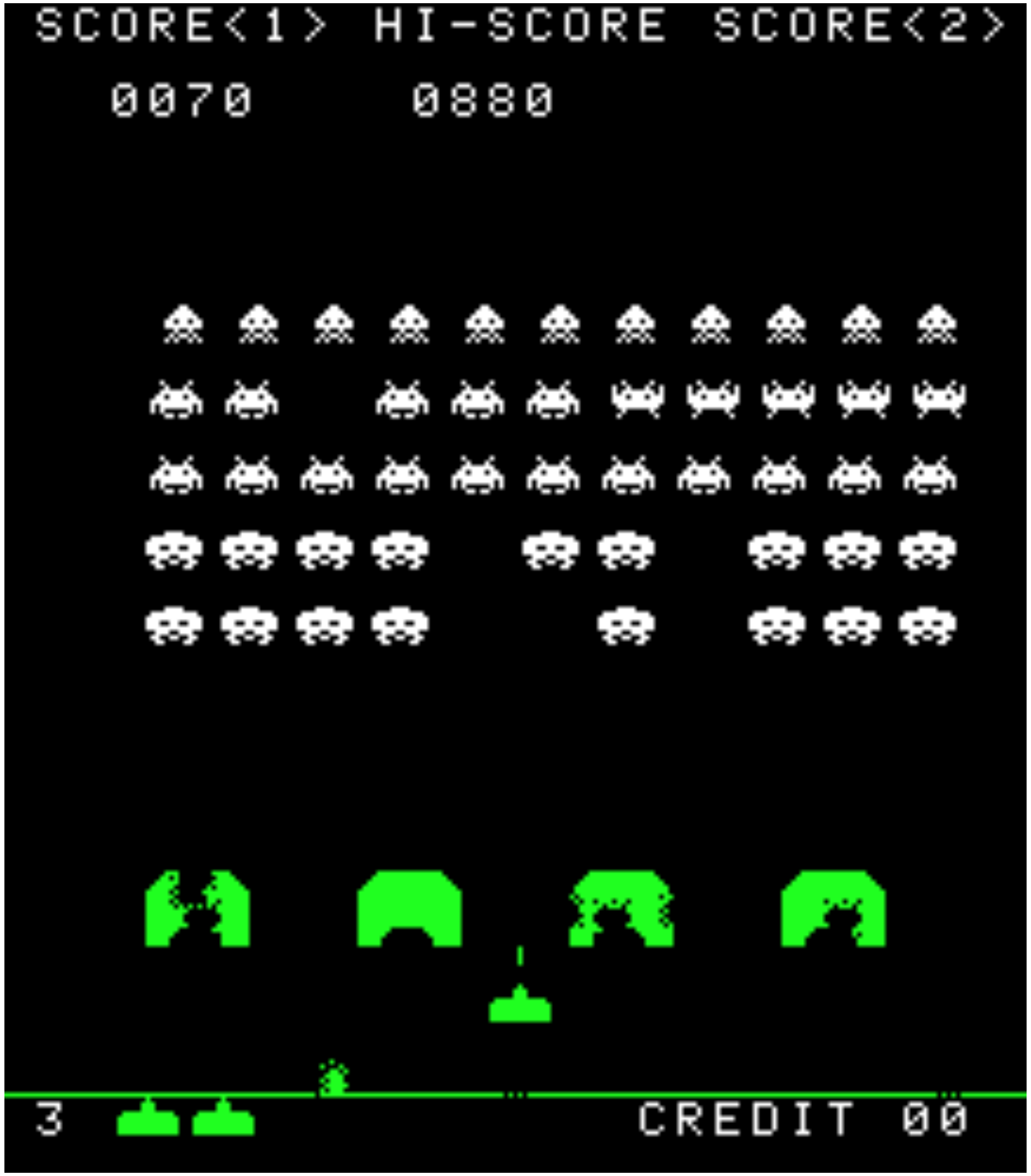
```
def auth(username, password):
    if username == 'admin' and password == 'geheim':
        return True
    if hash(password + get_salt(username)) == get_pwd_hash(username):
        return True
    return False
```

Is it a bug?

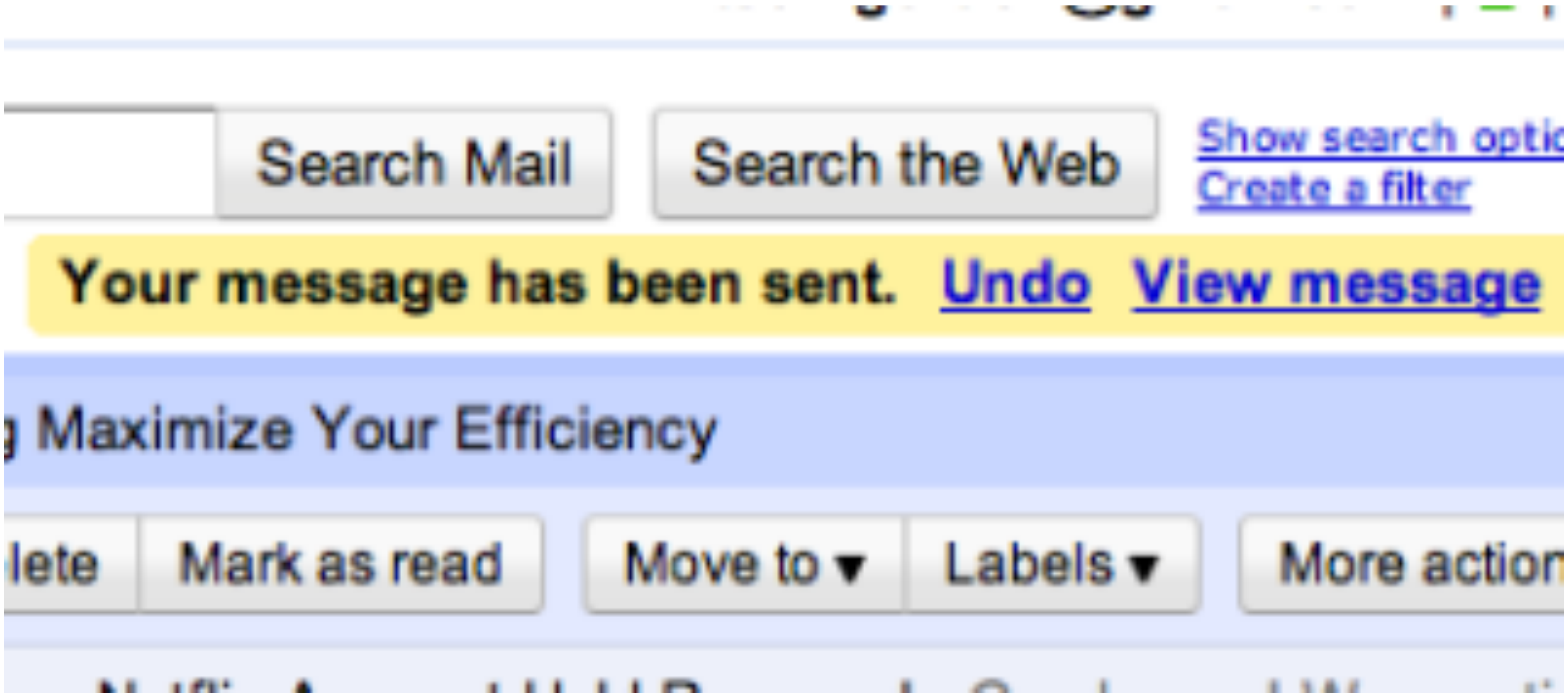
```
.
..
text.c
other.files
```

```c
if (name[0] == '.') continue;
```

Is it a bug?



Is it a bug?

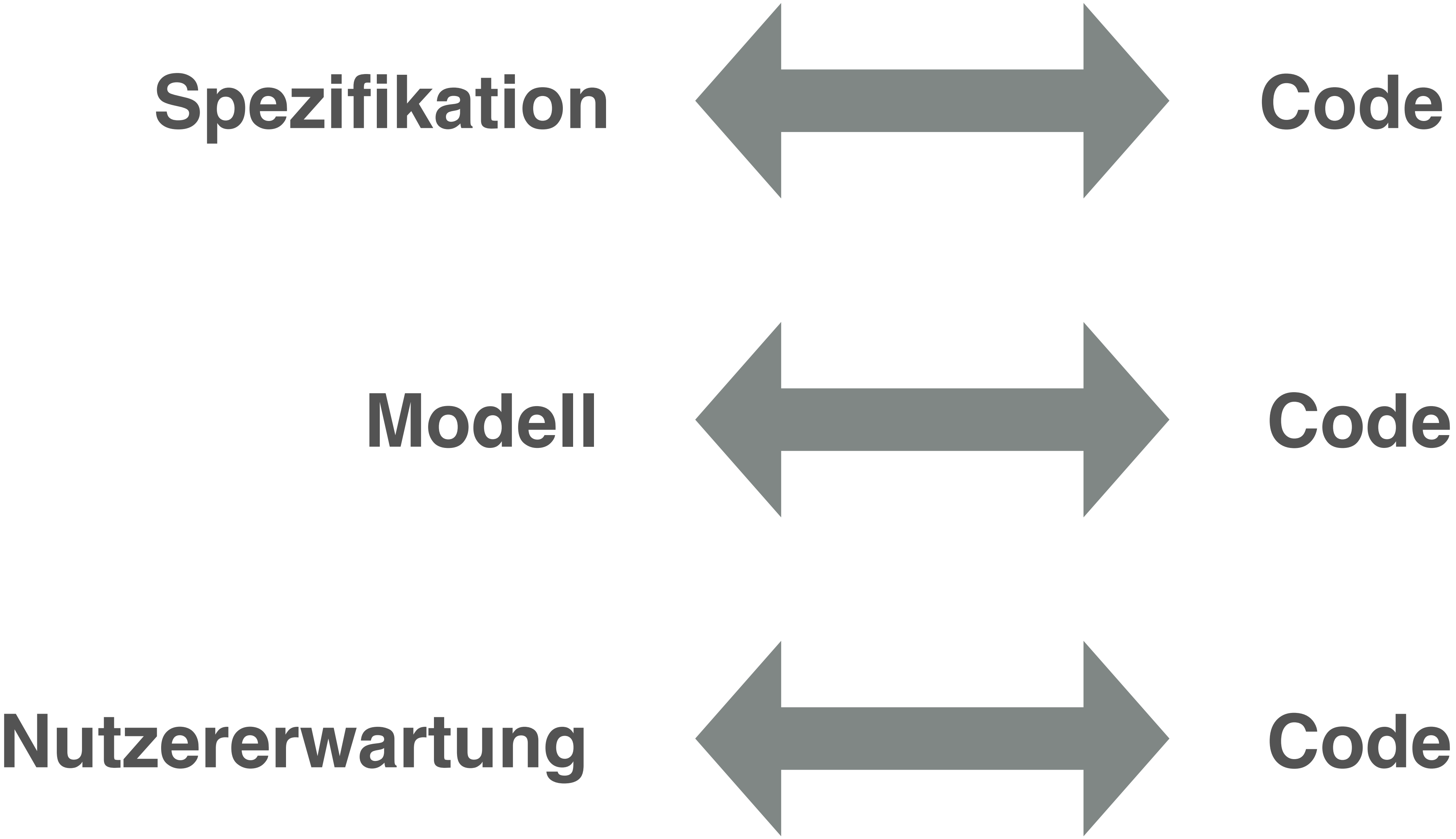


Your message has been sent. Undo View message

What is a bug?

> “ Without specification, there are no bugs — only surprises.
>
> Brian Kernighan

What is a bug?

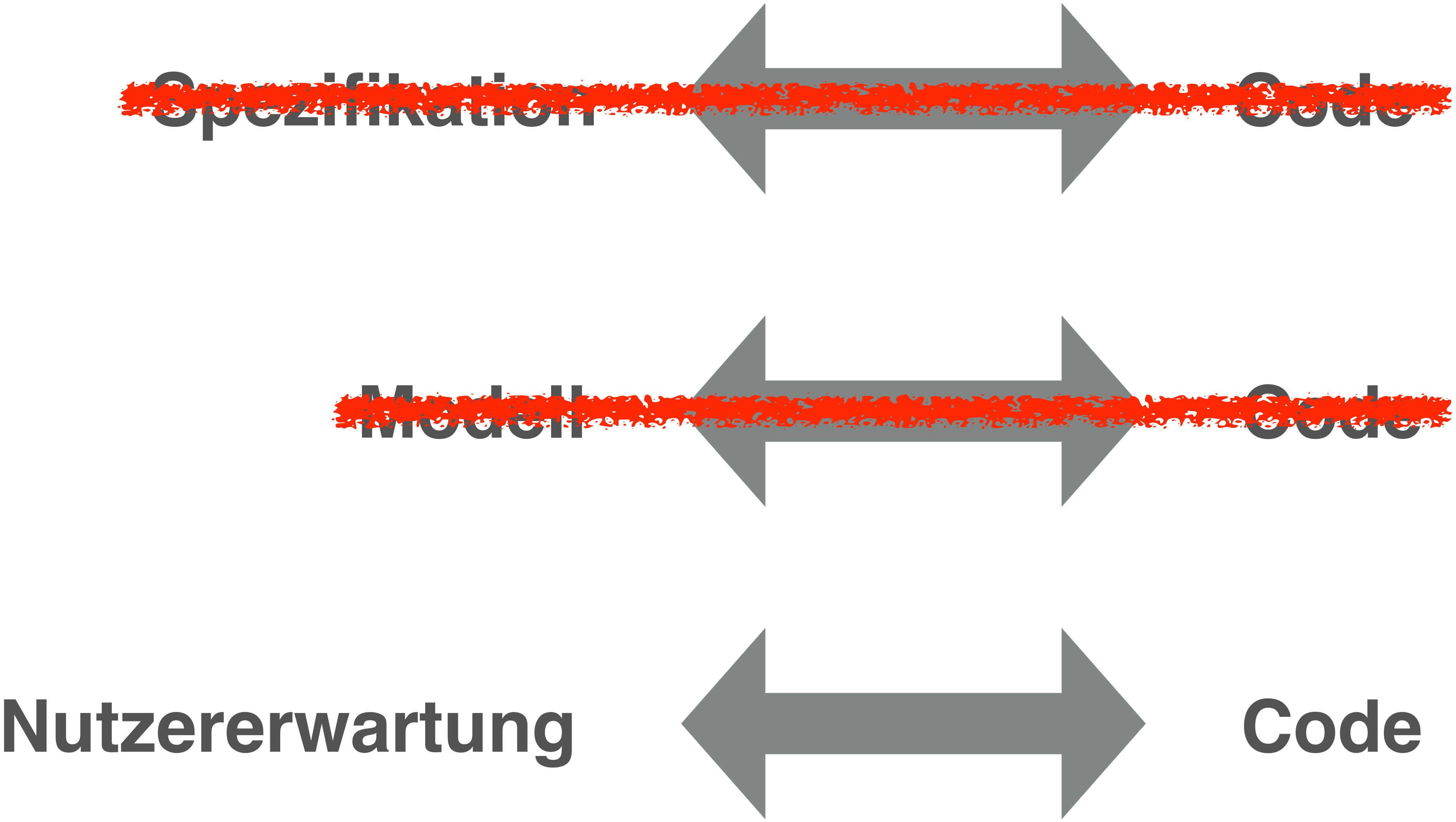


Spezifikation ⟷ Code

Modell ⟷ Code

Nutzererwartung ⟷ Code

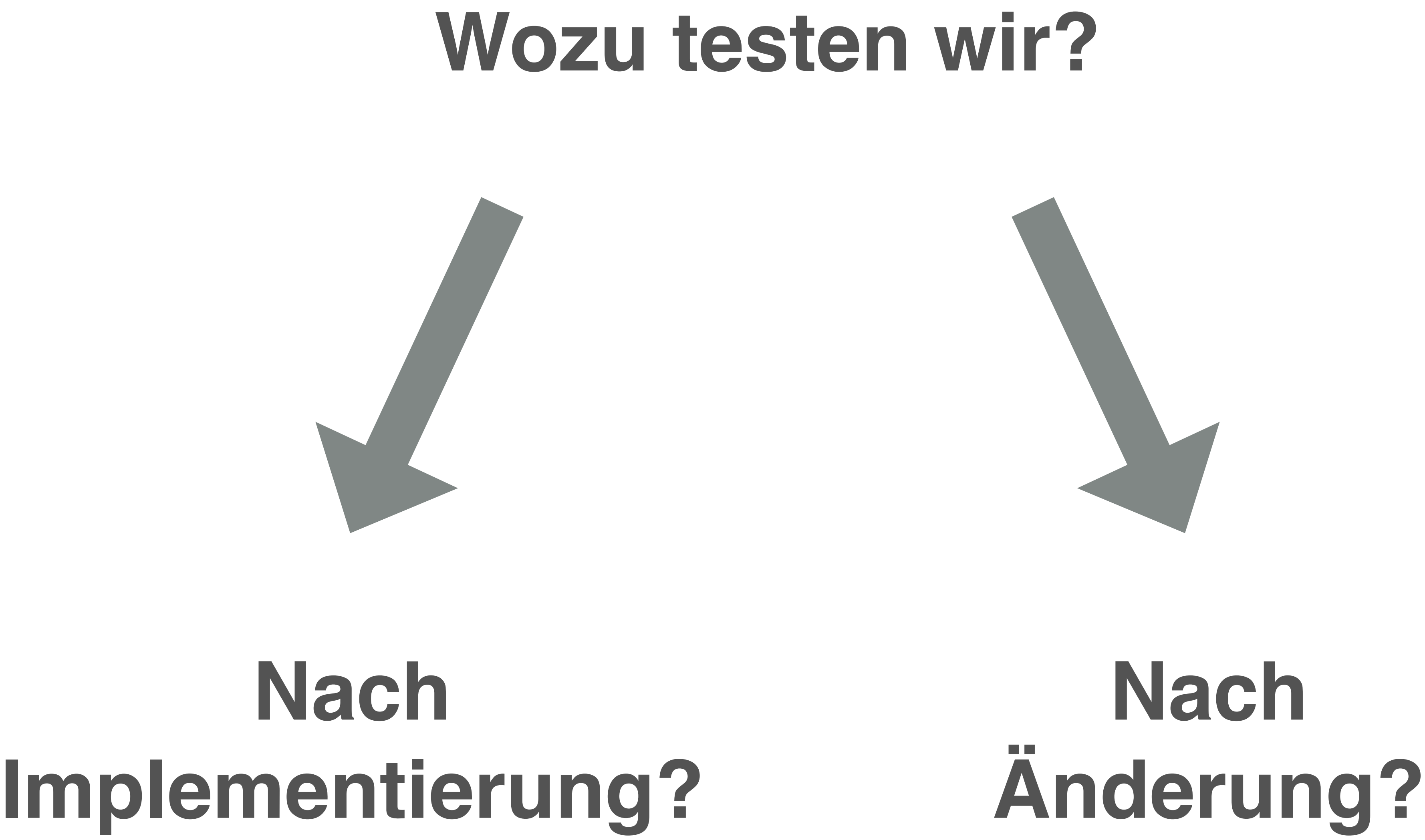
Monkey Testing



~~Spezifikation~~ ~~Code~~

~~Modell~~ ~~Code~~

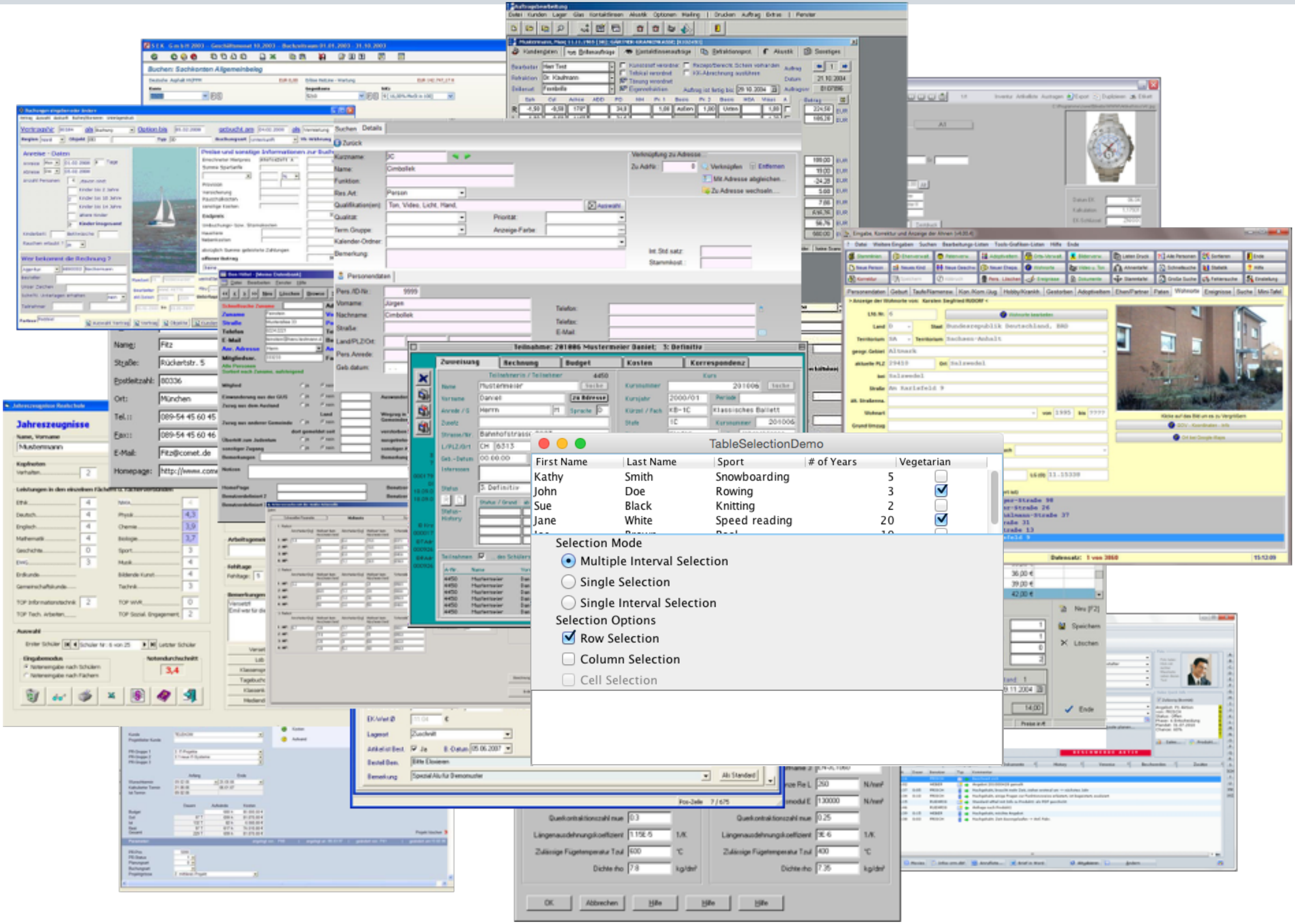
Nutzererwartung Code



Wozu testen wir?

Nach Implementierung?

Nach Änderung?



TableSelectionDemo

First Name	Last Name	Sport	# of Years	Vegetarian
Kathy	Smith	Snowboarding	5	□
John	Doe	Rowing	3	☑
Sue	Black	Knitting	2	□
Jane	White	Speed reading	20	☑
Joe	Brown	Pool	10	□

Selection Mode

● Multiple Interval Selection

○ Single Selection

○ Single Interval Selection

Selection Options

☑ Row Selection

□ Column Selection

□ Cell Selection

WE WANT YOU!

ReTest

https://github.com/retest/retest

ReTest

www.retest.de