“Bad Smells” in
TTCN-3 Test Suites

Martin Bisanz, Jens Grabowski,
Helmut Neukirchen, Benjamin Zeiss

Software Engineering for Distributed Systems Group
Institute for Informatics
Georg-August-University Göttingen
Germany

http://www.swe.informatik.uni-goettingen.de

Outline

1. Introduction
2. TTCN-3 Code Smells
3. Smell Detection in TRex
4. Summary / Outlook

1. Introduction

- Presentation at T3UC 2006: TRex Tool
  - Improvement of test code: **Refactoring**.
  - Issue Detection: **Metrics**.

- Systematic investigation of bad patterns.

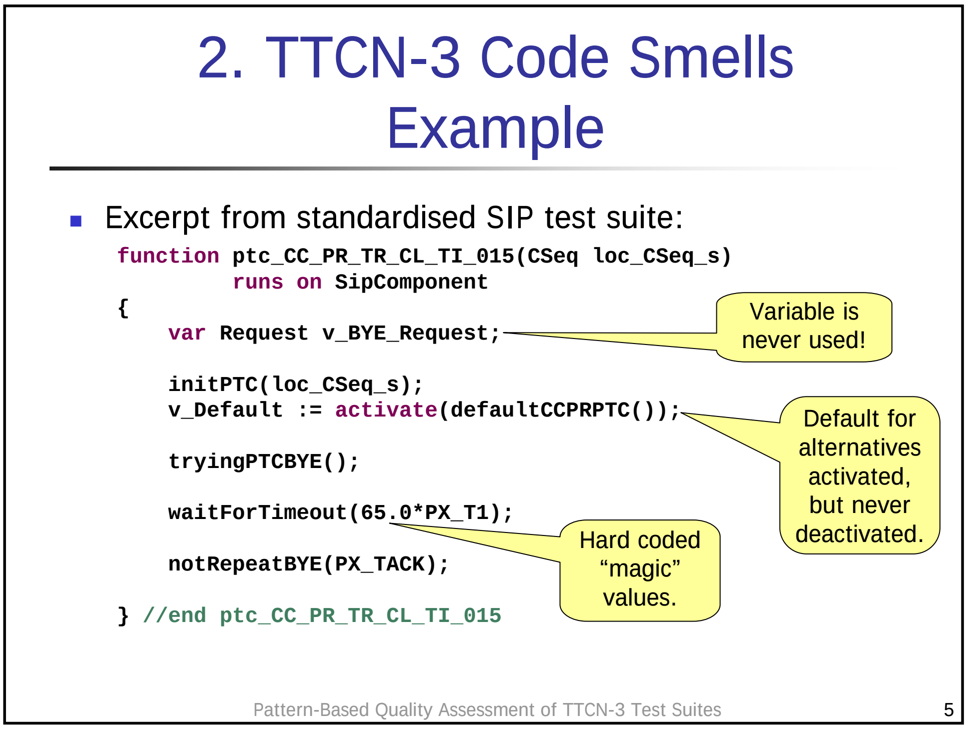
⇒ Code smells

- **“certain structures in the code that suggest (sometimes they scream for) the possibility of refactoring”**

Fowler: *Refactoring – Improving the Design of Existing Code*.
Addison-Wesley, 1999

Outline

1. Introduction
2. **TTCN-3 Code Smells**
3. Smell Detection in TRex
4. Summary / Outlook



2. TTCN-3 Code Smells Example

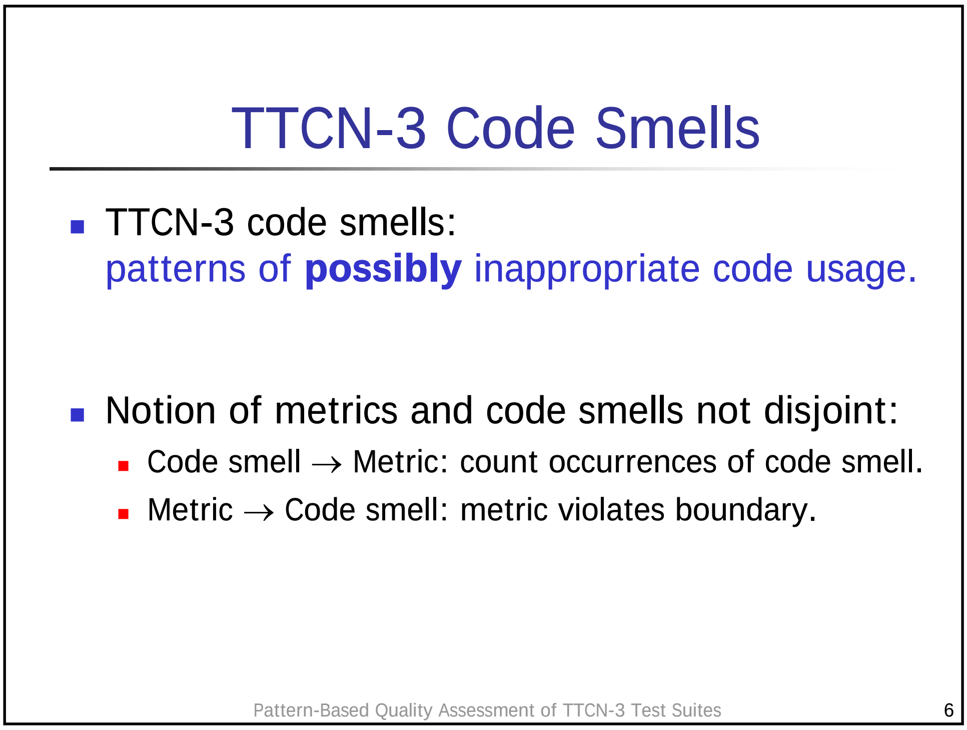
- Excerpt from standardised SIP test suite:

```
function ptc_CC_PR_TR_CL_TI_015(CSeq loc_CSeq_s)
         runs on SipComponent
{
    var Request v_BYE_Request;

    initPTC(loc_CSeq_s);
    v_Default := activate(defaultCCPRPTC());

    tryingPTCBYE();

    waitForTimeout(65.0*PX_T1);

    notRepeatBYE(PX_TACK);

} //end ptc_CC_PR_TR_CL_TI_015
```

Variable is never used!

Default for alternatives activated, but never deactivated.

Hard coded “magic” values.



TTCN-3 Code Smells

- TTCN-3 code smells:
  patterns of **possibly** inappropriate code usage.

- Notion of metrics and code smells not disjoint:
  - Code smell → Metric: count occurrences of code smell.
  - Metric → Code smell: metric violates boundary.

TTCN-3 Code Smell Catalogue

- Collected TTCN-3 code smells in a structured catalogue.
- So far identified 38 TTCN-3 code smells with respect to
  - Duplicated Code,
  - References,
  - Parameters,
  - Complexity,
  - Default Anomalies,
  - Test Behaviour,
  - Test Configuration,
  - Coding Standards,
  - Data Flow Anomalies,
  - Miscellaneous,

TTCN-3 Code Smell Description

- Fixed format:
  - Name,
  - Description,
  - Motivation,
  - Options,
  - Related Action(s),
  - Example.

TTCN-3 Code Smell (Example): *Idle PTC*

- **Description:**
  - A PTC is created but never started.
- **Motivation:**
  - A PTC which is not started is of no use for the test case.
- **Related Action(s):**
  - Insert a **start** statement.
  - Remove the PTC.

TTCN-3 Code Smell (Example): *Idle PTC*

- **TTCN-3 Example:**

```
testcase exampleTestCase() runs on MTCType system SystemType {
  // ...
  var PTCType exampleComponent := PTCType.create
  map(self:aPort, system:aPort);
  connect(self:anotherPort, exampleComponent:aPort);
  // no start here
}
```

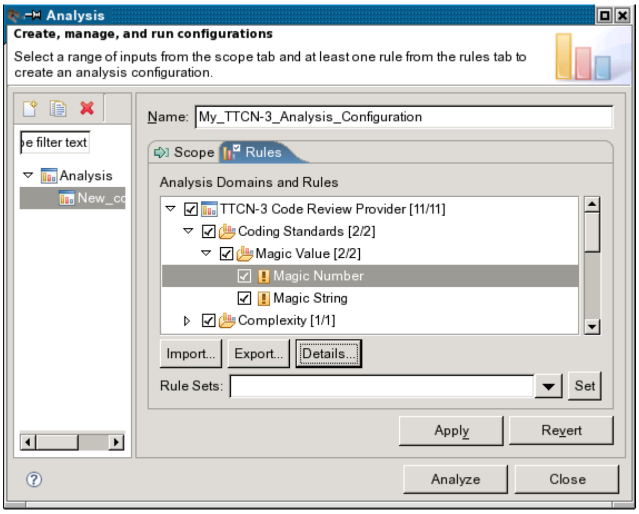
Outline

1. Introduction
2. TTCN-3 Code Smells
3. **Smell Detection in TRex**
4. Summary / Outlook

3. Smell Detection in TRex

- New TRex functionality in 2007:
  - Automatic Detection of TTCN-3 code smells
    - Uses Eclipse TPTP Analysis Framework
    - Currently: 11 smells from the smell catalogue
  - Complexity Metrics

TTCN-3 Code Smell Detection Configuration



Create, manage, and run configurations

Select a range of inputs from the scope tab and at least one rule from the rules tab to create an analysis configuration.

pe filter text

- Analysis
  - New_co

Name: My_TTCN-3_Analysis_Configuration

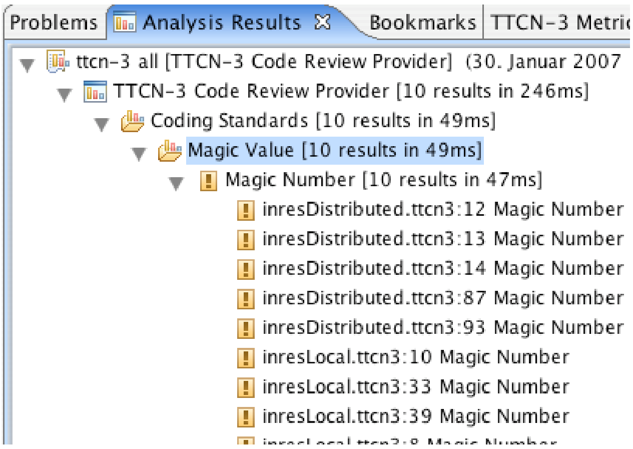
Scope | Rules

Analysis Domains and Rules

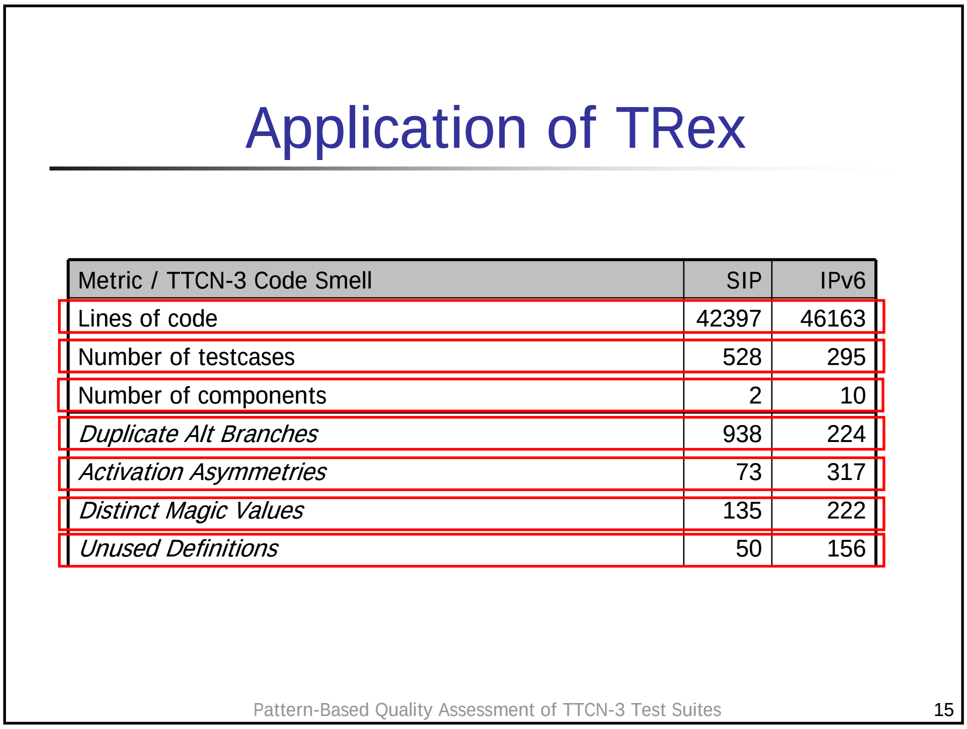
- ☑ TTCN-3 Code Review Provider [11/11]
  - ☑ Coding Standards [2/2]
    - ☑ Magic Value [2/2]
      - ☑ Magic Number
      - ☑ Magic String
  - ☑ Complexity [1/1]

Rule Sets:

TTCN-3 Code Smell Detection Results

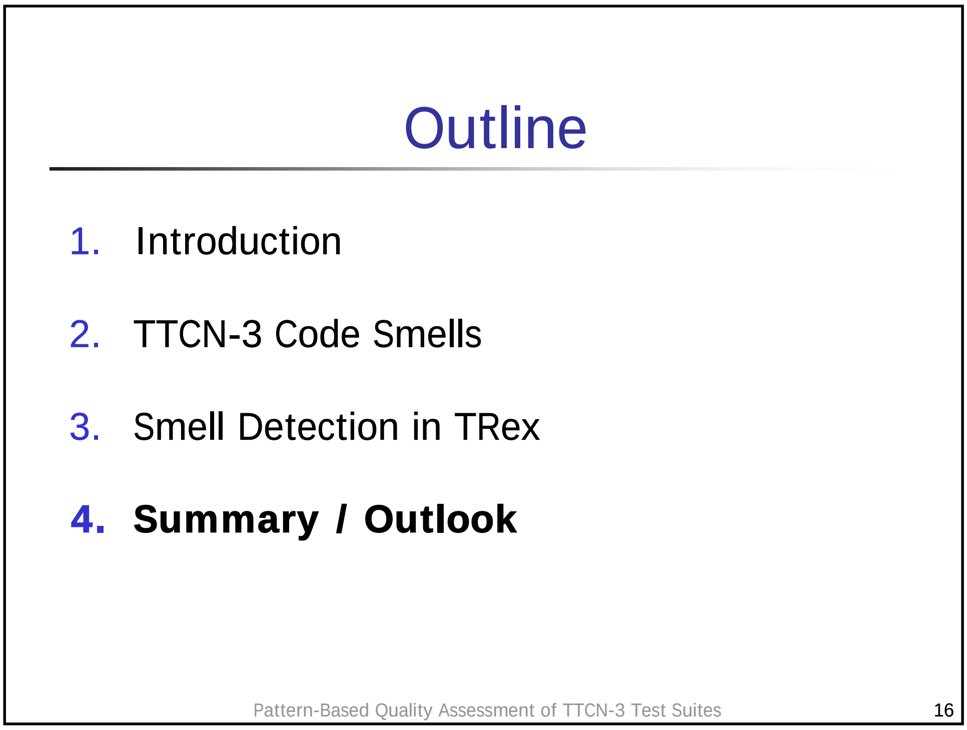


- ttcn-3 all [TTCN-3 Code Review Provider] (30. Januar 2007
  - TTCN-3 Code Review Provider [10 results in 246ms]
    - Coding Standards [10 results in 49ms]
      - Magic Value [10 results in 49ms]
        - Magic Number [10 results in 47ms]
          - inresDistributed.ttcn3:12 Magic Number
          - inresDistributed.ttcn3:13 Magic Number
          - inresDistributed.ttcn3:14 Magic Number
          - inresDistributed.ttcn3:87 Magic Number
          - inresDistributed.ttcn3:93 Magic Number
          - inresLocal.ttcn3:10 Magic Number
          - inresLocal.ttcn3:33 Magic Number
          - inresLocal.ttcn3:39 Magic Number
          - inresLocal.ttcn3:8 Magic Number



Application of TRex

Metric / TTCN-3 Code Smell	SIP	IPv6
Lines of code	42397	46163
Number of testcases	528	295
Number of components	2	10
Duplicate Alt Branches	938	224
Activation Asymmetries	73	317
Distinct Magic Values	135	222
Unused Definitions	50	156



Outline

1. Introduction
2. TTCN-3 Code Smells
3. Smell Detection in TRex
4. **Summary / Outlook**

4. Summary and Outlook

- Summary:
  - TTCN-3 code smells.
  - TRex tool for automatic detection of TTCN-3 code smells.
  - Smell-reated observations in the SIP and IPv6 test suites.

- Outlook:
  - Make TTCN-3 code smell catalogue publicly available.
  - Realisation of a more flexible code smell representation.

- Thank you for your attention!

- Visit our booth for a demo!

http://www.trex.informatik.uni-goettingen.de