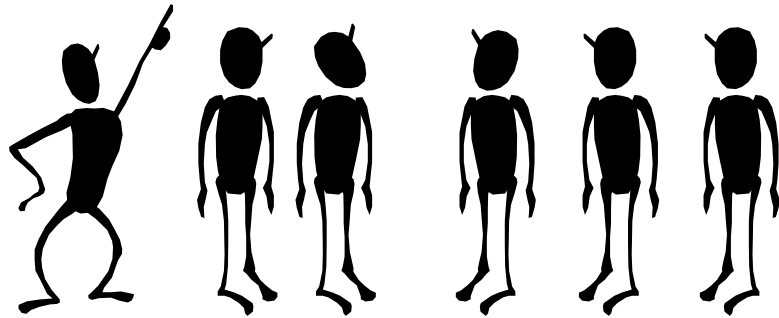


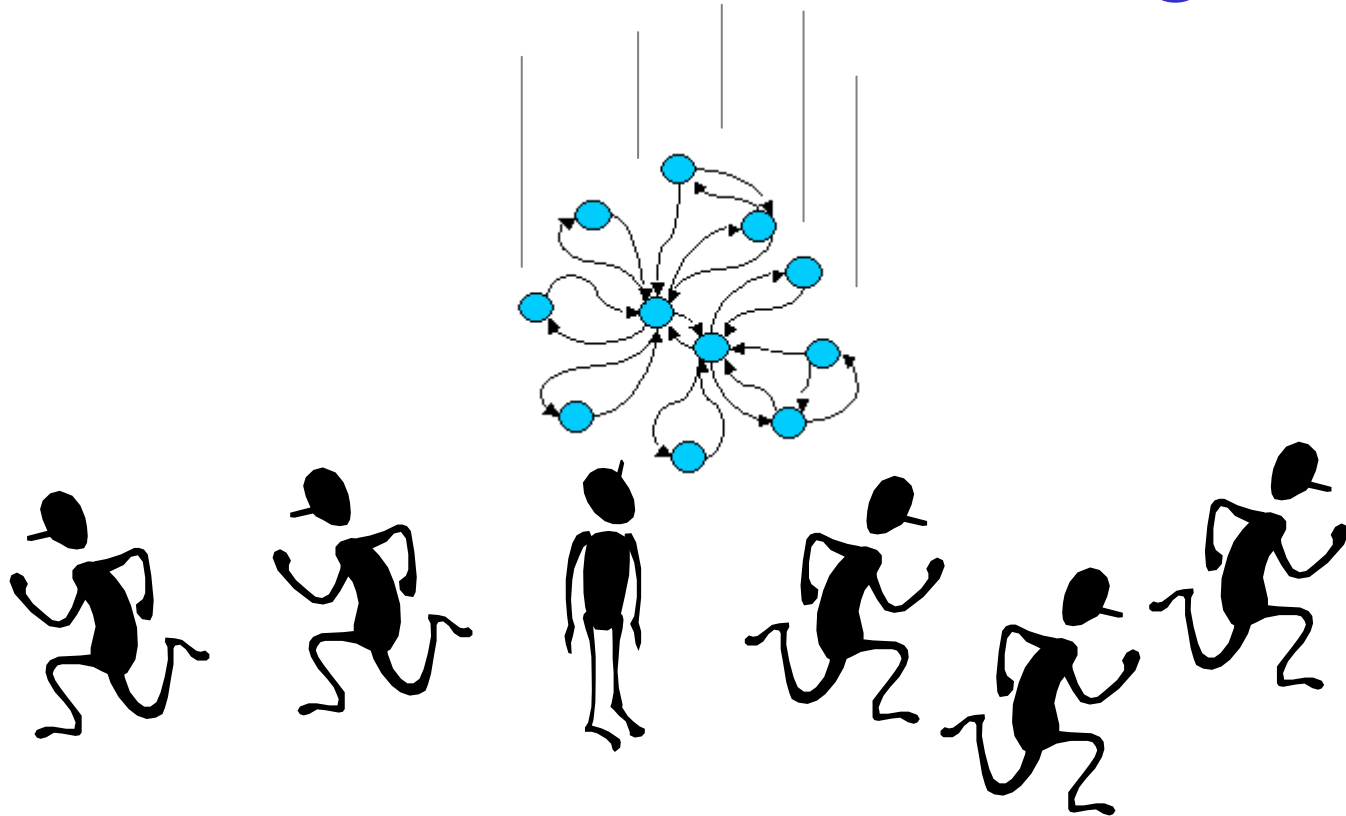
Model-Based Testing for the Masses



Harry Robinson



Is the Industry Ready for Model-Based Testing?



The State of Testing Today



\$ 59 500 000 000

€ 49 400 000 000



“It's not going to work.”

**Jim Allchin, Senior MS executive,
Wall Street Journal 23 Sept 2005**

**Windows Vista Release
Pushed Back to January 2007**

Tuesday, March 21, 2006

But Formality Intimidates Testers

$project : OZSpec \rightarrow UMLDiagram$

$\forall(oz, uml) : project \bullet$

$\{c : oz \cap Classdef \bullet c.name\} = \{c : uml.classes$

$\bullet c.name\} \bullet \forall c_1, c_2 : oz \cap Classdef \bullet \exists_1 c' :$

$uml.classes \bullet c'.name = c_1.name$

$c'.attris = \{cls : Classdef \mid cls \in oz \bullet cls.name\}$

$\triangleleft c_1.state.decpart$

$c'.ops = \{o : Opdef \mid o \in c_1.ops \bullet o.name\}$

$c_2.name \in \{t : \text{ran } c_1.state.decpart \bullet t.name\} \Rightarrow$

$\exists_1(c'_1, c'_2) : uml.agg \bullet c'_1.name = c_1.name$

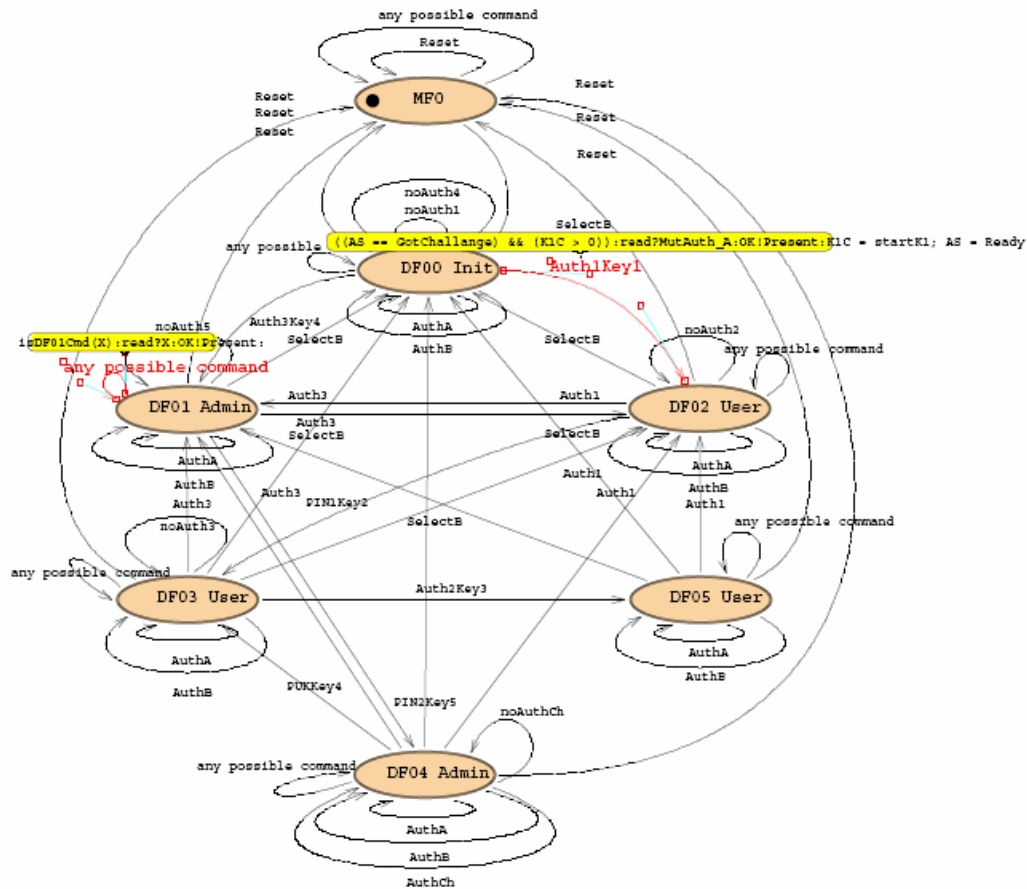
$\wedge c'_2.name = c_2.name$

$c_2.name \in \{inh : \text{dom } c_1.inherit \bullet inh.name\} \Rightarrow$

$\exists_1(c'_1, c'_2) : uml.inh \bullet c'_1.name = c_1.name$

$\wedge c'_2.name = c_2.name$

And Big Models Intimidate Testers



Model Based Testing for Real: The Inhouse Card Case Study
Pretschner, Slotosch, Lötzbeyer, Aiglstorfer, Kriebel

And ...

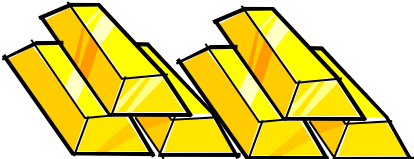
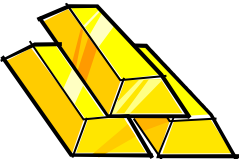

“Modelling is hard”

A Great Industrial Technology should be ...

- Cheap
- Easy to apply
- Measurable

Cheap

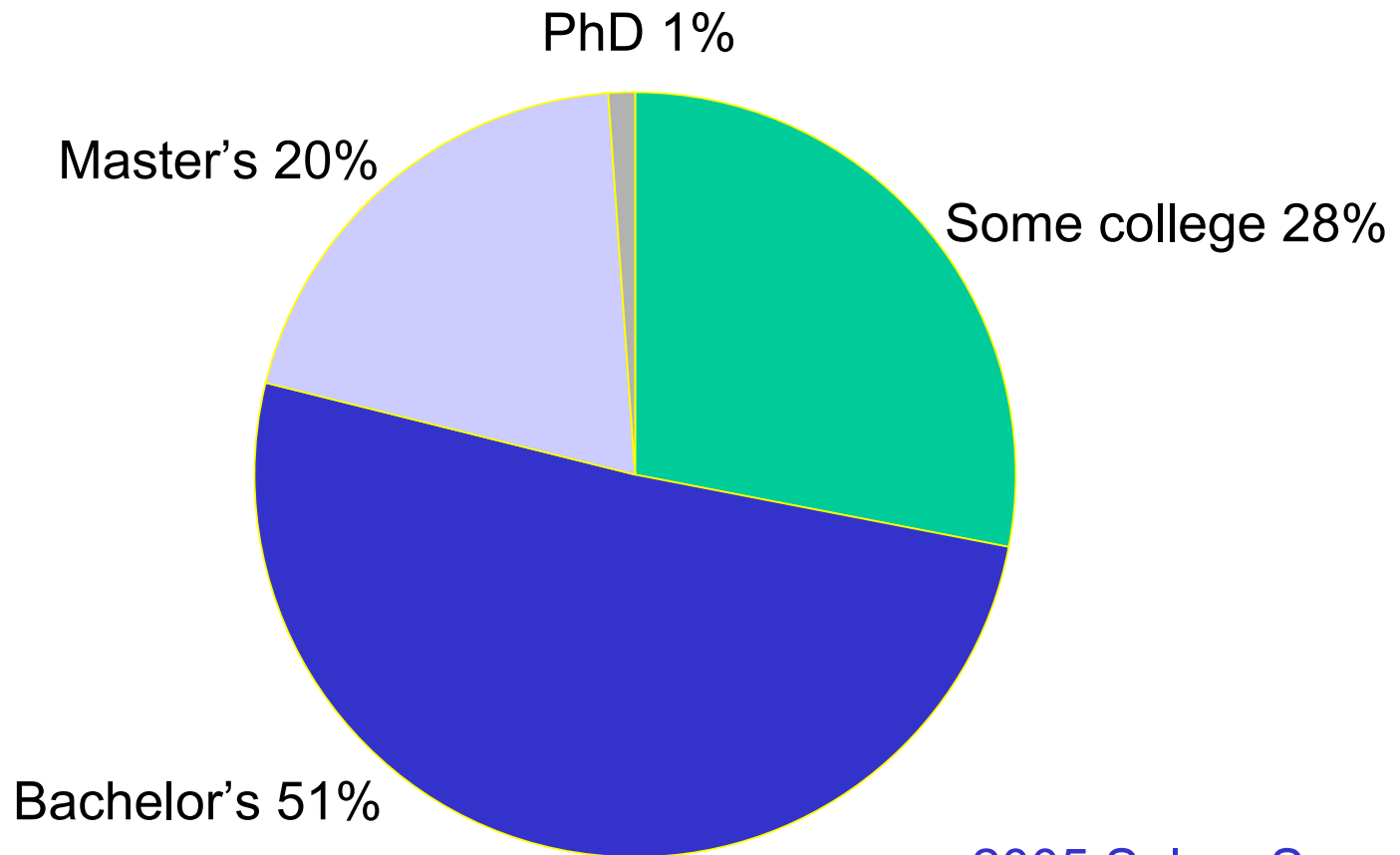
Test teams typically have

- Little budget to start 
- Less after buying shelfware 
- Very little budget for methodologies 

Easy to Apply (1)

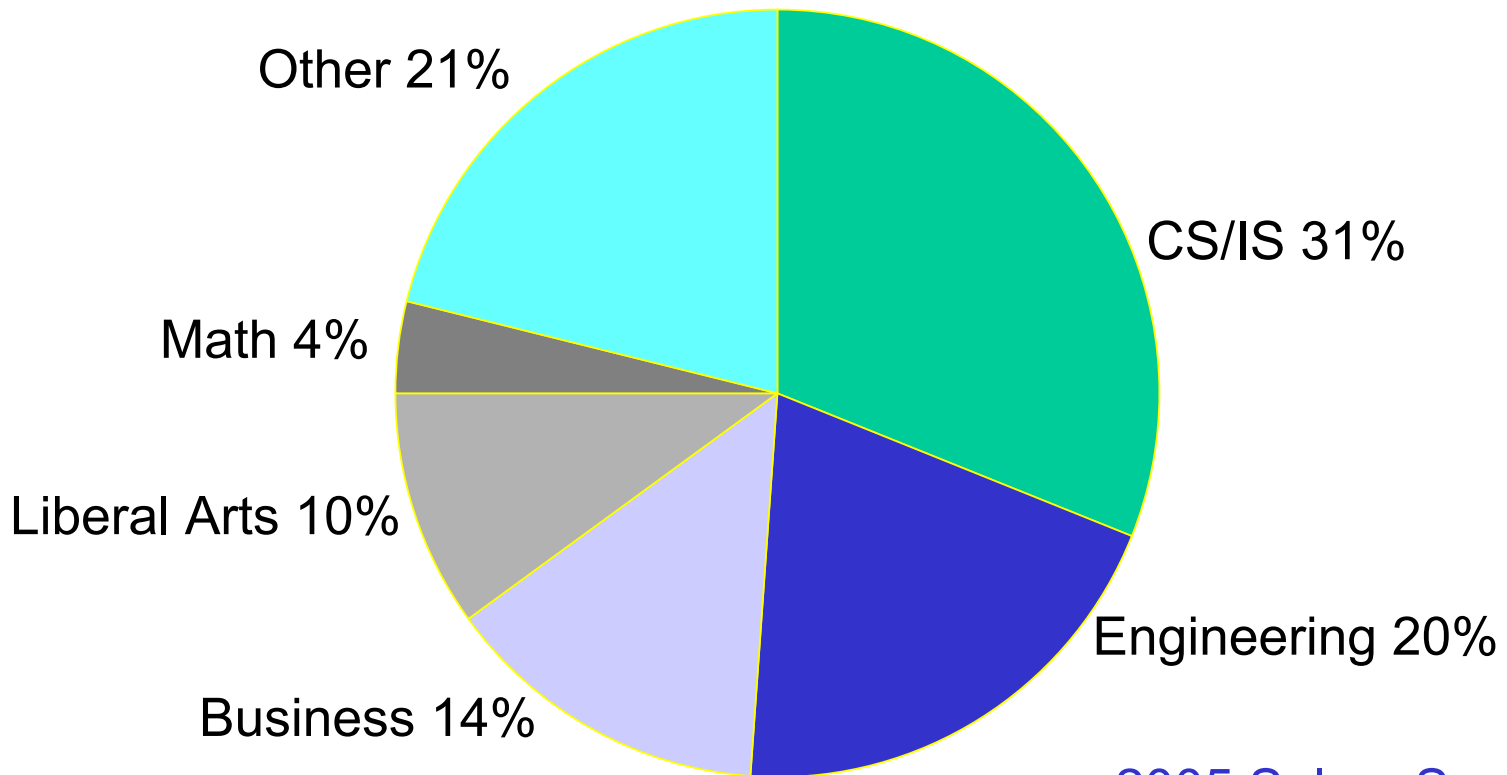
- This will depend on the tester's
 - Background
 - Methodology training

Industry Testers: Education



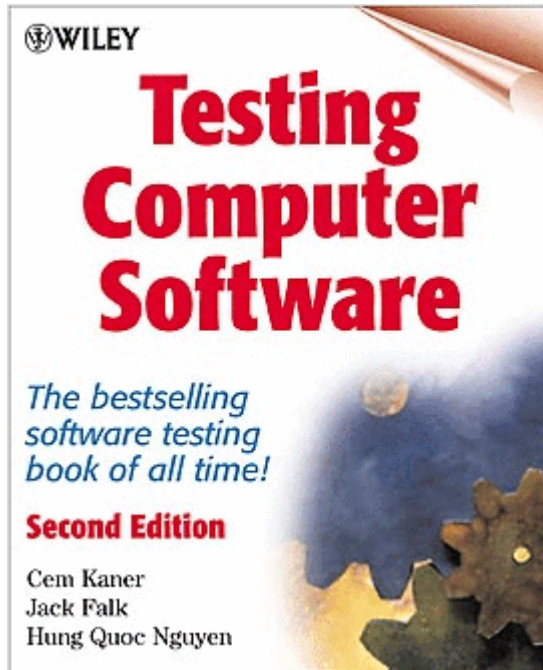
2005 Salary Survey
Better Software magazine
March 2006

Industry Testers: Area of Study

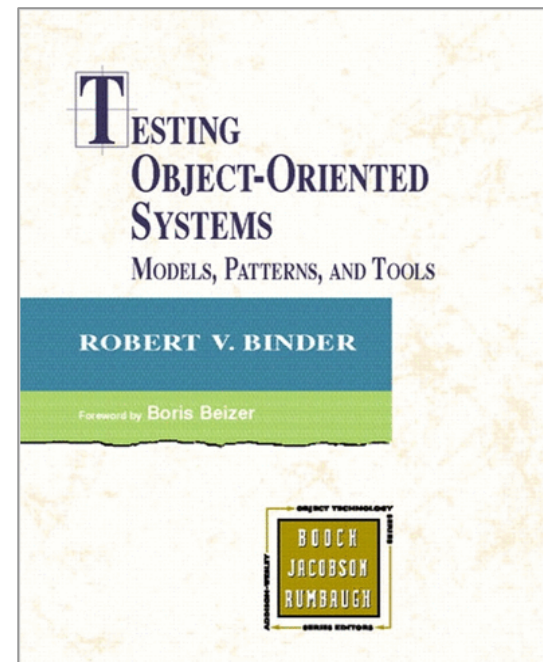


2005 Salary Survey
Better Software magazine
March 2006

Industry Testers: Methodologies



VS.



Easy to Apply (2)

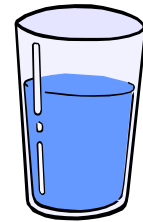
- Integration with existing processes
 - Lightweight
 - Incremental approach



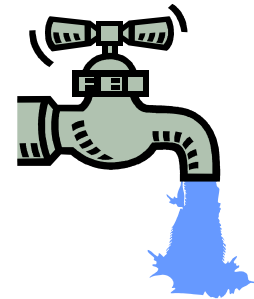
See "What Do You Mean 'pls test?'"
<http://www.qualitytree.com/ruminate/041597.htm>

Measurable (1)

Number of test cases created

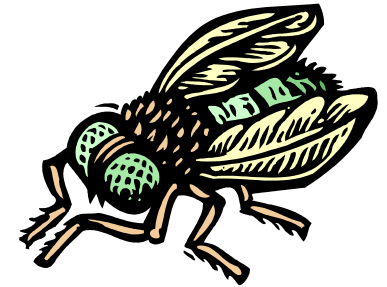


Number of test cases generated?



Measurable (2)

Number of bugs found

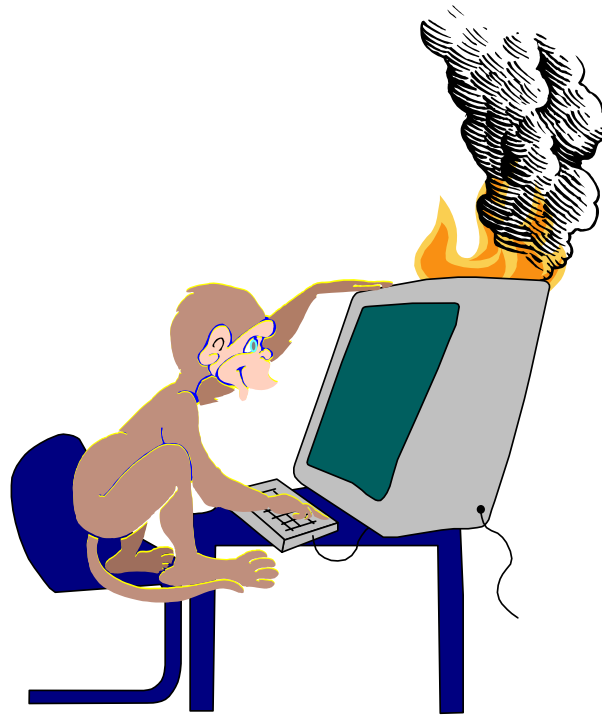


Number of bugs prevented?



“Nobody Ever Gets Credit for Fixing Problems that Never Happened”
- Repenning and Sterman

Measurable (3)

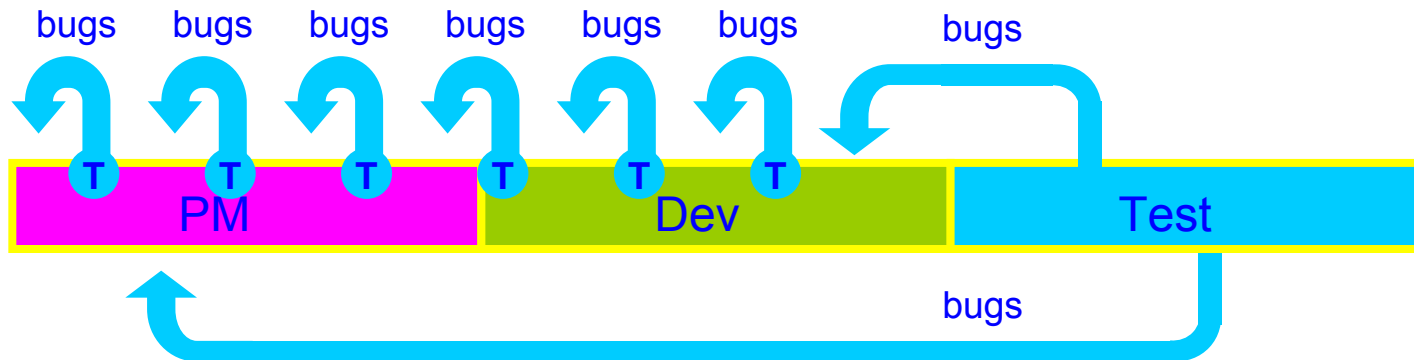
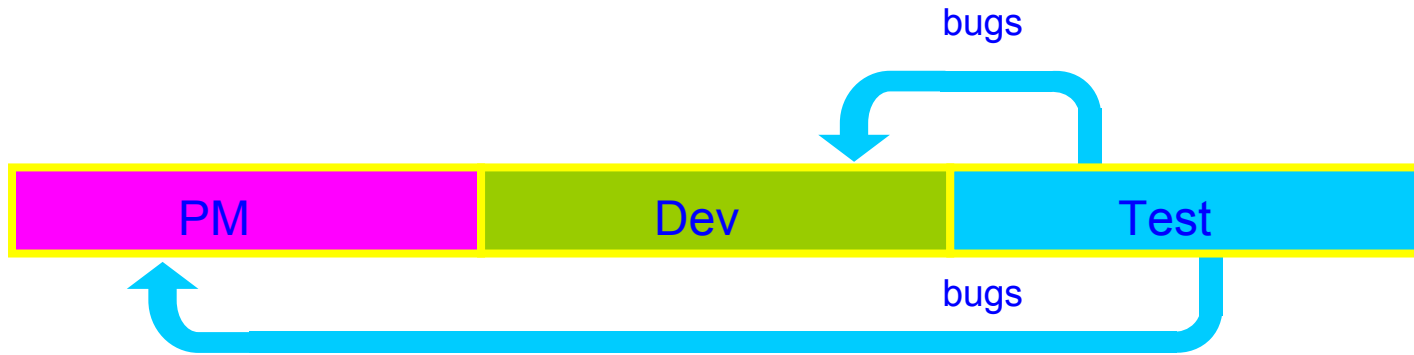


“Do your testing for nuthin’, find your bugs for free!”
- Noel Nyman, Microsoft

Factors in Favor of MBT

- Time
- Machines

Time



Machines

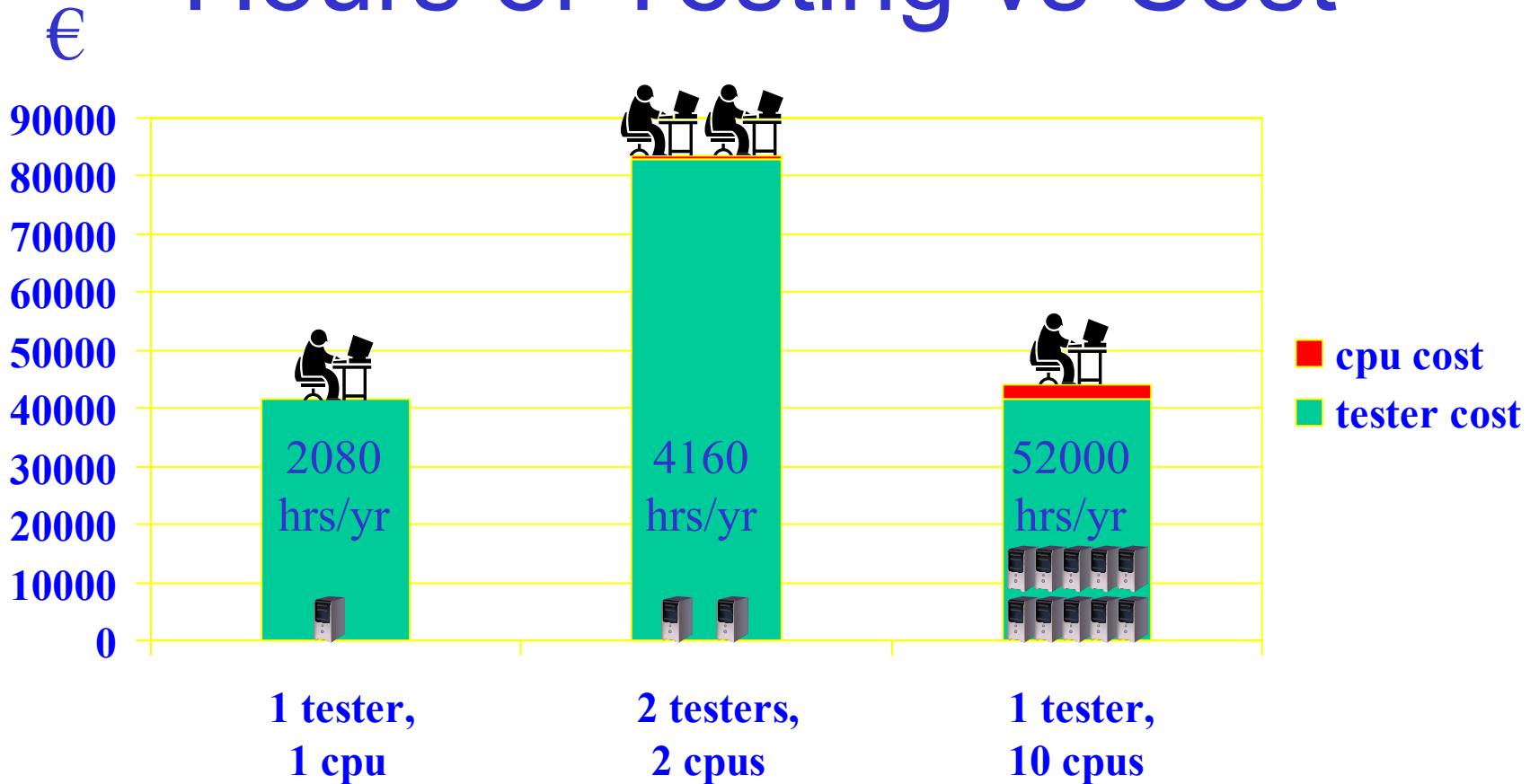
- A typical test engineer
 - Earns € 41 500 (\$50 000 USD) per year
 - Works 40 to 50 hours per week



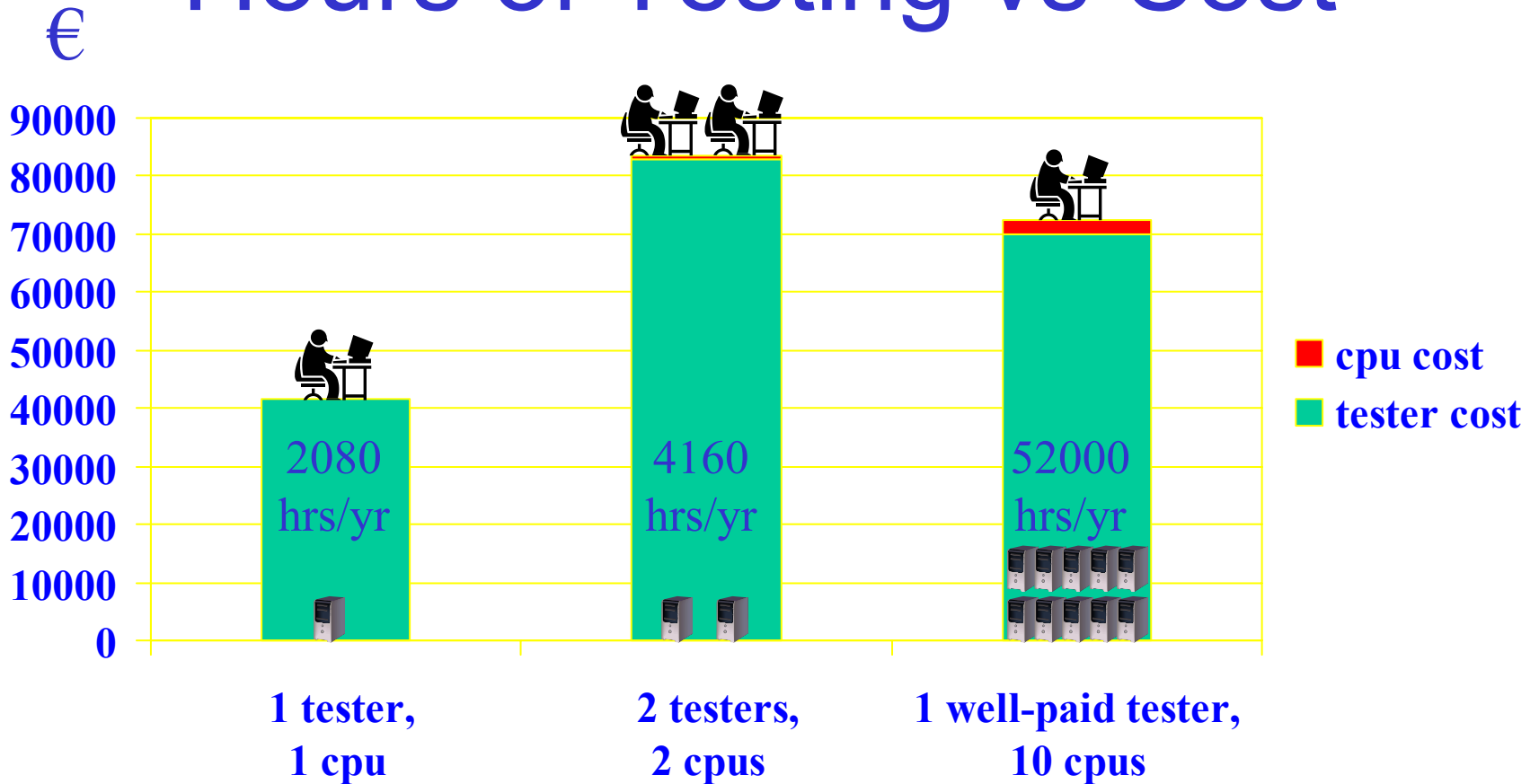
- A typical test machine
 - Costs € 250 (\$300 USD) per year to buy and operate
 - Can work 100 hours per week



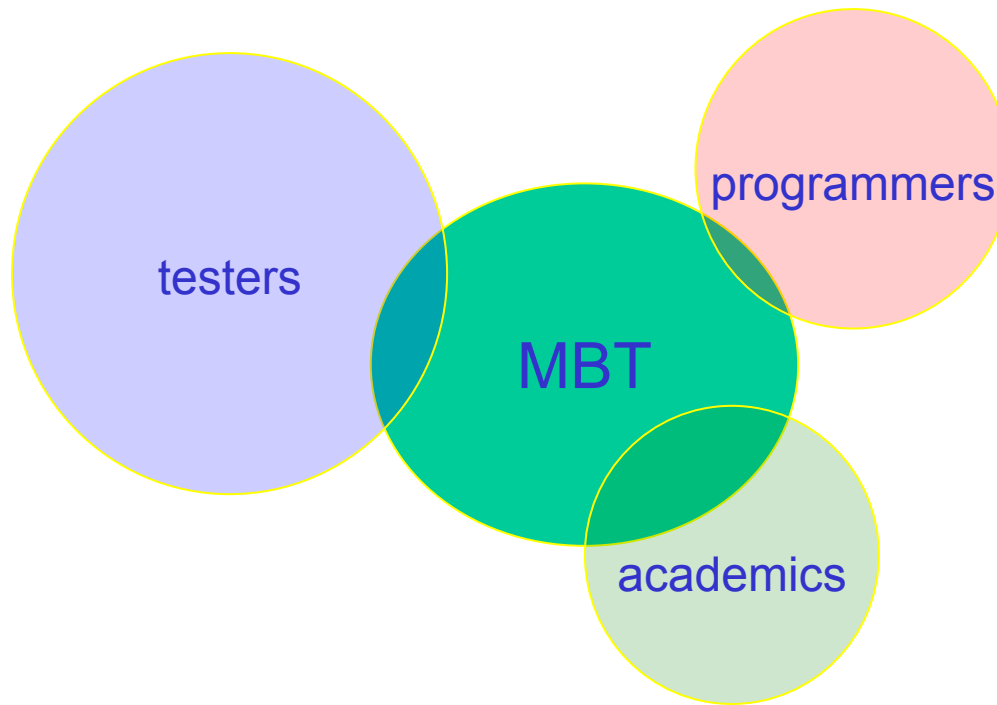
Hours of Testing vs Cost



Hours of Testing vs Cost



Caught in the Middle

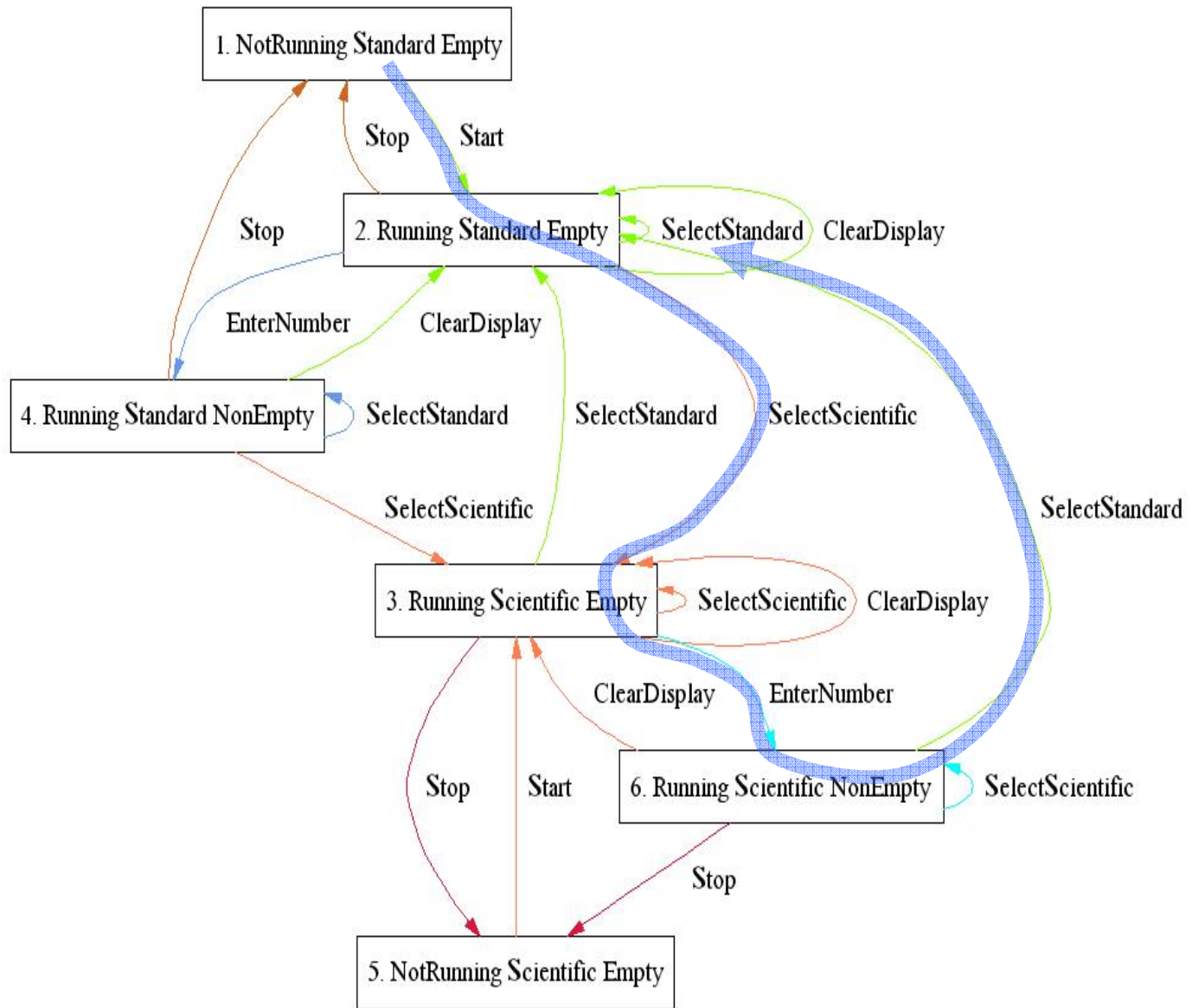


"Because MBT ... requires strong software development skills, when I recruit test engineers, I look for developers and get them excited about testing."

Jeff Feldstein, Cisco Systems

What's Happening Now?

- Home-Brew Models
 - C# / Python
 - Watir
 - Graphviz
- Half-hearted, piecemeal adoption
 - Whiteboard modeling
 - Hand-traced test sequences



Where Could Models Take the Industry?

- Better specs
- Better metrics
- Integration of testers into the development process
 - Continuous testing
 - Testers becoming more technical

MBT is Entering the Mainstream

“These [High Volume Test Automation] techniques are not widely used in industry, but we believe they have the potential to help us substantially increase the reliability of software.”

Experiments with High Volume Test Automation

Cem Kaner, Pat McGee

“Modeling in general seems to be gaining favor; particularly in domains where quality is essential and less-than-adequate software is not an option.”

Model-Based Software Testing

James Whittaker, Ibrahim El-Far

What Needs to Happen?

Z

Industry's issues with modeling:

- Too academic
- Too process-heavy
- Too steep a learning curve

```
CheckOut
-----
Δ Documents
p?: PERSON
d?: DOCUMENT
-----
d? ∈ dom checked_out
(d?, p?) ∈ permission
checked_out' = checked_out ∪ {(d?, p?)}
```

Responses:

- Easier notation
- Incremental approach
- Pilots and examples

Spec#

```
bool Running = false;  
bool Scientific = false;
```

```
[Action] void SetScientific(bool newScientific)  
  requires Running;  
  requires Scientific != newScientific; {  
    Scientific = newScientific;  
  }
```

How Can You Help?

- Do case studies of well-known systems
- Publish in QA magazines
- Teach Advanced Software Testing
- Spend time with practitioners
- Encourage your students to study industrial testing
- Share your insights with the industrial community

Thank You!

harryr@google.com