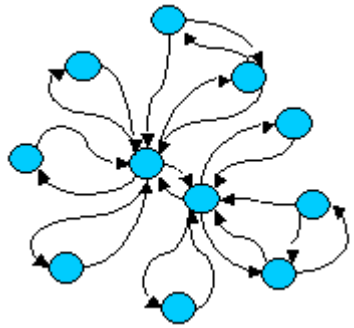
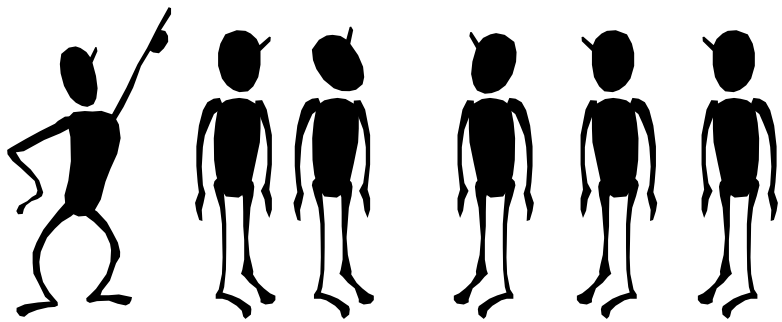


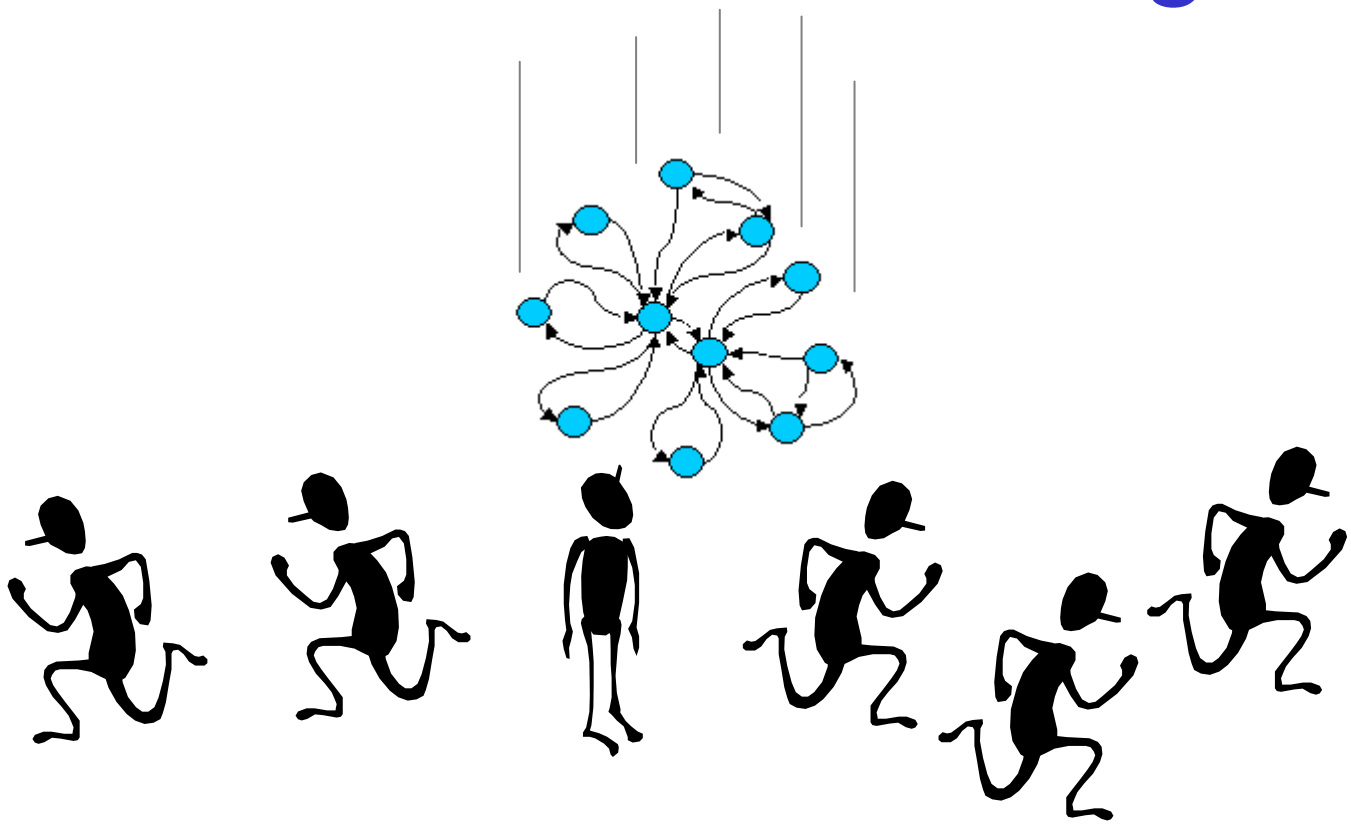
Model-Based Testing for the Masses



Harry Robinson

Google

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

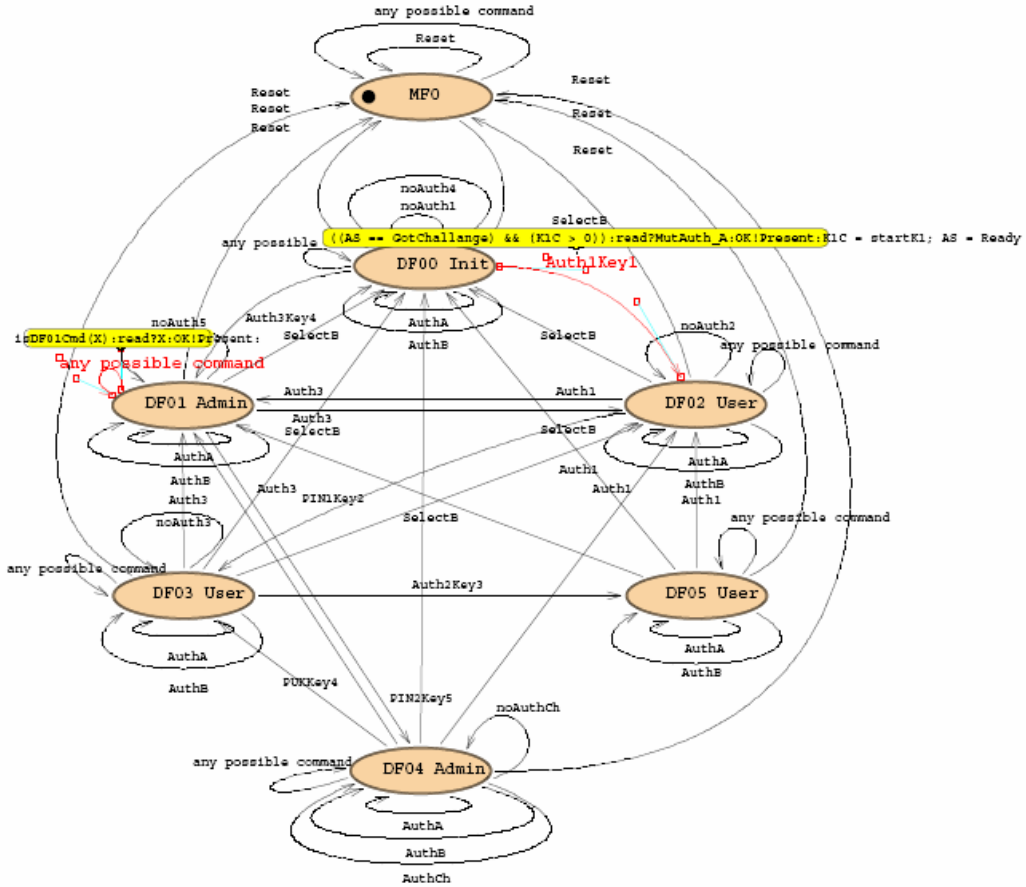
Windows Vista Release
Pushed Back to January 2007

Tuesday, March 21, 2006

But Formality Intimidates Testers

$$
\begin{array}{|l}
project : OZSpec \rightarrow UMLDiagram \\
\hline
\forall (oz, uml) : project \bullet \\
\quad \{c : oz \cap Classdef \bullet c.name\} = \{c : uml.classes \\
\qquad \bullet c.name\} \bullet \forall c_1, c_2 : oz \cap Classdef \bullet \exists_1 c' : \\
\qquad\quad uml.classes \bullet c'.name = c_1.name \\
\qquad\quad c'.attris = \{cls : Classdef \mid cls \in oz \bullet cls.name\} \\
\qquad\qquad \lhd c_1.state.decpart \\
\qquad\quad c'.ops = \{o : Opdef \mid o \in c_1.ops \bullet o.name\} \\
\qquad c_2.name \in \{t : \mathrm{ran}\ c_1.state.decpart \bullet t.name\} \Rightarrow \\
\qquad\quad \exists_1 (c_1', c_2') : uml.agg \bullet c_1'.name = c_1.name \\
\qquad\qquad \wedge\ c_2'.name = c_2.name \\
\qquad c_2.name \in \{inh : \mathrm{dom}\ c_1.inherit \bullet inh.name\} \Rightarrow \\
\qquad\quad \exists_1 (c_1', c_2') : uml.inh \bullet c_1'.name = c_1.name \\
\qquad\qquad \wedge\ c_2'.name = c_2.name
\end{array}
$$

And Big Models Intimidate Testers



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

And …

“Modelling is hard”

- AGEDIS Case Studies: Model-Based Testing in Industry

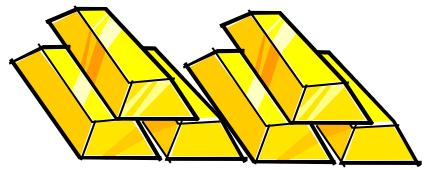
A Great Industrial Technology should be …

- Cheap
- Easy to apply
- Measurable

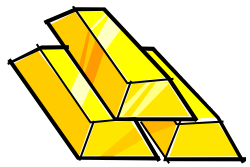
Cheap

Test teams typically have

- Little budget to start



- Less after buying shelfware

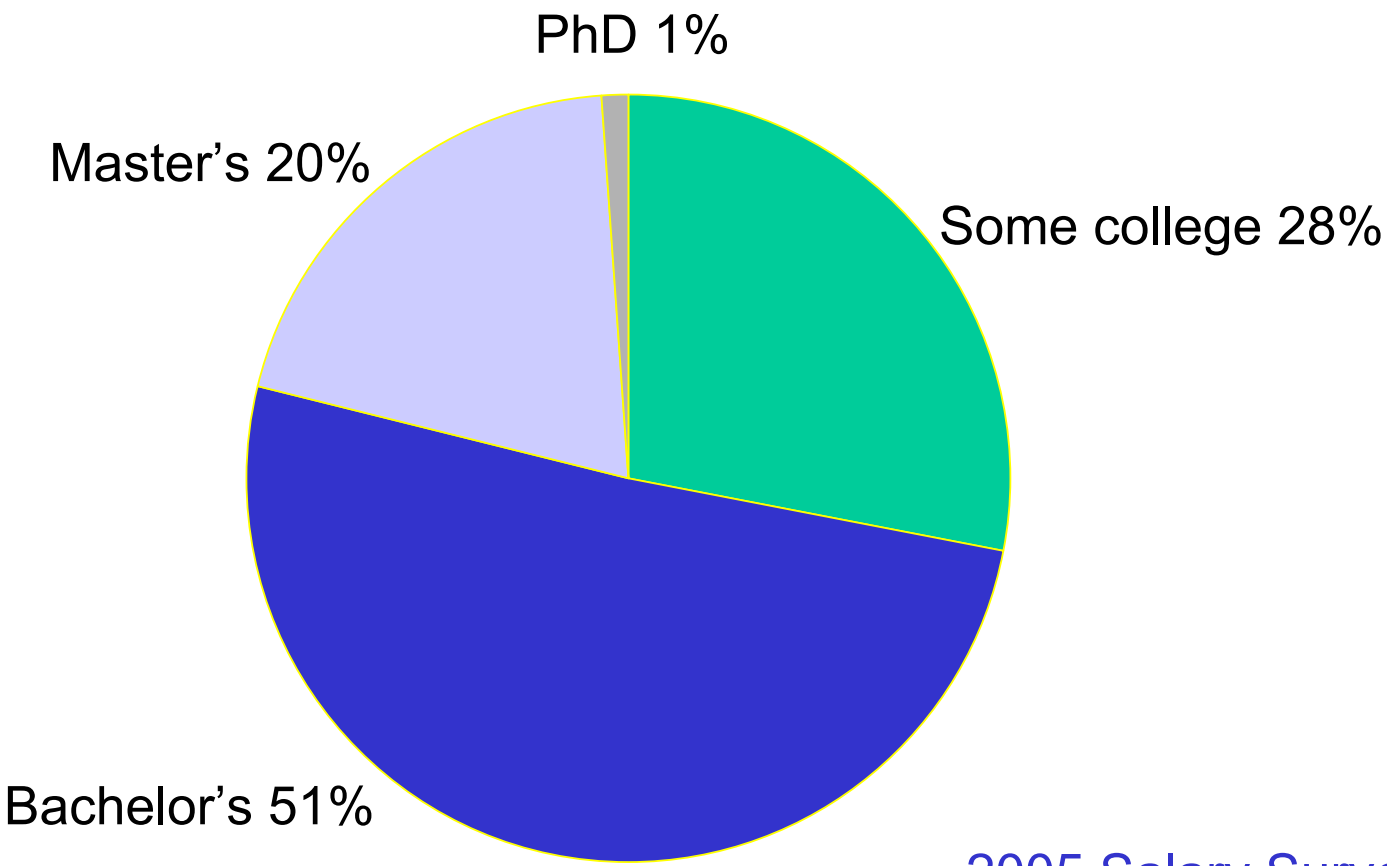


- Very little budget for methodologies

Easy to Apply (1)

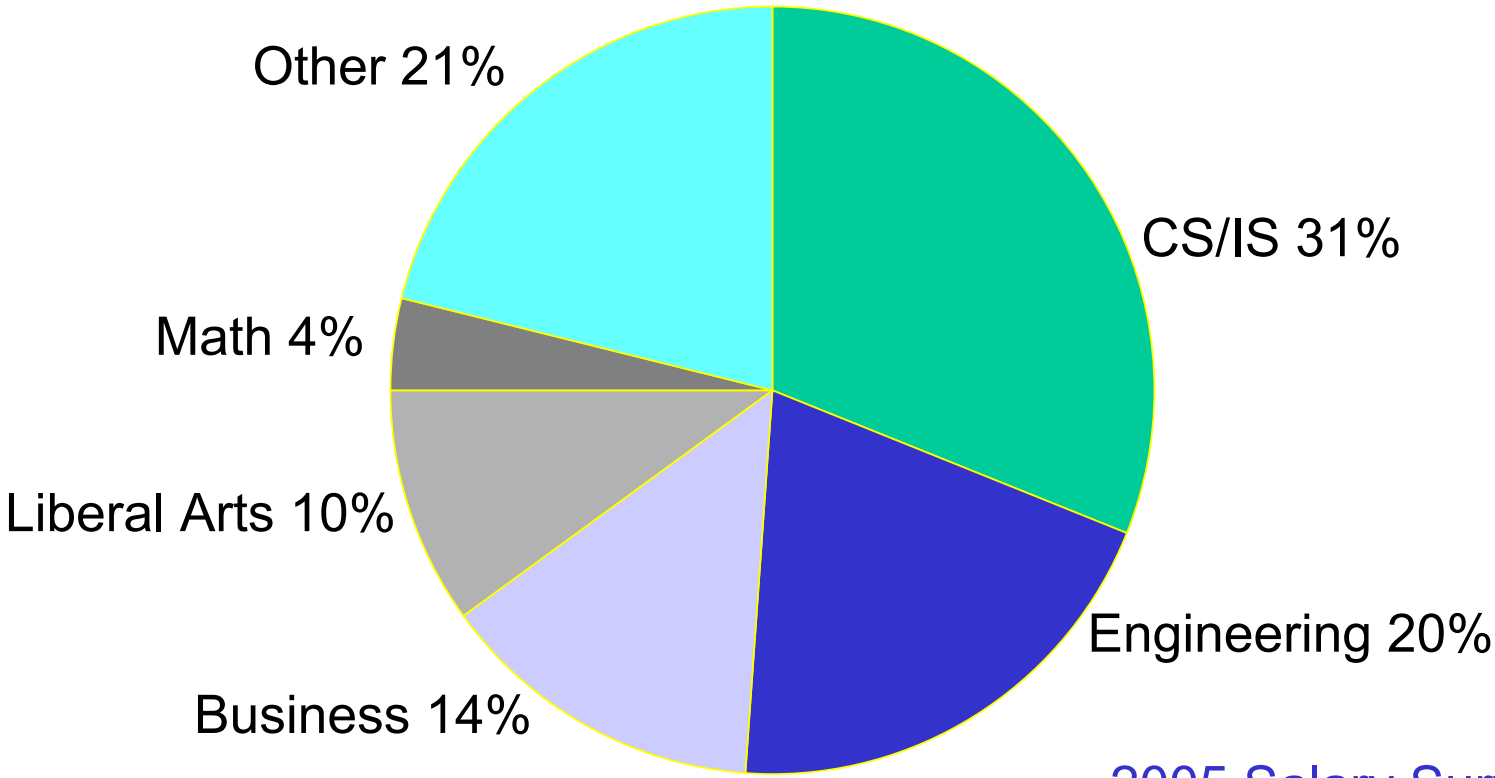
- This will depend on the tester's
  - Background
  - Methodology training

Industry Testers: Education



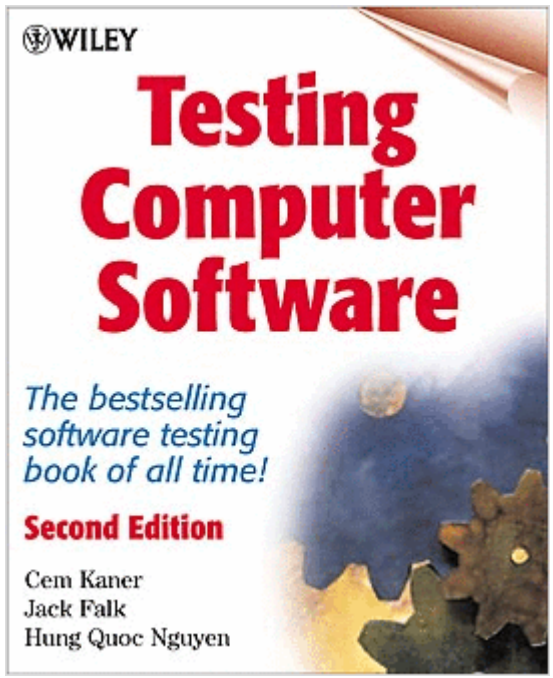
2005 Salary Survey
Better Software magazine
March 2006

Industry Testers: Area of Study

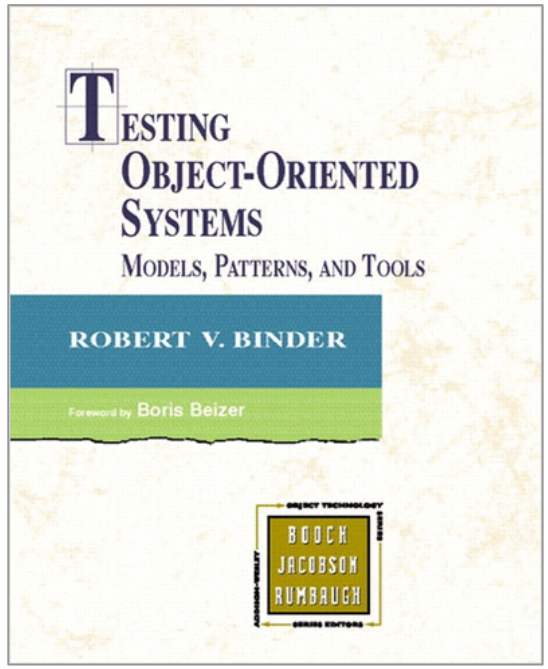


2005 Salary Survey
Better Software magazine
March 2006

Industry Testers: Methodologies



vs.



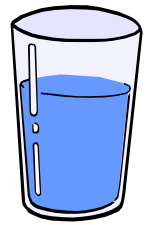
Easy to Apply (2)

- Integration with existing processes
  - Lightweight
  - Incremental approach

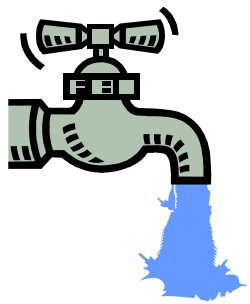
See “What Do You Mean ‘pls test?’ ”
http://www.qualitytree.com/ruminate/041597.htm

Measurable (1)

Number of test cases created

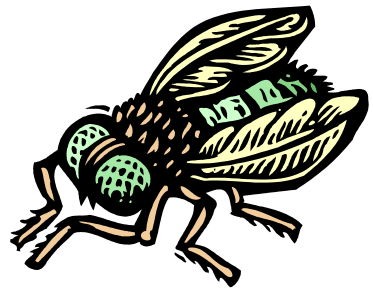


Number of test cases generated?



Measurable (2)

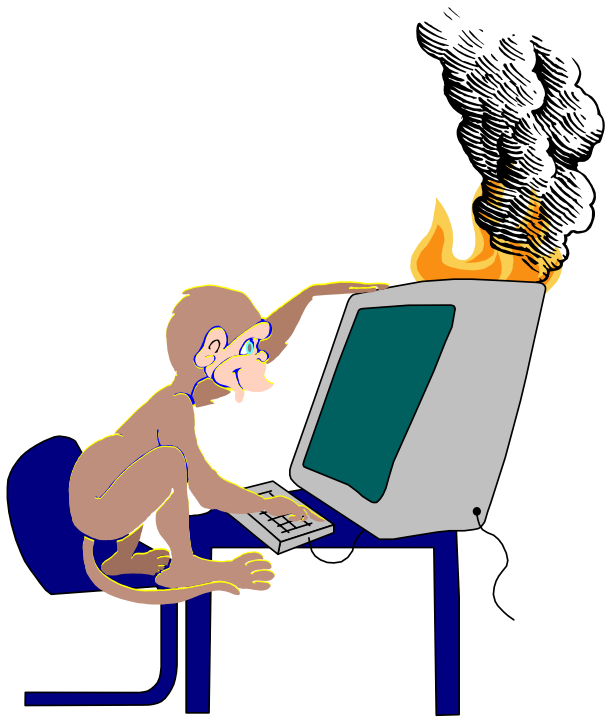
Number of bugs found



Number of bugs prevented?

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

Measurable (3)



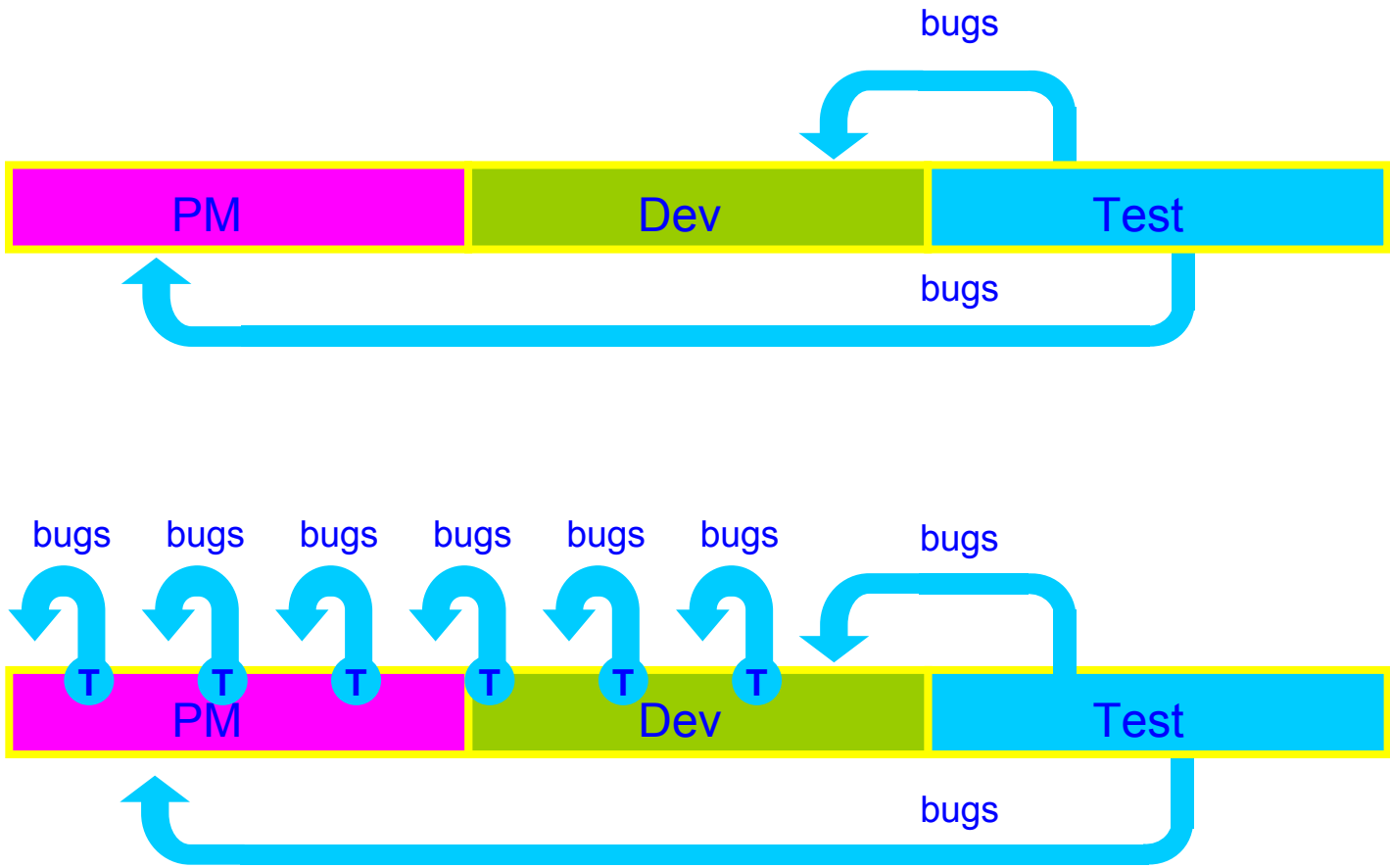
“Do your testing for nuthin’, find your bugs for free!”

- Noel Nyman, Microsoft

Factors in Favor of MBT

- Time
- Machines

Time

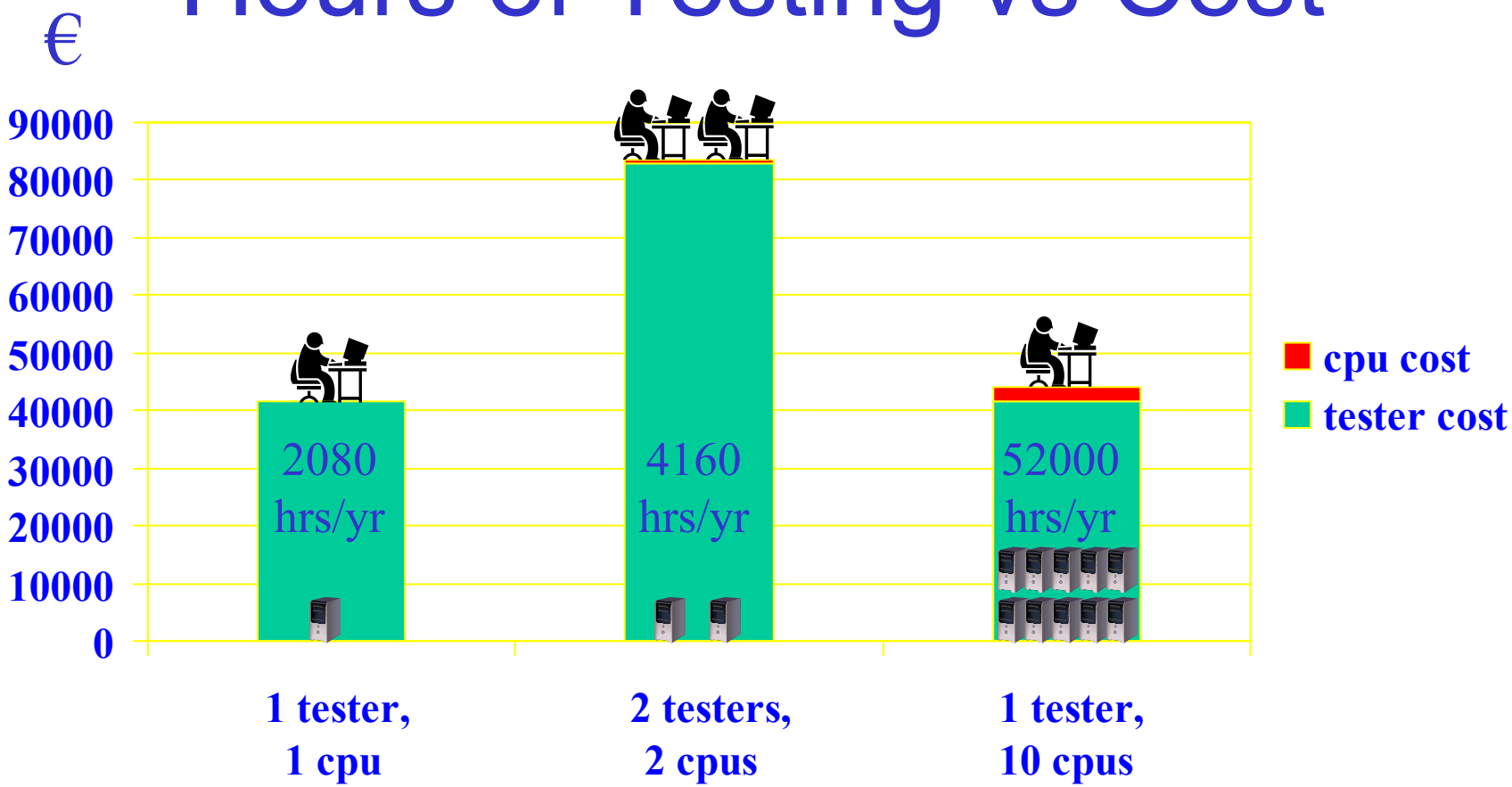

bugs
PM
Dev
Test
bugs
bugs
bugs
bugs
bugs
bugs
bugs
T
T
T
T
T
T
PM
Dev
Test
bugs

Machines

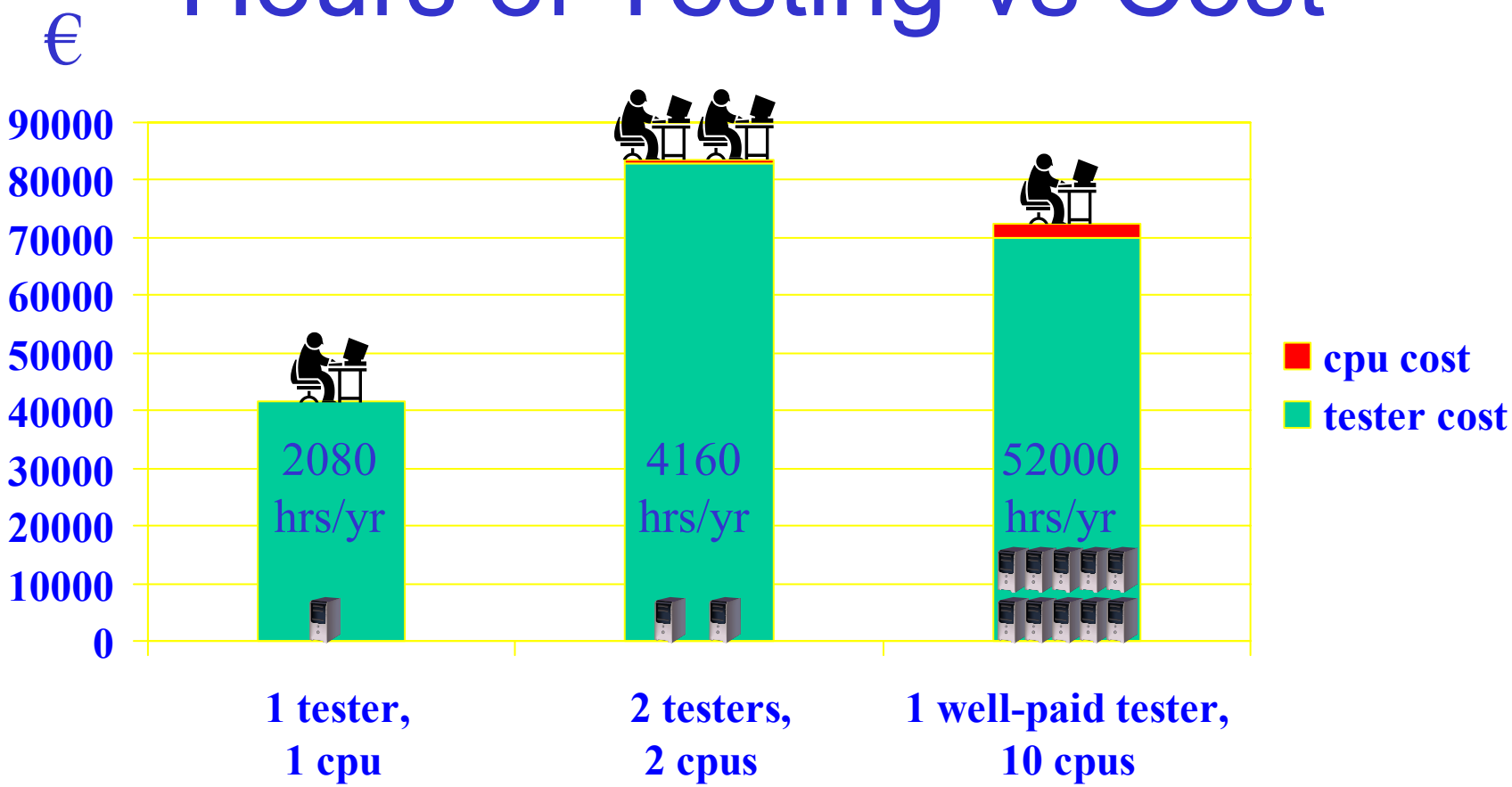
- A typical test engineer
  - Earns € 41 500 ($50 000 USD) per year
  - Works 40 to 50 hours per week

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

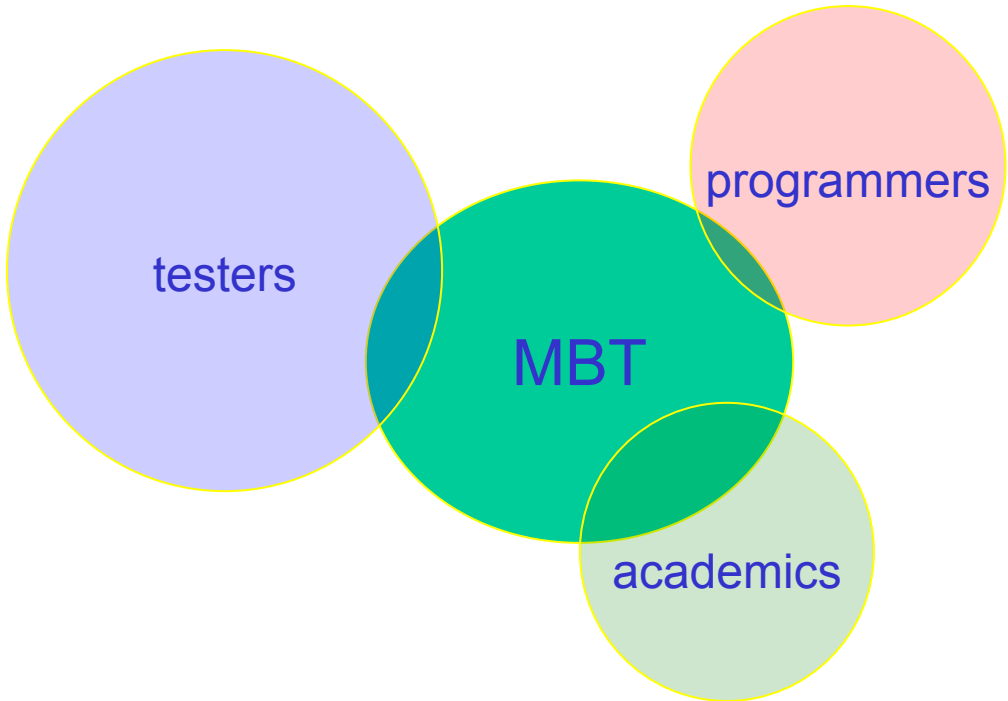
Hours of Testing vs Cost



Hours of Testing vs Cost



Caught in the Middle

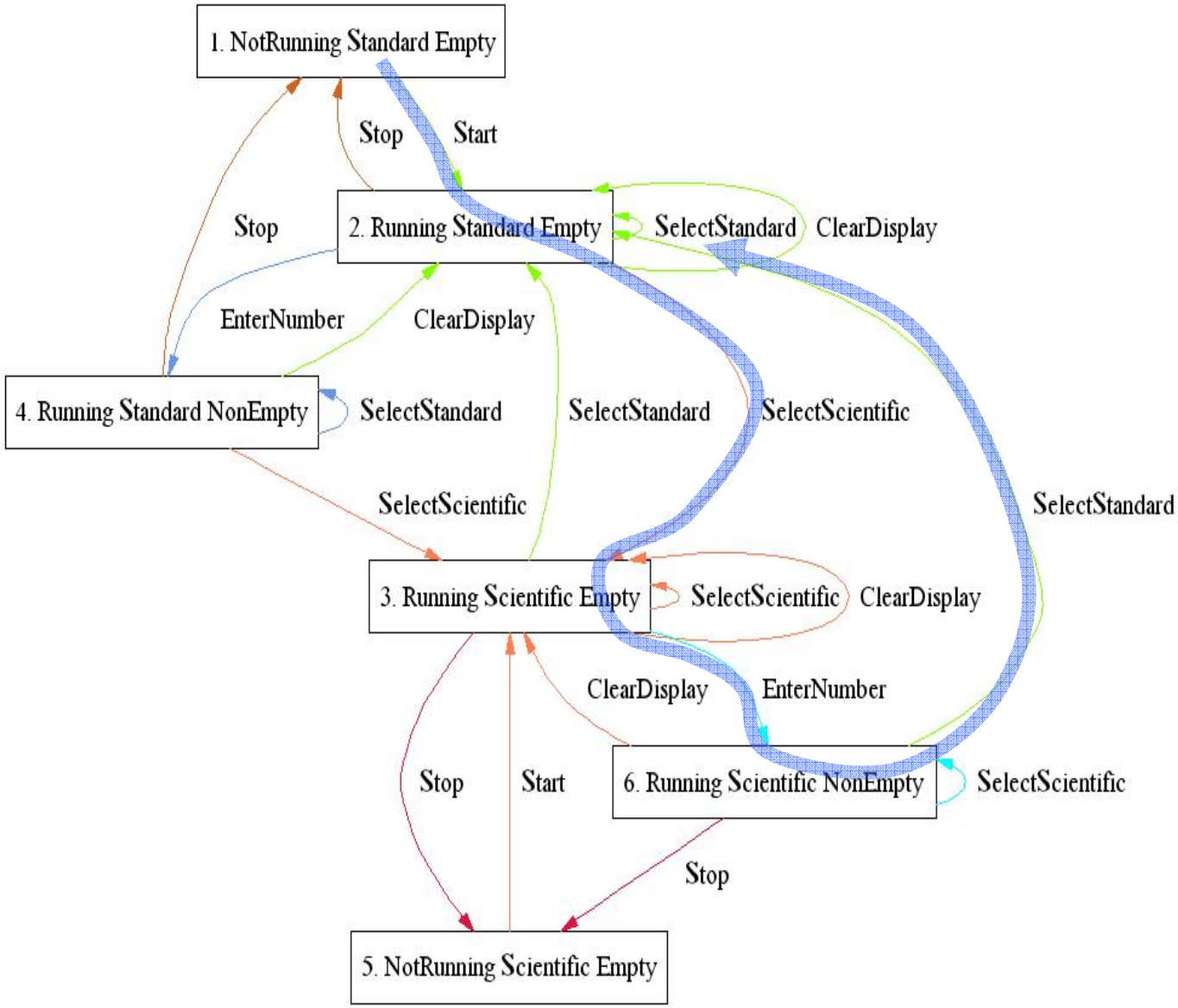


"Because MBT … requires strong software development skills, when I recruit test engineers, I look for developers and get them excited about testing."

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


1. NotRunning Standard Empty
Stop
Start
Stop
2. Running Standard Empty
SelectStandard
ClearDisplay
EnterNumber
ClearDisplay
4. Running Standard NonEmpty
SelectStandard
SelectStandard
SelectScientific
SelectScientific
SelectStandard
3. Running Scientific Empty
SelectScientific
ClearDisplay
ClearDisplay
EnterNumber
Stop
Start
6. Running Scientific NonEmpty
SelectScientific
Stop
5. NotRunning Scientific Empty

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."

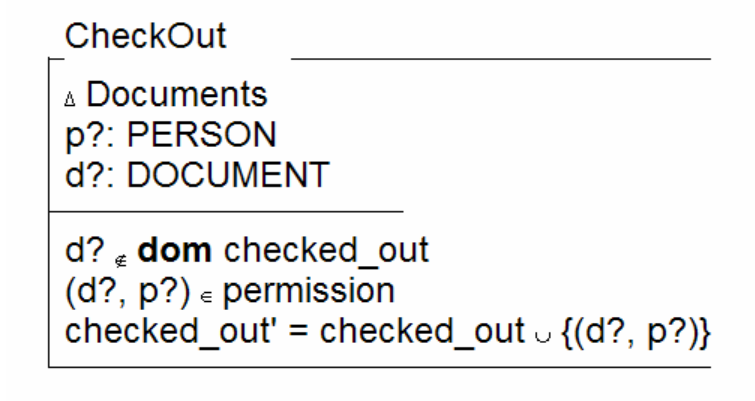
Model-Based Software Testing
James Whittaker, Ibrahim El-Far

What Needs to Happen?

Industry's issues with modeling:

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

Z



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