

# *Distributed Testing with SmartFrog*

Julio Guijarro

Steve Loughran

HP Laboratories, Bristol, UK



julio.guijarro at hpl.hp.com  
steve.loughran at hpl.hp.com

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# About Us



## *Julio Guijarro*

Research scientist at HP Laboratories on  
*Grid-Scale Deployment*

*Leads the SmartFrog open source effort*

## *Steve Loughran*

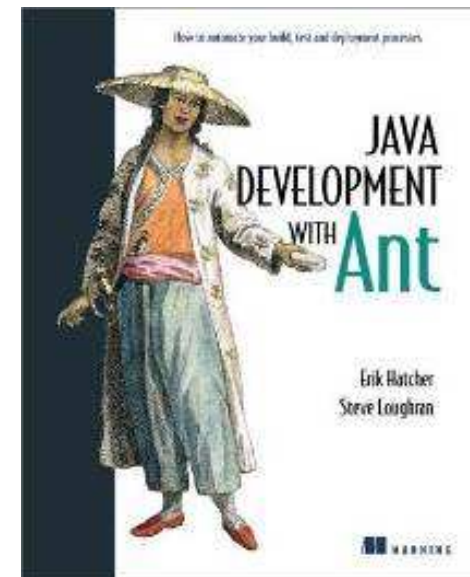
Research scientist at HP Laboratories on  
*Grid-Scale Deployment*

Apache Ant committer

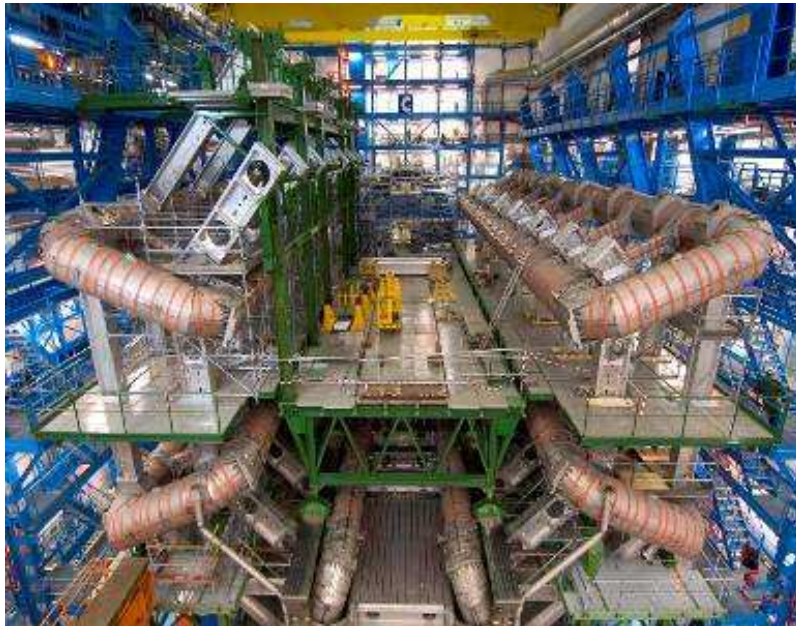
Co-author of

*Java Development with Ant*

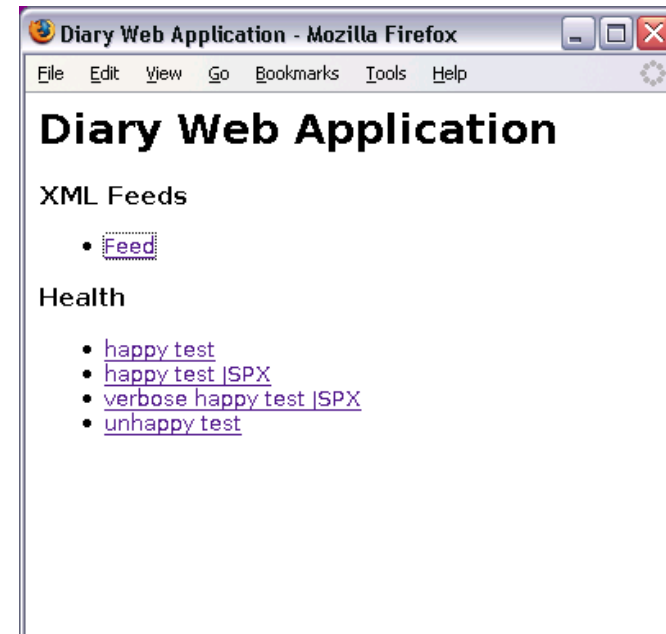
2<sup>nd</sup> edition due by Xmas (as is Ant1.7)



# Two different distributed systems



CERN Large Hadron Collider



Multi-tier webapp

# How do you show it works?



- Europe's high-end server farms
- Years of simulations
- Nobel Prize winners, Computer Scientists and physics PhD students



- An old laptop nobody wants
- Any spare time before the go-live date
- You



Any application  
without adequate  
system tests  
doesn't exist

0. Developer education & motivation
1. Writing the tests
2. Running the tests
3. Analysing the results

*If we can make system testing compelling, the tests will follow*

# Writing the tests

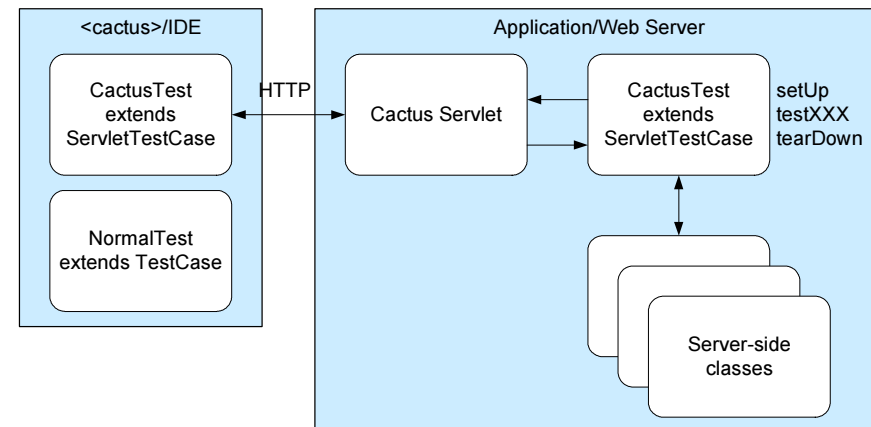
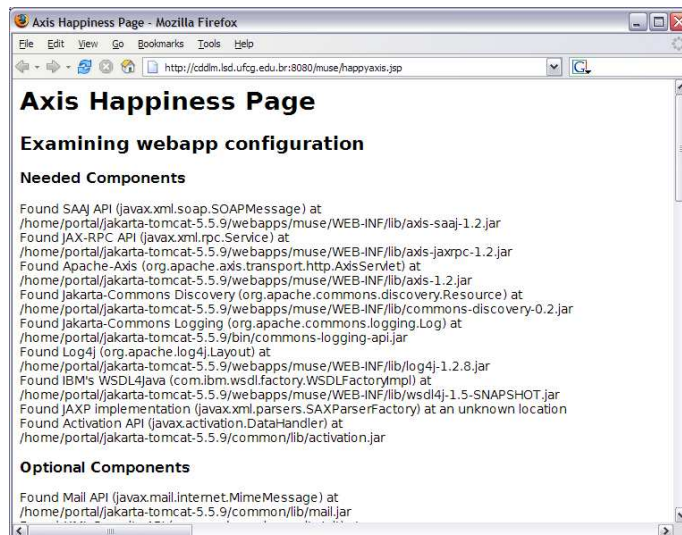
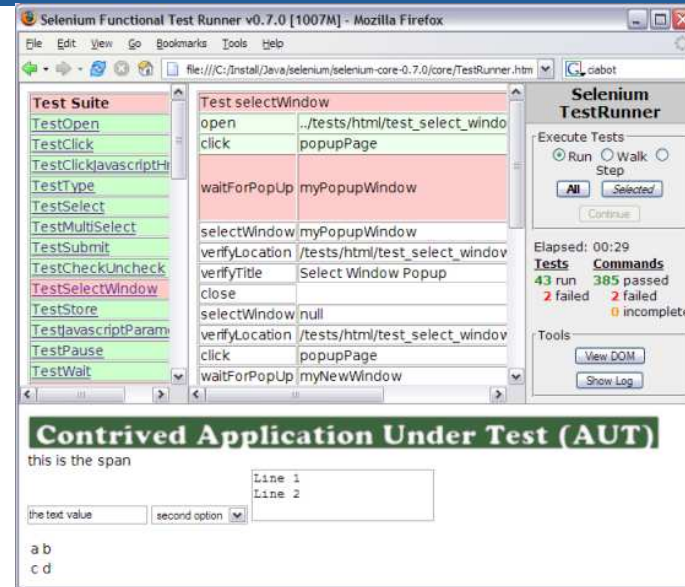


No single test framework  
will suffice

# Unit-test derived test frameworks



- JUnit 3+extensions
- JUnit 4
- TestNG
- Apache Cactus
- HttpUnit
- Selenium
- jsUnit
- ...





# Running the tests



# Today



- IDE/Ant/Maven hosted test runners
- Continuous Integration servers
- JUnit is primary test platform
- Bridges to other processes (Cactus, Selenium Server)
- Local system
- Local network



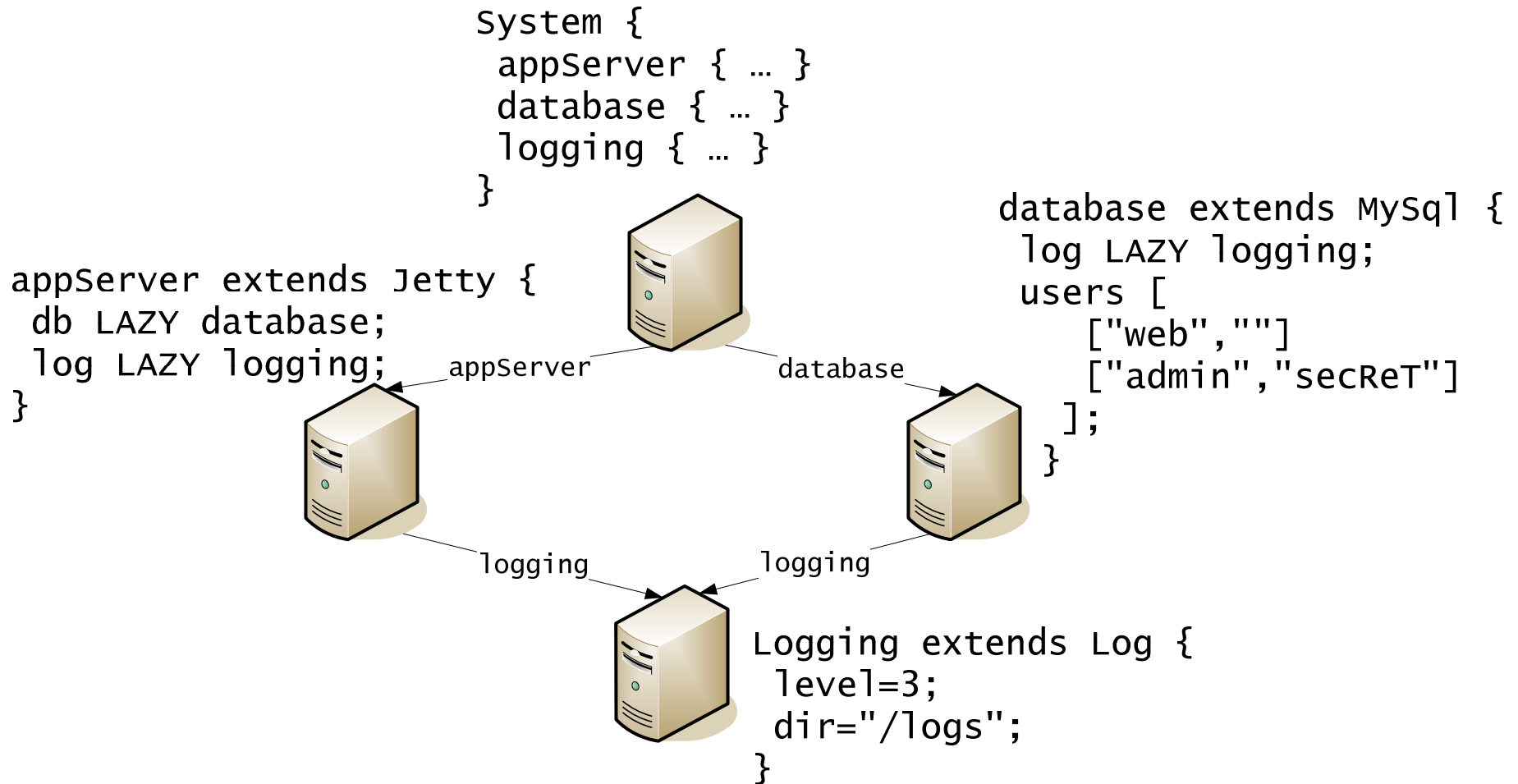
*System testing is tacked on to unit testing*

- Applications & tests run on multiple different hosts
- Hosts (real and virtual) are dynamically allocated
- Host and networks configured as part of the test
- Reports include output from all hosts and network
- Result presentation scales up.
- Data mining of multiple tests runs
- Runs as a background task under the CI server.

## *Transforming how mainstream developers deploy applications*

- HPLabs research
- Java Based distributed deployment system
- LGPL licensed
- <http://smartfrog.org/>

# Configuration is Deployment



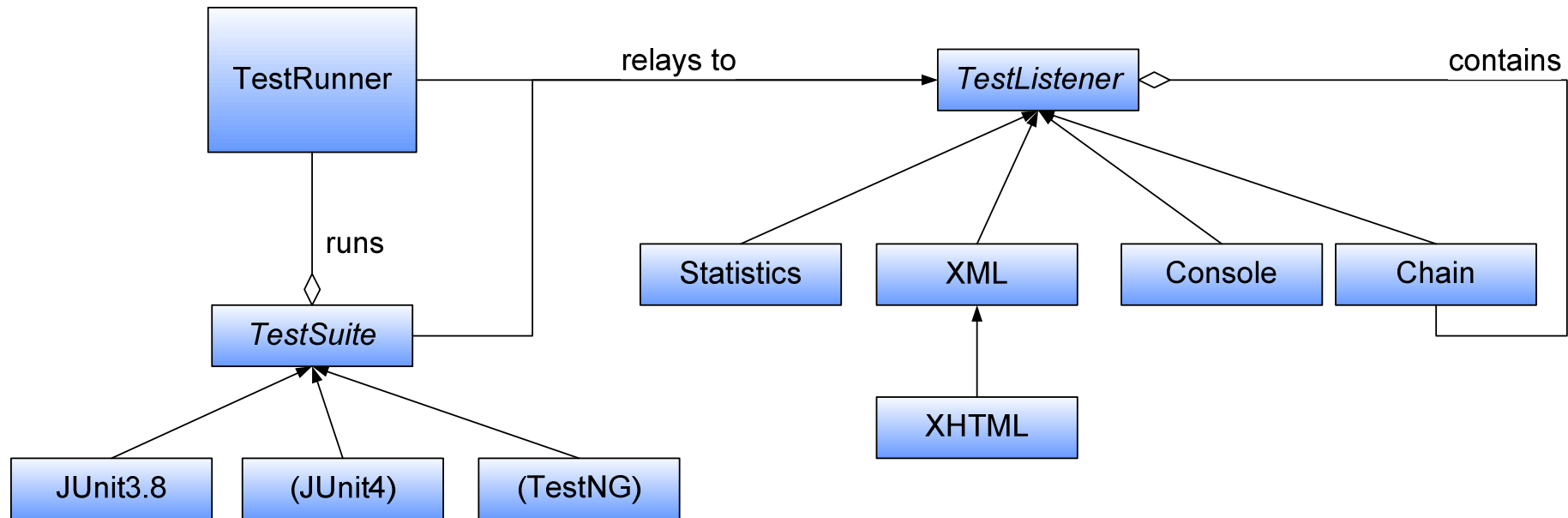
# SmartFrog for testing



- set up application with different options
- preconfigure the database
- bring up Xen/VMware images for hosting
- deploy the tests and collect the results
- clean up

*Tests are just something else to deploy*

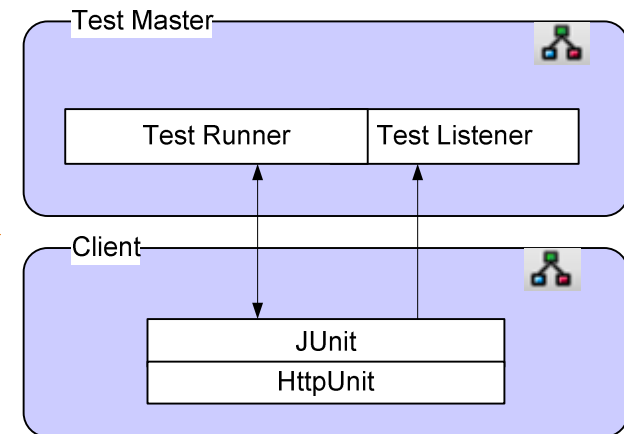
# Component model



# Test Suites



```
HttpUnitTests extends
JUnitTestSuite {
  package "d1.webapp.test";
  name "HttpUnitTests";
  server.url TBD;
  sfProcessHost "client";
  properties [
    ["server.url", server.url],
  ];
  classes [
    "EventFeedTest",
    "HappyTagTest",
    "IndexTest"
  ];
}
```





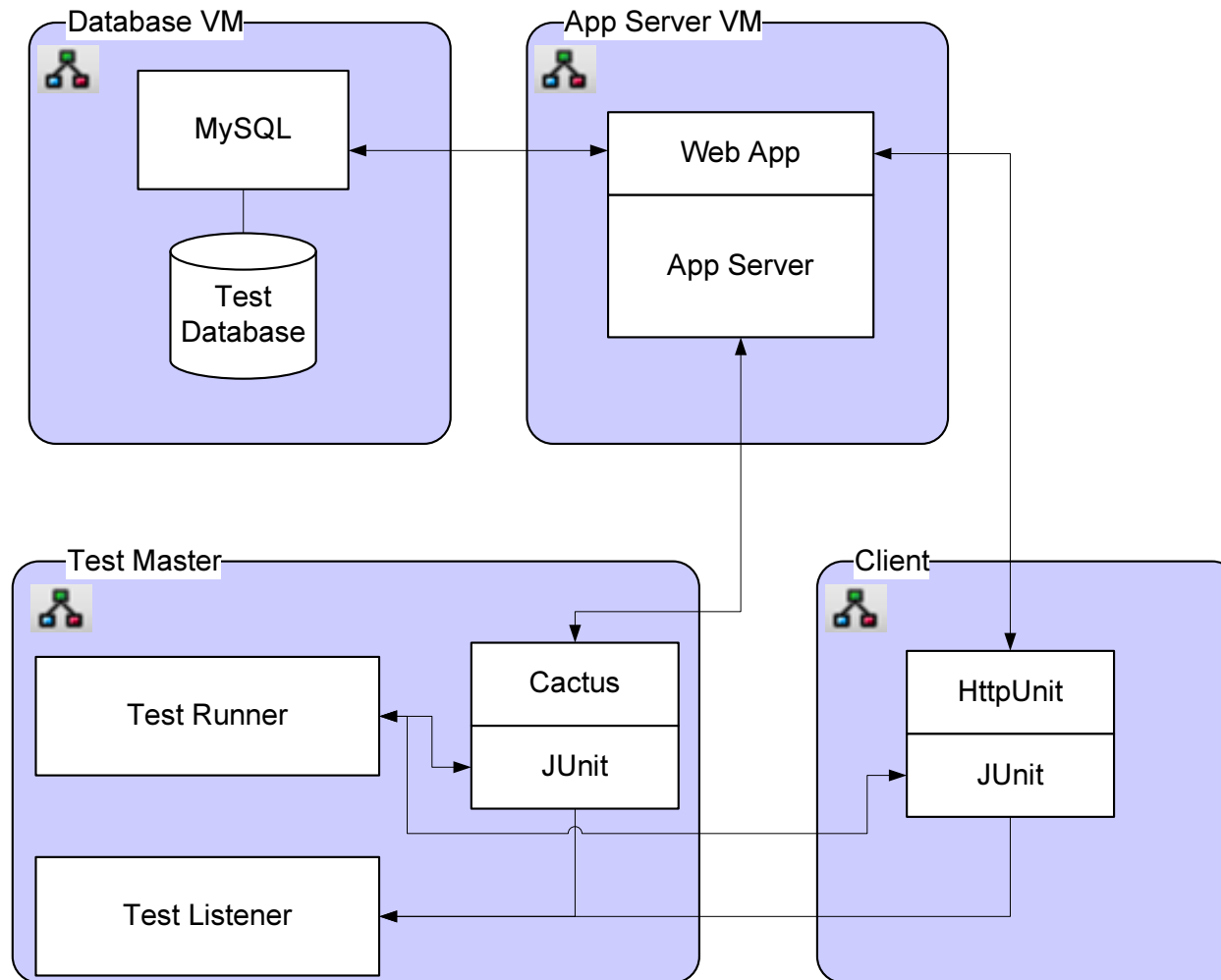
- Allocate & configure test systems
- Deploy application across nodes
- Deploy tests on other nodes
- Collect and correlate results
- Try to understand what went wrong

# Test scenarios

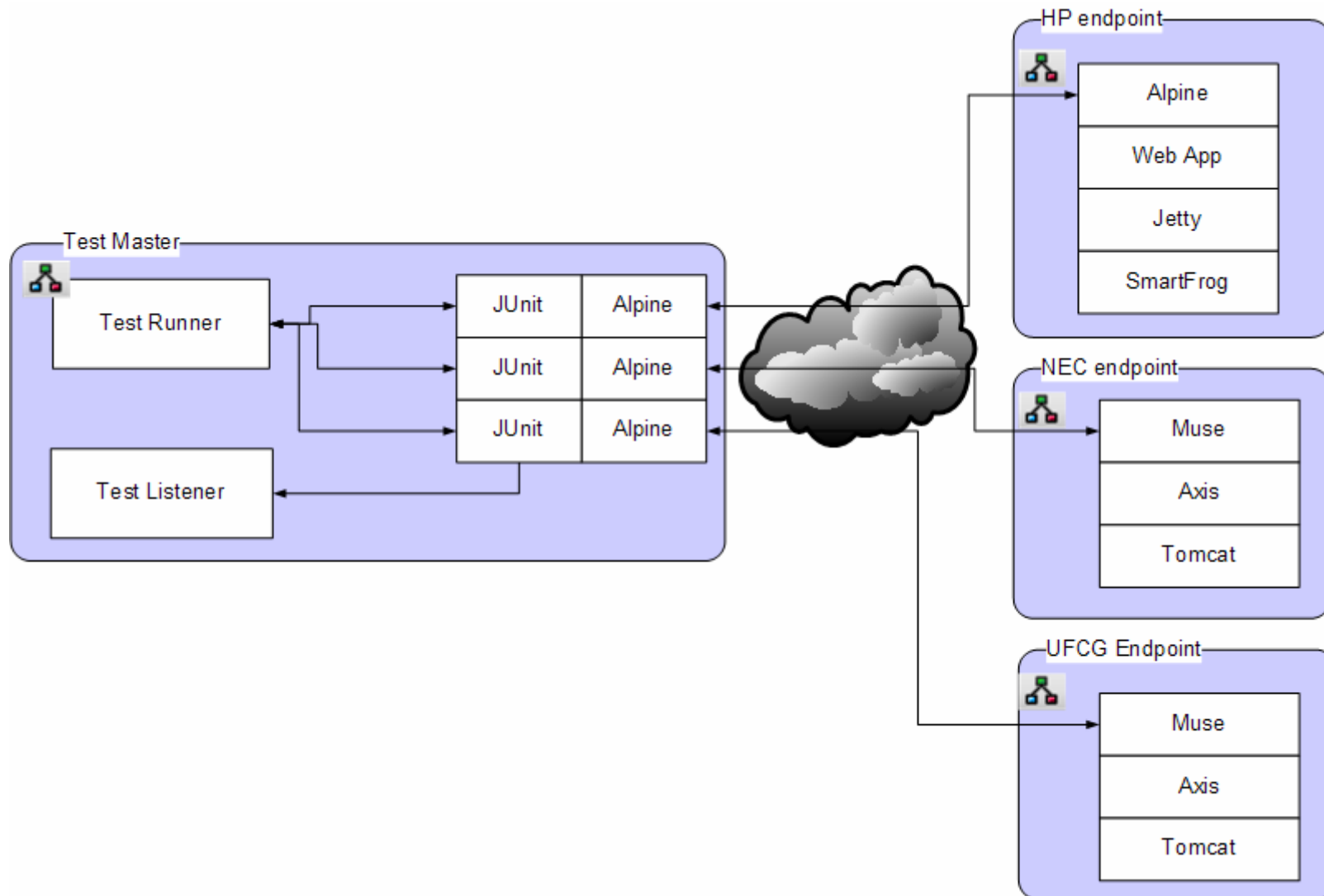


		Application	
		Single Node	Multiple Nodes
Test	Single Node	Traditional testing	client/server
	Multiple Nodes	Write once, test everywhere -client side apps	fully distributed application and tests

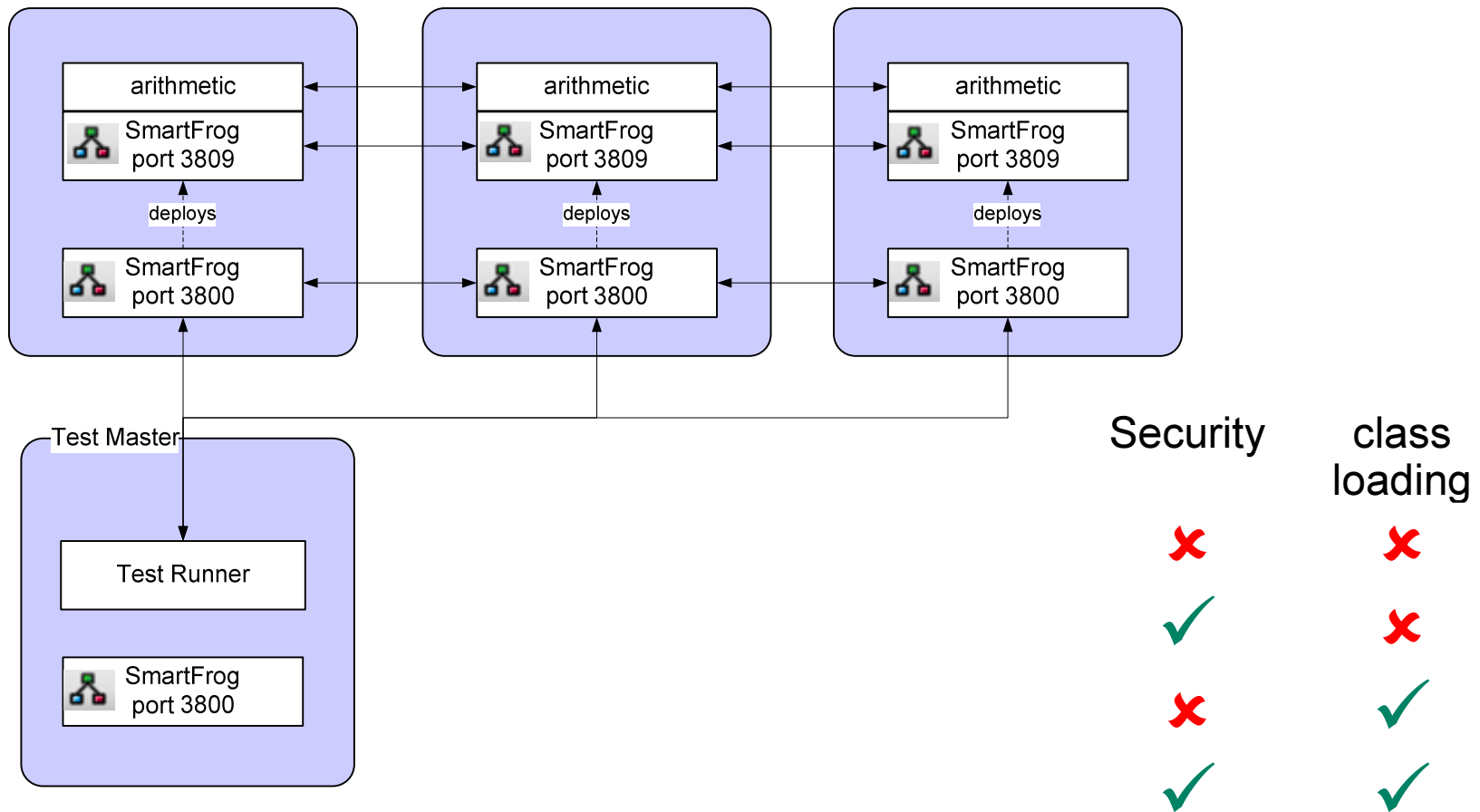
# Demo: "Enterprise" Web Server



# Demo: Interop testing of SOAP Systems



# How we test SmartFrog itself



One ring of SmartFrog daemons deploys a new set

# Data Mining of Results



Please, solve this

# Ant's HTML report of JUnit is ubiquitous



Unit Test Results

Designed for use with [JUnit](#) and [Ant](#).

### Summary

Tests	Failures	Errors	Success rate	Time
1597	6	0	99.19%	484.988

Note: *failures* are anticipated and checked for with assertions while *errors* are unanticipated.

### Packages

Name	Tests	Errors	Failures	Time(s)	Time Stamp	Host
<a href="#">org.apache.tools.ant</a>	53	1	0	3.714	2006-07-04T22:38:01	Zermatt
<a href="#">org.apache.tools.ant.filters</a>	50	0	0	2.404	2006-07-04T22:38:05	Zermatt
<a href="#">org.apache.tools.ant.taskdefs</a>	902	5	4	303.196	2006-07-04T22:38:07	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.condition</a>	45	0	0	4.397	2006-07-04T23:02:37	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.email</a>	15	0	0	0.040	2006-07-04T23:02:41	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.optional</a>	74	0	0	18.196	2006-07-04T23:02:41	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.optional.depend</a>	9	0	0	21.060	2006-07-04T23:03:00	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.optional.i18n</a>	1	0	0	0.321	2006-07-04T23:03:21	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.optional.junit</a>	28	0	0	18.086	2006-07-04T23:03:21	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.optional.perforce</a>	2	1	0	0.030	2006-07-04T23:03:39	Zermatt
<a href="#">org.apache.tools.ant.taskdefs.optional.unix</a>	4	0	0	0.010	2006-07-04T23:03:39	Zermatt
<a href="#">org.apache.tools.ant.types</a>	189	0	0	80.576	2006-07-04T23:03:39	Zermatt
<a href="#">org.apache.tools.ant.types.mappers</a>	4	0	0	0.050	2006-07-04T23:05:00	Zermatt
<a href="#">org.apache.tools.ant.types.optional.depend</a>	7	0	0	2.684	2006-07-04T23:05:00	Zermatt
<a href="#">org.apache.tools.ant.types.resources</a>	2	0	0	0.110	2006-07-04T23:05:03	Zermatt

# But the underlying XML is limited



## summary at the top

```
<testsuite errors="0" failures="0" hostname="Zermatt"
name="api.Api_05_system_create_destroy_Test" tests="1" time="2.623"
timestamp="2006-06-29T11:09:48">
```

```
<properties>
  <property name="epr.hp"
    value="http://deployapi.iseran.com/alpine/portal/" />
</properties>
```

Minimal context

```
<testcase classname="api.Api_05_system_create_destroy_Test"
name="testCreateCreatedTimeDestroySystem" time=" 2.623" />
```

```
<system-out><![CDATA[
0    DEBUG org.smartfrog.projects.alpine.transport.http.HttpTransmitter -
    Posting to http://deployapi.iseran.com:8080/alpine/portal/
141  DEBUG httpClient.wire.header - >> "POST /alpine/portal/
    HTTP/1.1[\r][\n]"
151  DEBUG httpClient.wire.header - >> "SOAPAction: [\r][\n]"
151  DEBUG httpClient.wire.header - >> "User-Agent: Alpine [\r][\n]"
]]></system-out>
</testsuite>
```

single-host log loses information



# We need a unified format of test results



- real-time and post-run display/analysis
- extensible metadata (dublin core, context)
- integrate logs from multiple machines
- streamable to disk/over the network
- cross-language stack traces

A new XML format, or XHTML?

# SmartFrog XHTML output



Test suite HttpUnitTests on Zermatt started Thu Jun 29 16:19:30 BST 2006

[summary](#)

**d1.webapp.test.HappyTagTest**  
duration 2.603s  
testIndex

**d1.webapp.test.HappyTagTest**  
duration 0.071s  
testUnhappy

**d1.webapp.test.HappyTagTest**  
duration 0.04s  
testSPX

**d1.webapp.test.HappyTagTest**  
duration 0.02s  
testJP

**d1.webapp.test.EventFeedTest**  
duration 1.592s  
testFeedDefault

**d1.webapp.test.IndexTest**  
duration 0.14s  
testEveryLinkOnThePage

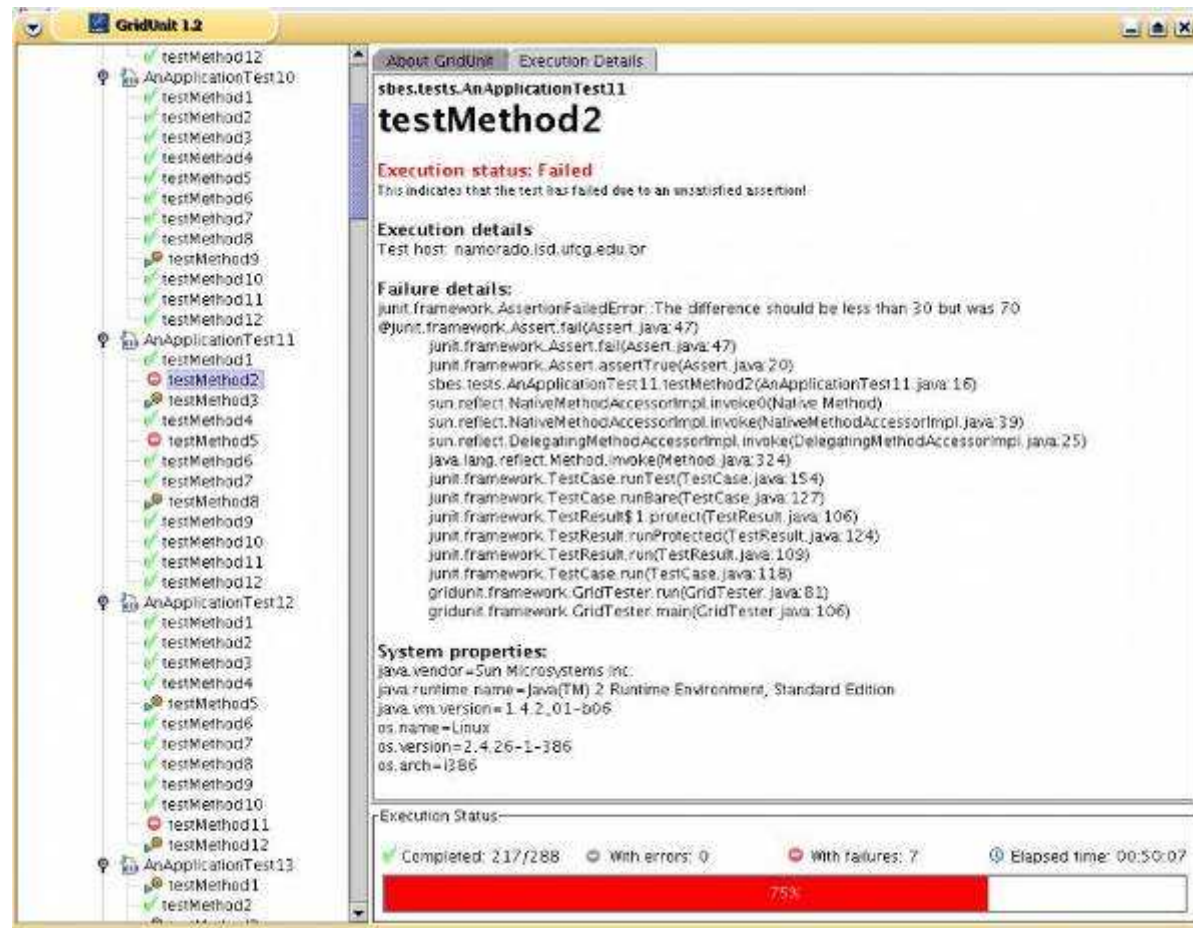
Test Summary	
Tests	6
Successes	6
Percentage Successes	100
Failures	0
Errors	0
Started	Thu Jun 29 16:19:30 BST 2006
Finished	Thu Jun 29 16:19:30 BST 2006
Host	Zermatt

~live output  
log capture

# Future GUI? GridUnit



- Swing GUI for testing on OurGrid
- Aggregate view of results
- “partial” success



<http://gridunit.sourceforge.net/>

# Call to Action



- Focus on system tests
- Automate deployment
- Automate system testing
  
- Work on an XML/XHTML test result format
- Test framework authors: help us run your frameworks.

If you have big deploy/test problems, come join the SmartFrog community

# Topic for discussion



*Any W3C/OASIS/WSI/GGF/IETF  
standard without  
tests doesn't exist*