

Multi-Platform SCADA GUI Regression Testing at CERN

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Practical Experience With Sexy Software









- Hands-on, practical talk
- Why are you interested?
 - You can laugh at other people's mistakes
 - You may be about to make the same journey (with same mistakes!) as me ⁽²⁾
- What will you gain from this talk?
 - A desire to actually read our paper (?)
 - A chance to get your Testing System right, 1st time



Salient Points



- Beware the siren song
 - Truthful(!) salesmen
 - But what remains unsaid?
- Testing Cross-platform (vs Multi-platform)

 Messy
- Virtual machines
 - Appropriate



Layout Of This Talk



- Introduction:
- Testing what?
- How? Automatic; Squ
- Orchestration:
- JCOP Framework Automatic; Squish

GUI Quality Assurance

Continuous Integration tool.

• Lessons:

- "In the light of experience..."
 - What went badly 1st time?
 - How did we respond?



GUI Quality Assurance (QA)



- Lots of people test their software (some even document it...)
 - Unit testing; Black box, white box
 - ~ Easy(?) Straightforward
- Testing SCADA (control) systems
 - Many Graphical User Interface (GUI) panels
 - Need testing too
 - Don't want to do it manually

Not so easy. Especially when there is control logic behind the buttons etc



Testing What?

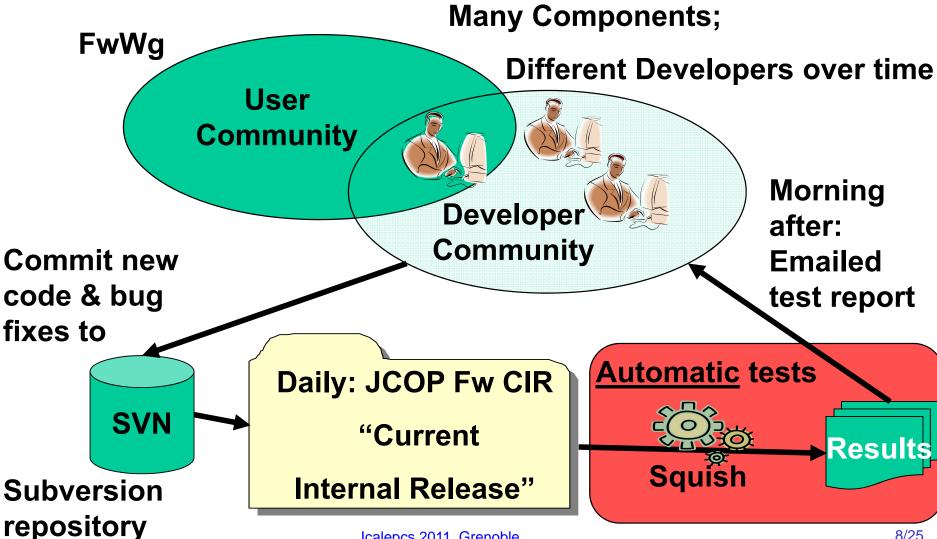


- JCOP Framework
 - A toolkit for end users to build their own control applications
 - Long-lifetime project (-10..+15 years)
 - Staff rotation
 - Natural turnover
 - Use Experiment staff/students
 - New developers -> unintended side-effects

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(Re-)Testing is crucial

JCOP Fw Development Process



Icalepcs 2011, Grenoble



How Do We GUI-Test JCOP-Fw?

- Commercial tool:
 - (Rational Robot)
 - Squish (Qt) from Froglogic GmbH
- Very powerful
 - Intuitive
 - "Record my keystrokes"
 - "Record my mouseclicks"
 - Generates source code
 - Replay 😊
 - Regression testing done!



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How do you know it worked?



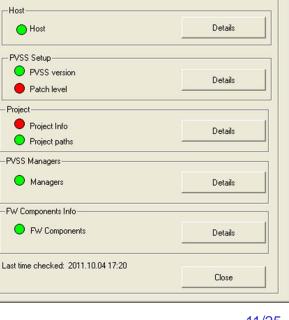
- A library call like sqrt(2) would be easy to check
- But Fw tool is used to
 - Declare hardware in a new control system
 - Define alarms on values
 - Replay & verify get same definitions as yesterday.

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- A library call like sqrt(2) would be easy to check
- But Fw tool is used to
 - Declare hardware in a new control system
 - Define alarms on values
 - Replay & verify get same definitions as yesterday.
- User presses a button, e.g. to connect to the database Verify that the LED is green



PVSS-DB Integrity Details (dist_252 - CdsiProject_pce...

PVSS-DB Consistency









- Tools to verify screen conditions:
 - Fields contain correct values, are correct colour,

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- ...cannot verify application-specific things:
 - WinCC-OA (PVSS) from Siemens (ETM)
 - Export definitions from WinCC
 - Write our own comparison tool

(Totem)



Problem: Software Versions



- Squish tests the JCOP-Framework,
 - which uses WinCC-OA,
 - which is built on Qt,
 - which uses Windows or Linux



Any changes can break the pre-recorded tests





Lesson 1



Squish tests the JCOP-Framework,

 Simply recording keystrokes and clicks is not scalable to many tests

 We had to seriously re-factor the code into libraries to make it maintainable

Any changes can break the pre-recorded tests





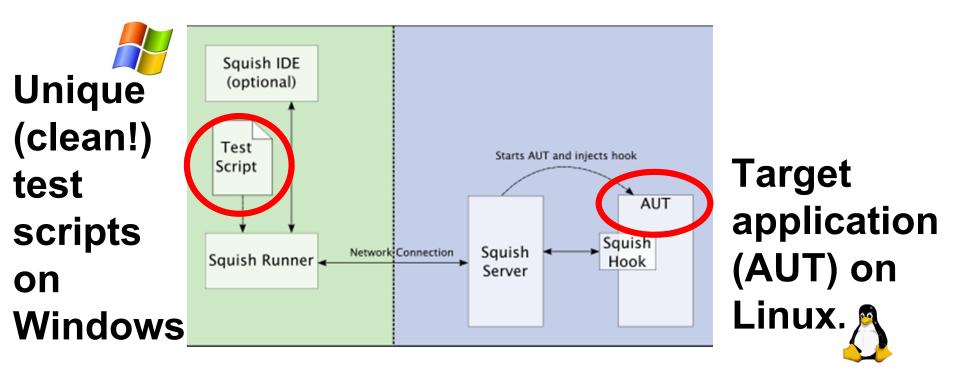
- Squish development environment is pretty...
 - ...but that's only half the story.
 - Overnight-runs started from a command line script
- Difficulties with the fundamentals
 - Bash to trigger the production runs:
 - Windows and Linux.
 - Seemed like a good idea at the time.
 - Incompatibilities
 - Cygwin-Bash (on Windows) vs Linux-Bash
 - One script for 2 platforms => Messy scripts



Powerful Solution ?



Squish has a client-server mode of operation







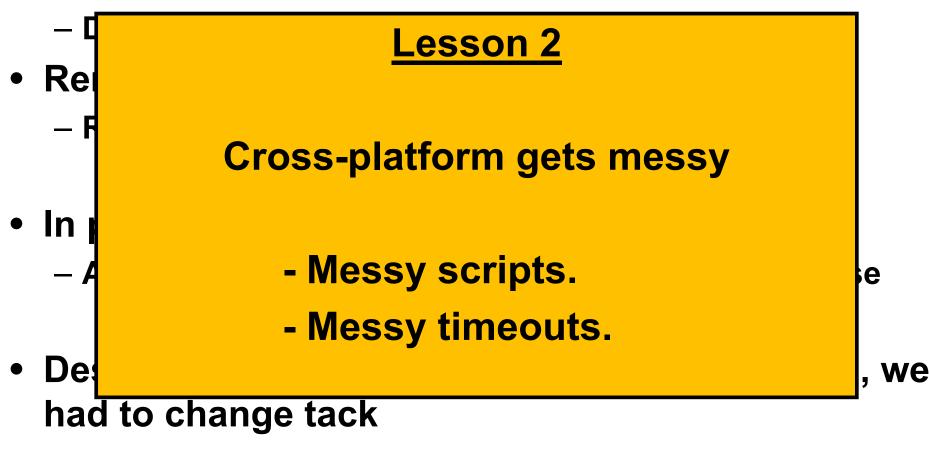


- Many Linux X–Windows
 - Display back to the client (on Microsoft Windows)
- Remote file access
 - Returning results across the link
- - All our displays (and open files) would then collapse
- Despite trying various workarounds (e.g. VNC), we had to change tack





• Many Linux X–Windows





Profound Reflection









- Abandon Bash
 - Use Python
 - Better compatibility across platforms
 - Consistent with use of Python within Squish
- Returned to running the Squish test scripts on the target platform being tested
- And...





- Orchestrate many different platform instances (Windows XP, W7, Linux SLCn, n+1 etc)
- Looked at tools to
 - Distribute the testing
 - Centralise the results.
- Bamboo (from Atlassian) ?
 but their model is different to ours.



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Chose Hudson



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- Hudson is a Continuous Integration (CI) tool that is
 - Flexible
 - Open Source (free licensing)
- Works well

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- Operational Environment
- CERN Virtual Machine (VM) service.
- Dedicated machines make life simple
 - Different O/Ses
 - Different software versions
- VMs work like the real thing ©
 - Functionality tests, not performance tests!
 - Speed/timing issues on different platforms (real or virtual) !
- CERN is happy too. (VM Server reallocation)









"Experience" Is Unfinished

- Real life is ongoing (fortunately).
- Setting up on Linux again right now.





- Sexiness doesn't scale (Ask your girlfriend/boyfriend...) – Investment in good old-fashioned coding (libraries)
- Cross-platform can be tricky
- Virtual machines are great



Conclusions - II

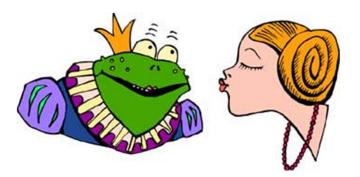


- We've made a system to test Qt GUIs, designed for multi-platform
 - Scalable
 - # tests
 - # machines
 - General
 - Applicable to testing other Qt GUIs (e.g. Unicos)
 - Useful (!)
 - Reduced manual effort (time!) to release each new version of the Fw
 - Steady trickle of errors found (1..2 per month). (Pays off!)





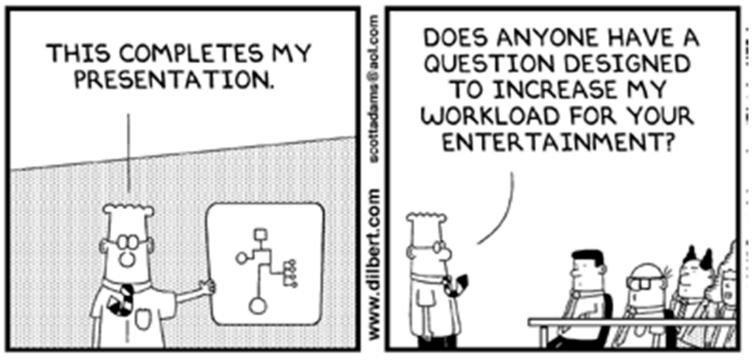
- As for Froglogic's Squish:
 - We love it, but (like with a husband or a wife) you've got to be prepared to work within (and on) the relationship





Questions?





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