ERICSSON

CI FOR FPGA D&V

Continuous Integration for FPGA Design and Verification

Verification Futures 2015-02-05

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AGENDA

- Ericsson TV background
- Ericsson TV Firmware Group design flow
- Issues
- Motivation for continuous integration
- Continuous Integration to the rescue!
- Application to FPGA Build
- Application to FPGA Simulation
- Conclusions

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- Market leader in professional video processing solutions for compression
- Primary site Hedge End, Southampton UK
- About 200 engineering staff
- FPGA (“Firmware”)group 30 staff

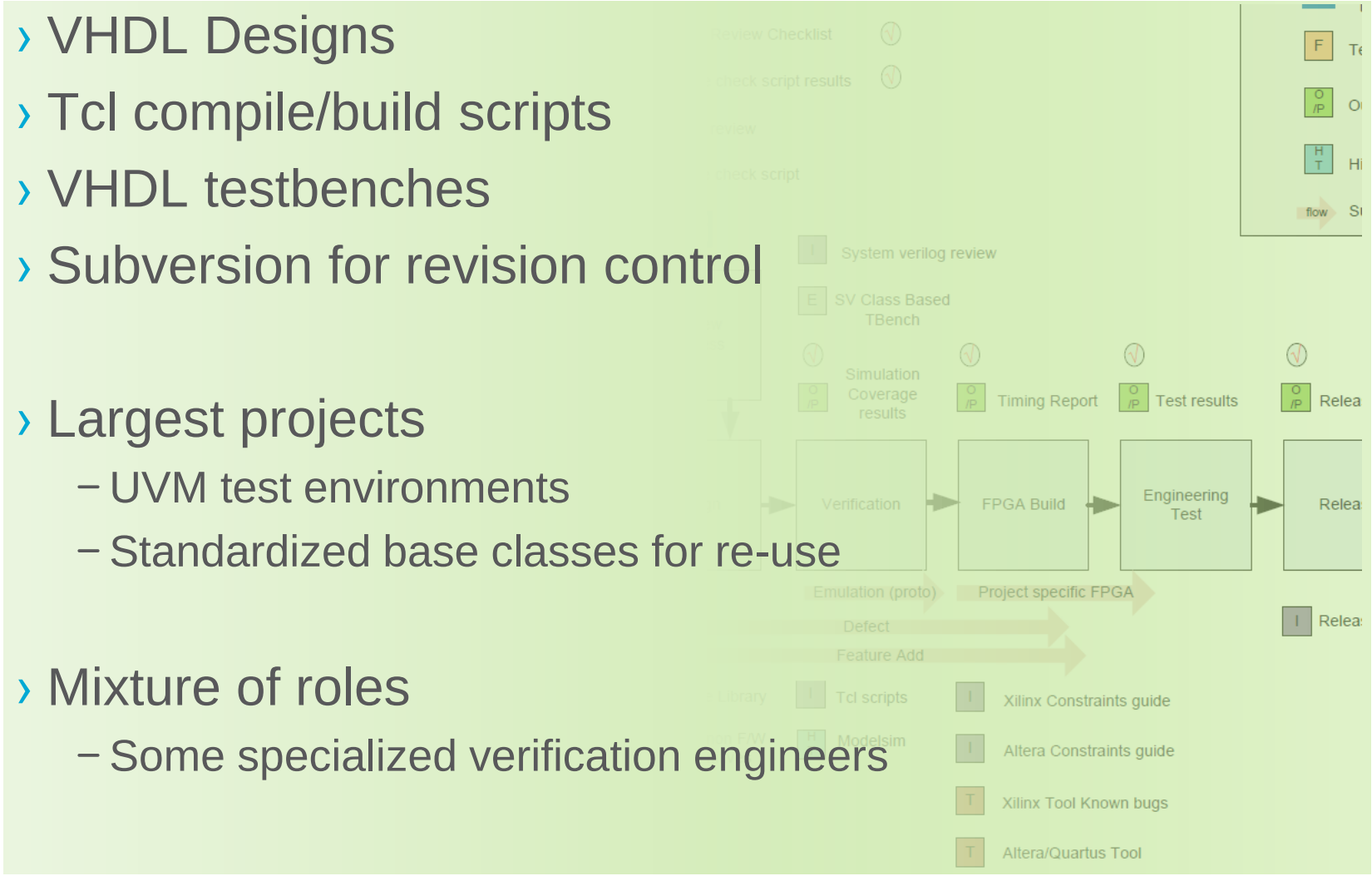
- Developing FPGAs
  - Largest project – 5 x 1M logic elements
  - Many existing designs in maintenance

DESIGN FLOW

- VHDL Designs
- Tcl compile/build scripts
- VHDL testbenches
- Subversion for revision control

- Largest projects
  - UVM test environments
  - Standardized base classes for re-use

- Mixture of roles
  - Some specialized verification engineers



ISSUES

- FPGA Build
  - Make “push-button”
  - Schedule builds over the weekend
- FPGA Simulation
  - Use regression with UVM/SV (non-proprietary)
  - Extend regression to VHDL
  - Make sure existing sims still compile and run (“smoke test”)
    - Avoid “software rot”
  - Efficient use of licenses (e.g. overnight/weekends)

CI TO THE RESCUE!

- We could have extended existing Tcl flow
  - But luckily local software groups had already implemented Jenkins
- Jenkins was applied to FPGA Build and Simulation
  - Work carried during “innovation days”, time allocated to process improvement at beginning of Agile Sprints
- Used for UVM regressions
- Extended to VHDL testbenches

APPLICATION TO BUILD

- Tcl flow already carries out automated build
  - But still required user checkout of large Subversion database
  - Knowing what directory to use and which script options to supply
- The Jenkins CI server allows arbitrary commands to be run on a Jenkins slave node
- The firmware slave node is a Grid Engine Master, which then queues the jobs on to a Linux server client

FPGA BUILD MADE EASY

Welcome to Jenkins - the Continuous Integration server for Engineering.

Scheduled builds

add description

Host Card | IO Cards | +

S	W	Name ↓	Last Success	Last Failure	Last Duration	Built On	Cron Trigger	Number of builds
		EN8100_ViPER_asi_io_card	5 mo 6 days - #15	N/A	58 min	typhon	Poll SCM: # 19:00 on Sunday 0 19 * * 7	1 0 0

Icon: S M L

Legend RSS for all RSS for failures RSS for just latest builds

Press button

Someone else has done the hard work…

Execute shell

Command

```
#!/bin/sh -xe
pwd
if [[ "$RELEASE_BUILD" == "true" ]]; then
  OPTION="-rel"
fi
cd asi_io_block/synthesis/scripts
JobRun ise_toplevel.tcl $OPTION
echo "Compile Done"
tclsh < ../scripts/xilinx_check_timing.tcl
```

See the list of available environment variables

Add build step

Post-build Actions

Archive the artifacts

Files to archive: output_files/**/*

CI WITH SIMULATION

- First applied with UVM
  - Jenkins interprets results in XML – JUNIT report format

```
function void scoreboard::report_phase(uvm_phase phase);
    // . . .
    // instance the junit class
    junit_results = new(junit_res_file_name);
    junit_results.start_tests();

    if (((svr.get_severity_count(UVM_FATAL) + svr.get_severity_count(UVM_ERROR)) == 0)))
    begin
        junit_results.add_test("uvm_tb", ctrl_knobs.get_str_value("test_name"), `PASS, , , );
    end

       // . . .
   endfunction: report_phase
```

Scoreboard base class

XML writer class

```
<?xml version="1.0" encoding="UTF-8"?>
<testsuite>
  <testcase name="test1"
            classname="uvm_tb"
            time="35">
  </testcase>
</testsuite>
```

JENKINS SIMULATION

S	W	Name ↓	Last Success	Last Failure	Last Duration	Built On	Cron Trigger
		COMMON_CSM_Interfaces_regression	2 days 2 hr - #302	2 hr 36 min - #304	8 min 10 sec	vishnu	
		overnight_regression_COMMON	2 hr 37 min - #287	5 days 18 hr - #280	1 min 1 sec	vishnu	Build periodi midnight ev
		project_crawler	28 min - #7769	1 hr 28 min - #7768	19 sec	vishnu	Build periodi
		SVN_checkout	2 hr 37 min - #1697	N/A	47 sec	typhon	

Python script builds project coverage web-page

Define build flow using flow DSL

```
1 build( "      SVN_checkout" )
2 ignore(FAILURE) {
3     parallel (
4         { build("     _COMMON_CSM_Interfaces_regression") }
5     )
6 }
```

DSL Plugin

Post-build Actions

E-mail Notification

Recipients: alan.fitch@ericsson.com

Whitespace-separated list of recipient addresses. May reference build parameters like $PARAM. E-mail will be sent when a build fails, I

☑ Send e-mail for every unstable build

ISSUES

- Jenkins connects to slaves through ssh
  - Loss of ssh connection for any reason stops periodic builds
  - Investigating a “slave monitor” Jenkins plugin
- It’s better to write XML status from wrapper scripts / log scanners (which we now do)
  - Applies to all languages (VHDL/SV) equally

CONCLUSIONS

- Jenkins is a powerful way to do regression and build
  - Unexpected benefit – helps engineers keep on top of code changes during rapid development

http://jenkins-ci.org

- Push-button or time-triggered builds/sims
- Common CI across software/firmware
- Plans
  - Extend into department to run “smoke tests” on VHDL sims
  - TV display of Coverage/Build status “build radiator”

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