CE Workgroup

Fuego
Status and Roadmap
BOF

Tim Bird

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LF CE Workgroup

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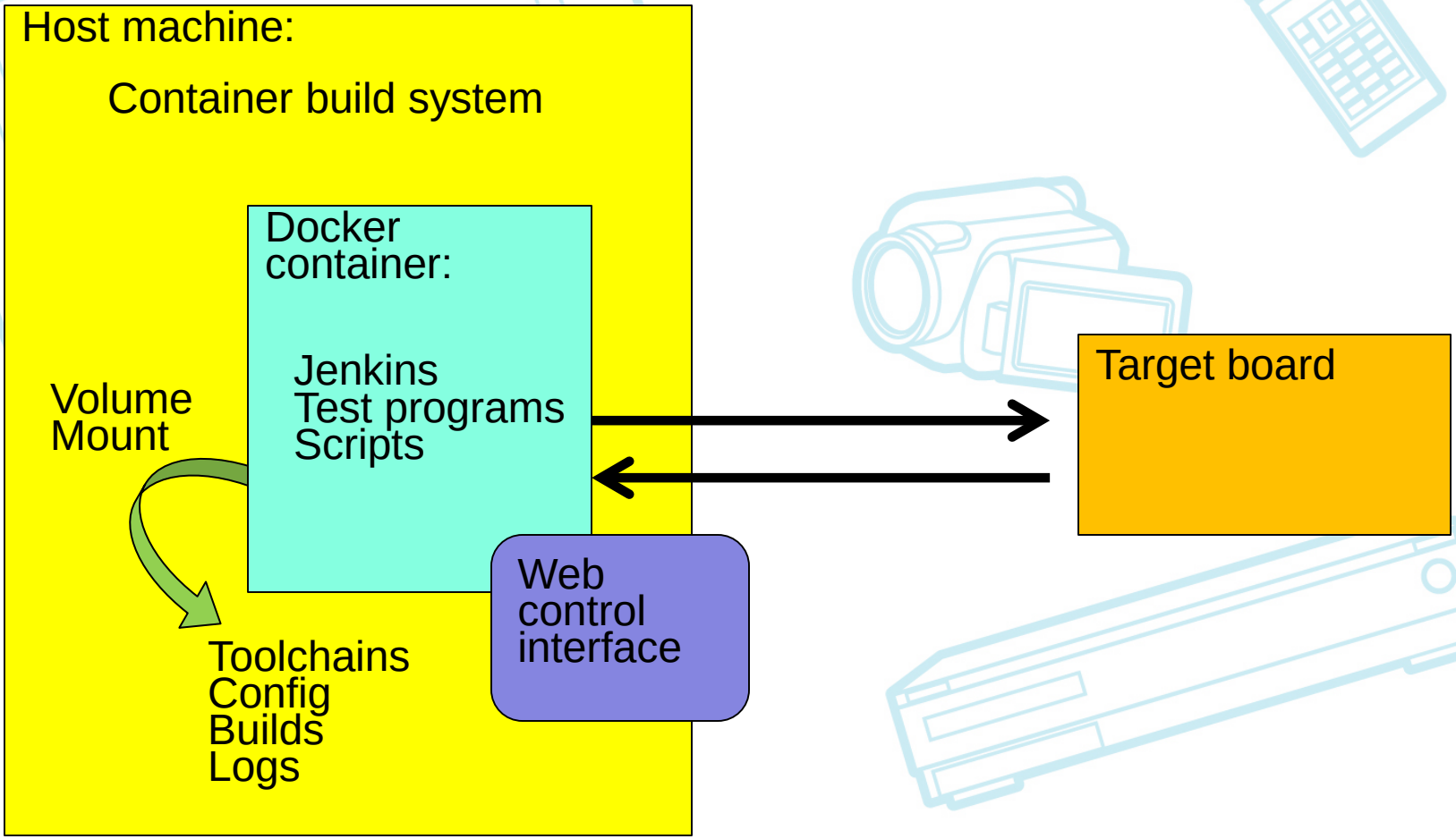
Micro-Introduction

Fuego = (Jenkins + abstraction scripts + pre-packaged tests) inside a container

Architecture Diagram



Vision – super high level

Do for testing
what open source
has done for coding

- Significant parts of the test process are unshared, ad hoc, private, etc.
  - For no good reason – most QA doesn't need to be proprietary
  - There are OSS frameworks and test programs but parts are missing to create a open testing community.
- Promote the sharing of tests, test methods, and test results, the way code is shared now
  - Make it easy to create, share and discover tests
  - Make test results easy to share and evaluate

Goals

- Allow quick and easy setup
- Support a wide variety of configurations and build systems
  - Yocto Project/OE, Buildroot, etc.)
- Support a wide variety of target types:
  - Transports: serial, ssh, adb, ttc
  - Distributions: Debian, Angstrom, Poky, custom
- Send data to centralized repository
- Make it possible to join a decentralized test network
  - Allow a developer to use my hardware for testing
  - Help solve the “developer can’t test on different hardware” problem

Outline

Status

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Vision

Roadmap

Status

- 3 main forks
  - Sony fork
  - Toshiba fork
  - AGL fork
- What features does each have?

Sony Fork

- In ‘next’ branch
  - Ftc – Fuego test control – command line tool
  - Test package system
    - Introduction of test package format (yaml file)
  - Client side of test server system
    - Test requests, test runs, packaging, install, running
  - New transports:
    - Serial, ttc
- Work in progress
  - Need_xxx system (test dependencies)

Toshiba Fork

- Refactored Jenkins integration
  - Uses minimal Jenkins plugins
  - Runs on latest Jenkins
- Refactored directories
  - Puts fuego-core outside the docker container
    - Much easier for development
  - Reduce symlink confusion
- Output results to excel file

AGL Fork

- Focused on LAVA integration
- Using latest Jenkins
- Test categories?
- Some reporting features??

Feature list

- Jenkins integration
- Containerization
- Overlay generation
  - Boards, distros, specs, plans
- Script system
- Transports
- Test collection
- Results parsing and post-processing
- Fuego server

Jenkins integration

- Toshiba fork simplifies integration
- ftc CLI allows Fuego use independent of Jenkins
- Want to use latest Jenkins
- Using a simple text template now
  - Maybe use Jenkins Job Builder to handle job and node creation?
- Add fuego-install-xxx commands to ftc?
- Handling dynamic parameters?
  - Target_cleanup, Reboot, Rebuild, Testplan

Overview of test framework landscape

- KernelCI
  - kernel build and boot
  - Multi-lab, client/server, results query
- LAVA
  - Board management, test scheduling
- Fuego
  - Host/target testing, jenkins integration
  - Docker container, test building, collection of tests
- Jenkins
  - Triggers, user interface, jobs, nodes, scheduling
- Avacado
  - Results processing, test server, matrix testing

Comparison of Fuego and Lava

Assumption	Fuego	LAVA	Jenkins
Board starting status	Board is running	Board will be provisioned and booted	Node is running
Test initiated by:	Manual, Jenkins trigger	External job insertion?	Jenkins trigger
Test software availability:	Source included, test binary is built and deployed to target	Is in distro or on target, or is installed during test	Builds software – no built-in deploy - left as exercise for test developer
Test scheduling	By Jenkins, cli has none, no target reservation system	By LAVA	By Jenkins
Results processing	Log parsing, send results to server (prototype)	Collect results?	Visualization for common formats (TAP, junit, xunit)

Feature list

- Containerization
- Overlay generation
- Script system
- Transport abstraction
- Test collection
- Results parsing and post-processing
- Command line
- Fuego server

Containerization

- Docker container builds OK
- Encountered issues with permissions for serial, usb (adb) operations
  - Docker-create-usb-privileged-container.sh
- Use of Fuego without container??
  - I had considered running outside docker, especially for tests with no build step (eg. Functional.bc)
    - To make host software lighter-weight
  - But there's lots of installation dependencies even without builds
  - Reproducible builds really benefits from a container

Overlay generation

- Boards, distros, specs, plans
- Need to adopt following:
  - Spec = test variant (test with different options)
  - Plan = set of tests
  - Distro should move to board file, IMHO
- We’re not using overlays to inherit from board types (like LAVA device types)
  - But we could
    - Eg: TimsPi:
      - Inherit RaspberryPi
      - IP_ADDR=10.10.1.8

Script system

- Core script system seems OK
- Overlays seems like overkill
  - Could this just be shell sourcing?
- Have been working to simplify specs and plans
  - Testplan_default is now implied
    - No need for each test to add something to a central plan on installation

Transports

- Added support for serial
  - About 80% there
  - Most tests run – there are a few remaining issues
    - Benchmark.reboot, target_reboot
    - ov_transport_connect, ov_transport_disconnect
- Added support for ttc
- Still want ‘adb’
- Does ‘lava2’ support go here?
  - I think this is where the LAVA integration is in AGL

Test collection

- This is the biggest value of the system eventually (IMHO)
- Not many new tests
- Currently have about 20 “useful” tests
- Want hundreds in lots of areas
  - Filesystem, networking, realtime, power, boot time, size, security, apis, utilities, specific sub-systems, hardware (drivers)
- Have been working on test package formatting and infrastructure first
- It is important not to delay too long actually making tests

Pre-packaged tests

- Comes with over 50 tests, already integrated
  - aim7, blobsalad, bonnie, cyclitest, dbench, dhrystone, ebizzy, ffsb, fio, GLMark, gtkperf, hackbench, himeno, Interbench, IOzone, iperf, Java, linpack, lmbench2, nbench, netperf, netpipe, OpenSSL, reboot, signaltest, Stream, tiobench, whetstone, x11perf, aiostress, arch_timer, bzip2, cmt, crashme, expat, fontconfig, glib, ipv6connect, jpeg, libpng, linus_stress, LTP, netperf, posixtestsuite, rmaptest, scifab, scrashme, sdhi_o, stress, synctest, zlib
- Includes functional, benchmark and stress tests

Results parsing and post-processing

- Log_compare, parser.py, flot charts
- FUNCTIONAL_LTP_POS,NEG
  - Number of expected successes and failures, for large tests
  - Kind of a cop-out
- Diff against reference log
  - This is a feature not being utilized
  - Needs easy tool to do reference log capture
    - Cogent had awk scripts
  - Needs smartdiff
    - To filter timestamps and other variations that don't matter

Command line

- ftc <verb>-<object> <args>
  - list-targets, query-target, get, set <values>
  - list-requests, put-request, run-request
  - list-tests, package-test, put-test, install-test, run-test
  - list-runs, package-run, put-run
- Proposed:
  - install-target, put-target
  - query-test
  - query-run

Fuego server

- Distributed test coordinator
  - So developer can do following workflow:
    - Create a test, publish to server, wait, collect results
  - Client node would:
    - Poll for test requests, match to local hardware
    - Download reqest (and test, if needed) and execute it
    - Push results
- Future/vision:
  - Intended to be a repository of hundreds of tests
    - “Test store” – like an app store
    - Choose the tests you like, and install them locally
  - Allow individuals to access a wide variety of nodes with different features
    - “need_xxx” system is key to matching tests to targets.

Outline

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Projects underway

- Fuego command line tool
- Jenkins integration refactoring
- Directory/link cleanup
- Test packaging system
- Test dependency system
- LAVA integration

Requested/Desired features

- Allow fuego use with other CI tools (Siemens)
- Make development and release management easier
  - Refactor Jenkins integration
- Fix bugs
  - reboot test, container issues, etc.
- Execute individual test phases
- Create & submit LAVA v2 jobs and post-process results (Kevin Hilman)
- Better test scheduling
  - Board reservation feature?

To-Do from Daniel

- Cleanup unneeded stuff
  - Overrides: the pretest should be able to automatically select
    - Otherwise override on the board file instead of selecting the dist?
- Keep it simple
  - Minimum requirements (sh + serial or ssh + writable folder/tmpfs)
  - It's our main advantage over other test frameworks
  - Simplistic testing
    - Ref: https://validation.linaro.org/static/docs/v2/simple-admin.html#index-0

To-Do from Daniel (cont.2)

- Provide deploy and boot as in LAVA
  - Deploy: prepare nfs/tftp
  - Boot: poweron board/reboot/ssh
- Transports:
  - ADB support
  - Serial port support
    - Use pexpect through
- Updating/deploy the OS
  - 1) hawkbeat/ostre... also tests the updates
  - 2) u-boot serial port with pexpect
  - 3) TFPT/NFS or NBDroot
  - 4) Fastboot

To-Do from Daniel (cont.3)

- Common output format:
  - TAP, junit, xunit, ... (which one??)
  - Allows for custom reports (excel)
- Parallel testing on same device types
  - Use Jenkins labels
- Multi-node tests like in LAVA
- Auto-generate timeouts
- Ability to run tests already in the target
- Autodiscovery of binary path for the run step [is_on_target()?]
- Automatically prepare TFTP/NBDroot before testing

To-Do from Daniel (cont.4)

- Support matrix of boards/tests
  - Fuzz coverage combinations
- Command-line fuego tool [ftc??]
  - Similar to "avocado“
- Create an interface to download and install and list new tests [ftc get-test,install-test?]
  - Tests in GIT (no tarballs)
  - Ability to specify tag or commit per test in the testplan (by default latest)
  - Plugin system like avocado
- Bisects
- Kernel CI integration

To-Do from Daniel (cont.5)

- LAVA support
  - Just open a hacking shell?
  - Or submitting YAML jobs?
- REST API instead of master-slave model
- Test pre_checks in the YAML file [need_xxx?]
- Support for read-only filesystems
  - Create a ramfs?
- Support for including strace output or running gdb remotely
- Ability to deploy standard distributions (for testing the kernel, hardware, or apps!)
  - Yocto based generic filesystem
  - Debian, others

To-Do from Daniel (cont.6)

- Allow to enter easily into a developer shell
  - $ fuego shell
- Update filesystem on the SD card by using update software
  - 2 partitions
- Login
  - support user, root password, ssh key [?]
- Jenkins-based test framework
- Testing as a service
  - https://bugzilla.redhat.com/show_bug.cgi?id=334411
  - https://gist.github.com/pklaus/319367
  - http://downloadmirror.intel.com/20927/eng/e1000.htm
  - https://github.com/kernelci/lava-ci

To-Do from Daniel (cont.7)

- Tests:
  - RT-tests
    - LTP
    - rt-tests
    - rt-eval (disturbance)
  - Kselftests support
  - Software update tests
- Disturbance loads
  - stress, hackbench, ...
  - Power cut tests
    - target_poweroff/poweron
  - Simulate application environment..

Test dependency system

- Modeled on 0-day system
- Uses declaration in base script:
  - NEED_KCONFIG_FOO=y
  - NEED_MEMORY=8M
  - NEED_WIRELESS_NETWORK=y
  - NEED_HARDWARE_FOO=y
  - NEED_PROGRAM_ETHTOOL=y
- Board provides items:
  - Some built into Fuego: kconfig, memory, sysfs
  - HAS_PROGRAM_ETHTOOL=/usr/bin/ethtool
- Probe tests can determine if a target has a requirement, and populate the board file with them
  - Using get/set
- Can use to filter tests which are appropriate for target

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Vision

- Already covered.

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Roadmap

- Process issues
- What technology to leverage
  - LAVA
  - Avacado
  - Jenkins (what plugins to require)?
- What are the priorities?
  - Tim's view: anything affecting test API or test packaging
    - Unified output format – may affect parsing API
- What tests to tackle next?
  - Move past the generic tests

Process

- Need to merge efforts
  - unfork the forks
- Need more real-time communication
  - Monthly conference call?
  - Use the AGL-CIAT call?
  - Fuego mini-conference (again)?

Priorities

- Unfork the Sony and Toshiba forks
- Features needed for LAVA integration

Resources

- http://bird.org/fuego/FrontPage
- Fuegotest.com
  - No domain name yet:
    - use http://52.88.166.49/server/FrontPage
  - Need to confirm name
  - Prototype server – very rough at the moment
- Daniel's server
- Repositories:
  - Sony: bitbucket.org/tbird20d/fuego,fuego-core
  - Toshiba: bitbucket.org/
  - AGL:

Notes from BOF

- ADB support
  - Run adbd outside container (on host), and container doesn't have to know about usb changes
- Could use transport=local for host as DUT
  - Now currently used for docker container as DUT
- Bypassing build step
  - It's OK to have something as a build cache, but make sure not to lost ability to build from source
  - Don't allow "magic binaries" that someone can't rebuild

Notes from BOF (2)

- Bisect
  - Should be a tool outside Fuego to bisect based on Fuego test result
  - Ftc needs to return proper error code
  - Maybe provide an example for how to do it
- Image Deploy, re-flash
  - Since LAVA does these, and AGL already uses LAVA, these are not high priority at the moment

Fuego

It’s hot!

Overlay processing

Base script

test-script.sh

test_build()
test_deploy()
test_run()

Fuego functions

functional.sh

functions.sh
common.sh
overlays.sh
reports.sh
etc.

<*board*>.conf

tools.sh

testplan

test specs

ovgen.py

Extended script

<*target*>_prolog.sh

Miscellaneous

- HealthCheck test
  - Ftc target-status
- Automatic board installation /wizard
  - ftc find-board
- Use ftc in Jenkins, instead of direct invocation of base-script for test
  - This is what avocado does

Next Steps (old)

- De-clutter the Jenkins front end
- Improve documentation
- Handle USB connections
  - For ADB-based targets
  - For Sony debug board

Next Steps (cont.)

- More tests
  - kselftest
  - kernelci ??
  - Look for a vertical to build out the test suite
- Send results to a centralized repository