Kselftest running in test rings - Where are we?

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Abstract

Kselftest is a developer test suite which has evolved to run in test rings, and by distributions. This evolution hasn't been an easy one.

In this talk, Shuah shares what it took to get Kselftest running in test rings such as Kernel CI. She will go over the changes necessary to run Kselftests to fully support relocatable builds and enable integration into test rings.
Agenda

Kselftest Overview
Kselftest goals & challenges
Kselftest use-cases
Kselftest running in test rings
Kselftest use-cases for Kernel CI and other test rings (support status)
Kselftest Kernel CI workflow
Next Steps
Kselftest is a developer test suite for

Kernel Developers

Kernel Users
Kselftest is a collection of tests

Open and closed box
Functional & feature
Hardware and drivers
Stress and performance
IRC: freenode #linux-kselftest

https://git.kernel.org/pub/scm/linux/kernel/git/shuah/linux-kselftest.git/
https://patchwork.kernel.org/project/linux-kselftest/list/
Testing focus is

Features
Functionality
Regressions
Subsystems

Several new tests and test cases are added every release.
Kselftest is not for testing

Workloads

Applications
Who are the authors?

Kernel Developers

Kernel Users
Who are the users?

Kernel Developers

Kernel Users
Individual test view

Main test (Target)

sub-test

Test

Individual Test Cases
Kselftest goals & challenges

Evolving common framework flexible for customizing tests
Increase coverage (drivers, configs, and features)
Add regression tests for fixed bugs
Common interfaces for Pass/Fail/Skip reporting
Reporting results in simple text based Test Anything Protocol 13
Balance kselftest run-time and coverage
Kselftest - goals & challenges

Balance kernel developer and user use-cases

Evolving common framework to support test ring use-cases
  Framework is well suited for manual testing.
  Needs changes to support auto-test environments.
Kselftest use-cases

Native and cross-build use-cases
  Individual tests
  Subset of tests
  All tests

Relocating native and cross-build objects
Kselftest use-cases

Running tests - use-cases

Individual tests

Subset of tests

All tests
Kselftest use-cases

Generating installable tests and run script - use-cases

  Individual tests
  Subset of tests
  All tests

Support relocating install objects (native & cross-builds)
Kselftest and test rings

Linux Kernel Functional Testing

Runs Kselftests on:

Linux-next

Linux-mainline

Stable

Active kernel Releases

Kselftests from the same repo are used to rev match kernel. One exception is Kselftest from latest stable is run on all stables.
Kselftest and test rings

0-Day service

Runs Kselftests from mainline on several trees and kernel configs.
Kernel CI (test rings) use-cases

Support relocating install objects (native & cross-builds)

- Supported in Linux 5.6 (except bpf)
- Relative path support is work in progress

Dependency checks for build/cross-build - kselftest_deps.sh

- Supported in Linux 5.6.
- Prints test targets that can be built. This output can be used in auto-test frameworks.

Build/cross-build tests for specific subsystems (supported with TARGETS var)
Kernel CI (test rings) use-cases

Build/cross-build tests for specific configs

- Individual tests add config file with required dependencies
  tools/testing/selftests/*/config
- "make kselftest-merge" generates kernel config to include individual test
  config files

Build/cross-build tests for specific features (this is a bit tricky)

- One single test could cover multiple features for a config or a subsystem.
Kselftest commands

Default builds/runs_installs all TARGETS.

- make kselftest-all
- make kselftest
- make kselftest-install

Using TARGETS helps select a subset of tests to build.

- make kselftest-install TARGETS="breakpoints timers"

Install generates a script to run tests and report results.
Kselftest Kernel CI workflow

Cross-compile kernel (relocatable):

- `make O=/arm64_build ARCH=arm64 HOSTCC=gcc CROSS_COMPILE=aarch64-linux-gnu- defconfig`
- `make O=/arm64_build ARCH=arm64 HOSTCC=gcc CROSS_COMPILE=aarch64-linux-gnu- all`
Kselftest Kernel CI workflow

Cross-compile kselftest-all (relocatable):

- make kselftest-all ARCH=arm64 HOSTCC=gcc CROSS_COMPILE=arm-linux-gnueabi- O=/tmp/kselftest_arm > kselftest_all_arm.log 2>&1
- make -C tools/testing/selftests ARCH=arm64 HOSTCC=gcc CROSS_COMPILE=aarch64-linux-gnu- CC="ccache aarch64-linux-gnu-gcc" O=build-arm64
Kselftest Kernel CI workflow

Cross-compile kselftest-install (relocatable):

- make kselftest-install O=/arm64_build ARCH=arm64 HOSTCC=gcc CROSS_COMPILE=aarch64-linux-gnu- > kselftest_install 2>&1
New in Linux 5.10-rc1

Speed up headers_install done during selftest build
Add generic make nesting support
Add support to select individual tests to run_kselftest.sh script:
   With this enhancement, user can select test collections (or tests) individually. e.g:
   run_kselftest.sh -c seccomp -t timers:posix_timers -t timers:nanosleep

   Additionally adds a way to list all known tests with "-l", usage with "-h", and
   perform a dry run without running tests with "-n".
Next Steps

Add support for build/cross-build tests for specific configs

Add support for build/cross-build tests for specific features (this is a bit tricky)

- One single test could cover multiple features for a config or a subsystem.
Thank You