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Kselftest running in test rings - Where are we?

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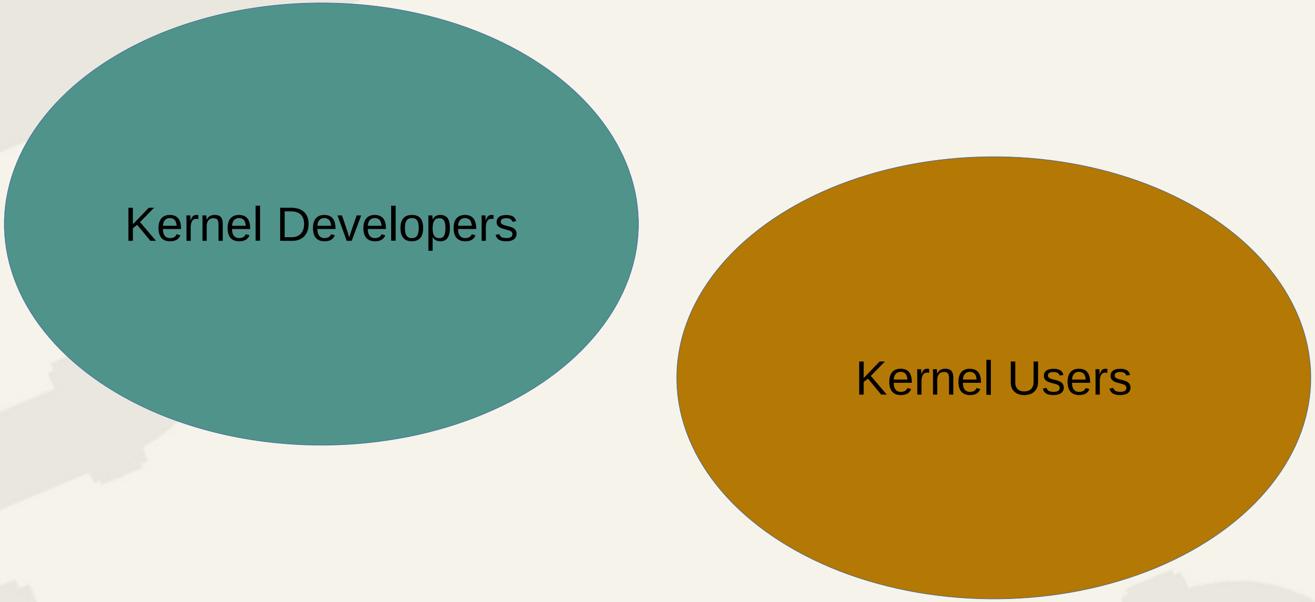
Kselftest is a developer test suite for



Kernel Developers

Kernel Users

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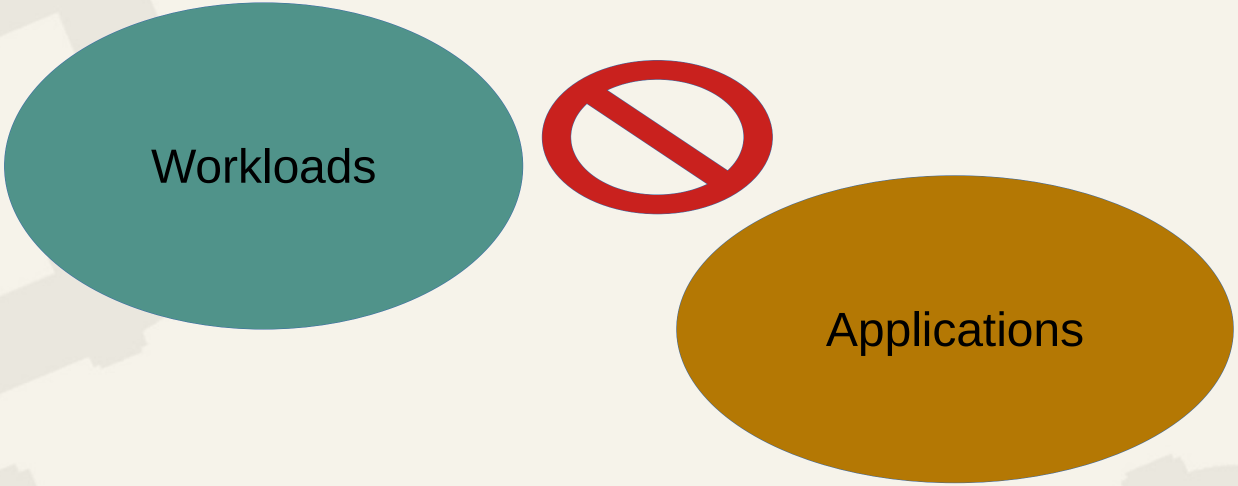
Kselftest is a collection of tests

- Code-Based (Open box)
- Behavioral (Closed box)
- Functional
- Feature
- Hardware and drivers
- Stress and performance
- https://git.kernel.org/pub/scm/linux/kernel/git/shuah/linux-kselftest.git/
- https://patchwork.kernel.org/project/linux-kselftest/list/

Kselftest is not for testing

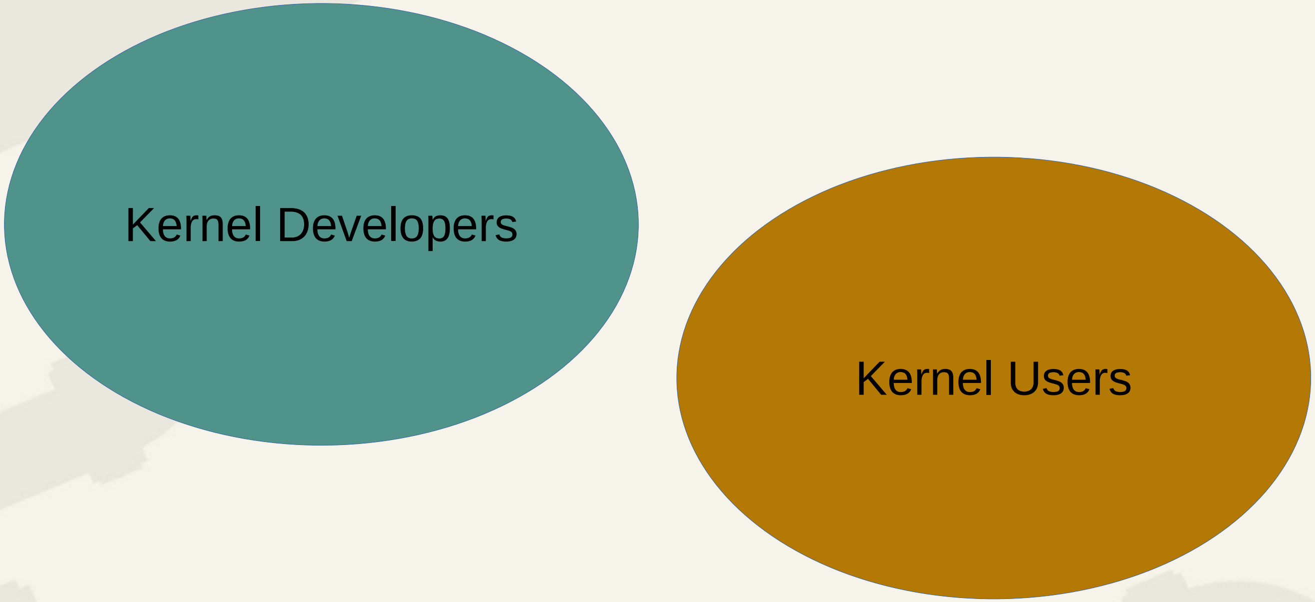


Testing scope and focus

- Kernel Features & API
- Kernel Functionality
- Regressions in features and API
- Subsystem specific

Several new tests and test cases are added every single release.

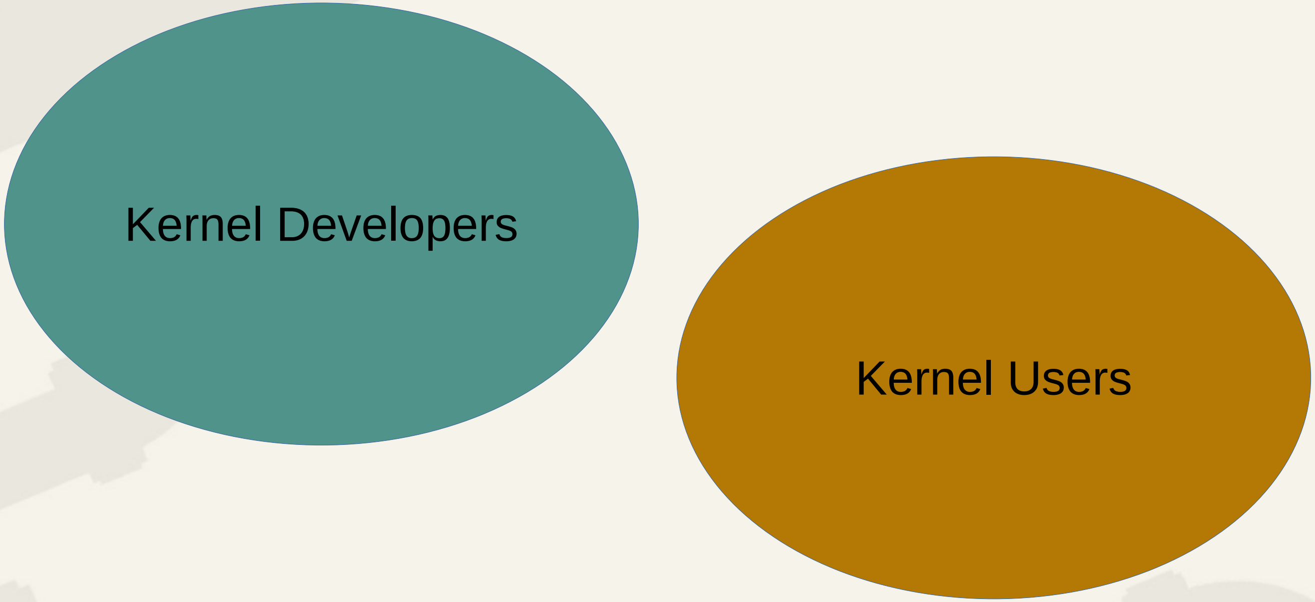
Who are the authors?



Kernel Developers

Kernel Users

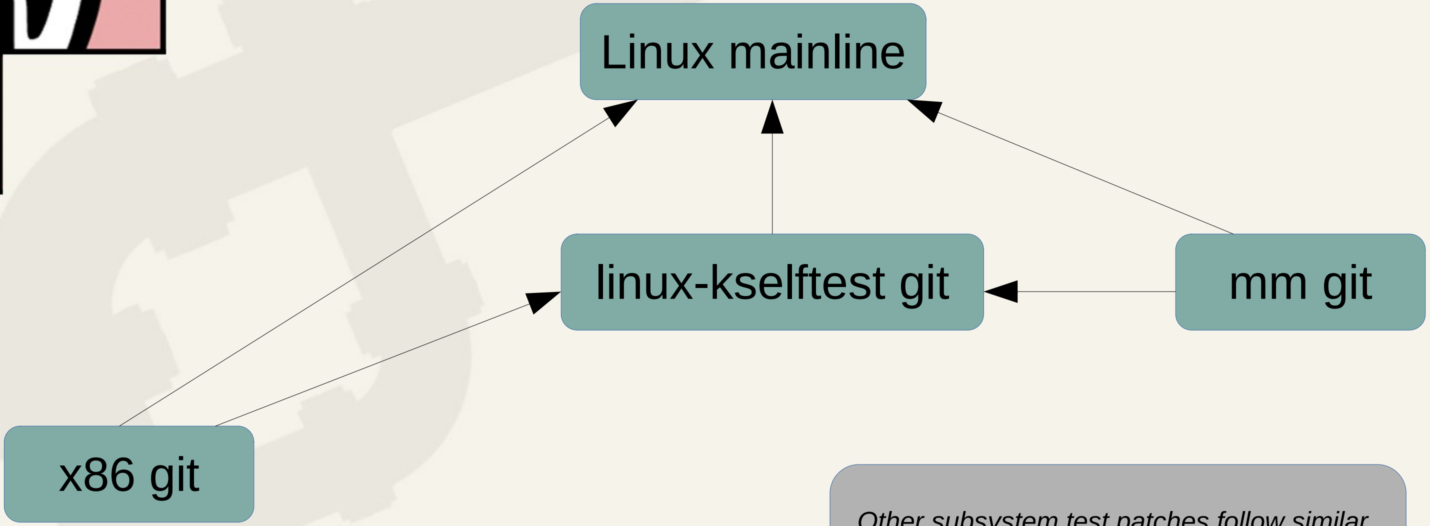
Who are the users?



Kernel Developers

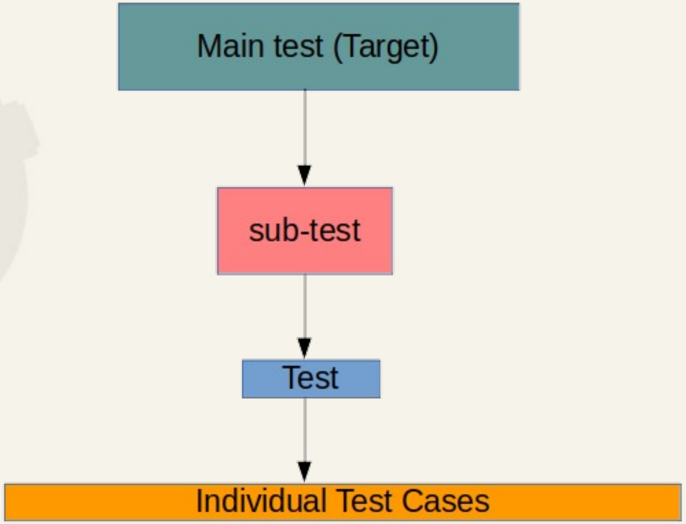
Kernel Users

How do patches flow?



Other subsystem test patches follow similar Flow in the interest of keeping features and tests grouped together in pull requests.

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 tests for install with 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. Once exception is kselftests from latest stable are run all stables.

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Kselftest and test rings

- 0-Day Service
  - Runs Kselftests from mainline on several tress and kernel configs

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Kernel CI use-cases

- Support relocating install objects (native & cross-builds)
  - Supported since Linux 5.6 (except bpf)
  - Relative path support is work in progress
- Dependency checks for build/cross-build - kselftest_deps.sh
  - Supported since 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)

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Kernel CI 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.

Kernel CI use-cases

- 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.

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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
    ```
- 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
    ```
- Cross-compile kselftest-install (relocatable):

  -
    ```
    make kselftest-install O=/arm64_build ARCH=arm64 HOSTCC=gcc CROSS_COMPILE=aarch64-linux-gnu- > kselftest_install 2>&1
    ```

Next steps

- Status - test breakages for cross-builds/installs since 5.6?
- 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.
- Problems/issues/suggestions?