
Chromebooks Test Suite Documentation

Release 0.1

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The `cros-ec-tests` package is a framework for fully automated testing. It is designed primarily to test the Linux Kernel under KernelCI with the main focus on Chromebooks devices.

`cros-ec-tests` is composed of a number of modules that will help you to do stand alone tests or setup a fully automated test on KernelCI, depending on what you are up to.

1.1 Installation

1.1.1 Requirements

`cros-ec-tests` has the following strict requirements:

- `Python` 3.5 or later
- `unittest2` 1.1.0 or later

1.1.2 Installing `cros-ec-tests`

To install `cros-ec-tests` with `pip`, run:

```
pip install git+https://gitlab.collabora.com/chromiumos/cros-ec-tests.git
```

Testing an Installed `cros-ec-tests`

The easiest way to test if your installed version of `cros-ec-tests` is running correctly is to use one of the runner function:

```
python3 -m cros.runners.lava_runner
```

The tests should run and print out the result.

Building Documentation

Dependencies

Building the documentation requires the `cros-ec-tests` source code and some additional packages. The easiest way to install the extra dependencies for documentation is to install the distribution packages:

- `Sphinx` - the main package we use to build the documentation
- `python3-sphinx-rtd-theme` - the default ‘bootstrap’ theme used by `cros-ec-tests`

Building

The easy way is to execute the command (from the `cros-ec-tests` source directory):

```
cd docs
make html
```

The documentation will be built in the `docs/build/html` directory, and can be read by pointing a web browser to `docs/build/html/index.html`.

2.1 Test Cases

A test case is a set of conditions or variables under which a tester will determine whether an application or system is working correctly. It may take many test cases to determine that a software program or system is considered sufficiently scrutinized to be released. Test cases are often referred to as test scripts, particularly when written. Written test cases are usually collected into test suites.

2.1.1 cros-ec-accel

```
class cros.tests.cros_ec_accel.TestCrosECAccel (methodName='runTest')
```

```
    test_cros_ec_accel_iio_abi()
```

```
        Checks the cros-ec accelerometer IIO ABI.
```

```
    test_cros_ec_accel_iio_data_is_valid()
```

```
        Validates accelerometer data by computing the magnitude. If the magnitude is not closed to 1G, that means data are invalid or the machine is in movement or there is a earth quake.
```

2.1.2 cros-ec-extcon

```
class cros.tests.cros_ec_extcon.TestCrosECextcon (methodName='runTest')
```

```
    test_cros_ec_extcon_usbcbi()
```

```
        Checks the cros-ec extcon ABI.
```

2.1.3 cros-ec-gyro

```
class cros.tests.cros_ec_gyro.TestCrosECGyro (methodName='runTest')
```

```
    test_cros_ec_gyro_iio_abi ()  
        Checks the cros-ec gyroscope IIO ABI.
```

2.1.4 cros-ec-mcu

```
class cros.tests.cros_ec_mcu.TestCrosECMCU (methodName='runTest')
```

```
    test_cros_ec_abi ()  
        Checks the standard ABI for the main Embedded Controller.  
  
    test_cros_ec_chardev ()  
        Checks the main Embedded controller character device.  
  
    test_cros_ec_hello ()  
        Checks basic communication with the main Embedded controller.  
  
    test_cros_fp_abi ()  
        Checks the standard ABI for the Fingerprint EC.
```

```
    test_cros_fp_hello ()  
        Checks basic communication with the fingerprint controller.
```

```
    test_cros_fp_reboot ()  
        Test reboot command on Fingerprint MCU.
```

Coming out of reset, the MCU boot into its RO firmware and jumps to the RW version after validate its signature. If the protocol used in RO version is different of the RW version, when a reboot is issued the AP still uses the protocol version queried before transition, this causes the AP to no communicate correctly with the RO firmware and thus it doesn't switches to RW firmware.

This test detects the that situation and reports a failure when the embedded controller is not able to transition from RO to RW, which is an indication that there is a problem.

The above issue was fixed with the kernel patch 241a69ae8ea8 ("platform/chrome: cros_ec: Query EC protocol version if EC transitions between RO/RW).

```
    test_cros_pd_abi ()  
        Checks the standard ABI for the Power Delivery EC.  
  
    test_cros_pd_hello ()  
        Checks basic communication with the power delivery controller.  
  
    test_cros_tp_abi ()  
        Checks the standard ABI for the Touchpad EC.  
  
    test_cros_tp_hello ()  
        Checks basic communication with the touchpad controller.
```

2.1.5 cros-ec-power

```
class cros.tests.cros_ec_power.TestCrosECPower (methodName='runTest')
```

```
test_cros_ec_battery_abi()
```

Check the cros battery ABI.

```
test_cros_ec_usbpd_charger_abi()
```

Check the cros USBPD charger ABI.

2.1.6 cros-ec-pwm

```
class cros.tests.cros_ec_pwm.TestCrosECPWM(methodName='runTest')
```

```
test_cros_ec_pwm_backlight()
```

Check that the backlight is connected to a pwm of the EC and that programming a brightness level to the backlight affects the PWM duty cycle.

2.1.7 cros-ec-rtc

```
class cros.tests.cros_ec_rtc.TestCrosECRTC(methodName='runTest')
```

```
test_cros_ec_rtc_abi()
```

Check the cros RTC ABI.

2.2 Test Helpers

2.2.1 kernel

```
cros.helpers.kernel.current_kernel_version()
```

Returns the current kernel version as an integer you can compare.

```
cros.helpers.kernel.kernel_greater_than(version, major, minor)
```

Returns true if the given version is greater than the running kernel version.

```
cros.helpers.kernel.kernel_lower_than(version, major, minor)
```

Returns true if the given version is lower than the running kernel version.

```
cros.helpers.kernel.version_to_int(version, major, minor)
```

Return an integer from kernel version to allow to compare with others.

2.2.2 mcu

```
cros.helpers.mcu.check_mcu_abi(s, name)
```

Checks that the MCU character device exists in /dev and then verifies the standard MCU ABI in /sys/class/chromeos.

```
class cros.helpers.mcu.cros_ec_command
```

```
class cros.helpers.mcu.ec_params_get_features
```

```
class cros.helpers.mcu.ec_params_hello
```

```
class cros.helpers.mcu.ec_response_get_features
```

```
class cros.helpers.mcu.ec_response_get_version
```

```
class cros.helpers.mcu.ec_response_hello
cros.helpers.mcu.is_feature_supported(feature)
    Returns true if the Embedded Controller supports the specified 'feature'.
cros.helpers.mcu.mcu_hello(s, name)
    Checks basic communication with MCU.
```

2.2.3 sysfs

```
cros.helpers.sysfs.read_file(name)
    Returns the content of the file named 'name'.
cros.helpers.sysfs.sysfs_check_attributes_exists(s, path, name, files, check_devtype)
    Checks that all attributes listed in 'files' for a given 'path' exists. Note that the 'name' parameter is used to
    define a pattern to match before checking a device path.
```

2.3 Test Runners

A Test Runner is used to execute the test suite and show the result. With a Test Runner, you can easily:

- Run automatic, semi-automatic and manual test cases and test suites.
- Follow the results in real time.
- Run only the needed test cases.
- Change the execution order of test cases.

2.3.1 LAVA Test Runner

```
class cros.runners.lava_runner.LavaTextTestResult(runner, verbosity=0)

    addError(test, err)
        Called when an error has occurred. 'err' is a tuple of values as returned by sys.exc_info().
    addFailure(test, err)
        Called when an error has occurred. 'err' is a tuple of values as returned by sys.exc_info().
    addSkip(test, reason)
        Called when a test is skipped.
    addSuccess(test)
        Called when a test has completed successfully
```

The developer documentation contains instructions for how to contribute to the Chromebook tests or affiliated packages, as well as coding, documentation, and testing guidelines.

3.1 Testing Guidelines

This section describes the testing framework and format standards for tests in `cros-ec-tests` packages.

3.1.1 Testing Framework

The testing framework used by `cros-ec-tests` is the `unittest` framework.

3.1.2 Running Tests

The first thing you should do is download latest source version:

```
git clone git://git.kernel.org/pub/scm/linux/kernel/git/chrome-platform/cros-ec-tests.  
↪ git  
cd cros-ec-tests
```

At the root of the project, add the current directory in the `PYTHONPATH`:

```
export PYTHONPATH=${PYTHONPATH}:${PWD}
```

There are currently different ways to invoke `cros-ec-tests`. Each method invokes `unittest` to run the tests but offers different options when calling. To run the tests, you will need to make sure you have the `unittest` package is installed.

Using a runner

This is the simplest way to run all the tests, just start a runner with:

```
python3 -m cros.runners.lava_runner
```

Using the unittest Command-Line Interface

The unittest module can be used from the command line to run tests from modules:

```
python3 -m unittest cros.tests.cros_ec_rtc
```

You can run tests with more detail (higher verbosity) by passing in the `-v` flag:

```
python3 -m unittest -v cros.tests.cros_ec_rtc
```

3.1.3 Writing tests

Simple example

The following example shows a simple function and a test to test this function:

```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-

import unittest

def func(x):
    """Add one to the argument."""
    return x + 1

class TestSimple(unittest.TestCase):
    def test_answer(self):
        """Check the return value of func() for an example argument."""
        self.assertEqual(func(3), 5)
```

If we place this in `cros/tests/example.py` file and then run:

```
python3 -m unittest cros.tests.example
```

The result is:

```
F
=====
FAIL: test_answer (cros.tests.example.TestSimple)
Check the return value of func() for an example argument.
-----
Traceback (most recent call last):
  File "~/cros-ec-tests/cros/tests/example.py", line 13, in test_answer
    self.assertEqual(func(3), 5)
AssertionError: 4 != 5
-----
Ran 1 test in 0.000s
```

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```
FAILED (failures=1)
```

Where to put tests

Package-specific tests

Each package should include a suite of unit tests, covering as many of the public methods/functions as possible. These tests should be included inside each sub-package, e.g:

```
cros/tests/
```

`tests` directories should contain an `__init__.py` file so that the tests can be imported and so that they can use relative imports.

Regression tests

One of the main focus of this framework is catch kernel regressions on future releases using KernelCI. Any time a kernel bug is fixed, and wherever possible, one or more regression tests should be added to ensure that the bug is not introduced in future. Regression tests should include a description of the reported bug.

4.1 Authors and Credits

4.1.1 Crostests Project Coordinators

- Fabien Lahoudere
- Enric Balletbo i Serra

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That’s all there is to it!

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