Firmware Test Suite - Uses, Development, Contribution and GPL

Fall 2017 UEFI Plugfest
October 30 – November 3, 2017
Presented by Alex Hung (Canonical, Ltd)
Agenda

• Introduction
• Installation & Uses
• Adding New Tests
• Contributing Patches
• GPLv2 & FWTS
• FWTS Community
Introduction
What is Firmware Test Suite (FWTS)?

- The recommended ACPI SCT
- Open-source Linux tool that automates firmware checking
- Detect bugs and advise firmware engineers
  - Test interactions between Linux & firmware
  - Gather firmware data for debug
What is Firmware Test Suite (FWTS)?

• A good choice if one wants to implement new tests for specific features
  – Device Tree (an alternative for ACPI)
  – SBBR (a requirement for ARM server)
  – OPAL (for IBM PowerPC)
FWTS Framework & Tests

Firmware Test Suite

- ACPI
- BIOS
- Device Tree
- Kernel
- SMBIOS
- Opal
- PCI
- UEFI
- etc...

ACPI

Linux Kernel

ACPI Tables and AML

UEFI Runtime

Hardware Devices

CPU

SMBIOS
FWTS Architecture – ACPI

ACPI

acpitables  apicinstance  asf  aspt  bert  boot  checksum  more ACPI tables...
FWTS Architecture – UEFI

UEFI Runtime Test

csm  esrt  securebootcert  uefibootpatch  uerfiauthvar  uefirtmisc  uefirttime  uefirtvariable
Installation & Uses
Getting FWTS-LIVE

• Download - http://fwts.ubuntu.com/fwts-live/

• Make bootable fwts-live USB disk
  – Linux:
    • Identify USB disk: dmesg | tail -10 | grep Attached
    • Copy image: sudo dd if=fwts-live-17.08.00.img of=/dev/sdb ; sync
  – Windows: Use “Win32 Disk Imager”
Installing FWTS in Ubuntu

• Add apt-repository for latest release
  – `sudo add-apt-repository ppa:firmware-testing-team/ppa-fwts-stable`

• Install fwts
  – `sudo apt update`
  – `sudo apt install fwts fwts-frontendl`
Installing from Source Code

• Download source code
  – `git clone git://kernel.ubuntu.com/hwe/fwts.git`
  – `git clone https://github.com/ColinIanKing/fwts`
• Setup build environment & configure
  – `sudo apt-get build-dep fwts`
  – `autoreconf -ivf && ./configure`
• Compile and install
  – `make clean && make -j4 (= 4 threads)`
  – `sudo make install`
FWTS User Interfaces
Using FWTS [Demo]
Using FWTS – Command Line

• Run a single test, ex. C states
  – `sudo fwts cpufreq`

• Run multiple tests, ex. C states + PCIe ASPM
  – `sudo fwts cpufreq aspm`

• Run all ACPI tests + all UEFI tests
  – `sudo fwts --acpitests --uefitests`

• View all tests
  – `fwts --show-tests-full`
Using FWTS – Command Line

```
alexhung@moon:--$ sudo fwts cpufreq aspm
Running 2 tests, results appended to results.log
Test: CPU frequency scaling tests.
    CPU frequency table consistency            1 passed
    CPU frequency table duplicates            1 passed
    CPU frequency firmware limits             1 passed
    CPU frequency claimed maximum             1 passed
    CPU frequency SW_ANY control             1 skipped
    CPU frequency SW_ALL control             1 skipped
    CPU frequency performance tests.         1 skipped
Test: PCIe ASPM test.
    PCIe ASPM ACPI test.                     1 passed, 2 warnings
    PCIe ASPM registers test.                1 passed
alexhung@moon:--$
```
Using FWTS – fwts-frontend-text

Select Tests

This will run a suite of firmware tests that will check the BIOS and ACPI tables. It can also find issues that can cause Linux problems.

The default below is to run just all the Batch Tests, but you can select more tests below if required.

Please select below (using cursor up/down and space) and press enter to continue.

- [ ] All
- [ ] ACPI
- [ ] UEFI
- [ ] Recommended
- [ ] Selected
- [ ] Abort

< OK >  < Cancel >  < Help >
Using FWTS – fwts-frontend-text
Using FWTS – fwts-frontend-text
Using FWTS – fwts-frontend-text
Using FWTS – fwts-frontend-text

Choose Exit

Select if you want to exit to a command line or poweroff.

If you select to poweroff and this is running from a LIVE USB, the host will be powered down.

If you are running this from a VM and you choose to poweroff, then only the VM will be powered down.

Exit       Exit to a command line
Poweroff   Shutdown and power off

< OK >  < Cancel >  < Help >
Results generated by fwts: Version V17.08.00 (2017-08-30 06:30:53).

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This test run on 19/09/17 at 21:04:24 on host Linux moon 4.10.0-33-generic
#37-16.04.1-Ubuntu SMP Fri Aug 11 14:07:24 UTC 2017 x86_64.

Command: "fwts cpufreq aspm".
Running tests: cpufreq aspm.

cpufreq: CPU frequency scaling tests.

-------------------------------------------------------------------------
WARNING: Test 1, Cannot set CPU 0 governor to userspace.
Failed to initialize cpufreq to set CPU speed

Test 1 of 7: CPU frequency table consistency
PASSED: Test 1, CPU frequency tables are consistent

Test 2 of 7: CPU frequency table duplicates
PASSED: Test 2, No duplicates in CPU frequency table

18,1 Top
Results.log – Tests

cpufreq: CPU frequency scaling tests.

WARNING: Test 1, Cannot set CPU 0 governor to userspace.
Failed to initialize cpufreq to set CPU speed
Test 1 of 7: CPU frequency table consistency
PASSED: Test 1, CPU frequency tables are consistent

Test 2 of 7: CPU frequency table duplicates
PASSED: Test 2, No duplicates in CPU frequency table

Test 3 of 7: CPU frequency firmware limits
PASSED: Test 3, No BIOS limits imposed

Test 4 of 7: CPU frequency claimed maximum
PASSED: Test 4, No max frequencies present

Test 5 of 7: CPU frequency SW_ANY control
SKIPPED: Test 5, Can't set CPU frequencies

Test 6 of 7: CPU frequency SW_ALL control
SKIPPED: Test 6, Can't set CPU frequencies

Test 7 of 7: CPU frequency performance tests.

31,1 20%
Results.log – Summary

5 passed, 0 failed, 2 warnings, 0 aborted, 3 skipped, 0 info only.

Test Failure Summary

Critical failures: NONE
High failures: NONE
Medium failures: NONE
Low failures: NONE
Other failures: NONE

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<tr>
<th>Test</th>
<th>Pass</th>
<th>Fail</th>
<th>Abort</th>
<th>Warn</th>
<th>Skip</th>
<th>Info</th>
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<tbody>
<tr>
<td>aspm</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
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<tr>
<td>cpufreq</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Total:</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
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</tbody>
</table>

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Adding New Tests
FWTS Directories

Firmware Test Suite

- ACPI
- BIOS
- Device Tree
- Kernel
- SMBIOS
- Opal
- PCI
- UEFI
- etc...

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Adding an ACPI Table Test

• [DEMO] adding DPPT table as an example
  – Add to FWTS
  – Use iasl & fwts — dumpfile to test the new table

• [DEMO] adding a new test group such as — acpitests
Contributing Patches
## Contributors

<table>
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<th>Name</th>
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Why do People Contribute?

• My manager asks me to
• A bug annoys me
• My name will show up in Google
• I can list this in LinkedIn
• I can get a free ticket to COSCUP
• All of the above
Why do Companies Contribute?

• Same reasons for any other open source projects
  – Framework is easy to add new features, ex. Device Tree
  – Existing code is available, ex. ARM’s Server Base Boot Requirements (SBBR)
  – Example: Linux-Only-Spec (imaginary) that must exclude all Windows features
    • No DBGP, DBG2, MSDM, and SLIC etc...
Submitting Patches

Write Some Code
- Add a new test
- Fix a bug

Check Coding Styles
- Function brackets
- Spaces & tabs
- Line length

(Implement fwts-test tests)

Generate patches by Git
- Header
- Signed-off

Send patches by Git
Check Patch Formats

• Following Linux source code convention
  – Not as restricted
• Signed-off
• Common format errors
  – Examples
FWTS-TEST

• A test for testing FWTS implementation
  — Check it
• Needed when adding new tests
• Ask us how to do it
  — We can help! (sometimes)
GPLv2 & FWTS
GPLv2

- FWTS uses GPLv2
- GPL is a “Copy-Left” license
- Can-do & can’t-do
- Implication
  - Contribute or not
  - Public & private PPA
Should I Upstream Patches?

• It depends
• But the answer is usually **YES**
Must I Release My Patches?

• It depends
• But the answer is usually NO
• Problems
  ― Maintenance gets more and more difficult as FWTS grows
Are You 100% Certain?

• No
• Open source license is a complex topic
• Please consult professional lawyers
Contact FWTS Community

• Email List (subscribe)
  – fwts-devel@lists.ubuntu.com

• Social media (FaceBook, Google+ & Twitter)

• Launchpad

• UEFI Plugfest!!!
Thanks for attending the Fall 2017 UEFI Plugfest

For more information on the Unified EFI Forum and UEFI Specifications, visit http://www.uefi.org

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