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CANONICAL

Self-Certification Tests (SCTs) in UEFI World

Fall 2017 UEFI Seminar and Plugfest

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Agenda



- Introduction to SCTs
- UEFI SCT
- PI SCT
- ACPI SCT
- Q&A





Introduction to SCTs

Self-Certification Tests (SCTs)



- Toolsets for firmware developers to validate the implementation for the specification compliance.
 - ✓ UEFI SCT - UEFI Spec
 - ✓ PI SCT - PI Spec
 - ✓ ACPI SCT (FWTS) - ACPI Spec
- The official or recommended versions are available on www.uefi.org/testtools



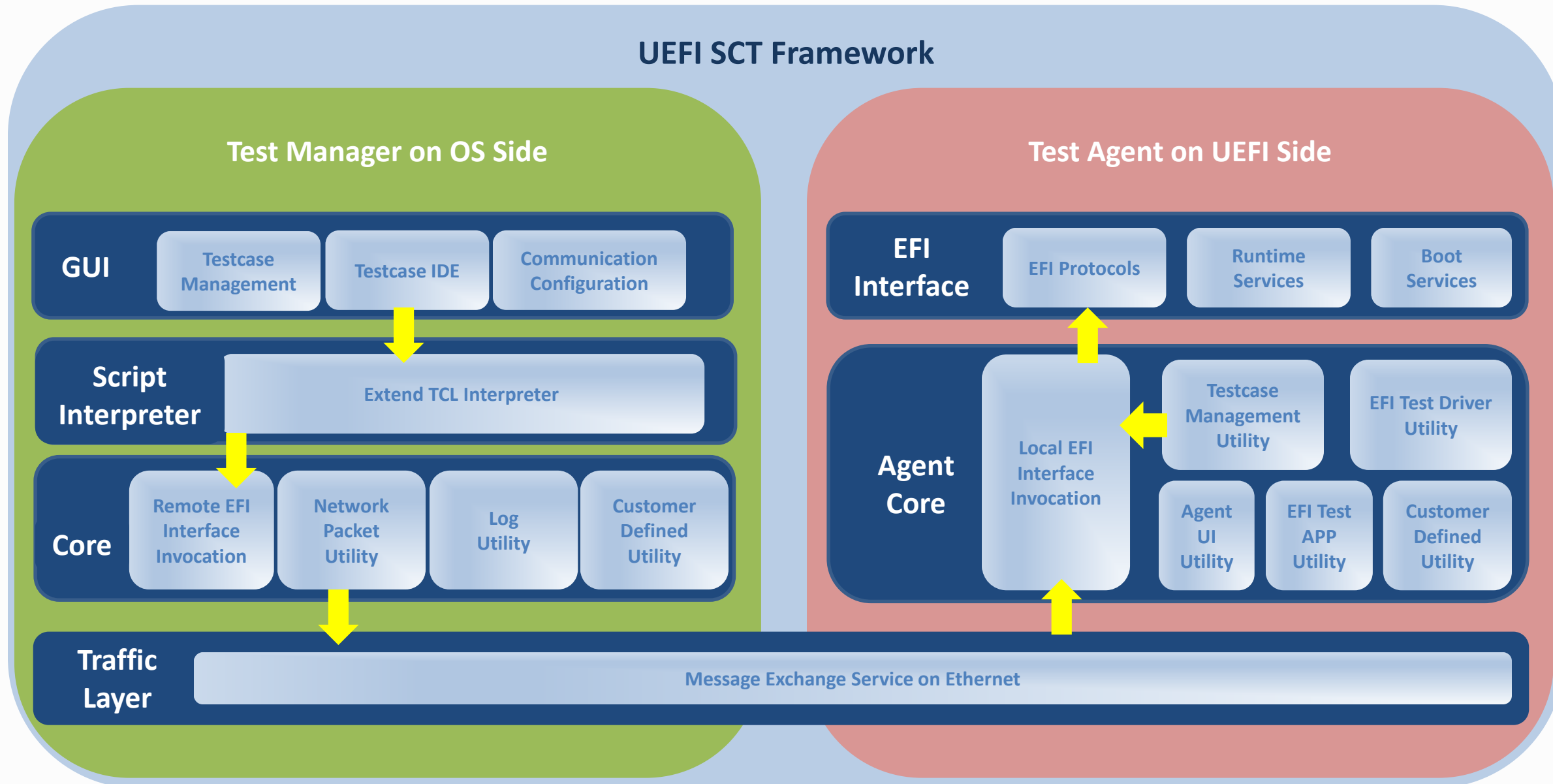
UEFI SCT

UEFI SCT



- Current stable version is UEFI 2.5 A SCT
- UEFI 2.6 A SCT is coming soon
- UEFI 2.7 SCT Alpha for Taipei Plugfest
- The components
 - ✓ UEFI SCT – focus on the platform/system
 - ✓ IHV SCT – focus on the device/driver
 - ✓ SCRT – focus on runtime service address conversion
 - ✓ EMS – focus on the network stack

UEFI SCT Framework

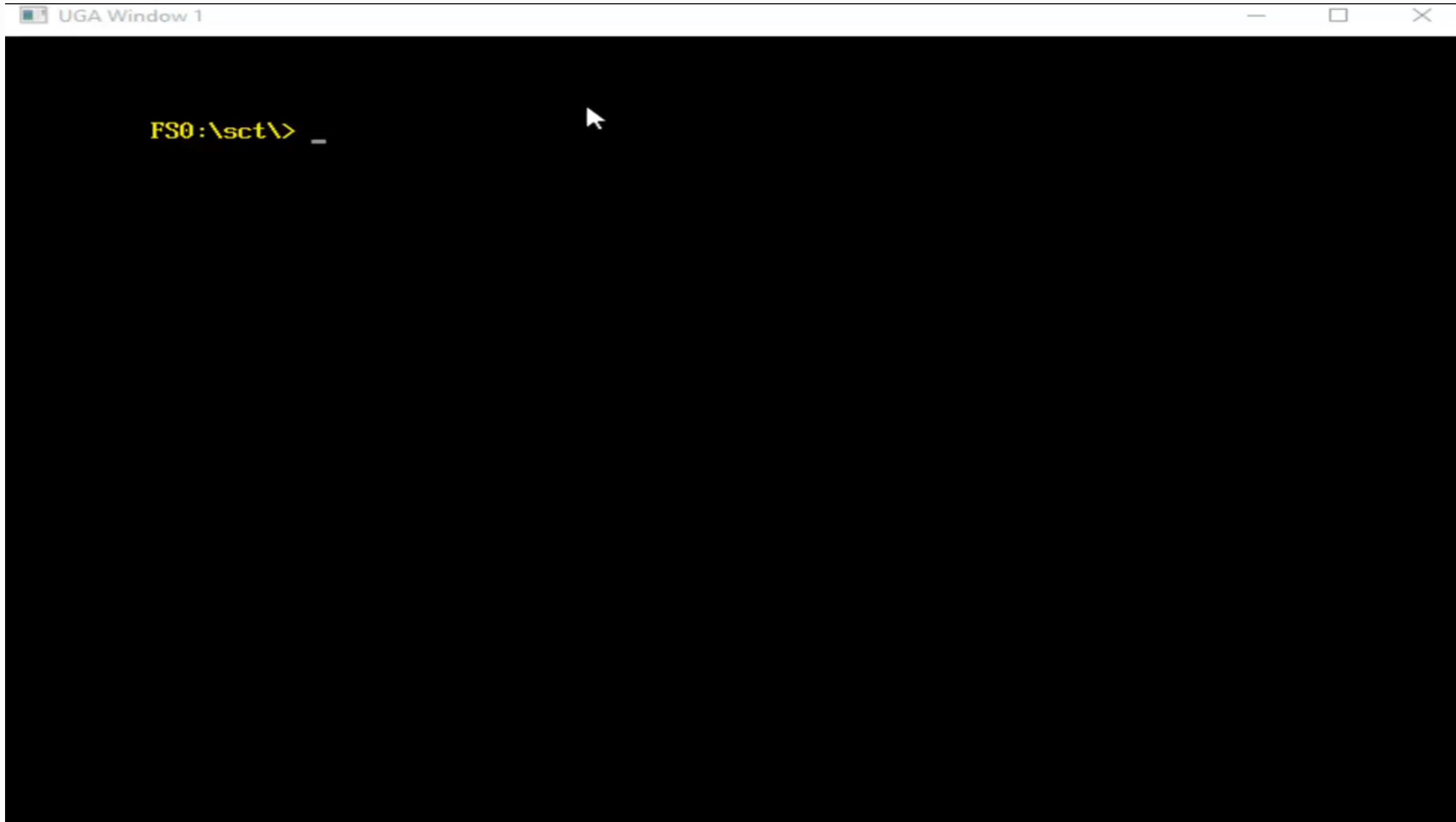




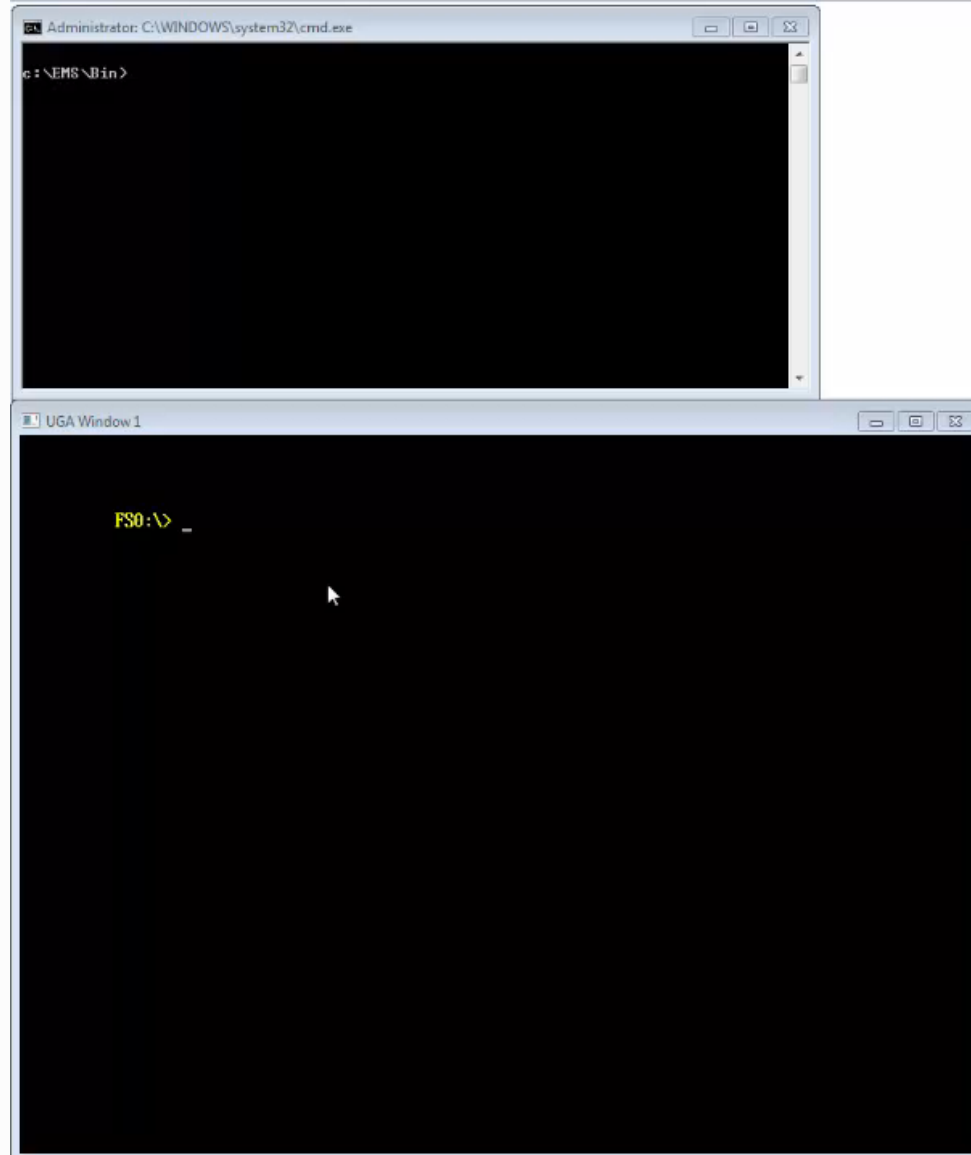
UEFI SCT Execution

- Execution Environments
 - ✓ UEFI Shell 1.x/2.x
 - ✓ SSD with 1GB free space (recommend)
- Execution Methods
 - ✓ Command line interface with configurable sequence
 - ✓ Menu-driven interface with hierarchical category
- Execution Modes
 - ✓ Native mode – execution on the single system
 - ✓ Passive mode – execution on the host/target machine

Native Execution Demo



Passive Execution Demo



UEFI SCT Result



UEFI2.6 Self Certification Test (SCT2)

MiscBootServicesTest			Description
	#Iter	Result	
[X] CalculateCrc32_Conf	[1]	PASS	
[X] CalculateCrc32_Func	[1]	PASS	
[X] CopyMem_Func	[1]	PASS	
[X] GetNextMonotonicCount_Conf	[1]	PASS	
[X] GetNextMonotonicCount_Func	[1]	PASS	
[X] InstallConfigurationTable_Conf	[1]	PASS	
[X] InstallConfigurationTable_Func	[1]	PASS	
[X] SetMem_Func	[1]	PASS	
[X] SetWatchdogTimer_Conf	[1]		
[X] SetWatchdogTimer_Func	[1]	PASS	
[X] Stall_Func	[1]	PASS	

Up/Dn Select Item Enter Select SubMenu F9 Run
Space Change Status ESC Exit

UEFI SCT Report



1.csv - Excel

File Home Insert Page Layout Formulas Data Review View Add-ins LOAD TEST 福昕阅读器 Team Tell me what you want to do

UPDATES AVAILABLE Updates for Office are ready to be installed, but first we need to close some apps. Update now

H13 c:\myworkspace\SctPkg\TestCase\UEFI\EFI\Generic\EfiCompliant\BlackBoxTest\EfiCompliantBBTestPlatform_uefi.c:1061: OP - Yes, EDID Discovered - No, EDID Active - No

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Self Certification Test Report																		
2	Service\Protocol Name	Total	Failed	Passed															
3	BootServicesTest\MiscBootServi	132	0	132															
4	DevicePathProcotols\DevicePat	61	0	61															
5	DevicePathProcotols\DevicePat	64	0	64															
6	DevicePathProcotols\DevicePat	52	0	52															
7	DevicePathProcotols\DevicePat	21	0	21															
8	GenericTest\EfiCompliantTest	34	19	**															
9	GenericTest\FloatingPointABITe	2	0																
10	Total service\Protocol	366	19																
11																			
12	Service\Protocol Name	Index	Instance	Iteration	Guid	Result	Title	Runtime I	Case Revi:	Case GUID	Device Path	Logfile Name							
13	GenericTest\EfiCompliantTest	5.22.1.2.2	0	0	72BA0E86-58E5-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
14	GenericTest\EfiCompliantTest	5.22.1.2.5	0	0	98551AE7-5020-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
15	GenericTest\EfiCompliantTest	5.22.1.2.15	0	0	4C82EB2D-C785-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
16	GenericTest\EfiCompliantTest	5.22.1.2.6	0	0	517BCBEB-4982-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
17	GenericTest\EfiCompliantTest	5.22.1.2.7	0	0	213A75C9-7F3D-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
18	GenericTest\EfiCompliantTest	5.22.1.2.8	0	0	0CCD5843-5BB5-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
19	GenericTest\EfiCompliantTest	5.22.1.2.18	0	0	5AEA7246-BCF9-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
20	GenericTest\EfiCompliantTest	5.22.1.2.19	0	0	5C80CDB5-AC80-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
21	GenericTest\EfiCompliantTest	5.22.1.2.9	0	0	2883418F-E7FB-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
22	GenericTest\EfiCompliantTest	5.22.1.2.13	0	0	28C068F2-F398-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
23	GenericTest\EfiCompliantTest	5.22.1.2.10	0	0	3EE22696-0875-4	FAIL	EFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
24	GenericTest\EfiCompliantTest	5.22.1.2.20	0	0	563F654F-ABA8-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
25	GenericTest\EfiCompliantTest	5.22.1.2.21	0	0	2E6D1733-6D39-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
26	GenericTest\EfiCompliantTest	5.22.1.2.22	0	0	E02A6EF3-4B70-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
27	GenericTest\EfiCompliantTest	5.22.1.2.23	0	0	CB6F7B77-0B15-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
28	GenericTest\EfiCompliantTest	5.22.1.2.24	0	0	77FDD895-5969-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
29	GenericTest\EfiCompliantTest	5.22.1.2.25	0	0	F0DC12FA-3C4B-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
30	GenericTest\EfiCompliantTest	5.22.1.2.26	0	0	87E50392-F5A2-4	FAIL	UEFI-Com c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
31	GenericTest\EfiCompliantTest		0	0	B27660E2-0E87-4	FAIL	UEFI Compl c:\mywor	0x000100C	A0A8BED3	No device p	PlatformSpecificElements_0_0_A0A8BED3-3D6F-4AD8-907A-84D52EE1543B.log								
32																			
33	Service\Protocol Name	Index	Instance	Iteration	Guid	Result	Title	Runtime I	Case Revi:	Case GUID									
34	BootServicesTest\MiscBootServi	5.1.5.7.1	0	0	3A1D2AD6-743C-	PASS	BS.Calcula c:\mywor	0x000100C	718165E6-C904-43F1-9A93-DDE3467EEDC2										

SourceFilename: LineNum

DevicePath

Checkpoint Guid

LogFileName

UEFI SCT Log



```
InstallConfigurationTable_Conf_0_0_E00A6879-AF7E-4238-AAD1-0B891E71D721.log - Notepad
File Edit Format View Help
-----
InstallConfigurationTable_Conf
Revision 0x00010001
Test Entry Point GUID: E00A6879-AF7E-4238-AAD1-0B891E71D721
Test Support Library GUIDs:
 1F9C2AE7-F147-4D19-A5E8-255AD005EB3E
-----
UEFI 2.6
Test Configuration #0
-----
Consistency Test for InstallConfigurationTable
-----
Logfile: "\\SCT\Log\BootServicesTest\MiscBootServicesTest0\InstallConfigurationTable_Conf_0_0_E00A6879-AF7E-4238-AAD1-0B891E71D721.log"
Test Started: 09/18/17 04:25p
-----
BS.InstallConfigurationTable - Guid is NULL -- PASS
12855EF2-5EC3-46EE-843A-E5A8F3D57BA4
c:\myworkspace\SctPkg\TestCase\UEFI\EFI\BootServices\MiscBootServices\BlackBoxTest\MiscBootServicesBBTestConformance.c:199:Status - Invalid Parameter

BS.InstallConfigurationTable - Guid is not present -- PASS
7A96CEFE-452C-4EA1-8C75-D9034E92ED84
c:\myworkspace\SctPkg\TestCase\UEFI\EFI\BootServices\MiscBootServices\BlackBoxTest\MiscBootServicesBBTestConformance.c:223:Status - Not Found

Returned Status Code: Success

InstallConfigurationTable_Conf: [PASSED]
  Passes..... 2
  Warnings..... 0
  Errors..... 0
-----
UEFI 2.6
Revision 0x00010001
Test Entry Point GUID: E00A6879-AF7E-4238-AAD1-0B891E71D721
-----
Logfile: "\\SCT\Log\BootServicesTest\MiscBootServicesTest0\InstallConfigurationTable_Conf_0_0_E00A6879-AF7E-4238-AAD1-0B891E71D721.log"
Test Finished: 09/18/17 04:25p
Elapsed Time: 00 Days 00:00:00
-----
```


EMS Result



The screenshot displays the UEFI SCT EMS interface with three main windows:

- Top Left (UGA Window 1):** Shows the UEFI shell environment. It lists aliases for FS1, BLK0, and BLK1, and shows the execution of the 'sct -p nup' command. The output indicates that support files are being loaded for various network protocols.
- Top Right (UEFI SCT EMS):** Shows the test results table. The table has columns for Case Name, Count, and Result. The results are as follows:

Case Name	Count	Result
Cancel_Confl_Case1	1	PASS(4) WARN(0) FAIL(0)
Cancel_Conf2_Case1	1	PASS(6) WARN(0) FAIL(0)
Cancel_Func1_Case1	1	PASS(7) WARN(0) FAIL(0)
Cancel_Func2_Case1	1	PASS(9) WARN(0) FAIL(0)
Configure_Confl_Case1	1	PASS(5) WARN(0) FAIL(0)
Configure_Confl_Case2	1	PASS(5) WARN(0) FAIL(0)
Configure_Conf2_Case1	1	PASS(5) WARN(0) FAIL(0)
Configure_Func1_Case2	1	PASS(7) WARN(0) FAIL(0)
Configure_Func1_Case3	1	PASS(5) WARN(0) FAIL(0)
CreateChild_Confl_Case1	1	PASS(1) WARN(0) FAIL(0)
CreateChild_Func1_Case1	1	PASS(6) WARN(0) FAIL(0)
DestroyChild_Confl_Case1	1	PASS(2) WARN(0) FAIL(0)
DestroyChild_Conf2_Case1	1	PASS(2) WARN(0) FAIL(0)
DestroyChild_Func1_Case1	1	PASS(6) WARN(0) FAIL(0)
GetModeData_Func1_Case1	1	PASS(11) WARN(0) FAIL(0)
GetModeData_Func2_Case1	1	PASS(5) WARN(0) FAIL(0)
GetModeData_Func3_Case1	1	PASS(6) WARN(0) FAIL(0)
GetModeData_Func4_Case1	1	PASS(7) WARN(0) FAIL(0)
GetModeData_Func5_Case1	1	PASS(10) WARN(0) FAIL(0)
Group1_Confl_Case1	1	PASS(4) WARN(0) FAIL(0)
- Bottom Left (Administrator: C:\WINDOWS\system32\cmd.exe - Ems.exe - Main.tcl):** Shows network configuration logs, including commands like 'ip4ServiceBinding->DestroyChild' and 'ip4ServiceBinding->CloseEvent', along with their respective lengths and return codes.
- Bottom Right (UEFI SCT EMS):** Shows the execution details for the 'DestroyPacket' test case. The status is 'Success'. The results are: PASS: 6, WARN: 4, FAIL: 0. The log file is 'Log IP4 Transmit.Func6.Case1.Log' and the test finished on 09/19/2017 at 13:38:19.



Getting Source Code

- Provide your github account to admin@uefi.org and ask for the access permission
- Download the code
 - ✓ *git clone https://www.github.com/UEFI/UEFI-SCT.git*
- Compile and build
 - ✓ Refer to the instruction in HowToBuild

Support and Contact



- Support
 - ✓ Email utwg@uefi.org, CC project maintainers
eric.jin@intel.com supreeth.venkatesh@arm.com
- Information
 - ✓ Subscribe to UTWG mail list (utwg@uefi.org)
 - ✓ Attend UTWG meetings



PI SCT

PI SCT

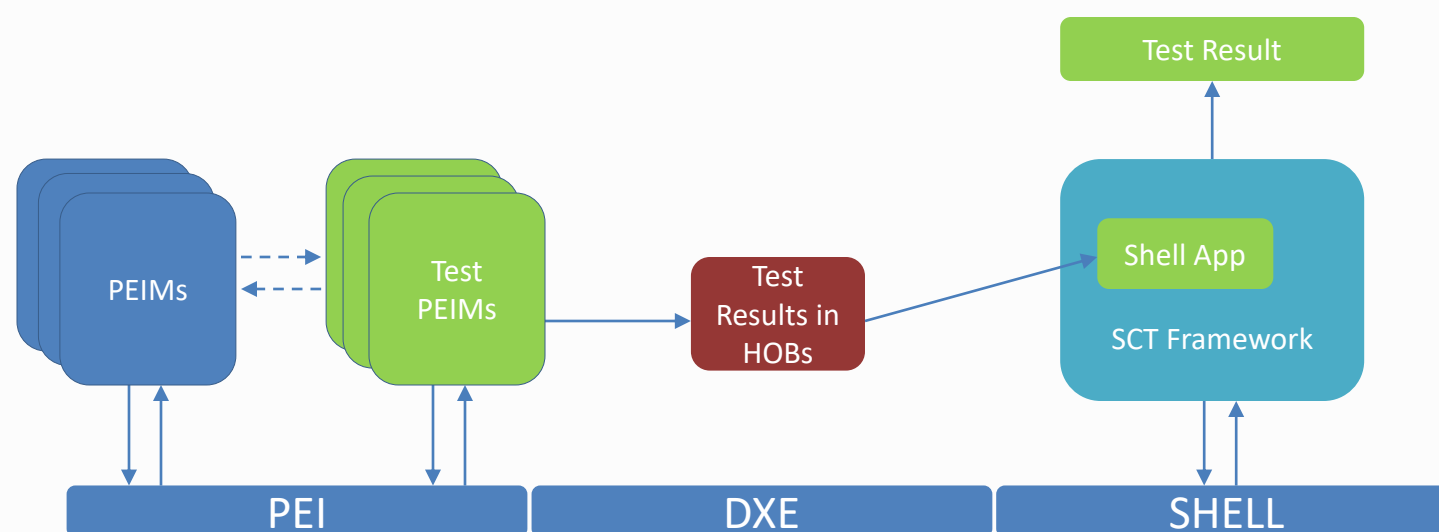


- Test PI Spec Compliance, including PEI/DXE phase.
- Current stable version is PI 1.4 SCT.
- Next release will be PI 1.6 SCT on the Q2, 2018.
- The components
 - ✓ PEIM test
 - ✓ DXE test
 - ✓ SMM test



PEI Test

- PEI test cases are designed as PEIMs and built in flash image
- Test PEIMs are dispatched and test log are saved in HOBs
- One Shell app parses the HOBs to generate the test result



```
SCT.report - Notepad
File Edit Format View Help
Your PEI SCT results should appear below.

2017-9-21, 5:5:15
874A39C8-F83A-4BB4-A01A-317BBDC04054 data:0x1 PASS|
874A39C8-F83A-4BB4-A01A-317BBDC04054 data:0x2 PASS
874A39C8-F83A-4BB4-A01A-317BBDC04054 data:0x3 PASS
E50BB913-5223-4C98-A019-EED541924E00 data:0x0 PASS
F987FD3C-E558-46DD-90D8-DC2DD1705A6B data:0x0 PASS
067A56B9-9E35-4CD7-A770-6EE10957D5B0 data:0x0 PASS
2FEDFBE9-855D-403F-A2A9-F56EC166E17C data:0x0 PASS
76F26DC1-8772-4749-B4ED-A20993FC847D data:0x0 PASS
33944658-E0EC-44DC-987C-7E4D06F92CA7 data:0x1 PASS
33944658-E0EC-44DC-987C-7E4D06F92CA7 data:0x2 PASS
872A0A1F-54E1-469D-9FFF-527ABFD2115F data:0x0 PASS
E9B04DFC-7229-45D4-8B37-20A12DC9C945 data:0x1 PASS
E9B04DFC-7229-45D4-8B37-20A12DC9C945 data:0x2 PASS
E9B04DFC-7229-45D4-8B37-20A12DC9C945 data:0x3 PASS
8A6990FB-8827-47E5-BF07-5212D895A16C data:0x0 PASS
62D0019A-0D54-4AF3-AD10-45650E60B839 data:0x0 PASS
04D669F0-D4CA-4FFE-9275-CF5D2354EC3F data:0x0 PASS
58FF0D38-0979-4979-A633-0C2B5D68104C data:0x0 PASS
4887D048-4A15-4826-8CEC-E2ED32FE3AA6 data:0x0 PASS
A5253425-FE78-4A39-9D08-0F77ECA372AE data:0x0 PASS
9191DBAE-E32F-4522-BB10-5442B214A84F data:0x0 PASS
CE5BEFE0-F988-4050-BBCB-26B9EB9A6C76 data:0x0 PASS
048F4F94-7883-4B27-A75A-42DF8CCA5F6D data:0x0 PASS
A3ADC842-CF7D-4492-91F9-26B9234B07E5 data:0x0 PASS
8E299E93-BA51-4A2E-9BB3-68E4DA2C6576 data:0x0 PASS
```

DXE Test

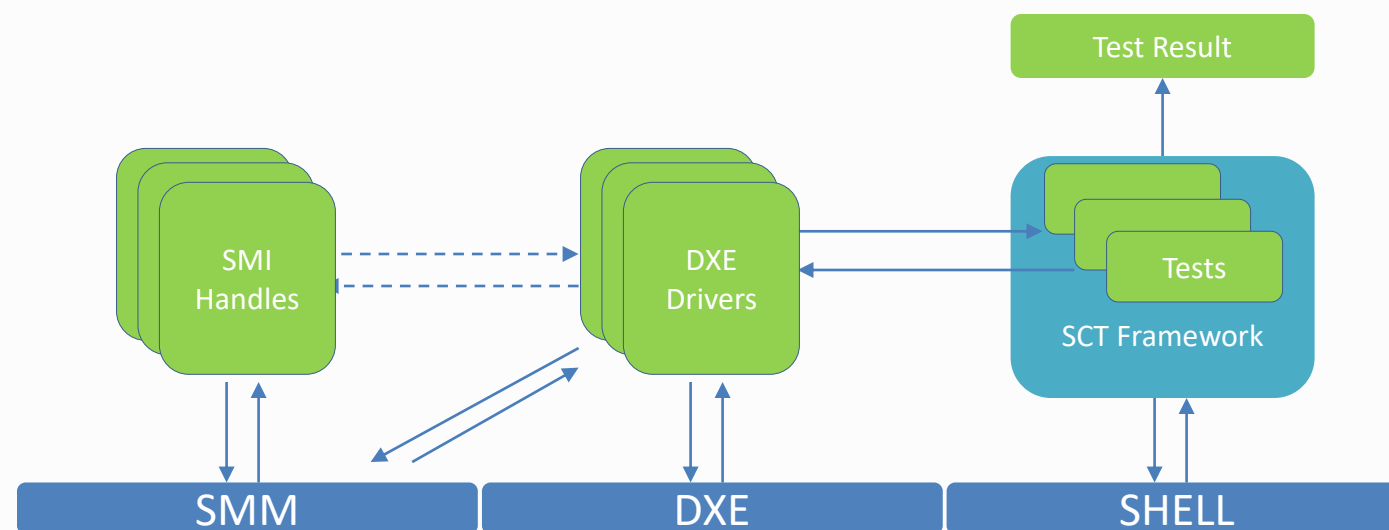


- DXE test is a series of DXE test drivers plus dependency
- User can give the input thru the configuration files
- DXE test result is displayed on the Menu-driven UI directly
- Log files are provided to record execution details



SMM Test

- SMM SCT is comprised of two parts
 - ✓ The SMM test entry point invoked by the DXE driver
 - ✓ The corresponding SMM test driver is loaded into SMRAM during boot
- SMM test driver is built into flash with platform SMM drivers
- Test SMI handlers are registered into SMRAM
- Shell application retrieves the test result from buffers



Getting PI SCT



- The related document/binary/source can be downloaded from <https://sourceforge.net/projects/pi-sct/>
- Please refer to the GetStarted and UserGuide for the usage and build instructions

Support and Contact

Please email project administrators

Jie.lin@intel.com

laurie.jarlstrom@intel.com





ACPI SCT

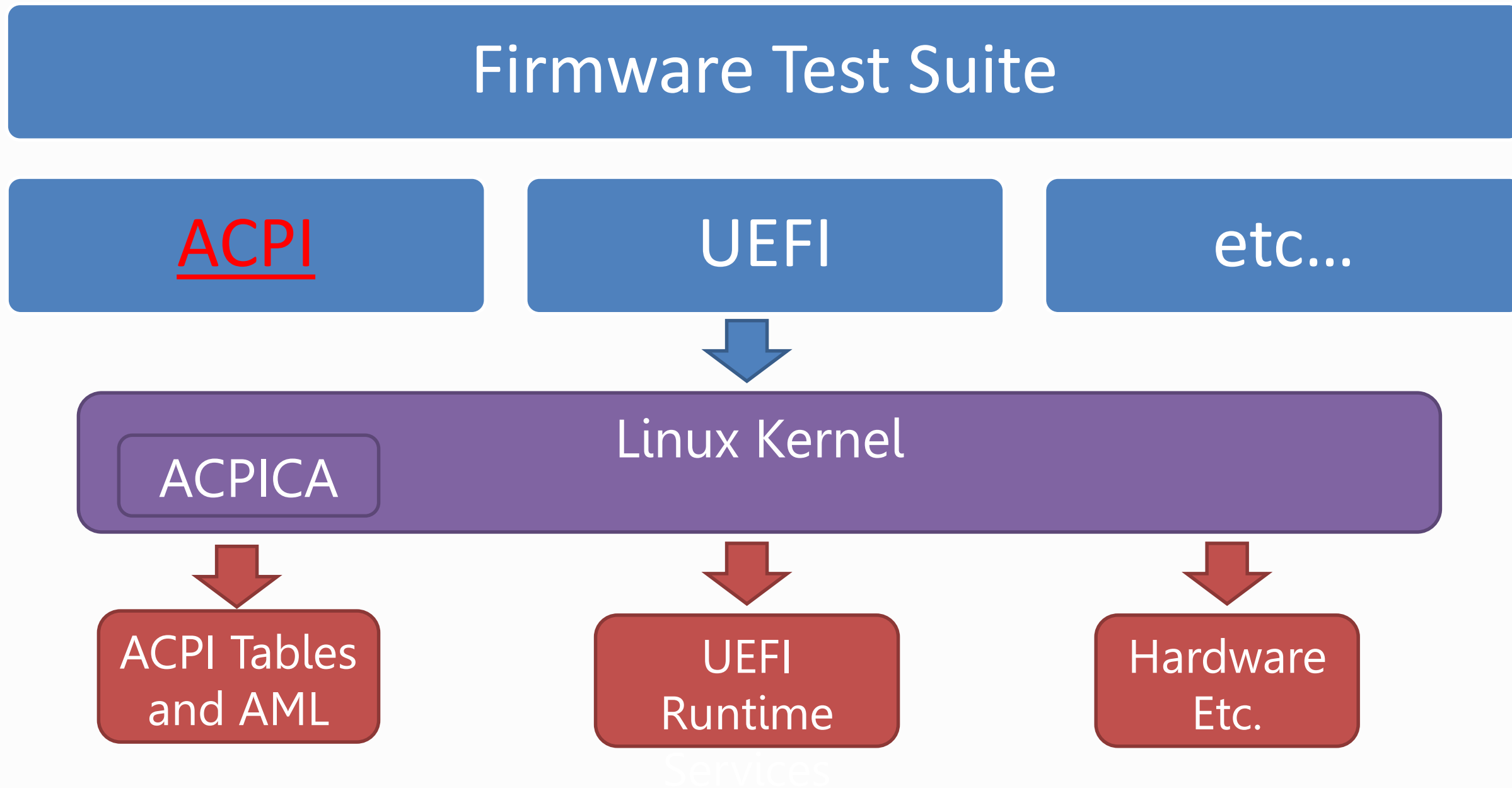
Firmware Test Suite



- FWTS 15.08.00 was recommended as the ACPI 5.1 SCT in 2015
- FWTS 17.03.00 was recommended as the ACPI 6.1 SCT in 2017
- Current version is FWTS 17.09.00
 - ✓ Alpha for ACPI 6.2 SCT for this Plugfest



FWTS Framework & Tests





FWTS Architecture – ACPI

ACPI

ACPI
Tables

FADT

MCFG

Method

Checksum

More
ACPI
tables...

- ACPI tables & headers & checksum
- ACPI methods
- Processors (P & C states)

<https://wiki.ubuntu.com/FirmwareTestSuite/Reference> or
fwts --show-tests / fwts --show-tests-full

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-17.09.00.img of=/dev/**sdb** ; sync*
 - **Windows:** Use “Win32 Disk Imager”

Using FWTS – LIVE



Fir

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.

<input checked="" type="checkbox"/>	ALL	All Batch Tests
<input type="checkbox"/>	ACPI	ACPI Tests
<input type="checkbox"/>	UEFI	UEFI Tests
<input type="checkbox"/>	Recommended	Recommended Tests
<input type="checkbox"/>	Selected	Select Individual Tests
<input type="checkbox"/>	Abort	Abort Testing

< OK > <Cancel> < Help >

Using FWTS – LIVE

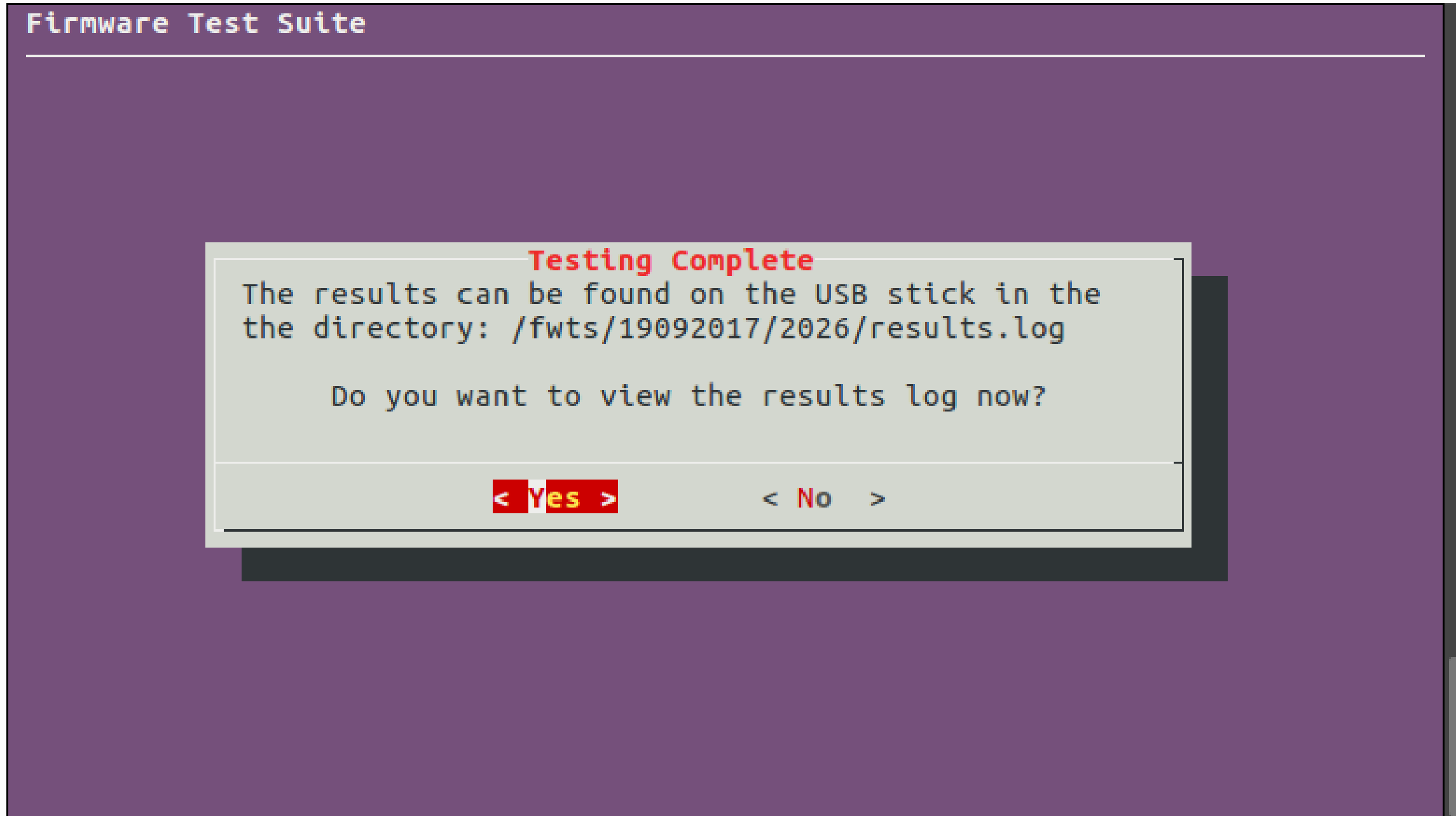


```
Firmware Test Suite
-----
Running ACPI Tests
578 passed, 21 failed, 3 warnings, 1 aborted, 187 skipped, 5 info only.
83.06% total run complete (6 seconds).
Processor C state support test.

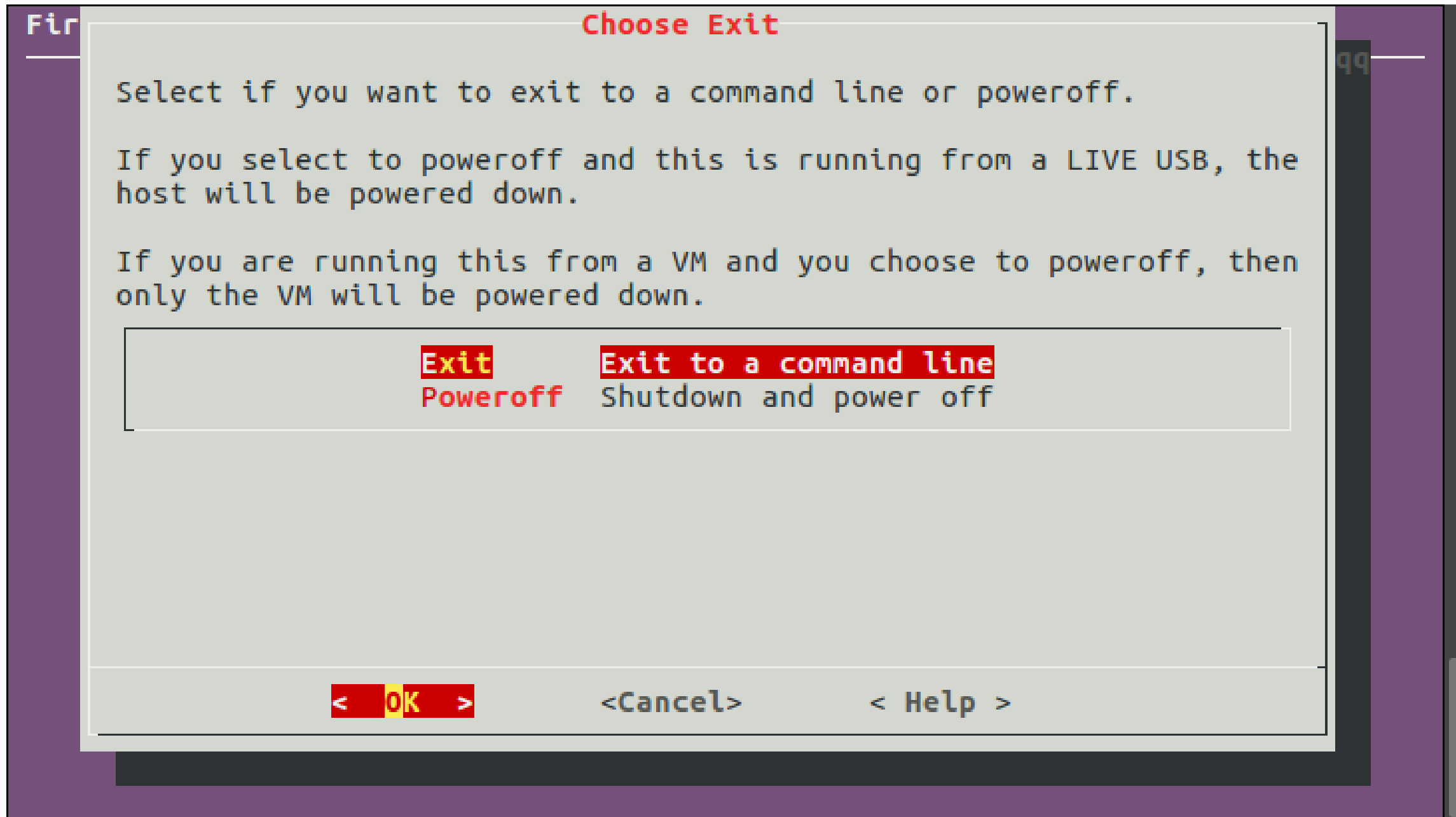
Running test #52 of 62: Test all CPUs C-states.

[Progress bar: 50%]
```

Using FWTS – LIVE



Using FWTS – LIVE





Results.log – Header

```
Results generated by fwts: Version V17.08.00 (2017-08-30 06:30:53).
█
Some of this work - Copyright (c) 1999 - 2017, Intel Corp. All rights reserved.
Some of this work - Copyright (c) 2010 - 2017, Canonical.
Some of this work - Copyright (c) 2016 - 2017, IBM.
Some of this work - Copyright (c) 2017, ARM Ltd.

This test run on 21/09/17 at 16:38:19 on host Linux moon 4.10.0-35-generic
#39~16.04.1-Ubuntu SMP Wed Sep 13 09:02:42 UTC 2017 x86_64.

Command: "fwts --acpitests".
Running tests: acpiinfo xenv xsdt wsmt wpbt wmi wdat waet uefi tpm2 tcpa stao
srat spmi sPCR slit slic sdei sbst rsdt rsdp rasf pptt pmtt pcct pcc nfit method
msdm msct mpst mchi mcfg madt lpit iort hmat hpet hest gtdt fpdt fadt facts erst
einj ecdt drtm dppt dmar dbg2 dbgp cstates csrt cpep checksum boot bgrt bert
aspt asf apicinstance acpitables.

acpiinfo: General ACPI information test.
-----
Test 1 of 3: Determine Kernel ACPI version.
Kernel ACPICA driver version: 20160930, supports ACPI 5.0

Test 2 of 3: Determine machine's ACPI version.

2,0-1 Top
```



Results.log – Test Body

```
acpiinfo: General ACPI information test.
-----
Test 1 of 3: Determine Kernel ACPI version.
Kernel ACPICA driver version: 20160930, supports ACPI 5.0

Test 2 of 3: Determine machine's ACPI version.
FADT X_FIRMWARE_CTRL 64 bit pointer was zero, falling back to using
FIRMWARE_CTRL 32 bit pointer.
FACP ACPI Version: 5.0

Test 3 of 3: Determine AML compiler.
Determine the compiler used to generate the ACPI AML in the DSDT and SSDT.
Table DSDT, OEM DELL , created with INTL (Intel) compiler.
Table SSDT0, OEM PmRef, created with INTL (Intel) compiler.
Table SSDT1, OEM PmRef, created with INTL (Intel) compiler.
Table SSDT2, OEM PmRef, created with INTL (Intel) compiler.
Table SSDT3, OEM SataRe, created with INTL (Intel) compiler.
Table SSDT4, OEM SaSsdt, created with INTL (Intel) compiler.

=====
0 passed, 0 failed, 0 warning, 0 aborted, 0 skipped, 3 info only.
=====

35,1 0%
```

Results.log – Summary



Test	Pass	Fail	Abort	Warn	Skip	Info
acpiinfo						3
acpitables	17	1				
apicinstance	1					
asf	6					
aspt					1	
bert					1	
bgrt	1					
boot					1	
checksum	20					
cpep					1	
csrt					1	
cstates	15					
dbg2					2	
dbgp					1	
dmar	2					
dppt					1	
drtm					1	
ecdt					1	
einj					1	
erst					1	
facsb	1					

2364,2 98%



Information & Contacts

- Source Code
 - ✓ `git clone git://kernel.ubuntu.com/hwe/fwts.git`
 - ✓ `git clone https://github.com/ColinIanKing/fwts`
- <https://wiki.ubuntu.com/FirmwareTestSuite>
- Subscribe to fwts-devel@lists.ubuntu.com
- Activities
 - ✓ Subscribe to UTWG mail list (utwg@uefi.org)
 - ✓ Attend UTWG meetings
 - ✓ Attend UEFI Plugfests



Q&A

Thanks for attending the Fall 2017
UEFI Plugfest

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

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