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Ubuntu Desktop Certified Hardware Coverage for 18.04 LTS OSP1
Version 1.0

Introduction

The Ubuntu Certification team is continuously revisiting the scope of the tests comprising the Ubuntu Certified programme which is reviewed every six months, following the same Ubuntu cadence for point releases on Long Term Support releases. This review of new tests is performed during Ubuntu's development cycle and it never affects already released versions of Ubuntu.

This document lists the coverage for certification of Ubuntu Desktop 18.04 LTS. This coverage will remain as it is for Ubuntu Desktop 18.04 LTS through the life cycle of Ubuntu Desktop 18.04 LTS.

The following test categories are specified:

- Whitelist, or features that are required for certification. If any of the tests in the whitelist fails, the certification will fail.
- Greylist, or features that are tested, but that don't block certification. If any of the tests under the greylist fail, a note will be added to the certificate to warn the potential customer or user.
- Blacklist, or features that are not currently tested. The items in the blacklist category are just reference items: **anything not explicitly called out in the whitelist or greylist categories can be considered part of the blacklist category**. We will consider adding more tests as needed.

Note: only categories of hardware are tested and not specific types of hardware. For example, tests are run to verify USB controllers work, but the type of peripheral(s) used during those tests are not specified.

A test will be considered passed if the reproduction rate of a failure is 1 fail out of 30 attempts or less.

Full test descriptions can be found in Canonical certification site for partners:

http://certification.canonical.com

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Whitelist

Firmware

Ubuntu 18.04 LTS OSP1 is installed using the factory default BIOS or UEFI, with the default options (including SecureBoot, if that's the default setting). Firmware needs to be compliant with Canonical Firmware Test Suite (FWTS).

It is recommended that after running Canonical fwts with the list of tests defined in the [Appendix A](#), ideally, no CRITICAL or HIGH failures should be reported, but those are not automatically certification blockers.

Systems supporting fwupd will undergo firmware update testing when newer firmwares are available to the system, to ensure that users can upgrade their firmware without issue. During the maintenance phase, firmware updates will be tested on a regular cadence.

Processors

x86_64 and ARM processors are tested to ensure proper functionality. We will test specific features as:
- CPU's performance states (frequency up and down in runtime)
- CPU's sleep states (cpu on and off in runtime)
- Running CPU at its maximum frequency

We will also include a general stress test performed for 120 minutes to verify that the system can handle a sustained high load for a period of time. This test uses the tool "stress-ng" available in the Universe repositories. In addition, for Intel devices, IPDT (Intel Processor Diagnostic Tools) test suite will be run, ensuring power management works as designed.

Memory

Proper detection of the amount of memory installed is required (the amount of memory installed is the memory seen by the OS).

Internal Hard Drives

All internal hard drives are tested to be properly detected. On all of them, an in-house performance test is run. All disks need to report at least a read performance of 15MB/s.

The following types of internal storage are currently supported/tested:
- PCIe NVMe SSD
- SATA SSD/HDD

Optical Drives

Optical drives are tested for read/write based on specifications of the optical unit. Depending on the unit theoretical feature support, we will test:
- CD read capabilities (data only)
- CD write capabilities
- DVD read capabilities (data only)
- DVD write capabilities
- Bluray-disc read capabilities (data only)
- Bluray-disc write capabilities

Graphics

The ability to run the desktop environment out of the box is required. When certifying, stock Ubuntu open source drivers need to work to complete the installation of Ubuntu, although proprietary drivers are accepted, if they are installable through Ubuntu Drivers.

Laptops

- The integrated display is tested with its highest resolution. At its highest resolution, the image should look clean, without any type of corruption.
- Each of available external video ports (currently supported: HDMI, DisplayPort, Mini Displayport, Thunderbolt 3) are tested one by one. Hot plugging and different modes (mirror, extended, just internal, just external) are required to work. If several external ports are available, they are not required (nor tested) to work simultaneously.
- Display brightness. It should be possible to dim the brightness of the internal display.
- The system must support Gnome Shell 3.28 and basic 3D rendering.

- Hybrid graphics:
  - On systems with Hybrid graphics, features described above need to work with both Performance and Power Saving mode.
  - On systems with an integrated and a NVIDIA discrete GPU users should be able to choose between a performance profile (discrete GPU is used to accelerate rendering) and a power saving profile (discrete GPU is switched off to save battery).
  - On systems with an integrated and an AMD discrete GPU users should be able to run graphics workloads in the discrete GPU.
  - On systems with a NVIDIA hybrid graphics, monitor hotplugging needs to work for all external graphics ports when system is in Performance mode. When the system is in Power Saving mode, external display is not required to work on the ports that are only physically connected to the discrete GPU.

Desktops with an integrated display (aka All-In-Ones)

- The integrated display is tested with its highest resolution. At its highest resolution, the image should look clean, without any type of corruption.
- The integrated display must support basic 3D rendering.
- The system must support display rotation (0°, 90°, 180°, 270°)
- Each of available external video ports (currently supported HDMI, DisplayPort, Mini Displayport, Thunderbolt 3 are tested one by one. Different modes (mirror, extended, just internal, just external) are required to work. If several external ports are available, they are not required (nor tested) to work simultaneously.

Desktops without an integrated display

- Each of available external video ports (currently supported HDMI, DisplayPort, VGA, DVI, S-Video, RCA) are tested one by one, at their highest resolution. Different modes (mirror, extended, just internal, just external) are required to work.
- If several external ports are available, no matter how many ports are designed to work synchronously on the graphic controller, only two of them (regardless the combination) are supported simultaneously (dual-head), unless the hardware does not support two monitors setup.
- If the system contains both an integrated and a discrete GPU, only the discrete GPU is supported
- The system must support Gnome Shell 3.28 and basic 3D rendering.
- The system must support display rotation (0°, 90°, 180°, 270°)
- Desktops with multiple discrete GPUs are not supported; we only support one discrete GPU, as above.

Convertible Laptops (aka 2-in-1s)
- The system must support display rotation (0°, 90°, 180°, 270°)

- The desktop environment must rotate automatically when sensors detect a rotation

Audio

Output sound needs to be undistorted between 0%-100%. Output lines tested:
- Internal speakers
- 3.5mm headphones
- HDMI audio output
- DisplayPort audio output

Input needs to be recorded undistorted between 0%-100%. Input lines tested:
- Internal microphone
- 3.5mm microphone

Plug detection: when a new audio line input or output is plugged in the system, it needs to be recognized.

Networking

- Ethernet. Connections are tested for functionality, but not for performance. Ethernet hot plugging must be supported and working.
- Wireless:
  - 802.11 b/g/n/ac connection

USB controllers

USB controllers are tested using storage devices in all available USB ports. And the USB human interface device, keyboard or mouse, should be working properly with any USB port.
- USB 2.0
- USB 3.0 SuperSpeed mode
- Keyboard or mouse (basic functionality)

Mediacard readers

Mediacard readers are tested for read and write for the following type or cards:

- SD
- SDHC

Bluetooth

Bluetooth 4.0 LE (Smart and Smart Ready) is tested for device scanning and pairing. Apart from pairing, several profiles are specifically tested and required:

- File transfer (OBEX)
- Audio (A2DP)
- HID Over GATT Profile (HOGP), Low-Energy keyboard or mouse with basic functionality

If Bluetooth 4 is not supported on the system, Bluetooth Classic (Bluetooth 3.0 and earlier) is tested for device scanning and pairing. Apart from pairing, several profiles are specifically tested and required:

- File transfer (OBEX)
- Audio (A2DP)
- Human Interface Device (HID) (keyboard or mouse with basic functionality)

Advanced Configuration and Power Interface

Suspend/Resume (S3)

A 30 cycle suspend/resume stress test is performed using the fwts S3 test. The test is passed if all 30 cycles complete without failure. Any errors reported in the fwts log for the 30 cycle suspend/resume stress test are informational only and do not affect the outcome of the test, however, we do recommend examining and fixing any failures noted, as they indicate firmware non-compliance with standards.

Apart from the stress test, a single cycle suspend/resume is performed, if it's a hybrid graphic system, suspend and graphic related functionalities are required to work flawlessly on both Performance mode and Power Saving mode, and the following features and devices are tested and need to work after suspend:

- CPU
- Memory
- Networking (Wifi, Ethernet)
- Audio
- Bluetooth
- Display resolutions should be consistent before and after suspend
- USB controllers
- Input devices
- Mediacards

Boot/Reboot
Both cold boot and soft boot are tested and required to work.

Input devices

Integrated input devices

- Internal keyboard (basic functionality)
- Trackpoint

Touch screens

Touch screens are tested for single touch and multitouch. Functionality tested:

- Single touch, including single tap and double tap
- For multitouch touchscreens with more than two finger support, at least 4 finger gestures must be recognized by the OS. Gestures tested include:
  - 2 finger expand/pinch zoom

Touchpads

Touchpads are tested for single touch and multitouch. Functionality tested:

- Single touch, including single tap and double tap
- Scrolling feature (horizontal and vertical) should work either with the edge scrolling option or the 2 finger scrolling option.

Webcam

Internal main webcams are tested to be able to take a static pictures and also video.

Sensors

- Lid close events in laptops need to be recognized by the OS and trigger a system suspend
- Lid open events in laptops need to be recognized by the OS and trigger a system wake up, when suspended.

Function keys

The following function or special keys in a laptop or an All-In-One system need to be supported (only when they exist in the system under test).

- Super key (Windows logo key). The Super key needs to show all open windows.
- Volume. Output volume needs to react to up and down volume keys
- Volume mute. Audio output needs to be muted and unmuted when pressing the volume mute key.
- Microphone mute. Audio input needs to be muted and unmuted when pressing the microphone mute key.
- Brightness. Internal display brightness needs to react to brightness keys.
- Monitor. Several display modes need to react to monitor hotkey.
- Media control. Keys that control media play need to be able to control a video played through "Totem" or an audio file played through "Rhythmbox"
- Wireless. Soft and hard wireless keys need to turn on and off wireless and Bluetooth in the system
- Suspend. Suspend key needs to send system to suspend
- Battery info. The battery key needs to make the power management dialog appear.
- Lock screen. The screen needs to be locked when pressing the lock screen key.
- Keyboard backlight. Backlight of the internal keyboard needs to be turned on and off when pressing the keyboard backlight key.
- Keyboard overhead lighting. Keyboard overhead lighting needs to be turned on and off when pressing the keyboard overhead lighting key.

LEDs

LED indicators are very common in laptops and some types of desktops. When those exist, they will be tested by following some basic expectations here. The actual behavior may vary depending on the hardware design. To ensure that the behavior is working as expected, please be sure to test against specifications obtained from OEM, as each OEM may have different defined behavior for LEDs.

- Power/suspend button LED. This needs to work as prescribed by OEM's expected LED behavior.
- Suspend chassis LED. This needs to work as prescribed by OEM's expected LED behavior.
- Volume mute LED. This needs to work as prescribed by OEM's expected LED behavior.
- Caps lock LED. Fixed light when input is set to all caps.
- Num lock LED. Fixed light when numeric keypad is on.
- Power supply LED. This needs to work as prescribed by OEM's expected LED behavior.
- Camera LED. Fixed light when the camera is on.

Thunderbolt 3
- Audio output needs to be undistorted over this port.
- Storage devices with hot plugging capability needs to work on it with BIOS set to "No

security" option.
- Display hot plugging and different modes (mirror, extended, just internal, just external) are required to work.
- Daisy-chain should work with a storage device and a monitor chained together.

USB 3.1 (Type C)

The following adapters/peripherals should work:
- Type-C to Type-A adapter
    - Storage devices (with a minimum read/write speed of 10MB/s)
    - Keyboard or mouse (basic functionality)
- Type-C to Display Port
    - Display hot plugging and different modes (mirror, extended, just internal, just external) are required to work.
    - Audio output needs to be undistorted over this port.

Greylist

Graphics

Dual monitors shall be supported, each with a 4K resolution (3480x2160), with a refresh rate of 60hz. The displays must work without any graphical artifacts/screen tearing.

Function keys

The additional function or special keys in a laptop or an All-In-One system are tested (only when they exists in the system under test).

- Power button. When the system is booted, pressing the power button will bring up the dialog to power off, reboot or log out from the system.

Networking

- WWAN connections (3G/4G)

Input devices

Touchpads

Touchpads are also tested for advanced multitouch gestures. Gestures in this section for

touchpads include:

- 4 finger tap

Mediacard readers

Mediacard readers are also tested for read and write for the following type or cards:

- MMC (before and after suspend)

Advanced Configuration and Power Interface

Hibernate/Resume (S4)

A general 30 cycle hibernate/resume stress test is performed. This test is performed using the fwts S4 test. No Critical/High failures in the fwts log are allowed.

Suspend/Resume (S3) time

On average, resume time needs to be less than 5 seconds, with an overall suspend/resume time of less than 10 seconds.

Sleep-to-idle (S0ix)

Supsend to idle will be tested to ensure proper function. If S0ix does not work, the system must fall back to S3.

Sensors

Free-fall sensors (accelerometer) are tested for the following functionality:
- Recognition. The device is recognized and the driver loaded correctly.
- Parking the HDD. The HDD is parked when a sudden fall is recognized.

LEDs

- Wireless LED. Fixed light when wireless signal is on (it can blink when transmitting data).
- Bluetooth LED. Fixed light when bluetooth signal is on.
- Microphone mute LED. Fixed light when input volume is muted.

Graphics

- All available resolutions on both GPUs before and after suspend are required to work flawlessly, the image should look clean, without any type of corruption.

TPM 2.0

TPM 2.0 should be able to be activated from the BIOS.
- For TPM 2.0, all [tpm2-tools](#) commands have to work and pass the upstream integrations tests (NV, Attestation, Key management, Encryption, Signing and Utilities tests)

Internal Hard Drive

The following storage options are tested for functionality:
- Optane Storage
- VRoC Raid

Internal Hard Drive Performance

The following performance targets will be validated:
- For PCIe NVMe SSD: 100MB/s read speed
- SATA SSD/HDD: 10MB/s read speed
- Optane Storage: 100MB/s read speed
- VRoC RAID: 100MB/s read speed

Networking

- Wireless:
  - 802.11 ax connection

Blacklist

- Dial-up modems
- Fingerprint readers
- Secondary camera (e.g. rear camera, 3D camera, IR Camera)

Q & A

- **Does changing the speed of processors require a new certificate?**
  No. Only changing the CPU family would require retesting and issuing a new certificate.

Appendix A. FWTS tests

As part of the certification process, we run a series of firmware tests that are part of the Canonical Firmware Test Suite. In general, any HIGH or CRITICAL error found in the fwts log can cause potential errors in the system and should be looked at by OEMs/ODMs.

Category	Test Item	Description
Information	acpidump	Check ACPI table acpidump.
Information	version	Gather kernel system information.
ACPI	acpitables	ACPI table settings sanity checks.
ACPI	apicinstance	Check for single instance of APIC/MADT table.
ACPI	hpet_check	High Precision Event Timer configuration test.
ACPI	mcfg	MCFG PCI Express* memory mapped config space.
ACPI	method	ACPI DSDT Method Semantic Tests.
CPU	mpcheck	Check Multi Processor tables.
CPU	msr	CPU MSR consistency check.
CPU	mtrr	MTRR validation.
System	apicedge	APIC Edge/Level Check.
System	klog	Scan kernel log for errors and warnings.