Canonical

Ubuntu Server Certified Hardware Coverage Guide

Contents

1. Welcome!

The Ubuntu Certification team is continuously revisiting the scope of the tests comprising the Ubuntu Certified programme and it is reviewed every six months, following the same cadence as the Ubuntu OS. This revision of new tests is performed during Ubuntu's development cycle and it never applies to already-released versions of Ubuntu.

This document was previously tied to specific Ubuntu Server LTS releases. Going forward, however, it will apply to all Ubuntu LTS releases. Release specific versions of this guide will no longer be produced.

For each test job, one of the following certification statuses is specified:

Blocking

> Features that are required for certification. If any of the blocking tests fails, the certification will fail.

Non-blocking

> Features that are tested but not mandatory for certification. Failure in non-blocking tests will not prevent certification. However, a note will be added to the certificate to inform potential customers or users.

> **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.
>
> Coverage is flexible based on customer requirements (for example, if a device's use cases don't require LEDs, then LEDs can be non-blocking)

Certain test jobs are designed to validate specific hardware capabilities, such as camera and audio playback functionality. To ensure that the required hardware capabilities are present and properly recognised on the machine under test, these features are explicitly defined in *manifest entries* and linked to the relevant test jobs. This prevents test jobs from being skipped due to system deficiencies in automated detection.

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

https://certification.canonical.com

2. Ubuntu Server LTS Coverage

As introduced in the 18.04 LTS cycle, Ubuntu LTS certification requires the testing of Vendor Approved Options in order to meet the requirements of the Ubuntu Server Certification programme. This means that all Vendor Approved Options for sale with a given model Server must be covered by testing at some point.

Once a Vendor Approved Option has been tested in one Server Model, it does not need to be retested for another Server Model. This increases the scope of testing but minimizes the amount of extra test work necessary. Thus, if Model A and Model B both feature Networkcard 1, Networkcard 1 is only required to be tested once in either Model A or Model B, and will be considered tested for both.

3. server-full

> **Note**
>
> The certification tests presented in this document are validated by Checkbox[1] version *4.4.0.dev55*.

3.1. Blocking

These items must be tested and must pass testing to be considered Certified.

- Installation Methods

  - Metal as a Service[2] is a required part of server certification testing. If a system cannot be automatically enlisted, commissioned, and deployed using MAAS **without user interaction other than manually powering the system on the first time** the system cannot pass Ubuntu Server Certification. An exception is made here for systems that use management engines like Intel AMT that provide no means of in-band configuration and thus require manual configuration in MAAS to work.

- Intel Optane DCPMM devices

  - Configuration

  - Intel DCPMMs are tested in both Memory and AppDirect (Storage) modes. Specifically, only the fsdax, raw, and sector modes are covered, devdax mode is not currently tested.

- Internal storage (RAID **and** Non-RAID). Only hardware RAID solutions are tested.

  - Storage devices (HDDs, SSDs, Hybrid, NVMe, RAID LUNs) are I/O load tested using open source tools

  - Basic RAID levels (0,1 or 5)

- OCP, Mezzanine, or Daughter Cards

  - Any OCP, mezzanine or daughter card that enables ports on the motherboard must pass. (e.g. a mezz card that enables 10Gb on onboard SFP+ ports)

- System management. Tests are applicable to systems that ship with a BMC or similar management device. Limited to Power Management and User/Password management for MAAS control and probing for info from the BMC.

  - In-Band Management (IPMI)

  - Out-of-Band Management (IPMI, AMT, etc)

  - Chassis Management (Blade / Cartridge type systems)

  - Virtual Machine Management (for LPAR or VM systems like Power or z13)

  - MAAS Compatibility

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[1] https://github.com/canonical/checkbox/tree/beta
[2] https://maas.io

- Containers
  - LXC must function
- System Identification
  - Ensure that the Make/Model being returned to the operating system and via OOB Management is the same as what is being submitted for certification. Firmware must accurately reflect the Make/Model being certified.
- Boot/Reboot
  - PXE Booting from a MAAS server
  - Rebooting to finalize deployment
- GPGPU Devices (NVIDIA or AMD)
  - Systems that are AI/ML focused, such as those that ship with multiple GPGPUs and marketed for AI/ML workloads, **must** pass the GPGPU tests in addition to the standard test plan for certification.
  - Any GPGPU that is listed as a Vendor Approved Option for a server model must be tested regardless of whether that system is AI/ML focused (e.g. a small server that includes a T4 GPU option)

3.1.1. Benchmarks tests

The following test units are covered in this category:

Test unit ID	Summary
benchmarks/disk/hdparm-cache-read_name	Cached read timing benchmark of {name} using hdparm
benchmarks/disk/hdparm-read_name	Raw read timing benchmark of {name} using hdparm

3.1.2. CPU tests

- A general stress test is performed to verify that the system can handle a sustained high load for a period of time.
- Currently, the following architectures can be tested:
  - Both Intel and AMD CPU platforms (64-bit only)
  - IBM and OpenPOWER Power 8 and Power 9 (ppc64el)
  - ARM64 (ARM64 based Server Models must use a SoC that has been SoC Certified[3].)
  - IBM s390x
  - RISC-V (when applicable)

The following test units are covered in this category:

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[3] https://ubuntu.com/certified/soc

Test unit ID	Summary
cpu/clocktest	Tests the CPU for clock jitter
cpu/maxfreq_ test	Test that the CPU can run at its max frequency
cpu/topology	Check CPU topology for accuracy between proc and sysfs

3.1.3. Disk tests

The following test units are covered in this category:

Test unit ID	Summary
disk/detect	Gathers information about each disk detected
disk/disk_cpu_load_name	Check of CPU load imposed by {product_slug}
disk/disk_stress_ng_name	Disk stress-ng test for {product_slug}
disk/read_performance_ name	Disk performance test for {product_slug}
disk/stats_name	Disk statistics for {product_slug}

3.1.4. Ethernet Device tests

The following test units are covered in this category:

Test unit ID	Summary
ethernet/multi_iperf3_nic_device__index___ interface	Multi-NIC Iperf3 stress testing for NIC {interface}

3.1.5. Memory tests

• Proper detection

• General usage

• A general stress test is performed to verify that the system can handle a sustained high load for a period of time.

The following test units are covered in this category:

Test unit ID	Summary
memory/info	Check the amount of memory reported by meminfo against DMI

3.1.6. Miscellaneous tests

The following test units are covered in this category:

Test unit ID	Summary
miscellanea/check_prerelease	Test that the system is not a pre-release version
miscellanea/cpus_are_not_samples	Test DMI data for CPUs
miscellanea/dmitest_server	Test DMI identification data (servers)
miscellanea/efi_boot_mode	Test that system booted in EFI mode
miscellanea/get_maas_version	Verify MAAS version used to deploy the SUT
miscellanea/ipmi_test	Test IPMI in-band communications
miscellanea/kernel_taint_test	Test that kernel is not tainted
miscellanea/klog	Run FWTS Kernel Log check
miscellanea/maas_user_check	Verify BMC user called 'maas' was successfully created with administrative privileges
miscellanea/olog	Run FWTS OLOG check on Power systems
miscellanea/oops	Run FWTS OOPS check

3.1.7. Non-device specific networking tests

- Ethernet devices are tested at their full speed and must show a minimum of 80% of advertised maximum speed.

- High Speed network devices (40 Gb/s and faster must also meet this requirement, however additional configuration and testing steps may be required)

- CNAs and Infiniband devices must at least pass in network mode.

The following test units are covered in this category:

Test unit ID	Summary
networking/predictable_names	Verify that all network interfaces have predictable names.

3.1.8. NVDIMM device tests

The following test units are covered in this category:

Test unit ID	Summary
nvdimm/health	Report health state of installed NVDIMM devices
nvdimm/info	Verify that NVDIMMs are discovered

3.1.9. Power Management tests

The following test units are covered in this category:

Test unit ID	Summary
`power-management/ rtc`	Test that RTC functions properly (if present)

3.1.10.   USB tests

- Externally accessible physical USB ports are tested to ensure operability.
- USB 2.0/3.x

The following test units are covered in this category:

Test unit ID	Summary
`usb/storage-server`	Test USB 2.0 or 1.1 ports
`usb3/storage- server`	Test USB 3.0 or 3.1 ports

3.1.11.   Virtualization tests

(Only applies to Ubuntu on Bare Metal and limited LPAR scenarios.)

- Virtualization extensions
- Running an Ubuntu image on KVM

The following test units are covered in this category:

Test unit ID	Summary
`virtualization/verify_lxd`	Verify LXD container launches
`virtualization/verify_lxd_ vm`	Verify LXD Virtual Machine launches

3.2.   Non-blocking

These items will not block certification if they fail. Any failures should be referred to the Certification Team so that we can investigate and file bugs where appropriate.

- Installation Methods
    - ISO Installation
- Storage
    - Advanced RAID levels (10, 15, 50, etc)
    - VROC
    - External Storage
        * iSCSI
        * FC, FCoE
    - Storage Management Tools

* Storage management tools packaged and documented for Ubuntu

  * Storage management tools should be fully functional on Ubuntu (executable from within Ubuntu)

- Networking

  - SmartNICs

  - Infiniband

- System Management

  - Redfish

    Redfish should be tested where supported, failures should be referred to the Certification Team, but IPMI can be used if Redfish fails.

- Firmware Updates

  - Firmware update tools packaged for Ubuntu

  - Firmware updates possible from within the Ubuntu OS

- TPM 2.0 Devices

- Input devices

  - External keyboard (basic functionality)

3.2.1. CPU tests

The following test units are covered in this category:

Test unit ID	Summary
cpu/arm64_vfp_support_platform	Validate that the Floating Point Unit is running on {platform} device
cpu/armhf_vfp_support_platform	Validate that the Vector Floating Point Unit is running on {platform} device
cpu/cpufreq_test-server	cpufreq scaling test
cpu/cstates	Run C-States tests
cpu/cstates_results.log	Attach C-States test log
cpu/maxfreq_test-log-attach	Attach CPU max frequency log

3.2.2. Disk tests

The following test units are covered in this category:

Test unit ID	Summary
disk/fstrim_name	Filesystem TRIM check for {product_slug}
disk/smart_name	Test SMART capabilities for {product_slug}

3.2.3. Ethernet Device tests

The following test units are covered in this category:

Test unit ID	Summary
ethernet/ethertool_check_device__index___interface	ethtool check for NIC {interface}
ethernet/info_automated_server	Provide information about detected ethernet devices

3.2.4. Firmware tests

The following test units are covered in this category:

Test unit ID	Summary
firmware/fwts_server	Run FWTS Server Cert selected tests.

3.2.5. Informational tests

The following test units are covered in this category:

Test unit ID	Summary
config_file_attachment	Attach a copy of /etc/xdg/canonical-certification.conf
cpuinfo_attachment	Attach a copy of /proc/cpuinfo
dkms_info_attachment	Attaches json dumps of installed dkms package information.
dmesg_attachment	Attach a copy of dmesg or the current dmesg buffer to the test results.
dmi_attachment	Attach a copy of /sys/class/dmi/id/*
dmidecode_attachment	Attach output of dmidecode
efi_attachment	Attaches firmware version info
info/buildstamp	Attaches the buildstamp identifier for the OS
info/disk_partitions	Attaches info about disk partitions
info/hdparm_name.txt	Attaches info from hdparm about {name}
info/kvm_output	Attaches console log from the kvm_check_vm test
info/network-config	attach network configuration
info/secure-boot-check	Check secure boot state
installer_debug.gz	Attach the installer's debug log for diagnostic purposes.
kernel_cmdline_attachment	Attach a copy of /proc/cmdline
lsblk_attachment	Attach information about block devices and their mount points.
lshw_attachment	Attach lshw output
lsmod_attachment	Attach a list of currently running kernel modules
lspci_attachment	Attach a list of PCI devices
lspci_network_attachment	Attach very verbose lspci output for device information.
lstopo_verbose_attachment	Attach the output of lstopo
lstopo_visual_attachment	Attach the output of lstopo command to present system topology.
lsusb_attachment	Attach output of lsusb
meminfo_attachment	Attach copy of /proc/meminfo
modinfo_attachment	Attach modinfo information
modprobe_attachment	Attach the contents of /etc/modprobe.*
modules_attachment	Attach the contents of /etc/modules

Table 1 – continued from previous page

Test unit ID	Summary
`sysctl_attachment`	Attach sysctl configuration files.
`sysfs_attachment`	Attach detailed sysfs property output from udev
`udev-summary_attachment`	Attach a summary of udev devices
`udev_attachment`	Attach dump of udev database

3.2.6. Miscellaneous tests

The following test units are covered in this category:

Test unit ID	Summary
`miscellanea/apport-directory`	Check the /var/crash directory's status and contents.
`miscellanea/bmc_info`	Gather BMC identification info
`miscellanea/cpuid`	Attempt to identify CPU family (x86/amd64 only)
`miscellanea/debsums`	Check the MD5 sums of installed Debian packages
`miscellanea/efi_pxeboot`	Test that system booted from the network
`miscellanea/get_make_and_model`	Gather info on the SUT's make and model
`miscellanea/klog_results.log`	Attach FWTS kernel log results for submission.
`miscellanea/olog_results.log`	Attach the FWTS olog results log to the submission.
`miscellanea/oops_results.log`	Attach the FWTS oops results for submission.
`miscellanea/reboot_firmware`	Test that system supports booting into firmware setup utility
`miscellanea/secure_boot_mode`	Test that system booted with Secure Boot active
`miscellanea/sosreport`	Generate baseline sosreport
`miscellanea/sosreport_attachment`	Attach the baseline sosreport file
`miscellanea/submission-resources`	Check that data for a complete result are present

3.2.7. Non-device specific networking tests

The following test units are covered in this category:

Test unit ID	Summary
`networking/ntp`	Test NTP server synchronization capability.

3.2.8. USB tests

The following test units are covered in this category:

Test unit ID	Summary
`usb/detect`	Display USB devices attached to SUT

4. Q & A

What do you mean by MAAS Compatibility?

In order to be listed as certified, a system is required to have been deployed using Ubuntu's Metal as a Service (MAAS) tool. This is determined by using MAAS to enlist, commission, and deploy the OS and certification tools onto the target systems to be tested. Additionally, there should be as little human intervention as necessary to perform this task, such as the user manually needing to power the machine on during the initial enlistment phase.

Does changing the speed of processors require a new certificate?

No. Only changing the CPU family would require retesting and issuing a new certificate.

What about non-x86 processors?

Any architecture supported by Ubuntu may be certified. At this time, this includes x86_64, ARM, ARM64, Power 8, Power 9, s390x, and RISC-V.

5. Complete Test Plan

The Hardware Certification Testing Coverage aims to test as thorough as possible and ensure that systems and their components are compatible and function well with Ubuntu and Ubuntu Tools; however, it is not possible for this scope of testing to catch issues that are unique to a system or platform or may appear during the hardware development lifecycle. For example, tools to manage firmware, storage configurations, etc., and their usage vary by vendor and platform, but end users expect this functionality. This testing is not done by the Ubuntu Server testing tools and and should be tested by the Partner on a regular basis.

Because of this, please work with your Partner Engineer to outline and document those tests that are not covered by the standard tooling. Partners are strongly encouraged to integrate the Ubuntu test tools and Ubuntu OS into their own processes for OS and Hardware Validation. Your Partner Engineer will gladly help assist you in any way to make this possible.