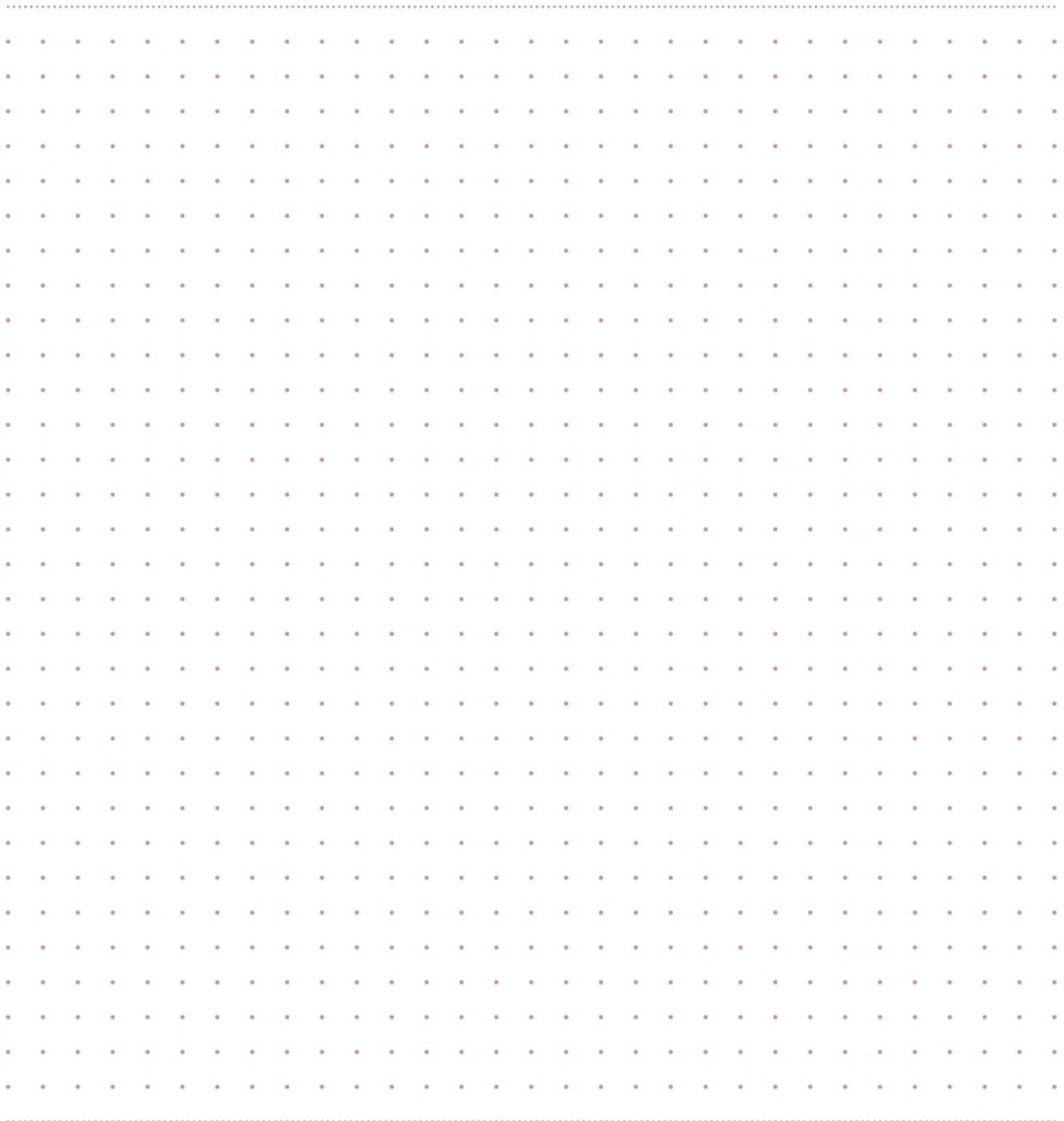


Ubuntu Server Certified Hardware Self-Testing Guide (14.04 LTS)



Contents

Introduction	5
Glossary	5
Overview of the Certification Process	8
Hardware Requirements	8
Network Test Environment	8
Before Running Test Cases	9
Before Uploading Test Case Results	10
Initial Setup	10
Equipment to Bring	11
Hardware Setup	11
Installing Ubuntu on the System	14
Logging Into the SUT	16
Installing the Server Test Suite Packages	17
Creating a Hardware Entry on C3	18
Running the Certification Tests	19
Manually Uploading Test Results to the Certification Site	25
Requesting a Certificate	26
Appendix A - Installing the Server Test Suite Manually	28
Installing the Server Test Suite via APT	28
Bringing the Server Test Suite Packages With You	29
Appendix B - Re-Testing and Installing Updated Tests	31
Appendix C - Using the Test Selection Screen	33
Appendix D - Point Release Testing	35
Appendix E - Troubleshooting Tips	36
Submitting Results	36

Inconsistent Message when Submitting Results	36
Network Problems	36
Issues During Testing	37

Introduction

The aim of this document is to provide the information needed to test a server on-site using the Canonical Server Test Suite without requiring an Internet connection and then submit the results of that testing to Canonical to meet the requirements for Server Hardware Certification.

Glossary

The following definitions apply to terms used in this document.

1Gbps

1 Gigabit per second — Network speed for Gigabit Ethernet (1000Mbps).

10Gbps

10 Gigabits per second — Network speed for 10 Gigabit Ethernet (10,000Mbps).

BMC

Baseboard Management Controller — A device in many server models that enables remote in- and out-of-band management of hardware.

DHCP

Dynamic Host Control Protocol — A method for providing IP addresses to the SUT and Targets.

Greylist test

A test that must be performed but will not affect the granting of a certified status.

KVM

Kernel Virtual Machine — A system for running virtual machines on Ubuntu Server.

IPMI

Intelligent Platform Management Interface — A technology for remotely connecting to a computer to perform management functions.

JBOD

Just a bunch of disks — A non-RAID disk configuration.

LAN

Local Area Network — The network to which your SUT and Targets are connected. The LAN does not need to be Internet accessible (though that is preferable if possible).

MAAS

Metal as a Service — A Canonical product for provisioning systems quickly and easily.

NIC

Network Interface Card — The network device(s).

PXE

Pre-boot Execution Environment — A technology that enables you to boot a computer using remote images for easy deployment or network-based installation.

RAID

Redundant Array of Independent Disks - Multi-disk storage providing redundancy, parity checking, and data integrity.

RAM

Random Access Memory — System memory.

SAN

Storage Area Network — Usually FibreChannel.

SUT

System Under Test — The machine you are testing for certification.

Target

A computer on the test LAN that the SUT can use for network testing. The Target must be running an `iperf` server, but otherwise does not need any special configuration. The MAAS server may double as the Target.

Test case

A test to be executed as part of the certification test suite. Test cases include things such as “CPU Stress” and “CPU Topology.”

Whitelist test

A test that *must* pass for the SUT to be granted a certified status.

Overview of the Certification Process

The certification process has certain prerequisites and procedures with which you should be familiar before beginning. Specifically, you should be aware of hardware requirements and the needs of the network test environment. There are steps you should perform before running the certification tests and before uploading the results. The following sub-sections briefly describe these requirements. Detailed descriptions appear later in this document.

Hardware Requirements

- SUTs must contain at least 4GiB of RAM and one hard disk, but using the maximum amount of RAM and the maximum number of disks is preferable. Likewise, if configurable, using the maximum number of CPUs is desirable.
- CPUs should support virtualization (VMX/SVM), when supported by CPU architecture.
- All firmware (BIOS/UEFI, NIC, storage controller, etc) should be shipping level, *not* development level.
- A monitor and keyboard for the SUT are helpful because they will enable you to monitor its activities. If necessary, however, certification can be done without these items.

Network Test Environment

- In addition to the SUT, the network must contain at least one other machine, which will run MAAS and an `iperf` server. (Both `iperf2` and `iperf3` are required.) The MAAS Advanced NUC Installation and Configuration (MANIAC) document (available from <https://certification.canonical.com>) describes how to configure a MAAS server. This server may be a standard part of the testing network or something you bring with you for testing purposes alone. A laptop or a small portable computer such as an Intel NUC is sufficient. MAAS version 1.7 or later is strongly preferred for certification work; the older MAAS 1.5 lacks certain features that are becoming increasingly important. This document describes use of MAAS 1.9. If you use MAAS 1.7 or 1.8, some procedures will differ slightly.
- The MAAS server computer should run Ubuntu 14.04 (Trusty Tahr), and should be configured to deliver Ubuntu 14.04 images to its clients. Testing with fixed point

releases, as described in the “Configuring MAAS to Deliver Fixed Point Releases” section of the MANIAC document, is required.

- Ideally, the network should have few or no other computers; extraneous network traffic can negatively impact the network tests.
- Ideally, the MAAS server system should handle DNS and DHCP for the network. If other computers manage these tasks, be sure that they’re configured to work with the MAAS server so that the SUT obtains its PXE-boot images from the MAAS server.
- Network cabling, switches, and the `iperf` server should be capable of at least the SUT’s best speed. For instance, if the SUT has 10Gbps Ethernet, the other network components should be capable of 10Gbps or faster speeds. If the local network used for testing is less capable than the best network interfaces on the SUT, those interfaces must be tested later on a more-capable network. If the test environment uses separate networks with different speeds, with the SUT cabled to multiple networks via different ports, you can specify multiple `iperf` servers, as described later.
- If desired, the MAAS server may be run inside a virtual machine; however, it is advisable to run the `iperf` server on “real” hardware so as to minimize the risk of network tests failing because of virtualization issues.

Before Running Test Cases

- The SUT must be properly configured and cabled.
- The SUT must have Ubuntu 14.04 installed on it. (This must be done via MAAS.) See the Installing Ubuntu on the System section below for details on how to do this.
- The `canonical-certification-server` package must be installed on the SUT together with all its dependencies. (This will normally be done via MAAS.) For more information about how to get all the packages, please refer to the Installing the Server Test Suite Packages section below.
- Be sure to have all the items described in the Equipment to Bring section below.
- Some manual configuration will be necessary to perform network testing. See the Installing Ubuntu on the System section below.

Before Uploading Test Case Results

Prior to uploading results to Canonical's certification site, you must handle some preliminary tasks:

- You will need an account at the certification web site, <https://certification.canonical.com>.
 - The certification web site is the location where all the test case results will be uploaded once your testing session has finished.
 - *If you do not have an account for your company on the private certification web site, please contact your account manager who will work with the Server Certification Team to establish the account.*
- You must create a hardware entry (unless one already exists for the SUT) at the certification web site with a secure ID.
 - The secure ID is a string made from 15 alphanumeric characters that is used to make sure that only authorized parties upload results to the site and also to associate the results to the hardware being tested. This can be found on the hardware entry page on the Certification web site:

System 201601-20487

Secure ID for testing purposes: **a00D000000fe68DIAQ**

- For more information on creating the hardware entry, please see *Creating a Hardware Entry on C3* below.
- If the SUT lacks Internet access, the package `canonical-certification-submit` should be installed on the system from which you plan to submit results. Please see the section below titled *Manually Uploading Test Results to the Certification Site* for more information on this topic.

Initial Setup

Before you certify the hardware, you must perform some initial setup steps. These steps are preparing the hardware you'll bring, configuring the SUT for testing, installing Ubuntu, and installing the Server Test Suite.

Equipment to Bring

The requirements for running the tests for a server are minimal. Ensure that you have:

- A writable USB stick with enough free space (> 256MB). It must contain a *single partition* with a *writable FAT* filesystem on it. If you need to test more than one computer then *bring one USB stick per system*. Note that a USB stick with multiple partitions may cause problems, so if necessary you should repartition your device to have a single partition.
- A data CD with some files written to it. This is required to test the system's optical drive read capabilities. Note that a movie DVD or an audio CD won't be useful in this case, as they are not in the right format for the test. If you need to test more than one computer then *bring one medium per system*.
- A computer to function as a MAAS server and `iperf` target on the test LAN. This server will provision the SUT. The MAAS server can be a normal part of the test LAN or can be brought in specifically for testing SUTs on the test LAN. (Note, however, that the MAAS server for certification testing should ideally be configured to automatically install the Server Test Suite on the SUT, which will not be the case for a "generic" MAAS server.)
- A USB flash drive that holds the Server Test Suite software. (This is a precautionary measure in case MAAS can't install the Server Test Suite packages and your LAN lacks Internet access.) The Bringing the Server Test Suite Packages With You section of Appendix A describes how to obtain the software.

Hardware Setup

The following should be considered the minimum requirements for setting up the SUT and test environment:

- Minimum loadout
 - Minimum of 4GiB RAM
 - 1 HDD (2 with minimal RAID)
 - 1 CPU of a supported type
- Recommended (preferred) loadout
 - Maximum supported number of HDDs or SSDs, especially if you can configure multiple RAID levels (e.g. 2 for RAID 0, 3 for RAID 5, and 6 for RAID 50)

- Maximum amount of supported RAM
- Maximum number of supported CPUs
- The SUT should not contain any extraneous PCI devices that are not part of the certification.
 - This includes things like network, SAN and iSCSI cards.
 - Hardware RAID cards are allowed if they are used to provide RAID services to the SUT's onboard storage.
- The SUT should be running a release level BIOS/UEFI configured using factory default settings, with the following exceptions:
 - If the hardware virtualization options in the BIOS/UEFI are not enabled, enable them, save the settings and allow the SUT to reboot.
 - The SUT must be configured to PXE-boot by default.
- Storage should be properly configured.
 - If the SUT is to be tested using RAID, then the proper hardware RAID configuration should be set up prior to testing.
 - Software RAID, including firmware-supported software RAID (aka "fake RAID") should *not* be used. If hardware RAID is not available, configure the server for JBOD.
 - Any additional HDDs or logical drives should be partitioned and mounted prior to testing. Partitions on those additional HDDs should, preferably, be a single partition that spans the entire disk.
 - Some computers may have problems booting from disks over 2TiB in size. If the SUT fails for this reason, it may pass with smaller disks (or a smaller RAID array). In some cases, configuring the SUT to boot in UEFI mode may also solve this problem; but consult the Canonical Certification Team before changing firmware settings to overcome such a problem.
 - Disks must be configured for "flat" storage — that is, filesystems in plain partitions, rather than using LVM or bcache configurations. "Flat" storage was the only option with MAAS 1.8 and earlier, but MAAS 1.9 introduced LVM and bcache options.
- If possible, as many processors as the SUT will support should be installed.

- Note that systems that ship with processors from different families (e.g Sandy Bridge vs. Haswell) will require extra testing.
- CPU speed bumps and die shrinks do not require extra testing.
- Disks with 4,096-byte *logical* sector sizes may require booting in EFI/UEFI mode, and MAAS's support for this is still new, so be alert to potential problems. For instance, some computers support EFI-mode booting but not EFI-mode PXE-booting. Note that disks with 4,096-byte *physical* sector sizes are fine, so long as the disk's firmware translates those sectors into 512-byte logical sectors.
- The test environment should have a working network setup. Internet access is not required, and testing should work on any private or segregated LAN.
 - If possible, the test LAN's speed should match or exceed the network speed of the SUT. For instance, a SUT with 1Gbps onboard Ethernet should be connected to a LAN capable of at least 1Gbps and a system with 10Gbps Ethernet should be connected to a LAN capable of at least 10Gbps. Connecting a SUT to a network with greater network speed is acceptable.
 - If the primary test network cannot meet these requirements, re-running the network tests in an environment that does match these requirements will be necessary.
 - Every network port must be cabled to the LAN and properly configured with either DHCP or static addressing. If a SUT has 4 NIC ports, then all 4 must be connected to the LAN.
 - It is very strongly recommended that SUT and Target machines be on a clean network (that is, one that is not full of other traffic), as extraneous network traffic could impact the network testing results.
- The test LAN must have a working MAAS server that can provision and run the tests on the SUT. The MAAS Advanced NUC Installation and Configuration (MANIAC) document, available at <https://certification.canonical.com>, describes the basics of the MAAS setup, but you may need to refer to additional documentation to complete the task if you're not already familiar with MAAS.
- The test LAN must have at least one system available to act as a Target for network testing with `iperf`. Note that accessing an `iperf` server that's reachable only via a router may not work, because routing tables are temporarily lost during network testing. The `iperf` server is normally the same as the MAAS server, but this does not

need to be the case. If the SUT has a faster network interface than the MAAS server, you should set up another computer that matches the SUT's network interface speed to function as an `iperf` server.

- The SUT's BMC, if present, may be configured via DHCP or with a static IP address. MAAS will set up its own BMC user account (`maas`) when enlisting the SUT.

Installing Ubuntu on the System

Beginning with Ubuntu 14.04 (Trusty Tahr), server certification requires that the SUT be installable via MAAS. Therefore, the following procedure assumes the presence of a properly-configured MAAS server. The MAAS Advanced NUC Installation and Configuration (MANIAC) document describes how to set up a MAAS server for certification testing purposes. This document describes use of MAAS 1.9. Using MAAS 1.7 or 1.8 is also acceptable, but some user interface details differ, particularly for MAAS 1.7.

Once the SUT and MAAS server are both connected to the network, you can install Ubuntu on the SUT as follows:

1. Unplug any USB flash drives or external hard disks from the SUT. (MAAS will attempt to install to a USB flash drive if it's detected before the hard disk. This is obviously undesirable.)
2. Power on the SUT and allow it to PXE-boot.
 - The SUT should boot the MAAS enlistment image and then power off.
 - You should see the SUT appear as a newly-enlisted computer in your MAAS server's node list. (You may need to refresh your browser to see the new entry.)
3. Check and verify the following items in the MAAS server's node details page:
 - If desired, set a node name for the SUT.
 - Check the SUT's power type and ensure it's set correctly (IPMI, AMT, etc.). If the SUT has no BMC, you can leave this section blank or enter "dummy" data. If the power control information was detected incorrectly or incompletely, you should consult the Canonical Certification Team for advice.
4. Commission the node by clicking Take Action followed by Commission and then Go.
 - If the SUT has a BMC, the computer should power up, pass more information about itself to the MAAS server, and then power down again.

- If the SUT does not have a BMC, you should manually power on the SUT after clicking the Commission Node button. The SUT should power up, pass more information about itself to the MAAS server, and then power down again.
 - Note that manual power control is acceptable only on low-end servers that lack BMCs. If MAAS fails to detect a BMC that is present or if MAAS cannot control a BMC that is present, please consult the Canonical Certification Team.
5. On the MAAS server, verify that the SUT's Status is listed as Ready in the node list or on the node's details page. You may need to refresh the page to see the status update.
 6. Click Take Action followed by Deploy. Options to select the OS version to deploy should appear.
 7. Select the Ubuntu release you want to deploy. Normally, you'll pick a point release that you installed as described in the MANIAC document. This image will appear as an OS type of Custom" and a description that you gave it. The normal procedure is to test with 14.04 GA followed by the latest point release. Appendix D - Point Release Testing, elaborates on this policy.
 8. Click Go to begin deployment.
 - If the SUT has a BMC, it should power up and install Ubuntu. This process can take several minutes.
 - If the SUT does not have a BMC, you should power it on manually after clicking Acquire and Start Node. The SUT should then boot and install Ubuntu. This process can take several minutes.

If MAAS has problems in any of the preceding steps, the SUT might not pass certification. For instance, certification requires that MAAS be able to detect the SUT and set its power type information automatically. If you have problems with any of these steps, contact the Canonical Server Certification Team to learn how to proceed; you might have run into a simple misconfiguration, or the server might need enablement work.

Logging Into the SUT

Once the SUT is installed, you should be able to log into it using SSH from the MAAS server. Check the node details page to learn its primary IP address. (Using a hostname will also work if DNS is properly configured, but this can be fragile.) The username on the node is `ubuntu`, and you should require no password when logging in from the MAAS server or from any other computer and account whose SSH key you've registered with the MAAS server.

You should keep some details in mind as you continue to access the SUT:

- You should *not* install updates to the SUT unless they are absolutely necessary to pass the certification. In that case, the Canonical Certification Team will make the determination of what updates should be applied.
- You should verify your SUT's version by typing `lsb_release -a`. The result includes both the main release version (such as 14.04) and the point release version (such as 14.04.2, on the *Description* line). You can also check your kernel version by typing `uname -r`. The kernel version changes with the Ubuntu release. Both 14.04 and 14.04.1 ship with 3.13-series kernels, while 14.04.2 ships with a 3.16-series kernel.
- By default, MAAS provides a DHCP server, and the SUT should use it to obtain an IP address. If necessary for your environment, you may manually change these settings on the SUT to use a static IP address.
- If you want to log in at the console or from another computer, you must set a password:

```
$ sudo passwd ubuntu
```

After prompting, this command changes the password for the user called `ubuntu`, which is the default user created by MAAS. Testing at the console has certain advantages (described shortly).

- A MAAS installation configured for certification testing should provision the SUT with the Server Test Suite and related packages. If you're using a more "generic" MAAS setup, you'll have to install the certification software yourself, as described in [Appendix A - Installing the Server Test Suite Manually](#).

Ensure all network devices are configured in the file `/etc/network/interfaces`:

```
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp

# Additional network interfaces
auto eth1
iface eth1 inet dhcp
~
~
~
~
~
```

Be sure to start networking on all the interfaces. (The network tests will *not* bring up a network interface, even if it's defined in `/etc/network/interfaces`.) In most cases, typing `sudo ifup eth1`, and so on for additional entries, will do the job. (The `eth0` interface is normally enabled by default on the first boot and so need not be explicitly brought up, but this isn't always the case.) Once you've done this, typing `ifconfig` should show that all the interfaces have IP addresses.

Installing the Server Test Suite Packages

Three methods of installing the Server Test Suite exist:

- Automatically by the MAAS server
- Using APT to retrieve the Server Test Suite packages on a SUT with full Internet access
- By loading the Server Test Suite Debian packages from a USB flash drive or other medium you bring with you to the test site

If MAAS is fully configured as described in the *MAAS Advanced NUC Installation and Configuration (MANIAC)* document, it should deploy the Server Test Suite automatically. If MAAS doesn't deploy the Server Test Suite properly, you can do so manually, as described in Appendix A - Installing the Server Test Suite Manually.

Creating a Hardware Entry on C3

In order to upload test results to the certification web site (<http://certification.canonical.com>, or C3 for short) you need to create a hardware entry for the system which you will be certifying. If the SUT has no direct Internet connection, you can put off creating the C3 entry until after the test (although doing it before testing is fine, too). If you don't plan to submit the results, you should not create a C3 entry for the machine. To create an entry you can go directly to:

<https://certification.canonical.com/hardware/create-system>

If you have problems accessing this site, contact your account manager.

When creating an entry, you must enter assorted pieces of information:

1. Fill in the details:

- **Account** — The name of your account. If the account is incorrect or can't be set, please contact your account manager for assistance. This field is never published; it is for internal use only.
- **Make** — The manufacturer of the system, e.g. Dell, HP, as you would like it to appear on the public web site.
- **Model** — The name of the system itself, e.g. ProLiant DL630 or PowerEdge R210, as you would like it to appear on the public web site.
- **Aliases** — This is used for alternate marketing names for a server. This field is only accessible to the Canonical Server Certification Team. If you need to add items to this field, please contact your account manager. These do appear publicly as separate entries in the database (e.g. Server1000, Alias1001 and Alias1002 all point to the same system, but appear as three separate entries on the public web site).
- **Codenames** — This is for your internal reference and use and is for the internal code name associated with the SUT. This data is *never* published and is visible only to you and to Canonical.
- **Web site** — Optional, link to the system info on the manufacturer's web site. This field is published publicly and is a way for potential customers to directly access information about your hardware on your own web site.

- **Comment** — Optional, any comment you want to make about the hardware, including things like tester name, test location, etc. These comments are never made public, they are for internal use only.
 - **Form factor** — The type of system: Laptop, Server, etc. This is not published directly, but determines where your system is displayed on the public site. Client form factors appear in one place while server form factors appear elsewhere on the public certification site. You may select any of the Server form factors you like except for Server SoC, which is reserved for System on Chip certifications.
 - **Architecture** — The CPU architecture of the SUT. This is used internally and is not published.
 - **Confidential** — Defaults to False (unchecked). Check the box if the system has not been publicly announced yet or should remain unpublished for any reason. This will cause the entire entry to *not* be published to the public web site.
2. Click Submit.
 3. Note the “Secure ID for testing purposes” value. You’ll need this when submitting the test results. (Note that this value is unique for each machine.)

Running the Certification Tests

To initiate a testing session in a server:

1. Connect to the server via SSH or log in at the console. A standard MAAS installation creates a user called `ubuntu`, as noted earlier. You can test using either a direct console login or SSH, but an SSH login may be disconnected by the network tests or for other reasons.
2. Before testing you must ensure that all network ports are cabled to a working LAN and configured in `/etc/network/interfaces` using the appropriate configuration (static or DHCP) for your test environment. If you edit this file, either reboot or bring up the interfaces you add with `ifup` before running tests.
3. If the SUT provides the suitable ports and drives, plug in a USB 2 stick, plug in a USB 3 stick, and insert a suitable data CD in the optical drive. Note that USB testing is not required for blades that provide USB ports only via specialized dongles. These media must remain inserted *throughout the test run*, because the media tests will be kicked off partway through the run.

4. If the system doesn't have Internet access:

- Copy the image you downloaded from <http://cloud-images.ubuntu.com/trusty/current/trusty-server-cloudimg-i386-disk1.img> (as noted in *Appendix A*) to any directory of the SUT.
- Supply the full path under the section labeled "environment" in `/etc/xdg/canonical-certification.conf`. For example:

```
[environment]
KVM_TIMEOUT:
KVM_IMAGE: /home/ubuntu/trusty-server-cloudimg-i386-disk1.img
```

5. If necessary, edit the `/etc/xdg/canonical-certification.conf` file on the SUT so as to specify your `iperf` server(s). For example:

```
TEST_TARGET_FTP = your-ftp-server.example.com
TEST_USER = anonymous
TEST_PASS =
TEST_TARGET_IPERF = 192.168.0.2,172.24.124.7
```

If you configured your MAAS server as described in the MANIAC document, the `TEST_TARGET_IPERF` line should already be set appropriately. If your environment includes multiple `iperf` servers, you can identify them all, separated by commas. The test suite will attempt to use each server in sequence until one results in a passed test or until they are all exhausted. You can use this feature if your environment includes separate networks with different speeds, to run `iperf` and `iperf3` on separate servers, or for other reasons. The Server Test Suite does not currently use FTP, but these lines must be uncommented. They may be left at their default values.

6. While editing `/etc/xdg/canonical-certification.conf`, you may optionally enter the SUT's Secure ID in the `[sru]` section. This can simplify submission of results at the end of the test; however, this will work only if the SUT has full Internet access.
7. Launch `iperf` (version 2) and `iperf3` on the server identified in the SUT's `/etc/xdg/canonical-certification.conf` file by typing, one command in each of two Terminals or logins:

```
$ iperf -s  
$ iperf3 -s
```

8. If you're running the test via SSH, type `screen` on the SUT to ensure that you can reconnect to your session should your link to the SUT go down, as may happen when running the network tests. If you're disconnected, you can reconnect to your session by logging in and typing `screen -r`. This step is not important if you're running the Server Test Suite at the console.

9. Run:

```
$ canonical-certification-server
```

10. A welcome message will be displayed. Make sure to read the message and follow its instructions.

11. Press the Enter key. The system will display a Suite Selection screen:

```
Suite selection

[ ] - Network-only
[X] - Server-full-14.04
[ ] - Server-functional-14.04
[ ] - Storage-only
[ ] - Usb-only
[ ] - Virtualization-only

< OK >
```

12. Select the *Server-full-14.04* item and deselect the other items. (These other suites exist to enable easy re-running of subsets of tests that often fail in some environments.)
13. Use the arrow keys to highlight the *<OK>* option and then press Enter.
14. After a few seconds, a test selection screen will appear, as shown below. You should ordinarily leave all the tests selected. (Tests that are irrelevant for a given computer, such as tests of the optical drive on computers that lack this hardware, are automatically ignored.) If a test is hanging or otherwise causing problems, please contact the Canonical Server Certification Team for advice on how to proceed. Using this screen is fairly straightforward, but Appendix C - Using the Test Selection Screen covers the details.

```

Choose tests to run on your system:
[X] - Benchmarks tests
[X]   - Benchmark for each disk
[X]     benchmarks/disk/hdparm-read_sda
[X]   - Benchmark for each disk
[X]     benchmarks/disk/hdparm-cache-read_sda
[X] - CPU tests
[X]   cpu/clocktest
[X]   cpu/maxfreq_test
[X]   cpu/maxfreq_test-log-attach
[X]   cpu/offlining_test
[X]   cpu/scaling_test
[X]   cpu/scaling_test-log-attach
[X]   cpu/topology
[X]   Create resource info for supported optical actions
[X] - Disk tests
[X]   - Check stats changes for each disk
[X]     disk/stats_sda
[X]   - SMART test
[X]     disk/smart_sda
[X]   - Verify system storage performs at or above baseline performance
[X]     disk/read_performance_sda
[X]   - Verify that storage devices, such as Fibre Channell and RAID can ...
[X]     disk/storage_device_sda
[X]     disk/detect
[X] - Ethernet Device tests
[X]   - Automated test to walk multiple network cards and test each one ...

Enter: Expand/Collapse  Select All  Deselect All  Start Testing

```

15. Press the `T` key to start testing. The screen will begin displaying a scrolling set of technical details about the tests as they are performed.
16. The full test suite can take several hours to complete, depending on the hardware configuration (amount of RAM, disk space, etc). During this time the computer may be unresponsive. This is due to the inclusion of some stress test cases. These are deliberately intensive and produce high load on the system's resources.
17. If at any time during the execution you are *sure* the computer has crashed (or it reboots spontaneously) then after the system comes back up you should run the `canonical-certification-server` command again and respond `y` when asked if you want to resume the previous session.
18. When the test run is complete, you should see a summary of tests run, a note about where the `submission.xml`, `results.html`, and `results.xlsx` files have been stored,

and a prompt to submit the results to `certification.canonical.com`. If you're connected to the Internet, typing `y` at this query should cause the results to be submitted. You will need either a Secure ID value or to have already entered this value in the `/etc/xdg/canonical-certification.conf` file.

19. Copying the results files off of the SUT is advisable. This is most important if the automatic submission of results fails; however, having the results available as a backup can be useful because it enables you to review the results off-line or in case of submission problems that aren't immediately obvious. The results are stored in the `~/.local/share/plainbox` directory.
20. Copy the whole directory to an external medium and bring it with you after certifying the system. It contains a file called `submission.xml` which is the results of the testing as well as a file called `results.html` that, if loaded in a web browser, will show you the results.

If you review your results by loading `results.html` in a web browser, you can quickly spot failed tests because they're highlighted in red with a "FAILED" notation in the Result column, whereas passed tests acquire a green color, with the word "PASSED." Note, however, that *a failed test does not necessarily denote a failed certification*. Reasons a test might fail but still enable a certification to pass include the following:

- A test may be a greylist test, as described in the *Ubuntu Server Hardware Certification Coverage* document, available from <https://certification.canonical.com>.
- Some tests are known to produce occasional false positives — that is, they claim that problems exist when in fact they don't.
- Some test environments are sub-optimal, necessitating that specific tests be re-run. This can happen with network tests or if the tester forgot to insert a removable medium. In such cases, the specific test can be re-run rather than the entire test suite.

Consult your account manager if you have questions about specific test results.

Manually Uploading Test Results to the Certification Site

If you can't upload test results to the certification site from the certification program itself, you must do so manually, perhaps from another computer. To upload the results, you should have the Server Test Suite and `canonical-certification-submit` installed on the system from which you plan to submit results. The Server Test Suite is part of the default install on all Ubuntu Desktop systems. At this time, there is no mechanism for submitting results from an OS other than Ubuntu.

To add the Hardware Certification PPA, install `canonical-certification-submit`, and submit the results, follow these instructions:

1. Add the Hardware Certification PPA:

```
$ sudo apt-add-repository ppa:hardware-certification/public
$ sudo apt-get update
```

2. Install the package:

```
$ sudo apt-get install canonical-certification-submit
```

3. Run the following command:

```
$ canonical-certification-submit --secure_id <SUT_SECURE_ID> \
  <PATH_TO>/submission.xml
```

where:

- `<SUT_SECURE_ID>` can be found on your system's page on the certification web site (<http://certification.canonical.com>) by looking next to "Secure ID for testing purposes":

System 201601-20487

Secure ID for testing purposes: `a00D000000fe68DIAQ`

- <PATH_T0> refers to the location of the submission.xml file (which should be contained in the ~/.local/share/plainbox directory you copied to the USB key).
- Older versions of this tool used --hwid rather than --secure_id.

You should see output similar to the following for a successful submission:

```
$ canonical-certification-submit --hwid a00D000000LU9Ji \  
  ~/.local/share/plainbox/submission.xml  
2012-03-28 11:05:30,575 INFO      Preparing to submit results using Hardware  
                                ID: a00D000000LU9Ji  
2012-03-28 11:05:30,576 INFO      Getting messages  
2012-03-28 11:05:56,726 INFO      Exchanged 8 of 8 messages  
2012-03-28 11:05:56,726 INFO      Results have been successfully submitted.  
                                To review your test results now, please  
                                go to the following URL:  
                                https://certification.canonical.com/submission/eFXnst3rVbBvdu2
```

Once results submission is complete, use the provided link in the output to review the results and confirm that they are correct.

Requesting a Certificate

Once you've uploaded the data to the certification site, you should review it in the web interface. If you're satisfied that there are no problems, you can request a certificate:

1. Click the date link under the Created column in the Submissions section. The result should be a page showing most of the same information as the previous page, but in a different format, and restricted to that one test run.
2. Click the Request Certificate link. The result should be a page with a few radio buttons in which you can enter information:
 - Status is fixed at In Progress.
 - Release indicates the Ubuntu release used for testing, and for which the certificate will be issued.
 - Level indicates the type of certification:

- Certified is for hardware that's ready to be deployed with Ubuntu. This is the option to choose for server hardware as that typically does not ship with a pre-installed operating system.
 - Certified Pre-installed is for hardware that ships with a (possibly customized) version of Ubuntu. This option is used almost exclusively for Client hardware such as desktops, laptops and tablets that typically ship with a pre-installed operating system.
 - Is Private should be checked if the certification should be kept private. Note that this check box affects the certificate only, not the entry for the computer as a whole on <http://certification.canonical.com>. Other public pre-existing certificates, or those issued in the future, will remain public.
3. Click Submit. You'll see a new screen in which you can (and in one case *must*) enter more information. In particular, you can click:
- Link Bug to link to a bug on <https://bugs.launchpad.net>. This option is available only to Canonical engineers.
 - Create Note or Create Note from Template to create a note. Most systems will have at least two notes:
 - A note titled "Tester" with the name of the person who did the testing is required.
 - A note titled "Test Notes" is usually present. It describes test-specific quirks, such as why a failure should be ignored (say, if a network test failed because of local network problems but succeeded on re-testing). If the *miscellanea/get-maas-version* test fails, be sure to specify the version of MAAS used to deploy the SUT.
- In most cases, the "Private" check box should be checked for your notes.

Appendix A - Installing the Server Test Suite Manually

Ordinarily, MAAS will install the Server Test Suite onto the SUT as part of the provisioning process, as described in the main body of this document. If the MAAS server is not configured to do this, though, you have two additional options for installing the Server Test Suite: You may use APT if the SUT has full Internet access or you may install the Server Test Suite from a tarball that you bring with you.

Installing the Server Test Suite via APT

If your lab setup has Internet access, getting the testing tools is a pretty straightforward process, because you can install the necessary tools from the Ubuntu Hardware Certification PPA.

Log in to the server locally or via SSH or KVM and run the following commands:

```
$ sudo apt-add-repository ppa:hardware-certification/public
$ sudo apt-add-repository ppa:firmware-testing-team/ppa-fwts-stable
$ sudo apt-get update
$ sudo apt-get install canonical-certification-server
```

If for some reason you want to run the test suite from an Ubuntu live medium, you must also enable the universe repository:

```
$ sudo apt-add-repository universe
```

Note that running the test suite from a live medium is not accepted for any certification attempt; this information is provided to help in unusual situations or when debugging problems that necessitate booting in this way.

During the installation, you may be prompted for a password for `mysql`. This can be set to anything you wish; it will not be used during testing.

At this point, you should have the test suite and dependencies installed and be ready to begin testing.

Bringing the Server Test Suite Packages With You

If you do not have Internet access from your LAN, you can find the pre-built tarball including the Server Test Suite packages under:

<https://certification.canonical.com/offline>

Note that you will be asked for your account credentials when you access that URL.

Copy the appropriate `.tar.gz` file to a USB stick and bring this with you when testing the system. You will also need to obtain and bring a copy of a bootable Ubuntu Cloud Image for the virtualization portion of the certification test. You can obtain that here:

<http://cloud-images.ubuntu.com/trusty/current/trusty-server-cloudimg-i386-disk1.img>

You can use another release of Ubuntu if this is convenient. An i386 image is used even when you're testing 64-bit hardware. The point is to test that virtualization features work, not that a specific Ubuntu version or architecture is supported. Because the i386 image is more general, it's the one that we use in testing.

To install the server certification packages from the copied tarball, perform the following steps on the SUT:

1. Insert the USB drive on which you placed the tarball.
2. Extract the contents of the `.tar.gz` file from the USB stick to a temporary directory (such as `/tmp/`):

```
$ tar -C /tmp -xzf ubuntu-14.04-server-amd64.tar.gz
$ cd /tmp
```

3. Look for a directory whose name begins with `apt-repo` and switch to it (note this is just an example, your exact directory name may be different):

```
$ cd apt-repo-ubuntu-14.04.1-server-amd64.iso-20140901-canonical-certification-ser
```

4. Use a provided helper script to add a local package repository:

```
$ sudo ./add_offline_repository -u
```

5. Install the Server Test Suite:

```
$ sudo apt-get install canonical-certification-server
```

During the installation, you may be prompted for a password for `mysql`. This can be set to anything you wish; it will not be used during testing. If you're asked about mail server configuration, respond that the mail server should not be configured.

Appendix B - Re-Testing and Installing Updated Tests

Occasionally, a test will fail, necessitating re-testing a feature. For instance, if you forget to insert a USB flash drive, the relevant USB tests will fail. The same thing will happen if a USB flash drive is defective or improperly prepared. Another common source of problems is network tests, which can fail because of busy LANs, flaky switches, bad cables, and so on. When this happens, you must re-run the relevant test(s).

Although it's often possible to re-run a test by directly executing a single test script, the preferred method is:

1. Re-run `canonical-certification-server`.
2. Use one of the abbreviated testing whitelists (such as *Network-only*) or adjust the set of tests to be run (as described in *Appendix C*).
3. Submit the resulting `submission.xml` file to the C3 site.

You can then request a certificate based on the main results (the one with the most passed tests) and refer to the secondary set of results in the certificate notes. This procedure ensures that all the necessary data will be present on C3. It also ensures that (sometimes subtle) problems will be avoided; for instance, network tests may not be valid if network ports that are not being tested are active. The `canonical-certification-server` framework ensures that such potential problems are avoided.

From time to time, a test will be found to contain a bug or need to be updated to deal with a problem. In such cases, it is often impractical to wait for the fix to work its way down through Ubuntu's packaging system, or even through the PPAs in which some of the relevant tools are distributed. In such cases, the usual procedure for replacing the script or file is as follows:

1. Consult with the Server Certification Team about the problem; *do not* install an updated script from some other source!
2. Obtain the updated file (typically a script) from the Server Certification Team. Store it on the SUT in the home directory of the test account. For instance, the new script might be `/home/ubuntu/newscript`. If necessary, give the new file execute permissions.

3. On the SUT, rename or delete the original file, as in:

```
$ sudo rm /usr/lib/2013.canonical.com\:checkbox/bin/oldscript
```

4. Create a symbolic link from the new script to the original name, as in:

```
$ sudo ln -s /home/ubuntu/newscript \  
/usr/lib/2013.canonical.com\:checkbox/bin/oldscript
```

5. Run the tests again, using the canonical-certification-server user interface.

In some cases, another procedure might be necessary; for instance, a bug fix might require installing a new Debian package with the `dpkg` command, or you might need to edit a configuration file. The Canonical Server Certification Team can advise you about such requirements.

Appendix C - Using the Test Selection Screen

It may be necessary for you to deselect some of the tests which are to be run for certification. This is unlikely, though, and you should only do it when so instructed.

The test selection screen looks like this:

```
Choose tests to run on your system:
[X] - Benchmarks tests
[X]   - Benchmark for each disk
[X]     2013.com.canonical::benchmarks/disk/hdparm-read_sda
[X]   - Benchmark for each disk
[X]     2013.com.canonical::benchmarks/disk/hdparm-cache-read_sda
[X] - CPU tests
[X]   2013.com.canonical::cpu/clocktest
[X]   2013.com.canonical::cpu/frequency_governors
[X]   2013.com.canonical::cpu/offlining_test
[X]   2013.com.canonical::cpu/scaling_test
[X]   2013.com.canonical::cpu/scaling_test-log-attach
[X]   2013.com.canonical::cpu/topology
[X] Create resource info for supported optical actions
[X] - Disk tests
[X]   - Check stats changes for each disk
[X]     2013.com.canonical::disk/stats_sda
[X]   SMART test
[X]   - Verify system storage performs at or above baseline performance
[X]     2013.com.canonical::disk/read_performance_sda
[X]   - Verify that storage devices, such as Fibre Channel and RAID can ...
[X]     2013.com.canonical::disk/storage_device_sda
[X]     2013.com.canonical::disk/detect
[X] - Ethernet Device tests
[X]   - Automated test to walk multiple network cards and test each one ...
[X]     2013.com.canonical::ethernet/multi_nic_eth0
[X]     2013.com.canonical::ethernet/detect

Enter: Expand/Collapse   Select All   Deselect All   Start Testing
```

Every test suite name is preceded by a brackets that contain either an X character or nothing to identify whether the test suite has been selected or not.

Tests are arranged hierarchically. When a top-level test is highlighted, you can hide or reveal the details by pressing the Enter key; or you can select or deselect all the tests in that category by pressing the Spacebar. For instance, with *Benchmark tests* highlighted, as in the figure, pressing Enter will hide the lines up to *CPU tests*, and pressing the

Spacebar will deactivate (or re-activate) all of the benchmark tests. You can select or de-select an individual test, such as the *hdparm-read_sda* test, by highlighting it and pressing the Spacebar.

Once you've selected all the tests, press the *T* key to begin the testing process.

Appendix D - Point Release Testing

Ordinarily, 14.04 certification requires testing two releases:

- Ubuntu 14.04 GA — That is, the version that was released in April of 2014.
- The current point release — That is, version 14.04.2 or whatever is the latest release in the 14.04 series.

In theory, compatibility will only improve with time, so a server might fail testing with 14.04 GA because it uses new hardware that had not been supported in April of 2014, but pass with the latest version. Such a server would be certified for that latest version, but not for the original GA release. If such a situation arises, testing should also be done with intervening releases so as to determine the earliest working version of Ubuntu.

If a server fails certification with a more recent release but works with an earlier one, this situation is treated as a regression; a bug report should be filed and note made of the problem in the certificate request. Please notify your TPM about such problems to facilitate their resolution.

Because Ubuntu 14.04.1 uses the same 3.13 kernel series as 14.04 GA, testing 14.04.1 is required only if 14.04 GA fails. (Although 14.04 GA and 14.04.1 use the same kernel series, 14.04.1 ships with a later kernel within that series, so it might fix a bug that blocks 14.04 GA certification.)

If the procedure for installing point releases, as described in the MANIAC document (available from <https://certification.canonical.com>), fails, then you should consult the Server Certification Team.

Appendix E - Troubleshooting Tips

Submitting Results

If submitting results from the Server Test Suite itself fails, you can use the `canonical-certification-submit` program, as described earlier, in *Manually Uploading Test Results to the Certification Site*. You can try this on the SUT, but if network problems prevented a successful submission, you may need to bring the files out on a USB flash drive or other removable medium and submit them from a computer with better Internet connectivity.

Inconsistent Message when Submitting Results

If you receive a message that looks like the following when using `canonical-certification-submit`, please be sure to save the `submission.xml` file and contact your account manager:

```
2014-04-28 10:55:33,894 CRITICAL Error: Inconsistent message
```

Network Problems

Network problems are common in testing. These problems can manifest as complete failures of all network tests or as failures of just some tests. Specific suggestions for fixing these problems include:

- **Check cables and other hardware** — Yes, this is very basic; but bad cables can cause problems. For instance, one bad cable at Canonical resulted in connections at 100Mbps rather than 1Gbps, and therefore failures. Some of these failures were identified in the output as the lack of a route to the host. Similarly, if a switch connecting the SUT to the `iperf` server is deficient, it will affect the network test results.
- **Use the simplest possible network** — Complex network setups and those with heavy traffic from computers uninvolved in the testing or those with multiple switches, bridges, etc., can create problems for network testing. Simplifying the network in whatever way is practical can improve matters.

- **Check the iperf server** — Ensure that the server computer is up and that the `iperf` server programs are both running on it. Also ensure that the computer has no issues. For instance, some versions of `iperf 2`, when run in daemon mode, cause the load average to go up every time a client disconnects. This can bring even a powerful computer to its knees quite quickly!
- **Restart iperf on the server** — Occasionally `iperf` (version 2) and `iperf3` interfere with one another when run simultaneously, resulting in poor network performance in both tests. Restarting `iperf` (version 2) on the server usually fixes this problem. If it doesn't, try running just one server at a time and run the network tests sequentially.
- **Ensure the iperf server is on the SUT's local network** — The network tests temporarily remove the default route from the routing table, so the `iperf` server computer must be on the same network segment as the SUT.
- **Check the SUT's network configuration** — A failure to configure the network ports in `/etc/network/interfaces` will cause a failure of the network tests. Likewise, a failure to bring up a network interface before testing will cause the test to fail, even if `canonical-certification-server` detects the interface.
- **Check your DHCP server** — A sluggish or otherwise malfunctioning DHCP server can delay bringing up the SUT's network interfaces (which repeatedly go down and come up during testing). This in turn can cause network testing failures.

If you end up having to re-run the network tests, either do so from within `canonical-certification-server` or be sure to bring down all the network interfaces except the one you're testing before using `iperf` manually. The way Linux manages network interfaces makes it difficult to ensure that network traffic will be restricted to a single network port if more than one is active.

Issues During Testing

The testing process should be straightforward and complete without issue. Should you encounter issues during testing, please contact your account manager. Be sure to save the `~/.local/share/plainbox` and `~/.cache/plainbox` directory trees as they will contain logs and other data that will help the Server Certification Team determine if the issue is a testing issue or a hardware issue that will affect the certification outcome.

If possible, please also save a copy of any terminal output or tracebacks you notice to a text file and save that along with the previously-noted directories. (Feel free to send us a photo of the screen taken with a digital camera.)