

# **Installation and Configuration**

# of the Ubuntu 14.04 Operating

# **System for IMS Servers**

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# 1 Purpose

The purpose of this document is to document the procedure for installing and configuring the operating system of IMS Servers. For the recommended server specifications, please refer to the document *Basic Hardware Specifications for IMS Server and Client PC's* which can be downloaded from http://software. imseismology.org/documents/PC-Specification\_IMS-DOC-201201-ILv4.pdf. For general IT requirements needed by the seismic system, please refer to the document *IT Requirements for IMS Services* available from http://software.imseismology.org/documents/IT/IMS\_IT\_requirements.pdf.

If the server is being configured by local IT services to be handed over to IMS once the OS has been installed, this guide should be completed to the end of Section 6: Update Ubuntu.

# 2 **Preparation**

# 2.1 Create Ubuntu Boot Media

The version of Ubuntu to be installed is:

- Latest Ubuntu Server 14.04 LTS (64-bit) (currently Ubuntu Server 14.04.5 LTS)
  - 64 bit version (for 64 bit hardware)
  - IMS does not recommend using a 32-bit operating system or hardware

The boot media can be created using a USB disk or CD:

- Download the correct ISO image from one of the following sites:
  - http://software.imseismology.org/os
  - http://www.ubuntu.com/download/server
- Create the bootable USB or CD image from the downloaded ISO image file. The recommended method within a Linux OS is to image a USB flash drive using the **dd** command (images created with Ubuntu startup disk creator are known to have some issues). An example imaging command would be:

#### \$ dd if=ubuntu-14.04.5-server-amd64.iso of=/dev/sdd

• If creating a boot CD/DVD from within a Windows OS, burn the ISO image to the CD/DVD



# 2.2 Network details

As part of the server configuration process, the operating system and software packages will be updated to their most recent versions by downloading updates from the Internet. You will therefore need to connect the server to the network and have the network configuration details available before proceeding.

- Dynamic network configuration via DHCP:
  - hostname
  - proxy server settings (IP, port, authentication details, etc. if applicable)

or

- Static network configuration:
  - hostname
  - IP address and netmask
  - DNS IP
  - DNS domain
  - Gateway IP address
  - Proxy IP and port (if applicable)

# **3** Hardware Configuration

# 3.1 Set PC BIOS

- Boot PC
- Enter BIOS
- Set boot sequence to CD or USB first
- Set Hardware Clock to UTC (GMT) this can be done from within Ubuntu as well, see 7.7.3
- Set AC Recovery to on
- Enable Hyper-Threading (if available)
- Ensure that is the PC has an on-board serial port, this is set to COM1
- If the system supports **UEFI**, turn it **on**



### **3.2 RAID**

If the system is planned for a RAID configuration

- Boot PC
- Enter BIOS
- Setup RAID as required (if available)

Only configure RAID if the PC has a dedicated **hardware** RAID controller. Do **NOT** configure software raid. During virtual disk configuration, the virtual disk should be initialised.

- For a configuration with 2 physical hard drives, create 1 virtual disk using RAID 1
- For a configuration with 4 physical hard drives, create 2 virtual disks using RAID 1

# 4 Install Ubuntu

Because Ubuntu Server does not assume that the machine has a graphical interface (i.e. may be installed via a terminal), all the installers user interaction is via keyboard interactive text based menus. Control keys are usually documented on the bottom of screen; usually <TAB> moves between fields, <SPACE> selects and <ENTER> activates fields.

### 4.1 Boot from Ubuntu Boot Media

- With the boot media (created in step 2.1) inserted into the machine, boot from the the device (you may need to enter the BIOS boot menu to select the correct boot device).
- Select your language and then from the boot menu select "Install Ubuntu Server".

### 4.2 Select Locale Settings

- language (English)
- location (**not** the end user/customer's timezone, but the local one where the machine is being setup - this is important because Ubuntu uses this setting to select the best software package repository servers to use based on region)
- keyboard (follow the interactive menus to detect your keyboard)



## 4.3 Configure the Network

Once the keyboard has been configured, the installer will scan and detect the machine's hardware configuration and may load the required drivers from the installation media. As part of this hardware detection process the machine's network interfaces should be detected. It is recommended that at this point, the PC does not have access to the Internet. To speed up Ubuntu installation time and reliability, updates should not be performed until after the OS is fully installed.

## 4.4 Create IMS User Account

- Full name of user: IMS
- username: ims
- password: <choose a strong password>
- encrypt /home partition: No

# 4.5 Timezone

The timezone should be configured to reflect the current location of the PC being installed as this will allow the closest, fastest update repositories to be used. Once the PC is on site, the timezone should be adjusted to reflect the site's location.

# 4.6 Disk Partitioning

- select **manual** partitioning
- follow the interactive menus to partition the disks as follows:
  - for a multi-disk system (with or without raid) put /data and /home on a second or third disk
  - delete all existing partitions if the PC has a pre-installed OS
  - if this is an upgrade preserve /data and /home
  - for systems supporting UEFI (recommended), the first partition should be an EFI boot partition of 0.55GB
  - for systems NOT supporting UEFI, the first partition should be 0.55GB mounted to /boot
  - if the disk sizes are below 1TB, the size of the /home partition might need to be adjusted to ensure the /data partition is large enough for long-term data storage



create partitions according to the following table (example partition sizes based on a minimum disk size of 1TB):

Description	Disk		Mount	Туре	Primary	Minimum Size
	2 HDDs	1 HDD	point		Logical	[GB]
EFI Boot	1	1		EFI boot	Primary	0.55 (550 MB)
Root partition	1	1	/	ext4	Primary	50
Log files and spool data	1	1	/var	ext4	Logical	50
Swap space	1	1	-	swap	Logical	2 x RAM size
IMS spare data area	1	n/a	/data1	ext4	Logical	rest of drive
Home directory	2	1	/home	ext4	Primary	250
IMS data area	2	1	/data	ext4	Logical	rest of drive

Table 1: Minimum partition sizes for a 1 or 2 disk system.

Note: Correct disk partition sizes are critical to the long-term stability of the system, please contact IMS Support if unsure of what partition sizes should be used.

### 4.7 Install the software

When prompted to select additional software packages for installation, select the **OpenSSH Server** package and leave the rest unselected.

- Review all the settings (in the summary and correct if needed)
- Select **Install** on the final step of the process
- After the install completes, Select Restart now

# 5 Network Settings

After Ubuntu installation, edit/etc/network/interfaces and configure the network settings for all network interfaces. Use the example network interfaces file as a starting point, available from http://software. imseismology.org/documents/System/interfaces

The interfaces file is found on the server at /etc/network/interfaces



# 6 Update Ubuntu

Update the Ubuntu installation:

- sudo apt-get update
- sudo apt-get dist-upgrade

# 7 Server Preparation

# 7.1 Additional Packages required by IMS

#### 7.1.1 Ubuntu Extras (compulsory)

A number of additional packages are required by the IMS system. A script named **ubuntu\_extras.sh** is available to install these packages; the latest version of the script can be downloaded from http://software.imseismology.org/os/ubuntu\_extras\_1404.sh.

Run the script, it will determine the package dependencies and install them.

• sh ubuntu\_extras\_1404.sh

Follow the interactive menus, answering Yes if asked to install additional packages.

The postfix installation will ask for some information:

- select **OK**
- select local only

After the script has completed, a log file will be written to disk which summarises the packages installed. Check that all packages were installed correctly. It is recommended that this log file gets copied to /home/ims/Downloads/InstallationRecords.

#### 7.1.2 Ubuntu Extras - GUI addon (optional)

If the system requires the GUI to be installed, run the script named ubuntu\_extras\_1404\_gui\_addon.sh which is available for download from http://software.imseismology.org/os/ubuntu\_extras\_1404\_gui\_addon.sh.

Run the script:



• sh ubuntu\_extras\_ 1404\_gui\_addon.sh

After the script has completed, a log file will be written to disk which summarises the packages installed. Check that all packages were installed correctly. It is recommended that this log file gets copied to **/home/ims/Downloads/InstallationRecords**.

#### 7.1.3 Disable Automatic System Updates (compulsory)

After all additional packages have been installed, disable automatic installation of updates. This should only be completed **after** all updates and packages have been installed.

From the commandline, edit file **/etc/apt/apt.conf.d/10periodic** and ensure the contents are the same as the below:

```
APT::Periodic::Unattended-Upgrade "0";
APT::Periodic::Update-Package-Lists "0";
APT::Periodic::Download-Upgradeable-Packages "0";
APT::Periodic::AutocleanInterval "0";
```

### 7.2 Hardware RAID utility, megacli for PERC

If the disk controller is a Dell PERC H series hardware RAID controller, then install the megacli utility to enable monitoring or changing the disk status.

A version of the package for Ubuntu 12.04 is available at URL: http://software.imseismology. org/os/ or the latest may be obtained from http://hwraid.le-vert.net/ubuntu/pool-precise/ or configure the repository by following instructions at http://hwraid.le-vert.net/wiki/DebianPack If a .deb file has been downloaded, install with sudo dpkg -i megacli\*.deb, there should be no problems with dependencies.

To find the device ID's of the installed disks and check their status, run

sudo megacli -PDList -a0

Check that the error counts for all devices are 0. The smartmontools package should have been installed in step 7.1 above and running megacli creates the device file /dev/megaraid\_sas\_ioctl\_node which the smart utilities use. So running

sudo smartctl -a -d megaraid,0 /dev/sda



should list the S.M.A.R.T. info for disk 0. Repeat for all device ID's listed by megacli. To enable continuous monitoring by smartd, add a line like

```
/dev/sda -d megaraid,0 -a
```

to /etc/smartd.conf for each disk.

Ensure that smartd will be started at boot by uncommenting the line

start\_smartd=yes

in /etc/default/smartmontools. Also, to ensure that the smartd messages are reported by logwatch (on Ubuntu 12.04 at least) create a file /etc/logwatch/conf/services/smartd.conf with the line

LogFile = syslog

Add an entry to root's cron to run the above megacli command once a day. And finally, try to divert root's mail to someone who will read it, by setting an alias in /etc/aliases, and running the command newaliases.

#### 7.3 Create root password

Normally Ubuntu does not have a login for root - all access is via the sudo command using the ims password. For some cases a root login is useful. The following commands will create the root login:

sudo passwd

- enter the ims password when prompted
- enter the technical services root password (twice) when prompted

#### 7.4 Create hardware summary of system

A unified summary of the system hardware is useful for future technical support, and should be generated using the lshw command:

- sudo lshw -html > [host\_name]\_lshw.html
- sudo lshw -xml > [host\_name]\_lshw.xml

Replace [host\_name] with the hostname of the PC.

This command will create a summary of the system hardware (including the DELL service tag number). These files should get copied to **/home/ims/Downloads/InstallationRecords**.



# 7.5 Grub Configuration

- Edit the following file (root privileges required):
  - /etc/default/grub
- Add the following lines at the end of the file:

# If this option is set, it overrides the default # recordfail setting. The default setting is -1, # which causes GRUB to wait for user input. # This option should be set on headless and appliance # systems where access to a console is restricted # or limited. GRUB\_RECORDFAIL\_TIMEOUT=30

#### and change the line

```
GRUB_HIDDEN_TIMEOUT=0
```

to

```
# Setting deprecated when used in conjunction
# with GRUB_TIMEOUT
#GRUB_HIDDEN_TIMEOUT=0
```

- Run the command (root privileges required):
  - update-grub

# 7.6 Remove IMS database from locate DB

The locate database must not be left to run on the IMS database partitions

- Edit the following file (root privileges required)
  - /etc/updatedb.conf
- make sure that the following partitions are added to the PRUNEPATHS entry
  - /data/ims
  - /data1/ims (if used)



### 7.7 UDEV Rules

The following UDEV rules should be added. Examples can be found at http://software.imseismology. org/documents/System/udev\_rules/

#### 7.7.1 USB port

- Create or edit the following file (root permissions required):
  - /etc/udev/rules.d/ttyUSB.rules
- The contents of the file should be:

```
# rules for USB serial cables: change ownership to ims:dialout
SUBSYSTEM=="tty", KERNEL=="ttyUSB*", OWNER="ims", GROUP="dialout"
```

#### 7.7.2 Standard serial ports

- Create or edit the following file (root permissions required):
  - /etc/udev/rules.d/ttyS.rules
- The contents of the file should be:

```
# rules for USB serial cables: change ownership to ims:dialout
SUBSYSTEM=="tty", KERNEL=="ttyS*", OWNER="ims", GROUP="dialout"
# uncomment the next line for NTP with GPS on ttyS0
#SUBSYSTEM=="tty", KERNEL=="ttyS0", SYMLINK+="gps0"
```

#### 7.7.3 Hardware Clock

It is important that the hardware clock (a.k.a. BIOS clock, RTC, etc.) is kept up to date and synchronised to UTC, so that after a reboot or power cycle the server starts up with reasonably accurate time (accurate enough for NTP to slave the local clock to external time servers, i.e. within a few seconds/couple of minutes of UTC). This is handled automatically by the operating system and NTP, but it is possible that the hardware clock can fall far out of sync (e.g. due to the BIOS battery running flat or other software changing the hardware clock to localtime).

For this reason the Synapse Server software will periodically check the hardware clock, and raise an issue if the hardware clock time is out of sync with UTC, but to be able to do this the hardware clock driver device file needs to be made accessible (readable) to the ims user. This can be achieved with a udev rule:



- Create or edit the following file:
  - /etc/udev/rules.d/imsRTC.rules:
- Contents of the file should be:

# Rule to grant read access to Real Time Clock
# Changes group ownership to ims and give group read permission
SUBSYSTEM=="rtc", KERNEL=="rtc\*", GROUP="ims", MODE="0640"

The system needs to be told that the hardware clock is set to UTC time. Ensure that the setting in /etc/default/rcS is:

UTC=yes

Once the time on the PC is correct - preferrably set through NTP, the following can be performed to set the hardware clock based on the current system time:

```
sudo hwclock --systohc --utc
```

Double-check that the time was set correctly by printing out the system time and hardware clock (they should be roughly the same):

```
date; sudo hwclock --utc
```

### 7.8 Change ssh server settings

Edit the file /etc/ssh/sshd\_config and make sure the following are set correctly

- Protect ssh root access
  - PermitRootLogin no
- Disable reverse DNS lookup
  - UseDNS no



# 8 Customise Server

Once on site, the server can be customised based on the specific system setup.

### 8.1 Moxa terminal servers (N-ports)

This unfortunately has to be done in a non-portable way, because the driver does not go through udev.

- Edit the following file:
  - /etc/rc.local:
- Contents of the file should be (note the line to be uncommented for GPS/NTP applications):

```
# change ownership of Moxa serial ports to ims:dialout
chown ims:dialout /dev/ttyr[01][0-9]
# uncomment the next 4 lines for NTP with GPS on ttyr00,
# and change ttyr00 as required
# ln -s /dev/ttyr00 /dev/gps0
# chown -h ims:dialout /dev/gps0
# stty 9600 -F /dev/ttyS0
# stty 9600 -F /dev/ttyS0
```

# 8.2 Time Synchronisation viaNTP

The Synapse server should synchronise to external time servers and will act as the time server for IMS devices in the field.

Most mines should have an NTP server on the local LAN (IP address supplied by the IT department).

A list of Internet NTP servers is provided and maintained by the POOL.NTP.ORG project. Time servers that are relatively close to the network location should be used; so if possible use servers that are specific to the country, or else servers in nearby countries, or servers in the appropriate world region. See pool.ntp. org for servers in the appropriate pool. Note that using Internet server's assumes that the port used by NTP (123) is allowed past the firewall etc.



#### 8.2.1 Synchronising to GPS

Where time synchronisation is via a GPS, the GPS's NMEA port should be connected to a serial port on the server, with the PPS signal on the DCD line of the serial port. Remember to make the correct symbolic link (/dev/gps0) to the serial port at boot time - refer to section 7.7.2.

The NTP program is started by the system by ntp user which will not have permission to read from the serial port. Based on how serial port ownership and permissions have been configured (section 7.7.2), add the ntp user to the dialout group as follows:

• sudo adduser ntp dialout

**AppArmor ntpd profile** By default Ubuntu will have an AppArmor profile enabled which restricts ntpd's access to the serial port. As a result ntpd will not be able to access the GPS NMEA messages via the serial port. The symptoms of this are that the GPS clock (refid: .GPS.) will not be visible in the output of the ntpq -p program command. There should also be a message in the system logs (/var/log/syslog and/or /var/log/messages) with fields such as: apparmor="DENIED", profile="/usr/sbin/ntpd" and name="/dev/ttyS0".

To disable this behaviour, put AppArmor's ntpd profile into complain mode, which will log attempts by ntpd to open the serial port, but will not disallow it. An AppArmor profile can be put into complain mode by using the aa-complain command. aa-complain should have been installed by the ubuntu-extras.sh script, but if it is not installed on the machine, you can do so by typing: sudo apt-get install apparmor-utils.

To put the ntpd program into complain mode, run the following command:

sudo aa-complain /usr/sbin/ntpd

#### 8.2.2 NTP configuration file

- The NTP configuration file should always contain an entry for the local clock (server 127.127.1.0) so that if all external servers are unreachable, the server can still act as a time source to clients (IMS devices).
- *Never have only 2 servers defined* (not including the local clock) 1 is better, 4 to 5 are recommended.
- Edit /etc/ntp.conf, commenting out all servers defined by default in Ubuntu, and add entries for the local clock, regional servers, local server and GPS. Example sections of the ntp.conf file defining the servers (with comments) is available for Ubuntu 10.04 and 12.04 at the following URL's (note: these files are different):



- Ubuntu 12.04 and 14.04: http://software.imseismology.org/documents/ntp. conf-servers-example\_ubuntu12.04.txt
- Restart ntp:
  - sudo service ntp restart
- Check NTP status:
  - ntpq -p

### 8.3 Timezone

The timezone of the PC should be set to the correct location. This can be done from the commandline:

- 1. sudo dpkg-reconfigure tzdata
- 2. Follow the directions to select the correct timezone

If the GUI is available, the following can be performed:

- 1. Open the System Settings (available on the power icon in the top right corner of the screen).
- 2. Open the **Time & Date** application.
- 3. Use the **Time & Date** panel to set the location and timezone.

# 8.4 Hardware Clock

Once the NTP and system timezone has been configured on site and the system time slaved to a reliable time source, the hardware clock should be updated manually to check that it is correct. Similar to in 7.7.3, the following should be performed:

sudo hwclock --systohc --utc

Double-check that the time was set correctly by printing out the system time and hardware clock (they should be roughly the same):

date; sudo hwclock --utc



## 8.5 SAMBA

SAMBA can be set up either graphically or from the commandline. Either way at least one data share must be setup to share the IMS database (/data/ims) for remote access by Windows Trace clients:

From a Graphical Login

- On the server, open the file browser:
  - Places -> Home
- Create the directory you wish to share
- Right click on the folder and select Sharing Options
  - Check the Share this folder checkbox (eg. /data/ims)
  - Add a share name and comment (e.g. "ims\_data" and "IMS databases share")
  - Check the Allow others to create and delete files options ONLY IF NECESSARY
  - Ensure Guest Access checkbox is left UNCHECKED
  - Click Create share
    - \* Click on the Add permissions automatically if prompted to do so

From the Command-Line:

- Open a terminal on the server
- Type the following command:
  - net usershare add ims\_data /data/ims "IMS databases share" ims:F
    guest\_ok=n
  - If this command fails with an error about you not having permissions to create a usershare, then you should add the ims user to the "sambashare" group as follows:

\* sudo adduser ims sambashare

- \* Logout and login again for the new group membership changes to take affect: you can check what groups the user belongs to by typing:
  - groups
- Once you have added the ims user to the sambashare group, run the above "net usershare..." command again



- This adds a share called "ims\_data" with description/comment "IMS databases share", which shares the /data/ims directory with full permissions for the ims user, guest access is not allowed
- To check the created usershare, type:
  - net usershare info --long

```
You should see the following output:
[ims_data]
path=/data/ims
comment=IMS databases share
usershare_acl=TSTIMS1\ims:F
guest_ok=n
```

#### Final Steps:

- Create a SAMBA password for the ims user (if not already done):
  - sudo smbpasswd -a ims (use the same password as the system ims user)
- Ensure ims user is enabled in local smbpasswd file:
  - sudo smbpasswd -e ims
  - sudo service smbd restart
- On a Windows client:
  - Browse to the share by entering \\hostname\share\_name in Windows file explorer
  - Map network drive as usual for use with Trace/Vantage

# 9 Install IMS Software

Continue with the installation of IMS software as required.



# **Change Record**

Date	Description	Revision						
Change Control Record								
2015/11/12	Original document by Gareth Goldswain based on	0						
	PROC-SERVERINSTALL-201111-IMSv35							
2016/09/26	Updated document to latest procedures. Specifically the disk partition	1						
	information and Ubuntu Extras sections. Added the SAMBA section							
2016/10/27	Updated some of the URLs. Added some example commands.	2						
2017/08/31	Updated non-EFI boot partition size and added Section 9.	3						

Table 3: Change record

