

Open source tools: Making a VM server

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Open source tools

- Hypervisor – VirtualBox
- Operating system – Ubuntu Server
- Remote access (SSH, SFTP)
- Linux commands

Virtualization (Hypervisor)

- Focus on **VirtualBox**, software for virtualization
- VirtualBox **enables** creating of a **virtual environment** and let us install a **guest operating system**
- VirtualBox is **Type 2 hypervisor**, it runs as an application within **host operating system**.
- Alternatively, **Type 1** hypervisors are installed directly onto hardware ("**bare metal**" hypervisor)

VirtualBox download and install

- Link: <https://www.virtualbox.org/wiki/Downloads>



The screenshot shows the VirtualBox website's download page. On the left is a sidebar with navigation links: About, Screenshots, Downloads, Documentation (with sub-links for End-user docs and Technical docs), Contribute, and Community. The main content area features the VirtualBox logo, a heading 'Download VirtualBox', and a paragraph stating that links to binaries and source code are provided. Below this is a section for 'VirtualBox binaries' with a disclaimer about terms and conditions. It lists three main categories: platform packages (with sub-links for Windows, OS X, Linux, and Solaris), the Oracle VM VirtualBox Extension Pack (with a link to all supported platforms and a note about installation), and the Software Developer Kit (SDK) (with a link to all platforms). A changelog link is provided, followed by a note about verifying checksums (SHA256 and MD5) and a recommendation to upgrade guest additions. The page concludes with a 'User Manual' section and a link to access it.

VirtualBox

Download VirtualBox

Here, you will find links to VirtualBox binaries and its source code.

VirtualBox binaries

By downloading, you agree to the terms and conditions of the respective license.

- **VirtualBox platform packages.** The binaries are released under the terms of the GPL version 2.
 - **VirtualBox 5.1.8 for Windows hosts** [↗ x86/amd64](#)
 - **VirtualBox 5.1.8 for OS X hosts** [↗ amd64](#)
 - **VirtualBox 5.1.8 for Linux hosts**
 - **VirtualBox 5.1.8 for Solaris hosts** [↗ amd64](#)
- **VirtualBox 5.1.8 Oracle VM VirtualBox Extension Pack** [↗ All supported platforms](#)
Support for USB 2.0 and USB 3.0 devices, VirtualBox RDP and PXE boot for Intel cards. See [this chapter from the User Manual](#) for an Pack. The Extension Pack binaries are released under the [VirtualBox Personal Use and Evaluation License \(PUEL\)](#).
Please install the extension pack with the same version as your installed version of VirtualBox:
*If you are using **VirtualBox 5.0.26**, please download the extension pack [↗ here](#).*
- **VirtualBox 5.1.8 Software Developer Kit (SDK)** [↗ All platforms](#)

See the [changelog](#) for what has changed.

You might want to compare the [SHA256](#) checksums or the [MD5](#) checksums to verify the integrity of downloaded packages. *The SHA256 checksum algorithm must be treated as insecure!*

Note: After upgrading VirtualBox it is recommended to upgrade the guest additions as well.

User Manual

The VirtualBox User Manual is included in the VirtualBox binaries above. If, however, you would like to take a look at it without having to install it, [access it here](#).

VirtualBox

- Creating a virtual machine (VM)
- Carefully select:
 - Number of CPUs,
 - RAM memory,
 - Hard drive size
 - Network adapter (Bridge mode)

The use of VirtualBox

- We need an operating system

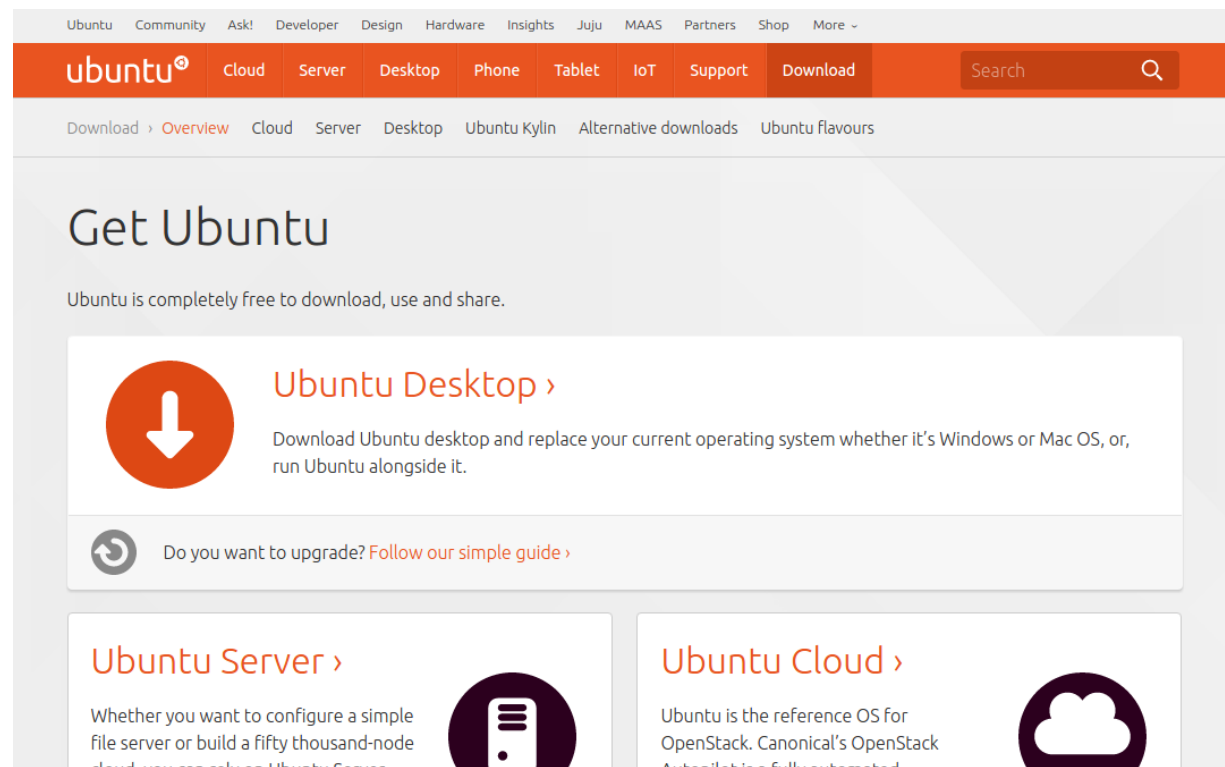


Ubuntu Linux OS

- **Open source**
- Ubuntu is one of the most popular **Linux** distros
- Often used on **servers** on **Internet** and **Cloud**

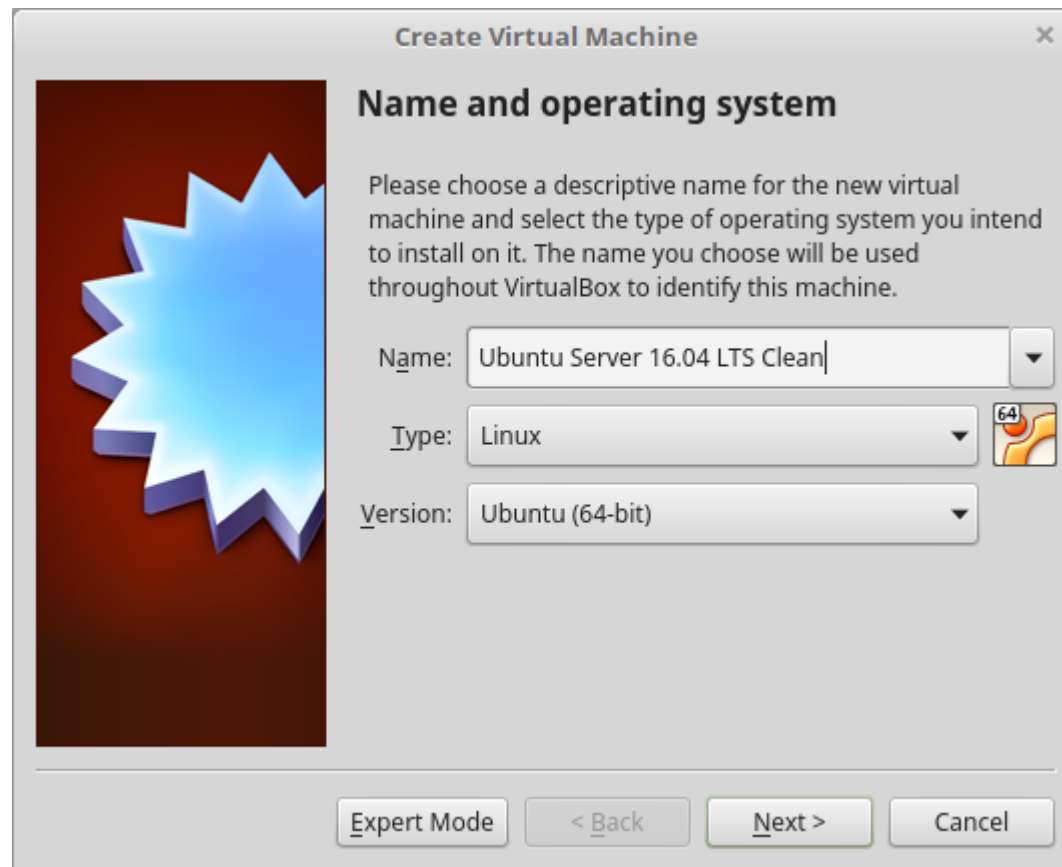
Downloading Ubuntu ISO file

- Link: <https://www.ubuntu.com/download>
- Server LTS, 64-bit, ISO file

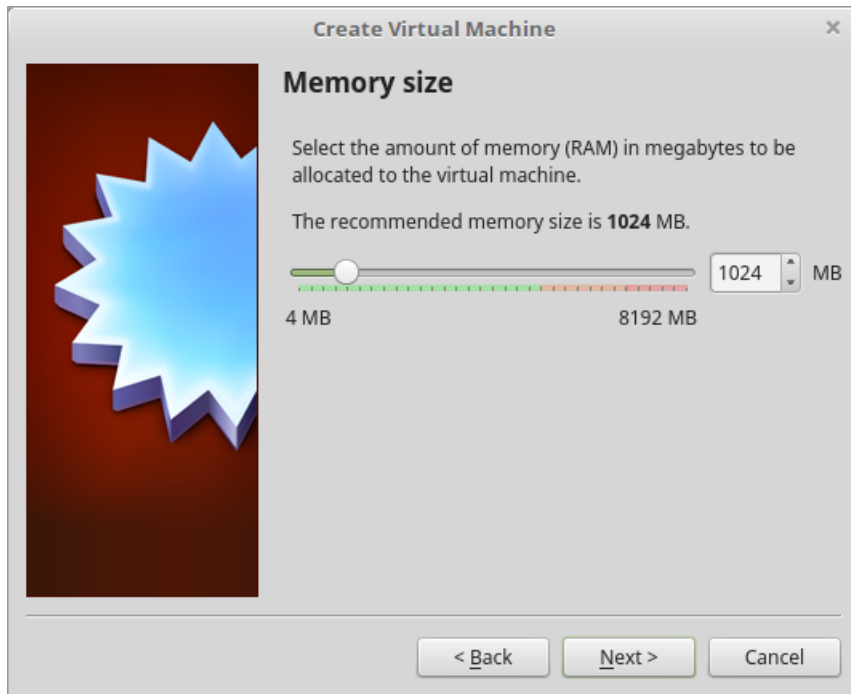


VirtualBox – Creating a VM

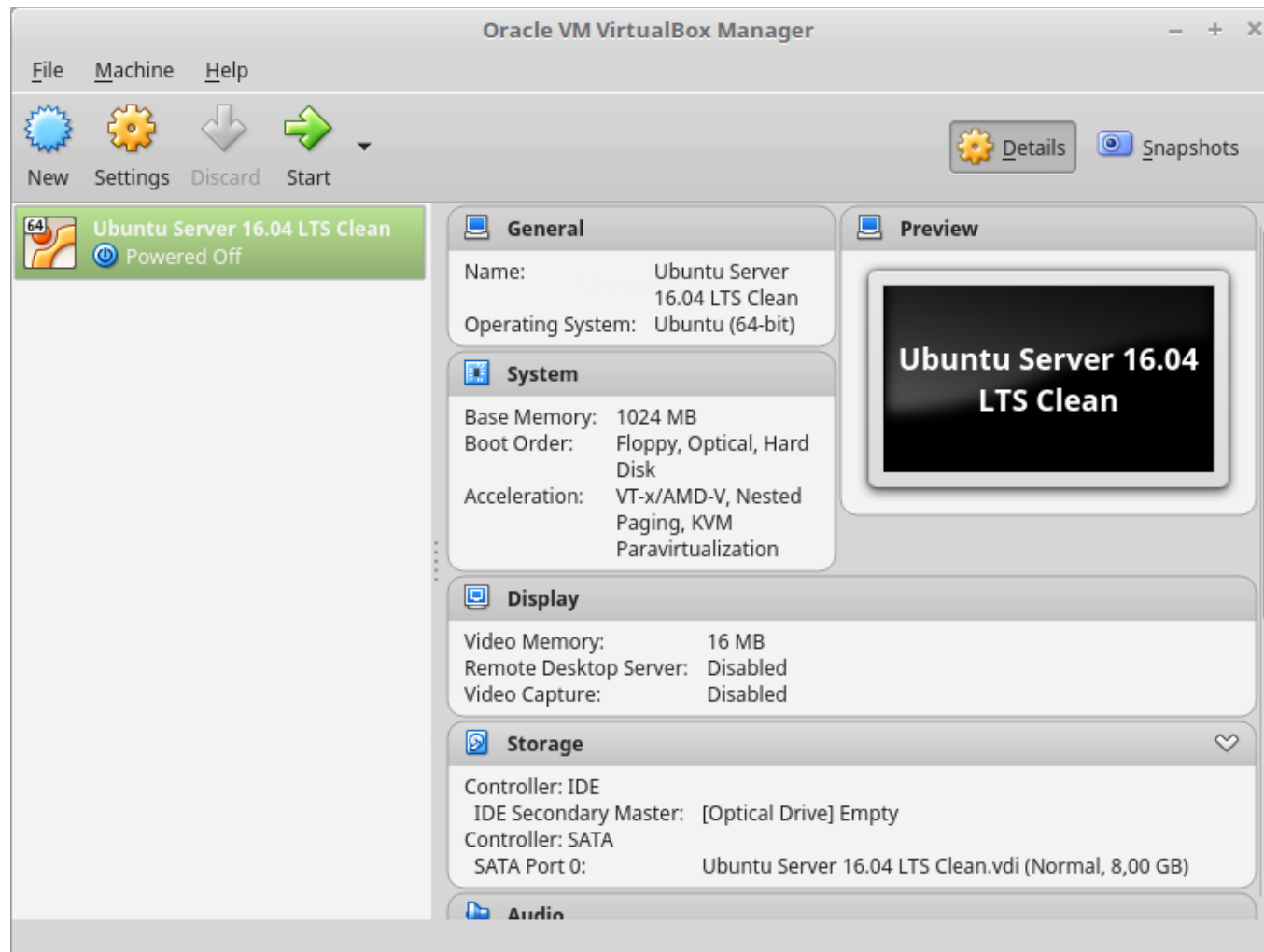
- Name VM and select the OS



VirtualBox – Creating a VM

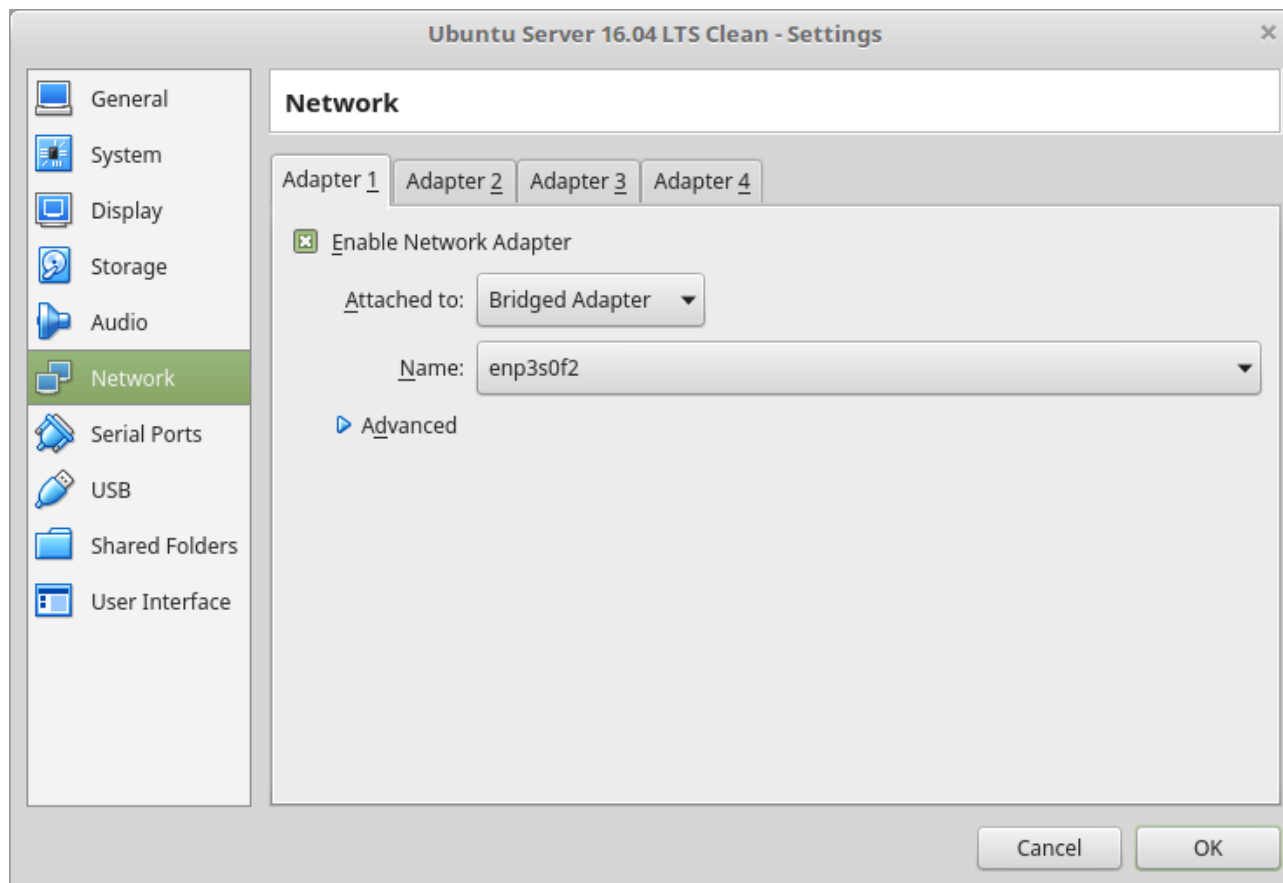


Looking at new VM



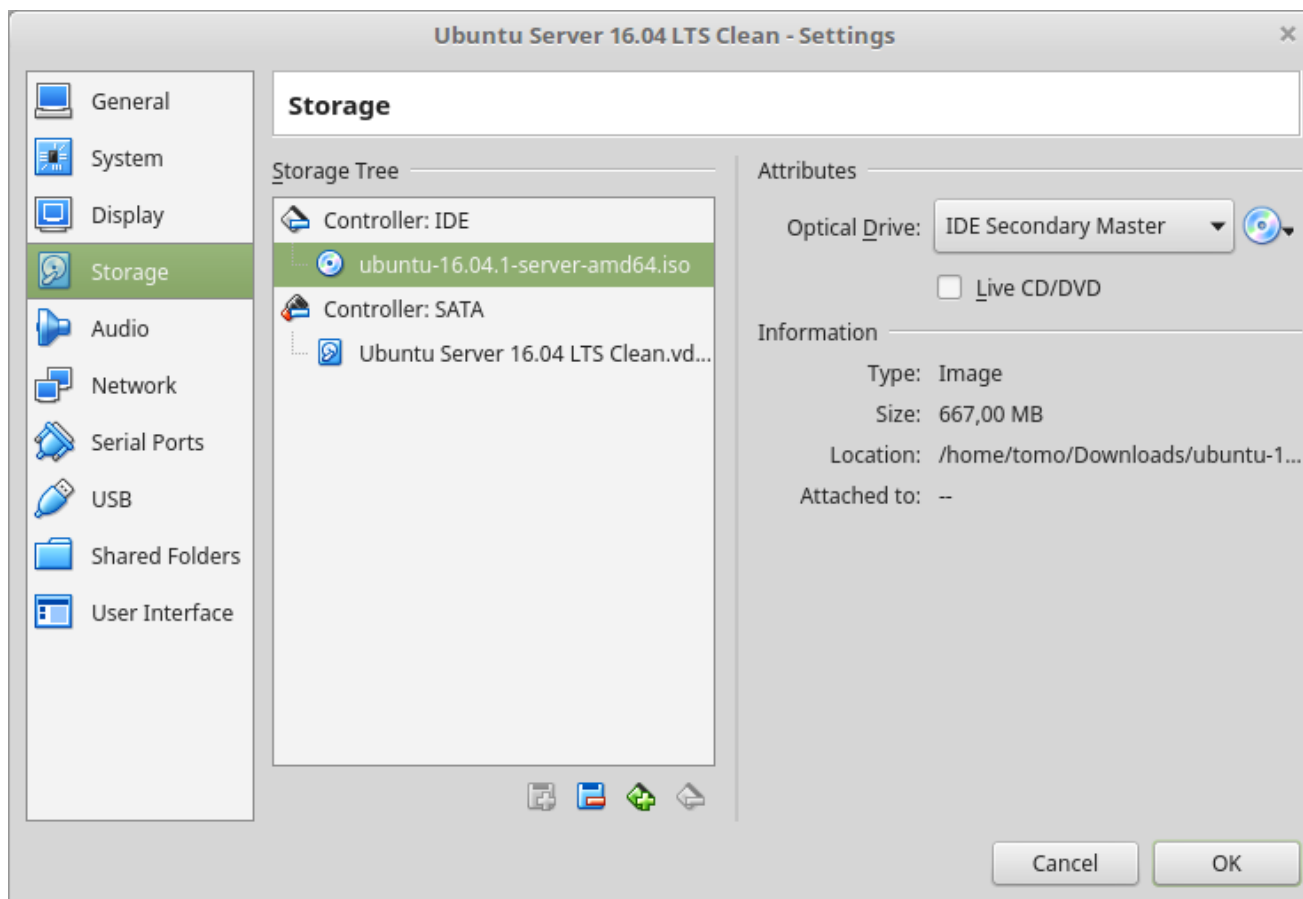
Network Settings

- Bridge mode



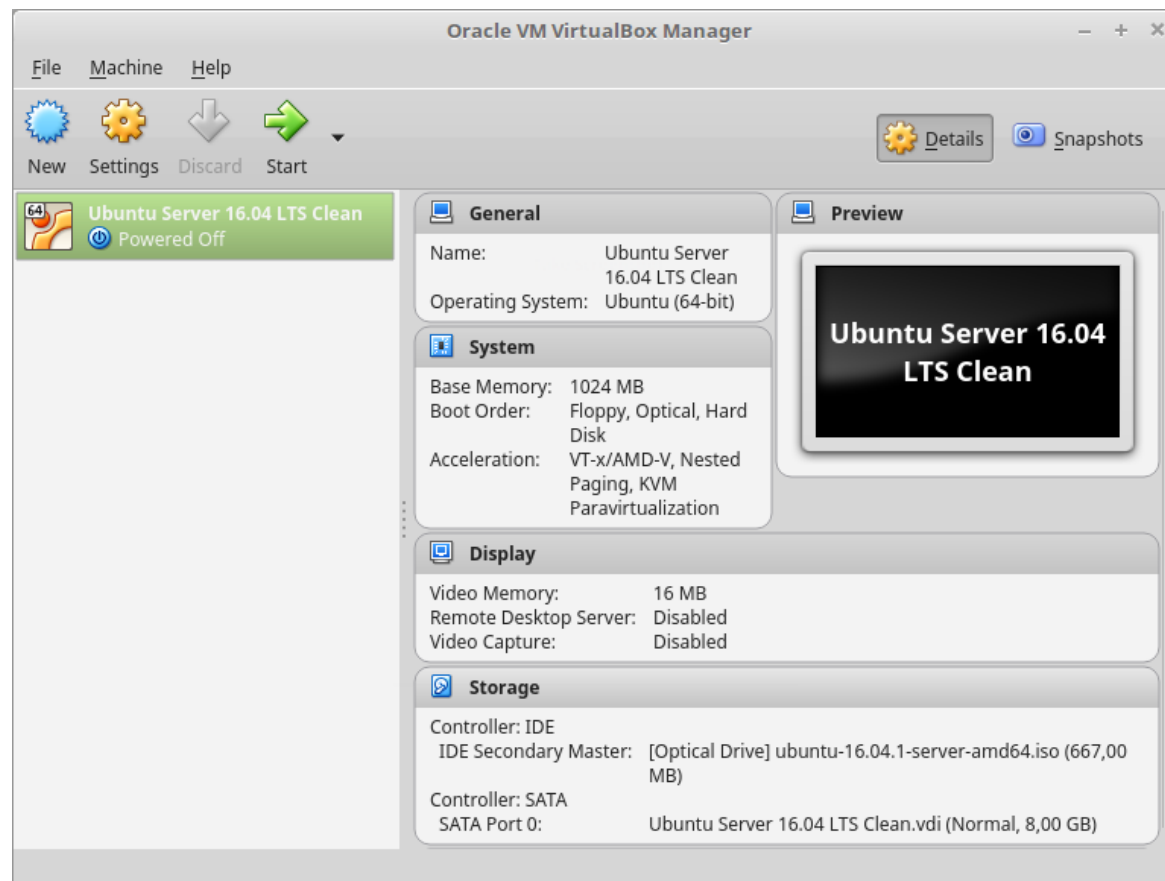
Storage Settings

- Select the ISO file



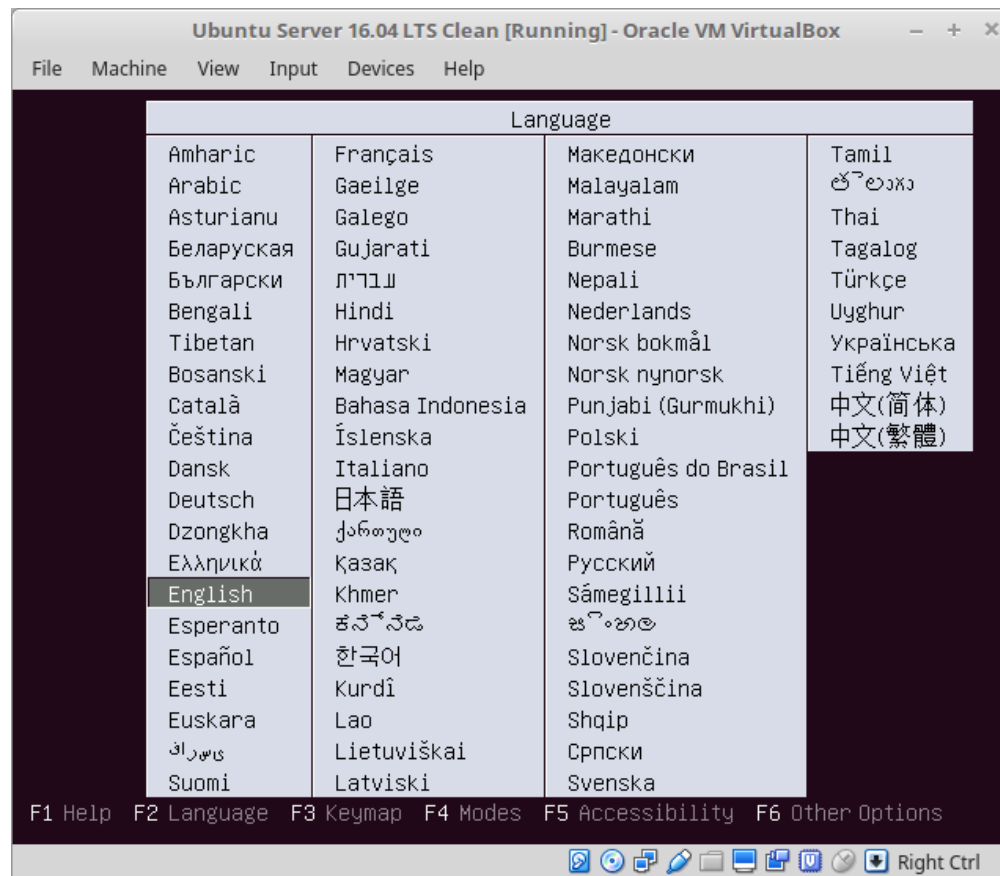
Starting the new VM

- We are ready to start...



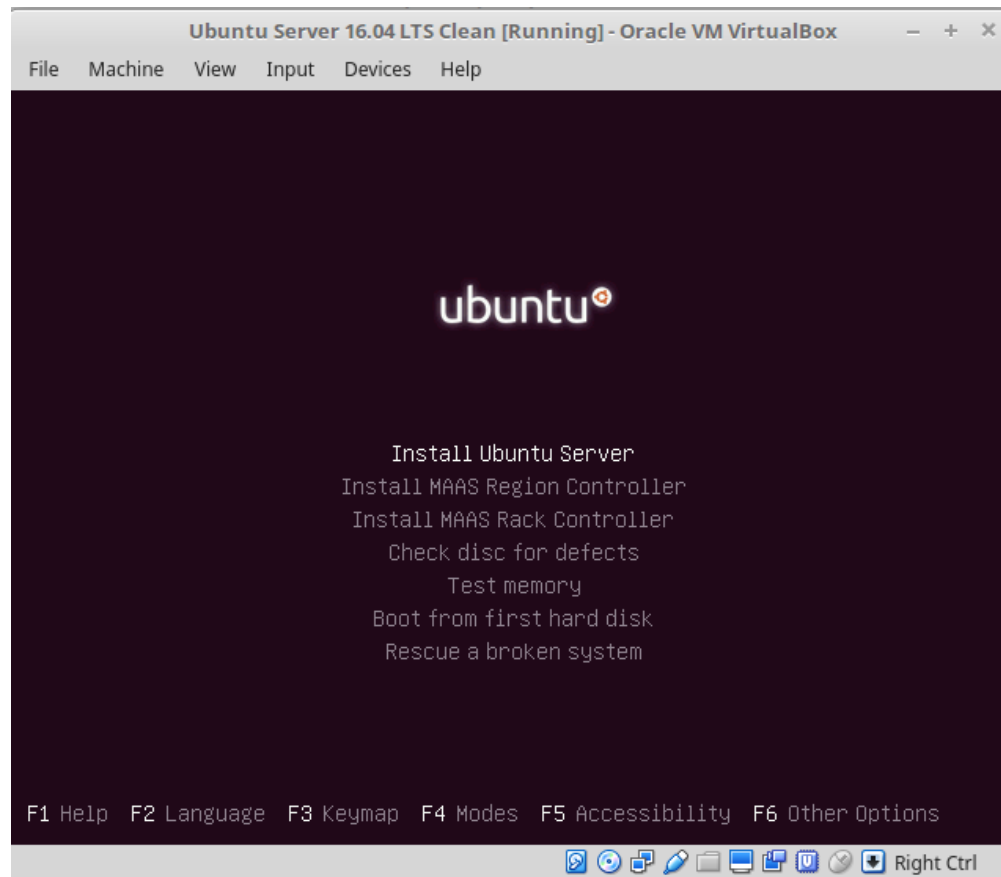
Initial start of the VM

- Booting from CD/DVD (ISO file)

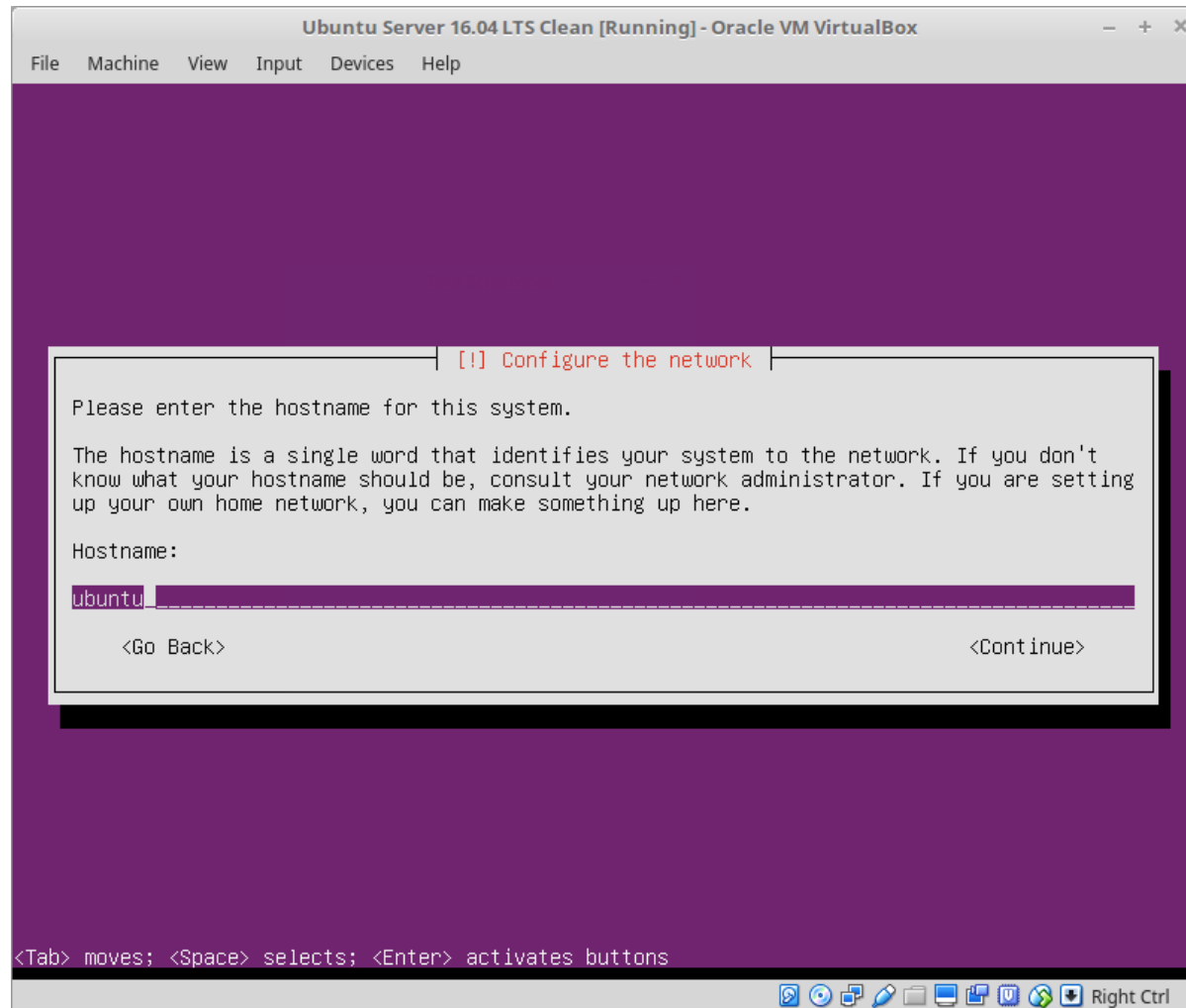


Starting Ubuntu installation

- Right CTRL “releases” the mouse

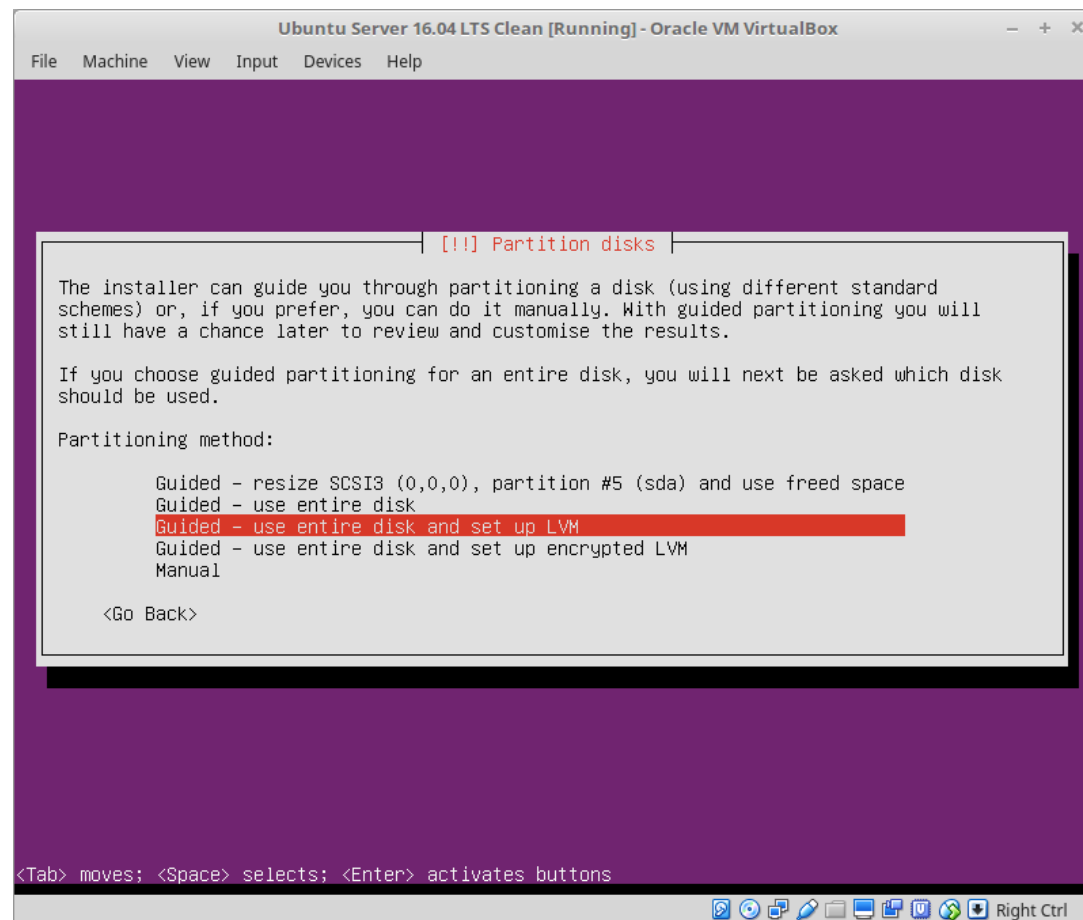


Installing Ubuntu to the VM



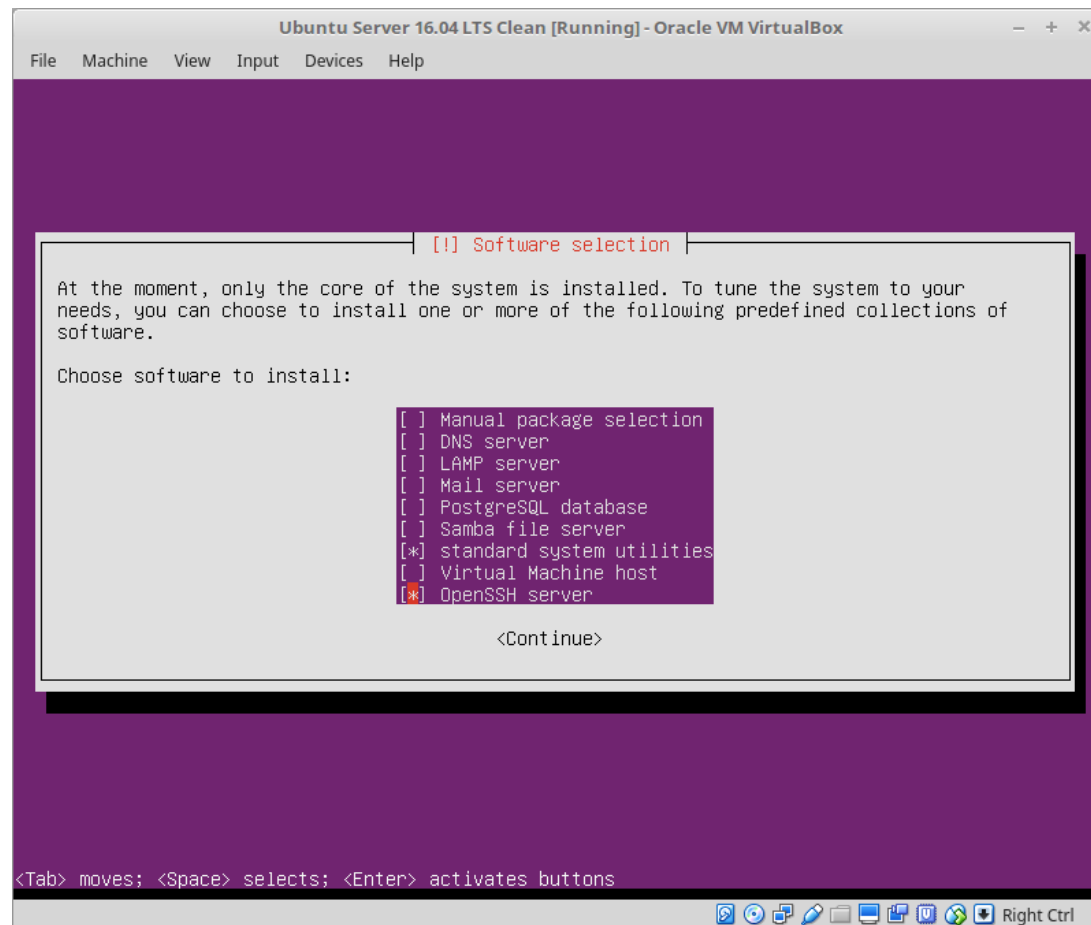
Installing Ubuntu to the VM

- Disk partition, for now select default



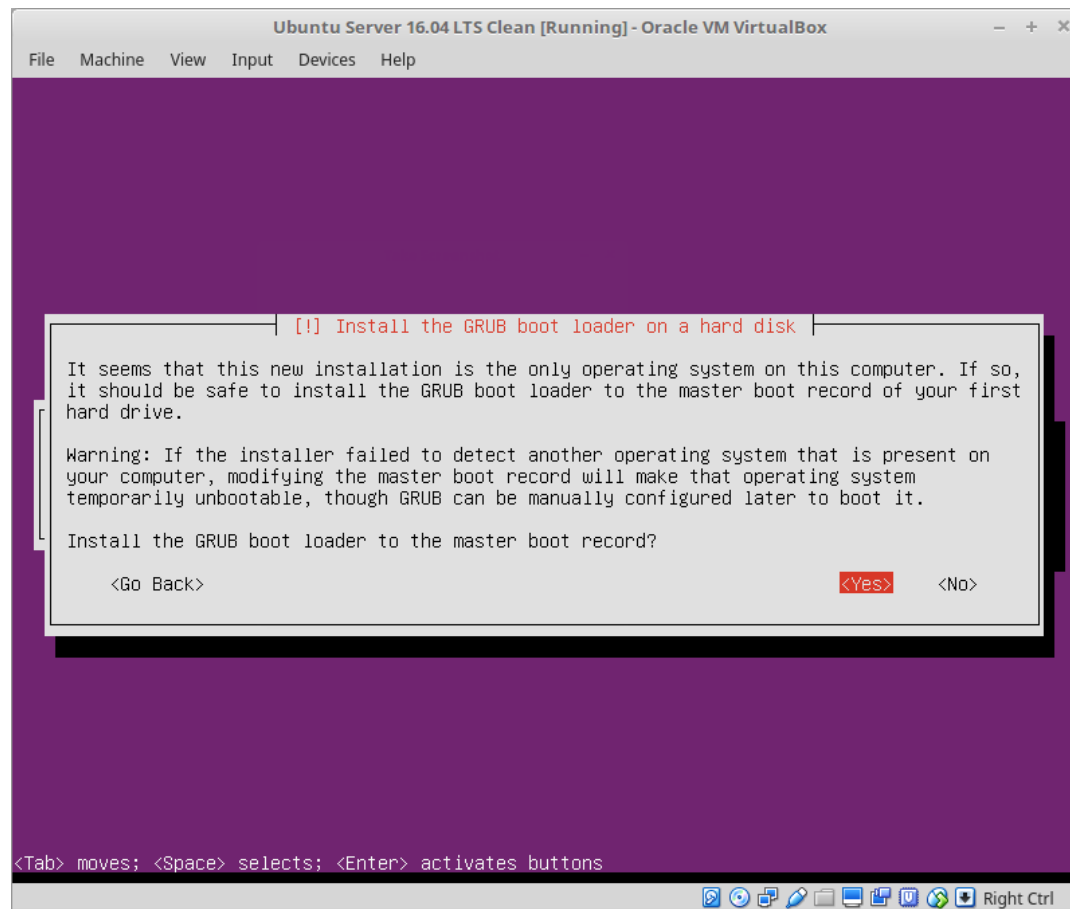
Additional software

- Select OpenSSH server



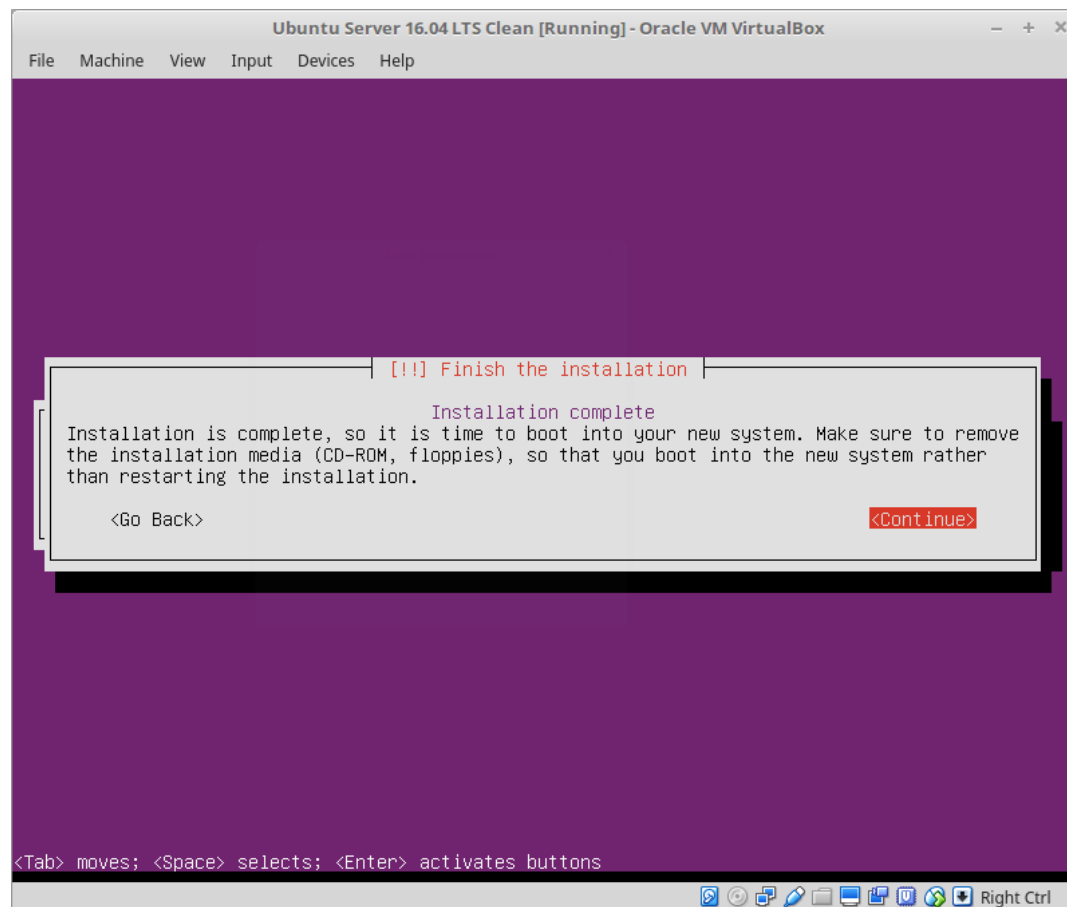
Finalizing installation

- GRUB boot loader



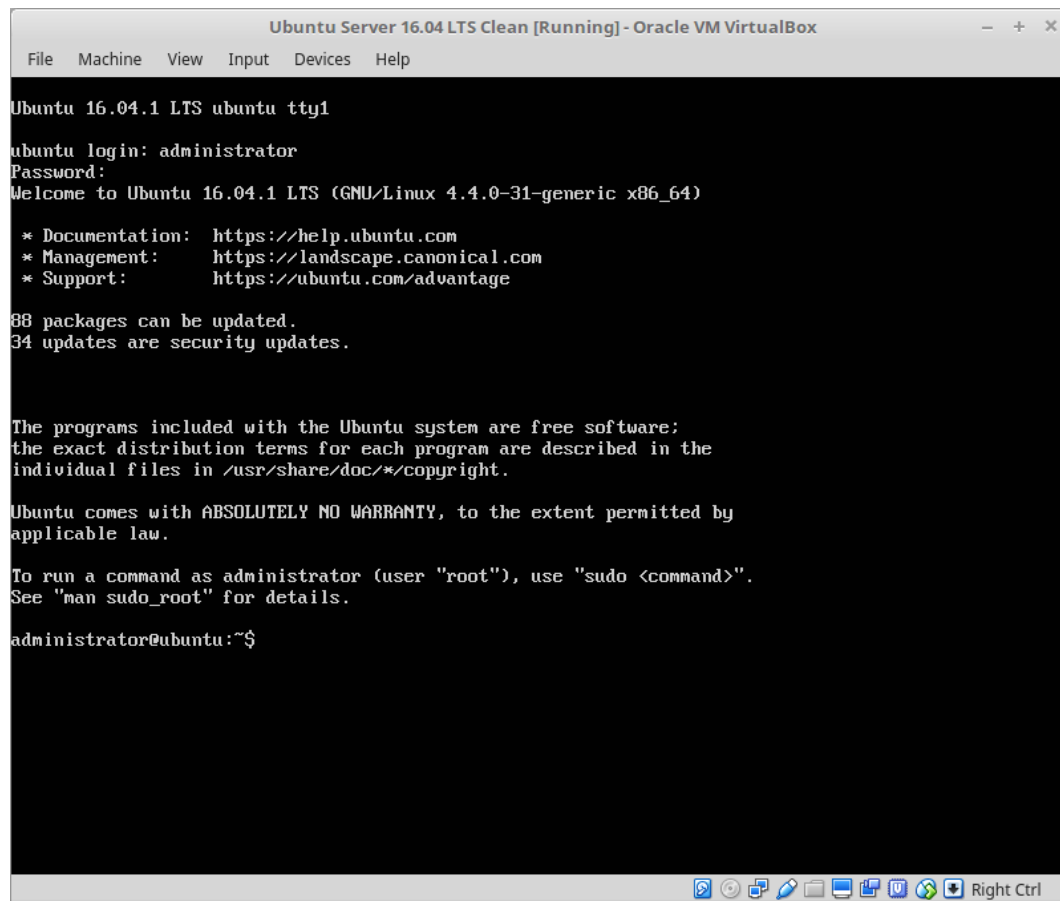
Starting the VM

- Rebooting after the installation



VM server

- Looking at new VM server via **VirtualBox**



The screenshot shows a VirtualBox window titled "Ubuntu Server 16.04 LTS Clean [Running] - Oracle VM VirtualBox". The window displays the Ubuntu installer's initial boot screen. The text on the screen includes the Ubuntu version, login prompt for the 'administrator' user, a welcome message, links to documentation, management, and support, a notification about 88 packages and 34 security updates, and a disclaimer about the free software and warranty. The prompt at the bottom is "administrator@ubuntu:~\$".

```
Ubuntu 16.04.1 LTS ubuntu tty1
ubuntu login: administrator
Password:
Welcome to Ubuntu 16.04.1 LTS (GNU/Linux 4.4.0-31-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

88 packages can be updated.
34 updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

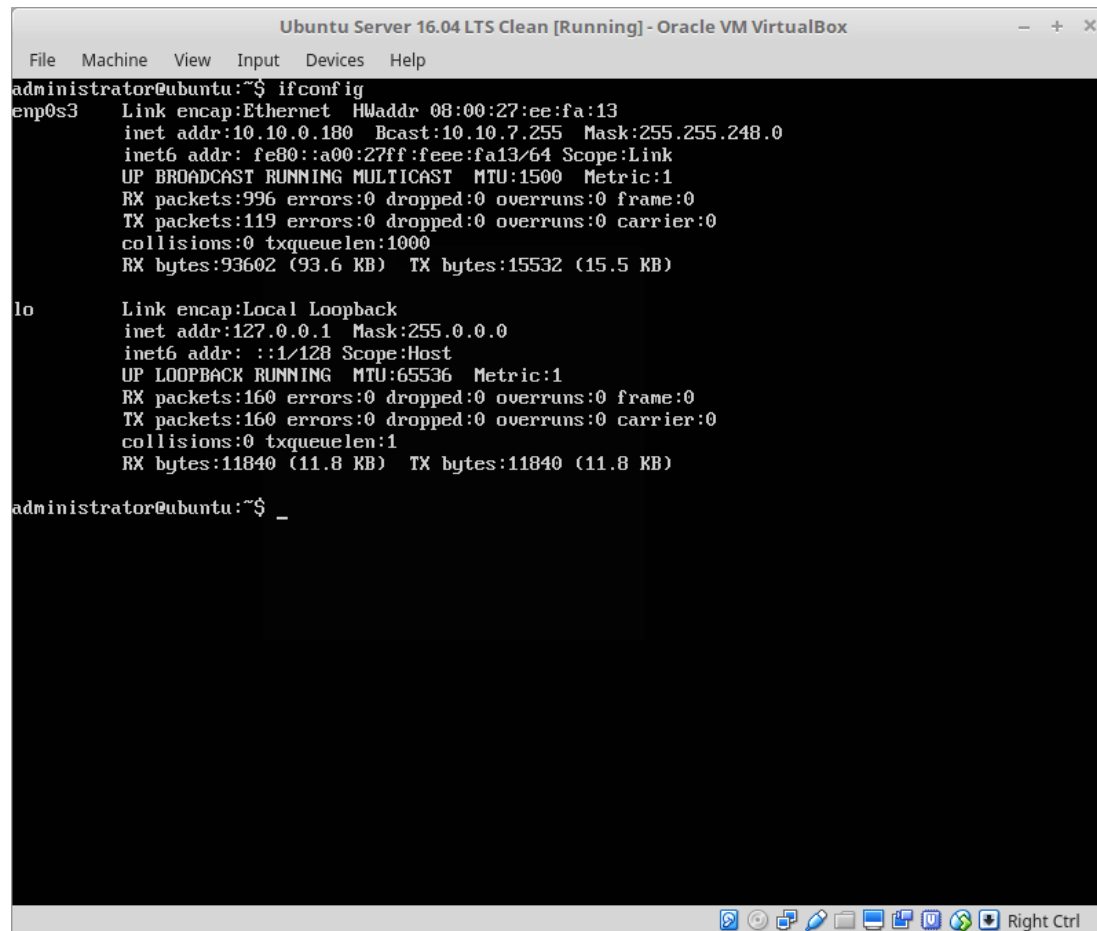
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

administrator@ubuntu:~$
```

Network test

- Commands **ifconfig**, **ping**, **CTRL+C**



```
Ubuntu Server 16.04 LTS Clean [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
administrator@ubuntu:~$ ifconfig
enp0s3  Link encap:Ethernet  HWaddr 08:00:27:ee:fa:13
        inet addr:10.10.0.180  Bcast:10.10.7.255  Mask:255.255.248.0
        inet6 addr: fe80::a00:27ff:feee:fa13/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:996 errors:0 dropped:0 overruns:0 frame:0
        TX packets:119 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:93602 (93.6 KB)  TX bytes:15532 (15.5 KB)

lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:160 errors:0 dropped:0 overruns:0 frame:0
        TX packets:160 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1
        RX bytes:11840 (11.8 KB)  TX bytes:11840 (11.8 KB)

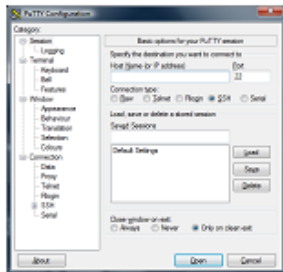
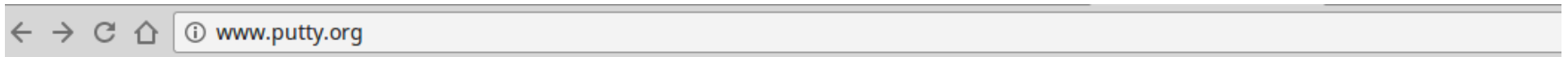
administrator@ubuntu:~$ _
```

Remote access

- SSH terminal
- PuTTY for Windows
 - Select 32 i 64-bit version

PuTTY client for Windows

- <http://www.putty.org/>



Download PuTTY

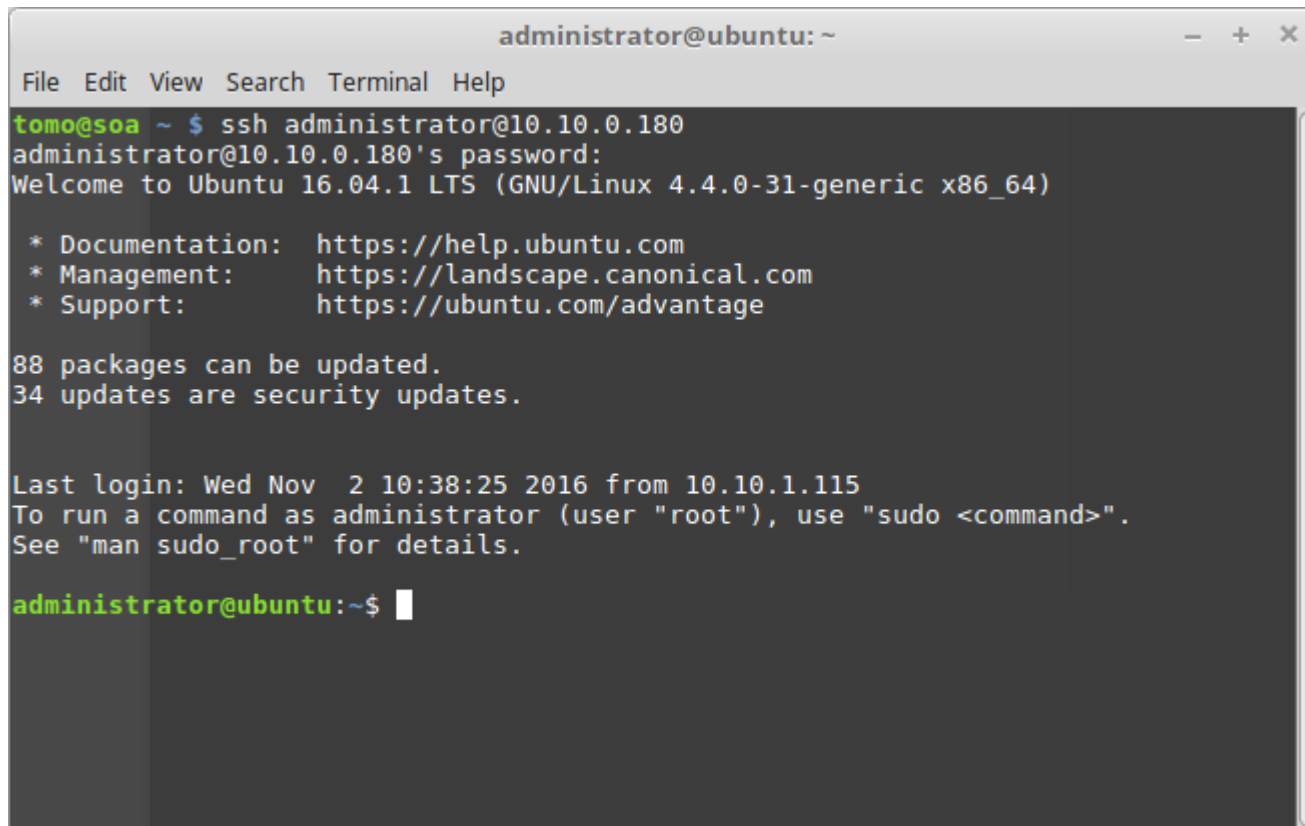
PuTTY is an SSH and telnet client, developed originally by Simon Tatham for the Windows platform. It is available with source code and is developed and supported by a group of volunteers.

You can download PuTTY [here](http://www.putty.org/).

Below suggestions are independent of the authors of PuTTY. They are *not* to be seen as endorsements by the

Remote access via SSH

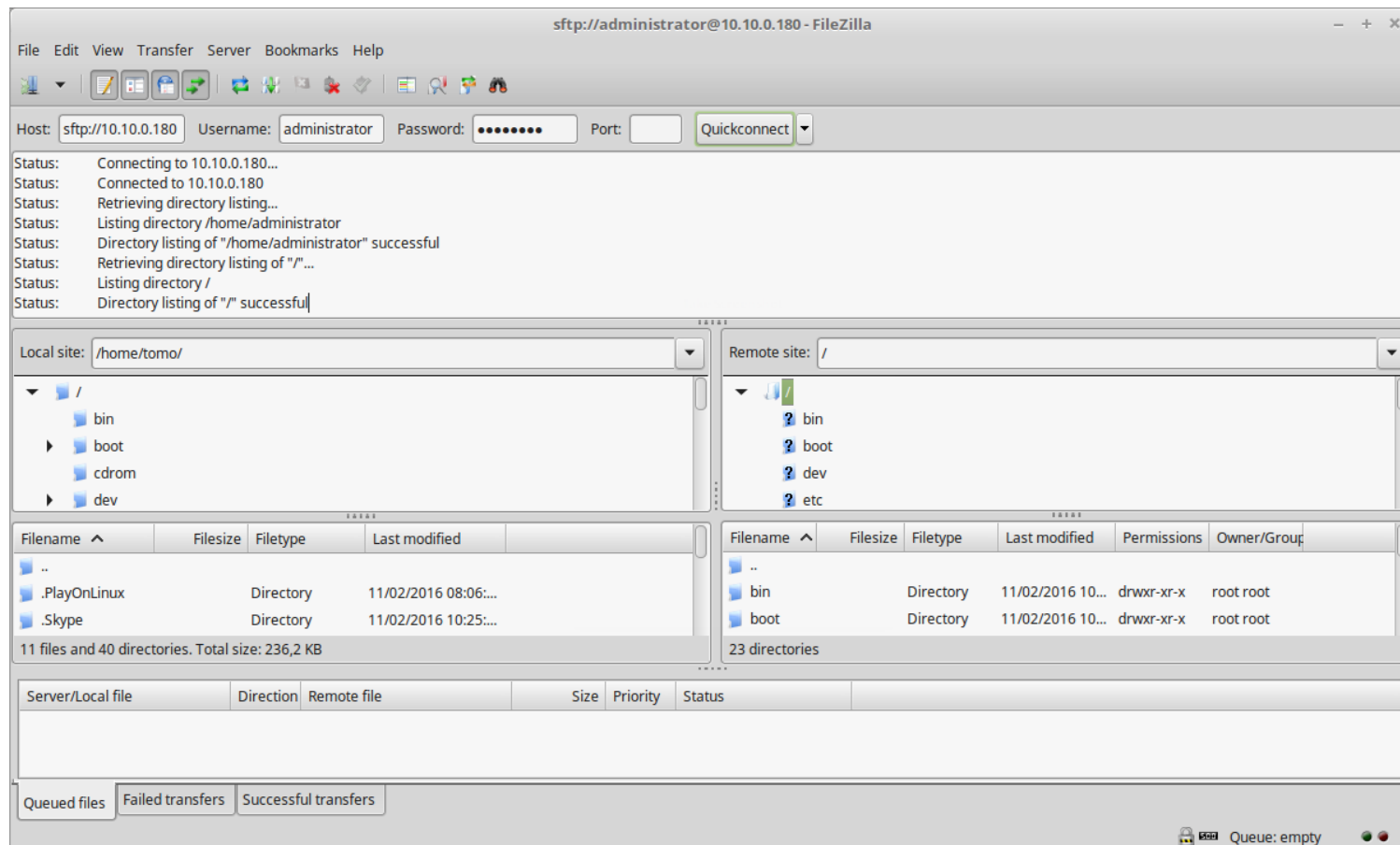
- SSH client (Linux terminal)



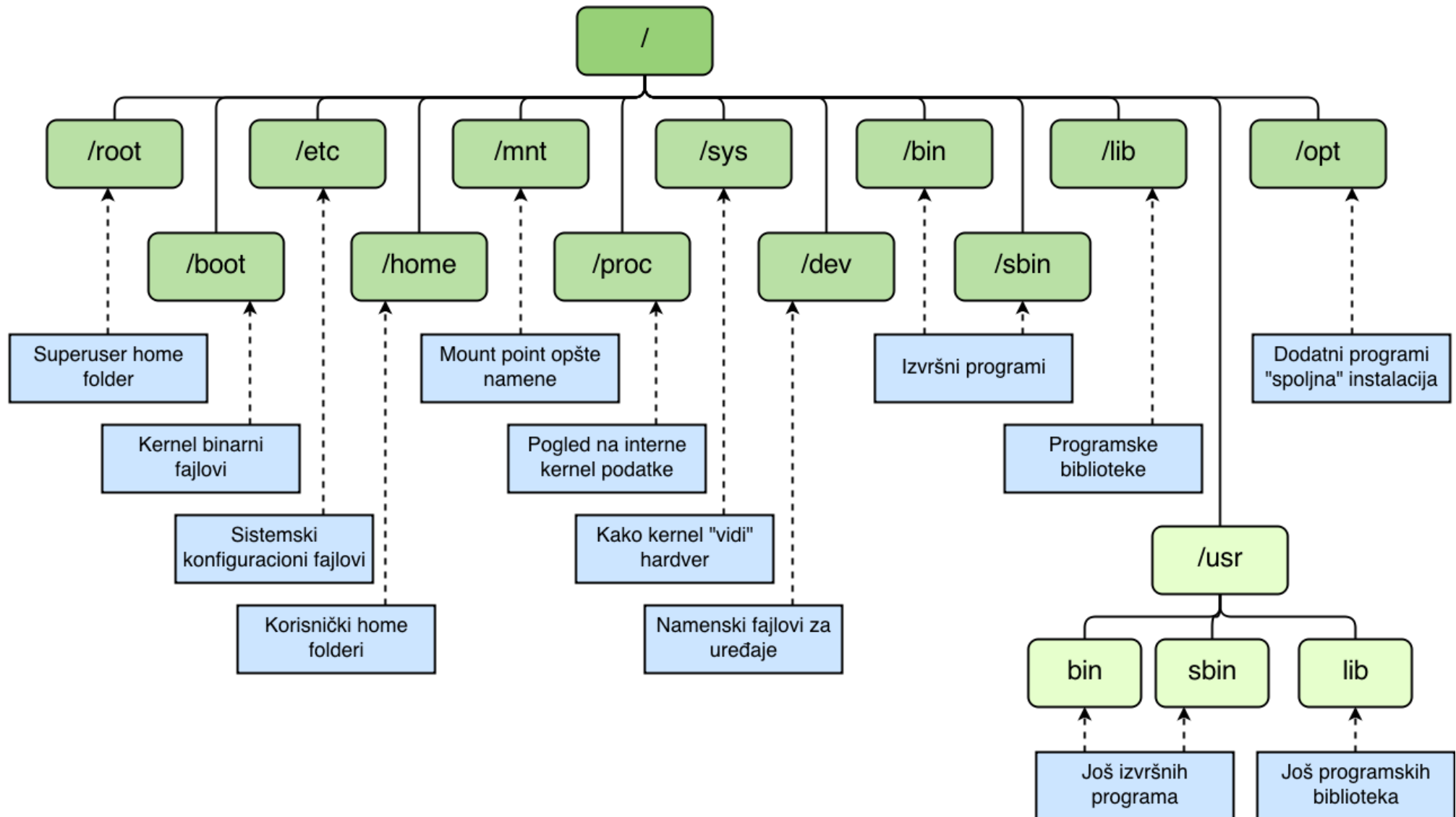
```
administrator@ubuntu: ~  
File Edit View Search Terminal Help  
tomo@soa ~ $ ssh administrator@10.10.0.180  
administrator@10.10.0.180's password:  
Welcome to Ubuntu 16.04.1 LTS (GNU/Linux 4.4.0-31-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
88 packages can be updated.  
34 updates are security updates.  
  
Last login: Wed Nov  2 10:38:25 2016 from 10.10.1.115  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
administrator@ubuntu:~$
```

Remote access SFTP

- SFTP client (FileZilla)



File structure in Linux



Linux commands

- **logout** – logging out
- **exit** – exiting the terminal
- **ls** – list files in current folder
- **pwd** – show current folder
- **cd** – change directory
- **man *cmd*** – display *cmd* instructions
- **cp** – copying files and directories
- **mv** – moving/renaming files and directories
- **rm** – removing/deleting files and directories
- **ifconfig** – show/change network adapter configuration

Run command as an Admin

- **sudo cmd** – executing commands as an administrator
- **sudo apt-get** [update | upgrade | install | remove] - program installation
- **sudo su** – switch to superuser mode
- Example:
 - sudo apt-get install **mc htop**
 - Check /etc/apt/sources.list (with nano)

htop and mc

```
Ubuntu Server 16.04 LTS Clean [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

CPU 0.7% Tasks: 26, 15 thr: 1 running
Mem 57.5M/992M Load average: 0.00 0.00 0.00
Sup 0K/1024M Uptime: 00:44:22

PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
3238 administr 20 0 26064 3828 3124 R 0.7 0.4 0:00.06 htop
2175 root 20 0 37880 5948 3992 S 0.0 0.6 0:01.60 /sbin/init
825 root 20 0 28356 3088 2760 S 0.0 0.3 0:00.12 /lib/systemd/sys
858 root 20 0 100M 3584 1316 S 0.0 0.4 0:00.00 /sbin/lumeta -f
882 root 20 0 45072 4696 3112 S 0.0 0.5 0:00.26 /lib/systemd/sys
1479 systemd-t 20 0 97M 2600 2392 S 0.0 0.3 0:00.00 /lib/systemd/sys
1468 systemd-t 20 0 97M 2600 2392 S 0.0 0.3 0:00.03 /lib/systemd/sys
2016 root 20 0 269M 8212 5480 S 0.0 0.8 0:00.06 /usr/lib/account
2022 root 20 0 269M 8212 5480 S 0.0 0.8 0:00.01 /usr/lib/account
1963 root 20 0 269M 8212 5480 S 0.0 0.8 0:00.10 /usr/lib/account
1969 root 20 0 29008 2988 2708 S 0.0 0.3 0:00.00 /usr/sbin/cron
1971 daemon 20 0 26044 2248 2048 S 0.0 0.2 0:00.00 /usr/sbin/atd -f
2008 root 20 0 95360 1384 1252 S 0.0 0.1 0:00.00 /usr/bin/lxcfs /
2009 root 20 0 95360 1384 1252 S 0.0 0.1 0:00.00 /usr/bin/lxcfs /
1978 root 20 0 95360 1384 1252 S 0.0 0.1 0:00.00 /usr/bin/lxcfs /
1982 root 20 0 28624 3100 2732 S 0.0 0.3 0:00.06 /lib/systemd/sys
2013 syslog 20 0 250M 3416 2736 S 0.0 0.3 0:00.00 /usr/sbin/rsysld
2014 syslog 20 0 250M 3416 2736 S 0.0 0.3 0:00.00 /usr/sbin/rsysld
2015 syslog 20 0 250M 3416 2736 S 0.0 0.3 0:00.00 /usr/sbin/rsysld
1989 syslog 20 0 250M 3416 2736 S 0.0 0.3 0:00.02 /usr/sbin/rsysld
1990 root 20 0 4400 1376 1284 S 0.0 0.1 0:00.02 /usr/sbin/acpid
1999 messagebu 20 0 42908 3976 3568 S 0.0 0.4 0:00.10 /usr/bin/dbus-da
2033 root 20 0 253M 12388 8876 S 0.0 1.2 0:00.00 /usr/lib/snapd/s
2035 root 20 0 253M 12388 8876 S 0.0 1.2 0:00.00 /usr/lib/snapd/s
2052 root 20 0 253M 12388 8876 S 0.0 1.2 0:00.00 /usr/lib/snapd/s
2088 root 20 0 253M 12388 8876 S 0.0 1.2 0:00.00 /usr/lib/snapd/s
2476 root 20 0 253M 12388 8876 S 0.0 1.2 0:00.00 /usr/lib/snapd/s
2023 root 20 0 253M 12388 8876 S 0.0 1.2 0:00.01 /usr/lib/snapd/s
2042 root 20 0 15996 856 0 S 0.0 0.1 0:00.00 /sbin/dhclient -
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice F8Nice F9Kill F10Quit
```

```
Ubuntu Server 16.04 LTS Clean [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

Left File Command Options Right
<- / .[^]>
Name Size Modify time
/bin 4096 Nov 2 10:27
1024 Nov 2 10:33
/boot 4096 Nov 2 10:33
/dev 4280 Nov 2 10:37
/etc 4096 Nov 2 11:18
/home 4096 Nov 2 10:33
/lib 4096 Nov 2 10:27
/lib64 4096 Nov 2 10:24
/lost+found 16384 Nov 2 10:24
/media 4096 Nov 2 10:24
/mnt 4096 Jul 19 22:43
/opt 4096 Jul 19 22:43
/proc 0 Nov 2 10:54
/root 4096 Nov 2 10:24
/run 860 Nov 2 11:19
/sbin 12288 Nov 2 10:35
/snap 4096 Jun 29 22:13
/srv 4096 Jul 19 22:43
/sys 0 Nov 2 10:35
/tmp 4096 Nov 2 11:18
/usr 4096 Nov 2 10:24
/var 4096 Nov 2 10:28
@initrd.img 32 Nov 2 10:24
@vmlinuz 29 Nov 2 10:24
/etc 4822M/6443M (74%)
UP--DIR 4822M/6443M (74%)

Hint: Setting the CDPATH variable can save you keystrokes in cd commands.
administrator@ubuntu:~$
1Help 2Menu 3View 4Edit 5Copy 6RenMov 7Mkdir 8Delete 9PullDn 10Quit
```

Review

- Virtualization i VirtualBox
- Ubuntu Server operativni sistem
 - OpenSSH server
 - LAMP stack, PostgreSQL
- Accessing the VM using VirtualBox-a and remotely
 - SSH terminal (PuTTY na Windows)
 - SFTP client (FileZilla)
- Linux commands
- Utilities: htop i mc

Exercise

- Practical VirtualBox installation
- Creating a VM
- Ubuntu operating system
 - SSH, LAMP, and others.
- Introduction to Linux commands
- Utility programs (ssh, mc, htop)

Resources

- <https://www.virtualbox.org/>
- <https://www.ubuntu.com/>
- <http://www.putty.org/>
- <https://blog.splunk.net/64bit-putty/>
- Linux commands