Linux network administration

Course Objectives

The primary objective of this course is to introduce students to the fundamental concepts of software deployment, configuration, network administration, and daily usage of Ubuntu Linux based systems.

Needed Software

vmWare Player, M0n0wall, Ubuntu 14.04 Server, Ubuntu 14.04

Assignments

Three assignments will be given during the course. The first two will account for 25% of the grade of the students, while the last one will account for 50% of the grade of the students. The first two are short presentations (about 15 minutes each) done by the students. The preparation of a PPTX is compulsory. The last assignment is a configuration task carried out individually by the students. All assignments are due at the start of class on the due date.

Evaluation and Grading

Evaluation will be done in percentage and corresponding ECTS grades will also be assigned.

Recommended readings

- M0n0wall installation and configuration: https://www.youtube.com/watch?v=2X-4JWzR4U4&list=PLDC8031561F9F8B3D
- m0n0wall - PC Platform Quick Start Guide http://doc.m0n0.ch/quickstartpc/index.html
- UbuntuServerGuide https://wiki.ubuntu.com/DocumentationTeam/SystemDocumentation/UbuntuServerGuide
- Installing Ubuntu 14.04 https://help.ubuntu.com/14.04/installation-guide/index.html
- Apt-Get https://help.ubuntu.com/community/AptGet/Howto

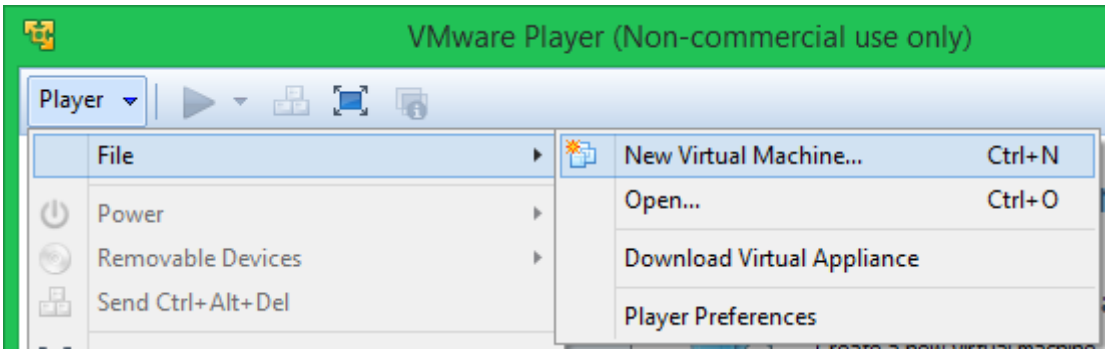
Class Schedule (tentative)

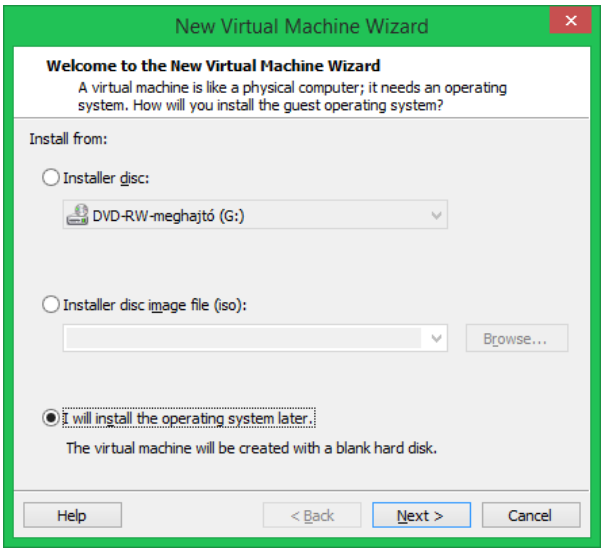
Lab 1

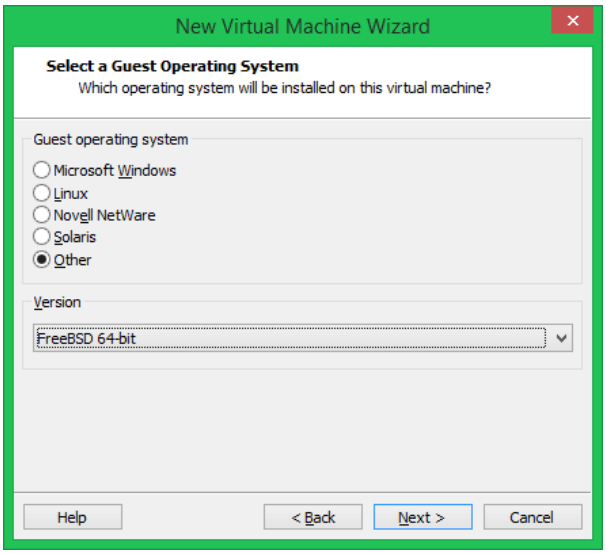
Installing M0n0wall, Ubuntu 14.04 Server, and Ubuntu 14.04 in vmWare Player virtual machines

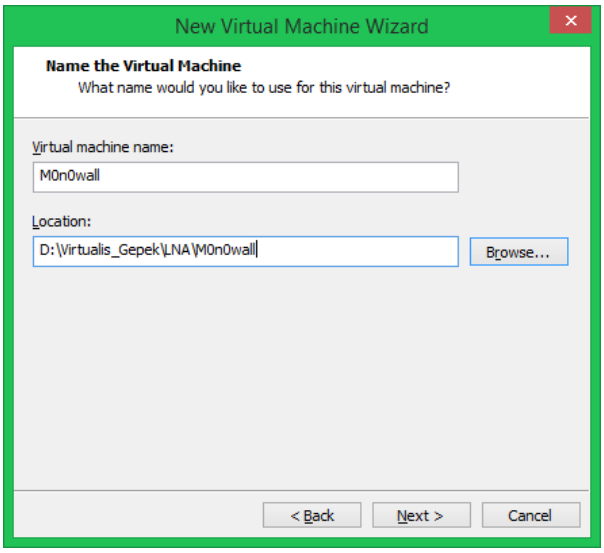
Introduction. Basic concepts and ideas to be discussed: computer network, local area network (LAN), wide area network (WAN), network interface (adapter), IP addressing, private network IP addressing, virtual machine, virtual network, router, etc.

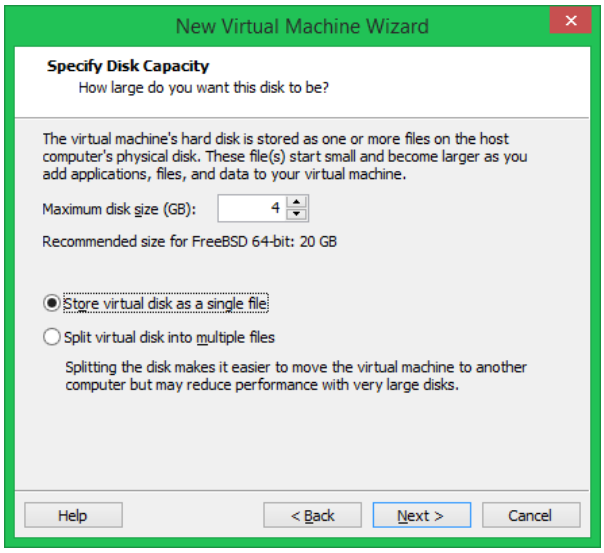
Taks 1. Create a virtual machine with two network interfaces (NAT and LAN1) and install M0n0wall in it

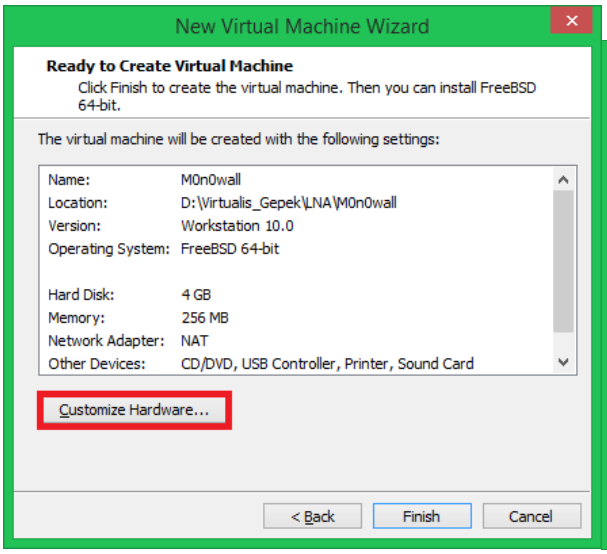


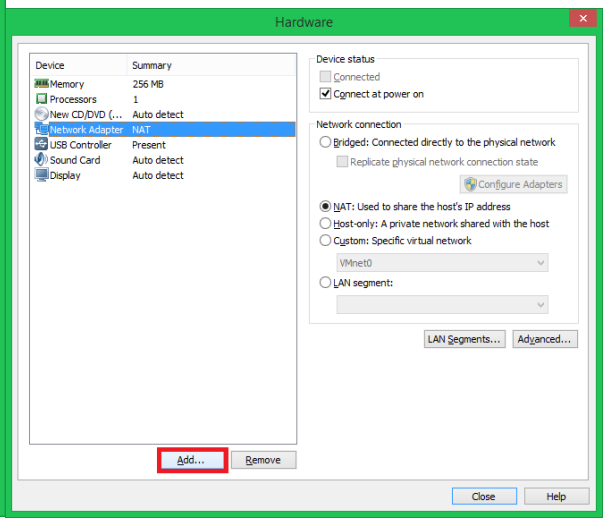


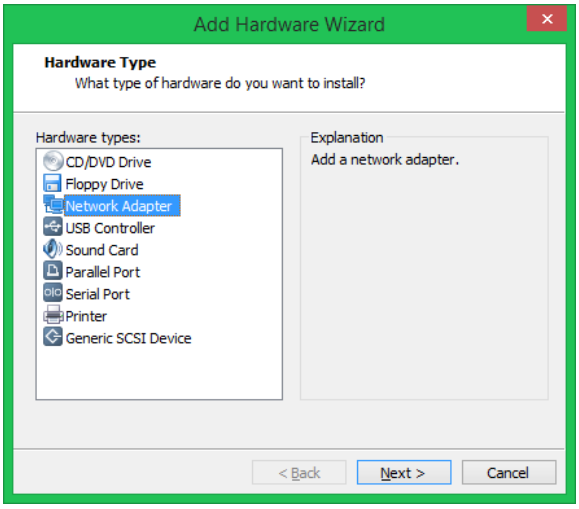


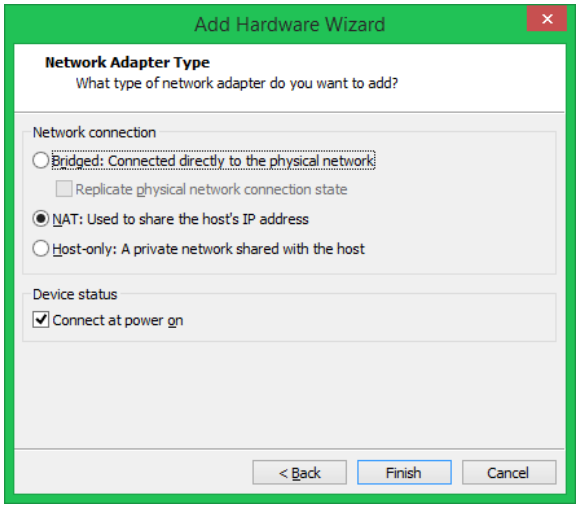

New Virtual Machine Wizard
Name the Virtual Machine
What name would you like to use for this virtual machine?
Virtual machine name:
M0n0wall
Location:
D:\Virtualis_Gepek\LNA\M0n0wall
Browse...
< Back
Next >
Cancel

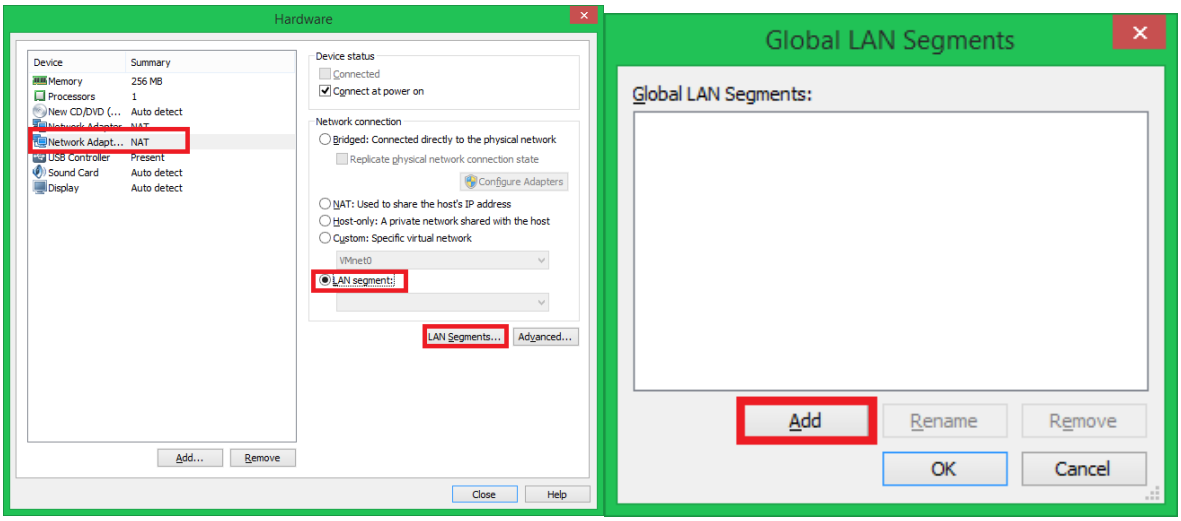

New Virtual Machine Wizard
Specify Disk Capacity
How large do you want this disk to be?
The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.
Maximum disk size (GB):
4
Recommended size for FreeBSD 64-bit: 20 GB
Store virtual disk as a single file
Split virtual disk into multiple files
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.
Help
< Back
Next >
Cancel

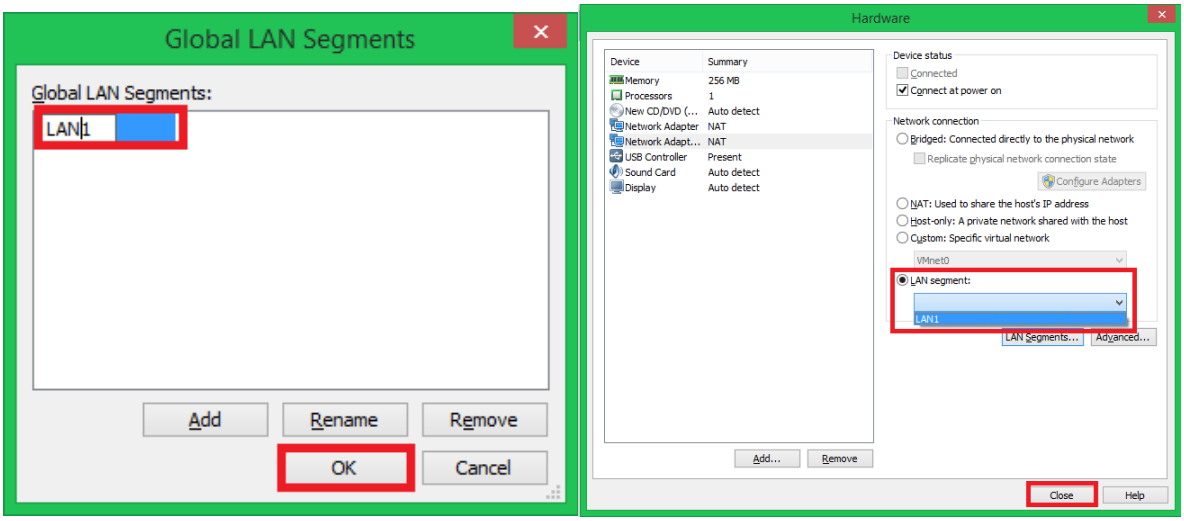

New Virtual Machine Wizard
Ready to Create Virtual Machine
Click Finish to create the virtual machine. Then you can install FreeBSD 64-bit.
The virtual machine will be created with the following settings:
Name: M0n0wall
Location: D:\Virtualis_Gepek\LNA\M0n0wall
Version: Workstation 10.0
Operating System: FreeBSD 64-bit
Hard Disk: 4 GB
Memory: 256 MB
Network Adapter: NAT
Other Devices: CD/DVD, USB Controller, Printer, Sound Card
Customize Hardware...
< Back
Finish
Cancel

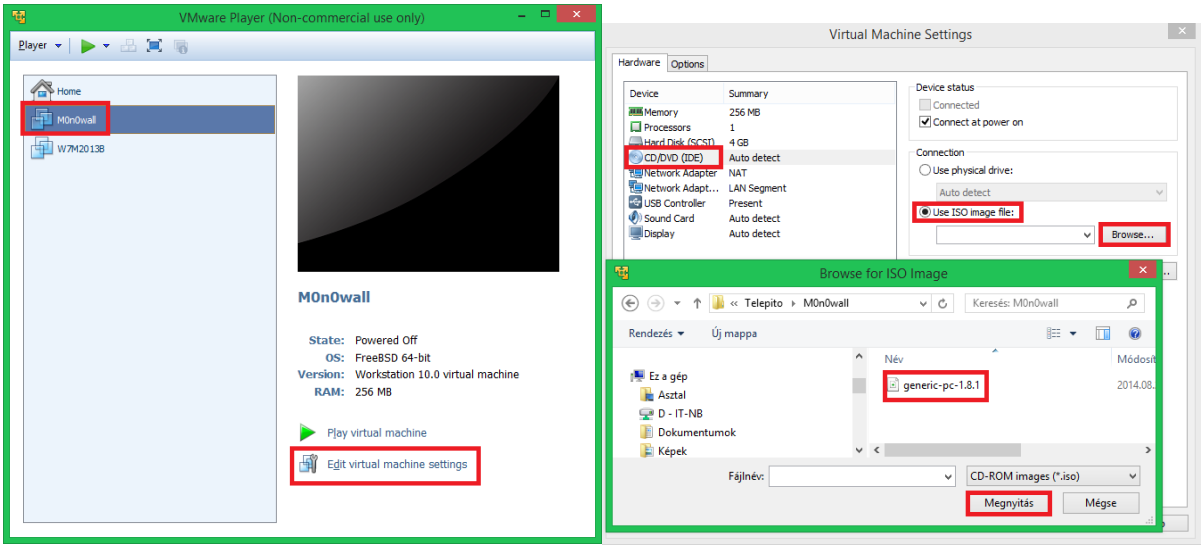

Hardware
Device
Summary
Memory 256 MB
Processors 1
New CD/DVD (... Auto detect
Network Adapter NAT
USB Controller Present
Sound Card Auto detect
Display Auto detect
Device status
Connected
Connect at power on
Network connection
Bridged: Connected directly to the physical network
Replicate physical network connection state
Configure Adapters
NAT: Used to share the host's IP address
Host-only: A private network shared with the host
Custom: Specific virtual network
VMnet0
LAN segment:
LAN Segments...
Advanced...
Add...
Remove
Close
Help

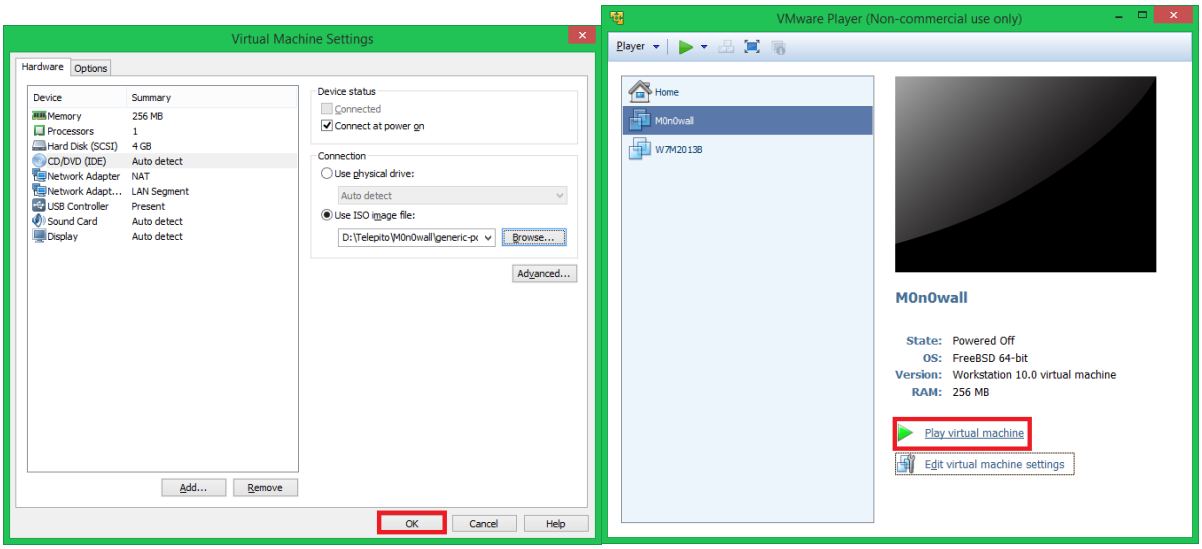

Add Hardware Wizard
Hardware Type
What type of hardware do you want to install?
Hardware types:
CD/DVD Drive
Floppy Drive
Network Adapter
USB Controller
Sound Card
Parallel Port
Serial Port
Printer
Generic SCSI Device
Explanation
Add a network adapter.
< Back
Next >
Cancel

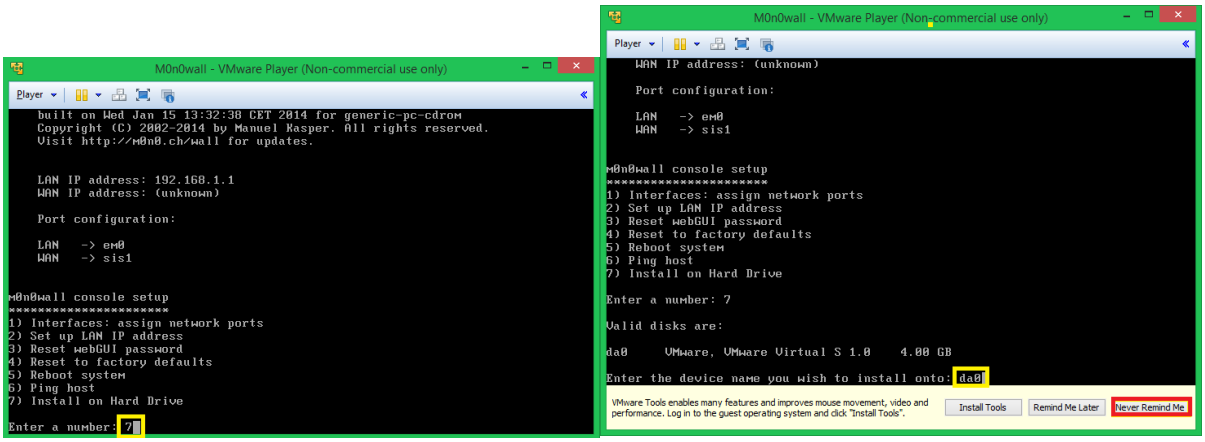

Add Hardware Wizard
Network Adapter Type
What type of network adapter do you want to add?
Network connection
Bridged: Connected directly to the physical network
Replicate physical network connection state
NAT: Used to share the host's IP address
Host-only: A private network shared with the host
Device status
Connect at power on
< Back
Finish
Cancel


Hardware
Device
Summary
Memory
256 MB
Processors
1
New CD/DVD (...
Auto detect
Network Adapt...
NAT
USB Controller
Present
Sound Card
Auto detect
Display
Auto detect
Device status
Connected
Connect at power on
Network connection
Bridged: Connected directly to the physical network
Replicate physical network connection state
Configure Adapters
NAT: Used to share the host's IP address
Host-only: A private network shared with the host
Custom: Specific virtual network
VMnet0
LAN segment:
LAN Segments...
Advanced...
Add...
Remove
Close
Help
Global LAN Segments
Global LAN Segments:
Add
Rename
Remove
OK
Cancel

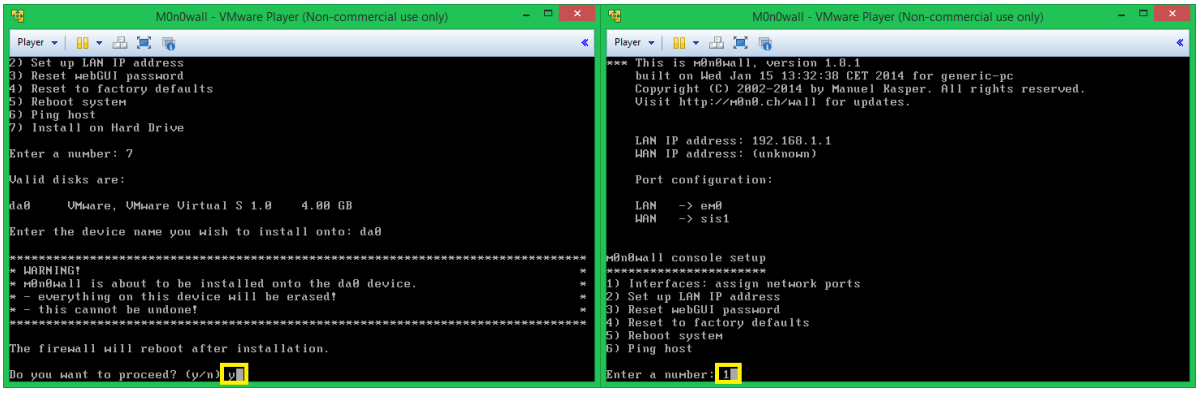

Global LAN Segments
Global LAN Segments:
LAN1
Add
Rename
Remove
OK
Cancel
Hardware
Device
Summary
Memory
256 MB
Processors
1
New CD/DVD (...
Auto detect
Network Adapter
NAT
Network Adapt...
NAT
USB Controller
Present
Sound Card
Auto detect
Display
Auto detect
Device status
Connected
Connect at power on
Network connection
Bridged: Connected directly to the physical network
Replicate physical network connection state
Configure Adapters
NAT: Used to share the host's IP address
Host-only: A private network shared with the host
Custom: Specific virtual network
VMnet0
LAN segment:
LAN1
LAN Segments...
Advanced...
Add...
Remove
Close
Help


VMware Player (Non-commercial use only)
Player
Home
M0n0wall
W7M2013B
M0n0wall
State: Powered Off
OS: FreeBSD 64-bit
Version: Workstation 10.0 virtual machine
RAM: 256 MB
Play virtual machine
Edit virtual machine settings
Virtual Machine Settings
Hardware
Options
Device
Summary
Memory
256 MB
Processors
1
Hard Disk (SCSI)
4 GB
CD/DVD (IDE)
Auto detect
Network Adapter
NAT
Network Adapt...
LAN Segment
USB Controller
Present
Sound Card
Auto detect
Display
Auto detect
Device status
Connected
Connect at power on
Connection
Use physical drive:
Auto detect
Use ISO image file:
Browse...
Browse for ISO Image
Telepito
M0n0wall
Keresés: M0n0wall
Rendezés
Új mappa
Név
Módosít
Ez a gép
Asztal
D - IT-NB
Dokumentumok
Képek
generic-pc-1.8.1
2014.08.
Fájlnév:
CD-ROM images (*.iso)
Megnyitás
Mégse

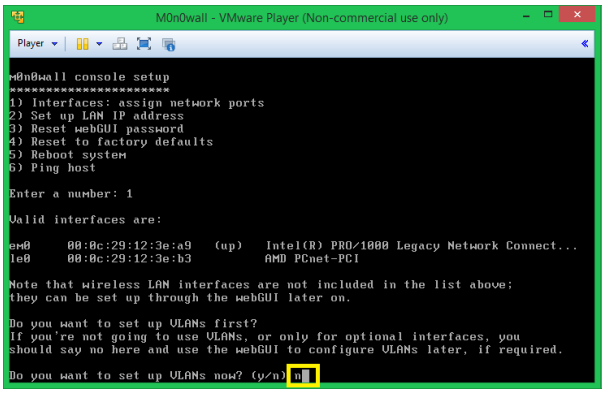

Virtual Machine Settings
Hardware
Options
Device
Summary
Memory
256 MB
Processors
1
Hard Disk (SCSI)
4 GB
CD/DVD (IDE)
Auto detect
Network Adapter
NAT
Network Adapt...
LAN Segment
USB Controller
Present
Sound Card
Auto detect
Display
Auto detect
Device status
Connected
Connect at power on
Connection
Use physical drive:
Auto detect
Use ISO image file:
D:\Telepito\M0n0wall\generic-pc
Browse...
Advanced...
Add...
Remove
OK
Cancel
Help
VMware Player (Non-commercial use only)
Player
Home
M0n0wall
W7M2013B
M0n0wall
State: Powered Off
OS: FreeBSD 64-bit
Version: Workstation 10.0 virtual machine
RAM: 256 MB
Play virtual machine
Edit virtual machine settings

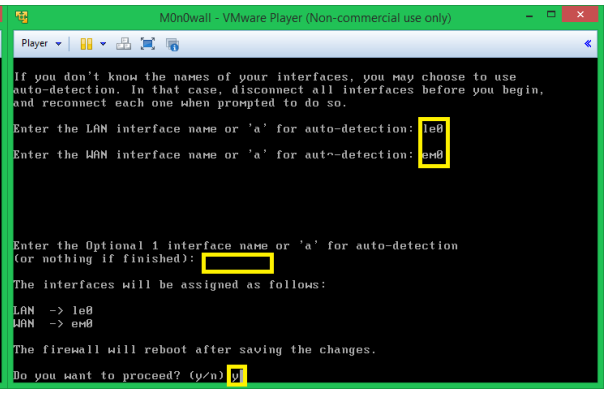

M0n0wall - VMware Player (Non-commercial use only)
Player
built on Wed Jan 15 13:32:38 CET 2014 for generic-pc-cdrom
Copyright (C) 2002-2014 by Manuel Kasper. All rights reserved.
Visit http://m0n0.ch/wall for updates.
LAN IP address: 192.168.1.1
WAN IP address: (unknown)
Port configuration:
LAN -> em0
WAN -> sis1
m0n0wall console setup
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
7) Install on Hard Drive
Enter a number: 7
M0n0wall - VMware Player (Non-commercial use only)
Player
WAN IP address: (unknown)
Port configuration:
LAN -> em0
WAN -> sis1
m0n0wall console setup
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
7) Install on Hard Drive
Enter a number: 7
Valid disks are:
da0 VMware, VMware Virtual S 1.0 4.00 GB
Enter the device name you wish to install onto: da0
VMware Tools enables many features and improves mouse movement, video and performance. Log in to the guest operating system and click "Install Tools".
Install Tools
Remind Me Later
Never Remind Me

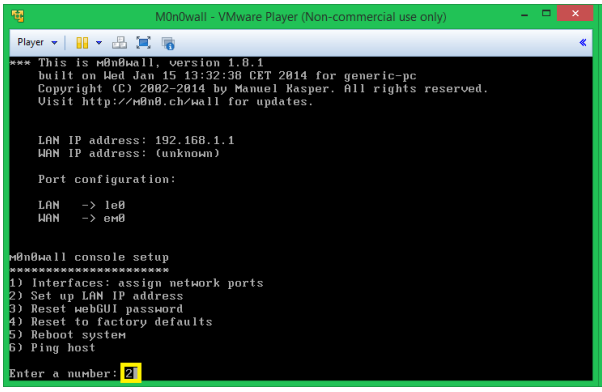
daö → da0

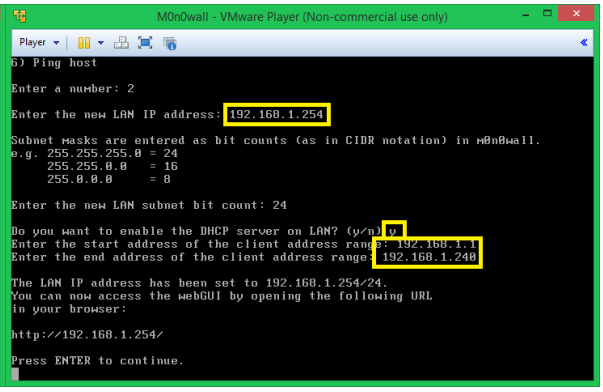

M0n0wall - VMware Player (Non-commercial use only)
Player
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
7) Install on Hard Drive
Enter a number: 7
Valid disks are:
da0 VMware, VMware Virtual S 1.0 4.00 GB
Enter the device name you wish to install onto: da0
* WARNING! *
* m0n0wall is about to be installed onto the da0 device. *
* - everything on this device will be erased! *
* - this cannot be undone! *
The firewall will reboot after installation.
Do you want to proceed? (y/n) y
M0n0wall - VMware Player (Non-commercial use only)
Player
*** This is m0n0wall, version 1.8.1
built on Wed Jan 15 13:32:38 CET 2014 for generic-pc
Copyright (C) 2002-2014 by Manuel Kasper. All rights reserved.
Visit http://m0n0.ch/wall for updates.
LAN IP address: 192.168.1.1
WAN IP address: (unknown)
Port configuration:
LAN -> em0
WAN -> sis1
m0n0wall console setup
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number: 1

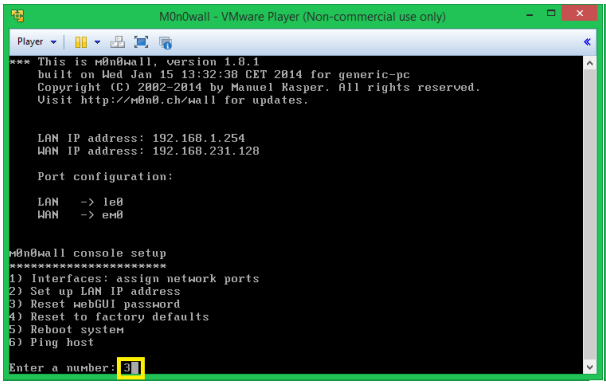
z→y

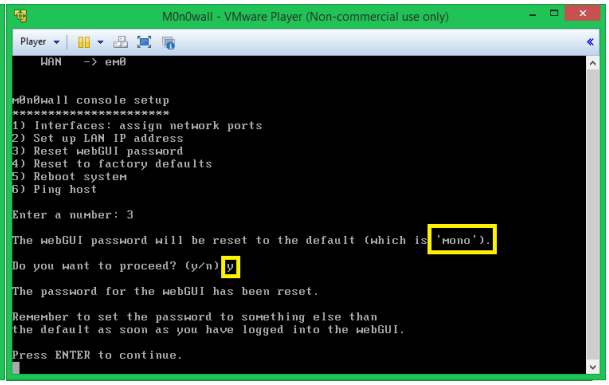

M0n0wall - VMware Player (Non-commercial use only)
Player
m0n0wall console setup
****
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number: 1
Valid interfaces are:
em0 00:0c:29:12:3e:a9 (up) Intel(R) PRO/1000 Legacy Network Connect...
le0 00:0c:29:12:3e:b3 AMD PCnet-PCI
Note that wireless LAN interfaces are not included in the list above;
they can be set up through the webGUI later on.
Do you want to set up VLANs first?
If you're not going to use VLANs, or only for optional interfaces, you
should say no here and use the webGUI to configure VLANs later, if required.
Do you want to set up VLANs now? (y/n) n

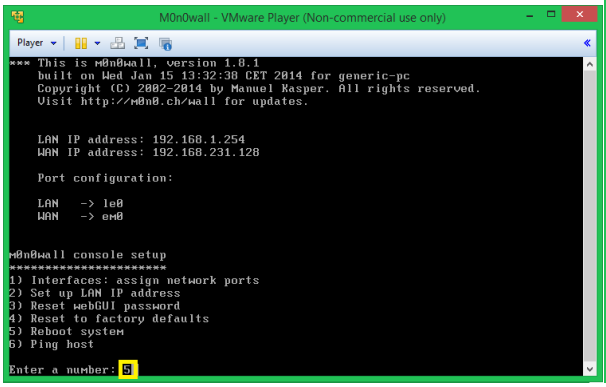

M0n0wall - VMware Player (Non-commercial use only)
Player
If you don't know the names of your interfaces, you may choose to use
auto-detection. In that case, disconnect all interfaces before you begin,
and reconnect each one when prompted to do so.
Enter the LAN interface name or 'a' for auto-detection: le0
Enter the WAN interface name or 'a' for aut~-detection: em0
Enter the Optional 1 interface name or 'a' for auto-detection
(or nothing if finished):
The interfaces will be assigned as follows:
LAN -> le0
WAN -> em0
The firewall will reboot after saving the changes.
Do you want to proceed? (y/n) y

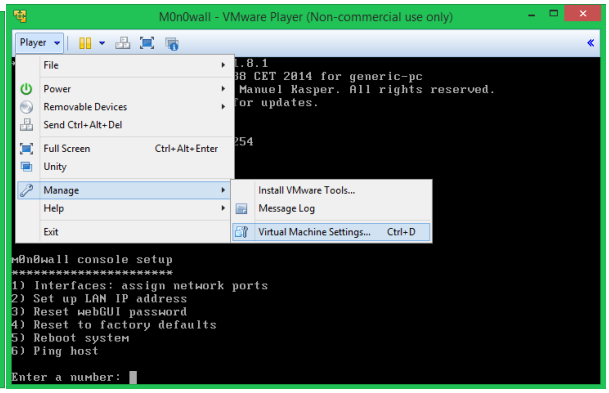

M0n0wall - VMware Player (Non-commercial use only)
Player
*** This is m0n0wall, version 1.8.1
built on Wed Jan 15 13:32:38 CET 2014 for generic-pc
Copyright (C) 2002-2014 by Manuel Kasper. All rights reserved.
Visit http://m0n0.ch/wall for updates.
LAN IP address: 192.168.1.1
WAN IP address: (unknown)
Port configuration:
LAN -> le0
WAN -> em0
m0n0wall console setup
****
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number: 2

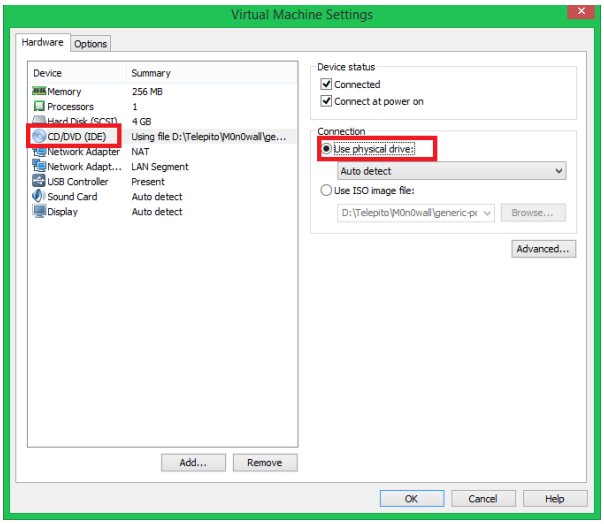

M0n0wall - VMware Player (Non-commercial use only)
Player
6) Ping host
Enter a number: 2
Enter the new LAN IP address: 192.168.1.254
Subnet masks are entered as bit counts (as in CIDR notation) in m0n0wall.
e.g. 255.255.255.0 = 24
255.255.0.0 = 16
255.0.0.0 = 8
Enter the new LAN subnet bit count: 24
Do you want to enable the DHCP server on LAN? (y/n) y
Enter the start address of the client address range: 192.168.1.1
Enter the end address of the client address range: 192.168.1.240
The LAN IP address has been set to 192.168.1.254/24.
You can now access the webGUI by opening the following URL
in your browser:
http://192.168.1.254/
Press ENTER to continue.


M0n0wall - VMware Player (Non-commercial use only)
Player
*** This is m0n0wall, version 1.8.1
built on Wed Jan 15 13:32:38 CET 2014 for generic-pc
Copyright (C) 2002-2014 by Manuel Kasper. All rights reserved.
Visit http://m0n0.ch/wall for updates.
LAN IP address: 192.168.1.254
WAN IP address: 192.168.231.128
Port configuration:
LAN -> le0
WAN -> em0
m0n0wall console setup
****
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number: 3


M0n0wall - VMware Player (Non-commercial use only)
Player
WAN -> em0
m0n0wall console setup
****
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number: 3
The webGUI password will be reset to the default (which is 'mono').
Do you want to proceed? (y/n) y
The password for the webGUI has been reset.
Remember to set the password to something else than
the default as soon as you have logged into the webGUI.
Press ENTER to continue.

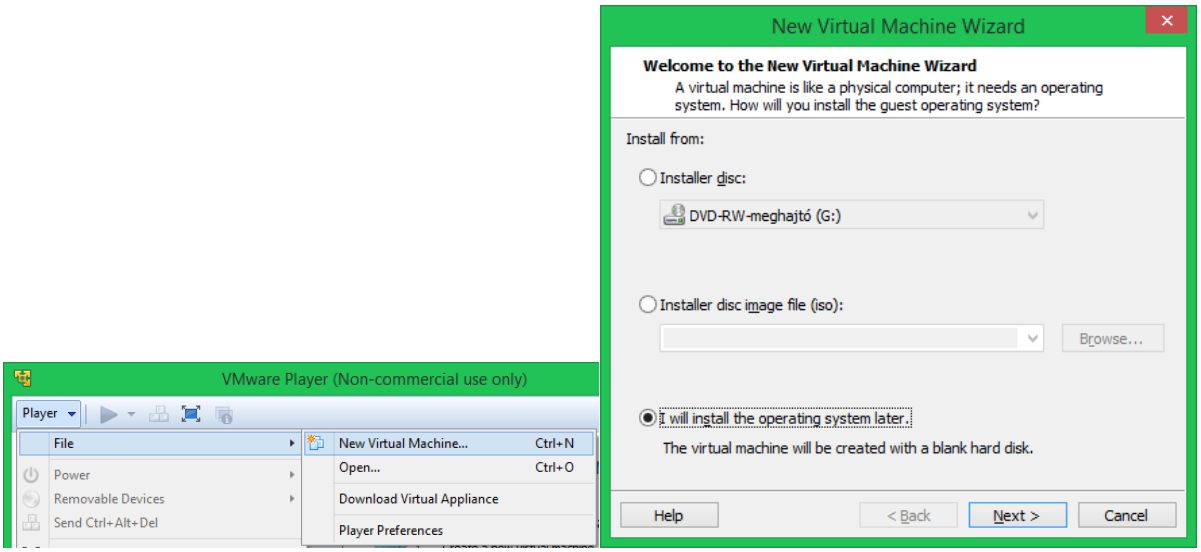

M0n0wall - VMware Player (Non-commercial use only)
Player
*** This is m0n0wall, version 1.8.1
built on Wed Jan 15 13:32:38 CET 2014 for generic-pc
Copyright (C) 2002-2014 by Manuel Kasper. All rights reserved.
Visit http://m0n0.ch/wall for updates.
LAN IP address: 192.168.1.254
WAN IP address: 192.168.231.128
Port configuration:
LAN -> le0
WAN -> em0
m0n0wall console setup
****
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number: 5

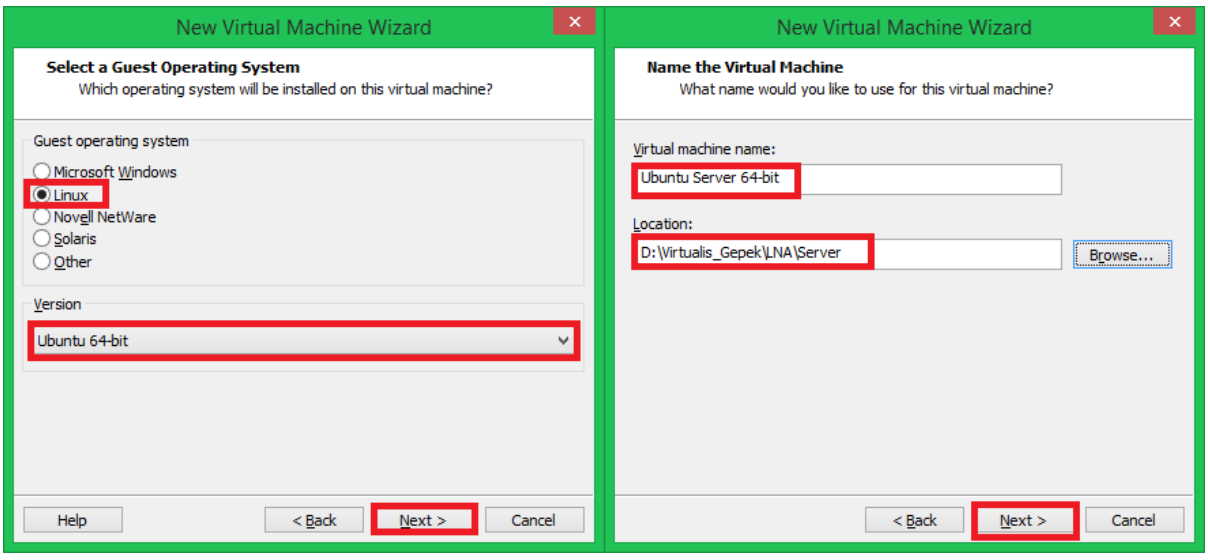

M0n0wall - VMware Player (Non-commercial use only)
Player
File
Power
Removable Devices
Send Ctrl+Alt+Del
Full Screen Ctrl+Alt+Enter
Unity
Manage
Help
Exit
Install VMware Tools...
Message Log
Virtual Machine Settings... Ctrl+D
m0n0wall console setup
****
1) Interfaces: assign network ports
2) Set up LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
Enter a number:

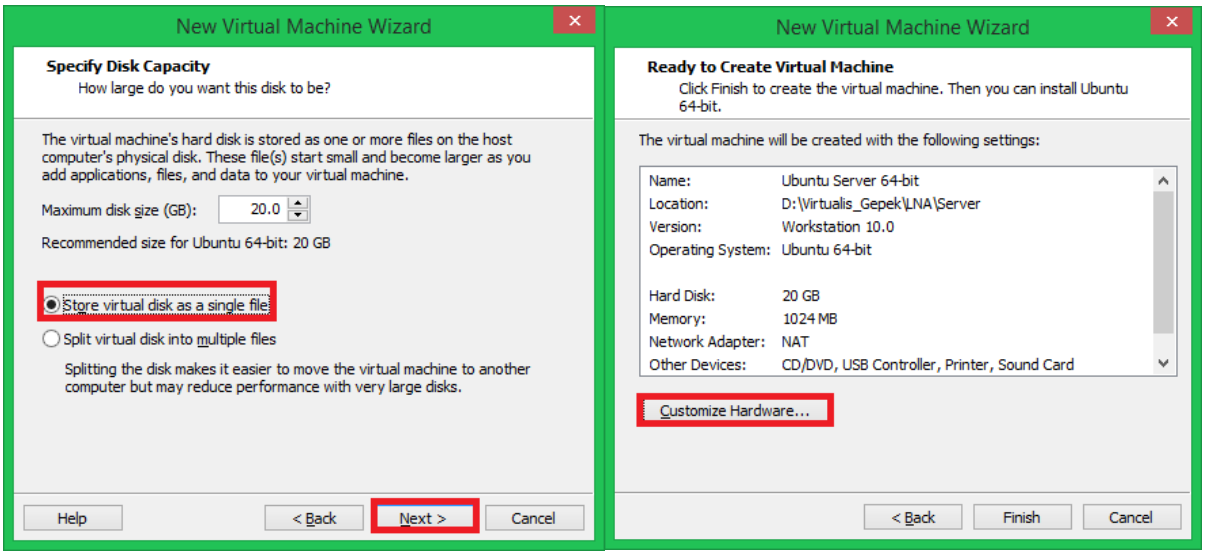


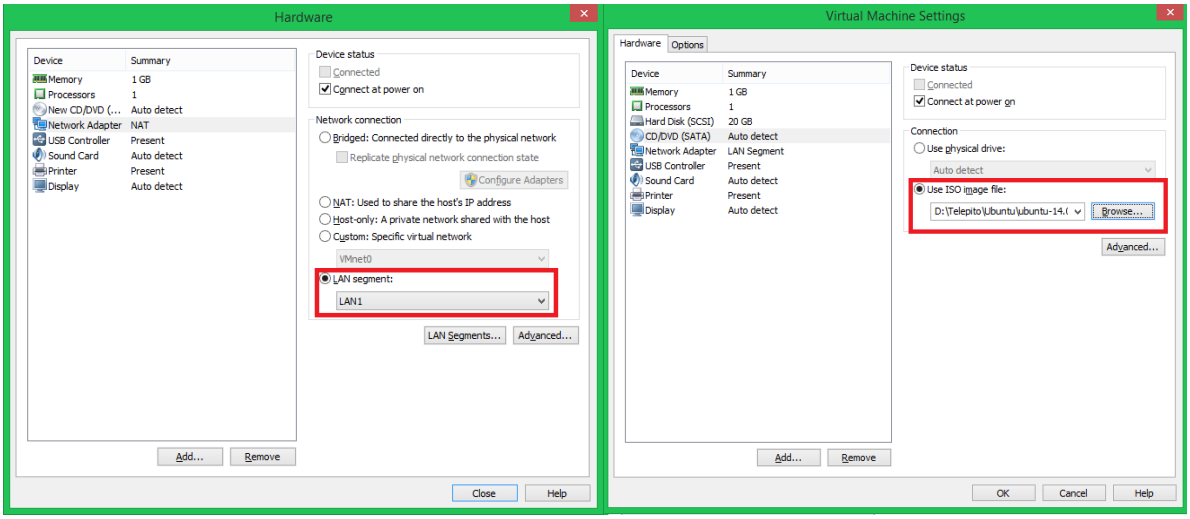
Taks 2. Create a virtual machine with one network interface (LAN1) and install Ubuntu Server in it

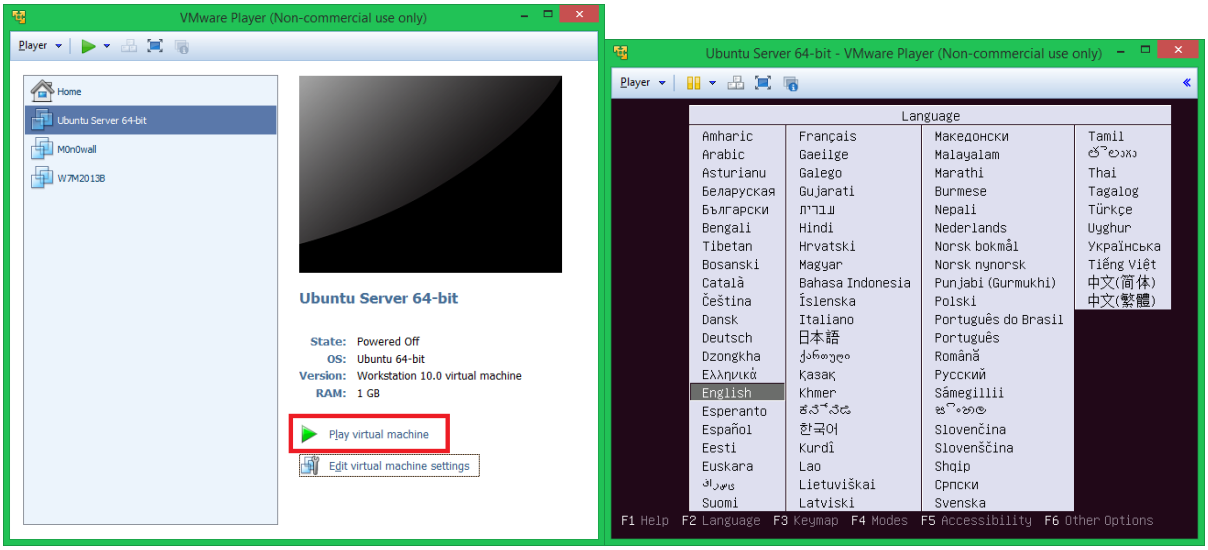
Start a new instance of vmWare player.



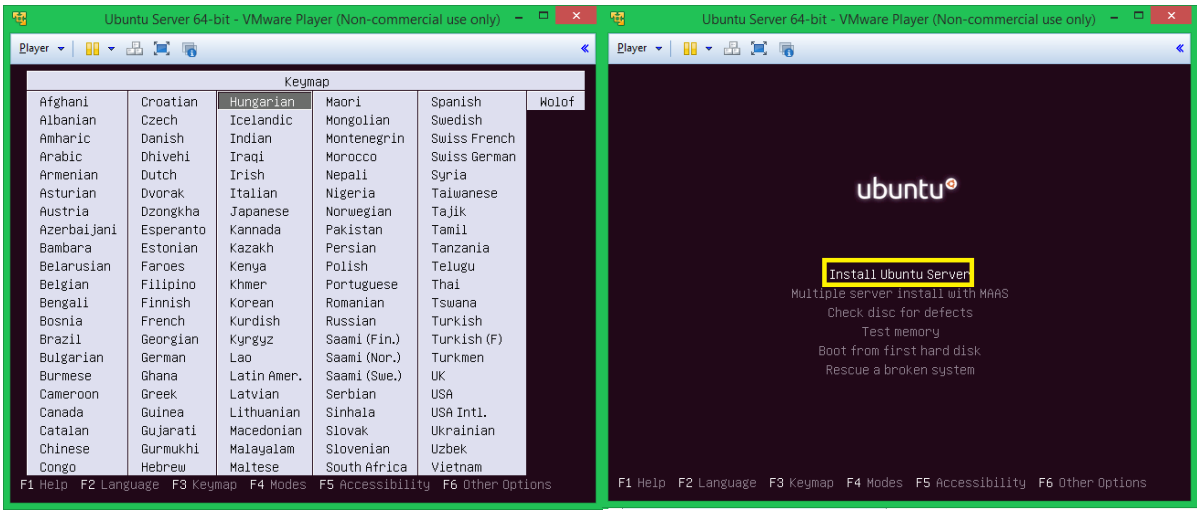


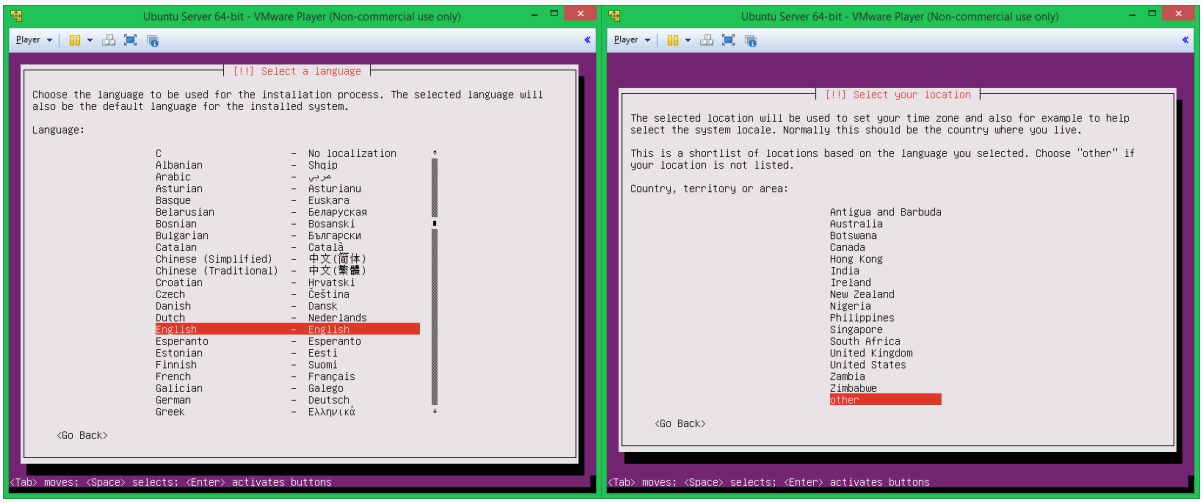


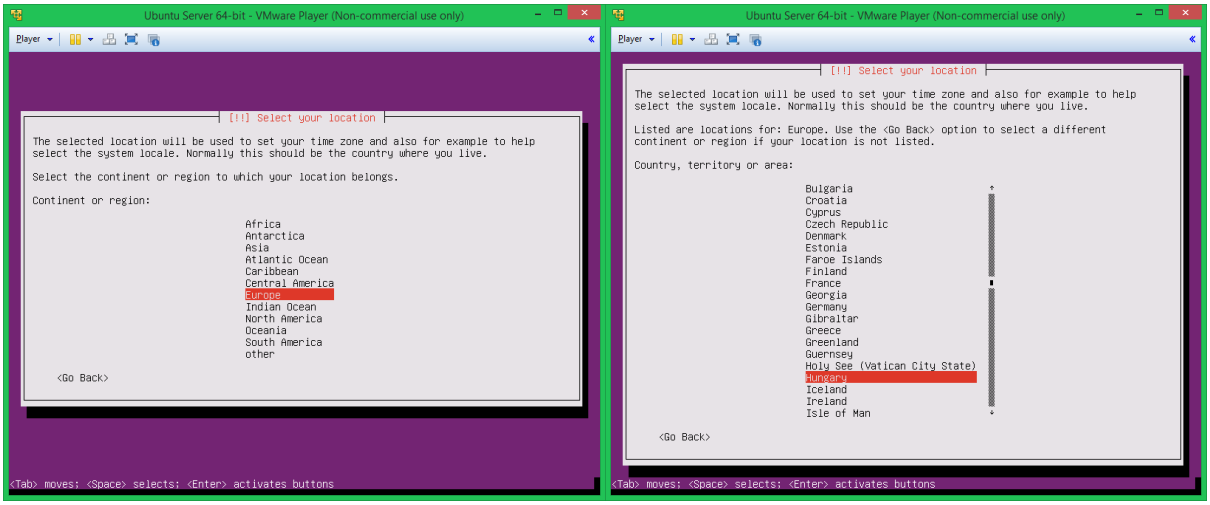


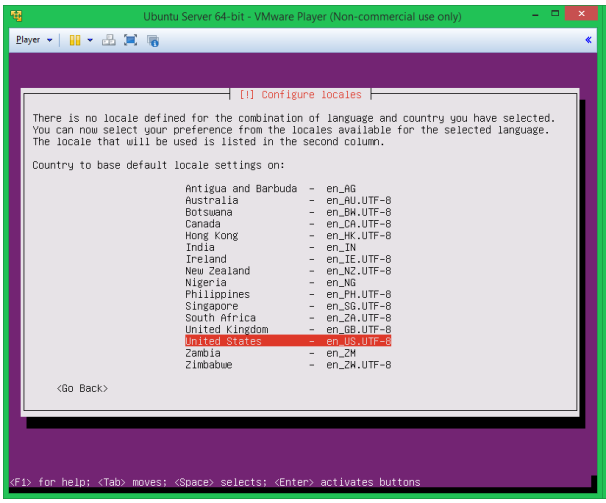


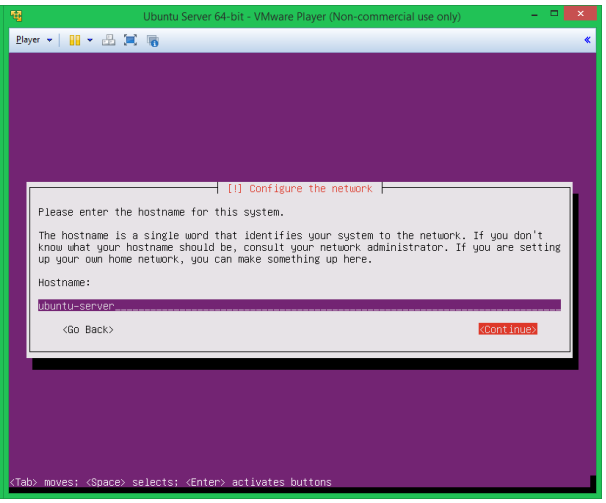
Press F3 – Keymap

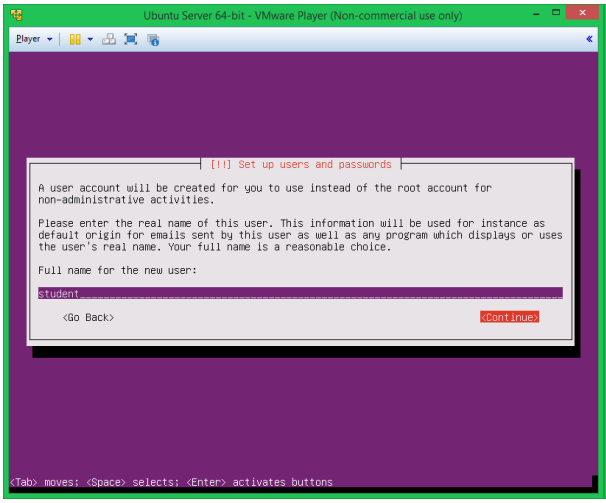

Ubuntu Server 64-bit - VMware Player (Non-commercial use only)
Player
Keymap
Afghani Albanian Amharic Arabic Armenian Asturian Austria Azerbaijani Bambara Belarusian Belgian Bengali Bosnia Brazil Bulgarian Burmese Cameroon Canada Catalan Chinese Congo
Croatian Czech Danish Dhivehi Dutch Dvorak Dzongkha Esperanto Estonian Faroes Filipino Finnish French Georgian German Ghana Greek Guinea Gujarati Gurmukhi Hebrew
Hungarian Icelandic Indian Iraqi Irish Italian Japanese Kannada Kazakh Kenya Khmer Korean Kurdish Kyrgyz Lao Latin Amer. Latvian Lithuanian Macedonian Malayalam Maltese
Maori Mongolian Montenegrin Morocco Nepali Nigeria Norwegian Pakistan Persian Polish Portuguese Romanian Russian Saami (Fin.) Saami (Nor.) Saami (Swe.) Serbian Sinhala Slovak Slovenian South Africa
Spanish Swedish Swiss French Swiss German Syria Taiwanese Tajik Tamil Tanzania Telugu Thai Tswana Turkish Turkish (F) Turkmen UK USA USA Intl. Ukrainian Uzbek Vietnam
Wolof
F1 Help F2 Language F3 Keymap F4 Modes F5 Accessibility F6 Other Options
Ubuntu Server 64-bit - VMware Player (Non-commercial use only)
Player
ubuntu
Install Ubuntu Server
Multiple server install with MAAS
Check disc for defects
Test memory
Boot from first hard disk
Rescue a broken system
F1 Help F2 Language F3 Keymap F4 Modes F5 Accessibility F6 Other Options

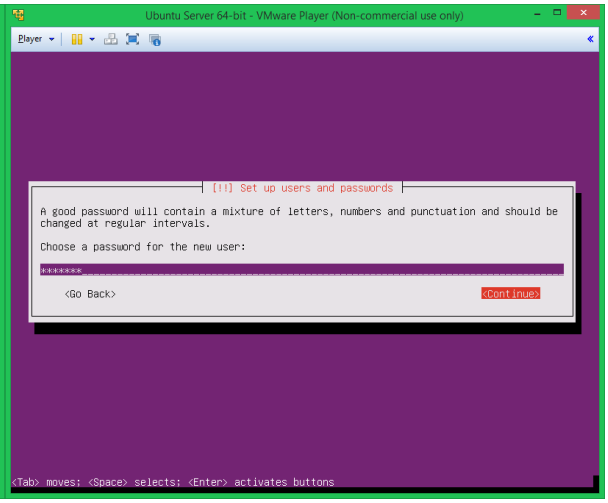

Ubuntu Server 64-bit - VMware Player (Non-commercial use only)
Player
[!!] Select a language
Choose the language to be used for the installation process. The selected language will also be the default language for the installed system.
Language:
C - No localization
Albanian - Shqip
Arabic - عربي
Asturian - Asturianu
Basque - Euskara
Belarusian - Беларуская
Bosnian - Bosanski
Bulgarian - Български
Catalan - Català
Chinese (Simplified) - 中文(简体)
Chinese (Traditional) - 中文(繁體)
Croatian - Hrvatski
Czech - Čeština
Danish - Dansk
Dutch - Nederlands
English - English
Esperanto - Esperanto
Estonian - Eesti
Finnish - Suomi
French - Français
Galician - Galego
German - Deutsch
Greek - Ελληνικά
<Go Back>
<Tab> moves; <Space> selects; <Enter> activates buttons
Ubuntu Server 64-bit - VMware Player (Non-commercial use only)
Player
[!!] Select your location
The selected location will be used to set your time zone and also for example to help select the system locale. Normally this should be the country where you live.
This is a shortlist of locations based on the language you selected. Choose "other" if your location is not listed.
Country, territory or area:
Antigua and Barbuda
Australia
Botswana
Canada
Hong Kong
India
Ireland
New Zealand
Nigeria
Philippines
Singapore
South Africa
United Kingdom
United States
Zambia
Zimbabwe
other
<Go Back>
<Tab> moves; <Space> selects; <Enter> activates buttons


Ubuntu Server 64-bit - VMware Player (Non-commercial use only)
Player
[!!] Select your location
The selected location will be used to set your time zone and also for example to help select the system locale. Normally this should be the country where you live.
Select the continent or region to which your location belongs.
Continent or region:
Africa
Antarctica
Asia
Atlantic Ocean
Caribbean
Central America
Europe
Indian Ocean
North America
Oceania
South America
other
<Go Back>
<Tab> moves; <Space> selects; <Enter> activates buttons
Ubuntu Server 64-bit - VMware Player (Non-commercial use only)
Player
[!!] Select your location
The selected location will be used to set your time zone and also for example to help select the system locale. Normally this should be the country where you live.
Listed are locations for: Europe. Use the <Go Back> option to select a different continent or region if your location is not listed.
Country, territory or area:
Bulgaria
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Faroe Islands
Finland
France
Georgia
Germany
Gibraltar
Greece
Greenland
Guernsey
Holy See (Vatican City State)
Hungary
Iceland
Ireland
Isle of Man
<Go Back>
<Tab> moves; <Space> selects; <Enter> activates buttons

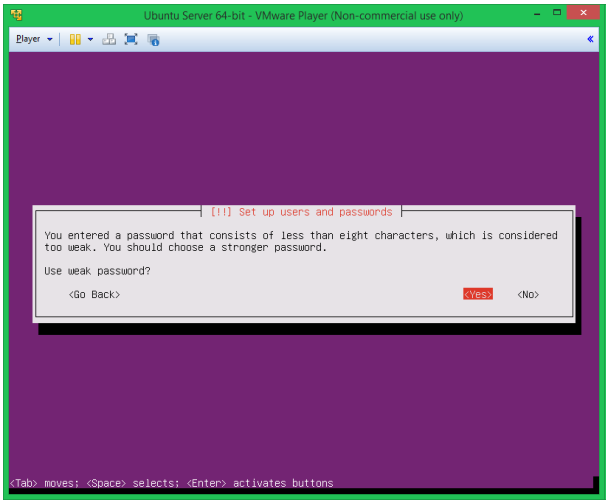


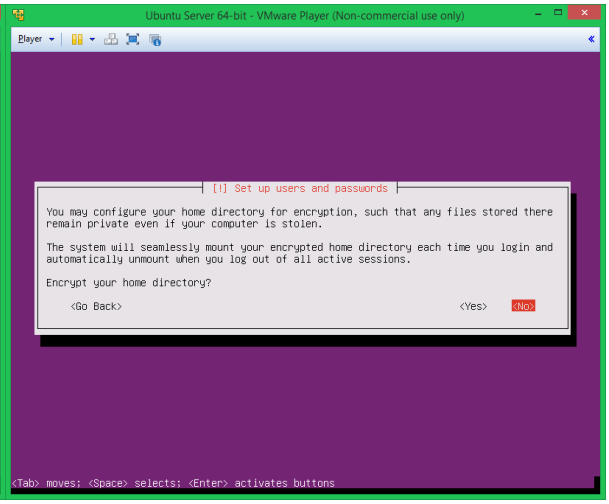


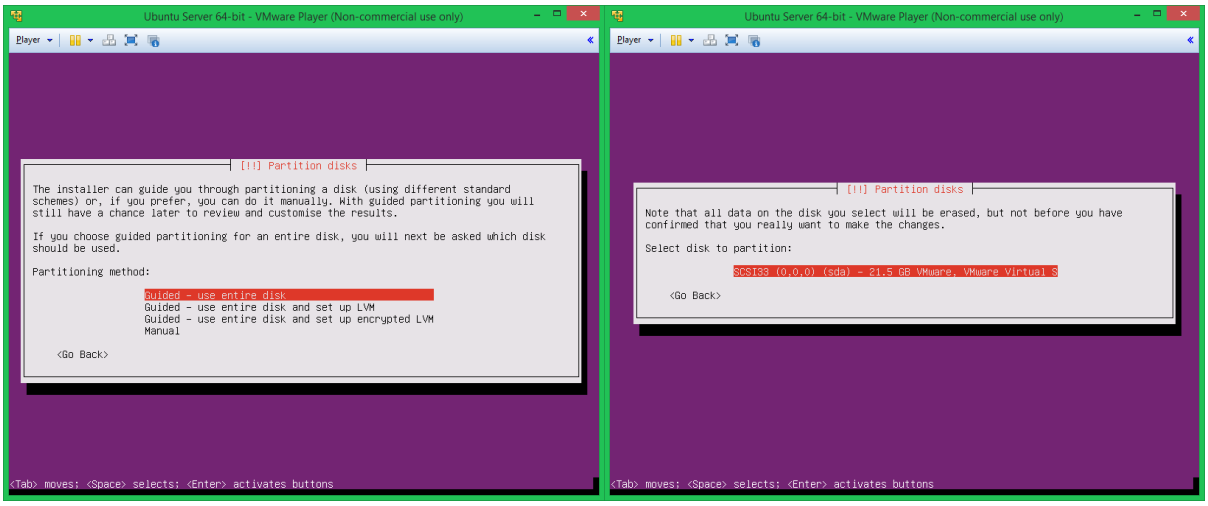


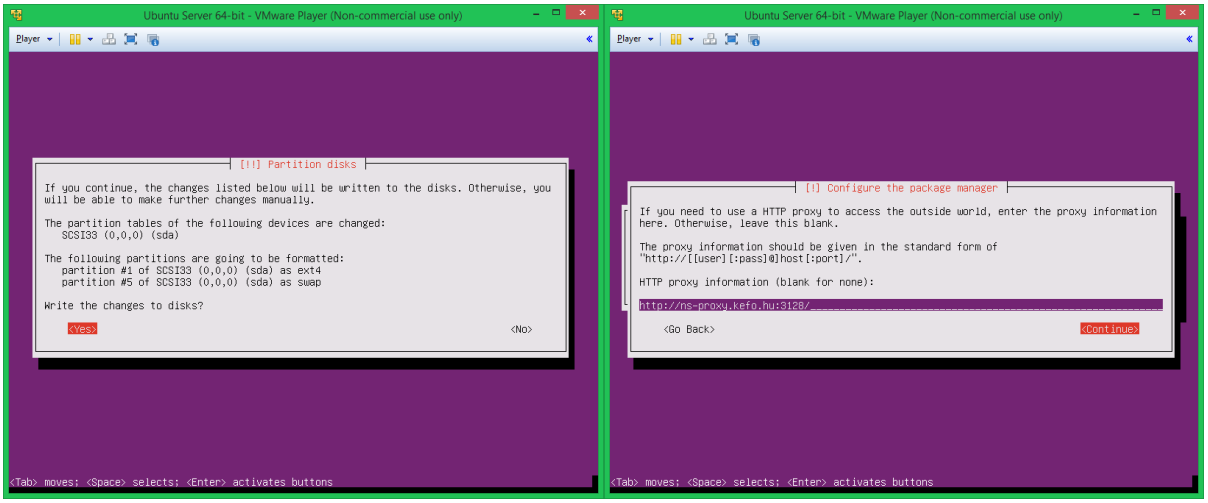


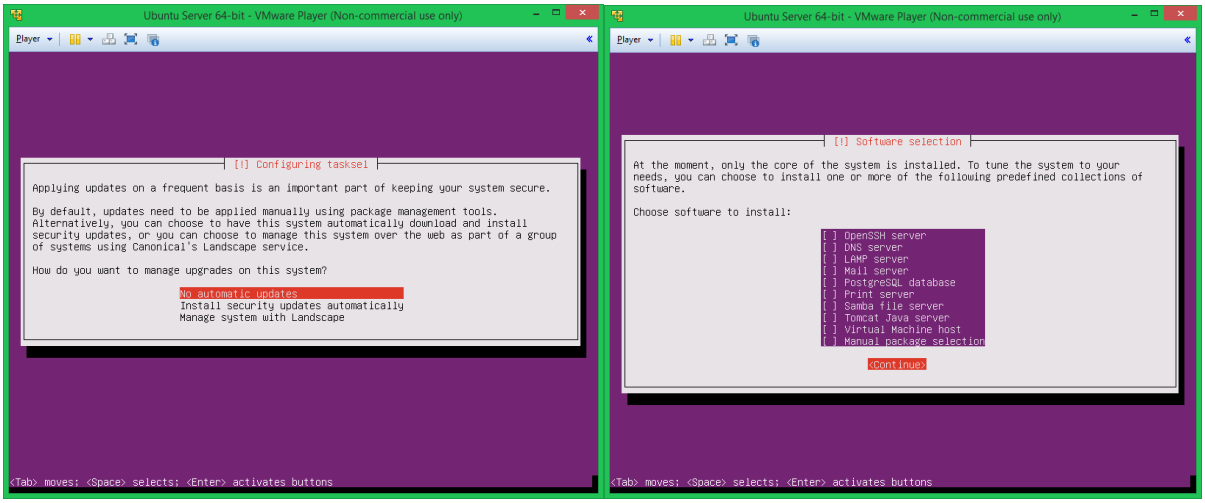
Password=student



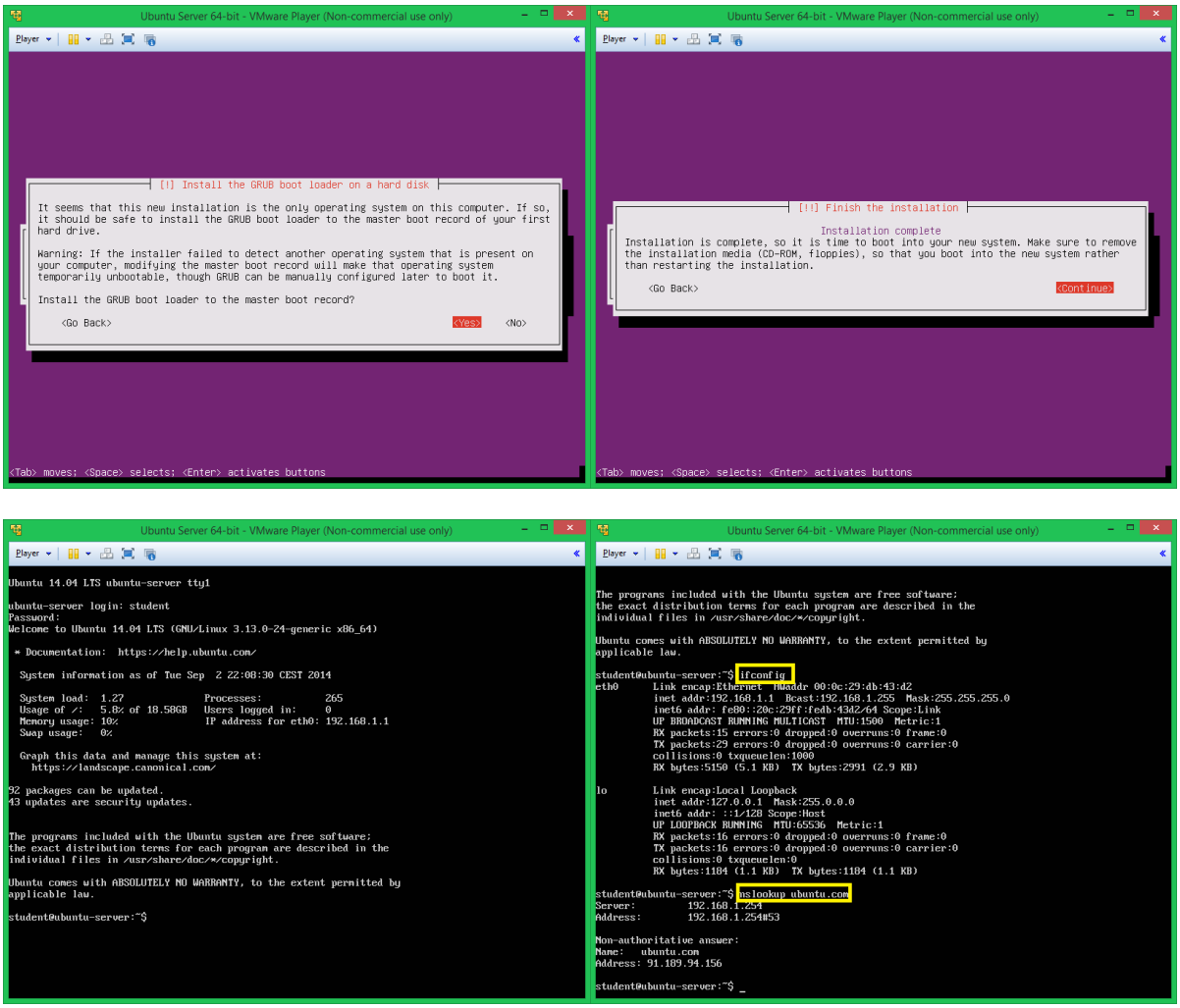








Automatic updates are not needed, because we will do the updates manually.



Check the existence if the IP configuration and the functioning of the name resolution, which will also check the outbound connection.

Change to super user privilege level

sudo su

Update the software package list

apt-get update

Upgrade the installed software

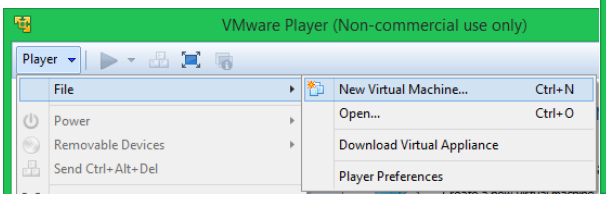
apt-get upgrade -y

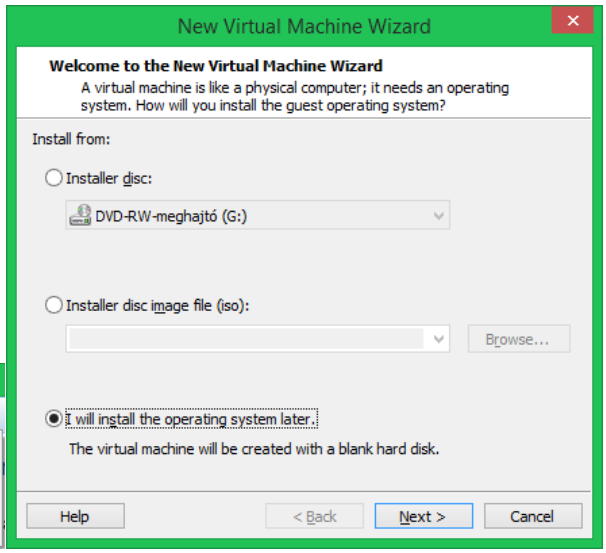
Install Midnight Commander

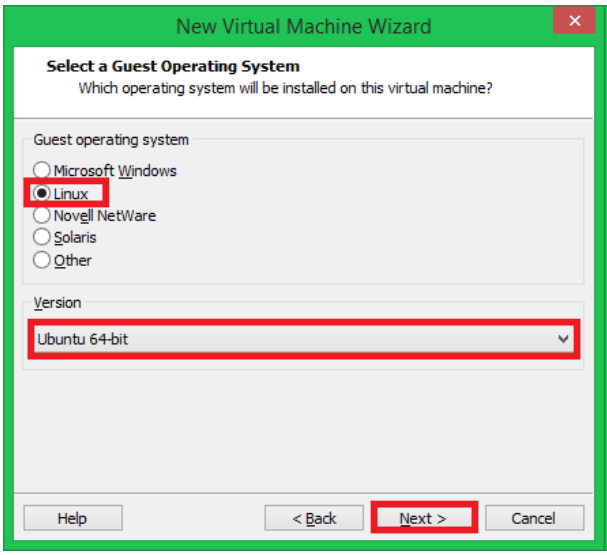
apt-get install mc -y

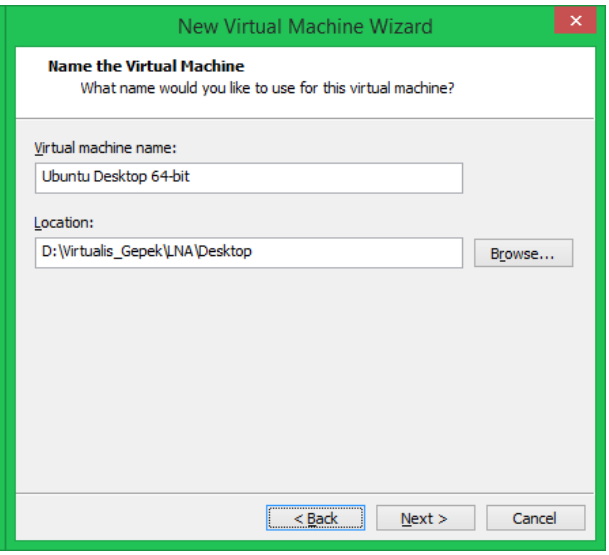
Taks 3. Create a virtual machine with one network interface (LAN1) and install Ubuntu Desktop in it

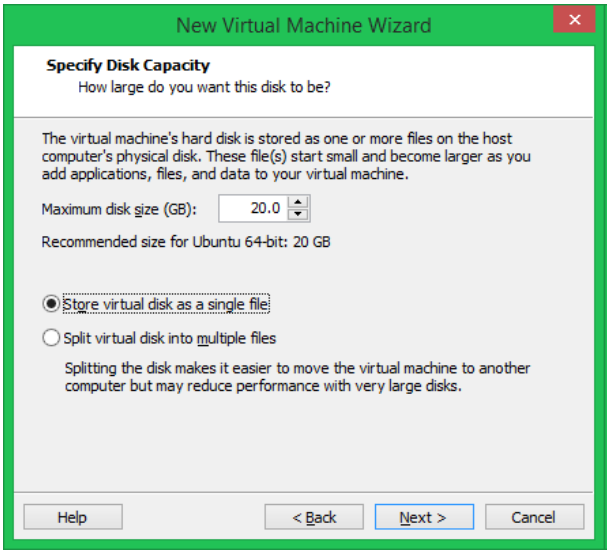
Start a new instance of vmWare player.

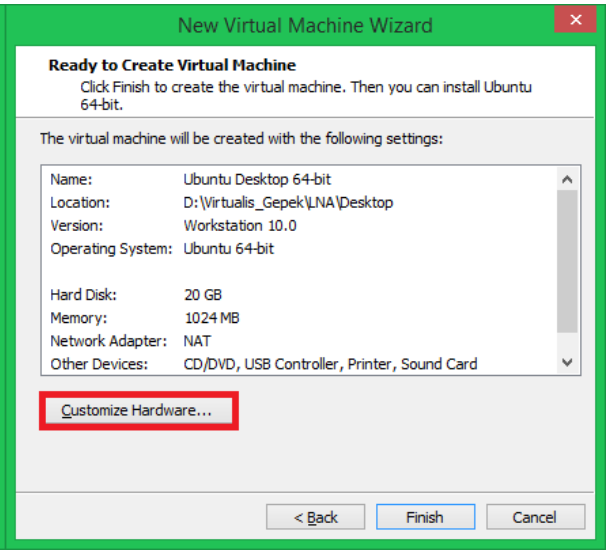


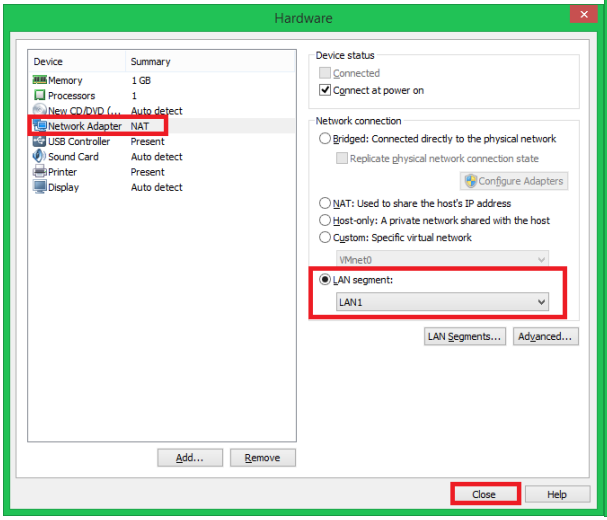


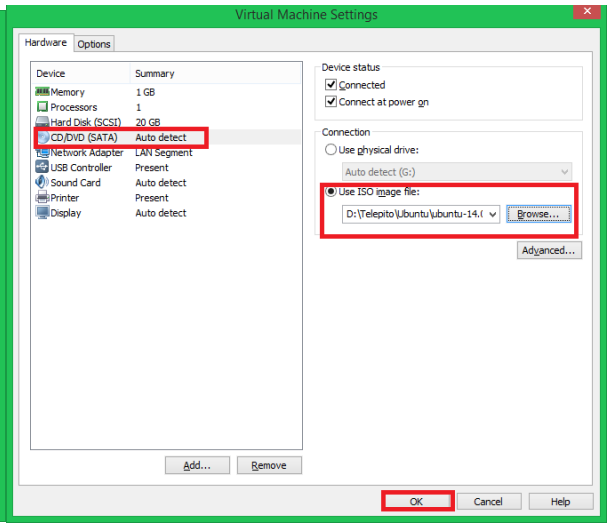


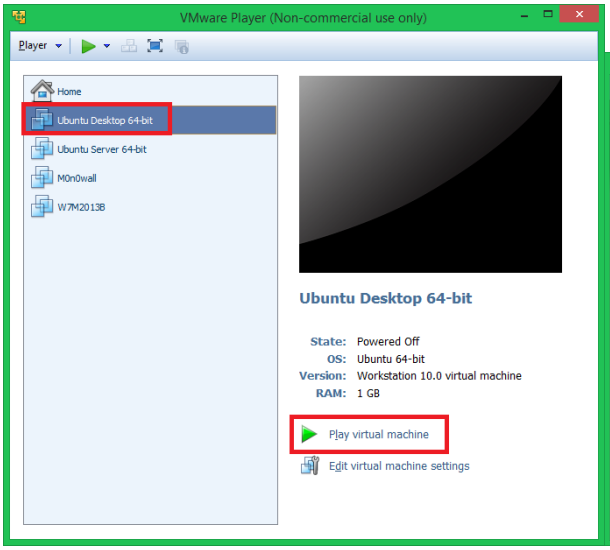


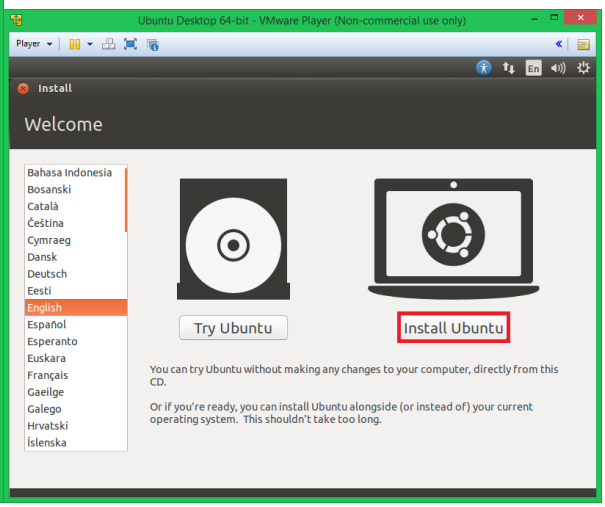


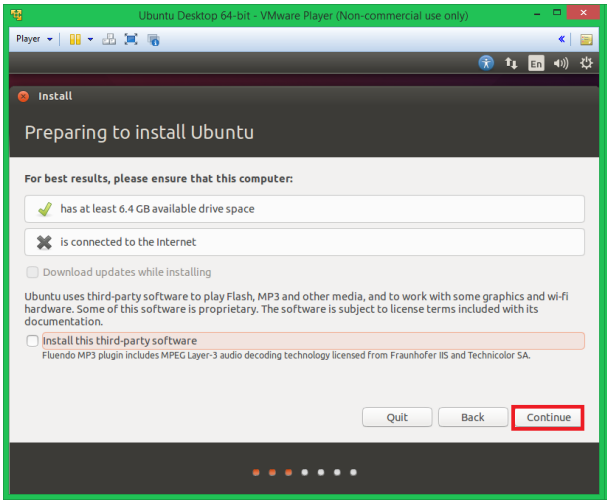


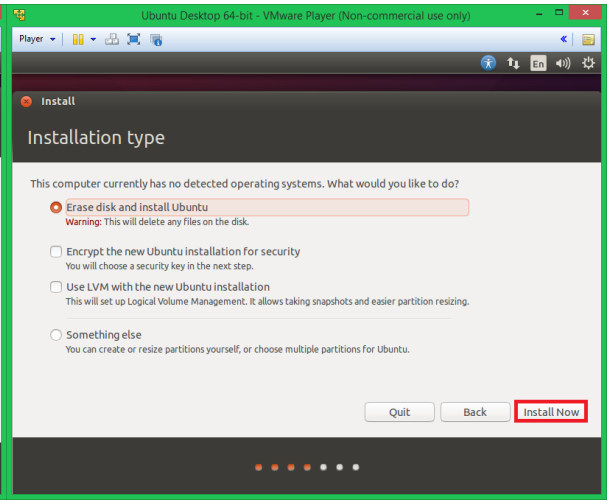

Hardware
Device
Summary
Memory
1 GB
Processors
1
New CD/DVD (...
Auto detect
Network Adapter
NAT
USB Controller
Present
Sound Card
Auto detect
Printer
Present
Display
Auto detect
Device status
Connected
Connect at power on
Network connection
Bridged: Connected directly to the physical network
Replicate physical network connection state
Configure Adapters
NAT: Used to share the host's IP address
Host-only: A private network shared with the host
Custom: Specific virtual network
VMnet0
LAN segment:
LAN1
LAN Segments...
Advanced...
Add...
Remove
Close
Help

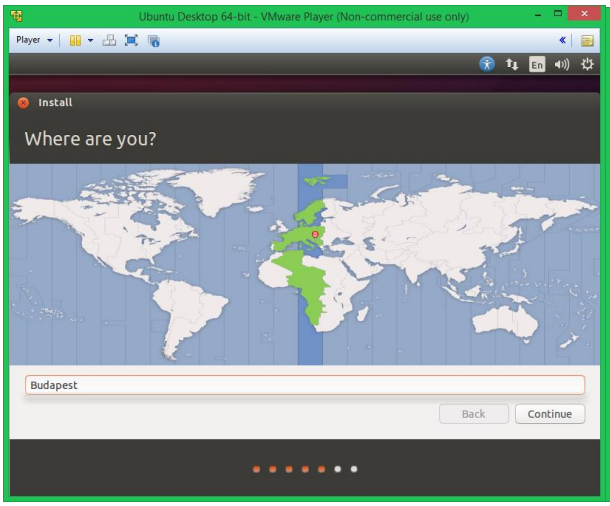

Virtual Machine Settings
Hardware
Options
Device
Summary
Memory
1 GB
Processors
1
Hard Disk (SCSI)
20 GB
CD/DVD (SATA)
Auto detect
Network Adapter
LAN Segment
USB Controller
Present
Sound Card
Auto detect
Printer
Present
Display
Auto detect
Device status
Connected
Connect at power on
Connection
Use physical drive:
Auto detect (G:)
Use ISO image file:
D:\Telepito\Ubuntu\ubuntu-14.(
Browse...
Advanced...
Add...
Remove
OK
Cancel
Help

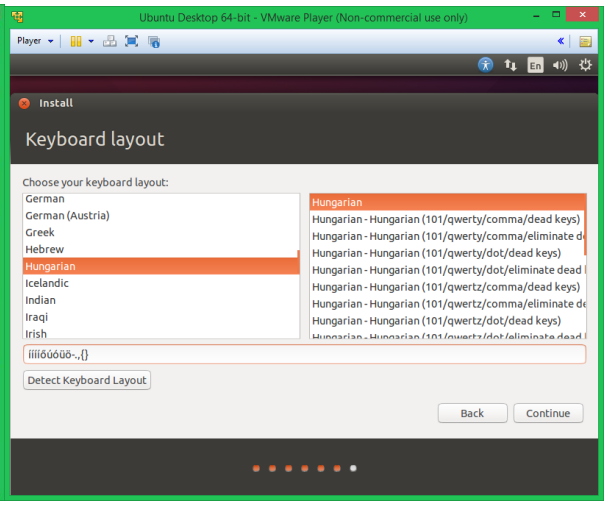

VMware Player (Non-commercial use only)
Player
Home
Ubuntu Desktop 64-bit
Ubuntu Server 64-bit
M0n0wall
W7M2013B
Ubuntu Desktop 64-bit
State: Powered Off
OS: Ubuntu 64-bit
Version: Workstation 10.0 virtual machine
RAM: 1 GB
Play virtual machine
Edit virtual machine settings

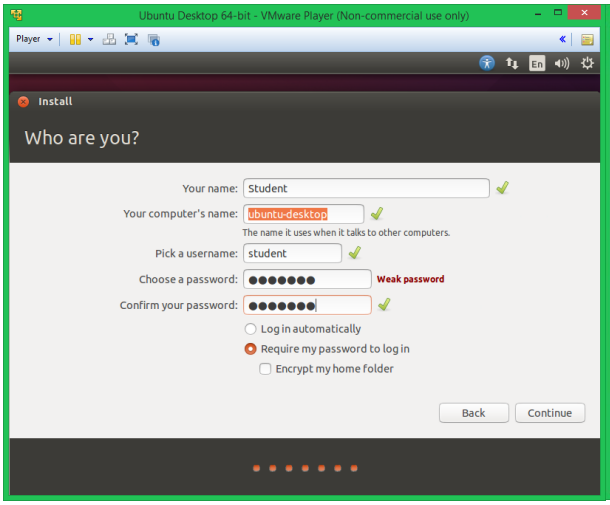

Ubuntu Desktop 64-bit - VMware Player (Non-commercial use only)
Player
Install
Welcome
Bahasa Indonesia
Bosanski
Català
Čeština
Cymraeg
Dansk
Deutsch
Eesti
English
Español
Esperanto
Euskara
Français
Gaeilge
Galego
Hrvatski
Íslenska
Try Ubuntu
Install Ubuntu
You can try Ubuntu without making any changes to your computer, directly from this CD.
Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long.

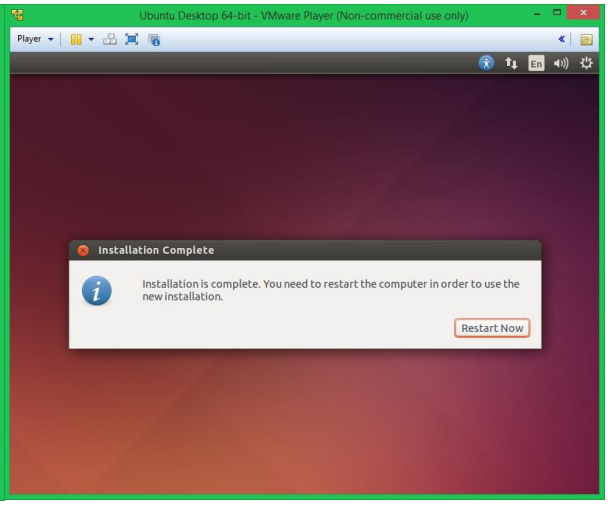

Ubuntu Desktop 64-bit - VMware Player (Non-commercial use only)
Player
Install
Preparing to install Ubuntu
For best results, please ensure that this computer:
has at least 6.4 GB available drive space
is connected to the Internet
Download updates while installing
Ubuntu uses third-party software to play Flash, MP3 and other media, and to work with some graphics and wi-fi hardware. Some of this software is proprietary. The software is subject to license terms included with its documentation.
Install this third-party software
Fluendo MP3 plugin includes MPEG Layer-3 audio decoding technology licensed from Fraunhofer IIS and Technicolor SA.
Quit
Back
Continue


Ubuntu Desktop 64-bit - VMware Player (Non-commercial use only)
Player
Install
Installation type
This computer currently has no detected operating systems. What would you like to do?
Erase disk and install Ubuntu
Warning: This will delete any files on the disk.
Encrypt the new Ubuntu installation for security
You will choose a security key in the next step.
Use LVM with the new Ubuntu installation
This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.
Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.
Quit
Back
Install Now

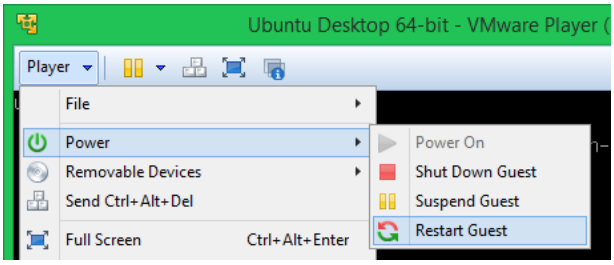




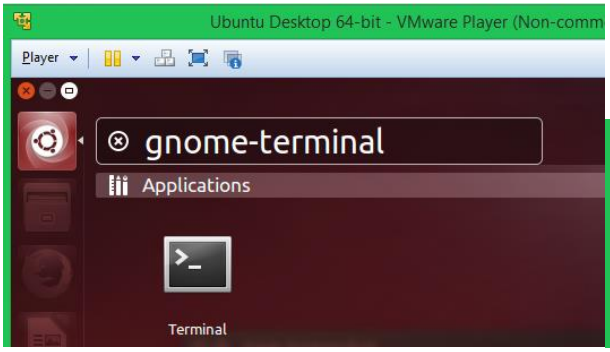


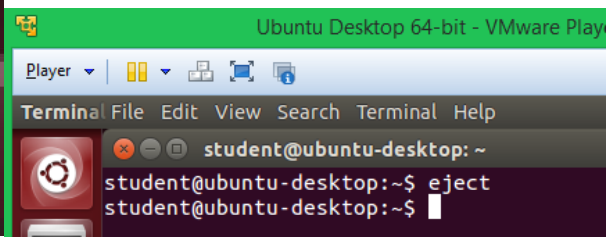


Password: student



After reboot log in, start a terminal window, and eject the virtual disk used for the installation.





Enter the proxy settings

sudo su

export http_proxy=http://ns-proxy.kefo.hu:3128/

Update the software package list

apt-get update

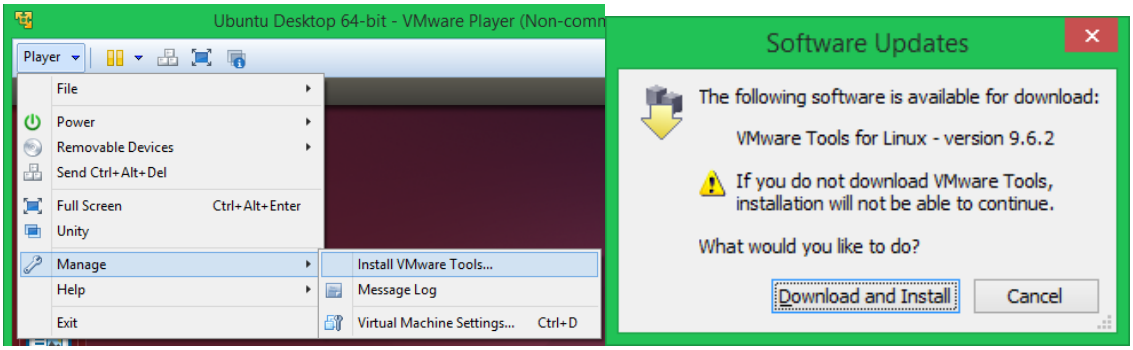
Upgrade the installed software

apt-get upgrade -y

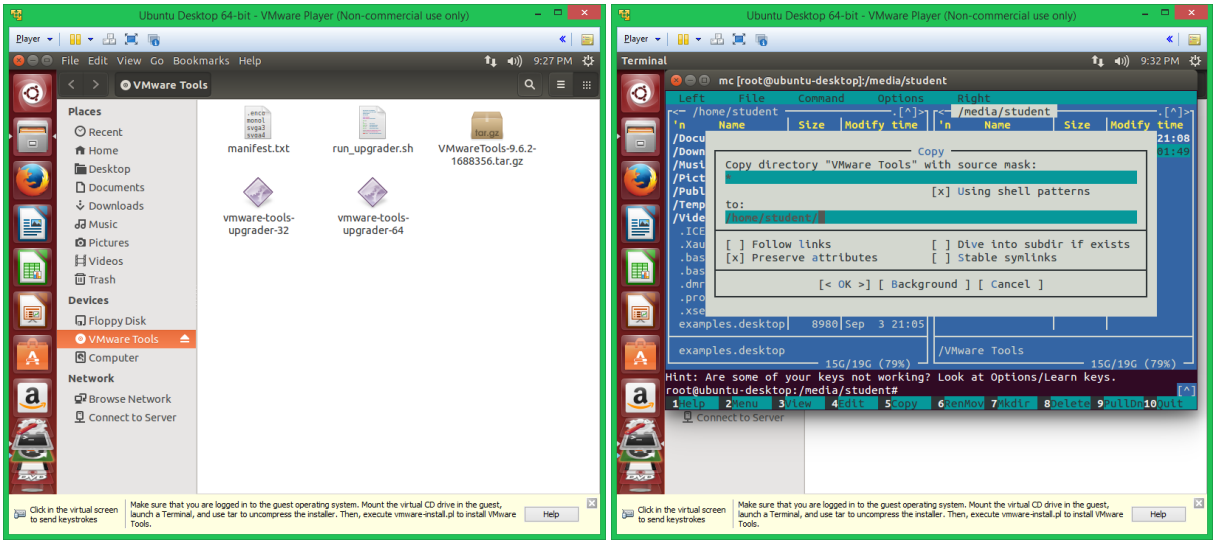
Install Midnight Commander

apt-get install mc -y

Install VMware Tools



Copy all files to student's home directory



```
root@ubuntu-desktop: /home/student/VMware Tools
root@ubuntu-desktop:/home/student# cd VMware\ Tools/
root@ubuntu-desktop:/home/student/VMware Tools# ls
manifest.txt      VMwareTools-9.6.2-1688356.tar.gz  vmware-tools-upgrader-64
run_upgrader.sh   vmware-tools-upgrader-32
root@ubuntu-desktop:/home/student/VMware Tools# gzip -d VMwareTools-9.6.2-168835
6.tar.gz
root@ubuntu-desktop:/home/student/VMware Tools# tar -xvf VMwareTools-9.6.2-16883
56.tar
```

```
root@ubuntu-desktop:/home/student/VMware Tools# cd vmware-tools-distrib/
root@ubuntu-desktop:/home/student/VMware Tools/vmware-tools-distrib# ls
bin  doc  etc  FILES  INSTALL  installer  lib  vmware-install.pl
root@ubuntu-desktop:/home/student/VMware Tools/vmware-tools-distrib# ./vmware-in
stall.pl
```

Use the default answers in case of each question.

/usr/bin/vmware-user

Reboot the system

reboot

Log in and start Firefox web browser