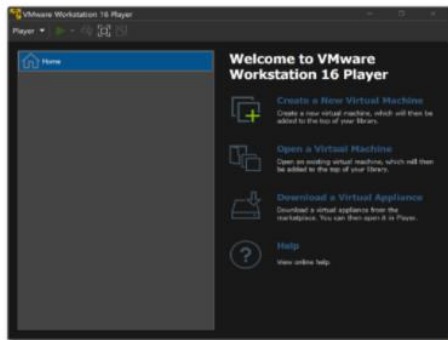

Lab 1

Embedded Linux Development Environment

Multiple OS in a PC

■ VMware

VMware Workstation 16 Player



VMware Workstation Player

VMware Workstation Player is an ideal utility for running a single virtual machine on a Windows or Linux PC. Organizations use Workstation Player to deliver managed corporate desktops, while students and educators use it for learning and training.

The free version is available for non-commercial, personal and home use. We also encourage students and non-profit organizations to benefit from this offering.

Commercial organizations require commercial licenses to use Workstation Player.

Need a more advanced virtualization solution? Check out Workstation Pro.

Try Workstation 16.0 Player for Windows


[DOWNLOAD NOW >](#)

Try Workstation 16.0 Player for Linux

[DOWNLOAD NOW >](#)

Multiple OS in a PC

■ Oracle Virtual Box



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 5.1.12 platform packages.** The binaries are released under the terms of the GPL version 2.
 - [Windows hosts](#)
 - [OS X hosts](#)
 - [Linux distributions](#)
 - [Solaris hosts](#)
- **VirtualBox 5.1.12 Oracle VM VirtualBox Extension Pack** [⇒ All supported platforms](#)
Support for USB 2.0 and USB 3.0 devices, VirtualBox RDP, disk encryption, NVMe and PXE boot for Intel cards. 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 5.0.30**, please download the extension pack [⇒ here](#).*
- **VirtualBox 5.1.12 Software Developer Kit (SDK)** [⇒ All platforms](#)

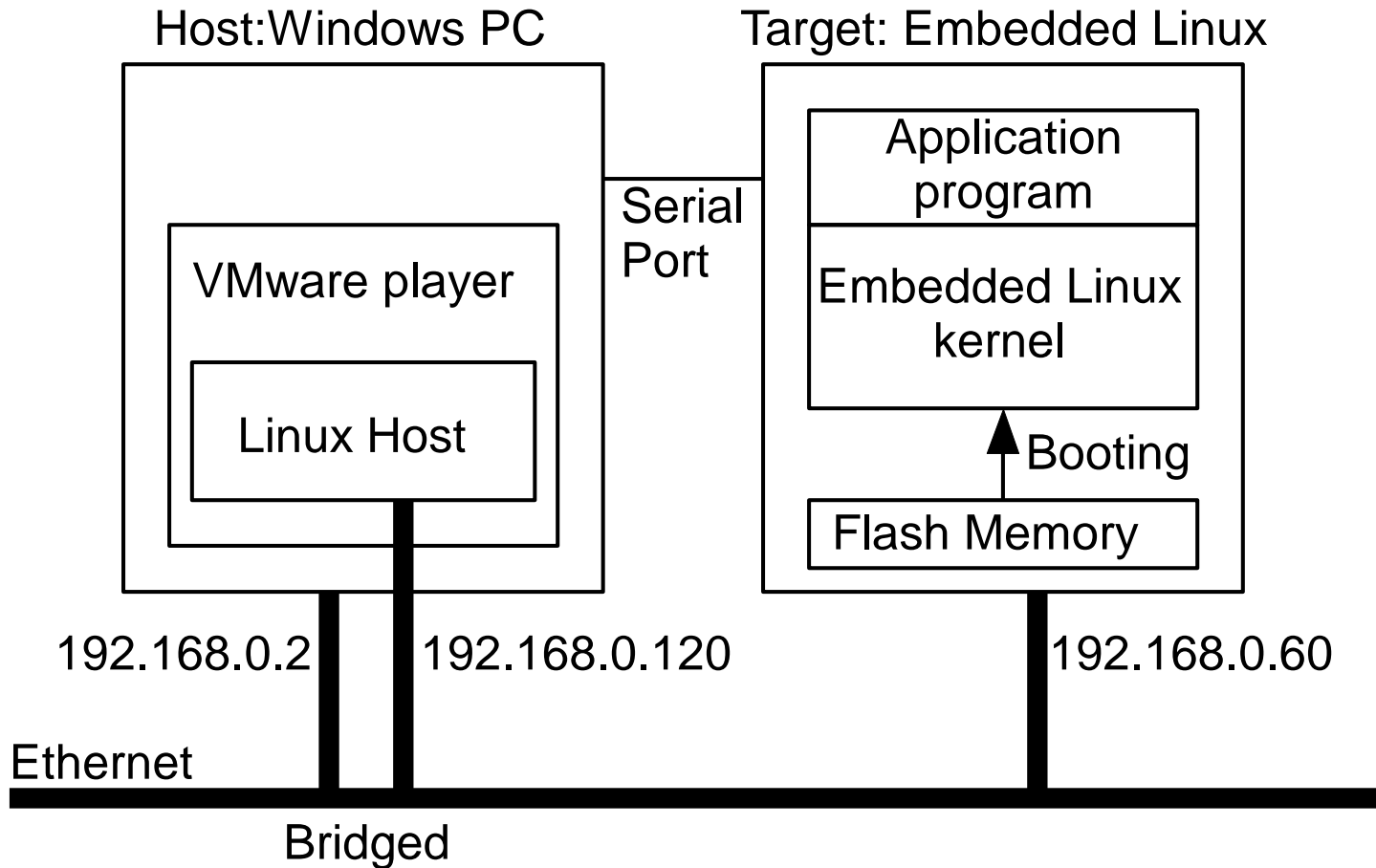
[About](#)
[Screenshots](#)
[Downloads](#)
[Documentation](#)
 [End-user docs](#)
 [Technical docs](#)
[Contribute](#)
[Community](#)

Linux

- Debian
- Ubuntu
- Linux Mint

- Redhat
- CentOS
- Fedora

Development Environment









USB to Ethernet Adapter

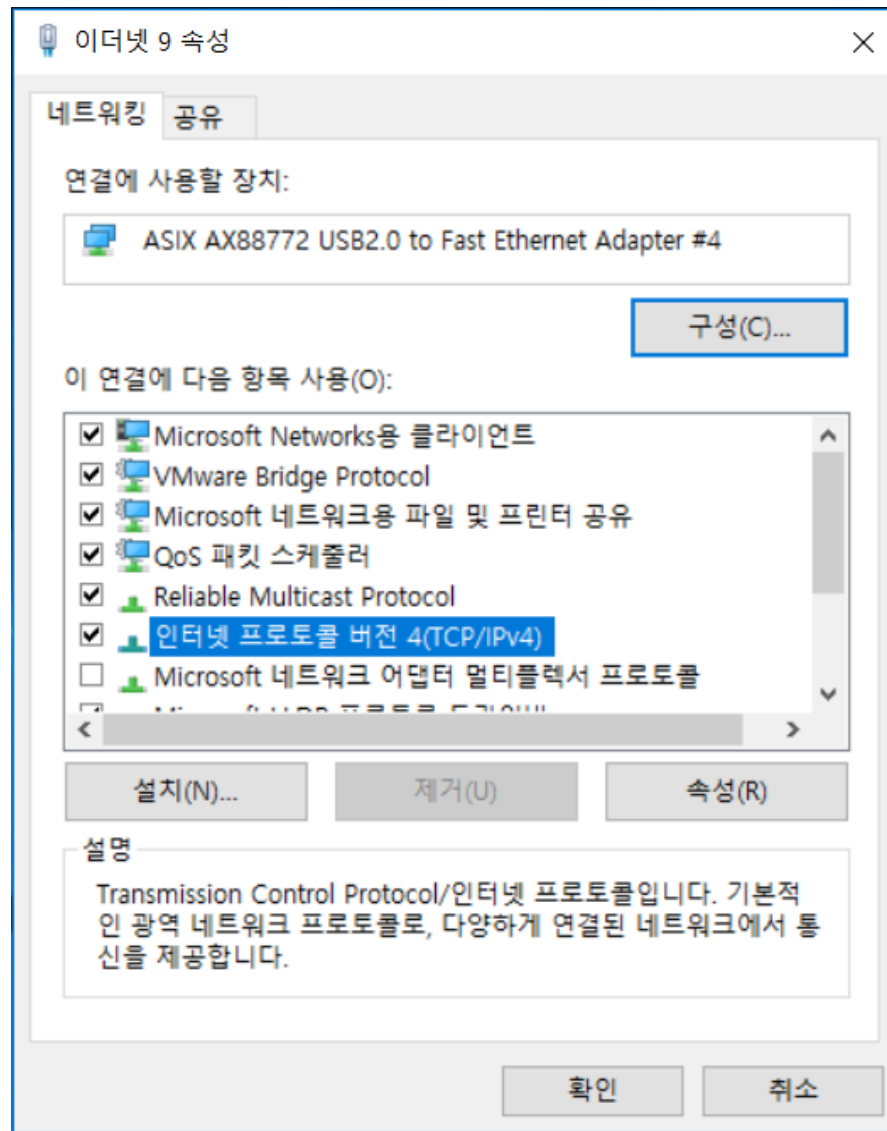
네트워크 연결

← → ↕ ↑ > 제어판 > 네트워크 및 인터넷 > 네트워크 연결

구성 ▾

 <p>Bluetooth 네트워크 연결 연결되어 있지 않음 Bluetooth Device (Persona...</p>	 <p>VMware Network Adapter VMnet1 사용함</p>
 <p>VMware Network Adapter VMnet8 사용함</p>	 <p>Wi-Fi 연결되어 있지 않음 Qualcomm Atheros QCA9...</p>
 <p>이더넷 iptime_limdj 2 Realtek PCIe GBE Family C...</p>	 <p>이더넷 9 식별되지 않은 네트워크 ASIX AX88772 USB2.0 to F...</p>

Properties



IP address

인터넷 프로토콜 버전 4(TCP/IPv4) 속성

일반

네트워크가 IP 자동 설정 기능을 지원하면 IP 설정이 자동으로 할당되도록 할 수 있습니다. 지원하지 않으면, 네트워크 관리자에게 적절한 IP 설정값을 문의해야 합니다.

자동으로 IP 주소 받기(O)

다음 IP 주소 사용(S):

IP 주소(I): 192 . 168 . 0 . 2

서브넷 마스크(U): 255 . 255 . 255 . 0

기본 게이트웨이(D): . . .

자동으로 DNS 서버 주소 받기(B)

다음 DNS 서버 주소 사용(E):

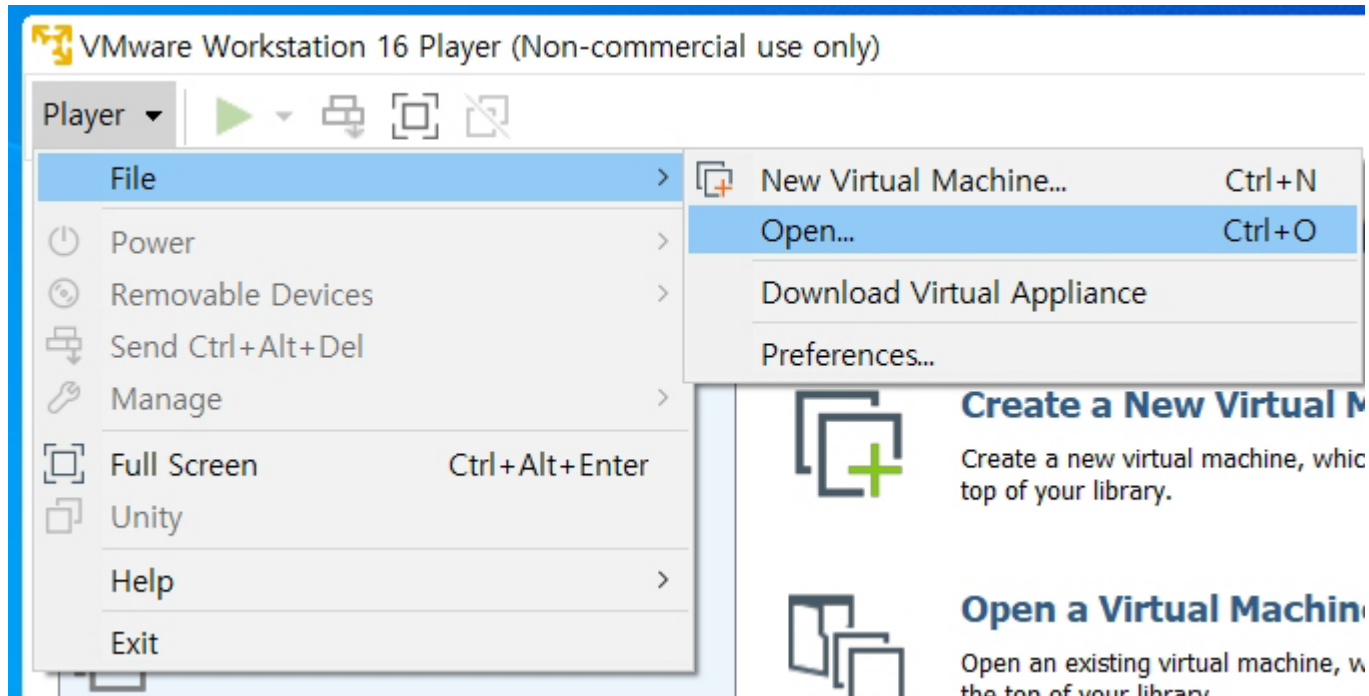
기본 설정 DNS 서버(P): . . .

보조 DNS 서버(A): . . .

끝낼 때 설정 유효성 검사(L) 고급(M)...

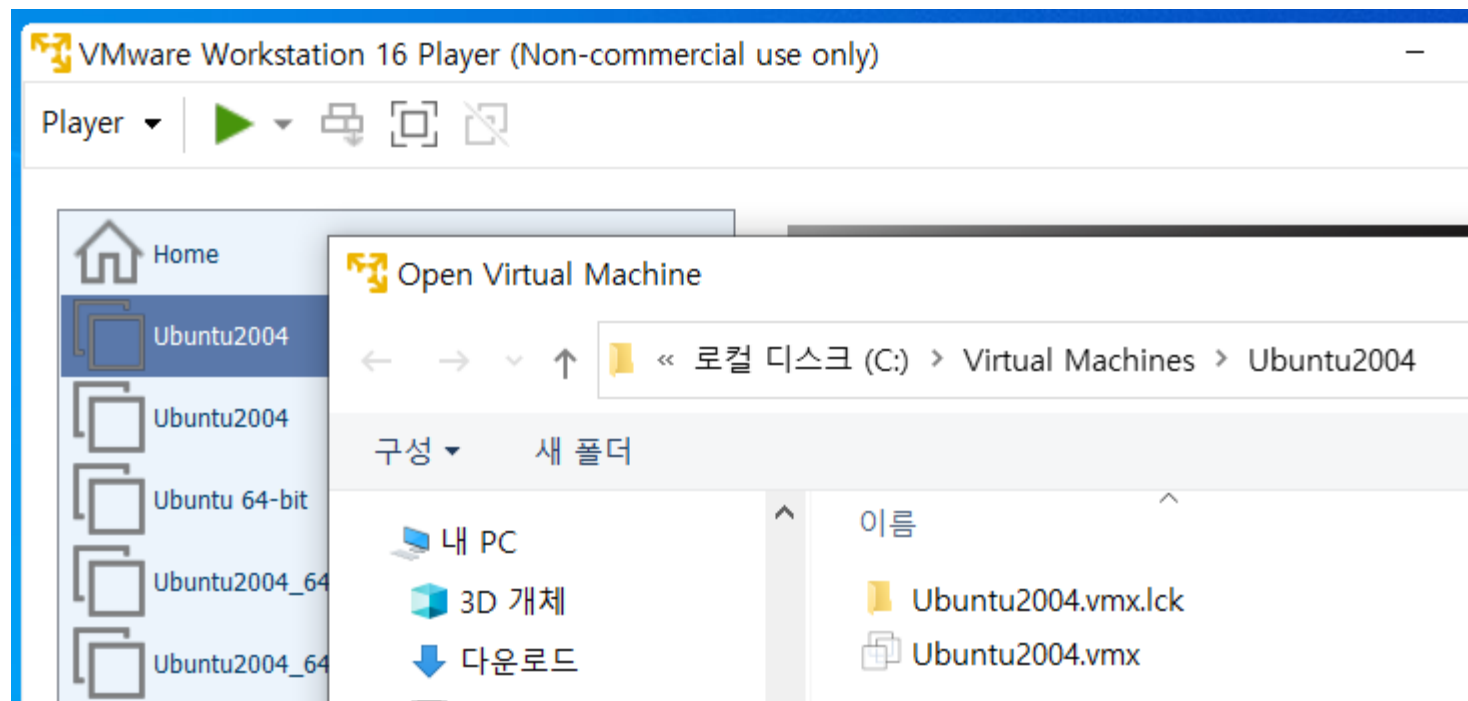
확인 취소

VMware Player



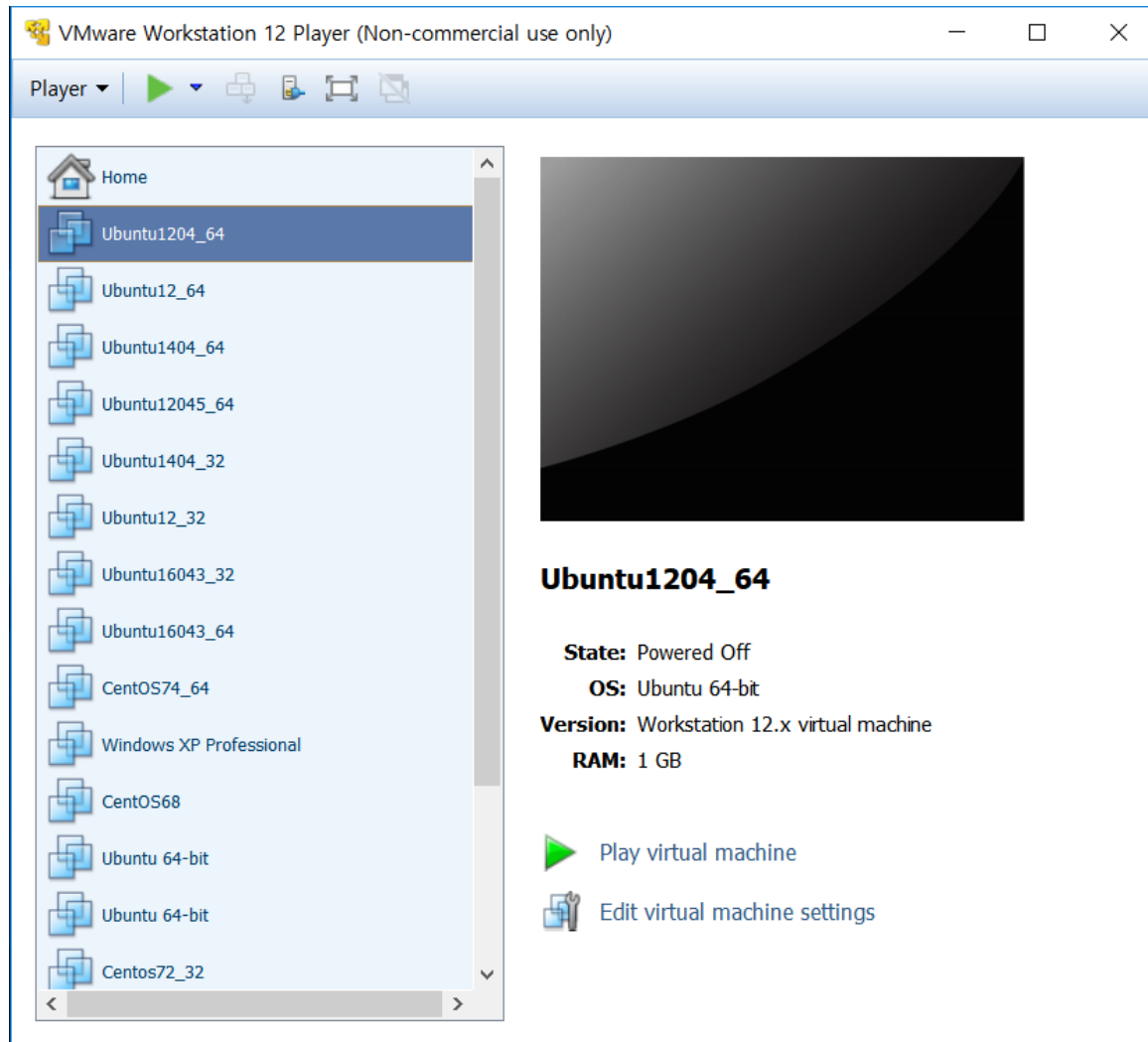
VMware Player

- Select **Ubuntu2004.vmx**



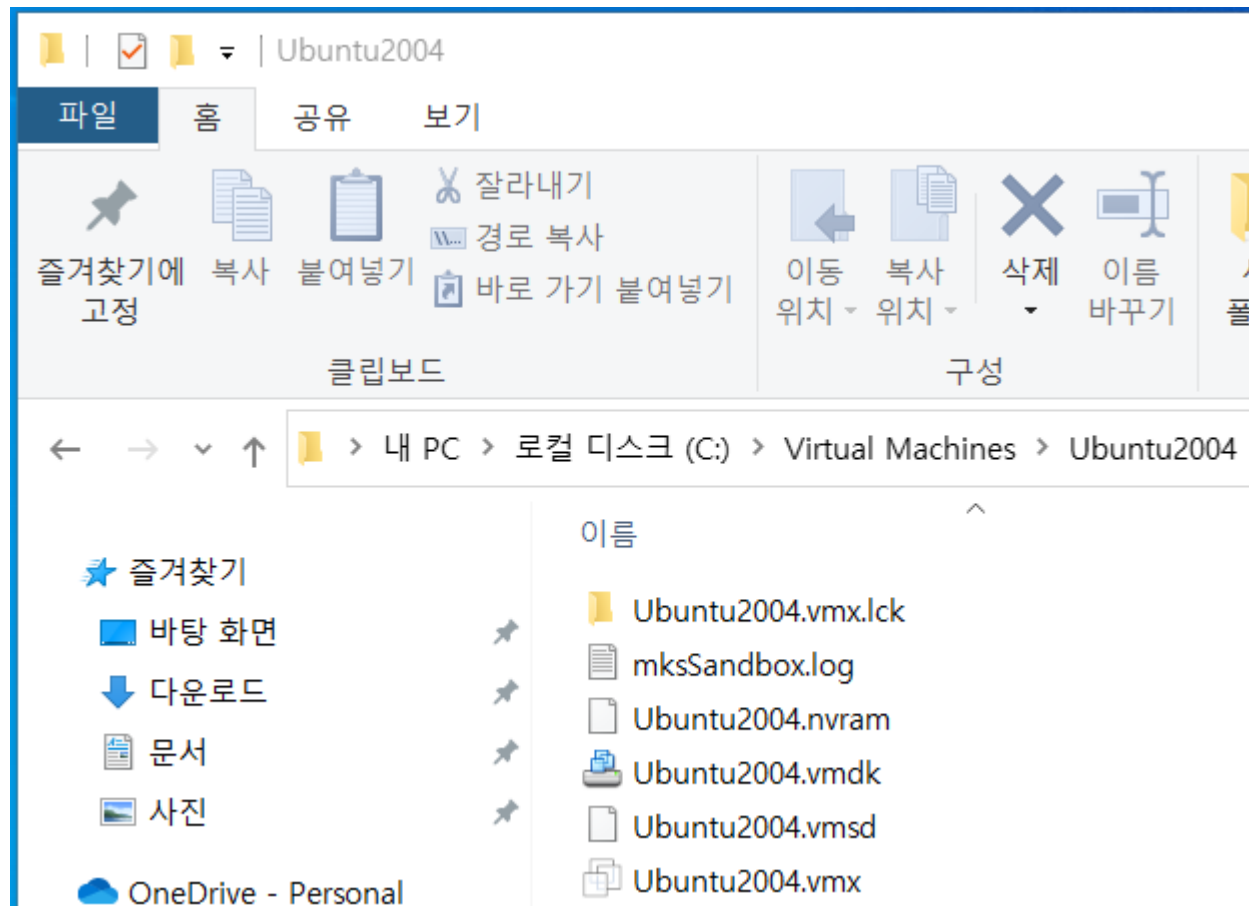
VMware Player

- Select **Ubuntu2004** and play



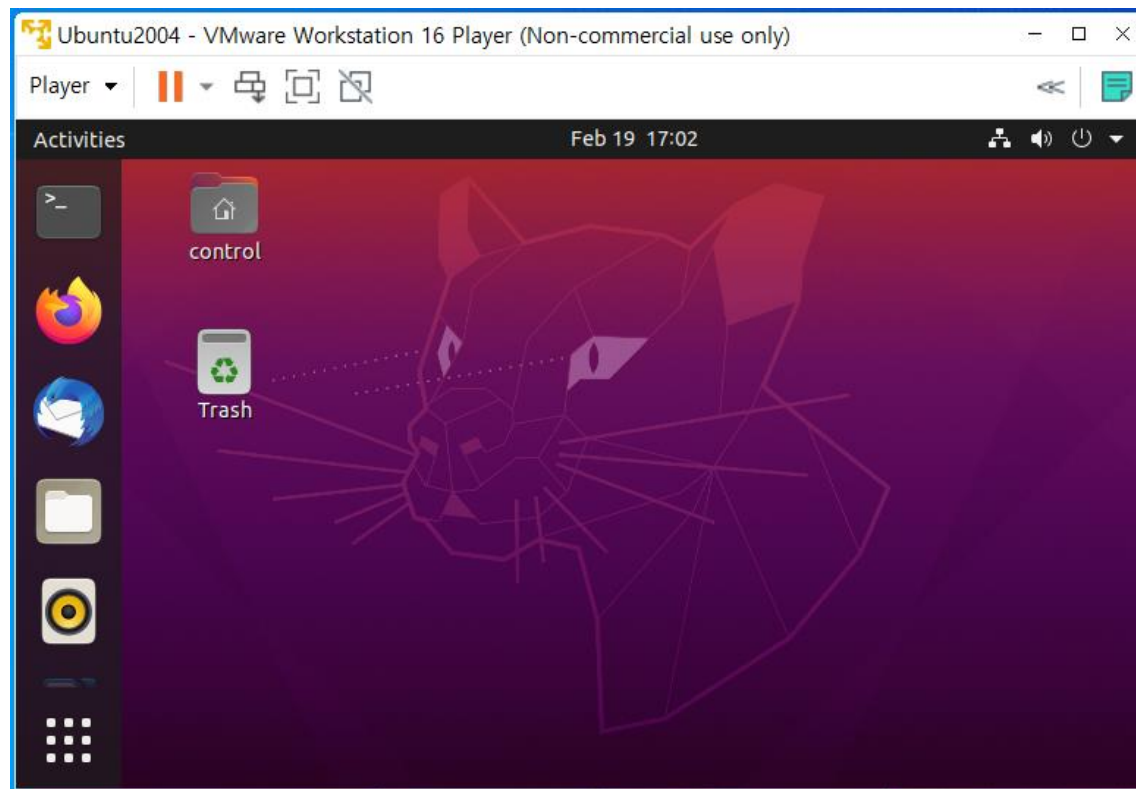
VMware Player

- Or double click **Ubuntu2004.vmx** in the folder Ubuntu2004



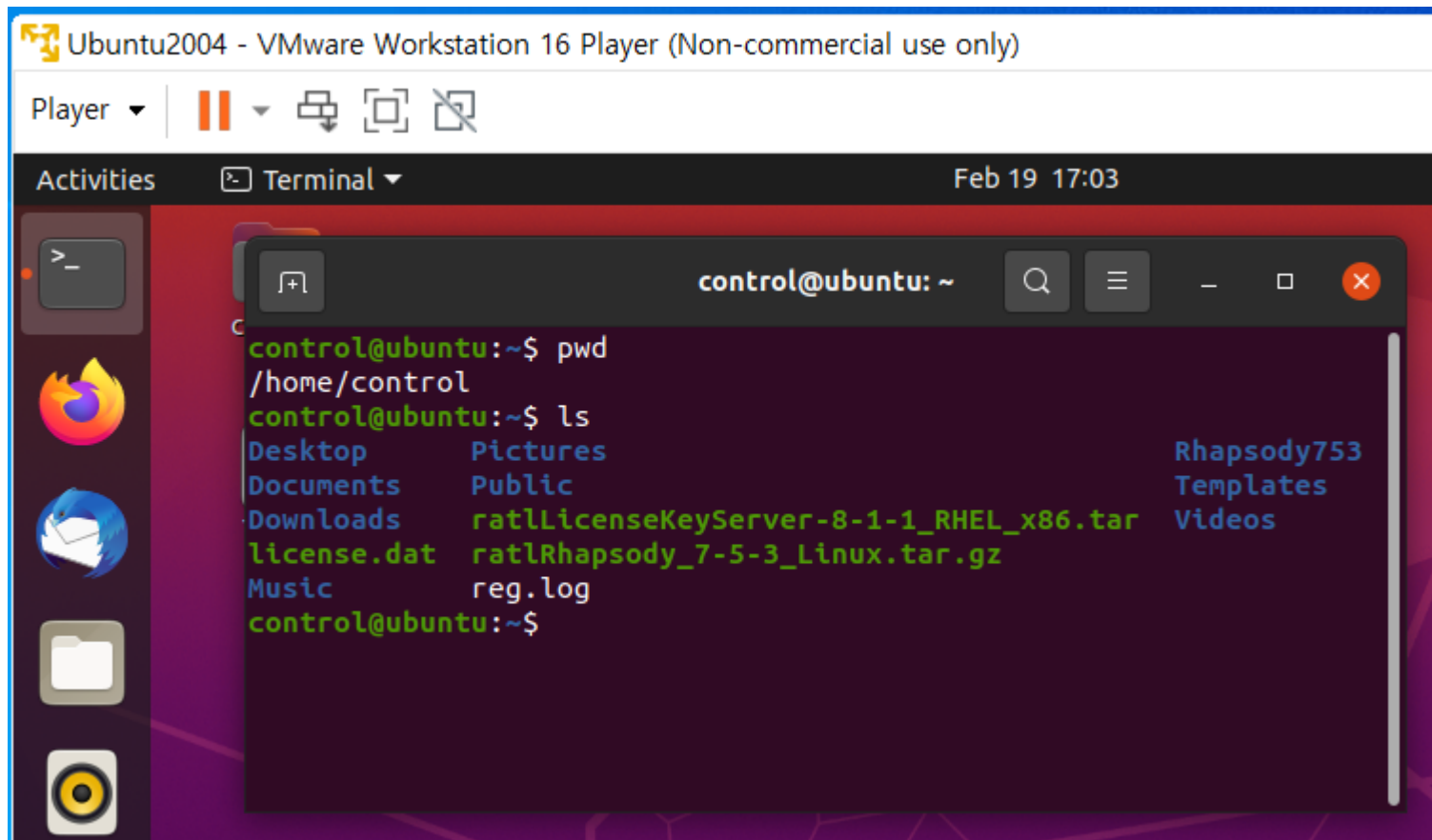
Log In

- ID:control password:
- ID:root password:control
- 마우스 포인터가 안 보일 경우에는 **Ctrl-Alt**



Open Terminal

- pwd: print working directory
- ls: list directory contents



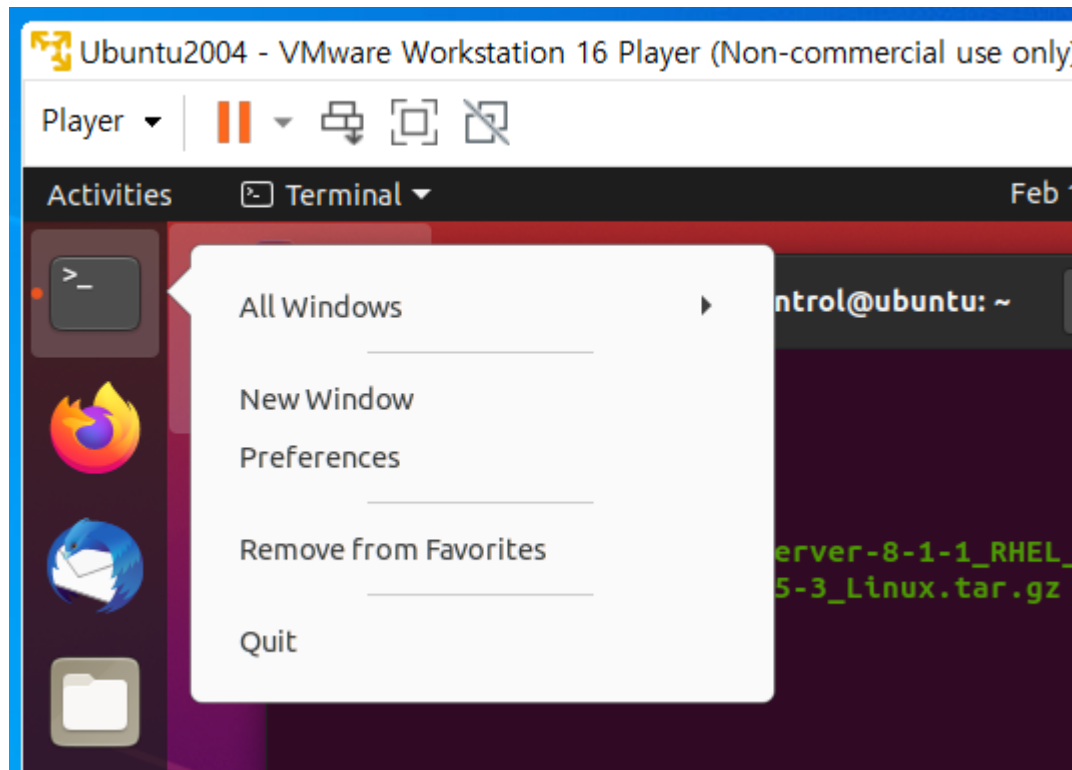
The screenshot shows a terminal window titled 'control@ubuntu: ~' within a VMware Workstation 16 Player. The terminal displays the following commands and their outputs:

```
control@ubuntu:~$ pwd
/home/control
control@ubuntu:~$ ls
Desktop      Pictures          Rhapsody753
Documents   Public           Templates
Downloads   ratLicenseKeyServer-8-1-1_RHEL_x86.tar  Videos
license.dat  ratRhapsody_7-5-3_Linux.tar.gz
Music       reg.log
```

The terminal window is part of a desktop environment with a sidebar on the left containing icons for a terminal, Firefox, Mail, Files, and Settings. The top of the window shows the VMware Player interface with a 'Player' dropdown, a play button, and other control icons. The system clock in the top right corner indicates 'Feb 19 17:03'.

New Terminal

- Right button click
- Select New Window



Check IP address

- Sudo apt install net-tools
- ifconfig

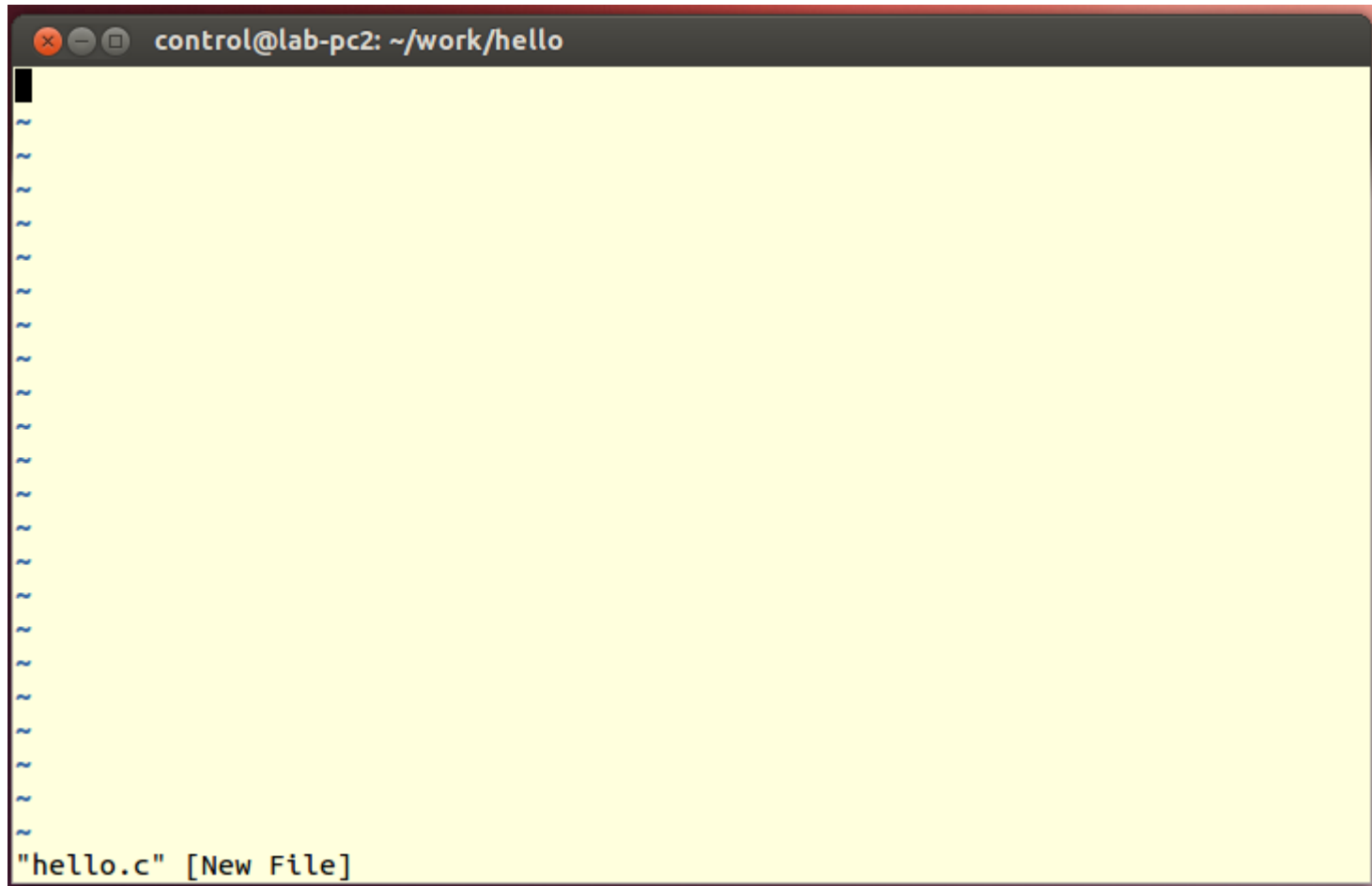
```
control@ubuntu: ~  
control@ubuntu:~$ ifconfig  
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 192.168.30.132 netmask 255.255.255.0 broadcast 192.168.30.255  
    inet6 fe80::3cad:54ae:1a18:fffc prefixlen 64 scopeid 0x20<link>  
    ether 00:0c:29:4b:b6:76 txqueuelen 1000 (Ethernet)  
    RX packets 359 bytes 225913 (225.9 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 197 bytes 17394 (17.3 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
    inet 127.0.0.1 netmask 255.0.0.0  
    inet6 ::1 prefixlen 128 scopeid 0x10<host>  
    loop txqueuelen 1000 (Local Loopback)  
    RX packets 173 bytes 14659 (14.6 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 173 bytes 14659 (14.6 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```


Make working directory

- mkdir: make directory
- cd: change directory
- vi hello.c

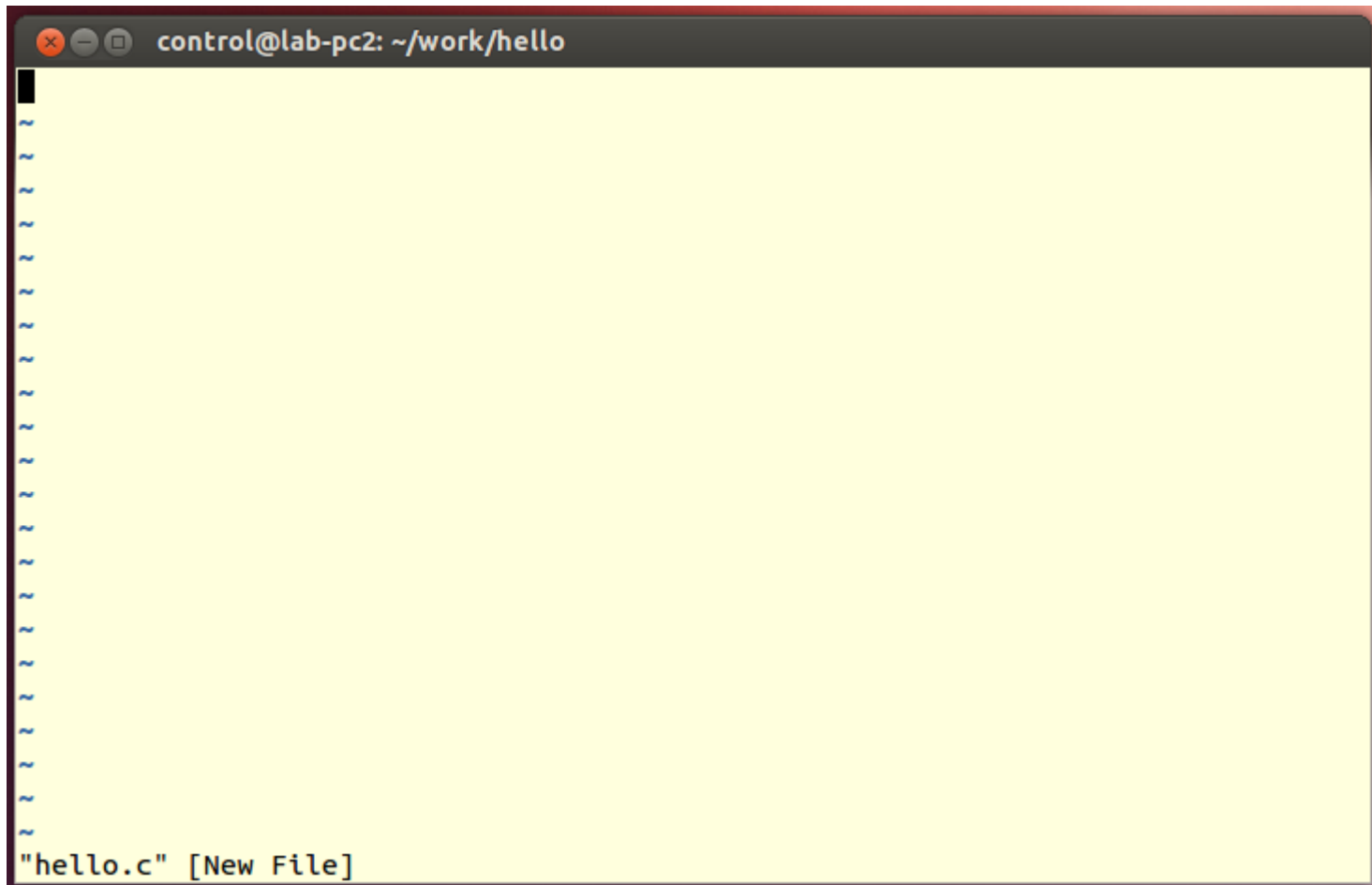
```
control@lab-pc2: ~/work/hello
control@lab-pc2:~$ cd work
control@lab-pc2:~/work$ mkdir hello
control@lab-pc2:~/work$ cd hello
control@lab-pc2:~/work/hello$ vi hello.c
```

- Press 'a' key to start to enter



The image shows a terminal window with a dark title bar containing the text "control@lab-pc2: ~/work/hello". The main area of the terminal is a light yellow background representing the vi editor. On the left side, there are several blue tilde (~) characters indicating the current line. At the bottom left, the text "'hello.c' [New File]" is displayed, indicating that a new file named 'hello.c' has been created. The cursor is positioned at the beginning of the first line.

- Start typing



The screenshot shows a terminal window with the title bar "control@lab-pc2: ~/work/hello". The terminal content is a large yellow area representing the vi editor's insert mode. On the left side of this area, there is a vertical column of blue tilde characters (~) indicating line numbers. At the bottom left of the yellow area, the text `"hello.c" [New File]` is visible, indicating that a new file named "hello.c" has been created and the editor is in insert mode.

Compile and run

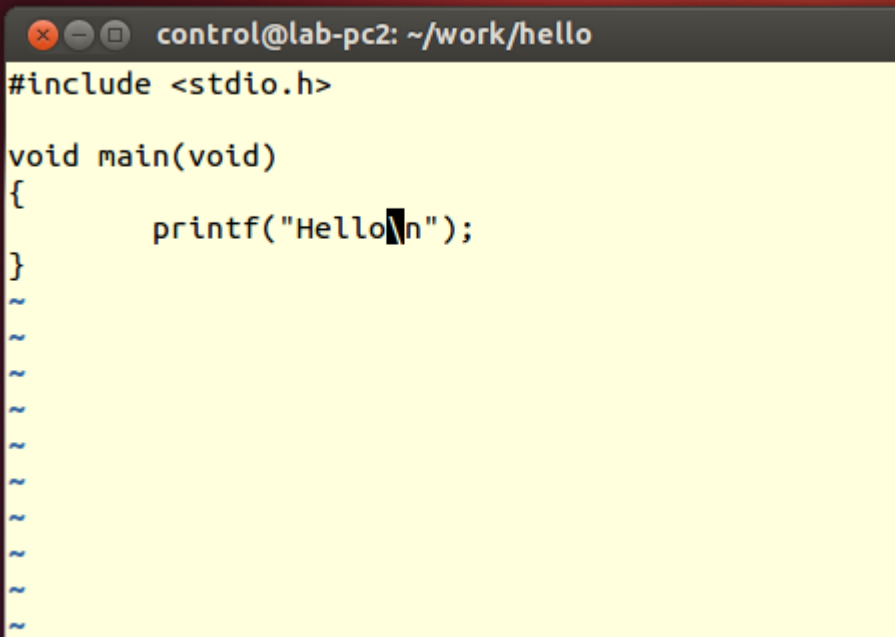
- gcc hello.c

```
control@ubuntu: ~/work/hello
control@ubuntu:~/work/hello$ gcc hello.c
control@ubuntu:~/work/hello$ ls
a.out  hello.c
control@ubuntu:~/work/hello$ ./a.out
Hello
control@ubuntu:~/work/hello$
```

- gcc -o hello hello.c

```
control@ubuntu: ~/work/hello
control@ubuntu:~/work/hello$ gcc -o hello hello.c
control@ubuntu:~/work/hello$ ls
a.out  hello  hello.c
control@ubuntu:~/work/hello$ ./hello
Hello
control@ubuntu:~/work/hello$
```

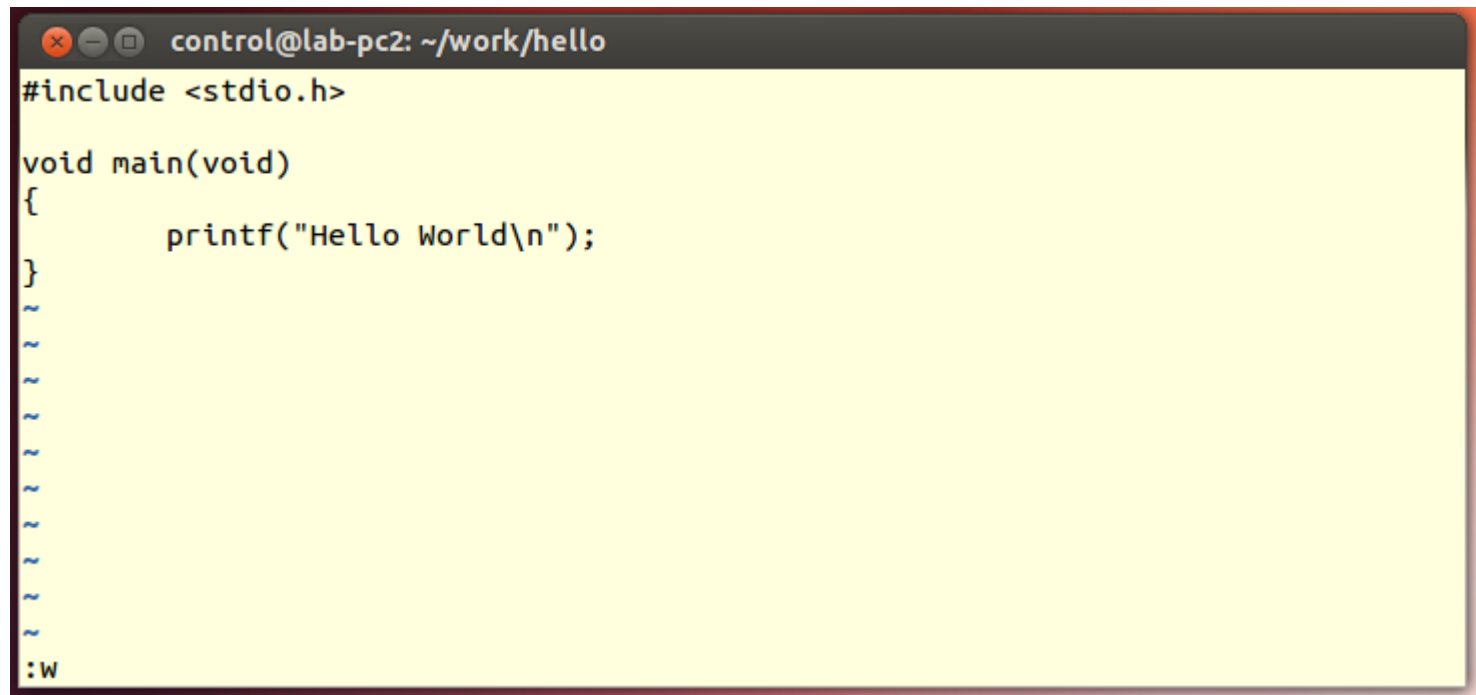
- 'vi hello.c' to start editing
- Move the cursor using arrow keys or 'h,j,k,l' keys
- Press 'i' to insert



```
control@lab-pc2: ~/work/hello
#include <stdio.h>

void main(void)
{
    printf("Hello\n");
}
~
~
~
~
~
~
~
~
```

- To finish typing press 'esc' key
- To save ':w' and Enter
- To quit ':q' and Enter



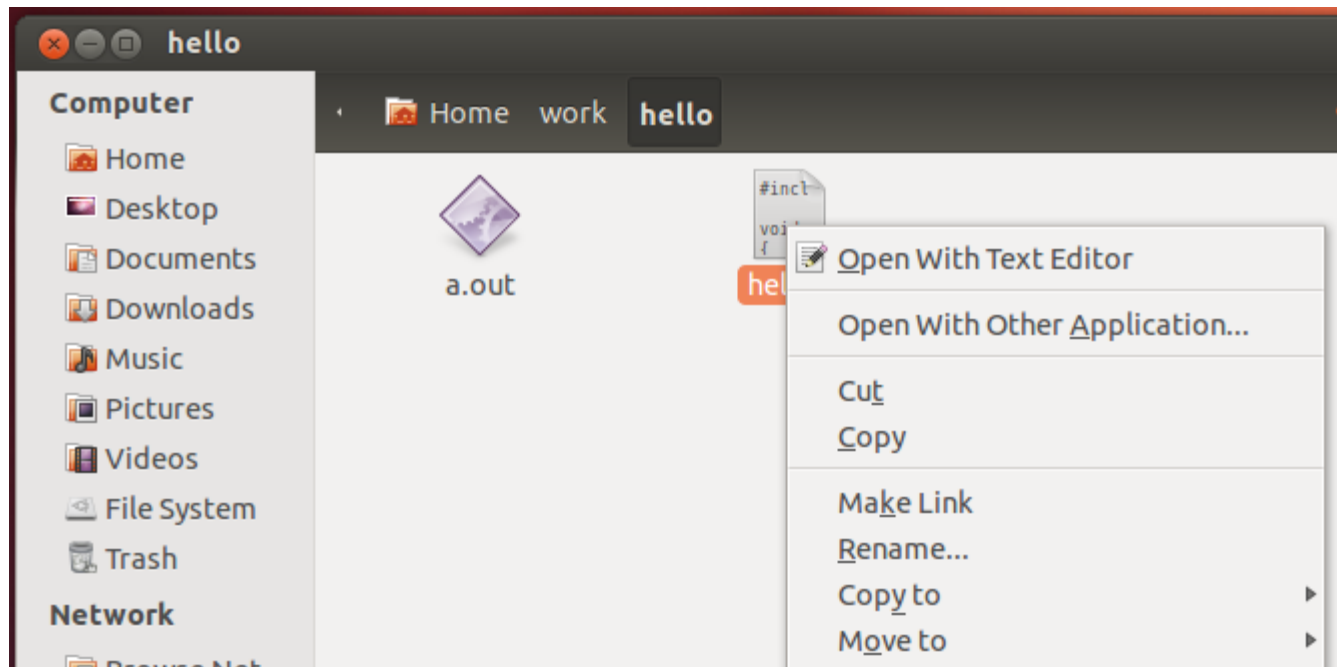
```
control@lab-pc2: ~/work/hello
#include <stdio.h>

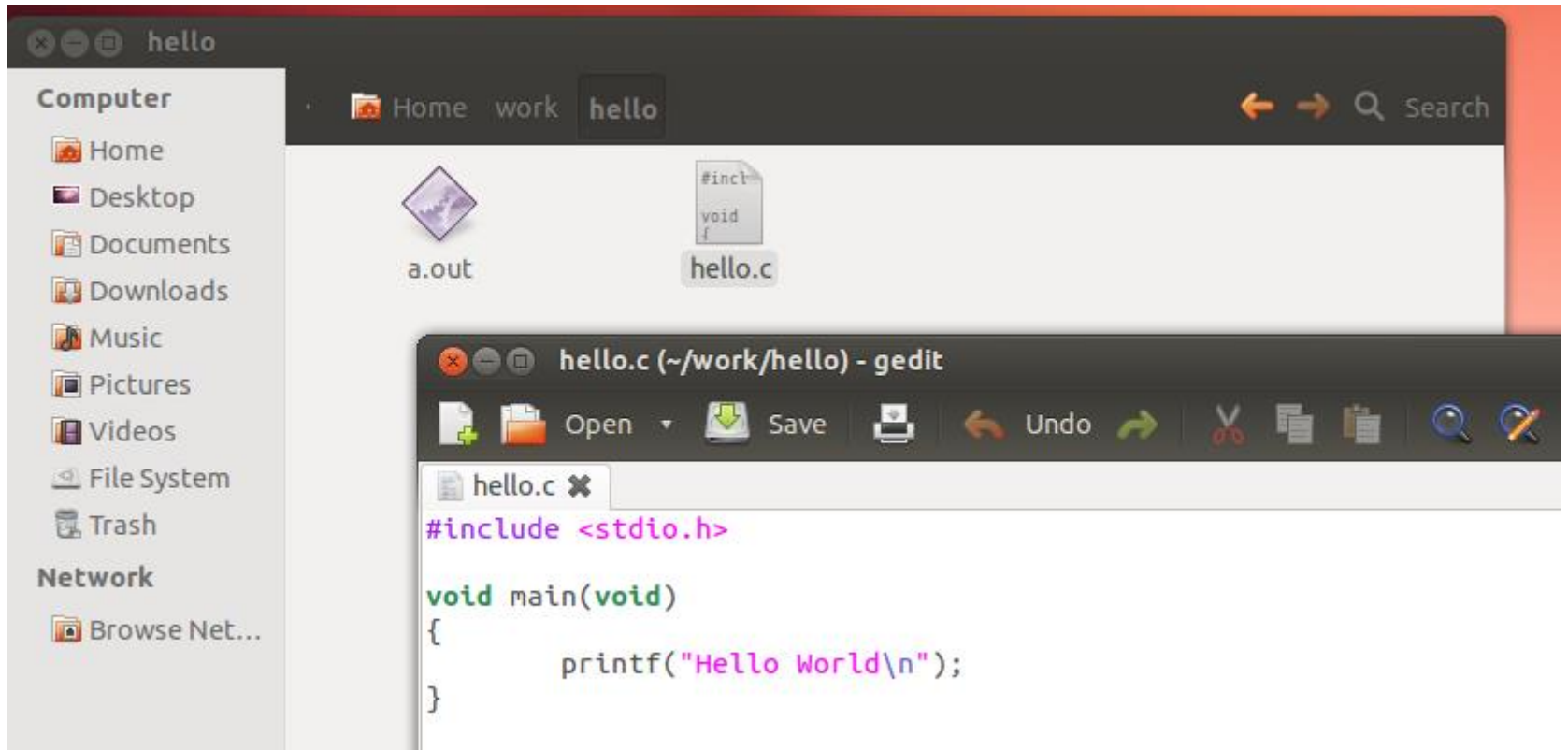
void main(void)
{
    printf("Hello World\n");
}
~
~
~
~
~
~
~
~
~
~
:w
```


-
- To delete a character press 'x'
 - To append a character 'a'
 - To copy a line 'yy'
 - To paste a line 'p'
 - To delete and copy a line 'dd'
 - To delete and copy multiple lines '#dd', for example '5dd' to delete and copy 5 lines
 - To insert a line 'o'
 - To cancel the last action 'u'

-
- Line number `':set nu'`
 - Replace a pattern `':%s/old/new/'`
 - Quit without saving `':q!'`
 - To copy from line number #1 to line number #2 to the next line of #3
`':#1,#2co#3'`
 - To move from #1 to #2 to the next line of #3 `':#1,#2m#3'`
 - To delete from #1 to #2 `':#1,#2d'`

Text Editor



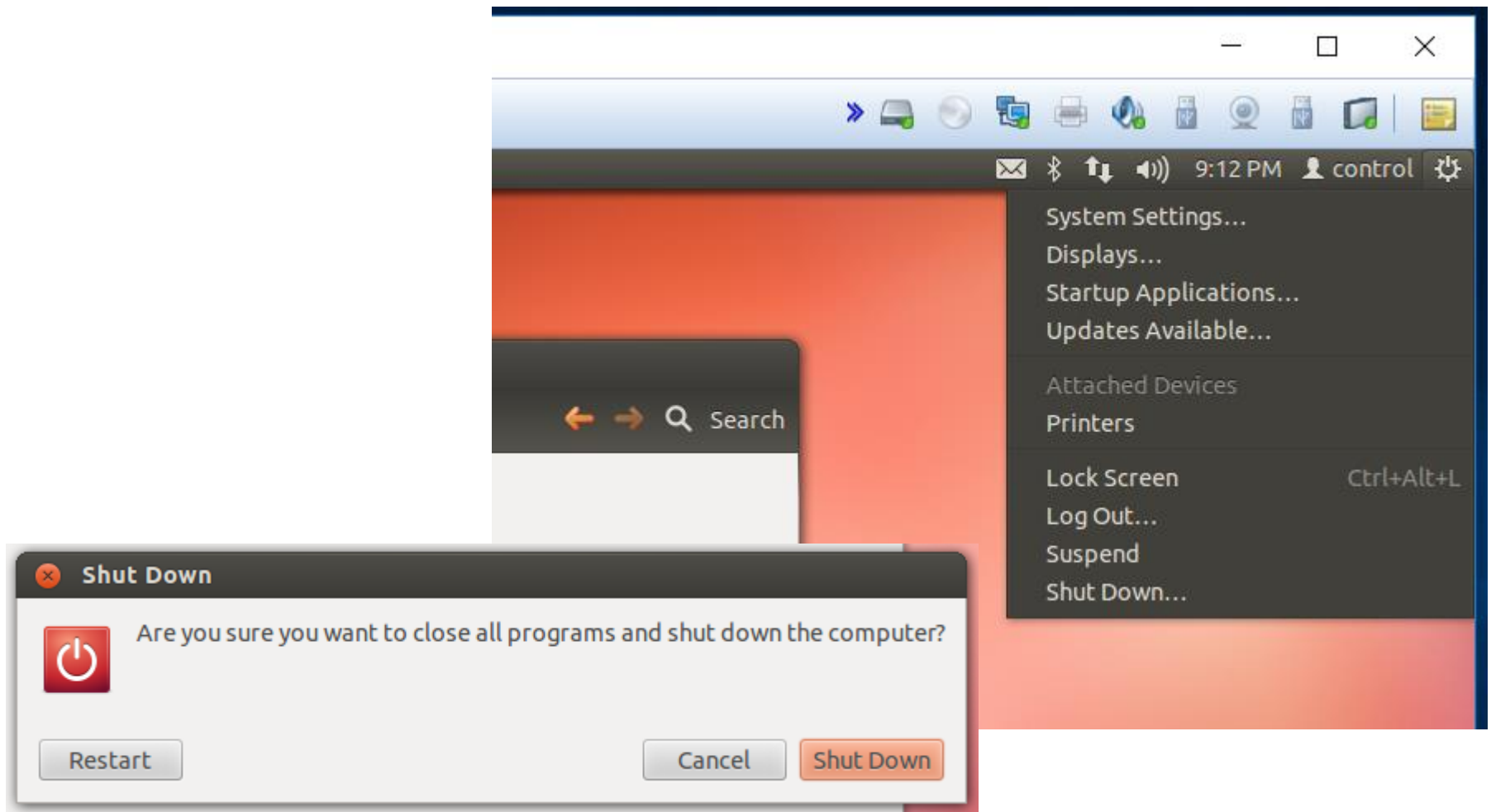


Basic Linux Commands

- `cd`: change directory
- `mkdir`: make a new directory
- `rmdir`: remove a directory, Directory including files or sub-directories cannot be deleted
- `cp`: copy one or more files to another location
- `rm`: remove files and directories
- `ls`: list files

Shut Down

- Do not just close the VMware window

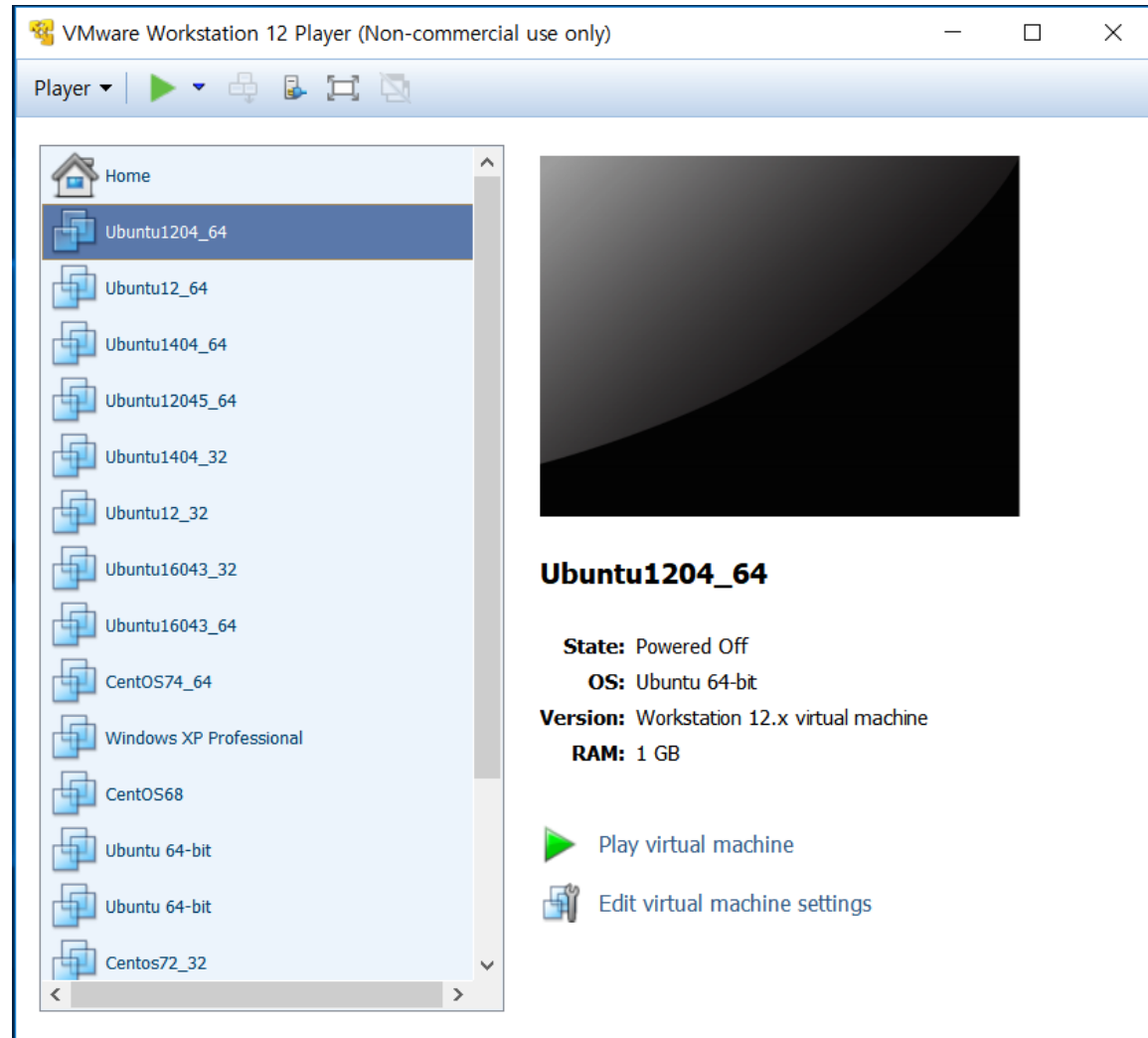


Exercise

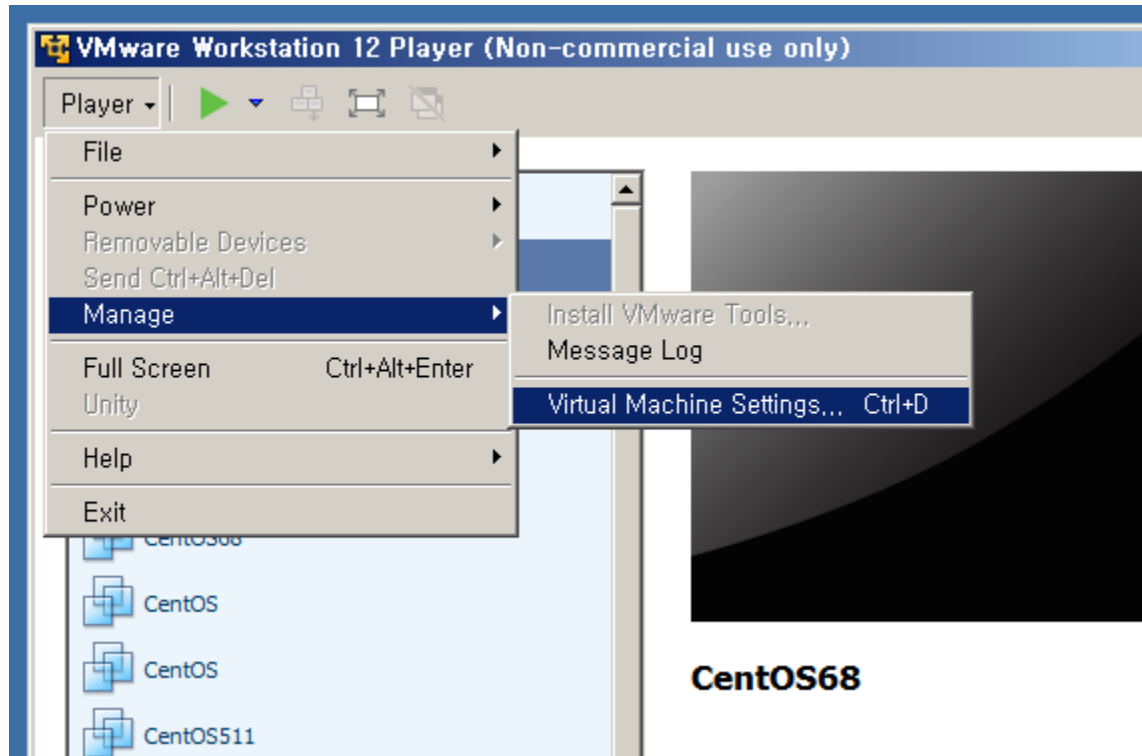
- Hello World를 10번 프린트 하는 프로그램을 vi 에디터를 사용하여 편집한 후, linux host와 target에서 각각 실행해 보십시오.

File Sharing with Windows

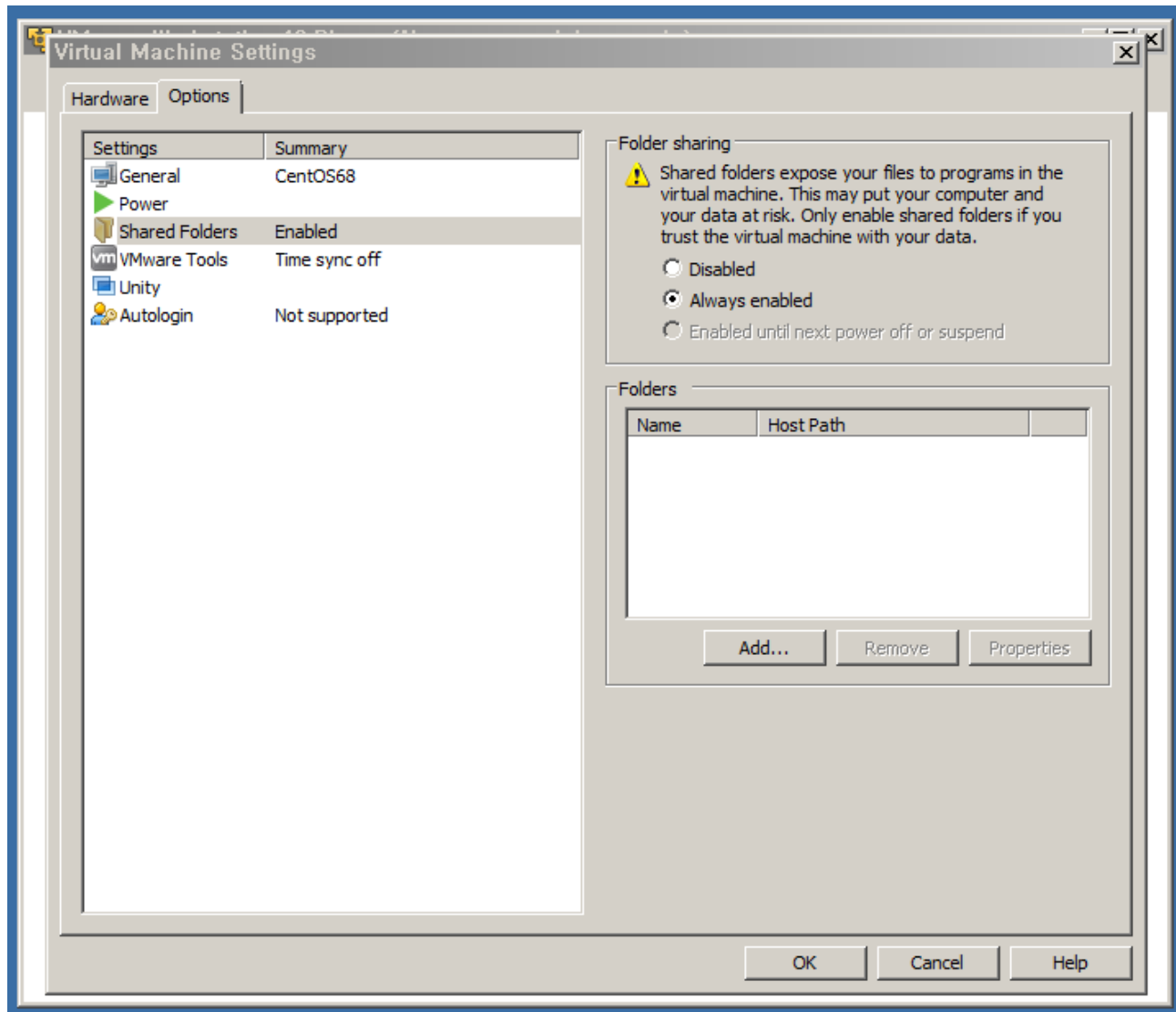
- Edit virtual machine settings



Virtual Machine Settings



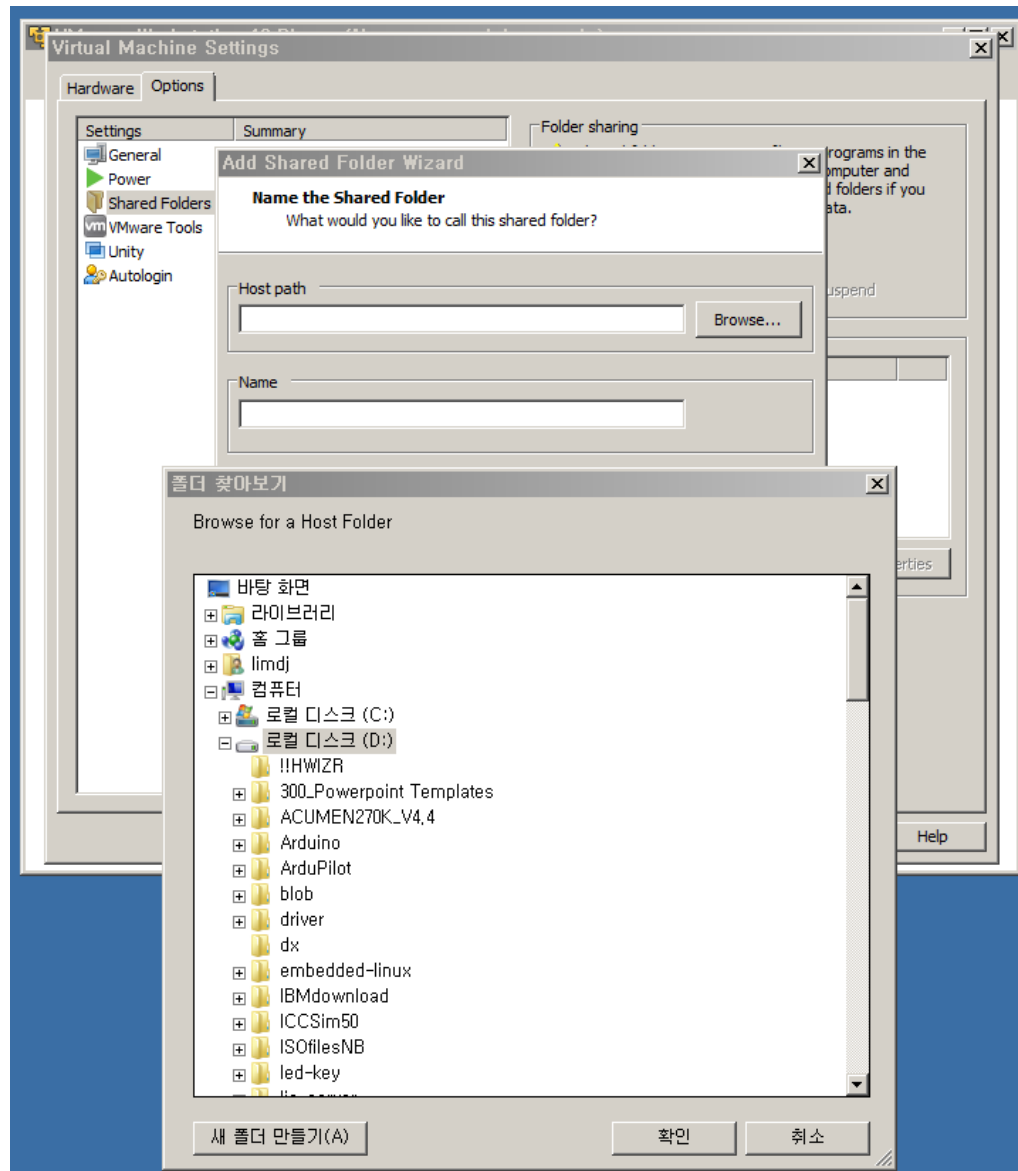
Folder sharing



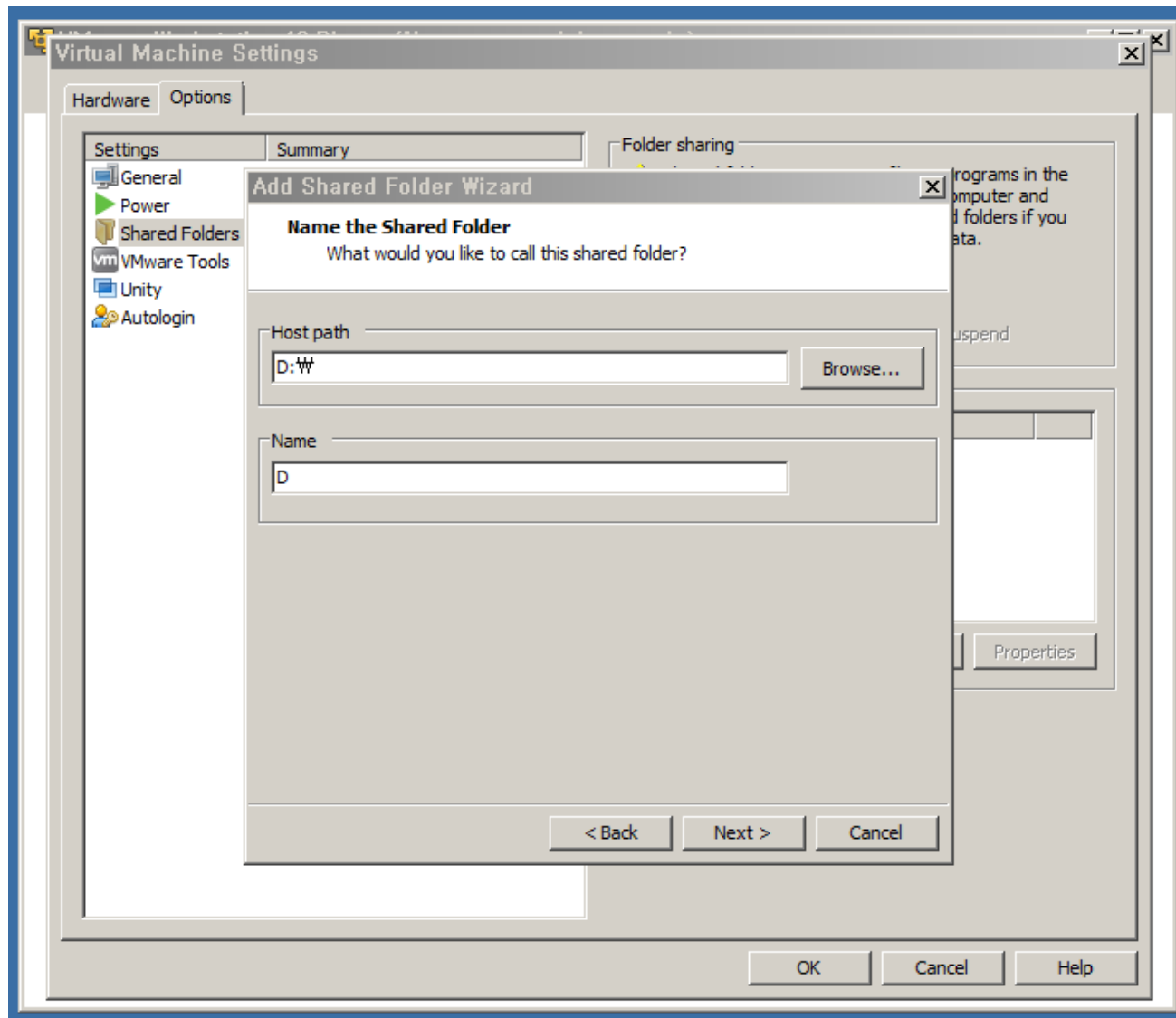
Folder sharing



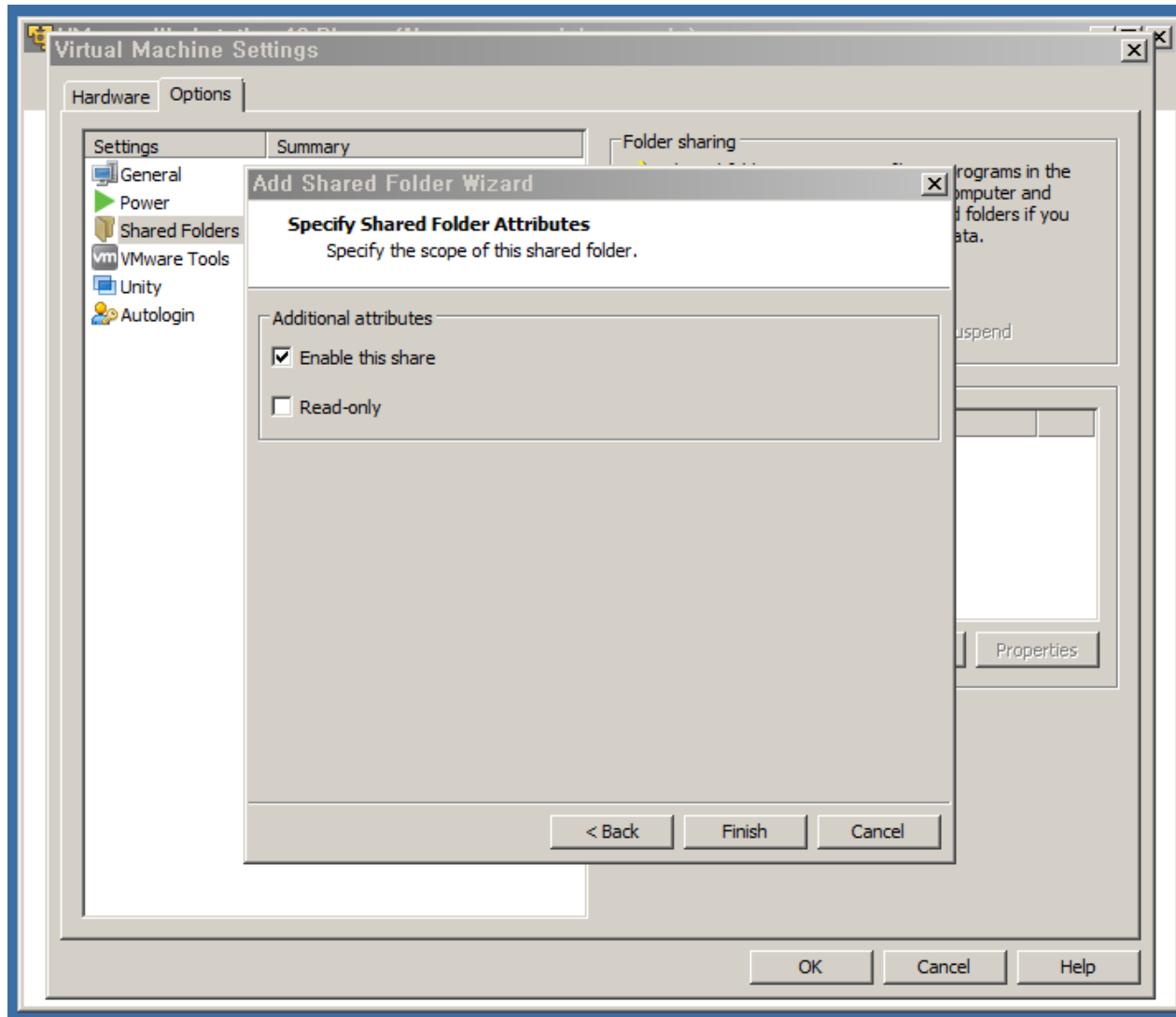
Folder sharing



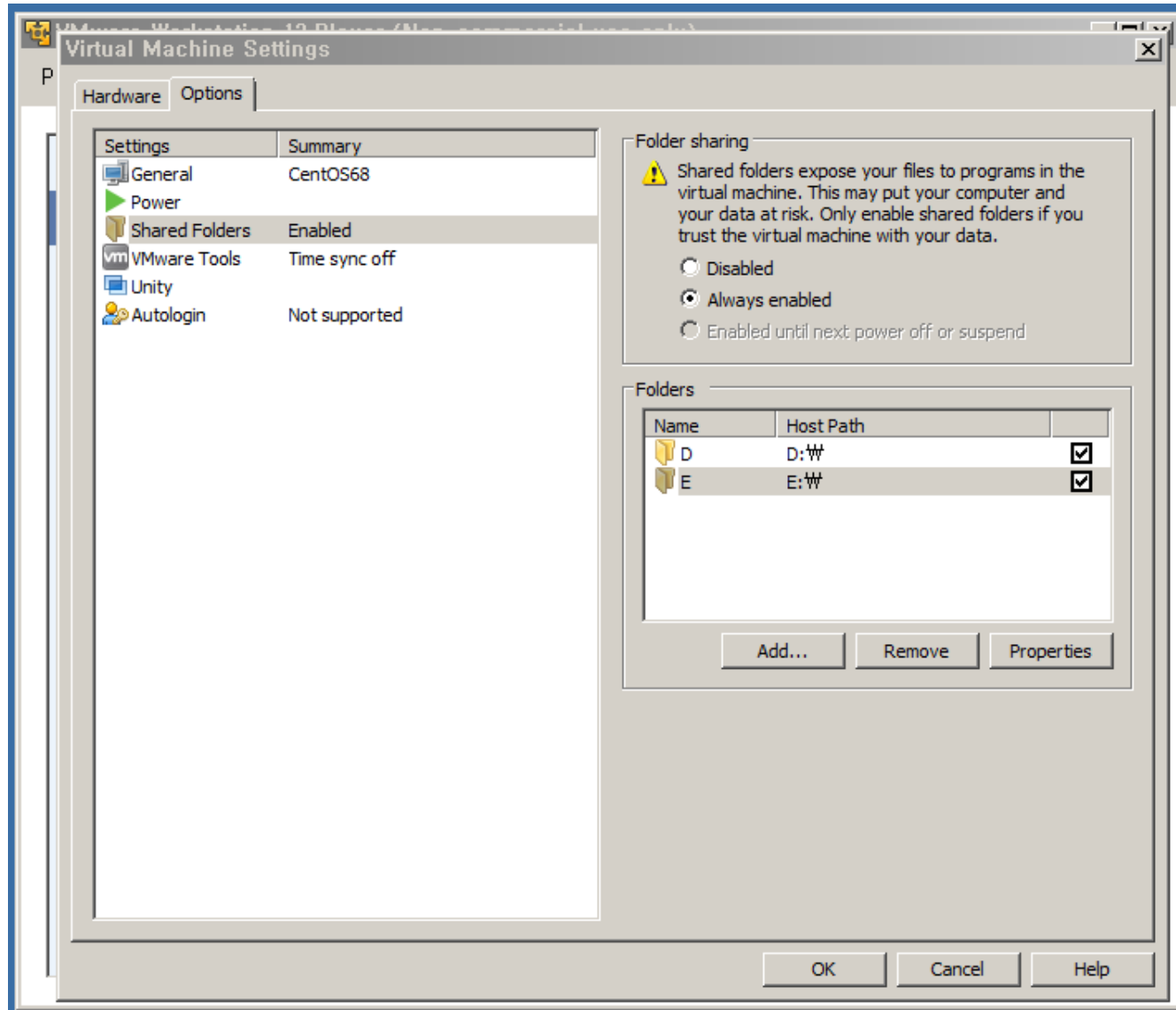
Folder sharing



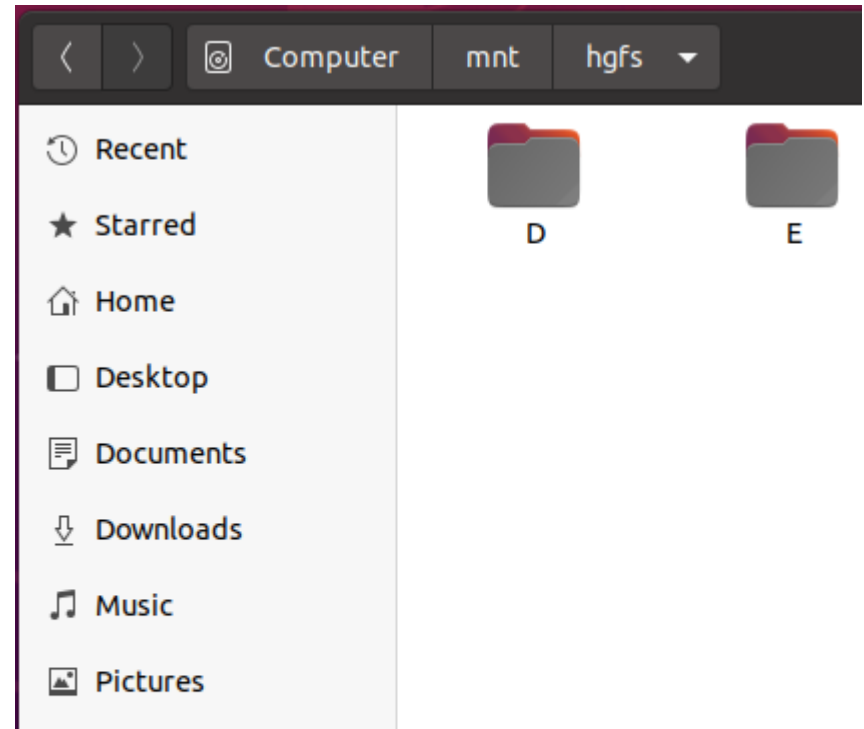
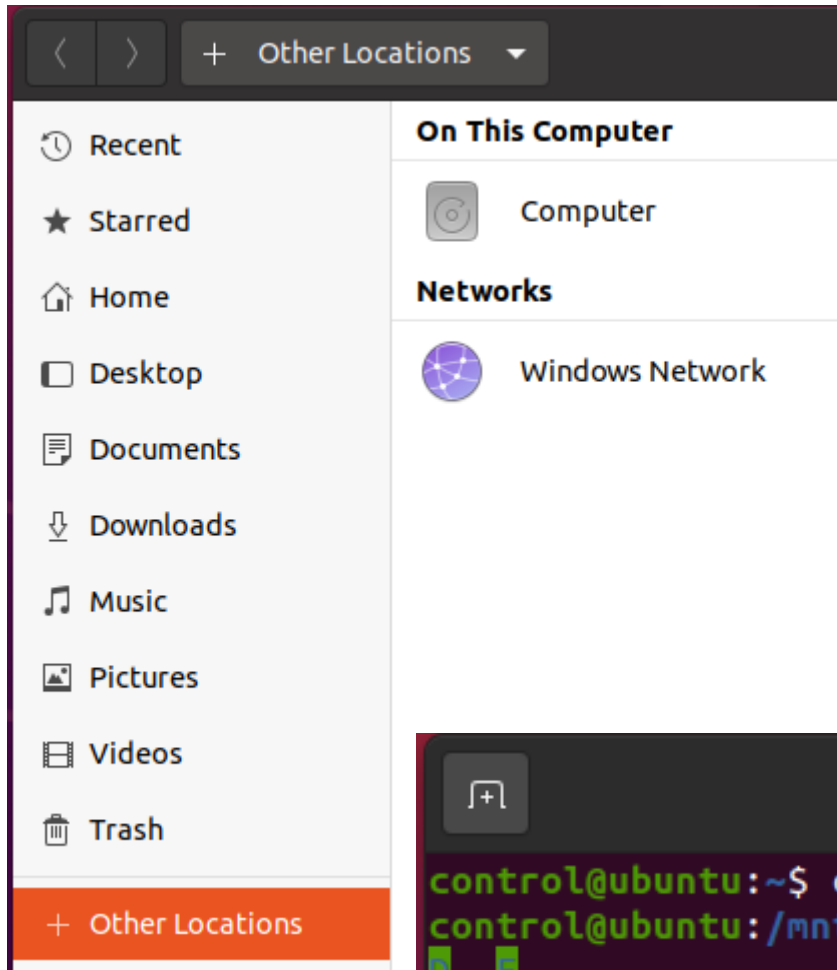
Folder sharing



Folder sharing



Folder sharing

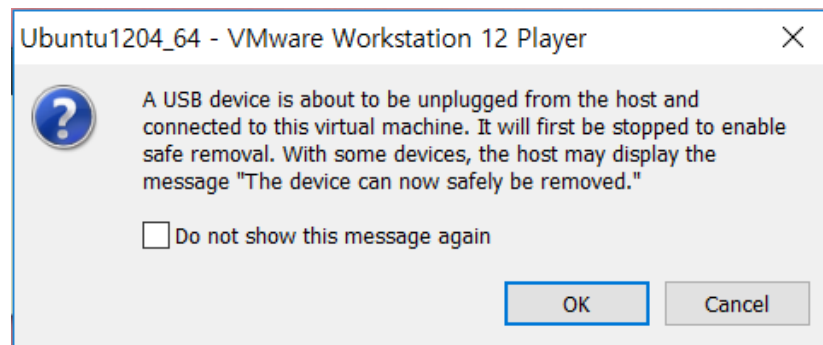
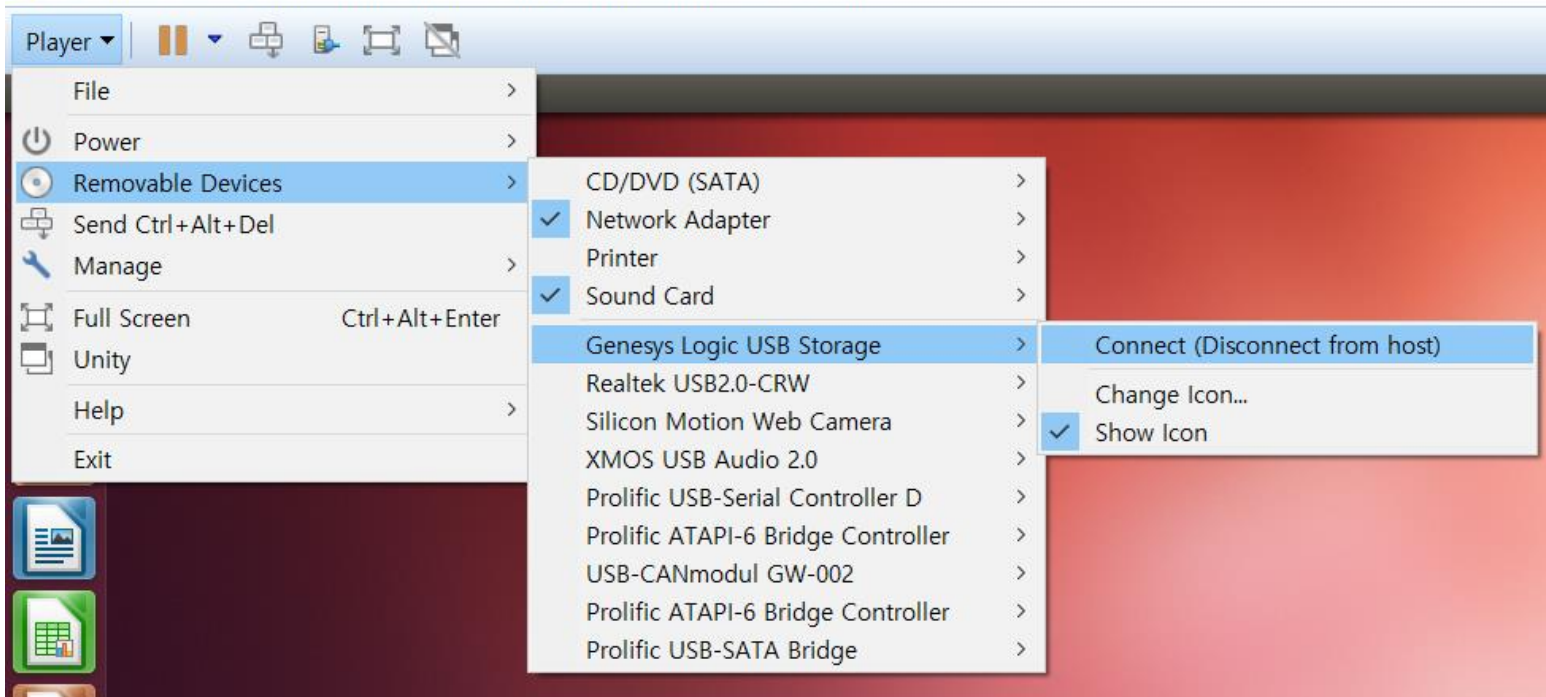


```
control@ubuntu: /mnt/hgfs

control@ubuntu:~$ cd /mnt/hgfs
control@ubuntu:/mnt/hgfs$ ls
D  E
control@ubuntu:/mnt/hgfs$
```

USB memory

Ubuntu1204_64 - VMware Workstation 12 Player (Non-commercial use only)



USB memory

