

# Bit Manipulation

**System Programming Recitation**

**2020.04.08**



# Programming Homework

- ▶ Bit manipulation
  - Solve a series of programming “puzzles”
  - Due date : 2020-4-17 (Friday) 11:59 PM
  - You can submit a zip file
- ▶ Please note the several instructions before programming
  - Using only straightline code (no loop or conditionals)
  - You are only allowed to use the eight operators
    - ! ~ & ^ | + << >>
- ▶ You should work on a Linux machine



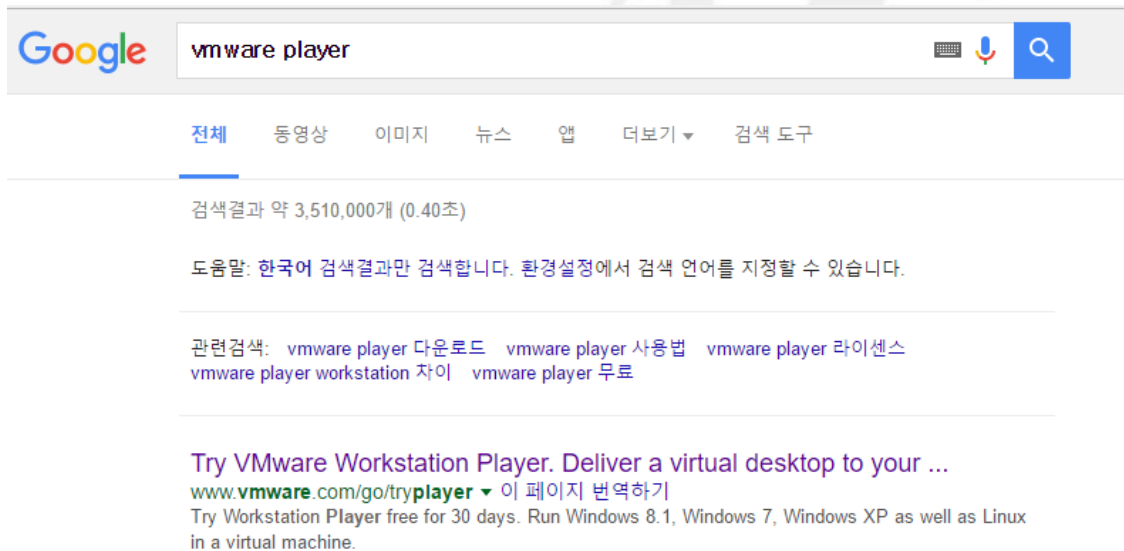
# Install Linux System

1

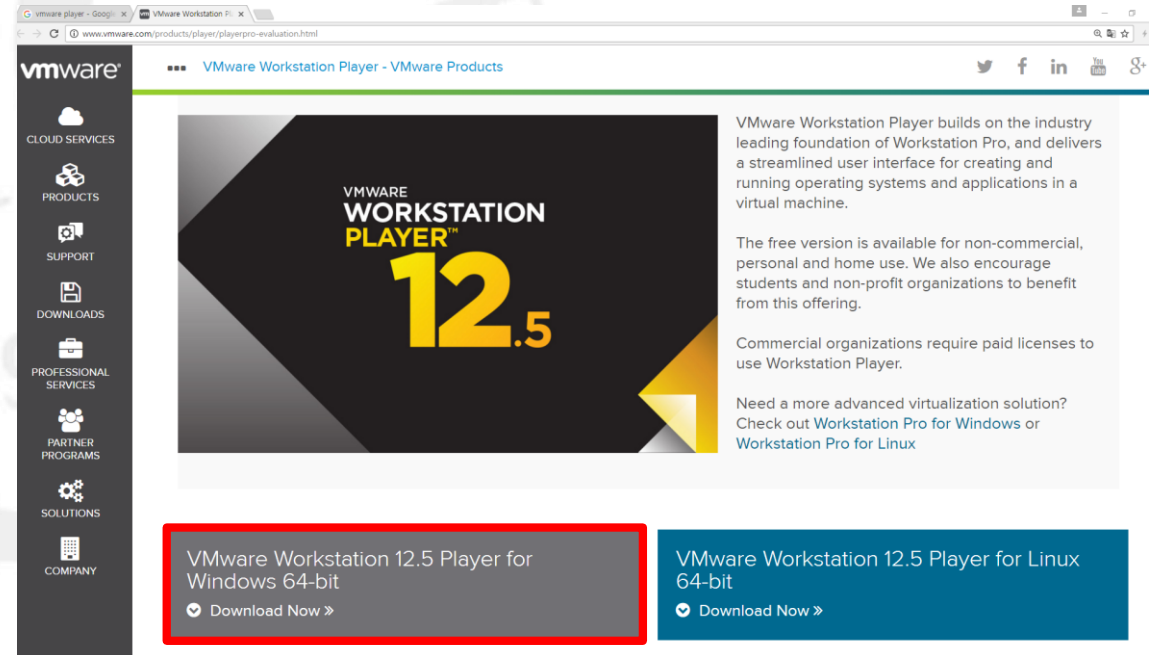


# VMware Player

- ▶ <http://www.vmware.com/products/player/playerpro-evaluation.html>
- ▶ Desktop virtualization application for test-and-development environment



Google search results for "vmware player". The search bar shows "vmware player" with a search icon. Below the search bar, there are tabs for "전체", "동영상", "이미지", "뉴스", "앱", "더보기", and "검색 도구". The search results show approximately 3,510,000 results in 0.40 seconds. A message indicates that the search language can be changed in the settings. Related searches include "vmware player 다운로드", "vmware player 사용법", "vmware player 라이선스", "vmware player workstation 차이", and "vmware player 무료". A snippet for "Try VMware Workstation Player. Deliver a virtual desktop to your ..." is visible, with a link to [www.vmware.com/go/tryplayer](http://www.vmware.com/go/tryplayer) and a note that the free version is available for 30 days.

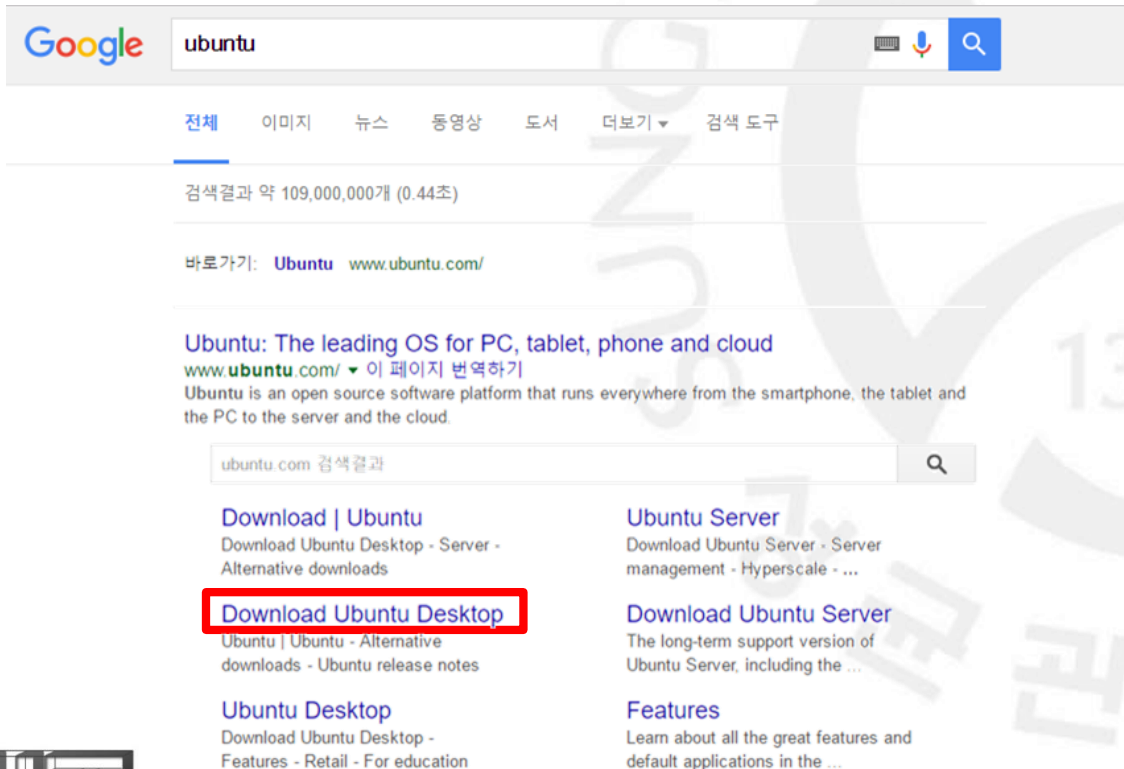


VMware Workstation Player - VMware Products. The page features a large graphic for "VMWARE WORKSTATION PLAYER 12.5". Text on the page states: "VMware Workstation Player builds on the industry leading foundation of Workstation Pro, and delivers a streamlined user interface for creating and running operating systems and applications in a virtual machine. 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 paid licenses to use Workstation Player. Need a more advanced virtualization solution? Check out Workstation Pro for Windows or Workstation Pro for Linux". At the bottom, there are two download buttons: "VMware Workstation 12.5 Player for Windows 64-bit" (highlighted with a red border) and "VMware Workstation 12.5 Player for Linux 64-bit". Both buttons include a "Download Now" link.



# Ubuntu

- ▶ <https://www.ubuntu.com/download/desktop>
- ▶ A Debian-based Linux operating system



Google search results for 'ubuntu'. The search bar shows 'ubuntu' and the results include a link to 'Download Ubuntu Desktop' which is highlighted with a red box.

전체 이미지 뉴스 동영상 도서 더보기 검색 도구

검색결과 약 109,000,000개 (0.44초)

바로가기: **Ubuntu** [www.ubuntu.com/](http://www.ubuntu.com/)

**Ubuntu: The leading OS for PC, tablet, phone and cloud**  
[www.ubuntu.com/](http://www.ubuntu.com/) 이 페이지 번역하기  
 Ubuntu is an open source software platform that runs everywhere from the smartphone, the tablet and the PC to the server and the cloud.

ubuntu.com 검색결과

**Download | Ubuntu**  
 Download Ubuntu Desktop - Server - Alternative downloads

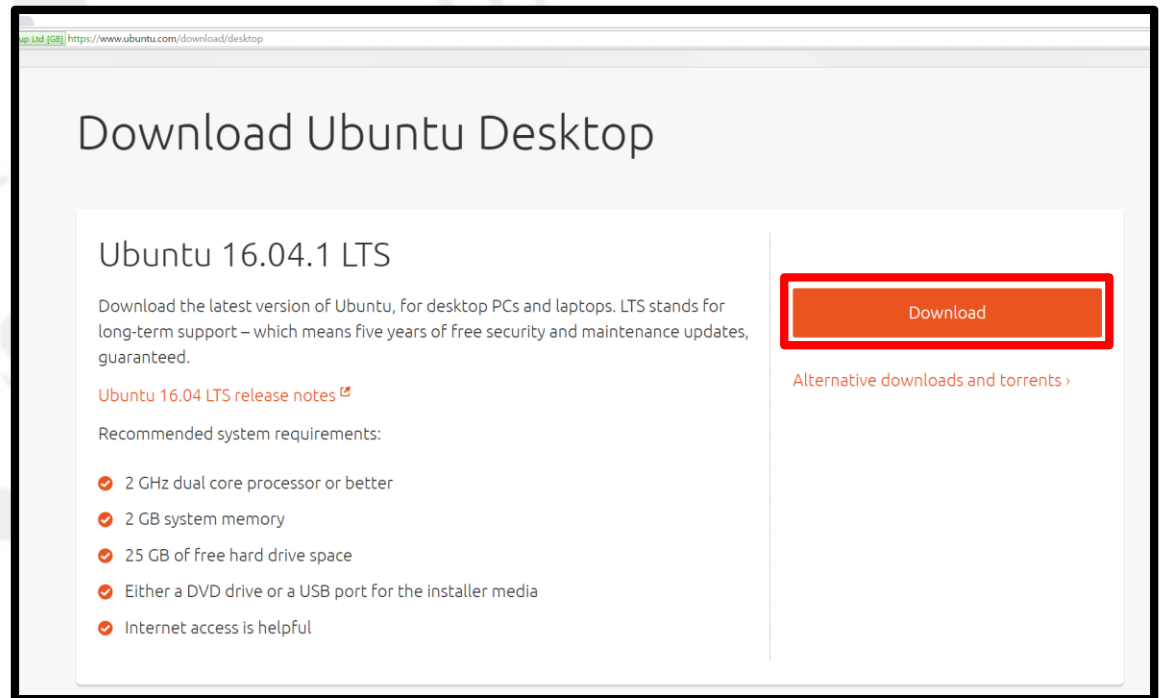
**Download Ubuntu Desktop**  
 Ubuntu | Ubuntu - Alternative downloads - Ubuntu release notes

**Ubuntu Desktop**  
 Download Ubuntu Desktop - Features - Retail - For education

**Ubuntu Server**  
 Download Ubuntu Server - Server management - Hyperscale - ...

**Download Ubuntu Server**  
 The long-term support version of Ubuntu Server, including the ...

**Features**  
 Learn about all the great features and default applications in the ...



Download Ubuntu Desktop

**Ubuntu 16.04.1 LTS**

Download the latest version of Ubuntu, for desktop PCs and laptops. LTS stands for long-term support – which means five years of free security and maintenance updates, guaranteed.

[Ubuntu 16.04 LTS release notes](#)

Recommended system requirements:

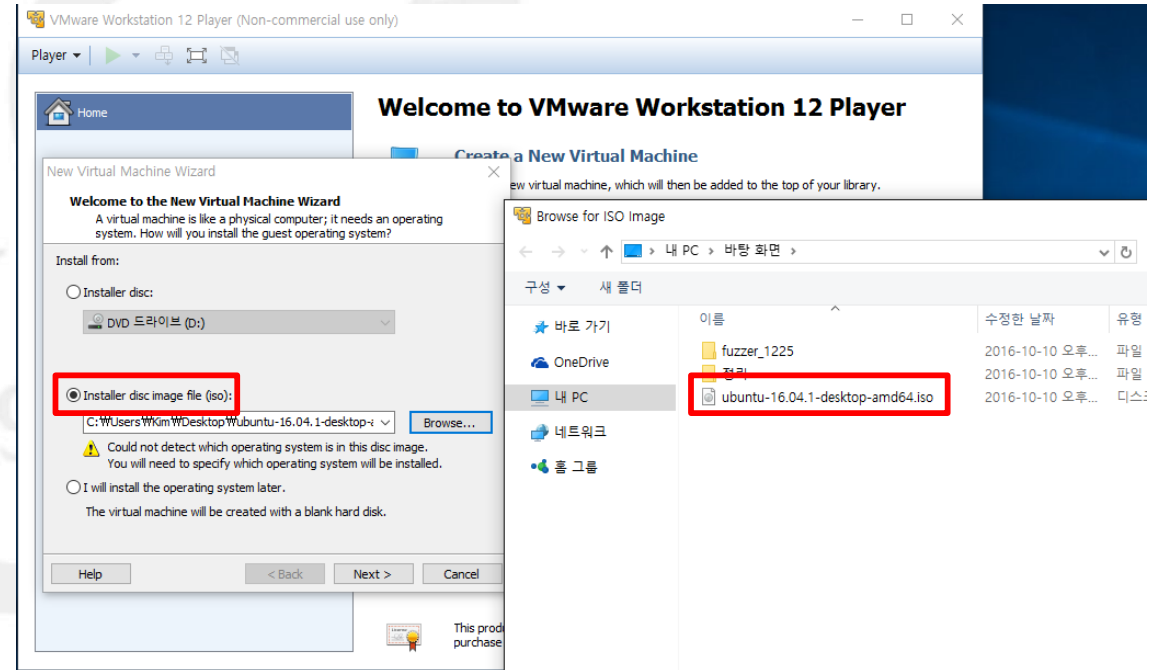
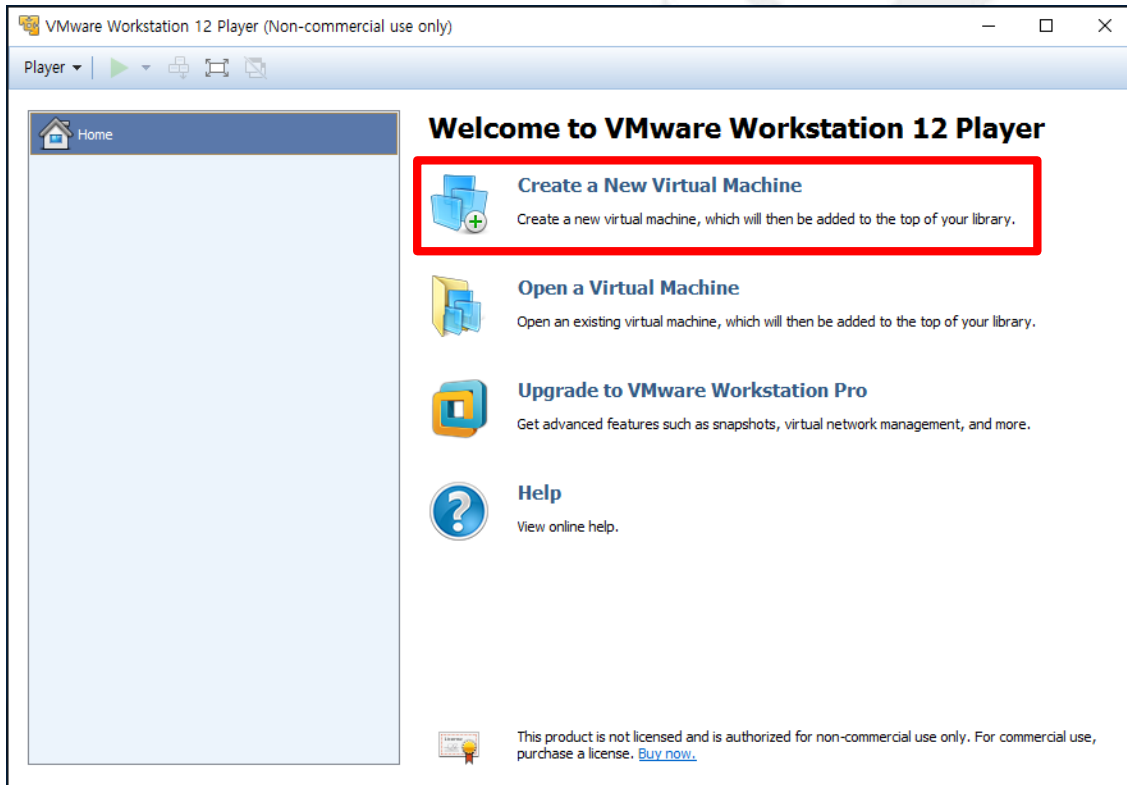
- ✓ 2 GHz dual core processor or better
- ✓ 2 GB system memory
- ✓ 25 GB of free hard drive space
- ✓ Either a DVD drive or a USB port for the installer media
- ✓ Internet access is helpful

**Download**

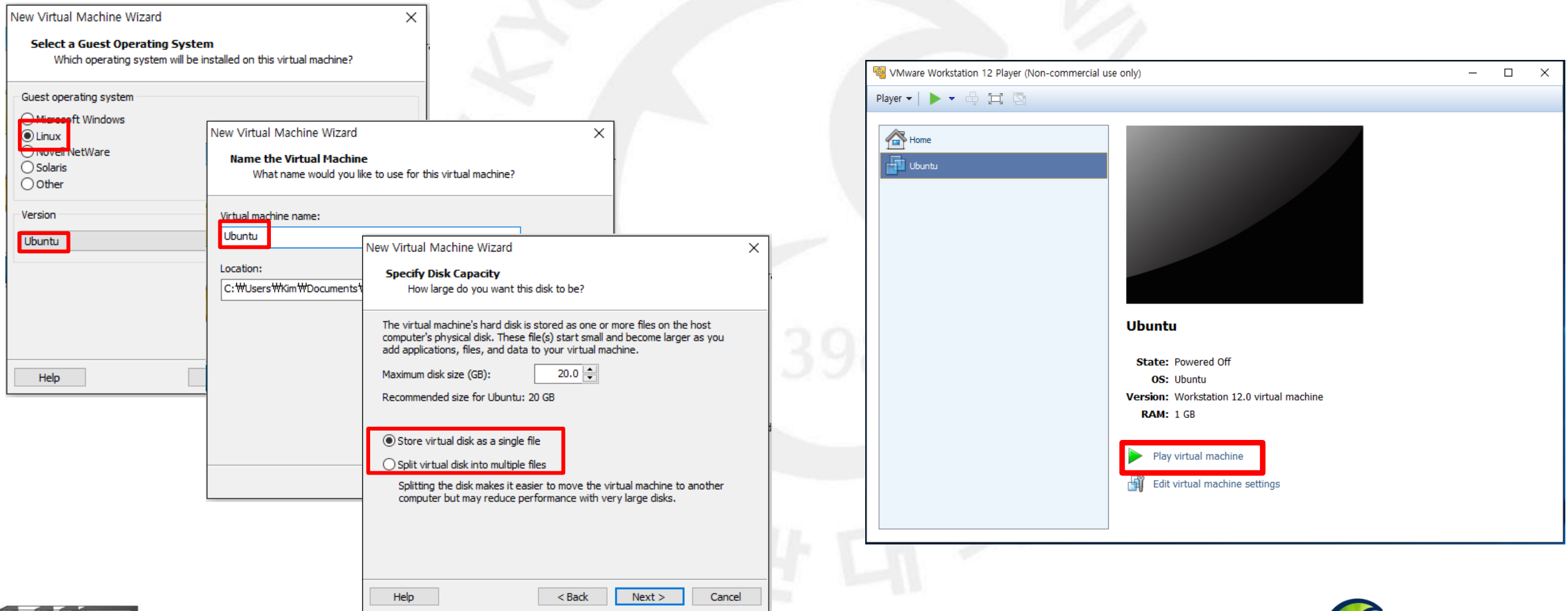
[Alternative downloads and torrents](#)



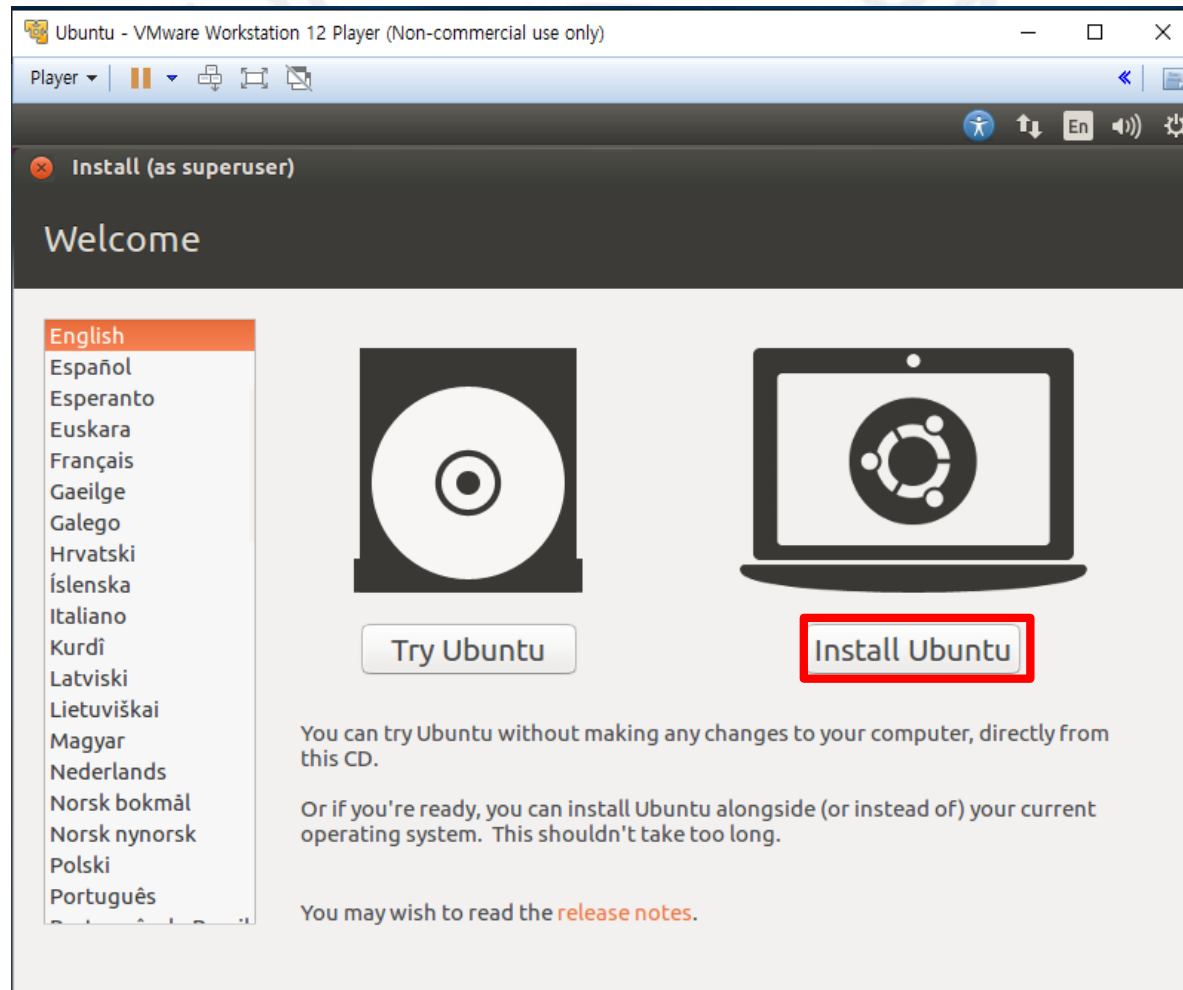
# Install Ubuntu in VMware Player #1



# Install Ubuntu in VMware Player #2



# Install Ubuntu in VMware Player #3





# Guide for Homework

2



# Handout Instructions

```
ejin@ubuntu: ~/Desktop/SP
ejin@ubuntu:~/Desktop/SP$ ls
sp_programming_hw1.zip
ejin@ubuntu:~/Desktop/SP$ unzip sp_programming_hw1.zip
Archive: sp_programming_hw1.zip
  inflating: sp-programming-hw1.docx
  inflating: sp-programming-hw1.pdf
  inflating: sp-programming-hw1.tar
ejin@ubuntu:~/Desktop/SP$ tar xvf sp-programming-hw1.tar
datalab-handout/
datalab-handout/bits.c
datalab-handout/btest.c
datalab-handout/fshow.c
datalab-handout/bits.h
datalab-handout/README
datalab-handout/Makefile
datalab-handout/Driverhdrs.pm
datalab-handout/driver.pl
datalab-handout/dlc
datalab-handout/Driverlib.pm
datalab-handout/btest.h
datalab-handout/ishow.c
datalab-handout/decl.c
datalab-handout/tests.c
ejin@ubuntu:~/Desktop/SP$
```

```
ejin@ubuntu: ~/Desktop/SP/datalab-handout
ejin@ubuntu:~/Desktop/SP$ ls -al
total 2724
drwxrwxr-x 3 ejin ejin 4096 Oct 10 07:36 .
drwxr-xr-x 13 ejin ejin 4096 Oct 10 07:35 ..
drwxrwxr-x 2 ejin ejin 4096 Oct 4 03:30 datalab-handout
-rw-rw-r-- 1 ejin ejin 37766 Oct 4 20:45 sp-programming-hw1.docx
-rw-rw-r-- 1 ejin ejin 508016 Oct 4 20:47 sp-programming-hw1.pdf
-rw-rw-r-- 1 ejin ejin 1310720 Oct 4 19:30 sp-programming-hw1.tar
-rw-rw-r-- 1 ejin ejin 909892 Oct 10 07:33 sp_programming_hw1.zip
ejin@ubuntu:~/Desktop/SP$ cd datalab-handout/
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ls -al
total 1300
drwxrwxr-x 2 ejin ejin 4096 Oct 4 03:30 .
drwxrwxr-x 3 ejin ejin 4096 Oct 10 07:36 ..
-rw-rw-r-- 1 ejin ejin 9382 Oct 4 03:30 bits.c
-rw-rw-r-- 1 ejin ejin 2285 Oct 4 03:30 bits.h
-rw-r--r-- 1 ejin ejin 15752 Sep 19 2012 btest.c
-rw-r--r-- 1 ejin ejin 1006 Sep 13 2010 btest.h
-rw-rw-r-- 1 ejin ejin 3253 Oct 4 03:30 decl.c
-rwxrwxr-x 1 ejin ejin 1234928 Oct 4 01:51 dlc
-rw-rw-r-- 1 ejin ejin 267 Oct 4 03:30 Driverhdrs.pm
-rw-r--r-- 1 ejin ejin 3630 May 23 2011 Driverlib.pm
-rwxr-xr-x 1 ejin ejin 11798 Apr 24 2012 driver.pl
-rw-r--r-- 1 ejin ejin 3009 Sep 13 2006 fshow.c
-rw-r--r-- 1 ejin ejin 1502 Sep 13 2006 ishow.c
-rw-r--r-- 1 ejin ejin 542 Nov 2 2010 Makefile
-rw-r--r-- 1 ejin ejin 4564 May 31 2011 README
-rw-rw-r-- 1 ejin ejin 4096 Oct 4 03:30 tests.c
ejin@ubuntu:~/Desktop/SP/datalab-handout$
```



# sys/cdefs.h

- ▶ You may meet this problem

```
hittest@ubuntu:~/Downloads/sp_programming_hw1/datalab-handout$ make
gcc -O -Wall -m32 -lm -o btest bits.c btest.c decl.c tests.c
In file included from /usr/include/stdio.h:27:0,
                 from btest.c:16:
/usr/include/features.h:374:25: fatal error: sys/cdefs.h: No such file or directory
```

- ▶ Solution

- sudo apt-get install g++-multilib

```
ejin@ubuntu:~/Desktop/SP/datalab-handout$ sudo apt-get install g++-multilib
[sudo] password for ejin:
ejin@ubuntu:~/Desktop/SP/datalab-handout$ make
gcc -O -Wall -m32 -lm -o btest bits.c btest.c decl.c tests.c
btest.c: In function 'main':
btest.c:528:9: warning: variable 'errors' set but not used [-Wunused-but-set-variable]
    int errors;
    ^
gcc -O -Wall -m32 -o fshow fshow.c
gcc -O -Wall -m32 -o ishow ishow.c
```



# Autograding Your Work #1

- ▶ Before testing your work, please execute **make** instruction

```
ejin@ubuntu:~/Desktop/SP/datalab-handout$ make
gcc -O -Wall -m32 -lm -o btest bits.c btest.c decl.c tests.c
btest.c: In function 'main':
btest.c:528:9: warning: variable 'errors' set but not used [-Wunused-but-set-variable]
    int errors;
        ^
gcc -O -Wall -m32 -o fshow fshow.c
gcc -O -Wall -m32 -o ishow ishow.c
```

- ▶ **btest**

```
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./btest
Score Rating Errors Function
3      3      0      add0K
3      3      0      sub0K
3      3      0      logicalShift
3      3      0      isGreater
4      4      0      satAdd
3      3      0      rempwr2
4      4      0      bitCount
2      2      0      byteSwap
4      4      0      float_i2f
4      4      0      float_twice
Total points: 33/33
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./btest -f add0K
Score Rating Errors Function
3      3      0      add0K
Total points: 3/3
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./btest -f sub0K
Score Rating Errors Function
3      3      0      sub0K
Total points: 3/3
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./btest -f add0K -1 0x80000000 0x80000000
Score Rating Errors Function
3      3      0      add0K
Total points: 3/3
```



# Autograding Your Work #2

## ► dlc

```
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./dlc bits.c
/usr/include/stdc-predef.h:1: Warning: Non-includable file <command-line> included from includable file /usr/include/stdc-predef.h.

Compilation Successful (1 warning)
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./dlc -e bits.c
/usr/include/stdc-predef.h:1: Warning: Non-includable file <command-line> included from includable file /usr/include/stdc-predef.h.
dlc:bits.c:181:addOK: 9 operators
dlc:bits.c:197:subOK: 12 operators
dlc:bits.c:215:logicalShift: 14 operators
dlc:bits.c:227:isGreater: 12 operators
dlc:bits.c:245:satAdd: 15 operators
dlc:bits.c:262:rempwr2: 11 operators
dlc:bits.c:286:bitCount: 25 operators
dlc:bits.c:306:byteSwap: 17 operators
dlc:bits.c:348:float_i2f: 27 operators
dlc:bits.c:382:float_twice: 15 operators

Compilation Successful (1 warning)
```

## ► driver.pl

```
ejin@ubuntu:~/Desktop/SP/datalab-handout$ ./driver.pl
5. Running './dlc -e' to get operator count of each function.

Correctness Results      Perf Results
Points  Rating  Errors  Points  Ops    Puzzle
3       3       0       2       9     addOK
3       3       0       2       12    subOK
3       3       0       2       14    logicalShift
3       3       0       2       12    isGreater
4       4       0       2       15    satAdd
3       3       0       2       11    rempwr2
4       4       0       2       25    bitCount
2       2       0       2       17    byteSwap
4       4       0       2       27    float_i2f
4       4       0       2       15    float_twice

Score = 53/53 [33/33 Corr + 20/20 Perf] (157 total operators)
```



# ■ Contact Us

## ▶ Email address

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- 이정호: [dlwjdgh100@o365.skku.edu](mailto:dlwjdgh100@o365.skku.edu)

## ▶ Lab.

- 제 2공학관 27313호 (방문 전 연락필요)

