

[CSED211] Introduction to Computer Software Systems

Lab 1: Introduction & Data Lab1

Yonggon Park



CAOS
COMPUTER ARCHITECTURE &
OPERATING SYSTEMS LABORATORY

2024.09.05

Today's Agenda

- Lab Introduction
 - Tips/Cautions
- About Programming Server
 - How to Access Programming Server
- Linux Command Basics
- Data Lab1

Introducing TAs

- How to contact TAs
 - Use **PLMS for most things** (e.g., any questions, requests, discussions, ...)
 - Please use **Q&A board** and **Lab Q&A board**
 - Use **e-mail for private/urgent issues** (e.g., attendance, scores, ...)
 - Please use the **alias email: csed211-ta@postech.ac.kr**
 - Adding “[CSED211]” to the title of your mail will make it easier for TA to find your mail
 - Do not reply to the announcement email: **Only a TA who sent a email can receive**
 - Search google for simple problems (e.g., how to unzip a file in Linux?)

현재 올라와있는 shell-lab 압축 폴더가 .zip형태로 되어있습니다. 이 폴더를 리눅스 상에서 열려고 하면 어떻게 해야 합니까?



박용곤



이수철



오형민



오승훈



손도원

About Lab Session

- Lab session will be held every Thursday, at 6:20 PM
 - TJ Park library 506 (청암학술정보관 506호)
 - If there is no lab session, TA will announce it in PLMS
- Attendance: No late/absence penalty
 - However, you will be responsible **for any penalties** caused by your absence, unless you have an acceptable excuse for your absence
- We will provide **(1) skeleton code(s)**, **(2) write-up PDF**, **(3) Q&A histories**
 - And the **(4) PPT slide**, which is used during the lab session
 - This will help your assignment a lot: Use them wisely!
 - If the TA forgets to provide any of these things, ask for TAs **immediately**

About Lab Session: Lab Schedule and Weights

Week	Lab Date	Lab	Deadline	Weight
1	09.05	Data Lab1	09.11	20
2	09.12	Data Lab2	09.18	40
3	09.19	Make Up Class		
4	09.26	Bomb Lab	10.09	100
5	10.03			
6	10.10	Attack Lab	10.27	100
7	10.17			
8		Midterm week		
9	10.31	Optimization Lab	-	-
10	11.07	Cache Lab	11.20	100
11	11.14			
12	11.21	Shell Lab	12.03	100
13	11.28			
14	12.04	Malloc Lab	12.18	100
15	12.11			
16	-	Final week	-	

About Lab Session: Submissions

- You have to submit (1) lab report in PDF and (2) source code in PLMS
 - Due: Day before the next lab session (Data Lab1 and Data Lab2 are different!)
 - Submit them in the following format (do not compress, just submit 2 files)
 - Incorrect format will not be graded, no exception (i.e., you will get 0 points)
 - Source code name: [student id].c (e.g., 20231234.c)
 - Report name: [student id].pdf (e.g., 20231234.pdf)
- Evaluations: Quiz (10 pt.) + Lab report (40 pt.) + Source code (50 pt.)
 - Lab report will have 90 pt. of the score if code submission is not required
- Late penalty: No late submission!
 - Unless there is acceptable excuses (e.g, PLMS server is down)

About Lab Session: Cheating Policy

- If you understand (1) **how to solve problem** and (2) **how your code works**, you are allowed to search the internet and use chatGPT
 - Otherwise, you will be **considered cheating (i.e., You will get F on this class)**
- Starting from this semester, we will have an **integrity meeting**
 - TA will ask several questions related to the lab
 - If student cannot answer the questions, he/she will be considered as cheating
 - Submitted lab report and provided materials is allowed
 - The meeting will be recorded for the purposes of the archive
- TA will schedule **integrity meetings** for some students, such as:
 - 1. Who is caught by copykiller or submitted very simple reports (very likely)
 - 2. Randomly sampled students

About Lab Session: How to Write Lab Report

- In the report, you should **explicitly show and explain**:
 - 1. The problem(s) to be solved
 - 2. How to solve the problem (solution)
 - 3. How to implement a solution to a code
 - 4. (Optional) Internet link you referenced during your assignment
 - TA will also show the pages during extra meeting
 - Link with explicit solution (code or solution process) will be considered as cheating
- You can use both Korean and English
 - However, any sentences that TA cannot understand will be ignored
- Note that if your report does not fully shows the above detail, TA will schedule integrity meeting to check your work

About Lab Session: Tips/Cautions

- 1. Use the provided materials wisely!
 - The write-up file will give you the guidelines for the lab report
 - Actively check the Q&A documents instead of waiting for answers from TAs
- 2. Choose the appropriate way when you contact TAs
 - Professor is also included in alias e-mail, who makes the big decisions
 - TAs will not answer your question if you do not use an alias email or PLMS
- 3. Always double-check your submission(s)
 - Does your code compile/run correctly on the programming server?
 - Did you rename the file correctly?
 - Is your report in a PDF format?

Today's Agenda

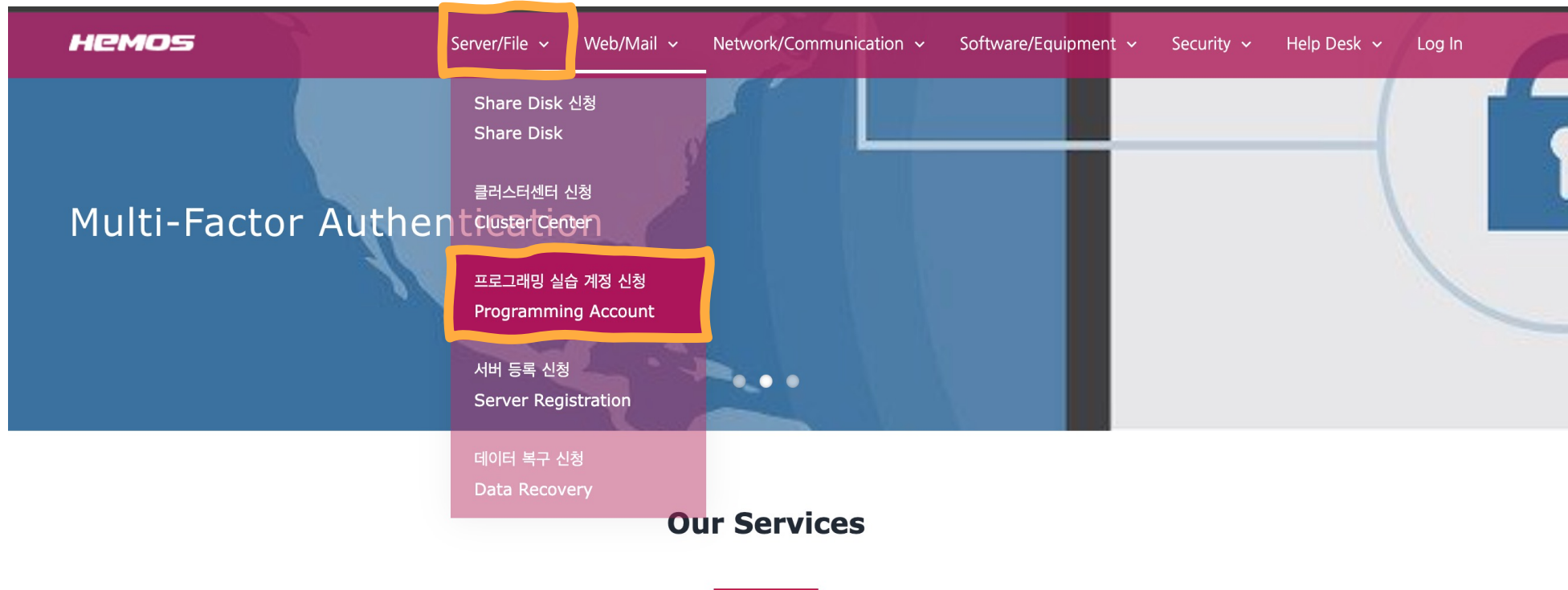
- Lab Introduction
 - Tips/Cautions
- **About Programming Server**
 - How to Access Programming Server
- Linux Command Basics
- Data Lab1

About Programming Account

- In this class, lab session will be processed on **programming server**
 - Your lab will be graded on the programming server
- **You have to be connected to POSTECH wifi** to access programming server
 - I assume that dormitory wifi is fine
 - If you are out of the campus, you can access the server **using POSTECH VPN**
 - Go to <https://vpn.postech.ac.kr> and follow the instructions
- You have to generate the programming server account to access them

Programming Account Registration

- 1. Login and enter the hemos (<https://hemos.postech.ac.kr/>)
- 2. Click “Server/File” → “Programming Account”



Programming Account Registration

- 3. Click the “request” button
 - You have to login to request account
- 4. Fill the blanks and “submit”

프로그래밍 실습 계정 신청 (Programming Account)

신청자 정보 (Applicant)

Date

2024/07/30

Time

14:20:05

Name

박용곤

HEMOS ID

nanimdo

Position *

신분을 선택하세요.

Department *

컴퓨터공학과

Office Tel.

Cell Phone

01048570727

신청 내용 (Details)

Usage *

사용 용도를 선택하세요.

Course (강의명)

Request Details

프로그래밍 실습 계정 신청 (Programming Account)

C 언어 등의 프로그래밍 및 기타 리눅스 실습을 수행할 수 있는 서버 환경에 대한 계정 신청 서비스입니다.

- 이용 기간
 - 계정 생성 후 1년간 유효
 - 졸업 시에는 이용 불가
- 접속 방법
 - 접속 주소 : programming2.postech.ac.kr
 - 접속 포트 : SSH (2022), FTP (21)
 - 대학 외부에서 접속 시에는 POSTECH VPN(vpn.postech.ac.kr) 접속 후 이용
- 유의 사항
 - 계정 생성 시, 패스워드는 'id + !@#' 형태로 생성되며 최초 접속 후 본인이 반드시 변경해야 함 (eg, HEMOS-ID: gildong 일 경우, 최초 패스워드는 gildong!@#)

Request

List

Search...

Server/File

Share Disk 신청
Share Disk

클러스터센터 신청
Cluster Center

프로그래밍 실습 계정 신청
Programming Account

서버 등록 신청
Server Registration

데이터 복구 신청
Data Recovery

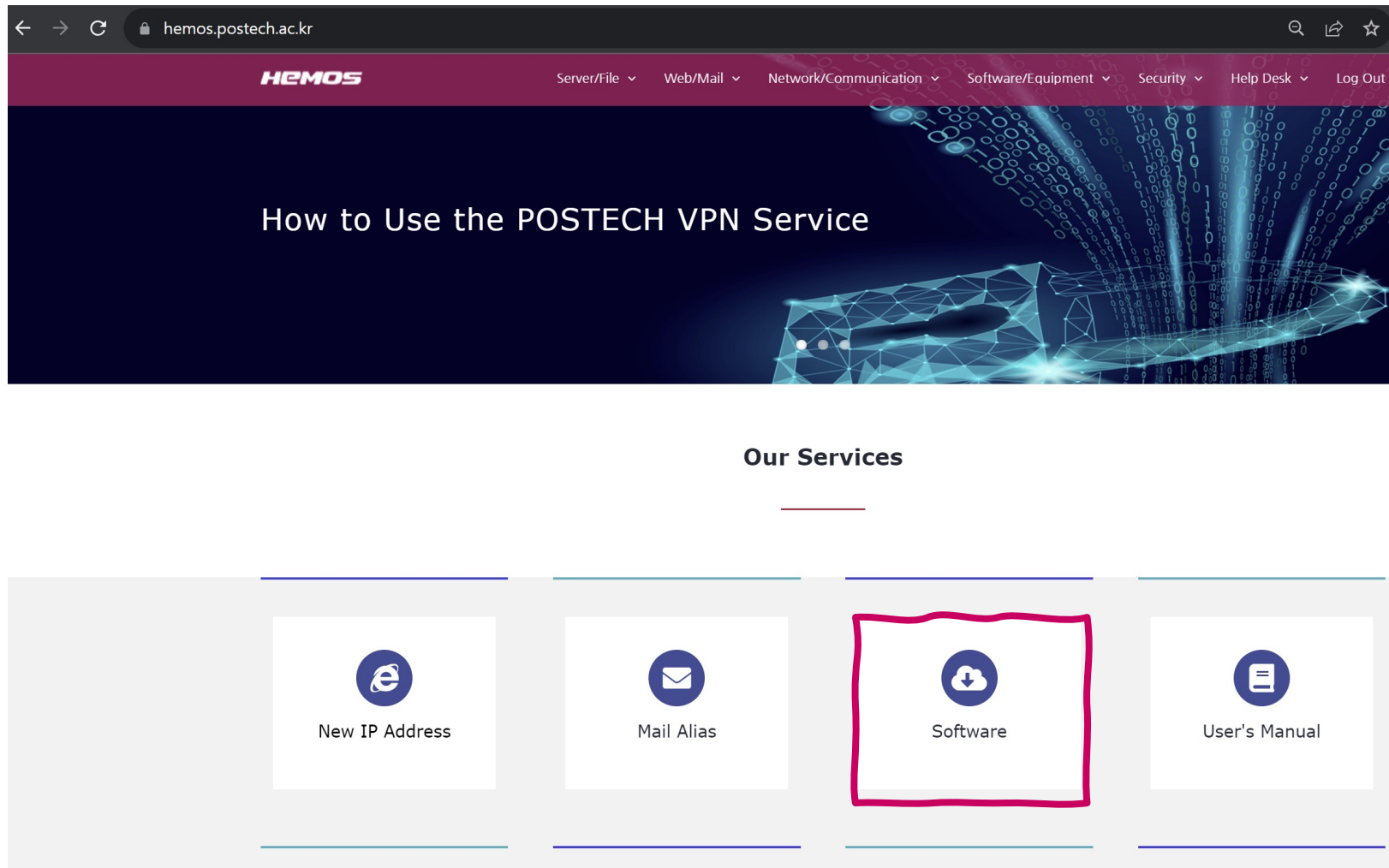
Creating an account can take multiple days, so start early!

How to Access Programming Server

- In the Window machine, (1) **XShell** and (2) **Putty** can be used to access server
 - Personally, XShell is recommended
- In the MacOS Machine, **terminal** can be used to access server
 - Also Window user can use **Powershell**
- **TA will not teach** you about the tools/languages
 - Any problems with tools should be solved by the student
 - But you can get some help from **FAQ in PLMS**
 - **Discussions in PLMS on your own are encouraged, but TA may not respond**

XShell Tutorial: How to Install

- 1. Go to Hemos and click “Software”



XShell Tutorial: How to Install (Cont.)

- 2. Click “Tool(Utility)”
- 3. download “Xmanager Enterprise”

소프트웨어 배포 (Software Library)

2.

The screenshot shows a software library interface. On the left, a vertical list of categories is displayed: ERP, GRAPHIC, LANGUAGES, LIBRARY, OA, OS, PROMOTION VIDEO, SIEMENS, STATISTICS_AI, TOOL(UTILITY), VACCINE, and WEB. The 'TOOL(UTILITY)' category is highlighted with a pink rectangular box. To the right of this list, the number '2.' is placed. Further to the right, a search bar contains the text 'xmanager'. Below the search bar, there are two dropdown menus: 'Order By:' set to 'Publish Date' and 'Order:' set to 'Descending Order'. Below these, a breadcrumb trail reads 'Home > Search Result For xmanager'. The number '3.' is placed to the left of the search results. The search results show a single entry, 'Xmanager Enterprise', which is highlighted with an orange rectangular box. Below the entry name, it displays '166.35 MB' and '2986 downloads'.

ERP
GRAPHIC
LANGUAGES
LIBRARY
OA
OS
PROMOTION VIDEO
SIEMENS
STATISTICS_AI
TOOL(UTILITY)
VACCINE
WEB

xmanager

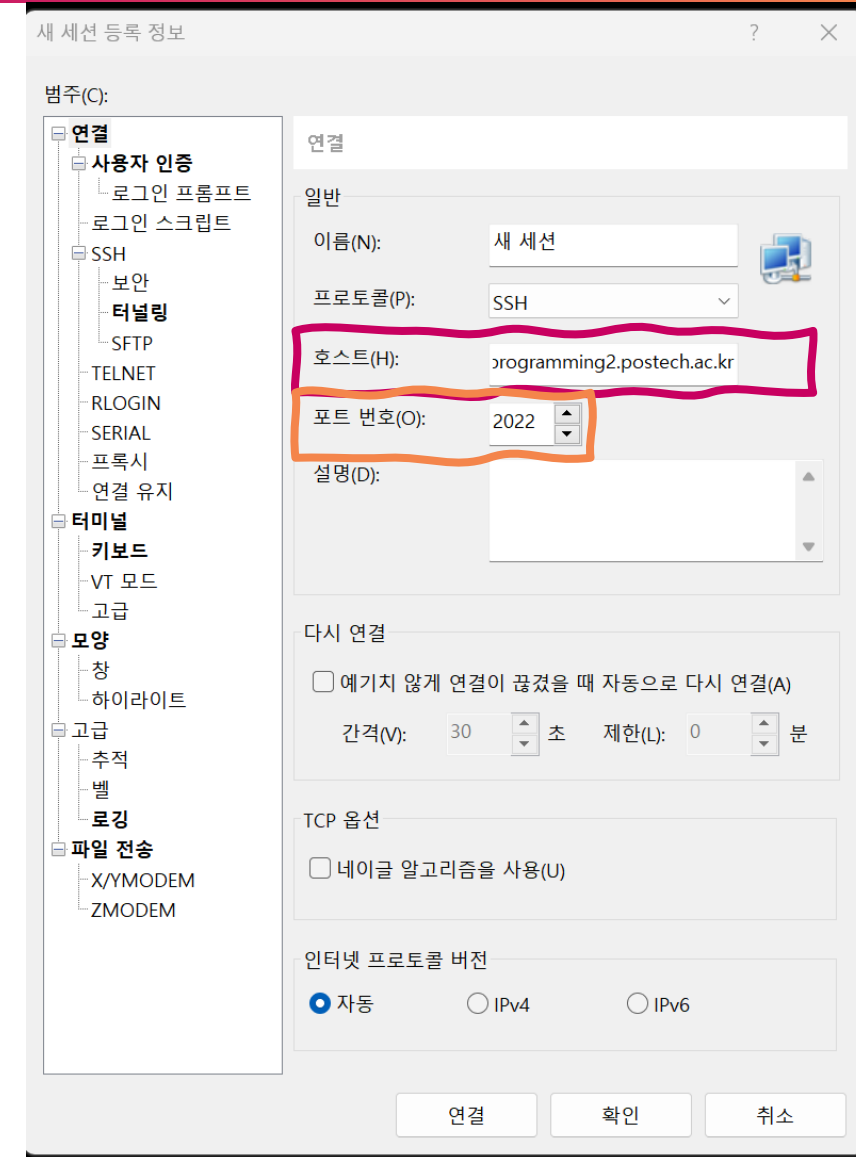
Order By: Publish Date Order: Descending Order

3. Home > Search Result For xmanager

Xmanager Enterprise
166.35 MB 2986 downloads

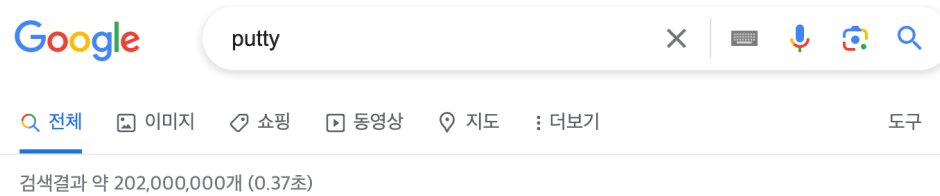
XShell Tutorial: How to Access Programming Server

- 1. Open new session (Press Alt + N)
- 2. Fill IP (Host) and Port number
 - IP: programming2.postech.ac.kr
 - Port: 2022



Putty Tutorial: How to Install

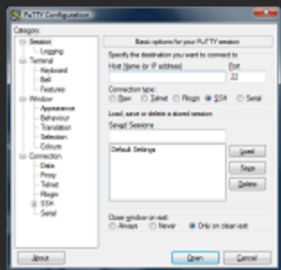
• 1. Search Putty in Google



도움말: 이 검색을 영어 검색결과로 제한합니다. 언어별 필터링에 관해 자세히 알아보기

PuTTY
<https://www.putty.org>
Download PuTTY - a free SSH and telnet client for Windows
PuTTY is an SSH and telnet client, developed originally by Simon Tatham for the Windows platform.
PuTTY is open source software that is available with ...

• 2. Click “Download PuTTY”



Download PuTTY

PuTTY is an SSH and telnet client, developed for the Windows platform. PuTTY is open source software and is developed and supported by a group of volunteers.

Download PuTTY

• 3. Download `putty.exe`

Alternative binary files

The installer packages above will provide versions of all of these (except PuTTYtel and PuTTYgen).
(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

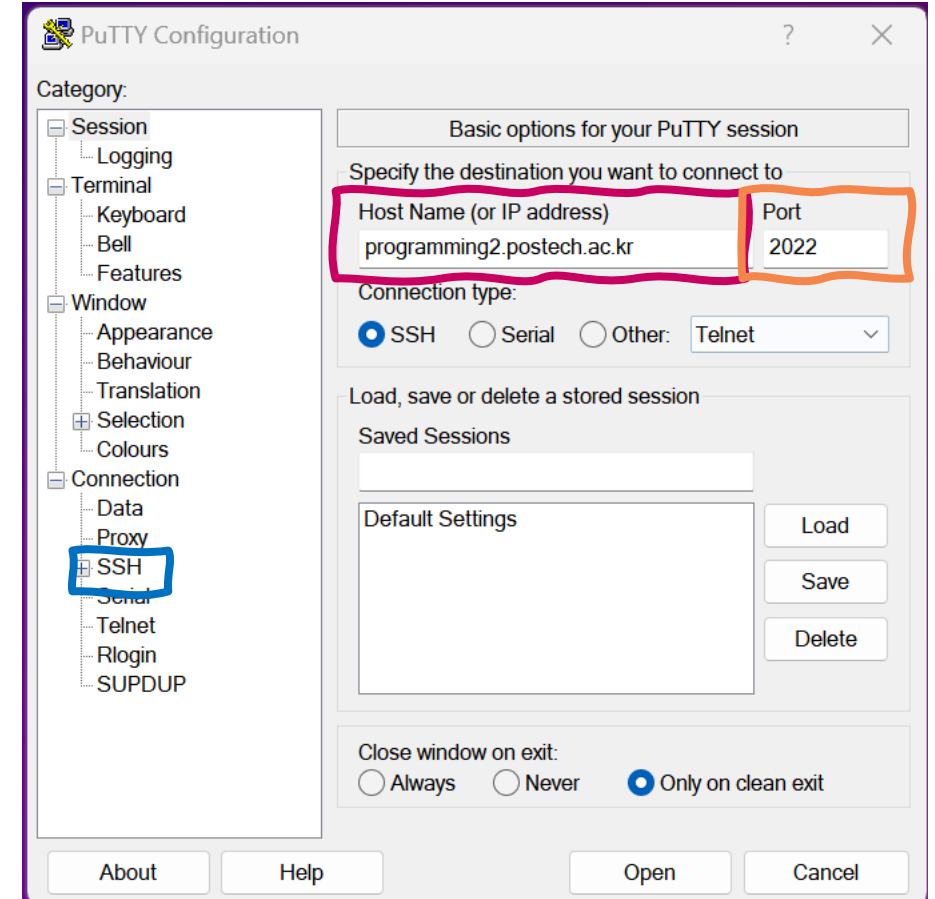
`putty.exe` (the SSH and Telnet client itself)

64-bit x86:	putty.exe	(signature)
64-bit Arm:	putty.exe	(signature)
32-bit x86:	putty.exe	(signature)

Select the file that matches with your OS

Putty Tutorial: How to Access Programming Server

- 1. Run `putty.exe`
- 2. Select **SSH** in Connection
- 3. Fill **Host Name** and **Port**
 - IP: `programming2.postech.ac.kr`
 - Port: `2022`



SSH Tutorial: How to Use Terminal or PowerShell

- Run “ssh [povis id]@programming2.postech.ac.kr -p2022”

```
[yonggonpark@bag-yong-gon-ui-MacBookPro ~ % ssh nanimdo@programming2.postech.ac.kr -p2022
Last login: Thu Dec 28 13:54:03 2023 from 141.223.145.26
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): 그런 파일이나 디렉터리가 없습니다
[nanimdo@programming2 ~]$ ls
20210782_mm.c  20220341_mm.c  20220848_mm.c  malloclab-handout
[nanimdo@programming2 ~]$
```

- (Optional) If you are tired of typing passwords, register your SSH key in server
 - This is not mandatory: Search Google for it



Today's Agenda

- Lab Introduction
 - Tips/Cautions
- About Programming Server
 - How to Access Programming Server
- **Linux Command Basics**
- **Data Lab1**

Linux Command Basics

- `$ ls`
 - List information of files in the directory
 - Option: `-a` (to show every files)
- `$ cd [directory name]`
 - Move current location to [directory name]
 - Use `“.”` for current directory, `“..”` to parent directory
- `$ cp [source file name] [new file name]`
 - Generate copy file of source file with given new file name

Linux Command Basics (Cont.)

- `$ mv [source file name] [new file name]`
 - Rename the source file to given new file name
- `$ mkdir [directory name]`
 - Generate new directory with given directory name
- `$ rm [file name]`
 - Delete given file (this command is irreversible!)
 - To delete directory, you have to give `-rf` option

Linux Command Basics (Cont.)

- `$ gcc [file(s) to compile]`
 - Compiles the given file(s) to executable file
 - Default output name is **a.out**: To specify output file name, run:
 - `$ gcc -o [output file name] [file(s) to compile]`
- `$./[executable file name]`
 - Run the given executable file (e.g. a.out)
- `$ chmod [option] [file name]`
 - Change the permission (read/write/executable) of the specified file(s)
 - E.g., To make `a.out` **executable**, run `chmod +x a.out`

Linux Command Basics (Cont.)

- `$ tar [option] [.tar file name]`
 - Compress (option: `-cvf`) or Decompress (option: `-xvf`) the `.tar` file
 - E.g., To get code for Data lab, run `$ tar -xvf data_lab1.tar`
- `$ cat [file name]`
 - Print the content of the file
- For more information, google 'linux commands'
 - E.g., <https://www.digitalocean.com/community/tutorials/linux-commands>

About Vim

- Vim is one of the most representative text editor
 - We highly encourage students to use this
- Simple tutorial:
 - Open file with vim: `$ vi [file name]`
 - To edit, press `a`
 - To save and quit, press `esc, :wq`
 - For the vim commands and configurations, please refer below websites
 - <https://www.cs.colostate.edu/helpdocs/vi.html>
 - <http://vimconfig.com>

Today's Agenda

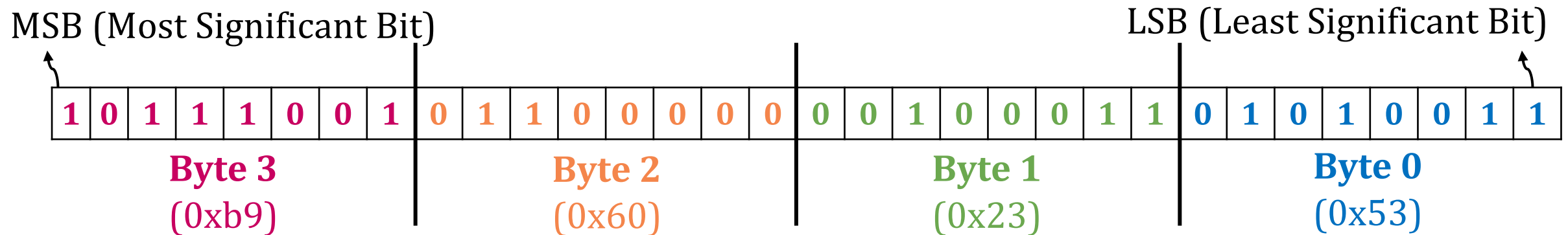
- Lab Introduction
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- Data Lab1

Data Lab1: Overview

- You should **implement simple functions using bitwise operations** while:
 - 1. Using only allowed operations
 - 2. Using less than a limited number of operations
 - 3. Following other programming rules (will be discussed later)
 - **Any violation will be regarded as 0 point**
- **Due: 09/11 23:59**
 - **Late submission will not be accepted**
- Submit a **code file** and your **lab report (in pdf)**
 - Source code name: **[student id].c** (e.g., 20231234.c)
 - Report name: **[student id].pdf** (e.g., 20231234.pdf)

Review: Bit and Byte

- Byte = 8 bits
 - Binary: $00000000_{(2)}$ to $11111111_{(2)}$
 - Decimal: $000_{(10)}$ to $255_{(10)}$
 - Hexadecimal: $00_{(16)}$ to $11_{(16)}$
 - Base-16 number representation
 - Uses symbols '0' to '9' and 'A' to 'F'
- E.g., `Int a = 0xb9602353;`



Review: Bitwise Operations

- A bitwise operation operates on binary numerals or bit pattern(s) **at bit-level**
- Bitwise operators (E.g., `~`, `&`, `|`, `^`)
 - Works on “each bit” of the operands
 - **Do not confuse with logical operators** where output is always a binary (0 or 1)
 - E.g., `&&`, `||`, `!`
- Shift operators (E.g., `<<`, `>>`)
- Bitwise assignment operators (E.g., `&=`, `|=`, `^=`, `<<=`, `>>=`)

Review: Bitwise Operators

AND: $A \& B = 1$ when both $A=1$ and $B=1$

$\&$	0	1
0	0	0
1	0	1

NOT: $\sim A = 1$ when $A=0$

\sim	
0	1
1	0

OR: $A \mid B = 1$ when either $A=1$ or $B=1$

\mid	0	1
0	0	1
1	1	1

XOR (Exclusive OR)

$A \wedge B = 1$ when either $A=1$ or $B=1$, but not both

\wedge	0	1
0	0	1
1	1	0

Review: Shift Operators

- **Left shift:** $x \ll y$
 - Shift bit vector x to left by y positions
 - Fill with 0's on right
- **Right shift:** $x \gg y$
 - Shift bit vector x to right by y positions
 - Logical shift: Fill with 0's on left
 - Arithmetic shift: Fill with **sign bit** on left
- In C, \gg operator **depends on the type** of the operand
 - \gg operator is **logical shift** when shifting **unsigned** value
 - \gg operator is **arithmetic shift** when shifting **signed** value


Argument a	01100010
$a \ll 3$	00010 000
$a \gg 2$ (logical)	00 011000
$a \gg 2$ (arithmetic)	00 011000

Argument b	10100010
$b \ll 3$	00010 000
$b \gg 2$ (logical)	00 101000
$b \gg 2$ (arithmetic)	11 101000

Review: Bitwise Assignment Operators

- Assigns the output value to the left operand

`a &= b`  `a = a & b`

`a |= b`  `a = a | b`

`a ^= b`  `a = a ^ b`

`a <<= b`  `a = a << b`

`a >>= b`  `a = a >> b`

Data Lab1: Problems

- Q1. `int bitNor(int x, int y)`
 - Perform bitwise NOR operation (i.e., $\sim(x|y)$)
 - Legal operations: `~`, `&`
 - Maximum operations: 8
- Q2. `int isZero(int x)`
 - Return 1 if x is 0, otherwise return 0
 - Legal operations: `!`, `~`, `&`, `^`, `|`, `+`, `<<`, `>>`
 - Maximum operations: 2

Data Lab1: Problems (Cont.)

- Q3. `int addOK(int x, int y)`
 - Return 1 if $x+y$ can be computed without overflow, otherwise return 0
 - Legal operations: `!, ~, &, ^, |, +, <<, >>`
 - Maximum operations: 20
- Q4. `int absVal(int x)`
 - Return absolute value of x ($TMin \leq x \leq Tmax$)
 - Legal operations: `!, ~, &, ^, |, +, <<, >>`
 - Maximum operations: 10

Data Lab1: Problems (Cont.)

- Q5. `int logicalShift(int x, int n)`
 - Perform logical right shift to input x by n ($0 \leq n \leq 31$)
 - Legal operations: `~, &, ^, |, +, <<, >>`
 - Maximum operations: 20

Data Lab1: Programming Rules

- You are **allowed** to use only the followings:
 - 1. Integer constants 0 through 255 (`0xFF`)
 - 2. Function arguments and local variables
 - 3. Unary integer operations (**if allowed**): `!`, `~`
 - 4. Binary integer operations (**if allowed**): `&`, `^`, `|`, `+`, `<<`, `>>`
- You are **not allowed** to use any of the followings:
 - 1. Use any control constructs: `if`, `do`, `while`, `for`, `switch`
 - 2. Define or use any macros
 - 3. Call any other functions
 - 4. Use any operations that are not allowed: `&&`, `||`, `-`, `...`
 - 5. Use any data type other than `int` (cannot use arrays, structs, or unions)

Data Lab1: How To Do

- Download the `datalab.tar` from PLMS, upload it to programming server
 - Use `scp` command to upload/download the files
 - `$ scp -P 2022 [path to datalab.tar] [povis ID]@programming2.postech.ac.kr:./`
 - `$ scp -P 2022 [povis ID]@programming2.postech.ac.kr:./[path to bits.c] [dst]`
- Decompress the tar file (Check slide #23)
- Open the `bits.c` file and implement 5 functions
 - Use minimum number of operators as you can
 - Follow the programming rules (0 point if violated)
- We provided grading program (`btest`) and programming rule checker (`dlc`)
 - TA will use this two programs to grade your works

Data Lab1: SCP Tutorial

Uploading a file

```
[yonggonpark@bag-yong-gon-ui-MacBookPro test % ls
datalab.tar
[yonggonpark@bag-yong-gon-ui-MacBookPro test % scp -P 2022 ./datalab.tar nanimdo@programming2.postech.ac.kr:./
datalab.tar
100% 1040KB 2.0MB/s 00:00
[yonggonpark@bag-yong-gon-ui-MacBookPro test % ssh nanimdo@programming2.postech.ac.kr -p2022
Last login: Wed Aug 7 15:25:55 2024 from 141.223.234.240
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): 그런 파일이나 디렉터리가 없습니다
[[nanimdo@programming2 ~]$ ls
datalab.tar mallocclab-handout
```

Downloading a file

```
[yonggonpark@bag-yong-gon-ui-MacBookPro test % rm datalab.tar
[yonggonpark@bag-yong-gon-ui-MacBookPro test % ls
[yonggonpark@bag-yong-gon-ui-MacBookPro test % scp -P 2022 nanimdo@programming2.postech.ac.kr:./datalab.tar ./
datalab.tar
100% 1040KB 2.9MB/s 00:00
[yonggonpark@bag-yong-gon-ui-MacBookPro test % ls
datalab.tar
yonggonpark@bag-yong-gon-ui-MacBookPro test % █
```

Quiz (5 Points for Each)

- 1. Write the name of the file(s) that "you" should submit for Data Lab 1.
- 2. Write the name of the given file that will be used to check whether or not you have violated the programming rules
- Go to PLMS, and start the quiz!

Questions?

[CSED211] Introduction to Computer Software Systems

Lab 1: Introduction & Data Lab1

Yonggon Park



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