

ITP20004 – Open-Source Software Labs

# Lab: Computer Networks

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Handong Global University



# Announcements

- Weekly schedule

Week	Mon	Week	Thur
1	Course overview, motivation, administrivia	1	CPR: C Programming Reinforcement - Functions
2	Computer organization and Linux environment (1)	2	CPR: C Programming Reinforcement - Strings
3	Computer organization and Linux environment (2)	3	CPR: C Programming Reinforcement - User-defined types, and memory allocation
4	Basic Linux commands + Writing code on Linux (vim)	4	Getting started with Linux / Hands-on Linux command-line tools
5	More Linux commands	5	CPR: C Programming Reinforcement - Understanding compilation and build process
6	Project management (1) <b>Proj 1 출제</b>	6	Project management (2)
7	-	7	Project: BASIC interpreter <b>Project 1</b>
8	- <b>Tuesday night: Midterm exam</b>	8	Project QnA (Optional)
9	CPR: C Programming Reinforcement - Accessing files and directories	9	Debugging with GDB + Unit testing with gtest <b>Project 1 due: Week#9 Saturday</b>
10	Shell script	10	Shell script
11	Code review GNU utilities <b>Proj 2 출제</b>	11	Writing an application in C
12	Github and open-source community	12	Using Github <b>Project 2 due: Week#12 Saturday</b>
13	Computer network basics	13	Linux network commands
14	Project: Text-based Game	14	Socket programming
15	Project: Multi-user game <b>Proj 3 출제</b>	15	Project: Multi-user game
16	Final exam	16	<b>Project 3 due: Week#16 Saturday</b>

# Announcements

- Team assignment for Weeks 11-16

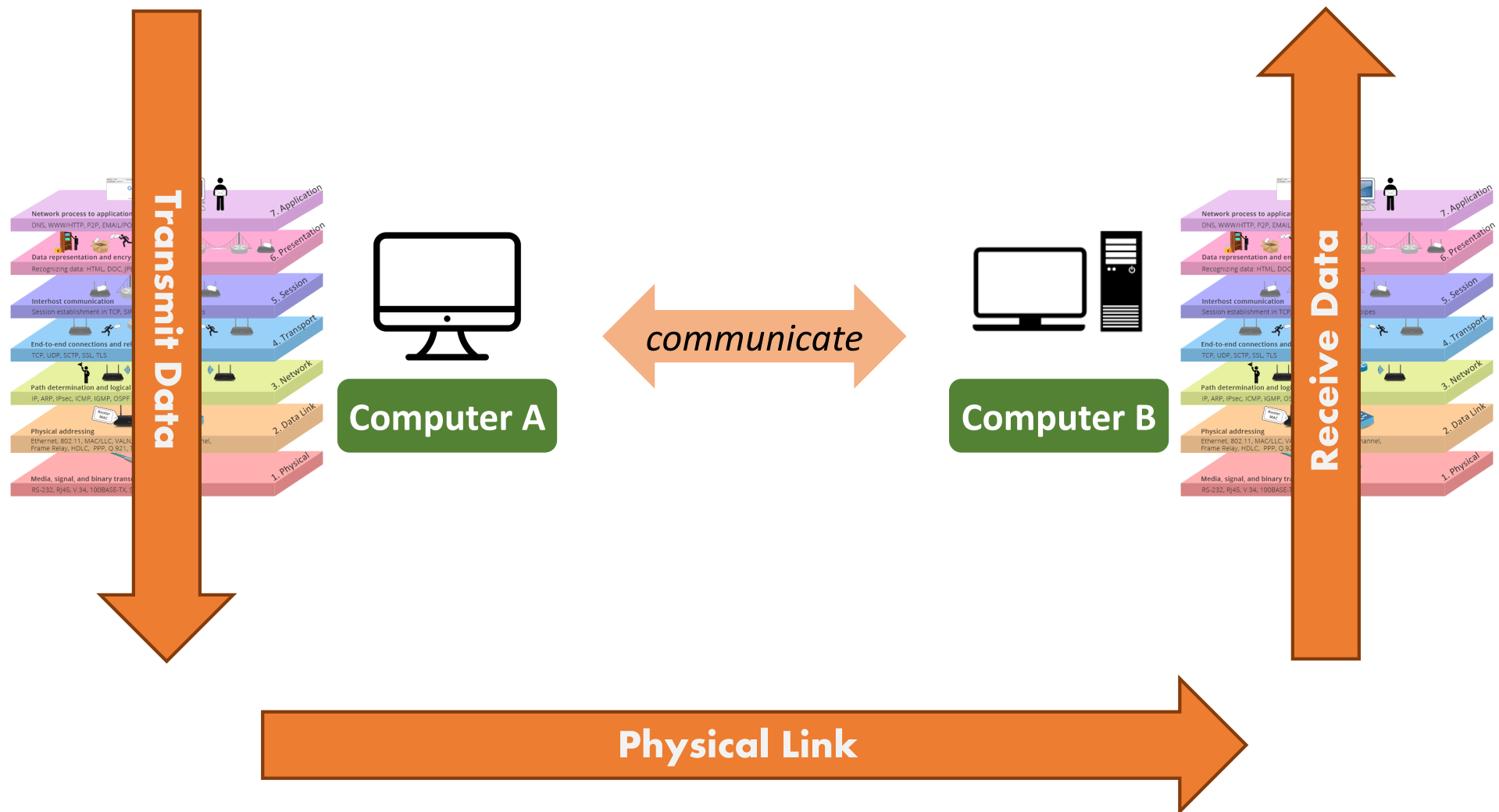
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22	곽철호	20	유승준	18	정현준	21	웰튼
18	임건호	18	조성민	21	송영은	22	서종현
20	비보시놉 아쟈	21	김연희	20	정성호	19	이지명
18	최정겸	20	정지원	19	유건민	21	서준예
20	이상현	20	이준형	18	마석재	22	반대준
21	조유진	21	사우 지아 유인	17	김홍찬	22	이채연
22	윤유원	18	현승준	20	윤예람	20	김가현
22	이온유	20	송산	18	김두환	22	황찬영
18	송민준	20	나예원	21	이선환	20	김승환
20	방석민	21	최지안	18	박현우	20	김유겸

# Announcements

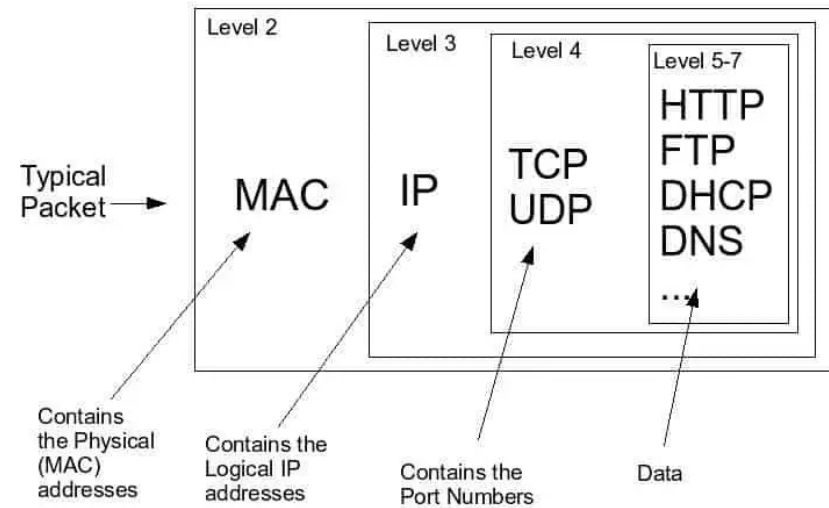
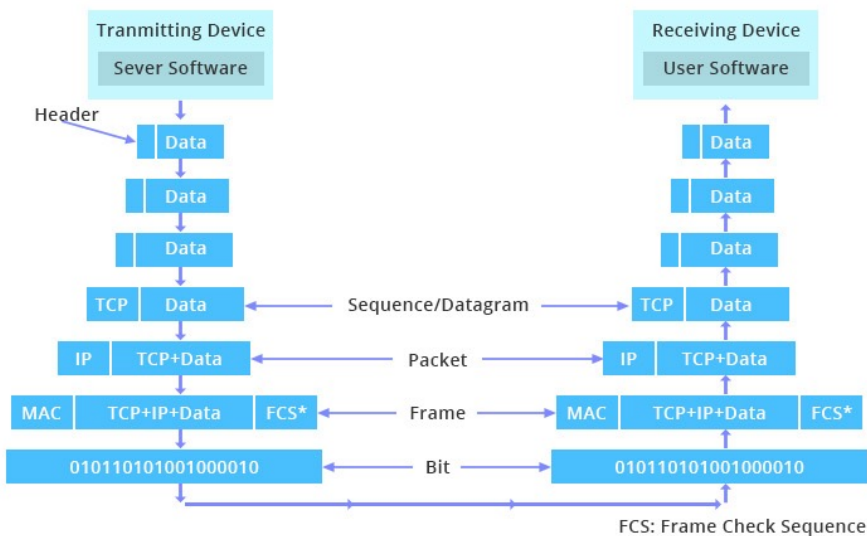
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- For each lab
  - Before a lab, **every student** submits a pre-lab report (worksheet-type assignment) – **individual work**
  - After a lab, **each team** sees and reports to the TA with the results – **team work**
- Up-coming schedule
  - We have a post-lab session on May 23 (Week #13) and May 30 (Week #14)

# OSI 7-Layer Model



- Data sent over computer networks is divided into packets
  - A packet is a small segment of a larger message
  - Packets are recombined by the computer or device that receives them



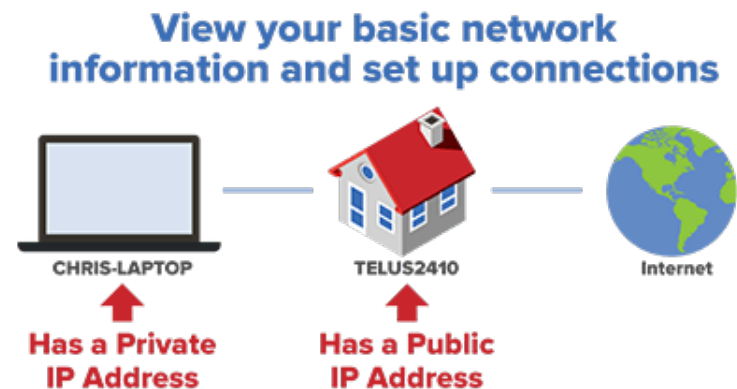
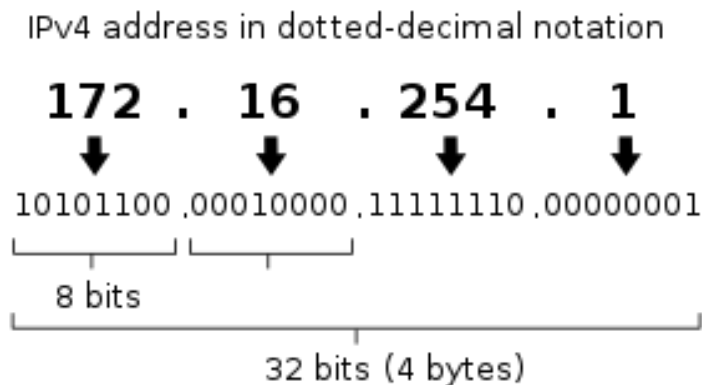
# Task 0 – Warm Up!

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- Read Chapter 16 of the TLCL book and grasp the general ideas related to the Linux network commands
  - TLCL: <http://sourceforge.net/projects/linuxcommand/> (-19.01.pdf)
- More resources (*for more interested students!*)
  - “ip” command and examples <https://phoenixnap.com/kb/linux-ip-command-examples>
  - “ping” command and examples <https://www.computernetworkingnotes.com/networking-tutorials/ping-command-explained-with-examples.html>
  - “traceroute” command examples <https://linuxhandbook.com/traceroute/>

# Task 1 – IP Addresses

- Review
  - Addressing/routing protocol – locates hosts and transport data packets
  - Uses the IP address (Internet Protocol address): a numerical label assigned to each device on network
    - An identifier of a device on network
    - IPv4 (32-bit), IPv6 (128-bit)





# Task 1 – IP Addresses

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- Task

- Let us investigate the Peace server

- What is the command to display the IP address?
    - What is the IP address of the Peace server?

`ip addr`

`ip addr show`

- Let us check out the interface statistics

- Using the “`ip -s link`” command, one can pull out the statistics related to the network traffic
      - “`enp129s0f1`” is the network interface name on Peace
    - How many data have been sent and received by Peace, in terms of both bytes and packets?

`ip -s link enp129s0f1`

# Task 2 – Ping

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- Let us ping Google

ping google.com

- Google's URL is google.com

- What is the command to ping Google?
    - What is the IP address of google.com? 142.250.207.110
    - Can you explain what is displayed on the screen after you ping Google?
      - What does each of icmp\_seq, ttl, and time mean?

- Let us ping Handong.edu

- What is the IP address of Handong.edu? 211.253.29.84
  - How does the result different from that of Google? ping is blocked
    - Can you explain why? Ping of death, Ping Flood

Hint: <https://superuser.com/questions/318870/why-do-companies-block-ping>

ping of death : 허용할 수 있는 패킷의 크이의 범위의 ICMP 패킷을 전송하여서 처리하기에 마비가 올 수 있도록 하는 것 (용량)  
ping flodd : 허용 할 수 있는 패킷의 양을 전송하여 서버를 마비 시키는 것 (양)

# Task 3 – Traceroute

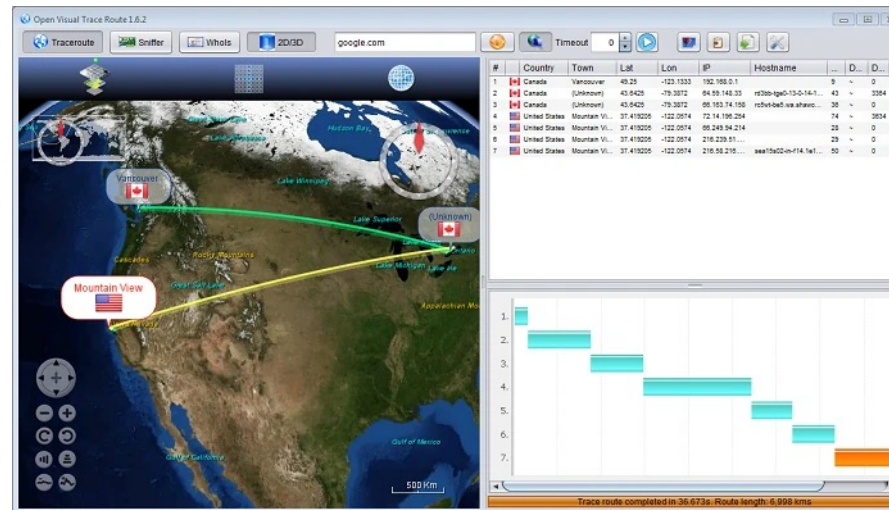
```
1 203.252.112.1 (203.252.112.1) 1.431 ms 2.401 ms 3.372 ms
2 172.18.201.1 (172.18.201.1) 0.046 ms 0.056 ms 0.038 ms
3 203.251.71.133 (203.251.71.133) 0.580 ms 0.583 ms 0.570 ms
4 * * *
5 * * *
6 112.190.176.157 (112.190.176.157) 1.825 ms 112.190.178.157 (112.190.178.157) 3.286 ms 112.190.178.161 (112.190.178.161) 2.307 ms
7 112.174.8.110 (112.174.8.110) 3.529 ms 112.190.29.249 (112.190.29.249) 17.743 ms 112.190.30.249 (112.190.30.249) 3.447 ms
8 112.174.84.18 (112.174.84.18) 4.428 ms 112.174.84.42 (112.174.84.42) 3.782 ms 112.174.84.50 (112.174.84.50) 5.127 ms
9 72.14.202.136 (72.14.202.136) 28.132 ms 142.250.165.78 (142.250.165.78) 24.738 ms 24.746 ms
10 * * *
11 142.251.70.23 (142.251.70.23) 24.504 ms 108.170.242.193 (108.170.242.193) 34.548 ms 108.170.242.129 (108.170.242.129) 29.325 ms
12 108.170.242.144 (108.170.242.144) 29.241 ms 108.170.242.146 (108.170.242.146) 28.274 ms 108.170.242.177 (108.170.242.177) 28.290 ms
13 kix06s11-in-f14.1e100.net (142.250.207.110) 24.754 ms 209.85.241.107 (209.85.241.107) 29.928 ms 209.85.249.241 (209.85.249.241) 28.099 ms
```

- Try “traceroute google.com”
  - What does the output on the screen mean?
    - Hint: See pages 203-204 of TLCL
    - Relevant discussions: What does “\*\*\*” mean when traceroute <https://serverfault.com/questions/334029/what-does-mean-when-traceroute>
- Now try “traceroute slashdot.org” and compare the output with that of google.com
  - How are the two results different?
  - You may “trace” the “route” of your packets using the Whois service
    - Whois: <https://tools.vo.lu/en/tools/whois/>

```
1 203.252.112.1 (203.252.112.1) 1.512 ms 2.490 ms 3.460 ms
2 172.18.201.1 (172.18.201.1) 0.052 ms 0.053 ms 0.044 ms
3 203.251.71.133 (203.251.71.133) 0.611 ms 0.560 ms 0.573 ms
4 * * *
5 * * *
6 112.190.178.157 (112.190.178.157) 3.499 ms 112.190.176.157 (112.190.176.157) 2.000 ms 112.190.178.161 (112.190.178.161) 2.579 ms
7 * * *
8 * * *
9 218.145.42.174 (218.145.42.174) 8.410 ms 7.946 ms 8.392 ms
10 104.18.28.86 (104.18.28.86) 6.410 ms 6.636 ms 7.419 msxt
```

# Task 3 – Traceroute

- Let us install Visual Traceroute on your local machine (laptop)
  - Open Visual Traceroute: <https://visualtraceroute.net/>



- Mac OSX users may have hiccups
  - "... developer cannot be verified ..." - <https://www.lifewire.com/fix-developer-cannot-be-verified-error-5183898>
  - "... no suitable Java version found on your system ..." <https://www.codejava.net/java-se/install-oracle-jdk-20-on-macos>

## Task 3 – Traceroute

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- Using Visual Traceroute, follow the itinerary of your packets to `google.com` and `slashdot.org`
  - Compare the visual outcome of Visual Traceroute with the results of Traceroute on the console

## Task 4 - Telnet

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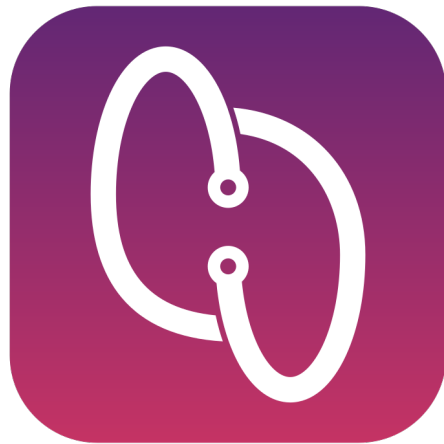
- There is a class-only server is running
  - `$ telnet localhost 10025`  
or  
`$ telnet peace.handong.edu 10025`
    - Try to enter some messages. What do you see?
    - When you want to quit,  
enter “Control + ]” and then enter “quit”
- Telnet is an internet-based protocol and is implemented at the client end to access a remote computer
  - What is the difference between Telnet and Ssh?  
<https://www.tutorialspoint.com/difference-between-ssh-and-telnet>



# Advertisement

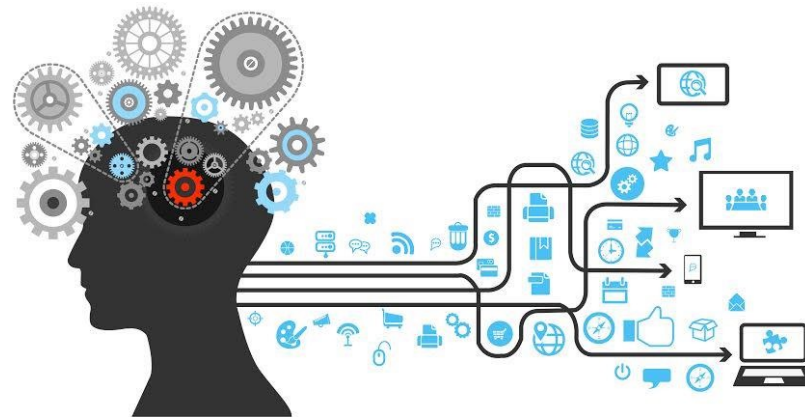
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- HAIL: [Handong Artificial Intelligence Lab](#)
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