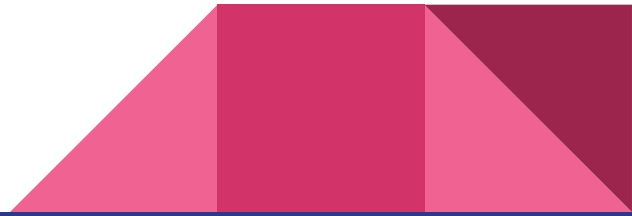
CS 33: Computer Organization

Dis 1B: Week 1 Discussion

Agenda

- Introduction / Logistics
- Environment Setup for Lab 0 and Lab 1
- Lecture Recap



Introduction / Logistics

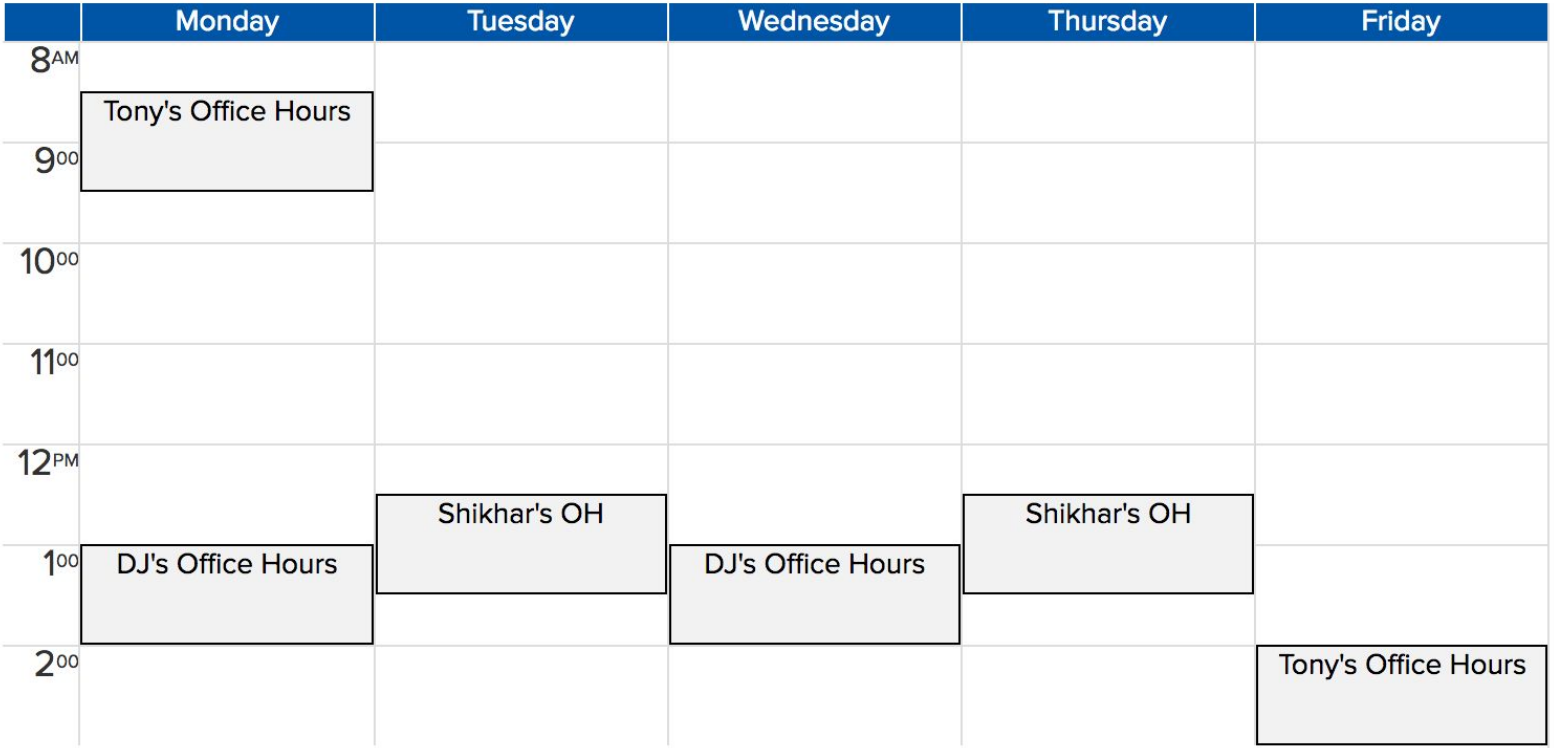
Hello ~~World!~~ Dis 1B!

- TA: DJ Kim
- E-mail: djkim@cs.ucla.edu
- Office Hours: MW 1:00~2:00PM
- BH 2432

Grading

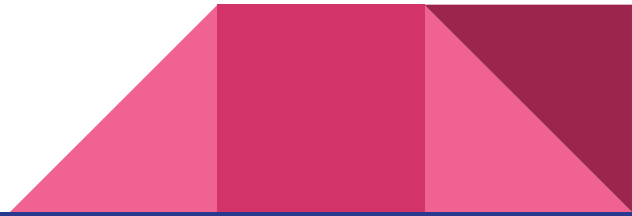
- Midterm 20%
- Final 35%
- Labs 40%
- Homework 5%
- Start early! Otherwise, you won't be able to finish the labs on time, just like how CS 31 and CS 32 were
- For the labs, work on your own! Otherwise you will fail the exams, just like how CS 31 and CS 32 were

If you need help...



If you need help...

- Come to any of our Office Hours!
- Post your question to the discussion board
  - We might use Piazza
  - To be announced…
- E-mail us!



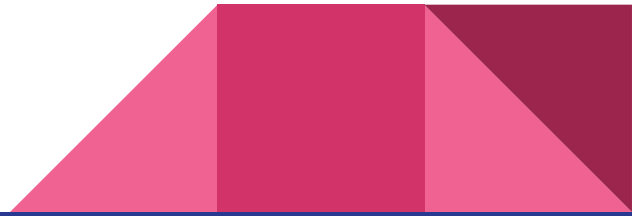
If you need help...

- Visit UPE (Computer Science Honor Society) tutors
- https://upe.seas.ucla.edu/tutoring/
- Boelter Hall 2763, 9am~5pm **everyday**
- UPE will also hold a midterm review session and a final review session

Environment Setup & Basic Linux

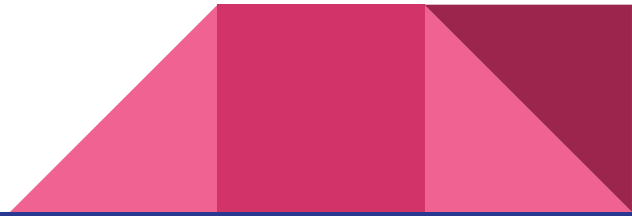
Setup

- In order to login to SEASnet, you need to be connected to wireless networks on campus



Setup

- In order to login to SEASnet, you need to be connected to wireless networks on campus
- Or login with VPN software
- https://www.it.ucla.edu/bol/services/virtual-private-network-vpn-clients

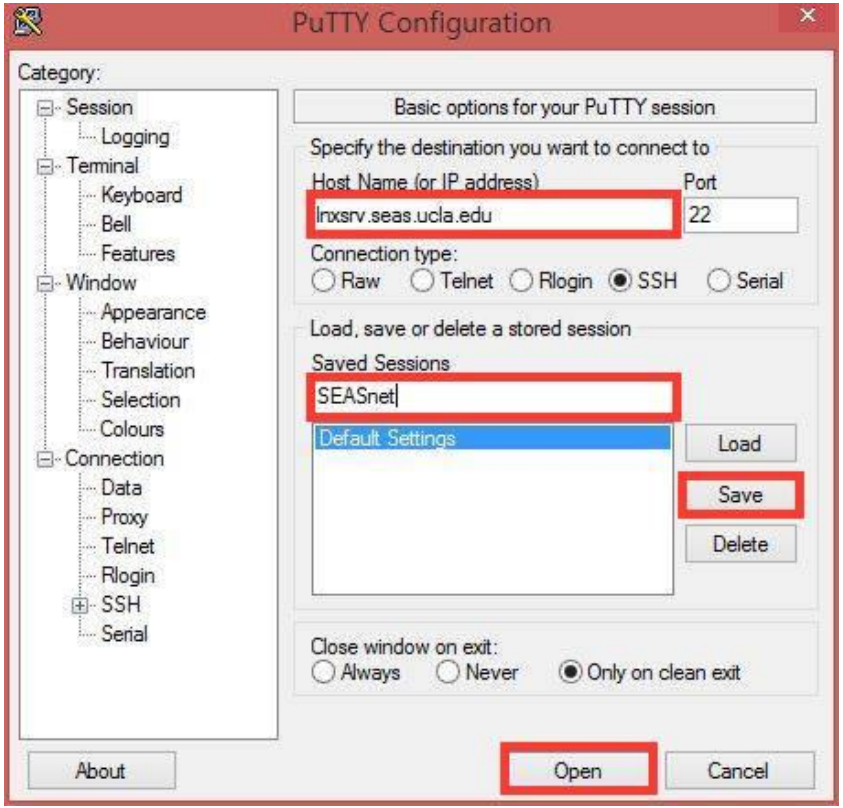


Setup Guide for Windows

- Download Putty
  - https://the.earth.li/~sgtatham/putty/latest/x86/putty.exe

Putty

- First Run
  - Type *lnxsrv@seas.ucla.edu* for Host Name
  - Type SEASnet for Saved Sessions
  - Click Save
  - Click Open
  - Type your SEASnet username and password
- Double-click SEASnet under Saved Sessions in the future

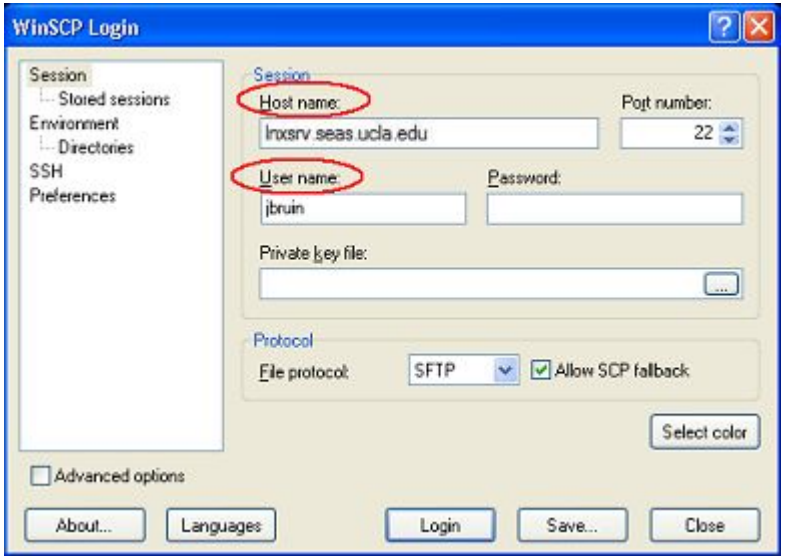


Setup Guide for Windows

- Download WinSCP
  - http://winscp.net/download/winscp427setup.exe

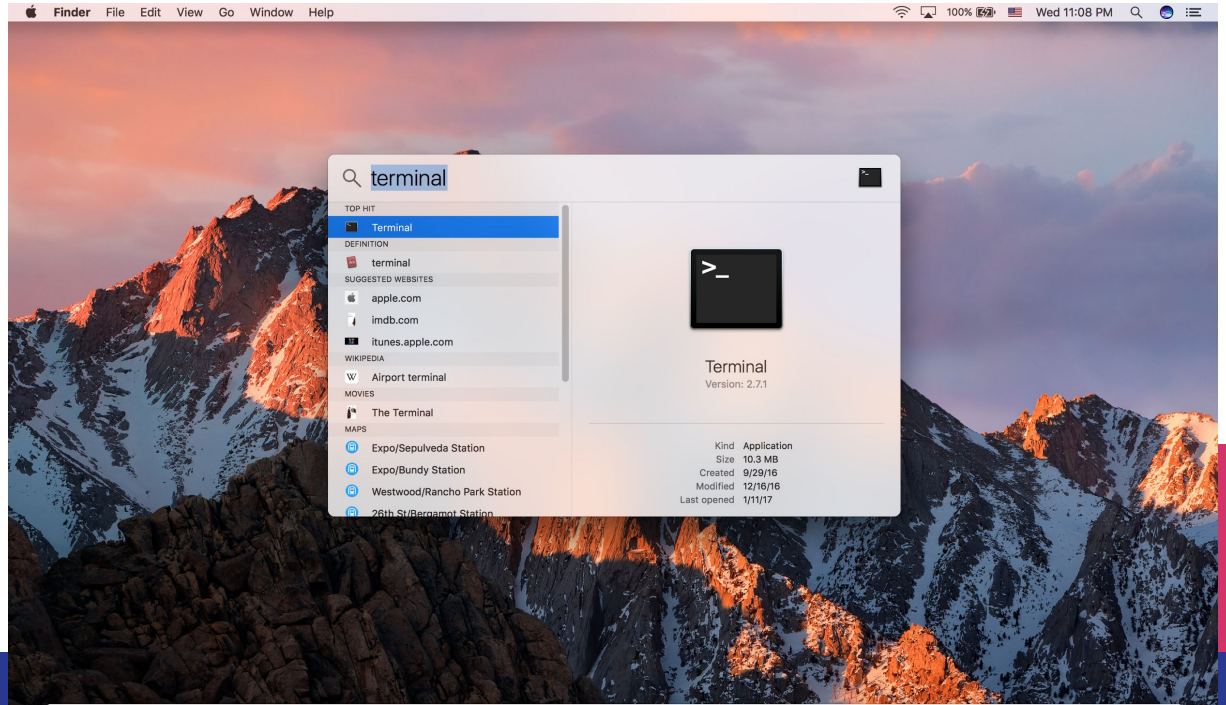
WinSCP

- Type *lnxsrv.seas.ucla.edu* for Host name
- Type your SEASnet username and password
- Right click a file and select upload or download



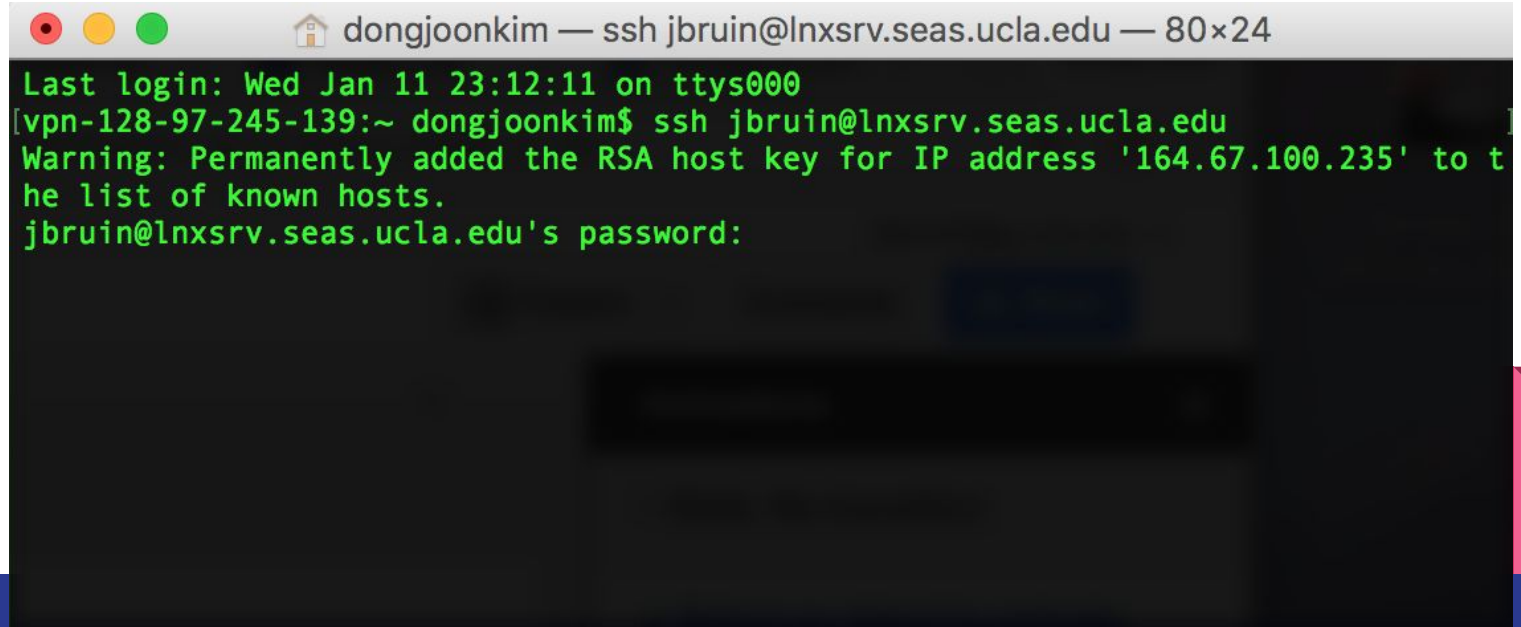
Setup Guide for Mac

- Open Terminal



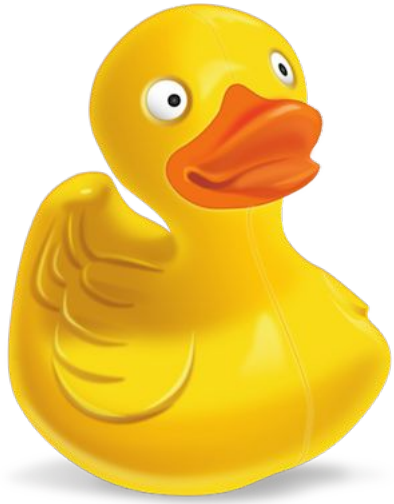
Terminal

- Type `ssh <SEASnet username>@lnxsrv.seas.ucla.edu`
- Enter your password



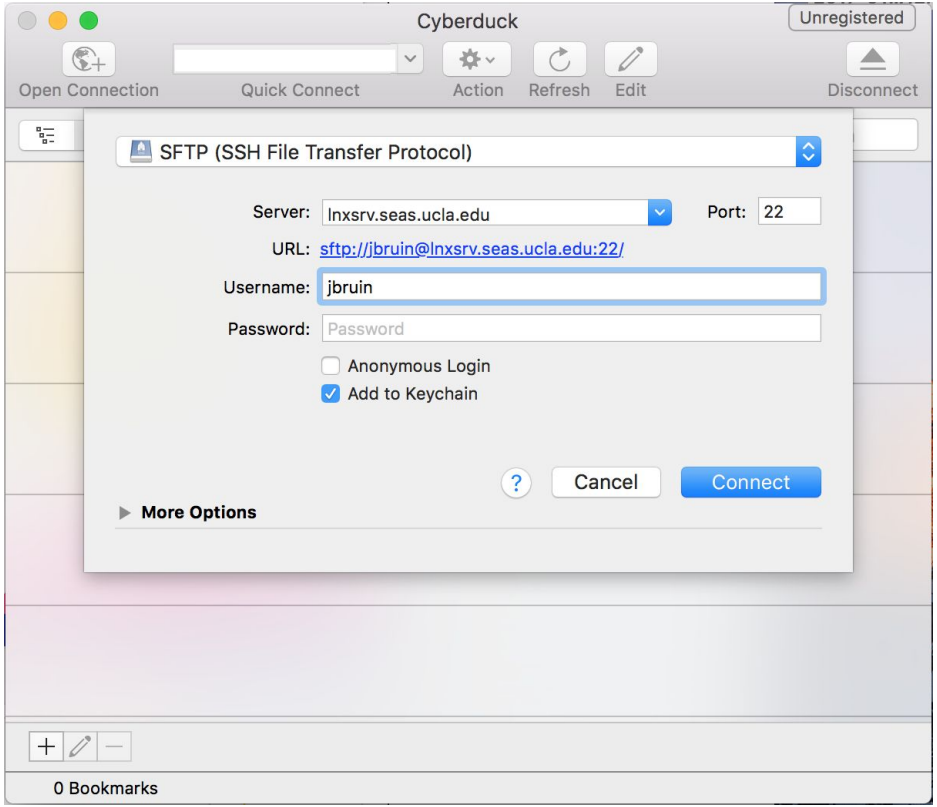
Setup Guide for Mac

- Download Cyberduck
  - https://update.cyberduck.io/Cyberduck-5.2.2.21483.zip

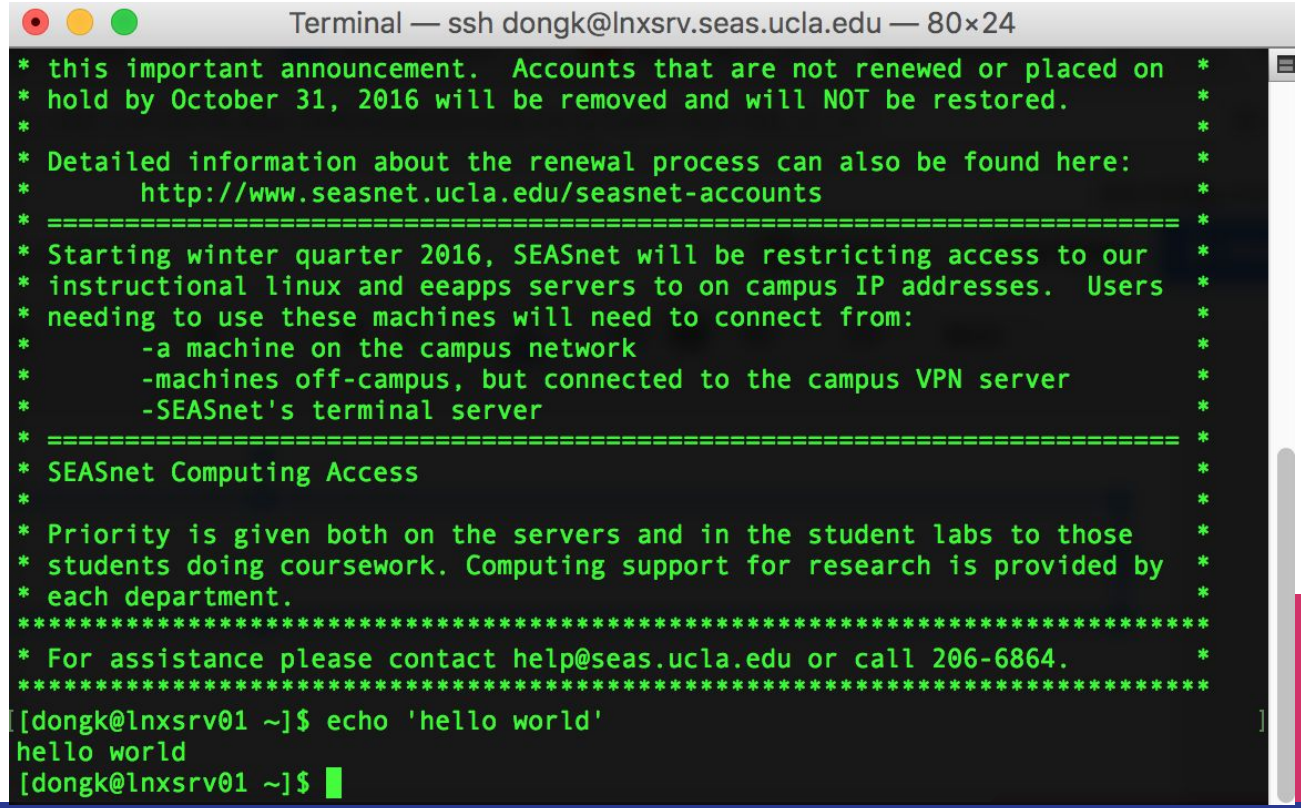


Cyberduck

- Click Open Connection
- Select SFTP (SSH File Transfer Protocol)
- Type *lnxsrv.seas.ucla.edu* for Server
- Type your username and password
- Click Connect

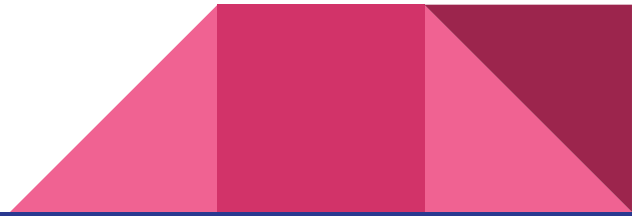


Linux


Terminal — ssh dongk@lnxsrv.seas.ucla.edu — 80×24
* this important announcement. Accounts that are not renewed or placed on *
* hold by October 31, 2016 will be removed and will NOT be restored.   *
*   *
* Detailed information about the renewal process can also be found here: *
*   http://www.seasnet.ucla.edu/seasnet-accounts   *
* == *
* Starting winter quarter 2016, SEASnet will be restricting access to our   *
* instructional linux and eeapps servers to on campus IP addresses. Users   *
* needing to use these machines will need to connect from: *
*   -a machine on the campus network   *
*   -machines off-campus, but connected to the campus VPN server   *
*   -SEASnet's terminal server   *
* == *
* SEASnet Computing Access   *
*   *
* Priority is given both on the servers and in the student labs to those   *
* students doing coursework. Computing support for research is provided by   *
* each department.   *
****
* For assistance please contact help@seas.ucla.edu or call 206-6864.   *
****
[dongk@lnxsrv01 ~]$ echo 'hello world'
hello world
[dongk@lnxsrv01 ~]$

Helpful Linux Commands

- Linux commands have the following format
  - <command name> <flags> <argument>
  - Flags and arguments are optional for some commands
  - Flags specify the behavior of the command

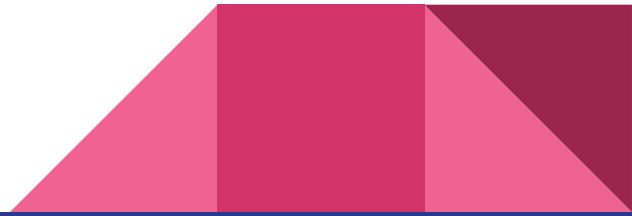


Helpful Linux Commands

- ls
  - ls command lists directory contents
  - Try these commands
    - ls
    - ls -l
    - ls -a
    - ls -al

Helpful Linux Commands

- pwd
  - pwd command prints the current working directory



Helpful Linux Commands

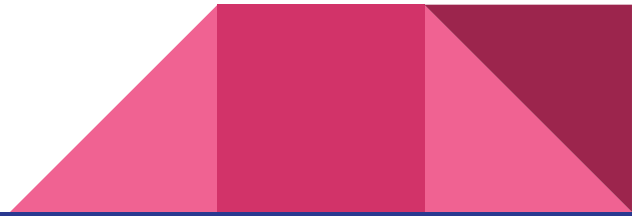
- cd
  - cd command is used to change directory
  - Try these commands
  - cd .
  - cd /w/class.1/cs/cs33/cs33w17/lab0-handout
  - cd

Helpful Linux Commands

- mkdir
  - mkdir command creates a new directory
  - Try creating a directory for CS33
    - cd
    - mkdir CS33

Helpful Linux Commands

- Change your directory to the newly created CS33 directory
  - cd CS33
- Then, run this command to get the files for Lab 0
  - cp -r /w/class.1/cs/cs33/cs33w17/lab0-handout .
- cp command is used to copy file or directory
  - -r (recursive flag, usually used to copy a directory)
  - Source
  - Destination
    - . stands for current directory
    - .. stands for previous directory

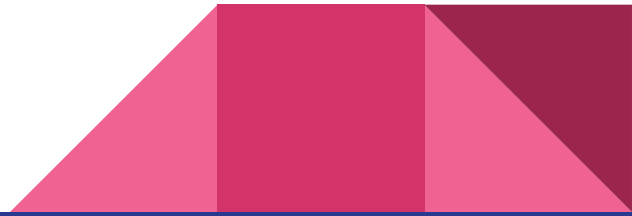


Helpful Linux Commands

- mv
  - mv command is used to move or rename file or directory
  - mv <flag> <source> <destination>
  - mv <flag> <original name> <new name>

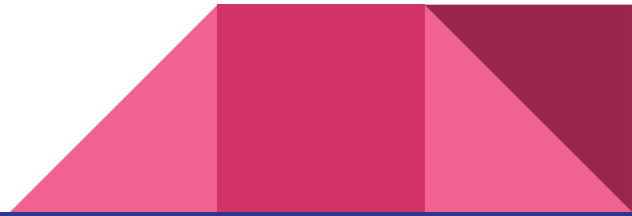
Man

- If you have questions about Linux commands or want to know more, ask **the man**
- man whoami
- man git
- man vim
- man man
- man ls
- man cd
- man cp



Text Editing on Linux

- If you are smart, use Vim
  - vim bits.c
- If you are super smart, use Emacs
  - emacs bits.c
- If you are normal, use WinSCP / Cyberduck to upload / download the file you want to edit and just edit them like normal people



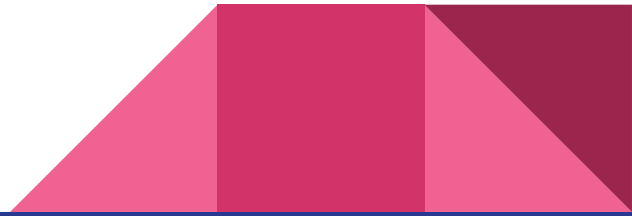
Lecture Recap

Decimal / Binary / Hexadecimal

- Decimal: Base 10
- Binary: Base 2
- Hexadecimal: Base 16
- How can we convert a number from decimal to binary representation?
- How can we convert a number from binary to hexadecimal representation?

Decimal to Binary

- How do we convert 2017_{10} to a binary representation?



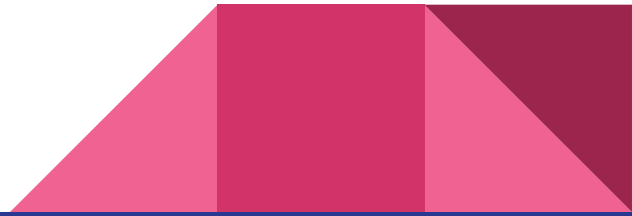
Binary to Hexadecimal

- How do we convert 11111100001_2 to hexadecimal representation?

Binary	Hex	Decimal
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	A	10
1011	B	11
1100	C	12
1101	D	13
1110	E	14
1111	F	15

Bits and Bytes

- A bit is the smallest unit of data
  - Joe Bruin: UCLA Wi-Fi's download speed is 300 KB/s!
  - Traveler Trojan: Haha suckers, USC's Wi-Fi's download speed is 1Mbps!
  - Joe Bruin: ????? What the…?
- Which campus has faster download speed?



Bits and Bytes

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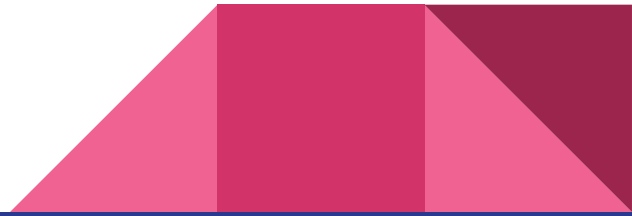
  - Joe Bruin: ????? What the…?
- Which campus has faster download speed?
- 1 Byte = 8 bits
- A bit can have only one of two values: 0 or 1

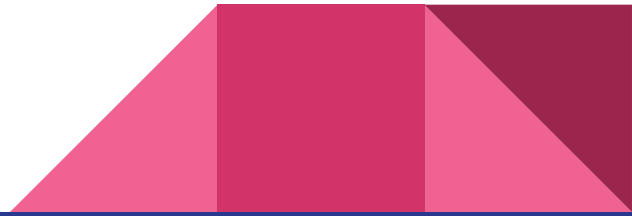
int

- How many **bytes** are in an integer variable?



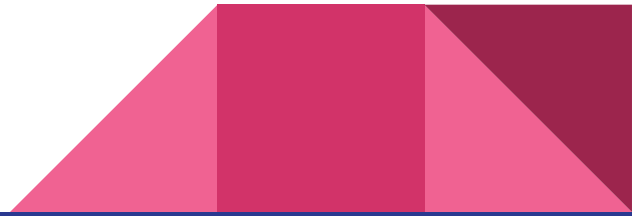
int

- How many **bytes** are in an integer variable?
  - 4 bytes



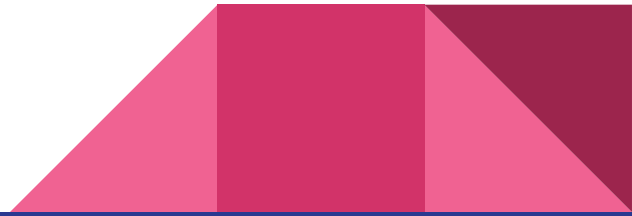
int

- How many **bytes** are in an integer variable?
  - 4 bytes
- How many **bits** are in an integer variable?



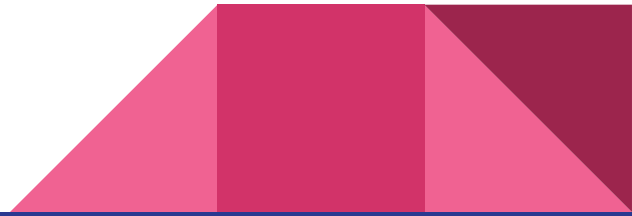
int

- How many **bytes** are in an integer variable?
  - 4 bytes
- How many **bits** are in an integer variable?
  - 32 bits



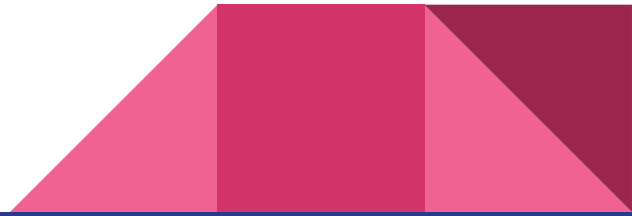
Bitwise Operators

- Bitwise operators operate on a single bit
- AND : &
  - 1 if both inputs are 1, 0 otherwise
- OR : |
  - 1 if at least one input is 1, 0 otherwise
- XOR : ^
  - 1 if two inputs have different values, 0 otherwise
- NOT : ~
  - 1 if the input was 0, 0 otherwise



Bitwise Operators Exercise

- 11110011 & 10101010
- 11110011 | 10101010
- 11110011 ^ 10101010
- ~11110011

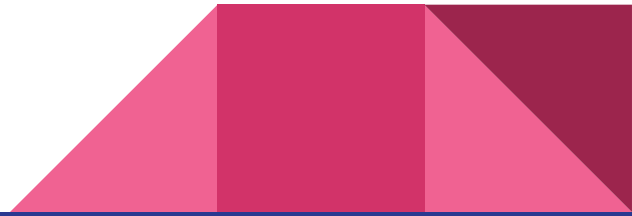


Logical Operators Exercise

- 11110011 && 10101010
- 11110011 && 00000000
- 11110011 || 10101010
- 11110011 || 00000000
- !11110011
- !00000000

Bitwise Operators

- Left shift : <<
  - 00000011 << 4
- Right shift : >>
  - 11110011 >> 4 (logical)
  - 11110011 >> 4 (arithmetic)
- Usually, C / C++ implements arithmetic right shift for right shift operator

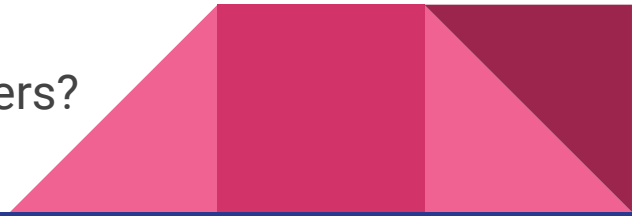


Two’s Complement

- The most significant bit of an N bit number has a value of -2^{N-1} instead of 2^{N-1}
- Suppose we are dealing with 8-bit numbers
  - What is the value of the unsigned binary number: 11001100?
  - What is the value of the signed binary number: 11001100?
  - How do we convert a positive number to a negative number?
  - 00001101 ⇔ ?

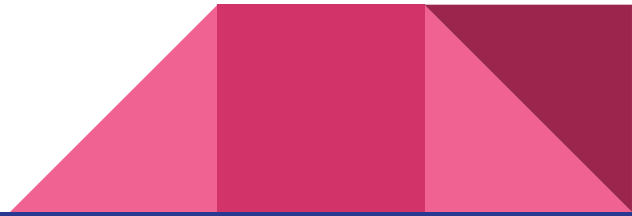
Extreme Values

- Umin: 0000….0000
- Umax: 1111….1111 (-1 if signed)
- Tmin: 1000….0000
- Tmax: 0111….1111
- 0
- These values are extremely helpful for solving C puzzles that we went over in the lecture
- What are Umin, Umax, Tmin, Tmax, 0, for 8-bit numbers?



Casting

- Signed values are implicitly casted to unsigned if there is a mix of unsigned and signed in a single expression



C Puzzles

Initialization

```
int x = foo();
int y = bar();
unsigned ux = x;
unsigned uy = y;
```

- `x < 0` □□ `((x*2) < 0)`
- `ux >= 0`
- `x & 7 == 7` □□ `(x<<30) < 0`
- `ux > -1`
- `x > y` □□ `-x < -y`
- `x * x >= 0`
- `x > 0 && y > 0` □□ `x + y > 0`
- `x >= 0` □□ `-x <= 0`
- `x <= 0` □□ `-x >= 0`
- `(x|-x)>>31 == -1`
- `ux >> 3 == ux/8`
- `x >> 3 == x/8`
- `x & (x-1) != 0`