Homework 1 – Systems Programming Concept
Spring'22
Due date: March 8th, 2022

Part 1 – ***Motive learning Linux Commands***

Task – For part 1, students are required to have Linux operating system access and highly encouraged to install Virtual Environment based Linux Operating System on their host machine. You may pick any flavor of Linux System to execute ***20 commonly used Linux Commands*** as attached on the Linux Intro Slides. For commands list refer to ***Moodle's Linux Commands*** slide attached. Alternatively, you may pick your choice of commands. You would be taking the screenshot of those executed commands and their respective output, and upload to the Moodle section of Homework 1.

Mark – 20 X 2 (each commands) = 40 points

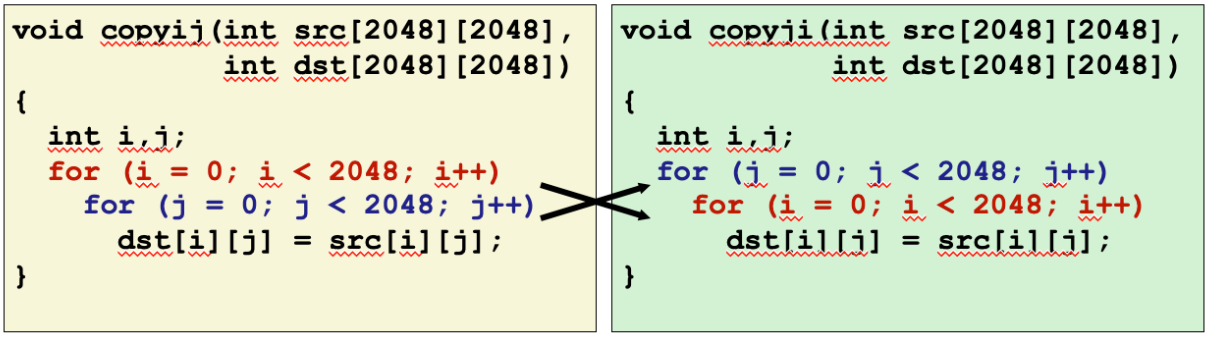
Part 2 – ***Motive understanding the performance differences among Operating Systems***

Task – For part 2, students are required to write a program (encouraged C) that would copy array from source to destination in 2 ways.

A. Copy each row of source array to destination – This will be referred as ***row by row copy*** where each element of first row would be copied before moving to second row.
B. Copy each column of source array to destination - This will be referred as ***column by column copy*** where each element of first column would be copied before moving to second column.
C. Measure the time it takes to copy on each level in 3 different machines on different array size. You would be filling the information below in table.

Operating System	Time to complete copying row by row (in ms)		Time to complete copying column by column (in ms)		Machine Architecture Specification
Linux Ubuntu	Array Size	Time	Array Size	Time	
	50k		50k		
	0.5 mil		0.5 mil		
	10 mil		10 mil		
Windows Machine	50k		50K		
	0.5 mil		0.5 mil		
	10 mil		10 mil		
Mac OSx or Others	50k		50k		
	0.5 mil		0.5 mil		
	10 mil		10 mil		

Reference – Refer to slide below on sample (Lecture Overview Slide # 12).



```
void copyij(int src[2048][2048],
            int dst[2048][2048])
{
  int i,j;
  for (i = 0; i < 2048; i++)
    for (j = 0; j < 2048; j++)
      dst[i][j] = src[i][j];
}
```

```
void copyji(int src[2048][2048],
            int dst[2048][2048])
{
  int i,j;
  for (j = 0; j < 2048; j++)
    for (i = 0; i < 2048; i++)
      dst[i][j] = src[i][j];
}
```

Extra Points (20) – Students who create an AWS free tier EC2 host machine and deploy their code to measure the time will get an extra 20 points. For how to create AWS free tier account refer to the posts below.

1. https://www.youtube.com/watch?v=rkKvzCskpLE
2. https://www.youtube.com/watch?v=Qp4C6GwX5V8
3. https://aws.amazon.com/free/?all-free-tier.sort-by=item.additionalFields.SortRank&all-free-tier.sort-order=asc&awsf.Free%20Tier%20Types=*all&awsf.Free%20Tier%20Categories=*all

Note: If you are unable to create AWS EC2 host, you may use Systems Lab machine from our university such as Linux / Windows via ssh / terminal UI. Both Operating Systems (Linux/Windows) are available to students.

Linux – ssh username@systems-lab.cs.uno.edu

Windows – https://terminal.cs.uno.edu

Mark – 20 X 3 (each machine output result) = 60 points