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Fall 2020

Fall 2020 - COM SCI35L-1 / COM SCI35L-2 / COM SCI35L-3 / COM SCI35L-4 / COM SCI35L-5 / COM SCI35L-6 / ... - KANNAN / LATIB / MEIROVITCH / SARMAH

Started on Monday, 14 December 2020, 9:20 AM PST**State** Finished**Completed on** Monday, 14 December 2020, 12:20 PM PST**Time taken** 3 hours**Grade** **76.75** out of 100.00

Information

Your friend is recording their grocery list as a plaintext file (named groceries) on their SEASnet account. The contents of the file are as follows:

```
eggs
milk
hand sanitizer
apple juice
a ficus plant
```

Question 1

Complete

1.00 points out of 1.00

Your friend realizes that they're out of bread, so they try to add bread to the list by using this command:

```
echo 'bread' > groceries
```

Is there anything wrong with their solution? Why or why not? Answer in 1 sentence.

This command will overwrite the contents in the file groceries (effectively deleting the previous items) instead of appending (use `>>` instead of `>`).

Comment:

CCLE

Complete

2.00 points out of 2.00



Need Help ?



Because this grocery list is on the SEASnet servers, they're now afraid that other people may try to read this list and discover their food preferences. What one-line command can your friend use to make sure that they are the only one that can read this grocery list?

```
chmod 700 groceries
```

They can turn off the read permissions for everyone but them.

Comment:

Information

Suppose you have two laptops A and B both running Ubuntu, and want to connect via ssh to your account on the SEASnet server lnxsr10 from on-campus. (What a nice supposition these days!) You want the connection to be easy, so that you can just type 'ssh lnxsr10' and it works with as little fuss as is reasonable. Both laptops have a freshly installed Ubuntu and your account is set up on both laptops with an empty home directory. Assume your SEASnet account is 'defoe' with home directory /u/cs/ugrad/defoe, and your account on both laptops is 'austen' with home directory /home/austen.

Question 3

Complete

1.25 points out of 2.00

Describe the steps needed to set up the first laptop (laptop A) so that it can connect in this way.

Assuming that lnxsr10 is already in laptopA's known list of servers: they can set first use ssh-keygen to generate a session key and password. Then copy the id of lnxsrc10 to SSH. After that, we need to start ssh-agent and add the server's id to the file id_rsa and enter the password once to save the key. Then laptopA can ssh without a password.

Comment:

Parts of this explanation are unclear

CCLE

Complete

2.00 points out of 2.00



Need Help ?



Suppose you simply copy Laptop A's /home/austen to Laptop B's /home/austen. Will you be able to use Laptop B to log into SEASnet, even if it happens to be the same SEASnet server at the same time? Briefly explain.

Unless there is group policy saying I can't, I would be able to use LaptopA and B to log onto SEASnet at the same time. Both LaptopA and B have the same credentials since I just copied them and so SEASnet would not distinguish them.

Comment:

Question 5

Complete

2.00 points out of 2.00

With this setup, can you now easily run a command like xeyes on Laptop A and have it display on Laptop B? If so, explain how; if not, explain why not, and give a list of steps you'll have to take to make this connection easy.

Not immediately. First, I need to ensure that Xming is running in the background of LaptopA, and then ssh to laptop B with the -X flag enabled. This will allow ssh forwarding with graphics display (eg. xeyes) on Laptop B. Then this is easy.

Comment:

CCLE

Complete

2.00 points out of 2.00



Need Help ?



Suppose SEASnet has set up a new server lnxsrv13 but for security reasons will let you use SSH into lnxsrv13 only from one of the existing servers lnxsrv06, lnxsrv09, and lnxsrv10. Explain how to make it convenient to connect to lnxsrv13 via SSH from your two laptops anyway, and discuss any possible security, reliability, or performance disadvantages of your method.

I need to first SSH into one the linux servers (6,9,or 10) with the -A flag to enable agent forwarding (no password). And then from there I can hop onto server 13. ssh -AX belle@lnxsrv09.seas.ucla.edu]. There're security issues after the 2nd hop with authentication. The server sees me as a trusted client from server 6,9, or 10. However, I could be from an untrusted server 1 persay who hopped into one of the trusted ones.

Comment:

Question 7

Complete

1.50 points out of 2.00

Suppose someone then steals Laptop B, just before this exam. Suppose also that you are taking this exam on Laptop A, and that I am concerned that your answers to this final exam have been tampered with by someone else - maybe the thief. I want assurance that the answers are just the way you wrote them, and have not been tampered with. Explain how you could use the GNU Privacy Guard to provide that assurance. Give the commands you'd run on Laptop A. Or, if it's not possible to provide such assurance, explain why not.

I would need to have typed my answers into another document that I could sign with my private key and then assuming you had the public key, you could unlock and see my answers. After that, you could compare my answers from the document to the submitted ones on CCLE.

To sign my document, I could use gpg to create a key pair with gpg --key-gen and my identity information. Then I can export the key with gpg --armor --export my_email into a file. Then I need to do gpg --output file.sig --sign [the previous file I exported] to create a signature. However, signatures just verify that the data hadn't been tampered with. To truly know that it was me, I need a 3rd party certificate authority to verify.

Comment:

Provided commands create signature of the public key file, not the final itself



Alice wants to buy a new graphics card (GPU) for her new computer. However, on every website they are either sold out or coming soon. Being a CS35L student, Alice has a plan: She wants to write a bash script to check the status of these graphics cards by effectively refreshing the page.

1. She has website names/urls stored in "gpu_site.txt", separated by newlines and her desired GPU's name stored in "gpu_wanted.txt", the first line being the brand desired (Invader PTX or AME Glaceon), and second line being the model number (e.g. 2150). These are passed in as inputs. E.g. './script.sh gpu_site.txt gpu_wanted.txt'
2. For each website, she wants to refresh (re-visit that webpage) roughly every 10 seconds (to check if status changed to "buy now")
3. If the desired GPU has the "Buy Now" status from any website, the program should terminate and output the website name/url.
4. On any website, GPU entries are displayed on two lines as follows:

AC<D>M

E<F>S<G>

- A is arbitrary text (it will contain some text, it cannot be empty)
- E is only whitespace
- C is the brand name ("Invader PTX", "AME Glaceon", etc. It cannot contain a number, cannot be empty)
- M is the model number (4200, 4250, 5000, etc. It will be a number, cannot be empty)
- S is the status (Either "Coming Soon", or "Buy Now", or "Sold Out")
- B,D,F,G are all arbitrary HTML stuff. Here is a source code example

An example of website source code is below

```
Get the new<strong> Invader PTX </strong> 4250
    <b> Coming Soon</b>
    Buy Buy Buy Now!      <font color="#F00F00" size="3">Invader PTX </font> 4244
        <b></b>Sold Out</b>
    This is the best we offer <strong> AME Glaceon</strong> 5050
<i>Buy Now </i>
    We are selling <mark>Invader PTX </mark>5050
    <font color="#FF0000" size="2">Buy Now </font>
Coming Soon Invader PTX, AME Glaceon Buy Now Sold Out 5050 <mark>Invader PTX </mark>5050
    <font color="#FF0000" size="2">Buy Now </font>
```

Some possibly useful commands she did not learn in CS35L, or may have forgotten include

- Sleep n (Wait n seconds)
- Wget (get source code from website)
- You can use grep to find a pattern on a line, and also return its neighboring lines

You cannot save outputs to files (e.g. wget name > site.txt). You must use bash variables

CCLE

Not answered

Points out of 10.00



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Please write your bash script below. Minor syntax errors acceptable 'x=3' and 'x = 3' are both OK, but 'x=ls' is not equivalent to 'x=\$(ls)'
(5pt for code structure, 5pt for regex part)

CCLE

Complete

3.00 points out of 3.00



Need Help ?



Write a Python (3.8 or higher) function called generate_favorites(N) that takes a positive integer argument N, and returns a list of N randomly generated strings in the form of "I like [adjective] [thing]", where [adjective] and [thing] are randomly chosen from the lists "adjectives" and "things" respectively.

```
import random

def generateFavorites(N):
    adjectives = ['warm', 'cream-colored', 'crisp', 'silver-white']
    things = ['woolen mittens', 'ponies', 'apple strudels', 'winters']
```

```
# TODO: Return a list of N randomly generated strings
# in the form of "I like {adjective} {thing}"
# Your CCLE Answer will go here
```

```
string_list = []
while N>0:
    R1=random.randint(0,3)
    R2=random.randint(0,3)
    new_string = "I like {} {}"
    string_list.append(new_string.format(adjectives[R1], things[R2]))
    N-=1
return string_list
```

Comment:

CCLE

Complete

5.00 points out of 5.00

 Need Help 

Write a class called Person that includes:

- (1 point). An initializer that takes arguments name (string) and favorites (list), and assigns them to instance variables self.name and self.favorites respectively.
- (1 point). A class variable total_people that is initialized to 0 and incremented every time a new Person is initialized.
- (3 points). An instance method pop_favorite() that removes the last item from self.favorites and returns that last item. If self.favorites is empty, it should return None.

```
class Person:  
    total_people = 0  
  
    def __init__(self, name, favorites):  
        self.name = name  
        self.favorites = favorites  
        Person.total_people+=1  
  
    def pop_favorite(self):  
        if self.favorites:  
            return(self.favorites.pop())  
        else:  
            return "None"
```

Comment:

Question 11

Complete

2.00 points out of 2.00

The code below uses generate_favorites() and the Person class as defined earlier. How many elements will be in favorite_things after running the following code? Explain why in 1-2 sentences.

```
favorite_things = generate_favorites(3)  
student = Person("Joe Bruin", favorite_things)  
print(student.pop_favorite())  
print(len(favorite_things))
```

2 elements; Python passes by object reference to which passes a copy of the variable to the caller, but both the caller and function see the same object in memory (this same object is stored in multiple places). Thus changing this object (by popping the last element) will change the actual object in memory.

Comment:

CCLE

Complete

2.00 points out of 2.00



Need Help ?



Does the following code compile and run, why or why not? Explain in no more than one sentence.

```
char* arr = malloc(sizeof(long) * 5);
arr[8] = 'c';
```

Yes; the size of a long is 8 bytes so the total contiguous size allocated by malloc is 40 bytes. Set the 8th space to the character c is not going out of memory bounds.

Comment:

Question 13

Complete

4.00 points out of 4.00

Please write a short program that, when ran through valgrind, would report only the below memory errors:

- An invalid read of size 8
- A memory leak of 24 bytes in 1 block.

```
#include <stdlib.h>
#include <stdio.h>
int main()
{
```

```
//Your CCLE Code Goes Here
```

```
}
```

```
// memory leak of 24 bytes in 1 block
char *ptr;
ptr = (char*)malloc(24*sizeof(char));

// invalid read of size 8
```

Comment:

Information

Assume you are writing a program similar to grep in C. The program will read input from stdin and place it in a 2D array, where each line of input is its own row in the 2D array. Your program should then run each line of input through the provided function (magicRegEx), which will say if that line matches a specific RegEx. Then your program should return an array, which contains the line numbers of which lines did match that RegEx.

CCLE

Complete

6.00 points out of 6.00



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First, you need to write the RegEx expression. It should search each line for phrases that match against a UCLA computer science course. Assume that for a phrase to be considered a valid UCLA computer science course:

- It must start with CS or CMPSC, in all capital letters.
- It must have a space between the department name and the course number.
- The course number can either be 2 digits long or 3 digits long. If it is 3 digits long, the first digit cannot be less than 1 or greater than 5.
- Course numbers can optionally end with a single capital letter. This letter can only be A, B, or L.
- The course number must be followed by a comma, then a space, and then the course's scheduled time.
- The scheduled time must be an hour between 1 and 12. Classes cannot start at any time during the hour; that is, classes can only start when the minute count is 00.
- The scheduled time must have a space after the minute count, and be followed by either AM or PM.

Valid entries include:

- CS 35L, 10:00 AM
- CMPSC 180, 12:00 PM
- CS 495, 2:00 PM
- CS 97, 3:00 PM

`^(CS|CMPSC) (\d{2}|[1-5]\d{2})[ABL]?, ([1-9]|10|11|12):00 (A|P)M$`

Comment:

CCLE

Complete

5.00 points out of 6.00



Need Help ?



Now, write the C code to meet the following requirements:

1. Assume you are provided a char** as input
 1. Each line is a line of input from stdin
 2. A line is defined as a series of characters being delimited by '\n'
2. Use the provided magicRegEx function to determine which lines match the RegEx you devised in step 1 above
3. Return an array of ints, and those ints should be which lines of input had a RegEx Match.
 1. Line numbers start at 0 for the first line of the file.
4. The last value in your output array of ints should be -1, to indicate to the caller where the end of the array is.
5. You should not have extra space in the array you return. It should only contain enough space to hold the matching line numbers and last -1.

Fill in your C code in the section below, you can assume the parts below have already been written:

```
#include <stdio.h>
#include <stdlib.h>

int main() { ... }

//returns 1 if inputLine matches your RegEx from step 1
//returns 0 if not
int magicRegEx(char* inputLine);
```

```
int *line;
int index = 1;

line = (int *)malloc(sizeof(int));
if (line == NULL) {
    fprintf(stderr, "Memory not allocated.\n");
    exit(1);
}

for (int i = 0; i <= numLines; i++) {
    if (magicRegEx() == 1) {
        int *tmp = (int *)realloc(line, sizeof(int) * (index + 1));
        if (tmp) {
            line = tmp;
            line[index - 1] = (int *)malloc(sizeof(int *));
            index += 1
        }
        else {
            fprintf(stderr, "Memory not allocated.\n");
            exit(1);
        }
        line[index] = -1;
    }
    return line;
```

CCLE

Store line number value at each index



Need Help ?



Information

Linux gives users the power to write their own userspace Filesystem. At a high-level, this means that system I/O calls like open, read, write, close, etc are trapped and redirected to a userspace program which will execute your own custom code for open, read, write, etc. This is called Filesystem in Userspace (FUSE). The following questions all assume you are writing your own filesystem using FUSE. We will call this **35-Fuse** for the remaining questions.

Question 16

Complete

1.00 points out of 2.00

As practice you first wrote 35-Fuse to just repeat the same I/O calls back. For example, if the system was trying to read 2 bytes from stdout, your 35-Fuse would intercept that and then read 2 bytes from stdout. Would this version of 35-Fuse be slower or faster than if you used plain system calls without 35-Fuse. Explain in no more than 2 sentences.

This is faster than using plain system calls because using system calls incurs overhead (needing to switch back and forth between the kernel and the user mode). Since 35-Fuse can read more than 1 byte from stdout at a time, it incurs less overhead.

Comment:

+1 for understanding userspace vs system speed, but you always have to interact with the kernel for I/O. This just wraps that interaction in another layer to cause slower speed.

Also, normal system calls can also read more than 1 byte at a time

Question 17

Complete

2.00 points out of 2.00

Using techniques learned in this class, how could you speed up your implementation of 35-Fuse (specifically read/write calls) from above? Explain in no more than 2 sentences.

You could speed up the implementation by making Buffered calls like library calls instead. That way you can read more bytes at a time, and have to switch from user to kernel mode less and this incur less overhead.

Comment:

CCLE

Not answered

Points out of 6.00



Need Help ?



We can do interesting things by writing our own filesystem with our own custom I/O calls. For example, we can make a custom read function, which fabricates input data (Bitwise XOR 42) as it is read, so the user will already see fabricated data in their read buffer. Please write the function that:

1. Matches the provided function signature for customRead
2. Returns the same values that read() would return
3. Except, the filled input buffer is the fabricated version of what was actually read from stdin. For example, if "The" was read from stdin, the buffer should contain "~BO" after being fabricated by 42.

HINT - You probably want to call the normal read() inside your function

```
ssize_t customRead(int fd, void* buf, size_t count)
```

{

```
/Your CCLE answer goes here
```

}



You and your teammate are working on a command-line program written in C that retrieves movie info. The project includes and uses the code for a custom library you wrote called moviedb. Your teammate has created a patch called "new.patch" shown below:

```
--- Makefile
+++ Makefile
@@ -3,12 +3,12 @@
 
 default: main moviedb
 
-main: main.c
+main: main.c moviedb
     $(CC) $(CFLAGS) -c main.c -o main.o
-    $(CC) $(CFLAGS) -ldl -Wl,-rpath $(PWD) main.o -o moviesearch
+    $(CC) $(CFLAGS) main.o moviedb.o -o moviesearch
 
 moviedb: moviedb.c
-    $(CC) $(CFLAGS) -fPIC -shared -o moviedb.so moviedb.c
+    $(CC) $(CFLAGS) -c moviedb.c -o moviedb.o
 
 clean:
     rm -f *.o *.so moviesearch
```

Question 19

Complete

2.00 points out of 2.00

Explain what this patch does at a high level. How many lines are changed by the patch?

The patch removed the creation of a dynamic library for the library moviedb. It also removed dynamically loading moviedb in main.

3 lines of code are changed.

Comment:

CCLE

Complete

3.00 points out of 3.00



Need Help ?



Your teammate forgot to fix the code in main.c that was affected by the patch. Modify main.c (included below) to support the changes in the patch. Remove any code that is no longer needed.

```
#include <stdlib.h>
#include <stdio.h>
#include <dlfcn.h>

int main() {
    void *handle = dlopen("moviedb.so", RTLD_NOW);

    if (!handle)
        return 1;

    char *(*get_poster_url)(char *) = dlsym(handle, "get_poster_url");

    if (dlerror() != NULL)
        return 1;

    char *poster_url = get_poster_url("Ratatouille");
    printf("URL: %s\n", poster_url);

    dlclose(handle);

    if (dlerror() != NULL)
        return 1;

    return 0;
}
```

```
#include <stdlib.h>
#include <stdio.h>
#include "moviedb.h"

// assuming that the function get_poster_url is defined in one moviedb.h
int main() {
    char poster_url = get_poster_url("Ratatouille");
    printf("URL: %s\n", poster_url);

    return 0;
}
```

Comment:

CCLE

Not answered

Points out of 2.00



Need Help ?



Suppose your changes from the last step were made in a copy of main.c called main_copy.c (leaving the original main.c as it was before). Write a shell command that adds your changes to main.c to your teammate's patch. Assume all the relevant files are in the same directory, which is also your current working directory.

Information

Alice and Bob are working on a software project using Git as the dedicated version control system. They decide it's best if they branch out and each work separately- Alice will work primarily on the DFS algorithm in the file "algorithms.c" and Bob will work on presenting the data, primarily in the file "data_plots.c". They both start from commit c1, and each make 3 commits on their respective branches:

```
c5 ← c6 ← c7 (Alice)
/
/
c1
\
\
c2 ← c3 ← c4 (Bob)
```

Question 22

Complete

3.00 points out of 3.00

After Bob merged c7 and c4 into c8, Alice notices there is an issue. She uses 'git checkout c1', and now wants to navigate from this commit through Bob's commit history (going c1 -> c2-> c3->c4) to see the potential changes.

Assuming she does not know the commit ids, is it feasible to move forward through Bob's commit history? Why or why not? [think about structure of git commits] (3pt)

No; commits only have the SHA1 hashes of their parents. The commit c1 doesn't contain the hashes of its two children c2 and c5. So if Alice doesn't know Bob's commit ids, she can't move through them from c1.

Comment:

CCLE

Complete

2.00 points out of 2.00



Need Help ?



Alice has checked out c3 and found a bug in Bob's commit (where Bob accidentally changed values in algorithms.c). She wants to see the exact differences between her latest (c7) algorithms.c file and this version. What command(s) can she use? (2pt)

She can use git diff to see the differences. Assume that h7 and h3 are the hashes of the commits, she can use this command:

```
git diff h3 h7 algorithms.c
```

Comment:

Question 24

Complete

3.00 points out of 3.00

Alice realises that Bob's changes are no longer required, and so her latest (c7) algorithms.c should be implemented in the next commit. She uses git checkout c8, and wants to change the current algorithms.c file to her previous version (in c7). Then, she wants to commit ONLY this change. What command(s) can she use? (3pt)

Assume that h7 is the hash for c7.

```
git reset h7 algorithms.c
```

```
git add algorithms.c
```

```
git commit -m "Reverted back to c7's algorithms.c"
```

Comment:

CCLE

Complete

1.00 points out of 2.00



Need Help ?



Alice produces the commit c9 from the above (Q8.3). Bob sees this and disagrees with Alice- Bob thinks his changes are necessary. While in the latest commit, he wants to make a patch from his (c3) algorithms.c and store it in "alg_patch.txt". Afterwards, he wants to use this patch to change algorithms.c. What command(s) can he use? (2pt)

Assume that h3 is the hash for c3.

```
git checkout c3  
git format-patch -1 h3 --stdout > alg_patch.txt  
git checkout c9  
git am alg_patch.txt
```

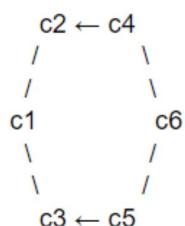
Comment:

Only wants to change algorithms.c
Git diff c3 algorithms.c > ./alg_patch.txt
Patch -p1 < ./alg_patch.txt

Information

Consider the graph of commits below. Assume that c1 is the oldest commit; that is, it is the initial commit of the project. Assume that we start with three files A, B, and C at c1.

- Between c1 and c2, we modify file A to look exactly like file B
- Between c2 and c4 we add a symbolic link SL to file B
- Between c1 and c3 we modify file C
- Between c3 and c5 we revert file C back to what it looked like at c1; we also add a file D



CCLE

Complete

7.00 points out of 8.00



Need Help ?



How many object files can you reasonably expect to find in the .git/objects directory? Explain your reasoning; simply stating a number will not be sufficient for full credit.

c1 has 5 objects to begin with: a commit, a new working directory tree (tree for short), and 3 blobs. Then c1-c2 adds another commit, tree and 1 blob (changing A creates a new file). There is a new tree because the working directory tree changed (however it still points to the original unchanged files; this is the same for the other trees). Then c2-c4 adds a commit, tree, and 1 blob (symbolic link is a new file). c1-c3 adds 1 commit, tree, and a blob (modifying file C creates a new file). Lastly, c3-c5 adds 1 commit, tree, and 2 blobs (changing file C and adding file D). c6 merged c4 and c5 which is a new commit object.

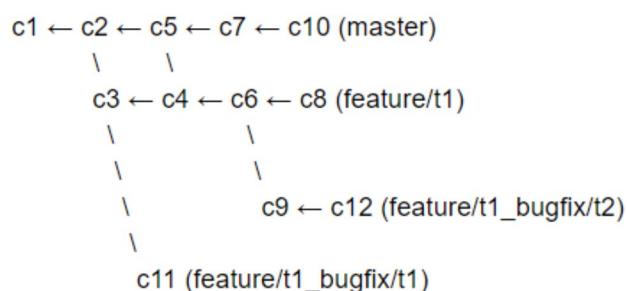
This is a total of $5+3+3+3+4+1 = 19$ objects files.

Comment:

-1 pts, should be 6 blob objects

Information

Consider the graph of commits below. Assume that c1 is the oldest commit; that is, it is the initial commit of the project.



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Cc
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CCLE Need Help 

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