
Protection of information based on sensitivity and privilege levels

CS3052 – Computer Security

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1. The program codes

```
import csv
import hashlib

# mapping of privileges to privilege levels

read_privileges = {
    'patient' :
['record_id','user_name','personal_details','sickness_details','drug_prescriptions','lab_test_prescriptions'],
    'lab staff' :
['record_id','user_name','personal_details','lab_test_prescriptions'],
    'pharmacy staff' :
['record_id','user_name','personal_details','drug_prescriptions'],
    'nurse' :
['record_id','user_name','personal_details','sickness_details','drug_prescriptions','lab_test_prescriptions'],
    'doctor' :
['record_id','user_name','personal_details','sickness_details','drug_prescriptions','lab_test_prescriptions']
}

allowed_actions = {
    'patient' : ['view my records'],
    'lab staff' : ['view all records', 'view all records by user name', 'view record by id'],
    'pharmacy staff' : ['view all records', 'view all records by user name', 'view record by id'],
    'nurse' : ['view all records', 'view all records by user name', 'view record by id'],
    'doctor' : ['view all records', 'view all records by user name', 'view record by id', 'add new record']
}

# hashing the given string using md5
def hash(str_to_hash):
    return hashlib.md5(str_to_hash.encode()).hexdigest()

# reading the config csv and store the data in the 2d array
def read_csv(filename):
    data= []
    with open(filename,"r") as file:
        csvreader = csv.reader(file,delimiter=",")

        for row in csvreader:
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        if row:
            data.append(row)

    return data

# writing a one row data to csv
def write_csv(filename,data):
    with open(filename,"a") as file:
        csvwriter = csv.writer(file)
        csvwriter.writerow(data)

# validating if a given user exists already
def validate_user_exists(user_details,username):
    for user_data in user_details:
        if user_data[0] == username:
            return True,user_data
    return False,[]

# function to handle login
def login():
    username = input("Enter your username: ")

    is_username_valid, user_data = validate_user_exists(user_details,username)

    if not is_username_valid:
        while True:
            choice = input("Entered username is invalid!\nPlease select a
choice to continue: \n1 - Re-enter the login details\n2 - Go to main menu\n")
            if choice == "1":
                return login()
            elif choice == "2":
                return False,[]
            else:
                print("Incorrect input. Please try again!\n")

    password = input("Enter your password: ")

    if not user_data[1] == hash(password):
        while True:
            choice = input("Entered username is invalid!\nPlease select a
choice to continue: \n1 - Re-enter the login details\n2 - Go to main menu\n")
            if choice == "1":
                login()
            elif choice == "2":
                return False,[]
            else:
                print("Incorrect input. Please try again!\n")

```

```

print("Login successfull!")
return True,user_data

# function to handle registration
def register():
    global user_details

    username = input("Enter a username: ")
    is_user_valid,_ = validate_user_exists(user_details,username)
    if is_user_valid:
        print("This username already exists. Please try a different one.")
        return register()

    password = input("Enter a password: ")
    hashed_password = hash(password)

    valid_user_type = False

    while not valid_user_type:
        user_type_choice = input("Enter the user type:\n1 - Patient\n2 - Hospital staff\n")
        valid_user_type = True
        if user_type_choice == "1":
            user_type = "patient"

        elif user_type_choice == "2":
            user_type = "hospital staff"
        else:
            print("Invalid input! Please try again.")

    if user_type == "patient":
        privilege_level = "patient"
    else:
        valid_privilege_level = False
        while not valid_privilege_level:
            privilege_level_choice = input("Enter your privilege level:\n1 - Lab staff\n2 - Pharmacy staff\n3 - Nurse\n4 - Doctor\n")
            valid_privilege_level = True

            if privilege_level_choice == "1":
                privilege_level = "lab staff"
            elif privilege_level_choice == "2":
                privilege_level = "pharmacy staff"
            elif privilege_level_choice == "3":
                privilege_level = "nurse"

```

```

        elif privilege_level_choice == "4":
            privilege_level = "doctor"
        else:
            print("Invalid input! Please try again.")

    user_data = [username,hashed_password,user_type,privilege_level]
    user_details.append(user_data)

    write_csv("config.csv",user_data)
    print("Registration successfull!")
    return True

# adding a new record
def add_record():
    record_id = str(len(record_details)+1)

    username = input("Enter the patient username: ")
    is_user_valid,_ = validate_user_exists(user_details,username)

    if not is_user_valid:
        print("This patient is not exist! please re-enter")
        return add_record()

    patient_details = input("Enter the patient details: ")
    sickness_details = input("Enter the sickness details: ")
    drug_description = input("Enter the drug description: ")
    lab_test_prescriptions = input("Enter the lab test prescriptions: ")

    record =
[record_id,username,patient_details,sickness_details,drug_description,lab_test
_prescriptions]
    write_csv("record.csv",record)
    record_details.append(record)

# getting records using record id
def get_record_by_id(id):
    return record_details[id-1]

# getting records using patient username
def get_records_by_username(username):
    output = []
    for record in record_details:
        if record[1] == username:
            output.append(record)

    return output

# helper function to show records to filter the fields in the records.

```

```

def filter_record(records,user_privilege):
    if user_privilege == "lab staff":
        for record in records:
            record.pop(4)
    elif user_privilege == "pharmacy staff":
        for record in records:
            record.pop(3)
    return records

# function to print the records with the filtering.
def show_records(records,user_privilege):
    print("Here the medical records!")
    filtered_records = filter_record(records,user_privilege)
    for record in filtered_records:
        print(" ".join(record))
    return

# generating action menu for given actions.
def generate_menu(actions):
    menu ="select a choice from below options.\n"

    i = 0
    for action in actions:
        i += 1
        menu += str(i)+"- "+action+"\n"

    return menu

# this will run given command with username and user privilege. This where
# user's actions running after login and they selects a action.
def do_action(action,username,user_privilege):
    if action == "view my records":
        records = get_records_by_username(username)
        show_records(records,user_privilege)
    elif action == "view all records":

        show_records(record_details,user_privilege)
    elif action == "view all records by user name":
        req_username = input("Enter the username of the patient: ")
        records = get_records_by_username(req_username)
        show_records(records,user_privilege)

    elif action == "view record by id":
        id = int(input("Enter the record ID: "))
        record = get_record_by_id(id)
        show_records([record],user_privilege)

    elif action == "add new record":

```

```

        add_record()

# loading neccessary data
user_details = read_csv("config.csv")
record_details = read_csv("record.csv")

# Here the main function
def main():
    is_validate_option = False
    user_data = []

    while(not (is_validate_option and user_data )):
        option = input("Select a relevent number for login or register\n1 -
Login\n2 - Register\n")
        if option == "1":
            is_validate_option,user_data=login()

        elif option == "2":
            is_validate_option= register()
        else:
            print("Invalid input. Please enter again choice 1 or 2.\n")

    username,user_type,user_privilege = user_data[0],user_data[2],user_data[3]

    actions = allowed_actions[user_privilege]
    menu = generate_menu(actions)

    while True:
        print(menu)
        choice = int(input("Enter your choice: "))
        if 1<=choice<=len(actions):
            do_action(actions[choice-1],username,user_privilege)
        else:
            print("Invalid input")

# running the main function.
main()

```

2. A description of how you decided the access to data records based on sensitivity of data

There are three sensitivity levels in the program data set

1. Low sensitivity
2. Medium sensitivity
3. High sensitivity

For each sensitivity level has list of data fields such as

```
low= ['record_id','user_name','personal_details'],  
medium=['drug_prescriptions','lab_test_prescriptions'],  
high= ['sickness_details']
```

After the user login then program will generate the relevant action menu using the user privilege and then user will be able to select any option from the menu. Filtering happening according to the level of sensitivity. Write record only set to doctor.

3. Annexes

Config file

charith	81dc9bdb52d04dc20036dbd8313ed055	hospital staff	doctor	
rowanga	202cb962ac59075b964b07152d234b70	patient	patient	
vishwa	202cb962ac59075b964b07152d234b70	patient	patient	
sajith	202cb962ac59075b964b07152d234b70	hospital staff	nurse	
damsara	81dc9bdb52d04dc20036dbd8313ed055	hospital staff	lab staff	

Records file

1	rowanga	data	data	data	data	
2	rowanga	new data	sickness data	drug data	lab data	
3	vishwa	det	dummy	drug dummy	dummy test	

Login as a patient

```
Select a relevent number for login or register
1 - Login
2 - Register
1
Enter your username: rowanga
Enter your password: 123
Login successfull!
select a choice from below options.
1- view my records
```

Register as a doctor

```
PS F:\5th semester\1 - Computer Security - 2 credits\Ass
Select a relevent number for login or register
1 - Login
2 - Register
2
Enter a username: charith
Enter a password: 1234
Enter the user type:
1 - Patient
2 - Hospital staff
2
Enter your privilege level:
1 - Lab staff
2 - Pharmacy staff
3 - Nurse
4 - Doctor
4
Registration successfull!
```

Register as a patient

```
Select a relevant number for login or register
1 - Login
2 - Register
2
Enter a username: rowanga
Enter a password: 123
Enter the user type:
1 - Patient
2 - Hospital staff
1
Registration successful!
```

Adding a new record and view all records as a doctor

```
1- view all records
2- view all records by user name
3- view record by id
4- add new record

Enter your choice: 4
Enter the patient username: vishwa
Enter the patient details: det
Enter the sickness details: dummy
Enter the drug description: drug dummy
Enter the lab test prescriptions: dummy test
select a choice from below options.
1- view all records
2- view all records by user name
3- view record by id
4- add new record

Enter your choice: 1
Here the medical records!
1 rowanga data data data data
2 rowanga new data sickness data drug data lab data
3 vishwa det dummy drug dummy dummy test
select a choice from below options.
1- view all records
2- view all records by user name
3- view record by id
4- add new record

Enter your choice: []
```

View all records as a nurse

```
Registration successful!
Select a relevant number for login or register
1 - Login
2 - Register
1
Enter your username: sajith
Enter your password: 123
Login successful!
select a choice from below options.
1- view all records
2- view all records by user name
3- view record by id

Enter your choice: 1
Here the medical records!
1 rowanga data data data
2 rowanga new data sickness data drug data lab data
3 vishwa det dummy drug dummy dummy test
select a choice from below options.
1- view all records
2- view all records by user name
3- view record by id

Enter your choice: []
```

View all records as a lab staff

```
Select a relevant number for login or register
1 - Login
2 - Register
1
Enter your username: damsara
Enter your password: 1234
Login successful!
select a choice from below options.
1- view all records
2- view all records by user name
3- view record by id

Enter your choice: 1
Here the medical records!
1 rowanga data data data
2 rowanga new data sickness data lab data
3 vishwa det dummy dummy test
select a choice from below options.
1- view all records
2- view all records by user name
3- view record by id

Enter your choice: []
```