Assignment_19-08-2024

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1. Explain about interfaces with respect to C++
Abstract class, pure virtual function and virtual destructor

Interfaces in C++: In C++, an interface is a way to define a contract for derived classes, specifying which functions the derived classes must implement. This concept is implemented through abstract classes and pure virtual functions.

Abstract Class:

- An **abstract class** is a class that cannot be instantiated directly. It typically contains one or more **pure virtual functions**, which means that derived classes must provide implementations for these functions.
- An abstract class serves as a blueprint for other classes, forcing them to implement specific methods.

```
class AbstractClass {
public:
   virtual void someMethod() = 0; // Pure virtual function
};
```

Pure Virtual Function:

- A **pure virtual function** is a function declared in a base class that has no definition (implementation) in the base class. It is denoted by = 0 after the function declaration.
- Derived classes **must** provide an implementation of the pure virtual function; otherwise, they too will be considered abstract.

```
class Interface {
public:
   virtual void doSomething() = 0; // Pure virtual function
};

class DerivedClass : public Interface {
public:
   void doSomething() override {
      // Provide implementation
   }
};
```

Virtual Destructor:

- In C++, when you are using polymorphism (i.e., base class pointers or references to derived class objects), it is crucial to declare the destructor in the base class as **virtual**.
- This ensures that the derived class's destructor is called when a derived object is deleted through a base class pointer, preventing memory leaks or undefined behavior.

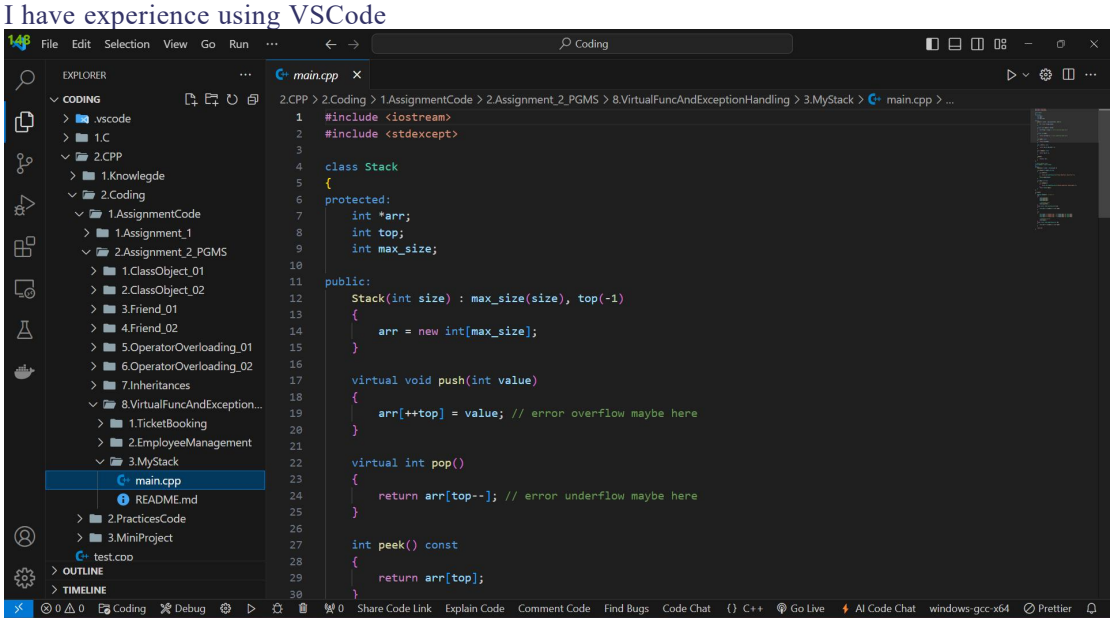
```
class Base {
```

```cpp
public:
    virtual ~Base() { // Virtual destructor
        // Clean up resources
    }
};

class Derived : public Base {
public:
    ~Derived() {
        // Derived class cleanup
    }
};
```

2. https://vscode.dev/ write C++ program, compile and execute it

I have experience using VSCode



3. What all phases of software development life cycle

1. Requirement Gathering and Analysis:

- **Purpose:** To understand and document what the software needs to accomplish. This phase involves gathering requirements from stakeholders and analyzing them to create a clear and detailed set of specifications.
- **Activities:**
    - Meetings with stakeholders and end-users.
    - Documentation of requirements.
    - Analysis of feasibility and risk.
- **Deliverables:**
    - Requirement Specification Document.
    - Feasibility Study Report.

2. Planning:

- **Purpose:** To create a detailed plan for how the project will be executed, including timelines, resources, and budget. This phase sets the groundwork for all subsequent activities.

- **Activities:**
    - Defining project scope and objectives.
    - Estimating time and cost.
    - Developing a project schedule and resource allocation.
- **Deliverables:**
    - Project Plan.
    - Schedule.
    - Resource and Budget Allocation.

3. Design:

- **Purpose:** To create a blueprint for the software based on the requirements. This phase involves specifying how the software will be built and how it will function.
- **Activities:**
    - Designing system architecture and components.
    - Creating data models, user interfaces, and detailed design specifications.
- **Deliverables:**
    - Design Document.
    - Data Models and Architecture Diagrams.
    - User Interface Design.

4. Development (Implementation):

- **Purpose:** To convert the design into a working software application. This phase involves coding and building the software according to the design specifications.
- **Activities:**
    - Writing code.
    - Integrating components.
    - Performing unit testing to ensure that individual parts work correctly.
- **Deliverables:**
    - Source Code.
    - Executable Software.
    - Unit Test Reports.

5. Testing:

- **Purpose:** To ensure that the software is functioning correctly and meets the requirements. This phase involves identifying and fixing defects and verifying that the software performs as expected.
- **Activities:**
    - Conducting various types of testing (e.g., functional, integration, system, acceptance).
    - Reporting and fixing bugs.
    - Validating that requirements are met.

- **Deliverables:**

    - Test Plans and Test Cases.
    - Test Reports.
    - Defect Logs.

6. Deployment:

- **Purpose:** To release the software to the end-users. This phase involves installing and configuring the software in the production environment.
- **Activities:**

    - Installing the software on user systems or servers.
    - Configuring the environment.
    - Training users and providing support.

- **Deliverables:**

    - Deployed Software.
    - User Documentation.
    - Training Materials.

7. Maintenance and Support:

- **Purpose:** To provide ongoing support and updates after the software is in use. This phase involves fixing any issues that arise and making enhancements as needed.
- **Activities:**

    - Monitoring software performance.
    - Providing technical support.
    - Implementing updates and enhancements.

- **Deliverables:**

    - Maintenance Logs.
    - Update and Patch Releases.
    - Support Documentation.

4. what is virtual memory . Learn about physical and virtual memory mapping

Virtual memory is a memory management technique that creates the illusion of a larger memory space by using disk storage to extend the available RAM.

Key Concepts:

Virtual Memory:

1. **Purpose:** Allows systems to use more memory than physically available by swapping data between RAM and disk storage.
2. **Benefits:**

- Increases system capacity.
- Provides process isolation and security.

- Optimizes RAM usage.

Physical Memory:

- **Definition:** Actual RAM installed in the computer.
- **Limitation:** Limited by the size of the RAM modules.

Memory Mapping:

1. **Virtual Address Space:** Range of addresses that applications can use, provided by the operating system.
2. **Physical Address Space:** Actual locations in RAM accessed by hardware.

How It Works:

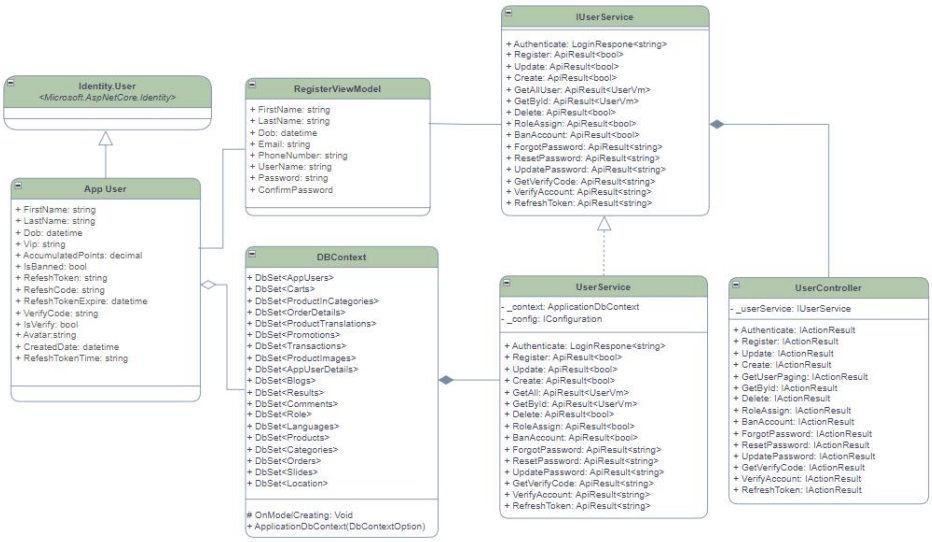
1. **Paging:**

   - Divides memory into fixed-size blocks (pages) and maps them to physical memory blocks (page frames).
   - Uses a page table to translate virtual addresses to physical addresses.

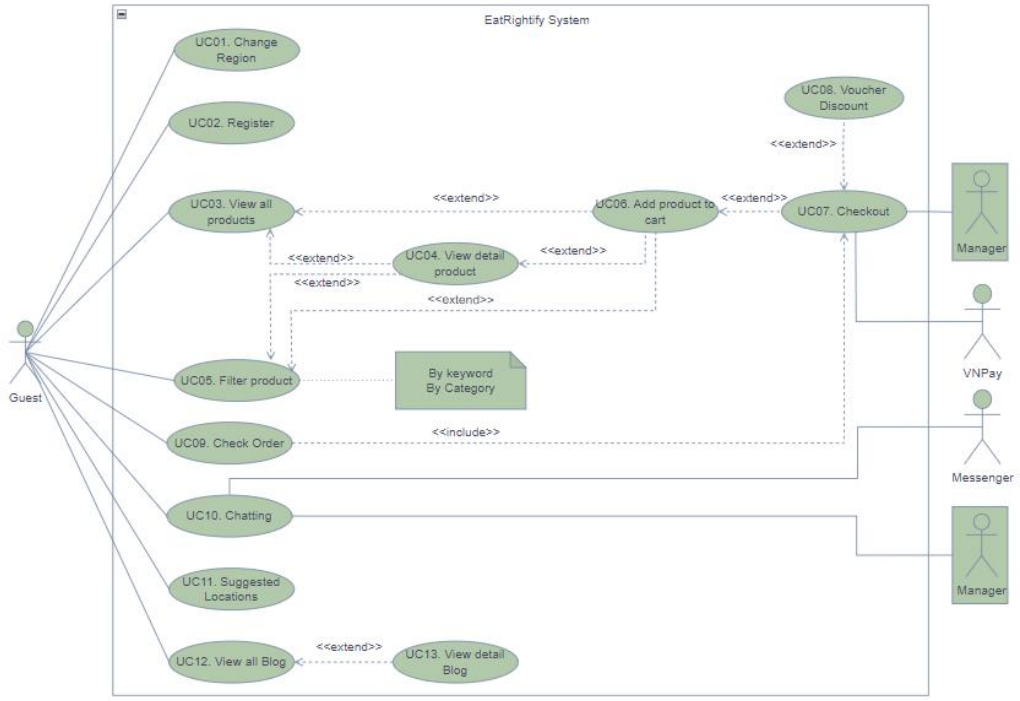
2. **Segmentation:** Divides memory into variable-sized segments based on logical divisions.
3. **Page Table:** A data structure that keeps track of the mapping between virtual and physical addresses.

5.Go through all UML diagrams with any available software

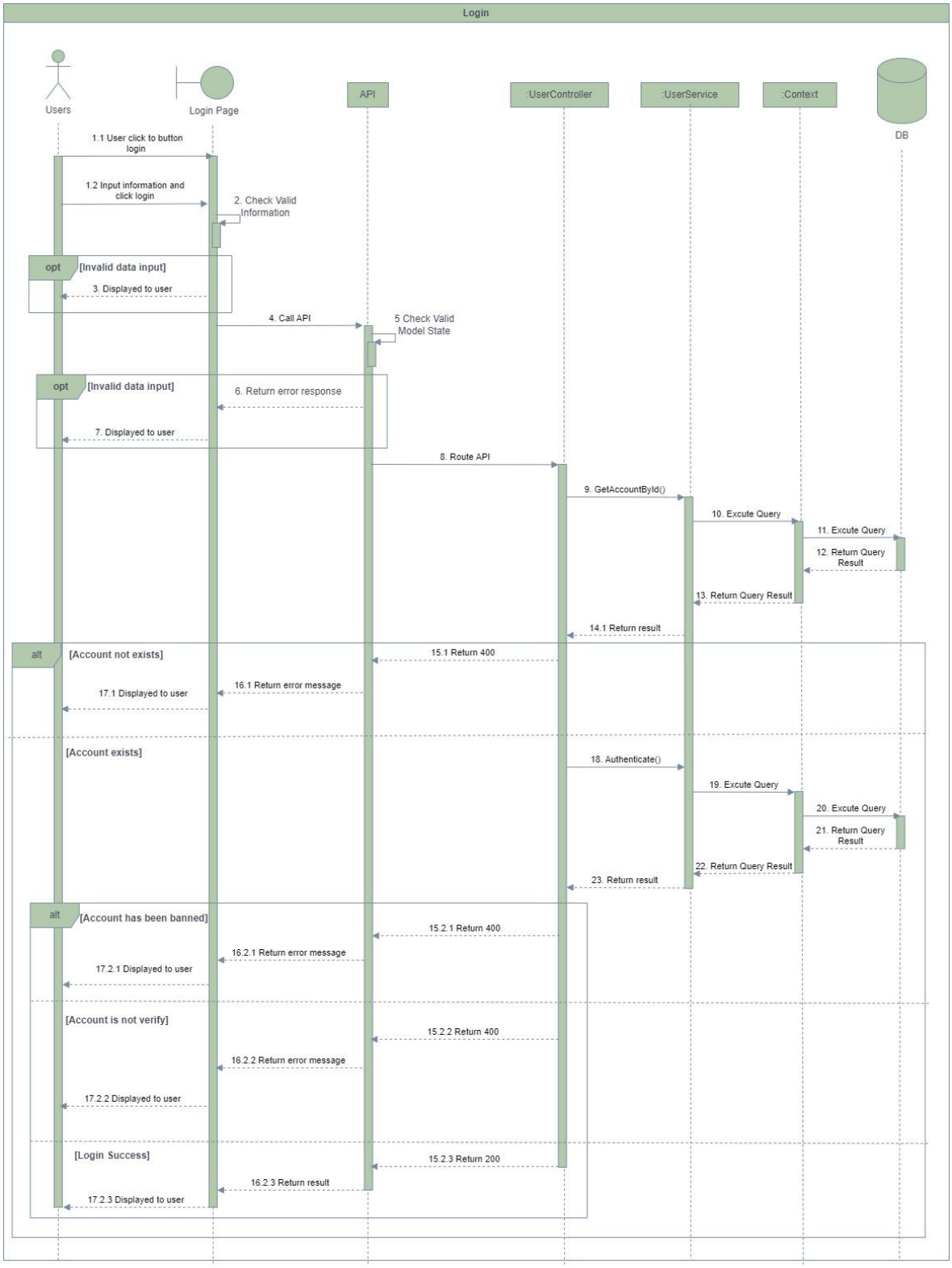
I using https://app.diagrams.net/
- Class diagram:



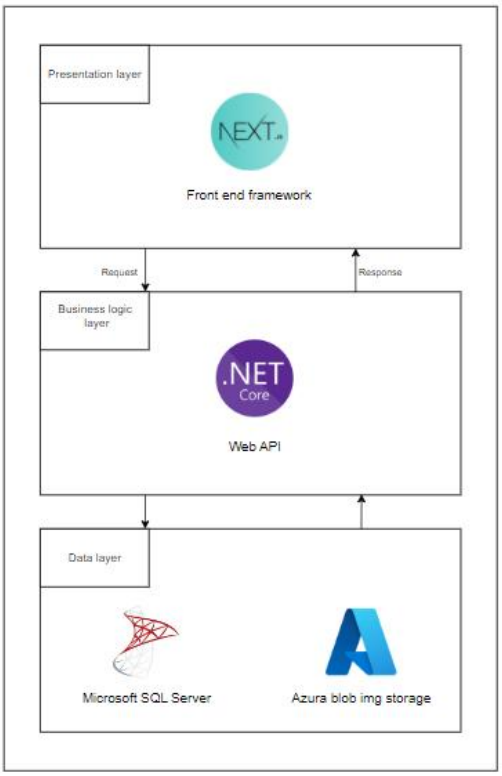
- Usecase diagram

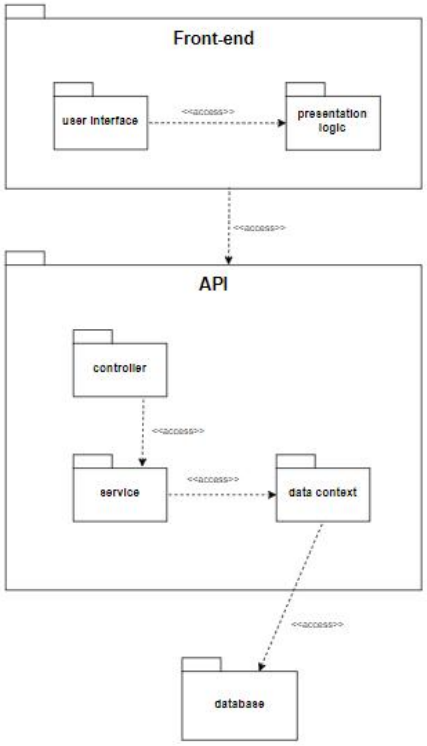


- Sequence diagram:



- Package diagram:


Presentation layer
Front end framework
Request
Response
Business logic layer
Web API
Data layer
Microsoft SQL Server
Azura blob img storage


Front-end
user interface
<<access>>
presentation logic
<<access>>
API
controller
<<access>>
service
<<access>>
data context
<<access>>
database