vMoodle Virtualize your online courses

vMoodle: Virtual Machine based Online Learning Environment

CIS4911 - Senior Project
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Problem Background

Web-based Virtual Learning Environments (VLEs)

- Interactive learning environment
  - Deliver course materials
  - Through the Internet
  - Educators conveniently
    - Create materials
    - Deliver materials
  - Students easily use material
- E.g., Moodle, Blackboard

Problem Background

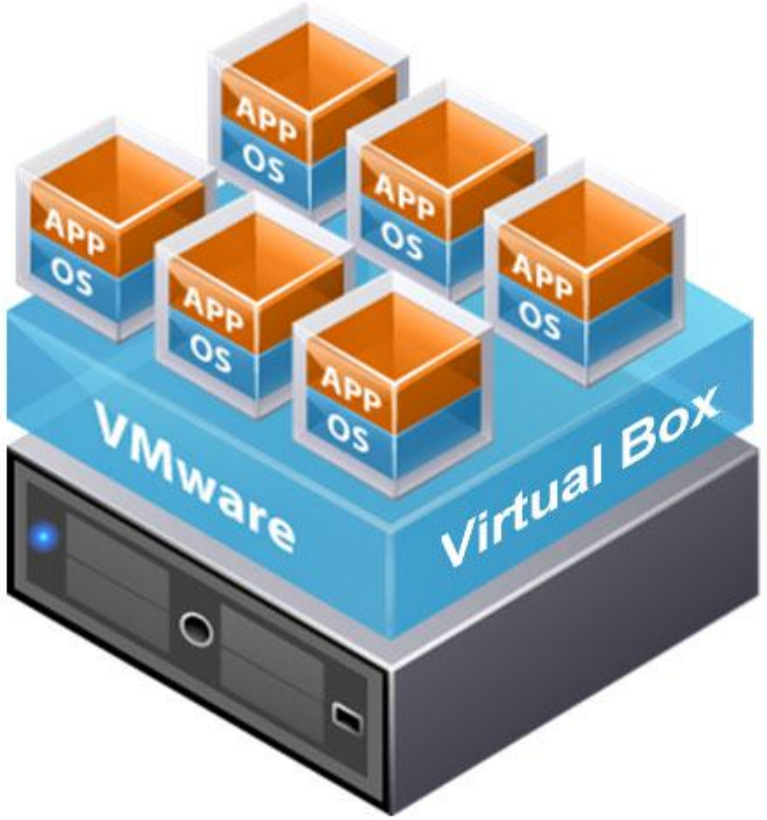
Cloud Computing

- Convenient, on-demand network access
- Shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services)
- Minimal management effort
- E.g., Amazon EC2

Problem Background

System virtual machines (VMs)

- Emerging as a valuable tool for
  - Creation of educational modules
    - Self-contained
    - Portable
  - Replication and deployment
    - Transparently
    - Anywhere
- E.g. VMware, VirtualBox, Xen



Current Approaches

- Using VMs in teaching
  - Upload VM image file to VLE as submission file
    - Bandwidth
    - Storage
  - Lab Sessions
    - Limited availability
    - Inconvenient
    - Requires more planning from instructor

Our Solution

VM-based VLE

- Three major pieces
  - Virtual Learning Environment
  - System Virtual Machine
  - Amazon EC2
- Problem
  - Integration not fully realized
- vMoodle
  - Aims to fit all pieces seamlessly

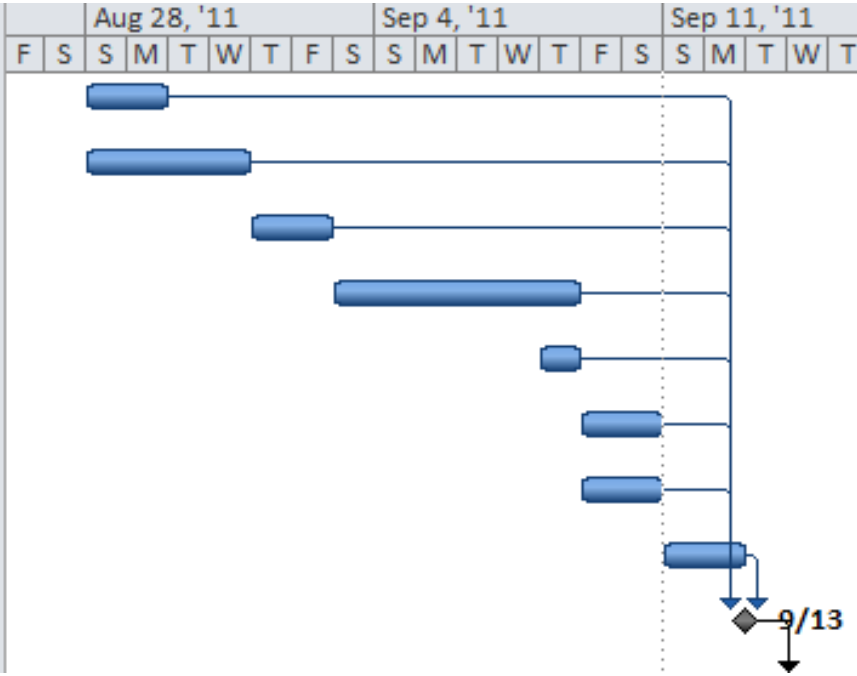
Personnel Organization

	Phase 1	Phase 2	Phase 3	Phase 4
Darien	Developer	Developer	Time Keeper	Leader
Diana	Time Keeper	Leader	Developer	Minute Taker
Gisselle	Minute keeper	Time Keeper	Leader	Developer
Jose	Leader	Minute Taker	Developer	Developer
Junior	Developer	Developer	Minute Taker	Time Keeper

Project Management

Feasibility Study

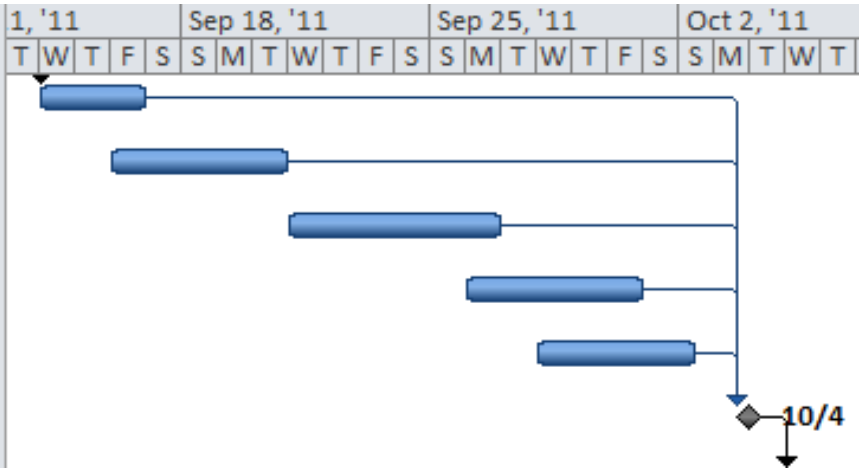
Task Name	Duration
Problem definition	2 days
High level requirements	4 days
Alternative solutions	2 days
Feasibility study	4 days
Personal organization	1 day
ID tasks milestones and deliverables	2 days
ID hardware and software needs	2 days
Prepare presentation	1 day
Deliverable 1	0 days



Project Management

Software Requirement Design

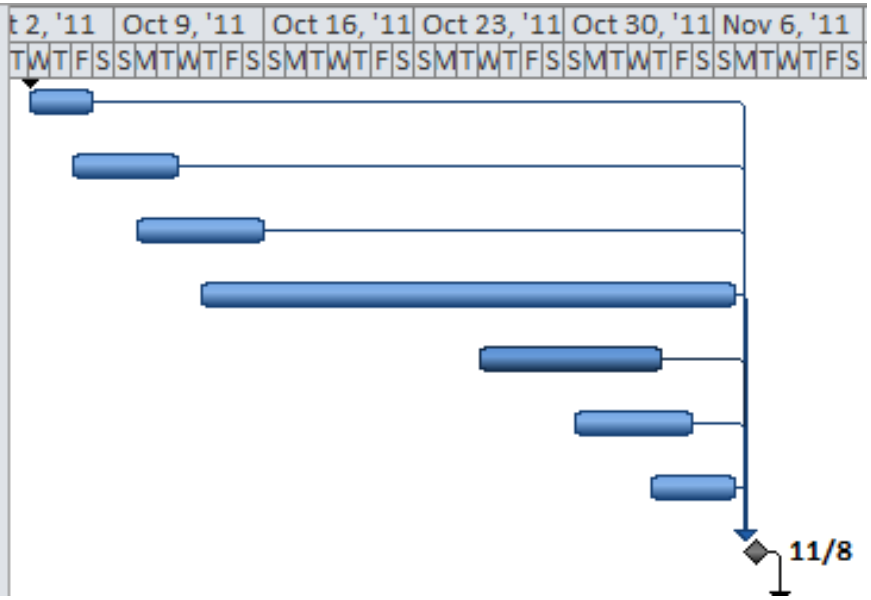
Task Name	Duration
Identify functional and non-funtional rec	3 days
Write and validate use cases	4 days
Create UML diagrams	4 days
Prepare SRD	5 days
Presentation 2	3.5 days
Deliverable 2	0 days



Project Management

Software Design

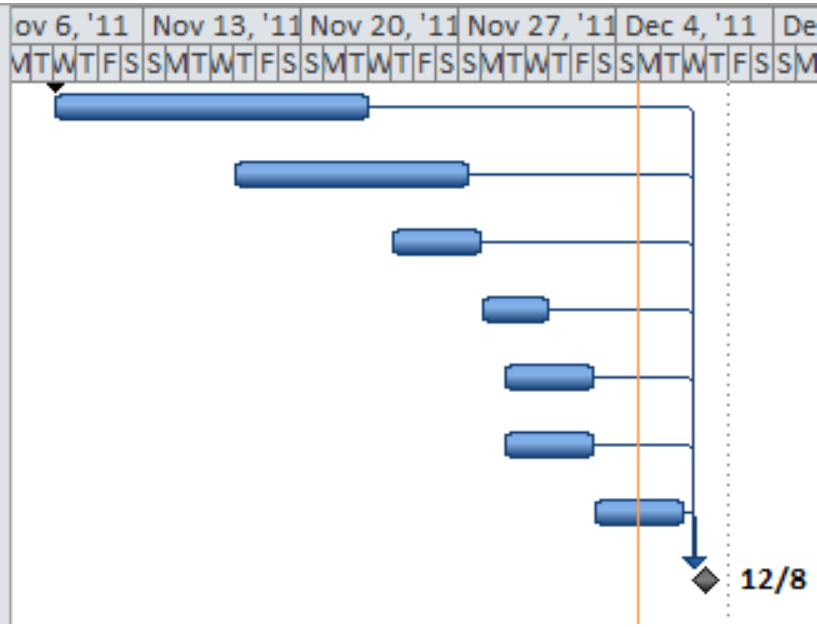
Task Name	Duration
Select architecture	3 days
Subsystem decomposition	3 days
Design user interface	6 days
Generate code	19 days
Refine UML diagrams	7 days
Prepare SDD	5 days
Presentation 3	3 days
Deliverable 3	0 days



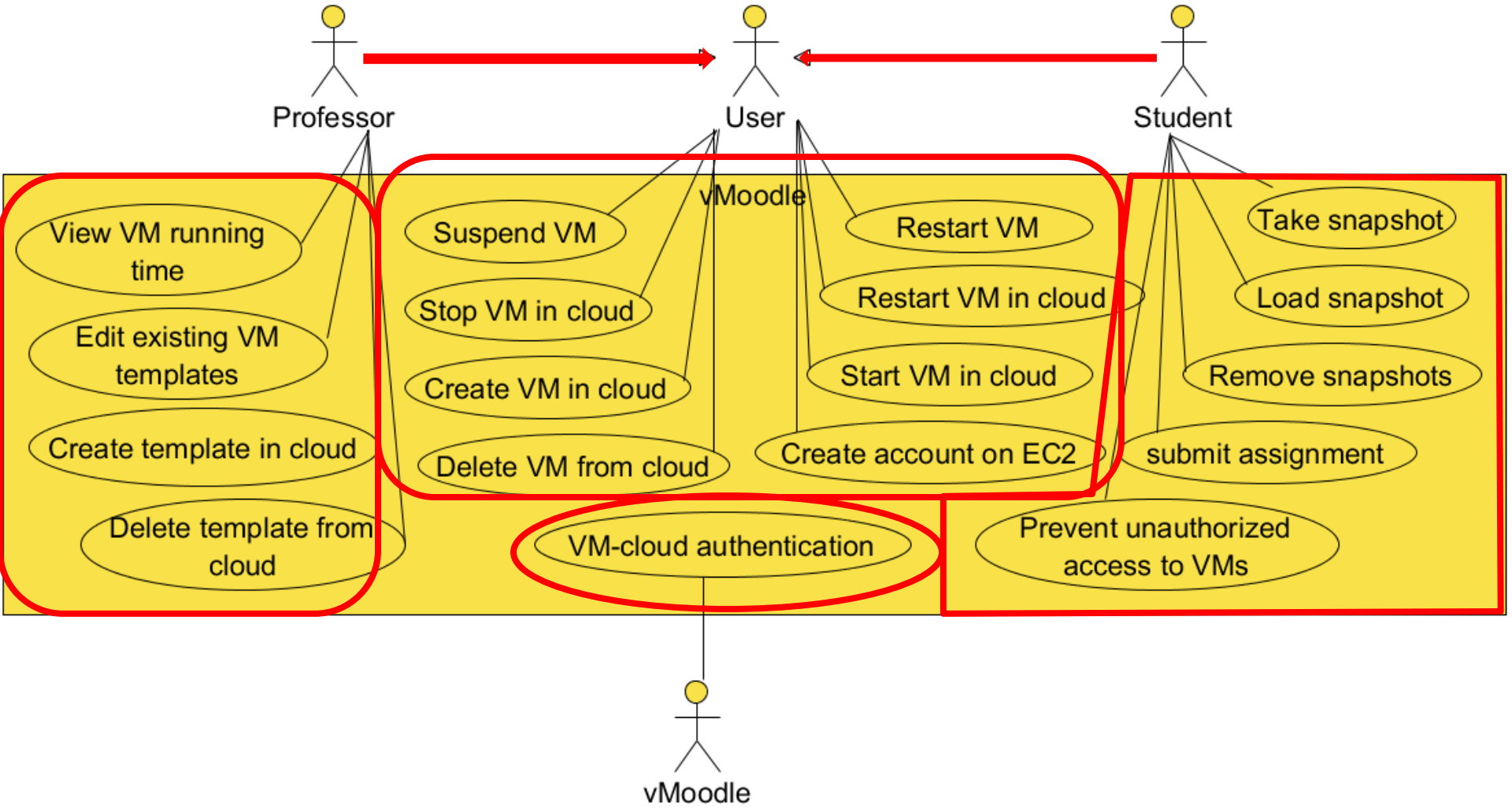
Project Management

System Validation

Task Name	Duration
Finalize system implementation	10 days
System tests	7.5 days
Subsystem tests	3 days
Evaluation of tests	3 days
Prepare final documentation	4 days
Prepare user guide document	4 days
Final presentation	2 days
Deliverable 4	0 days



UML Use Case Diagram



Use Case – Edit Templates in VBox

Actor:

Professor.

Pre-conditions:

Professor is signed on.

A template has been created.

The template has not been deployed to any assignment.

Professor is in the “Modify VM” page.

Description:

The user initiates an action by selecting the settings he would like to change from dropdown menus (RAM, # CPUS, HD, Name) and clicking the “Save” button.

The system responds by changing the VM settings in Virtual Box.

Use Case – Edit Template in VBox

Non functional requirements

Usability: Easy to use. No training required.

Reliability: Operation will be effective 99% of the time.

Performance: Fast. No more than couple seconds.

Supportability: Standard Web browsers with flash, JRE support (e.g., Chrome, Firefox, IE).

Implementation: PHP, MySQL.

Use Case – Create VM in EC2

Actor:

User

Pre-conditions:

User logged into the system.
User is in the “Create Virtual Machine” page.
Amazon EC2 is up and running.
VM template was created for cloud.

Description:

The user initiates an action by choosing the “EC2” option from the dropdown menu and clicking the “Go” button.
System responds by creating a VM in the cloud.

Use Case – Create VM in EC2

Non functional requirements

Usability: Easy to use. One click action.

Reliability: Operation will be effective 99% of the time.

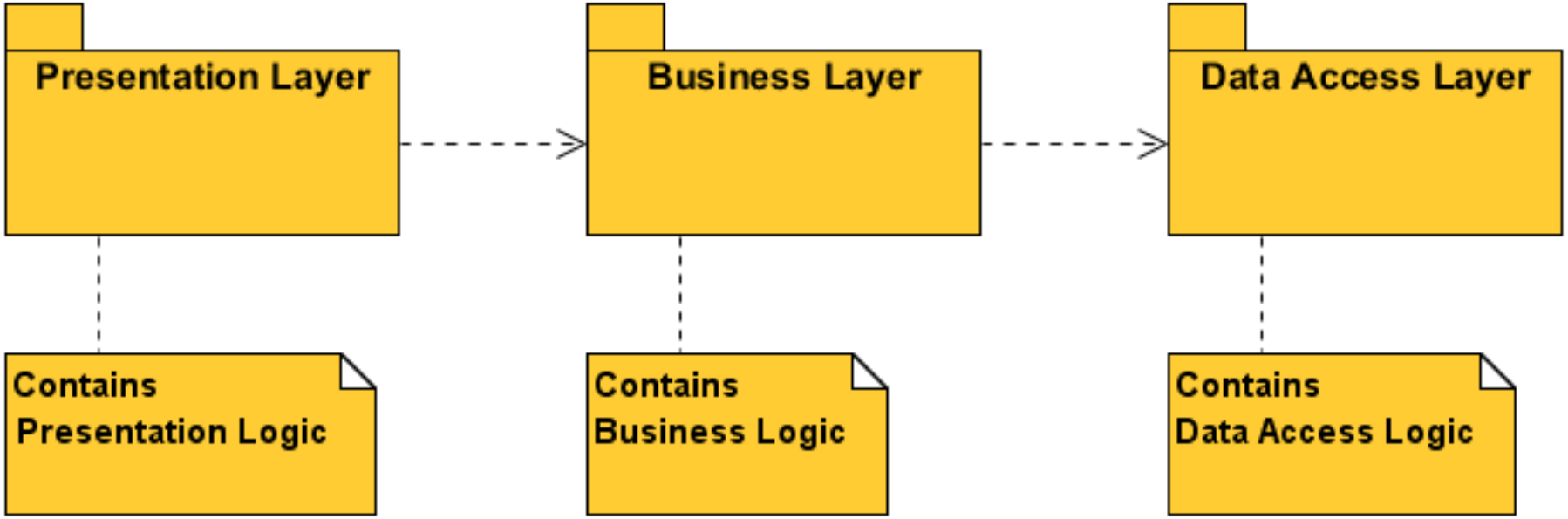
Performance: In average, it takes from 1 to 3 minutes.

Supportability: Standard Web browsers with flash, JRE support (e.g., Chrome, Firefox, IE).

Implementation: PHP, AWS SDK for PHP, MySQL.

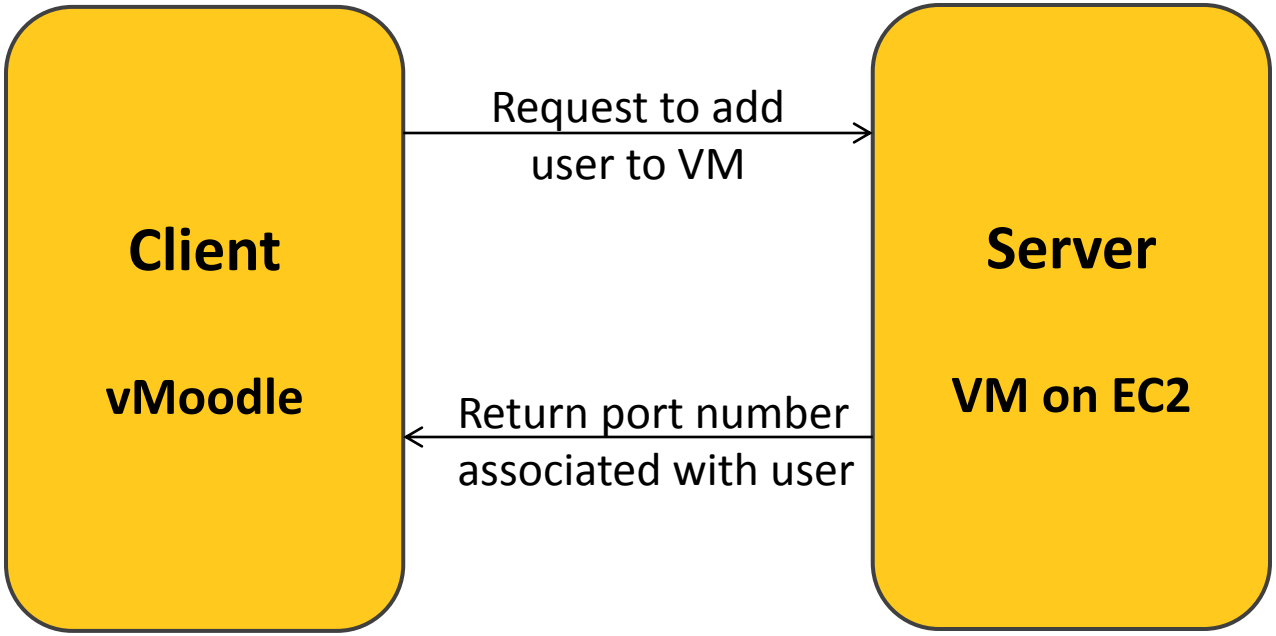
Architectural Design

Three Tier

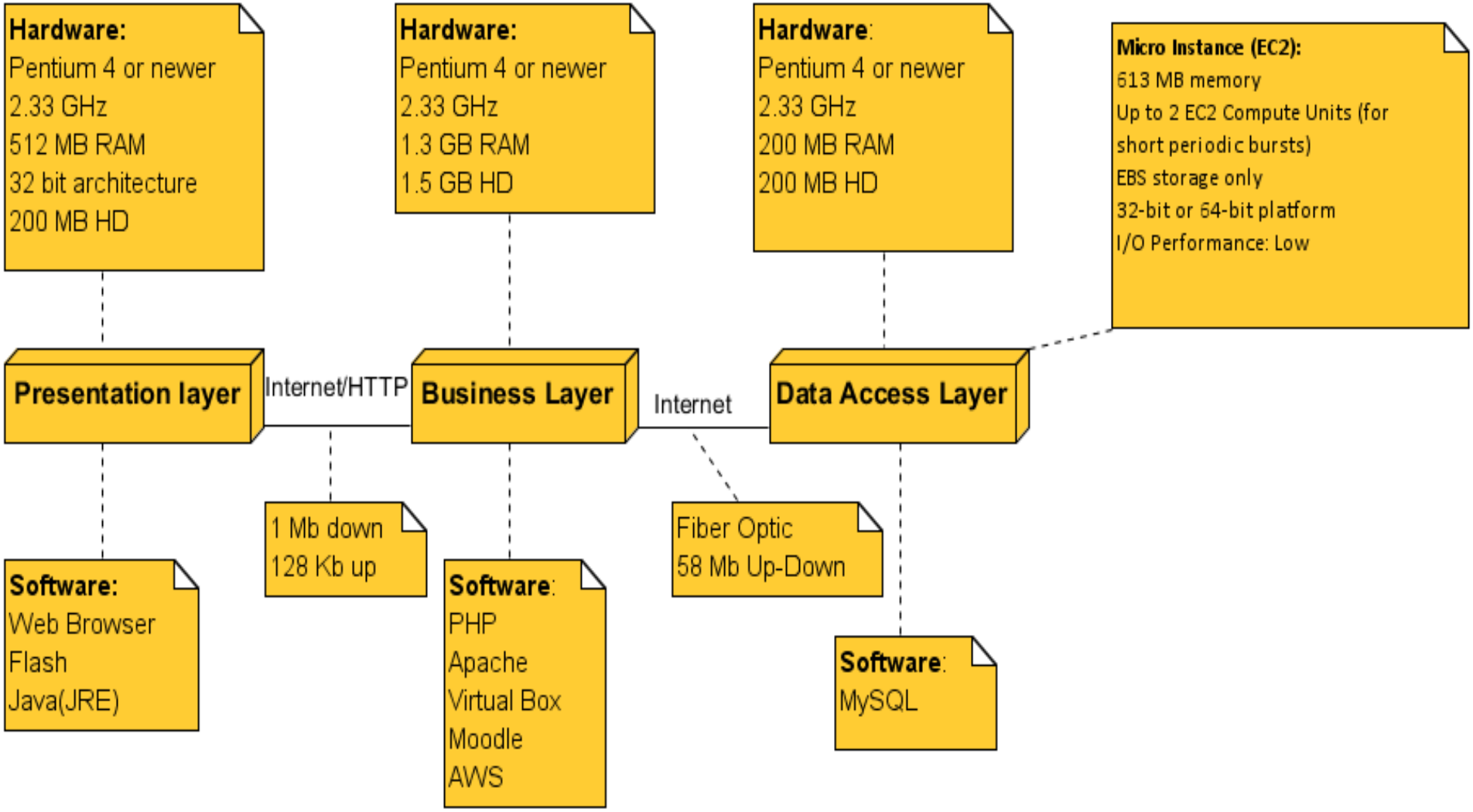


Architectural Design

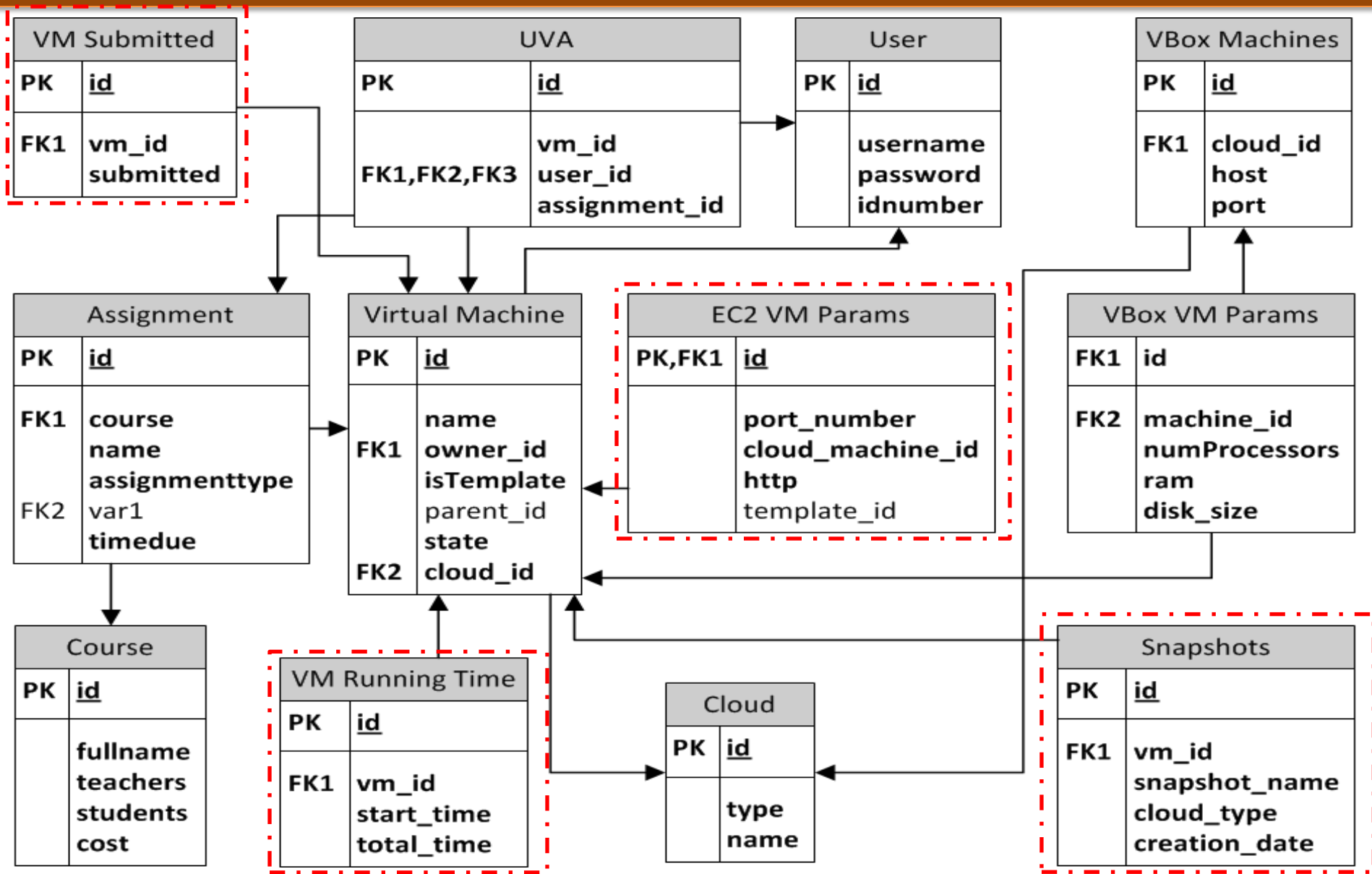
Client Server



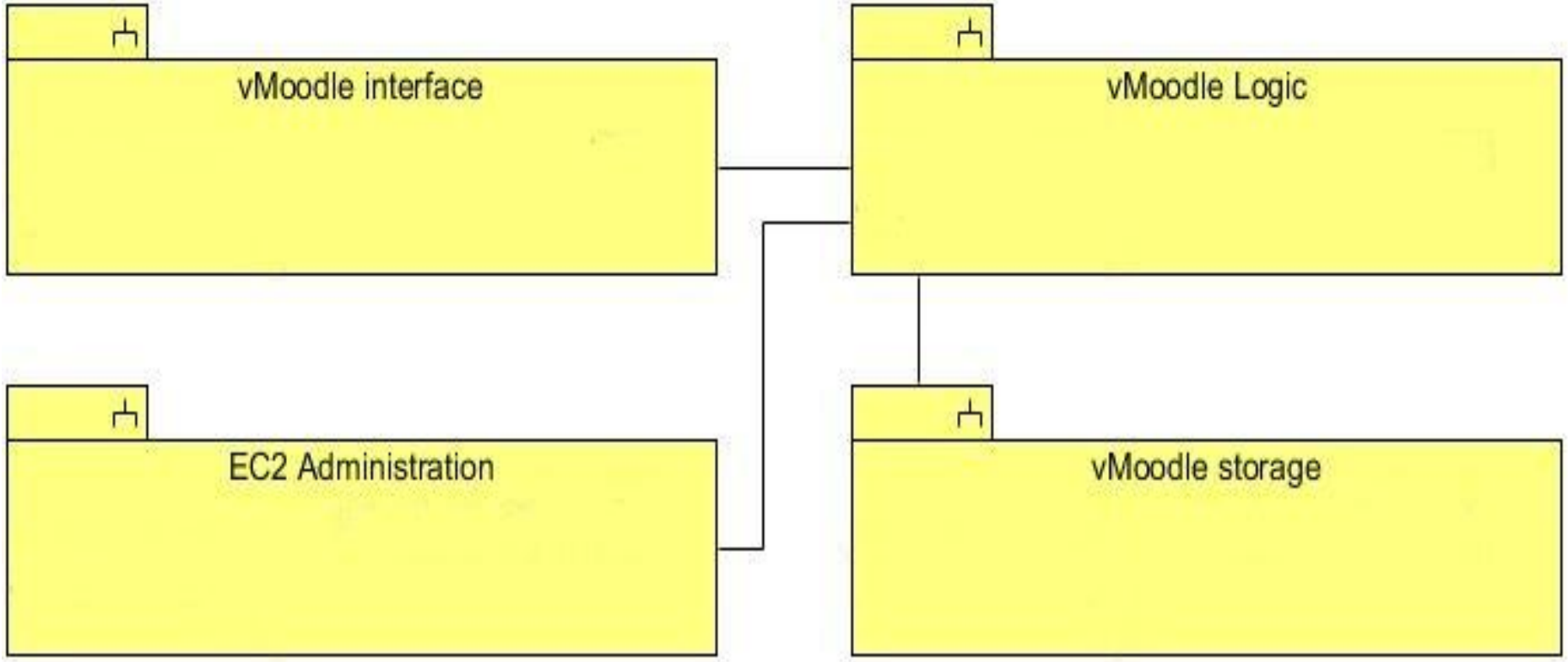
Hardware and Software Mapping



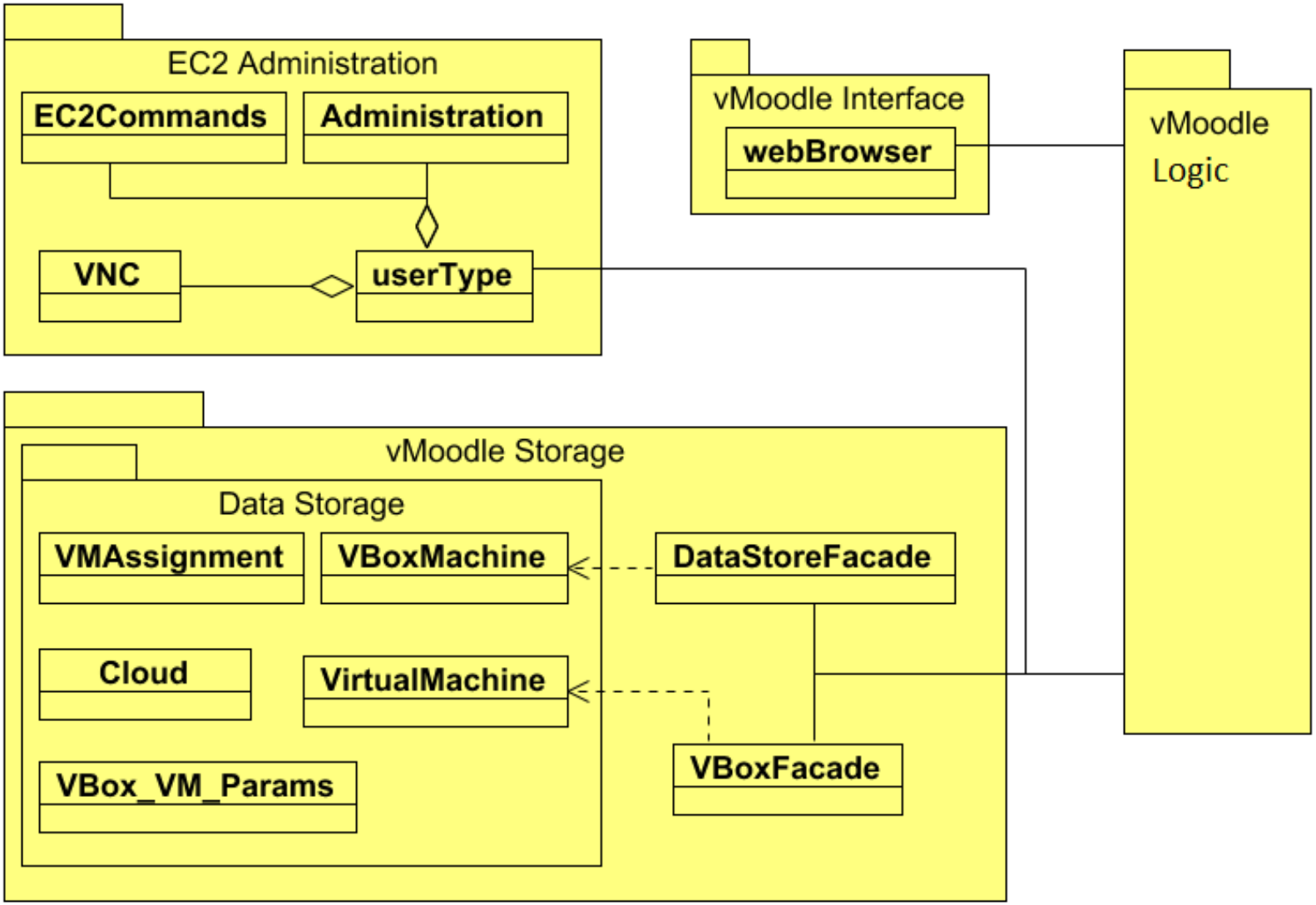
Persistent Data Management



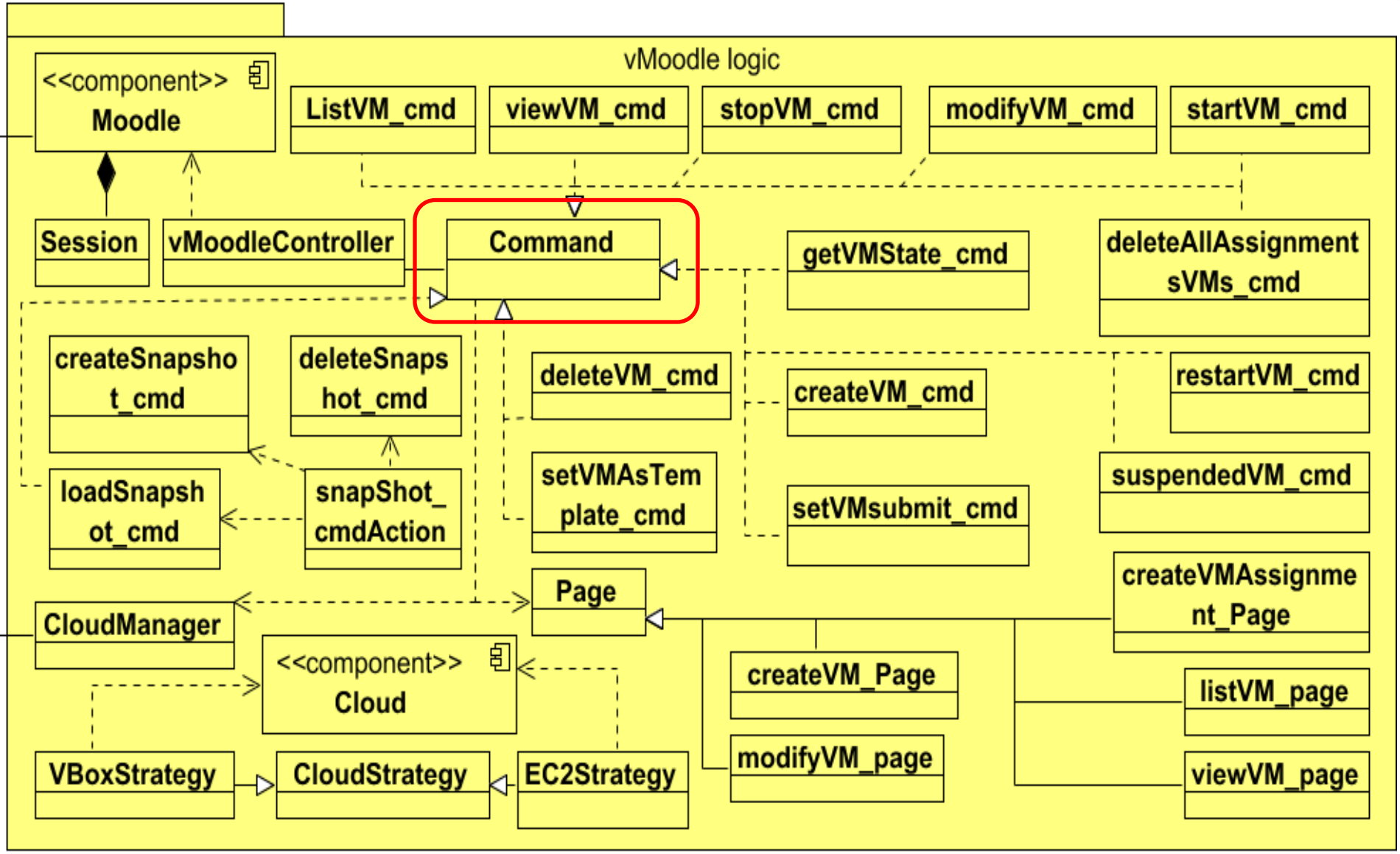
Minimal Class Diagram



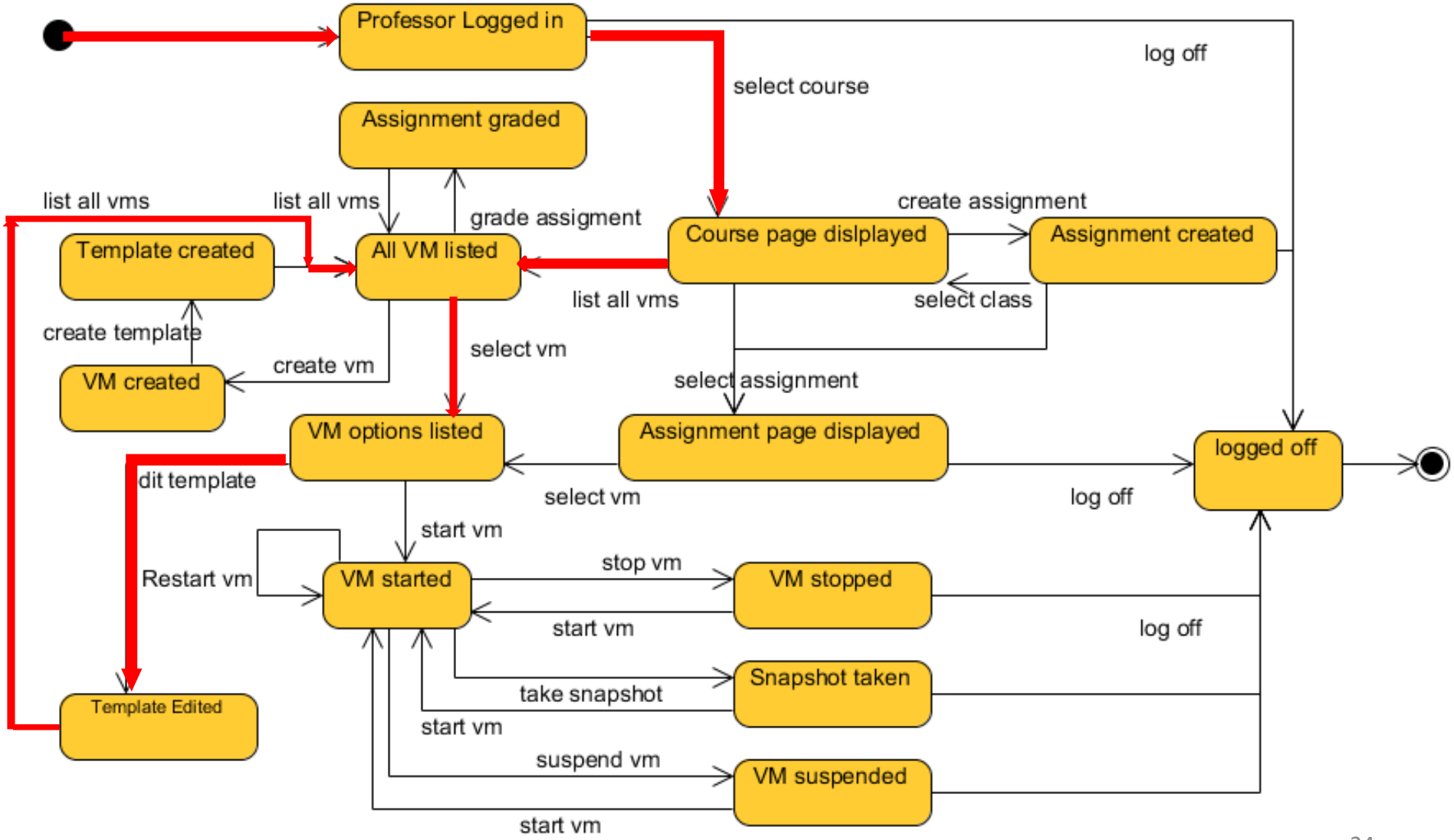
Minimal Class Diagram



Minimal Class Diagram



State Machine Diagram



Main Algorithm

Create VM in EC2

- Step 1 : Create VM
- Step 2: User is added into the system as an Administrator and VNC Configuration.
- Step 3: User can view VM through vMoodle in the cloud

Running Time:

- Step 1: O(1)
- Step 2: O(n) + O(m)
- Step 3: O(1)

  n = Number of VMs in EC2

  m= Number of Students in the VM

Sunny Day – Create VM in EC2

Test Case ID	Test VMT-004
Purpose	• To create a Instance of a VM in the Amazon EC2
Set up	• Course ”Install Web Server” was created. • Professor is logged in.
Input	• Name: “EC2 Professor Test” • Password: “Password”. • The professor is redirected to the View VM page. • The professor is prompted to enter previous password.
Expected Output	• Professor can access the new VM.

Rainy Day – Edit Templates in VBox

Test Case ID	Test VMT-006
Purpose	To modify an existing template.
Set up	• Course ”Install Web Server” was created. • Professor is logged in. • A template was created. • Unable to stable SSH connection
Input	• Number of processors changed from 1 to 2
Expected Output	• Error message “No SSH connection”

Demonstration

- ✓Create, Start, View VM on EC2
- ✓Take, Load Snapshot

Questions?