# Cmpe283_Team3_ Midterm Report

Fall 2016

Team 3

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## Table of Contents

**Title: Migration between VMware and AWS EC2**

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## Tasks to Tackle or Problem to Resolve

A desktop application that implements and manages migration between Amazon EC2 and standalone ESXi host and monitor the migration progress.

## Assumptions, Operating Environments, and Intended Usage

What if a user wants to leverage his investments in the VMs by bring those VMs into Amazon EC2 as ready-to-use instances. And after a while, user has purchased his own server and he doesn't want to use Amazon EC2 anymore.

Amazon EC2 has provided VM import/export functions to help user migrate from another virtualization environment to Amazon EC2 as instance or image. And VMware vSphere allows user to export different types of VM image files. However, there is no direct application can help user migrate between his Amazon EC2 and VMware VSphere. If the user wants to migrate, he has to migrate manually from Amazon EC2 to VMWare VSphere or verse vice.

## Solution

In this project, we intend to create a desktop application that helps user migrate the VMs from VMware vSphere ESXi host to Amazon EC2 and migrate it back to VMware vSphere ESXi host by using the AWS SDK for Java and vSphere Java APIs.

The application will provide interface to Amazon EC2, it means the user can use application to connect to his own Amazon EC2 and in the meanwhile, the application will display the EC2 instances and only the EC2 instance that previously migrated from other virtualization environment can be selected to migrate. The application also needs provide interface for user to connect to his standalone ESXi host, so it can display the VMs in ESXi host. Then the user can select VMs from ESXi host to migrate to EC2.

We plan to utilize the AWS Java SDK and EC2 CLI, vSphere Java SDK to implement the application. Detailed features and functions listed as below need to be implemented:

- Connect to AWS and ESXi host from application
- Display All the EC2s in AWS and virtual machines in on ESXi host from application
- Export OVF images of selected virtual machine in ESXi host
- Import OVF images to AWS as EC2 instance
- Export selected EC2 instance as OVF file
- Import OVF file to ESXi host
- Record and display migration history

## Implementation Platform, Environment, Technologies, Frameworks, and Languages

Software Platform: JavaFX 8, Local Database:MySql
Environment: Java SE 8 Platform: Eclipse
Communication tool: meeting, github, waffle.io,

**Virtualization/Cloud Features to be leveraged**
Amazon EC2 has provided VM import/export functions via AWS SDK for Java and EC2 CLI .
VMware has vSphere API for Java to manage VMs.

# Progress

## Design

### Architecture

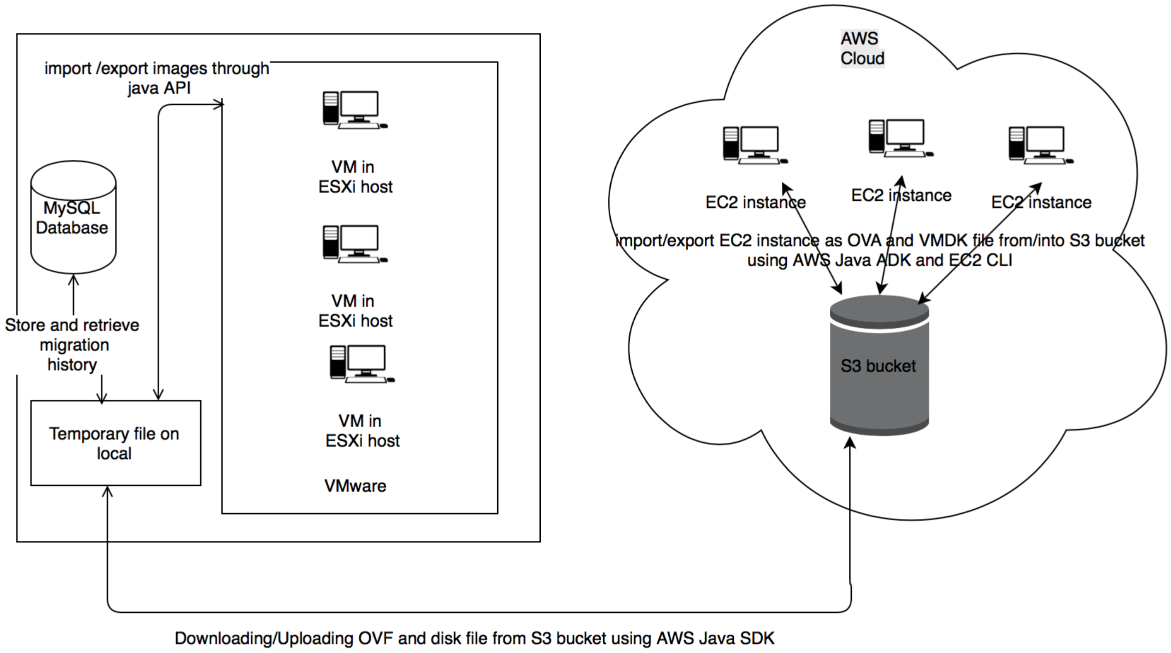

import /export images through java API
MySQL Database
Store and retrieve migration history
Temporary file on local
VM in ESXi host
VM in ESXi host
VM in ESXi host
VMware
AWS Cloud
EC2 instance
EC2 instance
EC2 instance
import/export EC2 instance as OVA and VMDK file from/into S3 bucket using AWS Java ADK and EC2 CLI
S3 bucket
Downloading/Uploading OVF and disk file from S3 bucket using AWS Java SDK

Figure 1.1 Architecture design for application

### Features

1. **Login:**
   - User login to their local ESXi host with/vCenter with IP address, username and password.
   - User login to their AWS account with aws.accessKeyId and aws.secretKey(Display instruction to user about how to create IAM user and get the credential).
2. **Information Display:**
   - User can see inventory and basic information about their VMs in ESXi host(VM summary)
   - User can see the EC2 instance basic information in different zones in his AWS environment.
3. **Migrate from ESXi host to EC2:**
   - User need to complete the preparation migration task if it cannot be implemented by the application
   - User can select one VM from his ESXi host, and choose which zone and what instance type, then he can migrate the VM.

- The VM will be exported as OVF and VMDK file from ESXi host to a temporary local folder.
- The VMDK file will be uploaded into S3 bucket in AWS
- AWS import the VMDK file from S3 bucket and convert it to instance/image.

4. **Migrate from EC2 to ESXi host:**
   - User can only select the EC2 instance that previously imported from ESXi host to be migrated to his ESXi host again.
   - EC2 instance will be exported as OVA to S3 bucket
   - Download the OVA file from S3 bucket to a local temporary folder.
   - Import OVA file into ESXi host.
5. **Monitor Migration:**
   - User should be able to start, pause and cancel the migration process.
   - User can check his migration history.

## Components Diagram

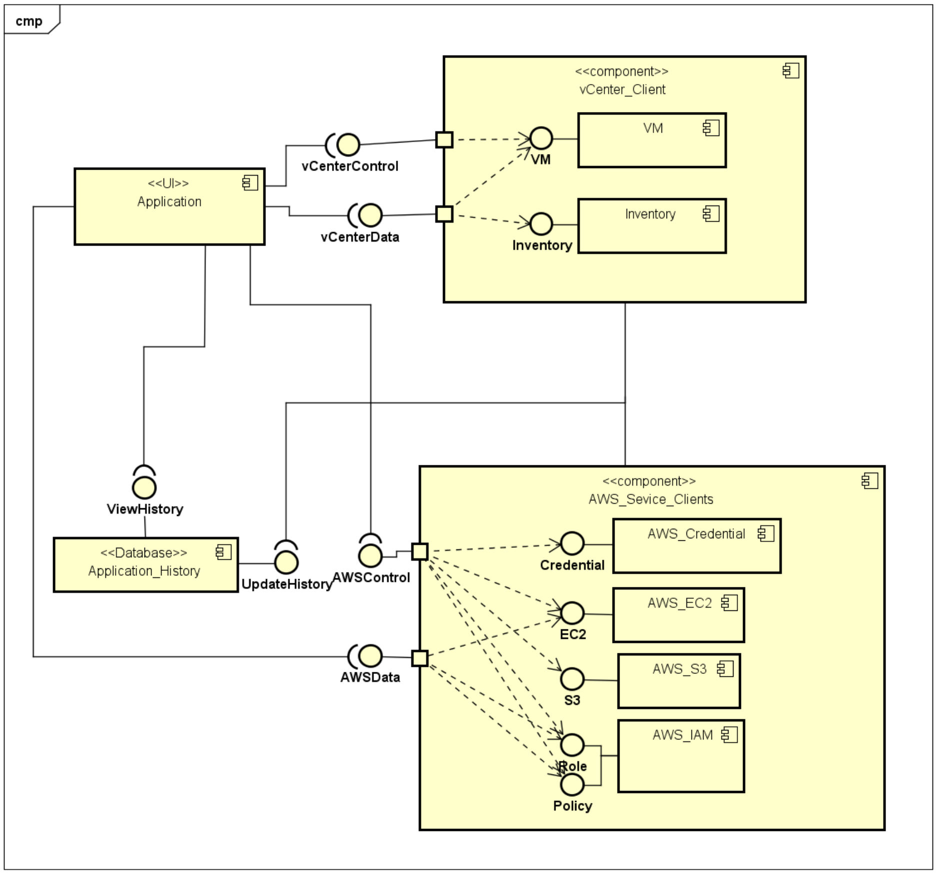


Figure 2.1 Component Diagram for application

## Sequence diagram

1. **Setup AWS credential:**

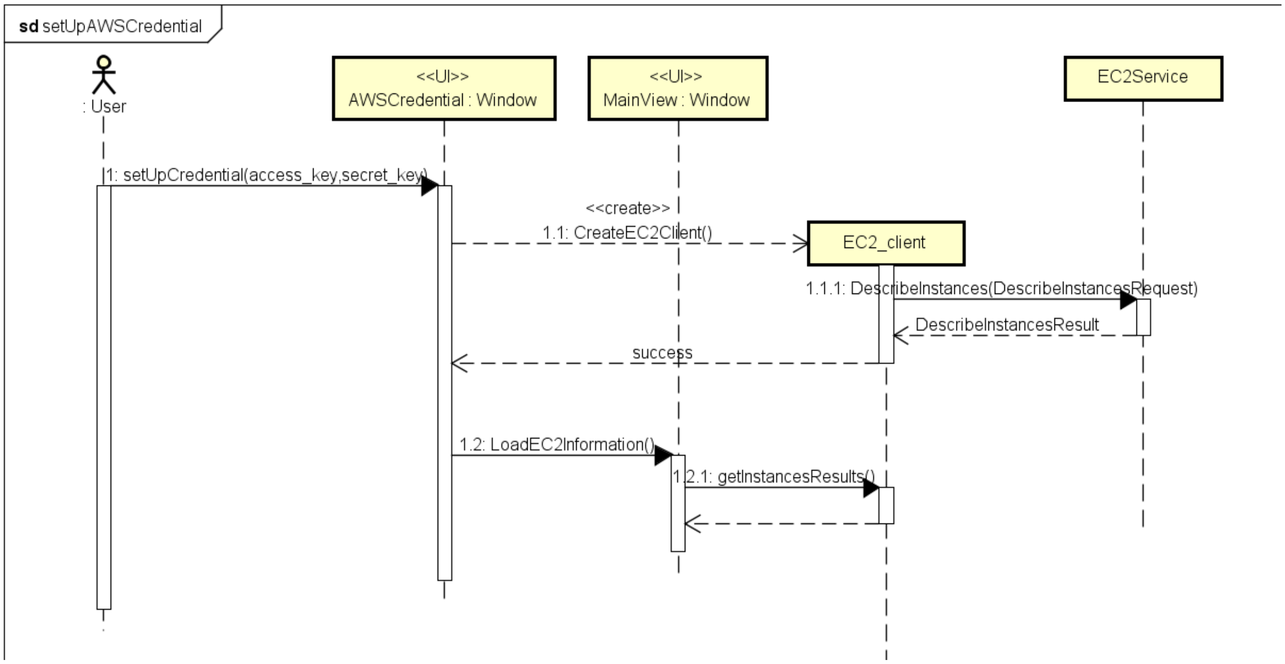


Figure 3.1 Sequence Diagram for Setup AWS credential

### 2. Setup vSphere Connection:

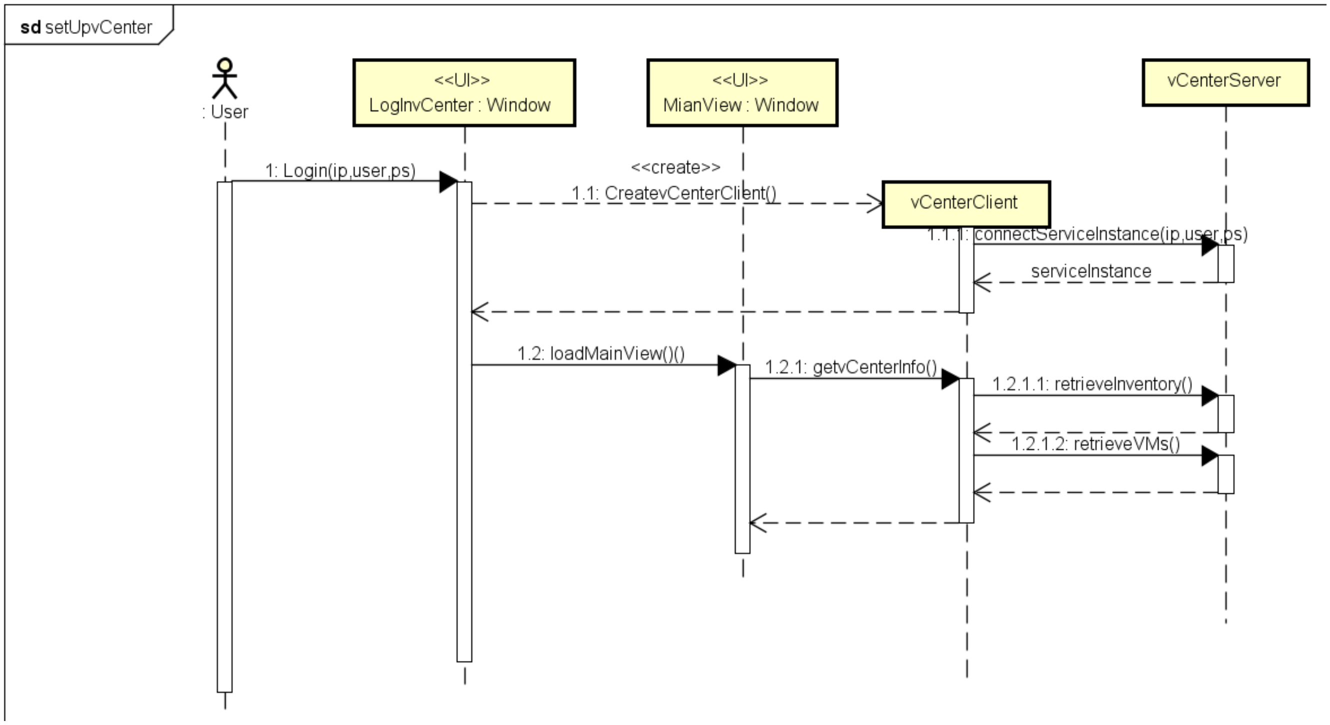
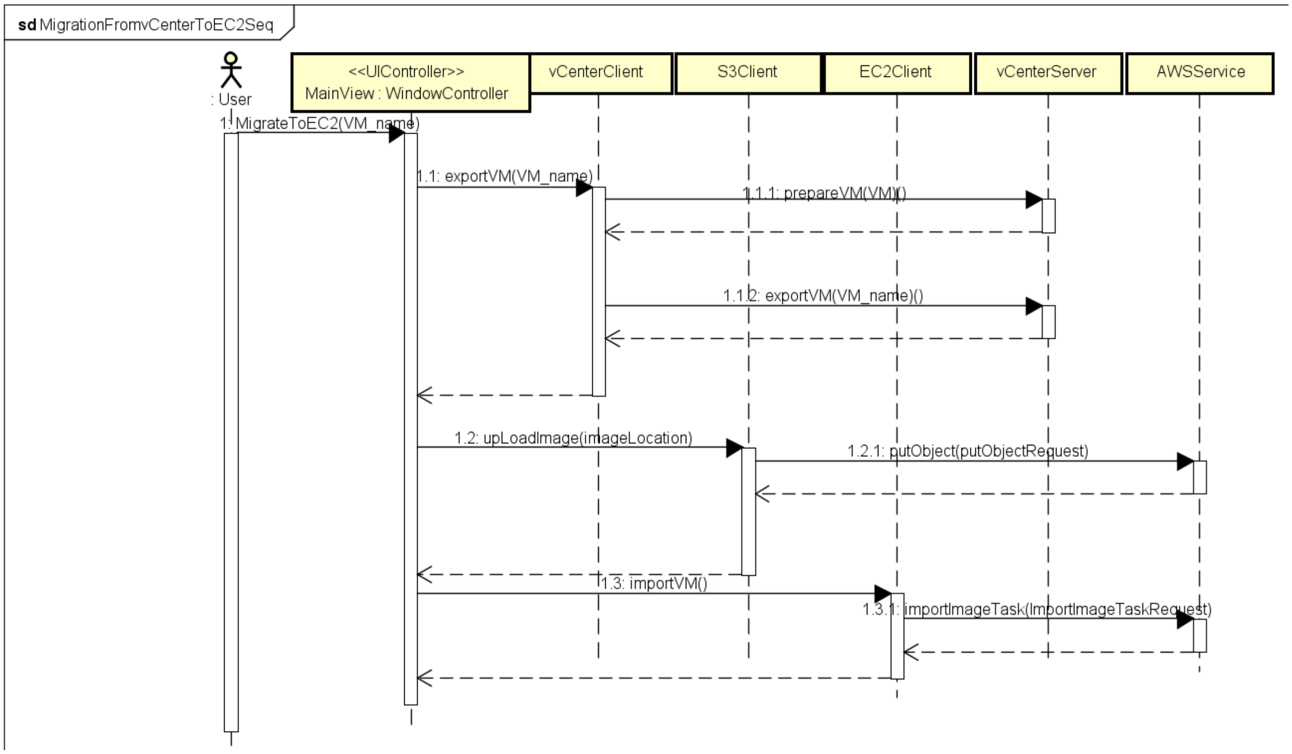


Figure 3.2 Sequence Diagram for Setup vSphere Connection

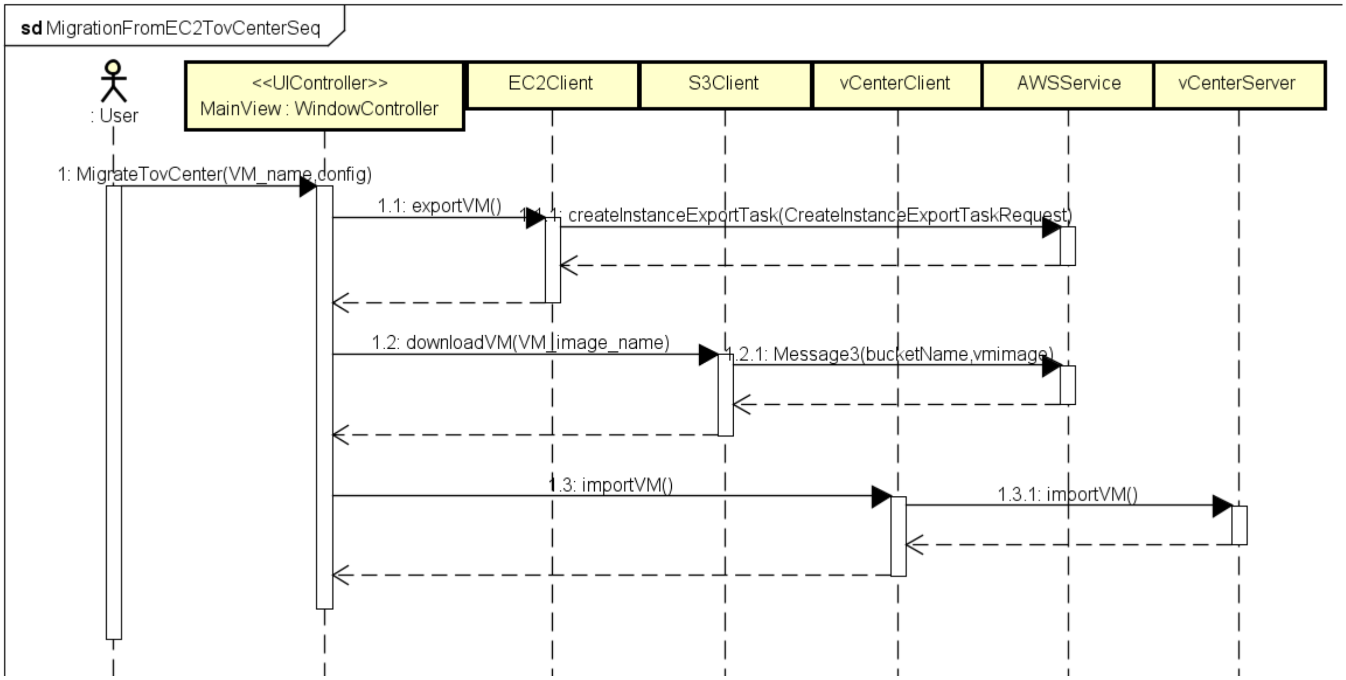
### 3. Migrate from ESXi host to EC



sd MigrationFromvCenterToEC2Seq
: User
<<UIController>>
MainView : WindowController
vCenterClient
S3Client
EC2Client
vCenterServer
AWSService
1: MigrateToEC2(VM_name)
1.1: exportVM(VM_name)
1.1.1: prepareVM(VM)()
1.1.2: exportVM(VM_name)()
1.2: upLoadImage(imageLocation)
1.2.1: putObject(putObjectRequest)
1.3: importVM()
1.3.1: importImageTask(ImportImageTaskRequest)

Figure 3.3 Sequence Diagram for Migrate from ESXi host to EC

4. **Migrate from EC2 to ESXi host**



sd MigrationFromEC2TovCenterSeq
: User
<<UIController>>
MainView : WindowController
EC2Client
S3Client
vCenterClient
AWSService
vCenterServer
1: MigrateTovCenter(VM_name,config)
1.1: exportVM()
1.1.1: createInstanceExportTask(CreateInstanceExportTaskRequest)
1.2: downloadVM(VM_image_name)
1.2.1: Message3(bucketName,vmimage)
1.3: importVM()
1.3.1: importVM()

Figure 3.4 Sequence Diagram for Migrate from EC2 to ESXi host

Flow of data

1. **Migrate From ESXi host to EC2**

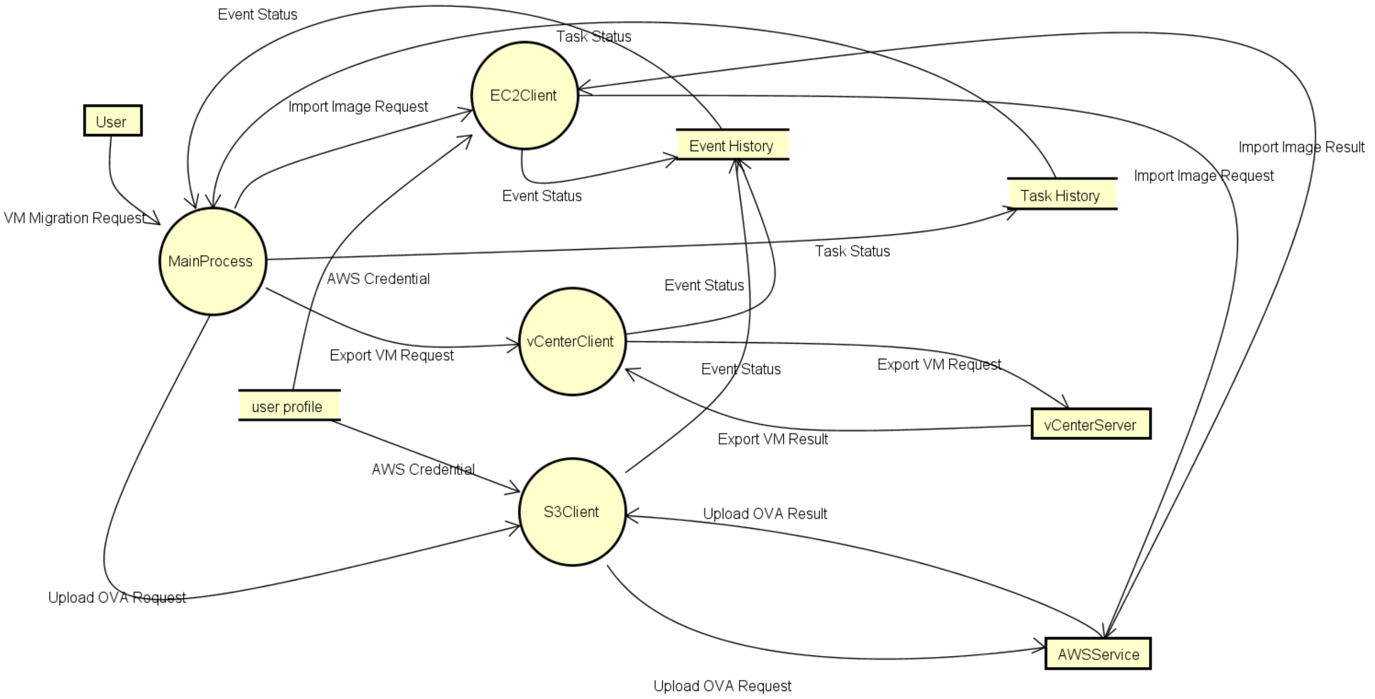


Figure 4.1 DFD for Migrate From ESXi host to EC2

## 2. Migrate from EC2 to ESXi host

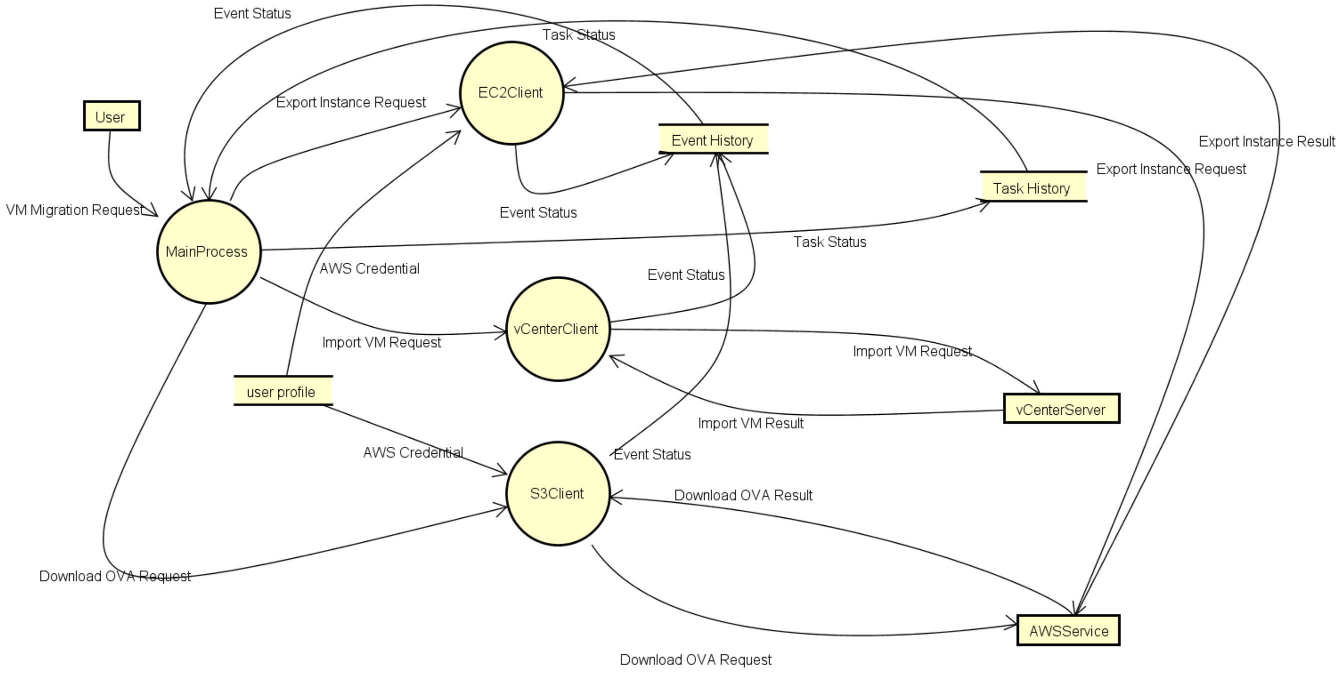


Figure 4.1 DFD for Migrate From EC2 to ESXi host

### Design tradeoffs

- Compatibility: In order to improve the usability of our application, we decided only focus on migrating the VMs or EC2s with Linux operating system. Since there are many preparation tasks needs to be done on the VM before it is migrated from ESXi host to AWS EC2, so in order to make it easy to use, we will consider to create linux scripts to help user accomplish some preparation tasks instead of letting them do by themselves.

### Any topic discussed in class

- OVF import and export

### GUI design

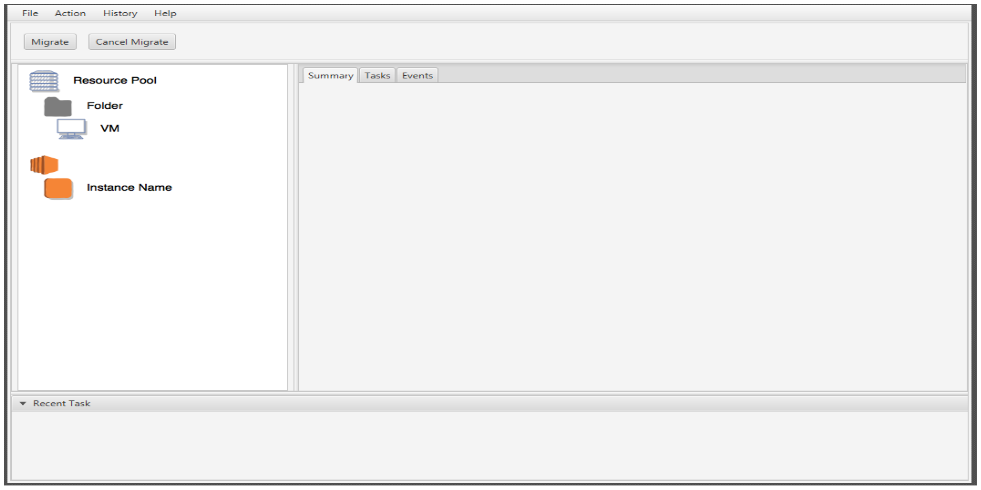


Figure 5.1 Main View

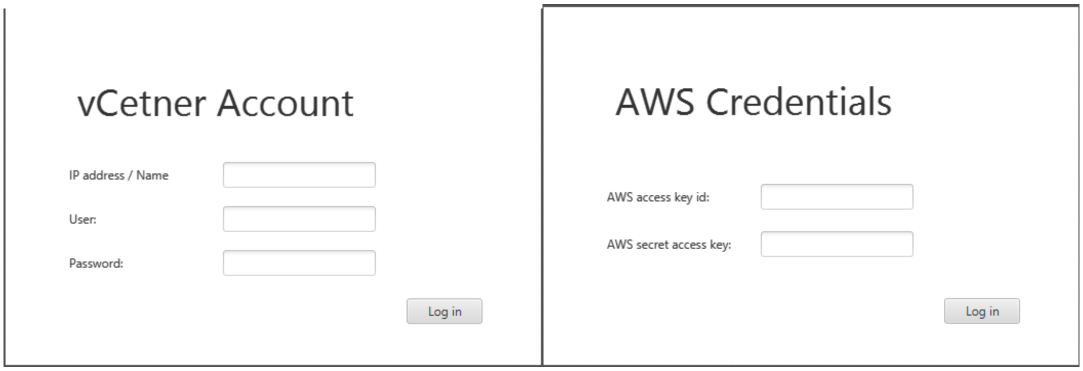


Figure 5.2 Login Views for vCenter and AWS

### Initial Implementation

GUI Language: JavaFX 8

GUI tool: Scene Builder

Environment: Java SE 8

IDE Platform: Eclipse on Mac and Windows

Communication tool:

- Meeting
- github:https://github.com/Dorajia/CMPE283-Project.git
- waffle.io:https://waffle.io/Dorajia/CMPE283-Project

Completed implementation

- Design first version of GUI by using JavaFX 8.
- Implement login function to AWS and ESXi host with java application.
- Implement get VM summary function from ESXi host with java application.
- Implement get EC2 information function from ESXi host with java application
- Implement import/export OVF file to ESXi host functions with java application.
- Implement upload/download a file to/from S3 bucket with java application.

**Responsibility**

### Miao Shi

*Major area:* Application GUI and workflow design, GUI Implementation, EC2 site export implementation, database operation implementation, testing

*Detailed task list:*

- Research on EC2 site and AWS Java API
- Application workflow design
- Application GUI design
- Design Data model
- Implement Application GUI
- Get VM summary from VMware site within java Application
- Get EC2 summary from AWS within java Application
- Try to manually export EC2 instance on EC2
- Implement export EC2 with java application
- Manipulate MySql from java application
- Integrate GUI and each function
- Test plan
- Unit testing
- Integration testing

### Yuanyuan Jia

*Major area:* Application architecture and component design, VMware site export/import implementation, EC2 site import implementation, database implementation, testing

*Detailed task list:*

- Research on VMware site, EC2 CLI on AWS and AWS Java API
- Architecture design
- Application component design
- Implement login to EXSi site and EC2 via Java API
- Implement the export OVF function with Java API  for VMware site
- Implement the import OVF function with Java API for VMware site
- Try to manually import OVF file from VMware to EC2
- Implement the 'Prepare for VM' on VMware site before it is migrated to EC2 in java application
- Implement import VM to EC2 with java application
- Integrate GUI and each function

- Implement database
- Unit testing

**Modification**

- The application should only migrate the EC2 instances that is previously imported from other virtualization environment from AWS EC2 to VMware vSphere ESXi host. Since on AWS site, only this kind of EC2 instance are allowed to be exported.
- The application will focus on migrate VM and EC2 with Linux operating system. Since on AWS site, only most of Linux system and windows system can be imported to and exported from Amazon EC2 and considering the limited time and resource, we will only focus on migrating Linux operating system. (see: http://docs.aws.amazon.com/vm-import/latest/userguide/vmimport-image-import.html)

**Current status**

- We have finished related research, so we have finished initial designs on architecture, workflow, components, data flow, function and GUI.
- We have finished implementation on GUI, login module, get VM summary and EC2 instance information in display information module, export/import local OVF to ESXi host function in migration module, upload/download local file to/from S3 bucket function, but not integrated with GUI.
- We are now working on the importing and exporting OVA and VMDK file from EC2 instance function.

**Encountered Problem**

- And now we have problem with the import instance request API in AWS Java SDK, since it is not documented very well, so it is very hard to use, We are thinking about using the EC2 CLI to perform import instance request.
- Another problem is that there are too many tasks needs to be done to prepare the VM before it can be exported from ESXi host and imported to AWS EC2. And some of them cannot be programmably finished by application, user has to do it by himself. We will try to write some scripts for user to run it directly and finish the preparation job.

**Test plan**

Since our project is implementation-based project, performance testing will be not included in our test scope.

Test item: Application we created

Features to be test: ESXi host/AWS login, GUI information display, Migration between EC2 and ESXi host, Migration Monitor

Features not to be test: Performance

Test environment: SJSU VPN needed, AWS roles and policies are created, db instance started

Test techniques: manual test/ functional test

Test cases:

| # | Test Description | Pre-conditions | Test steps | Expected Result |
|---|---|---|---|---|
| 1 | Open application | User never use this application before | Open the application | Login vsphere window pops up |
| 2 | Login vsphere | | In login vsphere window, | If success, AWS credential |

| | | | | |
|---|---|---|---|---|
| | | | enter Server IP, user name, password and click Log in | login window opens and vsphere account info has been stored in system |
| 3 | Login AWS | | In AWS credential login window, enter access key and secret key | If success, main view window opens, aws credential is stored in system |
| 4 | Vms in vsphere server and instances in EC2 are load in Main View | User login in vsphere server and aws successfully | Compare VM list in vsphere server and that in Main View window<br>Compare instance list in EC2 and that in Main view | Main View should display all the VMs and instance |
| 5 | VM/ Instance Summary populate correctly | Same as above | Click one vm/instance, summary info should be populated in the right part of the window | Summary info should contain the same data as the summary in EC2 and vsphere |
| 6 | Export VM to EC2 | | Select VM and click migrate; enter configuration and click start | Migration Task should show in Task list.<br>When migration ends, VM will be removed from vsphere, and new instances will show in EC2 |
| 7 | Export instance to vSphere host | | Select imported instance, enter configuration and click start migration | Migration Task should show in Task list. When task ends, instance will be removed from EC2 and new VM will show in vSphere host. |