Politecnico di Milano
5th School of Engineering

Software Engineering Project

wim v2

Requirement Analysis and Specification Document

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1. Introduction

1.1 Purpose

This document introduces the general functionalities of Small World hypothesIs Machine version 2 (SWIMv2), the project of the course of Software Engineering 2 at Politecnico di Milano. The intended audience is people who want to help each other by means of offering their expertise. Individuals that will participate actively in the project are Software Engineering students for the moment, and in the future experts who want to simplify the way they try to find the right person for the right job.
The main functionlities that SWIMv2 will offer are:

- A service for finding experts in a specific field.
- A mechanism to create a network of connections among experts.

1.2 Scope

The software product that will be delivered is SWIMv2. SWIMv2 is a web application intended to help people find support from their connections' expertise, or find experts that are useful to have as connections. For instance the application will allow registered users (experts) to manage their community of connections, manage their own information, manage their skills and provide useful feedback related to them.

The main objectives of SWIMv2 are:

- Allow users to find the right person for the right job.
- Allow users to build their network of trusted experts.
- Allow users to manage their personal data and skills.

SWIMv2 will provide general functionalities for managing:

- **Profile**
  SWIMv2 will manage personal data of the different types of users. Users can be unregistered, registered and administrator.

- **Connections**
  SWIMv2 will manage the network of connections of the experts.

- **Skills**
  SWIMv2 will manage the list of skills that experts can have.

- **Users**
  SWIMv2 will manage registering, loging in/out of users.

SWIMv2 will have the following limitations (probably developed in future versions)

1. **Different levels of privacy**
   These will be by default defined by the system as public information and private information.

2. **Payment**
   It will not offer any form of payment information for the help offered or any kind of

payment gateway.

3. **User Statistics and Auditing**
   It will not offer any kind of statistics based on user interaction. Auditing will be provided just for the number of attempts a user has to access his profile.

4. **Sub networks based on skills**
   It will not offer creation of networks or circles of people with the same skills.

5. **External interfaces to other Social Networks**
   It will not offer external interfaces to Facebook, Twitter, LinkedIn etc.

SWIMv2 will have the following goals:

- **[G1]** Allow people to search for experts in a specific topic.
- **[G2]** Experts can declare their fields of expertise and their personal information.
- **[G3]** Allow experts to share personal information
- **[G4]** Experts can enlarge or shrink their network.
- **[G5]** Experts can rate their connections.
- **[G6]** The system will provide a set of skills and allow experts to send requests to add skills.

1.3 Definitions and acronyms

1.3.1 Definitions

Keyword	Definitions
Skill	*An ability or area of expertise*
Connection	*A friend or expert that provides a service*
Software product	*System to be developed*
Expert	*A registered user*

1.3.2 Acronyms and abbreviations

Acronym or Abbreviation	Definitions
XML	*Extensible Markup Language*
RASD	*Requirementss Analysis and Specification Document*
SWIMv2	*Small World Hypothesis Machine version2*
NFR	*Non-functional Requirements*
QA	*Quality Attributes*
FR	*Functional Requirement*
G	*Goal*
DBMS	*Database Management System*
AS	*Application Server*
JEE	*Java Enterprise Edition*

1.4 References

1. Planning document: SWIMv2_PlanningDocument_Metra_Kragujevski_Hualpa.pdf
2. IEEE Recommended Practice for Software Requirements Specifications: *http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=5841*
3. Alloy model file: swimV2.als

1.5 Overview

The document is organized as follows:

- **Section 1**, Introduction, provides a synopsis of the software product to be developed.
- **Section 2**, Overall Description, describes the general factors that affect the software product and its requirements.
- **Section 3**, Specific Requirements, contains the artifacts generated by the analysis. It describes all of the software requirements to a level of detail sufficient to be externally perceivable.
- **Section 4**, Appendixes, provides supporting information about how the alloy model contributed to the requirement analysis and analysis model.

2. Overall Description

This section does not describe specific requirements, but puts the product into perspective and provides a background for specifying concrete requirements in the next section of this document.

2.1 Product Perspective

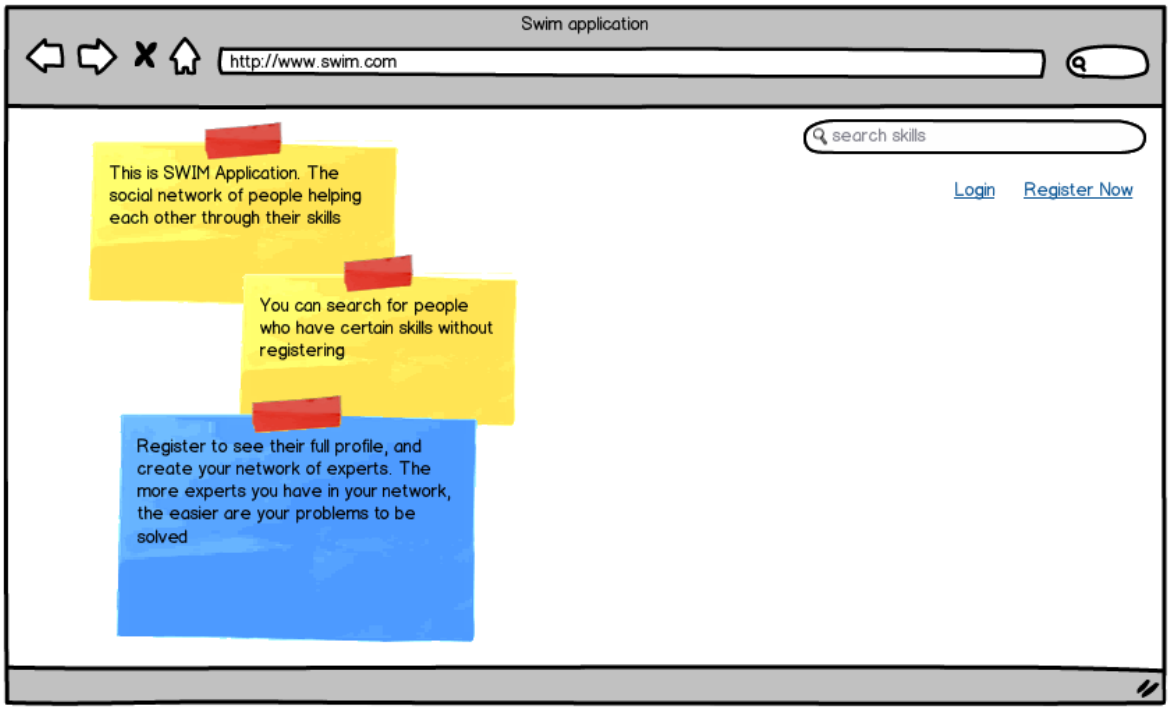
The software product is a complete self-contained system and it is not part of any other larger system. However in the future it may offer external interfaces to other social networks.

2.1.1 System interfaces

The software product does not provide any external interface.

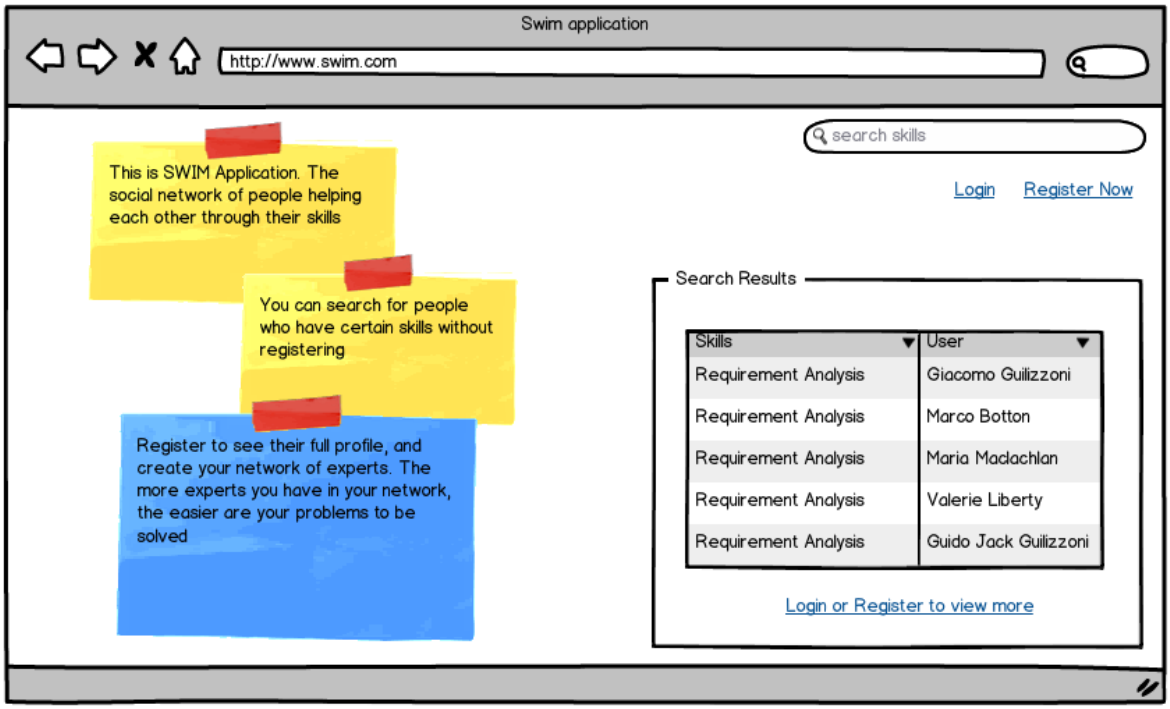
2.1.2 User interfaces

The software product will present the following page layouts as the user interface. These page layouts offer a minimalistic approach to design and navigation:

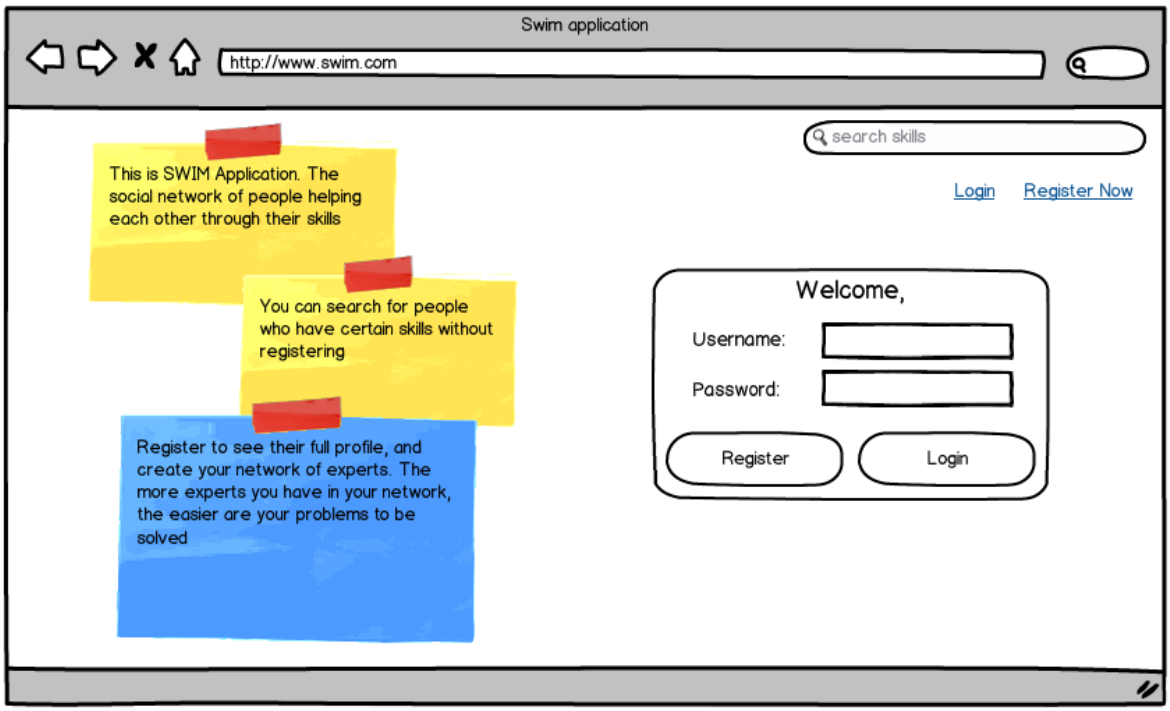


User interface 1: Default home layout

From this point the user can search or log in:

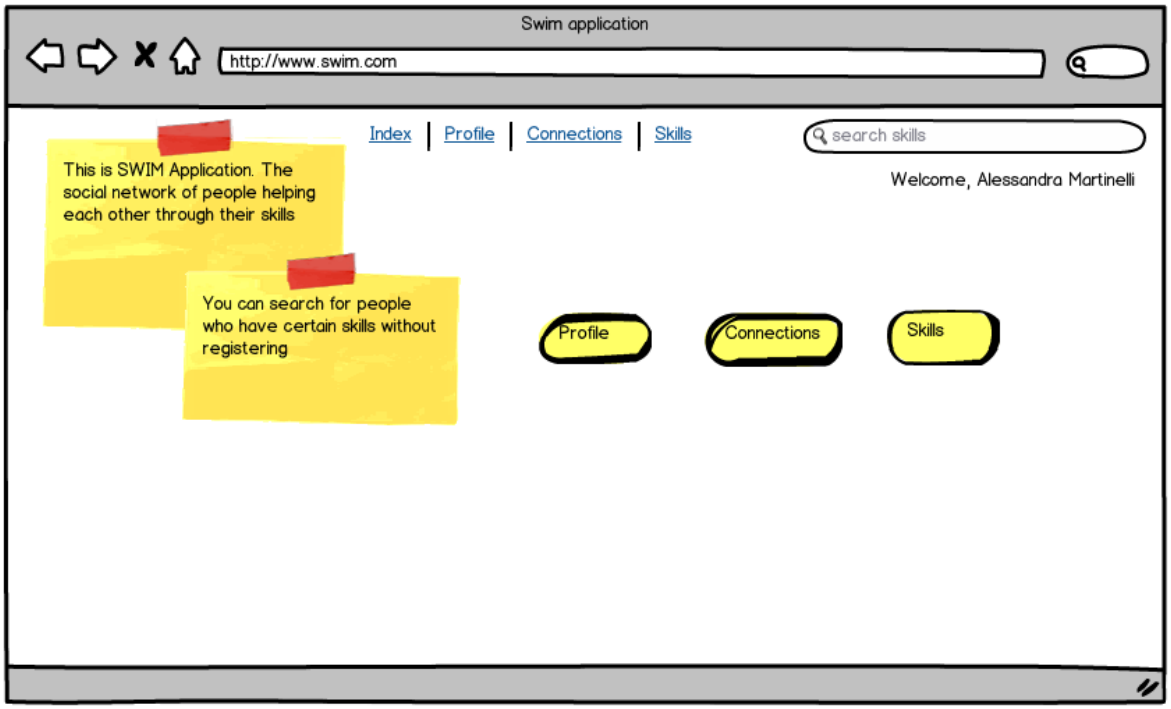


User interface 2: Unregistered search layout



User interface 3: Login layout

After logging in it a set of basic options for managing connections, profile and skills are provided:

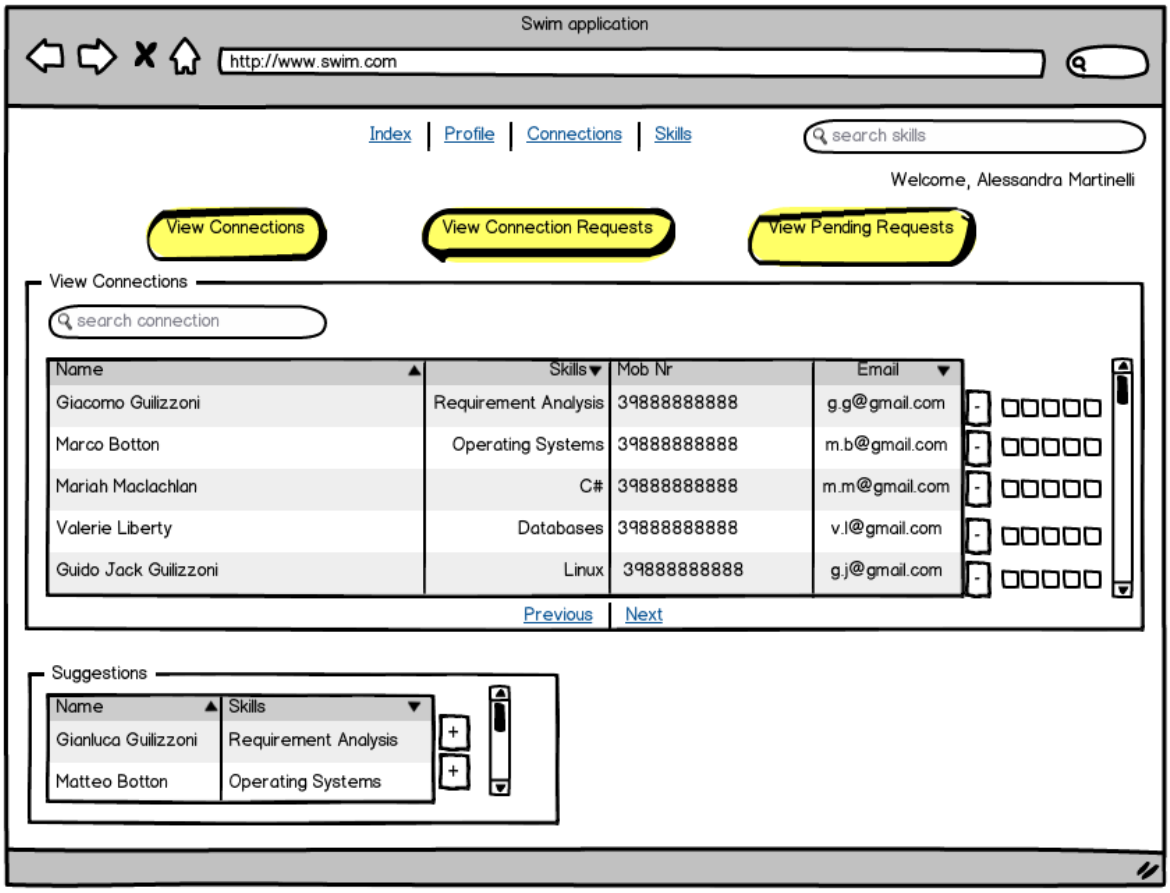


User interface 4: Expert home layout

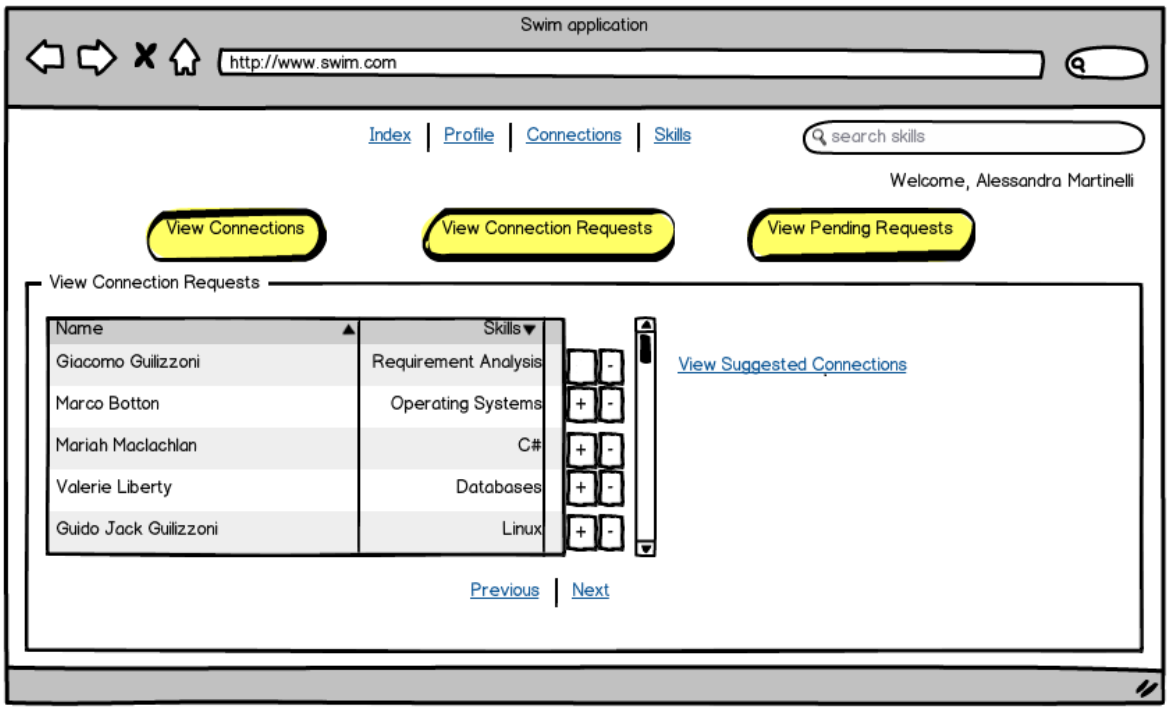
The user interface for managing the core entities (skills, connections) is divided in two basic components:

- Search mechanism: It allows filtering data by the name text field.
- Ordered list with actions: It contains basic information about the entities displayed in a grid layout. Each entity row offers some actions to take besides the data it provides.

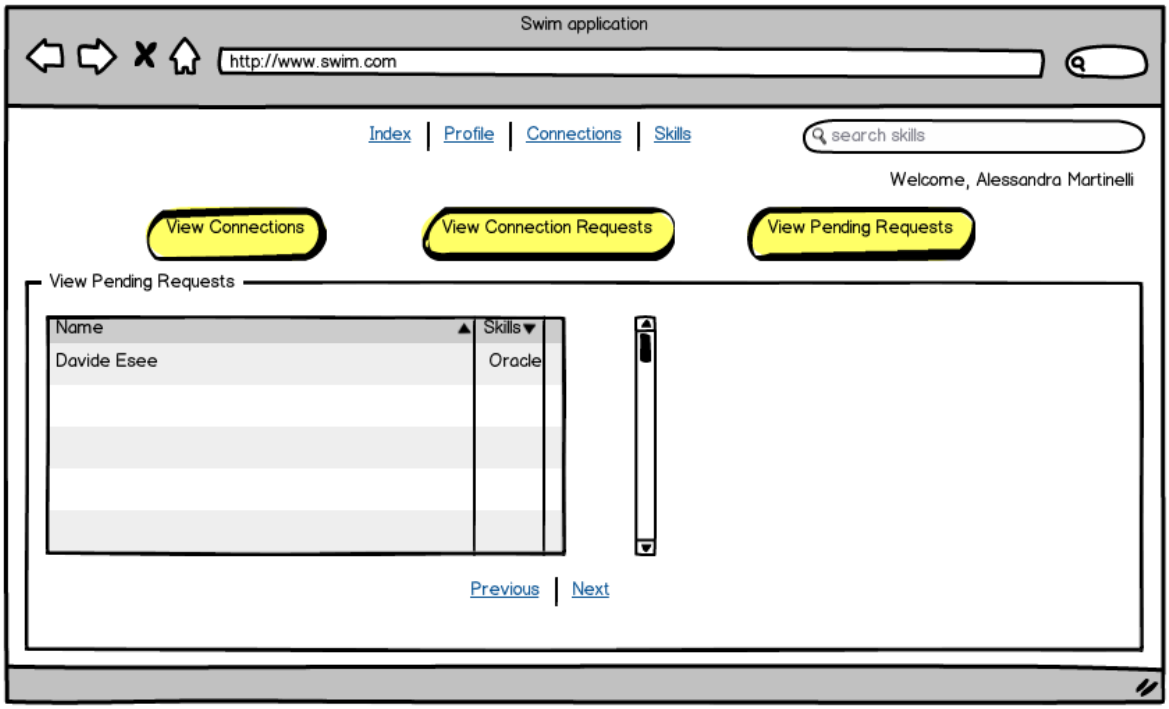
The following mockup represents the general layout applied for managing connections:



User interface 5: View connections layout

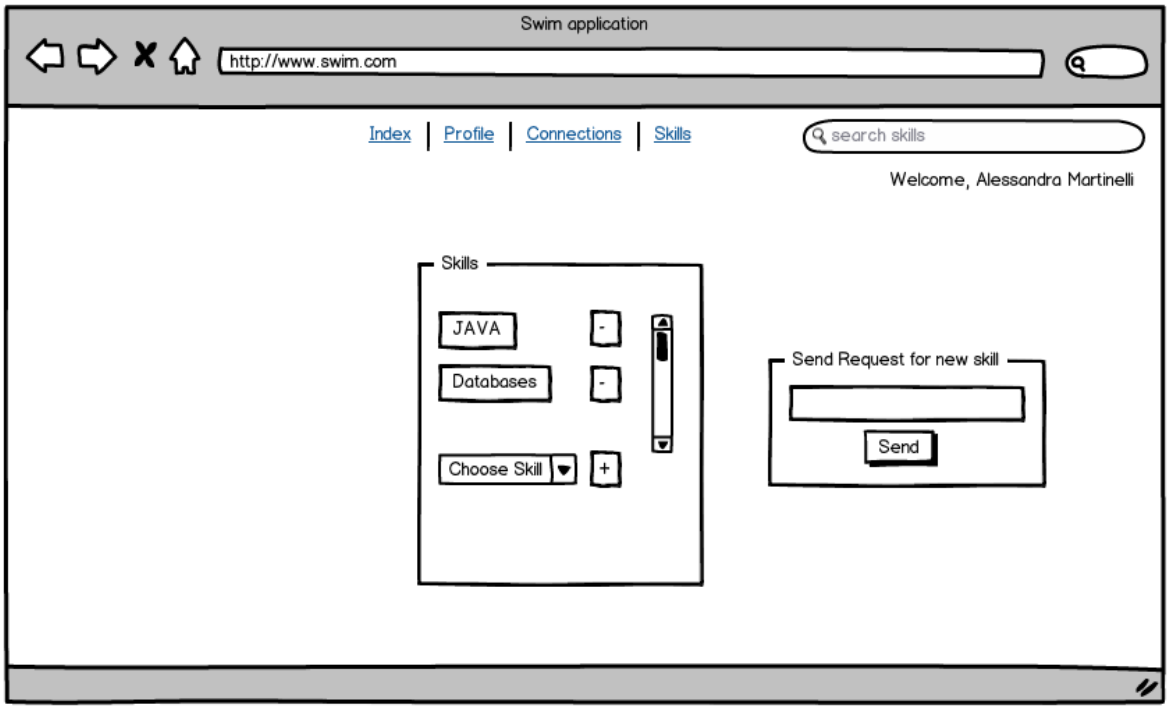


User interface 6: View connection requests layout



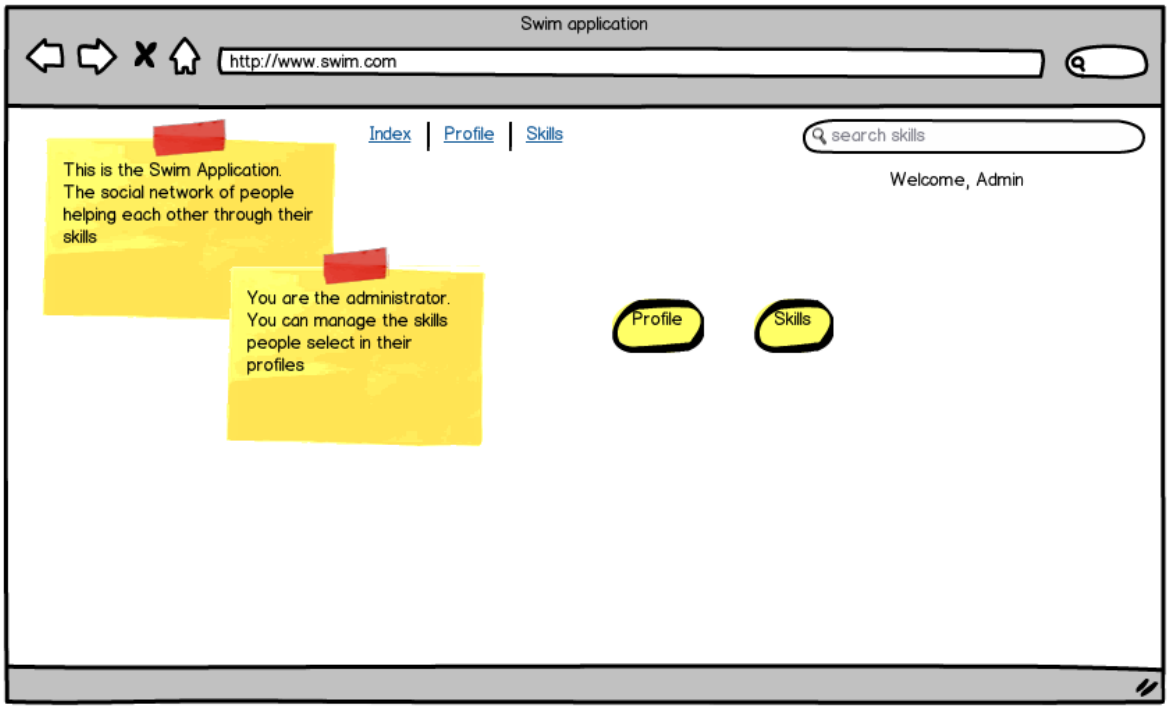
User interface 7: View pending requests layout

The following mockup represents the general layout applied for managing personal skills as an expert:

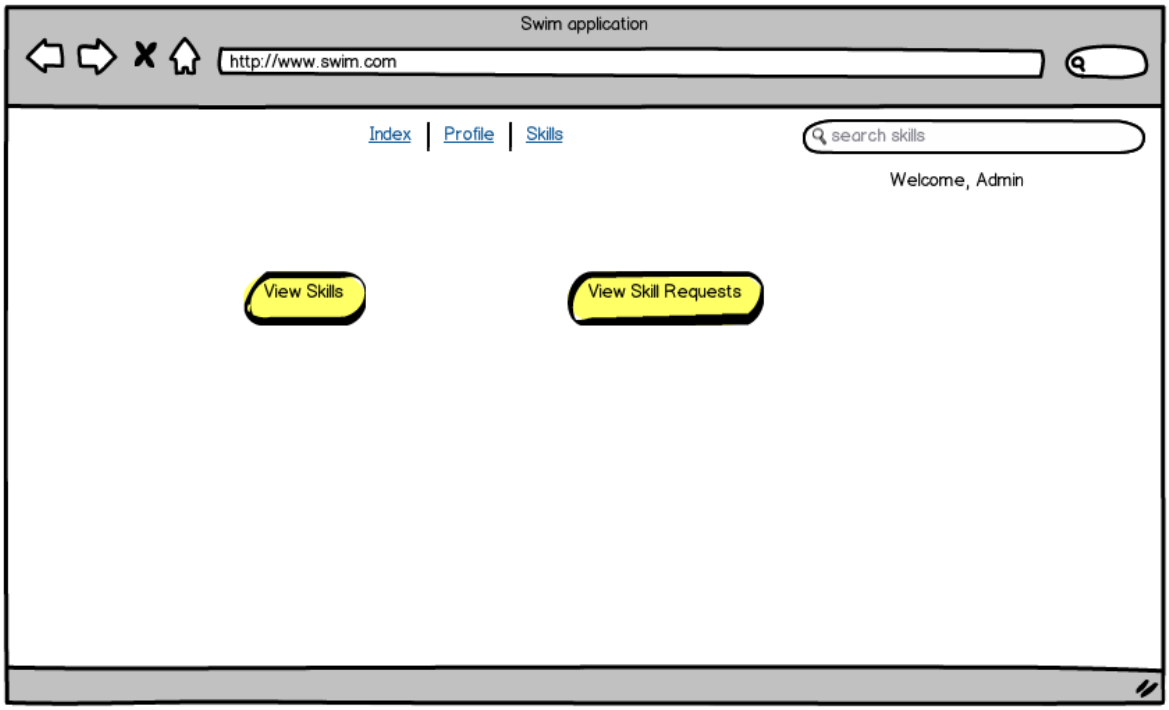


User interface 8: View skills layout

The following mockup represents the general layout applied for the administrator:

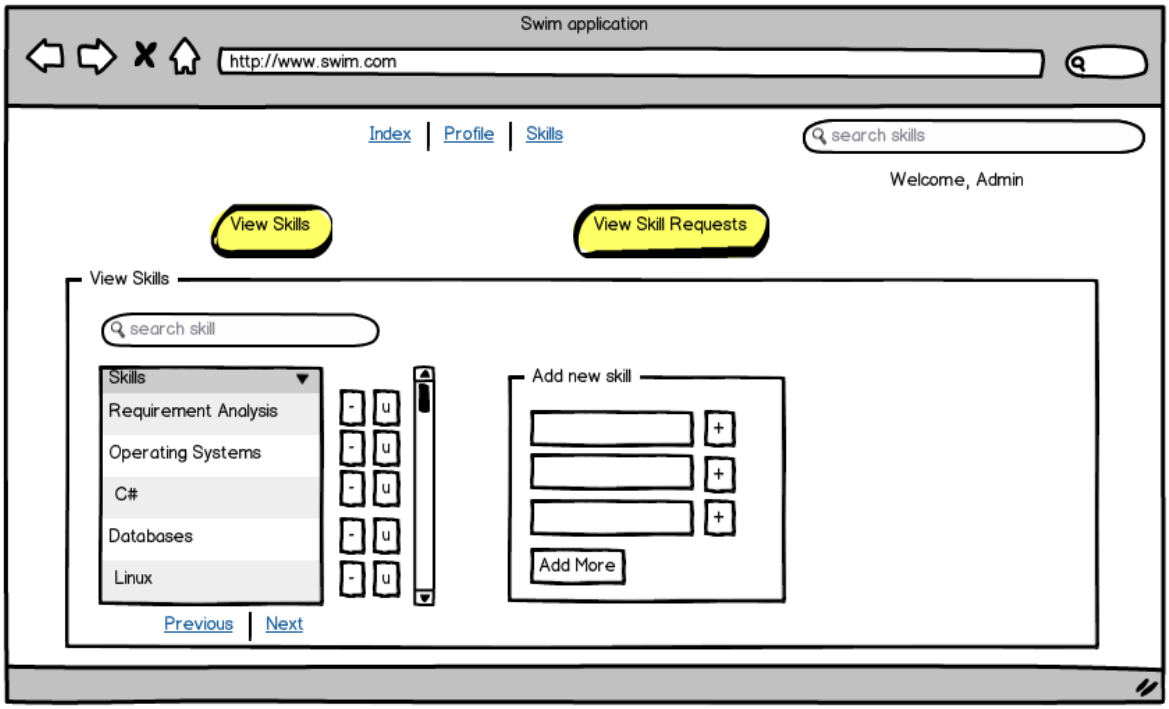


User interface 9: Admin homepage layout

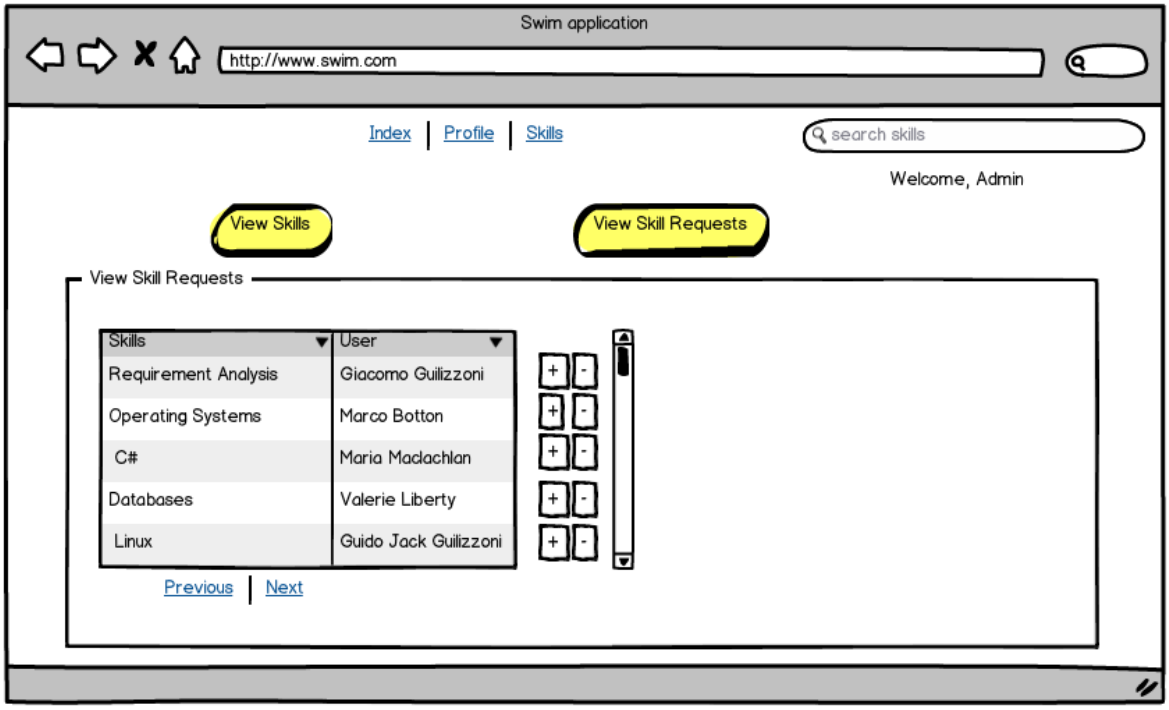


User interface 10: Admin skills layout

The following mockup represents the general layout applied for managing system skills as an administrator:



User interface 11: Admin view skills layout



User interface 12: Admin view skill requests layout

2.1.3 Hardware interfaces

The software product does not provide any hardward interface.

2.1.4 Software interfaces

Database Manaement System

Name: MySQL
Mnemonic: MySQL
Specification number: Community Server
Version number: 5.5.28
Source: http://www.mysql.com/downloads/mysql/

Application Server

Name: JBoss Application Server
Mnemonic: JBossAS
Specification number: Thunder
Version number: 7.1.0.Final
Source: http://www.jboss.org/jbossas/downloads/

Operating System

The software product will run in any operating that supports the Java virtual machine and the DBMS and application server described above.

2.1.5 Communications interfaces

Protocol	Port	Service
TCP	80	TCP
TCP	3306	MySQL(only if is in a different physical server)

Table 1: Communication interfaces

For the first release of the software product we will assume that the DBMS and the AS run both on the same physical server.

2.1.6 Memory

The minimum memory requirements are:

- Primary Memmory: 2 GB+
- Secondary Memmory: 40 GB+

2.1.7 Operations

A user can interact with the system as a functional user (anonymous or unregistered, expert or registered and administrator). For all the users, their functional operations are described in the product functions section.

2.1.8 Site adaptation requirements

The software product requires the following in order to run:

- Java virtual machine.
- AS
- DMBS
- Primary memory required space.
- Secondary memory required space.

Users are required to have installed any of the following web browsers: IE 6.0+, FF 10+ or Chrome 20+.

2.2 Product Functions

This subsection provides a summary of the major functions of the software product.

2.2.1 General Requirements

We have identified 4 main general requirements:

- Managing Profiles
- Managing Users
- Managing Connections
- Managing Skills

The functional and non-functional requirements are defined and explained in detail in the following subsections.

2.2.1.1 Managing Profiles

Functional requirements

[FR1] View personal information
[FR2] Modify personal information
[FR3] Add skill
[FR4] Remove skill

2.2.1.2 Managing Users

Functional requirements

[FR1] Register to the system
[FR2] Login
[FR3] Logout
[FR4] Modify password
[FR5] Recover password

Non-functional requirements

[NFR1] User password must be stored securely.
[NFR2] System must support high number of users

2.2.1.3 Managing Connections

Functional requirements

[FR1] Accept/Deny connection requests
[FR2] View connection requests
[FR3] View pending requests
[FR4] View connections
[FR5] Remove connections
[FR6] Search connections
[FR7] Add connection
[FR8] View suggested connections

Non-functional requirements

[NFR1] The precision of the suggestions related to the experts

2.2.1.4 Managing Skills

Functional requirements

[FR1] Send Request for new skill only for an Expert
[FR2] Add new skill into the set of skills only for Administrator
[FR3] Accept new skills for the set of skills only for Administrator
[FR4] Remove skill from the set of skills only for Administrator
[FR5] Rate the Expert for his skill only for Expert

2.3 User Characteristics

Intended users should meet the following characteristics:

- High school education level
- Knowledge in using a browser
- Knowledge in using a social network

2.4 Constraints

The following constraints apply to the software product:

2.4.1 Regulatory policies

The software product does not have to meet any regulatory policies.

2.4.2 Hardware limitations

The software product does not have any hardware limitations.

2.4.3 Interfaces to other applications

The software product does not interface to other applications.

2.4.4 Parallel operation

The software product must support the operation of simultaneous users specially when working with connection, and skill data.

2.4.5 Audit functions

The software product does not perform any audit.

2.4.6 Control functions

The software product does not control any device or any other system.

2.4.7 Higher-order language requirements

The software product requires basic knowledge of HTML, Java and JEE technologies.

2.4.8 Signal handshake protocols

The software product does not manage any handshake protocol.

2.4.9 Reliability requirements

The software product does not require any specific requirements to perform and maintain its functions under normal operation.

2.4.10 Criticality of the application

The software product requires proper support for concurrent users.

2.4.11 Safety and security considerations

The software product does not require any safety and security considerations.

2.5 Assumptions and Dependencies

The requirements in this document are grounded on the following assumptions:

1. The Java virtual machine is already installed on the OS.
2. Users have a decent and acceptable Internet connection.
3. The software product provides one administrator user by default.
4. The software product does not support more than 1 administrator.

2.6 Apportioning of requirements

Future releases of the software product may provide support for:

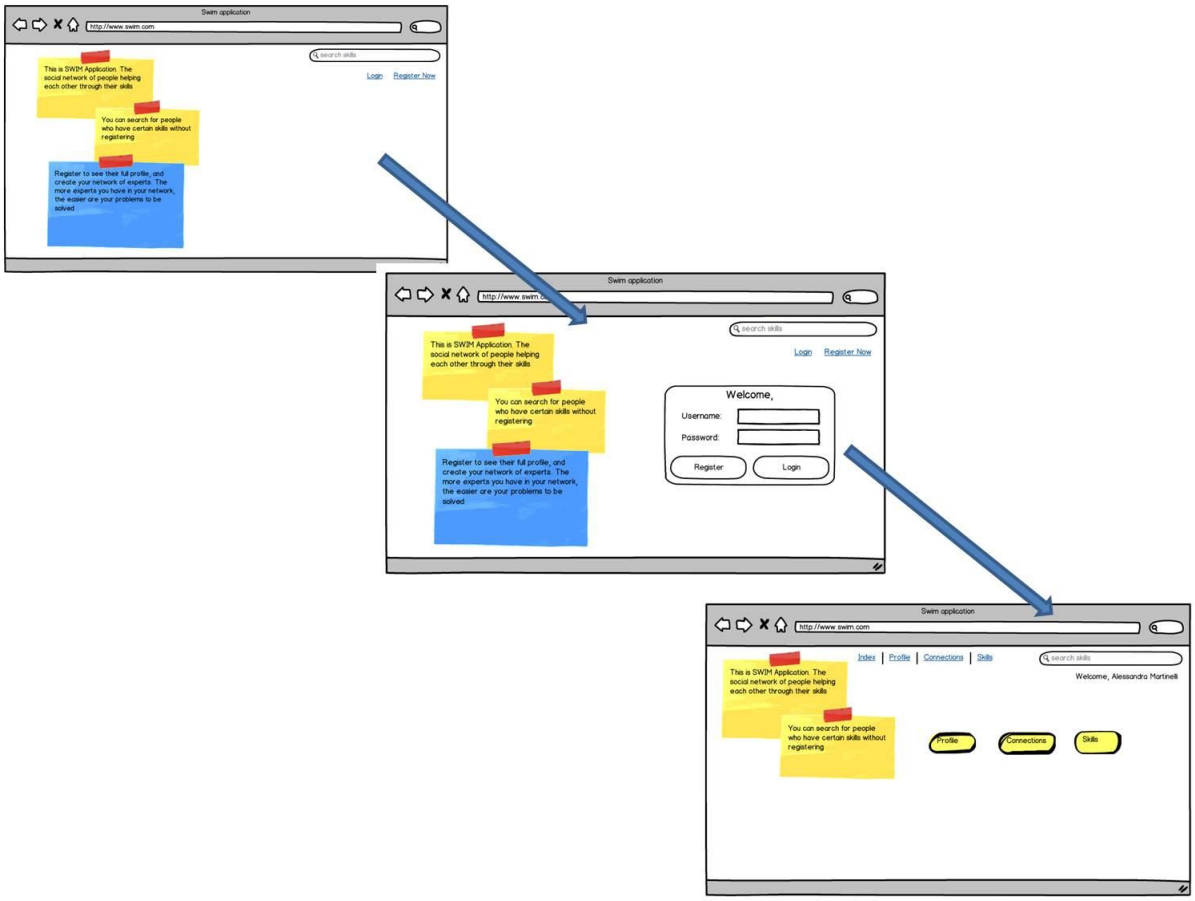
1. Connectivity to other social networks.
2. Many administrators.
3. Messaging among users.
4. Logging and auditiong of operations.

3. Specific Requirements

3.1 External interface requirements

3.1.1 User interfaces

The following story board represents the workflow to get to the expert home page from the default home page:



StoryBoard 1: Story board of the user interface

3.1.2 Hardware interfaces

The software product does not provide any hardware interfaces.

3.1.3 Software interfaces

The software product does not provide any software interfaces.

3.1.4 Communications interfaces

The software product does not provide any communications interfaces.

3.2 Functional Requirements

3.2.1 Scenarios

3.2.1.1 Unregistered user searches for a skill

Unregistered user searches for a skill	
Code	SCS001
Description	Describing how the unregistered user searches for a skill
Goal	[G1] Allow people to search for experts in a specific topic.
Assumption	1. User is not registered
Alessandra works as software programmer in a small firm that she owns. She is searching for a good Java programmer, who can help her in her latest project. Alessandra is not happy with the CV's she got from advertising the vacancy position, so she decides to check online in the search engines. She connects to the internet, and opens a web browser installed on her computer, and then she starts searching. During this search she finds a very nice website called SWIM where she reads that she can search any expert which has the skills that match her search. In the website, the search box is immediate. She can search in the entire set of users. She types Java Programming and she immediately gets the results of the most rated experts for that skill. The website lets her check who are the experts on Java Programming, but she cannot access any other information regarding the profiles of the experts she found.	

3.2.1.2 Registering in the system

Registering in the system	
Code	SCS002
Description	Describing how a user registers in the system
Goal	[G2] Experts can declare their fields of expertise and their personal information
Assumption	1. Expert is not registered
Alessandra likes SWIM and she wants to register and start searching for the experts she needs. So she clicks in the "Register" option. The system provides her of a form to be filled with useful information. There she has to input some mandatory information like her username, password, email address, name, surname and at least one skill which are mandatory information, then she inputs personal information like her phone number, website, address etc. At the end she has to press the "Save" button or the "Cancel" button. She saves everything and logs out since she has to go to an important meeting.	

3.2.1.3 Expert searches for skills and experts

Expert searches for skills and experts	
Code	SCS003
Description	Describing how the experts search for experts and skills
Goal	[G1] Allow people to search for experts in a specific topic.
Assumption	1. Expert is already registered
Alessandra finishes her meeting and decides to log in SWIM again. She opens a web browser installed on her computer, and then she navigates to the address of the SWIM web application. She logs in and then she goes to the search box and searches for Java Programmer. Now she can see more information about the experts but still she cannot see any contact information. She reads the hints of the website, and understands that in order to have the contact information she	

needs to be connected to an expert. She is interrupted by a phone call.

3.2.1.4 Experts sends request for a new connection

Experts sends request for a new connection	
Code	SCS004
Description	Describing how the expert sends a connection request.
Goal	[G1] Allow people to search for experts in a specific topic. [G4] Experts can enlarge or shrink their network.
Assumption	1. Expert is already registered 2. Expert is logged in
Alessandra finishes her phone call and returns in the website. She is so happy for finding Greg, so she presses the button "Add Connection". Then she resumes searching for very good Java Programmers. Again she finds Lisa, her ratings are very high, and so she decides to add her as a connection too.	

3.2.1.5 View expert contact information

View expert contact information	
Code	SCS005
Description	Describing how the expert checks contact information of his new connections.
Goal	[G3] Allow experts to share personal information
Assumption	1. Expert is already registered 2. Expert is logged in 3. Experts are in the connection network of each other.
After a few hours Alessandra logs in to SWIM and she goes through Connections, View Connections section. She is immediately displayed a list of all her friends with most relevant information: name, surname, skills, email and phone number. She copies Greg's phone number and gives him a call to request a meeting. Then she checks Lisa's information copies her email, and sends her an official email from her official email to setup an appointment, in case Lisa is interested for a new job opportunity.	

3.2.1.6 Expert views the suggested connections

Expert views the suggested connections and adds connection	
Code	SCS006
Description	Describe how the experts views the list of the suggested connections, and how he adds a connection into his network from this list
Goal	[G3] Allow experts to share personal information [G4] Experts can enlarge or shrink their network.
Assumption	1. The expert is already registered into the application 2. The expert has a network of connections 3. The expert is already logged into the application

In the application Alessandra has a network of friends (connections). She wants to enlarge her network of friends, but she doesn't know to which expert to send an friend request. So, Alessandra goes to the "Connection" page and then she navigates to the "View Connections" page. In the "View Connection" page she sees the table of all of her connections, but also at the bottom of the page she sees a table of a suggested connections, that are suggested to her by the system. She quickly founds in the table an expert named Greg with a C# skill, and because she is an programmer, she decides to send him an friend request.

3.2.1.7 Expert views connection requests and pending requests

Expert views connection requests and pending requests	
Code	SCS007
Description	Describing how the expert checks his connection requests.
Goal	[G4] Experts can enlarge or shrink their network.
Assumption	1. Expert is already registered 2. Expert is logged in
The next day, Alessandra logs in to SWIM, goes to Connections, then to View Connection Requests and she sees has two connection requests from Lionel and Matt. She starts checking their name, surname and skills. She is interested in Lionel because has C# programming skills, so she presses "Accept" button. When she accepts the connection request she sees some connection suggestions from SWIM. She sees that the system suggested to her Mark, an old friend of hers. She immediately adds him too. Then she goes back, she is not interested in Matt who has web designing skills, so she presses "Deny" button. Then she goes back and clicks on View Pending Connections, there she views Mark, as a pending connection.	

3.2.1.8 Expert modifies the personal data

Expert modifies the personal data	
Code	SCS008
Description	Describe how the expert changes the personal information
Goal	[G2] Experts can declare their fields of expertise and their personal information.
Assumption	1. The expert is already registered into the application
Alessandra has an account at the SWIM web application. She recently changed her home address, her cell phone, and also she got her new certificate in "ASP.NET 4.5" programming from Microsoft. So, now she wants to update her personal information, and skills in her SWIM profile. Alessandra connects to the internet, and opens a web browser installed on her computer, and then she navigates to the address of the SWIM web application. On the main page, she sees a navigation button named "Profile", and she presses the button. Because, she is not logged in into the application, the system first prompts to her a dialog for entering her username and password. After a successful validation of her credentials, the system navigates her automatically to the "Profile" page. In the "Profile" page, she sees all of her personal information. She updates the address and phone number fields with the new values. At the bottom of the "Personal" page she sees all of her	

skills. By choosing the skill “ASP.NET 4.5” from the predefined list of all skills, and pressing the command “Add skill”, she adds a new skill into her set of skills. At the end, Alessandra presses the “save” command and the system notifies her that all the data are successfully saved.

3.2.1.9 Expert views the connections

Expert views the connections	
Code	SCS009
Description	Describe how the experts views their connection
Goal	[G3] Allow experts to share personal information [G4] Experts can enlarge or shrink their network.
Assumption	4. The expert is already registered into the application 5. The expert has a network of connections
In the application Alessandra has a network of friends (connections). She wants to see her full list of connections. Alessandra connects to the internet, and opens a web browser installed on her computer, and then she navigates to the address of the SWIM web application. On the main page, she sees an navigation button named “Connections”, and she pressed the button. Because, she is not logged in into the application, the system first prompts to her a dialog for entering her username and password. After a successful validation of her credentials, the system navigates her automatically to the “Connections” page. In the “Connection” page, she sees the option “View Connections”, so she navigates to the “View Connections” page. There she sees a table with all of her connections. She wants to see if David is still in her connection list. By pressing the next command, located below the table, she sees her next 20 connections. She is trying to find David, but she can’t, because her connection list is very long. So, she uses the search option, located above the table, and makes a search by a connection name “David”. After the search she sees the connection David in the table, accompanying with his basic personal information.	

3.2.1.10 Expert removes a connection

Expert removes a connection	
Code	SCS010
Description	Describe how the experts remove a connection from their list of connections
Goal	[G3] Allow experts to share personal information [G4] Experts can enlarge or shrink their network.
Assumption	1. The user is already registered into the application 2. The expert has at least one connection, named “David”
Alessandra is a computer programmer, and she has an account at the SWIM web application. In the application she has a network of friends (connections). She wants to remove the connection named “David” from her connection list. She is already logged in into the application, because previously she was modifying some of her personal information. On the top of the application window she sees the main menu, and the button named “Connections”, she pressed the button, and the system navigates her to the “Connections” page. There she uses the “View Connection” option to navigate to the “View Connection” page	

In the “View Connections” page, she sees a table with all of her connections. By using the search option, located above the table, she finds the connection named “David”. In the table row she sees an option “Remove”, and by pressing this command she removes the connection David from her connection list. The system, notifies her that the operation was successful.

3.2.1.11 Expert recovers the password

Expert recovers the password	
Code	SCS011
Description	Describe how the expert recovers the password for the SWIM account
Goal	[G2] Experts can declare their fields of expertise and their personal information.
Assumption	1. The expert is already registered into the application
Alessandra wants to login into the SWIM application. She connects to the internet, and opens a web browser installed on her computer, and then she navigates to the address of the SWIM web application. On the main page, she sees a navigation button named “Login”, and she pressed the button. The system navigates her to the “Login” page, where she enters her username and password. She is unable to login into her account, because she enters a wrong password. She had forgotten her password. On the login form, she sees the option “Password recovery”, and after pressing that command the system prompts to her a dialog for entering a username, and notifies her that a new password will be sent to her registration email address. So she enters her username, and submits the form. Then, she checks her mail box, and sees an email with subtitle “SWIM password recovery”. In the email Alessandra sees her new password for her SWIM account.	

3.2.1.12 User change the password

User change the password	
Code	SCS012
Description	Describe how the expert change the password for the SWIM account
Goal	[G2] Experts can declare their fields of expertise and their personal information.
Assumption	1. The user is already registered into the application
Alessandra wants to change her password of her SWIM account, because she recently had released that her password is too weak. She connects to the internet, and open a web browser installed on her computer, and then she navigates to the address of the SWIM web application. On the main page, she sees an navigation button named “Profile”, and she pressed the button. The system first prompt to her a login dialog, because she is still not logged in into her account, and after a successful logins she sees the “Profile” page. On the page there is an option “Change password”, after pressing this command the system asks from her to enter his old password, and to enter his desirable new password in two different fields. She enters the data, and presses the “save” option, but the system notifies her that her old password is wrong. So she reenters her old password again, and she submits the form. The system notifies her that her password was successfully changed.	

3.2.1.13 Expert request new skill addition

Expert request new skill addition	
Code	SCS013
Description	Describe how an expert requests the administrator the addition of a new skill into the set of skills
Goal	[G2] Experts can declare their fields of expertise and their personal information.
Assumption	1. The expert is already registered 2. The expert is logged in
Alessandra has completed a course in JQuery. Now she has the skill needed to use this technology and she wants to declare on the SWIM application. She navigates to the SWIM web application and provides her credentials for authentication. After logged in, on the main page, she sees a button named “Skills”, and she clicks it. The system displays all her declared skills and an option to add a new skill. She inputs the new skill name and submits the request. Next the system notifies her that the new skill has been submitted for approval to the administrator.	

3.2.1.14 Expert rates another expert

Expert rates another expert	
Code	SCS014
Description	Describe how an expert rates the skill of another expert who has provided his services.
Goal	[G5] Experts can rate their connections
Assumption	1. The expert is already registered 2. The expert is logged in 3. The expert has at least one connection, named “David” who has at least 1 skill declared.
David is proficient with Oracle 10R2 database. Alessandra has hired David services and she is very satisfied with his work. She wants to express her satisfaction with a good rating on the SWIM application. She navigates to the SWIM web application and provides her credentials for authentication. After logged in, on the main page, she sees a button named “Connections”, and she clicks it. The system presents options for managing connections. Alessandra selects “View Connections”. Then the system displays a table with all the connections. She searches for David within the table of connections. Once it has found him, she grades him using a rating system provided. Immediately the rating indicator for David increases.	

3.2.1.15 Administrator modifies a skill

Administrator modifies a skill	
Code	SCS015
Description	Describes how an administrator modifies an existing skill.
Goal	[G2] Experts can declare their fields of expertise and their personal information
Assumption	1. There it at least 1 skill provided by default by the SWIM web application.
Greg receives an email where an expert reports that the existing skill "Rubi" has a typo error, instead it should be "Ruby". He browses to the SWIM web application and provides his credentials for authentication. After logged in, on the main page, he sees a button named "Skills", and he clicks it. The system presents the "Skills" page, where there is a table with all the skills. Greg quickly locates the mistyped skill "Rubi" by using the search option provided located above the table. After that, he clicks on the "Modify" option next to it to change the skill text to "Ruby". Finally to set the new skill name Greg clicks the "Save" option and the system updates the skill name in the list to "Ruby".	

3.2.1.16 Administrator accepts request for new skill

Administrator accepts request for new skill	
Code	SCS016
Description	Describes how an administrator accepts the request for a new skill.
Goal	[G6] The system will provide a set of skills and allow experts to send requests to add skills
Assumption	1. An expert has requested a new skill addition to the skillset.
Greg gets an email notification that there is a new skill request from Alessandra regarding JQuery. He browses to the SWIM web application and provides his credentials for authentication. After logged in, on the main page, he sees a button named "Skill Requests", and he clicks it. The system presents the skill requests management page where he can manage all pending requests for new skills. Greg reviews Alessandra's request for skill JQuery, checks and validates that the new skill meets the criteria of the SWIM web application and decides to accept it by clicking the "Accept" option next to it. After that, the system adds the JQuery skill to the SWIM skillset.	

3.2.1.17 Administrator Rejects request for new skill

Administrator rejects request for new skill	
Code	SCS017
Description	Describes how an administrator rejects the request for a new skill.
Goal	[G6] The system will provide a set of skills and allow experts to send requests to add skills
Assumption	1. An expert has requested a new skill addition to the skillset.
Greg gets an email notification that there is a new skill request from Alessandra regarding LISP. He browses to the SWIM web application and provides his credentials for authentication. After logged in, on the main page, he sees a button named "Skill Requests", and he clicks it. The system presents the skill requests management page where he can manage all pending requests for new skills. Greg reviews Alessandra's request for skill LISP, checks and validates that the new skill meets the criteria of the SWIM web application and decides to reject it (because there is already an skill named LISP) by clicking the "Deny" option next to it.	

3.2.1.18 Administrator views pending skill requests

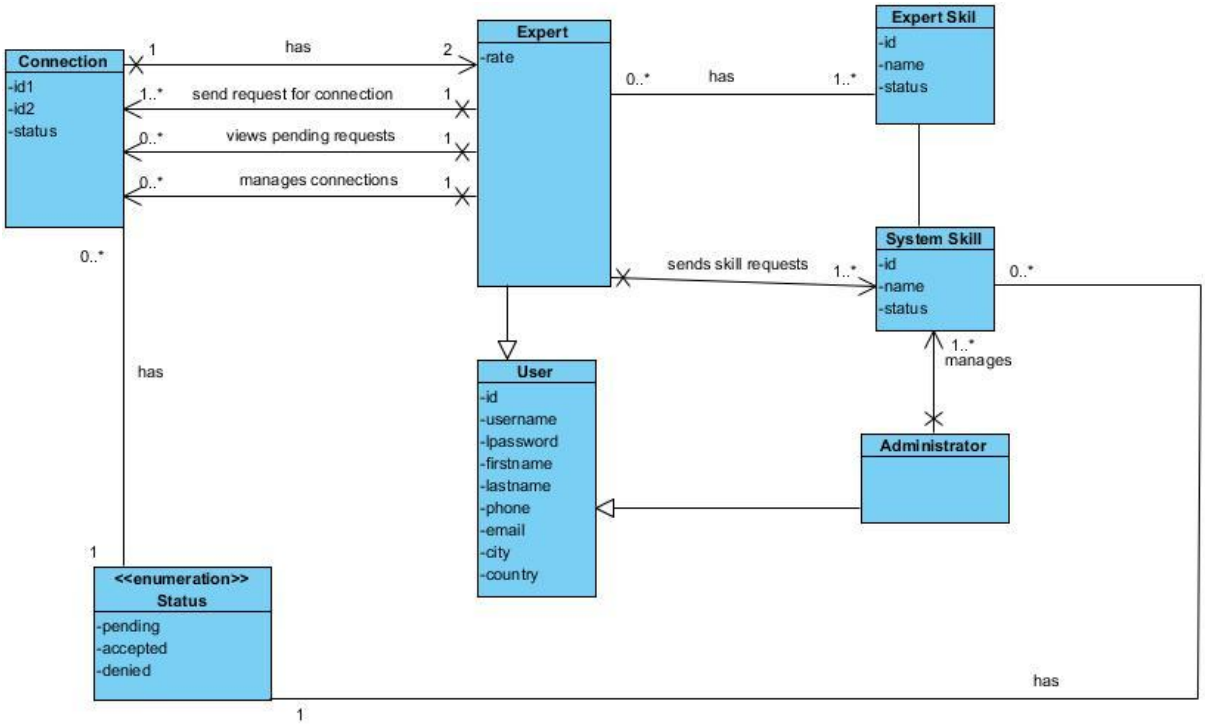
Administrator views pending skill requests	
Code	SCS018
Description	Describes how an administrator visualizes requests for new skills.
Goal	[G6] The system will provide a set of skills and allow experts to send requests to add skills
Assumption	1. The expert has requested a new skill addition to the skillset.
Greg browses to the SWIM web application and provides his credentials for authentication. After logged in, on the main page, he sees a button named "Skill Requests", and he clicks it. The system presents the skill request management page where it displays a table with all the pending skill requests.	

3.2.1.19 Administrator views pending Connection requests

Administrator views pending connection requests	
Code	SCS019
Description	Describes how an administrator visualizes requests for new connections.
Goal	[G4] Experts can enlarge or shrink their network
Assumption	1. Expert is already registered 2. Expert is logged in
Alessandra wants to check who she has sent connection requests to. She navigates to the SWIM web application and provides her credentials for authentication. After logged in, on the main page, she goes to “Connections”, then to “View Pending Requests”. The system displays a list of the pending connection requests issued by Alessandra.	

3.2.2 Analysis model

The analysis model represents the core concepts; the following diagram introduces the conceptual classes that we have decided to include in the software product.

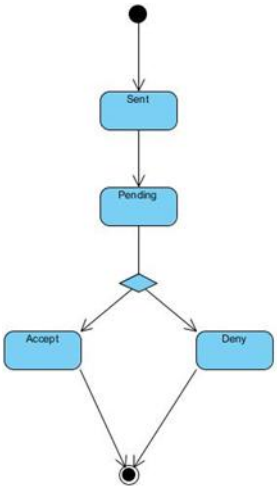


Class Diagram 1: Analysis diagram

Note that Expert Skill is the conceptuar class for the skills that an expert can manage, they represent his skills, meanwhile System Skill is the conceptual class for the whole set of skills in the system that the administrator can manage.

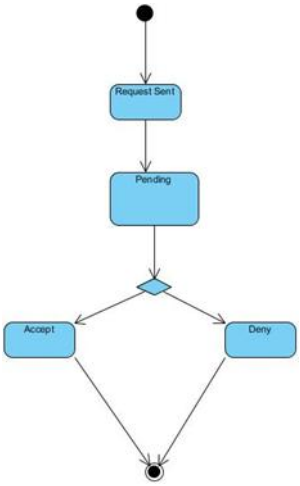
3.2.3 State chart model

The following following state charts were dentified as part of the requirements analysis: connection states and skill states.



State Chart 1: Connection states

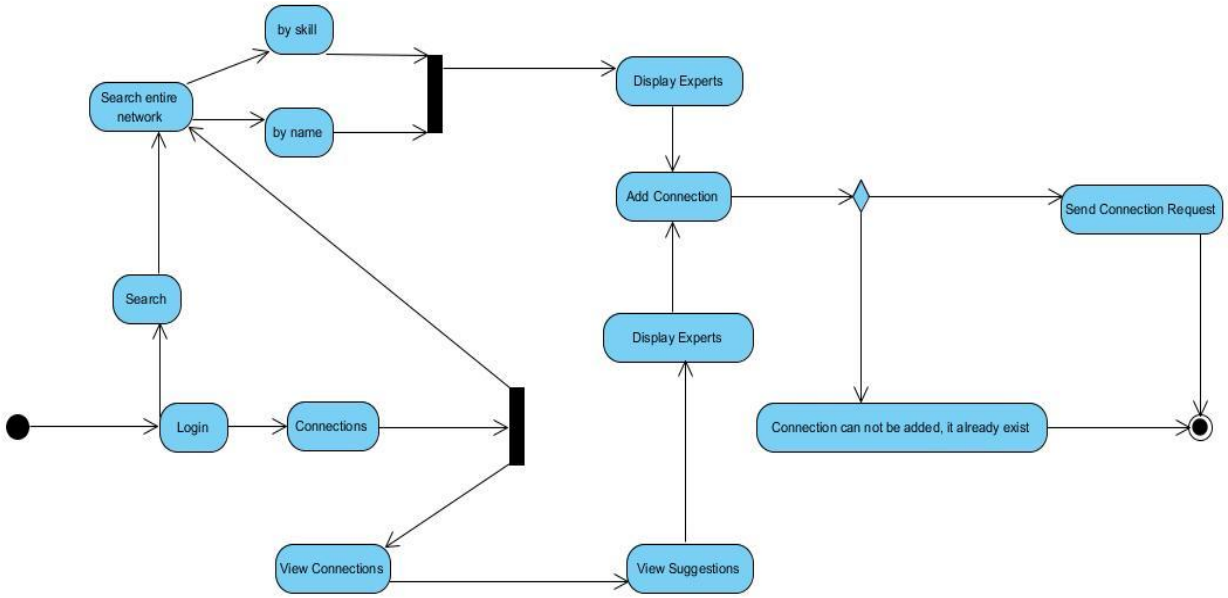
In both cases connections and skills undergo the same states. The difference is that in the connections the interaction is between experts, but in skills, the interaction is between the expert and the administrator of the system.



State Chart 2: Skill states

3.2.4 Activity Model

Since the main goal of the software product is to create a social network, below we introduce the activity diagram for adding a connection.

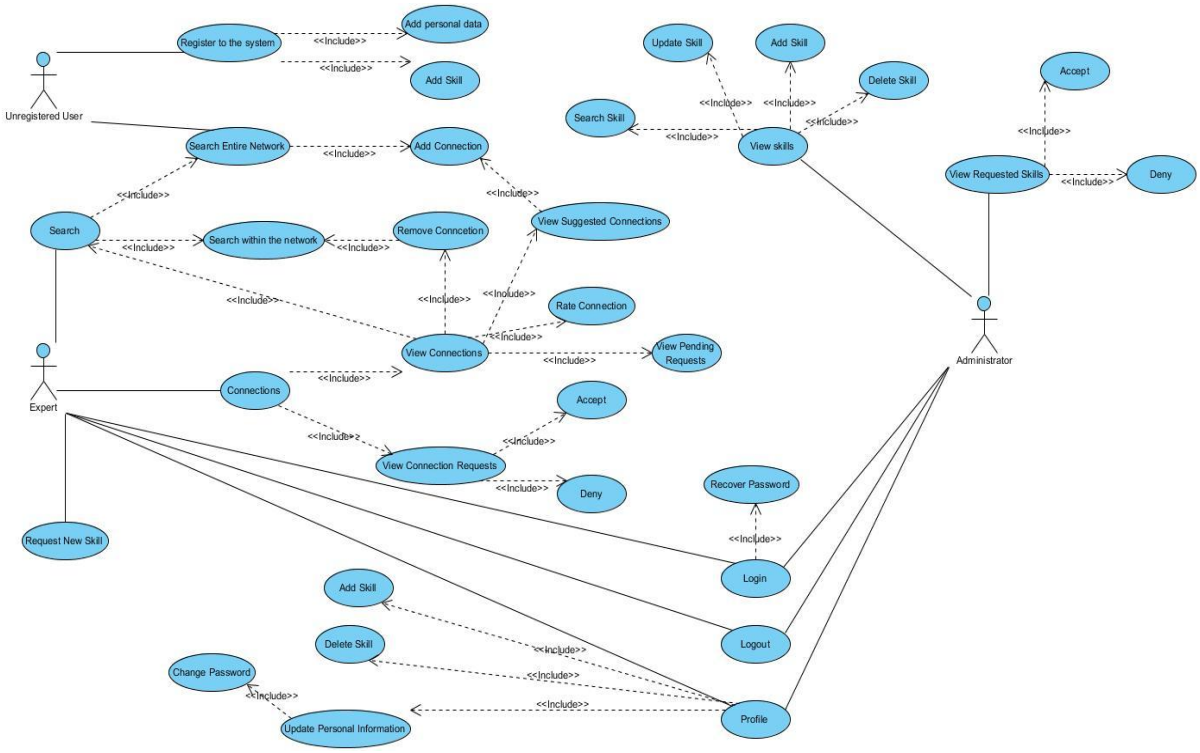


Activity Diagram 1: Add new connection diagram

3.2.5 Use case model

Below the general use case is depicted, in which we include our three main actors:

- Unregistered User
- Expert
- Administrator

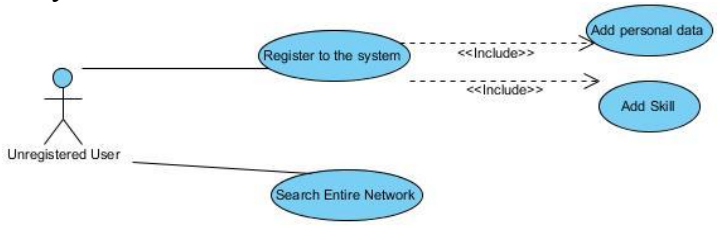


Use Case 1: General use case

The following subsections will present every usecase in detail.

3.2.6 Unregistered User

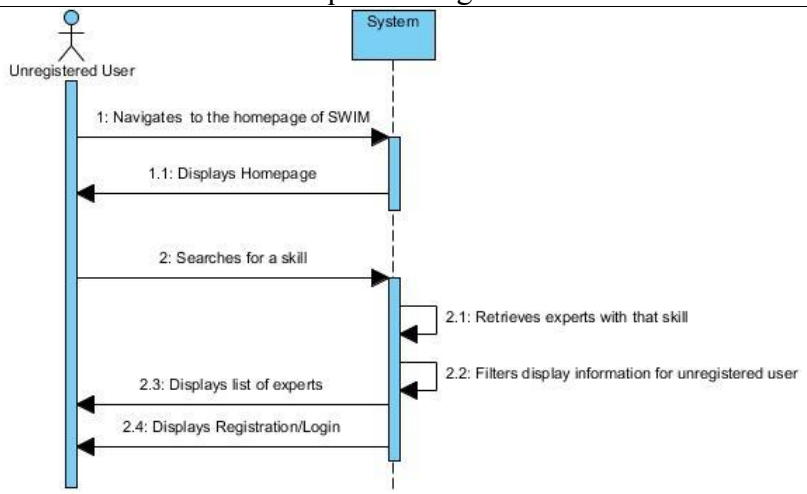
The unregistered user can search entire network without being registered or can register into the system.



Use Case 2: Unregistered user

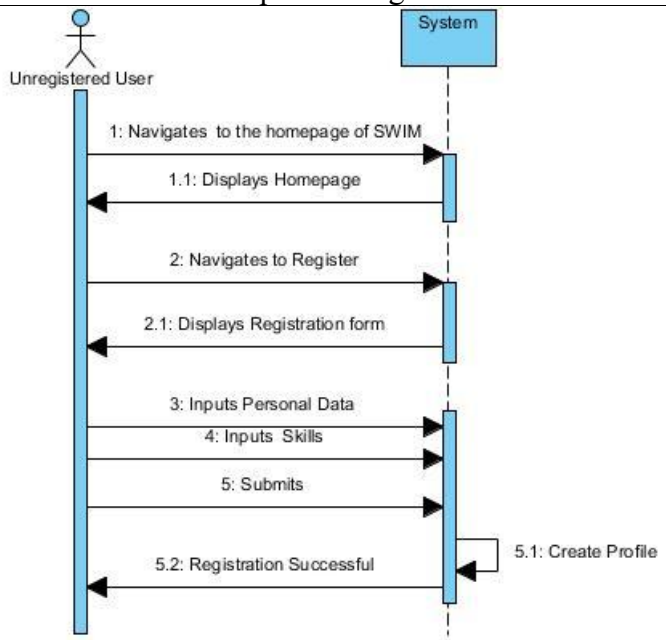
3.2.6.1 Searching

Searching	
Code	USC001
Description	Unregistered user searches for a skill in the entire set of experts
Goal	[G1] Allow people to search for experts in a specific topic.
Assumptions	
Actors	The unregistered user
Entry condition	The unregistered user navigates to the homepage of SWIM.
Exit condition	The list compliant to the search is displayed to the unregistered user.
Flow of events	
	1. The unregistered user navigates to the homepage of SWIM 2. The unregistered user inputs in the search box the skill he is searching for 3. The system provides him with the search results matching with the most rated experts who have that skill. 4. The system filters the information to be displayed, since the user is not logged in. 5. The system provides the Registration/Login form.
Exceptions	The skill does not exist, so the search returns no results.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



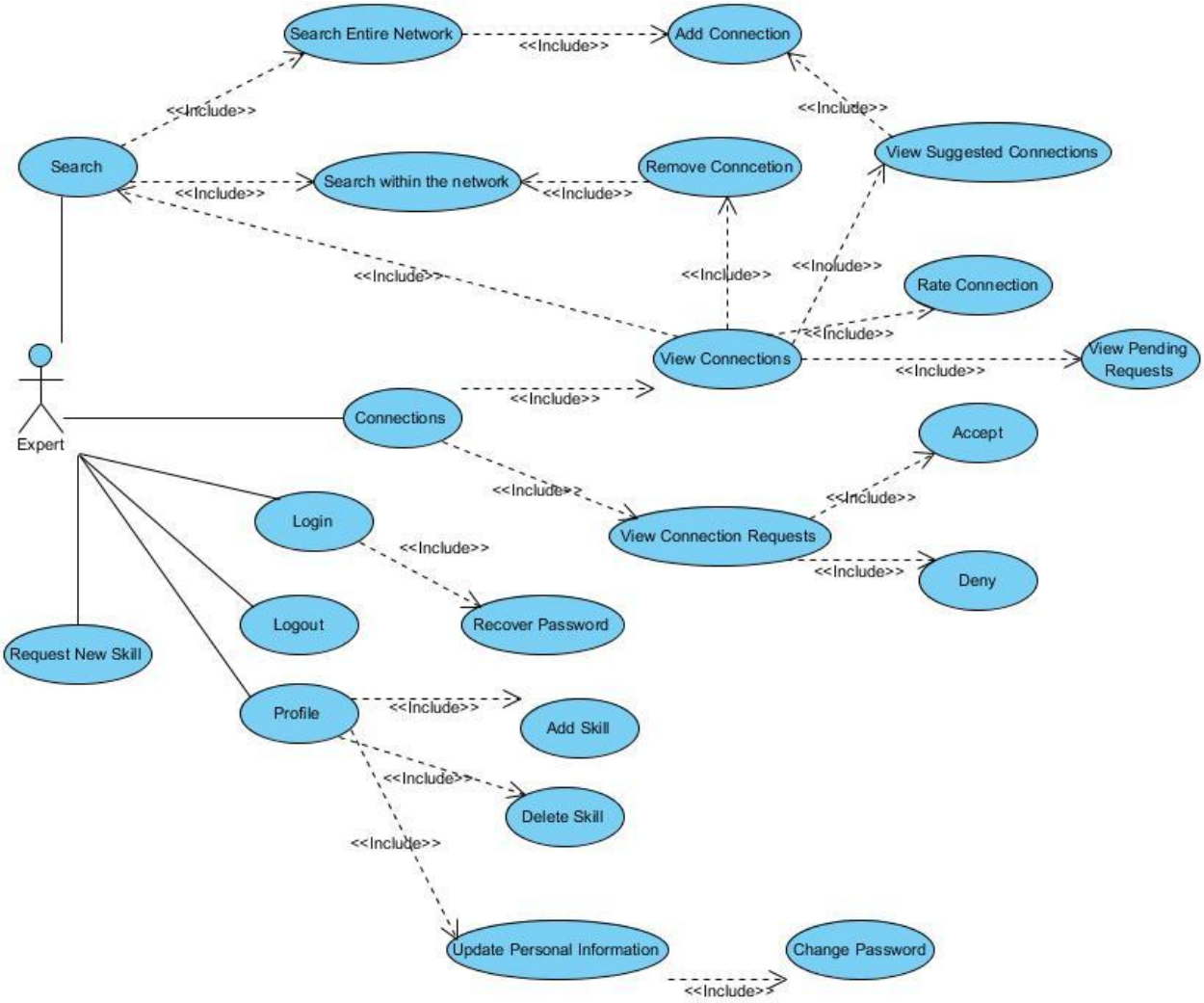
3.2.6.2 Registering in the system

Registering in the system	
Code	USC002
Description	The unregistered user registers in the system.
Goal	[G2] Experts can declare their fields of expertise and their personal information
Assumptions	User not registered in the system.
Actors	Unregistered User
Entry condition	The unregistered user navigates to the homepage of SWIM.
Exit condition	Profile information and data are successfully saved.
Flow of events	
	1. The unregistered user navigates to the homepage of SWIM 2. The unregistered user selects Registration option. 3. The system provides him the form to be filled with personal data and skills. 4. The Unregistered User fills the form, and clicks save button. 5. The system displays successful registration.
Exceptions	Mandatory data not correctly filled.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



3.2.7 Expert

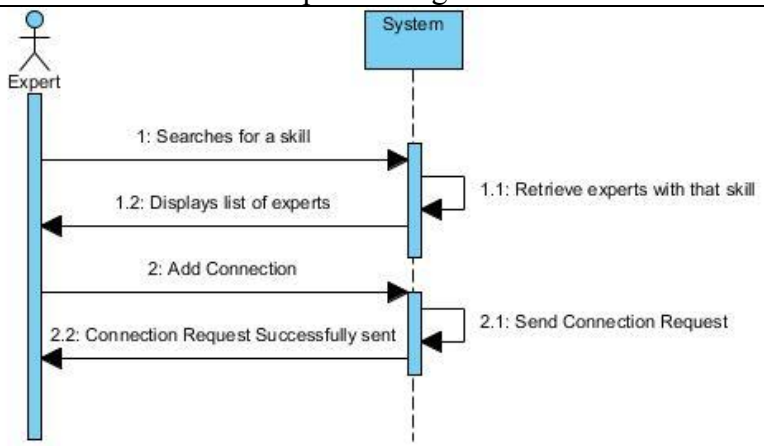
An expert is a registered user, who can login, logout, view/update profile, add/delete skills, request new skills, view/add/delete connections, accept/deny connection requests, view pending request, view/add suggested requests, search within the network, search in the entire network.



Use Case 3: Expert user

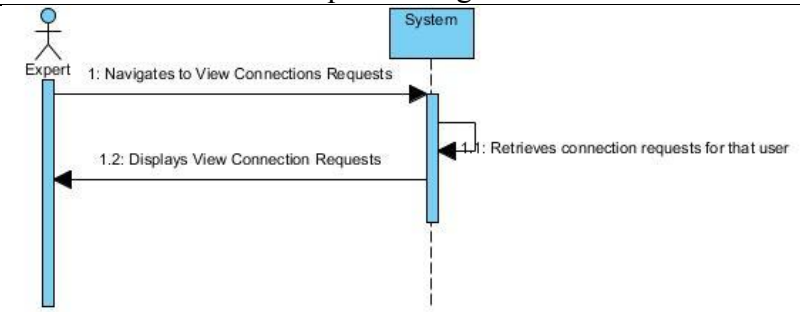
3.2.7.1 Searching, adding new connection

The expert logging in searching and adding a new connection, logging out	
Code	USC003
Description	The expert searches for specific skills and adds a new connection.
Goal	[G1] Allow people to search for experts in a specific topic. [G4] Experts can enlarge or shrink their network.
Assumptions	1. The expert is registered 2. The expert has already navigated to the homepage of SWIM 3. The expert has already logged in
Actors	The expert
Entry condition	The expert logs in his homepage of SWIM.
Exit condition	The expert logs out with successful new connection request sent
Flow of events	
	1. The expert goes to Search option and types a skill. 2. The system provides him with the search results matching with the most rated experts who have that skill. 3. The expert adds as connection one of the experts in the search result. 4. The system displays successful sent request.
Exceptions	Username, password mistake. Skill not existing.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



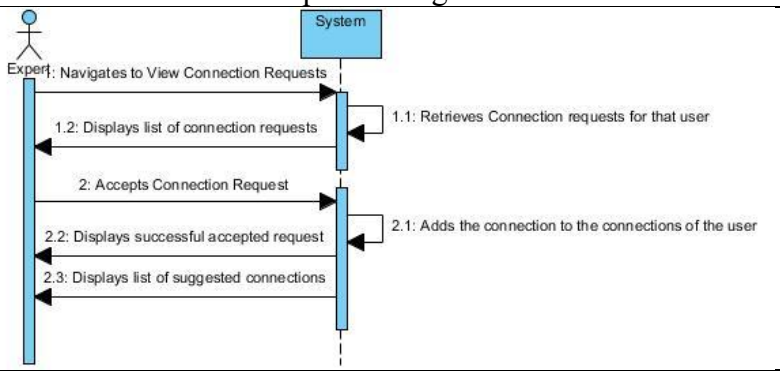
3.2.7.2 Viewing connection requests

The expert viewing connection requests	
Code	USC004
Description	The expert views his connection requests
Goal	[G1] Allow people to search for experts in a specific topic. [G4] Experts can enlarge or shrink their network.
Assumptions	1. The expert is registered 2. The expert has navigated to the homepage of SWIM 3. The expert has logged in 4. The expert has at least one connection 5. The expert has navigated in his homepage 6. The expert has navigated in Connection section
Actors	The expert
Entry condition	The expert logs in his homepage of SWIM.
Exit condition	The expert is provided the list of his connections requests.
Flow of events	
	1. The expert goes to View Connections Section. 2. The system displays the subsections 3. The expert goes to View Connection Requests 4. The system provides him with a table with all his connection requests, and the options of accepting or denying each connection request.
Exceptions	The expert not having any connections.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



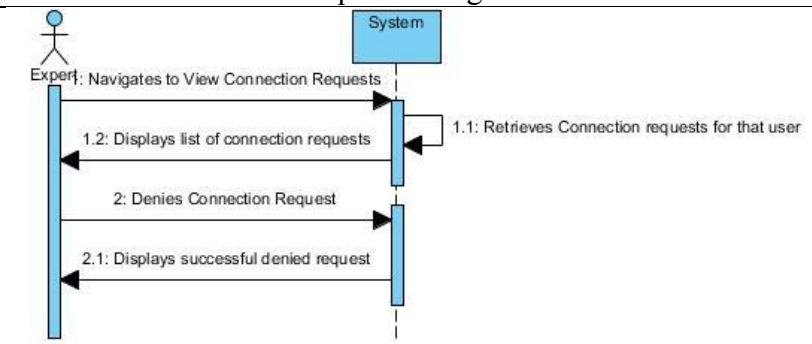
3.2.7.3 Accepting connection requests

The expert accepting connection requests	
Code	USC005
Description	The expert views his connection requests and decides to accept or deny them.
Goal	[G4] Experts can enlarge or shrink their network.
Assumptions	1. The expert is registered 2. The expert has navigated to the homepage of SWIM 3. The expert has logged in 4. The expert has at least one connection 5. The expert has navigated in his homepage 6. The expert has navigated through the Connections Section
Actors	The expert
Entry condition	The expert logs in his homepage of SWIM.
Exit condition	The expert accepts connection request.
Flow of events	
	1. The expert goes to View Connection Requests 2. The system displays list of connection requests 3. The expert accepts connection request 4. The system adds connection to the expert's connections 5. The system displays suggested connections based on the implemented algorithm
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



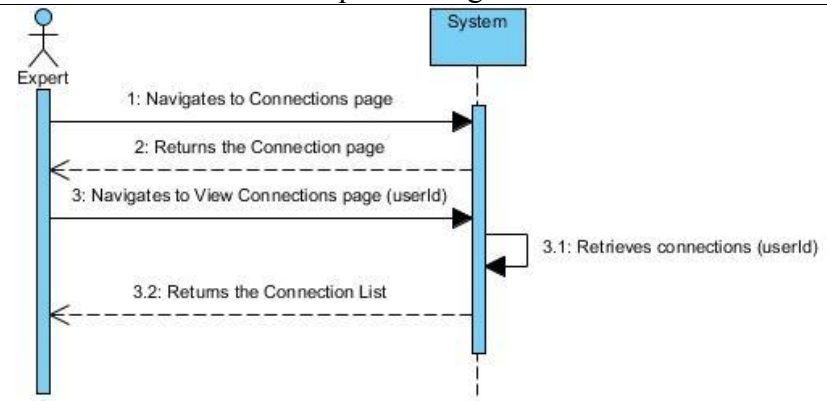
3.2.7.4 Denying connection request

The expert accepting connection requests	
Code	USC006
Description	The expert views his connection requests and decides to accept or deny them.
Goal	[G4] Experts can enlarge or shrink their network.
Assumptions	7. The expert is registered 8. The expert has navigated to the homepage of SWIM 9. The expert has logged in 10. The expert has at least one connection. 11. The expert has navigated in his homepage 12. The expert has navigated through the Connections Section.
Actors	The expert
Entry condition	The expert logs in his homepage of SWIM.
Exit condition	The expert denies connection request.
Flow of events	
	1. The expert goes to View Connection Requests 2. The system displays list of connection requests 3. The expert denies connection request 4. The system displays successful denial of request
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



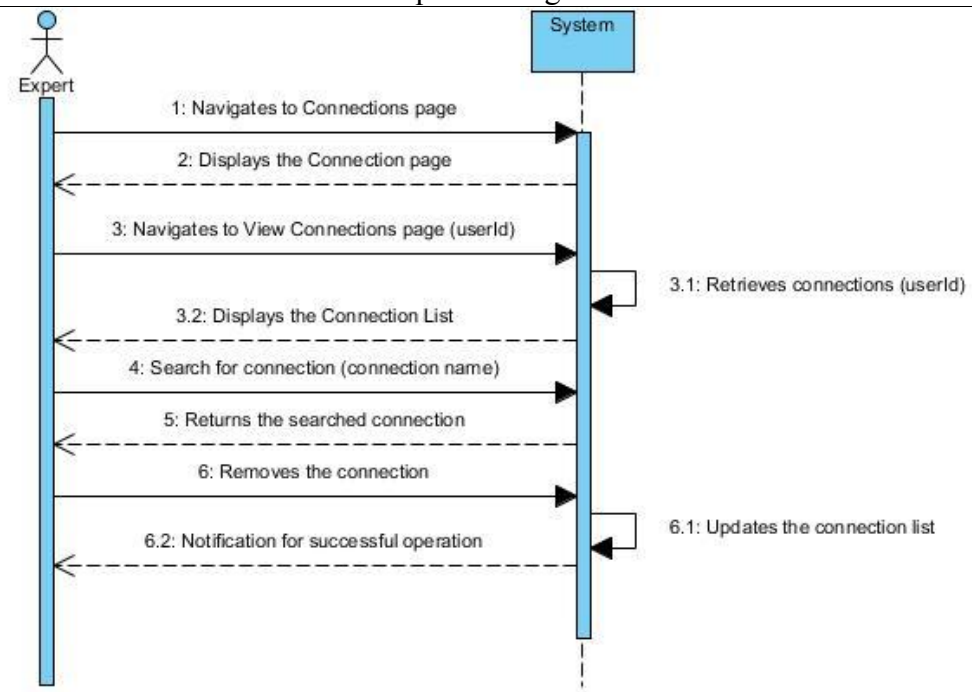
3.2.7.5 View Connections

View Connections	
Code	USC007
Description	The Expert views his connections
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigate to the “Connection” page
Exit condition	The Expert sees the table with his connections
Flow of events	
	6. The Expert navigate to the “Connections” page 7. The Expert navigate to the “View connection” page 8. The Expert sees the table of all of his connections
Exceptions	
Special requirements	The expert has a network of connections
Nonfunctional requirements	
Sequence diagram	



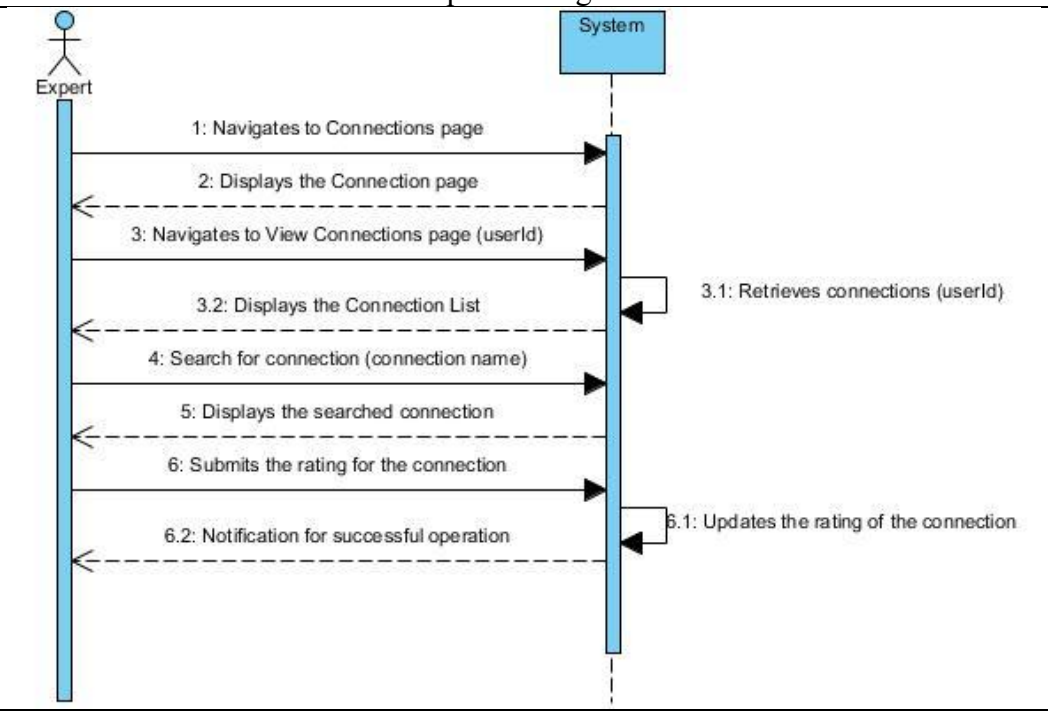
3.2.7.6 Remove Connection

Remove Connection	
Code	USC008
Description	The Expert removes a connection
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigate to the “Connection” page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigate to the “Connections” page 2. The Expert navigate to the “View connection” page 3. The Expert sees the table of all of his connections 4. The Expert search for the specific connection 5. The Expert sees the desired connection in the table, and uses the “remove” option in the table row to remove the connection 6. The system notifies the Expert that the connection is removed successfully
Exceptions	The search of the Expert doesn’t returns any of his connections
Special requirements	The expert has a network of connections
Nonfunctional requirements	
Sequence diagram	



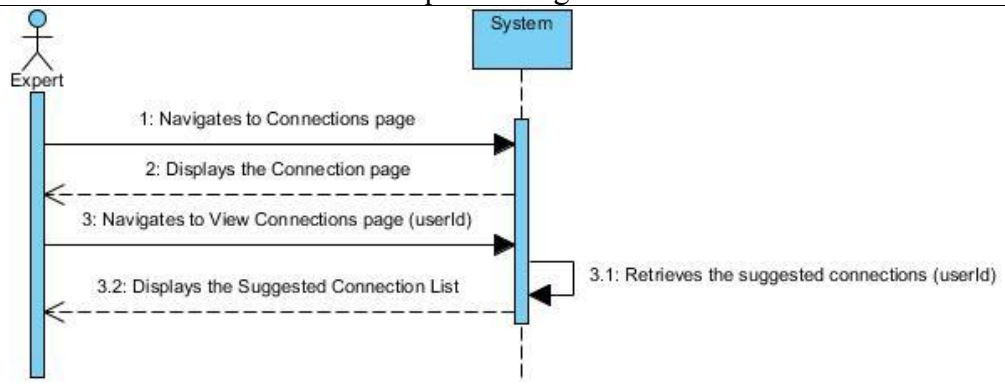
3.2.7.7 Rate an Expert (connection)

Rate an Expert (connection)	
Code	USC009
Description	The Expert gives a rating (from 1 to 5 start) to some connection into his network
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigates to the "Connection" page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigate to the "Connections" page 2. The Expert navigate to the "View connection" page 3. The Expert sees the table of all of his connections 4. The Expert search for the specific connection 5. The Expert sees the desired connection in the table, and uses the "rate" option list in the table row to choose a "star" rating for the connection 6. The Expert submits the data, by using the save option 7. The system notifies the Expert that the rating of that connection was successfully modified
Exceptions	The search of the Expert doesn't returns any of his connections
Special requirements	The expert has a network of connections
Nonfunctional requirements	
Sequence diagram	



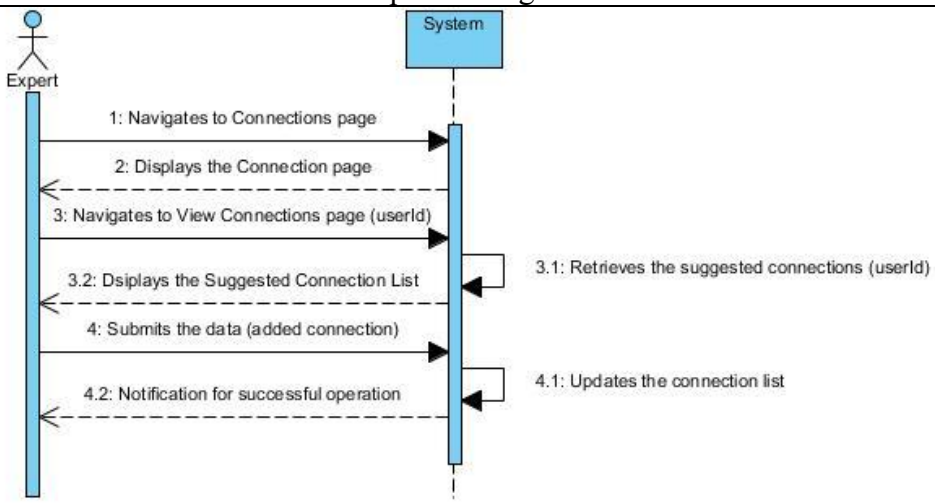
3.2.7.8 View suggested connections

View suggested connections	
Code	USC010
Description	The Expert views a list of suggested connections, that are not into his network of connections
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigates to the “Connection” page
Exit condition	The Experts sees the table with the suggested connections
Flow of events	
	1. The Expert navigates to the “Connections” page 2. The Expert navigates to the “View connection” page 3. The Expert sees a table with suggested connection for him
Exceptions	The system doesn’t provides suggested connections, because of a fault in the algorithm for calculating the suggested list
Special requirements	The expert has a network of connections
Nonfunctional requirements	
Sequence diagram	



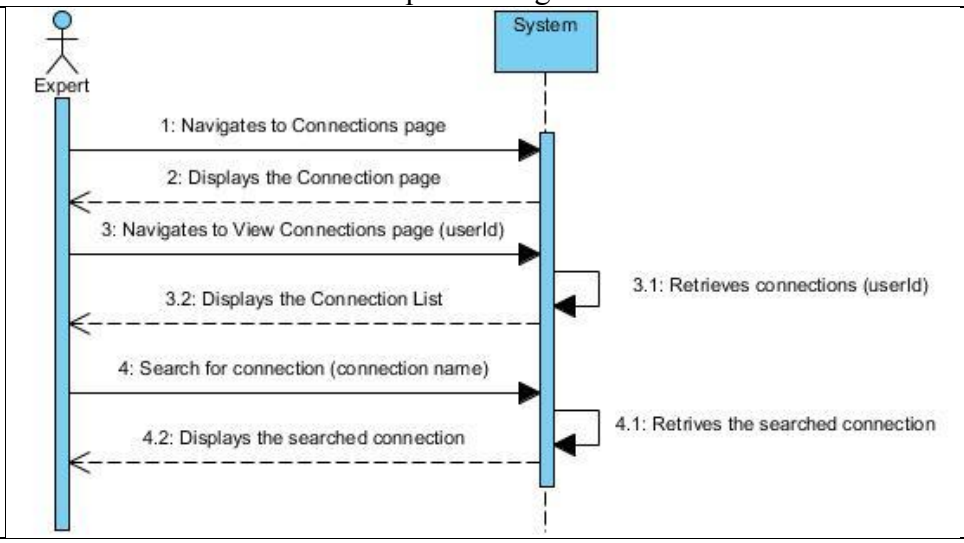
3.2.7.9 Add a suggested connection

Add a suggested connection	
Code	USC011
Description	The Expert views a list of suggested connections, and adds one of these connections into his network of connections
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigates to the “Connection” page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigates to the “Connections” page 2. The Expert navigates to the “View connection” page 3. The Expert sees a table with suggested connection for him 4. The Expert uses the option “Add” next to the suggested connection, and adds this connection into his network 5. The Expert submits the data, by using the save option 6. The system notifies the Expert for successfully adding the connection into his network
Exceptions	The system doesn’t provides suggested connections, because of a fault in the algorithm for calculating the suggested list
Special requirements	The expert has a network of connections
Nonfunctional requirements	
Sequence diagram	



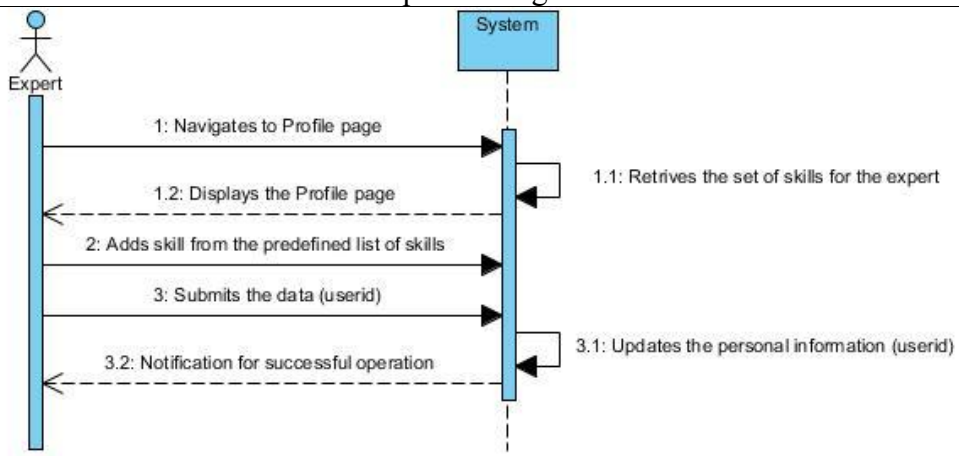
3.2.7.10 Search within the network of connections

Search within the network of connections	
Code	USC012
Description	The Expert makes a search only above his network of connections
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigates to the "Connection" page
Exit condition	The Expert sees the returned connection from the system
Flow of events	
	1. The Expert navigates to the "Connections" page 2. The Expert navigates to the "View connection" page 3. The Expert sees a table with all of his connections, and above the table he sees different search criteria 4. The expert makes a search by name, so he enters the name of the connection into the correct field 5. The Expert submits the data by using the search option 6. The Expert sees the returned connection from the system
Exceptions	
Special requirements	The expert has a network of connections
Nonfunctional requirements	
Sequence diagram	



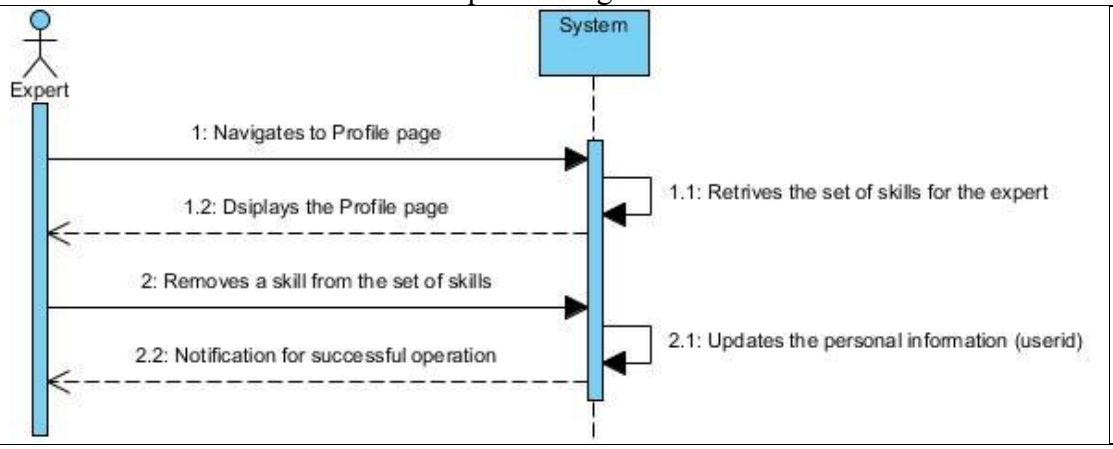
3.2.7.11 Adding a new skill

Adding a new skill	
Code	USC013
Description	The Expert adds a new skill into his profile
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigate to the Profile page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigates to the “Profile” page 2. The Expert sees the list with all of his skills 3. The Expert selects a new skill from the predefined set of skills, and by using the add option, he adds the skill into his set of skills 4. The Expert submits the data by using the save option 5. The system notifies the Expert that the data were successfully saved
Exceptions	The Expert already has this skill into his set of skills
Special requirements	
Nonfunctional requirements	
Sequence diagram	



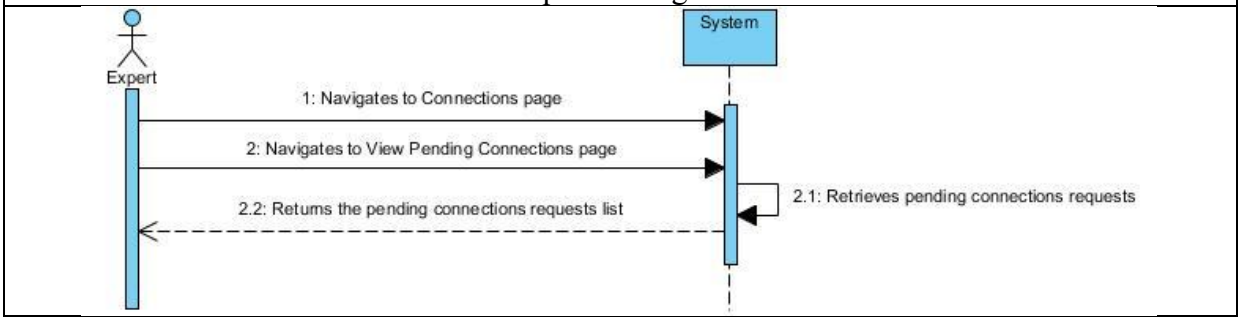
3.2.7.12 Deleting a skill

Deleting a skill	
Code	USC014
Description	The Expert deletes a skill from his set of skills
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert
Entry condition	The Expert navigate to the Profile page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigates to the “Profile” page 2. The Expert sees the list with all of his skills 3. The Expert selects one of his skills, and by using the delete option, he removes the skill from his set of skills 4. The Expert submits the data by using the save option 5. The system notifies the Expert that the data were successfully saved
Exceptions	
Special requirements	The Expert has more than one skill
Nonfunctional requirements	
Sequence diagram	



3.2.7.13 View Pending Requests

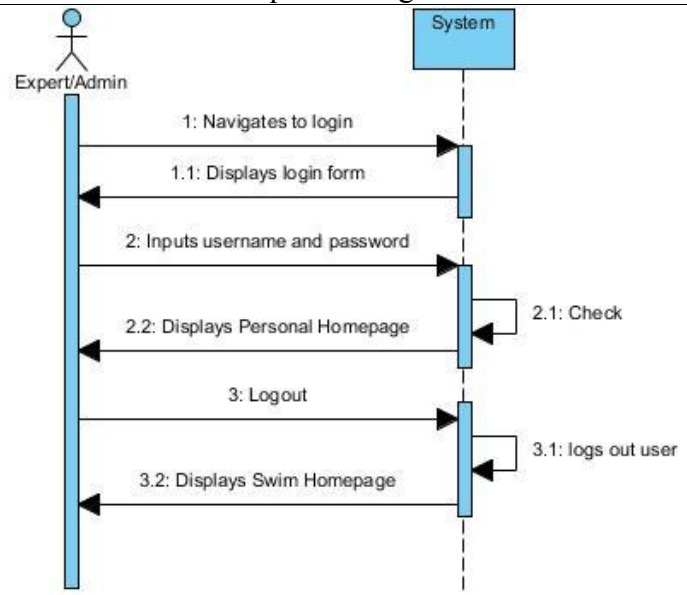
View Pending Requests	
Code	
Description	The expert views pending connection requests
Goal	[G4]
Assumptions	1. The expert is already registered into the application. 2. The expert is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The Expert sees the table with the pending connection requests.
Flow of events	
	1. The expert navigates to the “Connections” page. 2. The expert navigates to the “View Pending Connections” page. 3. The system displays a table with the pending connection requests.
Exceptions	The system does not display the table with the pending connections requests because there are no pending connection requests.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



3.2.8 Shared Usecases Expert/Administrator

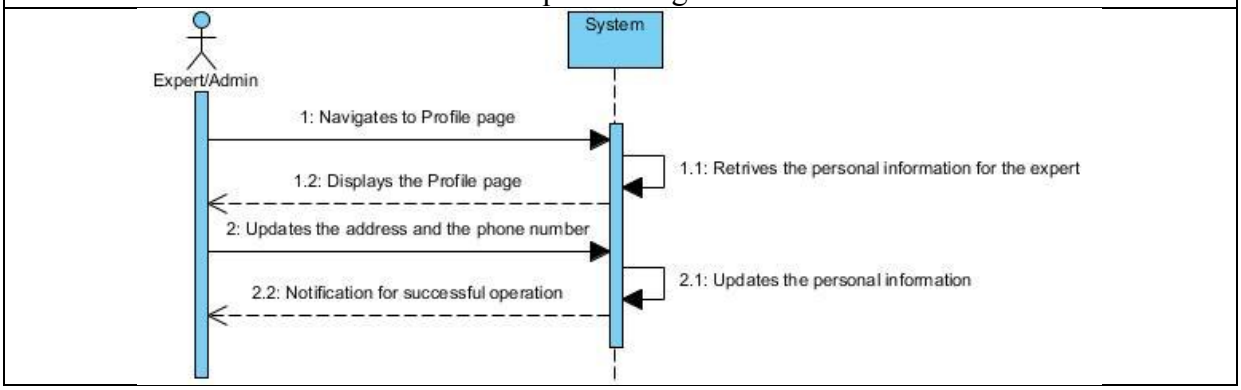
3.2.8.1 Logging in/logging out

Expert/Administrator log in and out	
Code	USC015
Description	The expert searches for specific skills and adds a new connection.
Goal	[G1] Allow people to search for experts in a specific topic. [G4] Experts can enlarge or shrink their network.
Assumptions	4. The expert/Administrator is registered
Actors	The expert, The Administrator
Entry condition	The expert logs in his homepage of SWIM.
Exit condition	The expert logs out with successful new connection request sent
Flow of events	
	1. The expert/ The Administrator navigates to the login page of SWIM 2. The system displays his personal homepage. 3. The expert/The Administrator logs out. 4. The system displays the homepage of SWIM.
Exceptions	Username, password mistake.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



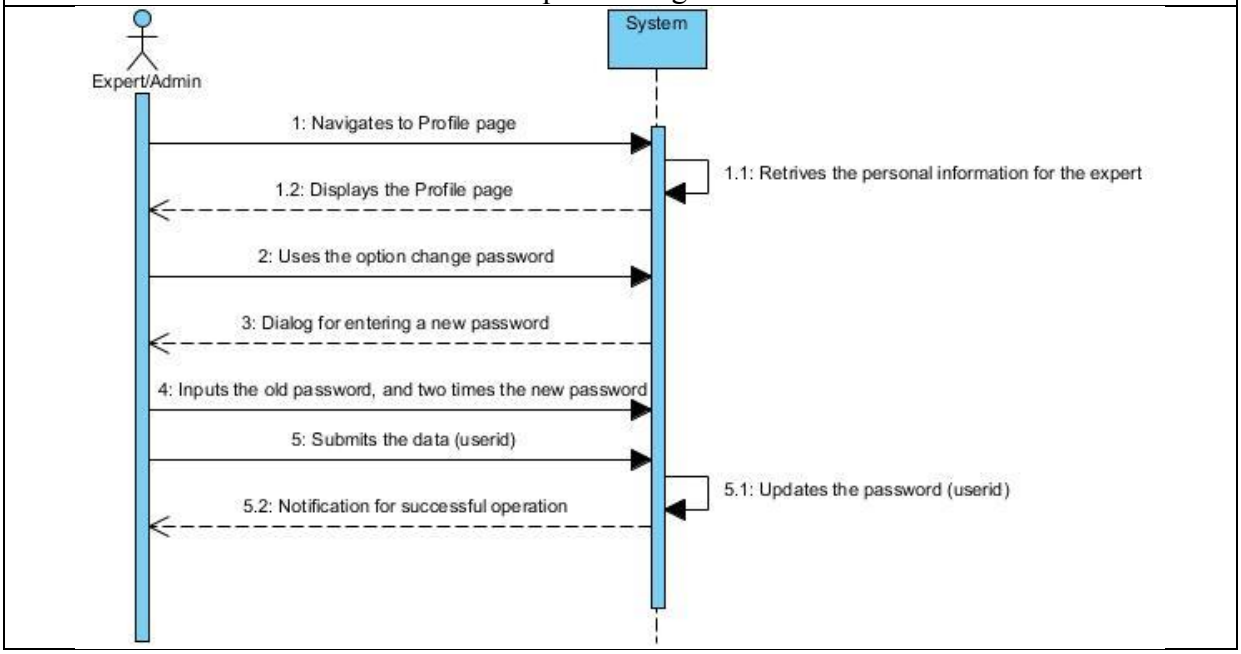
3.2.8.2 Changing of the personal information

Changing of the personal information	
Code	USC016
Description	The Expert changes some of his personal information
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert, Administrator
Entry condition	The Expert navigates to the “Profile” page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigates to the “Profile” page 2. The Expert sees all of his personal information in the Profile page 3. The Expert changes his address and his mobile phone 4. The Expert submits the data by using the save option 5. The system notifies the Expert that the data were successfully saved
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



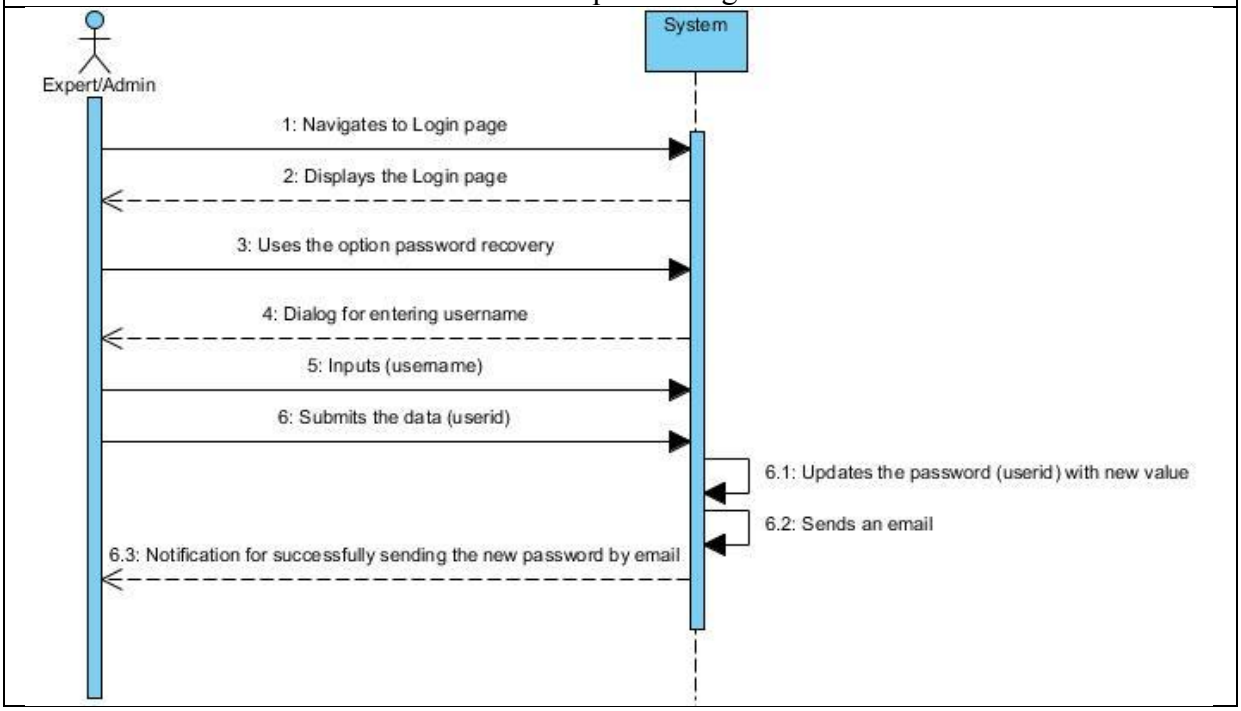
3.2.8.3 Changing the password

Changing the password	
Code	USC017
Description	The Expert changes the password
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application 2. The expert is already logged in to the system
Actors	Expert, Administrator
Entry condition	The Expert navigate to the Profile page
Exit condition	The Expert sees the notification from the system
Flow of events	
	1. The Expert navigates to the “Profile” page 2. The Expert uses the “change password” option 3. The system prompts a dialog to the Expert, for entering the old password, and for entering twice the new desired password 4. The Expert enters the data, and by using the save option he submits the data 5. The system notifies the Expert that the data were successfully saved
Exceptions	The Expert enters different values into the fields for the new password
Special requirements	The Expert knows his old password
Nonfunctional requirements	
Sequence diagram	



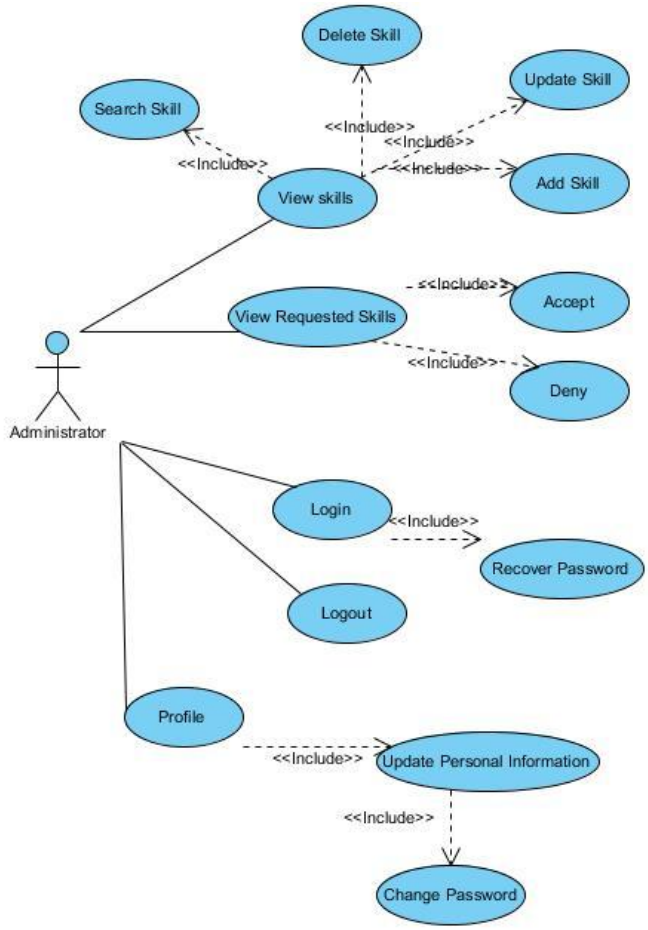
3.2.8.4 Recovery of password

Recovery of password	
Code	USC018
Description	The Expert gets a new password from the system
Goal	[G3][G4]
Assumptions	1. The expert is already registered into the application
Actors	Expert, Administrator
Entry condition	The Expert navigate to the SWIM main page
Exit condition	The Expert sees the notification from the system about the new password
Flow of events	
	1. The Expert loads the main page of the SWIM application 2. The Expert navigates to "Login" page 3. The Expert uses the "recovery password" option 4. The system prompts to the Expert an filed for entering the user name 5. The Expert enters his user name, and by using the "get password" option he submits the data 6. The system notifies the Expert that an email with the new password is sent to his registration email address
Exceptions	The Expert doesn't provide an valid username
Special requirements	The Expert knows his username
Nonfunctional requirements	
Related sequence diagram	



3.2.9 Administrator

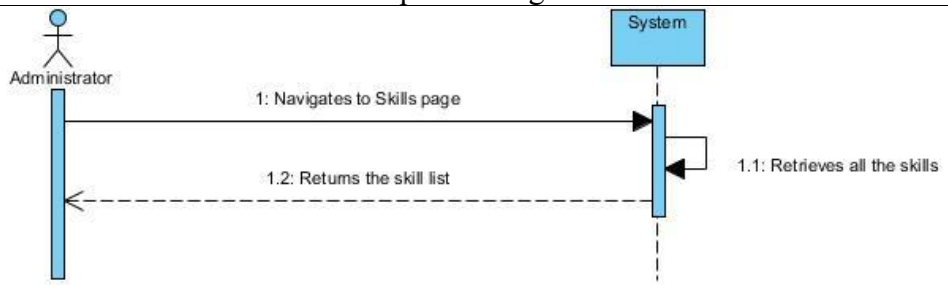
There is only one default administrator who can login, logut, recover password, view/update profile, add/delete/update skills, accept/deny requests from experts to add new skills.



Use Case 4: Administrator

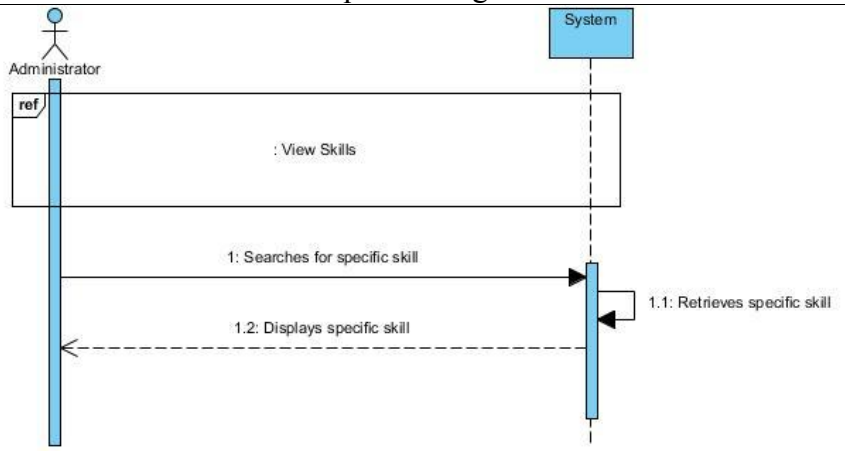
3.2.9.1 View Skills

View Skills	
Code	
Description	The administrator views the set of skills
Goal	[G6]
Assumptions	3. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The administrator sees a table with the available skill set
Flow of events	
	9. The administrator navigates to the “Skills” page. 10. The system displays a table with all the skills.
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



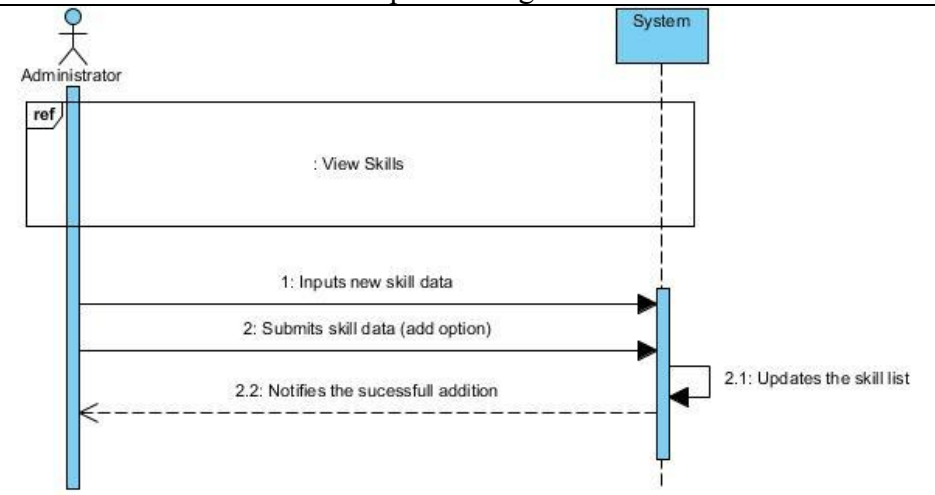
3.2.9.2 Search Skill

Search Skill	
Code	
Description	The administrator looks for an specific skill within the skill set
Goal	[G6]
Assumptions	3. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The administrator finds the specific skill
Flow of events	
	7. The administrator visualizes the skill set by invoking the View Skills use case 8. The administrator searches for the specific skill with the search option provided. 9. The system displays the skill in the table.
Exceptions	The search for the specific skill does not return anything.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



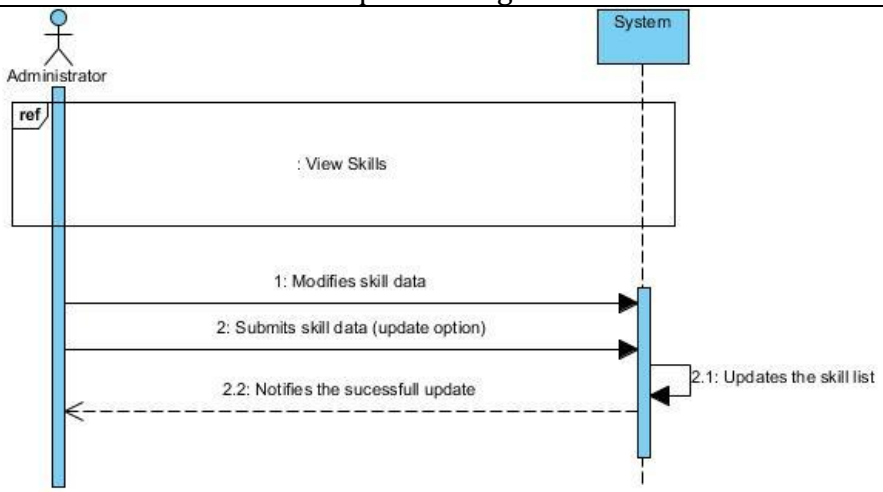
3.2.9.3 Add Skill

Add Skill	
Code	
Description	The administrator adds a new skill to the existing set
Goal	[G6]
Assumptions	1. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The new skill is displayed in the skill set list
Flow of events	
	1. The administrator visualizes the skill set by invoking the View Skills use case 2. The administrator inputs the new skill data. 3. The administrator submits the skill data, by using the add option. 4. The system notifies the administrator the successful addition of the skill.
Exceptions	A skill with the same name already exists.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



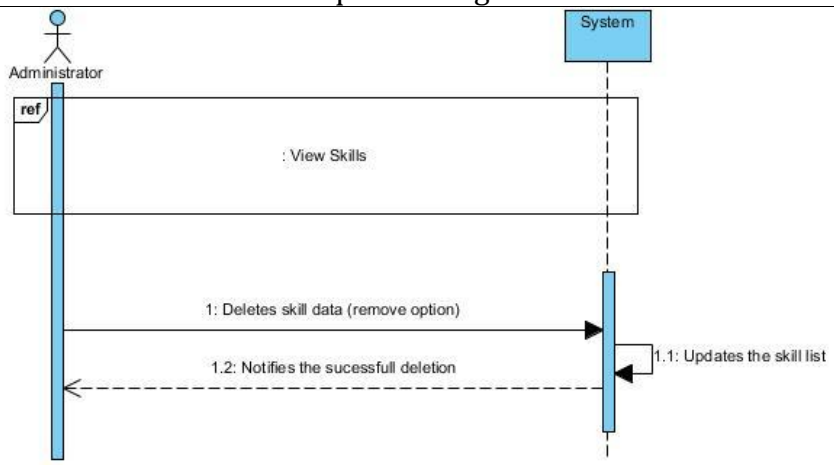
3.2.9.4 Update Skill

Update Skill	
Code	
Description	The administrator updates an existing skill
Goal	[G6]
Assumptions	1. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The updated skill is displayed in the skill set list
Flow of events	
	1. The administrator visualizes the skill set by invoking the View Skills use case 2. The administrator finds the skill to update using the search option provided. 3. The administrator modifies the skill data, by using the change option. 4. The system notifies the administrator about the successful update.
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



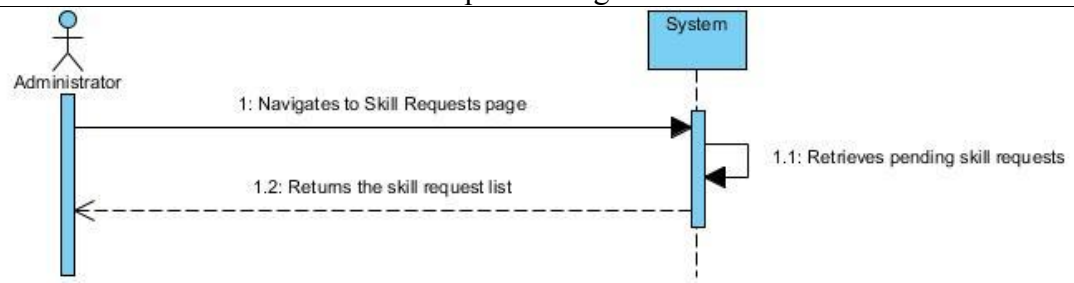
3.2.9.5 Delete Skill

Delete Skill	
Code	
Description	The administrator deletes an existing skill
Goal	[G6]
Assumptions	1. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The deleted skill is not displayed in the skill set list
Flow of events	
	1. The administrator visualizes the skill set by invoking the View Skills use case 2. The administrator finds the skill to delete using the search option provided. 3. The administrator deletes the skill, by using the remove option. 4. The system notifies the administrator the successful deletion of the skill.
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



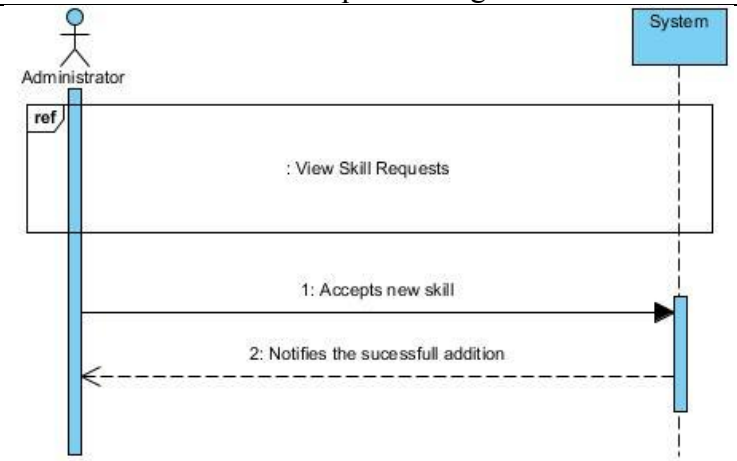
3.2.9.6 View Skill Requests

View Skill Requests	
Code	
Description	The administrator views the requests for new skills
Goal	[G6]
Assumptions	1. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The administrator sees a table with the skill requests from experts
Flow of events	
	1. The administrator navigates to the "Skill Requests" page 2. The system displays a table with the skill requests.
Exceptions	The system does not display the table with the skill requests because there are no requests.
Special requirements	
Nonfunctional requirements	
Sequence diagram	



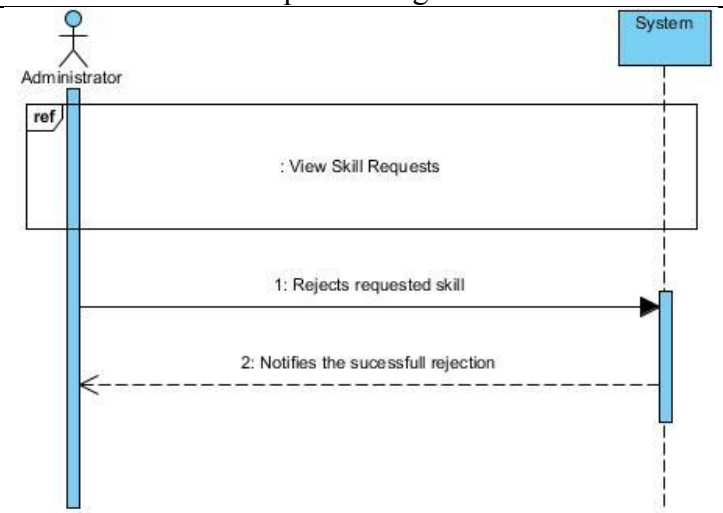
3.2.9.7 Accept Skill

Accept Skill	
Code	
Description	The administrator accepts a new skill request
Goal	[G6]
Assumptions	1. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The new skill is displayed in the skill set list
Flow of events	
	1. The administrator visualizes the pending skill requests by invoking the View Skill Request use case. 2. The administrator decides to accept the skill request based on the criteria of the system. 3. The system notifies the administrator the successful addition of the skill.
Exceptions	
Special requirements	
Nonfunctional requirements	
Related sequence diagram	



3.2.9.8 Deny Skill

Deny Skill	
Code	
Description	The administrator rejects a new skill request
Goal	[G6]
Assumptions	1. The administrator is already logged in to the system
Actors	Administrator
Entry condition	
Exit condition	The new skill is not displayed in the skill set list
Flow of events	
	1. The administrator visualizes the pending skill requests by invoking the View Skill Requests use case 2. The administrator decides to reject the skill request based on the criteria of the system. 3. The system notifies the administrator the rejection of the skill.
Exceptions	
Special requirements	
Nonfunctional requirements	
Sequence diagram	



3.3 Performance requirements

The software product requires that every web page shall download in 15 seconds or less.

3.4 Design constraints

The software product must be designed and implemented with JEE technologies, in particular EJBs for the business logic.

3.5 Software system attributes

3.5.1 Reliability

The software product does not any reliability factors because in case of malfunction it will cause minor invonceniences.

3.5.2 Availability

The system shall be available 24 hours per day, 365 days per year.

3.5.3 Security

The software product must provide secure storage of the passwords of its users. This can be achieved by using any cryptographical techniques.

3.5.4 Maintainability

The database must be backed up periodically, so that new connection and skill data is not lost in case of malfunction.

3.5.5 Portability

The software product can be installed in any operating system that supports the java virtual machine and its dependent components.

3.6 Other requirements

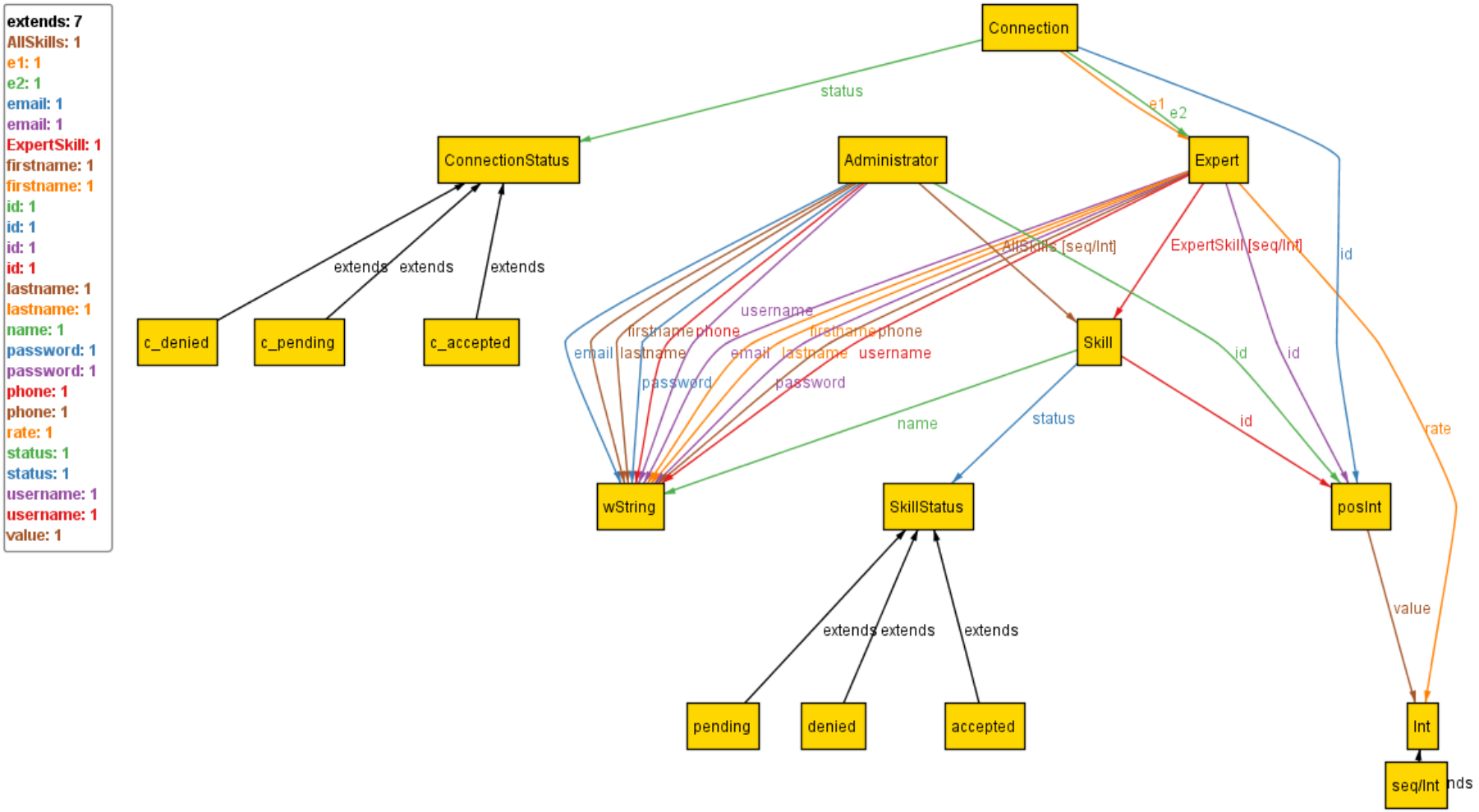
The software product must provide understandable messages in text form in the event of errors, and instruct the user on what to do.

4. Appendixes

4.1 Alloy

4.1.1 Static model

The model is in the attached file swimV2.als

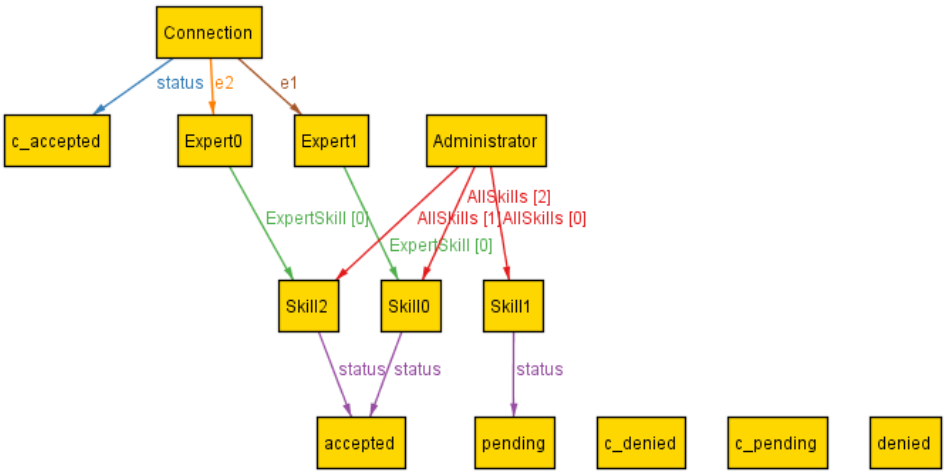


Alloy 1: Metamodel generated with Alloy

After putting the constraints, stated in the attached file swimV2.als we can have many different instances generated, for which we are diplaying only one of them.

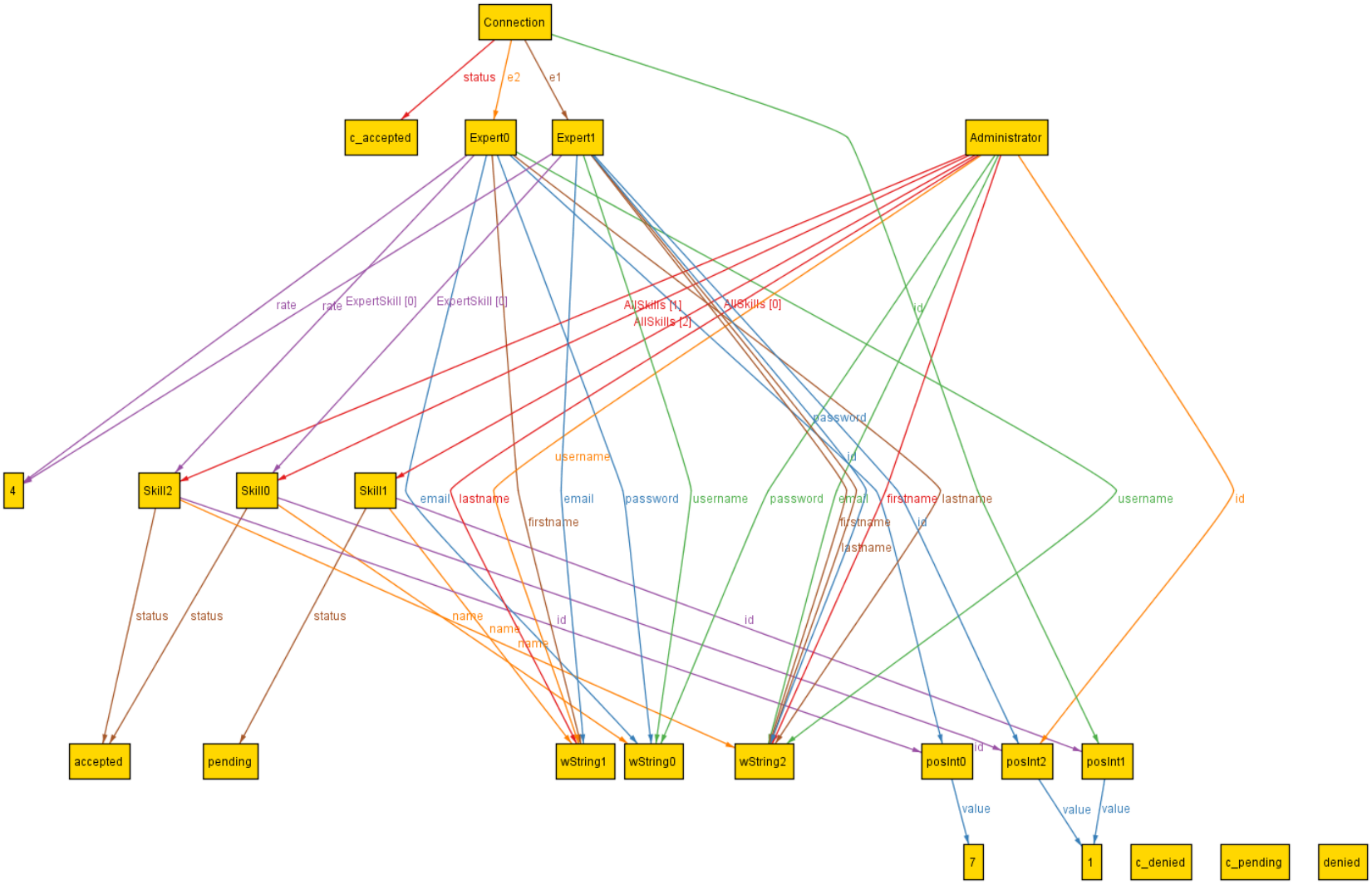
```
pred show()
{
#Skill > 2
#Administrator = 1
#Connection = 1
#Expert  > 1
#Expert  <= 5
}
run show for 5
```

```
Executing "Run show for 5"
  Solver=sat4j Bitwidth=4 MaxSeq=5 SkolemDepth=1 Symmetry=20
  13006 vars. 945 primary vars. 29832 clauses. 866ms.
  Instance found. Predicate is consistent. 308ms.
```



Alloy 2: Swimv2 Instance 1 (simplified)

In this case, there is no connection with status denied, because two experts can be in a connection only if they have accepted the connection. We have also put constraint regarding the duplications in username, email, id etc which is stated in the next page. The alloy model attached has every explanation about the constraints we put in our model.



Alloy 3:Swimv2 Instance 1 Complex view