Lab 2—Strome InFusion Specification Outline

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1 Introduction

The Strome Entrepreneurial Center (SEC) is a center on Old Dominion University (ODU) campus that exists to enable budding entrepreneurs at ODU to realize their entrepreneurial goals. The SEC regularly holds workshops and networking events and provides individual advising to any ODU student with an interest in starting a venture. By partnering with local business partners and individuals with relevant skills and resources, the SEC also has the means to connect ODU students with mentors to guide them through the process of developing and implementing their ventures.

1.1 Purpose

For SEC to be effective in achieving their goals of connecting budding ODU entrepreneurs to all available resources to help them be successful there are a few issues that need to be resolved. As of this writing, the current method for tracking students who visit the SEC and keeping in contact with them has not been very effective. The SEC is currently looking for a more efficient way to register students, advertise events, tracking visitors the SEC itself, and manage resources currently available to the SEC. In *figure 1* the current process is modeled with the chief pain points addressed circled.

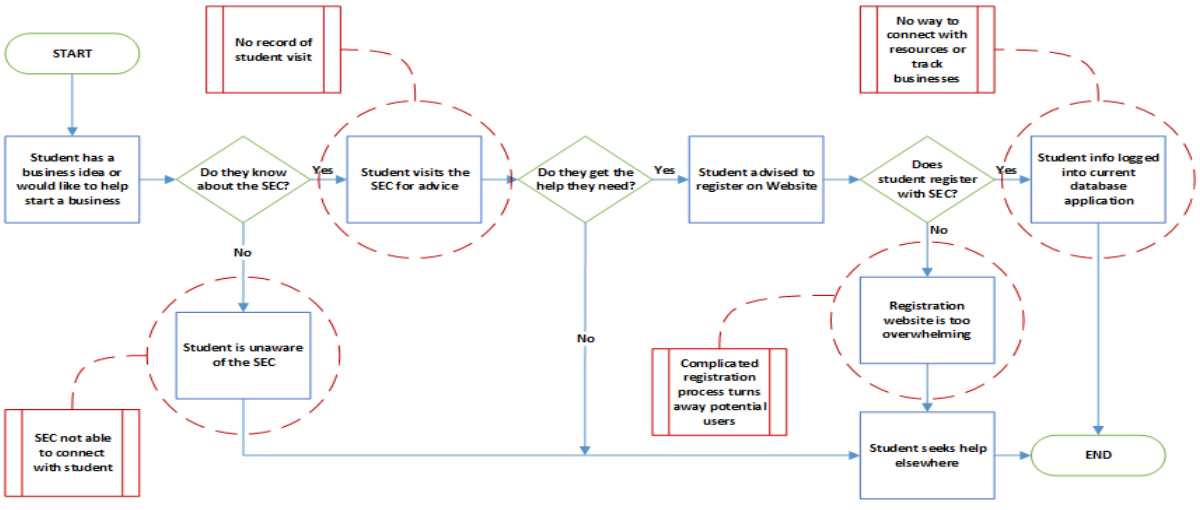

Figure 1 Current Process & Pain Points

In order to address these issues, Strome InFusion was designed as a custom management platform for entrepreneurial centers. ODU's CS411 Team Black designed Strome InFusion as a powerful and unique tool to empower budding ventures with the mentorship and resources provided by the SEC.

1.2 Scope

The prototype for Strome InFusion developed by Team Black will supplement the SEC's existing website with more tools and content to help SEC stay in contact with both current ventures and students with an interest in entrepreneurship. The total package will include a website, mobile application, web application, and database. The prototype will demonstrate specific features that are lacking in the current system that are necessary for the SEC to achieve its goals. However, the prototype will not feature all final aspects of the real world product as shown in *table 1.*

Table 1 Feature comparison of full product and prototype

Feature	Real World Project	Prototype
Authentication	Integration with 3rd party schemes such as shibboleth	Custom authentication
Client Testing	Testing across a large variety of mobile and desktop web browsers	Mobile testing on only the devices that our team members own. Full support only for modern browsers
Customer Support	Telephone and email support for problems or questions using the application	Not simulated – Customer support is a common need for software applications.
Events	Ability to list events and add events to a calendar view for individuals and companies	Eliminated from prototype
External Resources	External investors and mentors who are willing to contribute to the success of the venture.	Test data provided by Director Grden and the Strome InFusion team
Internal Resources	Students who want to utilize their skills to work on a business venture.	Strome InFusion team members connecting as a venture to test functionality
Mobile Application	Mobile application will be available natively for all major mobile OS platforms	Will only be available natively for Android devices
SEC Staff	SEC staff and mentors who will provide guidance for the project.	Director Grden as well as Strome InFusion team members simulating Strome Entrepreneurial Center staff
Security	Audited to confirm the security of proprietary data	Not reviewed
Service	Support for scaling to multiple servers and other environments	Limited to the capabilities of a single virtual machine
Service Integrations	Integrate with existing software and services used by universities such as Microsoft Lync	Integrated with email
Students	Students at ODU who wish to collaborate on a business venture	Actual student and Strome InFusion team members using virtual machines using Strome InFusion team data along with special test functionality

1.3 Definitions, Acronyms, and Abbreviations

ACID compliance: Atomicity, consistency, isolation, and durability are the properties that guarantee that a database transaction is processed reliably.

Agile (Software Development): A group of software development methods in which solutions evolve through collaboration between self-organizing, cross-functional teams. It promotes adaptive planning, evolutionary development, early delivery, continuous improvement, and encourages rapid and flexible response to change.

AngularJS: A structural framework for dynamic web applications, based off of JavaScript.

Apache Cordova: An open source project that provides a set of device APIs that allow a mobile application to utilize native device functions from JavaScript.

Apache web server: The world's most widely used web server software.

API server: A computer that provides API data over a network.

Application Programming Interface (API): An application programming interface is a set of routines, protocols, and tools for building software applications.

Application server: The middleware of a server centric architecture. Backend: The server, the web application, and the database.

Business Canvas: A strategic management and lean startup template for developing new business models.

Company: Any business that is owned or operated outside of ODU.

Company resource: A resource an external company registers in Strome InFusion to assist with student ventures.

Concurrency: Allowing multiple processes to go at once.

Cordova: See Apache Cordova.

CSS: Cascading style sheets, gives form to the HTML page.

Data integrity: The accuracy and consistency of data stored in the database.

Database: A comprehensive collection of related data organized for convenient access.

DOM: The Document Object Model is a logical structured document applied to HTML, it represents separate and distinct browsers and interfaces to view and interact with the web application.

Employer: A person or company that hires at least one or more employees.

Encryption: Encoding information in a way that is not readable except by authorized entities.

Entrepreneur: A person who organizes and operates a business or businesses, taking on greater than normal financial risks in order to do so.

Firewall: Software that prevents hackers from gaining access to systems with sensitive data.

Flask: A python web application framework.

Frontend: The HTML, CSS, and JavaScript of a web page.

GUI: Graphical user interface, is an interface that allows the user to interact with the application.

Horizontal Scaling: Adding more nodes to a system, such as adding a new computer to a distributed software application.

HTML: Hypertext Markup Language, a standardized system for tagging text files to achieve font, color, graphic, and hyperlink effects.

InFusion: An alternative name for Strome InFusion.

JavaScript: An object-oriented computer programming language commonly used to create interactive effects within web browsers.

JSON: JavaScript Object Notation is a minimal, readable format of structured data.

Linux: A Unix-like and mostly POSIX-compliant computer operating system assembled under the model of free and open-source software development and distribution.

Linux distributions: Operating systems based off of the Linux kernel.

Load balancing: The distribution of processes across multiple available systems to improve performance.

Mobile application: An application developed to be operated and interacted within a mobile operating system.

MVC: Model View Controller is an architectural pattern for building applications.

MySQL: An open-source relational database management system.

Native application: An application that has access to system functionality (i.e. the camera on a cell phone).

Nginx: A web server with a strong focus on high concurrency, performance and low memory usage.

ODU: Acronym for Old Dominion University.

Object-relational database: Is a database that uses an object-oriented model: objects, classes, and inheritance are directly supported in the database schema and in the query language.

Object-Relationship Mapper (ORM): A programming technique for converting data between incompatible type systems in object-oriented programming languages.

Open source: Software where the source code is freely available.

Operating system: The software that supports a computer's basic functions (i.e. launching applications and handling peripherals).

PostgreSQL: An open sourced, object-relational database system.

Push Notification: The delivery of information from a software application to a computing device without a specific request from the client.

Python: A widely used general-purpose, high-level programming language.

Representational State Transfer (REST): Software architectural style of the World Wide Web.

RESTful framework: Representational state transfer is an architectural style framework for the development of web services.

Reverse proxy server: A server that can retrieve resources from one or more servers.

SEC: Acronym for Strome Entrepreneurial Center.

SI: Acronym for Strome Infusion.

SDK: Software Development Kit, a set of software development tools that allow the creation of applications for a certain piece of software.

Server: A computer system that manages access to a central resource or service.

Small Business: A business that has less than 500 employees.

SQL: Structured Query Language is used to communicate with relational databases.

SQLAlchemy: A Python SQL toolkit and Object Relational Mapper that gives application developers the full power and flexibility of SQL.

Stakeholder: A person who will be affected by the outcome of Strome Infusions development..

Toolkit: A set of software tools.

Ubuntu: An open source operating system based off of Linux.

User experience: The overall experience of a person using a product.

User skill: A skill a user registers in Strome InFusion to assist with ventures.

uWSGI: Deploys the application server and implements WSGI protocols.

Venture: A student run business enterprise with a dedicated profile within Strome InFusion.

Vertical Scaling: Adding resources to a single node in a system, typically involving the addition of CPUs or memory to a single computer.

Virtual Machine or VM: An operating system OS or application environment that is installed on software which imitates dedicated hardware.

Web application: Client-server software application in which the client or GUI runs in a web browser.

Web application framework: A framework for software that supports web applications, services, and resources.

Web server: Systems that deliver web pages.

Web Server Gateway Interface (WSGI): Specification for simple and universal interface between web servers and web applications for the Python programming language.

1.4 References

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1.5 Overview

The Strome InFusion product specification describes the hardware, software, external interfaces, and functionality of the SI prototype. Section 2 explains the technical aspects of the hardware, software, interfaces, features and methodology used to create Strome Infusion and maintain its features.

2 General Description

Each of the following sections will cover some specific aspect of the Strome InFusion prototype in detail. Section 2.1 describes the prototype architecture, section 2.2 covers the prototype functional description and section 2.3 explains the extended interfaces including both web and mobile application.

2.1 Prototype Architecture

Strome InFusion is developed as an application that can be fairly self-sufficient. The hardware requirements are fairly minimal. The ODU physical *servers* are to host all aspects of Strome InFusion including all associated databases. Software requirements include server hosting, web application software, mobile application software, and databases. *Figure 2* is a quick overview to show how all the parts work together to allow Strome InFusion to function properly.

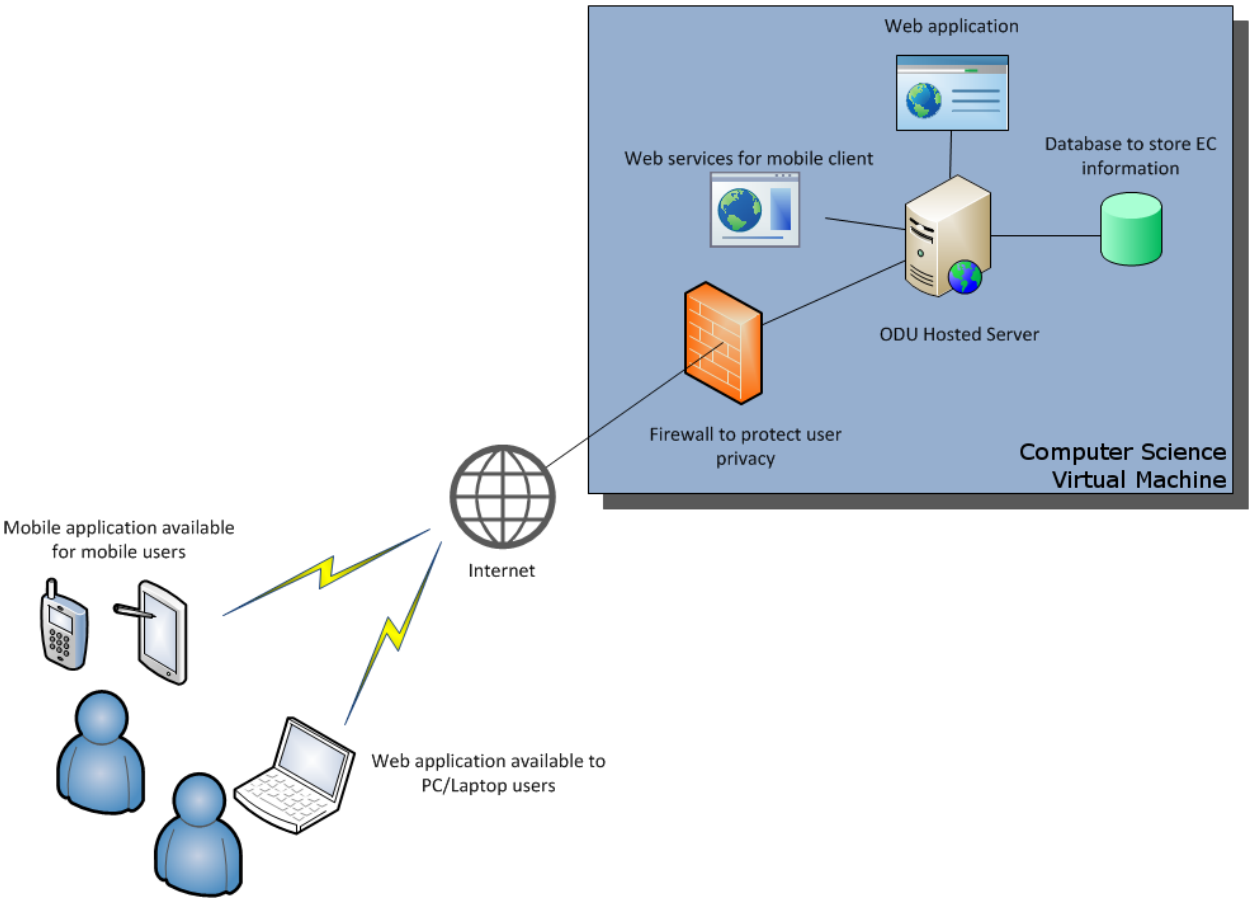


Figure 2. Major Component Diagram

Server hosting will be handled by *Ubuntu Server*. Ubuntu Server is an open-source server with amazing flexibility and scalability. It is compatible with all major hardware so future upgrades to the current servers will not affect Strome InFusion. Ubuntu Server also provides speed and simplicity, allowing Strome InFusion to work quickly and smoothly for users.

The web application itself will be hosted on *nginx*. Nginx will serve as both a web server and a *reverse proxy* server for Strome InFusion. Pairing nginx with *uWSGI* protocol, allows Strome InFusion to operate smoothly with as little *latency* as possible. uWSGI implements the Web Server Gateway Interface, connecting the application and the server. uWSGI allows nginx to *multithread* without being slowed by multiple *Python interpreters*.

To actually run the *back-end* of the web application and interact with the database, *flask* will be used. Flask will also handle all the *front-end API* requests, authentication, and hosting of the *AngularJS* pages. AngularJS will allow for the front-end application to work as an application, not a collection of pages written in *HTML*. Using flask and AngularJS will allow the web application to multitask efficiently.

With that framework in place, Strome InFusion will also be available as a mobile application. Using *Apache Cordova* along with AngularJS, all of the functionality of the web application is stored on the mobile device and Cordova's API will allow it to function as a mobile application. In doing so, the application will be usable across many platforms with few or no changes. Figure 3 shows how Strome InFusion's sitemap works to insure that the SEC can stay connected to students using this architecture.

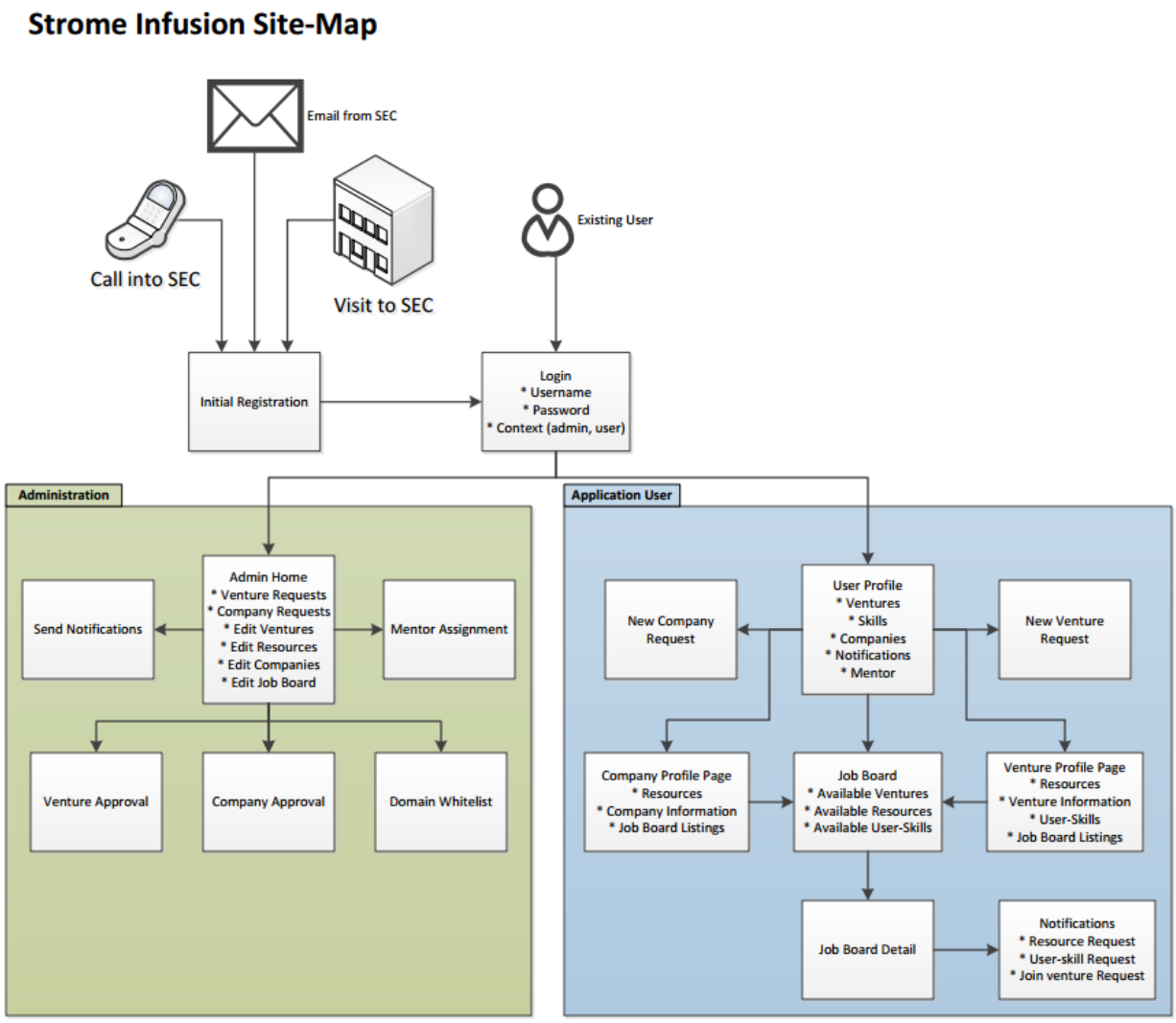


Figure 3. Application Site Map

All data associated with user accounts will be stored in a database powered by *PostgreSQL*. Postgres provides the framework to create a relational database while providing extra concepts to enhance the database system. Interfacing all this software together, Strome InFusion will meet the SEC's needs in an entrepreneurial management system.

By incorporating this system into the SEC's current methods, users who follow through procedures to get set up with Strome InFusion will find the resources they need to succeed. This process is outlined in Figure 4.

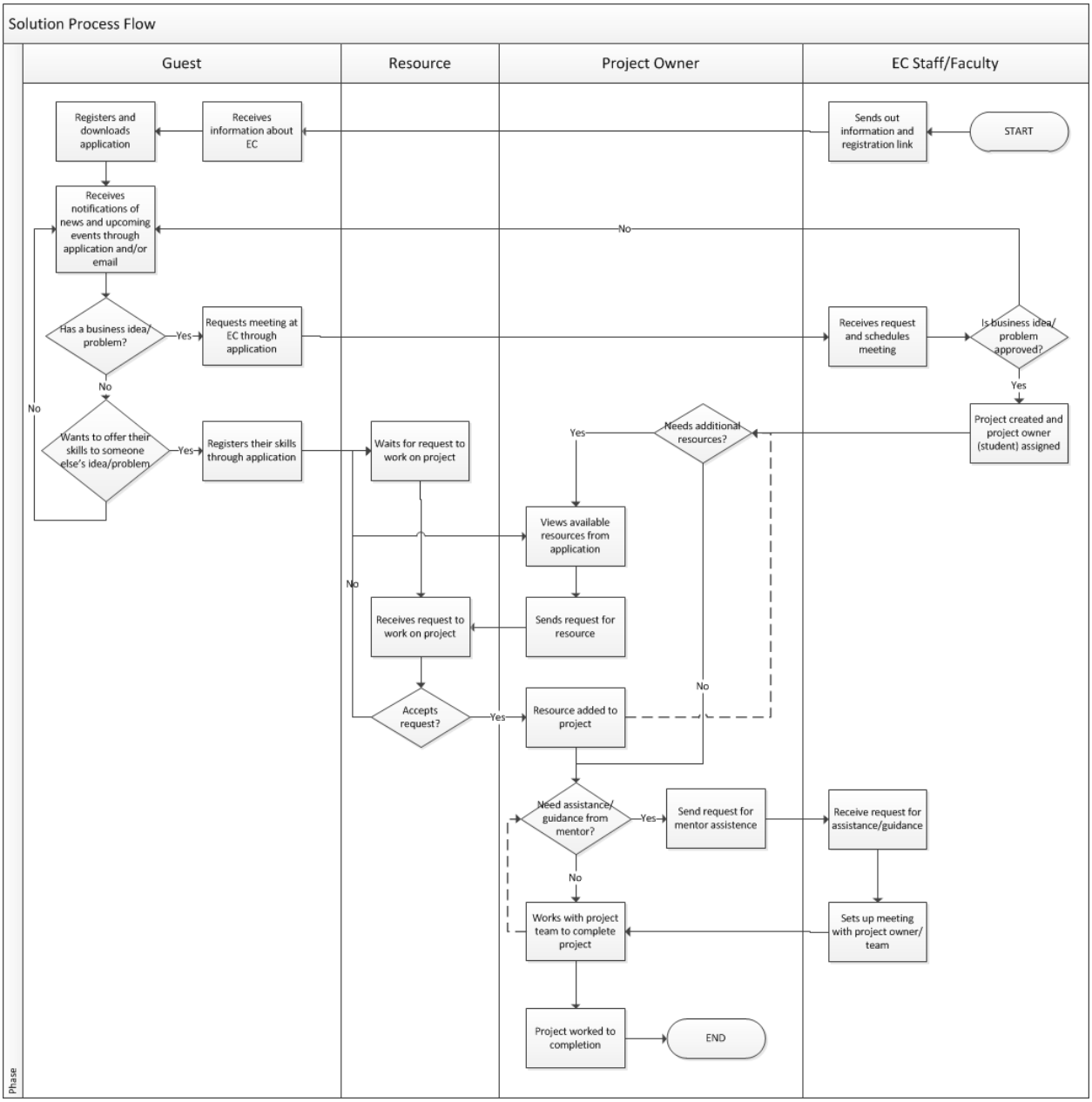


Figure 4. Solution Process Flow

2.2 Prototype Functional Descriptions

Through a web app and mobile app, Strome InFusion will allow users to stay connected and involved in their ventures. Both mobile and web app share various interfaces including a landing page, registration and login pages, job board, admin page, and a profile viewer for companies, ventures and other users. Another key feature, especially with the mobile app, is the ability to use push notifications

to inform the user of any pertinent information pertaining to their venture or to ventures they are a part of, as well as receiving information about events at the SEC itself. Figure 5 reflects this push notification process.

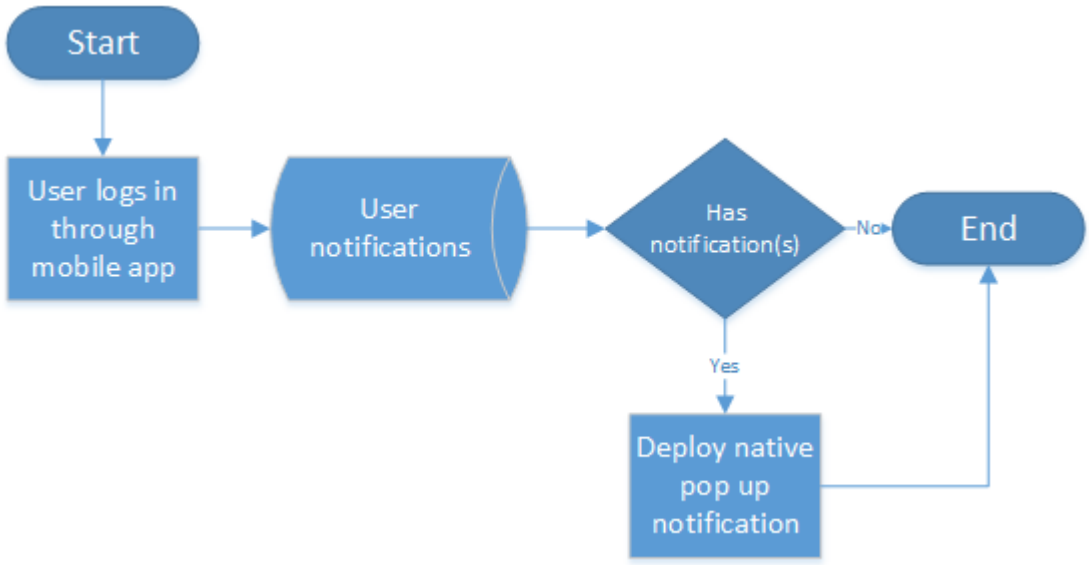


Figure 5. User Notification Algorithm

Each user will create a specific account with Strome InFusion based on their primary purpose. Students wishing to start a venture will create a venture role, SEC staff will create admin roles, and outside companies and mentors will create company roles. These roles interact differently with other roles. The SEC staff must approve a user's role before they can have full access to Strome InFusion. While waiting on approval, a user can still preview profiles and resources associated with SEC. This process is detailed in Figure 6.

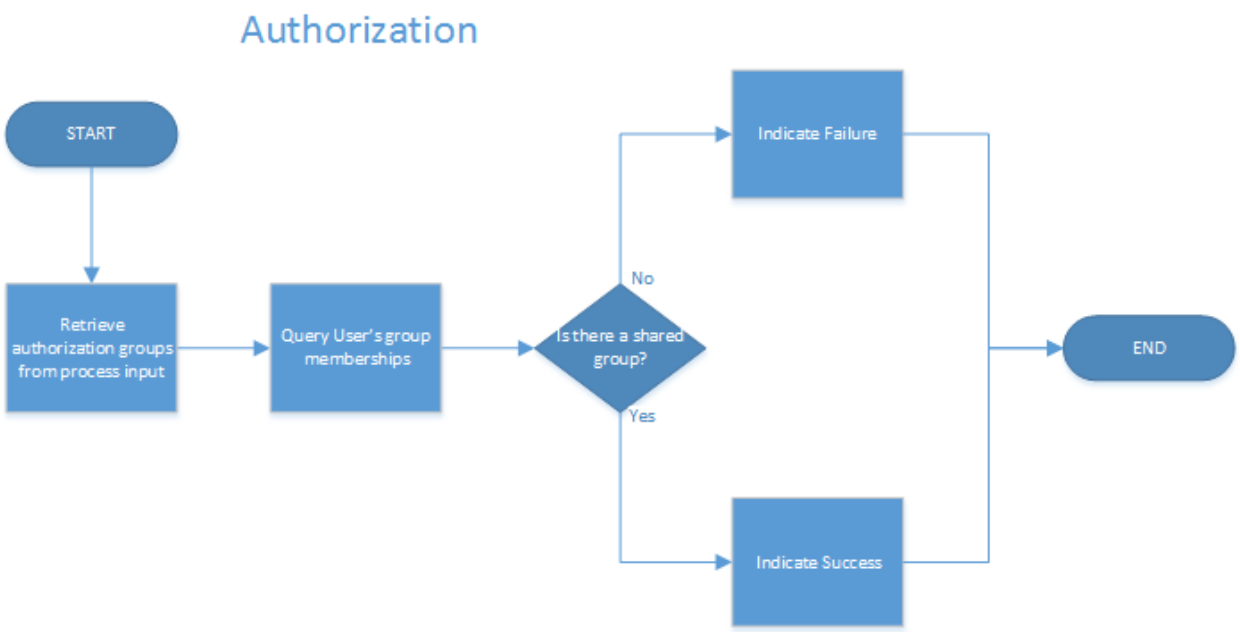


Figure 6. User Authorization

Once validated by SEC staff, students can create their first venture with Strome InFusion. They can create and modify their profile and request specific resources. If the specific resource is not currently available, then the request is made public on a job board where other ventures and companies have access and can view. The job board is a listing of all available resources offered by anyone involved in Strome InFusion as well as any needed resource that may not be listed currently in the job board. Many of the companies involved with SEC provide resources to the SEC for the use of startup ventures and the job board is the best way for these resources to be accessed by Strome InFusion users. These companies may also maintain a profile within Strome InFusion for students to view and request assistance with specific matters. Figure 7 is an overview of the job board and how it works.

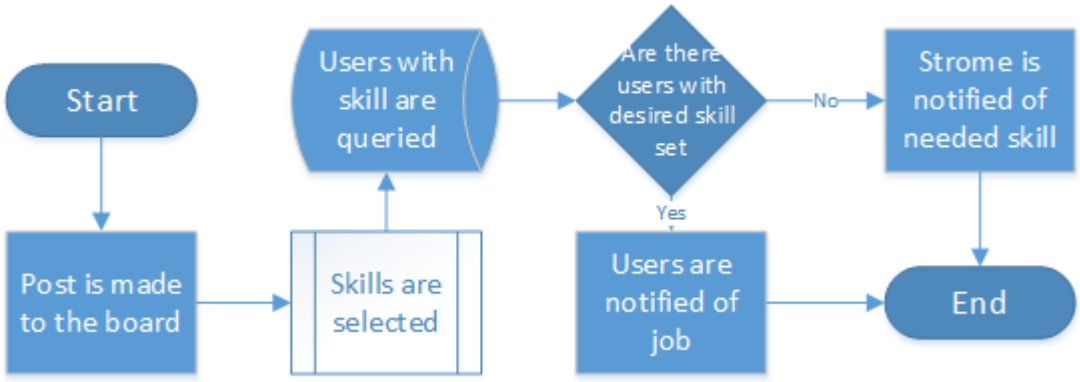


Figure 7. The Job Board

The SEC staff role is specifically for employees of the SEC center and is designed as an administrative role for the site. SEC staff will receive notification of pending requests for accounts which they can approve or deny, or change the user role if they accidentally attempted to register for the wrong role. SEC staff can continuously monitor the job board and make changes to key words for better searching of resources throughout the site. The staff user can make or approve requested appointments with mentors and ventures and send notifications to specific groups or to all members associated with the site. They have access to the list of all external mentors and companies and can add, change, and remove companies or any other user as needed. Figure 8 reflects the centers user role.

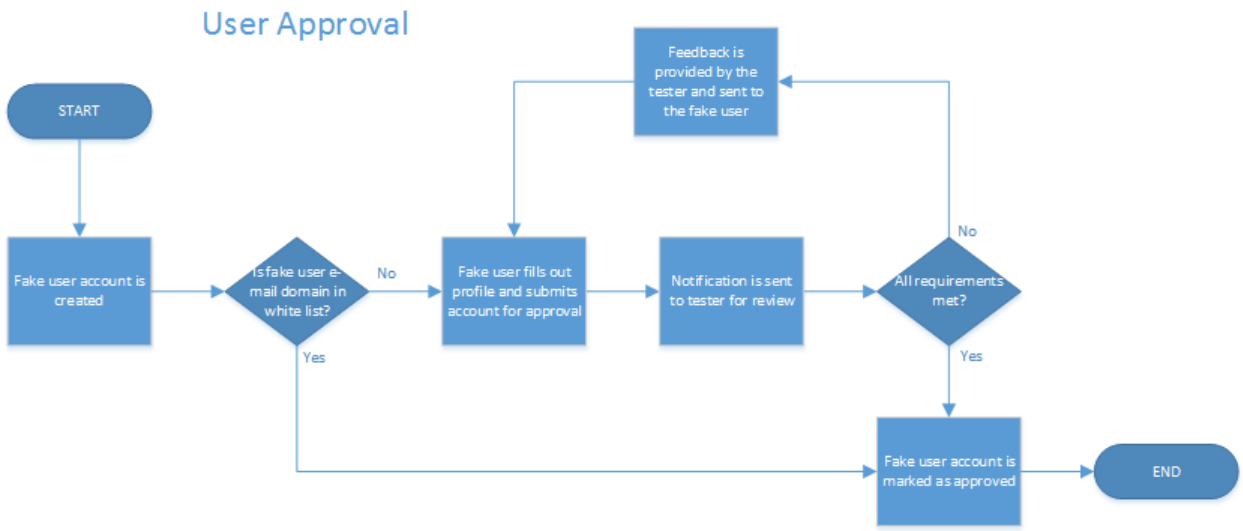
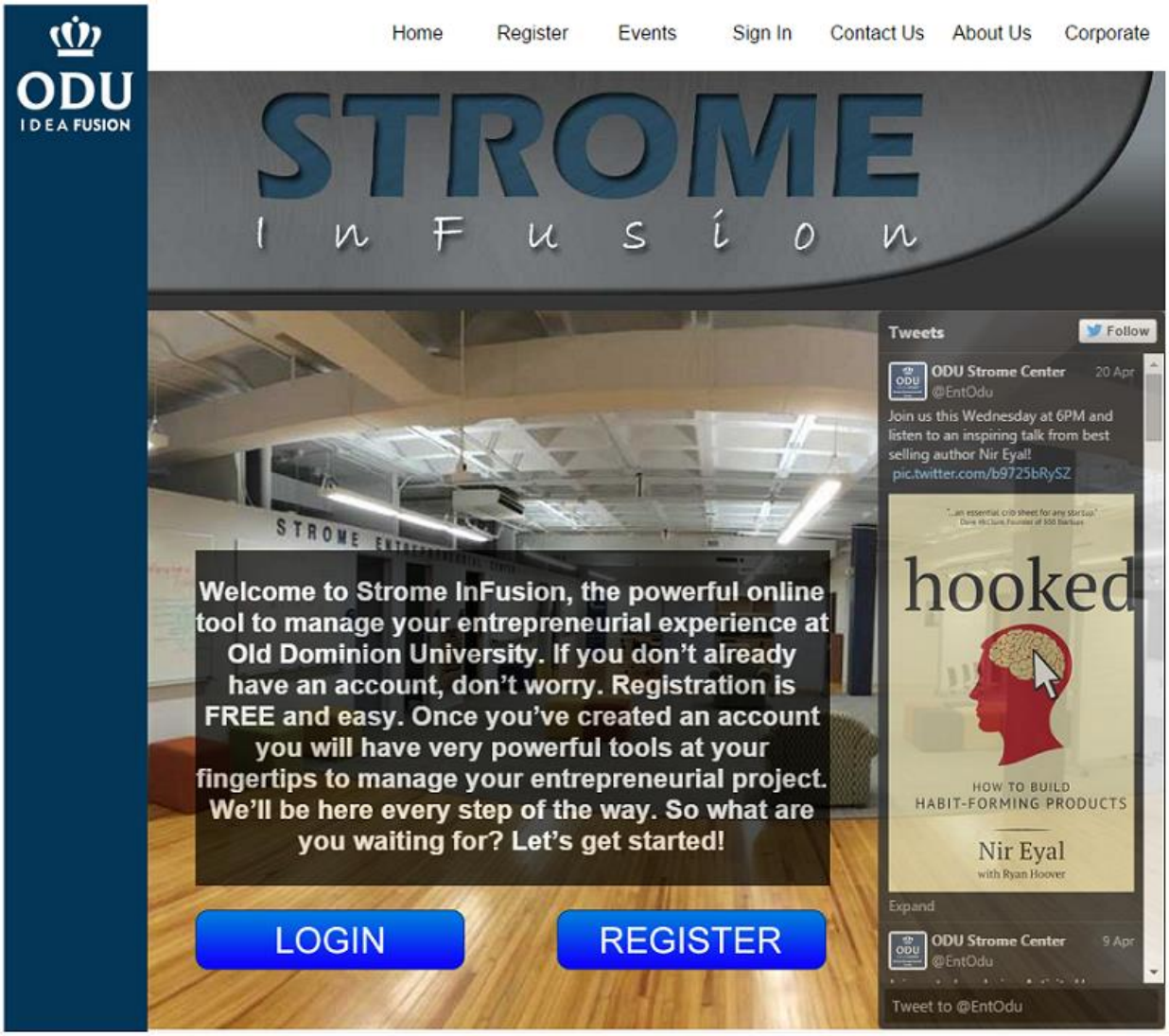


Figure 8. Staff User Approval

2.3 Extended Interfaces

The entire Strome InFusion experience is developed around an easy to use responsive web interface. This interface will be available for both web and mobile devices. The website is served using the Python based API using a uWSGI server. Figure 9 reflects the landing page of the Strome InFusion prototype as viewed from a PC.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