

NOVEMBER 13, 2019



*Travel Service*

SBRU SOCIAL MEDIA INITIATIVE  
BUSINESS REQUIREMENTS DOCUMENT

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## 1 Document Information

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### 1.1 Document History

DATE	VERSION	NOTES	AUTHOR
8/28/2019	0.01	Initial Draft	SCGerkin
8/29/2019	0.02	Add glossary, references, cover page	SCGerkin
9/6/2019	0.03	Add event decompositions with UML diagrams	SCGerkin
9/13/2019	0.04	Add Domain Case UML Model for Social Media subsystem	SCGerkin
9/18/2019	0.05	Add full use case descriptions with activity diagrams, SSD, and CRUD analysis for <i>Add New Resort</i> and <i>Create New Reservation</i>	SCGerkin
9/25/2019	0.06	Add security measurement details and implementation locations.	SCGerkin
9/27/2019	0.07	Add network system description and analysis	SCGerkin
10/9/2019	0.08	Add Security UX Design documents	SCGerkin
10/24/2019	0.09	Add iterative design plan and core functionality domain class documentation	SCGerkin
10/29/2019	.10	Add deployment schedule planning.	SCGerkin
10/30/2019	.11	Add DCD and CRC cards	SCGerkin
11/13/2019	.12	Add diagrams illustrating the classes involved in the overall system for booking reservations and adding new resorts.	SCGerkin

### 1.2 Glossary

TERM	DEFINITION
Social Media	To include Facebook, Twitter, and Instagram. More may be added
Customer	To include potential users of SBRU services for the purpose of booking Spring Break trips. A typical customer is a college-aged student
Affiliate	Current affiliated business partners of SBRU



<b>UX</b>	User Experience
<b>W3C</b>	World Wide Web Consortium—international standards organization for world wide web content
<b>WAI-ARIA</b>	Web Accessibility Initiative - Accessible Rich Internet Applications—accessibility standards created by the W3C [1]
<b>AES</b>	Advanced Encryption Standard
<b>MFA / 2FA</b>	Multi-factor authentication / two-factor authentication
<b>Multiplicity</b>	The number of links between associated objects (i.e. a database may have many records, but a record may only belong to one database).
<b>IAM</b>	Identity Access Management and Governance. A field of security concerned with limiting secure data and application access to proper accounts and users.
<b>HTTPS</b>	Hypertext Transfer Protocol Secure. A secure communication protocol for transferring data to and from web pages.
<b>Plaintext</b>	Unencrypted data.
<b>CI/CD</b>	Continuous integration and continuous deployment. A method by which iterative development is pushed to market allowing incremental changes to a system and addition of features.
<b>DCD</b>	Design Class Diagram. A UML diagram used to illustrate the class collaboration involved in a given use case.
<b>CRC Card</b>	Class Responsibility Collaboration Card. An informal design document (typically front and back on a notecard) that can help a developer design classes with attributes, responsibilities, and collaborations.



## 2 Introduction

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### 2.1 Problem Statement

SBRU has consistently endeavored to keep pace with trending methods of reaching a target demographic of college students, transitioning from in-person marketing to building a web presence. As social media and networking emerges as a new means of reaching potential customers and retaining existing customers, SBRU must adopt a business strategy that matches the needs and desires of a consistently young demographic, college students. Audiences expect businesses to provide direct, human interaction via online conversation, sharing experiences, and connecting on a personal level. Additionally, audiences want to feel as if a business is helping them attain their own goals, rather than selling them a product.

### 2.2 Proposed Solution

SBRU will create a new service that will function across multiple platforms and devices allowing for customers and businesses to better connect to each other. This will be accomplished with:

- Creation of a social media presence in current applications.
- Update website to allow integration with social media accounts.
- Data Analytics for determining popular and potential locations and projecting trends in travel for creating recommendations to customers, trending data for affiliates, and opportunities for SBRU market growth.
- Create a unique and memorable experience for the customer to better provide repeat business and customer retention.

### 2.3 Stakeholders

#### 2.3.1 Internal

- Sales agents employed or contracted by SBRU
- Marketing agents employed or contracted by SBRU
- Data analysts employed or contracted by SBRU

#### 2.3.2 External

- Customers: SBRU services users booking Spring Break trips (primarily college students).
- Businesses: SBRU affiliated business partners (resorts, restaurants, experience providers, etc.)

#### 2.3.3 Executive

- Management leadership
- Shareholders
- Board of Directors

### 2.4 Document Overview

This document will provide a continually evolving template for how to best implement the system. As new information is gathered, new requirements discovered, and decisions made, this document will be updated to continue to provide a reference for future decisions and priorities. As information gathering is in its infancy, expect several revision changes from the current document.



### 3 Requirements

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The base services provided by SBRU must continue to be supported in any new system created. Additional new services and requirements have been identified below.

#### 3.1 Functional

##### 3.1.1 Current

- Provide customers information on resorts to include price, available rooms, and special features.
- Provide customers with the ability to book travel plans, enter contracts, and make payments.
- Provide customers with updated booking information, resort information updates, and travel information.
- Provide affiliates with payments from customers for bookings, damages, and any other claims.
- Provide affiliates a means of marketing available rooms, prices, special features, and amenities.

##### 3.1.2 New

- Provide a relatable brand presence by interacting directly with customers using social media.
- Provide customers with an accessible means of providing direct feedback to SBRU about offerings, packages, and desires.
- Provide customers with the ability to easily share upcoming trip plans and details with friends and connections over social media.
- Provide customers with the ability to share their individual experiences on trips via social media during and following their trips.
- Provide customers with recommendations for activities while on Spring Break.
- Provide existing affiliates a means of marketing directly to potential customers and making recommendations for additional options.
- Provide new businesses with the ability to become affiliated with the SBRU travel network.
- Monitor, record, and analyze past and current bookings through SBRU to better provide targeted marketing opportunities to customers.
- Provide metrics and data to SBRU and affiliates on marketing campaigns, promotional pricing, and packages to improve existing strategies and assess new strategies.
- Provide metrics to analyze and predict trending desires of customers to provide current and up to date offerings to customers.

#### 3.2 Usability

Connectivity and use of business services ranges widely across platforms, devices, and individual user needs. The rise of Web 2.0 has created an expectation of simplicity and ease for users interacting with services. With this comes the expectation that a business will adapt to a user, rather than the user adapting to a business. To better serve our employees, customers, and affiliates, the usability requirements are as follows:

- All SBRU services must be cross-platform working seamlessly across mobile (Android and iOS), desktop (Windows and MacOS), and web.
- User Experience (UX) design must follow widely accepted design practices tailored to each device to allow easy adaptation to SBRU services to both new and existing users.
- Integration with existing social media accounts must be simple and painless, allowing a customer to login to SBRU services directly through existing social media or web accounts such as Facebook and Google. Additionally, linking SBRU services to existing social media accounts needs to be obvious, simple, and quick.



- Consistent SBRU branding, colors, and presentation across devices and platforms will enhance brand recognition and familiarity with the platform.
- A simple and intuitive system to navigate SBRU services must be implemented and universal across devices and platforms.
- Accessibility – SBRU services must follow the Web Accessibility Initiative - Accessible Rich Internet Applications (WAI-ARIA) [1] standards set by the World Wide Web Consortium (W3C) to reach all potential users of our services.

### 3.3 Reliability and Performance

User retention requires services to be fast, reliable, and performant. Studies by Google and others have shown 53% of mobile sites are abandoned after 3 seconds of loading [2]. Conversely, Pinterest has found increased traffic of up to 15% by simply changing a user's perception of wait times [3]. Additionally, users expect services to adapt to and correct their mistakes rather than return an error or null results. Based on this information, the reliability and performance requirements are as follows:

- Search results must be accurate and relevant, providing up to date, real-time information about resorts, business offerings, and any other queries.
- Common activities and queries must execute in less than 1 second. However, given the constraints and unpredictability of user connections, delayed actions must be communicated to the user in real-time.
- Searches must correct for typos, misspellings, and other user error.
- Searches that do not return results must make recommendations. For example, if a user searches for "Rock climbing in Spain" but no results are found, they must be offered other activities in Spain or other locations that offer rock climbing.
- Both client and server processes must be designed for peak workload times to allow dynamic and (preferably) automatic allocation of hardware resources before, during, and immediately following the Spring Break season.
- Data analysis metrics must be created and used to identify and predict potential upcoming peak workload times.
- Payments by customers must be processed within 1 second of submission. Longer response times lead to "Shopping Cart Abandonment" and customer attrition.
- While it is impossible to keep a service up 100% of the time, all services must be designed for fault-tolerance. Backup solutions for all services must be implemented at every level. Additionally, customers must have the ability to reference their travel information without needing access to SBRU services to better adapt to locales where wireless network connectivity is limited.

### 3.4 Security

Customers trust SBRU with their personal and financial information, vacation plans, and data about their choices. It is our responsibility to protect their privacy and information. Any breach in security will cause a loss of trust in our services and company and lead to significant business losses. Given this, the security requirements are as follows:

- Advanced Encryption Standard (AES) implementation and compliance for all data transmissions involving secured data including, but not limited to, payment transactions, customer account information, and business account information.
- Multi-factor authentication (MFA) required for all SBRU employee, agent, or affiliate accounts.
- The option to enable MFA for customer accounts.
- Appropriate data segmentation allowing affiliated businesses only access to what is required to provide services to customers.



- Secured database storage and backup with an industry trusted vendor.
- Routine auditing of security standards by an outside security auditing professional service.

## 4 Information Gathering

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Initial information gathering will involve questioning customers about their Spring Break experiences, social media interactivity, and how to interconnect them.

### 4.1 Customer Questions

#### 4.1.1 General Questions

- What is most important to you about a Spring Break vacation?
- Do you prefer to go with a large or small group of friends?
- How many friends went with you during your last Spring Break?
- If money was not a limiting factor, how would you spend your next Spring Break?

#### 4.1.2 Before Spring Break

- What do you find taxing or difficult about planning a Spring Break?
- What is your typical budget for Spring Break?
- How do you decide where to go for Spring Break?
- Do you prefer many general options and recommendations or a curated list of things you might enjoy?

#### 4.1.3 During Spring Break

- How do you decide what activities to participate in during your vacation?
- What do you look for when choosing a bar, restaurant, resort, or location to visit?
- Do you tend to want a new experience every Spring Break or do you often return to places you've already been to?

#### 4.1.4 After Spring Break

- Is it important to share your vacation experiences with friends and family?
- If so, how do you share your experience?
- What could be done to better help you share your experience?
- How likely are you to re-visit bars, restaurants, resorts, or locations outside of Spring Break?
- If unlikely, what would contribute to an urge to re-visit those places?
- If likely, what contributes to the urge to visit those places you've previously been?

### 4.2 Affiliate Questions

- What is currently the largest challenge you have for customer retention?
- What frustrations do you have about working with SBRU currently?
- How can payments, refunds, and other claims handled with customers be better handled?
- What data would improve your market share in your industry/location?

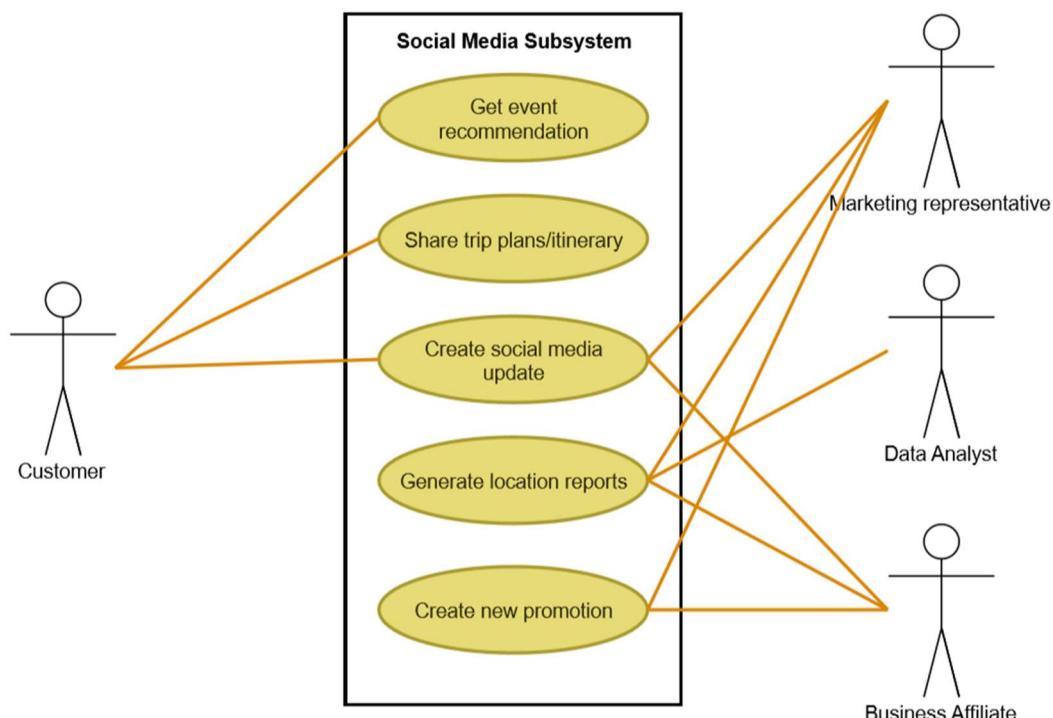
## 5 Event Decompositions

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The following is information about the required subsystems and the events encompassed by these subsystems. The users and actors involved have been listed along with a brief description of the use cases. UML diagrams are also included to help visualize the interaction between the various users and their associations for accessing the system for each use case.

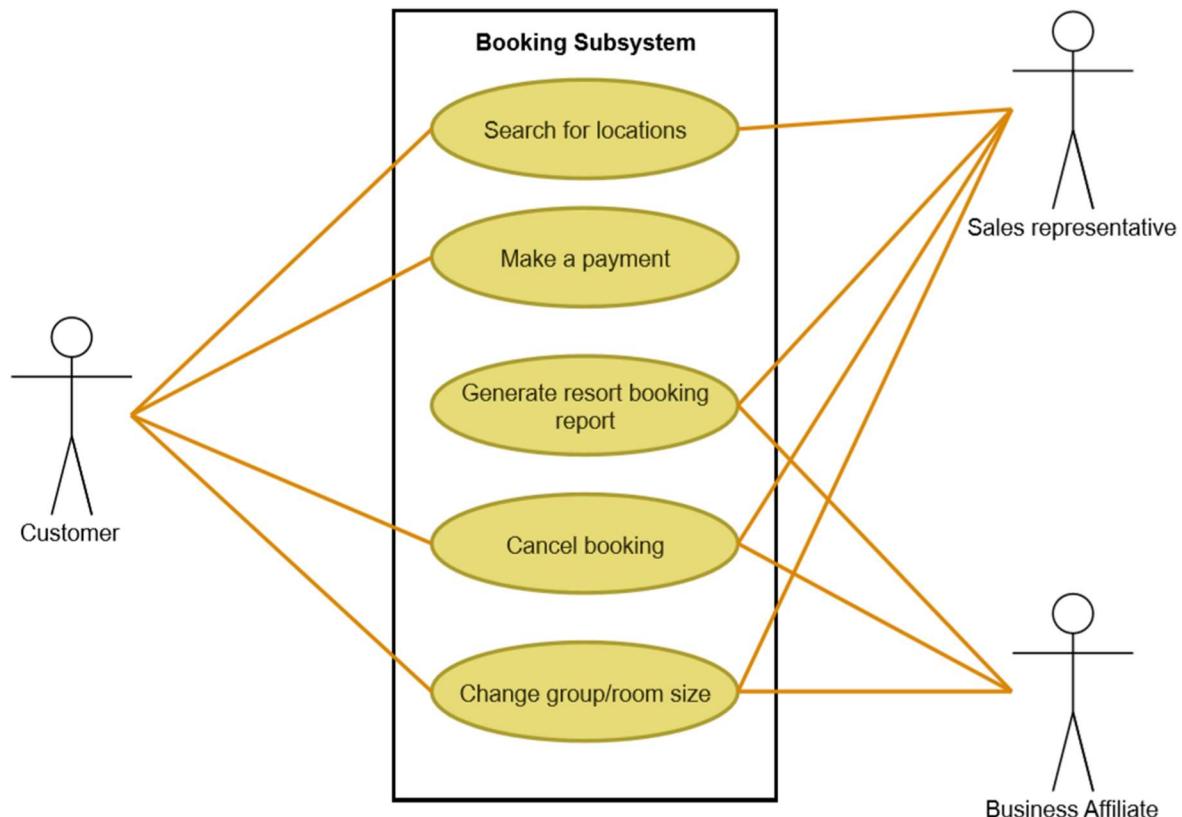
### 5.1 Social Media Subsystem

Use Case	Brief use case description	Users/actors
Get event recommendation	User/actor enters current location, system retrieves activity recommendations and displays recommendations	Customer
Share trip plans	User/actor creates a trip itinerary and the system posts the information to user/actor social media accounts	Customer
Create social media update	User/actor uploads a photo, video, or post to the system, the system posts the upload to all linked social media accounts automatically	Customer, marketing, affiliate
Generate location ranking report	User/actor enters time period, system generates location ranking report, displays report	Data analyst, marketing, affiliate
Create new promotion	User/actor enters new information for a promotion, package, or short-term offering, the system records the information to the listing offerings and emails customers the information	Affiliate, marketing



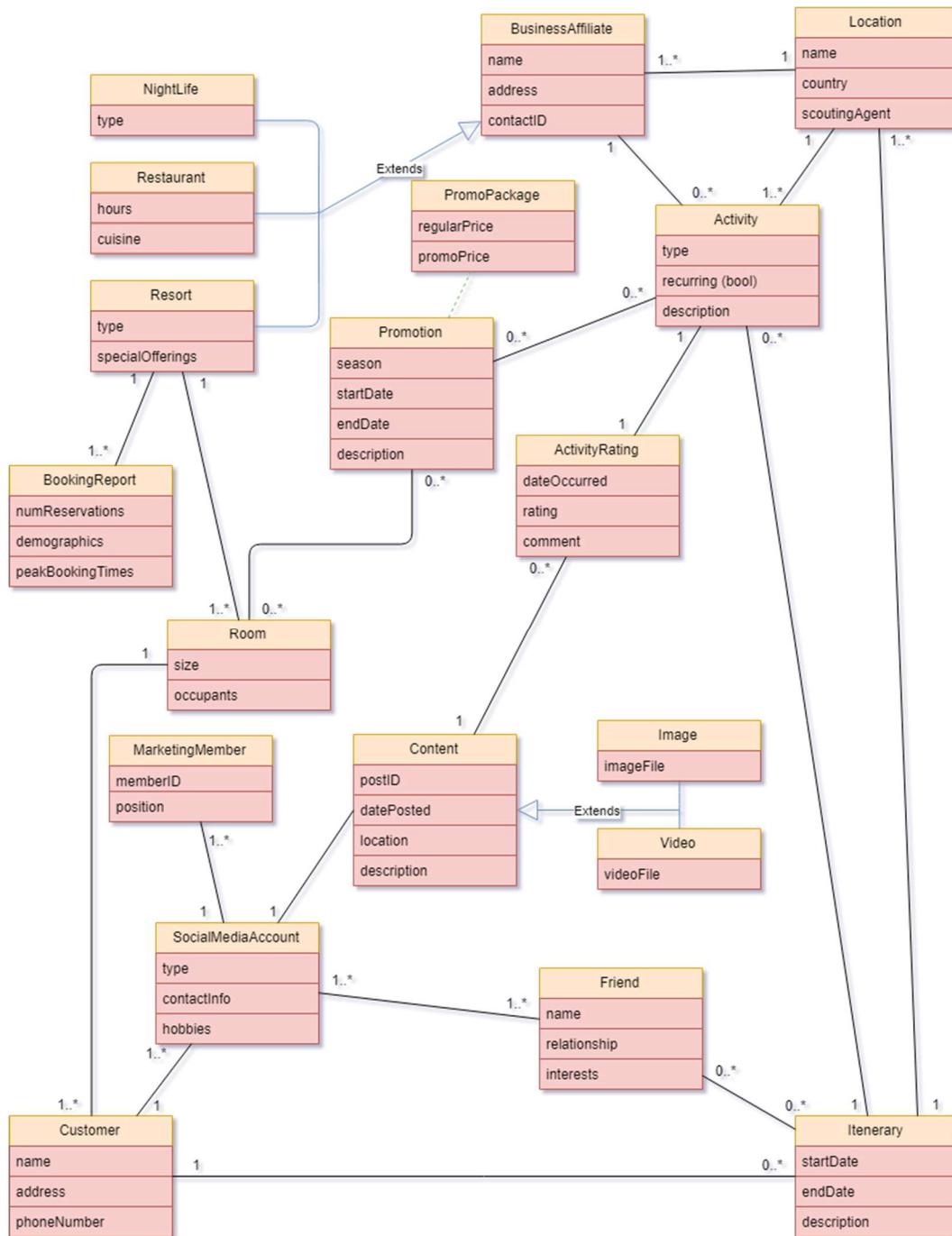
## 5.2 Booking Subsystem

Use Case	Brief use case description	Users/actors
Search for locations	User/actor enters a location to search for, system retrieves query results and displays resorts, packages, and activity options for location	Customer, sales representative
Make a payment	System sends out notification to user/actor that final payment is due, user/actor enters payment information, system processes the payment and forwards payment to appropriate affiliate	Customer
Generate resort booking report	User/actor enters a time period, system generates report about current bookings or reservations for specific business, and displays the report	Affiliate, sales representative
Cancel booking	User/actor enters information to cancel an upcoming trip, system updates database and cancels any reservations, system forwards cancellation information to applicable businesses	Customer, sales representative, affiliate
Change group/room size	User/actor enters new group information, system retrieves available room options for new group size, displays information	Customer, sales representative, affiliate



## 6 Domain Model

To visualize the problem space of the Social Media subsystem, it is helpful to identify each process of the system as an individual object that interacts with other objects. These objects consist of individual actors, social media accounts, business entities, and the various pieces that make up these entities or are aggregated by these entities. Each object interacts with another, in one form or another, through a chain of interactions. The following UML Domain Model demonstrates the relations between each object, its aggregates, and its interactions as well as their individual attributes and multiplicity.





## 7 Fully Developed Use Cases

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Fully developed use case models have been created to better streamline the process of implementing these into the new required subsystems. These use cases are *Add New Resort* and *Book A Reservation*. The following section consists of full descriptions, activity diagrams, sequence diagrams, and CRUD analysis tables for these use cases.

### 7.1 Add New Resort

When a new Resort Affiliate is to be added to the SBRU family, the *Add New Resort* use case is invoked, allowing a Business Relations Agent to enter the information to be saved to the database. The tables and diagrams provided below should be used as a resource to better understand the functionality and interaction of this use case within the rest of the system as well as provide information on how it is implemented.

### 7.2 Book a Reservation

Customers and Sales Agents can interact with the Reservation subsystem to create a new Reservation. This is the main source of revenue for SBRU and as such requires simplicity and accessibility to facilitate repeat business with our customers. The tables and diagrams provided below help to illuminate the best method for interacting with our Customers when creating Reservations through our Affiliated Business Partners.

#### Use Case Descriptions

Use case descriptions provide a general overview of the entire scope of the use case including actors, stakeholders, pre and postconditions, actions undertaken, and exceptional conditions.

Use case name	<i>Add New Resort</i>
Scenario	Add a new Resort account to Business Affiliates subsystem
Triggering event	Business Relations Agent needs to set up a new Resort affiliated business
Brief Description	A new resort business enters an affiliation relationship with SBRU for promoting business services and promotions and integration into Booking subsystem. Information about the business is verified and entered by a Business Relations Agent for entry into the database.
Actors	Business Relations Agent.
Related use cases	Invokes <i>New Business Relation</i> use case of Social Media subsystem. Invokes <i>New Package Creation</i> use case of Business Affiliates subsystem. Might be invoked by <i>Generate Location Reporting</i> use case when invalid or incomplete data present about a contained Business Affiliate present.
Stakeholders	Business Relations Agent, Marketing Agent, Sales Agent, Business Affiliate.



Preconditions	Affiliated Business subsystem must be available. Contract database must be available.	
Postconditions	Business Account must be created and saved. Address and Phone Number must be created and saved. Business Liaison must be created and saved. Address and Liaison must be associated with Account. Social Media subsystem must be alerted.	
Flow of activities	<p><b>Actor</b></p> <ol style="list-style-type: none"> <li>1. Business Relation Agent indicates need to create new Business Account.</li> <li>2. Agent provides contract ID information.</li> <li>3. Agent checks and verifies populated information.</li> <li>4. Agent provides Liaison information.</li> </ol>	<p><b>System</b></p> <ol style="list-style-type: none"> <li>1.1 System creates a new Business Account.</li> <li>1.2 System prompts for Contract ID information.</li> <li>2.1 System queries Contract database and verifies valid, current Contract on file.</li> <li>2.2 System populates Business Account information with Address and Phone Number.</li> <li>2.3 System displays information to Agent for verification.</li> <li>3.1 System saves data to account.</li> <li>3.2 System creates new Liaison account</li> <li>3.3 System prompts for Liaison information.</li> <li>4.1 System saves Liaison account information.</li> <li>4.2 System associates Liaison account, Address, and Phone Number to Business Account.</li> <li>4.3 System displays all information for final verification.</li> </ol>



	<p>5. Agent verifies all information is correct and indicates creation is complete.</p>	<p>5.1 System saves all information to database.</p> <p>5.2 System alerts Social Media subsystem to New Business Account.</p> <p>5.3 System initiates new Package Creation event.</p>
Exception conditions	<p>1.1 Business Account already exists in system.</p> <p>2.1 Invalid, missing, or expired contract with Business Affiliate.</p> <p>3.1 Incomplete or invalid data for Address or Phone Number.</p> <p>4.1 Incomplete or invalid data for Liaison information.</p>	

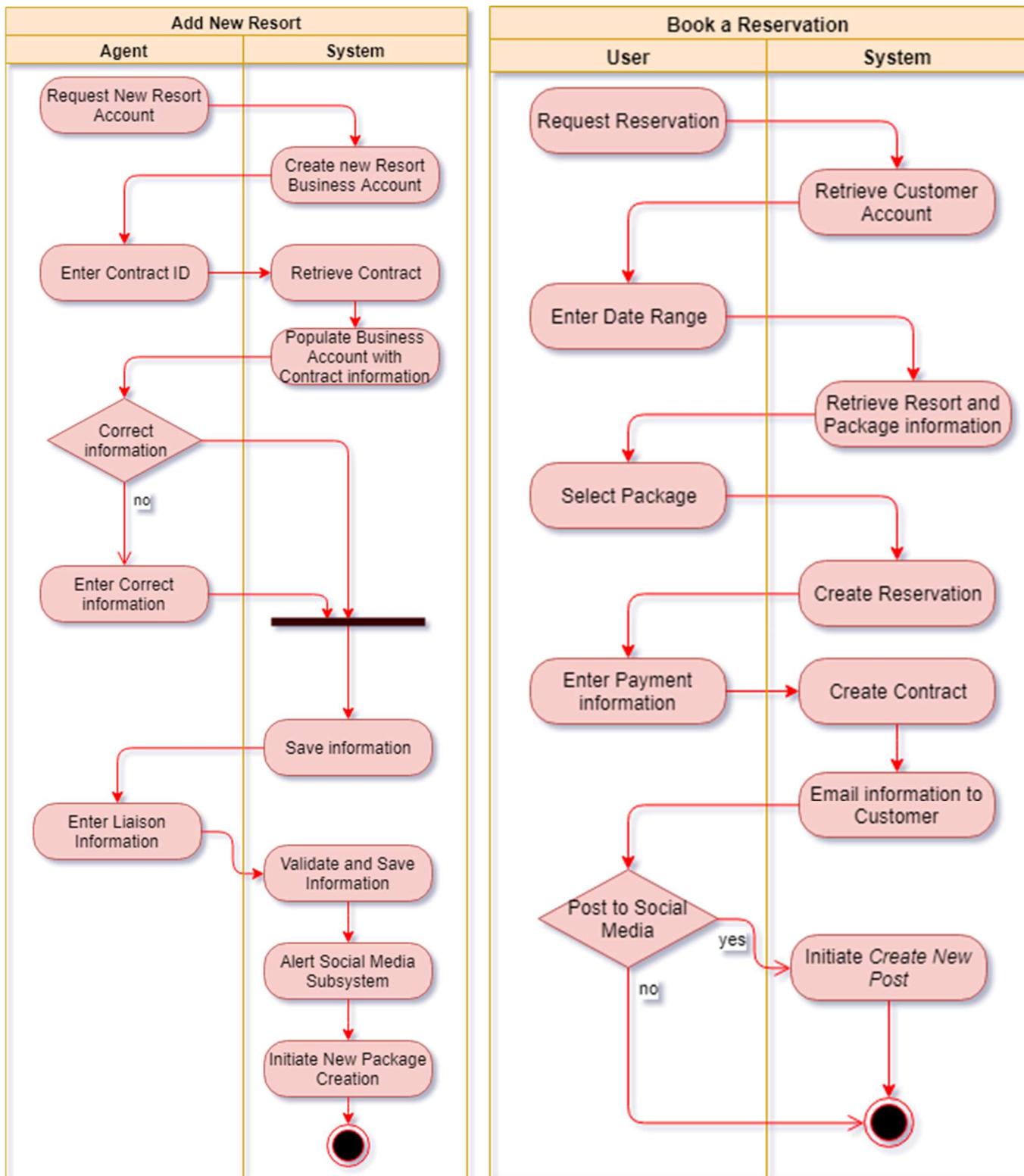
Use case name	<i>Book a Reservation</i>
Scenario	Book a new reservation for a customer with an affiliated business resort.
Triggering event	User indicates desire to book a reservation with a selected resort.
Brief Description	A customer or Sales Agent creates a new Reservation item with an affiliated Customer account and Resort account.
Actors	Customer, Sales Agent.
Related use cases	Might invoke <i>Create Customer Account</i> use case if not present. Might invoke <i>Post New Trip</i> use case of Social Media subsystem if desire indicated.
Stakeholders	Customer, Sales Agent, Business Affiliate
Preconditions	Customer Account subsystem must be available. Resort and Package subsystem must be available. Booking subsystem must be available. Customer Account must exist and contain valid data. Contract subsystem must be available.
Postconditions	Reservation must be created and saved. Contract must be created and saved. Reservation and Contract must be associated with Customer and Business Account.



Flow of activities	Actor	System
	<ol style="list-style-type: none"> <li>1. User indicates desire to book a new reservation with selected resort.</li> <li>2. User enters date range information.</li> <li>3. User selects a Package item.</li> <li>4. User provides payment information.</li> <li>5. User verifies all information.</li> </ol>	<ol style="list-style-type: none"> <li>1.1 System retrieves Customer Account information.</li> <li>1.2 System prompts for new date range information.</li> <li>2.1 System retrieves Resort and Package information.</li> <li>2.2 System displays available Package information and prompts for selection.</li> <li>3.1 System creates a new Reservation Item.</li> <li>3.2 System prompts for payment information.</li> <li>4.1 System verifies payment information.</li> <li>4.2 System creates new Contract item.</li> <li>4.3 System displays all information for verification.</li> <li>5.1 System saves Contract item and Reservation item to database.</li> <li>5.2 System emails Contract and Reservation information to Customer.</li> <li>5.3 System prompts user to <i>Create New Social Media Post</i>.</li> </ol>
Exception conditions	<ol style="list-style-type: none"> <li>1.1 Customer Account does not exist or is invalid.</li> <li>1.2 Invalid date range entered.</li> <li>2.2 No Package availabilities for Resort.</li> <li>4.1 Invalid payment information entered.</li> </ol>	

## Activity Diagrams

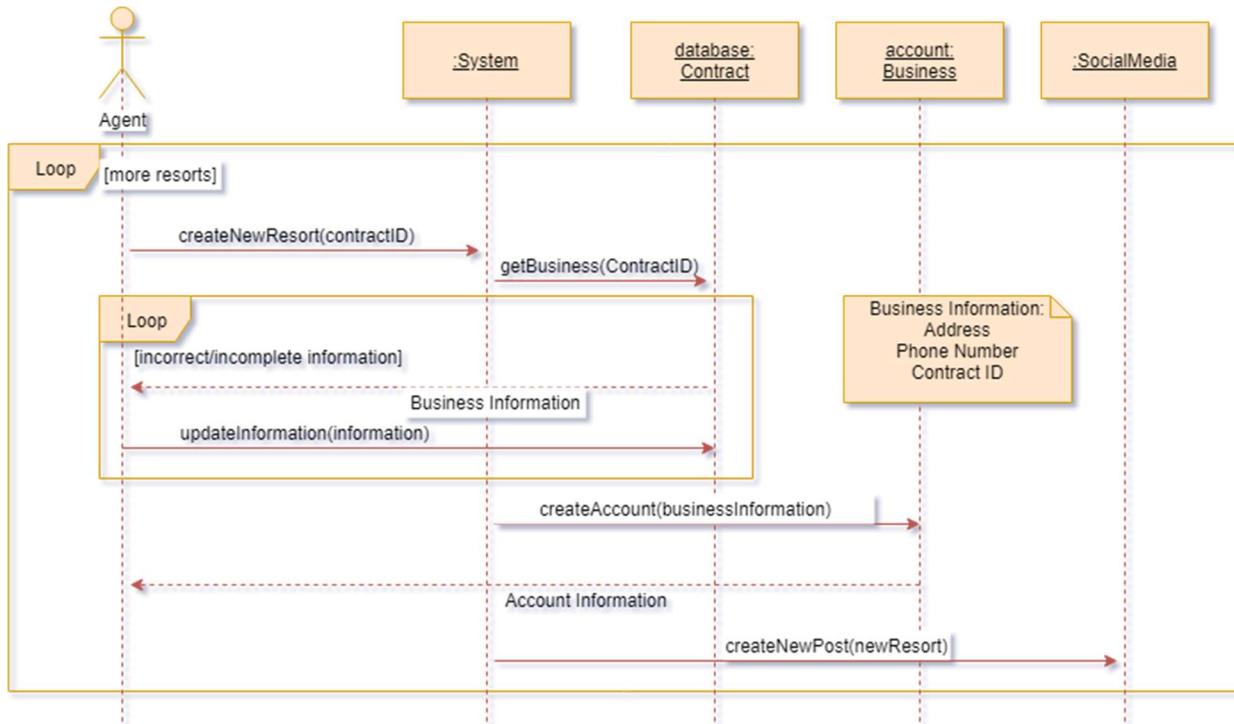
Activity diagrams illustrate the flow of actions between Actor and System.



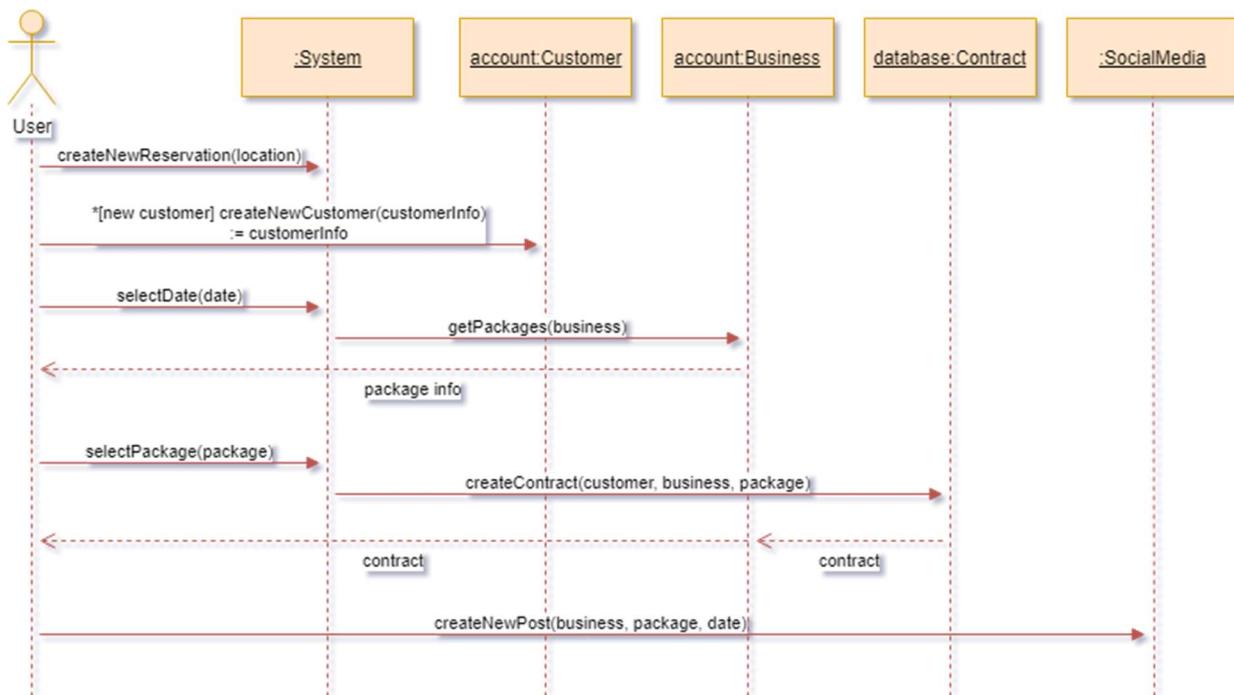
### System Sequence Diagrams (SSD)

System diagrams provide visualization between the systems involved in a use case and the flow of actions and events between the systems.

#### Add a new Resort



#### Book a Reservation





### CRUD Analysis

Create, Read, Update, Delete analysis provides verification that the entire data lifecycle is present in a use case.

Data entity	CRUD	Verified Use Case
Resort Account	Create	Create New Resort Business Account
	Read	Look up Contract ID Look up existing Account
	Update	Save new/updated information
	Delete	Update new account [archive to database]
Reservation	Create	Create New Reservation
	Read	Look up Customer Account Look up Business Account Look up Package information
	Update	Verify Customer Account Info
	Delete	Save Contract to Database [archive] Email Contract to Customer [archive]

### Add New Resort

Use case	Account	Contract	New Social Media Post
Create Account	C		
Get Contract information	R	R	
Get Business Information	R	R	
Get New/Updated Information	U	U	
Update and Archive	UD [archive]	UD [archive]	UD [new business post]

### Book a Reservation

Use Case	Customer	Business	Contract
Create New Reservation	C/R/U	R	C
Get date range			U
Get Package Information		R	
Select Package			U
Send Contract to Actors	U/D [archive]	U/D [archive]	U/D [archive]



## 8 System Security

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System security encompasses account management, data access management, data transfer protocols, fraud identification and prevention, and public perception. Maintaining a secure system is the responsibility of every person and team involved in the development of the system. As such, there is no one subsystem or area of development where it is more important to focus on security than another. However, certain subsystems may require additional security concerns that are not needed or included by other subsystems.

System-wide guidelines and implementations for providing an overall secure system have been identified below. While developing and designing the SBRU system, these guidelines should be followed for every subsystem, application, and access point.

Individual subsystems with additional security needs have been identified following the full system security measures.

### 8.1 Full System Security Measures

#### 8.1.1 *Identity Access Management and Governance.*

SBRU will contract with a trusted IAM provider to implement access control lists, authentication, and authorization. Additionally, any account with access to sensitive data must be accessed with multifactor authentication methods provided by the IAM contractor.

Consultation is currently underway with **Okta, Inc.** for access management and **SailPoint Technologies, Inc.** for identity governance solutions. Both companies have extensive knowledge of securing existing systems. As SBRU increases in size and considers migration of services to cloud based providers, relations with **Okta** and **SailPoint** will provide secure and simple transition to an updated system.

#### 8.1.2 *Data encryption of all archived or saved information.*

SBRU provides extensive data among its many subsystems that is freely and publicly available. However, it is considerably safer to save and archive all data in an encrypted format to be decrypted on an as needed basis and provide total security from the ground up. This includes but is not limited to customer account information, business account information, business offerings, social media posts, and all other information and data collected by SBRU.

Information that is to be publicly available should be securely retrieved from the storage system and decrypted by the accessing application before display. Interacting with data in this manner removes the possibility of sensitive information being stored in a *plaintext* manner altogether and eliminates the need for individual judgement to be used with regards to what should or should not be encrypted.

#### 8.1.3 *Separation of concerns between applications and systems.*

Modern design requires modularity in designing individual components of a system to help maintain a complex system of interwoven systems. It is expected that a finance system is an individual entity from a social media system as there is likely not to be an overlap of business logic or information exchange between these systems. Likewise, it provides additional security from penetration. If one system is compromised, it should not allow access to all information available from the SBRU system.



#### 8.1.4 Secure transfer of data.

Because of the separation of systems, it is expected that data must be transferred between them in order to function fully. All data transfers must be initiated using an asymmetric key encryption protocol to verify the recipient *and* the provider of information.

This initial connection between systems will then move to a single key encryption provided upon verification and authentication of both parties to facilitate faster data processing. Any information that is to be displayed or sent via the SBRU web pages will conform to HTTPS standards. SBRU cannot manage all devices that access our content, but we can ensure that any information sent to or retrieved from a user is safe by following these standards.

#### 8.1.5 Complete record keeping of all data access and transfers.

This is typically referred to as an *audit trail*. Any time data stored within SBRU systems is accessed or transferred from, to, or between an SBRU system, a standardized record will be generated. This record is to include the date and time of the action, brief description of the action taken (data access, data transfer, data update, etc.), identification information regarding the origin of the action, and a transaction identifier appended to the affected record and a centralized ledger.

Access to this ledger will be restricted to security professionals and other privileged users deemed necessary. However, accessing the ledger will not provide information contained within the record. Access to this information will additionally be limited based on access level specifications.

Implementation of the system is commonly provided by identity access and governance systems such as the ones provided by **SailPoint** and will require very little effort on the part of SBRU to implement but will provide redundancy and simplification for auditing purposes and limit potential for fraud.

#### 8.1.6 Physical data access.

At present, SBRU data is stored on premises in the home office. Access to these digital stores should be maintained as diligently as digital access to information. While this can be achieved with physical security measures such as access logs, physical locks, a security presence, and other methods, it is worth investigating migration of data to a trusted cloud services provider such as **Amazon Web Services** or **Microsoft Azure**.

Currently, migration to cloud services is beyond the scope of this project. However, the benefits gained by such a move include faster development and deployment of services and systems, increased security, lowered maintenance cost, and automatic data redundancy and backup services and should be investigated further in future iterations of development.

#### 8.1.7 Routine penetration testing by an external contractor.

By routinely searching for the weak points in the system, security can continue to improve. Just as any good development process is approached iteratively, security measures must be continually evaluated for efficacy and areas for improvement identified.

### 8.2 Resort Relations

#### 8.2.1 Input and data validation controls.

SBRU provides business accounts to our affiliated business partners to automatically update their listings and offerings. While it is the responsibility of these partners to provide accurate information, this data should be validated automatically by SBRU systems to limit entry mistakes that could cause potential strains in relationship with our partners.



For example, room rental rates should never be updated to unreasonable numbers. What constitutes unreasonable may vary between partners and should be created during formation of partnerships and periodically reviewed by an SBRU relations agent and the business partner.

#### *8.2.2 Routine auditing of business partner accounts.*

Again, while it is mostly the responsibility of each individual business partner to verify those with access to their SBRU business accounts are authorized users, these accounts should be routinely reviewed with the business partner with total transparency for audit trails provided if requested.

### **8.3 Student Booking**

#### *8.3.1 Input and data validation controls.*

Just as we protect our business partners from invalid or unreasonable data entry, SBRU must protect our customers from the same issue. All input from customers should be checked to be reasonable, complete, and valid. This includes selections for booking dates (cannot book a trip in the past, cannot book a trip for an unreasonable time in the future, cannot book a trip for an unreasonable length of time), customer information (valid contact information), and payment methods.

### **8.4 Accounting and Finance**

#### *8.4.1 Routine internal and external auditing.*

All accounting and financial records created by SBRU must be audited internally as a matter of habit throughout the entire accounting process. Auditing by an external accounting firm should be conducted no less than once yearly to verify the integrity of the internal auditing process and reports.

#### *8.4.2 Ongoing education about fraud.*

Employees should be educated on the automatic access control and auditing system used by SBRU. Potentially fraudulent activity is less likely to take place when an actor is aware of the system used to monitor fraud. Employees must also be educated on the potential signs of fraud and fraud prevention.

#### *8.4.3 Anonymous tips.*

An anonymous system for reporting malfeasance or fraud should be made available to any person wishing to make a report. This system should be open to those internal and external to SBRU to include but not limited to employees, contractors, vendors, customers, and business partners.

### **8.5 Social Media and Networking**

Security also means safety. Customers using the SBRU system to communicate among friend groups should trust that they will not be targets for harassment, discriminatory comments, or cyberbullying while using SBRU systems. SBRU must provide a safe space for our customers by implementing the following:

#### *8.5.1 Anti-discrimination Policy Implementation.*

Creation of a anti-discrimination policy that has clear and measurable metrics for how inappropriate behavior is identified and removed from SBRU systems. Systems must be implemented in order to conform to this policy.

#### *8.5.2 Reporting.*

Users of the Social Media system must be able to report inappropriate or indecent content and this content should be reviewed quickly and dealt with appropriately by SBRU.



## 8.6 Transparency

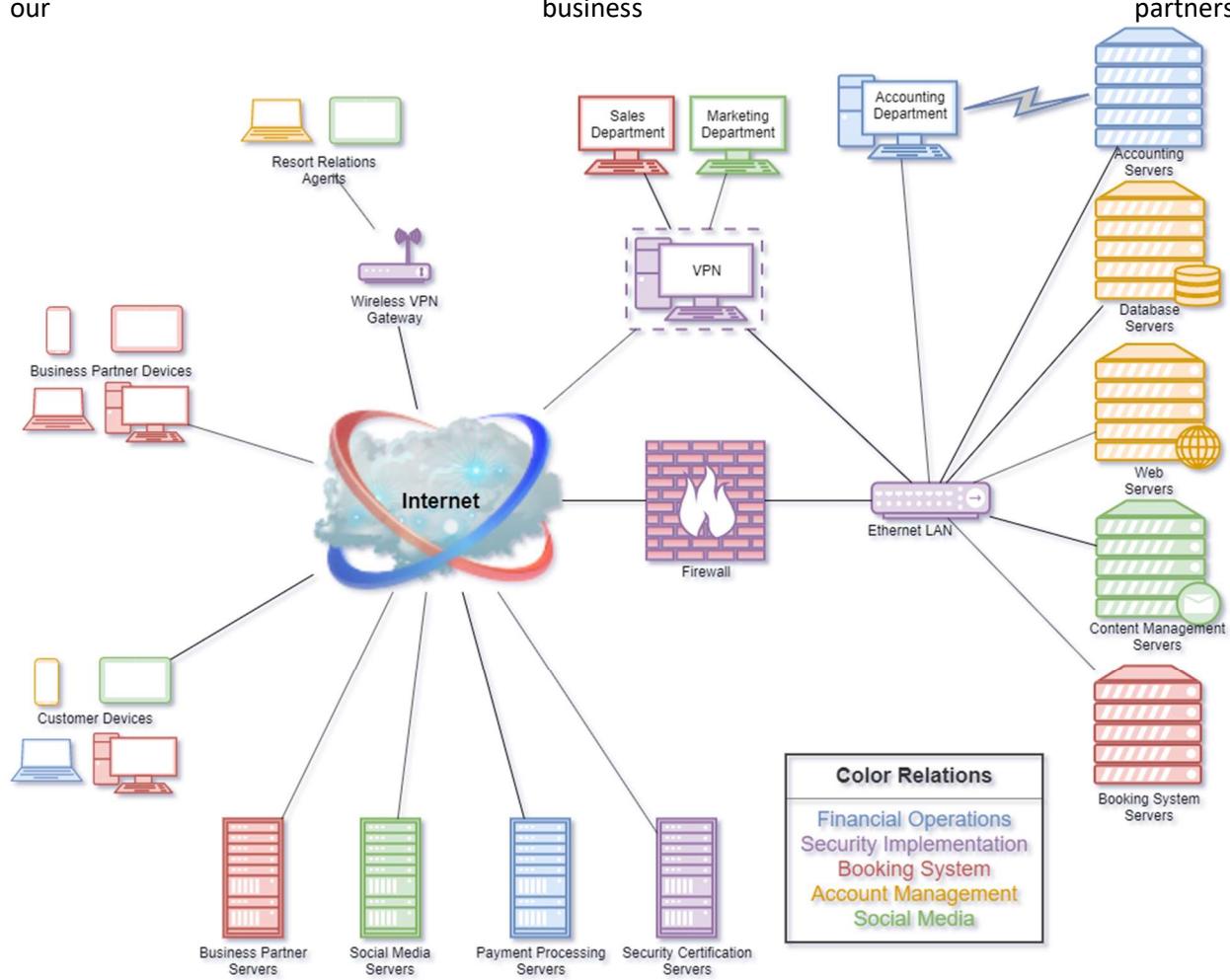
Having a secure system is important in and of itself. However, there are benefits to creating transparency regarding the implementation details of the system. Customers should feel safe that their data will not be compromised, shared without their consent, or otherwise misused. Business partners should feel safe sharing privileged information with SBRU without concern that this information could be revealed to a competitor or cause damage to the business's public perception. Regulators and government oversight need to verify data security follows laws and guidelines enacted to protect its citizens.

Documentation should thus be provided to any inquiring individual or entity that details how data and access is protected. This information should be clear, concise, and accessible to individuals without a working knowledge of cybersecurity measures.

## 9 Network System Architecture

### 9.1 Present Design

SBRU hosts and maintains all web presence with a physical hardware architecture located at the home office. This model has served the company well in the past, allowing departments easy access to the individual applications and databases directly through a local area network. Customers and business partners connect to the SBRU system via the internet and interact with our applications to manage their accounts, book new vacations, manage their billing and payment details, and connect SBRU with their social media accounts. The diagram that follows gives a basic overview of the connections between each component of the system and how it is accessed by SBRU employees, customers booking vacations, and our business partners.



### 9.2 Analysis

After analysis of the present design, the following benefits and critiques have been identified that need further consideration. A potential solution to improve upon the current system is migration to cloud based services provided by an enterprise cloud provider such as Amazon Web Services or Microsoft Azure. This is discussed following the analysis of the present system.



#### 9.2.1 Physical control over architecture, network, and data.

BENEFIT	SBRU maintains physical control over the architecture, network, and data involved in the entire system. This provides a certain degree of security from third party access to this architecture and information. All access to the system is physically secure from intrusion and corruption in so much as the SBRU home office is secure from physical intrusion. Digital access to the system is additionally regulated by in-house security specialists.
CRITQUE	<p>As a system grows and becomes increasingly more complex, maintaining this security can become increasingly expensive and unwieldy. It requires constant vigilance and training on the part of those responsible for maintaining the security of the system. As the field of cybersecurity grows, Security as a Service grows increasingly promising as a means of securing our system.</p> <p>Additionally, any required backup of data must be manually handled on a routine basis and physically transported offsite for redundancy in case of natural disaster. This can be automated and implemented more effectively by outsourcing to a company with specialization and experience in security and data management.</p>

#### 9.2.2 Instant and constant access of data by SBRU employees.

BENEFIT	With a centralized system, SBRU home office employees have access to required data no matter the state or health of internet connectivity. This provides both quick and constant access to internal services and data, allowing departments to continue to function without internet access.
CRITQUE	As SBRU continues to expand, access to this information is no longer limited to the employees in the home office. Business relation agents, location scouting agents, and additional departments require access to SBRU services and data offsite to provide a better experience to both our customers and our affiliated business partners. This creates a significant bottleneck in providing services should the SBRU network become unavailable for any reason. With additional expansion of satellite offices and additional locations, this benefit no longer applies to SBRU as an entity.

#### 9.2.3 Costs for implementing the system have already been realized.

BENEFIT	Because the system is already in place, there is no additional cost beyond maintenance costs. Moving the system to a cloud-based service would incur additional setup and maintenance costs that are not currently present
CRITQUE	For short-term projections, this is a valid concern. However, it is ultimately short-sighted and does not consider the long-term cost of upgrading a physical system. As server loads increase, hardware begins to fail, and the need for upgrades increases, a scalable solution becomes more cost effective overall.



### 9.3 Migration to Cloud-Based Architecture

Given the above analysis, it is worth considering a move to a cloud-based architecture in future iterations. As the system grows overall, deployment of new features and implementations can be difficult with an outdated system. Cloud based systems allow for quick and painless deployment to the system. Additionally, routine maintenance and uptime can be managed by the provider allowing SBRU development teams to focus on improving the product rather than supporting legacy architecture.

A threshold of 50% increased costs of maintenance and set up has been determined as a viable position of migration. It is better to incur additional costs now and save money overall in the long-term by providing scalable solutions to the SBRU system. Conversely, above 50% increased costs of migration would indicate continuing with the present architecture until these costs can be deflated.

However, this consideration may change based on the expansion of SBRU to additional locations, specifically overseas in Europe or Central America. The potential cost of setting up an entirely new system in a foreign country that can interface seamlessly with the present system could be astronomical. On the other hand, migration to cloud based technologies now makes creation of satellite locations and offices an almost trivial matter and overall costs would be significantly reduced. Therefore, the holistic expansion model of SBRU as a company must be considered when making the decision to migrate SBRU services to a cloud-based provider.



## 10 Security User Experience Design

The SBRU Social Media subsystem collects a considerable amount of data about users of the system. A pilot program initiative is currently being developed with select affiliated resort businesses to help with their existing security infrastructure by interfacing with the information available from the SBRU systems. SBRU has designed a prototype security interface for resorts to test and use to better maintain the safety of our customers.

What follows is a storyboard illustrating how a security officer would interact with the interface to handle an event *Pool Overcrowded* and how this information is portrayed to the managing security officer.

 DON JOE	File	Camera View	Environmental	Dispatch	Report	Information
						

### 1. Login Screen

The officer must first login to the system by providing valid credentials. Until the proper information has been supplied, menu items are greyed out to indicate they are not available for interaction.

## 2. Initial Display

The officer has logged into the system and can now interact with the system.

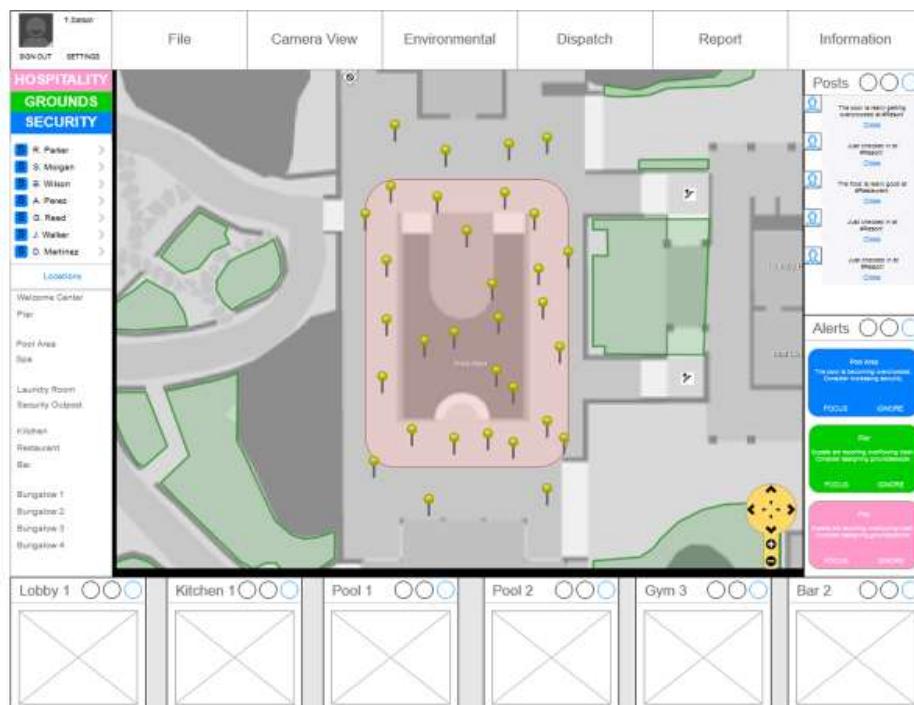
Location Focus list

Collapsible On Duty Roster lists



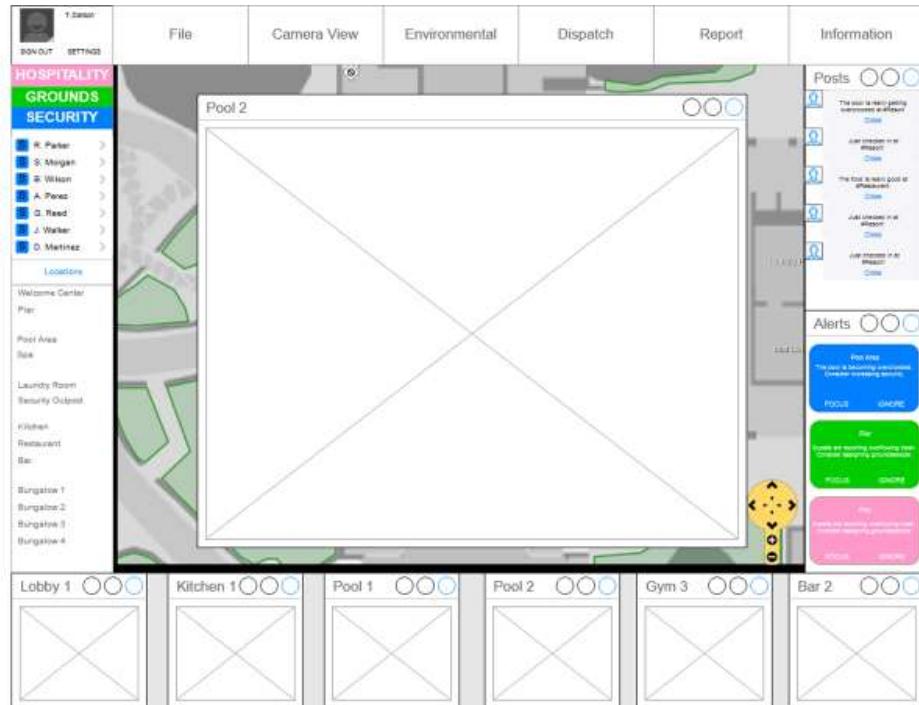
## 3. Focus Alert Area

After selecting to focus on the alert about the pool, map zooms in to the affected area. The area is highlighted with a red alert box and current guest locations are displayed as pushpins.



#### 4. Camera Focus

The officer selects a camera to magnify and focus on to get a better view of the current area.



#### 5. Dispatch Menu

The officer closes the magnified camera and selects the Dispatch menu item. A list of possible staff categories is provided for dispatch.



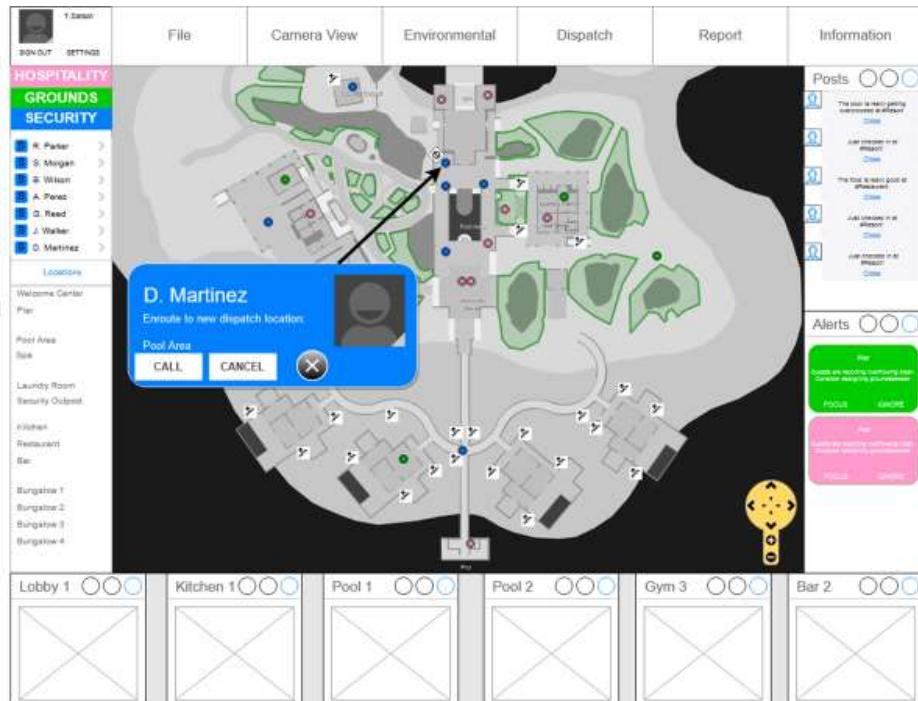
## 6. Dispatch Security

The officer clicks dispatch locations for the security officers. At each click, a pushpin corresponding to the category color is placed on the map indicating a new dispatch location.



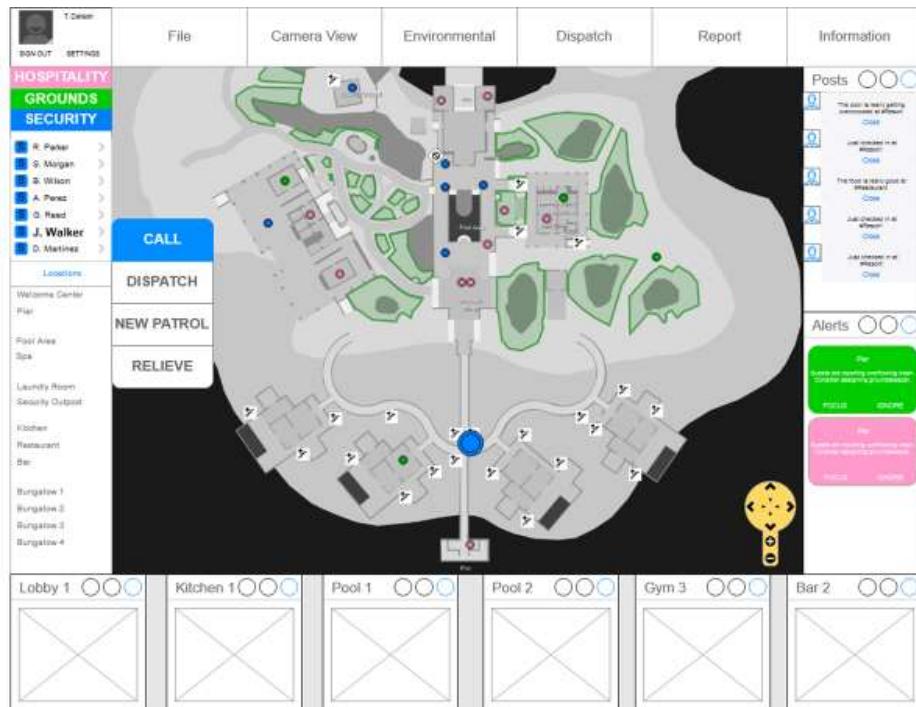
## 7. Select Staff from Map

The officer clicks on an individual staff icon and is displayed information about that staff member. The officer is given options to call the individual directly.



## 8. Select Staff from List

The officer needs to interact with an individual patrolling security officer to inform him of the situation. The selected individual is magnified on the map to display their current location and options for interaction are provided.



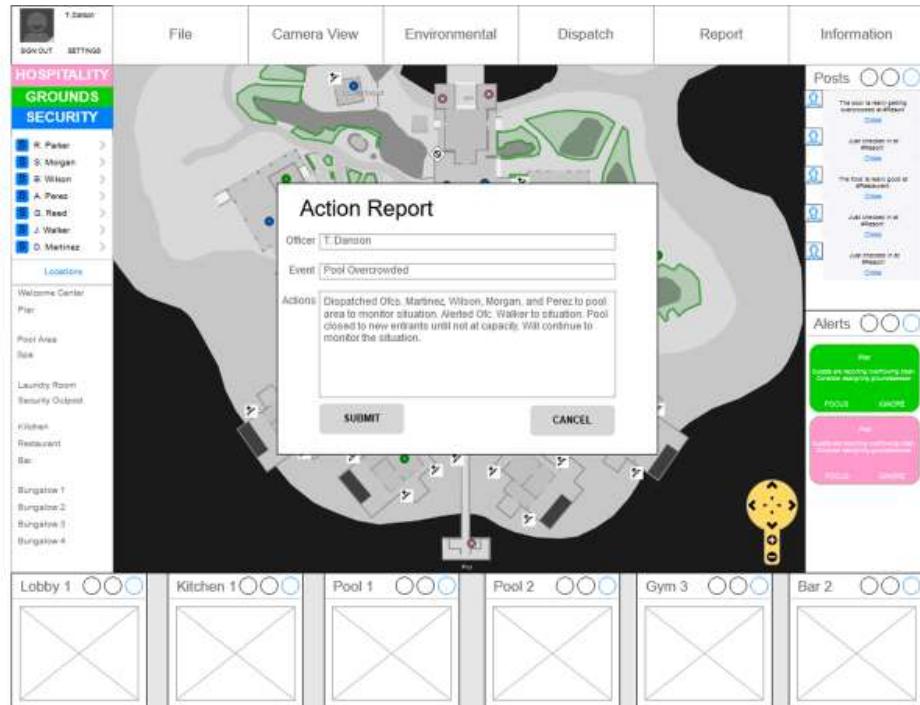
## 9. Initiate Phone Call

During the phone call with the officer, information is provided about the current officer with an arrow indicating their current location.



## 10. File Action Report

After the incident is handled, the officer must file an Action Report detailing actions taken.



## 11. Action Report Filed

The officer files the report and is notified of successful filing.





## 11 Core Functionality Development Planning

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The SBRU system contains four key subsystems to facilitate the overall business objective of fulfilling Student needs to create and book travel plans with affiliated SBRU Resort business affiliates. Each subsystem encapsulates a specific function of the SBRU system and has unique objectives. However, each subsystem must interact and communicate with each other in order to achieve the goal of providing an easy user experience in connecting our Student customers with our Resort business partners. The following information will provide brief information on each subsystem and what domain classes they encapsulate. The shared domain classes are then identified to illustrate the communication between each subsystem. Finally, a plan of iterative development focusing on developing these core domain classes will be discussed.

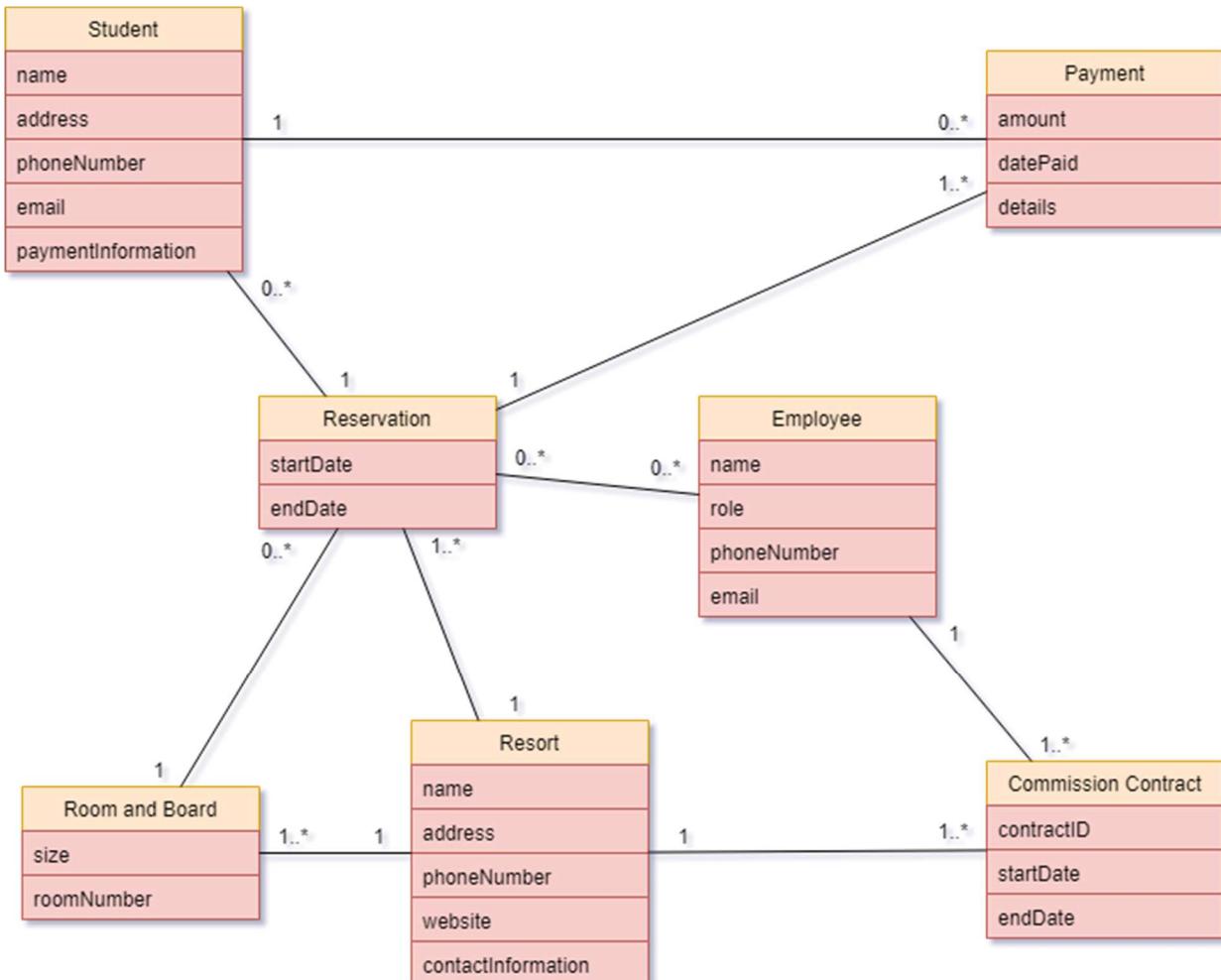
### 11.1 Subsystem Relations

The following table lists each subsystem and the classes that are necessary for the functioning of these subsystems. As this section is meant to illustrate only the shared information and functionality between each subsystem, the classes provided for each subsystem is not exhaustive but should provide a basis for priority development to provide the core functionality of the overall SBRU system.

Domain Class	Subsystem			
	Resort Relations	Student Booking	Accounting	Social Networking
Employee	✓	✓	✓	✓
Student		✓	✓	✓
Resort	✓	✓	✓	✓
Room and Board	✓	✓		✓
Reservation	✓	✓		✓
Payments	✓	✓	✓	
Commission Contract	✓		✓	

## 11.2 Core Functionality Mapping

The core functionality of the SBRU system is to allow Students to create and book travel accommodations through SBRU business affiliates and provide SBRU a means of producing a profit from this venture. To illustrate the ways with which the classes listed above interact to facilitate this, a domain model of the core functional classes identified is provided with the following diagram.





### 11.3 Iterative Design Implementation Planning

In order to bring the SBRU system to market as soon as possible, it is necessary to first implement the overall core functionality before fully investing in additional development for features that are not required for multiple subsystems. The classes identified above are required to begin offering services to both Students and Resort businesses. Similarly, the subsystems containing the most need for these classes will be identified for priority development in the first four iterations of project development. It is estimated that it will take one iteration (per subsystem) to introduce the core functionality and a second to fully implement the needs of an individual subsystem. The iterations are identified below along with the scope they will encompass including necessary use cases that must be implemented to consider core functionality fulfilled.

Iteration	Subsystem Focus	Necessary Use Cases	Encompassing Domains
1	Resort Relations	1. Create Business Affiliation 2. Create Resort Offerings	Resort Room and Board
2	Student Booking	1. Create Account 2. View Offerings 3. Make Travel Plans 4. Book reservation	Student Reservation
3	Resort Relations	1. Advertise Affiliation 2. Modify/Update Offerings 3. Create Commission Incentives	Commission Contract Employee
4	Student Booking	1. Modify/Update reservation 2. Cancel reservation 3. Pay for booking	Payment

### 11.4 Agile Design Principles

Given the iterative nature of this project development, Agile principles should be followed in order to better provide continual feature implementation in the overall system. Once the core functionality to book a reservation is provided, all additional features can follow incrementally. These incremental introductions can additionally be well designed based on continual user feedback after deploying the system to a production environment. This will allow a better understanding of additional needs within each subsystem and the system overall.

Primarily, this will provide an overall shorter development life cycle allowing SBRU to continually improve upon offerings to both Resort business affiliates and Students alike. With the early return on investment provided by early deployment of core functionality, SBRU will additionally be able to justify further development and target areas that are drivers for profit.



## 12 Subsystem Deployment Planning

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The SBRU system has been broken up into four, manageable subsystems. This provides several benefits for development of the overall system. Chief among these benefits is facilitating the ability to provide a continuous integration and continuous deployment (CI/CD) pipeline allowing for iterative development that allows SBRU to offer base services while gradually expanding upon features. As the core functionality of the system has been identified in the previous subsection, the task of delegating the order of the development for each subsystem logically follows.

### 12.1 Subsystem Development Ordering

The order in which these subsystems should be developed is as follows:

1. Resort Relations—Development of this subsystem allows business affiliates and resorts to begin creating content for display to student users.
2. Student Booking—Lorem Ipsum.
3. Accounting and Finance—Lorem.
4. Social Networking—Lorem.

The order for this has been determined to provide a viable solution to incremental development. By allowing resort content to be created, displayed, and selected, a better understanding of how the Student Booking subsystem will function can be realized. Additionally, as booking becomes available for testing, the details behind the Accounting and Finance process can be better understood. Lastly, with Social Networking providing intangible benefits to the overall system, it will be the last system developed to begin realizing a profit from the overall system. This subsystem will also rely on accounts and information created during the various use cases of the previously created subsystems.

### 12.2 Necessary Use Cases

Each subsystem has specific use cases that will be implemented in order to qualify them as ready for deployment. Listed below are the use cases that have been identified for these criteria.

#### 12.2.1 *Resort Relations*:

- Create business account with SBRU.
- Edit account information.
- Create business offering listing.
- Edit business offering listing.
- List offering.
- De-list offering.
- Retrieve reservation listings/reports.

#### 12.2.2 *Student Booking*

- Create student account with SBRU.
- Edit account information.
- Search business offerings.
- View business offerings.
- Create a reservation.



- Pay for reservation.
- Edit reservation.
- Cancel reservation.
- Create refund request.

#### *12.2.3 Accounting and Finance*

- Process payment.
- Update student account.
- Update business account.
- Process contract/commission payments.
- Process refund request.
- Remit refund.

#### *12.2.4 Social Networking*

- Link account to student/business account.
- Search businesses.
- Search people.
- Create connection with business/person.
- Link to existing social media account.
- Send private message to business/person.
- Upload video.
- Upload image.
- Create social media post.
- Comment on social media post.
- Create review (of business).

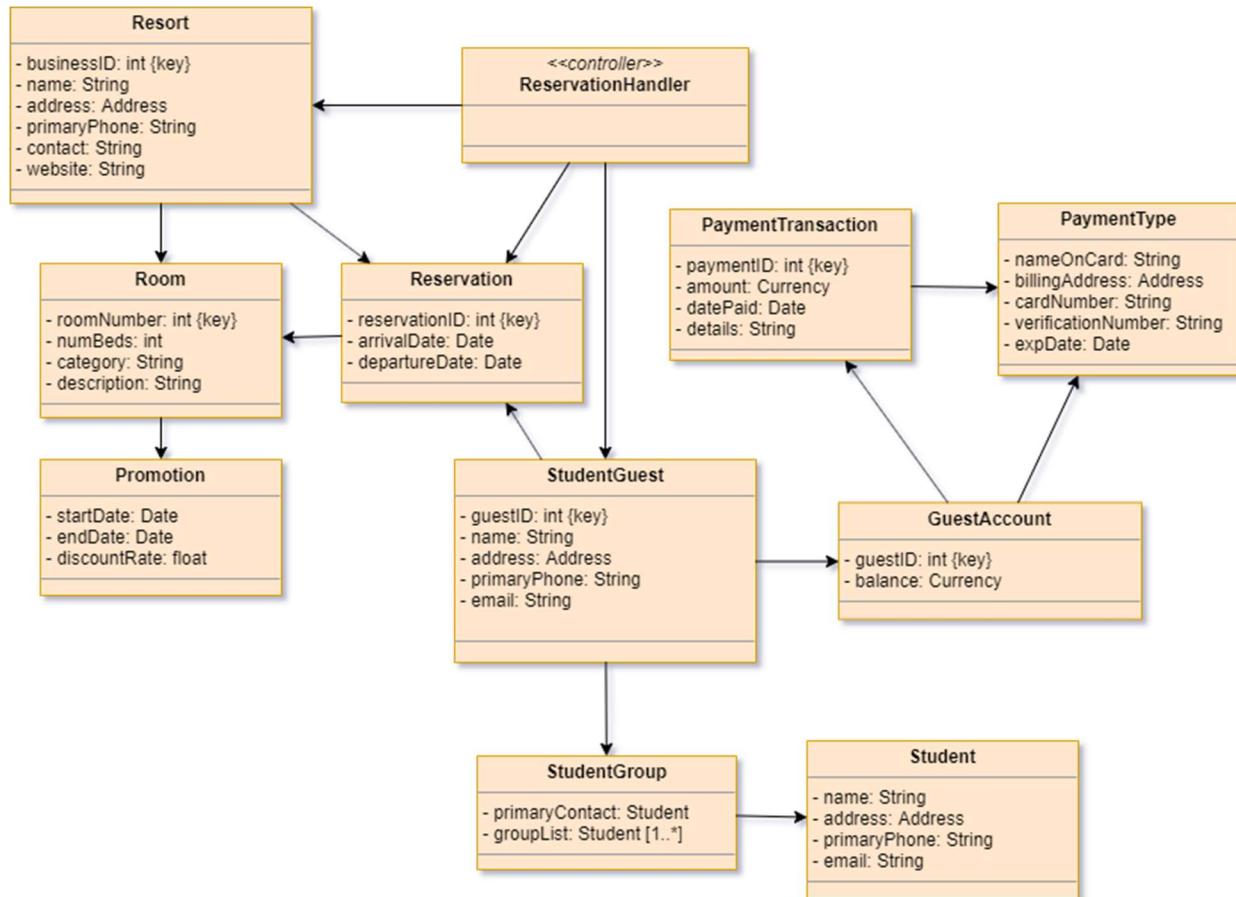
It is important to note that, because the software development life cycle will follow an Agile model, these use cases may change during each iterative phase of a project. These use cases should be used as a general guideline for determining the functionality that *must* be implemented in order to consider a subsystem ready for testing and/or deployment.

## 13 Class Design and Collaboration

The steps, collaborations, and complexity in a given use case can vary significantly amongst various use cases within each individual subsystem. It is important to understand the individual classes involved in a given use case and the way in which these classes interact. We must also know what a class is responsible for knowing and what a class is responsible for doing given a use case. One particular use case, *Book a Reservation*, is particularly complex, involving several different classes within the Booking subsystem. This use case will be used as an example of the full design process behind modelling classes involved in a use case including what they are responsible for knowing, what they are responsible for doing, and how they are to collaborate.

### 13.1 First-cut Design Class Diagram

The following diagram demonstrates the various classes that are involved in the *Book a Reservation* use case. The diagram demonstrates what each class is responsible for knowing and how it interacts with other classes involved in the use case.





### 13.2 Class Responsibility Collaboration

Based on the above diagram, the responsibilities of individual class methods can now be performed. The following shows CRC cards that help to further understand how these classes are interrelated and what specifically they are responsible for doing and knowing. These can be created as front/back notecards to better facilitate the design process.

An example CRC card is presented followed by the actual CRC cards created when designing for the use case *Book a Reservation*.

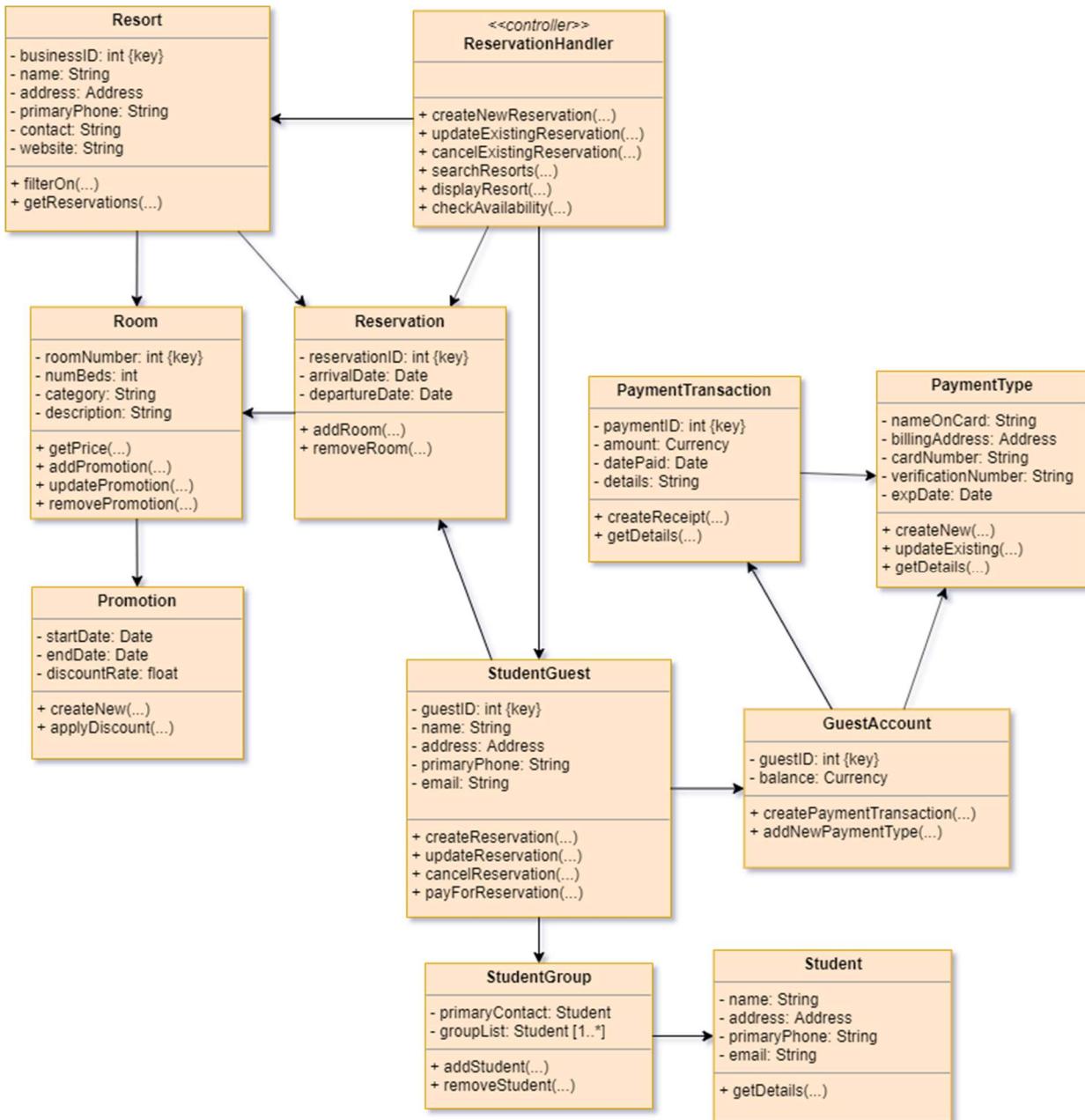
Front	Back
ExampleClass	ExampleClass
Example Responsibility Example Responsibility Example Responsibility	Collaborating Class Collaborating Class
	Attribute Attribute type String int
ReservationHandler	ReservationHandler
createNewReservation(...) updateExistingReservation(...) cancelExistingReservation(...) searchResorts(...) displayResort(...) checkAvailability(...)	Resort Reservation Room Promotion StudentGuest GuestAccount PaymentTransaction
(NONE)	
Reservation	Reservation
addRoom(...) removeRoom(...)	StudentGuest StudentGroup Room
	reservationID int {key} arrivalDate Date departureDate Date
Resort	Resort
filterOn(...) getReservations(...) getRooms(...) getAvailability(...)	Room StudentGuest Reservation
	businessID int {key} name String address Address primaryPhone String contactPerson String website String
Room	Room
getPrice(...) addPromotion(...) updatePromotion(...) removePromotion(...)	Promotion
	roomNumber int {key} numBeds int category String description String



Promotion		Promotion	
createNew(...)		startDate	Date
applyDiscount(...)		endDate	Date
		discountRate	float
StudentGuest		StudentGuest	
createReservation(...)	GuestAccount	guestID	int {key}
updateReservation(...)	PaymentInformation	name	String
cancelReservation(...)	PaymentTransaction	address	Address
payForReservation(...)		primaryPhone	String
		email	String
GuestAccount		GuestAccount	
createPaymentTransaction(...)	PaymentInformation	guestID	int {key}
addNewPaymentType(...)	PaymentTransaction	balance	Currency
StudentGroup		StudentGroup	
addStudent(...)	Student	primaryContact	Student
removeStudent(...)		groupList	[1..*]
PaymentTransaction		PaymentTransaction	
createReceipt(...)	PaymentType	paymentID	int {key}
		amount	Currency
		datePaid	Date
		details	String
PaymentType		PaymentType	
createNew(...)		nameOnCard	String
updateExisting(...)		billingAddress	Address
getDetails(...)		cardNumber	String
		verificationNumber	String
		expDate	Date
Student		Student	
getDetails(...)		name	String
		address	Address
		primaryPhone	String
		email	String

### 13.3 Updated Design Class Diagram

Using the CRC method above, we now have a better understanding of the relations between classes and can confirm that our diagram relations are correct. Additionally, we can now add the method signatures for each class responsibility to the diagram to have a complete picture of everything involved in the use case.

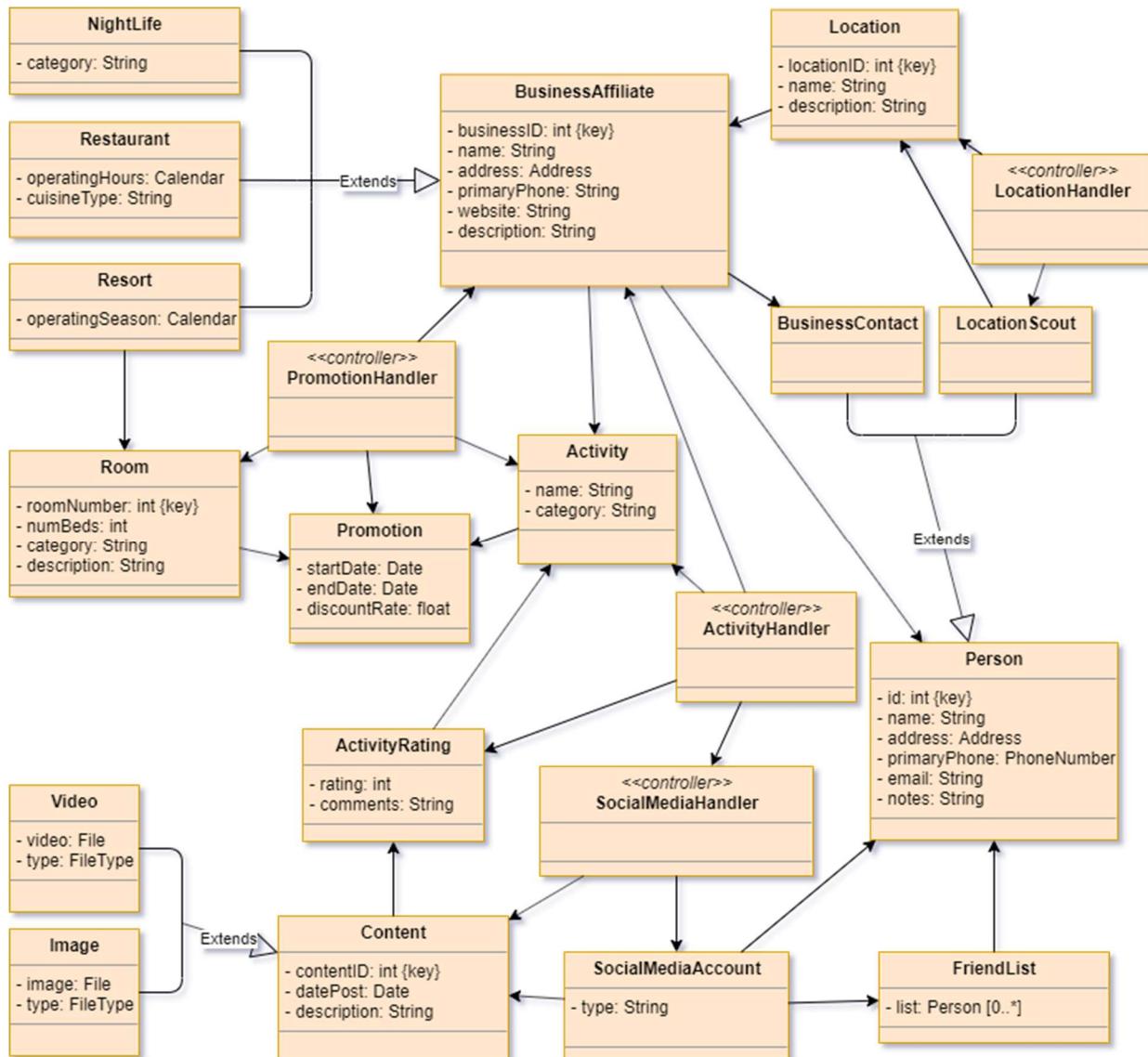


## 14 Domain Class and System Deployment

Now that the overall architecture of the four systems involved in the SBRU system have been established and designed, it is useful to understand the details of how these systems will interact. What follows are diagrams that use the *Book a Reservation* and *Add a Resort* use case in order to show the relations between each subsystem and the details of how the various layers involved in the system will communicate with each other.

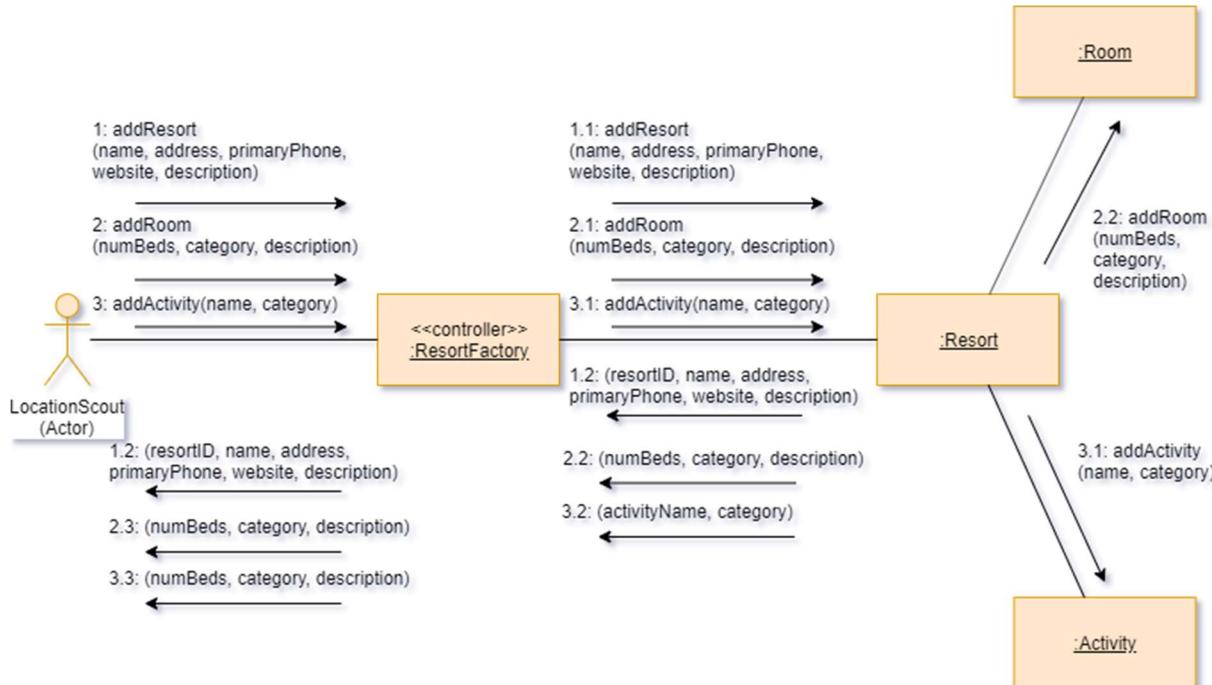
### 14.1 First-Cut Domain Class Diagram

The diagram below is a first-cut of the domain class diagram that shows the domain classes involved in both booking a reservation and adding a new resort to the system. The communication lines between each class of the system are shown to illustrate how each class within the system will communicate.



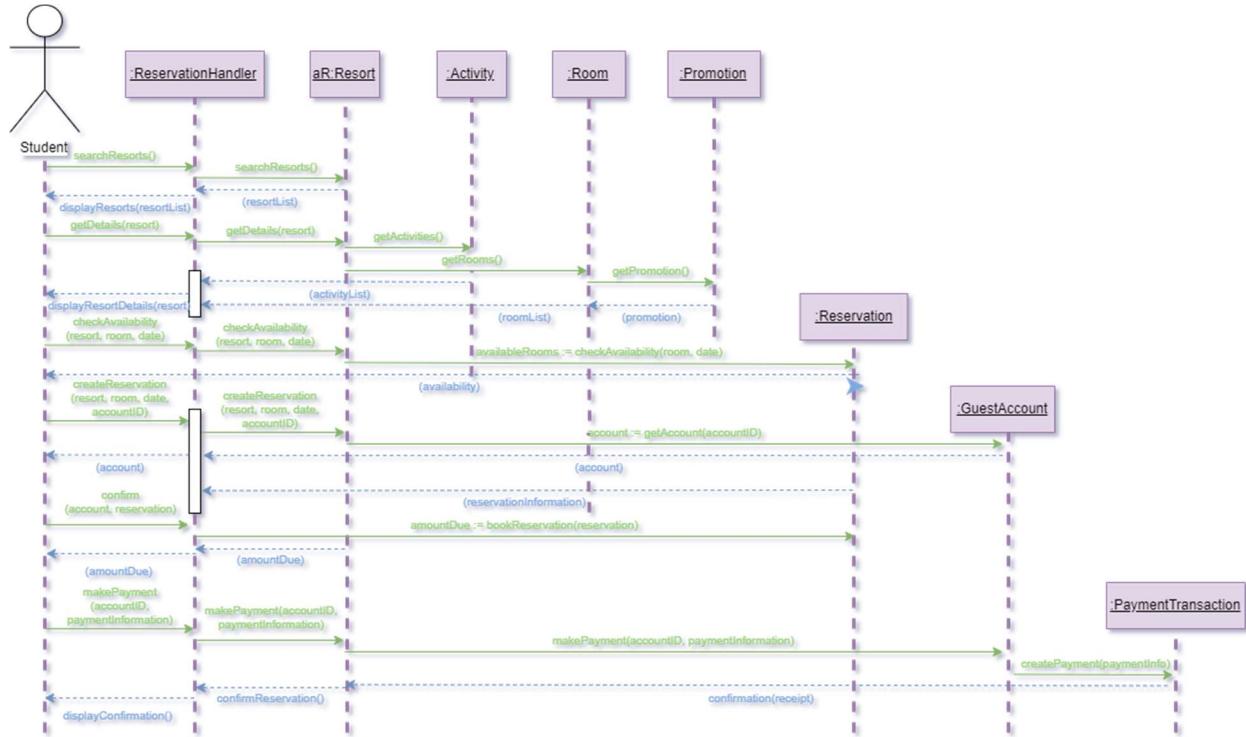
## 14.2 Communication Diagram

The following communication diagram displays the controller class and the domain classes involved in adding a new resort to the system. The steps that each actor will use (i.e. a location scout) are included and then passed on to each domain class involved, displaying the route in which these actions will take to other classes in order to facilitate this action.



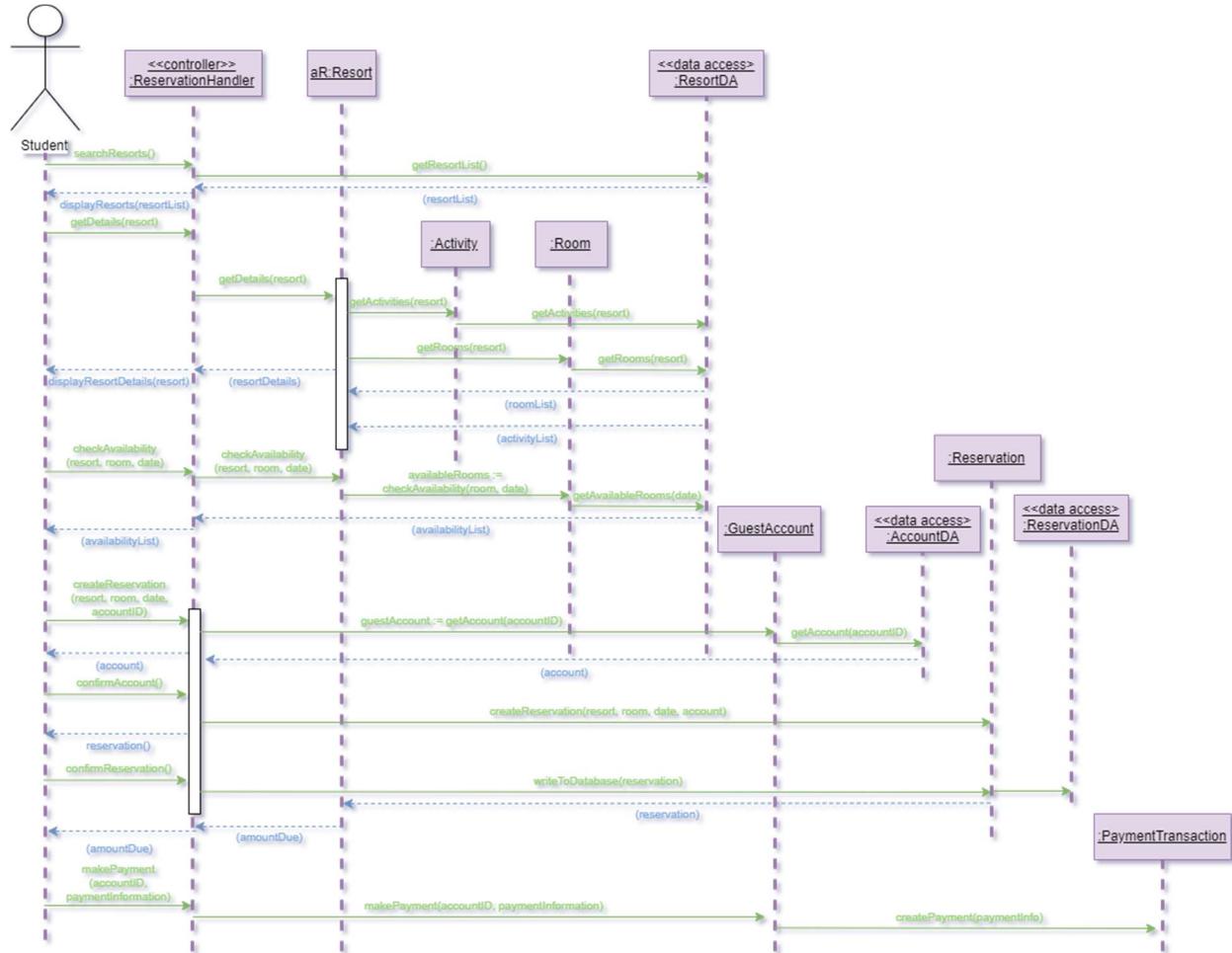
### 14.3 Sequence Diagram

The following diagram is a base sequence diagram for the *Book a Reservation* use case, displaying the steps involved with a user booking a new reservation. Each step is passed between various domain classes with each class having a different lifetime throughout the use case. These steps are shown by arrows showing the flow of control of data between the user and the system.



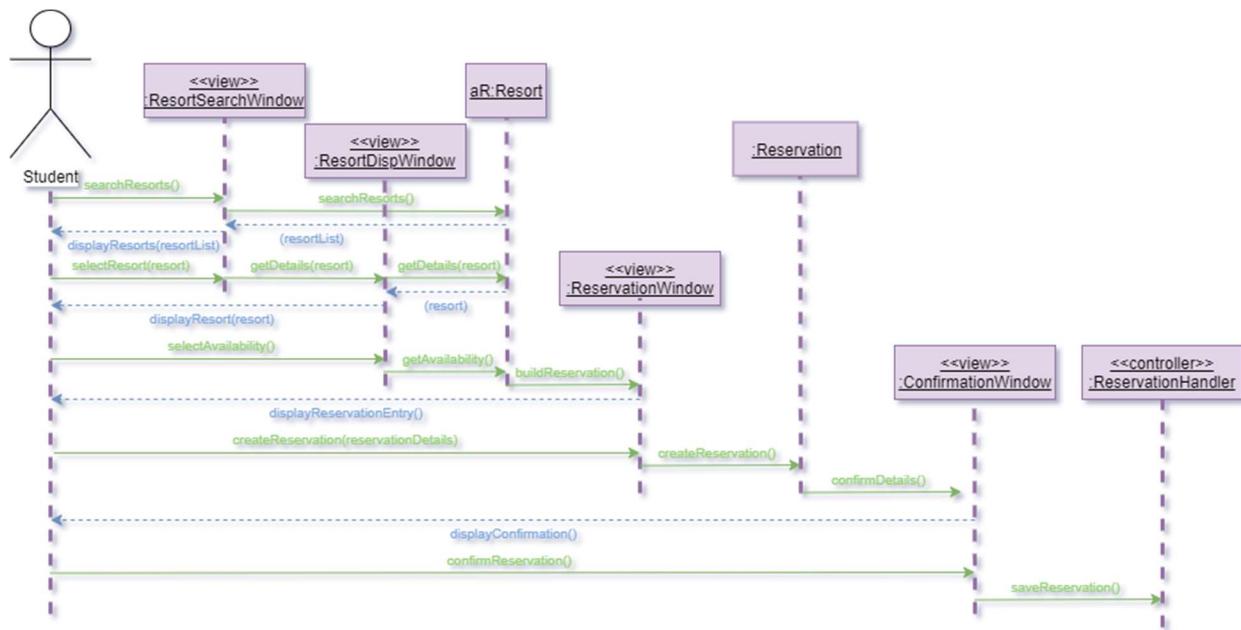
#### 14.4 Multilayer Sequence Diagram (domain and data access)

The above diagram simply illustrates the data classes involved within the *Book a Reservation* use case and does not highlight how these data classes will interact with each other and the underlying database that stores these data. The following diagram highlights two additional layers involved, the domain classes and the data access classes.



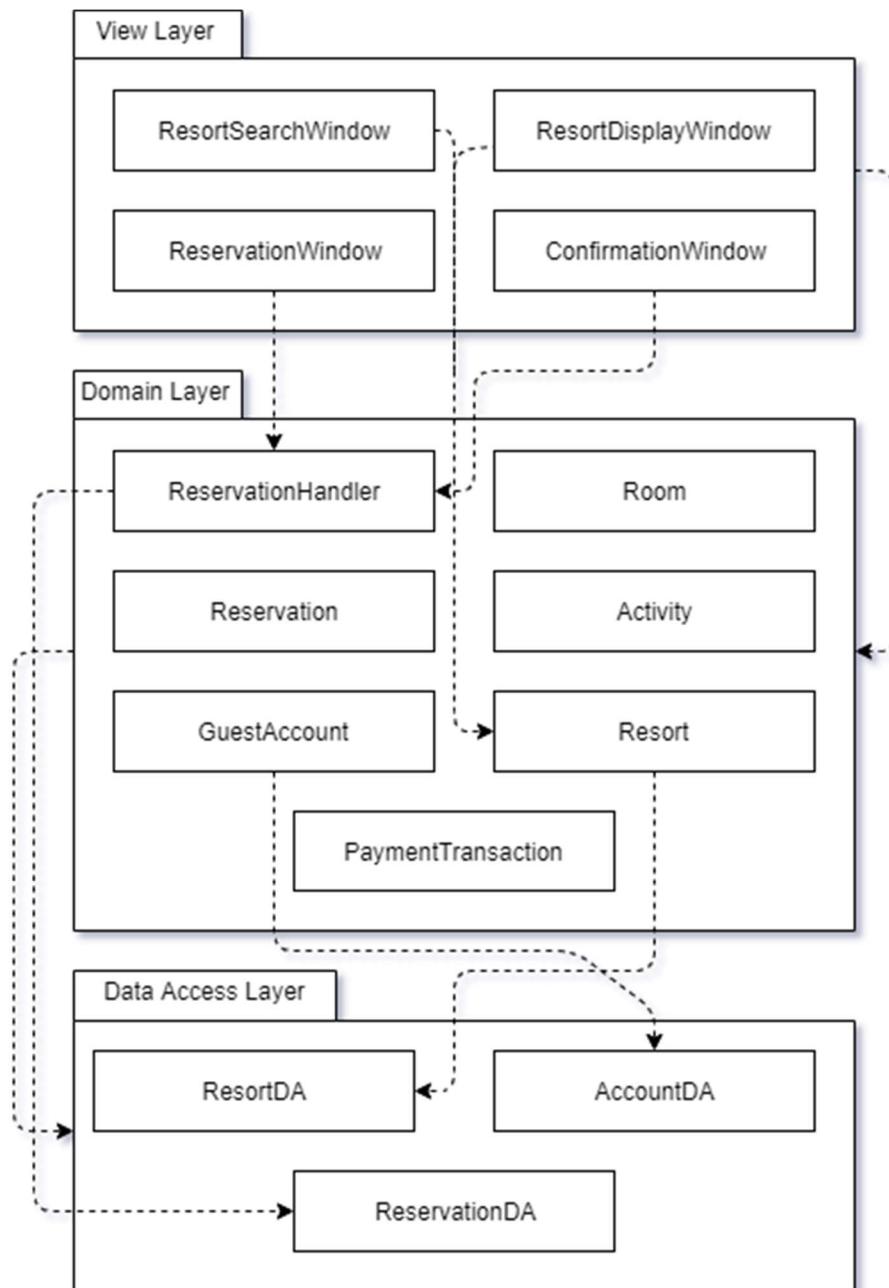
## 14.5 Multilayer Sequence Diagram (domain and view)

A user does not directly interact with domain classes or the data access layer. They are instead presented with a view with which they will interact, supplying the required input and data that is needed in order to book a reservation. The following diagram highlights how the user will interact with various viewing windows in order to supply the necessary information, and what classes these view windows will interact with in order to retrieve and save these data.



## 14.6 Package Diagram

In order to better understand the layers involved throughout the system, it is useful to group them into a package with each package containing the various domain classes involved. The basic interactions between packages and classes can then be highlighted to show how each individual package interacts with other packages, and how these classes within the packages communicate with each other. What follows is a package diagram that shows a much higher-level view of the system architecture than the previous diagrams.





## 15 References

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