

**System Design**

**Specification**

2019.5.19

TEAM #6

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1. **Preface**

1.1. Objective

In this part, the expected reader groups and the structure of this document are introduced. The consisting parts of the document and each part’s objective is introduced in the structure of this document part.

1.2. Expected Reader Groups

The expected user groups for this document are:

* + Developers of this system working on developing or improving
* the front-end
* the back-end
  + Developers maintaining or managing this system
  + Any developers or stakeholders interested in this system who are not included in the development of this system

1.3. Structure of the Document

This document consists of 9 parts, which are Preface, Architecture Outline, User Management System, Seller Management, Protocol Design, Database Design, Development Environment, Development Plan, and Index.

A. Preface

In this part, the expected reader groups and the structure of this document are introduced. The consisting parts of the document and each part’s objective is introduced in the structure of this document part.

B. Introduction

In this part, the tools and diagrams used to build the system are introduced. Tools include the language used to build the diagrams, and the diagrams are the diagrams used to explain the detailed aspects of the system. Also, the brief description about why this system is developed is included.

C. Architecture Outline

In this part, how the system is consisted will be shown. As it suggests the outline of the total system, the detailed description will be given at each system’s explanation.

D. Buyer Management System

In this part, the detailed description of subsystems of Buyer Management System is provided. The subsystems that will be explained in this chapter are User Registration (which includes Sign Up / Sign In) subsystem, Searching Products subsystem and Purchase Products subsystem.

E. Seller Management System

In this part, the detailed description of subsystems of Seller Management System is provided. The Seller Management System consists of three subsystems, Sign In, Sign Up and the Product Registration. Since the Sign In and Sign Up subsystems are same to those of the Buyer Management System, the subsystem that will be explained in this chapter are Product Registration subsystem, consisting of two components by two different purposes: advertising and sales.

F. Firebase description

As we used Firebase as a database of our project, this part consists of the description about the authentication and the database part of the Indi Market’s firebase, concentrating on how the data earned from the system is saved into the database and how they are being used in each systems.

G. Development Environment

In this part, the programming language, open source framework and IDE used to develop the project is explained.

I. Index

Index indicates the location of the images, diagrams or models.

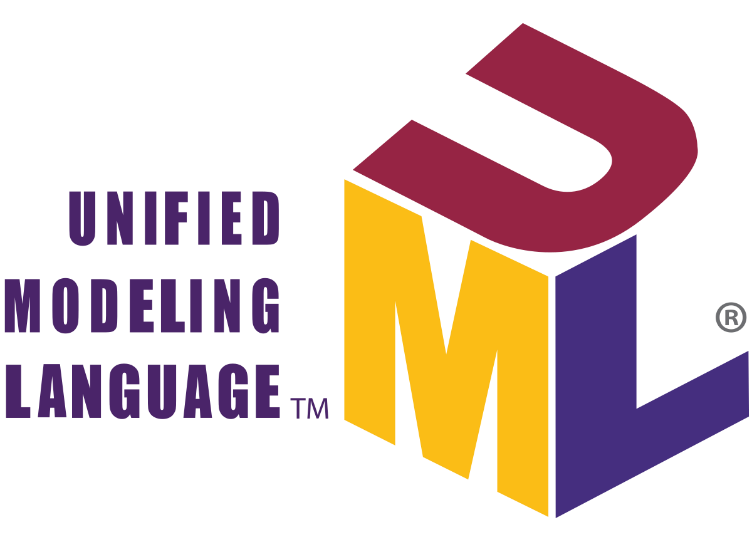
2. Introduction

2.1. Objective

In this part, the tools and diagrams used to build the system are introduced. Tools include the language used to build the diagrams, and the diagrams are the diagrams used to explain the detailed aspects of the system. Also, the brief description about why this system is developed is included.

2.2. Tools

A. UML



Picture 1. UML Logo

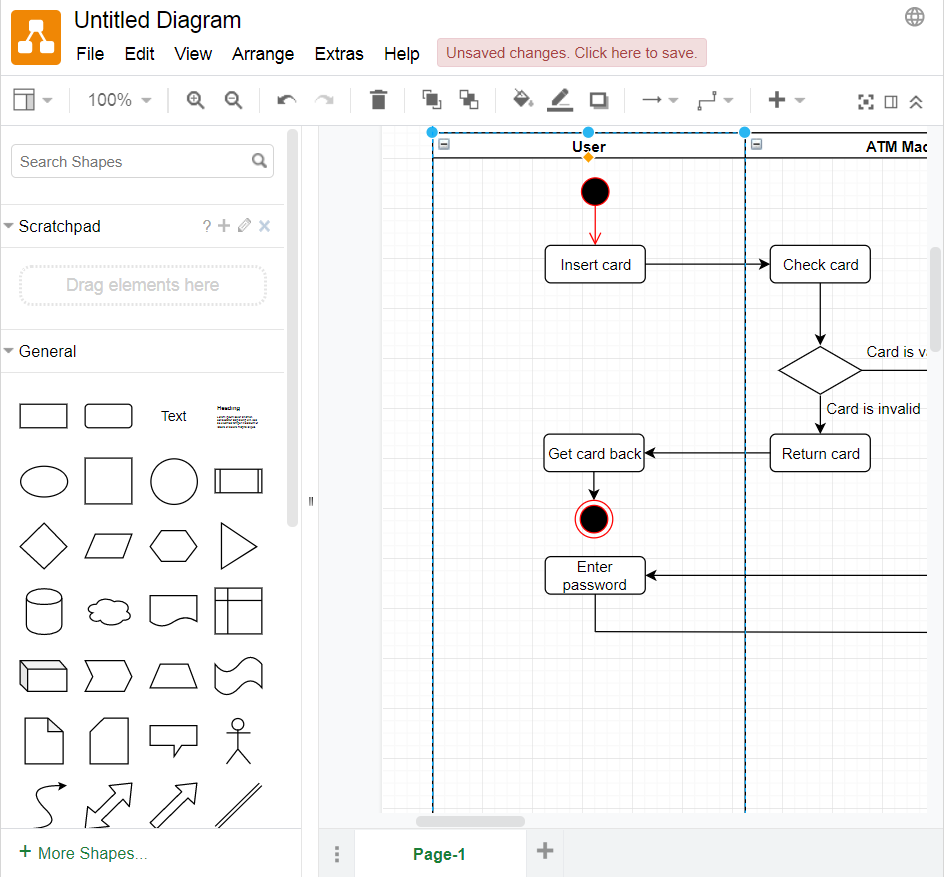
UML, or Unified Modeling Language, is a modern approach to modeling and documenting software. It is a standard visual modeling language for various purposes explained below:

* Modeling business and similar processes
* Analysis of software-based systems
* Design of software-based systems
* Implementation of software-based systems

UML is based on the diagrammatic representations of software components; by representing the system by an image, or a visual representation, the system gets easier to understand. The details of the system, including the innate flaws caused by the system’s architecture, can be easily found by visualizing the system as a model and therefore using UML helps making better software. Also, as UML is a language that is already defined and used by various developers and stakeholders, UML helps people communicate on the system without looking into a real code of the targeted system.

The important note of UML is that UML is a standard modeling language, not a software development process. So UML may provide a guidance to the order of the development, specify the target components of the system to develop, direct the task for individual or team developers, and offer criteria for monitoring and measuring a product, not developing the actual targeted software.

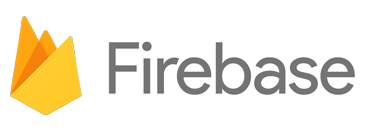
B. draw.io



Picture 2. draw.io

The system architecture and the diagrams were made by ‘draw.io’ according to UML. Draw.io is convenient as the software is offered through the Internet, and doesn’t require to join the service. Drawing process is easy and intuitive; the user needs to select the needed components from the offered shapes, and place them to express as they want. Also draw.io offers import and export service, which makes it easier to make, share or modify the result of the processes.

C. Firebase



Picture 3. Firebase Logo

Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014.

Firebase is a Backend-as-a-Service, and its services can be classified into two groups:

* + - * Developing and testing the application

In this group, services like realtime Database, authentication, test lab, crashlytics, cloud functions, firestore, cloud storage, performance monitoring, crash reporting, hosting are included.

* + - * Growing and engaging the audience.

In this group, services like firebase analytics, invites, cloud messaging, predictions, adMob, dynamic links, adwords, remote config, app indexing are included.

Our team concentrated on the former service group of Firebase and included into the development, especially the real-time database aspect of Firebase. In ‘Indi Market’ project, Firebase could be considered as a database that supports authentication and handling of the data collected by the subsystems.

2.3. Diagrams

A. Activity Diagram

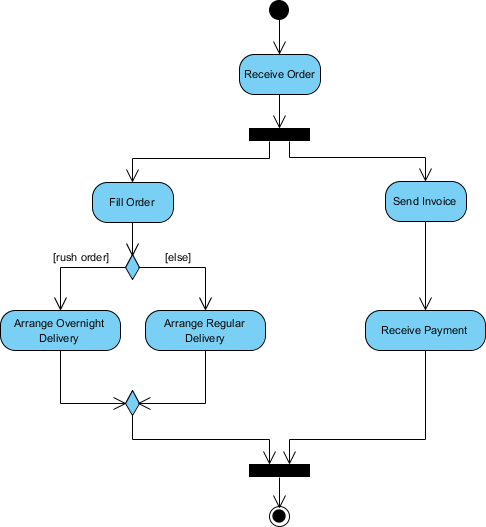


Diagram 1. Activity Diagram Example

Activity diagram is a diagram in UML to describe the dynamic aspects of the system. It is basically a flowchart to represent the flow from one activity to another activity, and the activity can be described as an operation of the system.

The basic purpose of the activity diagram is to capture the dynamic behavior of the system. In other words, activity diagram is used to show message flow from one activity to another.

Activity is a particular operation of the system. Activity diagrams are not only used for visualizing the dynamic nature of a system, but they are also used to construct the executable system by using forward and reverse engineering techniques. The only missing thing in the activity diagram is the message part. It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flowchart. Although the diagrams look like a flowchart, they are not. It shows different flows such as parallel, branched, concurrent, and single.

The purpose of an activity diagram can be described as −

* + - * Draw the activity flow of a system.
      * Describe the sequence from one activity to another.
      * Describe the parallel, branched and concurrent flow of the system.

B. Sequence Diagram

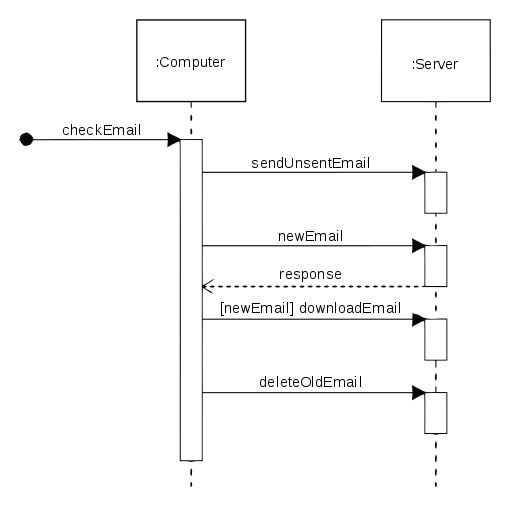


Diagram 2. Sequence Diagram Example

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the Logical View of the system under development.

A sequence diagram shows, as parallel vertical lines (lifelines), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.

C. ER Model

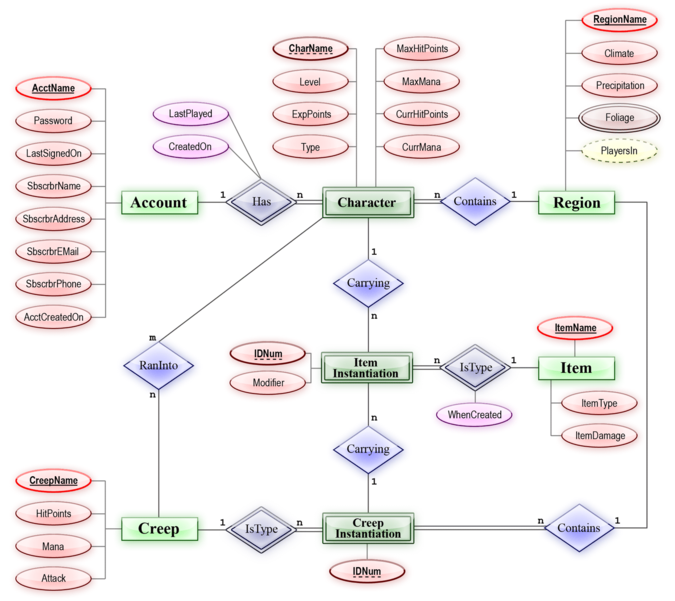


Diagram 3. ER Model Example

An entity–relationship model (or ER model) describes interrelated things of interest in a specific domain of knowledge. A basic ER model is composed of entity types (which classify the things of interest) and specifies relationships that can exist between entities (instances of those entity types).

In software engineering, an ER model is commonly formed to represent things a business needs to remember in order to perform business processes. Consequently, the ER model becomes an abstract data model that defines a data or information structure which can be implemented in a database, typically a relational database.

2.4. Project Description

“Indi Market” system is the combination of the small-quantity-batch-productions/sales system which already exists on the SNS-market, especially the ones on the Instagram platform (which would be called as Insta-market on this document), and the functionalities of the existing online shopping mall. The services of “Indi Market” can be divided into two groups, according to the group of the customer using this system.

The first expected customer group is the buyers of the products. Instead of searching for the reviews of the products on SNS or going through the long process of earning the necessary information about the product by messaging individually with the seller, the buyers can read the reviews on SNS or get the information about each products at this web application, making the total time needed for buying the product much shorter than that of current Insta-market. After deciding to buy the product, the buyers may purchase the product. The purchasing methods would vary from bank transfer to credit card, which is different from the current Insta-market allowing only bank transferring method, thus making the purchasing process much easier.

The second expected customer group is the sellers of the products. The sellers may upload their products on “Indi Market” and expand the customer base of their business.

The systems required to implement the functionalities described would be Buyer Management System, Seller Management System and Purchasing System.

In Buyer Management System, there are four subsystems. First one is the Sign Up subsystem which allows the user to authenticate into the system by email and password, and Sign In subsystem which allows the user to sign in to the system. Third subsystem is the Searching subsystem, which enables the user to find the product. Last subsystem is the Purchase System which allows the purchase by bank transfer and credit card, enabling the fast and easy purchase.

In Seller Management System, there are three subsystems which are Sign Up subsystem, Sign In subsystem and Uploading Product subsystem. The Sign Up and Sign In subsystems are same with those of User Management System. Uploading Product subsystem enables the seller to upload the product with the detailed information about it.

3. Architecture Outline

3.1. Objective

In this part, how the system is consisted will be shown. As it suggests the outline of the total system, the detailed description will be given at each system’s explanation.

3.2. System Organization

A. Outline of whole systems

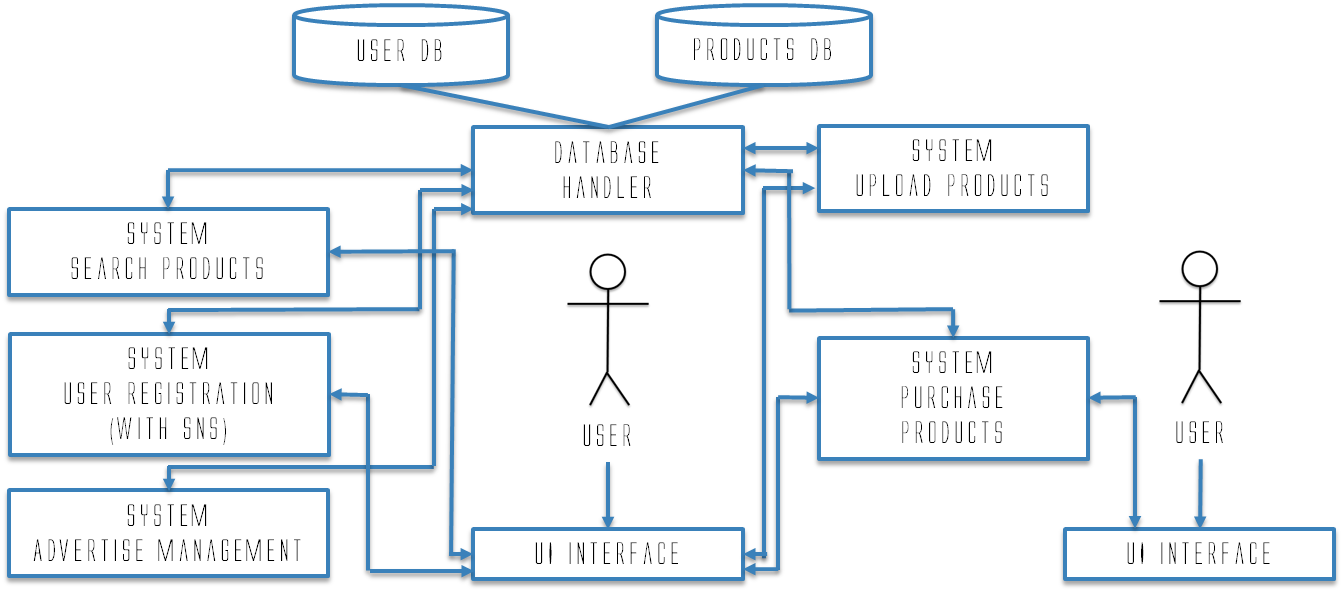


Diagram 4. Diagram for the outline of whole systems

User Interface is based on the existing web browser and the databases are based on Firebase.

B. Buyer Management System

Buyer Management System consists of Sign Up, Sign In, Product Searching and Purchasing subsystems. Below, subsystems’ activity diagram will be shown.

**B.1. Sign Up/Sign In**

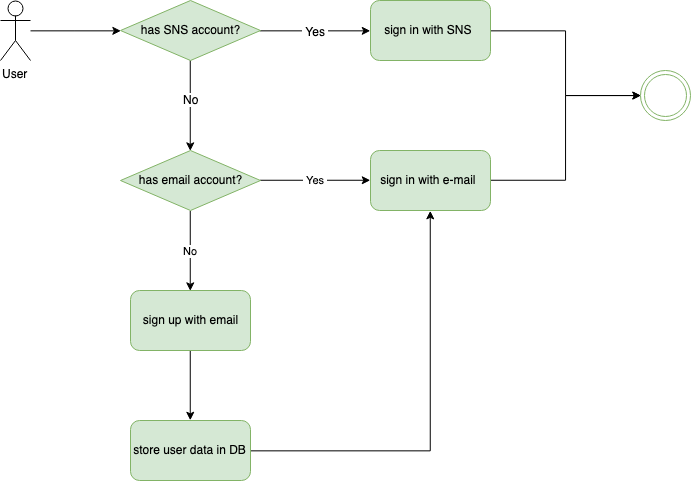


Diagram 5. Activity Diagram – Sign Up / Sign In

**B.2. Product Searching**

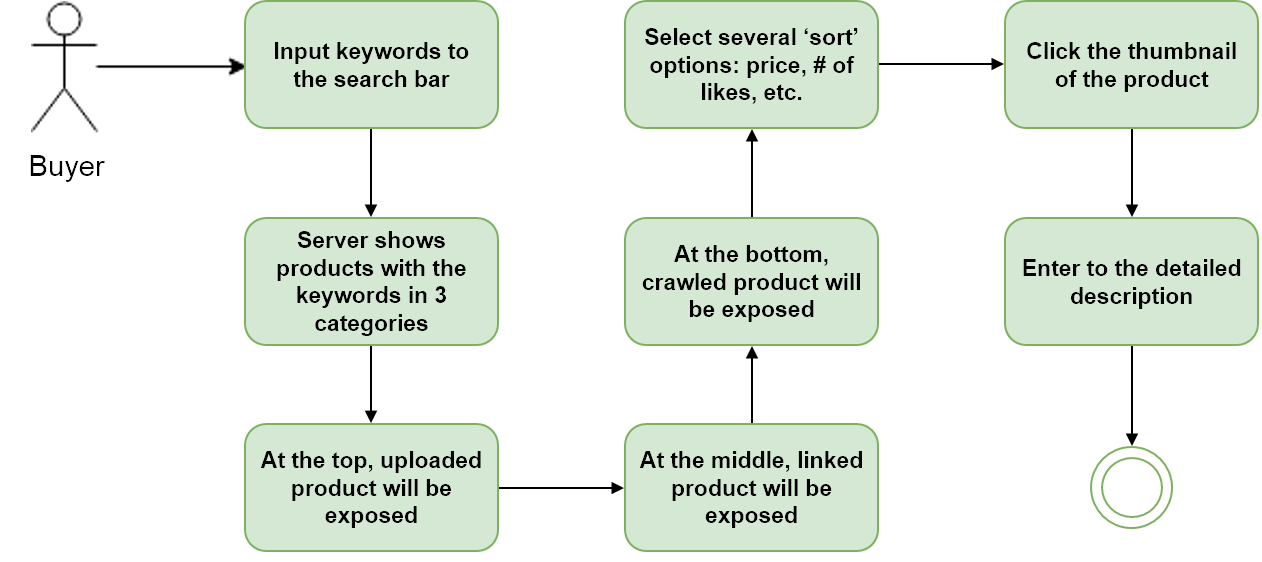
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Diagram 6. Activity Diagram – Product Searching

**B.3. Purchase Product**

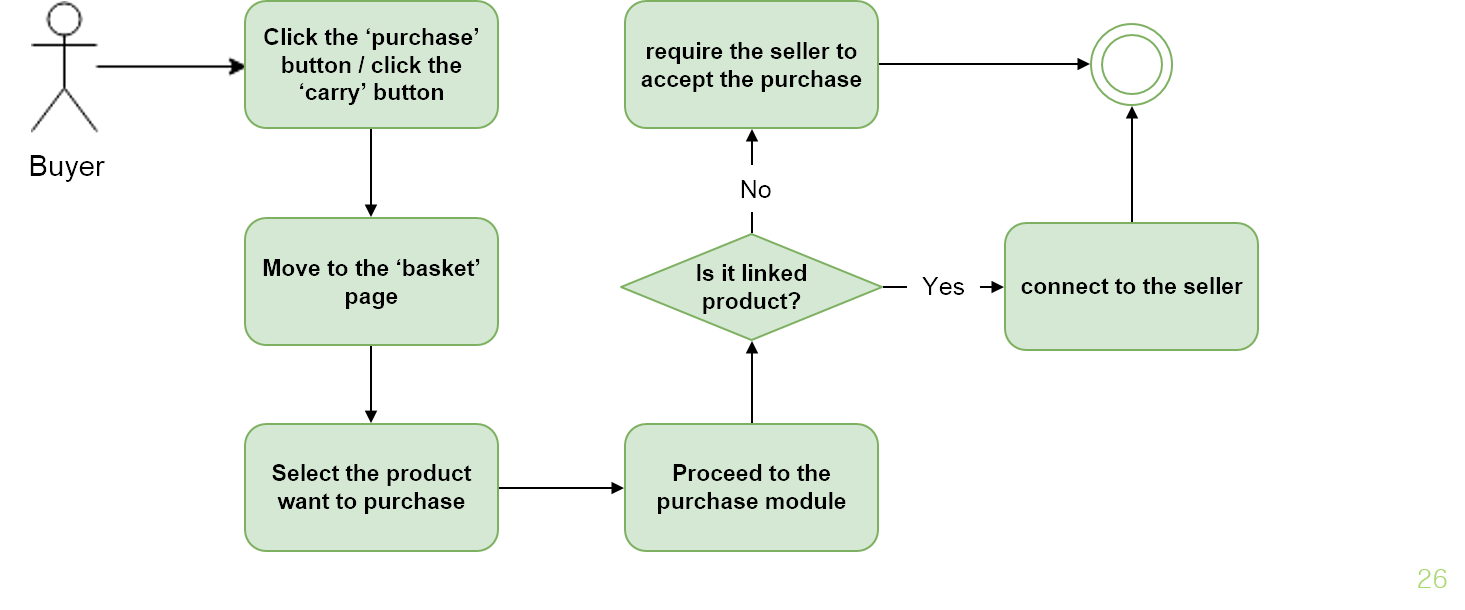


Diagram 7. Activity Diagram – Purchase Product

C. Seller Management System

Seller Management System consists of Sign Up, Sign In and Product Registration subsystems. As the Sign Up / Sign In subsystems are same with those of Buyer Management System, only the diagram for the Product Registration subsystem for sales and advertise will be shown below.

**C.1. Product Registration for Advertise**

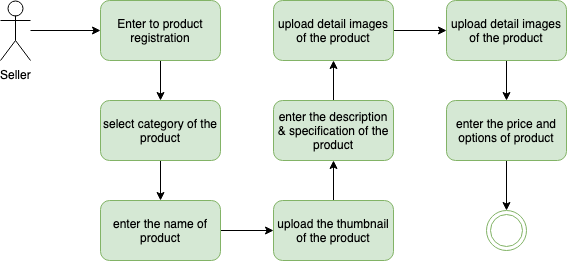


Diagram 8. Activity Diagram – Product Registration for Advertise

**C.2. Product Registration for Sales**

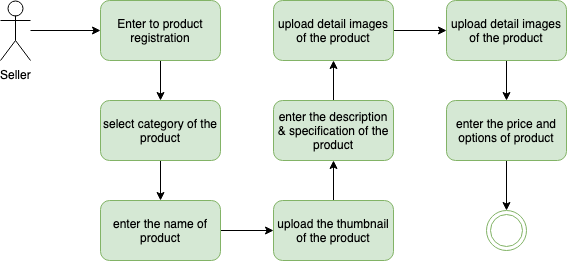


Diagram 9. Activity Diagram – Product Registration for Sales

4. Buyer Management System

4.1. Objective

In this part, the detailed description of subsystems of Buyer Management System is provided. The subsystems that will be explained in this chapter are User Registration (which includes Sign Up / Sign In) subsystem, Product Searching subsystem and Purchase Product subsystem.

4.2. User Registration

A. Description

As a rule, the user registration phase does not distinguish the seller from the buyer. It is the main point of the system based on the idea that any user can become a seller and a buyer.

However, in order for the seller to sell the goods in earnest, information such as the deposit account, sales policy, etc. is necessary, so separate authentication system is also implemented.

B. Activity Diagram

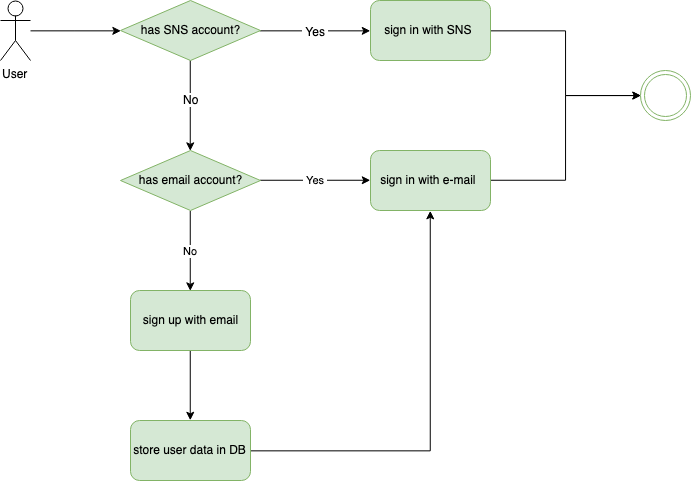


Diagram 5. Activity Diagram – Sign Up / Sign In

C. Sequence Diagram

C.1. Sequence Diagram for Sign Up

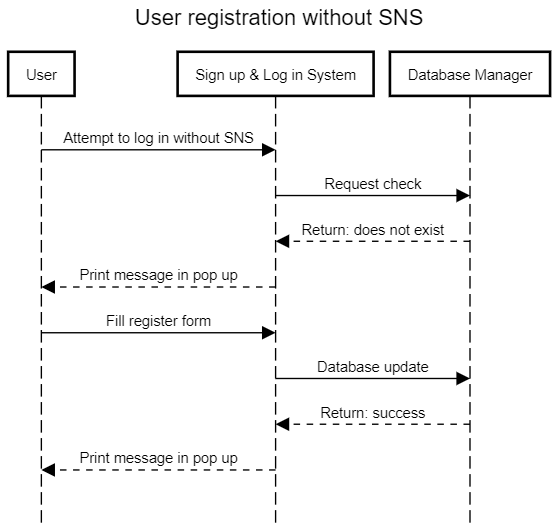


Diagram 10. Sequence Diagram – Sign Up without SNS

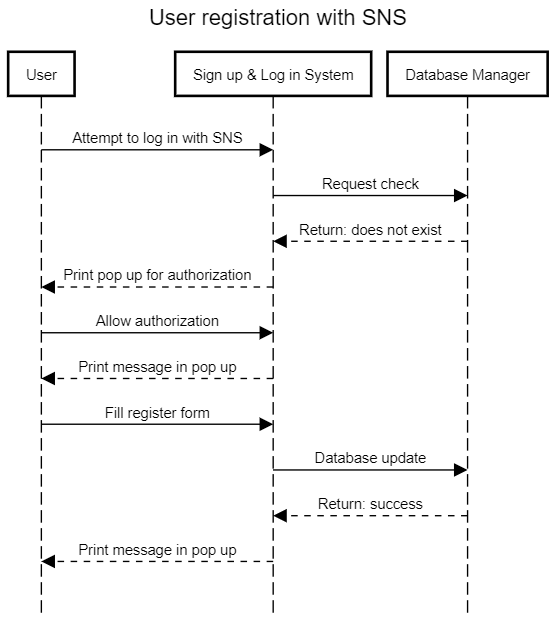


Diagram 11. Sequence Diagram – Sign Up with SNS

C.2. Sequence Diagram for Sign In

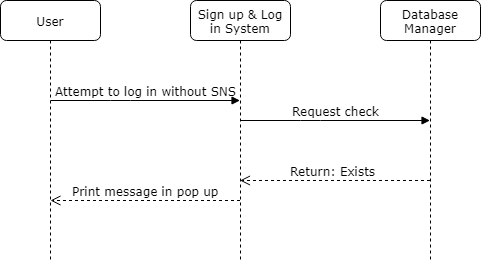


Diagram 12. Sequence Diagram – Sign In without SNS

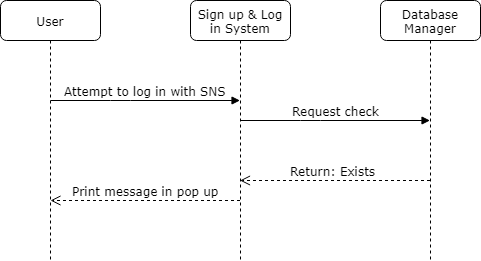


Diagram 13. Sequence Diagram – Sign In with SNS

4.3. Product Searching

A. Description

The Searching Product subsystem enables the buyer to get the appropriate result according to the keyword. The appropriate result includes the uploaded product, linked (or related) product and the crawled product. If the sorting filter is selected, the result will be handled according to the filter.

B. Activity Diagram

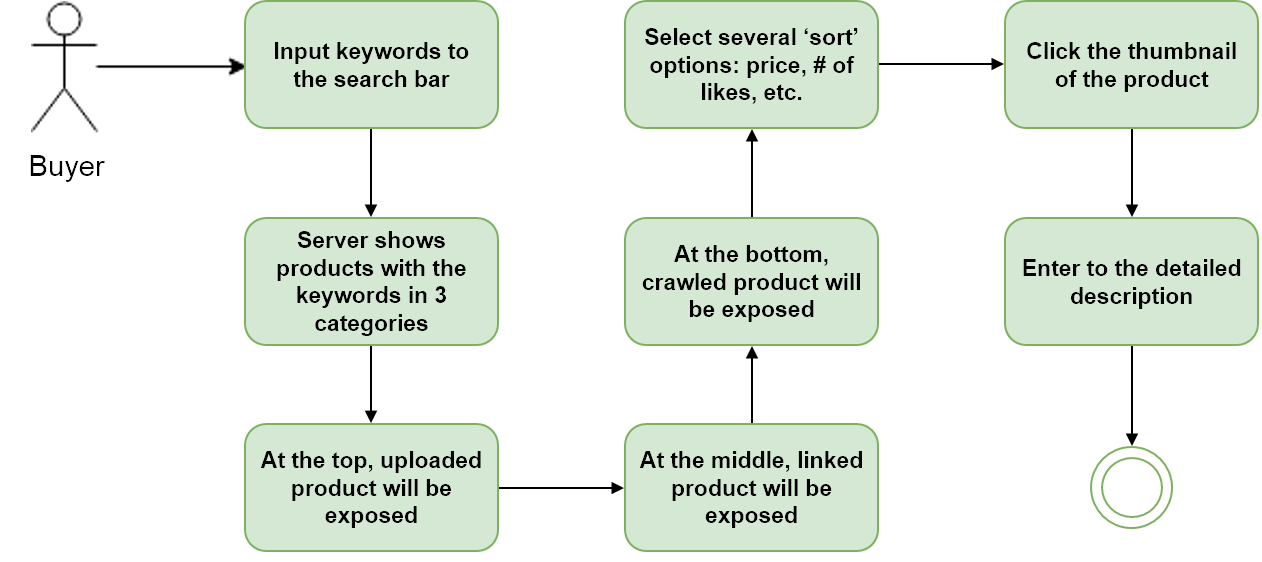
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Diagram 6. Activity Diagram – Product Searching

C. Sequence Diagram

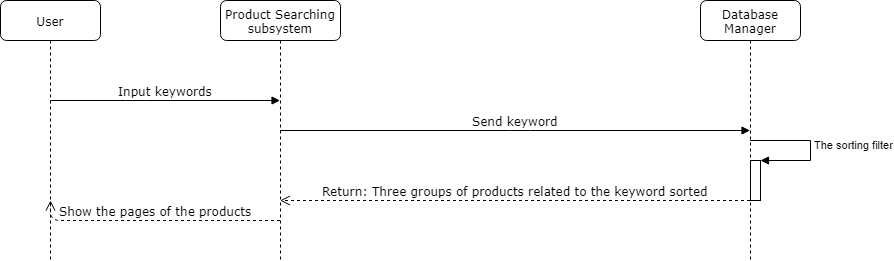


Diagram 14. Sequence Diagram – Product Searching

4.4. Purchase Product

A. Description

The Purchase Product subsystem enables the buyer to purchase the product. By introducing the purchase module, credit card and bank transfer are available.

B. Activity Diagram

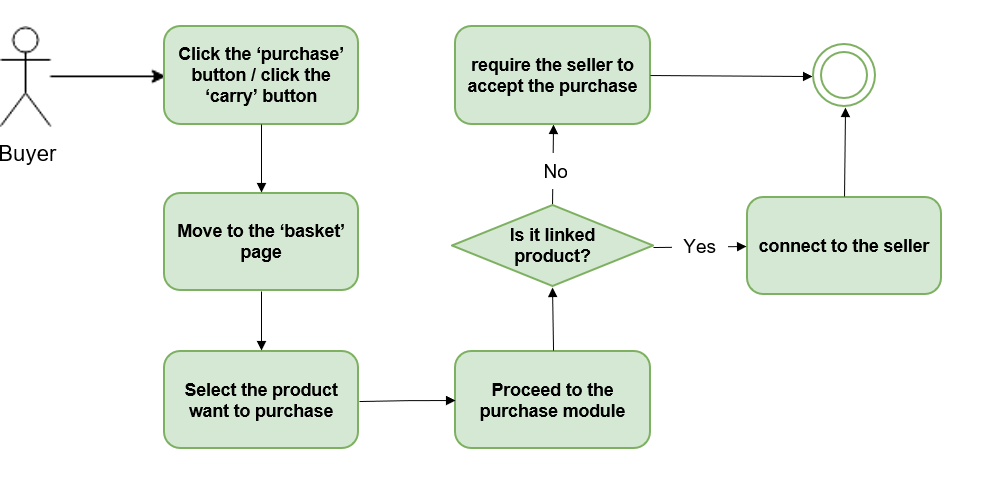


Diagram 7. Activity Diagram – Purchase Product

5. Seller Management System

5.1. Objectives

In this part, the detailed description of subsystems of Seller Management System is provided. The Seller Management System consists of three subsystems, Sign In, Sign Up and the Product Registration. Since the Sign In and Sign Up subsystems are same to those of the Buyer Management System, the subsystem that will be explained in this chapter are Product Registration subsystem, consisting of two components by two different purposes: advertising and sales.

5.2. Product Registration

5.2.1. Product Registration for advertising

**A. Description**

System offers not only direct sales, but also the ability to promote own personal market of the user. This is also very simple, not very different from direct product registration, but there is a difference in that it links to the seller's personal market link instead of the product's price and sales policy.

**B. Activity Diagram**

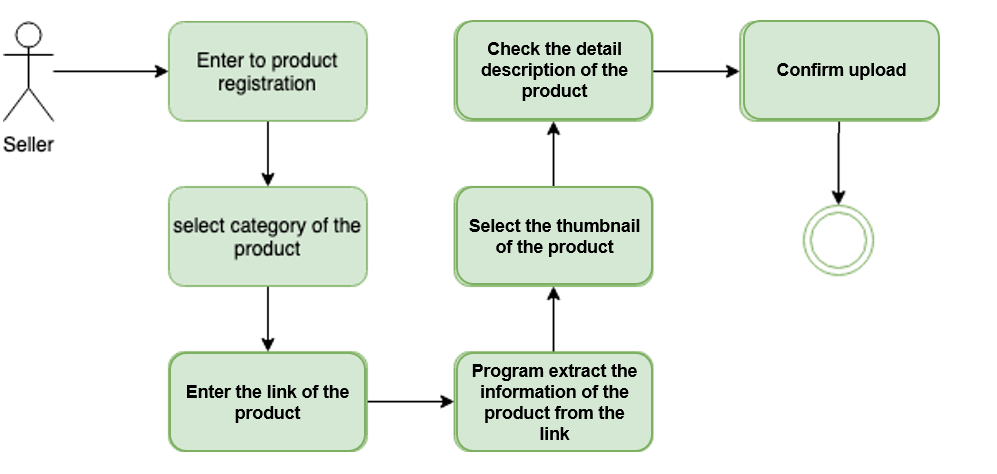


Diagram 8. Activity Diagram – Product Registration for Advertise

5.2.2. Product Registration for Sales

**A. Description**

Each seller uploads his/her product by entering the name, description, category and images for both main and detail sections. Information then transferred to database and stored for upcoming transactions.

**B. Activity Diagram**

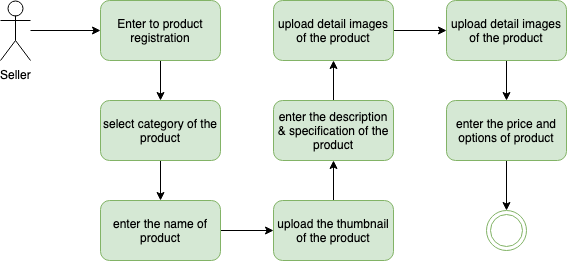


Diagram 9. Activity Diagram – Product Registration for Sales

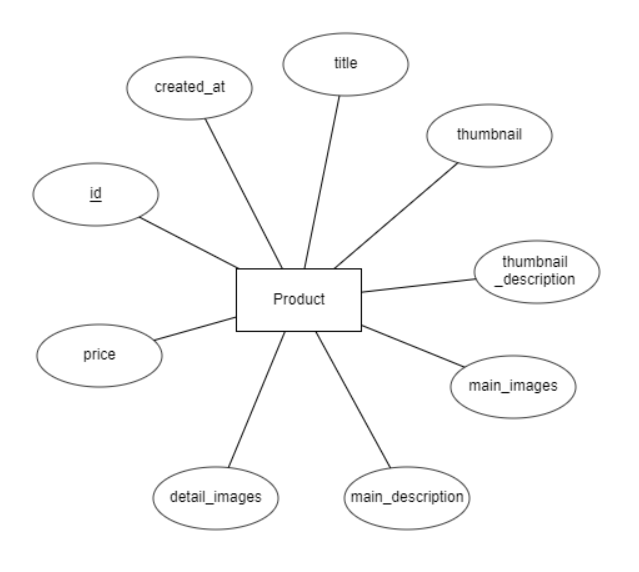
6. Firebase description

6.1. Objectives

As we used Firebase as a database of our project, this part consists of the description about the authentication and the database part of the Indi Market’s firebase, concentrating on how the data earned from the system is saved into the database and how they are being used in each systems.

6.2. Product

A. ER Model



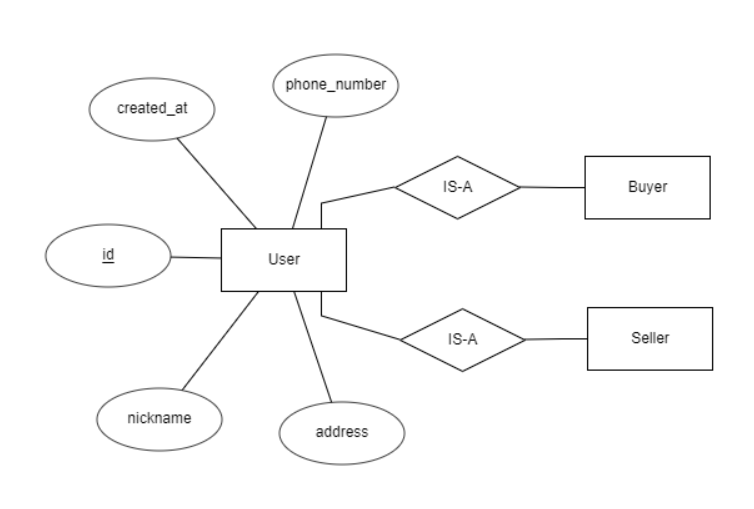
Model 1. ER Model of Product

B. Attributes’ type and explanation

* id (string) : The key of the product that helps distinguishing the product
* created\_at (timestamp) : Indicates when the product is uploaded on the database
* title (string) : The name of the product
* thumbnail (string) : The URL link for the thumbnail image of the product
* thumbnail\_description (string) : The description that will be shown below the thumbnail image at shop.vue
* main\_images (array of strings) : The URL links for the images of the product that will be shown at the detailed product page
* main\_description (string) : The description that will be shown at the detailed product page
* detail\_images (array of strings) : The URL links for the review images of the product that will be shown at the detailed product page
* price (number) : The price of the product

6.3. User

A. ER Model



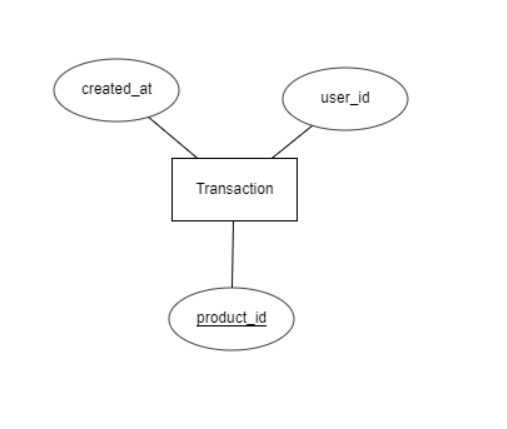
Model 2. ER Model of User

B. Attributes’ type and explanation

* id (string) : The key of the user that helps distinguishing the user
* created\_at (timestamp) : Indicates when the user is uploaded on the database
* nickname (string) : The nickname of the user
* address (string) : The address of the user
* phone\_number (string) : The phone number of the user
* The type of the user is selected between Buyer and Seller

6.4. Transactions

A. ER Model



Model 3. ER Model of Transaction

B. Attributes’ type and explanation

* product\_id (string) : The foreign key used to identify the product included in the transaction
* user\_id (string) : The foreign key used to identify the user included in the transaction
* created\_at (timestamp) : Indicates the time when the transaction is uploaded on the database

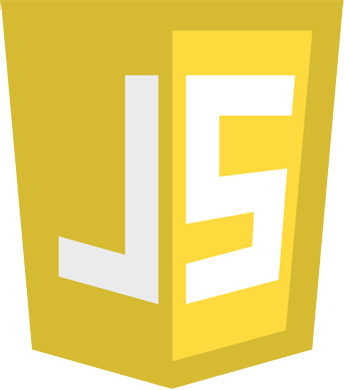
7. Development Environment

7.1. Objectives

In this part, the programming language, open source framework and IDE used to develop the project is explained.

7.2. Programming Language & Open Source Software & IDE

A. Programming Language & Open Source Software



Picture 4. JavaScript Logo

The main language used in the development process is JavaScript, which is the programming language of HTML and the Web. It is a high-level, interpreted programming language that conforms to the ECMAScript specification. JavaScript enables interactive web pages and is an essential part of web applications.

JavaScript supports event-driven, functional, and imperative (including object-oriented and prototype-based) programming styles.

 Picture 5. Vue.js Logo

Vue.js is an open-source JavaScript framework used to build the user interfaces and single-page applications. It features an incrementally adoptable architecture focusing on declarative rendering and component composition. Also, advanced features required for complex applications such as routing, state management and build tooling are offered via officially maintained supporting libraries and packages.

B. IDE



Picture 6. JetBrains Webstorm IDE Logo

Webstorm IDE developed by JetBrains s.r.o. is mainly used throughout the development process. It is a cross-platform IDE primarily for web, JavaScript and TypeScript development. It provides full support for JavaScript, TypeScript, HTML, CSS as well as for frameworks such as React, Angular, and Vue.js without additional plugins.

7.3. Version Management Tool



Picture 7. GitHub Logo

GitHub is a web-based hosting service based on Git. Git is version control software, which manages changes to a project without overwriting any part of that project. By using GitHub, the efficient development or code management, and code sharing between the development team is done easier.

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