MoonBird

系統需求規格書
Software Requirements Specification (SRS)
Version: 1.0

姓名	學號	E-mail
李浩銘	108590050	t108590050@ntut.org.tw
謝宗麟	108590004	t108590004@ntut.org.tw
朱欣雨	108590029	t108590029@ntut.org.tw
符芷琪	108590049	t108590049@ntut.org.tw
鄭琳玲	108590056	t108590056@ntut.org.tw
黃聖耀	108590061	t108590061@ntut.org.tw
盧佩怡	110AEM001	t110AEM001@ntut.org.tw
譚永駿	110AEM002	t110AEM002@ntut.org.tw

Department of Computer Science & Information Engineering
National Taipei University of Technology

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目錄 (Table of Contents)

Section 1   簡介 (Introduction)

1.1 目的 (Purpose)

Due to COVID-19, E-commerce development between retail stores and online stores is necessary. Therefore, a consistent database system is important for E-commerce development to avoid data redundancy and data inconsistency. Through this course, we have the opportunity to develop an online e-commerce system to learn database architecture. Our project team would deploy the concept of Enterprise Resource Planning (ERP) which integrates systems across the whole company and retail store including financial resources, human resources, Inventory management, Point of sale (POS), and E-commerce.

Concerning the Point of sale (POS), the web-based system in retail stores would be created to develop the synchronous data transfer between successful transactions and update sale records. All data will connect to the database server. There are 2 types of users with the following privileges:

Staff: manage the data of products, such as querying and updating products, processing product orders.

Administrators: have basic privileges of the staff but also can create and manage user accounts.

Regarding E-commerce, the Web Interface would be created to develop a B2C drop-shipping online store and provide some additional functions such as online product checking, online purchase. The necessary data such as product state, the valid user state will connect with the database server. There is 1 type of user with the following privileges:

Customers: search and purchase products

1.2 系統名稱 (Identification)

Our project will implement a Web-based E-commerce System in which users will be divided into three; which are: different identities, system administrators, staff and customers. These three identities will use different functions in the store, so each identity will also have a different table to store the corresponding information. If you want to obtain information between different identities, it will be executed through a relational database.

1.3 概觀 (Overview)

The system consists of the main system and several subsystems that are described as follows:

Main system:

Web-based E-commerce System(WECS)

Subsystem:

Member Management Subsystem, MMS

Product Management Subsystem, PMS

Discount Management Subsystem, DMS

Order Management Subsystem, OMS

Logistics Management Subsystem, LMS

Financial Management Subsystem, FMS

Shopping Cart Management Subsystem, SCMS

Comment and Score Management Subsystem, CSMS

1.4符號描述 (Notation Description) (if any)

Notation	Description
WECS 1.0.0	Web-based E-commerce System will be labeled with the number 1.0.0
MMS 1.1.n	Member Management Subsystem will be labeled with the number 1.1.n
PMS 1.2.n	Product Management Subsystem will be labeled with the number 1.2.n
DMS 1.3.n	Discount Management Subsystem will be labeled with the number 1.3.n
OMS 1.4.n	Order Management Subsystem will be labeled with the number 1.4.n
LMS 1.5.n	Logistics Management Subsystem will be labeled with the number 1.5.n
FMS 1.6.n	Financial Management Subsystem will be labeled with the number 1.6.n
SCMS 1.7.n	Shopping Cart Management Subsystem will be labeled with the number 1.7.n
CSMS 1.8.n	Comment and Score Management Subsystem will be labeled with the number 1.8.n

| Notation	Description
FR-n	Functional Requirements
DR-n	Data Requirements
PR-n	Performance Requirements
SR-n	Security Requirements
UIR-n	User Interface Requirements
XIR-n	External Interface Requirements
IIR-n	Internal Interface Requirements
ER-n	Environment Requirements
IR-n	Installation Requirements
TR-n	Test Requirements
BR-n	Business Rule and Integrity Constraints

Section 2　系統(System)

2.1 系統描述 (System Description)

The System Architecture will be divided into the main system and multiple subsystems. The main system is the Web-based E-commerce System(WECS). Also, there are many subsystems in the main system, which are divided into Member Management Subsystem (MMS), Product Management Subsystem (PMS), Discount Management Subsystem (DMS), Order Management Subsystem (OMS), Logistics Management Subsystem (LMS), Financial Management Subsystem (FMS), Shopping Cart Management Subsystem (SCMS), Comment and Score Management Subsystem (CSMS).

For the Application Architecture, it will be implemented as a Model–View–Controller (MVC) structure. The model is responsible for managing the data of the application. It receives user input from the controller. The view renders the presentation of the model in a particular format. The controller responds to the user input and performs interactions on the data model objects. The controller receives the input, optionally validates it, and then passes the input to the model.

For the Network Architecture, Nginx can improve the performance of Web Server and using Nginx has lots of advantages such as Caching and Load balance. Caching can reduce the waiting time of response. If there are a large number of static files on the web service, setting Cache will allow the browser to cache these files, saving network traffic costs, and allowing users to visit the website more quickly. Load balance refers to the process of distributing a set of tasks over a set of resources (computing units), with the aim of making their overall processing more efficient. Load balancing can optimize the response time and avoid unevenly overloading some compute nodes while other compute nodes are left idle.

2.1.1　系統架構圖 (System Architecture Diagram)
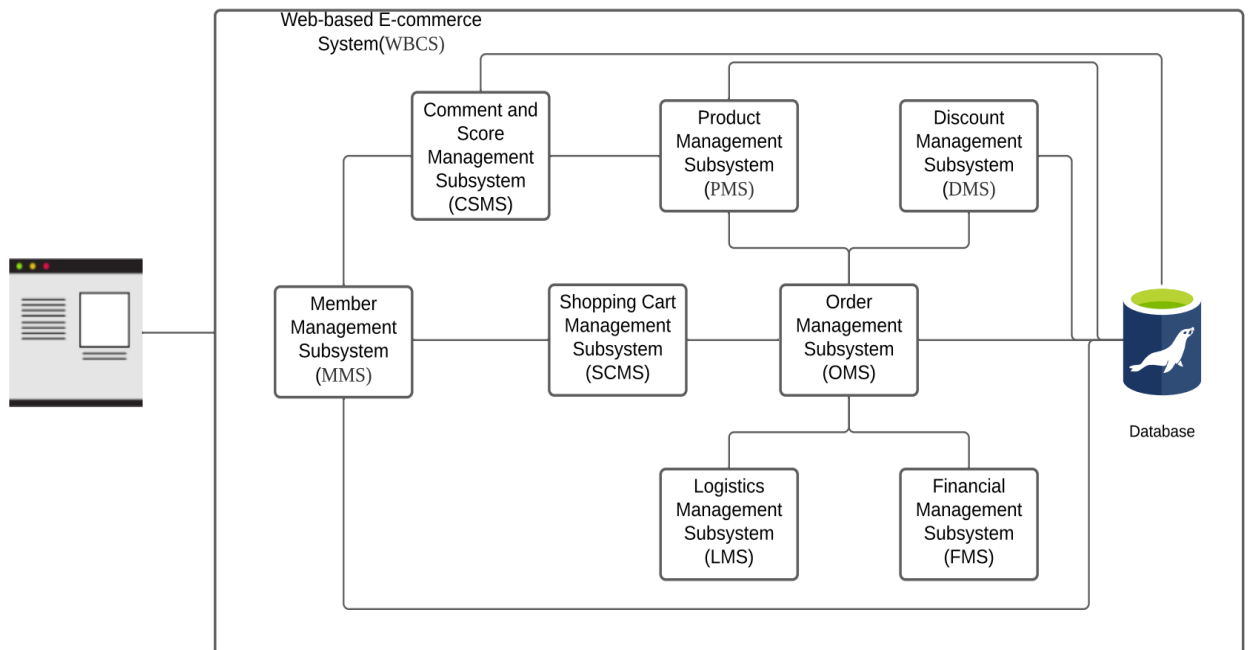
2.1.2 應用程式架構圖 (Application Architecture Diagram)
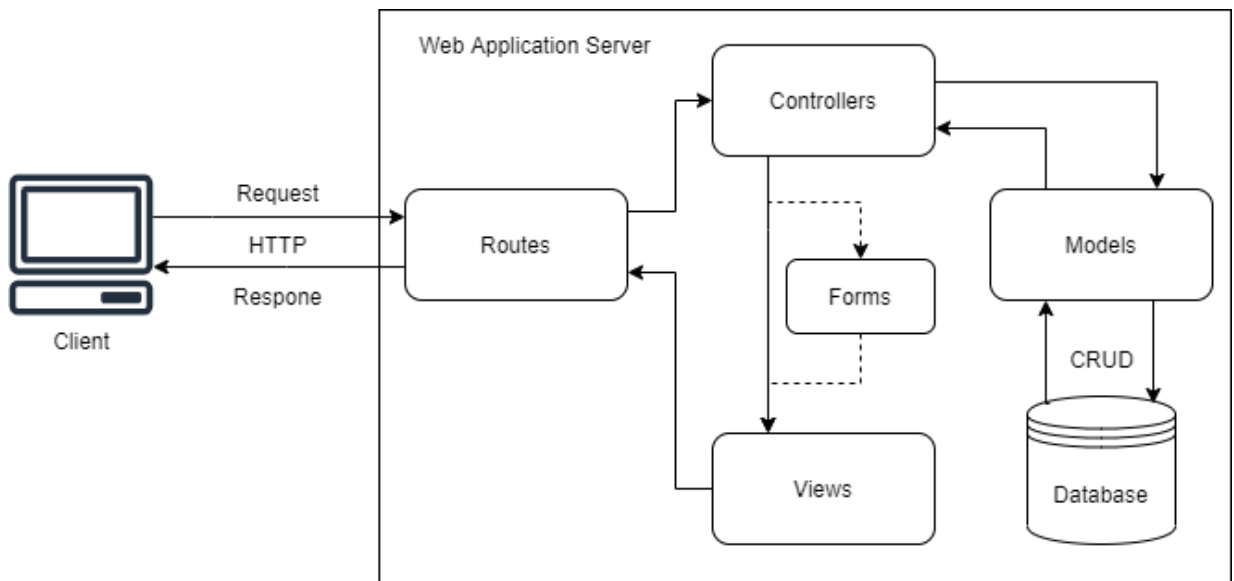
2.1.3 網路架構圖 (Network Architecture Diagram)
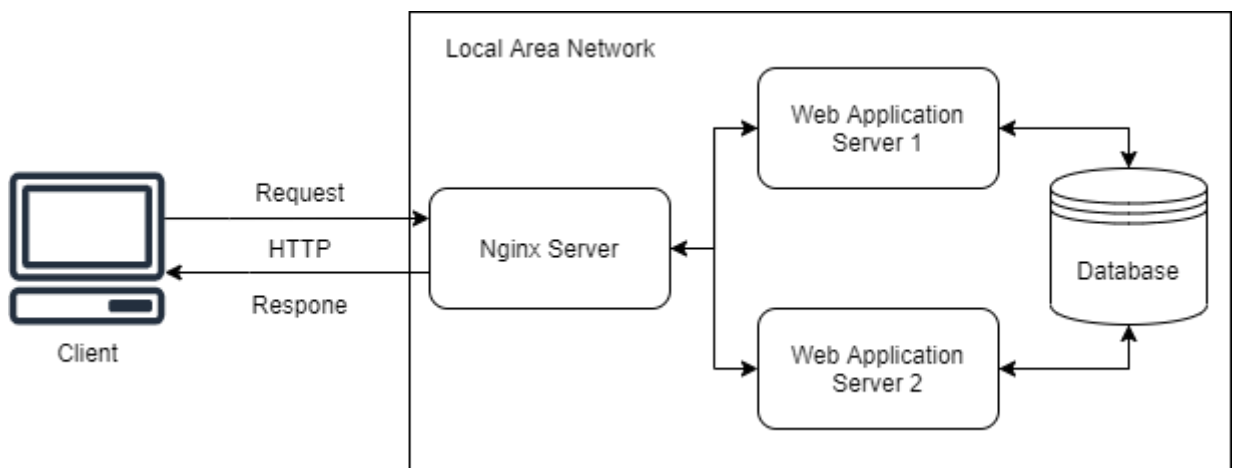
2.2 操作概念 (Operational Concepts or User Stories)

Scenario 1：Guest Operational Concepts

Guests can view product details via a Web-based E-commerce System(WECS). Guests also can search products and view suggested products on "The Customers Who Bought This Product Also Bought" Suggestion through the Product Management Subsystem(PMS). After selecting products, Guests can add items to the Shopping Cart Management Subsystem(SCMS). If guests want to check-in, guests must register as a customer on Member Management Subsystem(MMS).

Scenario 2：Customer Operational Concepts

After customers log in with a valid user ID on Member Management Subsystem(MMS), customers can search products and view suggested products through the Product Management Subsystem(PMS). After selecting products, customers can add items to the Shopping Cart Management Subsystem(SCMS).

In Shopping Cart Management Subsystem(SCMS), customers can add/remove product items into/from the shopping cart, insert discounts code, and check-out. The total purchase amount will be calculated automatically. After the order transaction is received, customers can track the order's status and query the order history via Order Management Subsystem(OMS). Logistics Management Subsystem(LMS) updates orders' status automatically depending on the order tracking. After the order transaction is completed, customers can write review comments and rates for the store on the Comment and Score Management Subsystem(CSMS).

Scenario 3：Staff Operational Concepts

After staff logs in with a valid user ID on Member Management Subsystem(MMS), staff can manage the products, including insert, update, query, and delete products on Product Management Subsystem(PMS). Staff can also manage the discount policy, including insert, update, query, and delete discount policies on Discount Management Subsystem(DMS), the discount is divided into 3 types, which are shipping, seasoning, and special event discount. In addition, staff can process and update the status of customers' orders on the Order Management Subsystem(OMS). Logistics Management Subsystem(LMS) will update the order's status automatically after the order's status is changed.

In the Financial Management Subsystem(FMS), staff can view statistical reports about the product sales including daily, weekly, monthly sales reports, best-selling product reports for each store. Staff also can select a special period to view purchase statistics reports for each product or each store.

Scenario 4：Administrator Operational Concepts

After administrators log in with a valid user ID on Member Management Subsystem(MMS), administrators have all privileges of the staff.

In Member Management Subsystem(MMS), administrators can search user account information through some searching attributes such as userID, user's type. Administrators also can create and manage user accounts including staff account and customer account.

2.3 功能性需求 (Functional Requirements)

No.	Description
FR-01	The customers can search and purchase products.
FR-02	The staff can manage the data of products, such as query and update products and process product orders.
FR-03	The administrator can create and manage user accounts.
FR-04	The system shall allow users to log in and log out.
FR-05	The system shall authenticate users with *username* and *password.*
FR-06	The system should allow a user to register himself/herself as a customer.
FR-07	The system shall allow staff to manage the discount policy, including insert, update, query and delete discount policies.
FR-08	The system shall allow customers to add or remove product items from the shopping cart.
FR-09	The system shall calculate the total purchase amount of each customer's order when the customer checks out their shopping carts.
FR-10	The order transaction is completed when the customers confirm the payment of the purchase after checking out the shopping carts.
FR-11	The system shall allow customers to query the history of their orders
FR-12	The system should automatically email an order confirmation message to the customers who place an order
FR-13	The system shall support online payment and cash on delivery.
FR-14	The system shall provide the statistic report about the product sales, such as the daily, weekly, monthly sales reports
FR-15	The system should provide the report about the best-selling product for each store
FR-16	The system should provide the purchase statistic reports for each product or each store for a given period.
FR-17	The system shall allow customers to rate and/or comment on what they bought.
FR-18	The system shall provide some suggested products for the customers.
FR-19	The system shall keep tracking the status of the orders.

2.4 資料需求 (Data Requirements)

No.	Description
DR-01	The system shall contain information about each valid user of the system: email, username, password(hash), name, address, date of birth.
DR-02	The system shall contain information about each product: category, name, description, price, quantity, picture.
DR-03	The system shall contain information about each category: name, description
DR-04	The system shall contain information about each discount: name, description, code, status, discount rate
DR-05	The system shall contain information about each comment: user, content, rate

2.5 非功能性需求 (Non-Functional Requirements)

2.5.1 效能需求 (Performance Requirements)

No.	Description
PR-01	Page response should be less than 3 seconds.
PR-02	Searching time should be less than 3 seconds.
PR-03	When an error occurs in the system, an error message should be displayed and the user should return to the previous page.

2.5.2 資安需求 (Security Requirements) (if any)

No.	Description
SR-01	All users must be authenticated and data access is only allowed to authorized users.
SR-02	All user passwords must meet the complexity requirements.
SR-03	Verify there are no default passwords in use for the application framework or any components used by the application.
SR-04	All passwords are stored in the database in the ciphertext.

2.6 介面需求 **(Interface Requirements)**

2.6.1 使用者介面需求 (User Interfaces Requirements)

No.	Description
UIR-01	After the user logs in, the website will provide different pages for users of different identities.
UIR-02	Can't use any real money to buy or sell.
UIR-03	Login page for all user roles
UIR-04	Register page for user role of customer
UIR-05	Forgot Password page for user role of customer
UIR-06	MMS page for user role of admin
UIR-07	PMS page for user role of staff
UIR-08	DMS page for user role of staff
UIR-09	OMS page for user role of staff
UIR-10	LMS page for user role of staff
UIR-11	FMS page for user role of staff
UIR-12	SCMS page for user role of customer
UIR-13	CSMS page for user role of customer

2.6.2 外部介面需求 (External Interface Requirements) (if any)

No.	Description
XIR-01	The user browses the web through the browser using HTTP communication.

2.6.3 內部介面需求 (Internal Interface Requirements) (if any)

No.	Description
IIR-01	MMS manages all users.
IIR-02	PMS manages all products.
IIR-03	DMS manages all discounts.
IIR-04	OMS manages all orders.

No.	Description
IIR-05	LMS manages all logistics information.
IIR-06	FMS manages all financial reports.
IIR-07	SCMS manages all shopping carts.
IIR-08	CSMS manages all comments and ratings.

2.7 其他需求 (Other Requirements)

2.7.1 環境需求 (Environmental Requirement)

No.	Description
ER-01	Linux(Ubuntu/Debian) or Windows with WSL.
ER-02	64-bit dual-core 2.0GHz processor.
ER-03	100GB or more storage space.
ER-04	4GB or more memory.
ER-05	100Mbps full-duplex NIC.

2.7.2 安裝需求 (Installation Requirement)

No.	Description
IR-01	Python 3.6 up
IR-02	Relational DBMS (MySQL/MariaDB)
IR-03	Coding IDE (VS Code/Atom)

2.7.3 測試需求 (Test Requirements) (if any)

No.	Description
TR-01	All modules should pass unit tests.
TR-02	The system should pass vulnerability testing.
TR-03	The system should pass penetration testing.
TR-04	The system should pass the stress testing.
TR-05	All UIs should pass the functional testing
TR-06	The system should work on different platforms

2.8 商業規則與限制 (Business Rules and Integrity Constraints)

No.	Description
BR-01	Discount periods for special events for a specific product cannot overlap.
BR-02	The quantity of each product purchased must be an integer greater than zero.
BR-03	The purchase quantity for a product must be less than or equal to the current stock quantity for this product.

Section 3　資料庫概念設計（Conceptual Design of the Database）

3.1 Entity Relationship ER Model
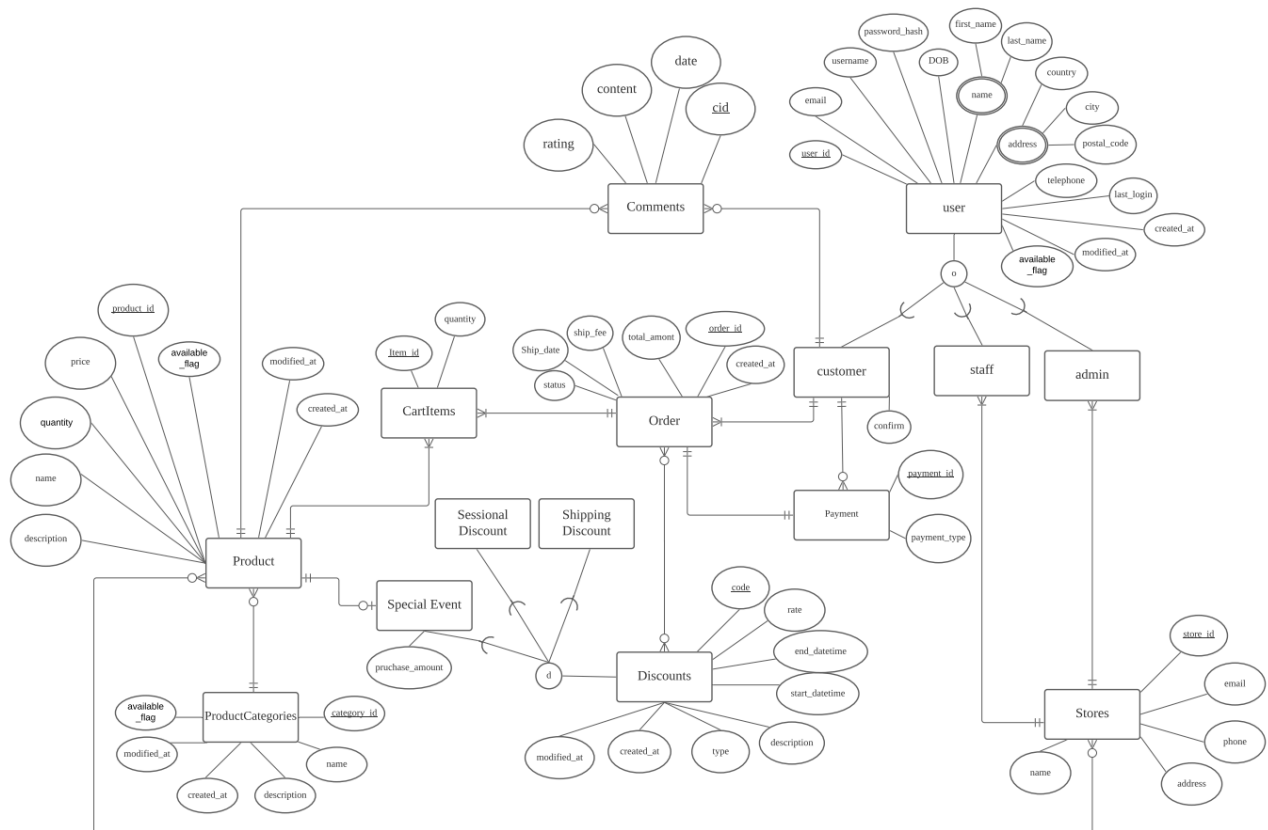
Section 4　邏輯資料庫綱要（Logic Database Schema）

4.1 Schema of the Database

4.2 Domain of the Database

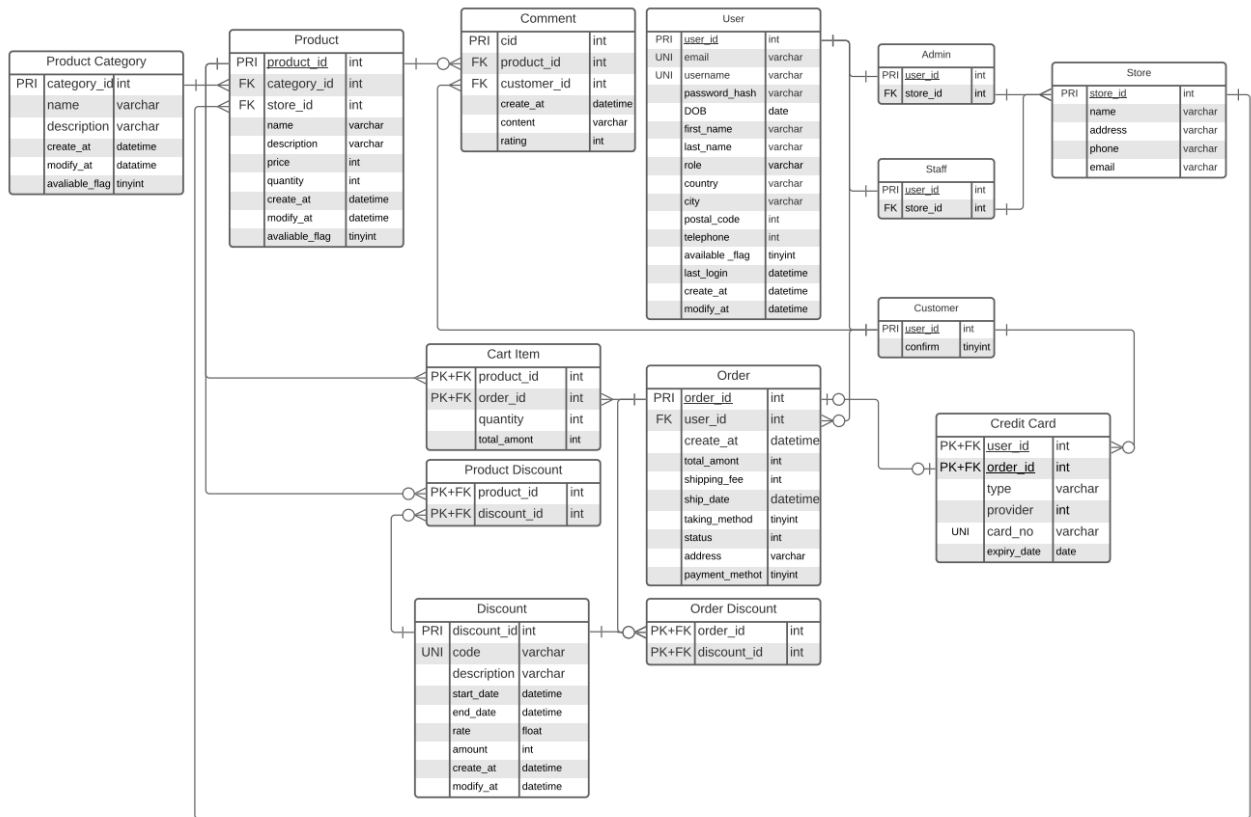| User				
Description: Base table of user role				
Attribute	Domain Type	Key	Nullable	Description
user_id	int(11)	Primary	Not null	User's ID
email	varchar(63)	Unique	Not null	User's email
username	varchar(31)	Unique	Not null	User's login account
password_hash	varchar(1023)		Not null	User's password
first_name	varchar(31)		Not null	User's first name
last_name	varchar(31)		Not null	User's last name
role	varchar(10)		Not null	classify the role of customer, admin, staff
DOB	datetime		Not null	User's date of birth
country	varchar(15)			User's country from multivalued attribute 'address'
city	varchar(255)			User's city from multivalued attribute 'address'
address	varchar(255)			User's address (multivalued attribute)
postal_code	varchar(7)			User's postal code from multivalued attribute 'address'
telephone	varchar(15)	Unique		User's phone number
last_login	datetime			the date and time for user last login
create_at	datetime		Not null	default=current datetime
modified_at	datetime		Not null	default=current datetime on update=current datetime

Customer				
Description: Inherited from User table				
Attribute	Domain Type	Key	Nullable	Description
user_id	int(11)	Primary Foreign	Not null	Customer.user_id refers to User.user_id
confirm	tinyint(1)		Not null	default=False

Staff				
Description: Inherited from User table				
Attribute	Domain Type	Key	Nullable	Description
user_id	int(11)	Primary Foreign	Not null	Staff.user_id refers to User.user_id
store_id	int	Foreign	Not null	Staff.store_id refers to Store.store_id

Admin				
Description: Inherited from User table				
Attribute	Domain Type	Key	Nullable	Description
user_id	int(11)	Primary Foreign	Not null	Admin.user_id refers to User.user_id
store_id	int	Foreign	Not null	Admin.store_id refers to Store.store_id

CreditCard				
Description: customer payment table				
Attribute	Domain Type	Key	Nullable	Description
user_id	int	Primary Foreign	Not null	Payments.user_id refers to Customer.user_id
order_id	int	Primary Foreign	Not null	CreditCard.order_id refers to Order.order_id
payment_type	varchar(31)		Not null	Payment Type(VISA/MASTER/UNIONPAY)
provider	varchar(64)		Not null	the provider of credit card
account_no	int()	Unique	Not null	Customer's credit card no.
expiry_date	datetime		Not null	the expiry date of customer's credit card

Store				
Description: Base table of store role				
Attribute	Domain Type	Key	Nullable	Description
store_id	int	Primary	Not null	Store's ID
name	varchar(255)		Not null	Store's name
address	varchar(255)			Store's address
email	varchar(255)			Store's contact email
phone	int			Store's phone number

Products

Description: products table

Attribute	Domain Type	Key	Nullable	Description
product_id	int(11)	Primary	Not null	Product ID
category_id	int(11)	Foreign	Not null	Products.category_id refers to ProductCategories
store_id	int	Foreign	Not null	products.store_id refers to Store.store_id
name	varchar(63)		Not null	Product's name
description	varchar(255)			Product's description
price	decimal(10,2)		Not null	Product's price
quantity	int		Not null	Product's stock quantity
create_at	datetime		Not null	default=current datetime
modified_at	datetime		Not null	default=current datetime on update=current datetime
available _flag	tinyint(1)			default=true,true=available,false=unavailable

ProductCategories

Description: category table

Attribute	Domain Type	Key	Nullable	Description
category_id	int(11)	Primary	Not null	Category ID
name	varchar(63)	Unique	Not null	Category's name
description	varchar(255)			Category's description
create_at	datetime		Not null	default=current datetime
modified_at	datetime		Not null	default=current datetime on update=current datetime
available _flag	tinyint(1)			default=true,true=available,false=unavailable

Order				
Description: Order table				
Attribute	Domain Type	Key	Nullable	Description
order_id	int	Primary	Not null	Order ID
user_id	int	Foreign	Not null	Order.customer_id refers to Customer.user_id
created_at	DATETIME		Not null	The date of creating transaction
Total_amont	int		Not null	The total amount of transaction
shipping_fee	int		Not null	The shipping fee of transaction
ship_date	DATETIME			The shipping date of transaction
taking_method	tinyint		Not null	0=shipping, 1=in-store pickup
status	int(1)		Not null	0=received, 1=processing, 2=shipping, 3=closed
Address	varchar(255)		Not null	shipping address
payment_method	tinyint		Not null	0=credit card, 1=cash

Order_discount				
Description: order discount table				
Attribute	Domain Type	Key	Nullable	Description
order_id	int	Primary Foreign	Not null	Order_discount.order_id refers to Order.transaction_id
discount_id	int	Primary Foreign	Not null	Discount.discount_id refers to Order.discount_id

CartItems

CartItems				
Description: cartitem table				
Attribute	Domain Type	Key	Nullable	Description
product_id	int	Primary Foreign	Not null	Cartitem.product_id refers to Product.product_id
order_id	int	Primary Foreign	Not null	Cartitem.order_id refers to Order.order_id
quantity	int		Not null	the quantity of product
Total_amount	int		Not null	the total amount of product

Discounts				
Description: discount table				
Attribute	Domain Type	Key	Nullable	Description
discount_id	int	Primary	Not null	Discount ID
code	varchar(45)	Unique	Not null	Discount code entered by customer
type	int(1)		Not null	0=shipping type ,1=seasonings type , 2=special event type
description	varchar(255)			The description of discount
start_datetime	datetime		Not null	the start date of discount period
end_datetime	datetime		Not null	the end date of discount period
rate	Float		Not null	the rate of discount
purchase_amount	int		Not null	the limit of purchase amount
created_at	datetime		Not null	the date of creating discount
modified_at	datetime			the date of modifying discount

Comments				
Description: customer comment table				
Attribute	Domain Type	Key	Nullable	Description
cid	int	Primary	Not null	The comment ID
product_id	int	Primary Foreign	Not null	Comments.product_id refers to Produuct.product_id
customer_id	int	Primary Foreign	Not null	Comments.customer_id refer to Customer.user_id
create_date	datetime		Not null	default=current datetime
content	varchar(64)		Not null	The comment's content
rating	int		Not null	1-5 rating for product

ProductsDiscounts				
Description: product matching special event discount table				
Attribute	Domain Type	Key	Nullable	Description
product_id	int	Primary Foreign	Not null	ProductsDiscounts.product_id refers to Product.product_id
discount_id	int	Primary Foreign	Not null	ProductsDiscounts.discount_id refer to Discount.discount_id

Glossary

<u>Enterprise resource planning (ERP)</u> is the integrated management of main business processes, often in real-time and mediated by software and technology. ERP is usually referred to as a category of business management software—typically a suite of integrated applications—that an organization can use to collect, store, manage and interpret data from many business activities. ERP Systems can be local-based or Cloud-based. Cloud-based applications have grown in recent years due to information being readily available from any location with internet access.

<u>Point of sale (POS)</u> or **point of purchase** (**POP**) is the time and place where a retail transaction is completed. At the point of sale, the merchant calculates the amount owed by the customer, indicates that amount, may prepare an invoice for the customer (which may be a cash register printout), and indicates the options for the customer to make payment. It is also the point at which a customer makes a payment to the merchant in exchange for goods or after the provision of a service. After receiving payment, the merchant may issue a receipt for the transaction, which is usually printed but can also be dispensed with or sent electronically.

<u>Business-to-consumer (B2C)</u> refers to businesses selling products directly to customers, bypassing any third-party retailers, wholesalers, or any other middlemen. B2C brands are usually sold online only and specialize in a specific product category: Casper, Warby Parker, Everlane, Harry's, Outdoor Voices, AWAY, and Dollar Shave Club. Some direct-to-consumer brands have opened a limited number of physical retail spaces in addition to their main e-commerce platform in a clicks-and-mortar business model.

<u>Drop shipping</u> is a form of retail business wherein the seller accepts customer orders but does not keep goods sold in stock. Instead, in a form of supply chain management, it transfers the orders and their shipment details to either the manufacturer, wholesalers, other retailers, or a fulfillment house, which then ships the goods directly to the customer. As such, the retailer is responsible for marketing and selling a product, but has little or no control over product quality, storage, inventory management, or shipping. This eliminates the costs of maintaining a warehouse – or even a brick and mortar storefront, purchasing and storing inventory, and employing necessary staff for such functions. As in any other form of retail, the seller makes their profit on the difference between an item's wholesale and retail price, less any pertinent selling, merchant, or shipping fees accruing to them.

<u>Model–view–controller (MVC)</u> is a software design pattern commonly used for developing user interfaces that divide the related program logic into three interconnected elements. This is done to separate internal representations of information from the ways information is presented to and accepted by the user.

Windows Subsystem for Linux (WSL) is a compatibility layer for running Linux binary executables (in ELF format) natively on Windows 10, Windows 11, and Windows Server 2019.

Network interface controller (**NIC**, also known as a **network interface card**, **network adapter**, **LAN adapter,** or **physical network interface**, and by similar terms) is a computer hardware component that connects a computer to a computer network.

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產品經理電商規劃實錄，解構綜合性電商全維度規劃心法

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電子商務是什麼？做電商前的3大思考關鍵和成功要素

https://transbiz.com.tw/電子商務是什麼？ecommerce-sucess/

Appendix