HO CHI MINH CITY NATIONAL UNIVERSITY

INTERNATIONAL UNIVERSITY

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SCALABLE & DISTRIBUTED COMPUTING

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PROJECT REPORT

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I. Introduction

It is not exaggerating to say that coffee culture is dominating Vietnam in this industry 4.0 - where young intellectuals stay up to keep in pace with the world's transformation. The coffee culture has extended to a point where it is predictable that people would choose coffee shop as a destination to gather around in for meetings, working purposes or just to simply sit down and have a cup of full of happiness. Understands this need of high-quality yet affordable coffee shops, Trung Nguyen coffee company provides a number of coffee shops across Ho Chi Minh City, offering food, drinks and coffee products. Nevertheless, it is important to emphasize that it is impossible to handle such huge data created in business without the help of distributed programs. This project is a prototype of the distributed sale system for a chain of Trung Nguyen coffee shops. It's objective is to act as an effective communication means between staffs and the distributed system.

This project is developed by 4 students of the course Scalable and Distributed Computing: Nguyen Quynh Huong, Vo Ngoc Minh Chau and Nguyen Thi Hoai An.

II. Business Assumption

Suppose that payments using credit card and e-wallets are managed by a system seperate from this prototype sale system. The procedure of creating an order takes reference from the modern coffee shops' systems:

- Firstly, customers visit the counter to choose a number of products they want to order.

- System checks if all of the products on the list are available. If not, system deletes the item from the list.

- Customer's phone number is asked:

  a. If customer's information has been saved in database: Staff informs customer that they will get a free product on their birthday (according to the birthdate they provided).

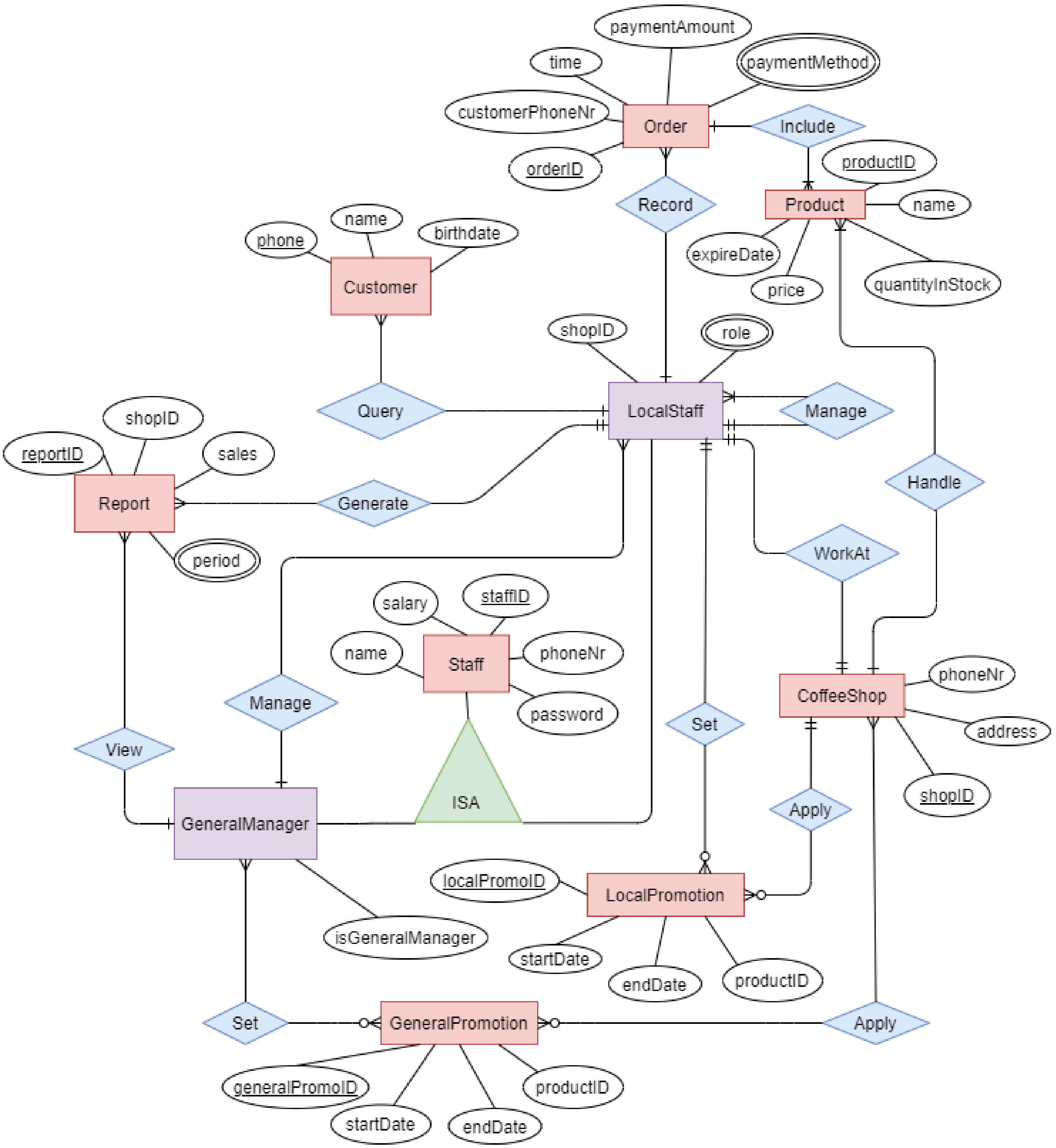
  b. If customer's information has not been saved in database: Staff enters customer's information to save in database for later use and informs customer that they will get a free product on their birthday.

- Payment is performed in either of the three methods: cash, credit card or e-wallet. If customer fails to make payment, system cancels the order.

- System prints out the bill with the bill ID, customer's phone number, the exact timing that the order is created, and the total payment of the order along with the payment method.

III. Explanation of diagrams

1. ***Entity Relationship Diagram***



There 8 main entities in this diagram (Staff is decomposed into its sub-components: GeneralManager and LocalStaff, which makes up 10 entities in total).

- Local manager is also considered as LocalStaff since they work in a particular coffee shop. Each LocalStaff is assigned with a role attribute with data type enum of two values: “salesStaff” and “localManager”, which will be later on be mentioned in the class diagram explanation. A local manager can be differentiated with local sales staff using this “role” attribute.

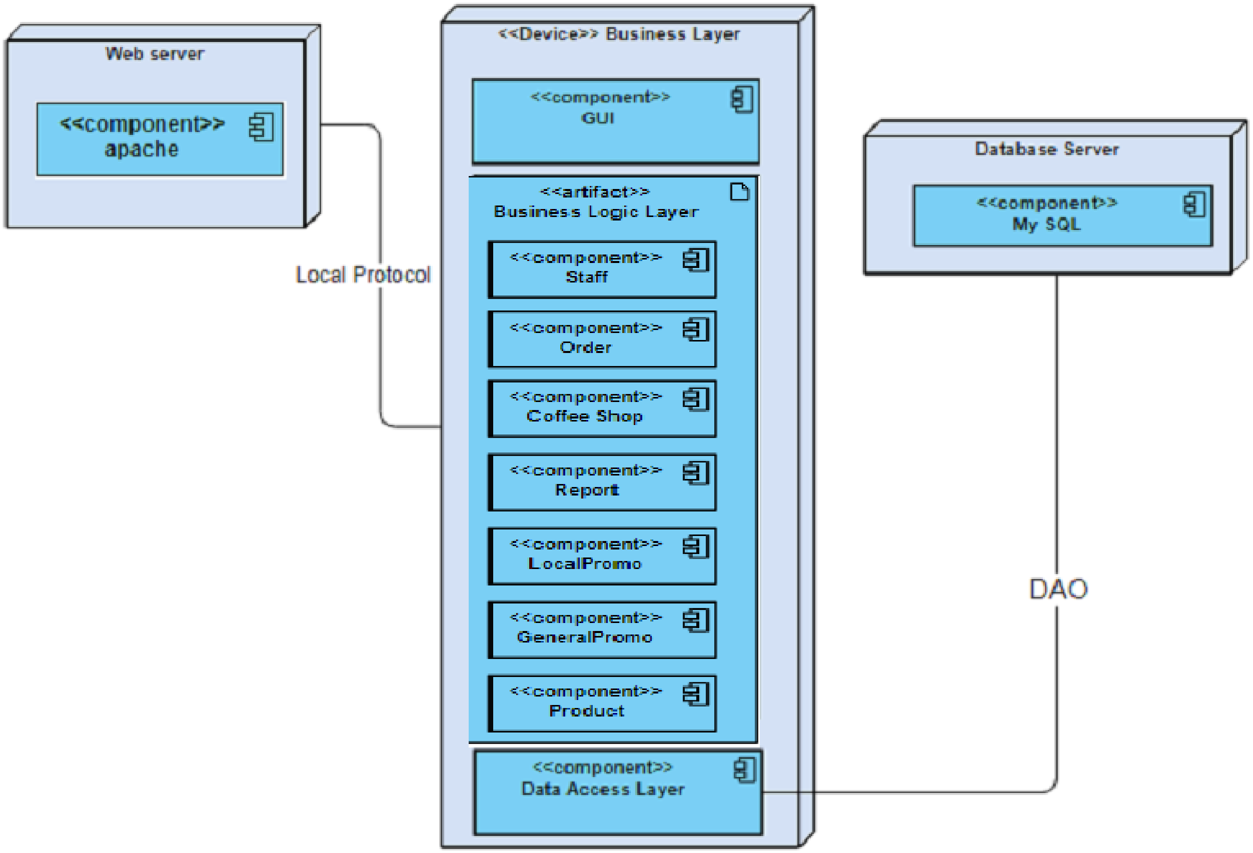
- “One and only one LocalStaff manages one to many LocalStaff” is the relationship where a coffee shop has only one local manager (a LocalStaff of which “role” is localManager) and that local manager is responsible for all of the staffs working at that coffee shop. “One and only one LocalStaff generates Report” and “One and only one LocalStaff sets LocalPromo” can be also explained with the same pattern.

- As assumed in the second section of this report (II. Assumption), an Order is only complete when the payment for the products is successfully done, therefore, the attributes “paymentAmount” and “paymentMethod” is recorded for this entity. There are up to three methods of payment that can be used (cash, credit card an e-wallet), that is why it is reasonable to let the attribute “paymentMethod” be a multivalue attribute.

- Local manager can create two types of Record: a daily or weekly report, which is differentiated using the multivalue attribute “period”.

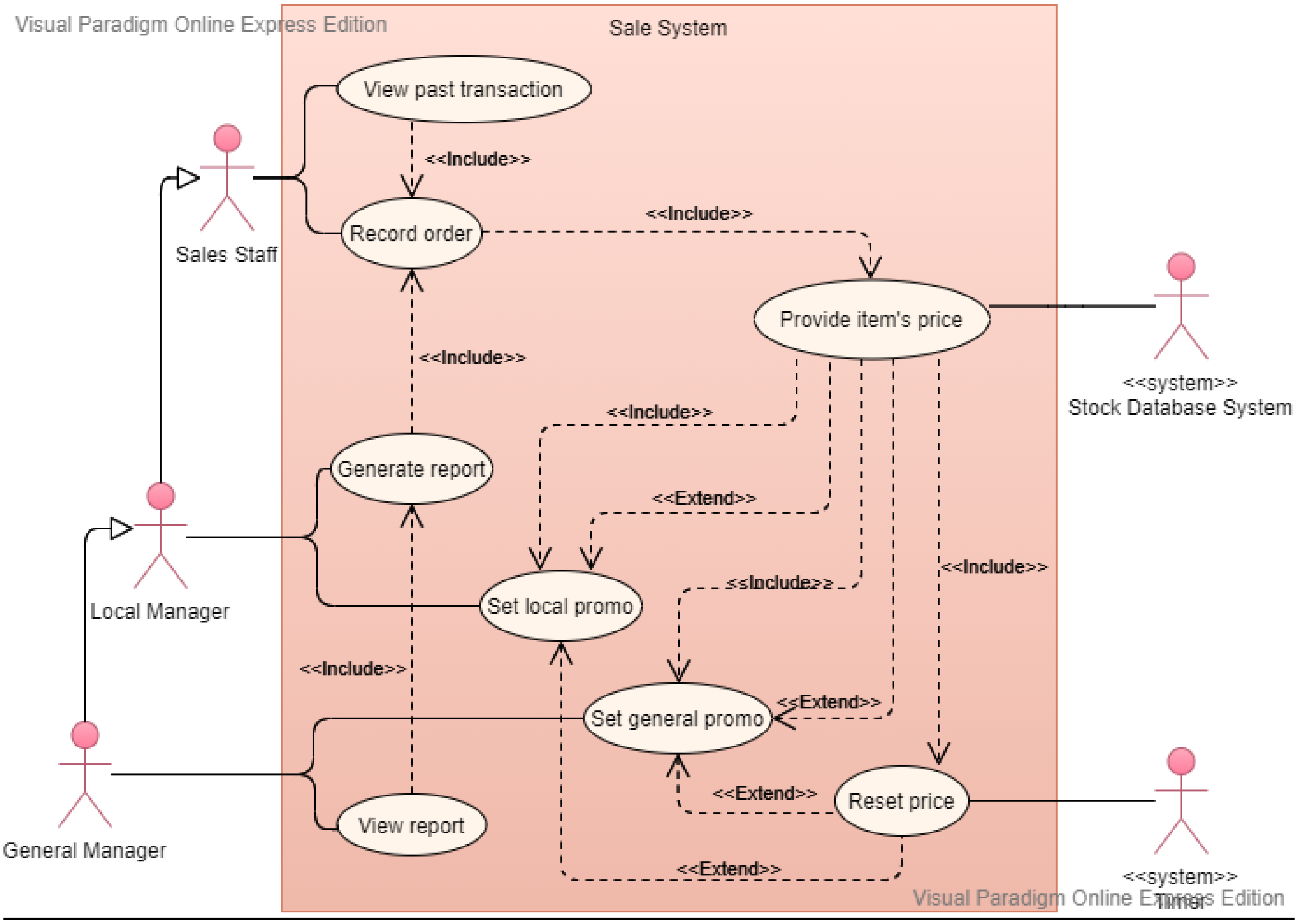
- “One GeneralManager manages many LocalStaff” is the relationship where a GeneralManager can perform all of the acts that a LocalStaff can. A GeneralManager can also update the LocalStaff’s “role”: demote a local manager and set another staff working at the same coffee shop to be the new local manager.

2. ***Deployment Diagram***



Sales system of Trung Nguyen coffee shops consists of three layers, which are presented using the three nodes: Web server, Business Layer, Database Server. Incoming HTTP requests are first processed by Apache web server. Static content such as HTML pages, images, CSS, and JavaScript are served by the web server. It gets data from the second layer (Business Layer) through the Local Protocol which is connected to components GUI of the Business Layer. The artifact Business Logic Layer consists of database schemes with seven components representing seven tables (Staff, Order, CoffeeShop, Report, LocalPromo, GeneralPromo, and Product) in Database System. Component Data Access Layer of the Node Business Layer connects with Database Server through Data Access Object. Last is the Database Server layer, which uses MySQL to store database.

3. ***Use-Case Diagram***



- Local Manager can do all of Sales Staff's activities. And General Manager can do what Local Manager can. Generalization is used between the three Actors to show their relationship, their activities, and scope. Generalization is helpful to group the use case of single actor: General Manager has all of the use cases which Local Manager has, and Local Manager has all of the use cases which Sales Staff has.

- Local Manager generates reports and the General Manager views them.

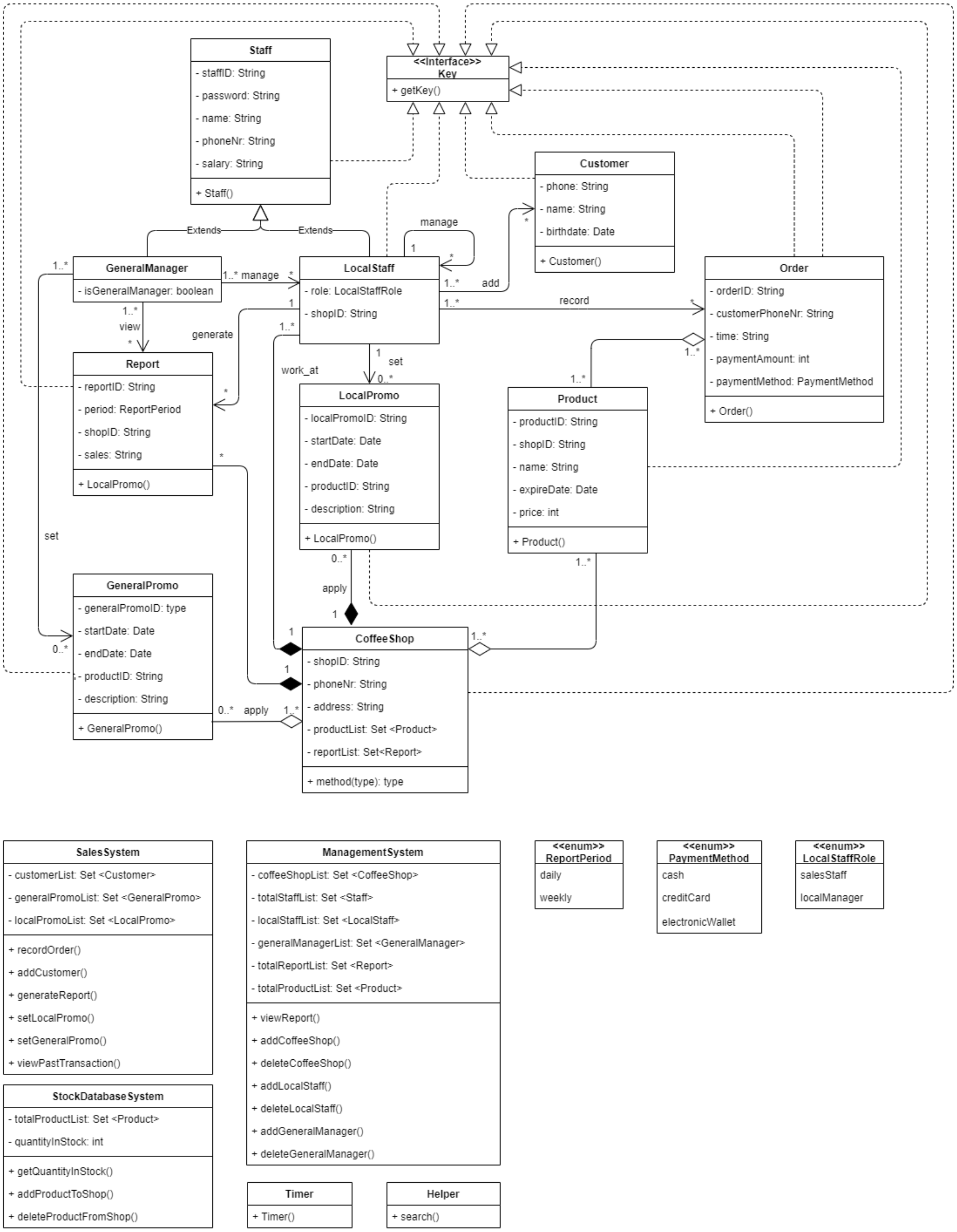
- The use case Generate Report includes Record Report because Local Manager needs to read the orders created by Record Order in order to write down a report. General Manager can view the reports created by Local Manager, therefore, the use case View Report includes Generate Report Use Case.

- Local promotions and general promotions' regulations can be to discount directly on products' price. If this is the case then every time Record Order happens, Stock Database System will initialize use case Provide Item's Price to adjust the item's price according to the promotion applied to the coffee shop. Therefore, use case Provide Item's Price includes both of the Set General Promo and Set Local Promo use cases.

- Local promotions and general promotions' regulations can be to discount on the order (discount percentage over the total order). When Record Order happens, Provide Item's Price will not need to adjust the price of the products but just to provide their original price. If this is the case, then the Sales System will discount percentage of the total bill according to the promotion's regulations. Therefore, use case Provide Item's Price extends both of the Set General Promo and Set Local Promo use cases.

- In the case that the promotion's regulation is to discount directly on products' price, then when the promotion is out of date, the price needs to be reset. Use case Provide Item's Price includes Reset Price initializes by Timer to countdown the promotion time and reset the products' price back to its originals. Reset Price extends Set General Promo and Set Local Promo use cases to receive the promotion's start and end dates.

4. Class Diagram



- The distributed system is decomposed into three sub-systems: SalesSytem, StockDatabaseSystem and ManagementSystem. Each sub-system has different purposes of using:

- Selling acts are done by all staffs using the SalesSystem.

- The StockDatabaseSystem is used by GeneralManager to manage the products in stock.

- The ManagementSystem is used by GeneralManager to take control of the company business.

- Multivalued attributes’ data types described in ERD are represented in class diagrams as enums: LocalStaffRole, ReportPeriod and PaymentMethod.

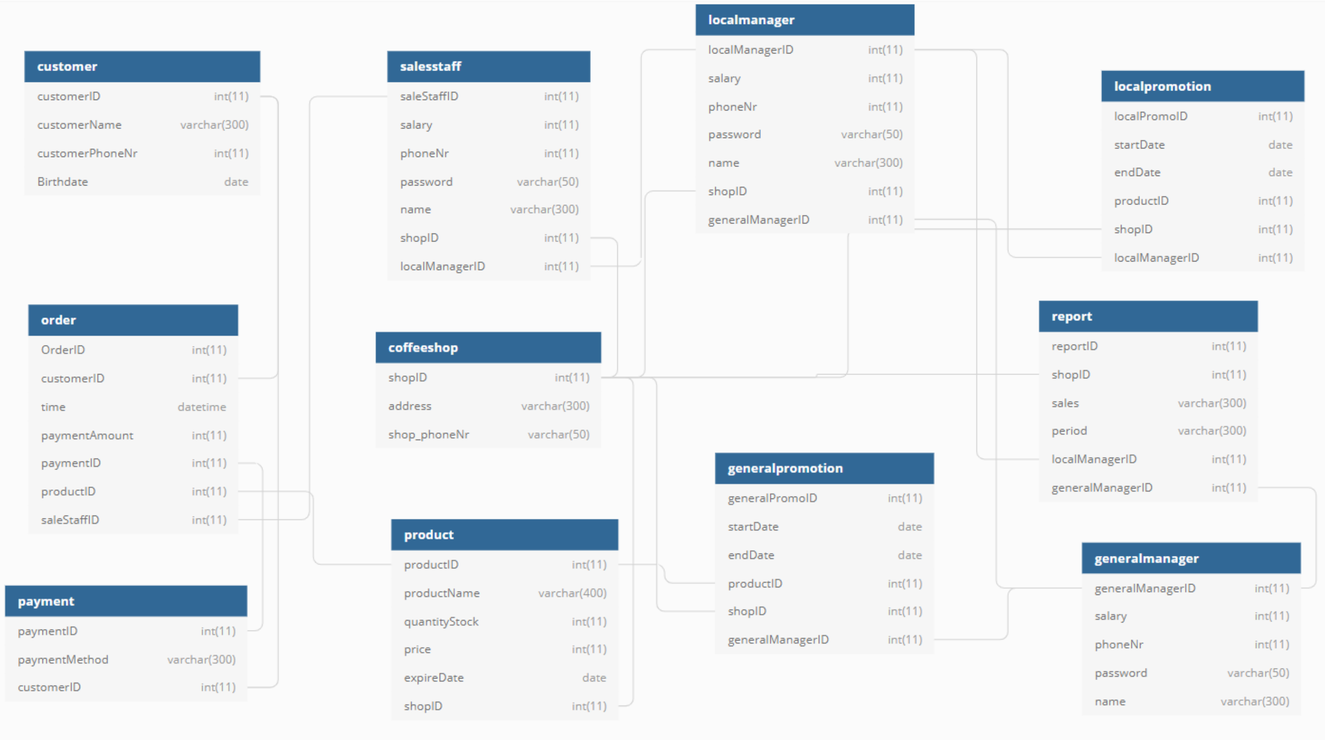
- As described using ERD, LocalStaff and GeneralManager are extensions of Staff.

- The attribute “role” of LocalStaff is used to differentiate between local sales staffs and the local manager of a coffee shop.

- GeneralManager owns a boolean attribute to differentiate between them and LocalStaff.

- Timer is a class provided by java.utils and is used to count down the promotion time and in the case that the promotion regulation is to discount price directly on product then Timer helps to reset the product’s price as well.

IV. Database Of System



customer	
customerID	int(11)
customerName	varchar(300)
customerPhoneNr	int(11)
Birthdate	date

salesstaff	
saleStaffID	int(11)
salary	int(11)
phoneNr	int(11)
password	varchar(50)
name	varchar(300)
shopID	int(11)
localManagerID	int(11)

localmanager	
localManagerID	int(11)
salary	int(11)
phoneNr	int(11)
password	varchar(50)
name	varchar(300)
shopID	int(11)
generalManagerID	int(11)

localpromotion	
localPromoID	int(11)
startDate	date
endDate	date
productID	int(11)
shopID	int(11)
localManagerID	int(11)

order	
OrderID	int(11)
customerID	int(11)
time	datetime
paymentAmount	int(11)
paymentID	int(11)
productID	int(11)
saleStaffID	int(11)

coffeeshop	
shopID	int(11)
address	varchar(300)
shop_phoneNr	varchar(50)

report	
reportID	int(11)
shopID	int(11)
sales	varchar(300)
period	varchar(300)
localManagerID	int(11)
generalManagerID	int(11)

generalpromotion	
generalPromoID	int(11)
startDate	date
endDate	date
productID	int(11)
shopID	int(11)
generalManagerID	int(11)

product	
productID	int(11)
productName	varchar(400)
quantityStock	int(11)
price	int(11)
expireDate	date
shopID	int(11)

payment	
paymentID	int(11)
paymentMethod	varchar(300)
customerID	int(11)

generalmanager	
generalManagerID	int(11)
salary	int(11)
phoneNr	int(11)
password	varchar(50)
name	varchar(300)

To have a look at the system's database written in SQL, please visit the Github repository link below: https://github.com/justhoaian/CoffeeShopSystem_Database

V. Evaluation Of System Design

- *Superiority:*

- The system is scalable: It is easy to add or delete an element from the system

- The system is distributed: All information used is stored at a central database and used by different roles of actors through different sub-systems. The system with multiple components is located on different machines that communicate and coordinate actions in order to appear as a single coherent system to the end-user.

- *Shortcoming:*

- The business logic's details are yet to compare with those of the system used by Trung Nguyen in reality.

- Implementation step has not been finished in order to test if this distributed system works well in parallel on different devices.