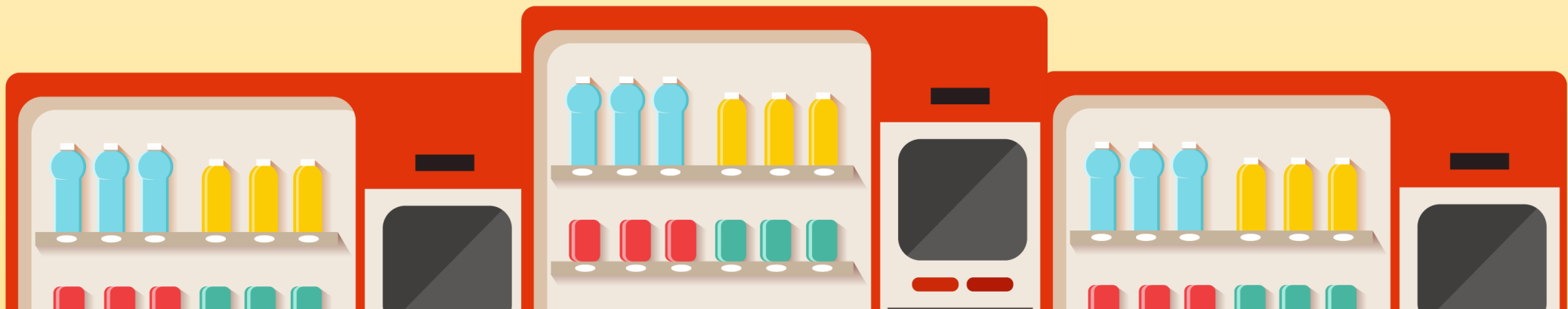# DISTRIBUTED VENDING MACHINE

객체지향개발방법론 [T2]

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Use Case	1. Item Type Display
Actor	User and System
Purpose	display item type sold in the VM
Overview	System displays item type upon starting the machine.
Type	Evident
Cross Reference	Functions: R 1.1
Pre-requisites	N/A
Typical Courses of Events	(U) User (S) System (U) turns the machine on. (S) displays item type upon starting the machine.
Alternative Courses of Events	(S) displays item type after user completes the payment.
Exceptional Courses of Events	N/A

2131 DEFINE ESSENTIAL USE CASES

Use Case	2. Item Selection
Actor	User
Purpose	select item User want to buy
Overview	User chooses the type of item and select quantity of items. System checks stock of items user chosen. If stocks are available, System goes to use case (3. Payment). Otherwise, goes to use case (4. Request Stock of Other VM).
Type	Evident
Cross Reference	Function R 1.2
Pre-requisites	Function R 1.1 needs to be executed before.
Typical Courses of Events	(U) User (S) System (U) selects type of items and quantity of items. (S) checks the stock of selected item. (S) If stocks are available, goes to use case (3. Payment) [E1].
Alternative Courses of Events	(U) selects type of items and quantity of items. (S) checks the stock of selected item. (S) If stocks are unavailable, goes to use case (4. Request Stock of Other VM) .
Exceptional Courses of Events	[E1](S) If stocks are available but not sufficient in quantity, sends error message to user and System goes to use case (1. Item type Display).

Use Case	3. Payment
Actor	User
Purpose	proceed payment on VM
Overview	System displays order sheet. User inserts card, then System checks card's validity and if validation is successful, completes the payment.
Type	Evident
Cross Reference	Function R 2.1
Pre-requisites	Function R 1.1 to 1.2 need to be executed before.
Typical Courses of Events	(U) User (S) System (S) display the order sheet. (U) inserts card to the card holder. (S) checks card's validity[E1]. (S) completes the payment.
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] System returns the card to user and shows message to user "Error in payment. Please try again". If payment failure happened more than three times, return to use case (1. Item type display).

Use Case	4. Request Stock of Other VM
Actor	System
Purpose	request stock of other VM to check stock availability.
Overview	As System does not have the stock user chose, requests stock from the other VM.
Type	Hidden
Cross Reference	Function R 3.1
Pre-requisites	Executed as Alternative Courses of Events of use case (2. Item Selection)
Typical Courses of Events	(S) System (OVM) Other VM (S) sends stock message of selected item. (OVM) responds message of stock information[E1].
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] If other VM does not have the stock as well, displays error message on the screen "The stocks are not available at this moment".

2131 DEFINE ESSENTIAL USE CASES

Use Case	5. Provide Stock Information to Other VM
Actor	Other VM
Purpose	provide stock information to Other VM
Overview	Other VM sends stock check message to System. System sends message if has stock of requested item.
Type	Evident
Cross Reference	Function R 3.2
Pre-requisites	N/A
Typical Courses of Events	(S) System (OVM) Other VM (OVM) sends stock message to System. (S) If System has stock of requested items, sends message[E1].
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] If System doesn't have stock of requested item, doesn't send message.

2131 DEFINE ESSENTIAL USE CASES

Use Case	6. Provide Product Information to Other VM
Actor	Other VM
Purpose	provide product information to the Other VM.
Overview	Other VM sends product check message to System. System sends message if has product data of requested item.
Type	Evident
Cross Reference	Function R 3.3
Pre-requisites	N/A
Typical Courses of Events	(S) System (OVM) Other VM (OVM) sends product check message to System. (S) If System has product data of requested items, sends message[E1].
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] If System doesn't have any product data, doesn't send message.

Use Case	7. Provide Prepayment Information to Other VM
Actor	System
Purpose	provide prepayment information to other VM
Overview	After prepayment happens and verification was made, send info of prepayment.
Type	Hidden
Cross Reference	Function R 3.4
Pre-requisites	Function R 4.1 need to be executed before.
Typical Courses of Events	(S) System (S) sends verification and item info to Other VM.
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A

Use Case	8. Prepayment
Actor	User
Purpose	User can prepay items they wanted to buy at other VM.
Overview	System gives options to user to prepay the stocks they chose which are available at other VM. User may proceed with prepayment if they agree to proceed with the transaction.
Type	Evident
Cross Reference	Function R 4.1
Pre-requisites	Function R 3.1 need to be executed before.
Typical Courses of Events	(U) User (S) System (S) gives out the order. (U) inserts card to the card holder. (S) checks card's validity [E1]. (S) completes the prepayment. (S) goes to use case (10. Create Verification).
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] System returns the card to user and show message to user "Error in prepayment. Please try again". If payment failure happened more than three times, return to use case (1. Item type display).

2131 DEFINE ESSENTIAL USE CASES

Use Case	9. Synchronize Information of Prepayment
Actor	Other VM
Purpose	synchronize prepayment information.
Overview	If Other VM sends prepayment information, System synchronizes prepayment information.
Type	Evident
Cross Reference	Function R 4.2
Pre-requisites	N/A
Typical Courses of Events	(OVM) Other VM (S) System (OVM) sends prepayment information. (S) synchronizes stock information[E1].
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] If stock is unavailable cancel the prepayment .

Use Case	10. Create Verification
Actor	System
Purpose	create Verification for other VM to confirm the order and Prepayment.
Overview	After the User selects a drink which is on the other VM and completes the Prepayment, the current VM generates Verification.
Type	Hidden
Cross Reference	Function R 4.3
Pre-requisites	Function R 4.1 needs to be executed before.
Typical Courses of Events	(S) System (S) processes payment. (S) creates Verification for this order. (S) displays Verification and goes to use case(7. Provide prepayment information to the other VM).
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A

2131 DEFINE ESSENTIAL USE CASES

Use Case	11. Confirm Verification
Actor	User
Purpose	give out items legitimately and successfully
Overview	User inputs the Verification and System checks it if it is correct or not.
Type	Evident
Cross Reference	Function R 4.4
Pre-requisites	Function R 4.1 and 4.3 need to be executed first
Typical Courses of Events	(U) User (S) System (U) inputs the verification (S) verifies that it is the same as in the database[E1] (S) If verification is successful, removes the Verification and item comes out.
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1]If the User enters an incorrect verification , System displays to the user "Your verification is incorrect, please enter again", and returns to the input Verification interface.

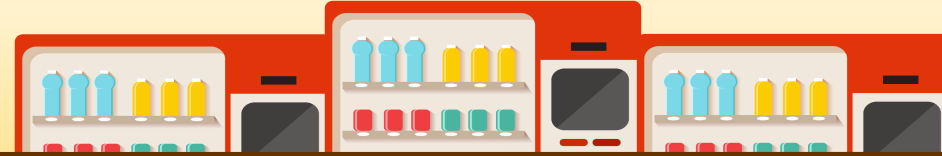| Use Case	12. Administrator Login
Actor	Administrator
Purpose	let administrator to login to the system.
Overview	Administrator may choose to login to the system by clicking a login button on the screen.
Type	Evident
Cross Reference	Function R 5.1
Pre-requisites	1. Administrator must know the location of the login button. 2. Administrator must have login ID and password to access the system.
Typical Courses of Events	(A) Administrator (S) System (A) presses the login button. (S) A login interface appears. (A) needs to insert login ID and password. [E1] (S) If the login ID and password match with the administrator's login ID and password in the database, goes to use case (14. Change Stock Quantity).
Alternative Courses of Events	N/A
Exceptional Courses of Events	[E1] If the login ID and password does not match with the administrator's login ID and password in the database, System sends an error message. The process is repeated three times. if login failed on the third time, System goes to use case (1. Item type display)

| Use Case	13. Administrator Logout
Actor	Administrator
Purpose	let administrator to logout of the system.
Overview	Administrator may choose to logout of the system by clicking a logout button on the screen.
Type	Evident
Cross Reference	Function R 5.2
Pre-requisites	1. Function R 5.1 needs to be executed first. 2. Administrator must know the location of the logout button.
Typical Courses of Events	(A) Administrator (S) System (A) presses the logout button. (S) moves to use case (1. Item Type Display).
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A

| Use Case	14. Change Stock Quantity
Actor	Administrator
Purpose	change the stock quantity sold in the VM.
Overview	Administrator can add any available stock to the VM or remove any expired stock from the VM.
Type	Evident
Cross Reference	Function R 5.3
Pre-requisites	1. Function 5.1 needs to be executed first. 2. Administrator must login successfully into the system to execute this use case.
Typical Courses of Events	(A) Administrator (S) System (A) changes the stock quantity in the VM (S) updates the change to the database of VM.
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A

- ● **Use Case Diagram**
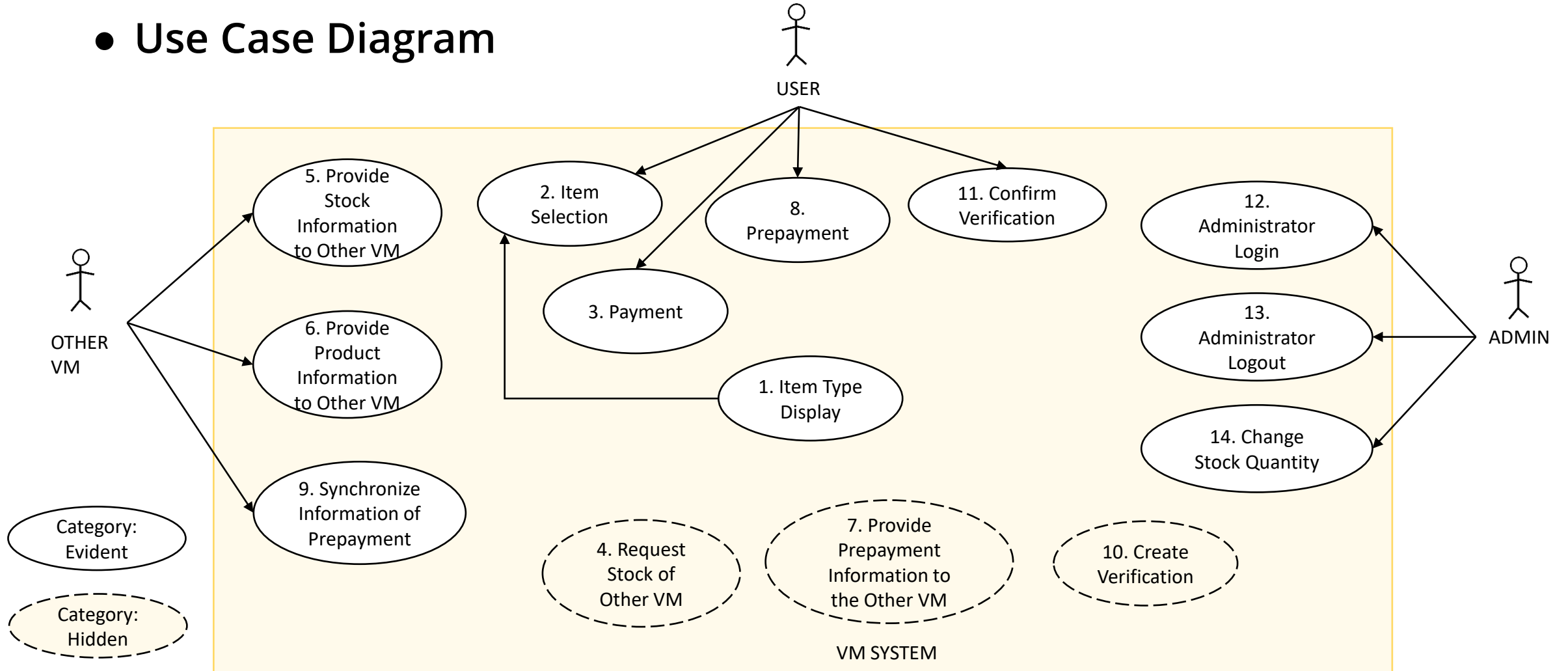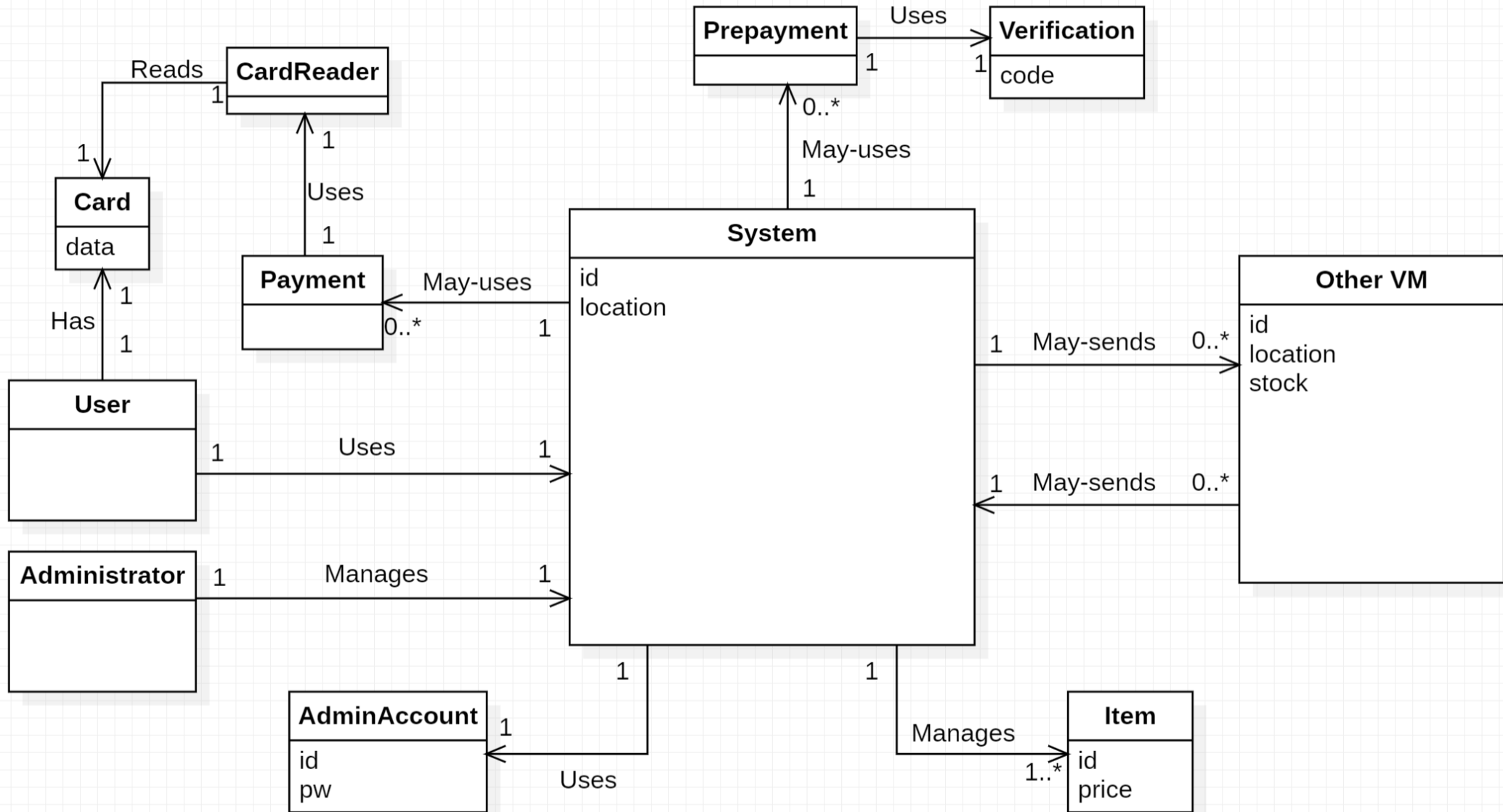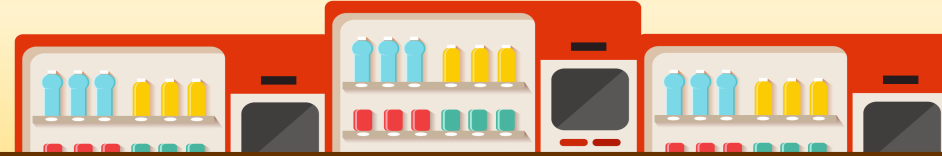
2134 REFINE GLOSSARY

| Term	Category	Comments
System	Class	The current VM user is using
OtherVM	Class	Other vending machine
Item	Class	Different kinds of drinks
User	Class	The person who is using VM
Administrator	Class	The manager of system
vmId	Attribute	VM's ID
vmLocation	Attribute	The specific location of VM which has stock of specific drink
itemId	Attribute	Item's ID
itemQuantity	Attribute	drink's quantity
verificationCode	Attribute	Verification that can get drinks from other VM
adminId	Attribute	Administrator' login ID
adminPwd	Attribute	Administrator's login password
distance	Attribute	The distance between current VM and chosen VM
Prepayment	Operation	The prepayment for drinks which are in other VM
Payment	Operation	User makes payment on current VM

Use case: 1. Item Type Display

Typical courses of event:

1. User turns the machine on.
2. System displays item type upon starting the machine.
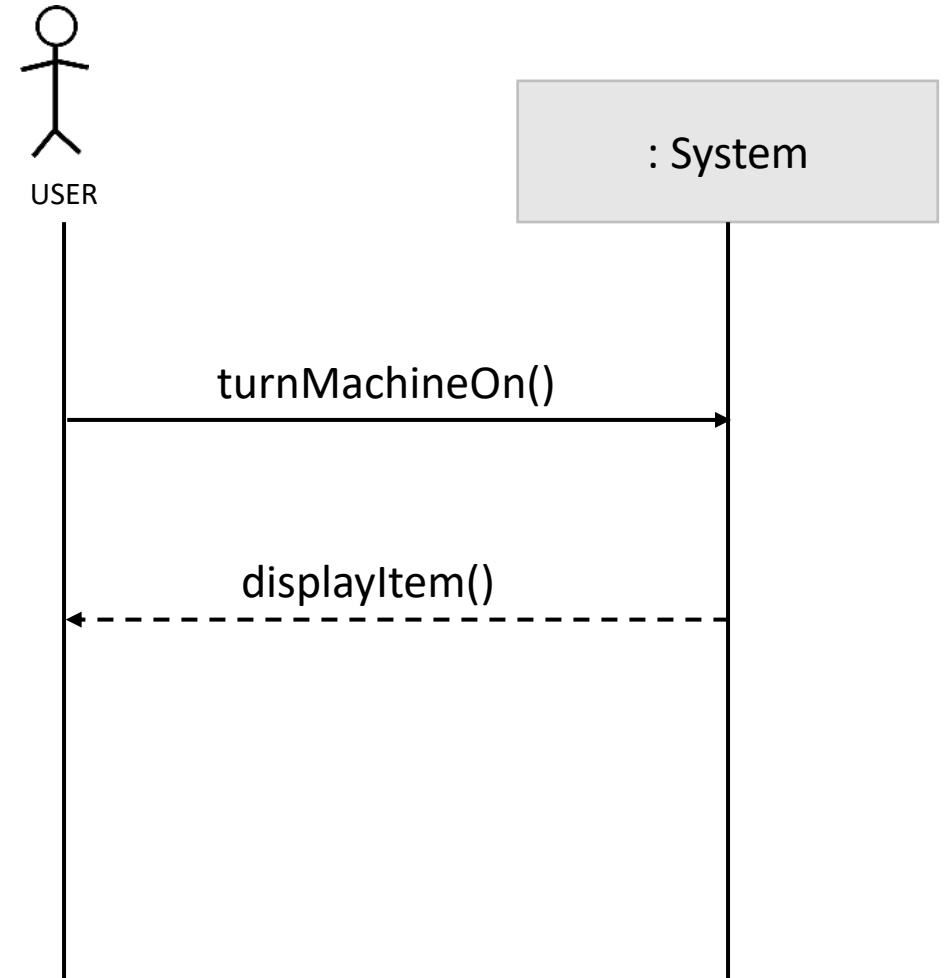
USER

: System

turnMachineOn()

displayItem()

Use case: 2. Item Selection

Typical courses of event:

1. User selects type of items and quantity of items.
2. System checks the stock of selected item.
3. If stocks are available, System goes to use case (3. Payment).
4. If stocks are unavailable, System goes to use case (4. Request Stock of Other VM).

USER

: System

selectItem(itemId, itemQuantity)
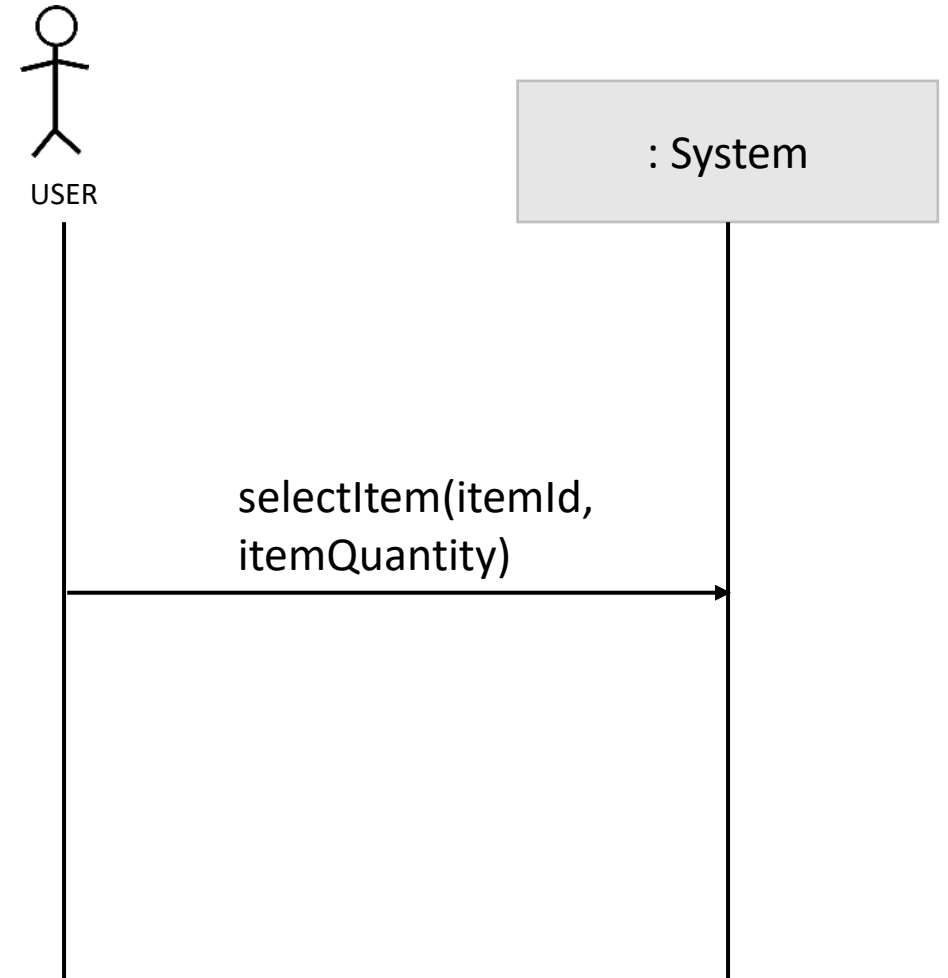
Use case: 3. Payment

Typical courses of event:

1. System gives out the order sheet.
2. User inserts card to the card reader.
3. System checks card's validity.
4. Complete the payment.

USER

: System

displayPrice()

payByCard(cardData)

Exceptional:

If card is invalid:
displayErrorInPaymentMessage()

If payment's failure happened more than thrice:

displayItem()
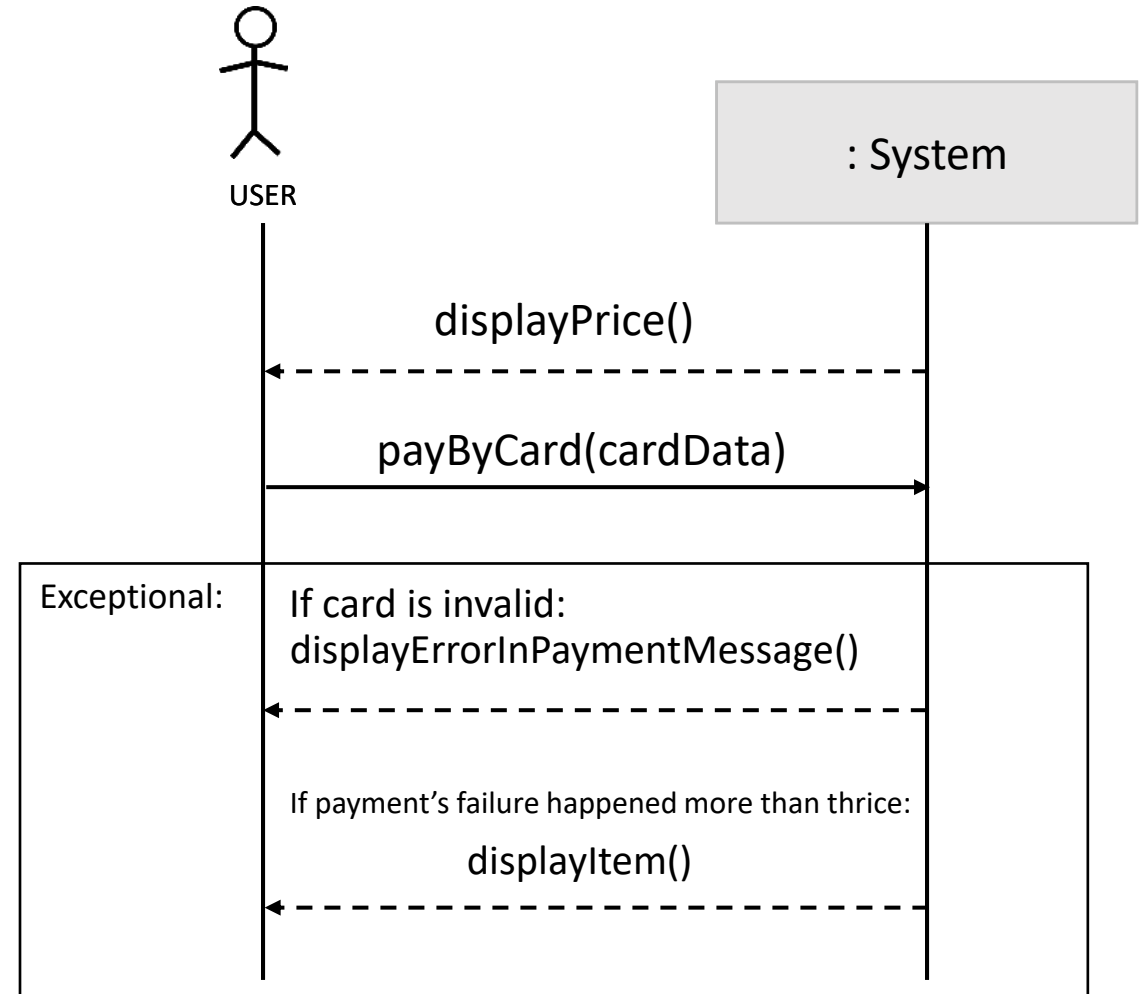
Use case: 4. Request Stock of Other VM

Typical courses of event:

1. System sends stock message about selected item.
2. Other VM responds message of stock information.
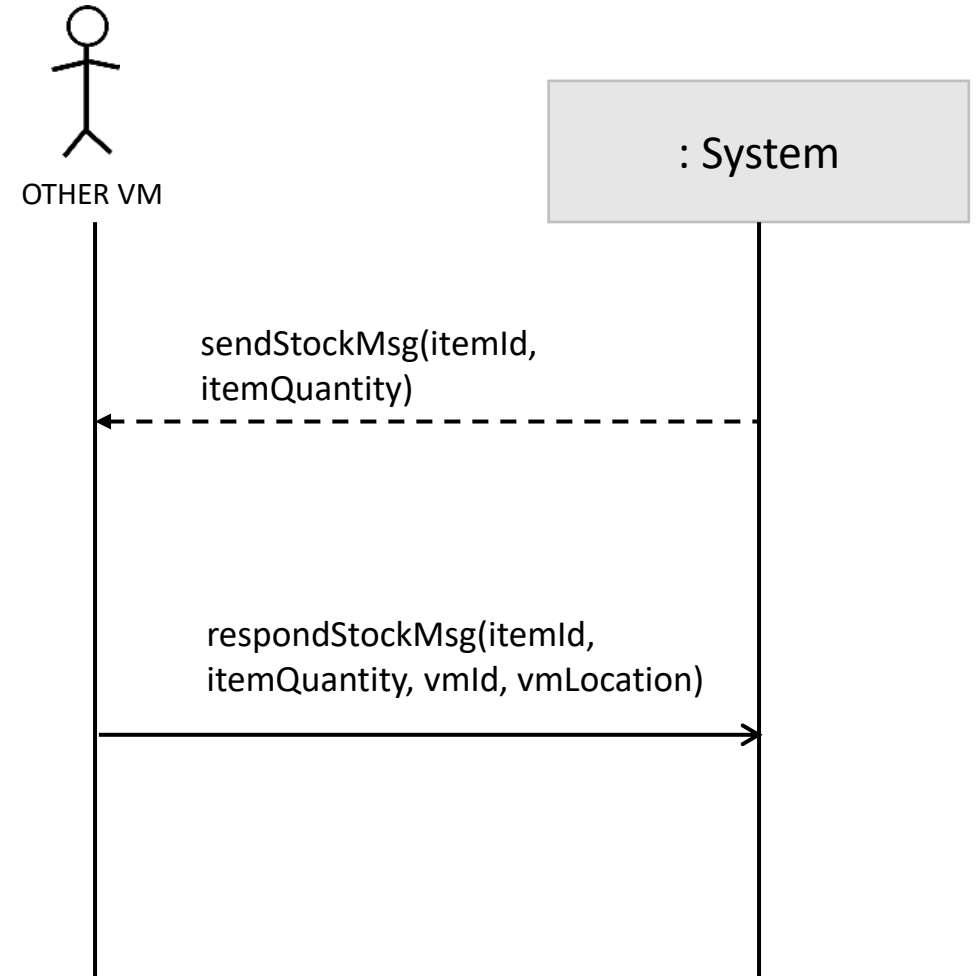
OTHER VM

: System

sendStockMsg(itemId, itemQuantity)

respondStockMsg(itemId, itemQuantity, vmId, vmLocation)

Use case: 5. Provide Stock Information to Other VM

Typical courses of event:

1. Other VM sends stock message to System.
2. If System has stock of requested items, sends message.
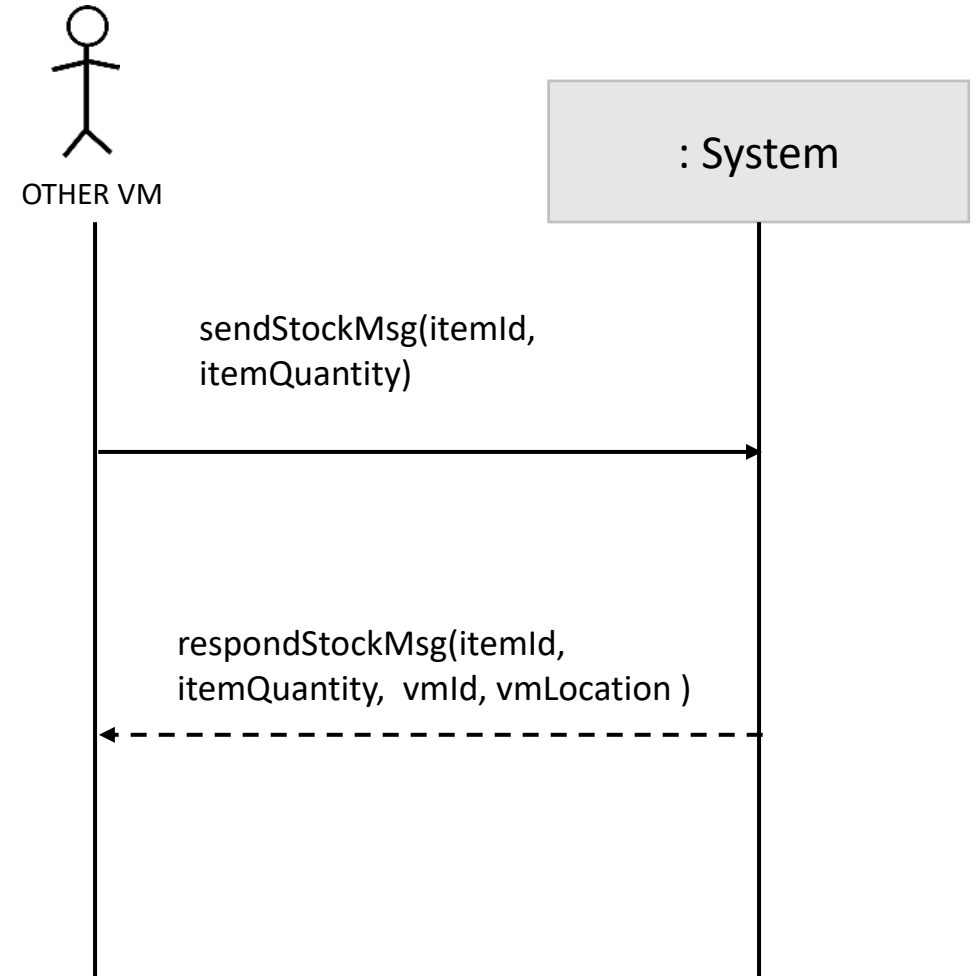
OTHER VM

: System

sendStockMsg(itemId, itemQuantity)

respondStockMsg(itemId, itemQuantity, vmId, vmLocation)

Use case: 6. Provide Product Information to Other VM

Typical courses of event:

1. This use case begins when the items User want to buy are not available at the other vending machine.
2. Other VM sends the product information request to the System.
3. If requested item is available at the Current VM, System responds the message.
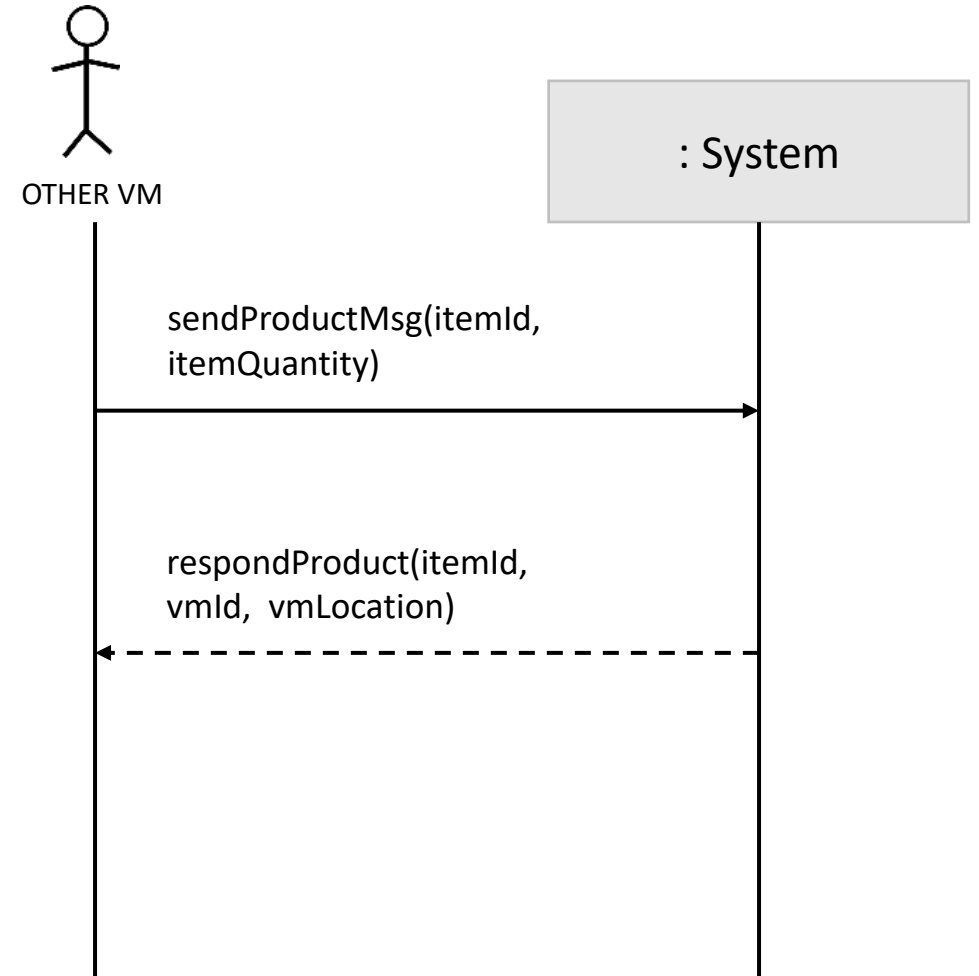
OTHER VM

: System

sendProductMsg(itemId, itemQuantity)

respondProduct(itemId, vmId, vmLocation)

Use case: 7. Provide Prepayment Information to Other VM

Typical courses of event:

1. This use case begins after prepayment was successfully done and verification code was created.

2. System sends verification code and items data to the Other VM.

OTHER VM

: System

updateVerificationCode(verification Code, itemId, itemQuantity)
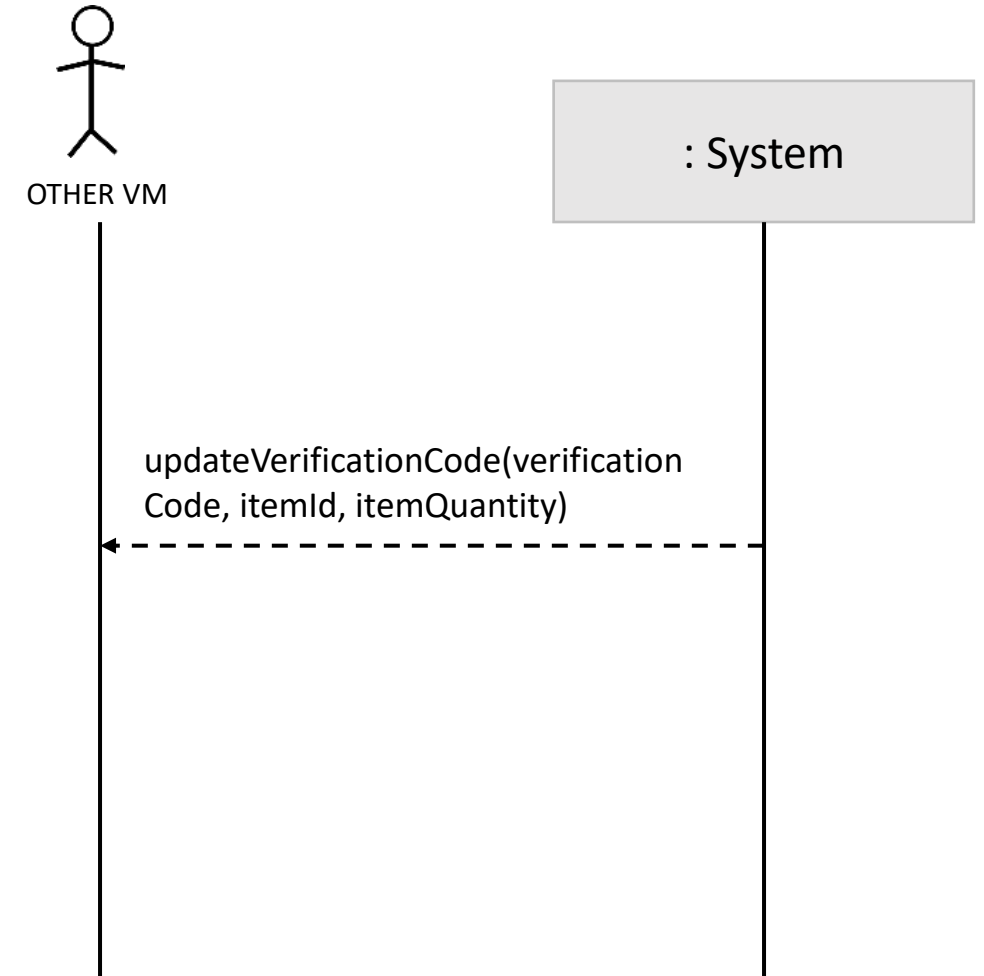
Use case: 8. Prepayment

Typical courses of event:

1. This use case begins when the items User wants to buy are sold at the other vending machine.
2. System gives option to prepay the items to User.
3. User may choose to proceed with the prepayment or cancel it.
4. System gives out the order sheet.
5. User inserts card to the card holder.
6. System checks the card's validity(card reader).
7. After the prepayment complete, System moves to user case (10. Create Verification)

USER

: System

displayPrice()

If User decline: displayItem()

If User proceed: payByCard(cardData)

Exceptional:

If card is invalid:
displayErrorInPaymentMessage()

If prepayment's failure happened more than thrice: displayItem()
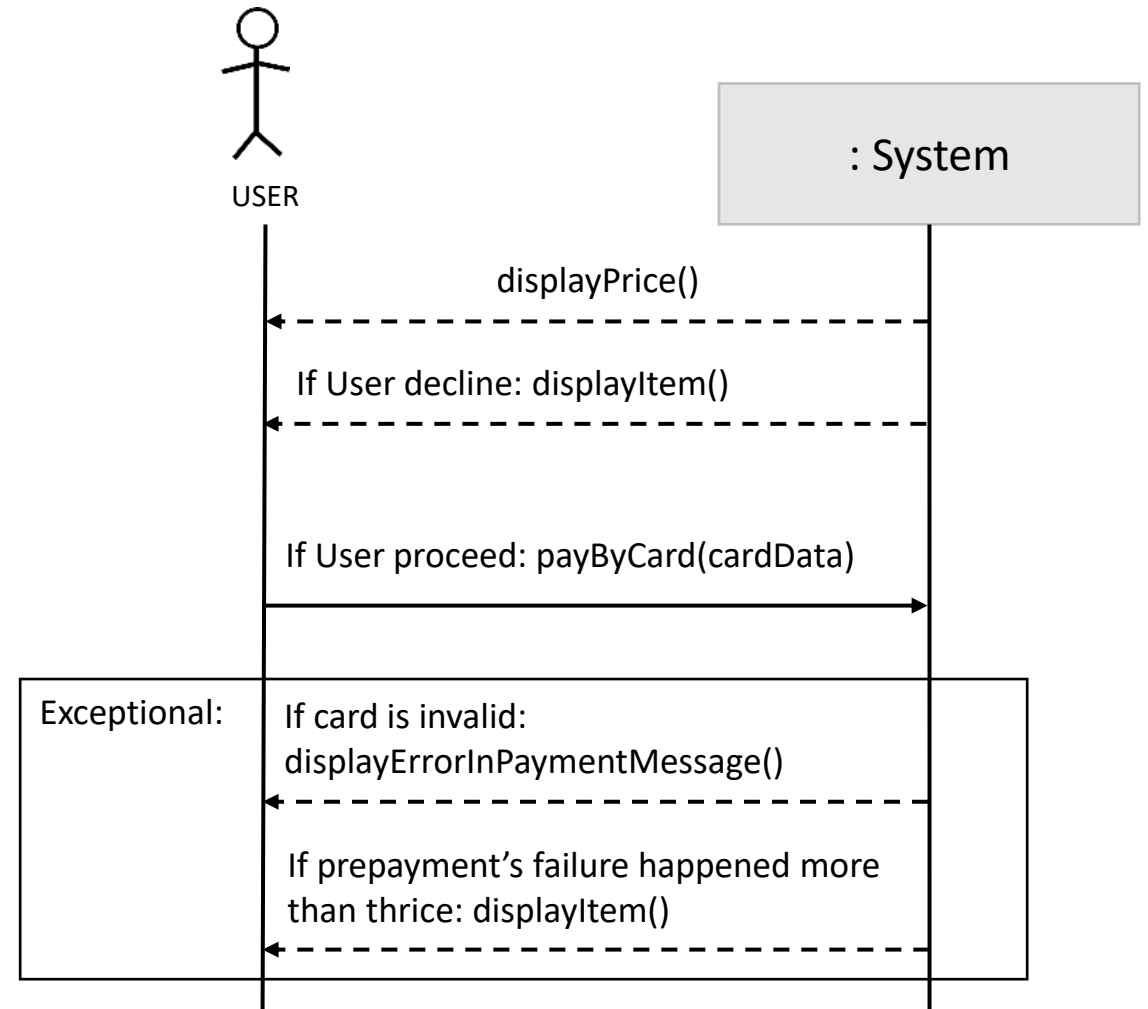
2135 DEFINE SYSTEM SEQUENCE DIAGRAMS

OTHER VM

: System

Use case: 9. Synchronize Information of Prepayment

Typical courses of event:

1. Other VM sends a prepayment message.
2. System synchronizes stock information.

sendPrepaymentMsg(itemId, itemQuantity, verificationCode)
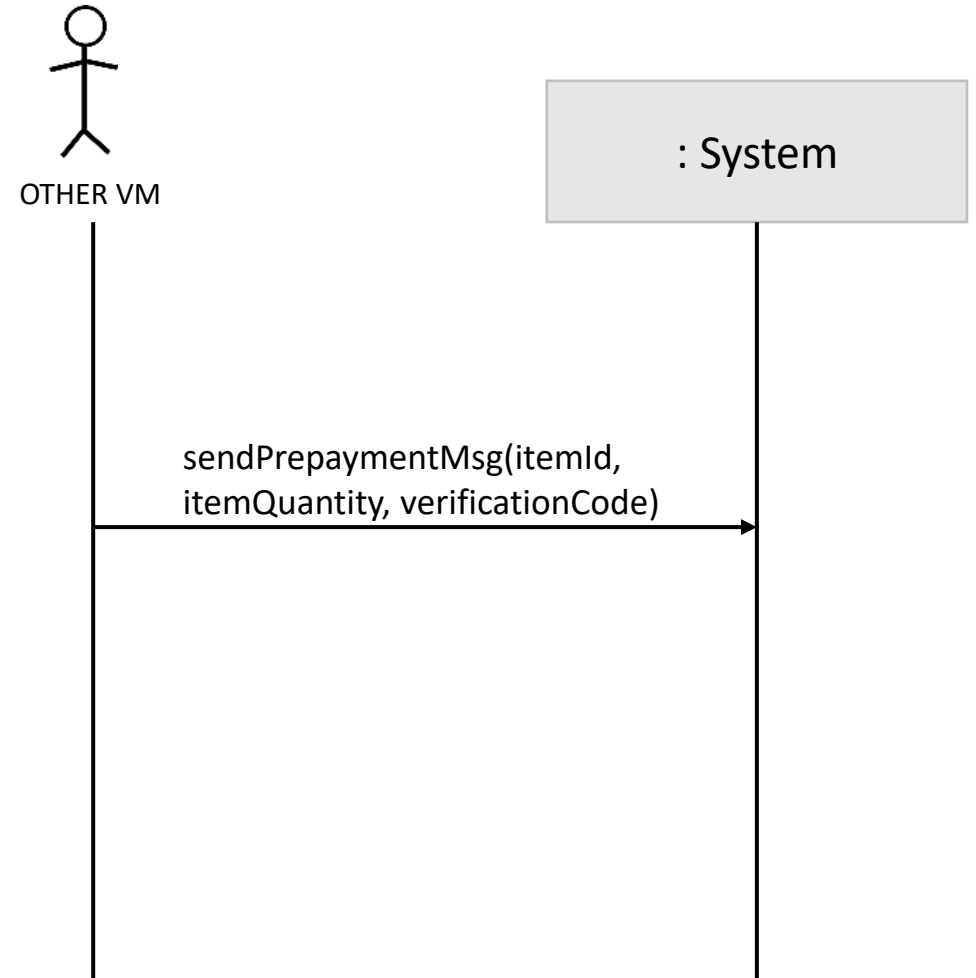
Use case: 10. Create Verification

Typical courses of event:

1. This use case begins after System receives prepayment from the User.
2. System generates a 10 digits Verification code for the order paid by the User.
3. System displays the verification code on the screen.

USER

: System

displayVerificationCode(
verificationCode)
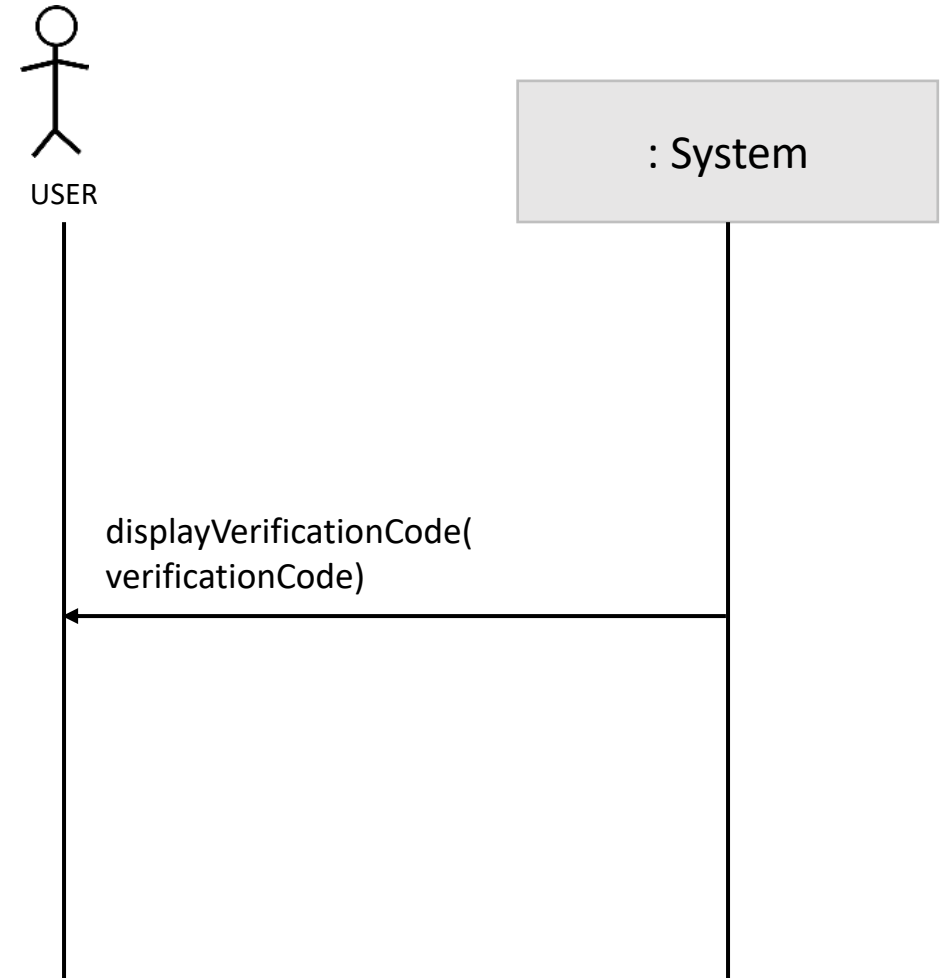
Use case: 11. Confirm Verification

Typical courses of event:

1. User inputs the verification
2. System verifies that it is same as in the database
3. If Verification is successful, System removes the verification and item comes out.

USER

: System

inputVerification(verificationCode)
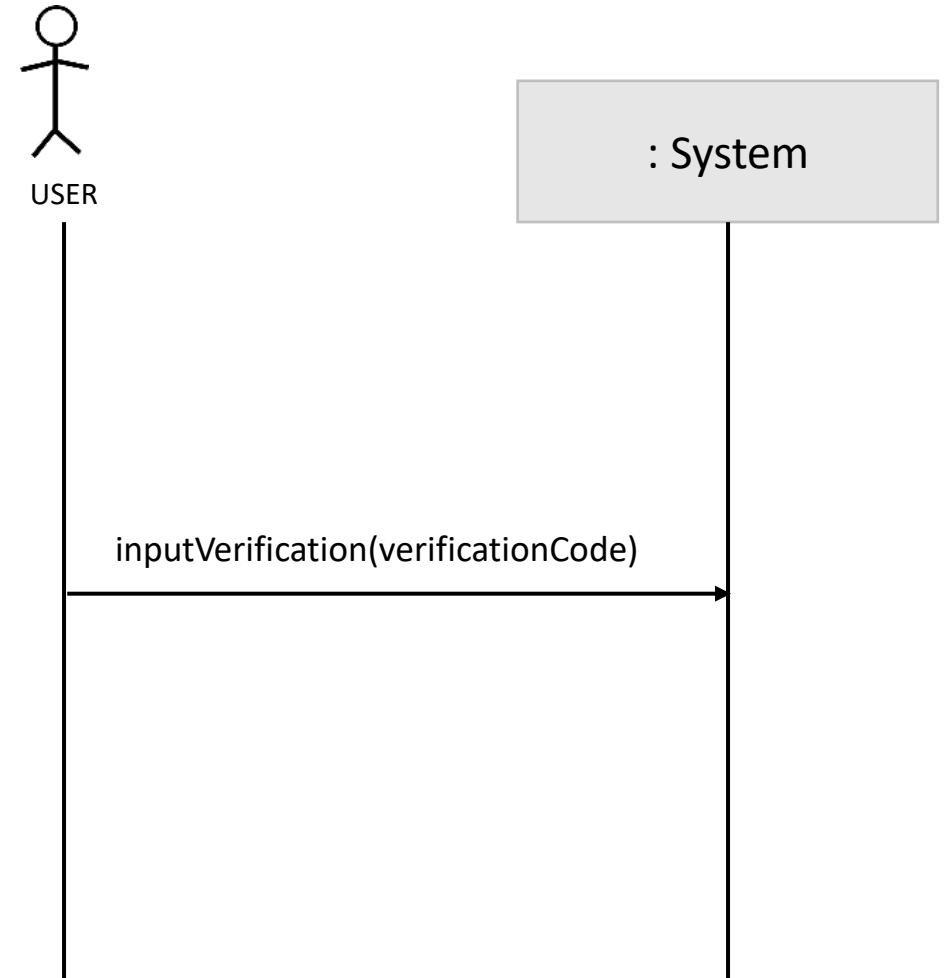
Use case: 12. Administrator Login

Typical courses of event:

1. Administrator presses the login button.
2. A login interface appears.
3. Administrator needs to insert login ID and password.
4. If the login ID and password match with the administrator's login ID and password in the database, System goes to use case (14. Change of Stock Quantity).

ADMIN

: System

loginPage()

adminLogin(adminId, adminPwd)
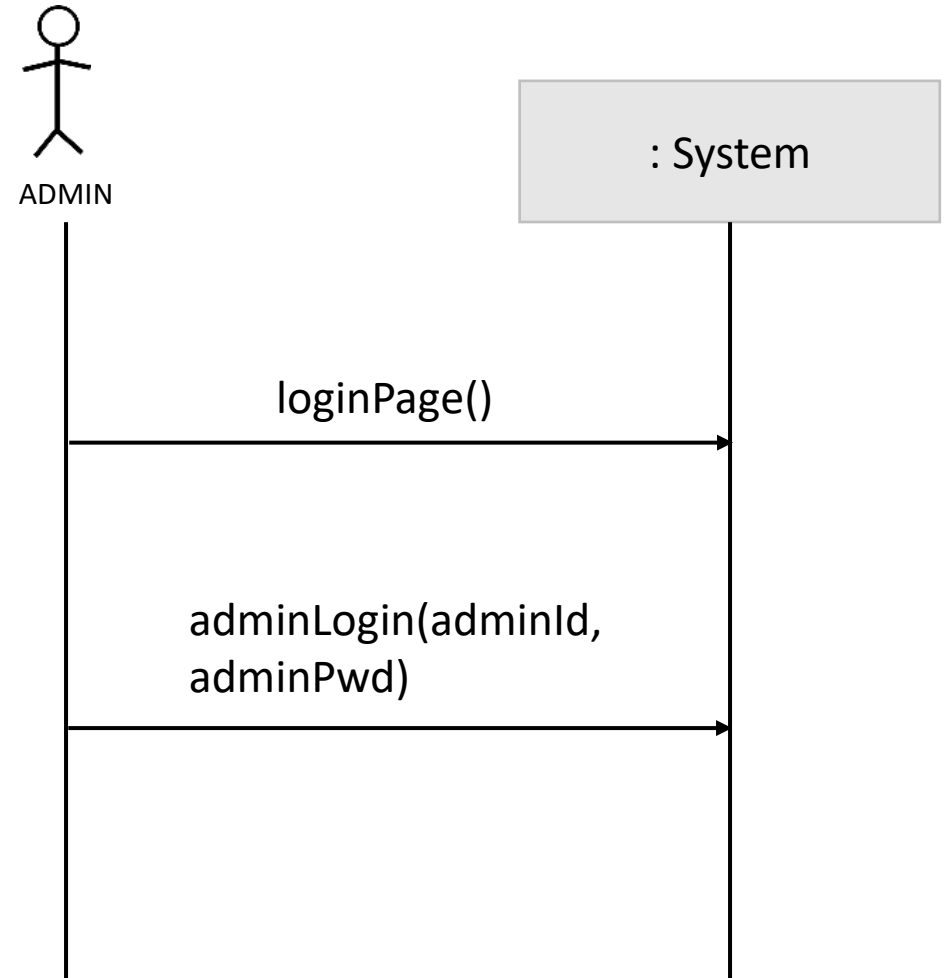
Use case: 13. Administrator Logout

Typical courses of event:

1. Administrator presses the logout button.
2. System logs off and move to use case (1. Item Type Display).

ADMIN

: System

adminLogout()
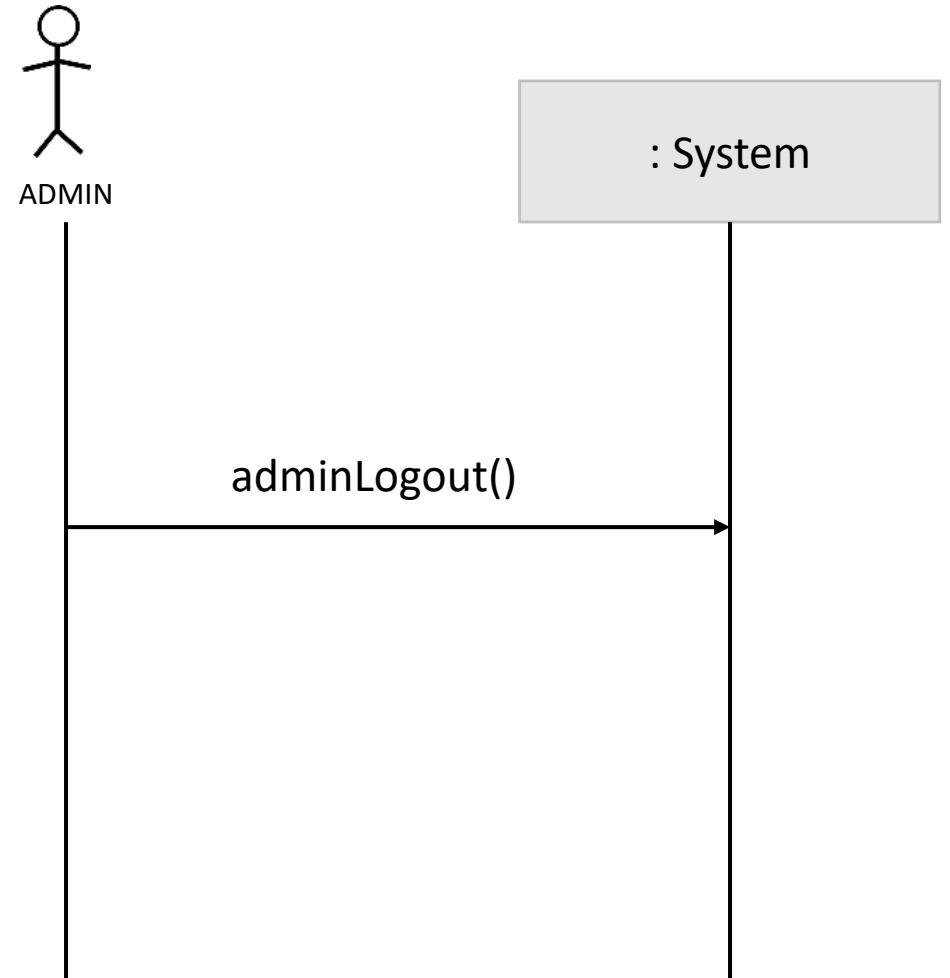
Use case: 14. Change Stock Quantity

Typical courses of event:

1. Admin changes the stock quantity in the System.
2. The change is updated into the database of System.

ADMIN

: System

changeStock(itemId, itemQuantity)
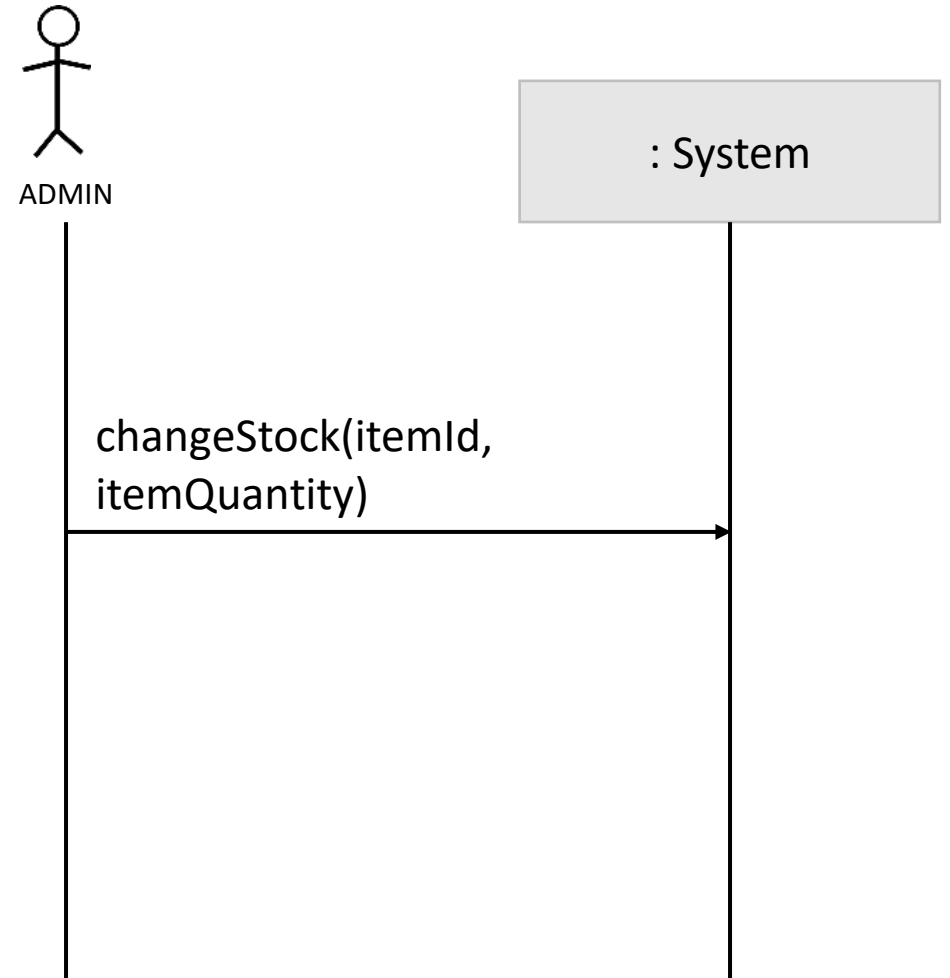
2138 REFINE SYSTEM TEST CASE

Test Number	Test 항목	Use Case	System Function	Description
1	Item Display	1. Item type display	R 1.1	- 시스템을 켰을 때 정상적으로 UI가 노출되는지 확인한다.
2	Item Selection	2. Item Selection	R 1.2	- 음료의 재고가 충분할 때 결제창으로 넘어가는지 확인한다. - 음료의 재고가 불충분할 때 Other VM의 재고를 파악하는지 테스트한다.
3	Payment	3. Payment	R 2.1	- 유효한 카드를 입력 받았을 때 정상적으로 결제가 진행되는지 확인한다. - 유효하지 않은 카드를 입력 받았을 때 경고창을 노출하는지 확인한다. - 일정 시간 이벤트가 없으면 display 화면으로 돌아가는지 테스트한다.
4	Message Request	4. Request Stock of OtherVM	R 3.1	- 재고 정보 요청 메시지를 정상적으로 모든 자판기에 보내는지 확인한다.
5	Message Respond	5 & 6 & 7	R 3.2, 3.3, 3.4	- 정상적으로 메세지를 수신하는지 확인한다. - 응답 메시지와 자판기의 데이터가 일치하는지 확인한다.
6	Prepayment	8. Prepayment	R 4.1	- 다른 자판기의 정보를 정상적으로 가져오는지 확인한다. - 가장 가까운 자판기를 출력하는지 확인한다. - 유효한 카드를 입력 받았을 때 정상적으로 결제가 진행되는지 확인한다. - 유효하지 않은 카드를 입력 받았을 때 경고창을 노출하는지 확인한다. - 일정 시간 이벤트가 없으면 display 화면으로 돌아가는지 확인한다.

2138 REFINE SYSTEM TEST CASE

Test Number	Test 항목	Use Case	System Function	Description
9	Synchronize Information	9. Synchronize Information of Prepayment	R 4.2	- 재고 정보를 정상적으로 수정하는지 확인한다. - 재고가 없으면 결제를 취소하는지 확인한다.
10	Create Verification	10. Create Verification	R 4.3	- 중복되지 않은 10자리의 인증코드를 정상적으로 생성하는지 확인한다.
11	Manage Verification	11. Confirm Verification	R 4.4	- 유효한 인증코드를 입력 받았을 때 정상적으로 음료를 제공하는지 확인한다. - 유효하지 않은 인증코드를 입력 받았을 때 에러 메세지를 출력하는지 확인한다.
12	Administrator Login	12. Administrator Login	R 5.1	- 관리자 로그인 버튼을 눌렀을 때 로그인 화면이 뜨는지 확인한다. - 유효한 아이디와 비밀번호를 입력 받았을 때 로그인이 되는지 확인한다. - 유효하지 않은 아이디와 비밀번호가 입력되었을 때 에러 메세지를 출력하는지 확인한다.
13	Administrator Logout	13. Administrator Logout	R 5.2	- 관리자 로그아웃버튼을 누르면 로그인 정보가 없어지고 item display가 진행되는지 확인한다.
14	Change Stock Quantity	14. Change Stock Quantity	R 5.3	- 관리자가 선택한 item의 재고가 선택한 수량만큼 데이터에 반영되는지 확인한다.

2139 ANALYZE (2030) TRACEABILITY ANALYSIS

System Function	Use Case	Operation
R 1.1 Item Type Display	1. Item Type Display	1. turnMachineOn()
R 1.2 Item Selection	2. Item Selection	2. displayItem()
R 2.1 Payment	3. Payment	3. selectItem(itemId, itemQuantity)
R 3.1 Request Stock of Other VM	4. Request Stock of Other VM	4. displayPrice()
R 3.2 Provide Stock Information to Other VM	5. Provide Stock Information to Other VM	5. payByCard(cardData)
R 3.3 Provide Product Information to Other VM	6. Provide Product Information to Other VM	6. displayErrorInPaymentMessage()
R 3.4 Provide Prepayment Information to Other VM	7. Provide Prepayment Information to Other VM	7. sendStockMsg(itemId, itemQuantity)
R 4.1 Prepayment	8. Prepayment	8. respondStockMsg(itemId, itemQuantity, vmId, vmLocation)
R 4.2 Synchronize information of Prepayment	9. Synchronize information of Prepayment	9. sendProductMsg(itemId, itemQuantity)
R 4.3 Create Verification	10. Create Verification	10. respondProduct(itemId, vmId, vmLocation)
R 4.4 Confirm Verification	11. Confirm Verification	11. updateVerificationCode(verificationCode, itemID, itemQuantity)
R 5.1 Administrator Login	12. Administrator Login	12. sendPrepaymentMsg(itemId, itemQuantity, verificationCode)
R 5.2 Administrator Logout	13. Administrator Logout	13. displayVerificationCode(verificationCode)
R 5.3 Change Stock Quantity	14. Change Stock Quantity	14. inputVerification(verificationCode)
		15. loginPage()
		16. adminLogin(adminID, adminPwd)
		17. adminLogout()
		18. changeStock(itemID, itemQuantity)

QnA