

Attendance/Demo

To receive credit for this lab, you must make reasonable progress towards completing the exercises and submit individually the final result of your work on cuLearn. When you have finished the exercise, call your instructor or a TA, who will review your solution. For those who don't finish early, the TA will ask you to show whatever you have completed, starting at about 15 minutes before the end of the lab period. Finish any exercises that you don't complete on your own time.

Instructions

To better benefit from the work being asked, it is recommended to work in groups of two or three (not more). Your answer document should contain the names of all the group members.

Problem definition

Recall the ATM problem description you worked on during the last two labs. You may download the text from those labs, as well as solutions.

What to do

You are asked to start the analysis phase for this software system, given the result of the requirement elicitation phase (solution to last lab).

So your task is to produce a class diagram from the use case descriptions and use case diagram.

More specifically, your task is to create a class diagram with only Entity classes. Use every aspect of the UML class diagram notation you feel is necessary to specify classes, attributes and associations (or other relationships). Do not focus on operations yet.

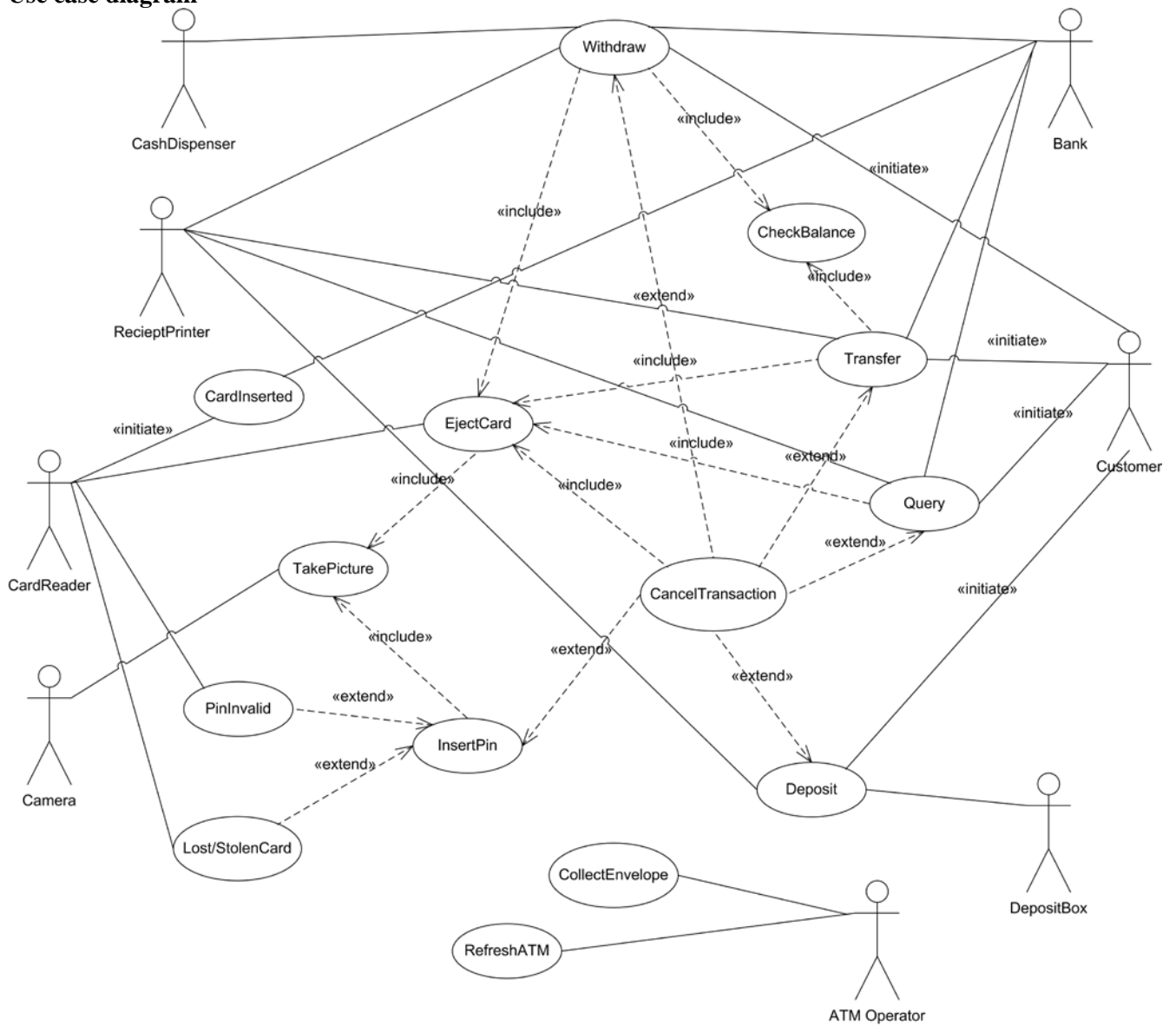
Remember that Entity classes indicate data that the system needs to know about, needs to manipulate, needs to store.

Your answer should include:

1. a class diagram
2. a short textual description of each class (including description of specializations)
3. a short textual description of each attribute
4. a short textual description of each association

Laboratory 5

ANSWER TO PREVIOUS LAB
 Use case diagram



List of actors (in alphabetical order)

ATM Operator: The ATM Operator stops the ATM system to begin maintenance. Maintenance performed includes refilling cash in the dispenser, routine maintenance, validating deposited envelopes and crediting the customer's account, and restarting the ATM system.

Bank: The Bank maintains all customer account information, transaction records, records of lost or stolen cards, and images uploaded by the ATM system (which are taken upon card insertion and ejection).

Camera: Takes a picture of customer and timestamps it when the card is first inserted in the card reader and when the card is ejected.

CardReader: Validates the card and its PIN before each transaction and ejects the card at the end of a transaction. It can also keep the card in case the card is tagged as being stolen.

CashDispenser: This is a part of the ATM. It provides money to the customer during a withdrawal.

Customer: The Customer is a person who is registered with the bank to use the ATM and has been issued an ATM card with a personal PIN. The Customer once logged onto the ATM may use the ATM system to perform the following transactions: withdraw, deposit, transfer, and query. Once the customer completes his transactions, the card is ejected.

Deposit box: Accepts the envelope during each deposit transaction and prints amount of funds and the account where the funds needs to go on the envelope.

Receipt printer: This is a part of ATM. It prints the receipt after each transaction (deposit, withdraw,...).

Laboratory 5**List of use cases (in alphabetical order)**

Cancel transaction: A customer may cancel a transaction at any time (though not after a withdrawal transaction has been approved, or after inserting an envelope); the transaction is terminated and the card is ejected.

Check Balance: The ATM asks the Bank whether the account from where some funds have to be moved has a sufficient balance.

Collect Envelope: The ATM operator retrieves the deposit envelope.

Deposit: Request the customer to select an account and an amount to deposit. The system waits for the customer to place the deposit envelope into the ATM. A receipt is printed, mentioning the details of the deposit and the ATM also prints that information on the inserted envelope (the device accepting envelopes has a printer). After that the card is ejected (includes eject card). The customer can cancel the deposit transaction (extends cancel transaction).

Eject card: The card is ejected at the end of each transaction.

Card Inserted: A transaction is initiated when a customer inserts an ATM card into the card reader. Encoded in the chip on the card is the card number, the start date, and the expiration date.

Insert PIN: After the card is inserted the system validates the ATM card to determine that the expiration date has not passed, that the inserted PIN (personal identification number) matches the PIN maintained by the system, and that the card is not lost or stolen.

PIN Invalid: The customer is allowed three attempts to enter the correct PIN; the card is confiscated if the third attempt fails.

Stolen/Lost Card: Cards that have been reported lost or stolen are confiscated.

Query: Requests the customer to select an account. For approved query a receipt is printed and the card is ejected (includes eject card). The customer can cancel the query transaction (extends cancel transaction).

Refresh ATM: An ATM operator may start and close down the ATM to replenish the ATM cash dispenser, and for routine maintenance.

Take picture: The ATM takes a picture of the customer using the ATM, adds a date, time, and location stamp, and uploads it to the Central Server.

Transfer: Request the customer to select two accounts (one to transfer to and one to transfer from) and an amount to transfer between them. It then verifies that one of the accounts (the one to be debited) has sufficient funds. For approved transfer a receipt is printed and the card is ejected (includes eject card). The customer can cancel the transfer transaction (extends cancel transaction).

Withdraw: Request the customer to select an account and an amount to withdraw. Checks the selected account has sufficient funds to withdraw the requested amount as well as if the ATM system has sufficient cash in its cash dispenser to handle the request. If so, the ATM system dispenses the cash and ejects the card (See: Eject card). The customer can cancel the withdrawal (extends cancel transaction).

Laboratory 5

Use case descriptions**Use Case Name: Cancel transaction**

Brief Description: A customer may cancel a transaction at any time (though not after a withdrawal transaction has been approved, or after inserting an envelope); the transaction is terminated and the card is ejected.

Precondition: A transaction is in progress other than a withdrawal after it has been approved or a deposit after inserting an envelope.

Primary Actor: None

Secondary Actor: None

Dependency: INCLUDE USE CASE EjectCard, EXTENDS USE CASE Withdraw, EXTENDS USE CASE InsertPin, EXTENDS USE CASE Deposit, EXTENDS USE CASE Query, EXTENDS USE CASE Transfer

Generalization: None

Basic Flow:

Steps:	
1	The ATM terminates the transaction
2	INCLUDE USE CASE EjectCard

Postcondition: Transaction is cancelled and card is ejected.

Use Case Name: Check Balance

Brief Description: The ATM asks the Bank whether the account from where some funds have to be moved has a sufficient balance.

Precondition: A withdraw or transfer has been initiated

Primary Actor: None

Secondary Actor: None

Dependency: None

Generalization: None

Basic Flow:

Steps:	
1	The ATM VALIDATES THAT the account has a sufficient balance

Postcondition: ATM has access to accounts balance.

Specific Alternative Flow BFS1

1. IF the account does not have sufficient fund THEN the error message “Insufficient fund” is displayed.
2. ABORT

Use Case Name: Collect Envelope

Brief Description: The ATM operator retrieves the deposit envelope.

Precondition: The ATM is closed down

Primary Actor: ATM Operator

Secondary Actor: None

Dependency: None

Generalization: None

Basic Flow:

Steps:	
1	The ATM operator retrieves the deposit envelope from the ATM

Postcondition: Deposit envelope is ready to be manually processed by the ATM operator.

Laboratory 5

Use Case Name: Deposit**Brief Description:** A specific amount is deposited in customer's account**Precondition:** The ATM has accepted the user's Pin**Primary Actor:** Customer**Secondary Actor:** ReceiptPrinter, DepositBox**Dependency:** INCLUDE USE CASE EjectCard**Generalization:** None

Basic Flow:

Steps:	
1	The customer selects an account to deposit to.
2	The customer selects an amount to deposit.
3	The customer inserts deposit envelope in the Deposit box.
4	The ATM ReceiptPrinter prints a receipt.
5	The ATM DepositBox prints on the envelope.
6	INCLUDES USE CASE EjectCard

Postcondition: A specific amount is deposited in customer's account.

Bounded Alternative Flow: BFS 1-2 The customer enters cancel

Steps:	
1	INCLUDES USE CASE CancelTransaction
2	ABORT

Postcondition: Transaction is cancelled.**Use Case Name: Eject card****Brief Description:** The card is ejected at the end of each transaction.**Precondition:** A transaction has been completed.**Primary Actor:** None**Secondary Actor:** CardReader**Dependency:** INCLUDE USE CASE TakePicture

Generalization: None

Basic Flow:

Steps:	
1	INCLUDE USE CASE TakePicture
2	The ATM ejects the card
3	The ATM displays the welcome screen

Postcondition: ATM is ready for another transaction.

Use Case Name: Card Inserted

Brief Description: A card is inserted into the card reader. ATM reads Card number, the start date, and the expiration date from the cards chip.

Precondition: No other card is inserted in this ATM.

Primary Actor: Card Reader

Secondary Actors: Bank

Dependencies to other use cases: INCLUDES use case TakePicture

Basic Flow

Steps:	
1	A card is inserted into the card reader
2	INCLUDE USE CASE TakePicture
3	Card reader reads card number, the start date, and the expiration date from the cards chip.

Postcondition: The ATM has a card inserted in it.

Specific Alternative Flow BFS 3 – The inserted card is expired or lost/stolen.

1. IF the entered card is a lost or stolen THEN INCLUDE USE CASE Lost/Stolen
2. ATM confiscates the card.

Postcondition: The card is confiscated.

Use Case Name: Insert PIN

Brief Description: A customer enters his pin using the keyboard and the pin is checked if it is valid, not expired and not lost or stolen

Precondition: A card is inserted into the ATM

Primary Actor: Customer

Secondary Actors: None

Dependencies to other use cases: EXTENDED BY use case PINInvalid and Lost/stolen card.

Basic Flow

Steps:	
1	Customer enters a pin on the keypad
2	ATM VALIDATES THAT the pin is valid.
3	The entered pin matches the pin found on the ATM

Postcondition: Entered PIN is verified.

Specific Alternative Flow BFS 3

1. IF the entered pin is does not match the pin found on the ATM THEN INCLUDE USE CASE PinInvalid .

Global Alternative Flow

1. If cancel key is pressed at any time then INCLUDE USE CASE CancelTransaction
2. ABORT

Postcondition: Transaction is aborted.

Use Case Name: Pin Invalid

Brief Description: A customer is allowed two more attempts to enter a correct pin

Precondition: None

Primary Actor: CardReader

Secondary Actors: None

Dependencies to other use cases: EXTENDED BY USE CASE InsertPin

Basic Flow

Steps:	
1	Customer enters a pin on the keypad
2	ATM VALIDATES THAT the inserted PIN is valid
3	The entered pin does not match the pin found on the ATM
4	Customer enters a pin on the keypad
5	ATM VALIDATES THAT the inserted PIN is valid
6	The entered pin does not match the pin found on the ATM
7	The card is confiscated

Postcondition: The card is confiscated.

Specific Alternative Flow BFS 2

1. Pin is valid and Pin Invalid ends
2. ABORT

Postcondition: Use case is aborted.

Specific Alternative Flow BFS 5

1. Pin is valid and Pin Invalid ends
2. ABORT

Postcondition: Use case is aborted.

Use Case Name: Lost/stolen

Brief Description: Card is a lost or stolen card and is confiscated

Precondition: Inserted card is lost or stolen.

Primary Actor: CardReader

Secondary Actors: None

Dependencies to other use cases: EXTENDEDs USE CASE InsertPin

Basic Flow

Steps:	
1	The card is confiscated

Postcondition: The card is confiscated.

Laboratory 5

Use Case Name: Query

Brief Description: Card is a stolen a card and is confiscated

Precondition: None

Primary Actor: RecieptPrinter

Secondary Actors: Bank

Dependencies to other use cases: INCLUDES USE CASE EjectCard

Basic Flow

Steps:	
1	Customer selects an account
2	ATM accesses the Bank's balance for that account
3	Account balance is displayed on the screen.
4	Balance is printed by RecieptPrinter
5	INCLUDE USE CASE EjectCard

Global Alternative Flow

1. If cancel key is pressed at any time then INCLUDE USE CASE CancelTransaction

Postcondition: None

Use Case Name: Refresh ATM

Brief Description: An ATM operator may start and close down the ATM to replenish the ATM cash dispenser, and for routine maintenance.

Precondition: The ATM is turned off.

Primary Actor: ATM Operator

Secondary Actor: None

Dependencies to other use cases: None

Basic Flow:

Steps:	
1	ATM operator turns off the ATM.
2	ATM operator performs ATM maintenance actions and updates ATM data based on that. (e.g. Amount of money inserted in the ATM)
5	ATM operator turns on and starts up the ATM

Postcondition: ATM is refreshed and ready to use.

Laboratory 5

Use Case Name: Take Picture

Brief Description: The ATM takes a picture of the customer using the ATM, adds a date, time, and location stamp, and uploads it to the Central Server.

Precondition: The ATM is turned on.

Primary Actor: Camera

Secondary Actor: None

Dependencies to other use cases: None

Basic Flow:

Steps:	
2	Camera takes a picture of the customer
3	ATM adds date, time and location information to the picture
4	Upload the picture to the central server

Postcondition: A picture of customer is saved in the central server.

Use Case Name: Transfer

Brief Description: Request the customer to select two accounts (one to transfer to and one to transfer from) and an amount to transfer between them. It then verifies that one of the accounts (the one to be debited) has sufficient funds. For approved transfer a receipt is printed and the card is ejected (includes eject card). The customer can cancel the transfer transaction (extends cancel transaction).

Precondition: The ATM has accepted the user's PIN

Primary Actor: Customer

Secondary Actor: Bank, ReceiptPrinter

Dependencies to other use cases: include use case CheckBalance, Include use case EjectCard

Basic Flow:

Steps:	
1	Customer selects Transfer
2	ATM asks which account to transfer money from and which account to transfer to
3	Customer selects which account to transfer money from and which account to transfer to
4	The ATM VALIDATES THAT both accounts are valid accounts with the help of central server
5	Both accounts are valid accounts
6	Customer inputs the amount they wish to transfer
7	INCLUDE USE CASE CheckBalance
8	Customer's desired funds are available
9	The ReceiptPrinter prints a receipt with information about the previous and current account balances and the amount transferred in the transaction.
10	INCLUDE USE CASE EjectCard

Postcondition: A specific amount is transferred from customer's account to another account.

Specific Alternative Flow: (user cancels)

BFS 4-8:	
1	Customer selects Cancel
2	INCLUDE USE CASE CancelTransaction
3	ABORT

Postcondition: Transaction is aborted.

Specific Alternative Flow: (Funds not available)

BFS 7:	
1	Customer's desired funds are not available
2	INCLUDE USE CASE CancelTransaction
3	INCLUDE USE CASE EjectCard
4	Display "Funds not Available" Message

5 ABORT

Postcondition: Transaction is aborted.

Use Case Name: Withdraw

Brief Description: Request the customer to select an account and an amount to withdraw. Checks the selected account has sufficient funds to withdraw the requested amount as well as if the ATM system has sufficient cash in its cash dispenser to handle the request. If so, the ATM system dispenses the cash and ejects the card (See: Eject card). The customer can cancel the withdrawal (extends cancel transaction).

Precondition: The ATM has accepted the user's PIN.

Primary Actor: Customer

Secondary Actor: CashDispenser, Bank, ReceiptPrinter

Dependencies to other use cases: Include use case CheckBalance, Include use case EjectCard

Basic Flow:

Steps:	
1	Customer selects withdraw
2	Customer inputs the amount they wish to withdraw
3	INCLUDE USE CASE CheckBalance
4	Customer's desired funds are available
5	Validate the ATM has the funds available
6	The ATM has enough funds available
7	The ATM dispenses the selected amount of cash
8	The ReceiptPrinter prints a receipt with information about the previous and current account balances and the amount withdrawn in the transaction.
9	INCLUDE USE CASE EjectCard

Specific Alternative Flow: (user cancels)

BFS 2-8:	
1	Customer selects Cancel
2	INCLUDE USE CASE CancelTransaction
3	ABORT

Postcondition: Transaction is aborted.

Specific Alternative Flow: (Funds not available)

BFS 4-10:	
1	Customer's desired funds are not available
2	INCLUDE USE CASE CancelTransaction
3	INCLUDE USE CASE EjectCard
4	Display "Funds not Available" Message
5	ABORT

Postcondition: Transaction is aborted.