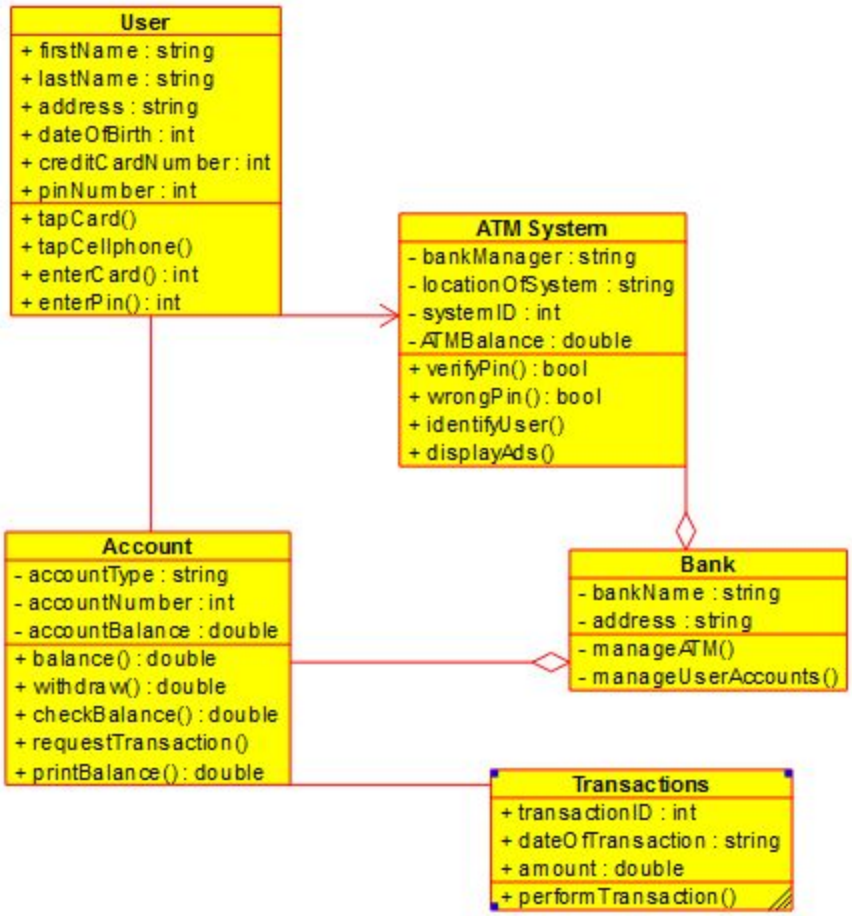
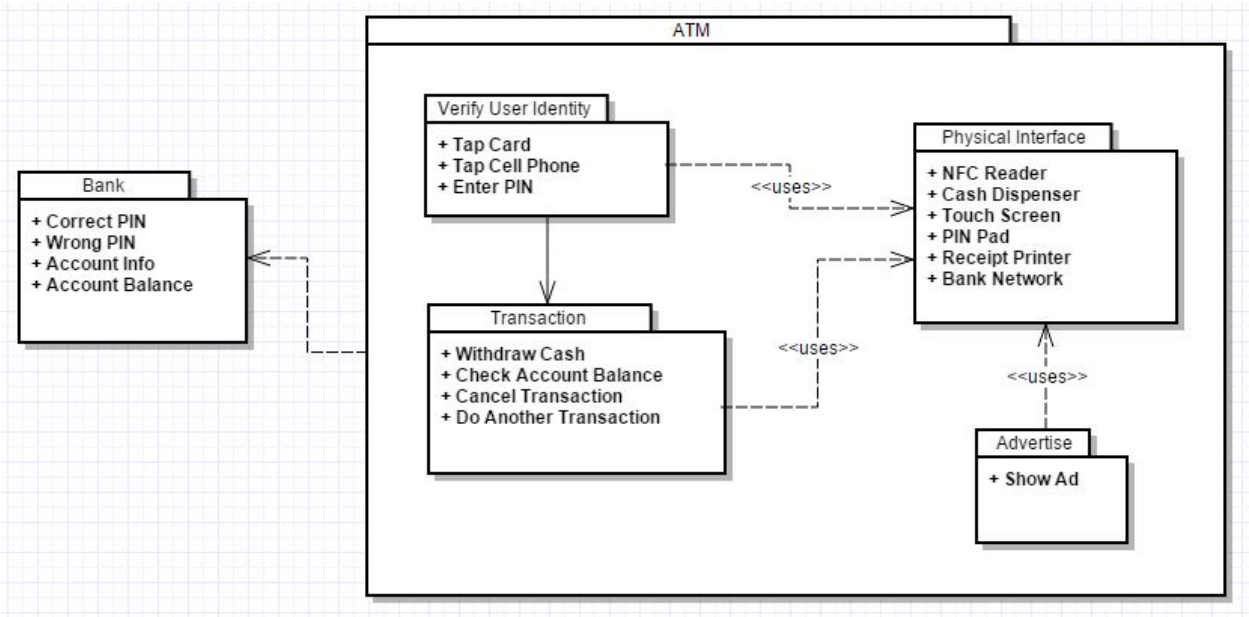
**FINAL VERSION OF SOFTWARE ARCHITECTURE LINK:**
**https://docs.google.com/document/d/1yyVJYu1GjJ0MO8CVGzlPtL04R6JTMoktLJlxYkC9_ll/edit**






**Software Architecture Checklist**

1.

- **Object-oriented architecture** (eg. class diagram, package, state, etc)

2.
Components: a “package” that performs a function required by a system, can be reusable in other systems

| **Component** | **Sub-components** |
|---|---|
| Verify User Identity | Tap card, tap cell phone, enter pin |
| Transaction | Withdraw cash, check account balance, do another transaction, cancel transaction |
| Bank | Correct PIN, wrong PIN, account info, account balance |
| Advertise | Show ad |
| Physical Interface | NFC Reader, cash dispenser, touch screen, PIN pad, receipt printer, bank network |

4. The components relate to the requirements by explaining how the ATM system can accomplish the functional and ranked requirements. These components separate the main parts

of the system. For example, the system requires a user, a transaction, and a physical interface to perform these transactions. For these requirements, the components are listed as “Verify User Identity”, “Transaction”, and “Physical Interface”. The components help explain the functions of the system and show which methods are going to be within which class.

**Innovative Automated Teller Machine(ATM)**

This is an example of an ATM.
The ATM has a screen, a card reader, a NFC receiver, a small printer, a cash dispenser and a keyboard. The keyboard has numeric buttons, an enter key, a cancel key and a clear key. On both the left and right of the screen are three buttons that allow selection of any options displayed on the screen. The ATM is connected to the bank over the network.
The ATM provides facilities to:

- Withdraw cash
- Display the current balance.

The user has to:

1. Offer up their card to the reader. The display then asks the user to enter their PIN, via the keyboard. Alternatively the user has also the option to use his cell phone as identification, via NFC.

2. If Pin or NFC is successful, the display presents a set of options.
The system must be highly robust, since it is to be used by untrained bank customers in public places.

**System Functional Requirements**

1. A customer will be able to withdraw cash from their account and know their balance.
2. The machine will have a following components: a screen a card reader, a NFC receiver, a cash dispenser, and a keyboard.
3. The machine shall be programmed to make the customer choose one of the three identity verification methods: NFC reading, entering a cell phone number, or entering a pin.
4. The customer will be able to have the choice of cancelling a transaction midway or do another transaction without having to re-verify their identity.
5.

**Non-functional Requirements**

1. The program shall be reliable and not crash when inputting different request and transitioning through different functions.
2. The program shall be easy to navigate for the user.

3. The program will only allow a pin consisting of exactly 4 digits, fail safes will be put in place in case use enters more or less that 4 digits as well as letters instead of numbers.
4. The user won't be able to withdraw more than what is in the account balance. If so the system will refuse and notify the user.
5. The system should respond to the user's' request with a near immediate response time.
6. The system will withdraw cash and re-calculate the user's account balance with perfect accuracy.
7. The program will be customizable to allow for features changes.
8. The program won't allow users to view the account of of different users, high privacy.
9. Should be able to support multiple users.
10. In terms of tools and standards, the program will be designed through the language of JAVA.

**Prioritized Ranked Requirements**

**Use Cases**

*required use cases*

to enter pin, user has choice of:

**-NFC**

**-cellphone identification**

**-enter pin via keyboard**

if identification fails, alternative flow to:

**-try again**

**-or cancel**

if successful, alternative flow to:

**-withdraw**

**-check balance, (paper or on screen)**

during the transaction, user can also:

**-cancel the transaction**

after the first transaction, user can:

**-do another transaction**

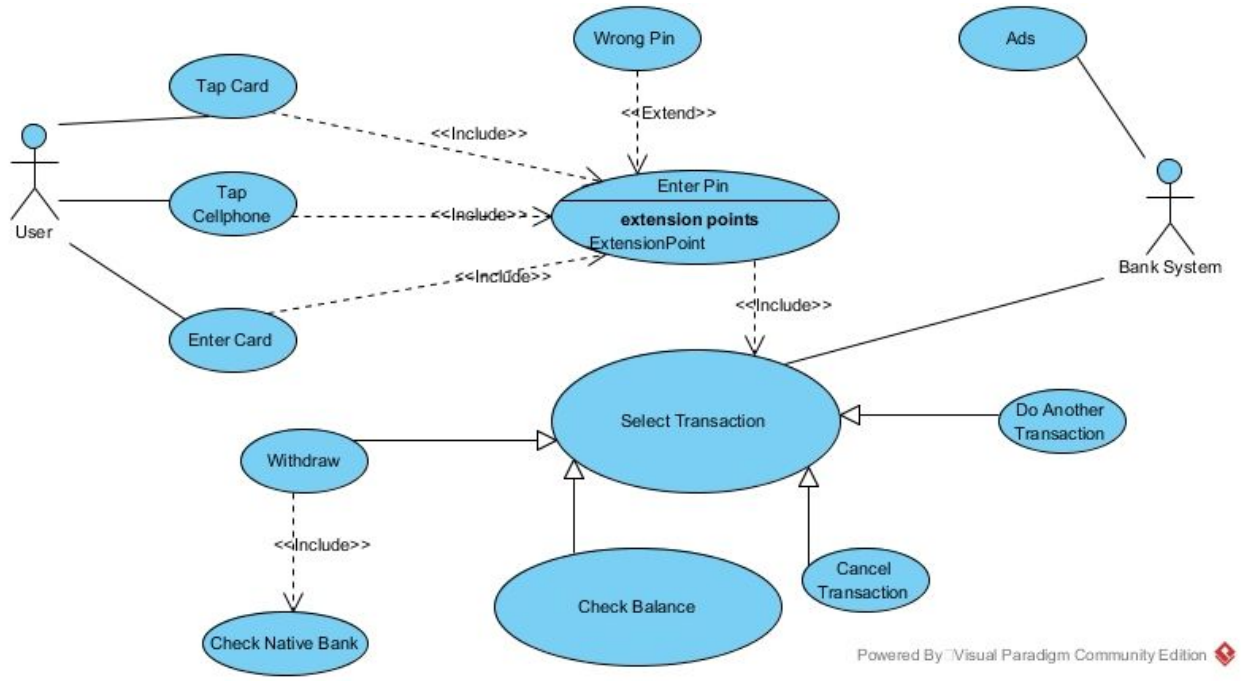
*optional use cases*
-if unsuccessful for more than 3 times, do a security lockdown (shut down their card, ask them to call the bank)

while client is waiting for transaction:
-popup advertisement for bank

-if card is not from original bank, charge the client a withdrawal fee

# Use Case Diagram

Updated use case diagram



**https://github.com/mattfdev/cps406_s1_group9_w16/issues**

**Video on non-functional requirements for further understanding**
**https://www.youtube.com/watch?v=AjLWQg6jGIA**

**Use Case Name:** Verify User Identity

**Brief Description**

- This Use Case describes the Verify User Identity process. The user is asked to confirm their identity before being able to do their original transaction.

**Actors**

- User (Primary)
- Machine: ATM made accessible to user. (Secondary)

**Triggers**

- User chooses options to withdraw cash or check their balance through an ATM to call this use case.

**Flow of Events**

Basic Flow — Verify identity

1. Use case begins when user enters the option to withdraw cash or check their balance.
2. System detects that report name status is "not set" and prompts for new report name. User chooses report name; system validates that the report name doesn't exist in Report List yet. Adds entry to Report List.
3. System asks for user's identity verification with three given options: by NFC reader, by cell phone, or by pin. User then chooses from one of the options.
4. If verification fails, the user can:
    a. Retry the verification, or
    b. Cancel the transaction
5. If successful, user can:
    a. Withdraw cash, or
    b. Check account balance
6. Use case ends when the user fails or succeeds in the verification.

**Alternative Flows and/or Subflows ...**

A. Tap Card
B. Tap Cell Phone
C. Enter Pin
D. Cancel transaction

**Special Requirements**

- None

**Preconditions**

- The user has a card to input into the machine and is able to verify identity using at least one of the verification methods.

**Postconditions**

**Success Postcondition(s) [a.k.a. the Success Guarantee]**

- System waiting for user interaction. User chooses one of the verification methods. User succeeds in verification. System gives more choices to user to do their original task.

**Failure Postcondition(s) [a.k.a. the Minimal Guarantee]**

- System waiting for user. User chooses one of the verification methods. User fails in verification. System gives the choices of retrying the verification or cancelling the entire transaction.

**Extension Points**

A. Withdraw cash
B. Check account balance

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**Use Case Name:** Tap Card

**Brief Description:**

- To initiate the first step of the access to one's account.

**Primary Actors**

- User

**Secondary Actors**

ATM

**Preconditions:**

1. Card must support NFC chip

**Main flow:**

1. User taps card on the NFC reader
2. include( Enter Pin )

**Postconditions:**

1. Screen successfully transitions to pin entry.

**Alternative flows:**

None

**Use Case Name:** Tap Cellphone

**Brief Description:**

- To initiate the first step of the access to one's account.

**Primary Actors**

- User

**Secondary Actors**

None

**Preconditions:**

1. Cellphone must support NFC chip

**Main flow:**

1. User taps cellphone on the NFC reader
2. include( Enter Pin )

**Postconditions:**

1. Screen successfully transitions to pin entry.

**Alternative flows:**

None

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**Use Case Name:** Insert Card

**Brief Description:**

- To initiate the first step of the access to one's account.

**Primary Actors**

- User

**Secondary Actors**

None

**Preconditions:**

None

**Main flow:**

1. User inserts card into ATM
2. include( Enter Pin )

**Postconditions:**

1. Screen successfully transitions to pin entry.

**Alternative flows:**

None

**Include Use Case Name:** Enter Pin

**Brief Description:**

- User inputs pin to access account

**Primary Actors**

- User

**Secondary Actors**

ATM

**Preconditions:**

1. Card/Cellphone successfully inserted or tapped.

**Main flow:**

1. Prompt screen so the user can enter a 4 digit pin
2. If the user enters the wrong pin then
   2.1 extend (Wrong Pin)
3. If pin is succusful then
   3.1 include (Transaction)

**Postconditions:**

1. Pin succusfully entered within 3 tries

**Alternative flows:**

None

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**Use Case Name:** Withdraw Cash

**Brief Description:**

- User requests cash withdrawal.

**Primary Actors**

- User

**Secondary Actors**

- ATM

**Preconditions:**

1. User has already verified their identity by one of the valid methods of verification.
2. The account the user requested a cash withdrawal from has sufficient funds for the transaction.
3. ATM has a sufficient amount of cash to complete the transaction.

**Main flow:**

1. The use case starts when the user requests a cash withdrawal from the ATM.

1.1 Include (Check Native Bank)

2. If the amount requested by the user does not result in balance less than 0

2.1 The system gets the value entered by the user and subtracts it from their total balance to provide them with the money requested.

3. The system updates the new balance of the user's account.

Extension point: Print Balance

**Postconditions:**

1. The correct amount of money was dispensed to the user.
2. The account was updated correctly with the new balance after the user's withdrawal request.

**Alternative flows:**

None

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**Use Case Name:** Check Account Balance

**Brief Description**:

- Client requests machine to retrieve their account's balance, and display it on screen or print it on a paper

**Primary Actors**

- User

**Secondary Actors**

- ATM

**Preconditions**:

1. User has requested information from a specific bank account given by their client card
2. User has already verified their identity via a PIN
3. The ATM's network connection is operational

**Main Flow**:

1. The use case starts when the client selects check balance from the onscreen display
2. The ATM then prompts the user to select either their checking or saving account
3. The client selects an account to view the balance of
4. The ATM sends a request to the Banking network for the user's account balance
5. The ATM prompts the user to select either to view balance on screen or print
6. The ATM displays the user's account balance on screen or prints it

Extension Point: Print account balance

**Postconditions**:

- The requested account's balance is shown on screen

**Alternative Flows**:

None.

**Extension Use Case:** Wrong Pin

**Brief Description:**
- User provides an invalid PIN when attempting to verify their identity.

**Primary Actors:**
- User

**Secondary Actors:**
- ATM

**Segment 1 Preconditions:**
1. The user selected one option to verify their identity.
2. The user provided incorrect PIN information.
3. The user has attempted to verify themselves less than 4 times.

**Segment 1 Main flow:**
1. The system requests the user to attempt to correctly verify their identity once again.
2. The system checks the new PIN information provided by the user.
3. If the PIN information provided is correct
   3.1 The ATM proceeds to the Transaction Use Case
4. Else
   4.1 The system increments the value holding the number of times the user attempted identity verification.
   4.2 The ATM restarts this use case, requesting the user to enter a valid PIN once again.

**Segment 1 Postconditions:**
- The new PIN information provided by the user is correct.

**Alternative flows:**
None

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**Use Case Name:** Cancel Transaction

**Brief Description**
- User decides to cancel ongoing transaction and exit system

**Primary Actors**
- User

**Secondary Actors**
- ATM

**Preconditions**:

1. User has already logged in and been authenticated by PIN

**Main Flow**:

1. User clicks cancel transaction button on the ATM keypad
2. The system prompts the user if they want to cancel the transaction and exit the system
3. If the user selects Yes
   3.1 The system cancels the user's current ongoing transaction
   3.2 The system logs off the user's account
   Extension Point: Eject card
4. Else
   4.1 Prompt is cleared
   4.2 System returns to the environment the user was present at before cancellation input

**Postconditions**:

- The cancellation input was dealt with in the desired manner

**Alternative Flows**:

None.

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**<u>Use Case Name:</u>** Do Another Transaction

**Brief Description**

- Client decides to continue with other transaction

**Primary Actors**

- Client

**Secondary Actors**

- ATM

**Preconditions**:

- User has already verified their identity by one of the valid methods of verification.

**Main Flow**:

1. The use case starts when the user selects 'Another Transaction' from the onscreen display
2. The ATM then prompts the user to select either 'check balance', 'withdraw cash' or 'cancel transaction'

**Postconditions**:

- User sees the option they chose on the ATM display

**Alternative Flows**:

None.

**Use Case Name:** Ads

**Brief Description**

- The ATM provides advertisements for users.

**Primary Actors**

- ATM

**Secondary Actors**

- User

**Preconditions**:

- User has not interacted with the system yet.
- Advertisements are obtained by the system successfully.

**Main Flow**:

1. The use case starts when the system is turned on.
2. If no user is currently interacting with the system.
   2.1 Advertisements will be played.
3. Else
   3.1 Advertisements will stop.

**Postconditions**:

- A user has interacted with the system, causing the advertisements to stop.

**Alternative Flows**:

None.

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**Include Use Case Name:** Check Native Bank

**Brief Description:**

- Checks if the user's account is native to the ATM

**Primary Actors**

- User

**Secondary Actors**

ATM

**Preconditions:**

1. Card/Cellphone must be successfully entered into the ATM
2. Pin must be successfully entered
3. There must be a sufficient balance to complete the transaction
4. Must be withdrawing cash

**Main flow:**

1. Check if card is from the same bank account as the ATM
2. If the card is from a different bank then
   2.1 Charge a fee of $1.50

**Postconditions:**

1. User accepts the charges

**Alternative flows:**

None

**<u>Use Case Name:</u>** Transaction

**Brief Description**

- The user selects a transaction from the ATM list.

**Primary Actors**

- User

**Secondary Actors**

- ATM

**Preconditions**:

- The PIN information provided by the user was verified successfully.

**Main Flow**:

1. The use case starts when the user requests a transaction from the ATM.
2. The user should select the account they want to perform the transaction on.

**Postconditions**:

- Transaction was approved by the ATM.

**Alternative Flows**:

None.

# Sample Templates

**example use case:**

**Brief Description**

This Use Case describes the Save Report process. This use case is called from the use case Manage Reports and from the use case Exit Report.

**Actors**

User (Primary)

File System: Typical PC or network file system with access by user. (Secondary)

**Triggers**

User selects operations through tasks in the Manage Reports use case or Exit Report use case (which is included in Manage Reports use case) to call this use case.

**Flow of Events**

Basic Flow — Save New Report

**a.** Use case begins when user selects Save Report.

**b.** System detects that report name status is "not set" and prompts for new report name. User chooses report name; system validates that the report name doesn't exist in Report List yet. Adds entry to Report List.

**c.** User cancels save operation... Use case ends.

**d.** System updates Report List with Report information. System creates unique report file name if not already set, and saves report specs to file system.

**e.** Report is set as "unmodified" and name status set to "set."

**f.** Use Case ends with report displayed.

**Alternative Flows and/or Subflows ...**

**Special Requirements**

None

**Preconditions**

A data element exists on the machine and has been selected as the "Current element." A report is currently displayed and set as the "Current Report."

Report status is "modified."

**Postconditions**

**Success Postcondition(s)** [a.k.a. the Success Guarantee]

System waiting for user interaction. Report loaded and displayed. Report List is updated with report name, etc. as required by specific Save operation. Report status is "unmodified." Report Name Status is "Set."

**Failure Postcondition(s)** [a.k.a. the Minimal Guarantee]

System waiting for user. Report loaded and displayed. Report status is "modified." Report name status same as at start of use case. Report list still valid (Report list cleaned up when save fails as necessary).

**Extension Points**

None

example use case:

**Use Case Name:** BookAppointment
**UC ID #**: 1
**BD (Brief Description)**: Patient books an appointment with receptionist.
**PA (Primary Actors)**: Patient
**SAs (Secondary Actors)**: Receptionist
**Pr (Preconditions)**:

1. The patient is in contact with the receptionist.
2. The receptionist is logged into the system.

**MF (Main Flow)**:

1. The use case starts when the patient needs to book an appointment.
2. The receptionist checks the system for the Dentist's schedule for an available time.
3. The receptionist confirms the time with the patient.
4. The receptionist enters the appointment information into the system.
5. The system adds the appointment to the schedule.
   Extension point: remindPatient

**Po (Postconditions)**:

1. Changes are made to the dentist's schedule to accommodate the new appointment for the patient.
2. A reminder is generated

**Afs(if any)(Alternative Flows)**:

None.

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**Use Case Model**

Actor (Primary)

Client

Via NFC

- Tap Card – (then initiate pin)
- Tap Cellphone – (then initiate pin)

Just enter card and pin

Other Actions

- Withdraw (insufficient fund check)
- Check balance (paper or on screen)
- Cancel transaction
- Do another transaction

Actor (Second)

Bank (Bank System)

- Check if card is from native bank (if not charge withdrawal fee)
- Unsuccessful pin entered 3 times (freeze account, tell to contact the bank)
- Display advertisement before and after ATM use

(Unofficial Use Case Version 1)... Just need to add

- Check if card is from native bank (the charge if not)
- Unsuccessful pin enter