COS 301 Group 9 Phase 1

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1 Introduction

The development of the 'next generation' Automatic Teller Machine (ATM) should include the convenient functionalities of the current ATM, but require less effort from the customer to use, as well as less time spent waiting to use the ATM.

2 Purpose

The FNB ATM has undergone numerous changes, as FNB aims to provide convenient and satisfactory service to its clients. The ATM was modified to include services that were offered inside the FNB bank branches, like being able to deposit money. Now, these additional services have led to an increase in the usage of these ATMs - and with some services taking a bit more time than others, this has led to longer queues at ATMs, leaving clients frustrated.

So - how to curb the problem? A way to reduce the length of queues at ATMs and the amount of time spent at an ATM must be found, whilst providing the same services. The goal is for clients to spend approximately 5 seconds in front of the ATM to withdraw cash, or not even standing in front of the ATM at all for enquiries of balance and viewing of mini-statements. This would lead to more transactions and interaction at a much quicker rate, and overall customer satisfaction.

3 Scope

The scope of the project is to produce a 'Mobile ATM application' that will run on smartphones that are equipped with NFC readers. The ATMs should mainly be able to support 3 key transactions (cash withdrawal/ balance enquiry/ mini-statement). Clients should just tap their NFC cards on their smartphone and use the ATM app to perform their desired transaction - before visiting an ATM to receive their money if a withdrawal was needed.

4 Definitions

(ATM = Automatic Teller Machine)
(MATMA = Mobile ATM Application)
(PW = 'pending' withdrawal)

5 User Characteristics

There are a number of different users that will be interacting with the system and these users are listed as followed:

1. **User A**:
   User A will be a customer without a smartphone. Since the app we are designing is intended for smartphones that have NFC readers, these users will carry on using an ATM as normal. The app won't affect their normal behaviour as the app is designed to speed up your visit at an ATM and not to replace the current behaviour of visiting an ATM. Because the actual ATM is not changing itself, User A should have no problem using the ATM system.

2. **User B**:
   User B will be a customer with a smartphone, and that smartphone has an NFC reader. User B is fairly familiar with how a smartphone works and where to install the app on the respective smartphone User B has. In the case where User B is not familiar with an NFC reader, a visual can be added on the home screen of the app (before the user is logged in) showing how/where to tap the bank card on the phone.
   User B will find the app easy to use as the layout will be similar to the ATM screen to make it more relatable for all users. User B might have to learn how the app works but after drawing money for the first time using the app, User B will be familiar with how it works.

3. **Maintenance Personnel**:
   This will be someone employed by the bank. This user will be familiar with how the ATM system works and will be able to see when an ATM is down. This user will know if the problem is a network/software or hardware related problem and will delegate it to the correct division for maintenance. This user will need to follow up on ATM maintenance to make sure the ATMs are up and running as soon as possible to reduce inconvenience for clients. The user will also need to inform the Money Transport Personnel that an ATM is out of cash or in some cases full of cash (where deposits are accepted).

4. **Money Transport Personnel**:
   This will be someone employed by the bank and will have the necessary training and education on the risk of the job. This user will need to know where the ATMs are located and which ones need money. This user will also need to know how to operate the ATM and then also inform the bank that the ATM is filled.

6 Functional Requirements

1. **MATMA** should be a **mobile application** ("app") for smartphones with **NFC readers**

   (a) MATMA should only allow access/login into MATMA by having the following procedure take place:

       i. A bank card with NFC enabled is tapped against the back of any smartphone with a NFC reader and MATMA installed

       ii. The smartphone reads the NFC signal from the card, and then allows the user to enter the pin for that card on their smartphone

       iii. On correct pin entry, access into MATMA is granted

       iv. On closing of MATMA the user is automatically logged out with no local data stored on the device

2. MATMA should allow users to **enquire** on the **current balance** of their account

   (a) The balance enquiry should be displayed on their smartphone screen

   (b) The balance enquiry may also be downloaded as a PDF and emailed to the email associated with their bank account, so it can be printed/shared

3. MATMA should allow users to create a **mini-statement** based on the transactions in and out of their account

   (a) The mini-statement should be displayed on their smartphone screen

   (b) The mini-statement may also be downloaded as a PDF and emailed to the email associated with their bank account, so it can be printed/shared

4. MATMA should allow users to make **cash withdrawals** from an ATM, but in a faster and safer way by creating **PWs**

   (a) Users shall be able to create a PW by following this process:

       i. Choose the cash withdrawal option from the homescreen of MATMA

       ii. Choose the account they wish to withdraw from

       iii. Choose the amount they want to withdraw

       iv. Choose whether they would like a receipt or not

       v. Finally, confirm this PW and it's details

   (b) On confirmation of the withdrawal, a PW is created on the back-end:

       i. The user will see it as a PW loaded on the card

       ii. This PW is given a 1 hour time limit to be physically withdrawn until it is cancelled (the money is not removed from the account upon cancellation)

   (c) The user can then go to a physical FNB ATM, and withdraw the cash by following this process:

    i. Tap their NFC bank card against the NFC reader of the ATM

    ii. Enter the pin for that card on the ATM

    iii. Their PW is then processed and they receive the money they chose to withdraw, as well as a receipt if they chose to have one

5. MATMA must allow users to save a **'favourite' PW**

    (a) Upon creation of a PW, a user can indicate that they wish to save this PW as a 'favourite' PW

    (b) When on the home screen, they can then click that 'favourite' PW, click confirm and then that PW will be instantly created, without having to enter all the details again in the PW creation process

6. MATMA must **display** the details of the **current PW** on the card

    (a) The interactions with this PW must be:

        i. Cancellation of the PW

        ii. Viewing of the details of the PW

           A. The amount of money to be withdrawn

           B. The account the PW was drawn from

           C. Whether or not they wish to have a receipt printed

           D. The time the PW was created

           E. The time the PW has remaining before it is cancelled

        iii. Refreshing of the 1 hour time limit on the PW

7. MATMA should show a **list of ATMs** that are **geographically closest** to the user, and for each ATM, the following information should be shown:

    (a) The liveness of the ATM (whether or not it is functional/up and running)

    (b) A face-on photo of the ATM

    (c) The address of the ATM

    (d) The distance from the user's current location to the ATM by road

    (e) A button which, when clicked, opens Google Maps and starts navigation to that ATM

8. The system must have functionality to manage customers and **users of MATMA**, with **CRUD** functionality being implemented for these users

    (a) C - Creation of MATMA users and their details

    (b) R - Selection and viewing (reading) of MATMA users and their details

    (c) U - Updating the details of MATMA users

    (d) D - Deletion of MATMA users and all of their details

9. The system must have **audit logging functionality** to log all transactions

    (a) Any withdrawals that take place from PWs created by MATMA users must be logged i.e. recorded with relevant information e.g. amount, account drawn from, receipt given, time of transaction, ATM ID etc.

10. **Physical FNB ATMs** must contain specifically designed **MATMA software** to handle the PWs that users have created and **give out physical money** (see 4c)

11. The system must have a **monitoring subsystem** which keeps track of certain ATM qualities:

    (a) If the ATM is functional (live/up)
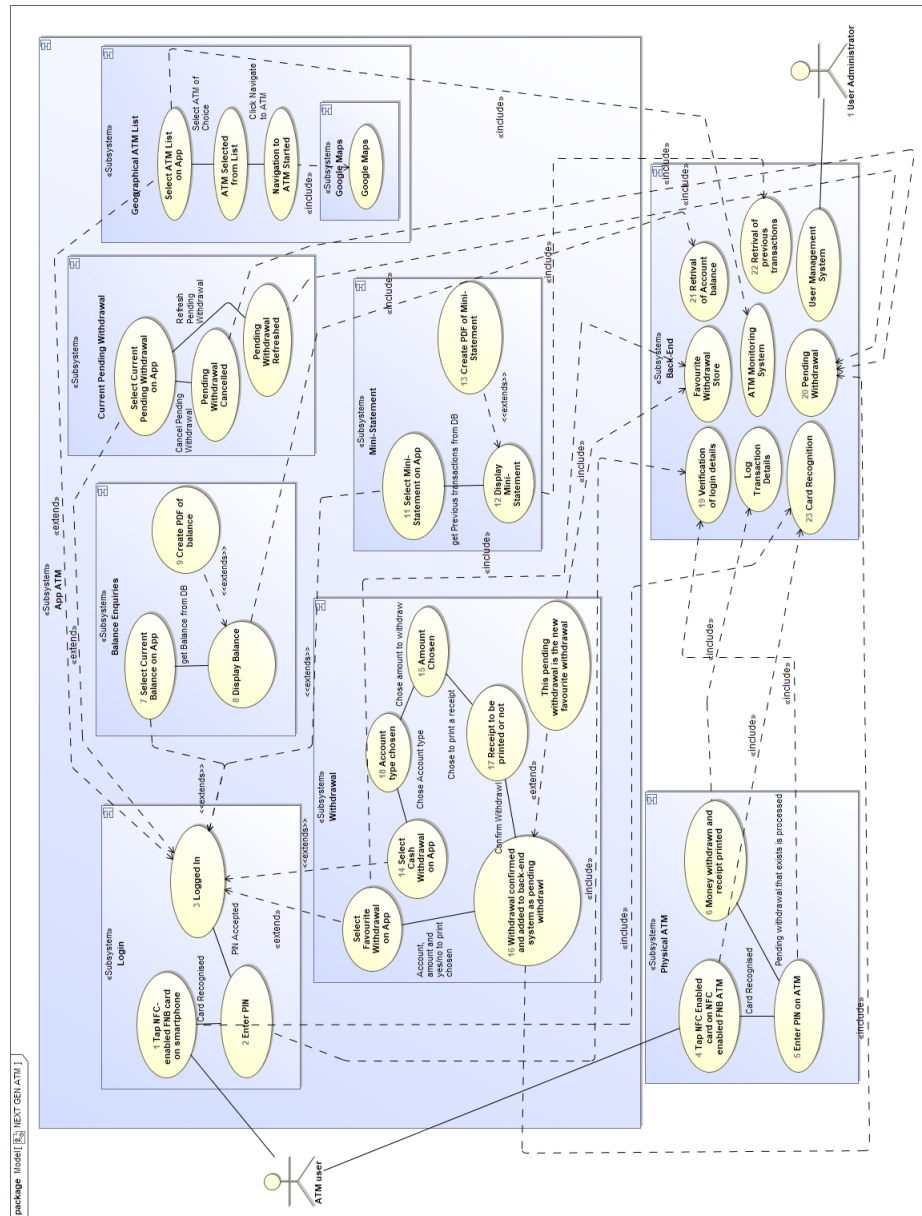   (b) If the ATM is empty (no money to be withdrawn)

7 Use Cases

Figure 1: Use Case diagram for next Gen ATM

8 Quality Requirements

Our goal, as group 9, is to create and theorize quality software. While this may be difficult to measure, certain testing scenarios and specific guidelines will be used when determining the overall quality of our system. The guidelines used are as follows:

1. **Consistency**: all work and scripts used will be held up to the highest of standards.

2. **Testing cases**: all quality and functionality requirements will be tested thoroughly to guarantee a consistent system.

Performance

- A performance measure required by the ATM is that the ATM must have maximum up time in that it should be available 24 hours of the day, 7 days a week.

- Within our system we have catered for when an ATM might go down for a period and have ensured performance is guaranteed and that it is kept up for as long as possible.

- This can be tested by 'turning ATM's on and off' to inspect the current statuses on any one ATM.

- Verification for the many authorization methods (pin verification, NFC scan, application login) should not exceed a specific time interval to ensure a user is not held up at an ATM for extended period of times.

- Response time between issuing a request to the chosen ATM should not exceed a time interval to later be determined.

- These measures may be tested under scrutinous test cases to ensure the best results for all performance requirements.

- Withdrawals will only be processed once a request has been processed and approved by the bank.

Reliability

- The system will be reliable in that it may only process successful requests made by the user if communication between the banks main systems and the ATM have been met and approved.

- The same follows for the theorized application, a successful process may only be deemed successful if communication between the selected ATM and the application has been approved.

- Tests cases for this requirement will be to ensure communication has been successful and that specific encrypted messages have been relayed over the networks.

Availability

- Any abnormal processes or forbidden activity will result in a shutdown of the ATM.

- Only a registered serviceman will be able to reset a shutdown ATM following an abnormal shutdown sequence.

- A separate power supply acting as a backup will be used in power failure situations.

Scalability

- Both the ATM and the application servers will be able be able to monitor and process multiple requests to ensure a smooth experience.

- Request will be compacted with the necessary details (under encryption) for any one of the three tasks the ATM can perform (Withdrawal, Bank statements and Current balances).

Security

- Security will be maintained and held in the highest order by ensuring that a user may only be able to use the application we have theorised by logging in.

- Having a dual authorization point when a user approaches the ATM (Automatic Teller Machine) will further enforce security within our system and design.

- These features will be tested by ensuring a single login key value pair is successful through the application.

- Further, testing will be done to make sure a dual authorization between either combination of card-to-NFC Scan and between card-to-pin is respectively successful.

- Withdrawals will only be processed once a request has been processed and approved by the bank.

- The system will comply with current standards set by SARB (South African Reserve Bank).

- Encryption systems will be incorporated in relaying pin as well as login features for the application.

- A user will only have a maximum of three attempts to login to the application as well as the use of their personal pin when at the ATM.

- Users local data will not be stored on the device for any user to ensure the devices/applications security cannot compromise the users or systems security

Flexibility

- Users of our 'App ATM' would be able to easily alter their withdrawal amount before visiting an ATM

- A user can save time by choosing 'favourite withdrawals'

- Any user can use any smartphone with MATMA installed, there is no restrictions as to which smartphone is used

Maintainability

- The ATM's used and registered with FNB (First National Bank) will be monitored to determine whether any ATM's have been tampered with to ensure that the application will reflect this.

- Components for the ATM should be easily serviceable to reduce the time spent on a service and will be kept apart from the vault of the ATM.

- A self-monitoring mechanism will be employed to test for certain errors or faults within the system so a serviceman will be able to rectify any issues.

Audibility

- The app could be advertised by FNB on television, billboards, current ATMs as well as on the FNB banking app to create awareness about our new 'App ATM'

Monitorability

- A list of 'live' ATMs will be kept by the application to ensure only available ATMs can be interacted by the user.

- Communication between the ATM and the bank's headquarters will be monitored to ensure correct communications are being processed as well inspecting the state of the ATM (in case of an abnormal shutdown).

Integrability

- Just as people have been using the FNB banking app for transfers, they would be comfortable using our 'App ATM' to make withdrawals from ATMs as it would fill the gap left from the current infrastructure (withdrawals, balance enquries and statements would be easier)

Cost

- The cost of replacing majority of current FNB ATMs with new ATMs that are NFC enabled would need to be addressed

Usability

- The same font, icons and placement will be used between both the ATM's interface as well as the applications interface to ensure a friendly, seen before feel to users.

- The application will employ a simple interface to allow users to efficiently log a request for the selected ATM.

9 Trace-ability matrix

*Requirement Numbers come from Functional Requirements (see Section 6: Functional Requirements)

Sub-Systems

Requirement No.	Login	Balance enq.	Withdrawal	Statement	Current PW	Geographical ATM list	Google maps	Physical ATM	Back-end
1	x								
2	x	x							x
3	x			x					x
4a	x		x						
4b	x		x						x
4c	x		x					x	x
5a	x		x						x
5b	x		x						x
6	x				x				x
7	x					x	x		x
8									x
9								x	x
10								x	
11						x	x	x	x

10 Conclusion

The next generation of ATM systems need to comply with the current direction in which banking is moving all over the world - into the mobile, portable, personal sphere. With the system specified in this document, the same old ATM functionality is shifted into this new sphere - as well as gaining some improvements.

Less time will be spent in front of an ATM if the user has used MATMA to create a PW, as all they need to do is tap, pin, and take. Less time in front of an ATM means less potential crime around ATMs, and shorter lines to access ATMs. MATMA also enables users to potentially not even stand in front of an ATM at all - they can view information about their bank accounts from the screen of their smartphone.

By using MATMA, users are safer and save time. Safe clients are happy clients, and clients that spend more time using their money than retrieving their money will be more satisfied, making it a win-win situation for both FNB and its clients. However, MATMA is not just a tool to gain these advantages - is it a tool FNB can use to boldly step into the future of ATM systems.