Requirements Document
for an
Automated Teller Machine (ATM) System

v01

by John G. Artus

(jgartus.net)

1 Introduction

1.1 Purpose

This document describes the system requirements for an Automated Teller Machine (ATM) system.

1.2 System Description

The purpose of the ATM system is to provide an automated interface for a banking Customer to interact with a banking network using a standard set of simple account management capabilities.

1.3 System Scope

The scope of the ATM system described in this document, and therefore that of the set of system requirements that constrain the design of the system, is limited to a basic set of capabilities described herein. The capabilities of the described system are limited such that analysis and development of a system architecture model fits within the scope of one college semester lasting 14 weeks. For the purposes of this exercise, the scope of the problem extends only so far as to consider the interactions of a single Bank Server, working with a single Customer, at a single ATM, at a single time.

1.4 Definitions

1.4.1 Account

One or more accounts held by a single Customer at a commercial bank against which transactions can be applied. A Customer can hold and manage more than one account.

1.4.2 ATM System

The ATM System consists of a network of ATM devices (hereafter called ATMs) connected in a centralized network where the Bank Server sits at the center of the network, and the set of connected ATM nodes exist at the periphery.

1.4.3 ATM

A station that allows Customers to conduct their own transactions using a banking-institution-provided "Bank Card" as identification. The ATM interacts with the Customer to gather transaction information, sends the transaction information to an external bank server for validation and processing, and then completes the requested transaction to end the Customer transaction session. The ATM does not operate independently. The ATM must be connected to the Bank Server in order to perform Customer transactions. A banking institution can own and operate any number of interconnected ATMs distributed in its area of operations.

1.4.4 ATM Network (hereafter called "Network")

The electronic network owned by a bank that interconnects the Bank Server with a set of physically distributed ATMs. A bank may actually have other internal networks of computers to process accounts, but here we are only concerned with the one that interacts with the ATMs.

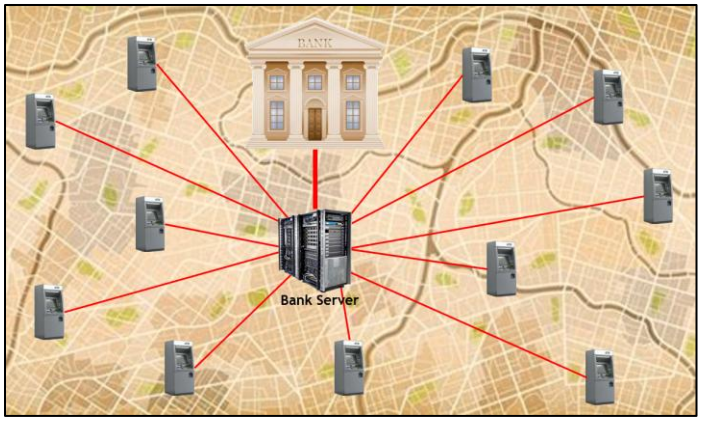

Figure 1. ATM Network

1.4.5 Bank

A financial institution that holds accounts for Customers and that issues Bank Cards that authorize the Customer to have access to their accounts over the ATM Network via the ATM. For the purposes of developing the architecture of an ATM System, the Bank itself is not considered to be a part of the ATM network.

1.4.6 Bank Server (hereafter called "Bank Server")

The computer system owned by a Bank that actually manages the Customer accounts for the Bank.

1.4.7 Bank Card

An identification card issued by a Bank to a Customer that authorizes the Customer to access only their own accounts via an ATM System that is part of the ATM Network. The Bank Card contains a bank code and a card number, encoded in accordance with national standards on credit cards and bank cards. The bank code uniquely identifies the Bank within the banking institution consortium. Each Bank Card is issued to a single Customer. For simplicity, it will be assumed that each card is unique and there are no duplicate cards.

1.4.8 Customer

The holder of one or more accounts at a Bank. A Customer can consist of one or more persons or commercial businesses; the distinction is not relevant to this problem. The same person holding an account at a different bank is considered a different Customer.

1.4.9 Transaction

A single integral request for operations on the accounts owned by a single Customer. Within the limited scope of this system definition, transactions can be one of these four types:

- Check Balance
- Withdraw Cash
- Make Deposit

- Transfer Funds (between accounts accessible by the same Bank Card during the same ATM transaction).

A single transaction must balance properly with the Bank Server prior to conclusion of the transaction.

1.4.10 Session

A single contiguous interaction by a single Customer at a single an ATM. A session begins with Customer identity verification and ends with session closure. Multiple transactions may be conducted by the Customer within a single session. All transactions conducted by a Customer within a single session are conducted in series. Within a session, one transaction must be completed before another transaction may be initiated.

1.4.11 Personal Identification Number (PIN)

A four-digit number known only by the Customer which is used to authorize the Customer's ATM session.

2 General Description

2.1 Product Perspective

An ATM doesn't work independently. It can only work in coordination with the Bank Server on the ATM Network owned by a Bank. There are clearly defined, standard, secure interfaces for ATMs connected to and operating with a Bank Server on an ATM Network.

2.2 Primary Product Functions

An ATM communicates with the Bank Server to perform transactions requested by a Customer. An ATM accepts and reads a Bank Card, interacts with the Customer, communicates with the Bank Server to carry out the transaction, dispenses cash, accepts deposits, and prints receipts. The ATM System requires appropriate record keeping and security provisions. The system must be able to handle concurrent access to the multiple accounts owned by the same Customer.

2.3 User Characteristics

There are two types of users of the ATM System:

2.3.1 Customer

A Customer interacts with the Bank Server via an ATM. The Customer interface at the ATM should be as simple and easy-to-use as possible and be able to complete any of the four transaction types with the least amount of Customer interaction.

2.3.2 Maintainer

A Maintainer services, diagnoses, and repairs an ATM. The Maintainer interface at the ATM should be such that the Maintainer is able to perform all the required functions needed to service,

diagnose, and repair an ATM. The Maintainer will, at times, need access to the internal compartments of an ATM in order to perform the needed maintenance services. The Maintainer is the only non-customer person that is allowed to access the interior of the ATM and to connect an ATM to the network. The Maintainer will require the use of a Bank Card with specific codes that identify the person as a Maintainer of an ATM.

3 Minimum Set of Required ATM System Components

While design innovations are encouraged, the functionality of the ATM System should follow accepted norms of the industry in order to maintain the sense of the Customer interaction that ATM Customers have become accustomed to. Therefore, the ATM System will need to include the following industry-standard components.

Note that this set of required components only cover the essential components. It is not the purpose of this document to describe all the detailed components that would make up the ATM System. Therefore, there may be gaps in the total arrangement of components, such as interfaces between components, that are best left to the design team to figure out.

Category	Req ID	Req Name	Description
Min Set of Components	MC01	Display Screen	The ATM System Display Screen **shall** provide instructions and information to the Customer during a transaction.
Min Set of Components	MC02	Touch Screen	If an optional touchscreen is considered for the ATM System Display Screen, then ATM System Touch Screen Display **shall** be capable of accepting Customer touch inputs.
Min Set of Components	MC03	Card Reader	The ATM System Card Reader **shall** be capable of reading data from the Bank Card of the type issued by the Bank. Note: The two possible types of Bank Cards are 1) Magnetic Stripe, 2) Electronic Chip.
Min Set of Components	MC04	Keypad	The ATM System Keypad **shall** be capable of accepting Customer numeric data inputs, such as the Bank Card PIN.
Min Set of Components	MC05	Printer	The ATM System Printer **shall** be capable of printing and delivering physical copies of transaction data to the Customer.
Min Set of Components	MC06	Speaker	The ATM System Speaker **shall** be capable of producing aural signals to the Customer, such as "beeps" to signal completion of certain transactions.
Min Set of Components	MC07	Central Processing Unit (CPU)	The ATM System CPU **shall** be capable of managing the interaction with the Customer through coordination of all peripheral devices needed to service the Customer's transaction requests. Included in the concept of a CPU is the software that will be executed on the physical CPU to provide the required interactions.

Category	Req ID	Req Name	Description
Min Set of Components	MC08	Cash Dispenser	The ATM System Cash Dispenser **shall** be capable of dispensing Treasury Bills through an external slot on the ATM Case to fulfill approved Withdrawal Transaction requests by the Customer.
Min Set of Components	MC09	Deposit Receiver	The ATM System Deposit Receiver **shall** be capable of receiving deposit documents from the Customer through an external slot on the ATM Case to fulfill approved Deposit Transaction requests by the Customer.
Min Set of Components	MC10	Network Interface	The ATM System Network Interface **shall** be capable of interacting with the Bank Server by way of an exchange of network messages designed to implement a coordinated set of data exchanges. The ATM System Network Interface includes a standard connectivity port for connecting to the Network Cable, which is not an ATM System Component.
Min Set of Components	MC11	Power Supply	The ATM System Power Supply **shall** be capable of delivering electrical power at the proper voltage to all internal ATM System components requiring electrical power.
Min Set of Components	MC12	Maintenance Interface	The ATM System Maintenance Interface **shall** be capable of allowing the Maintainer to connect to and interface with the ATM System for the purpose of performing maintenance activities.
Min Set of Components	MC13	Enclosure	The ATM System Enclosure **shall** provide a secure, hardened containment environment for all internal ATM System components.
Min Set of Components	MC14	Door	The ATM System Door **shall** be attached to the Enclosure in a way that provide a secure, hardened access to all internal ATM System components by the Maintainer.
Min Set of Components	MC15	Door Locking Mechanism	The ATM System Door Locking Mechanism **shall** be attached to the Door in a way that provides a secure, hardened access denial to all internal ATM System components by all people except the Maintainer.
Min Set of Components	MC16	Dispensing Slot	The ATM System Dispensing Slot **shall** be attached to the Enclosure in a way that provides alignment with the ATM System Cash Dispenser for passing cash to the Customer.
Min Set of Components	MC17	Positive Dispensing Slot Lock	The ATM System Dispensing Slot **shall** include an electro-mechanical locking mechanism that is placed in the locked position by default.
Min Set of Components	MC18	Deposit Slot	The ATM System Deposit Slot **shall** be attached to the Enclosure in a way that provides alignment with the ATM System Deposit Receiver for accepting deposit documents from the Customer.

4 ATM System Requirements

4.1 Functional Requirements

The functional requirements for the ATM System are organized in the following way: General requirements, requirements for authorization, requirements for each of the four transaction types.

Note that this set of functional requirements only cover the essential functional requirements. It is not the purpose of this document to describe all the functional details needed of the ATM System. Therefore, there may be gaps in the flow of some procedures, such as operator interaction procedures, that are best left to the design team to figure out.

4.1.1 General Requirements of the ATM System

Category	Req ID	Req Name	Description
General	GR01	Welcome Screen	The ATM System **shall** display the initial "Welcome" screen when there is no Bank Card in the card reader slot.
General	GR02	Low Cash Halt	The ATM System **shall** refuse a new Customer transaction when the amount of cash in the system has gone below the Min Cash value.
General	GR03	Low Cash Message	The ATM System **shall** display the Out-Of-Service screen when the amount of cash in the system has gone below the Min Cash value and after the current Customer transaction has completed.

4.1.2 Maintenance Requirements of the ATM System

Category	Req ID	Req Name	Description
Maintenance	MR01	Initialize Cash	The ATM System **shall** set the number of cash notes in the system for each type of note according to Maintainer instructions.
Maintenance	MR02	Set Max Withdrawal Per Day	The ATM System **shall** set the maximum amount of cash withdrawal allowed per day per account according to Maintainer instructions.
Maintenance	MR03	Set Max Withdrawal Per Transaction	The ATM System **shall** set the maximum amount of cash withdrawal allowed per transaction according to Maintainer instructions.
Maintenance	MR04	Set Min Cash	The ATM System **shall** set the minimum amount of cash within the system at which point the system will no longer permit a cash withdrawal transaction to proceed, according to Maintainer instructions.
Maintenance	MR05	Set Max Invalid PIN	The ATM System **shall** set the maximum number of allowed invalid PIN entries over 24-hour period, according to Maintainer instructions.

4.1.3 Customer Authorization Requirements of the ATM System

Category	Req ID	Req Name	Description
Authorization	AR01	Card Inserted	The ATM System **shall** attempt to read a Bank Card when the card reader detects that a card has been inserted in the card reader slot.

Category	Req ID	Req Name	Description
Authorization	AR02	Unreadable Card	During reading of a Bank Card, the ATM System **shall** reject the Bank Card if the card information can not be read.
Authorization	AR03	Check Card Expiration	During reading of a Bank Card, the ATM System **shall** reject the Bank Card if the card information indicates the card is expired.
Authorization	AR04	Card Bank Code	During reading of a Bank Card, the ATM System **shall** extract the bank code indicating the institution that issued the card.
Authorization	AR05	Card Serial Number	During reading of a Bank Card, and after successful extraction of a bank code, the ATM System **shall** extract the serial number of the card.
Authorization	AR06	Prompt for PIN	During reading of a Bank Card, and after successful extraction of a card serial number, the ATM System **shall** command the display to prompt the Customer to enter a PIN.
Authorization	AR07	Check Authorization	During reading of a Bank Card, and after successful capture of Customer PIN, the ATM System **shall** transmit the following information to the bank server 1) bank code, 2) card serial number, 3) PIN.
Authorization	AR08	Invalid PIN	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of invalid PIN error, the ATM System **shall** command the display to present the Invalid PIN screen.
Authorization	AR09	Invalid PIN Tally	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of invalid PIN error, the ATM System **shall** increment the tally of invalid PIN entry over 24-hour period.
Authorization	AR10	Invalid PIN Card Seizure	During reading of a Bank Card, and after receipt of the maximum allowed invalid PIN entries within a 24-hour period, the ATM System **shall** seize the Bank Card.
Authorization	AR11	Display Contact Bank Screen	After seizure of a Bank Card, the ATM System **shall** command the display to present the Contact Bank screen.
Authorization	AR12	Display Bank Out Of Network Screen	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of bank out of network error, the ATM System **shall** command the display to present the Bank Out of Network screen.
Authorization	AR13	Bank Out Of Network Card Eject	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of bank out of network error, the ATM System **shall** eject the Bank Card.
Authorization	AR14	Display Account Problem Screen	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of account problem error, the ATM System **shall** command the display to present the Account Problem screen.
Authorization	AR15	Account Problem Card Eject	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of account problem error, the ATM System **shall** eject the Bank Card.
Authorization	AR16	Card Eject on Error	During reading of a Bank Card, and on the event of receipt of error message from the bank server, the ATM System **shall** eject the Bank Card.
Authorization	AR17	Display Menu	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of Card

Category	Req ID	Req Name	Description
			Is Authorized message, the ATM System **shall** command the display to present the Menu Options screen.
Authorization	AR18	Log Card Data	During reading of a Bank Card, and after authorization check by bank server, and on the event of receipt of the Card Is Authorized message, the ATM System **shall** log all Bank Card information.

4.1.4 Check Balance Transaction Requirements of the ATM System

Category	Req ID	Req Name	Description
Check Balance Transaction	CB01	Send Check Balance Message	Upon detection of the Customer selection of the Check Balance menu option, the ATM System **shall** command the Network Controller to issue a Check Balance message to the Bank Server.
Check Balance Transaction	CB02	Display Balance Data Screen	Upon receipt of a Balance Data message from the Bank Server, the ATM System **shall** command the display to present the Balance Data screen.

4.1.5 Cash Withdrawal Transaction Requirements of the ATM System

Category	Req ID	Req Name	Description
Cash Withdrawal Transaction	CW01	Display Withdrawal Amount Screen	Upon detection of the Customer selection of the Cash Withdrawal menu option, the ATM System **shall** command the Display to present the Withdrawal Amount screen.
Cash Withdrawal Transaction	CW02	Send Withdrawal Request Message	Upon detection of the Customer entry of the Withdrawal Amount, the ATM System **shall** command the Network Controller to issue a Withdrawal Request message to the Bank Server.
Cash Withdrawal Transaction	CW03	Unlock the Locking Mechanism	Upon receipt of a Withdrawal Approved message from the Bank Server, the ATM System **shall** command the Cash Dispenser electro-mechanical locking mechanism to unlock.
Cash Withdrawal Transaction	CW04	Dispense Approved Cash Amount	Upon detection of the Cash Dispenser electro-mechanical locking mechanism being in the unlocked state, the ATM System **shall** command the Cash Dispenser to dispense the approved amount of cash.
Cash Withdrawal Transaction	CW05	Lock the Locking Mechanism	Upon completion of the cash withdrawal by the Cash Dispenser, the ATM System **shall** command the Cash Dispenser electro-mechanical locking mechanism to lock.
Cash Withdrawal Transaction	CW06	Display Withdrawal Denied Screen	Upon receipt of a Withdrawal Denied message from the Bank Server, the ATM System **shall** command the Display to present the Withdrawal Denied screen.

4.1.6 Bank Deposit Transaction Requirements of the ATM System

Category	Req ID	Req Name	Description
Bank Deposit Transaction	BD01	Accept Deposit Document(s)	Upon detection of the Customer selection of the Bank Deposit menu option, the ATM System **shall** command the Deposit Receiver to accept the deposit document(s).

Category	Req ID	Req Name	Description
Bank Deposit Transaction	BD02	Read Deposit Documents	Upon receipt of the deposit document(s), the ATM System Deposit Receiver **shall** read the deposit document(s) and determine the total deposit amount being made.
Bank Deposit Transaction	BD03	Confirm Deposit Amount	Upon completion of the reading of the deposit document(s), the ATM System Deposit Receiver **shall** command the Display to present the Deposit Confirmation screen.
Bank Deposit Transaction	BD04	Confirm Deposit Amount	Upon detection of the Customer confirmation of the Deposit Amount, the ATM System **shall** command the Network Controller to issue a Deposit Amount message to the Bank Server.
Bank Deposit Transaction	BD05	Display Deposit Received Screen	Upon receipt of a Deposit Received message from the Bank Server, the ATM System **shall** command the Display to present the Deposit Received screen.

4.1.7 Fund Transfer Transaction Requirements of the ATM System

Category	Req ID	Req Name	Description
Fund Transfer Transaction	FT01	Display Fund Transfer Screen	Upon detection of the Customer selection of the Fund Transfer menu option, the ATM System **shall** command Display to present the Fund Transfer screen.
Fund Transfer Transaction	FT02	Send Fund Transfer Message	Upon detection of the Customer entry of the Source Account, Destination Account, and Transfer Amount information, the ATM System **shall** command the Network Controller to issue a Fund Transfer message to the Bank Server.
Fund Transfer Transaction	FT03	Display Funds Transferred Screen	Upon receipt of a Funds Transferred message from the Bank Server, the ATM System **shall** command the Display to present the Funds Transferred screen.

4.2 Performance Requirements

The performance requirements for the ATM System are organized in the following way: General requirements, requirements for authorization, requirements for a transaction.

Note that this set of performance requirements only cover the essential performance requirements. It is not the purpose of this document to describe all the performance details needed of the ATM System.

4.2.1 Performance Requirements of the ATM System

Category	Req ID	Req Name	Description
Performance Requirements	PR01	Display Fund Transfer Screen	The ATM System shall display any error message within 30 seconds of the error situation being detected by the ATM System.
Performance Requirements	PR02	Loss of Comms with Bank Server	The ATM System shall eject the Customer's Bank Card and terminate the ongoing session following 2 minutes of lack of communication with the Bank Server.
Performance Requirements	PR03	Uptime	The ATM System shall be available 24 hours a day, except during scheduled maintenance periods.

Category	Req ID	Req Name	Description
Performance Requirements	PR04	Network Access Security	The physical design of the ATM System shall prevent physical access to the Network Connectivity Port after installation of the ATM System is complete.