ATM MANAGEMENT SYSTEM DATABASE

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Checkpoint I	2/21/2023
Checkpoint II	2/28/2023
Checkpoint III	3/14/2023
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Checkpoint V	4/04/2023
Checkpoint VI	4/11/2023
Checkpoint VII	4/18/2023
Checkpoint VIII	5/02/2023
Checkpoint IX	5/23/2023
Checkpoint X	5/23/2023

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Product Description

ATM Management system is a system software that is used mainly by banks in order to get a proper insight of the usage of the Automated Teller Machines and how the machines can be used more efficiently. ATMs are majorly used by people to Deposit as well as Withdraw Cash to a certain limit, but it can also be used to transfer money from one bank account to another one. The main reason for the popularity of ATMs is that it helps both the Banks as well as the customers. It reduces the work of banks as now most people prefer to access ATMs which reduces the transaction time as well as the cost of the transaction for the customers and the banks.

Even though it has proved to be a great asset for both Banks as well as its users, it still has its own limitations.
Sometimes the consumers are not able to withdraw as much money as they want as there isn't sufficient money in the ATM. It would be better if the maintenance is predicted beforehand so that the user experience is improved and there are less unsatisfied customers.

It needs real time monitoring so that the bank can look at the ATM status, transactions, errors, so that it can be resolved quickly and remotely if required to do so which will reduce the maintenance time and cost to the bank.

This will also increase the security of the ATM transactions. The other ways to improve ATM security is by adding two factor authentication and finger print or facial recognition to increase security. The analysis of the data would also help find unusual transactions if occurred by an account and can stop the transaction if it can be found that it is a fraud. This will also increase the user Experience and there would be less trouble to banks as less manual labor will be applied. The banks won't have to deal with a lot of customers and can divert the workflow to other places.

USE CASE

Use Case 1 :- Unwanted Refill
Actor :- Pramod, Bank Staff
Description :- Regular refill is required at all the ATMs and they are generally refilled one after another. But there are some places where money in the ATM is not utilized completely yet, it is refilled just because it was on the list, Even though the ATM has enough money in it. Every time he has to refill some or the other ATM which is still filled and causes him to waste energy in the process. He needs a better system that can show which ATMs are in actual need to be refilled and which are not,so that he doesn't have to go there and waste his time checking the ATM.

The proposed system has the feature of providing information about the ATM such as the amount which is still present in the ATM and the calculated time it will not need any refill.

Use Case 2 :- Urgent Refill Complaints
Actor :- Shubham, Bank Staff
Description :- There have been several complaints from some specific locations that there is no money in the ATM, even though it was refilled recently. These locations are busy areas around some shopping malls, which require cash regularly and in large amounts as well. These locations need more refills than any other places. Due To a large number of complaints Shubham is frustrated and is looking for a solution to this tiresome problem.

Use Case 3 :- Insufficient cash
Actor :- Ishiska, Shopping freak
Description :- Ishsika loves to do a lot of shopping,but is unable to pay cashless everywhere, so she needs an ATM in order to get cash for her expenses. She visited malls near Golden Gate Bridge in San Francisco and was unable to pay through a card so she needed cash from the ATM, but the ATM didn't have sufficient money in it to meet her demands. This made her an unsatisfied consumer as she couldn't buy everything she wanted there.
Due to a lot of usage in crowded places or places with high demands the Database of ATM should be those places and need more priority or need to be refilled and maintained more regularly than other ATMs in the surrounding area.

Use Case 4 :- Security Enhancement
Actor :- Criss, regular customer
Description :- Criss has been a regular customer of Chase bank and his transactions are usually small and regular at the end of the month, but his card got stolen and there was a transaction from the ATM done in order to withdraw all the money at once from his account.

The proposed additional feature will let the customers have an option of two factor authentication which will not let this kind of transaction to occur at all.

Use Case 5 :- Unusual activity
Actor :- Jesssi, consumer
Description :- Jessi rarely uses her card and has only small transactions throughout the year. But once her card credentials were leaked and used to make big payments online. The analysis of her account will show that this account does not have big transactions, so this unusual activity is then reported to the user before the payment is being done. This feature will reduce the amount of fraud that occurs from stolen card details online.

Software Tools

Some of the software tools and products that are currently in the market are ATMdesk,Odoo,Diebold Nixdorf ATM software, NCR APTRA Edge and Wincor Nixdorf Proview systems are currently used for the System Database of ATM. Each tool has its own feature and its limitations, but by the proposed database.

Database Requirements

1. ATM User

    1.1 The User shall have at least one bank account.

    1.2 The User shall be able to view their balance.

    1.3 A User shall be able to view transactions.

    1.4 A user should be able to deposit cash from the account if there is sufficient balance in it.

    1.5 Users shall have access to an ATM at any point in time.

    1.6 A user should be able to withdraw cash from the account if there is sufficient balance in it.

2. ATM

    2.1 ATM shall be accessible by multiple users.

    2.2 The ATM shall be at a unique address at the specific location.

    2.3 The ATM shall be able to transfer funds across at least one account .

    2.4 All the ATMs shall be a part of the network of ATMs.

    2.5 The ATM shall be able to show all the basic account enquiries.

    2.6 The ATM shall be able to send at least one SMS and an E-mail for each transaction.

2.7 The ATM shall be accessible by at most one user at a time.

2.8 ATM shall keep an exact record of all the transactions being done on it.

2.9 ATM shall be able to keep a record of all the different cards and cash inserted in it by the user.

2.10 Each ATM shall be associated with only one bank.

3. Transactions

3.1 A transaction shall be done from at least one account.

3.2 The transaction shall be done by only one user.

3.3 The transaction shall be recorded by the ATM.

3.4 The transaction shall be authorized by at least one bank.

3.5 The transaction shall have a specific timeframe, and the transaction must be completed within the timeframe only, or else it must terminate the transaction.

4.Maintenance

4.1 Maintenance shall be done to each and every ATM.

4.2 Maintenance shall keep track of all the transactions occurring in the ATM.

4.3 The Maintenance shall be done by at least one bank employee.

5. Report

5.1 The system shall generate reports of all the ATM usage and its performance regularly.

5.2 The Bank shall only allow authorized users to access the data of the ATM performance.

5.3 The bank shall report at least one report in case a fraud is detected.

6. Accounts

6.1 An account shall have at least one user.

6.2 Account shall be open and accessible in at least one bank.

6.3 Accounts shall be created and managed by at least one user.

6.4 An account shall have multiple transactions associated with it.

6.5 An account shall be associated in a transaction.

6.6 An account shall have multiple sub-accounts.

7. Customer Service

7.1 The customer service shall be available to each user in case it is needed at any time.

7.2 The customer service shall be able to send at least one alert message to the bank if required or requested by the users.

7.3 Customer service shall keep a record of feedback and complaints sent by the users for the maintenance or the bank.

7.4 The customer service shall be able to give receipts of the transactions that occurred, and back it up in the bank's record.

8. Security Code

8.1 A security code shall be used by the user to access the account.

8.2 Security code shall be unique for each ATM to access it by Bank.

8.3 Each bank shall have a unique security code.

9. Cash Dispenser

9.1 Cash dispenser shall be in an ATM

9.2 Cash dispensers shall be regularly monitored by Maintenance.

9.3 Cash dispensers shall be kept track by the Bank.

10. Depository Modules

10.1 Each depository module shall belong to one ATM.

10.2 Depository modules shall be regularly monitored for Security.

10.3 Each Depository module shall be monitored by the Maintenance.

11. Card Reader

11.1 Each card reader shall belong to at least one ATM.

11.2 Card readers shall be regularly tested by maintenance.

11.3 Card readers should be authorized by the Bank.

11.4 Card readers shall be regularly supervised by the security.

12. Receipt Printers

12.1 Each receipt printer shall belong to one and only one ATM.

12.2 Receipt printers shall be regularly checked to ensure that they are functioning properly and producing accurate receipts.

12.3 Receipt Printers should print receipts for each and every transaction that occurs in that ATM.

13. Region

13.1 A region shall have many Banks.

13.2 A region shall have many users.

13.3 A region shall have many ATMs.

13.4 Each Region shall be supervised by at least one bank.

13.5 Each region shall have many maintenance employees.

14. Employee

14.1 At least one bank employee shall do the maintenance when required.

14.2 A bank employee shall help the users when requested.

14.3 At Least one employee should be present in one region.

15. Bank

15.1 The bank shall be associated with at least one ATM.

15.2 The bank shall take care of the maintenance.

15.3 The bank shall create and manage accounts when requested by at least one user.

16.Roles

16.1 Specific roles can only access maintenance.

16.2 All roles shall be associated with the bank.

16.3 One role shall be provided to only one employee.

17. Manager

17.1 Manager shall manage a branch of a bank.

17.2 A bank shall have more than one manager.

17.3 An Employee shall be a Manager.

17.4 A bank shall have at least one manager.

Non-Functional Requirements

1. Performance
    1.1 The system shall be capable of handling a large number of transactions simultaneously without any crashes or performance issues.
    1.2 The system shall be able to perform a large number of calculations accurately and efficiently without any errors or delays.
    1.3 The system shall be able to support multiple concurrent users without any performance degradation.
    1.4 The system shall have a disaster recovery plan in place in case of emergencies.

2. Accessibility
    2.1 The system shall be designed to be user-friendly and easily accessible for all users.
    2.2 The system shall support multiple languages and characters to cater to users from different regions.
    2.3 The system shall provide clear and concise instructions for users to access it.

3. Scalability

    3.1 The system shall be designed to be scalable to handle larger volumes of data over time.

    3.2 The system shall be able to support an increasing number of users over time.

4. Storage

    4.1 The database shall allocate a minimum of 10MB of memory per table to ensure data integrity and performance.

    4.2 The database shall have a backup mechanism in place to ensure data availability in case of emergencies.

5. Security

    5.1 The system shall have multiple levels of security protections such as passwords, authentication, and firewall to ensure data confidentiality, integrity, and availability.

    5.2 The system shall log and track multiple failed login attempts and unauthorized access attempts.

    5.3 The system shall maintain a log of all user activities to enable auditing and investigation in case of any security incidents.

5.4 The system shall be able to detect and notify the bank and account users of any potential security threats or malicious activities.

5.5 The system shall be able to respond and mitigate any security threats encountered.

5.6 The security measures shall ensure that the account is isolated when a user is making a transaction to prevent any interference from other transactions.

5.7 The system shall keep track of biometric lock passwords.

5.8 The security database must notify the bank and customers in case of emergencies.

5.9 The system shall implement authentication, authorization, and accounting mechanisms to ensure only authorized users can access the account and perform transactions.

6. System Requirements

6.1 The system shall be capable of handling a large number of transactions simultaneously without any crashes or performance issues.

6.2 The system shall be able to perform a large number of calculations accurately and efficiently without any errors or delays.

6.3 The system shall be able to support multiple users without any performance degradation.

6.4 The system shall be scalable to accommodate increasing numbers of customers and transactions over time.

7. Environmental
    7.1 The system shall comply with relevant environmental regulations and standards.
    7.2 The system shall be resistant to dust and other environmental contaminants.
8. Legal
    8.1 The entire system shall comply with all applicable rules and regulations related to financial transactions and customer data privacy.
    8.2 The system shall generate reports and provide information to regulatory bodies when requested.

9. Content
    9.1 The system shall use clear and concise language for all user content.
    9.2 The system shall be designed with a user-friendly interface to allow for easy content updates.
    9.3 The system shall provide accurate and up-to-date information to users at all times.

10. Compatibility

    10.1The system shall be compatible with different third-party software and hardware such as receipt printers, scanners, and card readers.

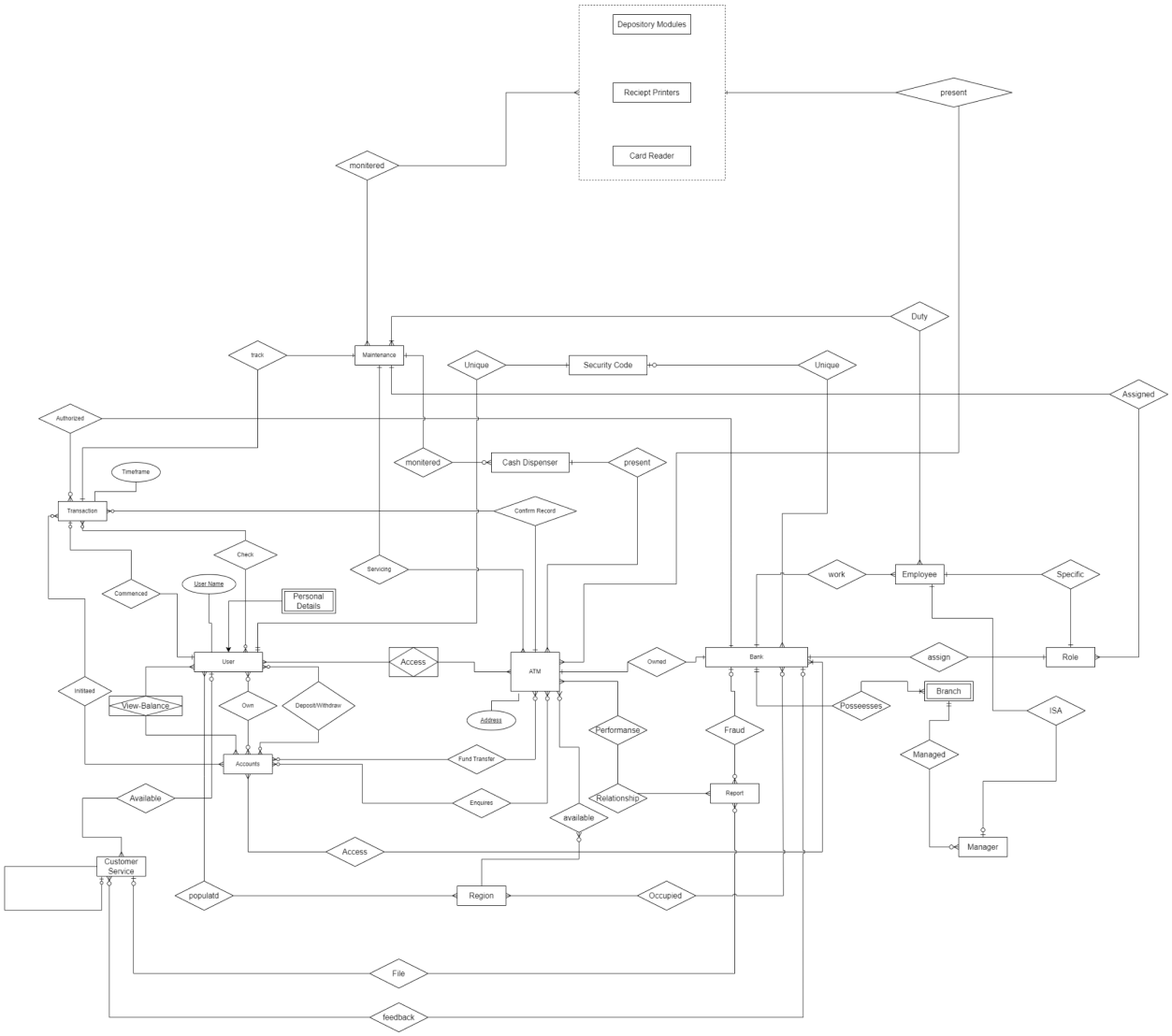
    10.2 The system shall be compatible with all major payment processors such as Visa, Mastercard, and American Express.

11. Organizational

    11.1 The system shall adhere to the organizational policies and procedures for handling the data they have and for security.

    11.2 The system shall have roles and permissions assigned to employees based on their job responsibilities.

ERD


Depository Modules
Reciept Printers
Card Reader
present
monitered
Duty
track
Maintenance
Unique
Security Code
Unique
Assigned
Authorized
monitered
Cash Dispenser
present
Timeframe
Transaction
Confirm Record
Check
Servicing
work
Employee
Specific
Commenced
User Name
Personal Details
User
Access
ATM
Owned
Bank
assign
Role
Initiated
View-Balance
Own
Deposit/Withdraw
Address
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Branch
ISA
Accounts
Fund Transfer
Managed
Available
Enquires
Relationship
Report
available
Access
Manager
Customer Service
populatd
Region
Occupied
File
feedback

Database Entities Description

1. User (Strong)
    a. User_id: key, numeric
    b. User_name: composite, alphanumeric
    c. dob: multivalue, timestamp
2. ATM (Strong)
    a. ATM_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. ATM_address: composite, alphanumeric
3. View Balance (Weak)
    a. User_id: key, numeric
    b. Bank _id: key, numeric
    c. Bank_name: composite, alphanumeric
4. Transactions (Strong)
    a. Transactions_id: key, numeric
    b. name: composite, alphanumeric
    c. time: multivalue, timestamp
5. Maintenance (Strong)
    a. Maintenance_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. ATM_id: key, numeric
    d. employee_name: composite, alphanumeric
    e. Location: composite, alphanumeric
    f. time: multivalue, timestamp

6. Reports (Strong)
    a. Reports_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. ATM_id: key, numeric
    d. time: multivalue, timestamp
7. Personal Details (Weak)
    a. User_id: key, numeric
    b. User_name: composite, alphanumeric
    c. Middle_name: composite, alphanumeric
    d. Sur_name: composite, alphanumeric
    e. dob: multivalue, timestamp
8. Accounts (Strong)
    a. Accounts_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. User_name: composite, alphanumeric
    d. Location: composite, alphanumeric
9. Customer Service (Strong)
    a. Customer_Service_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. User_id: key, numeric
    d. time: multivalue, timestamp
10. Security Code (Strong)
    a. Security_Code_id: key, numeric
    b. Accounts_id: key, numeric

c. User_id: key, numeric

11. Cash Dispenser (Strong)
    a. Cash_Dispenser_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. ATM_id: key, numeric
    d. time: multivalue, timestamp

12. Depository Modules (Strong)
    a. Depository_Modules_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. ATM_id: key, numeric
    d. Maintenance_id: key, numeric
13. Card Reader (Strong)
    a. Card_Reader_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. ATM_id: key, numeric
    d. Maintenance_id: key, numeric
14. Check (Weak)
    a. Card_Reader_id: key, numeric
    b. Receipt_Printers_id: key, numeric
    c. Depository_Modules_id: key, numeric
    d. Maintenance_id: key, numeric
15. Receipt Printers (Strong)
    a. Receipt_Printers_id: key, numeric
    b. Receipt_count: key, numeric

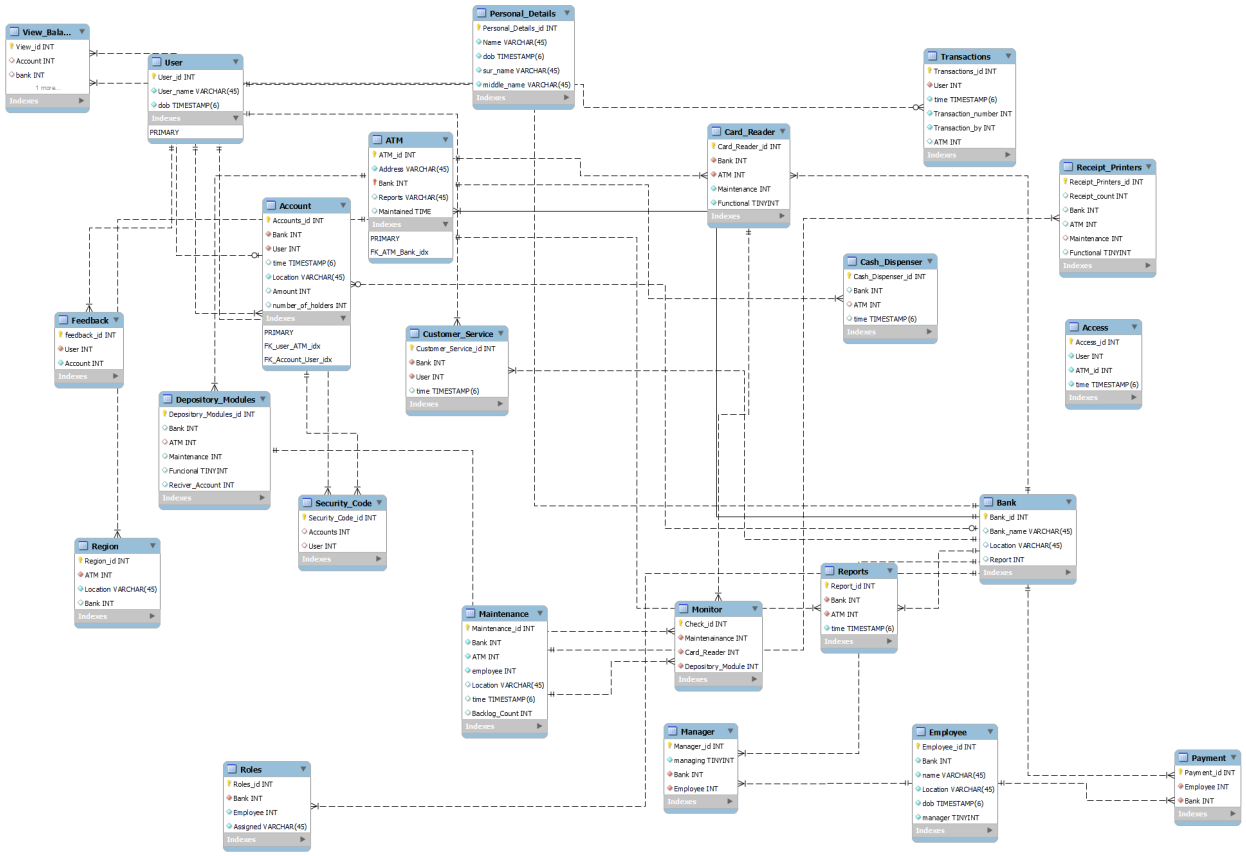
c. Bank_name: composite, alphanumeric
d. ATM_id: key, numeric
e. Maintenance_id: key, numeric

16. Receipt (Weak)
    a. Receipt_Printers_id: key, numeric
    b. ATM_id: key, numeric
    c. User_id: key, numeric
17. Feedback(Weak)
    a. Customer_Service_id: key, numeric
    b. User_id: key, numeric
    c. Maintenance_id: key, numeric
18. Region (Strong)
    a. Region_id: key, numeric
    b. ATM_id: key, numeric
    c. Location: composite, alphanumeric
19. Bank-Report
    a. Bank _id: key, numeric
    b. ATM_id: key, numeric
    c. Reports_id: key, numeric
20. Employee (Strong)
    a. Employee_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. employee_name: composite, alphanumeric
    d. Location: composite, alphanumeric
    e. dob: multivalue, timestamp

21. Duty (Weak)
    a. Employee_id: key, numeric
    b. Location: composite, alphanumeric
    c. ATM_id: key, numeric
    d. Bank _id: key, numeric
22. Bank-ATM (Weak)
    a. Bank _id: key, numeric
    b. ATM_id: key, numeric
23. Bank (Strong)
    a. Bank_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. Location: composite, alphanumeric
24. Payment (Weak)
    a. Employee_id: key, numeric
    b. Bank _id: key, numeric
25. Roles (Strong)
    a. Roles_id: key, numeric
    b. Bank_name: composite, alphanumeric
    c. Employee_id: key, numeric
26. Authorization (Weak)
    a. Bank _id: key, numeric
    b. User_id: key, numeric
    c. Transactions_id: key, numeric
27. Manager (Weak)
    a. Bank _id: key, numeric

    b. Employee_id: key, numeric
    c. Roles_id: key, numeric
28. Admin (Weak)
    a. Bank _id: key, numeric
    b. Employee_id: key, numeric
    c. Roles_id: key, numeric
29. Manager (Strong)
    a. Manager_id : key, numeric
    b. Managing : key, Boolean
    c. Bank_id : key, numeric
    d. Employee_id : key, numeric

Entity Establishment Relationship Diagram



Constraints Description

Table	FK	ON DELETE	ON UPDATE	Comment
Bank	ATM	CASCADE	CASCADE	If a Bank is deleted, then the ATM must also be deleted.
User	Transaction	NO ACTION	CASCADE	If the user is deleted there is no change in the transaction.
User	Account	CASCADE	CASCADE	If a user is deleted, then the account from that user must be deleted as we
Role	Employee	CASCADE	CASCADE	If a Role is deleted, then the employee role from that employee must be deleted as we
Account	ATM	NO ACTION	NO ACTION	If there is a change in account there is no change done on the ATM
Account	Bank	NO ACTION	CASCADE	If there is a change made in account then the bank must update the change.
User	Transaction	NO ACTION	CASCADE	If the user updates some info it must be updated in its transaction
Maintenance	ATM	CASCADE	CASCADE	If there is a change in the Maintenance then there must be changes made on the ATM as well.
Customer Service	Reports	CASCADE	CASCADE	If there is any change made by the customer service then the reports should also be updated.
User	Reports	NO ACTION	CASCADE	If there is a change made by the user then the reports should also be updated accordingly.
Role	Maintenance	CASCADE	CASCADE	If the roles are deleted or updated then the maintenance table should also reflect the changes.

Role	Employee	CASCADE	CASCADE	If the role is updated or deleted of an employee then the employee table must be updated accordingly.
Bank	Employee	CASCADE	CASCADE	If a bank deletes or updates a role for an employee then there should be a table to see the new assigned role in the employee table.
User	Security Code	CASCADE	CASCADE	If a User changes the security code then there should be a change in the security code table.
ATM	Card Reader	CASCADE	CASCADE	If an ATM is deleted then the card reader should also be deleted
ATM	Cash Dispenser	CASCADE	CASCADE	If an ATM is deleted then the Cash Dispenser should also be deleted
Bank	Region	CASCADE	CASCADE	If a bank is deleted from a region then the region table must be updated to show that there is no bank at the location.
ATM	Region	CASCADE	CASCADE	If an ATM is deleted from a region then the region table must be updated to show that there is no bank at the location.
ATM	Receipt Printers	CASCADE	CASCADE	If an ATM is deleted then the Receipt Printers should also be deleted.
User	View Balance	CASCADE	CASCADE	If an User is deleted then the View Balance table should also be removed
Account	View Balance	CASCADE	CASCADE	If an account is updated then the balance should also be updated or deleted accordingly.
employee	employee	CASCADEs	CASCADE	An employee can be a manager but not all employees are managers.

Database business Rules Description

1. "The user shall be able find the count of ATM did not receive any maintenance after <X> date"
2. "The user shall be able find all the account holder that made transaction on a <X> date on <Y> ATM"
3. "The user shall find the account holder that made the transaction before a <X> date and the amount that was transaction was more than <Y> ”
4. "The user shall find the the total amount present in the <X> account along with the Bank in which the account was created"
5. "The user shall find the number of account holders per <X> account with their date of birth and the transactions that they made"
6. "The List of user that can make transactions if there is <X> amount in the account and the user has enough credit to make the transactions"
7. "The user shall find the accounts that has money more than <X> in the bank account along with that the last 5 transactions that were occurred in the account, with the account holder details that made the transactions"
8. "The user shall find the ATM where the card readers are not functional and have a report not submitted for the maintenance for that ATM"

9. "The user shall be able to find ATM that need maintenance for the depository modules in a <X> region of a <Y> bank"
10. "The user shall be able to find all the ATM that are located in a region that have a report submitted against it which were maintained after <X> date"
11. "The user shall be able to find the number of ATM that are in need for new receipt printers that have a report for them by a <X> bank"
12. "The user shall be able to determine whether an <X> employee is a manager and the bank in which he works in with his date of birth and name."
13. "The user shall be able to find the <X> account holder’s bank and the date account was created along with the number of transactions made by the account holder with the total amount that was spent"
14. "The user shall be able to check which employee maintained the receipt printers which are not functional and which were maintained after <X> date"
15. "The user shall be able to find the number of fraud reported by a <Z> bank after <X> date in <Y> region "
16. "The user shall be able to find the employee that is going to do the maintenance at <X> ATM and bank he is from"

17. "The user shall be able to find reports submitted for ATM by more than <X> account holders in a <Y> bank"
18. "The user shall be able find the address of a <X> bank, the number of ATM it has and the number of reports submitted by the bank "
19. "The user shall be able find which fraud is reported by <X> bank after <Y> time and which employee maintained that particular ATM report"
20. "The user shall be able to find how many reports were submitted by <X> account holder for <A> ATM between the date of <Y> and <Z>"