

Core Banking Data Model & SQL Architecture Design

DENİZ YALÇIN

1. Definition

This database model is designed to represent a conceptual core banking system architecture.

The system simulates fundamental banking operations including customer management, account ownership, transaction processing and branch-based operations.

The primary function of the system is to enable secure and structured fund transfers between accounts while maintaining data integrity and relational consistency.

The model is structured around three core entities: customers, employees and the bank's organizational structure (branches and locations). Customers perform financial transactions through branch-linked accounts, while employees manage operational activities within the banking framework.

These components collectively define the relational structure and transactional logic of the database model.

2. Business Rules

1. Each CUSTOMER must reference exactly one LOCATION record (mandatory address association).
2. Each CUSTOMER must have at least one associated PHONE_NUMBER record.
3. A CUSTOMER may own zero, one or multiple CREDIT_CARD records.
4. The BANK entity must be associated with a valid LOCATION record.
5. Each ACCOUNT must be linked to exactly one BRANCH (mandatory foreign key relationship).
6. A CUSTOMER may own multiple ACCOUNTS; however, each ACCOUNT must belong to only one CUSTOMER (one-to-many relationship).
7. An ACCOUNT may process multiple TRANSACTION records.
8. Each TRANSACTION must reference a valid CUSTOMER and be traceable via customer identification.
9. Every TRANSACTION must be associated with a predefined TRANSACTION_TYPE.
10. CREDIT_SCORE values are system-generated based on customer payment behavior and financial activity.
11. CREDIT_CARD maximum limit adjustments are determined proportionally according to customer repayment performance.

3. Components of the Entity Relationship Model

ENTITY	RELATIONSHIP	CONNECTIVITY	ENTITY
CUSTOMER	HAS	1-*	CREDIT_CARD
CUSTOMER	HAS	1-*	PHONE_NUMBER_CUSTOMER
CUSTOMER	HAS	1-*	ACCOUNT
CREDIT SCORE	HAS	1-*	CUSTOMER
LOCATION	LOCATED IN	1-1	BRANCH
LOCATION	LOCATED IN	1-*	EMPLOYEE
LOCATION	LOCATED IN	1-*	CUSTOMER
CITY	IN	1-*	LOCATION
COUNTRY	IN	1-*	CITY
EMPLOYEE	HAS	1-*	PHONE_NUMBER_EMPLOYEE
BRANCH	HAS	1-*	EMPLOYEE
ACCOUNT	MAKE	1-*	TRANSACTION
TRANSACTION TYPE	HAS	1-*	TRANSACTION

4.Entities

CUSTOMER

It will be the person who executes the transactions.

CUSTOMER	CUSTOMER_TC	CUSTOMER TURKISH IDENTIFICATION NUMBER	SMALLINT
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT
	CUSTOMER_NAME	CUSTOMER NAME	VARCHAR(50)
	CUSTOMER_LAST_NAME	CUSTOMER LAST NAME	VARCHAR(50)
	CUSTOMER_EMAIL_ID	CUSTOMER EMAIL IDENTIFICATION	VARCHAR(50)
	CUSTOMER_DOB	CUSTOMER DATE OF BIRTH	DATE
	LOCATION_ID	LOCATION IDENTIFICATION	INT
	CUSTOMER_JOB	CUSTOMER JOB	VARCHAR(50)
	CREDIT_SCORE_ID	CUSTOMER SCORE IDENTIFICATION NUMBER	INT
	CUSTOMER_WAGE	CUSTOMER WAGE	INT

EMPLOYEE

The employee entity will have a list of employees currently available in the system.

EMPLOYEE	EMPLOYEE_NAME	EMPLOYEE NAME	VARCHAR(50)
	EMPLOYEE_LAST_NAME	EMPLOYEE LAST NAME	VARCHAR(50)
	EMPLOYEE_ID	EMPLOYEE IDENTIFICATION NUMBER	INT
	BRANCH_ID	BRANCH IDENTIFICATION NUMBER	INT
	LOCATION_ID	EMPLOYEE LOCATION IDENTIFICATION NUMBER	INT
	EMPLOYEE_DOB	EMPLOYEE DATE OF BIRTH	DATE
	EMPLOYEE_DATE_OF_START	EMPLOYEE DATE OF START JOB	DATE
	EMPLOYEE_REGISTRY	EMPLOYEE REGISTRY	INT
	EMPLOYEE_POSITION	EMPLOYEE POSITION	VARCHAR(50)
	EMPLOYEE_WAGE	EMPLOYEE WAGE	INT

ACCOUNT

This entity contains Customers' personal accounts and information.

ACCOUNT	ACCOUNT_ID	ACCOUNT IDENTIFICATION NUMBER	INT
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT
	ACCOUNT_IBAN	INTERNATIONAL BANK ACCOUNT NUMBER	NVARCHAR
	ACCOUNT_TYPE	ACCOUNT TYPE IDENTIFICATION NUMBER	SMALLINT
	ACCOUNT_NUMBER	ACCOUNT NUMBER	INT
	BRANCH_ID	BRANCH IDENTIFICATION NUMBER	SMALLINT
	ACCOUNT_OD	ACCOUNT CREATION DATE	DATE

BRANCH

It includes the branches owned by the bank and their information.

BRANCH	BRANCH_ID	BRANCH IDENTIFICATION NUMBER	INT
	BRANCH_CODE	BRANCH CODE	INT
	BRANCH_MANAGER	BRANCH MANAGER	VARCHAR(50)
	BRANCH_NAME	BRANCH NAME	VARCHAR(50)
	BRANCH_OD	BRANCH CREATION DATE	DATE
	LOCATION_ID	LOCATION IDENTIFICATION NUMBER	INT

CREDIT CARD

customers have information for credit withdrawal.

CREDIT_CARD	CARD_ID	CARD IDENTIFICATION NUMBER	INT
	CREDIT_CARD_ED	CREDIT CARD EXPIRE DATE	DATE
	CARD LIMITS	CARD LIMITS	INT
	CARD_PASSWORD	CARD PASSWORD	SMALLINT
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT
	MAXIMUM_LİMIT	MAXIMUM LİMIT OF CREDIT CARD	INT
	CREDIT_CARD_CVV	CUSTOMER CARD VERIFICATION VALUE	INT

CREDIT SCORE

It is the credit score that is formed according to the use of customers.

CREDIT SCORE	CREDIT_SCORE_ID	CREDIT CARD IDENTIFICATION NUMBER	INT
	CD_SCORE	CREDIT CARD SCORE	INT
	RISK_GROUP	RISK GROUP	CHAR(50)
	GRADE RANGE	GRADE RANGE	INT
	LOAN_USAGE_STATUS	LOAN USAGE STATUS	CHAR(50)

TRANSACTION

It shows us the actions that customers can take.

TRANSACTION	TRANSACTION_ID	TRANSACTION IDENTIFICATION NUMBER	INT
	FROM_ACCOUNT_ID	FROM ACCOUNT IDENTIFICATION NUMBER	INT
	TO_ACCOUNT_ID	TO ACCOUNT IDENTIFICATION NUMBER	INT
	TRANSACTION_TYPE_ID	TRANSACTION TYPE IDENTIFICATION NUMBER	INT
	TRANSACTION_DATE	TRANSACTION DATE TIME	DATE
	TRANSACTION_AMOUNT	TRANSACTION AMOUNT	INT

TRANSACTION_TYPE

Customers can perform many transactions. This specifies the type of their transaction.

TRANSACTION_TYPE	TRANSACTION_TYPE_ID	TRANSCATION TYPE IDENTIFICATION NUMBER	SMALLINT
	TYPE_NAME	TYPE NAME	CHAR(50)
	TYPE_DESCRIPTION	TYPE DESCRIPTION	CHAR(50)

PHONE_NUMBER_CUSTOMER

Contains the customer's contact information.

PHONE_NUMBER_CUSTOMER	C_PHONE_ID	PHONE NUMBER IDENTIFICATION NUMBER	INT
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT
	PHONE_NUMBER	CUSTOMER PHONE NUMBER	INT
	PHONE_DESCRIPTION	PHONE DESCRIPTION	CHAR(50)

PHONE_NUMBER_EMPLOYEE

Contains employee contact information.

PHONE_NUMBER_EMPLOYEE	E_PHONE_ID	EMPLOYEE PHONE NUMBER IDENTIFICATION	INT
	EMPLOYEE_ID	EMPLOYEE IDENTIFICATION NUMBER	INT
	PHONE_NUMBER	PHONE NUMBER IDENTIFICATION NUMBER	INT
	PHONE_DESCRIPTION	PHONE DESCRIPTION	CHAR(50)

LOCATION

It includes the current location of branches, customers and employees.

LOCATION	LOCATION_ID	LOCATION IDENTIFICATION NUMBER	INT
	STREET_NAME	STREET NAME	CHAR(50)
	CITY_ID	CITY IDENTIFICATION NUMBER	SMALLINT
	NEIGHBORHOOD_NAME	NEIGHBORHOOD NAME	CHAR(40)
	APARTMENT_NO	APARTMENT NUMBER	INT
	FLOOR	FLOOR NUMBER	SMALLINT
	ZIP_CODE	ZIP CODE	SMALLINT

CITY

Contains city information in the location.

CITY	CITY_ID	CITY IDENTIFICATION NUMBER	INT
	COUNTRY_ID	COUNTRY IDENTIFICATION	INT
	CITY_TELEPHONE_CODE	CITY TELEPHONE CODE	SMALLINT
	CITY_NAME	CITY NAME	CHAR(50)

COUNTRY

Contains country information in the location.

COUNTRY	COUNTRY_ID	COUNTRY IDENTIFICATION	INT
	COUNTRY_NAME	COUNTRY NAME	CHAR(50)
	COUNTRY_TELEPHONE_CODE	COUNTRY TELEPHONE CODE	SMALLINT
	COUNTRY_CODE	COUNTRY CODE	SMALLINT

5. DATA DICTIONARY

Table Name	Attribute Name	Contents	Type	Format	Domain	Required	Pf or fk	FK Referenced Tabl
CUSTOMER	CUSTOMER_TC	CUSTOMER TURKISH IDENTIFICATION NUMBER	SMALLINT	#####	1000000000-9999999999	Y		
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT	#####	0-9999999999	Y	PK	
	CUSTOMER_NAME	CUSTOMER NAME	VARCHAR(50)	XXXXXXXXXXXX	TR	Y		
	CUSTOMER_LAST_NAME	CUSTOMER LAST NAME	VARCHAR(50)	XXXXXXXXXXXX	TR	Y		
	CUSTOMER_EMAIL_ID	CUSTOMER EMAIL IDENTIFICATION	VARCHAR(40)	XXXXXXXXXXXXXX	TR	Y		
	CUSTOMER_DOB	CUSTOMER DATE OF BIRTH	DATE	DD-MON-YYYY	TR	Y		
	LOCATION_ID	LOCATION IDENTIFICATION	INT	###	0-999	Y	FK	LOCATION
	CUSTOMER_JOB	CUSTOMER JOB	VARCHAR(50)	XXXXXXXXXX	TR	Y		
	CREDIT_SCORE_ID	CUSTOMER SCORE IDENTIFICATION NUMBER	INT	#####	TR	Y	FK	CREDIT SCORE
	CUSTOMER_WAGE	CUSTOMER WAGE	INT	#####	0-99999999	Y		
EMPLOYEE	EMPLOYEE_NAME	EMPLOYEE NAME	VARCHAR(50)	XXXXXXXXXXXX	TR	Y		
	EMPLOYEE_LAST_NAME	EMPLOYEE LAST NAME	VARCHAR(50)	XXXXXXXXXXXX	TR	Y		
	EMPLOYEE_ID	EMPLOYEE IDENTIFICATION NUMBER	INT	####	0-99999	Y	PK	
	BRANCH_ID	BRANCH IDENTIFICATION NUMBER	INT	#####	0-99999	Y	FK	BRANCH
	LOCATION_ID	EMPLOYEE LOCATION IDENTIFICATION NUMBER	INT	###	0-999	Y		
	EMPLOYEE_DOB	EMPLOYEE DATE OF BIRTH	DATE	DD-MON-YYYY	TR	Y		
	EMPLOYEE_DATE_OF_START	EMPLOYEE DATE OF START JOB	DATE	DD-MON-YYYY	TR	Y		
	EMPLOYEE_POSITION	EMPLOYEE POSITION	VARCHAR(50)	XXXXXXXXXXXX	TR	Y		
	EMPLOYEE_WAGE	EMPLOYEE WAGE	INT	#####	0-999999	Y		
	ACCOUNT_ID	ACCOUNT IDENTIFICATION NUMBER	INT	#####	0-9999999	Y	PK	
ACCOUNT	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT	####	0-99999	Y	FK	CUSTOMER
	ACCOUNT_IBAN	INTERNATIONAL BANK ACCOUNT NUMBER	INT	#####	100000000-99999999	Y		
	ACCOUNT_TYPE	ACCOUNT TYPE IDENTIFICATION NUMBER	SMALLINT	##	0-99	Y		
	ACCOUNT_NUMBER	ACCOUNT NUMBER	INT	#####	10000-99999	Y		
	BRANCH_ID	BRANCH IDENTIFICATION NUMBER	SMALLINT	###	1000-9999	Y	FK	BRANCH
	ACCOUNT_OD	ACCOUNT CREATION DATE	DATE	DD-MON-YYYY	TR	Y		
	BRANCH_ID	BRANCH IDENTIFICATION NUMBER	INT	###	0-99999	Y	PK	
	BRANCH_CODE	BRANCH CODE	INT	#####	0-999999	Y		
	BRANCH_MANAGER	BRANCH MANAGER	VARCHAR(50)	XXXXXXXXXXXX	TR	Y		
	BRANCH_NAME	BRANCH NAME	VARCHAR(50)	XXXXXXXXXXXX	TR	Y	FK	BRANCH
BRANCH	BRANCH_OD	BRANCH CREATION DATE	DATE	DD-MON-YYYY	TR	Y		
	LOCATION_ID	LOCATION IDENTIFICATION NUMBER	INT	###	0-99999	Y	FK	LOCATION
	CARD_ID	CARD IDENTIFICATION NUMBER	INT	#####	10-999999	Y	PK	
	CREDIT_CARD_ED	CREDIT CARD EXPIRE DATE	DATE	DD-MON-YYYY	TR	Y		
	CARD_LIMITS	CARD LIMITS	INT	#####	0-999999999999	Y		
	CARD_PASSWORD	CARD PASSWORD	SMALLINT	##	1000-9999	Y		
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT	#####	0-999999	Y	FK	CUSTOMER
	MAXIMUM_LIMIT	MAXIMUM LIMIT OF CREDIT CARD	INT	#####	0-999999999999	Y		
	CREDIT_CARD_CVV	CUSTOMER CARD VERIFICATION VALUE	INT	#####	0-99999999	Y		
	CREDIT_SCORE_ID	CREDIT CARD IDENTIFICATION NUMBER	INT	#####	0-99999999	Y	PK	
CREDIT_SCORE	CD_SCORE	CREDIT CARD SCORE	INT	#####	0-999999	Y		
	RISK_GROUP	RISK GROUP	CHAR(50)	XXXXXXX	TR	Y		
	GRADE_RANGE	GRADE RANGE	INT	###	0-9999	Y		
	LOAN_USAGE_STATUS	LOAN USAGE STATUS	CHAR(50)	XXXXXXX	TR	Y		
	TRANSACTION_ID	TRANSACTION IDENTIFICATION NUMBER	INT	#####	0-999999	Y	PK	
	FROM_ACCOUNT_ID	FROM ACCOUNT IDENTIFICATION NUMBER	INT	#####	100000000-999999999	Y		
	TO_ACCOUNT_ID	TO ACCOUNT IDENTIFICATION NUMBER	INT	#####	100000000-999999999	Y		
	TRANSACTION_TYPE_ID	TRANSACTION TYPE IDENTIFICATION NUMBER	INT	#####	0-999999999	Y	FK	TRANSACTION TYPE
	TRANSACTION_DATE	TRANSACTION DATE TIME	DATE	HH:MM	TR	Y		
	TRANSACTION_AMOUNT	TRANSACTION AMOUNT	INT	#####	0-999999999999	Y		
TRANSACTION_TYPE	TRANSACTION_TYPE_ID	TRANSACTION TYPE IDENTIFICATION NUMBER	SMALLINT	##	0-99	Y	PK	
	TYPE_NAME	TYPE NAME	CHAR(50)	XXXXXXXXXX	TR	Y		
	TYPE_DESCRIPTION	TYPE DESCRIPTION	CHAR(50)	XXXXXXXXXX	TR	Y		
	C_PHONE_ID	PHONE NUMBER IDENTIFICATION NUMBER	INT	#####	0-999999999999	Y	PK	
	CUSTOMER_ID	CUSTOMER IDENTIFICATION NUMBER	INT	#####	0-999999999999	Y	FK	CUSTOMER
	PHONE_NUMBER	CUSTOMER PHONE NUMBER	INT	999-999-99-99	TR	Y		
	PHONE_DESCRIPTION	PHONE DESCRIPTION	CHAR(50)	XXXXXXXXXX	TR	Y		
	E_PHONE_ID	EMPLOYEE PHONE NUMBER IDENTIFICATION	INT	#####	0-99999999	Y	PK	
	EMPLOYEE_ID	EMPLOYEE IDENTIFICATION NUMBER	INT	####	0-999999	Y	FK	EMPLOYEE
	PHONE_NUMBER	PHONE NUMBER IDENTIFICATION NUMBER	INT	999-999-99-99	TR	Y		
LOCATION	PHONE_DESCRIPTION	PHONE DESCRIPTION	CHAR(50)	XXXXXXXXXX	TR	Y		
	LOCATION_ID	LOCATION IDENTIFICATION NUMBER	INT	#####	0-9999999999	Y	PK	
	STREET_NAME	STREET NAME	CHAR(50)	XXXXXXXXXXXX	TR	Y		
	CITY_ID	CITY IDENTIFICATION NUMBER	SMALLINT	##	00-99	Y	FK	CITY
	NEIGHBORHOOD_NAME	NEIGHBORHOODNAME	NVARCHAR(50)	XXXXXXXXXX	TR	Y		
	APARTMENT_NO	APARTMENT NUMBER	INT	###	0-999	Y		
	FLOOR	FLOOR NUMBER	SMALLINT	##	0-999			
	ZIP_CODE	ZIP CODE	SMALLINT	####	00000-99999	N		
	CITY_ID	CITY IDENTIFICATION NUMBER	INT	####	0-99999	Y	PK	
	COUNTRY_ID	COUNTRY IDENTIFICATION	INT	####	0-99999	Y	FK	COUNTRY
CITY	COUNTRY_ID	COUNTRY IDENTIFICATION	INT	####	0-99999	Y		
	CITY_TELEPHONE_CODE	CITY TELEPHONE CODE	SMALLINT	##	0-999	Y		
	CITY_NAME	CITY NAME	CHAR(50)	XXXXXXXXXX	TR	Y		
COUNTRY	COUNTRY_ID	COUNTRY IDENTIFICATION	INT	####	0-99999	Y	PK	
	COUNTRY_NAME	COUNTRY NAME	CHAR(50)	XXXXXXXXXX	TR	Y		
	COUNTRY_TELEPHONE_CODE	COUNTRY TELEPHONE CODE	SMALLINT	##	0-999	Y		
	COUNTRY_CODE	COUNTRY CODE	SMALLINT	###	0-999	Y		

PK= Primary Key

FK = Foreign Key

CHAR = Fixed character length

data, 1 to 255.

VARCHAR = Variable character length data, 1 to 4000.

INT = Integer values only.

SMALLINT = Small integer values only.

DATE format dd-mon-yyyy

TIME format hh:mm

6.ER DIAGRAM

