**Bank Database Project Documentation**

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***Project Overview***

*This project involves the creation of a bank database named `Bank\_X` using SQL Server Management Studio (SSMS). The objective is to modernize and secure the data management system for a newly acquired financial institution. The database consists of various tables to manage clients, accounts, funds, movements, expenses, operators, and services. Below are the detailed steps taken to design and implement this database.*

***1. Database Structure***

The database `Bank\_X` is structured to include the following tables:

- Client

- Compte

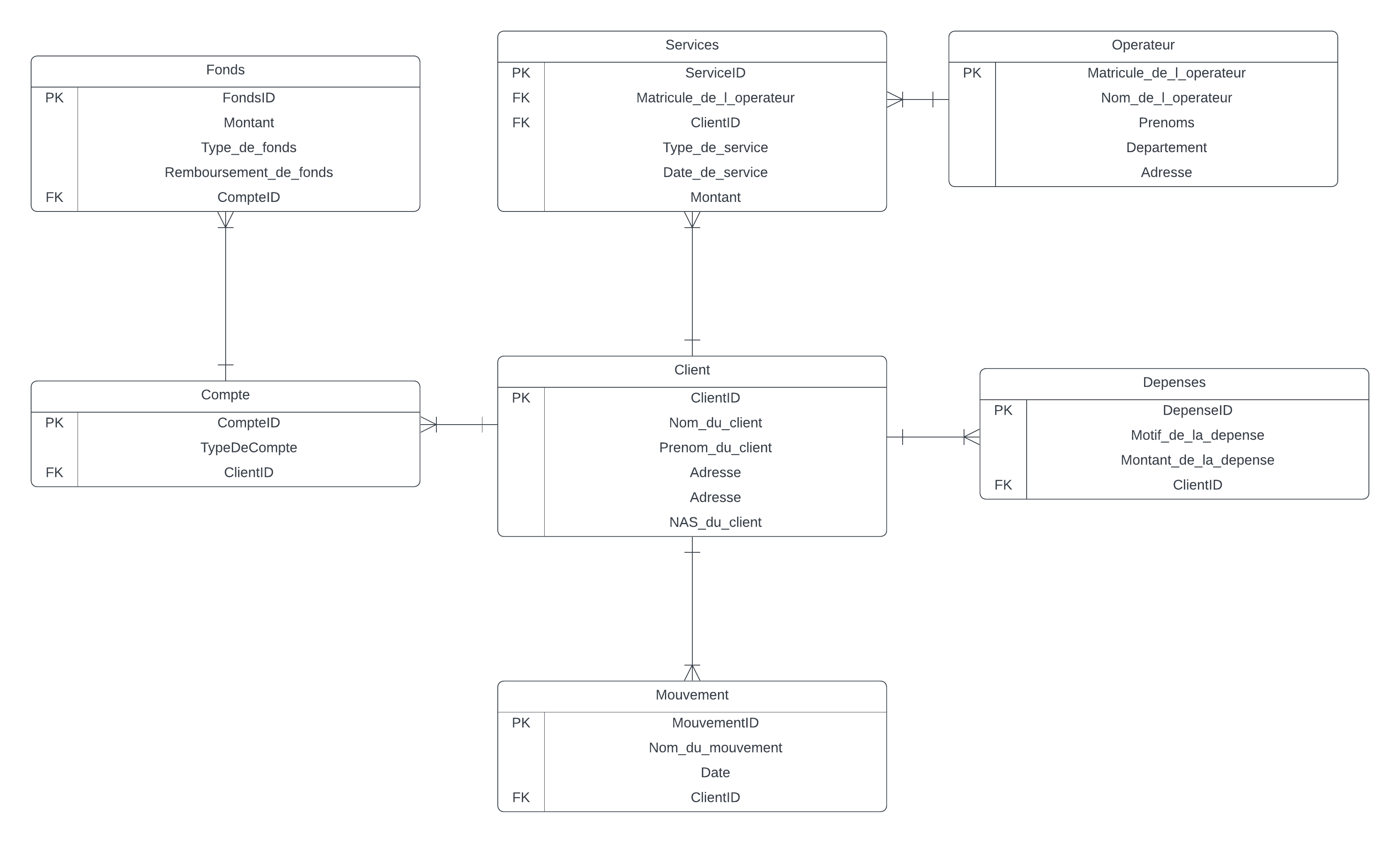
- Fonds

- Mouvement

- Depenses

- Operateur

- Services



Each table serves a specific purpose and has defined relationships with other tables to ensure data integrity and optimization.

**2. Table Creation**

Below are the SQL scripts used to create each table:

CREATE TABLE Client (

ClientID INT PRIMARY KEY,

Nom\_du\_client VARCHAR(255) NOT NULL,

Prenom\_du\_client VARCHAR(255) NOT NULL,

Telephone VARCHAR(20) NOT NULL,

Adresse VARCHAR(255) NOT NULL,

NAS\_du\_client VARCHAR(20) NOT NULL

);

CREATE TABLE Compte (

CompteID INT PRIMARY KEY,

ClientID INT,

CONSTRAINT FK\_Compte\_Client FOREIGN KEY (ClientID) REFERENCES Client(ClientID)

);

CREATE TABLE Fonds (

FondsID INT PRIMARY KEY IDENTITY(1,1) NOT NULL,

Montant DECIMAL(18, 2) NOT NULL,

Type\_de\_fonds VARCHAR(255) NOT NULL,

Remboursement\_de\_fonds DECIMAL(18, 2) NOT NULL,

AccountID INT,

CONSTRAINT FK\_Fonds\_Compte FOREIGN KEY (CompteID) REFERENCES Compte(CompteID)

);

CREATE TABLE Mouvement (

MouvementID INT PRIMARY KEY IDENTITY(1,1) NOT NULL,

Nom\_du\_mouvement VARCHAR(255) NOT NULL,

Date DATETIME NOT NULL,

ClientID INT,

CONSTRAINT FK\_Mouvement\_Client FOREIGN KEY (ClientID) REFERENCES Client(ClientID)

);

CREATE TABLE Operateur (

Matricule\_de\_l\_operateur INT PRIMARY KEY NOT NULL,

Nom\_de\_l\_operateur VARCHAR(255) NOT NULL,

Prenoms VARCHAR(255) NOT NULL,

Departement VARCHAR(255) NOT NULL,

Adresse VARCHAR(255) NOT NULL

);

CREATE TABLE Services (

ServiceID INT PRIMARY KEY IDENTITY(1,1) NOT NULL,

Matricule\_de\_l\_operateur INT,

ClientID INT,

Type\_de\_service VARCHAR(255),

Date\_de\_service DATETIME,

Montant DECIMAL(10, 2),

CONSTRAINT FK\_Services\_Client FOREIGN KEY (ClientID) REFERENCES Client(ClientID),

CONSTRAINT FK\_Services\_Operateur FOREIGN KEY (Matricule\_de\_l\_operateur) REFERENCES Operateur(Matricule\_de\_l\_operateur)

);

CREATE TABLE Depenses (

DepenseID INT PRIMARY KEY IDENTITY(1,1) NOT NULL,

Motif\_de\_la\_depense VARCHAR(255) NOT NULL,

Montant\_de\_la\_depense DECIMAL(18, 2) NOT NULL,

ClientID INT,

CONSTRAINT FK\_Depenses\_Client FOREIGN KEY (ClientID) REFERENCES Client(ClientID)

);

**3. Data Insertion**

Data was inserted into the tables using the following SQL statements to ensure the database is populated and ready for queries:

INSERT INTO Client (Nom\_du\_client, Prenom\_du\_client, Telephone, Adresse, NAS\_du\_client)

VALUES

('Dupont', 'Jean', '514-123-4567', '123 Rue Saint-Denis, Montréal', '123-456-789'),

('Tremblay', 'Marie', '514-234-5678', '456 Rue Sherbrooke, Montréal', '234-567-890'),

('Lavoie', 'Paul', '514-345-6789', '789 Rue Ontario, Montréal', '345-678-901'),

('Gagnon', 'Lucie', '514-456-7890', '101 Rue de la Gauchetière, Montréal', '456-789-012'),

('Roy', 'Sophie', '514-567-8901', '202 Avenue du Mont-Royal, Montréal', '567-890-123'),

('Côté', 'Marc', '514-678-9012', '303 Boulevard Saint-Laurent, Montréal', '678-901-234'),

('Bouchard', 'Julie', '514-789-0123', '404 Rue Sainte-Catherine, Montréal', '789-012-345'),

('Gauthier', 'André', '514-890-1234', '505 Rue Papineau, Montréal', '890-123-456'),

('Morin', 'Claire', '514-901-2345', '606 Chemin de la Côte-des-Neiges, Montréal', '901-234-567'),

('Lévesque', 'René', '514-012-3456', '707 Rue Jean-Talon, Montréal', '012-345-678'),

('Fortin', 'Patricia', '514-123-4567', '808 Avenue McGill College, Montréal', '123-456-789'),

('Pelletier', 'Louis', '514-234-5678', '909 Boulevard René-Lévesque, Montréal', '234-567-890'),

('Bergeron', 'Anne', '514-345-6789', '1010 Rue Notre-Dame, Montréal', '345-678-901'),

('Leclerc', 'Guy', '514-456-7890', '1111 Avenue des Pins, Montréal', '456-789-012'),

('Bélanger', 'Isabelle', '514-567-8901', '1212 Boulevard de Maisonneuve, Montréal', '567-890-123');

INSERT INTO Compte (ClientID, TypeDeCompte)

VALUES

(1, 'Compte Courant'),

(1, 'Compte Épargne'),

(2, 'Compte Courant'),

(3, 'Compte Courant'),

(3, 'Compte Épargne'),

(4, 'Compte Épargne'),

(5, 'Compte Courant'),

(6, 'Compte Courant'),

(6, 'Compte Épargne'),

(7, 'Compte Épargne'),

(8, 'Compte Courant'),

(9, 'Compte Courant'),

(9, 'Compte Épargne'),

(10, 'Compte Épargne'),

(11, 'Compte Courant'),

(12, 'Compte Courant'),

(12, 'Compte Épargne'),

(13, 'Compte Épargne'),

(14, 'Compte Courant'),

(15, 'Compte Courant'),

(15, 'Compte Épargne');

INSERT INTO Depenses (Motif\_de\_la\_depense, Montant\_de\_la\_depense, ClientID)

VALUES

('Achat en ligne', 120.50, 1),

('Facture électricité', 90.75, 2),

('Supermarché', 230.00, 3),

('Abonnement musique', 15.99, 4),

('Achat en ligne', 45.30, 5),

('Facture électricité', 110.20, 6),

('Supermarché', 180.45, 7),

('Abonnement gym', 29.99, 8),

('Achat en ligne', 99.99, 9),

('Facture téléphone', 49.50, 10),

('Supermarché', 210.00, 11),

('Abonnement musique', 9.99, 12),

('Achat en ligne', 60.00, 13),

('Facture électricité', 105.25, 14),

('Supermarché', 195.75, 15),

('Achat en Ligne', 500.00, 1),

('Casino', 700.00, 3);

INSERT INTO Fonds (Montant, Type\_de\_fonds, Remboursement\_de\_fonds, CompteID)

VALUES

(5000.00, 'fonds communs de placement', 250.00, 1),

(6000.00, 'fonds distincts', 300.00, 2),

(7000.00, 'fonds négociés en bourse', 350.00, 3),

(8000.00, 'fonds communs de placement', 400.00, 4),

(9000.00, 'fonds distincts', 450.00, 5),

(10000.00, 'fonds négociés en bourse', 500.00, 6),

(11000.00, 'fonds communs de placement', 550.00, 7),

(12000.00, 'fonds distincts', 600.00, 8),

(13000.00, 'fonds négociés en bourse', 650.00, 9),

(14000.00, 'fonds communs de placement', 700.00, 10),

(15000.00, 'fonds distincts', 750.00, 11),

(16000.00, 'fonds négociés en bourse', 800.00, 12),

(17000.00, 'fonds communs de placement', 850.00, 13),

(18000.00, 'fonds distincts', 900.00, 14),

(19000.00, 'fonds négociés en bourse', 950.00, 15);

INSERT INTO Mouvement (Nom\_du\_mouvement, Date, ClientID)

VALUES

('Dépôt', '2023-01-10 00:00:00', 1),

('Retrait', '2023-01-15 00:00:00', 1),

('Virement', '2023-02-01 00:00:00', 2),

('Dépôt', '2023-02-10 00:00:00', 3),

('Retrait', '2023-02-20 00:00:00', 3),

('Virement', '2023-03-05 00:00:00', 4),

('Dépôt', '2023-03-10 00:00:00', 5),

('Retrait', '2023-03-15 00:00:00', 5),

('Virement', '2023-04-01 00:00:00', 6),

('Dépôt', '2023-04-10 00:00:00', 7),

('Retrait', '2023-04-15 00:00:00', 7),

('Virement', '2023-05-01 00:00:00', 8),

('Dépôt', '2023-05-10 00:00:00', 9),

('Retrait', '2023-05-15 00:00:00', 9),

('Virement', '2023-06-01 00:00:00', 10);

INSERT INTO Operateur (Matricule\_de\_l\_operateur, Nom\_de\_l\_operateur, Prenoms, Departement, Adresse)

VALUES

(101, 'Martin', 'Luc', 'Comptabilité', '123 Rue Principale, Montréal'),

(102, 'Dupuis', 'Émilie', 'Crédit', '456 Avenue du Parc, Québec'),

(103, 'Leroy', 'Jean', 'Service client', '789 Boulevard de Maisonneuve, Montréal'),

(104, 'Moreau', 'Claire', 'Crédit', '1010 Rue Sherbrooke, Montréal'),

(105, 'Petit', 'Marc', 'Comptabilité', '1111 Chemin Sainte-Foy, Québec'),

(106, 'Durand', 'Sophie', 'Service client', '1212 Rue Saint-Jean, Québec'),

(107, 'Lefebvre', 'Patrick', 'Crédit', '1313 Rue de la Montagne, Montréal'),

(108, 'Roy', 'Isabelle', 'Comptabilité', '1414 Avenue McGill, Montréal'),

(109, 'Gagnon', 'Thierry', 'Service client', '1515 Rue Sainte-Catherine, Montréal'),

(110, 'Boucher', 'Nathalie', 'Crédit', '1616 Boulevard Laurier, Québec'),

(111, 'Poirier', 'Bruno', 'Comptabilité', '1717 Avenue du Mont-Royal, Montréal'),

(112, 'Morin', 'Julie', 'Service client', '1818 Rue Papineau, Montréal'),

(113, 'Fortin', 'Denis', 'Crédit', '1919 Boulevard Saint-Laurent, Québec'),

(114, 'Pelletier', 'Louise', 'Comptabilité', '2020 Rue Saint-Denis, Montréal'),

(115, 'Bertrand', 'Anne', 'Service client', '2121 Boulevard René-Lévesque, Québec');

INSERT INTO Services (Matricule\_de\_l\_operateur, ClientID, Type\_de\_service, Date\_de\_service, Montant)

VALUES

(101, 1, 'Conseil financier', '2023-01-15 00:00:00', 200.00),

(102, 2, 'Ouverture de compte', '2023-01-20 00:00:00', 0.00),

(103, 3, 'Assistance en ligne', '2023-01-25 00:00:00', 0.00),

(104, 4, 'Gestion de portefeuille', '2023-02-01 00:00:00', 300.00),

(105, 5, 'Analyse de crédit', '2023-02-05 00:00:00', 150.00),

(106, 6, 'Assurance vie', '2023-02-10 00:00:00', 250.00),

(107, 7, 'Rachat de crédit', '2023-02-15 00:00:00', 0.00),

(108, 8, 'Conseil pour investissement', '2023-02-20 00:00:00', 200.00),

(109, 9, 'Service après-vente', '2023-02-25 00:00:00', 0.00),

(110, 10, 'Planification de retraite', '2023-03-01 00:00:00', 400.00),

(111, 1, 'Consultation juridique', '2023-03-05 00:00:00', 250.00),

(112, 2, 'Conseil immobilier', '2023-03-10 00:00:00', 200.00),

(113, 3, 'Optimisation fiscale', '2023-03-15 00:00:00', 300.00),

(114, 4, 'Gestion des risques', '2023-03-20 00:00:00', 150.00),

(115, 5, 'Solutions de financement', '2023-03-25 00:00:00', 0.00),

(101, 6, 'Conseil financier', '2023-04-01 00:00:00', 200.00),

(102, 6, 'Ouverture de compte', '2023-04-02 00:00:00', 0.00),

(103, 6, 'Assistance en ligne', '2023-04-03 00:00:00', 0.00);

```

**4. Queries**

Several SQL queries were created to retrieve and analyze data from the database:

**Sum of Total Reimbursements for Each Type of Fund:**

SELECT Type\_de\_fonds, SUM(Remboursement\_de\_fonds) AS Somme\_Totale\_Remboursements

FROM Fonds

GROUP BY Type\_de\_fonds;

**Clients with Expenses Above the Average:**

SELECT c.ClientID, c.Nom\_du\_client, c.Prenom\_du\_client

FROM Client c

JOIN Depenses d ON c.ClientID = d.ClientID

GROUP BY c.ClientID, c.Nom\_du\_client, c.Prenom\_du\_client

HAVING SUM(d.Montant\_de\_la\_depense) > (SELECT AVG(Montant\_de\_la\_depense) FROM Depenses);

**Operators in the Same Department Serving a Specific Client:**

SELECT DISTINCT o.Matricule\_de\_l\_operateur, o.Nom\_de\_l\_operateur, o.Departement

FROM Operateur o

JOIN Services s ON o.Matricule\_de\_l\_operateur = s.Matricule\_de\_l\_operateur

JOIN Client c ON s.ClientID = c.ClientID

WHERE EXISTS (

SELECT 1

FROM Operateur o2

JOIN Services s2 ON o2.Matricule\_de\_l\_operateur = s2.Matricule\_de\_l\_operateur

JOIN Client c2 ON s2.ClientID = c2.ClientID

WHERE o2.Departement = o.Departement

AND c2.NAS\_du\_client = (SELECT NAS\_du\_client FROM Client WHERE ClientID = 3)

)

AND c.NAS\_du\_client = (SELECT NAS\_du\_client FROM Client WHERE ClientID = 3);

Operators Performing Movements After a Specific Client's Last Expense:

SELECT DISTINCT o.Matricule\_de\_l\_operateur, o.Nom\_de\_l\_operateur, o.Departement

FROM Operateur o

JOIN Services s ON o.Matricule\_de\_l\_operateur = s.Matricule\_de\_l\_operateur

JOIN Client c ON s.ClientID = c.ClientID

WHERE s.Date\_de\_service > (

SELECT MAX(Date\_de\_service)

FROM Services s2

JOIN Client c2 ON s2.ClientID = c2.ClientID

WHERE c2.NAS\_du\_client = '012-345-678'

);

**Security Implementation**

To apply security rules on the `Bank\_X` database, the following measures were proposed and implemented. Passwords are required to be changed upon the first login to enhance security. Below is the list of employees and their roles along with the necessary steps to secure the database.

|  |  |
| --- | --- |
| **Name** | **Fonction** |
| Daniel | Directeur de la banque |
| Smith | Directeur des opérations |
| Jacqueline | Gestionnaire des comptes |
| Williams | Analyste financier |
| Anthony | Conseiller en investissement |
| Patrick | Agent de crédit |
| Robert | Responsable de la conformité réglementaire |
| Céline | Opérateur |
| Gabaski | Service à la clientèle |
| Grâce | Accueil |

##### 1. Creating Logins with Password Change Requirement

CREATE LOGIN Anthony WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Celine WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Daniel WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Gabaski WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Grace WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Jacqueline WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Patrick WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Robert WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Smith WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

CREATE LOGIN Williams WITH PASSWORD = 'MotDePasseTemporaire!' MUST\_CHANGE, CHECK\_EXPIRATION = ON;

```

##### 2. Creating Users Associated with Logins in the Database

CREATE USER [Anthony] FOR LOGIN [Anthony] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Celine] FOR LOGIN [Celine] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Daniel] FOR LOGIN [Daniel] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Gabaski] FOR LOGIN [Gabaski] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Grace] FOR LOGIN [Grace] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Jacqueline] FOR LOGIN [Jacqueline] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Patrick] FOR LOGIN [Patrick] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Robert] FOR LOGIN [Robert] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Smith] FOR LOGIN [Smith] WITH DEFAULT\_SCHEMA=[dbo];

CREATE USER [Williams] FOR LOGIN [Williams] WITH DEFAULT\_SCHEMA=[dbo];

##### 3. Creating Roles

CREATE ROLE [Accueil];

CREATE ROLE [Agent\_de\_credit];

CREATE ROLE [Analyste];

CREATE ROLE [Conseiller];

CREATE ROLE [Directeur];

CREATE ROLE [Gestionnaire];

CREATE ROLE [Responsable\_conformite];

CREATE ROLE [Service\_Client];

##### 4. Assigning Roles to Users

ALTER ROLE [Directeur] ADD MEMBER [Daniel];

ALTER ROLE [Directeur] ADD MEMBER [Smith];

ALTER ROLE [Gestionnaire] ADD MEMBER [Jacqueline]

ALTER ROLE [Analyste] ADD MEMBER [Williams]

ALTER ROLE [Conseiller] ADD MEMBER [Anthony]

ALTER ROLE [Agent\_de\_credit] ADD MEMBER [Patrick]

ALTER ROLE [Responsable\_conformite] ADD MEMBER [Robert]

ALTER ROLE [Service\_Client] ADD MEMBER [Celine]

ALTER ROLE [Service\_Client] ADD MEMBER [Gabaski]

ALTER ROLE [Accueil] ADD MEMBER [Grace]

##### 5. Granting Access Rights to Roles

\*\*Accueil:\*\*

GRANT SELECT ON Client TO Accueil;

\*\*Agent\_de\_credit:\*\*

GRANT SELECT, INSERT, UPDATE ON Compte TO Agent\_de\_credit;

GRANT SELECT, INSERT, UPDATE ON Fonds TO Agent\_de\_credit;

\*\*Analyste:\*\*

GRANT SELECT ON Client TO Analyste;

GRANT SELECT ON Compte TO Analyste;

GRANT SELECT ON Fonds TO Analyste;

GRANT SELECT ON Mouvement TO Analyste;

GRANT SELECT ON Services TO Analyste;

\*\*Conseiller:\*\*

GRANT SELECT, INSERT ON Client TO Conseiller;

GRANT SELECT, INSERT ON Services TO Conseiller;

\*\*Directeur:\*\*

GRANT SELECT, INSERT, UPDATE, DELETE ON Client TO Directeur;

GRANT SELECT, INSERT, UPDATE, DELETE ON Compte TO Directeur;

GRANT SELECT, INSERT, UPDATE, DELETE ON Fonds TO Directeur;

GRANT SELECT, INSERT, UPDATE, DELETE ON Mouvement TO Directeur;

GRANT SELECT, INSERT, UPDATE, DELETE ON Services TO Directeur;

GRANT SELECT, INSERT, UPDATE, DELETE ON Operateur TO Directeur;

\*\*Gestionnaire:\*\*

GRANT SELECT, UPDATE ON Client TO Gestionnaire;

GRANT SELECT, UPDATE ON Compte TO Gestionnaire;

GRANT SELECT, UPDATE ON Fonds TO Gestionnaire;

\*\*Responsable\_conformite:\*\*

GRANT SELECT ON Client TO Responsable\_conformite;

GRANT SELECT ON Compte TO Responsable\_conformite;

GRANT SELECT ON Fonds TO Responsable\_conformite;

GRANT SELECT ON Mouvement TO Responsable\_conformite;

GRANT SELECT ON Services TO Responsable\_conformite;

\*\*Service\_Client:\*\*

GRANT SELECT, INSERT ON Client TO Service\_Client;

GRANT SELECT, INSERT ON Services TO Service\_Client;

**Conclusion**

The creation and implementation of the `Bank\_X` database have established a solid foundation for managing the bank's data. Security measures have been integrated to ensure that data access is appropriately restricted based on roles and responsibilities. This project has demonstrated the ability to design, populate, and secure a comprehensive database system using SQL Server Management Studio.

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