

Database Management System Implementation for Horizon Bank

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1. Introduction

North Star Consultants

North Star Consultants is a leading consultancy dedicated to designing and implementing cutting-edge Database Management Systems (DBMS) for businesses across various industries. With a team of highly skilled database experts and a passion for data optimization, we specialize in helping financial institutions harness the full potential of their data resources.

Mission Statement:

“Our mission is to offer comprehensive DBMS solutions that enable financial institutions to unlock the true value of their data assets and ensure that our clients thrive in a rapidly evolving financial landscape.”

Vision Statement:

“To be the trusted partner of choice for financial institutions seeking excellence in optimizing data storage, retrieval, and analysis, ensuring our clients stay ahead in today's data-driven world”.

Our Services:

- **Data Quality Assurance:** We ensure your data is accurate, consistent, and reliable, eliminating errors and inaccuracies.
- **Data Transformation:** We convert raw data into actionable insights, seamlessly integrating data from multiple sources.
- **Insights for Success:** We provide client-centric insights to empower strategic planning and drive success.
- **Engaging Reporting:** Our visualizations and reports offer clarity and actionable recommendations.

Why Invest in us?

We have a history of over 100+ successful database implementations and satisfied clients in our 2 years of existence. Our solutions are high in demand and our expertise and commitment to excellence ensure investor confidence in our ability to execute and deliver results.

Customer Background

Horizon Bank is a prominent bank with over 50 branches across the United States. The bank wants to launch a new loan product for its loyal customers (more than 2 years with the bank). In addition, the bank is grappling with soaring marketing expenditures and an alarming drain on resources due to inefficient marketing campaigns. Horizon Bank is in dire need of a database with insights for optimizing their marketing strategies targeting the right customers, reducing expenses, and maximizing the effectiveness of their campaigns to maintain a competitive edge in the financial sector.

Value Proposition

1. To Build a relational database for managing the data set of the bank and leverage advanced data analytics and predictive modeling
2. To identify customers who qualify for the loan loyalty product for targeted marketing
3. To provide customer insights to enable the bank to develop a marketing strategy that minimizes expenses while delivering superior results.

Industries of Focus

1. Financial Services:

- Banking: Assisting banks in optimizing customer experience, risk management, and data analytics.
- Insurance: Providing data-driven insights for pricing, underwriting, and claims processing.

2. Retail and E-commerce:

- Retail Chains: Helping retail giants enhance inventory management, customer segmentation, and marketing strategies.
- E-commerce: Supporting e-commerce platforms with data-driven recommendations for product recommendations and customer retention.

3. Healthcare:

- Hospitals and Clinics: Offering data solutions for patient care optimization, resource allocation, and healthcare analytics.
- Pharmaceuticals: Assisting pharmaceutical companies in drug research, clinical trials, and supply chain management.
- Offers real-time production monitoring and supply chain optimization.

Customer Background

Horizon Bank is a prominent bank with over 50 branches across the United States. The bank wants to launch a new loan product for its loyal customers (more than 2 years with the bank). In addition, the bank is grappling with soaring marketing expenditures and an alarming drain on resources due to inefficient marketing campaigns. Horizon Bank is in dire need of a database with insights for optimizing their marketing strategies targeting the right customers, reducing expenses, and maximizing the effectiveness of their campaigns to maintain a competitive edge in the financial sector.

About the Database

The database developed by North Star Consultants is a robust solution designed to meet Horizon Bank's critical needs for data management and marketing optimization. It serves as a central repository for storing and managing essential customer-related information, enabling targeted marketing strategies and in-depth campaign analysis.

Industry or Domain

Horizon Bank operates in the finance industry, specifically the banking sector. Our database solution is tailored to the unique requirements of this industry, focusing on data-driven decision-making, marketing strategy optimization, and customer relationship management.

2. Database Schema

Database Structure

The database comprises five principal tables, each with a well-defined purpose:

- **Customers:** This table holds comprehensive customer data, encompassing demographics and personal details.
- **Customer_Accounts:** It manages customer account-related information, including account balance.
- **Loans:** This table records customer loan details.
- **Contacts:** It tracks customer interactions, campaign data, and contact history.
- **Subscriptions:** This table stores information pertaining to customer subscriptions.

Table Descriptions

Let's delve into the specifics of each table.

Customers: This table serves as the core of the database, housing essential customer information. It includes fields for demographics, personal details, and identifiers. The `customer_ID` is the primary key for the table and it uniquely identifies each customer. It has a connection with all the tables.

The screenshot displays the MySQL Workbench interface. The left sidebar shows the 'SCHEMAS' tree with 'horizon_bank' expanded, listing tables like 'bank_campaign', 'contacts', 'customer_accounts', 'customers', 'loans', 'subscriptions', 'Views', 'Stored Procedures', and 'Functions'. The 'customers' table is selected, and its structure is shown in the 'Table: customers' panel. The columns are: `Customer_ID` (int PK), `MaritalStatus` (varchar(50)), `First_Name` (varchar(50)), `Last_Name` (varchar(50)), `Nationality` (varchar(50)), `Age` (int), `Job` (varchar(50)), and `Education` (varchar(50)).

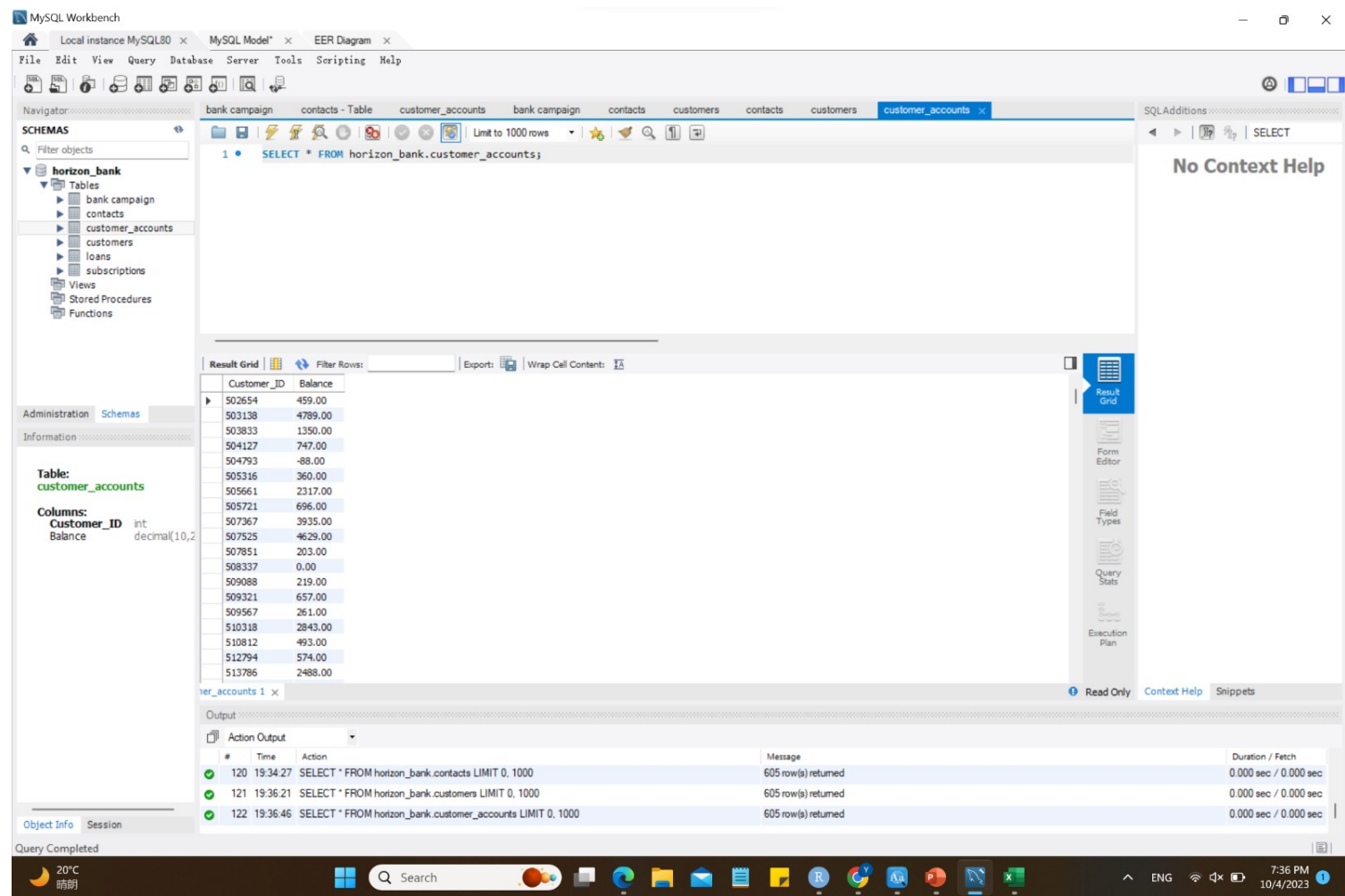
The main window shows a SQL query: `SELECT * FROM horizon_bank.customers;` The 'Result Grid' displays 20 rows of customer data. The 'Output' panel at the bottom shows the execution of the query, indicating that 605 row(s) were returned.

Customer_ID	MaritalStatus	First_Name	Last_Name	Nationality	Age	Job	Education
502654	Married	Karsyn	Ballard	US	31	services	primary
503138	Married	Riley	Medina	US	33	services	secondary
503833	Married	Haisley	Henson	US	35	management	tertiary
504127	Married	Paris	Conner	US	35	management	tertiary
504793	Married	Ailani	Weiss	US	43	services	primary
505316	Married	David	Fuller	US	31	blue-collar	secondary
505661	Married	Ulyana	Clarke	US	37	admin.	tertiary
505721	Married	Stetson	Gray	US	67	retired	other
507367	Married	Leo	Velasquez	US	33	management	secondary
507525	Married	Jalayah	Rangel	US	61	admin.	other
507851	Married	Amy	Reilly	US	51	blue-collar	secondary
508337	Married	Matias	Rollins	US	37	management	tertiary
509088	Married	Alyah	Campbell	US	40	unemployed	secondary
509321	Married	Anika	Gillespie	US	52	services	secondary
509567	Married	Jax	Santana	US	30	admin.	tertiary
510318	Married	Xiomara	Cardenas	US	36	blue-collar	secondary
510812	Married	Hassan	Hughes	US	38	management	tertiary
512794	Married	Milani	Stevenson	US	32	management	tertiary
513786	Married	Julita	Cisneros	US	21	student	secondary

Use cases

- Marketing Department:** They can utilize the customer demographics (e.g., age, marital status) for targeted marketing campaigns.
- Customer Relationship Management (CRM) Department:** This will enable them to maintain and update customer profiles for personalized services.

Customer_Accounts: This table is closely related to the customer table and stores account-related data. It establishes a one-to-one relationship with the customer table through the Customer_ID as a foreign key from the customer table.



Use cases

1. **Loan and Credit Department:** To access account balance data for loan eligibility assessments.
2. **Risk Management Department:** In order to monitor account balances and financial transactions to assess and mitigate risks.
3. **Finance and Accounting Department:** This will enable the team access account balance and transaction data for financial reporting and auditing.

Loans: The loans table records details about customer loans, including types and terms. It maintains a one-to-one relationship with the customer table.

MySQL Workbench

Local instance MySQL80 x MySQL Model* x EER Diagram x

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

Filter objects

horizon_bank

Tables

bank_campaign

contacts

customer_accounts

customers

loans

subscriptions

Views

Stored Procedures

Functions

Administration Schemas

Information

Table: loans

Columns:

Customer_ID int

Housing_Loan varchar(10)

Personal_Loan varchar(10)

bank_campaign contacts - Table customer_accounts bank_campaign contacts customers contacts customers customer_accounts loans x

1 SELECT * FROM horizon_bank.loans;

Limit to 1000 rows

SQL Additions

SELECT

No Context Help

Result Grid

Filter Rows:

Export: Wrap Cell Content: I

Customer_ID	Housing_Loan	Personal_Loan
502654	yes	no
503138	yes	yes
503833	yes	no
504127	no	no
504793	yes	yes
505316	yes	yes
505661	yes	no
505721	no	no
507367	yes	no
507525	yes	no
507851	yes	no
508337	no	no
509088	yes	no
509321	no	no
509567	no	no
510318	no	no
510812	yes	no
512794	yes	no
513786	no	no

loans 1 x

Read Only Context Help Snippets

Output

Action Output

#	Time	Action	Message	Duration / Fetch
121	19:36:21	SELECT * FROM horizon_bank.customers LIMIT 0, 1000	605 row(s) returned	0.000 sec / 0.000 sec
122	19:36:46	SELECT * FROM horizon_bank.customer_accounts LIMIT 0, 1000	605 row(s) returned	0.000 sec / 0.000 sec
123	19:37:29	SELECT * FROM horizon_bank.loans LIMIT 0, 1000	605 row(s) returned	0.016 sec / 0.000 sec

Query Completed

20°C 晴明

Search

7:37 PM 10/4/2023

Use cases

Loan and Credit Department: In order to evaluate and manage customer loan history and eligibility for future loan products.

Contacts: This table manages customer interactions, campaign data, and contact history. It establishes a one-to-many relationship with the customer table, allowing multiple contact records for a single customer. This implies that one customer may be contacted multiple times by the bank.

The screenshot displays the MySQL Workbench interface. On the left, the 'SCHEMAS' pane shows the 'horizon_bank' database with tables like 'bank_campaign', 'contacts', 'customer_accounts', 'customers', 'loans', and 'subscriptions'. The central pane shows a query: `SELECT * FROM horizon_bank.contacts;` with a 'Result Grid' below it. The 'Result Grid' displays a table with 9 columns: Customer_ID, Contact, Day_of_Month, Last_Contact_Month, Duration_Second, Campaign_Times, Past_Days, Previous_Contact, and Previous_Outcome. The table contains 18 rows of data. On the right, the 'SQLAdditions' pane shows 'No Context Help'. Below the table, the 'Action Output' pane shows three successful queries: `SELECT * FROM horizon_bank.contacts LIMIT 0, 1000`, `SELECT * FROM horizon_bank.customers LIMIT 0, 1000`, and `SELECT * FROM horizon_bank.contacts LIMIT 0, 1000`.

Customer_ID	Contact	Day_of_Month	Last_Contact_Month	Duration_Second	Campaign_Times	Past_Days	Previous_Contact	Previous_Outcome
502654	cellular	7	may	623	1	293	1	success
503138	cellular	11	may	220	1	339	4	failure
503833	cellular	16	apr	185	1	330	1	failure
504127	cellular	23	feb	141	2	176	3	failure
504793	cellular	17	apr	313	1	147	2	failure
505316	cellular	29	jan	89	1	241	1	failure
505661	cellular	20	apr	114	1	152	2	failure
505721	telephone	17	aug	119	1	105	2	failure
507367	cellular	6	may	765	1	342	2	failure
507525	cellular	27	jan	181	1	92	1	success
507851	cellular	8	may	134	1	170	5	failure
508337	cellular	16	jul	268	2	182	3	success
509088	cellular	17	nov	204	2	196	1	failure
509321	telephone	7	jul	398	2	460	2	failure
509567	cellular	19	oct	233	1	137	20	failure
510318	cellular	12	feb	473	1	182	1	success
510812	cellular	11	may	553	1	367	7	failure
512794	cellular	14	apr	259	2	145	3	failure
513786	cellular	30	jun	258	6	169	3	success

Use cases

1. **Marketing Department:** To track customer interactions and campaign effectiveness.
2. **Customer Relationship Management (CRM) Department:** To store and retrieve historical customer interactions for better customer support.
3. **Operations and Customer Support:** To access contact history to address customer inquiries and issues.

Subscriptions: This table captures information about customer subscriptions. It also maintains a one-to-one relationship with the customers table.

MySQL Workbench

Local instance MySQL80 x MySQL Model* x EER Diagram x

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

Filter objects

horizon_bank

Tables

- bank_campaign
- contacts
- customer_accounts
- customers
- loans
- subscriptions

Views

Stored Procedures

Functions

Administration Schemas

Information

Table: subscriptions

Columns:

- Customer_ID int
- Subscribe_Result varchar(50)

SQL Editor

1 SELECT * FROM horizon_bank.subscriptions;

Result Grid

Customer_ID	Subscribe_Result
502654	yes
503138	no
503833	no
504127	no
504793	no
505316	no
505661	no
505721	no
507367	yes
507525	yes
507851	no
508337	yes
509088	no
509321	yes
509567	no
510318	no
510812	no
512794	no
513786	yes

subscriptions 1 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
122	19:36:46	SELECT * FROM horizon_bank.customer_accounts LIMIT 0, 1000	605 row(s) returned	0.000 sec / 0.000 sec
123	19:37:29	SELECT * FROM horizon_bank.loans LIMIT 0, 1000	605 row(s) returned	0.016 sec / 0.000 sec
124	19:38:08	SELECT * FROM horizon_bank.subscriptions LIMIT 0, 1000	605 row(s) returned	0.000 sec / 0.000 sec

Query Completed

20°C 晴朗

Search

ENG

7:38 PM 10/4/2023

Use cases

Marketing Department: To enable the team to analyze subscription data to tailor marketing strategies for different customer segments.

3. Normalization

First Normal Form (1NF)

All the tables meet the requirements of 1NF because they contain atomic values in each column, each column has a unique identifier and no column is duplicated.

- **Customer:** The Customer table is in 1NF as it contains atomic values in each column. Each column holds single pieces of data, such as First_Name, Last_Name, and Age.
- **Customer_Account:** This table is also in 1NF as each column holds atomic values, such as Balance.
- **Loan:** The Loan table is in 1NF as it contains atomic values, such as Housing_Loan and Personal_Loan and they are independent of each other.
- **Contact:** This table is in 1NF because it holds atomic values, such as Contact, Day_of_Month, and Duration_Seconds.
- **Subscription:** The Subscription table is in 1NF as it contains atomic values, such as Subscribe_Result.

Second Normal Form (2NF)

All the tables meet the requirements of 2NF because they are in 1NF, and there are no partial dependencies.

- **Customer:** This table has a primary key, Customer_ID, and non-key attributes like MaritalStatus, First_Name, Last_Name, Nationality, Age, Job, and Education. All these attributes depend on the entire primary key, Customer_ID, and there are no partial dependencies. Therefore, the Customer table is in 2NF.
- **Customer_Account:** The Customer_Account table has a primary key, Customer_ID, and a non-key attribute, Balance. Balance depends on the entire primary key (Customer_ID), so there are no partial dependencies. Therefore, the table is in 2NF.
- **Loans:** The Loan table has a primary key, Customer_ID, and non-key attributes, Housing_Loan and Personal_Loan. Both attributes depend on the entire primary key, Customer_ID, with no partial dependencies. Therefore, the table is in 2NF.
- **Contacts:** The Contact table has a primary key, Customer_ID, and non-key attributes like Contact, Day_of_Month, Duration_Second, Campaign_Times, Past_Days, Previous_Contact, and Previous_Outcome. All these attributes depend on the entire primary key, Customer_ID, without partial dependencies. Therefore,

the Contacts table is in 2NF.

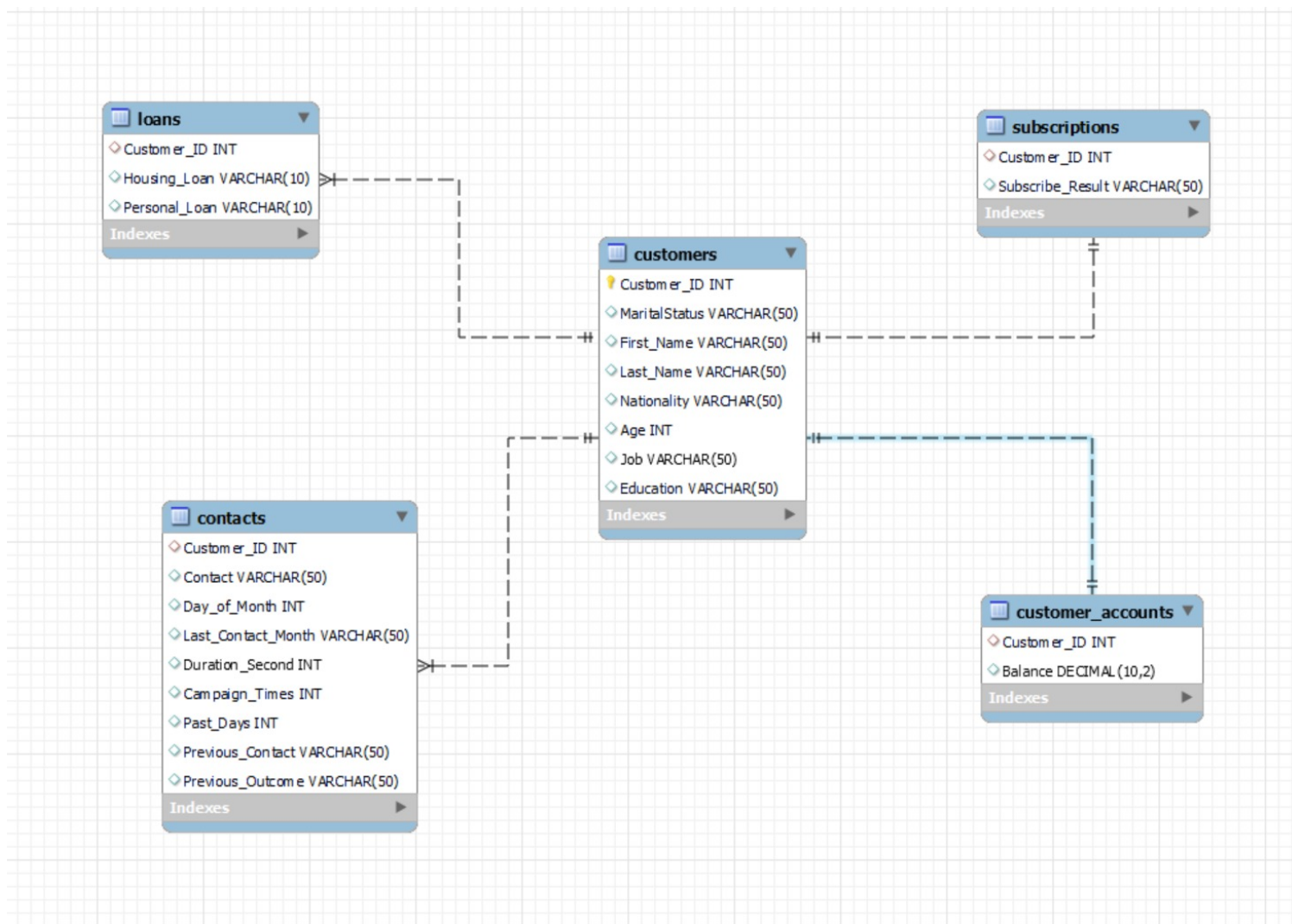
- **Subscriptions:** The Subscription table has a primary key, Customer_ID, and a non-key attribute, Subscribe_Result. Subscribe_Result depends on the entire primary key (Customer_ID), so there are no partial dependencies. This table is in 2NF.

Third Normal Form (3NF)

- **Customer:** The Customer table is in 3NF because all non-key attributes (MaritalStatus, First_Name, Last_Name, Nationality, Age, Job, Education) depend only on the primary key, Customer_ID. There are no transitive dependencies.
- **Customer_Account:** The Customer_Account table has a primary key, Customer_ID, and a non-key attribute, Balance. Balance does not depend on any other non-key attributes; it depends only on the primary key, Customer_ID. There are no transitive dependencies. Therefore, this table is in 3NF.
- **Loan:** The Loan table has a primary key, Customer_ID, and non-key attributes, Housing_Loan and Personal_Loan. These attributes depend solely on the primary key, Customer_ID, without any transitive dependencies. Thus, the Loan table is in 3NF.
- **Contact:** The Contact table has a primary key, Customer_ID, and non-key attributes like Contact, Day_of_Month, Duration_Second, Campaign_Times, Past_Days, Previous_Contact, and Previous_Outcome. All these attributes depend exclusively on the primary key, Customer_ID, with no transitive dependencies. Hence, the Contact table is in 3NF.
- **Subscription:** The Subscription table has a primary key, Customer_ID, and a non-key attribute, Subscribe_Result. Subscribe_Result does not depend on any other non-key attributes; it depends solely on the primary key, Customer_ID. There are no transitive dependencies. Therefore, this table is in 3NF.

4. EER Diagram

The Entity-Relationship Diagram (ERD) provides a visual representation of these relationships



Explanation of Entities and Relationships

In our Entity-Relationship (ER) diagram, several tables work together to form a comprehensive database for managing customer data and interactions within Horizon Bank. The **Customers** table serves as the central hub, representing bank customers. It is linked to other tables, including **Customer_Accounts** for tracking financial accounts, **Loans** for managing loans, **Contacts** for recording customer interactions, and **Subscriptions** for monitoring service. Together, these tables create a holistic view of customer relationships, financial activities, and interactions, enabling Horizon Bank to tailor its services, make informed decisions, and optimize customer engagement.

1. Customers Table (One-to-One and One-to-Many Relationships):

The customers table has a one-to-many relationship with all the tables except the subscription table and contacts table.

2. Customer_Accounts Table (One-to-One): Each customer can have one account, and each account is associated with one customer. This one-to-one relationship links customers to their account details, including balances and transactions.

3. Loans Table (One-to-Many): The loan table maintains a one-to-many relationship with customers. Each customer may have either a Personal Loan or Loan or both.

4. Contacts Table: This table has a Many-to-One Relationship with Customer Table: Many contact records can be associated with one customer. This allows for tracking multiple interactions a customer may have with the bank.

5. Subscription Table: This table has a Many-to-One Relationship with Customer Table: Many subscription records can be associated with one customer.

5. Conclusion

In conclusion, North Star Consultants has delivered a powerful and sophisticated database solution to Horizon Bank. This database serves as a cornerstone for data-driven decision-making, marketing optimization, and customer relationship management. Its implementation marks a significant milestone in Horizon Bank's quest for competitiveness and efficiency within the finance industry.