

|  |
| --- |
| Subway Business Template  **Subject areas** |
| **Logo / Image** |

Contents

[1 Business Description 3](#_Toc62212630)

[1.1 Business Background 3](#_Toc62212631)

[1.2 Problems. Current Situation 3](#_Toc62212632)

[1.3 The benefits of implementing a database. Project Vision 3](#_Toc62212633)

[2 Model description 3](#_Toc62212634)

[2.1 Definitions & Acronyms 3](#_Toc62212635)

[2.2 Logical Scheme 3](#_Toc62212636)

[2.3 Objects 3](#_Toc62212637)

# 

# Business Description

## Business background

Efficient management of a metro station system is crucial for urban transport networks. Metro stations require precise coordination across various operational dimensions, including train schedules, ticket sales, employee management, and infrastructure maintenance such as tunnels, tracks, and stations. Effective management ensures safety, reliability, and optimal passenger experience, contributing to urban mobility's overall efficiency and sustainability.

## Problems. Current Situation

Metro management faces several challenges due to manual data handling and disconnected systems. Key issues include:

* Inefficient scheduling causing delays and overcrowding.
* Inaccurate tracking of maintenance activities leading to infrastructure failures.
* Limited capability to analyze ticket sales and promotions effectively.
* Poor employee assignment processes, causing resource misallocation.

These issues increase operational costs, passenger satisfaction, and enlarge safety risks.

## the Benefits of implementing a database. Project Vision

Implementing a database system will:

1. Improve schedule accuracy and operational efficiency.
2. Enhance infrastructure maintenance tracking, reducing unexpected downtime.
3. Provide insights into passenger preferences and promotional effectiveness.
4. Facilitate better resource allocation through improved employee management.

# Model description

## Definitions & Acronyms

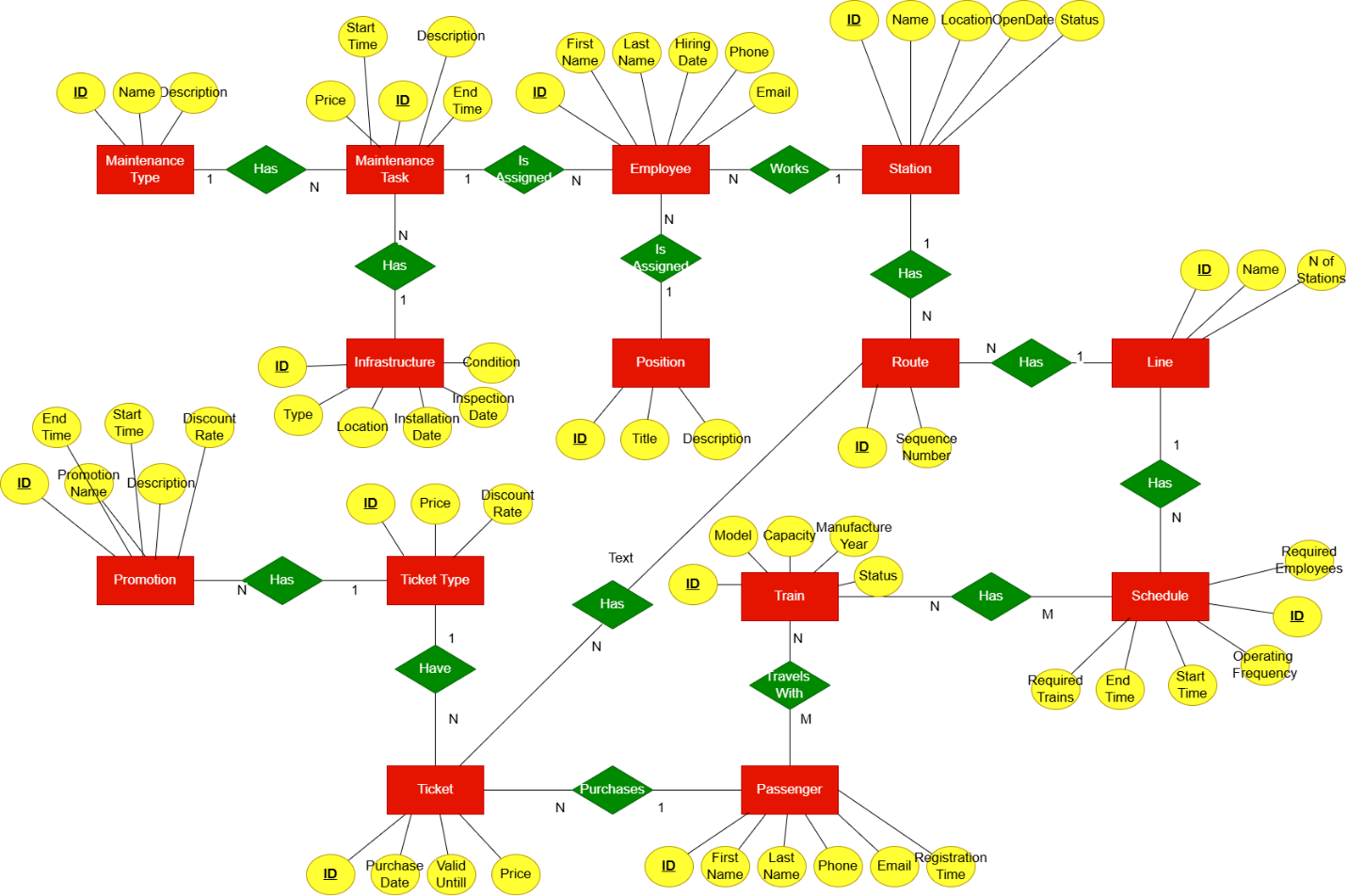
**PK**: Primary Key

**FK**: Foreign Key

**Operational Frequency**: How often trains run on a specific line.

**Infrastructure**: Physical assets of the metro such as tunnels, tracks, and stations.

## Logical Scheme



## Objects

Table Description

This table stores data about stations.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Stations | Station ID | PK, auto-increment | Int |
| Name  Location  OpenDate  Status | Not Null  Not Null  Not Null  Not Null | Varchar(100)  Varchar(150)  Date  Varchar(20) |

Comments on table relationships

Each station can be part of multiple routes, but each route step is linked to one specific station.

Example with data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Station ID | Name | Location | OpenDate | Status |
| 1 | Didube | Tbilisi | 01/10/1961 | Functional |

Describes each metro line, including starting and ending stations

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Line | Line ID | PK, auto-increment | Int |
| Name  StartStationID  EndStationID  TotalStations | Not Null  FK, Not Null  FK, Not Null  Not Null | Varchar(100)  Int  Int  Int |

Comments on table relationships

Each line has exactly one starting and ending station, but each station can serve as start or end for multiple lines, also each line can have multiple routes, but each route belongs to one line.

Example with data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Line ID | Name | StartStationID | EndStationID | TotalStations |
| 1 | Saburtalo Line | 4 | 36 | 7 |

Defines the sequence and association of stations within specific metro lines.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Route | Route ID | PK, auto-increment | Int |
| Line ID  Station ID  Sequence Number | FK, Not Null  FK, Not Null  Not Null | Int  Int  Int |

Comments on table relationships

Example with data

|  |  |  |  |
| --- | --- | --- | --- |
| Route ID | Line ID | Station ID | Sequence Number |
| 1 | 1 | 5 | 12 |

Contains information about individual trains including capacity and operational status.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Train | Train ID | PK, auto-increment | Int |
| Model  Capacity  Manufacture Year  Status | Not Null  Not Null  Not Null  Not Null | Varchar(50)  Int  Year  Varchar(20) |

Comments on table relationships

Example with data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Train ID | Model | Capacity | Manufacture Year | Status |
| 1 | MAN | 200 | 2004 | Functional |

Maintains data regarding employees, their positions, and assigned stations.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Employee | Employee ID | PK, auto-increment | Int |
| First Name  Last Name  Position ID  Assigned Station ID  Hire Date  Email  Phone | Not Null  Not Null  FK, Not Null  FK, Not Null  Not Null  Unique, NOT NULL, CHECK (email LIKE '%*@*%.\_%')  Not Null, Unique | Varchar(50)  Varchar(50)  Int  Int  Date  Varchar(100)  Varchar(20) |

Comments on table relationships

Many employees can hold the same position, but each employee holds only one position, and multiple employees can be assigned to one station, but each employee is assigned to exactly one station.

Example with data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Employee ID | First Name | Last Name | Position ID | Assigned Station ID | Hire Date | Email | Phone |
| 1 | Giorgi | Mujrii | 4 | 2 | 3/15/2021 | skop@gmail.com | +995123123 |

This table lists all employee positions and their detailed descriptions.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Position | Position ID | PK, auto-increment | Int |
| Title  Description | Not Null  Not Null | Varchar(50)  Text |

Comments on table relationships

Example with data

|  |  |  |
| --- | --- | --- |
| Position ID | Title | Description |
| 1 | Train Operator | Responsible for operating metro trains. |

Holds schedules for each metro line including operational timings and resource requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Schedule | Schedule ID | PK, auto-increment | Int |
| Line ID  Operating Frequency  Start Time  End Time  Required Trains  Required Employees | Not Null  Not Null  Not Null  Not Null  Not Null  Not null | Int  Varchar(50)  Time  Time  Int  Int |

Comments on table relationships

Multiple schedules can exist for one line, but each schedule is specific to one line.

Example with data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Schedule ID | Line ID | Operating Frequency | Start Time | End Time | Required Trains | Required Employees |
| 1 | 4 | Everyday | 3/15/2025  07:00 Am | 3/15/2025  11:00 PM | 4 | 12 |

Records the assignment of trains to specific schedules and shifts.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Train Schedule | Train Schedule ID | PK, auto-increment | Int |
| Train ID  Schedule ID  Assignment Date  Shift | Fk, Not Null  FK, Not Null  Not Null  Not Null | Int  Int  Date  Varchar(20) |

Comments on table relationships

Trains can be scheduled multiple times, and each schedule can have multiple trains assigned to it.

Example with data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Train Schedule ID | Train ID | Schedule ID | Assignment Date | Shift |
| 1 | 4 | 12 | 3/14/2025 | Morning (6:00 – 14:00) |

Tracks ticket transactions, linking passengers to specific routes.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Ticket | Ticket ID | PK, auto-increment | Int |
| Ticket Type ID  Passenger ID  Route ID  Purchase Date  Valid Until  Price | Fk, Not Null  FK, Not Null  FK, Not Null  Not Null  Not Null  Not null | Int  Int  Int  Date  Date  Decimal(10,2) |

Comments on table relationships

Many tickets can be purchased for one route, but each ticket is valid for exactly one route.

Example with data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ticket ID | Ticket Type ID | Passenger ID | Route ID | Purchase Date | Valid Until | Price |
| 13 | 3 | 104 | 13 | 3/15/2025  11:00 PM | 3/16/2025  11:00 AM | 12,49 |

This table includes the details of various ticket types, their base prices, and discounts available.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Ticket Type | Ticket Type ID | PK, auto-increment | Int |
| Type Name  Price  Discount Rate | Not Null  Not Null  Not Null | Varchar(50)  Decimal (8,2)  Decimal (4,2) |

Comments on table relationships

Example with data

|  |  |  |  |
| --- | --- | --- | --- |
| Ticket Type ID | Type Name | Price | Discount Rate |
| 1 | Regular | 49,99 | 10,5 |

Manages promotional campaigns associated with different ticket types.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Promotions | Promotion ID | PK, auto-incerement | Int |
| Ticket Type ID  Promotion Name  Description  Start Date  End Date  Discount Percentage | FK, Not Null  Not Null  Not Null  Not Null  Not null | Int  Varchar(100)  Text  Date  Date  Decimal(4,2) |

Comments on table relationships

Many promotions can apply to one ticket type, but each promotion applies to exactly one ticket type.

Example with data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Promotion ID | Ticket Type ID | Promotion Name | Description | Start Date | End Date | Discount Percentage |
| 1 | 1 | Christmas Promotion | Promotion for Christmas holidays | 12/15/2024 | 01/01/2025 | 20,00 |

Records scheduled and completed maintenance tasks for metro infrastructure.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Maintenance Task | Maintenance Task ID | PK, auto-incerement | Int |
| Infrastructure ID  Maintenance Type ID  Scheduled Date  Completion Date  Employee ID  Description  Cost | FK, Not Null  FK, Not Null  Not Null  Not Null  FK, Not Null  Not Null | Int  Int  Date  Date  ID  Text  Decimal(10,2) |

Comments on table relationships

Many maintenance tasks can be performed on one infrastructure item, but each task relates to one specific infrastructure component, also, an employee can handle many maintenance tasks, but each task is handled by one responsible employee.

Example with data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Maintenance Task ID | Infrastructure ID | Maintenance Type ID | Scheduled Date | Completion Date | Employee ID | Description | Cost |
| 1 | 15 | 3 | 12/15/2024 | 01/15/2025 | 01/01/2025 | 20,00 | 15000,00 |

Categorizes types of maintenance tasks with relevant descriptions.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Maintenance Type | Maintenance Type ID | PK, auto-increment | Int |
| Type Name  Description | Not Null | Varchar(50)  Text |

Comments on table relationships

Example with data

|  |  |  |  |
| --- | --- | --- | --- |
| Maintenance Type ID | Type Name | Description | |
| 1 | Escalator Maintenance | | Changing damaged escalator fully |

Details infrastructure components such as tunnels, tracks, and stations, along with their condition and maintenance history.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Infrastructure | Infrastructure ID | PK, auto-increment | Int |
| Type  Location  Installation Date  Inspection Date  Status | Not Null  Not Null  Not Null  Not Null  Not Null | Varchar (50)  Varchar (150)  Date  Date  Varchar (20) |

Comments on table relationships

Example with data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Infrastructure ID | Type | Location | Instalation Date | Inspection Date | Status |
| 12 | Escalator | At Metro Station Didube | 01/01/2014 | 01/15/2025 | Functional |

Stores passenger information including contact details and registration dates.

|  |  |  |  |
| --- | --- | --- | --- |
| Table Name | Field name | Field Description | Data Type |
| Passenger | Passenger ID | PK, auto-incerement | Int |
| First Name  Last Name  Email  Phone  Registration Date | Not Null  Not Null  Unique, NOT NULL, CHECK (email LIKE '%*@*%.\_%')  Unique, Not null  Not Null | Varchar(50)  Varchar(50)  Varchar(100)  Varchar(20)  Date |

Comments on table relationships

Example with data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employee ID | First Name | Last Name | Email | Phone | Registration Date |
| 17 | Anna | Kordzaia | skopio@gmail.com | +995123124 | 3/15/2021 |