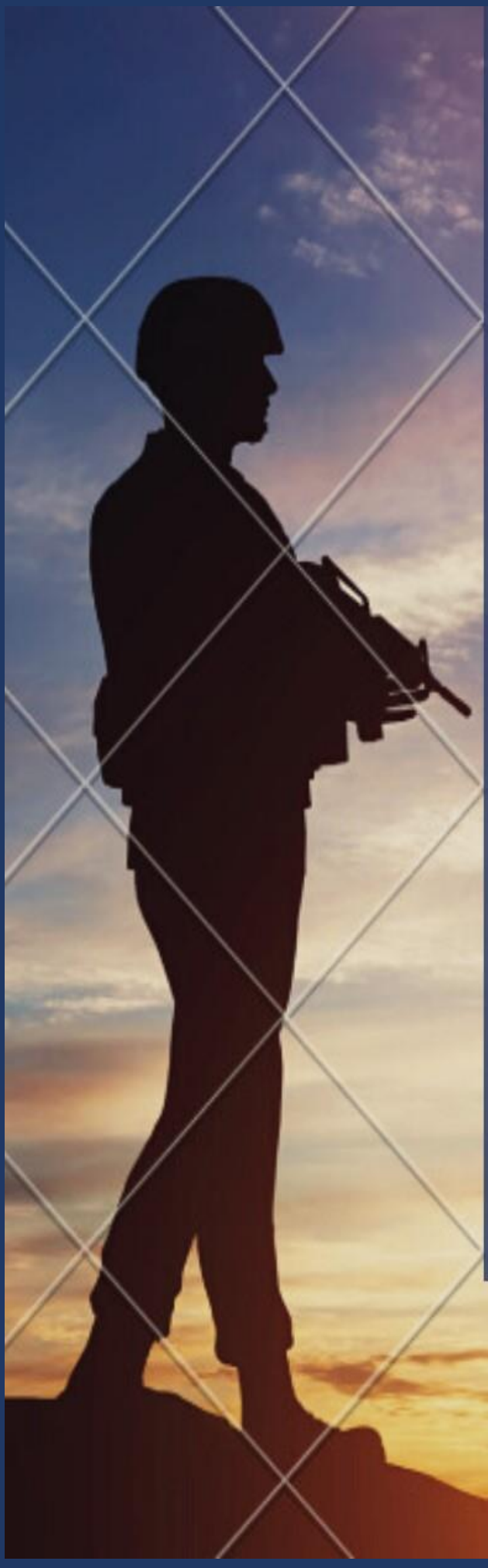

DATABASE PROJECT

SURVEY CORPS

UNIVERSITY OF MAURITIUS(FOICDT)

STUDENT DETAILS:

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ACKNOWLEDGEMENT

We would like to thank our dear lecturer Mrs Sudha Cheerkoot-Jalim for having assigned us this project as it helped us improve our understanding of database systems. We realised just how much work is required to create and maintain a database, and that we should never take such tasks lightly. Overall, it was a very rich experience for all of us and we look forward to more such projects in the future.

THE SURVEY CORPS

Introduction: The Survey Corps Military Database is a system designed to manage and organize crucial information related to the operations, personnel, equipment, missions, and training programs of a military organization. With a focus on efficiency, organisation, and data integrity, the database aims to improve the effectiveness and success of the missions being undertaken by the Survey Corps.

Purpose: The primary purpose of the Survey Corps Military Database is to provide a centralized platform for storing, retrieving, and managing essential data related to various aspects of the military organization. This includes information about personnel, like their personal details, ranks, assignments, and training records, as well as data on units, missions, equipment, suppliers, and training programs. By consolidating this information into a single, accessible database, the Survey Corps can facilitate efficient coordination, planning, and execution of military operations.

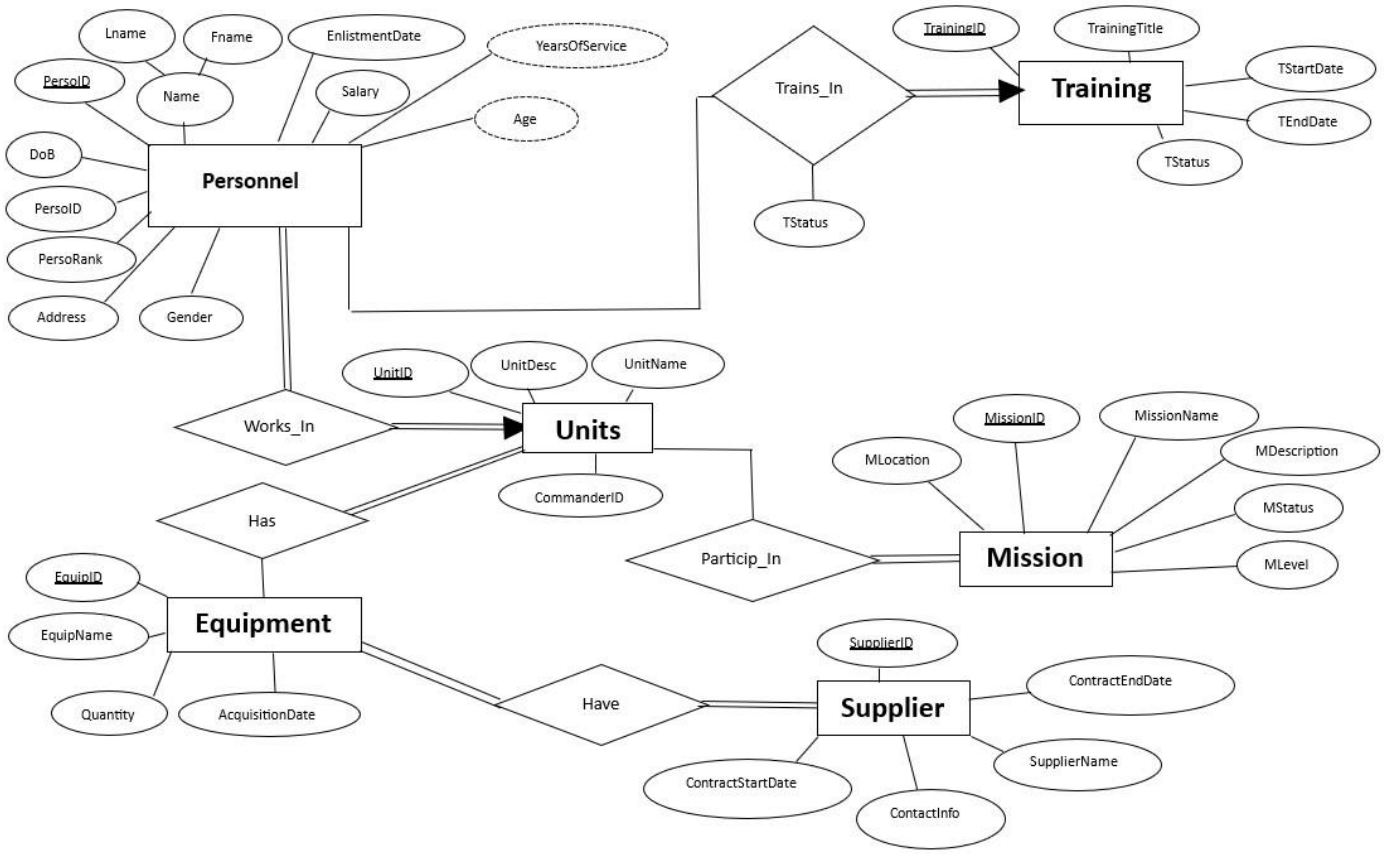
Key Features:

1. **Personnel Management:** The database maintains profiles of military personnel, including their identification details, locations, enlistment history, ranks, salaries, and assigned units. It also tracks their training records, facilitating the monitoring of skill development and career progression.
2. **Unit Organization:** Information on military units, including unit names, commanders, personnel counts, and descriptions, is stored within the database. This enables effective management of unit deployments, assignments, and resource allocations.
3. **Mission Tracking:** The database records mission details such as mission names, locations, descriptions, statuses, and levels of urgency. This feature aids in the planning, coordination, and monitoring of mission operations across the Survey Corps.
4. **Equipment Inventory:** A detailed inventory of military equipment, including equipment names, quantities, and acquisition dates, is maintained within the database. Additionally, the database tracks equipment suppliers, contracts, and procurement details to ensure the availability and maintenance of essential resources.
5. **Supplier Details:** Information about equipment suppliers, including supplier names, contact information, and contract dates is stored. This facilitates effective communication, contract management, and procurement processes with external suppliers.
6. **Training Program Administration:** Details of training programs offered to personnel, including training titles, start and end dates, are stored within the database. It also tracks personnel participation in training programs and their training completion statuses.
7. **Relationships:** The database establishes relationships between different entities, such as personnel and units, units and missions, equipment and suppliers, and personnel and training programs. This allows for efficient data retrieval and analysis.

ASSUMPTIONS:

- Each person can work in only 1 unit but a unit contains many personnel.
- Some soldiers take part in training programs.
- Each unit has many equipment in stock and the same equipment can be used by many units.
- Each equipment can be supplied by more than 1 supplier and a supplier can supply many equipment.
- 1 or more units take part in a mission and a mission might have a few units working on it.

ER DIAGRAM


Lname
Fname
EnlistmentDate
YearsOfService
PersoID
Name
Salary
Age
DoB
Personnel
PersoID
PersoRank
Address
Gender
Trains_In
TrainingID
TrainingTitle
Training
TStartDate
TEndDate
TStatus
TStatus
UnitID
UnitDesc
UnitName
Works_In
Units
CommanderID
Has
MissionID
MissionName
MLocation
MDescription
MStatus
Particip_In
Mission
MLevel
EquipID
EquipName
Equipment
Quantity
AcquisitionDate
Have
SupplierID
Supplier
ContractEndDate
SupplierName
ContractStartDate
ContactInfo

NORMALISATION

Functional dependencies

PersoID → Fname, Lname, Gender, DateOfBirth, EnlistmentDate, PersoRank, Salary, PAddress, UnitID

UnitID → UnitName,NumPersonnel, UnitDesc, CommanderID

MissionID → MissionName, MLocation, MDescription, MStatus, MLevel

EquipID → EquipName, Quantity, AcquisitionDate

SupplierID → SupplierName, ContactInfo, ContractStartDate, ContractEndDate

TrainingID → TrainingTitle, TStartDate, TEndDate, TStatus

First Normal Form(identify primary keys)

Big_table{PersoID, MissionID, SupplierID, TrainingID, EquipID ,Fname, Lname, Gender, DateOfBirth, EnlistmentDate, PersoRank, Salary, PAddress,UnitID,UnitName, CommanderID, NumPersonnel, UnitDesc, MissionName, MLocation, MDescription, MStatus, MLevel, , EquipName, Quantity, AcquisitionDate, SupplierName, ContactInfo, ContractStartDate, ContractEndDate,TrainingTitle, TStartDate, TEndDate, TStatus}

Second Normal Form(remove partial functional dependencies)

Personnel{ PersoID, Fname, Lname, Gender, DateOfBirth, EnlistmentDate, PersoRank, Salary, PAddress,UnitID,UnitName, CommanderID, NumPersonnel, UnitDesc}

Mission{MissionID, MissionName, MLocation, MDescription, MStatus, MLevel}

Supplier{SupplierID, SupplierName, ContactInfo, ContractStartDate, ContractEndDate }

Training{TrainingID, TrainingTitle, TStartDate, TEndDate, TStatus}

Equipment{ EquipID, EquipName, Quantity, AcquisitionDate}

Third Normal Form(remove transitive functional dependencies)

Personnel{ PersoID, Fname, Lname, Gender, DateOfBirth, EnlistmentDate, PersoRank, Salary, PAddress, UnitID}

Unit{UnitID,UnitName, CommanderID, NumPersonnel, UnitDesc}

Mission{MissionID, MissionName, MLocation, MDescription, MStatus, MLevel}

Supplier{SupplierID, SupplierName, ContactInfo, ContractStartDate, ContractEndDate}

Training{TrainingID, TrainingTitle, TStartDate, TEndDate, TStatus}

Equipment{EquipID, EquipName, Quantity, AcquisitionDate}

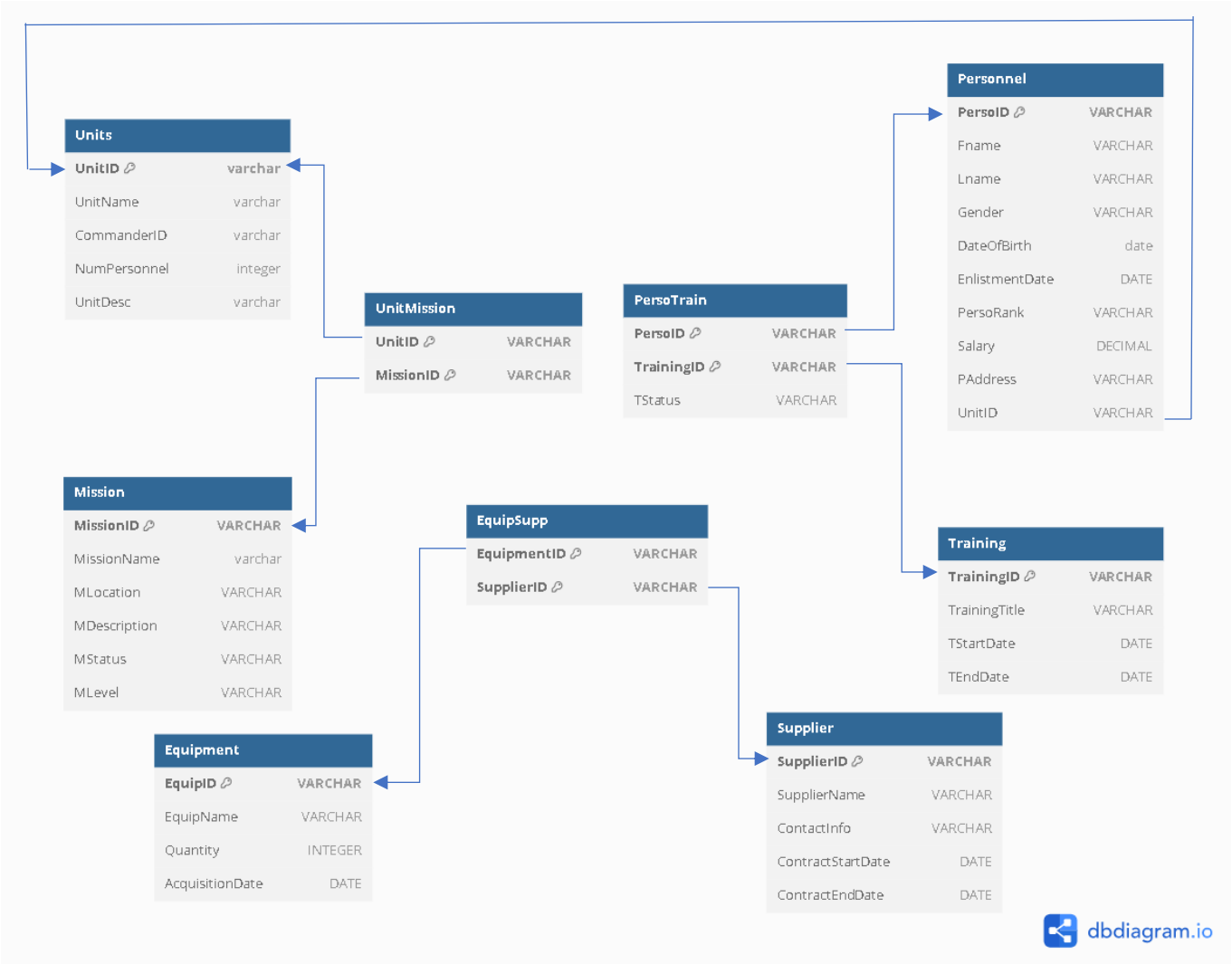
Additional tables for many-to-many relationships

PersoTrain{PersoID,TrainingID,TStatus}

EquipSupp{ EquipmentID,SupplierID}

UnitMission{UnitID,MissionID}

DB SCHEMA


Units
UnitID varchar
UnitName varchar
CommanderID varchar
NumPersonnel integer
UnitDesc varchar
UnitMission
UnitID VARCHAR
MissionID VARCHAR
PersoTrain
PersoID VARCHAR
TrainingID VARCHAR
TStatus VARCHAR
Personnel
PersoID VARCHAR
Fname VARCHAR
Lname VARCHAR
Gender VARCHAR
DateOfBirth date
EnlistmentDate DATE
PersoRank VARCHAR
Salary DECIMAL
PAddress VARCHAR
UnitID VARCHAR
Mission
MissionID VARCHAR
MissionName varchar
MLocation VARCHAR
MDescription VARCHAR
MStatus VARCHAR
MLevel VARCHAR
EquipSupp
EquipmentID VARCHAR
SupplierID VARCHAR
Training
TrainingID VARCHAR
TrainingTitle VARCHAR
TStartDate DATE
TEndDate DATE
Equipment
EquipID VARCHAR
EquipName VARCHAR
Quantity INTEGER
AcquisitionDate DATE
Supplier
SupplierID VARCHAR
SupplierName VARCHAR
ContactInfo VARCHAR
ContractStartDate DATE
ContractEndDate DATE
dbdiagram.io

DB DESIGN

Personnel

Attribute	Data type	Description	Constraint
PersoID	VARCHAR (6)	Unique ID for each staff	Primary key
Fname	VARCHAR (30)	First name of personnel	NOT NULL
Lname	VARCHAR (30)	Last name of personnel	NOT NULL
Gender	CHAR (1)	Gender of personnel	Possible values: M, F
DateOfBirth	DATE	Date of birth of personnel	Date less than current date
EnlistmentDate	DATE	Date on which the staff was enlisted	
PersoRank	VARCHAR (15)	Rank of personnel in the organisation	Possible values: Commander, Soldier
Salary	DECIMAL	Salary of personnel	
PAddress	VARCHAR (50)	Personal address of the staff	
UnitID	VARCHAR (6)	UnitID of unit in which the personnel operate	Foreign key referencing to Units table

Units

Attribute	Data type	Description	Constraint
UnitID	VARCHAR(6)	Unique ID for unit	Primary key
UnitName	VARCHAR(30)	Name of unit	
CommanderID	VARCHAR(6)	ID of commander in the unit	
UnitDesc	VARCHAR(100)	Description of the unit	

Mission

Attribute	Data type	Description	Constraint
MissionID	VARCHAR(5)	Unique ID of the mission	Primary key
MissionName	VARCHAR(30)	Name of the mission	
MLocation	VARCHAR(20)	Location where the mission is carried out	
MDescription	VARCHAR(50)	Description of the mission	
MStatus	VARCHAR(10)	Status(Active,Planned,Ongoing)	
MLevel	VARCHAR(10)	Difficulty level of the mission	

Equipment

Attribute	Data type	Description	Constraint
EquipID	VARCHAR(7)	Unique ID of the equipment	Primary key
EquipName	VARCHAR(30)	Name of the equipment	
Quantity	INTEGER	Quantity of equipment in stock	
AcquisitionDate	DATE	Date when we acquired the equipment	

Supplier

Attribute	Data type	Description	Constraint
SupplierID	VARCHAR(5)	Unique ID of the supplier	Primary key
SupplierName	VARCHAR(30)	Name of the supplier	
ContactInfo	VARCHAR(12)	Contact Info about supplier	
ContractStartDate	DATE	Start date of contract	
ContractEndDate	DATE	End date of contract	

Training

Attribute	Data type	Description	Constraint
TrainingID	VARCHAR(6)	Unique ID of the training	Primary key
TrainingTitle	VARCHAR(40)	Title of the training	
TStartDate	DATE	Start date of the training	
TEndDate	DATE	End date of the training	

EquiSupp

Attribute	Data type	Description	Constraint
EquipmentID	VARCHAR(7)	ID of the equipment	Primary key, Foreign key referencing to Equipment table
SupplierID	VARCHAR(5)	ID of the supplier	Primary key, Foreign key referencing to Supplier table

UnitMission

Attribute	Data type	Description	Constraint
UnitID	VARCHAR(6)	ID of the unit	Primary key, Foreign key referencing to Units table
MissionID	VARCHAR(5)	ID of the mission	Primary key, Foreign key referencing to Mission table

PersoTrain

Attribute	Data type	Description	Constraint
PersoID	VARCHAR(6)	ID for each person	Primary key, Foreign key referencing to Personnel table
TrainingID	VARCHAR(6)	ID of the training	Primary key, Foreign key referencing to Training table
TStatus	VARCHAR(20)	Status of the training	Possible values: Planned, Ongoing, Completed

Insert Dataset

Personnel

PersoID	Fname	Lname	Gender	DateOfBirth	EnlistmentDate	PersoRank	Salary	PAddress	UnitID
P001	Lionel	Messi	M	1990-05-15	2010-07-20	Soldier	40000	Flacq	U001
P002	Jane	Smith	F	1995-10-20	2013-02-15	Soldier	40000	Petit Verger	U002
P003	Ghanishth	Sewtohul	M	1980-03-12	2000-09-10	Commander	75000	Mont Ida	U001
P004	Emily	Brown	F	1992-07-08	2014-05-25	Soldier	40000	Medine	U001
P005	Zahiir	Peerbux	M	1985-01-30	2007-11-18	Commander	75000	Rose Hill	U002
P006	Vedrajsing	Jankee	M	1993-09-05	2015-03-20	Commander	75000	Rose Belle	U003
P007	Yanky	Boombang	M	1977-04-18	2012-08-10	Soldier	40000	Verdun	U001
P008	Amanda	Williams	F	1990-08-22	2011-06-15	Commander	75000	Reduit	U004
P009	James	Rodriguez	M	1985-01-25	2016-09-05	Soldier	40000	Quartier Militaire	U004
P010	Sarah	Genave	F	1989-06-14	2010-11-30	Soldier	40000	Camp Thorel	U001
P011	Yohaan	Mohadawoo	M	1991-04-28	2012-03-14	Commander	75000	Port Louis	U005
P012	Jennifer	Aniston	F	1996-09-08	2014-11-20	Commander	75000	Helvetia	U006
P013	David	Goggins	M	1982-12-15	2005-05-05	Soldier	40000	Curepipe	U003
P014	Ashley	Young	F	1993-10-22	2016-07-10	Soldier	40000	St Pierre	U001
P015	Harry	Kane	M	1988-02-18	2010-09-30	Commander	75000	Rose Hill	U007
P016	Megan	Fox	F	1994-06-30	2017-11-15	Soldier	40000	Port Louis	U003
P017	Jude	Bellingham	M	1989-08-10	2011-12-25	Soldier	40000	Flacq	U001
P018	Candice	Johnson	F	1990-03-05	2013-08-05	Soldier	40000	Constance	U002
P019	Harry	Maguire	M	1995-07-20	2015-04-12	Soldier	40000	Lalmatie	U003
P020	Emma	Watson	F	1986-11-12	2008-10-03	Soldier	40000	Bel Etang	U007

Units

UnitID	UnitName	CommanderID	UnitDesc
U001	Alpha Company	P003	Ground operations specialists
U002	Naval Fleet 7	P005	Versatile naval fleet
U003	Air Squadron 15	P008	Elite aerial unit
U004	Air Squadron 33	P009	Close air support and airborne troop transport
U005	Coast Guards	P011	Coastal security and rescue specialists
U006	Artillery Battalion	P012	Heavy artillery support unit
U007	Medical Unit	P015	Dedicated medical care unit

Mission

MissionID	MissionName	MLocation	MDescription	MStatus	MLevel
M001	Operation Eagle	Desert	Neutralize enemy forces	Active	High
M002	Naval Exercise 2024	Ocean	Training exercise for naval fleet	Planned	Medium
M003	Air Defense Patrol	Sky	Surveillance and protection of airspace	Ongoing	Low
M004	Search and Rescue	Mountain	Rescue mission in rugged terrain	Active	Medium
M005	Maritime Security Patrol	Coast	Patrolling to ensure maritime security	Ongoing	Low
M006	Aerial Reconnaissance	Various	Gathering intelligence from the air	Planned	High
M007	Medical Aid Mission	Urban Area	Provide medical aid and support to civilians	Planned	Medium

Supplier

SupplierID	SupplierName	ContactInfo	ContractStartDate	ContractEndDate
S001	Bullet & Co.	523-456-78	2023-01-01	2025-01-01
S002	Unlimited Firearm Works	587-654-32	2022-06-15	2024-06-15
S003	Military Gear	570-434-12	2022-12-01	2024-12-01
S004	Naval Fighters	579-887-32	2023-03-01	2025-03-01
S005	Air Warriors	570-167-71	2023-04-01	2025-04-01

Training

TrainingID	TrainingTitle	TStartDate	TEndDate
T001	Ground Combat Tactics	2024-01-01	2024-02-28
T002	Naval Operations	2024-03-01	2024-04-30
T003	Aerial Scouting Techniques	2024-02-15	2024-04-15
T004	Airborne Assault Training	2024-05-01	2024-06-30
T005	Coastal Security Procedures	2024-04-01	2024-05-31
T006	Artillery Operations	2024-06-01	2024-07-31
T007	Combat Medical Care	2024-08-01	2024-09-30

Equipment

EquipID	EquipName	Quantity	AcquisitionDate
E001	Bullets	10000	2023-03-10
E002	AK-47 Guns	500	2023-04-20
E003	Flamethrowers	20	2023-02-15
E004	Grenades	200	2023-01-05
E005	Gas Mask	1000	2023-07-01
E006	Helmet	1000	2023-08-12
E007	Navy Ship	3	2023-06-30
E008	Fighter Jet	5	2023-05-20
E009	Torpedo	10	2023-04-15
E010	Submarine	2	2023-03-25
E011	Helicopters	10	2023-02-10
E012	Bulletproof Vest	300	2023-01-02
E013	Night Vision Goggles	200	2023-07-15
E014	Medical Kit	50	2023-08-20
E015	Walkie Talkie	100	2023-06-05

EquipSupp

EquipmentID	SupplierID
E001	S001
E002	S002
E003	S003
E004	S003
E005	S003
E006	S003
E007	S004
E007	S005
E008	S005
E009	S004
E009	S005
E010	S004
E010	S005
E011	S004
E011	S005
E012	S003
E013	S003
E014	S003
E015	S003

PersoTrain

PersoID	TrainingID	TStatus
P001	T001	Completed
P001	T007	Ongoing
P002	T002	Ongoing
P002	T005	Planned
P004	T007	Completed
P007	T001	Ongoing
P007	T004	Completed
P010	T006	Planned
P013	T003	Completed
P014	T001	Completed
P014	T002	Ongoing
P014	T004	Planned
P017	T006	Completed
P018	T004	Ongoing
P019	T003	Completed
P019	T004	Ongoing
P020	T002	Ongoing
P020	T007	Planned

UnitMission

UnitID	MissionID
U001	M001
U002	M002
U003	M003
U003	M006
U004	M004
U005	M005
U006	M007
U007	M004
U007	M007

DESCRIPTION OF STORED PROCEDURES AND TRIGGERS

STORED PROCEDURES:

1. **GetPersoRank:** This procedure outputs the ID, first name and last name of all Commanders or Soldiers
2. **GetPersoByMission:** This outputs the details of all Personnel who are working on a particular mission
3. **GetCommanderName:** The UnitID in the personnel table is linked to the UnitId in the Units table where the ID of each unit's commander is stored. So, using this link, we can access the commander of a particular soldier. We will output the full name of that commander.
4. **GetMissionsByPerso:** This outputs all the missions on which a particular staff is working on.
5. **Promotion:** The procedure will be used to promote a soldier into a commander. It will have to change the salary of that person and it will also enter the CommanderID in the Units table.
6. **AddUnitMission:** It allows user to enter the ID of a certain unit and the ID of the mission on which it is working. The data is then saved in the UnitMission table.
7. **AddNewMission:** Allows user to enter a new MissionID and all the details related to that mission in the "Missions" table. Since each mission has at least 1 UnitID working on it, it also takes a UnitID as parameter. This procedure will also call the "AddUnitMission" procedure (number 6) to enter the UnitID and the MissionID in the UnitMission table. If the mission has more units working on it, the user can simply use "AddUnitMission" directly to enter more UnitIDs for the same mission.
8. **ExamineEquipment:** Each equipment, for example, a gun, has a certain lifespan, after which it might not operate to its full potential or it may simply not work. Therefore, we use the Acquisition date to calculate the number of years since we have that equipment. If the number of years is greater than 3, a message is displayed to request user to verify the equipment for any malfunction. This procedure also verifies whether the quantity of certain equipment meets the bare minimum that the military base needs. For example, if the number of bullets is less than 5000, it is important that we contact the supplier for more.
9. **Post_EquipData:** This procedure is designed to handle the updating of equipment data after a certain quantity has been used. It retrieves the ID of the specified equipment item based on its name. It calculates the remaining quantity of the equipment item after deducting the quantity used from the total quantity available. It checks if the resulting quantity after deduction is not negative, ensuring that there is sufficient equipment available. If the resulting quantity is non-negative, it updates the quantity of the specified equipment item in the database. After updating the quantity, it executes the **examine_equipment** procedure to verify the updated equipment. Finally, it prints a message, indicating whether the equipment update was successful or if there was an error due to insufficient quantity.

10. **Delete_Personnel:** This procedure is used whenever a staff has retired or passed away during a mission, we have to delete his record in the personnel table. However, there are many more adjustments to be made. In the Units table, “NumPersonnel” should be decremented. Moreover, the deletion activates the trigger “Check_Commander”. This verifies whether the person being deleted was a commander, and if so, it updates the CommanderID in the Units table to NULL. It then executes the “Promotion” procedure to set another staff as the commander of that unit. This is done by promoting the soldier with the oldest “EnlistmentDate” to commander and entering his ID in the Units table where we had just set the “CommanderID” to NULL. It also updates the salary of that staff to 75000. So, the “Delete_personnel” table activates a trigger (Check_Commander) which in turns runs another stored procedure (Promotion) to ensure all tables are updated accordingly.

TRIGGERS:

1. **DisplayNewPersonnel:** This trigger, named is designed to execute after a new personnel record is inserted into the database. Its purpose is to provide a notification and display relevant information about the newly added person, including their Personnel ID, name, associated unit, and mission. This information helps in monitoring and managing the military personnel database effectively.
2. **CheckCommander:** After having deleted a row in the Personnel table, this trigger is activated to check whether the person being deleted was a Commander. If so, it will set the correspoding CommanderID in the units table to NULL and it will call the procedure “Promotion” to change the rank of a soldier to a Commander.
3. **Insert_deleted_data:** Everytime a record for a staff is deleted, his/her details will be stored in a table called “Old_Personnel_Records”. Each record in the new table will be just the way it was in the Personnel table.
4. **Verify_rank:** Each time a record is added in the Personnel Table. If his/her rank is “Commander”, this trigger checks whether there is already a commander for the unit.
5. **Verify_Commander_ID :** If the CommanderID being entered in the Units table does not correspond to any commander in the Personnel Table, an error message is output and the CommanderID is not entered in the Units table. Otherwise, it is input in the table.

ACCESS CONTROL:

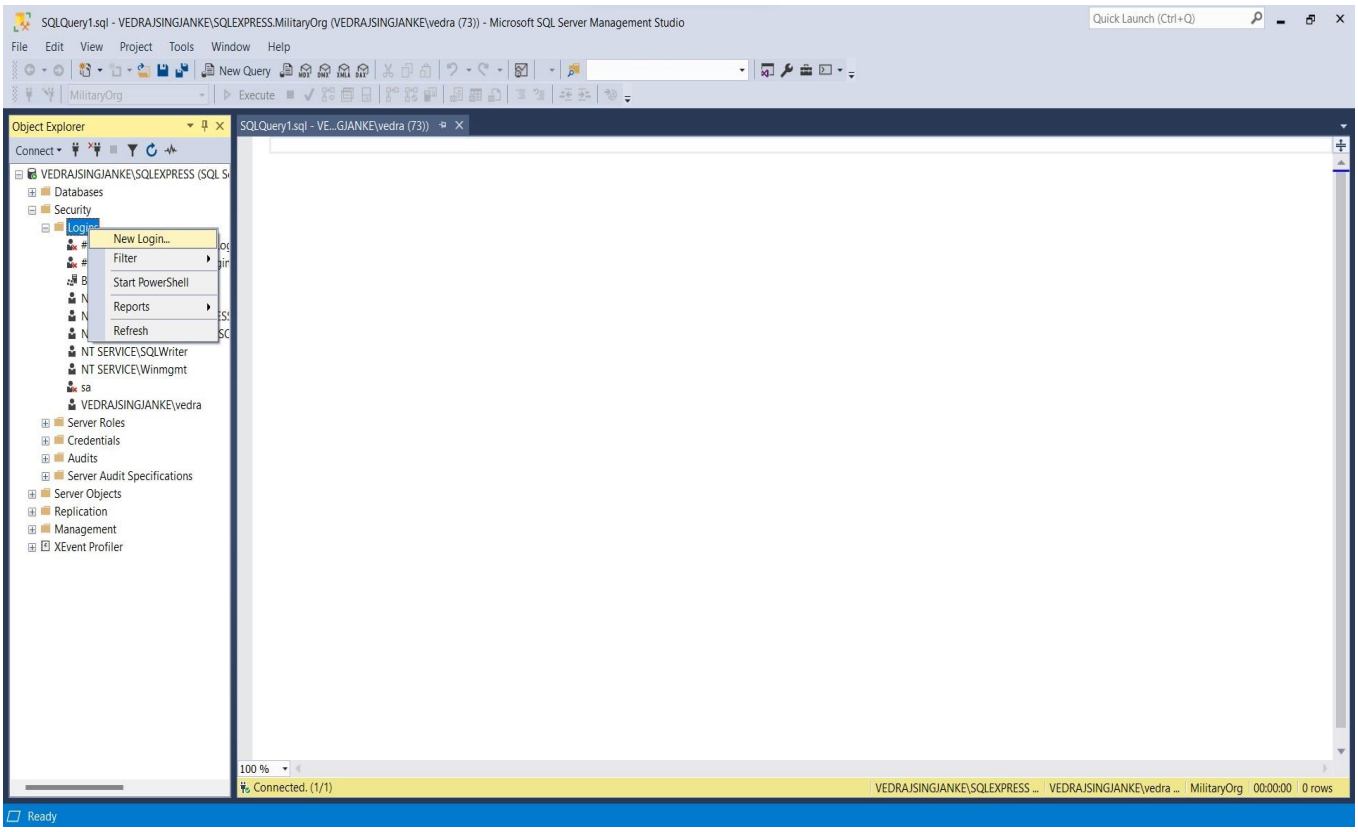
Users concerned: Commander, Soldier

User ‘Commander’: Since commander is the highest rank in the military base, a commander has access to the whole database and can read/write to any table.

User ‘Soldier’: Since soldier is the lowest rank in the military base, a soldier has access to the database but can only read them without modifying or deleting any table.

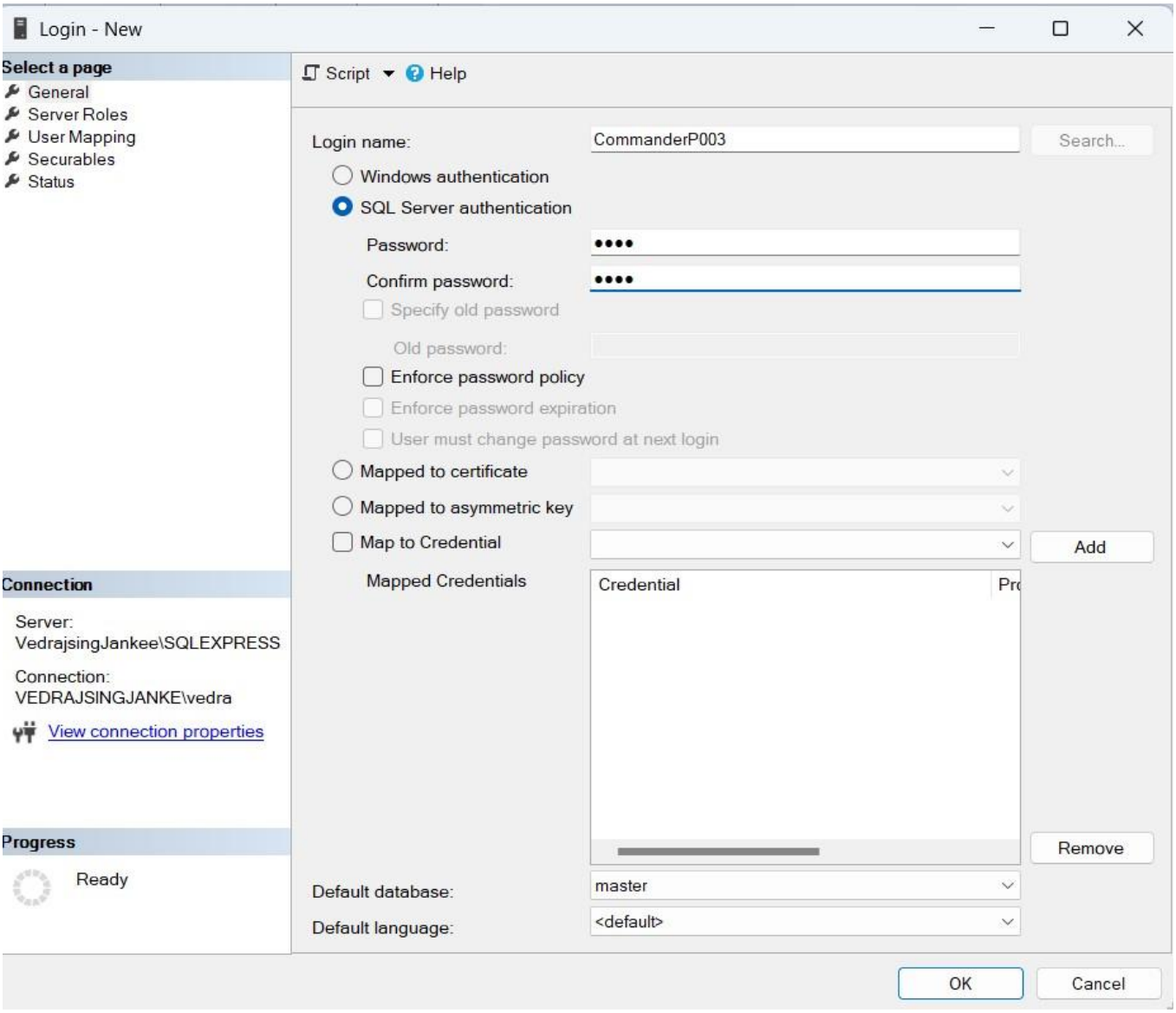
The following shows how logins can be created for each commander and soldier.

Step 1



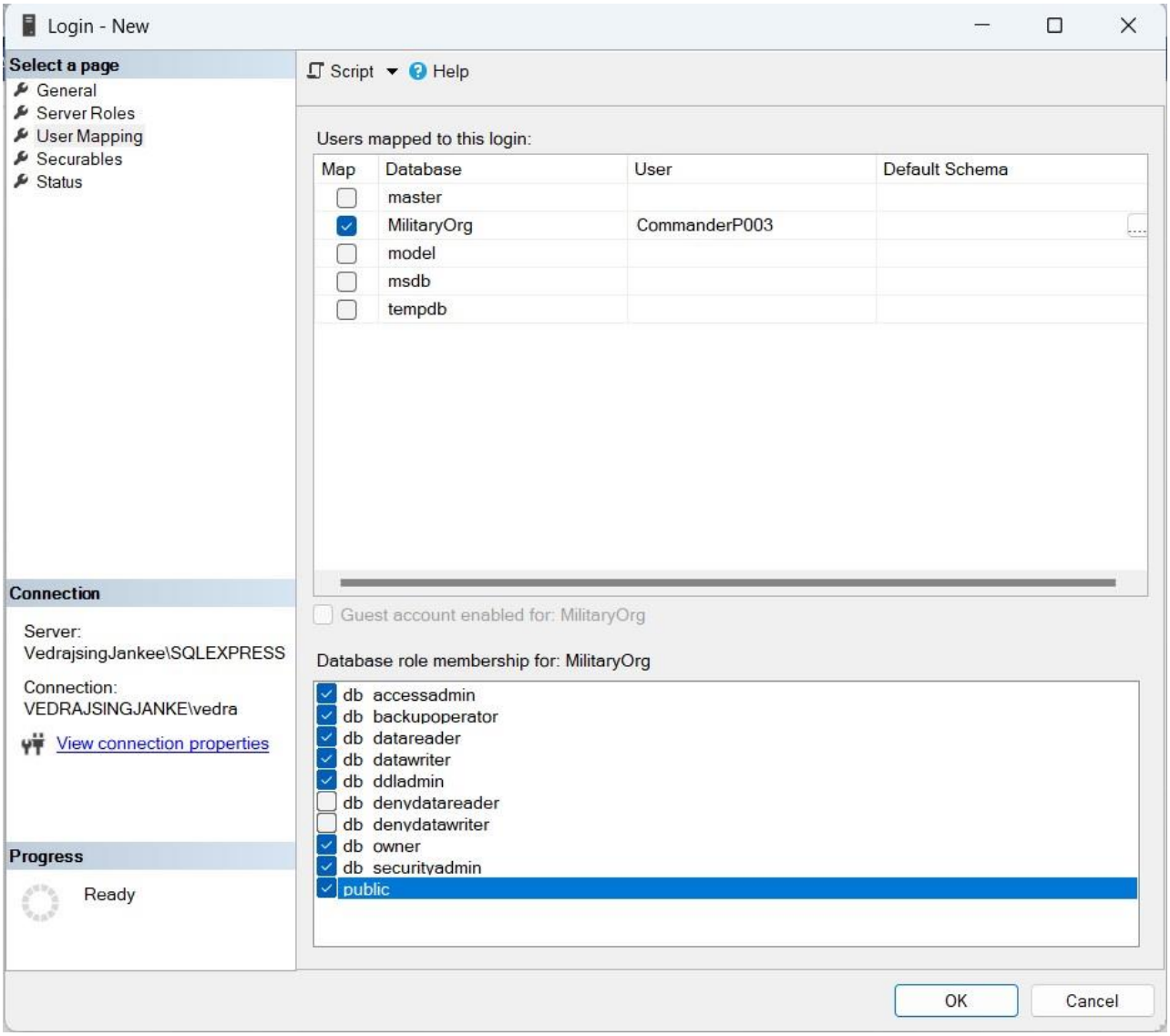
Step 2

Enter login credentials.



Step 3

Map the user to the military database and grant access to permissions needed.



Steps 1 to 3 can be repeated to create another login for soldier but grant only DB datareader permission.

Now, using SQL server authentication, you can access the database and perform operations as per your rank in the database.

TASK ALLOCATION

In order to complete the project efficiently, the four of us, split the tasks based on our strengths.

ER DIAGRAM: We brainstormed the ERD together and then, **Modahawoo Y.** used Microsoft Word to draw it. We went through the ERD to make sure no detail was left out.

NORMALISATION: The ERD gave us a clear indication of which tables would be required and we had an idea on how to link the tables effectively. However, showing the steps in normalization is also important and this was done by **Peerbux Z**. He outlined all steps from 0 NF to 3 NF and **Sewtohul G.P.** made some minor tweaks to it.

DB SCHEMA AND DESIGN: The schema was drawn by **Peerbux Z**. using dbdiagram.io while Jankee V. created the tables and filled with the required data.

STORED PROCEDURES AND TRIGGERS: For this part, all of us had to put our mind together as we realized that individual effort wouldn't be enough. **Modahawoo Y.** came up with some very original ideas and **Jankee V**., as well as **Peerbux Z**. were in charge of writing the codes on SQL server**. Sewtohul G.P** had to debug each and every single one of the procedures and triggers, making sure they all work as expected, in a way that doesn't clash with the constraints already set up.

ACCESS CONTROL: This part was done by **Jankee V**. His idea was that only the Commander has the ability to modify the database and that soldiers cannot do so. The latter can only read the required data.

REPORT DESIGN: The report was made by **Sewtohul G.P** who compiled all the necessary data into a Word Document. The other members proofread it, ensuring nothing was missing.

While this mini project was certainly a tough task which required a proper understanding of database systems, all group members put their soul into it to ensure it was of the highest possible level.