

4D2A Information Management and Data Engineering

Database Project Report

St. John Ambulance Brigade

For my database project, I have chosen to model the St. John Ambulance (SJA). SJA is a voluntary first aid institution with a pseudo-military organisation structure.

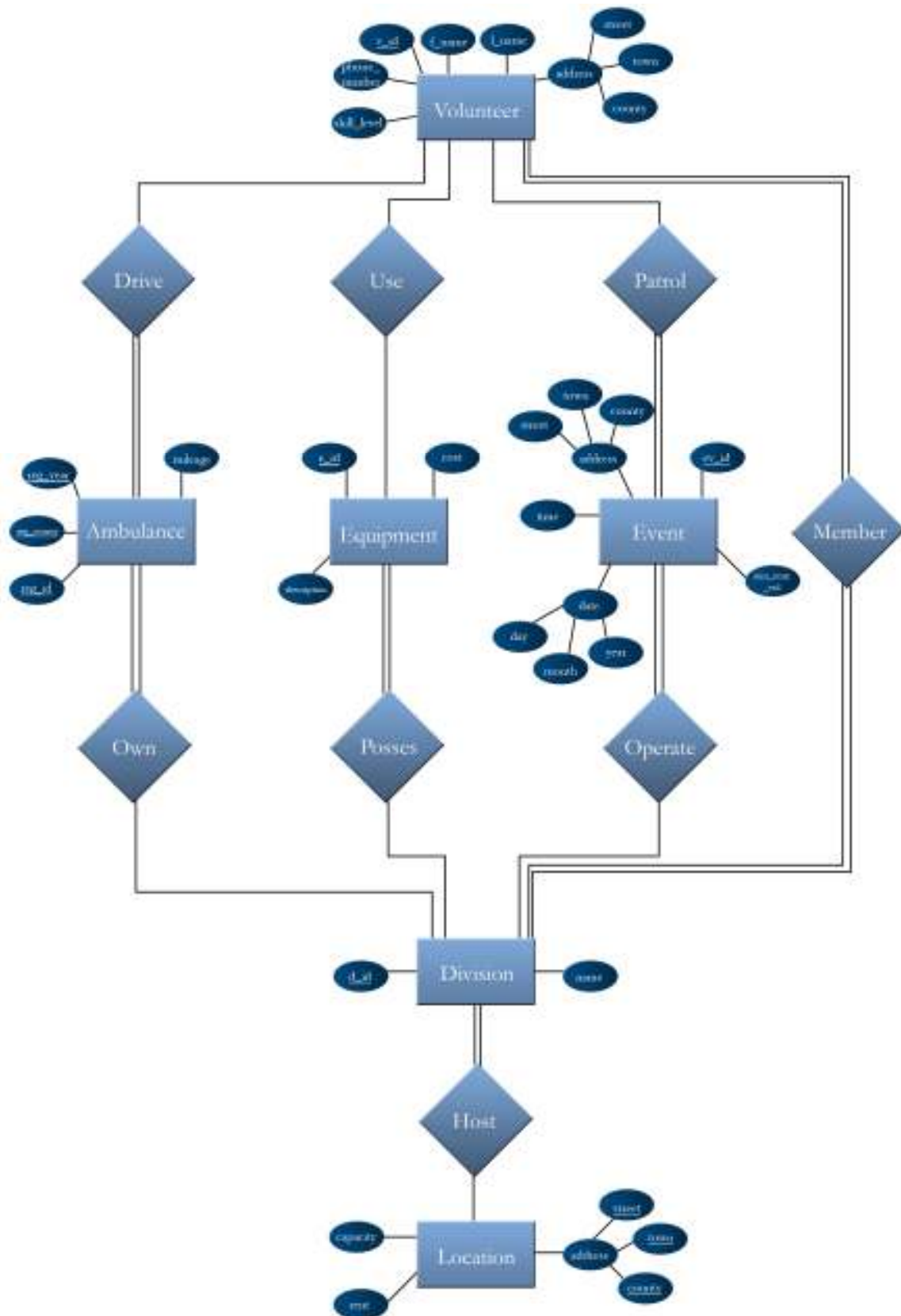
There are multiple Divisions within the brigade, each with a name and local headquarters. The divisions are populated by Volunteers, who have a name, address, phone number and practical first aid skill level. The Location in which a division is based is defined by its address, and has attributes capacity and rental cost.

Equipment can be assigned to multiple divisions and has an associated cost and description. Ambulances are recognised by their registration plates, belong to one division and have a mileage value. Events are once off occurrences that have requested that members of the brigade be present in the event that first aid is required, e.g. football matches. Events could be recognised by their time and date attributes, but they have been assigned an event id to simplify this database.

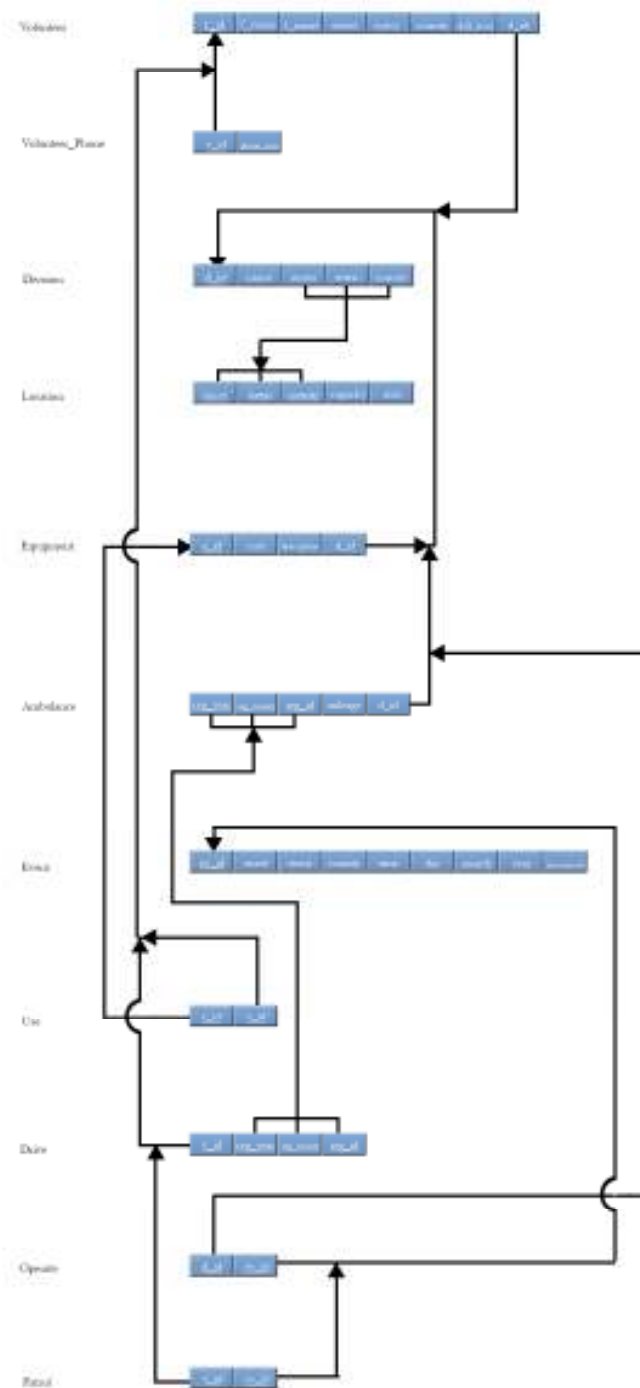
The relationships that link the above entities are as follows.

Equipment use links a volunteer with the equipment that they are allowed to use. Drive is the relationship between the volunteers and the ambulances. A division Operates an event. Volunteers Patrol an event. Volunteers are a member of a division. Divisions own ambulances and possess equipment. Locations host divisions.

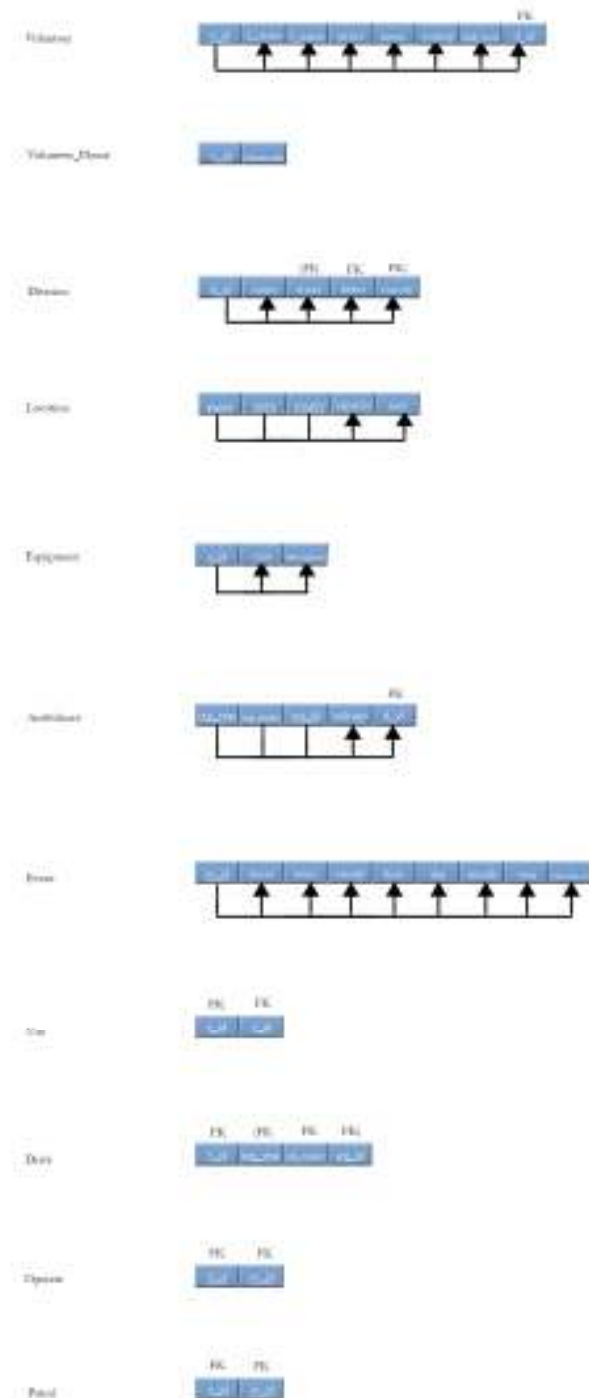
Entity Relationship Diagram



Relational Schema



Functional Dependencies



Semantic Constraints

There are two explicit constraints I have applied to my database. The first is to ensure that all volunteer ids are positive numbers.

```
CONSTRAINT check_id CHECK(v_id > 0)
```

The second constraint is to ensure that all phone numbers recorded in the database are Irish mobiles. This is done by checking that the listed number is in the format 08* *** ***.

```
CONSTRAINT check_num CHECK(phone_number > 799999999 AND  
phone_number < 1800000000)
```

Trigger and Update

The trigger that I have included in my program has no actual purpose and is only present to demonstrate trigger functionality. Before a volunteer is deleted from the database, the trigger changes their first name to “goodbye”, and then deletes the row.

```
CREATE TRIGGER del_vol  
BEFORE DELETE ON Volunteer  
FOR EACH ROW  
BEGIN  
UPDATE Volunteer  
    SET f_name = 'goodbye'  
    WHERE Volunteer.v_id = :OLD.v_id;  
END del_vol;  
.  
RUN
```

View and Security

To prevent any member of the brigade accessing another’s personal information, a view is created. This view lists all volunteers’ names, skill level and the division they are in.

```
CREATE VIEW vol_stats AS SELECT f_name, l_name, skill_level,  
name FROM Volunteer, Division WHERE Volunteer.d_id =  
Division.d_id;
```

Only members who have been granted the Junior or Senior status are able to access this view. Senior members are allowed to add and remove tables from the database.

```
CREATE ROLE Senior IDENTIFIED BY seniorpassword;  
GRANT CREATE TABLE TO Senior;  
GRANT DELETE TABLE TO Senior;  
GRANT SELECT ON vol_stats TO Senior;  
  
CREATE ROLE Junior IDENTIFIED BY juniorpassword;  
GRANT SELECT ON vol_stats TO Junior;  
  
GRANT Senior TO Annie Arthemia;  
GRANT Junior TO Donnie Dislocation;
```

Appendix

```
CREATE TABLE Volunteer(v_id INT NOT NULL, f_name VARCHAR(20), l_name
VARCHAR(20), v_street VARCHAR(40), v_town VARCHAR(20), v_county
VARCHAR(20), skill_level INT, d_id INT NOT NULL, PRIMARY KEY(v_id),
CONSTRAINT check_id CHECK(v_id > 0));
```

```
CREATE TABLE Volunteer_Phone(v_id INT NOT NULL, phone_number INT NOT NULL,
PRIMARY KEY(v_id, phone_number), CONSTRAINT check_num CHECK(phone_number >
799999999 AND phone_number < 1800000000));
```

```
CREATE TABLE Division(d_id INT NOT NULL, d_name VARCHAR(40) NOT NULL,
d_street VARCHAR(20) NOT NULL, d_town VARCHAR(20) NOT NULL, d_county
VARCHAR(20) NOT NULL, PRIMARY KEY(d_id));
```

```
CREATE TABLE Location(l_street VARCHAR(20) NOT NULL, l_town VARCHAR(20) NOT
NULL, l_county VARCHAR(20) NOT NULL, capacity INT, rental_cost INT, PRIMARY
KEY(l_street, l_town, l_county));
```

```
CREATE TABLE Equipment(e_id INT NOT NULL, e_name VARCHAR(20) NOT NULL, cost
INT, description VARCHAR(100), PRIMARY KEY(e_id));
```

```
CREATE TABLE Ambulance(reg_year VARCHAR(3) NOT NULL, reg_county VARCHAR(2)
NOT NULL, reg_id VARCHAR(6) NOT NULL, mileage INT, d_id INT NOT NULL,
PRIMARY KEY(reg_year, reg_county, reg_id));
```

```
CREATE TABLE Event(ev_id INT NOT NULL, e_street VARCHAR(20), e_town
VARCHAR(20), e_county VARCHAR(20), t_time INT, d_date VARCHAR(6), PRIMARY
KEY(ev_id));
```

```
CREATE TABLE Equipment_Use(e_id INT NOT NULL, v_id INT NOT NULL, PRIMARY
KEY(e_id, v_id));
```

```
CREATE TABLE Drive(v_id INT NOT NULL, reg_year VARCHAR(3) NOT NULL,
reg_county VARCHAR(2) NOT NULL, reg_id VARCHAR(6) NOT NULL, PRIMARY
KEY(v_id, reg_year, reg_county, reg_id));
```

```
CREATE TABLE Operate(d_id INT NOT NULL, ev_id INT NOT NULL, PRIMARY
KEY(d_id, ev_id));
```

```
CREATE TABLE Patrol(v_id INT NOT NULL, ev_id INT NOT NULL, PRIMARY
KEY(v_id, ev_id));
```

```
CREATE TABLE Equipped_With(e_id INT NOT NULL, d_id INT NOT NULL, PRIMARY
KEY(e_id, d_id));
```

```
INSERT INTO Volunteer Values(101, 'Annie', 'Arthemias', '1 Arthemias Ave',
'Swords', 'Dublin', 2, 0);
INSERT INTO Volunteer Values(102, 'Benny', 'Bleeding', '1 Bleeding Blvd',
'Dublin', 'Dublin', 2, 0);
INSERT INTO Volunteer Values(103, 'Carly', 'Concussion', '1 Concussion
Circuit', 'Dublin', 'Dublin', 1, 0);
```

```
INSERT INTO Volunteer Values(104, 'Donnie', 'Dislocation', '1 Dislocation Drive', 'Dublin', 'Dublin', 0, 0);
INSERT INTO Volunteer Values(105, 'Emily', 'E-coli', '1 E-coli Enclose', 'Bray', 'Wicklow', 0, 0);
INSERT INTO Volunteer Values(111, 'Freddie', 'Fracture', '1 Fracture Farm', 'Dublin', 'Dublin', 1, 1);
INSERT INTO Volunteer Values(112, 'Gemma', 'Gallstones', '1 Gallstones Gates', 'Maynooth', 'Kildare', 0, 1);
INSERT INTO Volunteer Values(113, 'Harry', 'Hiccups', '1 Hiccups Hill', 'Dublin', 'Dublin', 0, 1);
INSERT INTO Volunteer Values(114, 'Isabella', 'Internalinjuries', '1 Internalinjuries Incline', 'Dublin', 'Dublin', 2, 1);
INSERT INTO Volunteer Values(115, 'Jack', 'Jaundice', '1 Jaundice Jump', 'Dublin', 'Dublin', 0, 1);
INSERT INTO Volunteer Values(121, 'Karen', 'Kidneystone', '1 Kidneystone Kite', 'Dublin', 'Dublin', 1, 2);
INSERT INTO Volunteer Values(122, 'Liam', 'Leprosy', '1 Leprosy Lane', 'Bray', 'Wicklow', 3, 2);
INSERT INTO Volunteer Values(123, 'Michelle', 'Malignant', '1 Malignant Mile', 'Maynooth', 'Kildare', 1, 2);
INSERT INTO Volunteer Values(124, 'Niall', 'Nausea', '1 Nausea Nail', 'Dublin', 'Dublin', 1, 2);
INSERT INTO Volunteer Values(125, 'Orlaith', 'Obesity', '1 Obesity Open', 'Dublin', 'Dublin', 2, 2);
INSERT INTO Volunteer Values(131, 'Paul', 'Pain', '1 Pain Park', 'Swords', 'Dublin', 2, 3);
INSERT INTO Volunteer Values(132, 'Quentin', 'Quadriparesis', '1 Quadriparesis Queen', 'Dublin', 'Dublin', 2, 3);
INSERT INTO Volunteer Values(133, 'Ruth', 'Rabies', '1 Rabies River', 'Dublin', 'Dublin', 1, 3);
INSERT INTO Volunteer Values(134, 'Sam', 'Sammonella', '1 Sammonella St', 'Swords', 'Dublin', 1, 3);
INSERT INTO Volunteer Values(135, 'Tracy', 'Tuberculosis', '1 Tuberculosis Tracks', 'Dublin', 'Dublin', 0, 3);
INSERT INTO Volunteer Values(141, 'Ulrich', 'Ulcer', '1 Ulcer Underpass', 'Maynooth', 'Kildare', 1, 4);
INSERT INTO Volunteer Values(142, 'Victoria', 'Vein', '1 Vein Victoryway', 'Maynooth', 'Kildare', 1, 4);
INSERT INTO Volunteer Values(143, 'William', 'Wheezing', '1 Wheezing Way', 'Maynooth', 'Kildare', 1, 4);
INSERT INTO Volunteer Values(144, 'Xena', 'X-ray', '1 X-ray X-ing', 'Maynooth', 'Kildare', 1, 4);
INSERT INTO Volunteer Values(145, 'Yusuf', 'Yellowfever', '1 Yellowfever Yacht', 'Maynooth', 'Kildare', 1, 4);

INSERT INTO Volunteer_Phone Values(101, 0861111111);
INSERT INTO Volunteer_Phone Values(112, 0862222222);
INSERT INTO Volunteer_Phone Values(123, 0863333333);
INSERT INTO Volunteer_Phone Values(134, 0864444444);
INSERT INTO Volunteer_Phone Values(145, 0865555555);
```



```
INSERT INTO Division Values(0, 'Cardiac Crashers', 'o2 Arena', 'Dublin',
'Dublin');
INSERT INTO Division Values(1, 'De-Deathers', 'Trinity College', 'Dublin',
'Dublin');
INSERT INTO Division Values(2, 'First Aid Fairies', 'o2 Arena', 'Dublin',
'Dublin');
INSERT INTO Division Values(3, 'Bandage Brigade', 'Micks House', 'Dublin',
'Dublin');
INSERT INTO Division Values(4, 'The Splints', 'Mantra', 'Maynooth',
'Kildare');

INSERT INTO Location Values('o2 Arena', 'Dublin', 'Dublin', 1000, 50000);
INSERT INTO Location Values('Trinity College', 'Dublin', 'Dublin', 200,
1000);
INSERT INTO Location Values('Micks House', 'Dublin', 'Dublin', 10, 1);
INSERT INTO Location Values('Mantra', 'Maynooth', 'Kildare', 150, 800);
INSERT INTO Location Values('Coolock Rugby Club', 'Coolock', 'Dublin', 150,
750);

INSERT INTO Equipment Values(1000, 'Bandages', 2, 'Stop the blood and guts
falling out.');
```

```
INSERT INTO Equipment Values(1001, 'Slings', 3, 'For holding broken body
bits.');
```

```
INSERT INTO Equipment Values(1002, 'Oxygen', 50, 'Breathey innny stuff.');
```

```
INSERT INTO Equipment Values(1003, 'Scalpels', 2, 'For slicing and
dicing');
```

```
INSERT INTO Equipment Values(1004, 'Defibulator', 100, 'Zappy');
```

```
INSERT INTO Ambulance Values('132', 'D', '117', 100, 1);
INSERT INTO Ambulance Values('12', 'WD', '1980', 20000, 2);
INSERT INTO Ambulance Values('10', 'D', '5485', 50000, 3);
INSERT INTO Ambulance Values('08', 'KE', '99', 50001, 4);
INSERT INTO Ambulance Values('131', 'DL', '7', 1000, 4);

INSERT INTO Event Values(10, 'Aviva Stadium', 'Dublin', 'Dublin', 1900,
010113);
INSERT INTO Event Values(20, 'Croke Park', 'Dublin', 'Dublin', 2000,
090613);
INSERT INTO Event Values(30, 'Clarion Hotel', 'Dublin', 'Dublin', 2100,
310113);
INSERT INTO Event Values(40, 'Maynooth GAA Club', 'Maynooth', 'Kildare',
2200, 210913);
INSERT INTO Event Values(50, '1 Pearse St', 'Dublin', 'Dublin', 2300,
311213);

INSERT INTO Equipment_Use Values (1004, 103);
INSERT INTO Equipment_Use Values (1004, 111);
INSERT INTO Equipment_Use Values (1004, 123);
INSERT INTO Equipment_Use Values (1004, 134);
INSERT INTO Equipment_Use Values (1004, 145);
```

```
INSERT INTO Drive Values(111, '132', 'D', '117');
INSERT INTO Drive Values(122, '12', 'WD', '1980');
INSERT INTO Drive Values(133, '10', 'D', '5485');
INSERT INTO Drive Values(134, '10', 'D', '5485');
INSERT INTO Drive Values(141, '08', 'KE', '99');
INSERT INTO Drive Values(142, '08', 'KE', '99');
INSERT INTO Drive Values(144, '08', 'KE', '99');
INSERT INTO Drive Values(141, '131', 'DL', '7');
INSERT INTO Drive Values(142, '131', 'DL', '7');
```

```
INSERT INTO Operate Values(0, 10);
INSERT INTO Operate Values(1, 20);
INSERT INTO Operate Values(2, 30);
INSERT INTO Operate Values(3, 40);
INSERT INTO Operate Values(4, 40);
INSERT INTO Operate Values(4, 50);
```

```
INSERT INTO Patrol Values(101, 10);
INSERT INTO Patrol Values(102, 10);
INSERT INTO Patrol Values(104, 10);
INSERT INTO Patrol Values(112, 20);
INSERT INTO Patrol Values(115, 20);
INSERT INTO Patrol Values(121, 30);
INSERT INTO Patrol Values(122, 30);
INSERT INTO Patrol Values(123, 30);
INSERT INTO Patrol Values(133, 40);
INSERT INTO Patrol Values(143, 40);
INSERT INTO Patrol Values(142, 50);
INSERT INTO Patrol Values(144, 50);
INSERT INTO Patrol Values(145, 50);
```

```
INSERT INTO Equipped_With Values(1000, 0);
INSERT INTO Equipped_With Values(1001, 0);
INSERT INTO Equipped_With Values(1002, 0);
INSERT INTO Equipped_With Values(1004, 0);
INSERT INTO Equipped_With Values(1000, 1);
INSERT INTO Equipped_With Values(1001, 1);
INSERT INTO Equipped_With Values(1002, 1);
INSERT INTO Equipped_With Values(1004, 1);
INSERT INTO Equipped_With Values(1000, 2);
INSERT INTO Equipped_With Values(1001, 2);
INSERT INTO Equipped_With Values(1002, 2);
INSERT INTO Equipped_With Values(1003, 2);
INSERT INTO Equipped_With Values(1004, 2);
INSERT INTO Equipped_With Values(1000, 3);
INSERT INTO Equipped_With Values(1000, 4);
INSERT INTO Equipped_With Values(1001, 4);
INSERT INTO Equipped_With Values(1002, 4);
INSERT INTO Equipped_With Values(1003, 4);
INSERT INTO Equipped_With Values(1004, 4);
```

```
ALTER TABLE Volunteer_Phone ADD FOREIGN KEY(v_id) REFERENCES
Volunteer(v_id);
ALTER TABLE Volunteer ADD FOREIGN KEY(d_id) REFERENCES Division(d_id);
ALTER TABLE Division ADD FOREIGN KEY(d_street, d_town, d_county) REFERENCES
Location(l_street, l_town, l_county);
ALTER TABLE Ambulance ADD FOREIGN KEY(d_id) REFERENCES Division(d_id);
ALTER TABLE Equipment_Use ADD FOREIGN KEY(e_id) REFERENCES Equipment(e_id);
ALTER TABLE Equipment_Use ADD FOREIGN KEY(v_id) REFERENCES Volunteer(v_id);
ALTER TABLE Drive ADD FOREIGN KEY(v_id) REFERENCES Volunteer(v_id);
ALTER TABLE Drive ADD FOREIGN KEY(reg_year, reg_county, reg_id) REFERENCES
Ambulance(reg_year, reg_county, reg_id);
ALTER TABLE Operate ADD FOREIGN KEY(d_id) REFERENCES Division(d_id);
ALTER TABLE Operate ADD FOREIGN KEY(ev_id) REFERENCES Event(ev_id);
ALTER TABLE Patrol ADD FOREIGN KEY(v_id) REFERENCES Volunteer(v_id);
ALTER TABLE Patrol ADD FOREIGN KEY(ev_id) REFERENCES Event(ev_id);
ALTER TABLE Equipped_With ADD FOREIGN KEY(e_id) REFERENCES Equipment(e_id);
ALTER TABLE Equipped_With ADD FOREIGN KEY(d_id) REFERENCES Division(d_id);

CREATE TRIGGER del_vol
BEFORE DELETE ON Volunteer
FOR EACH ROW
BEGIN
UPDATE Volunteer
    SET f_name = 'goodbye'
    WHERE Volunteer.v_id = :OLD.V_ID;
END del_vol;

.
RUN

CREATE VIEW vol_stats AS SELECT f_name, l_name, skill_level, d_name FROM
Volunteer, Division WHERE Volunteer.d_id = Division.d_id;

CREATE ROLE Senior IDENTIFIED BY seniorpassword;
GRANT CREATE TABLE TO Senior;
GRANT DELETE TABLE TO Senior;
GRANT SELECT ON vol_stats TO Senior;

CREATE ROLE Junior IDENTIFIED BY juniorpassword;
GRANT SELECT ON vol_stats TO Junior;

GRANT Senior TO Annie Arthemia;
GRANT Junior TO Donnie Dislocation;
```