**CSU-34041 Information Management II**

**SQL Database Project**

Abhay Singh Khanka (18309999)

**Description**

I made a database that represents a Formula one season. The database can be used to organize an F1 season, hold data of the teams and drivers participating as well as represent the details of the races that will take place. The database contains **8** tables. These are :

* Team

This table contains all the information about the teams that are participating each year, such as name and ID of the team, their sponsors, their budget and their drivers.

Each team has 3 Drivers, two of which are their main drivers and one is a reserve driver. I assumed every team will have their unique ID created when inserted in the database. Also note that budget is in units of a million USD.

* Driver

This table contains all the information about the drivers driving for the teams, such as their name and license, age, salary and the team they are driving for. It is checked whether their license is for F1 or not. Please not that salary is in units of a million USD.

* Car

This table contains the information of the car each team will field. It is referenced by its chassis name which is assumed created uniquely when inserting values in the database.

* Race Venue

This table provides information about the each race that will take place during the season, such as date and venue of the race and the chief of operations for the venue.

* Sponsor

This table provides information of all the companies that are the title sponsors of the Formula one teams. We can see which industry the company belongs to as well as who owns the company.

* Venue Staff

This table holds the information of the staff responsible for management and production of race events. Staff can only belong to three departments which are production, business and engineering. It is assumed that every staff member will have their unique ID created when inserted to the database.

* FIA Staff  
  This table holds the information of FIA (the governing body) stewards that will be responsible for ensuring a fair race and giving out any penalties if necessary. The table includes their names and IDs.
* Logistics

This table provides the information of the logistic companies that are responsible for moving race cars from one track location to the other. The table includes the company name and ID.

**Entity Relationship Diagram**

**Chart, scatter chart

Description automatically generated**

**Mapping to Relational Schema**

**Diagram

Description automatically generated**

**Functional Dependencies**

Diagram

Description automatically generated

**Semantic Constraints**

**Key Constraints**

Every table has a primary key defined, which in most cases is an unique ID. For the table car the primary key is the chassis of the car and for the table driver it is their license.

It is also ensured that none of the primary keys in the table can be NULL.

It is ensured that the foreign keys are always referring to existing tuples. In case the referred tuple is deleted or updated, we use ON UPDATE or ON DELETE to either update or delete a tuple.

**Other Constraints**

In addition to the key constraints, there are several checks in place to make sure data is normalised and within required bounds.

A few examples are :

**ALTER TABLE Driver ADD CHECK(salary>0);**

**ALTER TABLE Driver ADD CHECK(gender IN("M","F"));**

**ALTER TABLE Driver ADD CHECK(license LIKE ("F1%"));**

This check insures that the driver is licensed to race in Formula one.

**ALTER TABLE Team ADD CHECK(budget>0 AND budget<=400);**

This check insures that the team is within the budget cap which is 400 million USD, as per F1 rules and regulations.

**ALTER TABLE VenueStaff ADD CHECK(department IN("Business and HR","Production","Engineering"));**

**Views**

There are 3 views which are created in this application, each of them utilise the SELECT command.

The first view is the spectator view which displays the driver names, their teams, sponsors and more.

**CREATE VIEW spectator\_view AS SELECT firstName,lastName,Driver.teamName,sponsorName,wins,salary,Driver.country,age**

**FROM Driver,Team**

**WHERE Driver.teamName = Team.teamName;**

**Graphical user interface, application

Description automatically generated**

The second view is the technical view which displays the data about the car and the name of the team to which the car belongs to.

**CREATE VIEW technical\_view AS SELECT Team.teamName,chassis,engineManf,tyres,budget**

**FROM Car,Team**

**WHERE Car.teamName = Team.teamName;**

**Table

Description automatically generated**

The third view is the steward view which displays the data about the car chassis, team budget and driver license. This view is important as it can allow the stewards(FIA Staff) to view the teams budget, license and car in order to make sure all regulations are followed. In the given code we have assumed that the FIA steward responsible for the race has the ID “BG”.

**CREATE VIEW steward\_view2 AS SELECT DISTINCT FIAchiefID,chassis,Team.teamName,budget,license,firstName,lastName**

**FROM Car,Team,Driver,FIAstaff**

**WHERE Car.TeamName = Team.teamName and Driver.teamName = Team.teamName and Fancified="BG";**

**Graphical user interface, application

Description automatically generated**

**Security**

For this database we use roles for security. Certain roles have access to viewing select tables while some will have the option to modify and delete data from tables.

Some examples are :

**CREATE ROLE FIA\_STAFF;**

**GRANT SELECT ON steward\_view2 TO FIA\_STAFF;**

**GRANT UPDATE,DELETE ON Driver to FIA\_STAFF;**

**GRANT UPDATE,DELETE ON car to FIA\_STAFF;**

**GRANT UPDATE,DELETE ON Team to FIA\_STAFF;**

**GRANT UPDATE,DELETE ON Car to FIA\_STAFF;**

The FIA Staff role will have access to a steward view and will also have the option to edit and delete teams, drivers or cars which might have broken the rules and regulations of the sport.

**CREATE ROLE VIEWER;**

**GRANT SELECT ON spectator\_view to VIEWER;**

**CREATE ROLE ENGINEER;**

**GRANT SELECT ON technical\_view TO ENGINEER;**

There are two roles which make use of our remaining views. The first of which is the viewer one which grants a spectator view to the audience. The other is a technical view which gives information about the vehicles.

**Triggers**

In the database we have two triggers.

**CREATE TRIGGER sponsor\_withdrawl**

**AFTER DELETE ON sponsor**

**FOR EACH ROW**

**BEGIN**

**DECLARE**

**del\_id VARCHAR(10);**

**IF (OLD.sponsorID IS NOT NULL) THEN**

**SET@del\_id := OLD.sponsorID;**

**UPDATE Team**

**SET sponsorID = "N/A" AND sponsorName = "N/A"**

**WHERE temp = Team.sponsorID;**

**END IF;**

**END$$**

The purpose of this trigger is when a sponsor is deleted from the sponsor table, the corresponding team has its sponsor ID and sponsor name removed and changed to “N/A”.

**CREATE TRIGGER deletion\_of\_team**

**AFTER DELETE ON Team**

**FOR EACH ROW**

**BEGIN**

**DECLARE**

**deleted\_name VARCHAR(80);**

**IF (OLD.teamID IS NOT NULL) THEN**

**SET@deleted\_name:=OLD.teamName;**

**DELETE FROM Car**

**where deleted\_name=teamName;**

**END IF;**

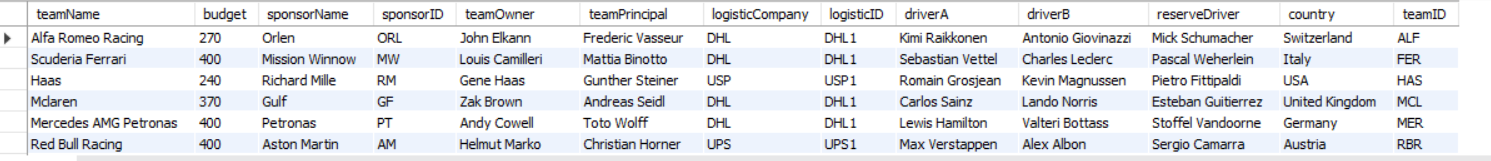
**END$$**

This trigger is called when a team is deleted from the team table and its corresponding car is then deleted by the trigger.

**Examples**

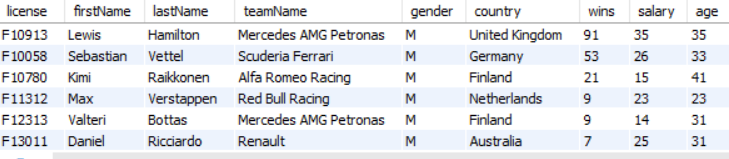
Here are some examples from querying the database:

**select \* from team;**



**select \* from driver**

**order by wins desc;**

****

**select raceDay,trackName,country from raceVenue;**

**Graphical user interface, text, application

Description automatically generated**

**select \* from car**

**where engineManf = "Ferrari";**

**Graphical user interface, application, table

Description automatically generated**

**Appendix**

CREATE DATABASE F1;

USE F1;

CREATE TABLE Car(

factoryLocation VARCHAR(30) NOT NULL,

teamName VARCHAR(50) NOT NULL,

tyres VARCHAR(20) NOT NULL,

engineManf VARCHAR(30) NOT NULL,

chassis VARCHAR(10) NOT NULL PRIMARY KEY

);

CREATE TABLE Logistics(

arrivalDate DATE NOT NULL,

teamName VARCHAR(50) NOT NULL,

pickupLocation VARCHAR(50) NOT NULL,

destination VARCHAR(50) NOT NULL,

companyName VARCHAR(40) NOT NULL,

companyID VARCHAR(10) NOT NULL PRIMARY KEY

);

CREATE TABLE VenueStaff(

staffName VARCHAR(30) NOT NULL,

job VARCHAR(50) NOT NULL,

department VARCHAR(30) NOT NULL,

venueHead VARCHAR(50) NOT NULL,

staffID VARCHAR(10) NOT NULL PRIMARY KEY

);

CREATE TABLE RaceVenue(

raceDay DATE NOT NULL,

fiaChiefID VARCHAR(10) NOT NULL,

venueHead VARCHAR(50) NOT NULL,

country VARCHAR(50) NOT NULL,

trackName VARCHAR(80) NOT NULL,

venueID VARCHAR(10) NOT NULL PRIMARY KEY

);

CREATE TABLE FIAStaff(

fiaChiefID VARCHAR(10) NOT NULL PRIMARY KEY,

fiaChiefName VARCHAR(50) NOT NULL

);

CREATE TABLE Sponsor(

sponsorID VARCHAR(10) NOT NULL PRIMARY KEY,

sponsorName VARCHAR(50) NOT NULL,

industry VARCHAR(50) NOT NULL,

ownerName VARCHAR(50) NOT NULL

);

CREATE TABLE Driver(

license VARCHAR(10) NOT NULL PRIMARY KEY,

firstName VARCHAR(50) NOT NULL,

lastName VARCHAR(50) NOT NULL,

teamName VARCHAR(50) NOT NULL,

gender char NOT NULL,

country VARCHAR(50) NOT NULL,

wins INT,

salary INT,

age INT

);

CREATE TABLE Team(

teamName VARCHAR(50) NOT NULL,

budget INT,

sponsorName VARCHAR(50) NOT NULL,

sponsorID VARCHAR(10) NOT NULL,

teamOwner VARCHAR(50) NOT NULL,

teamPrincipal VARCHAR(50) NOT NULL,

logisticCompany VARCHAR(50) NOT NULL,

logisticID VARCHAR(10) NOT NULL,

driverA VARCHAR(50) NOT NULL,

driverB VARCHAR(50) NOT NULL,

reserveDriver VARCHAR(50) NOT NULL,

country VARCHAR(30) NOT NULL,

teamID VARCHAR(10) NOT NULL PRIMARY KEY

);

INSERT INTO Team VALUES("Mercedes AMG Petronas",400,"Petronas","PT","Andy Cowell","Toto Wolff","DHL","DHL1","Lewis Hamilton","Valteri Bottass","Stoffel Vandoorne","Germany","MER");

INSERT INTO Team VALUES("Scuderia Ferrari",400,"Mission Winnow","MW","Louis Camilleri","Mattia Binotto","DHL","DHL1","Sebastian Vettel","Charles Leclerc","Pascal Weherlein","Italy","FER");

INSERT INTO Team VALUES("Red Bull Racing",400,"Aston Martin","AM","Helmut Marko","Christian Horner","UPS","UPS1","Max Verstappen","Alex Albon","Sergio Camarra","Austria","RBR");

INSERT INTO Team VALUES("Mclaren",370,"Gulf","GF","Zak Brown","Andreas Seidl","DHL","DHL1","Carlos Sainz","Lando Norris","Esteban Guitierrez","United Kingdom","MCL");

INSERT INTO Team VALUES("Racing Point",300,"BWT","BWT","Lawrence Stroll","Otmar Szafnauer","DHL","DHL1","Sergio Perez","Lance Stroll","Nico Hulkenberg","United Kingdom","RPF");

INSERT INTO Team VALUES("Renault",320,"Infiniti","INF","Jean Senard","Cyril Abiteboul","DHL","DHL1","Daniel Ricciardo","Esteban Ocon","Guanyu Zhou","France","REN");

INSERT INTO Team VALUES("Scuderia Alpha Tauri",300,"Alpha Tauri","AT","Graham Watson","Franz Tost","UPS","UPS1","Pierre Gasly","Danil Kvyat","Sebastien Buemi","Italy","SAT");

INSERT INTO Team VALUES("Alfa Romeo Racing",270,"Orlen","ORL","John Elkann","Frederic Vasseur","DHL","DHL1","Kimi Raikkonen","Antonio Giovinazzi","Mick Schumacher","Switzerland","ALF");

INSERT INTO Team VALUES("Haas",240,"Richard Mille","RM","Gene Haas","Gunther Steiner","USP","USP1","Romain Grosjean","Kevin Magnussen","Pietro Fittipaldi","USA","HAS");

INSERT INTO Team VALUES("Williams Racing",220,"Lavazza","LZ","Sir Frank Williams","Claire Williams","DHL","DHL1","George Russell","Nicholas Latifi","Jack Aitken","United Kingdom","WIL");

INSERT INTO Car VALUES("Germany","Mercedes AMG Petronas","Pirelli","Mercedes","W11");

INSERT INTO Car VALUES("Italy","Scuderia Ferrari","Pirelli","Ferrari","SF1000");

INSERT INTO Car VALUES("Austria","Red Bull Racing","Pirelli","Honda","RB16");

INSERT INTO Car VALUES("United Kingdom","Mclaren","Pirelli","Renault","MCL35");

INSERT INTO Car VALUES("United Kingdom","Racing Point","Pirelli","Mercedes","RP20");

INSERT INTO Car VALUES("France","Renault","Pirelli","Renault","RS20");

INSERT INTO Car VALUES("Italy","Scuderia Alpha Tauri","Pirelli","Honda","AT01");

INSERT INTO Car VALUES("Switzerland","Alfa Romeo Racing","Pirelli","Ferrari","C39");

INSERT INTO Car VALUES("USA","Haas","Pirelli","Ferrari","VF20");

INSERT INTO Car VALUES("United Kingdom","Williams Racing","Pirelli","Mercedes","FW34");

INSERT INTO FIAStaff VALUES("BG","Brian Gibbons");

INSERT INTO FIAStaff VALUES("GS","Graham Stoker");

INSERT INTO FIAStaff VALUES("TW","Thierry Willemarck");

ALTER TABLE Logistics

DROP COLUMN teamName,

DROP COLUMN arrivalDate,

DROP COLUMN pickupLocation,

DROP COLUMN destination;

INSERT INTO Logistics VALUES("DHL","DHL1");

INSERT INTO Logistics VALUES("UPS","UPS1");

INSERT INTO Sponsor VALUES("PT","Petronas","Oil and Gas","Tengku Aziz");

INSERT INTO Sponsor VALUES("MW","Mission Winnow","Tobacco","Andre Calantzopoulos");

INSERT INTO Sponsor VALUES("AM","Aston Martin","Automotives","Lawrence Stroll");

INSERT INTO Sponsor VALUES("GF","Gulf","Oil and Gas","Eric Johnson");

INSERT INTO Sponsor VALUES("BWT","BWT","Water Treatment","Gerhard Speigner");

INSERT INTO Sponsor VALUES("INF","Infiniti","Automotives","Peyman Kargar");

INSERT INTO Sponsor VALUES("AT","Alpha Tauri","Fashion","Graham Watson");

INSERT INTO Sponsor VALUES("ORL","Orlen","Oil and Petroleum","Daniel Obajtek");

INSERT INTO Sponsor VALUES("RM","Richard Mille","Fashion","Richard Mille");

INSERT INTO Sponsor VALUES("LZ","Lavazza","Beverage","Alberto Lavazza");

ALTER TABLE VenueStaff

DROP venueHead;

INSERT INTO VenueStaff VALUES("David Hall","Venue Chief","Production","PD001");

INSERT INTO VenueStaff VALUES("Dennis Bernal","Aero Camera Operator","Production","PD247");

INSERT INTO VenueStaff VALUES("Tim Mayer","Camera Observer","Production","PD892");

INSERT INTO VenueStaff VALUES("John Reynold","PitLane Camera Operator","Production","PD403");

INSERT INTO VenueStaff VALUES("John Reynold","Graphics Developer","Production","PD89");

INSERT INTO VenueStaff VALUES("Mark Blundell","Media Systems Engineer","Engineering","E556");

INSERT INTO VenueStaff VALUES("Keeva Archer","Track Systems Engineer","Engineering","E318");

INSERT INTO VenueStaff VALUES("Nathan Bate","Senior Software Developer","Engineering","E018");

INSERT INTO VenueStaff VALUES("Gregory Kane","Press Officer","Business and HR","BHR488");

INSERT INTO VenueStaff VALUES("Maira Leigh","Health and Safety Rep","Business and HR","BHR619");

INSERT INTO VenueStaff VALUES("Wilfred Richmond","HR Executive","Business and HR","BHR091");

INSERT INTO VenueStaff VALUES("Julia Perez","Security Operations Manager","Business and HR","BHR258");

INSERT INTO RaceVenue VALUES("2020-7-5","BG","David Hall","Austria","Red Bull Ring","T01");

INSERT INTO RaceVenue VALUES("2020-7-19","BG","David Hall","Hungary","Hungaroring","T02");

INSERT INTO RaceVenue VALUES("2020-8-2","GS","David Hall","United Kingdom","Silverstone Circuit","T03");

INSERT INTO RaceVenue VALUES("2020-8-16","GS","David Hall","Belgium","Circuit de Spa-Francorchamps","T04");

INSERT INTO RaceVenue VALUES("2020-9-6","TW","David Hall","Italy","Autodromo Nazionale di Monza","T05");

INSERT INTO RaceVenue VALUES("2020-9-27","TW","David Hall","Russia","Sochi Autodrom","T06");

INSERT INTO RaceVenue VALUES("2020-10-11","TW","David Hall","Germany","Nurburgring","T07");

INSERT INTO Driver VALUES("F10913","Lewis","Hamilton","Mercedes AMG Petronas","M","United Kingdom",91,35,35);

INSERT INTO Driver VALUES("F12313","Valteri","Bottas","Mercedes AMG Petronas","M","Finland",9,14,31);

INSERT INTO Driver VALUES("F10058","Sebastian","Vettel","Scuderia Ferrari","M","Germany",53,26,33);

INSERT INTO Driver VALUES("F18912","Charles","Leclerc","Scuderia Ferrari","M","Monaco",2,15,23);

INSERT INTO Driver VALUES("F11312","Max","Verstappen","Red Bull Racing","M","Netherlands",9,23,23);

INSERT INTO Driver VALUES("F19002","Alex","Albon","Red Bull Racing","M","Thailand",0,12,24);

INSERT INTO Driver VALUES("F13771","Carlos","Sainz","Mclaren","M","Spain",0,14,26);

INSERT INTO Driver VALUES("F19201","Lando","Norris","Mclaren","M","United Kingdom",0,11,21);

INSERT INTO Driver VALUES("F11981","Sergio","Perez","Racing Point","M","Mexico",1,15,30);

INSERT INTO Driver VALUES("F17268","Lance","Stroll","Racing Point","M","Canada",0,13,22);

INSERT INTO Driver VALUES("F13011","Daniel","Ricciardo","Renault","M","Australia",7,25,31);

INSERT INTO Driver VALUES("F15128","Esteban","Ocon","Renault","M","France",0,12,24);

INSERT INTO Driver VALUES("F17590","Pierre","Gasly","Scuderia Alpha Tauri","M","France",1,12,24);

INSERT INTO Driver VALUES("F14418","Danil","Kvyat","Scuderia Alpha Tauri","M","Russia",0,10,26);

INSERT INTO Driver VALUES("F10780","Kimi","Raikkonen","Alfa Romeo Racing","M","Finland",21,15,41);

INSERT INTO Driver VALUES("F19310","Antonio","Giovinazzi","Alfa Romeo Racing","M","Italy",0,10,26);

INSERT INTO Driver VALUES("F13881","Romain","Grosjean","Haas","M","France",0,13,34);

INSERT INTO Driver VALUES("F14095","Kevin","Magnussen","Haas","M","Denmark",0,11,28);

INSERT INTO Driver VALUES("F18910","George","Russel","Williams Racing","M","United Kingdom",0,9,22);

INSERT INTO Driver VALUES("F19332","Nicholas","Latifi","Williams Racing","M","Canada",0,8,25);

ALTER TABLE Driver ADD CHECK(salary>0);

ALTER TABLE Driver ADD CHECK(gender IN("M","F"));

ALTER TABLE Driver ADD CHECK(teamName IN (Team.teamName));

ALTER TABLE VenueStaff ADD CHECK(department IN("Business and HR","Production","Engineering"));

ALTER TABLE Car ADD CHECK(teamName IN (Team.teamName));

ALTER TABLE Team ADD CHECK(budget>0 AND budget<=400);

ALTER TABLE Team ADD CHECK(sponsorID IN (Sponsors.sponsorID));

ALTER TABLE Driver ADD CHECK(license LIKE ("F1%"));

ALTER TABLE RaceVenue ADD CONSTRAINT fk\_FIAchiefID foreign key(fiaChiefID) REFERENCES FIAStaff(fiaChiefID)

ON DELETE SET NULL

ON UPDATE CASCADE;

ALTER TABLE Team ADD CONSTRAINT fk\_sponsorID foreign key(sponsorID) REFERENCES Sponsor(sponsorID)

ON DELETE SET NULL

ON UPDATE CASCADE;

CREATE VIEW spectator\_view AS SELECT firstName,lastName,Driver.teamName,sponsorName,wins,salary,Driver.country,age

FROM Driver,Team

WHERE Driver.teamName = Team.teamName;

CREATE VIEW technical\_view AS SELECT Team.teamName,chassis,engineManf,tyres,budget

FROM Car,Team

WHERE Car.teamName = Team.teamName;

CREATE VIEW steward\_view2 AS SELECT DISTINCT FIAchiefID,chassis,Team.teamName,budget,license,firstName,lastName

FROM Car,Team,Driver,FIAstaff

WHERE Car.TeamName = Team.teamName and Driver.teamName = Team.teamName and FIAchiefID="BG";

CREATE ROLE FIA\_STAFF;

GRANT SELECT ON steward\_view2 TO FIA\_STAFF;

GRANT UPDATE,DELETE ON Driver to FIA\_STAFF;

GRANT UPDATE,DELETE ON car to FIA\_STAFF;

GRANT UPDATE,DELETE ON Team to FIA\_STAFF;

GRANT UPDATE,DELETE ON Car to FIA\_STAFF;

CREATE ROLE VIEWER;

GRANT SELECT ON spectator\_view to VIEWER;

CREATE ROLE ENGINEER;

GRANT SELECT ON technical\_view TO ENGINEER;

DELIMITER $$

CREATE TRIGGER sponsor\_withdrawl

AFTER DELETE ON sponsor

FOR EACH ROW

BEGIN

DECLARE

del\_id VARCHAR(10);

IF (OLD.sponsorID IS NOT NULL) THEN

SET@del\_id := OLD.sponsorID;

UPDATE Team

SET sponsorID = "N/A" AND sponsorName = "N/A"

WHERE temp = Team.sponsorID;

END IF;

END$$

DELIMITER ;

DELIMITER $$

CREATE TRIGGER deletion\_of\_team

AFTER DELETE ON Team

FOR EACH ROW

BEGIN

DECLARE

deleted\_name VARCHAR(80);

IF (OLD.teamID IS NOT NULL) THEN

SET@deleted\_name:=OLD.teamName;

DELETE FROM Car

where deleted\_name=teamName;

END IF;

END$$

DELIMITER ;