CPSC 304 Project Cover Page

Milestone #: 4
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Group Number: 11

Name	Student Number	CS Alias (UserID)	Preferred Email Address
Kyle Rich	36316933	h7w2nb	kyledvrich@gmail.com
Eric Liu	95724787	p3v2b	liu.eric103@gmail.com
Anisha Gill	27909993	r4h0d	gill.anisha@outlook.com

By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia.

Project Description

Our project aims to capture all the information necessary for the Federation Internationale de l'Automobile (FIA) – the Formula 1 league – to collect and reference data from current or previous seasons. This includes everything, from drivers, teams, engineers, managers, races, grand prix, circuits, and so on anything the FIA could possibly need to manage the sport.

Our design allows a Formula 1 sport manager to access quick, useful information about the top performing teams, players, etc. It also allows them to filter and view all data within the database, such as about drivers, races, teams, etc. They also have the power to access a Race Details dashboard where they can quickly filter joined tables (races, raced, and drivers), so they can quickly figure out important information about the winners of each race, etc. Additionally, they can edit the details of drivers, add new circuits, and delete historic season data if necessary.

Overall, our project has the goal of providing an Formula 1 sport manager with all the information they could need at their fingertips.

Schema Differences

We spent considerable time in milestone 2 to make sure our schema was mostly 100% perfect, to minimize our work later on. Therefore, we actually made no changes to our schema AT ALL. The schema's listed below in the "Schemas and Screenshots" section are **literally** copy and pasted from milestone 2. We realize there is a 2 point mark for this section, but we do not think it is fair to lose that mark simply for being proactive, and making sure our schema was correct the first time around during milestone 2.

The only changes we made were insignificant:
1) using "_" instead of UpperCamelCase or lowerCamelCase
2) using singular, rather than plural (for example, "car" rather than "cars")
3) fixing typos
4) re-ordering some of the data fields. (for example, on the drivers table, fastest_laps now comes before podiums)

Schema and Screenshots

Cars: Cars(<u>carNumber: int</u>, **<u>teamName: string</u>**, powerUnit: string, chassisModel: string, toDate: Date, fromDate: Date, **driverID: int**)

	number [PK] integer	team_name [PK] character varying (255)	power_unit character varying (255)	chassis_model character varying (255)	to_date date	from_date date	driver_id integer
1	1	Mercedes-AMG Petronas Formula 1 Team	Renault	MD34s	2019-04-10	2022-10-14	149
2	2	Mercedes-AMG Petronas Formula 1 Team	Renault	MD34s	2019-04-10	2022-10-14	148
3	2	Red Bull Racing	Honda	RB2d7	2018-12-11	2020-10-15	240
4	3	Scuderia Ferrari	Ferrari	Frh9d	2013-05-12	2020-10-16	241
5	4	McLaren F1 Team	Mercedes	MLnw0	2020-04-13	2020-10-17	132
6	5	Alpine F1 Team	Renault	APjf8	2021-04-14	2020-10-18	164
7	6	Red Bull Racing	Honda	RB2d7	2018-12-11	2020-10-15	239
8	7	McLaren F1 Team	Mercedes	MLnw0	2020-04-13	2020-10-17	131
9	8	Scuderia Ferrari	Ferrari	Frh9d	2013-05-12	2020-10-16	242
10	9	Alpine F1 Team	Renault	APjf8	2021-04-14	2020-10-18	163

Circuits: Circuits(<u>circuitName: string</u>, mapURL: string, lastLengthIUsed: int, direction: string, type: string, changeInElevation: int, **grandPrixTitle: string**)

	name [PK] character varying (255)	map_url character varying (255)	last_length_used integer	direction character varying (255)	type character varying (255)	change_in_elevation integer	grand_prix_title character varying (255)
1	Bahrain International Circuit	http://en.wikipedia.org/wiki/Bahrain_International_Circuit	4	cw	race track	63	Bahrain Grand Prix
2	Circuit de Barcelona-Catalunya	http://en.wikipedia.org/wiki/Circuit_de_Barcelona-Catalun...	5	clockwise	race track	45	Catalunya Grand Prix
3	Circuit de Monaco	http://en.wikipedia.org/wiki/Circuit_de_Monaco	6	counterclockwise	street track	42	Monaco Grand Prix
4	Circuit Gilles Villeneuve	http://en.wikipedia.org/wiki/Circuit_Gilles_Villeneuve	6	counterclockwise	race track	20	Canadian Grand Prix
5	Istanbul Park	http://en.wikipedia.org/wiki/Istanbul_Park	5	clockwise	race track	31	Istanbul Grand Prix

Drivers: Drivers(<u>driverID: int</u>, name: string, nationality: string, dateOfBirth: Date, placeOfBirth: string, worldChampionships: int, fastestLaps: int, racesWon: int, podiums: int)

	id [PK] integer	name character varying (255)	nationality character varying (255)	dob date	place_of_birth character varying (255)	world_championships integer	fastest_laps integer	races_won integer	podiums integer
1	131	Daniel Ricciardo	Australian	1989-07-01	Australia	0	16	8	32
2	132	Lando Norris	British	1981-07-29	UK	0	51	7	126
3	148	George Russell	British	1998-02-15	UK	0	0	3	13
4	149	Lewis Hamilton	British	1985-01-07	UK	7	15	5	285
5	163	Fernando Alonso	Spanish	1981-07-29	Spain	2	23	32	98
6	164	Esteban Ocon	French	1981-10-19	France	0	68	2	69
7	239	Sergio Pérez	Mexican	1990-05-10	Mexio	0	3	4	26
8	240	Max Verstappen	Dutch	1977-05-10	Netherlands	1	39	7	289
9	241	Carlos Sainz Jr.	Argentine	1985-06-27	Spain	0	65	2	213
10	242	Charles Leclerc	Monégasque	1997-10-16	Monaco	0	24	5	24

DrivesOn: DrivesOn(<u>**teamName: string**</u>, <u>**driverID: int**</u>, fromDate: Date, toDate: Date)

	team_name [PK] character varying (255)	driver_id [PK] integer	from_date date	to_date date
1	Alpine F1 Team	163	2019-12-15	[null]
2	Alpine F1 Team	164	2018-12-15	[null]
3	McLaren F1 Team	131	2018-07-01	[null]
4	McLaren F1 Team	132	2014-07-01	[null]
5	Mercedes-AMG Petronas Formula 1 Team	148	2019-06-15	[null]
6	Mercedes-AMG Petronas Formula 1 Team	149	2015-06-15	[null]
7	Red Bull Racing	239	2018-07-04	[null]
8	Red Bull Racing	240	2019-04-13	[null]
9	Scuderia Ferrari	241	2019-09-28	[null]
10	Scuderia Ferrari	242	2018-09-28	[null]

DroveDuring: DroveDuring(**driverID: int**, **seasonYear: int**, driverRank: int)

	driver_id [PK] integer	season_year [PK] integer	driver_rank integer
1	131	2020	7
2	132	2020	4
3	148	2020	9
4	149	2020	1
5	163	2020	12
6	164	2020	16
7	239	2020	14
8	240	2020	2
9	241	2020	6
10	242	2020	5

Engineers: Engineers(engineerID: int, name: string, nationality: string, dateOfBirth: Date, placeOfBirth: string, educationLevel: string)

	id [PK] integer	name character varying (255)	nationality character varying (255)	dob date	place_of_birth character varying (255)	education_level character varying (255)
1	1	David	Honduran	1995-05-22	Honduras	Bachelors or equivalent level
2	7	Jenson	Cuban	1994-11-16	Canada	Bachelor's or equivalent level
3	11	Mellisa	Haitian	1993-10-05	United States of America	Master's or equivalent level
4	14	Jarno	Thai	1983-04-13	Canada	Post-secondary non-tertiary education
5	16	Mark	Mongolian	1987-08-10	Philippines	Bachelor's or equivalent level

EngineersFor: EngineersFor(**teamName: string**, **engineerID: int**, fromDate: Date, toDate: Date)

	team_name [PK] character varying (255)	engineer_id [PK] integer	from_date date	to_date date
1	Alpine F1 Team	7	2017-07-14	[null]
2	McLaren F1 Team	16	2020-01-29	[null]
3	Mercedes-AMG Petronas Formula 1 Team	1	2016-10-28	[null]
4	Red Bull Racing	14	2019-11-05	[null]
5	Scuderia Ferrari	11	2017-06-12	[null]

GrandPrix: GrandPrix(title: string, country: string)

	title [PK] character varying (255)	country character varying (255)
1	Bahrain Grand Prix	Bahrain
2	Canadian Grand Prix	Canada
3	Catalunya Grand Prix	Spain
4	Istanbul Grand Prix	Turkey
5	Monaco Grand Prix	Monaco

Investors: Investors(name: string)

	name [PK] character varying (255)
1	AMD
2	Chrome
3	Dell
4	Goldman Sachs
5	Hewlett Packard Enterprise

InvestsIn: InvestIn(**investorName**, **teamName**, startDate, endDate, **amount**)

	investor_name [PK] character varying (255)	team_name [PK] character varying (255)	start_date date	end_date date	amount integer
1	AMD	Mercedes-AMG Petronas Formula 1 Team	2015-06-15	[null]	23145731
2	Chrome	McLaren F1 Team	2020-09-28	[null]	21050104
3	Dell	McLaren F1 Team	2014-07-01	[null]	16632288
4	Goldman Sachs	McLaren F1 Team	2018-12-15	[null]	8282840
5	Hewlett Packard Enterprise	Mercedes-AMG Petronas Formula 1 Team	2020-04-13	[null]	17351333

InvestsInAmounts: InvestInAmounts(<u>amount</u>, level)

	amount [PK] integer	level character varying (255)
1	8282840	bronze
2	16632288	silver
3	17351333	silver
4	21050104	gold
5	23145731	platinum

Maintains: Maintains(<u>**carNumber: int**</u>, <u>**teamName: string**</u>, <u>**pitCrewID: int**</u>)

	car_number [PK] integer	team_name [PK] character varying (255)	pit_crew_id [PK] integer
1	1	Mercedes-AMG Petronas Formula 1 Team	22
2	2	Red Bull Racing	22
3	3	Scuderia Ferrari	27
4	4	McLaren F1 Team	21
5	5	Alpine F1 Team	35
6	6	Red Bull Racing	22
7	7	McLaren F1 Team	21
8	8	Scuderia Ferrari	27
9	9	Alpine F1 Team	35

MaintainsCarsFor: MaintainsCarsFor(**teamName: string**, **pitCrewID: int**, fromDate: Date, toDate: Date)

	team_name [PK] character varying (255)	pit_crew_id [PK] integer	from_date date	to_date date
1	Alpine F1 Team	35	2019-06-26	[null]
2	McLaren F1 Team	21	2016-12-17	[null]
3	Mercedes-AMG Petronas Formula 1 Team	22	2016-11-23	[null]
4	Red Bull Racing	21	2020-03-25	[null]
5	Scuderia Ferrari	27	2019-01-10	[null]

Managers : Managers(managerID: int, name: string, nationality: string, dateOfBirth: Date, placeOfBirth: string, role: string)

	id [PK] integer	name character varying (255)	nationality character varying (255)	place_of_birth character varying (255)	dob date	role character varying (255)
1	275	Gianmaria	Italian	Italy	1981-12-15	principal
2	320	Antônio	French	France	1983-10-15	principal
3	322	Olivier	British	Britan	1993-12-15	principal
4	341	Giorgio	Italian	Italy	1982-12-15	principal
5	356	Cristiano	French	France	1993-08-16	principal

Manages : Manages(**teamName: string**, **managerID: int**, fromDate: Date, toDate: Date)

	manager_id [PK] integer	team_name [PK] character varying (255)	from_date date	to_date date
1	275	Alpine F1 Team	2018-12-15	[null]
2	320	Mercedes-AMG Petronas Formula 1 Team	2020-10-15	[null]
3	322	Scuderia Ferrari	2018-12-15	[null]
4	341	McLaren F1 Team	2019-12-15	[null]
5	356	Red Bull Racing	2013-08-16	[null]

ParticipatedIn: ParticipatedIn(**teamName: string**, **seasonYear: int**, constructorRank: int)

	team_name [PK] character varying (255)	season_year [PK] integer	constructor_rank integer
1	Alpine F1 Team	2020	9
2	McLaren F1 Team	2020	4
3	Mercedes-AMG Petronas Formula 1 Team	2020	2
4	Red Bull Racing	2020	1
5	Scuderia Ferrari	2020	7

PitCrew: PitCrew(<u>pitCrewID: int</u>, Name: string, nationality: string, dateOfBirth: Date, placeOfBirth: string, position: string, bestTime: Time)

	id [PK] integer	name character varying (255)	nationality character varying (255)	dob date	place_of_birth character varying (255)	position character varying (255)	best_time time without time zone
1	21	Sam	Iranian	1999-07-19	Iran	BR	00:00:01.82
2	22	Samantha	German	1989-12-01	Germany	BR	00:00:02.36
3	23	Alex	Spanish	1986-01-01	Spain	FR	00:00:01.97
4	27	Lilly	Bulgarian	1990-03-10	United States of America	FL	00:00:02.2
5	35	Heikki	Swedish	1984-03-22	Sweden	BL	00:00:01.88

Races: Races(<u>raceID: int</u>, raceDate: Date, temperature: int, fastestLapTime: Time, redFlagCount: int, **safetyCarModel: string**, DNFCount: int, **poleSitterDriverID: int**, **seasonYear: int**, **circuitName: string**)

	id [PK] integer	date date	temperature integer	fastest_lap time without time zone	safety_car_model character varying (255)	dnf_count integer	pole_sitter_id integer	season_year integer	circuit_name character varying (255)	red_flag_count integer
1	400	2020-07-21	10	00:00:01.4	Porsche 914	2	149	2020	Bahrain International Circuit	1
2	401	2022-10-18	10	00:00:02.3	Lamborghini Countach	6	149	2020	Circuit de Barcelona-Catalunya	6
3	402	2020-12-17	17	00:00:01.5	Mercedes-AMG GT Black Series	3	241	2020	Istanbul Park	2
4	403	2020-10-15	27	00:00:01.9	Lamborghini Diablo	7	149	2020	Circuit de Monaco	4
5	404	2020-07-25	21	00:00:03.4	Mercedes-AMG GT R	4	164	2020	Circuit Gilles Villeneuve	3

Raced: Raced(**raceID: int**, **driverID: int,** placement: int)

	race_id [PK] integer	driver_id [PK] integer	placement integer
1	400	149	1
2	400	240	2
3	401	148	3
4	401	149	2
5	401	239	10
6	401	240	1
7	402	149	4
8	402	240	5
9	402	241	3
10	402	242	1
11	403	131	4
12	403	132	5
13	403	149	1
14	403	240	2
15	404	149	3
16	404	163	7
17	404	164	8
18	404	240	9

SafetyCar: SafetyCar(model: string, topSpeed: int)

	model [PK] character varying (255)	top_speed integer
1	Lamborghini Countach	172
2	Lamborghini Diablo	201
3	Mercedes-AMG GT Black Series	202
4	Mercedes-AMG GT R	224
5	Porsche 914	175

Season: Season(year: int, races: int)

	year [PK] integer	races integer
1	2016	21
2	2017	20
3	2018	21
4	2019	21
5	2020	17

Teams: Teams(<u>teamName: string</u>, baseLocation: string, owner: string, firstTeamEntry: Date, fastestLaps: int, worldChampionships: int)

	name [PK] character varying (255)	base_location character varying (255)	owner character varying (255)	first_team_entry date	fastest_laps integer	world_championships integer
1	Alpine F1 Team	Italian	Miller	1988-11-27	4	12
2	McLaren F1 Team	French	Jones	1994-02-17	7	5
3	Mercedes-AMG Petronas Formula 1 Team	British	Johnson	1991-06-19	7	7
4	Red Bull Racing	German	Williams	1999-01-01	9	11
5	Scuderia Ferrari	British	Brown	1982-08-11	12	2

WorksOn: WorksOn(<u>**carNumber: int**</u>, <u>**teamName: string**</u>, <u>**engineerID: int**</u>)

	car_number [PK] integer	team_name [PK] character varying (255)	engineer_id [PK] integer
1	1	Mercedes-AMG Petronas Formula 1 Team	1
2	2	Red Bull Racing	14
3	3	Scuderia Ferrari	11
4	4	McLaren F1 Team	16
5	5	Alpine F1 Team	7
6	6	Red Bull Racing	14
7	7	McLaren F1 Team	16
8	8	Scuderia Ferrari	11
9	9	Alpine F1 Team	7

INSERT QUERY DETAILS

Code Reference(s)

src/server/src/rest/Server.ts::107
src/server/src/rest/interfaces.ts::16
src/server/src/QueryBuilder.ts::69
src/public/pages/newCircuit.js::10

Query Reference (These queries are built dynamically according to infinite number of user filters)

```typescript
static buildInsertQuery(insertQuery: InsertQuery): string {
  let query = "INSERT INTO circuit VALUES (" + "'" + insertQuery.columnValues.name + "'";
  insertQuery.columnValues.map_url ? query += ",'" + insertQuery.columnValues.map_url + "'" : query += "," + "Null";
  insertQuery.columnValues.last_length_used ? query += "," + insertQuery.columnValues.last_length_used : query += "," + "Null"
  insertQuery.columnValues.direction ? query += ",'" + insertQuery.columnValues.direction + "'" : query += "," + "Null";
  insertQuery.columnValues.type ? query += ",'" + insertQuery.columnValues.type + "'" : query += "," + "Null";
  insertQuery.columnValues.change_in_elevation ? query += "," + insertQuery.columnValues.change_in_elevation : query += "," +"Null";
  query += ",'" + insertQuery.columnValues.grand_prix_title + "')"
  return query;
}
```

Before INSERT Query

Dashboard Filter Data Race Details **New Circuit** Update Drivers Delete Seasons

NEW CIRCUIT

Circuit Name *

Hi 304 TA! This screenshot stuff is pretty tedious

Grand Prix Name *

Bahrain Grand Prix

DETAILS

Map URL

http://localhost:1337/

Last Length Used

123

Direction

Clockwise

Race Type

Street Track

Change In Elevation

456

Add New Circuit

Circuit successfully added below!

Name	Map Url	Last Length Used	Direction	Type	Change In Elevation	Grand Prix Title
Bahrain International Circuit	http://en.wikipedia.org/wiki/Bahrain_International_Circuit	4	cw	race track	63	Bahrain Grand Prix
Circuit de Barcelona-Catalunya	http://en.wikipedia.org/wiki/Circuit_de_Barcelona-Catalunya	5	clockwise	race track	45	Catalunya Grand Prix
Istanbul Park	http://en.wikipedia.org/wiki/Istanbul_Park	5	clockwise	race track	31	Istanbul Grand Prix
Circuit de Monaco	http://en.wikipedia.org/wiki/Circuit_de_Monaco	6	counterclockwise	street track	42	Monaco Grand Prix
Circuit Gilles Villeneuve	http://en.wikipedia.org/wiki/Circuit_Gilles_Villeneuve	6	counterclockwise	race track	20	Canadian Grand Prix
Hi 304 TA! This screenshot stuff is pretty tedious	http://localhost:1337/	123	clockwise	street track	456	Bahrain Grand Prix

After INSERT Query

Dashboard Filter Data Race Details **New Circuit** Update Drivers Delete Seasons

NEW CIRCUIT

Circuit Name *

Hi 304 TA! Here is another new circuit because its cool

Grand Prix Name *

Istanbul Grand Prix

DETAILS

Map URL

http://localhost:1337/1234

Last Length Used

12352

Direction

Counterclockwise

Race Type

Race Track

Change In Elevation

4562424

Add New Circuit

Circuit successfully added below!

Name	Map Url	Last Length Used	Direction	Type	Change In Elevation	Grand Prix Title
Bahrain International Circuit	http://en.wikipedia.org/wiki/Bahrain_International_Circuit	4	cw	race track	63	Bahrain Grand Prix
Circuit de Barcelona-Catalunya	http://en.wikipedia.org/wiki/Circuit_de_Barcelona-Catalunya	5	clockwise	race track	45	Catalunya Grand Prix
Istanbul Park	http://en.wikipedia.org/wiki/Istanbul_Park	5	clockwise	race track	31	Istanbul Grand Prix
Circuit de Monaco	http://en.wikipedia.org/wiki/Circuit_de_Monaco	6	counterclockwise	street track	42	Monaco Grand Prix
Circuit Gilles Villeneuve	http://en.wikipedia.org/wiki/Circuit_Gilles_Villeneuve	6	counterclockwise	race track	20	Canadian Grand Prix
Hi 304 TA! This screenshot stuff is pretty tedious	http://localhost:1337/	123	clockwise	street track	456	Bahrain Grand Prix
Hi 304 TA! Here is another new circuit because its cool	http://localhost:1337/1234	12352	counterclockwise	race track	4562424	Istanbul Grand Prix

DELETE QUERY DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::133
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::80
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/interfaces.ts::44
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/public/pages/deleteSeasons.js::11

Query Reference (These queries are built dynamically according to infinite number of user filters)

```
static buildDeleteQuery(deleteQuery: DeleteQuery): string {
  let query = 'DELETE FROM ';
  query += deleteQuery.tableName;
  if (deleteQuery.filter) {
    if(deleteQuery.filter.filterItems.length === 0) {throw new Error("Please enter numbers for any filter items")}
    query += ' WHERE ';
    const logicalOperator = deleteQuery.filter.type === 'and' ? ' AND ' : ' OR ';
    const deleteItems = deleteQuery.filter.filterItems;
    for (let i = 0; i < deleteItems.length; i++) {
      if(deleteItems[i].value == "") {throw new Error("filter items are invalid")}
      query += deleteItems[i].column + deleteItems[i].compareOperator + deleteItems[i].value;
      if (i != deleteItems.length - 1) query += logicalOperator;
    }
  }
  return query;
}
```

Before DELETE Query

FILTERS

AND

Fields   **Value**

| Races | = | 20 |

[+] [-]

[Delete Seasons]

Seasons successfully deleted! Please see updated table below

Year	Races
2016	21
2018	21
2019	21
2020	17

After DELETE Query

UPDATE QUERY DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::97
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/public/pages/updateDrivers.js::9
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/interfaces.ts::29
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::148

Query Reference (These queries are built dynamically according to infinite number of user filters)

```ts
static buildUpdateQuery(updateQuery: UpdateQuery): string {
  let query = 'UPDATE ';
  query += updateQuery.tableName;
  query += ' SET ';
  if (Object.keys(updateQuery.newColumnValues).length === 0) {
    throw new Error('Please specify at least one column to update');
  }
  let temp_query = '';


  for (const col in updateQuery.newColumnValues) {
    const value = String(updateQuery.newColumnValues[col as keyof typeof updateQuery.newColumnValues]);
    query += col + ' = ' + `'` + value + `'` + ', ';
  }
  temp_query = query.slice(0,-2);

  if (updateQuery.filter) {
    temp_query += ' WHERE ';
    const logicalOperator = updateQuery.filter.type === 'and' ? ' AND ' : ' OR ';
    const filterItems = updateQuery.filter.filterItems;
    for (let i = 0; i < filterItems.length; i++) {
      if(filterItems[i].value == "") {throw new Error("filter items are invalid")}
      query += filterItems[i].column + filterItems[i].compareOperator + filterItems[i].value;
      temp_query += filterItems[i].column + ' ' + filterItems[i].compareOperator + ' ' + filterItems[i].value;
      if (i != filterItems.length - 1) temp_query += logicalOperator;
    }
  }


  return temp_query;
}
```

Before UPDATE Query

FILTERS

AND

Fields | **Value**

World championships | = | 7

+ -

New Values

Name

Kyle Rich

Nationality

Date of Birth

yyyy-mm-dd

Birth Place

World Championships

Fastest Laps

Races won

Podiums

Update Drivers

If any drivers matched your filters: Drivers successfully updated! Please see updated table below

id	Name	Nationality	Dob	Place Of Birth	World Championships	Fastest Laps	Races Won	Podiums
148	George Russell	British	1998-02-15T00:00:00.000Z	UK	0	0	3	13
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289
239	Sergio Pérez	Mexican	1990-05-10T00:00:00.000Z	Mexio	0	3	4	26
241	Carlos Sainz Jr.	Argentine	1985-06-27T00:00:00.000Z	Spain	0	65	2	213
242	Charles Leclerc	Monégasque	1997-10-16T00:00:00.000Z	Monaco	0	24	5	24
132	Lando Norris	British	1981-07-29T00:00:00.000Z	UK	0	51	7	126
131	Daniel Ricciardo	Australian	1989-07-01T00:00:00.000Z	Australia	0	16	8	32
164	Esteban Ocon	French	1981-10-19T00:00:00.000Z	France	0	68	2	69
163	Fernando Alonso	Spanish	1981-07-29T00:00:00.000Z	Spain	2	23	32	98
149	Kyle Rich	British	1985-01-07T00:00:00.000Z	UK	7	15	5	285

After UPDATE Query

Dashboard | Filter Data | Race Details | New Circuit | **Update Drivers** | Delete Seasons

FILTERS

AND

Fields		Value
World championships	>=	5
Nationality	=	British
Id	!=	132

[+] [-]

New Values

Name
Rice

Nationality
Canadian

Date of Birth
2022-09-09

Birth Place
UBC

World Championships
100

Fastest Laps
123

Races won
123

Podiums
213

[Update Drivers]

If any drivers matched your filters: Drivers successfully updated! Please see updated table below

Id	Name	Nationality	Dob	Place Of Birth	World Championships	Fastest Laps	Races Won	Podiums
148	George Russell	British	1998-02-15T00:00:00.000Z	UK	0	0	3	13
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289
239	Sergio Pérez	Mexican	1990-05-10T00:00:00.000Z	Mexio	0	3	4	26
241	Carlos Sainz Jr.	Argentine	1985-06-27T00:00:00.000Z	Spain	0	65	2	213
242	Charles Leclerc	Monégasque	1997-10-16T00:00:00.000Z	Monaco	0	24	5	24
132	Lando Norris	British	1981-07-29T00:00:00.000Z	UK	0	51	7	126
131	Daniel Ricciardo	Australian	1989-07-01T00:00:00.000Z	Australia	0	16	8	32
164	Esteban Ocon	French	1981-10-19T00:00:00.000Z	France	0	68	2	69
163	Fernando Alonso	Spanish	1981-07-29T00:00:00.000Z	Spain	2	23	32	98
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213

SELECTION / PROJECTION QUERY DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::8
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::77
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/interfaces.ts::1
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/public/pages/filterData.js::12

Query Reference (These queries are built dynamically according to infinite number of user filters)

```
static buildFilterQuery(filterQuery: FilterQuery): string {
  let query = 'SELECT ';
  for (let i = 0; i < filterQuery.selectedColumns.length; i++) {
    query += filterQuery.selectedColumns[i];
    if (i != filterQuery.selectedColumns.length - 1) query += ', ';
  }
  if (filterQuery.selectedColumns.length === 0) {
    throw new Error('Please select at least one column');
  }
  query += ' FROM ';
  query += filterQuery.tableName;
  if (filterQuery.filter) {
    query += ' WHERE ';
    const logicalOperator = filterQuery.filter.type === 'and' ? ' AND ' : ' OR ';
    const filterItems = filterQuery.filter.filterItems;
    for (let i = 0; i < filterItems.length; i++) {
      if(!filterItems[i].value) {
        throw new Error("filter items are invalid")
      }
      query += filterItems[i].column + ' ' + filterItems[i].compareOperator + ' ' + filterItems[i].value;
      if (i != filterItems.length - 1) query += logicalOperator;
    }
  }
```

Before SELECTION / PROJECTION Query

Dashboard | Filter Data | Race Details | New Circuit | Update Drivers | Delete Seasons

TABLES

Driver ▾

FILTERS

No Filters ▾

COLUMNS

Id
Name
Nationality
Dob
Place of birth
World championships
Fastest laps
Races won
Podiums

[Filter Data]

Id	Name	Nationality	Dob	Place Of Birth	World Championships	Fastest Laps	Races Won	Podiums
148	George Russell	British	1998-02-15T00:00:00.000Z	UK	0	0	3	13
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289
239	Sergio Pérez	Mexican	1990-05-10T00:00:00.000Z	Mexio	0	3	4	26
241	Carlos Sainz Jr.	Argentine	1985-06-27T00:00:00.000Z	Spain	0	65	2	213
242	Charles Leclerc	Monégasque	1997-10-16T00:00:00.000Z	Monaco	0	24	5	24
132	Lando Norris	British	1981-07-29T00:00:00.000Z	UK	0	51	7	126
131	Daniel Ricciardo	Australian	1989-07-01T00:00:00.000Z	Australia	0	16	8	32
164	Esteban Ocon	French	1981-10-19T00:00:00.000Z	France	0	68	2	69
163	Fernando Alonso	Spanish	1981-07-29T00:00:00.000Z	Spain	2	23	32	98
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213

After SELECTION / PROJECTION Query

Dashboard	Filter Data	Race Details	New Circuit	Update Drivers	Delete Seasons

TABLES

Driver

FILTERS

AND

Fields		Value
Nationality	!=	British
Dob	>=	1990-05-10T00:00:00.000Z
Fastest laps	!=	0
Name	!=	Rice

[+] [-]

COLUMNS

Id
Name
Nationality
Dob
Place of birth
World championships
Fastest laps
Races won
Podiums

[Filter Data]

Name	Nationality	Dob	Place Of Birth	World Championships	Fastest Laps
Sergio Pérez	Mexican	1990-05-10T00:00:00.000Z	Mexio	0	3
Charles Leclerc	Monégasque	1997-10-16T00:00:00.000Z	Monaco	0	24

JOIN QUERY DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::35
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::94
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/interfaces.ts::7
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/public/pages/raceDetails.js::13

Query Reference (These queries are built dynamically according to infinite number of user filters)

```typescript
static buildJoinQuery(joinQuery: JoinQuery): string {

  let query = 'SELECT ';
  for (let i = 0; i < joinQuery.selectedColumns.length; i++) {
    query += joinQuery.selectedColumns[i];
    if (i != joinQuery.selectedColumns.length - 1) query += ', ';
  }
  if (joinQuery.selectedColumns.length === 0) {
    throw new Error('Please select at least one column');
  }
  query += ' FROM ' + joinQuery.tableName1 + ', ' + joinQuery.tableName2 + ', ' + joinQuery.tableName3;
  query += ' WHERE ' + joinQuery.tableName1 + '.id = ' + joinQuery.tableName3 + '.' + joinQuery.tableName1 + '_id';
  query += ' AND ' + joinQuery.tableName3 + '.' + joinQuery.tableName2 + '_id = ' + joinQuery.tableName2 + '.id';
  if (joinQuery.filter && joinQuery.filter.filterItems.length > 0) {
    query += ' AND (';
  }
  if (joinQuery.filter && joinQuery.filter.filterItems.length > 0) {
    const logicalOperator = joinQuery.filter.type === 'and' ? ' AND ' : ' OR ';
    const filterItems = joinQuery.filter.filterItems;
    for (let i = 0; i < filterItems.length; i++) {
      if(!filterItems[i].value) {
        throw new Error("filter items are invalid")
      }
      query += filterItems[i].column + ' ' + filterItems[i].compareOperator + ' ' + filterItems[i].value;
      if (i != filterItems.length - 1) query += logicalOperator;
    }
  }
  if (joinQuery.filter && joinQuery.filter.filterItems.length > 0) {
    query += ')';
  }


  return query;
}
```

Before JOIN Query

Dashboard   Filter Data   **Race Details**   New Circuit   Update Drivers   Delete Seasons

FILTERS

No Filters

COLUMNS

Driver Id
Driver Name
Driver Nationality
Driver Dob
Driver Place of birth
Driver World championships
Driver Fastest laps
Driver Races won
Driver Podiums
Race Id
Race Date
Race Temperature
Race Fastest lap
Race Safety car model
Race Dnf count
Race Pole sitter id
Race Season year
Race Circuit name
Race Red flag count
Race Placement

See race details

Driverid	Name	Nationality	Dob	Place Of Birth	World Championships	Fastest Laps	Races Won	Podiums	Raceid	Date	Temperature	Fastest Lap	Safety Car Model	Dnf Count	Pole Sitter Id	Season Year	Circuit Name	Red Flag Count	Placement
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213	400	2020-07-21T00:00:00.000Z	10		Porsche 914	2	149	2020	Bahrain International Circuit	1	1
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213	401	2022-10-18T00:00:00.000Z	10		Lamborghini Countach	6	149	2020	Circuit de Barcelona-Catalunya	6	2
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213	402	2020-12-17T00:00:00.000Z	17		Mercedes-AMG GT Black Series	3	241	2020	Istanbul Park	2	4
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213	403	2020-10-15T00:00:00.000Z	27		Lamborghini Diablo	7	149	2020	Circuit de Monaco	4	1
149	Rice	Canadian	2022-09-09T00:00:00.000Z	UBC	100	123	123	213	404	2020-07-25T00:00:00.000Z	21		Mercedes-AMG GT R	4	164	2020	Circuit Gilles Villeneuve	3	3
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289	400	2020-07-21T00:00:00.000Z	10		Porsche 914	2	149	2020	Bahrain International Circuit	1	2
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289	401	2022-10-18T00:00:00.000Z	10		Lamborghini Countach	6	149	2020	Circuit de Barcelona-Catalunya	6	1
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289	402	2020-12-17T00:00:00.000Z	17		Mercedes-AMG GT Black Series	3	241	2020	Istanbul Park	2	5
240	Max Verstappen	Dutch	1977-05-10T00:00:00.000Z	Netherlands	1	39	7	289	403	2020-10-15T00:00:00.000Z	27		Lamborghini Diablo	7	149	2020	Circuit de Monaco	4	2
240	Max	Dutch	1977-05-	Netherlands	1	39	7	289	404	2020-07-	21		Mercedes-AMG GT R	4	164	2020	Circuit Gilles	3	3

After JOIN Query

FILTERS

AND

Fields

| Driver Id | | = | | Race Pole sitter id |

+ Field Filter   + Value Filter   −

COLUMNS

Driver Id
Driver Name
Driver Nationality
Driver Dob
Driver Place of birth
Driver World championships
Driver Fastest laps
Driver Races won
Driver Podiums
Race Id
Race Date
Race Temperature
Race Fastest lap
Race Safety car model
Race Dnf count
Race Pole sitter id
Race Season year
Race Circuit name
Race Red flag count
Race Placement

See race details

Driverid	Name	Raceid	Date	Pole Sitter Id
149	Rice	400	2020-07-21T00:00:00.000Z	149
149	Rice	401	2022-10-18T00:00:00.000Z	149
241	Carlos Sainz Jr.	402	2020-12-17T00:00:00.000Z	241
149	Rice	403	2020-10-15T00:00:00.000Z	149
164	Esteban Ocon	404	2020-07-25T00:00:00.000Z	164

Aggregation with Group By DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::130
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::164

Query Reference

```typescript
    static getAggregationWithGroupByQuery(): string {
      let query = `SELECT maxpods.tn AS Team_Name,
          d.name          AS Driver_Name,
          dd.season_year    ,
          maxpods.pods AS Podiums
FROM    driver d,
        drives_on dsd,
        drove_during dd,
        (
                SELECT  dsd.team_name  AS tn,
                        max(d.podiums) AS pods
                FROM    driver d,
                        drives_on dsd,
                        drove_during dd
                WHERE   dd.season_year = 2020
                AND     dd.driver_id = dsd.driver_id
                AND     d.id = dsd.driver_id
                GROUP BY dsd.team_name) maxpods
WHERE   dd.season_year = 2020
AND     dd.driver_id = dsd.driver_id
AND     d.id = dsd.driver_id
AND     d.podiums = maxpods.pods
AND     dsd.team_name = maxpods.tn`;

      return query;
    }
```

Aggregation with Group By Query

Team Name	Driver Name	Season Year	Podiums
Mercedes-AMG Petronas Formula 1 Team	Rice	2020	213
Red Bull Racing	Max Verstappen	2020	289
Scuderia Ferrari	Carlos Sainz Jr.	2020	213
McLaren F1 Team	Lando Norris	2020	126
Alpine F1 Team	Fernando Alonso	2020	98

Dashboard   Filter Data   Race Details   New Circuit   Update Drivers   Delete Seasons

Welcome to your Formula 1 Database Dashboard

Find useful data here

Get All-star Drivers By Team in 2020
For each team, find the drivers that drove on that team in 2020 and have the most podiums (most talented drivers)

Get Frugal High Performing Teams
Which teams have won the most world championships with less than 3 investors

Get High Podium Teams
Teams with above averge number of podiums

Get Well-rounded Drivers
Drivers that have raced on all circuits

Aggregation with Having DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::157
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::178

Query Reference

```typescript
static getAggregationWithHavingQuery(): string {
  let query = `SELECT ii.team_name, max(te.world_championships) AS world_championships
              FROM invests_in ii, team te
              WHERE te.name = ii.team_name
              GROUP by ii.team_name
              HAVING count(*) < 3`;


  return query;
}
```

Aggregation with Having Query

Nested Aggregation with Group By DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::168
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::194

Query Reference

```typescript
static getNestedAggregationWithGroupByQuery(): string {
  let query = `SELECT dsd.team_name
               FROM driver d, drives_on dsd, drove_during dd
               WHERE dd.driver_id = dsd.driver_id AND d.id = dsd.driver_id AND dd.season_year = 2020
               GROUP By dsd.team_name
               HAVING avg(d.podiums) >= (SELECT avg(d1.podiums)
                                         FROM driver d1)`;


  return query;
}
```

Nested Aggregation with Group By Query

Division DETAILS

Code Reference(s)

/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/QueryBuilder.ts::180
/Users/kylerich/Developer/304/project_h7w2b_p3v2b_r4h0d/src/server/src/rest/Server.ts::208

Query Reference

```typescript
static getDivisionQuery(): string {
  let query = `SELECT d.name, d.nationality, d.world_championships
               FROM driver d
               WHERE NOT EXISTS ((SELECT name
                                  FROM circuit)
                      EXCEPT
                          (SELECT ra.circuit_name
                           FROM raced r, race ra
                           WHERE d.id = r.driver_id and r.race_id = ra.id))`;

  return query;
}
```

Division Query

Dashboard | Filter Data | Race Details | New Circuit | Update Drivers | Delete Seasons

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For each team, find the drivers that drove on that team in 2020 and have the most podiums (most talented drivers)

Get Frugal High Performing Teams
Which teams have won the most world championships with less than 3 investors

Get High Podium Teams
Teams with above averge number of podiums

Get Well-rounded Drivers
Drivers that have raced on all circuits

Name	Nationality	World Championships
Max Verstappen	Dutch	1
Rice	Canadian	100