COMPX323 – Project

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1. Project Milestone 1

1.1 Application Description

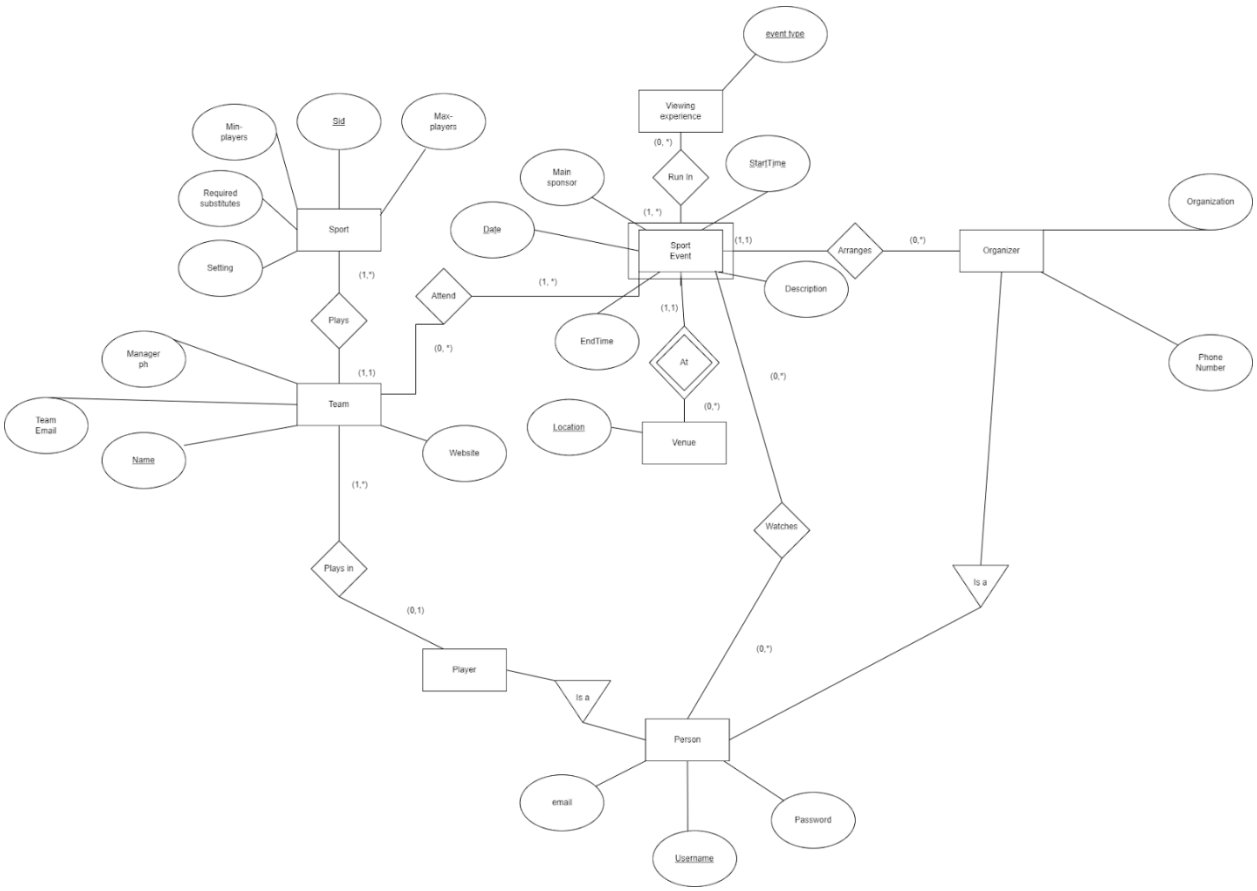
The application focuses on sports event information storage. It keeps track of which events happened at which location at which time. Users can use it as a watch list to as they will have a watchlist dedicated to their id, so that they can keep a track of all events that they have watched. If a person is in a team they have access to an additional page that shows matches that they have personally participated in as well as their current members. It does not keep track of wins and losses as that brings up potential storage and relational issues in which the win storage location will have to be decided e.g. attached to team or event.

The sport platform wants to have a new database to store information about sport events. The platform stores. Sport events can be hosted in-person, virtual or both. The platform wants to store information about the players, organizers, viewers, the team the players are in and the sport. The team only records the current roster and players can only be assigned to at most 1 team at any given time. Details about the Organization are stored in the organizers. The Sport Event is created when it is organized by an organizer.

Explanation of relationships:
Team - Plays - Sport: 1 team can play 1 and only 1 sport; A sport will have at least 1 team, to many teams that play it.
Sport - Sport - Event: A sport can take place at no events, to many events; A sport event can hold one to many sports
Person - Attends - Sport Event: 1 viewer can attend 0 events or many events; A sport event can have 0 to many members in attendance
Sport-event - arranges - Organizer: A sport event is organized by one organizer and only 1, An organizer can organize 0 to many events.

A sporting event is a generalization between virtual esports and other forms of sports that do not have to be played from a shared location.

1.2 Revised ER Diagram



2. Project Milestone 2

2.1 Relation Schema

Person
Username, Email, Password, First Name, Last Name
Player (Inherit from Person)
Username, TeamID
Organizer (Inherit from Person)
Username, Organization, Phone Number
Team
TeamID, Name, TeamEmail, Phone Number, Website, Sport
Sport
Name, MinPlayer, MaxPlayer, Required Substitute, Setting
Setting
Setting
Sport Event
Date, Start Time, Location, End Time, Main Sponsor, Description, Organizer
Venue
Location
Viewing experience
Event-type
Run In
Date, Start Time, Organizer, Event-type
Attends
TeamID, Date, Start Time, Location
Watches
Person, Date, Start Time, Location

2.2 Table Definitions

```
create table Person(
Username varchar(30),
Email varchar(50) not null,
Password varchar(30) not null,
FirstName varchar(30) not null,
LastName varchar(30) not null,

CONSTRAINT PKPerson PRIMARY KEY (Username),
CONSTRAINT emailCheck check (email LIKE '%_@_%.___%')
);
```

```sql
create table Organizer(
Username varchar(30),
Organization varchar(50) not null,
PhoneNumber varchar(20),

CONSTRAINT PKOrg PRIMARY KEY (Username),
CONSTRAINT FKOrg FOREIGN KEY (Username) REFERENCES Person ON DELETE CASCADE
);
```

```sql
create table Player(
Username varchar(30),
TeamID varchar(30),

CONSTRAINT PKPlayer PRIMARY KEY (Username),
CONSTRAINT FKPlayer FOREIGN KEY (Username) REFERENCES Person ON DELETE CASCADE,
CONSTRAINT FKTeamID FOREIGN KEY (TeamID) REFERENCES Team
);
create table Setting(
SettingID varchar(30),

CONSTRAINT PKSettingID PRIMARY KEY (SettingID)
);
```

```sql
create table Setting(
SettingID varchar(30),

CONSTRAINT PKSettingID PRIMARY KEY (SettingID)
);
```

```sql
create table Sport(
Name varchar(30),
MinPlayer integer not null,
MaxPlayer integer not null,
RequiredSubstitute varchar(50),
SettingID varchar(30),

CONSTRAINT PKSport PRIMARY KEY (Name),
CONSTRAINT FKSetting foreign key(SettingID) references Setting(SettingID)
);
```

```
create table Team(
TeamID varchar(30),
Name varchar(30) not null,
TeamEmail varchar(50) not null,
PhoneNumber varchar(20),
Website varchar(50) not null,
Sport varchar(30),

CONSTRAINT PKTeam PRIMARY KEY (TeamID),
CONSTRAINT FKSport foreign key(Sport) references Sport(Name)
);

create table Venue(
Location varchar(30),

CONSTRAINT PKLocation PRIMARY KEY (Location)
);

create table SportEvent(
EventDate Date,
StartTime Date,
Location varchar(30),
EndTime Date,
Organizer varchar(30),
MainSponsor varchar(50) not null,
Description varchar(100),

CONSTRAINT PKSportEvent PRIMARY KEY (EventDate, StartTime, Location),
CONSTRAINT FKLocation FOREIGN KEY(Location) REFERENCES Venue(Location),
CONSTRAINT FKOrganizer FOREIGN KEY(Organizer) REFERENCES Organizer(Username)
);
```

S

```
create table ViewingExperience(
EventType varchar(30),

CONSTRAINT PKViewingExperience PRIMARY KEY (EventType)
);

create table RunIn(
EventDate date,
StartTime date,
Location varchar(30),
EventType varchar(30),

CONSTRAINT PKIn PRIMARY KEY (EventDate, StartTime, Location, EventType),
CONSTRAINT FKEventDate foreign key(EventDate, StartTime, Location) references SportEvent(EventDate, StartTime, Location),
CONSTRAINT FKEventType foreign key(EventType) references ViewingExperience(EventType)
);
```

```
create table RunIn(
EventDate date,
StartTime date,
Location varchar(30),
EventType varchar(30),

CONSTRAINT PKIn PRIMARY KEY (EventDate, StartTime, Location, EventType),
CONSTRAINT FKEventDate foreign key(EventDate, StartTime, Location) references SportEvent(EventDate, StartTime, Location),
CONSTRAINT FKEventType foreign key(EventType) references ViewingExperience(EventType)
);

create table Attends(
TeamID varchar(30),
EventDate date,
StartTime date,
Location varchar(30),

CONSTRAINT PKAttends PRIMARY KEY (TeamID, EventDate, StartTime, Location),
CONSTRAINT FKTeam foreign key(TeamID) references Team(TeamID),
CONSTRAINT FKEventDate2 foreign key(EventDate, StartTime, Location) references SportEvent(EventDate, StartTime, Location)
);

create table Watches(
Person varchar(30),
EventDate date,
StartTime date,
Location varchar(30),

CONSTRAINT PKWatches PRIMARY KEY (Person, EventDate, StartTime, Location),
CONSTRAINT FKPerson foreign key(Person) references Person(Username),
CONSTRAINT FKEventDate3 foreign key(EventDate, StartTime, Location) references SportEvent(EventDate, StartTime, Location)
);
```

2.3 Dataset

2.3.1 Small

Person

	USERNAME	EMAIL	PASSWORD	FIRSTNAME	LASTNAME
1	jt123	jt@gmail.com	123	John	Tan
2	bk456	bk@hotmail.com	456	Ben	Key
3	tk789	tk@yahoo.com	789	Thomas	Key
4	sb111	sb@gmail.com	111	Sally	Brown
5	kk123	weq@gmail.com	1234	Kai	Wen
6	jj123	jt66@gmail.com	123	Johnny	Brown
7	bk32456	bk33@hotmail.com	456	Tristana	Yong
8	tk42789	tk44@yahoo.com	789	Thomas	Tan
9	sb64111	s33b@gmail.com	111	Garen	Wu
10	kk18623	we33q@gmail.com	1234	Karen	Wang

Organizer

	USERNAME	ORGANIZATION	PHONENUMBER
1	jt123	Riot Games	02705183131

Player

	USERNAME	TEAMID
1	tk789	1
2	sb111	1
3	kk123	2
4	kk18623	3

Setting

	SETTINGID
1	Indoor
2	Outdoor

Sport

	NAME	MINPLAYER	MAXPLAYER	REQUIREDSUBSTITUTE	SETTINGID
1	League of Legend	5	5	5	Indoor

Team

	TEAMID	NAME	TEAMEMAIL	PHONENUMBER	WEBSITE	SPORT
1	1	SKT	skt@gmail.com	877650521	www.skt.com	League of Legend
2	2	TSM	tsm@gmail.com	7113867511	www.tsm.com	League of Legend
3	3	RNG	rng@gmail.com	2081615316	www.rng.com	League of Legend

Venue

	LOCATION
1	108 Dallow Place
2	139 Clipston Place
3	169 Jensen Place
4	197 Derby Place
5	225 Beaumont Road
6	238 Gretna Street
7	244 Sunburst Court

Sport Event

	EVENTDATE	STARTTIME	LOCATION	ENDTIME	ORGANIZER	MAINSPONSOR	DESCRIPTION
1	05/06/22	01/06/22	225 Beaumont Road	01/06/22	jt123	Nike	B05
2	06/06/22	01/06/22	225 Beaumont Road	01/06/22	jt123	Harvey Norman	Finals
3	06/06/22	01/06/22	244 Sunburst Court	01/06/22	jt123	Nike	(null)
4	08/06/22	01/06/22	244 Sunburst Court	01/06/22	jt123	Google	Semi Finals
5	09/06/22	01/06/22	238 Gretna Street	01/06/22	jt123	Nike	(null)
6	10/06/22	01/06/22	139 Clipston Place	01/06/22	jt123	Apple	(null)
7	11/06/22	01/06/22	238 Gretna Street	01/06/22	jt123	Yahoo	(null)
8	12/06/22	01/06/22	197 Derby Place	01/06/22	jt123	Nike	B01
9	13/06/22	01/06/22	169 Jensen Place	01/06/22	jt123	Google	(null)
10	14/06/22	01/06/22	108 Dallow Place	01/06/22	jt123	Samsung	(null)
11	15/06/22	01/06/22	197 Derby Place	01/06/22	jt123	Nike	(null)

Viewing Experience

	EVENTTYPE
1	In Person
2	Streaming Platform

Run In

	EVENTDATE	STARTTIME	LOCATION	EVENTTYPE
1	05/06/22	01/06/22	225 Beaumont Road	Streaming Platform
2	06/06/22	01/06/22	225 Beaumont Road	Streaming Platform
3	06/06/22	01/06/22	244 Sunburst Court	Streaming Platform
4	08/06/22	01/06/22	244 Sunburst Court	Streaming Platform
5	09/06/22	01/06/22	238 Gretna Street	Streaming Platform
6	10/06/22	01/06/22	139 Clipston Place	In Person
7	11/06/22	01/06/22	238 Gretna Street	In Person
8	12/06/22	01/06/22	197 Derby Place	Streaming Platform
9	13/06/22	01/06/22	169 Jensen Place	In Person
10	14/06/22	01/06/22	108 Dallow Place	Streaming Platform
11	15/06/22	01/06/22	197 Derby Place	In Person

Attends

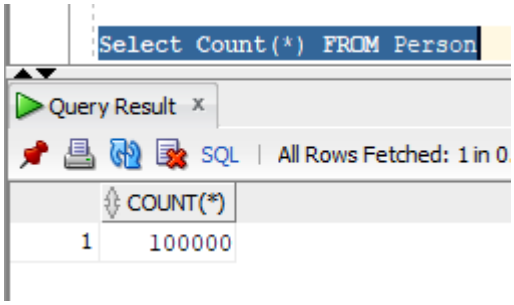
	TEAMID	EVENTDATE	STARTTIME	LOCATION
1	1	05/06/22	01/06/22	225 Beaumont Road
2	1	06/06/22	01/06/22	225 Beaumont Road
3	1	06/06/22	01/06/22	244 Sunburst Court
4	1	08/06/22	01/06/22	244 Sunburst Court
5	1	09/06/22	01/06/22	238 Gretna Street
6	2	05/06/22	01/06/22	225 Beaumont Road
7	2	06/06/22	01/06/22	225 Beaumont Road
8	3	06/06/22	01/06/22	225 Beaumont Road

Watches

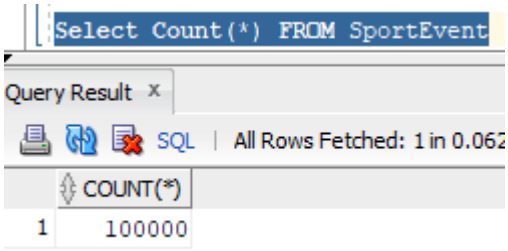
	PERSON	EVENTDATE	STARTTIME	LOCATION
1	bk32456	08/06/22	01/06/22	244 Sunburst Court
2	jt123	05/06/22	01/06/22	225 Beaumont Road
3	jt123	08/06/22	01/06/22	244 Sunburst Court
4	sb111	05/06/22	01/06/22	225 Beaumont Road
5	tk42789	08/06/22	01/06/22	244 Sunburst Court

2.3.2 Large

Person Table



Sport Event Tables



The screenshot above are the two main table.

The dataset is randomly generated using a java program generating random string of chars/integer.

2.4 Application

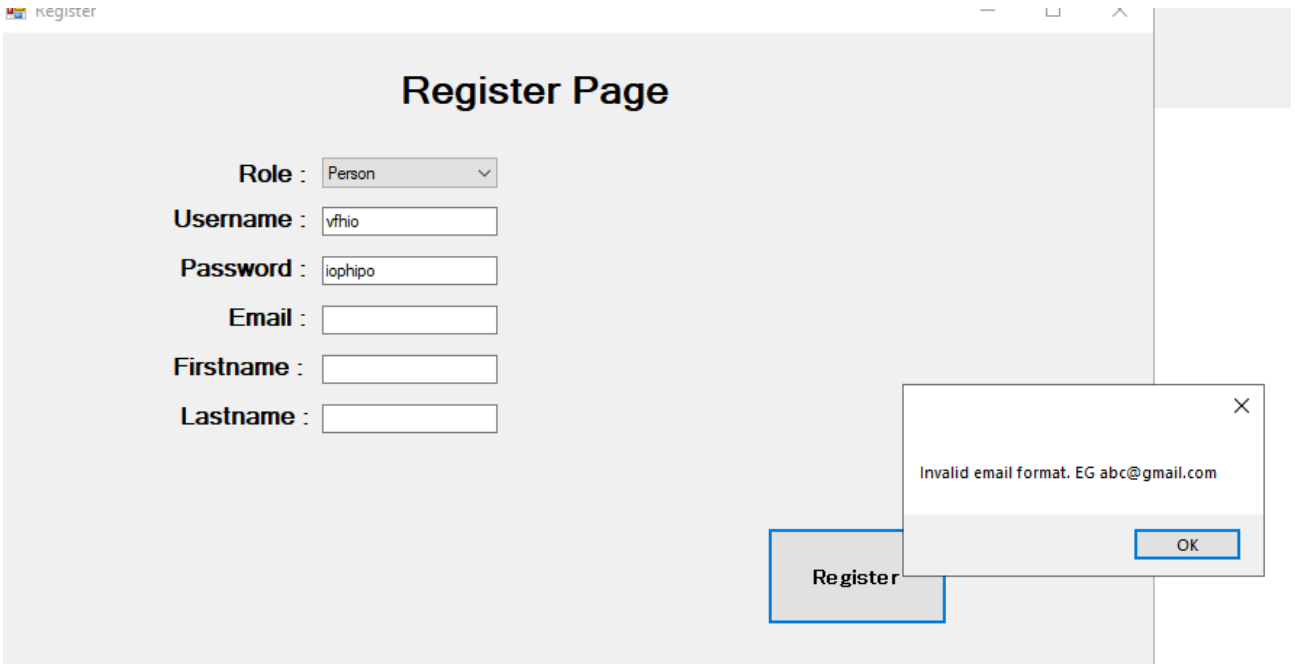
Showing that the data can be deleted, with user interaction.

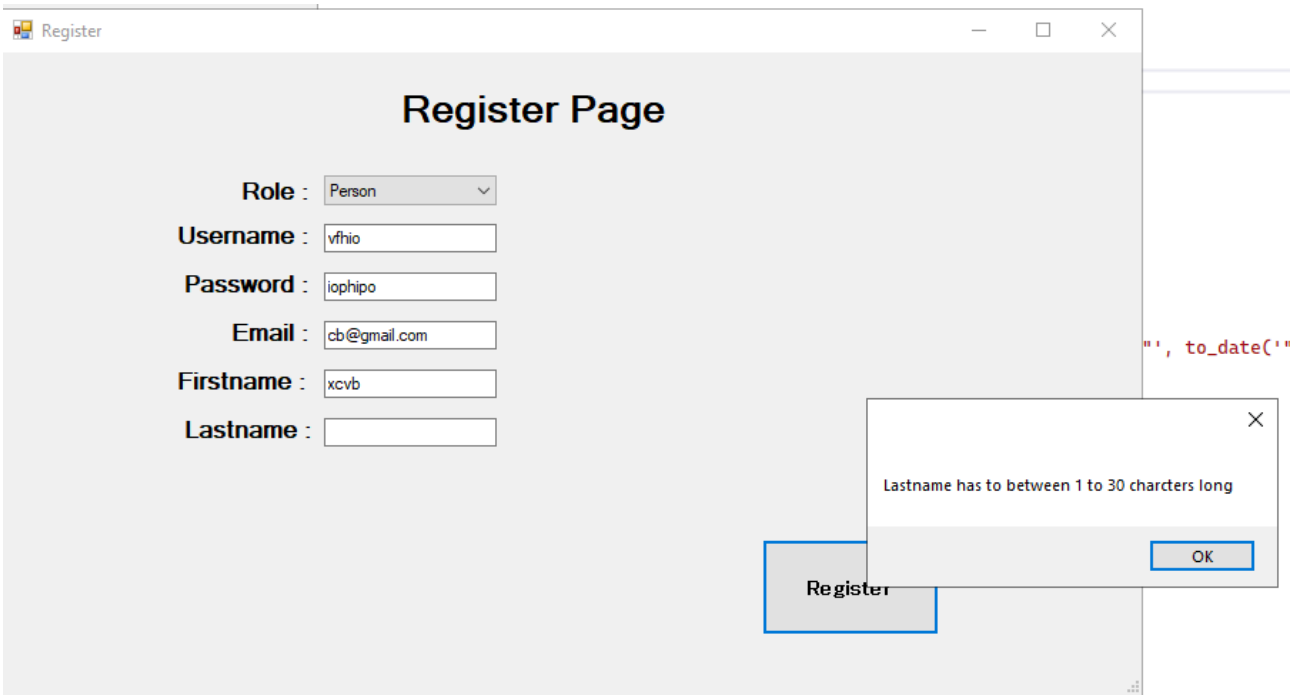
```
1 reference
private void button1_Click(object sender, EventArgs e)
{
    // gets an entry that the user has watched
    String myString = Regex.Replace(listBox2.SelectedItem.ToString(), @"\s+", " ");
    String[] sarray = myString.Split(' ');
    String command = "DELETE  FROM  watches  WHERE person like '" + userid + "' and location like '" + sarray[3] + "'";
    listBox2.Items.Clear();

    //executes it in the oracle db
    OracleCommand cmd = new OracleCommand();
    cmd.CommandText = command;
    cmd.CommandType = CommandType.Text;
    cmd.ExecuteNonQuery();

    //requeries the remaining data
    cmd.CommandText = "select * from watches where person like '" + userid + "'";
    cmd.CommandType = CommandType.Text;
    OracleDataReader dr2 = cmd.ExecuteReader();
    while (dr2.Read())
    {
        String result1 = dr2.GetString(0);
        String result2 = dr2.GetString(1);
        String result3 = dr2.GetString(2);
        String result4 = dr2.GetString(3);
        listBox2.Items.Add(result1.PadRight(15) + result2.PadRight(15) + result3.PadRight(30) + result4.PadLeft(5));
    }
}
```

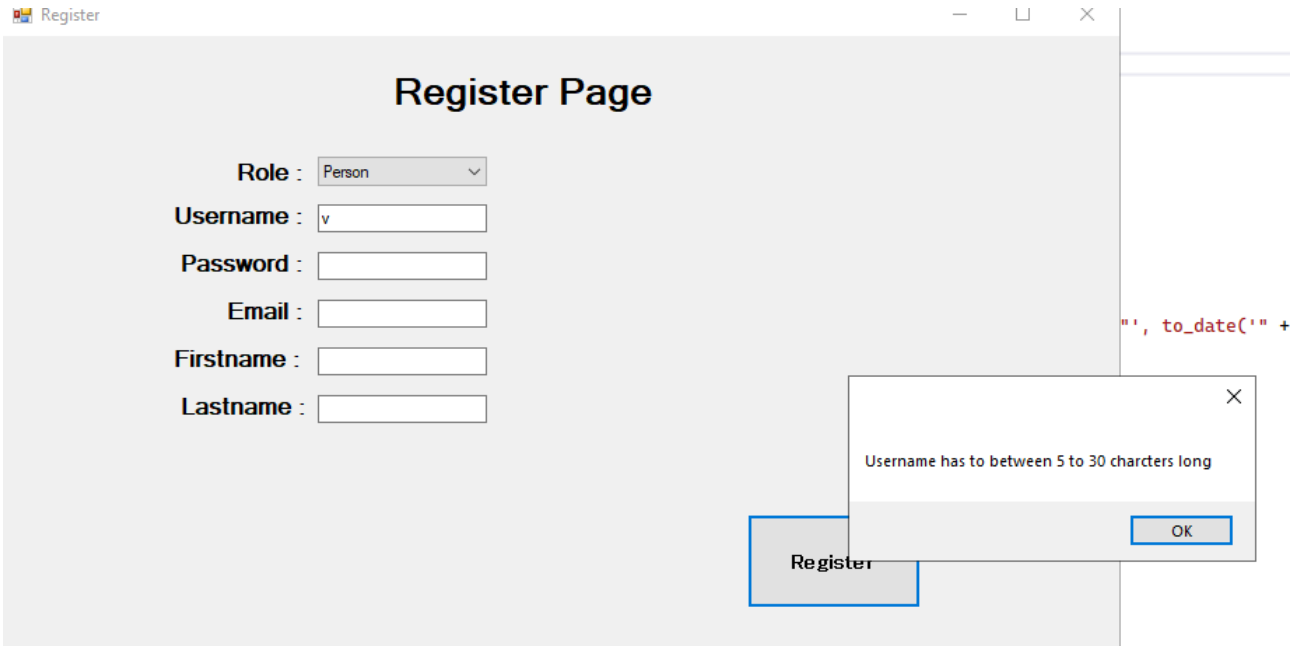
User can insert data into the database

```
private void buttonWatchEvent_Click(object sender, EventArgs e)
{
    //Get the lisiting the user has clicked on

    if (listBox1.Items.Count != 0)
    {
        String myString = Regex.Replace(listBox1.SelectedItem.ToString(), @"\s+", " ");
        String[] sarray = myString.Split(' ');
        MessageBox.Show(sarray[1]);
        listBox2.Items.Clear();

        OracleCommand cmd2 = new OracleCommand();
        cmd2.Connection = conn;

        //insert it into the watches list
        cmd2.CommandText = "Insert into watches values(\'" + userid + "\', " + sarray[0] + ", " + sarray[1] + ",'" + sarray[2] + "')";
        cmd2.CommandType = CommandType.Text;
        OracleDataReader drtest = cmd2.ExecuteReader();
    }


    // show all of the watches table
    OracleCommand cmd = new OracleCommand();
    cmd.Connection = conn;
    cmd.CommandText = "select * from watches where person like '" + userid + "'";
    cmd.CommandType = CommandType.Text;
    OracleDataReader dr = cmd.ExecuteReader();
    while (dr.Read())
    {
        String result1 = dr.GetString(0);
        String result2 = dr.GetString(1);
        String result3 = dr.GetString(2);
        String result4 = dr.GetString(3);
        listBox2.Items.Add(result1.PadRight(15)+ result2.PadRight(15) + result3.PadRight(30) + result4.PadLeft(5) );
    }

}
```

Error handling


Register
Register Page
Role :
Person
Username :
vfhio
Password :
iophipo
Email :
Firstname :
Lastname :
Invalid email format. EG abc@gmail.com
OK
Register


Register
Register Page
Role :
Person
Username :
vfhio
Password :
iophipo
Email :
cb@gmail.com
Firstname :
xcvb
Lastname :
"', to_date('"
Lastname has to between 1 to 30 charcters long
OK
Register



3. Project Milestone 3

3.1 Indexing and Querying Optimization

3.1.1 Queries and SQL script to create index

```
create table SportEvent(
EventDate Date,
StartTime Date,
Location varchar(30),
EndTime Date,
Organizer varchar(30),
MainSponsor varchar(50) not null,
Description varchar(100),

CONSTRAINT PKSportEvent PRIMARY KEY (EventDate, StartTime, Location),
CONSTRAINT FKLocation FOREIGN KEY(Location) REFERENCES Venue(Location),
CONSTRAINT FKOrganizer FOREIGN KEY(Organizer) REFERENCES Organizer(Username)
)cluster hashCluster(Organizer);

Create cluster hashCluster (
    Organizer varchar(30))
```

```
Select * from SportEvent where organizer = 'umtbverr90633';
```

3.1.2 Why was it chosen?

B-Tree:
We decided to choose first name on Person table. It allows us to search for different group of people with some similarities with their first name.
Hash-Cluster:
We chose organizer as the hash for the Sport Event table. We felt that there will be lot of queries trying to find the events that are organized by certain organizer. Using hash allow for quick direct to all event organized by the one organizer.

3.1.3 Performance Measurement

B-Tree Index Before Implement

```
Plan hash value: 1493655343

-------------------------------------------------------------------------------
| Id  | Operation          | Name   | Rows  | Bytes | Cost (%CPU)| Time     |
-------------------------------------------------------------------------------
|   0 | SELECT STATEMENT   |        |   124 |  8556 |   308   (1)| 00:00:01 |
|*  1 |  TABLE ACCESS FULL| PERSON |   124 |  8556 |   308   (1)| 00:00:01 |
-------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   1 - filter("FIRSTNAME" LIKE 'nu%q%')
```

B-Tree Index After Implement

```
Plan hash value: 4105735724

-----------------------------------------------------------------------------------------------
| Id  | Operation                           | Name   | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                    |        |   124 |  8556 |   126   (0)| 00:00:01 |
|   1 |  TABLE ACCESS BY INDEX ROWID BATCHED| PERSON |   124 |  8556 |   126   (0)| 00:00:01 |
|*  2 |   INDEX RANGE SCAN                  | BTREE  |   124 |       |     2   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   2 - access("FIRSTNAME" LIKE 'nu%q%')
       filter("FIRSTNAME" LIKE 'nu%q%')
```

Hash-Cluster Index Before Implement

```
Plan hash value: 1484609831

-------------------------------------------------------------------------------------
| Id  | Operation          | Name       | Rows  | Bytes | Cost (%CPU)| Time     |
-------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT   |            |  1000 | 74000 |   308   (1)| 00:00:01 |
|*  1 |  TABLE ACCESS FULL| SPORTEVENT |  1000 | 74000 |   308   (1)| 00:00:01 |
-------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   1 - filter("ORGANIZER"='umtbverr90633')
```

Hash-Cluster Index After Implement

```
Plan hash value: 4210168801

-------------------------------------------------------------------------------------
| Id  | Operation          | Name       | Rows  | Bytes | Cost (%CPU)| Time     |
-------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT   |            |  1317 |   180K|     1   (0)| 00:00:01 |
|*  1 |  TABLE ACCESS HASH| SPORTEVENT |  1317 |   180K|     1   (0)| 00:00:01 |
-------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   1 - access("ORGANIZER"='umtbverr90633')

Note
-----
   - dynamic statistics used: dynamic sampling (level=2)
```

3.1.4 Discussion of Performance Measurement

Using indexing it was demonstrated that the cost for finding the value that is being searched for is less costly. This is important as with large datasets such as user information storage, the more information you store the slower the retrieval is. As time delays are an important factor to consider therefore indexing becomes increasing important based on the dataset. Indexing allows for faster querying ability however it has downsides of being expensive to insert new data. Because of this it is good for applications in which user retention and activity are high but user intake is low. Comparing the specific indexes shows that there are benefits to each and that they have specific upsides to consider.

3.2 Mongo db

3.2.1 Structure


```
{"username":"jt123", "email":"jt@gmail.com", "password":"123", "Name":"John Tan", "Organisation":"Riot Games", "Phone":"02705183131", "Watches":
[{"EventDate":"05/06/2022","StartTime":"13:00","Address":"225 Beaumont Road"}, {"EventDate":"08/06/2022","StartTime":"13:00","Address":"244 Sunburst Court"}]}
{"username":"bk456", "email":"bk@hotmail.com", "password":"456", "Name":"Ben Key"}
{"username":"tk789", "email":"tk@yahoo.com", "password":"789", "Name":"Thomas Key", "Team":[{"TeamID":"1", "Name":"SKT", "Email":"skt@gmail.com","Phone":"877650521", "Site":"www.skt.com", "Sport":
[{"Name":"League of Legend", "MinPlayer":"5", "MaxPlayer":"5", "Subs":"5", "Setting":"Indoor"}]}]}
{"username":"sb111", "email":"sb@gmail.com", "password":"111", "Name":"Sally Brown", "Team":[{"TeamID":"1", "Name":"SKT", "Email":"skt@gmail.com","Phone":"877650521", "Site":"www.skt.com", "Sport":
[{"Name":"League of Legend", "MinPlayer":"5", "MaxPlayer":"5", "Subs":"5", "Setting":"Indoor"}]}], "Watches":[{"EventDate":"05/06/2022","StartTime":"13:00","Address":"225 Beaumont Road"}]}
{"username":"kk123", "email":"weq@gmail.com", "password":"123", "Name":"Kai Wen", "Team":[{"TeamID":"2", "Name":"TSM", "Email":"tsm@gmail.com","Phone":"7113867511", "Site":"www.tsm.com", "Sport":
[{"Name":"League of Legend", "MinPlayer":"5", "MaxPlayer":"5", "Subs":"5", "Setting":"Indoor"}]}]}
{"username":"jj123", "email":"jt66@gmail.com", "password":"123", "Name":"Jhonny Brown" "Watches":[{"EventDate":"08/06/2022","StartTime":"13:00","Address":"244 Sunburst Court"}]}
{"username":"bk32456", "email":"bk33@hotmail.com", "password":"456", "Name":"Tristana Yong"}
{"username":"tk42789", "email":"tk44@yahoo.com", "password":"789", "Name":"Thomas Tan" "Watches":[{"EventDate":"08/06/2022","StartTime":"13:00","Address":"244 Sunburst Court"}]}
{"username":"sb64111", "email":"s33b@gmail.com", "password":"111", "Name":"Garen Wu"}
{"username":"kk18623", "email":"we33q@gmail.com", "password":"1234", "Name":"Karen Wang", "Team":[{"TeamID":"3", "Name":"RNG", "Email":"rng@gmail.com","Phone":"2081615316", "Site":"www.rng.com", "Sport":
[{"Name":"League of Legend", "MinPlayer":"5", "MaxPlayer":"5", "Subs":"5", "Setting":"Indoor"}]}]}
```


For our mongo db structure we chose to have person as the main outermost element, then within the person document we chose to list all the related elements the person had interacted with within the same document. This means that for the persons that had not watched an event or had participated in an event they will have had smaller documents. Because mongo db is a NoSQL structure there are no joins, storing everything within the single document style is beneficial for our application as sport events won't exist if no players attended it. Therefore, we do not need additional tables to store sport event or other tables. Concludingly as the existence of teams, organizers, sport event is based on the existence of persons having all the information nested within is person is appropriate for our application.

We implemented functionality for the login phase of our application use using Mongo db. We did not implement the modification of the database using mongo dB, therefore it cannot be inserted into or deleted from.

Comparing to the storage method in our SQL the mongo dB will have larger storage size requirements because of duplicate data, however for the purpose of the common user (non admin) the queries will be much faster as they will be making queries with low traversal cost.

4. COMPX323-22A Project Checklist

Kevin Han: 56 (Contributions %)
Bedir Asici: 37 (Contributions %)
Tetsusaburo Kato:7 (Contributions %)

Project Milestone 1		
1	1a. Clear structure of milestone material, including headings, sections, readable screenshots with captions. This checklist should be included and filled in.	✔
2	1b. Database application description.	✔
6	1c. Revised ER Diagram.	✔
Project Milestone 2		
4	2. Relational schema for your ER Diagram.	✔
6	3. Table definitions in Oracle, include SQL script which creates relevant tables etc.	✔
3	4a. Dataset: small (screenshots of dataset successfully loaded).	✔
4	4b. Dataset: large. Description of how data was created (incl code if relevant) Screenshot of large dataset successfully loaded (use count).	✔
	5. Application: Functionality to display and modify the database. System should be error proof with appropriate user messages. Screenshots showing functionality, with appropriate descriptions.	✔
Project Milestone 3		
	6. Indexing and Query Optimization: Show queries used and SQL script that creates the indexes. Discussion of why these indexes were chosen to optimize the queries. Performance measurements with and without indexes (with query plan). Discussion of performance measurements.	✔
	7. Application: extend with MongoDB. MongoDB version of database (show structure) + small dataset (screenshot). Explanation of the data structures you have chosen and comparison to your SQL version. Core functionality of application in second tab/area, using MongoDB (screenshots).	

5. Code, SQL and Data

https://github.com/Lecreator-KH/COMPX323App.git