University of British Columbia, Vancouver
Department of Computer Science

CPSC 304 Project Cover Page

Milestone #: 2

Date: Jul 27, 2022

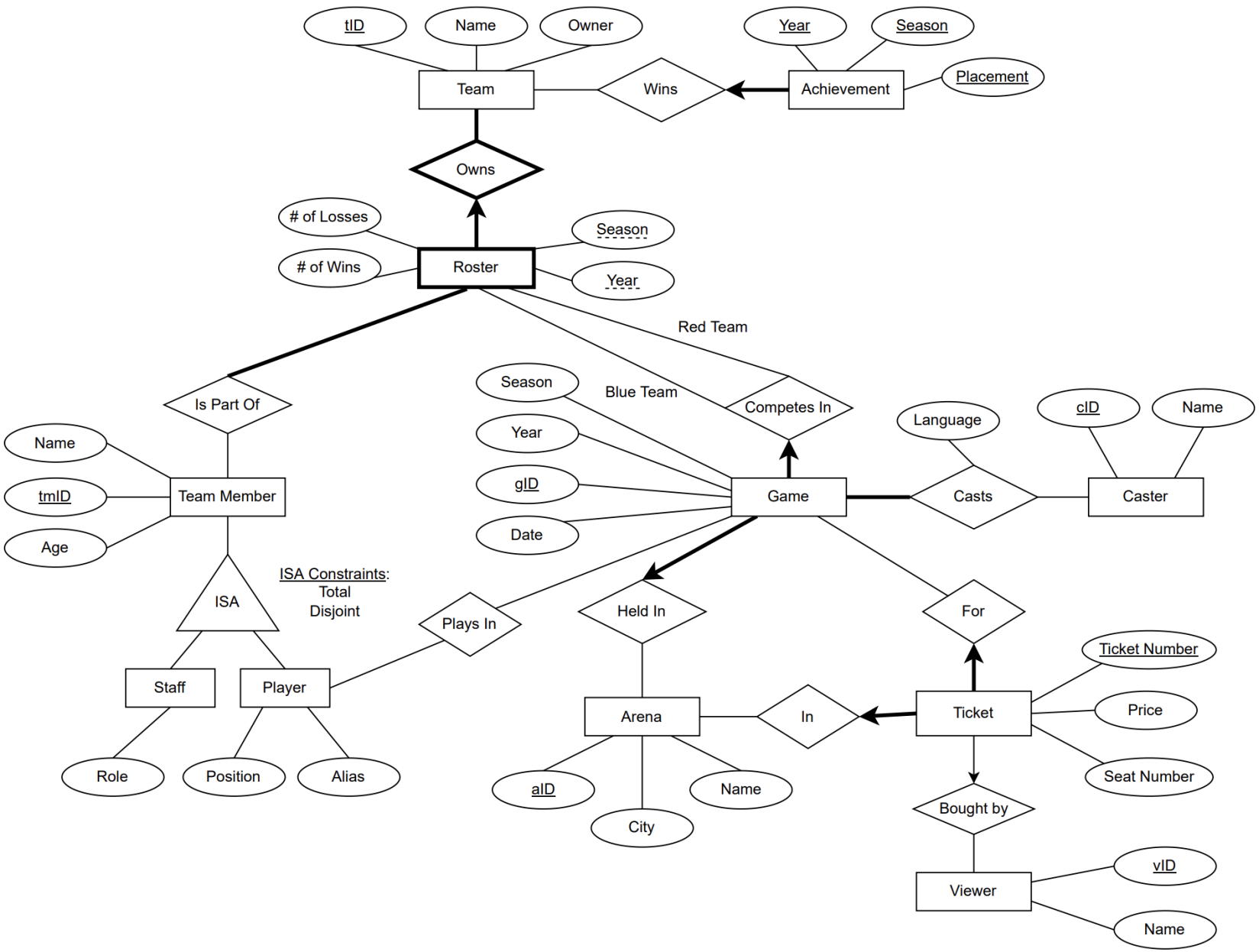
Group Number: 43

Name	Student Number	CS Alias (Userid)	Preferred E-mail Address
Dennis Li	94349206	f9g6h	dennisdfs30@gmail.com
Ryan Tan	66458373	k4o1f	ryanmtan5@gmail.com
Adrian Pang	23413743	o9k0x	apang661@gmail.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

2. ER Diagram


tID
Name
Owner
Team
Wins
Year
Season
Achievement
Placement
Owns
# of Losses
# of Wins
Roster
Season
Year
Red Team
Blue Team
Is Part Of
Competes In
Season
Year
gID
Date
Game
Language
cID
Name
Casts
Caster
Name
tmID
Age
Team Member
ISA
ISA Constraints:
Total
Disjoint
Plays In
Held In
For
Staff
Player
Role
Position
Alias
Arena
aID
Name
City
In
Ticket
Ticket Number
Price
Seat Number
Bought by
Viewer
vID
Name

ER Diagram Updates:

- replaced game number with gID in Game for easier FK references to Game
- changed Ticket from a relationship to an entity since it has many relationships with other entities
    - added ticket number to Ticket as the PK
- added day in Game to include a non-trivial FD
    - removed year from Game because day covers the same information
- added ISA constraints for Team Member
- added labels for teams competing in game

3-4. Schema + Functional Dependencies

Schema	Candidate Keys	Constraints * = design constraint - = relationship constraint	Functional Dependencies = *non-key FD*
Team (tID: integer, name: string, owner: string)	- {tID} - {name}	* name must not be NULL	tID -> name,owner name -> tID,owner
Achievement (season: string, year: integer, placement: integer, **tID**: integer)	- {season, year, placement} - {tID, season, year}	- tID must not be NULL	season, year, placement -> tID tID, season, year -> placement
Roster (season: string, year: integer, **tID**: integer, wins: integer, losses: integer)	- {season, year, tID}	* wins must not be NULL * losses must not be NULL	season, year, tID -> wins, losses
PartOfRoster (**season:** string, **year**: integer, **tID**: integer, **tmID**: integer)	- {season, year, tID, tmID}		
TeamMember (tmID: integer, name: string, age: integer)	- {tmID}	- ISA Constraints for Player and Staff: Total, Disjoint	tmID -> name, age
Player (**tmID**: integer, position: string, alias: string)	- {tmID} - {alias}	- alias must not be NULL	tmID -> position, alias alias -> tmID, position
Staff (**tmID**: integer, role: string)	- {tmID}		tmID -> role
PlaysIn (**gID**: integer, **pID**: integer)	- {gID, pID}		
Game (gID: integer, **rtID**: integer, **btID**: integer, season: string, day: date, **aID**: integer)	- {gID}	- aID must not be NULL (do we want to represent online tournaments with NULL?) - rtID must not be NULL - btID must not be NULL	day -> season gID -> rtID, btID, season, day, aID, cID

Caster (cID: string, name: string)	- {cID}	* name must not be NULL	cID -> name
Casts (**cID**: integer, **gID**: integer, language: string)	- {cID, gID}	* language must not be NULL	cID, gID -> language
Arena (aID: integer, name: string, city: string)	- {aID} - {name, city}	* name must not be NULL * city must not be NULL	aID -> name, city name, city -> aID
Viewer (vID: integer, name: string)	- {vID}	* name must not be NULL	vID -> name
Ticket (ticketNum: integer, **vID**: integer, **gID**: integer, **aID**: integer seatNum: integer, price: double)	- {ticketNum} - {gID,seatNum}	* seatNum must not be NULL - gID must not be NULL - aID must not be NULL	ticketNum->vID, gID, aID, seatNum, price gID, seatNum->vID, aID, price, ticketNum aID, seatNum -> price

NOTE: ALL candidate keys/primary keys must be UNIQUE

5. Normalization: BCNF

Game: Game (gID, rtID, btID, season, day, aID)

FD 1: day -> season | not BCNF

- day^+ = {day, season}
  - not a superkey as does not contain gID, rtID, btID, aID

FD 2: gID -> rtID, btID, season, year, day, aID, cID | BCNF

- gID^+ = {gID, rtID, btID, season, day, aID, cID}
  - is a superkey

Decomposition:

Game1(day, season): BCNF holds because there are only 2 attributes

Game2(gID, rtID, btID, day, aID)

- day->season no longer relevant

Ticket: Ticket (ticketNum, vID, gID, aID, seatNum, price)

FD 1: ticketNum -> vID, gID, aID, seatNum, price | BCNF

- $ticketNum^+$ = {ticketNum, vID, gID, aID, seatNum, price}
  - superkey

FD 2: gID, seatNum -> vID, aID, price, ticketNum | BCNF

- $(gID, seatNum)^+$ = {gID, seatNum, vID, aID, price, ticketNum}
  - superkey

FD 3: aID, seatNum -> price | not BCNF

- $(aID, seatNum)^+$ = {aID, seatNum, price}
  - not a superkey as does not contain ticketNum, vID, gID

Decomposition:

Ticket1(aID, seatNum, price)

- $(aID, seatNum)^+$ = {aID, seatNum, price} = superkey

Ticket2(ticketNum, vID, gID, aID, seatNum)

- aID, seatNum -> price no longer relevant

No other relations need to be decomposed as there are no other non-key functional dependencies (see schema for non-key FDs).

Normalized Tables:

Relation	Table	Candidate Keys
Team	Team (tID: integer, name: string, owner: string)	- {tID} - {name}
Achievement	Achievement (season: string, year: integer, placement: integer, **tID**: integer)	- {season, year, placement} - {tID, season, year}
Roster	Roster (**tID**: integer, season: string, year: integer, wins: integer, losses: integer)	- {season, year, tID}
PartOfRoster	PartOfRoster (**season:** string, **year**: integer, **tID**: integer, **tmID**: integer)	- {season, year, tID, tmID}
TeamMember	TeamMember (tmID: integer, name: string, age: integer)	- {tmID}
Player	Player (**tmID**: integer, position: string, alias: string)	- {tmID} - {alias}
Staff	Staff (**tmID**: integer, role: string)	- {tmID}
PlaysIn	PlaysIn (**gID**: integer, **pID**: integer)	- {gID, pID}
Game	Game (gID: integer, **rtID**: integer, **btID**: integer, day: date, **aID**: integer)	- {gID}
	SeasonDates(day: date, season: string)	**-** {date}
Caster	Caster (cID: integer, name: string)	- {cID}
Casts	Casts (**cID**: integer, **gID**: integer, language: string)	- {cID, gID}
Arena	Arena (aID: integer, name: string, city: string)	- {aID} - {name, city}
Viewer	Viewer (vID: integer, name: string)	- {vID}
Ticket	Ticket (ticketNum: integer, **vID**: integer, **gID**: integer, **aID**: integer **seatNum**: integer)	- {ticketNum} - {gID,seatNum}
	Seat(**aID**, seatNum: integer, price: integer)	- {aID, seatNum}

6. SQL DDL: CREATE TABLE Statements

```
CREATE TABLE Team (
        tID INTEGER PRIMARY KEY,
        name CHAR(32) UNIQUE NOT NULL,
        owner CHAR(32)
);


CREATE TABLE Achievement (
        season CHAR(6),
        year INTEGER,
        placement INTEGER,
        tID INTEGER NOT NULL,
        PRIMARY KEY (season, year, placement),
        FOREIGN KEY (tID) REFERENCES Team (tID)
                ON UPDATE CASCADE,
        UNIQUE (season, year, tID)
);


CREATE TABLE Roster (
        tID INTEGER,
        season CHAR(6),
        year INTEGER,
        wins INTEGER NOT NULL,
        losses INTEGER NOT NULL,
        PRIMARY KEY (season, year, tID),
        FOREIGN KEY (tID) REFERENCES Team (tID)
                ON UPDATE CASCADE
);


CREATE TABLE TeamMember (
        tmID INTEGER PRIMARY KEY,
        name CHAR(32),
        age INTEGER
);
```

```
CREATE TABLE PartOfRoster (
        season CHAR(6),
        year INTEGER,
        tID INTEGER,
        tmID INTEGER,
        PRIMARY KEY (season, year, tID, tmID),
        FOREIGN KEY (season, year, tID) REFERENCES Roster (season, year, tID)
                ON DELETE CASCADE
                ON UPDATE CASCADE,
        FOREIGN KEY (tmID) REFERENCES TeamMember
                ON UPDATE CASCADE
);


CREATE TABLE Player (
        tmID INTEGER PRIMARY KEY,
        position CHAR(7),
        alias CHAR(20) UNIQUE NOT NULL,
        FOREIGN KEY (tmID) REFERENCES TeamMember (tmID)
                ON UPDATE CASCADE
);


CREATE TABLE Staff (
        tmID INTEGER PRIMARY KEY,
        role CHAR(20),
        FOREIGN KEY (tmID) REFERENCES TeamMember
                ON UPDATE CASCADE
);


CREATE TABLE Arena (
        aID INTEGER PRIMARY KEY,
        name CHAR(64) NOT NULL,
        city CHAR(32) NOT NULL,
        UNIQUE (name, city)
);
```

```
CREATE TABLE Game (
        gID INTEGER PRIMARY KEY,
        rtID INTEGER NOT NULL,
        btID INTEGER NOT NULL,
        day DATE,
        aID INTEGER NOT NULL,
        FOREIGN KEY (rtID) REFERENCES Team(tID)
                ON UPDATE CASCADE,
        FOREIGN KEY (btID) REFERENCES Team(tID)
                ON UPDATE CASCADE,
        FOREIGN KEY (aID) REFERENCES Arena
                ON DELETE CASCADE
                ON UPDATE CASCADE
);


CREATE TABLE PlaysIn (
        gID INTEGER,
        pID INTEGER,
        PRIMARY KEY (gID, pID),
        FOREIGN KEY (gID) REFERENCES Game (gID)
                ON DELETE CASCADE
                ON UPDATE CASCADE,
        FOREIGN KEY (pID) REFERENCES Player (pID)
                ON DELETE CASCADE
                ON UPDATE CASCADE
);


CREATE TABLE SeasonDates (
        day DATE PRIMARY KEY,
        season CHAR(6)
);


CREATE TABLE Caster (
        cID INTEGER PRIMARY KEY,
        name CHAR(32) NOT NULL
);
```

```
CREATE TABLE Casts (
        cID INTEGER,
        gID INTEGER,
        language CHAR(20) NOT NULL,
        PRIMARY KEY (cID, gID),
        FOREIGN KEY (cID) REFERENCES Caster (cID)
                ON DELETE CASCADE
                ON UPDATE CASCADE,
        FOREIGN KEY (gID) REFERENCES Game (gID)
                ON DELETE CASCADE
                ON UPDATE CASCADE
);


CREATE TABLE Viewer (
        vID INTEGER PRIMARY KEY,
        name CHAR(32)
);


CREATE TABLE Ticket (
        ticketNum INTEGER PRIMARY KEY,
        vID INTEGER,
        gID INTEGER NOT NULL,
        aID INTEGER NOT NULL,
        seatNum INTEGER NOT NULL,
        FOREIGN KEY (vID) REFERENCES Viewer (vID)
                ON DELETE SET NULL
                ON UPDATE CASCADE,
        FOREIGN KEY (gID) REFERENCES Game (gID)
                ON DELETE CASCADE
                ON UPDATE CASCADE,
        FOREIGN KEY (aID, seatNum) REFERENCES Seat (aID, seatNum)
                ON DELETE CASCADE
                ON UPDATE CASCADE,
        UNIQUE (gID, seatNum)
);
```

```
CREATE TABLE Seat (
        aID INTEGER,
        seatNum INTEGER,
        price DOUBLE,
        PRIMARY KEY (aID, seatNum),
        FOREIGN KEY (aID) REFERENCES Arena (aID)
                ON DELETE CASCADE
                ON UPDATE CASCADE
);
```

7. SQL DDL: INSERT Statements:

```
INSERT INTO Team VALUES (1, 'Cloud9', 'Jack Etienne');
INSERT INTO Team VALUES (2, '100 Thieves', 'Matthew Haag');
INSERT INTO Team VALUES (3, 'Team Liquid', 'Steve Arhancet');
INSERT INTO Team VALUES (4, 'Team SoloMid', 'Andy Dinh');
INSERT INTO Team VALUES (5, 'Evil Geniuses', 'Nicole LaPointe Jameson');

INSERT INTO Achievement VALUES ('Spring', 2022, 1, 1);
INSERT INTO Achievement VALUES ('Spring', 2022, 2, 5);
INSERT INTO Achievement VALUES ('Spring', 2022, 3, 4);
INSERT INTO Achievement VALUES ('Spring', 2022, 4, 3);
INSERT INTO Achievement VALUES ('Spring', 2022, 5, 2);

INSERT INTO Roster VALUES (1, 'Spring', 2022, 10, 3);
INSERT INTO Roster VALUES (2, 'Spring', 2022, 3, 10);
INSERT INTO Roster VALUES (3, 'Spring', 2022, 9, 6);
INSERT INTO Roster VALUES (4, 'Spring', 2022, 20, 1);
INSERT INTO Roster VALUES (5, 'Spring', 2022, 0, 10);

INSERT INTO TeamMember VALUES (1, 'Ibrahim Allami', 21);
INSERT INTO TeamMember VALUES (2, 'Can Celik', 22);
INSERT INTO TeamMember VALUES (3, 'Soren Bjerg', 23);
INSERT INTO TeamMember VALUES (4, 'Peng Yiliang', 24);
INSERT INTO TeamMember VALUES (5, 'Philippe Laflamme', 25);
INSERT INTO TeamMember VALUES (6, 'Daniel Guy', 31);
INSERT INTO TeamMember VALUES (7, 'Brian Pang', 32);
INSERT INTO TeamMember VALUES (8, 'Mickey Mouse', 33);
INSERT INTO TeamMember VALUES (9, 'Barack Obama', 34);
INSERT INTO TeamMember VALUES (10, 'Peter Parker', 35);

INSERT INTO Player VALUES (1, 'TOP', 'Fudge');
INSERT INTO Player VALUES (2, 'JNG', 'Closer');
INSERT INTO Player VALUES (3, 'MID', 'Bjergsen');
INSERT INTO Player VALUES (4, 'ADC', 'Doublelift');
INSERT INTO Player VALUES (5, 'SUP', 'Vulcan');

INSERT INTO Staff VALUES (6, 'Coach');
INSERT INTO Staff VALUES (7, 'Assistant Coach');
INSERT INTO Staff VALUES (8, 'Analyst');
INSERT INTO Staff VALUES (9, 'Sports Psychologist');
INSERT INTO Staff VALUES (10, 'Positional Coach');

INSERT INTO Game VALUES (1, 1, 2, '10-OCT-22', 1);
INSERT INTO Game VALUES (2, 2, 3, '23-JAN-22', 3);
```

```
INSERT INTO Game VALUES (3, 3, 4, '30-OCT-22', 4);
INSERT INTO Game VALUES (4, 1, 2, '30-FEB-22', 3);
INSERT INTO Game VALUES (5, 5, 3, '10-OCT-22', 1);

INSERT INTO SeasonDates VALUES ('10-OCT-22', 'Winter');
INSERT INTO SeasonDates VALUES ('23-JAN-22', 'Winter');
INSERT INTO SeasonDates VALUES ('30-OCT-22', 'Winter');
INSERT INTO SeasonDates VALUES ('30-FEB-22', 'Spring');
INSERT INTO SeasonDates VALUES ('25-JUN-22', 'Summer');

INSERT INTO PartOfRoster VALUES ('Spring', 2022, 1, 1);
INSERT INTO PartOfRoster VALUES ('Spring', 2022, 2, 2);
INSERT INTO PartOfRoster VALUES ('Spring', 2022, 3, 3);
INSERT INTO PartOfRoster VALUES ('Spring', 2022, 4, 4);
INSERT INTO PartOfRoster VALUES ('Spring', 2022, 5, 5);

INSERT INTO Caster VALUES (1, 'Kobe');
INSERT INTO Caster VALUES (2, 'CaptainFlowers');
INSERT INTO Caster VALUES (3, 'Phreak');
INSERT INTO Caster VALUES (4, 'Jatt');
INSERT INTO Caster VALUES (5, 'Azael');

INSERT INTO Casts VALUES (1,1, 'English');
INSERT INTO Casts VALUES (2,1, 'French');
INSERT INTO Casts VALUES (3,2, 'English');
INSERT INTO Casts VALUES (2,3, 'French');
INSERT INTO Casts VALUES (1,4, 'English');
INSERT INTO Casts VALUES (1,5, 'English');

INSERT INTO Arena VALUES (1, 'Rogers Arena', 'Vancouver');
INSERT INTO Arena VALUES (2, 'LCS Arena', 'Los Angeles');
INSERT INTO Arena VALUES (3, 'LEC Studio', 'Berlin');
INSERT INTO Arena VALUES (4, 'LPL Stadium', 'Shanghai');
INSERT INTO Arena VALUES (5, 'LOL Park', 'Seoul');

INSERT INTO Viewer VALUES (1, 'Bob');
INSERT INTO Viewer VALUES (2, 'Joe');
INSERT INTO Viewer VALUES (3, 'Tom');
INSERT INTO Viewer VALUES (4, 'Sam');
INSERT INTO Viewer VALUES (5, 'Rob');

INSERT INTO Ticket VALUES (1, 1, 1, 1, 1);
INSERT INTO Ticket VALUES (2, 2, 2, 2, 2);
INSERT INTO Ticket VALUES (3, 3, 3, 3, 3);
```

```
INSERT INTO Ticket VALUES (4, 4, 4, 4, 4);
INSERT INTO Ticket VALUES (5, 5, 5, 5, 5);

INSERT INTO Seat VALUES (1, 1, 1.00);
INSERT INTO Seat VALUES (2, 2, 2.00);
INSERT INTO Seat VALUES (3, 3, 3.00);
INSERT INTO Seat VALUES (4, 4, 4.00);
INSERT INTO Seat VALUES (5, 5, 5.00);

INSERT INTO PlaysIn VALUES (1, 1);
INSERT INTO PlaysIn VALUES (2, 2);
INSERT INTO PlaysIn VALUES (3, 3);
INSERT INTO PlaysIn VALUES (4, 4);
INSERT INTO PlaysIn VALUES (5, 5);
```

The instances of each relation are shown below:

Team:

tID	name	owner
1	Cloud9	Jack Etienne
2	100 Thieves	Matthew Haag
3	Team Liquid	Steve Arhancet
4	Team SoloMid	Andy Dinh
5	Evil Geniuses	Nicole LaPointe Jameson

Achievement:

season	year	placement	tID
Spring	2022	1	1
Spring	2022	2	5
Spring	2022	3	4
Spring	2022	4	3
Spring	2022	5	2

Roster:

tID	season	year	wins	losses
1	Spring	2022	10	3
2	Spring	2022	3	10
3	Spring	2022	9	6
4	Spring	2022	20	1
5	Spring	2022	0	10

Team Member:

tmID	name	age
1	Ibrahim Allami	21
2	Can Celik	22
3	Soren Bjerg	23
4	Peng Yiliang	24
5	Philippe Laflamme	25
6	Daniel Guy	31
7	Brian Pang	32
8	Mickey Mouse	33
9	Barack Obama	34
10	Peter Parker	35

Player:

tmID	position	alias
1	TOP	Fudge
2	JNG	Closer
3	MID	Bjergsen
4	ADC	Doublelift
5	SUP	Vulcan

Staff:

tmID	role
6	Coach
7	Assistant Coach
8	Analyst
9	Sports Psychologist
10	Positional Coach

Arena:

aID	name	city
1	Rogers Arena	Vancouver
2	LCS Arena	Los Angeles
3	LEC Studio	Berlin
4	LPL Stadium	Shanghai
5	LOL Park	Seoul

Game:

gID	rtID	btID	date	aID
1	1	2	10-OCT-22	1
2	2	3	23-JAN-22	3
3	3	4	30-OCT-22	4
4	1	2	30-FEB-22	3
5	5	3	10-OCT-22	1

PlaysIn:

gID	pID
1	1
2	2
3	3
4	4
5	5

SeasonDates:

date	season
10-OCT-22	Winter
23-JAN-22	Winter
30-OCT-22	Winter
30-FEB-22	Spring
25-JUN-22	Summer

Caster:

cID	name
1	Kobe
2	CaptainFlowers
3	Phreak
4	Jatt
5	Azael

Casts:

cID	gID	language
1	1	English
2	1	French
3	2	English
2	3	French
1	4	English
1	5	English

Ticket:

ticketNum	vID	gID	aID	seatNum
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5

Viewer:

vID	name
1	Bob
2	Joe
3	Tom
4	Sam
5	Rob

Seat:

aID	seatNum	price
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5