

CPSC 304 Final Project Report

Jacob Lee

Norman Sue

Daniel Tsang

Marvin Cadano

June 18, 2014

Contents

1 Project Description	7
Platforms	7
System functionality	7
players.php (Jacob)	7
profiles.php (Jacob)	7
teams.php (Marvin)	8
rosters.php (Jacob)	8
games.php (Daniel)	8
stats.php (Jacob)	8
update.php (Norman)	8
venues.php (Norman)	8
2 Entity-Relationship Diagram	9
3 SQL Table Schemas	11
Legend	11
Division	11
Venue	11
NBATeam_BelongsTo	12
NBAPlayer_PlaysFor	12
NBASTaff_WorksFor	12
Sponsor_Endorses	13
NBAGame_Plays_PlayedAt	13
NBAReferee	14
Referees	14

4 SQL Queries	15
Selection and Projection Queries	15
Join Queries	16
Division Query	16
Aggregation Query	18
Nested Aggregation with Group-By Query	18
Delete Operation	18
Update Operation	19
Other Queries and Extra Features	21
5 Functional Dependencies	25
Division	25
Venue	25
NBATeam_BelongsTo	25
NBAPlayer_PlaysFor	26
NBASTaff_WorksFor	26
Sponsor_Endorses	26
NBAGame_Plays_PlayedAt	26
NBAReferee	26
Referees	26
6 SQL Table Contents	27
Division	27
Venue	27
NBATeam_BelongsTo	28
NBAPlayer_PlaysFor	28
NBASTaff_WorksFor	28
Sponsor_Endorses	29
NBAGame_Plays_PlayedAt	29
NBAReferee	29
Referees	30
7 Demo Script	31
Before the demo	31
Setup (2 minutes)	31
Selection and Projection Query (2 minutes)	31
Join Query (2 minutes)	32
Division Query (2 minutes)	32

Aggregation Query (2 minutes)	32
Nested Aggregation with Group By (2 minutes)	32
Delete Operation (4 minutes)	33
Update Operation (2 minutes)	33
Extra Features (2 minutes)	34

Chapter 1

Project Description

We modeled the 2013-2014 NBA league using real data for the most part, and randomly generated data for certain data that we could not easily find.

We modeled NBA players that play for Teams, along with NBA Staff that work for Teams. Each Team belongs to a Division. Each Team plays a game refereed by an NBA Referee against another Team at a Venue on a particular date. Each Team's Sponsor is also modeled.

User classes include NBA Staff and normal users. Only NBA Staff can modify database information. All other users can only view database information. We did not actually implement any user access control, but included functionality for both user classes in our UI.

Platforms

- Amazon EC2 virtual server running Ubuntu 12.04.4 LTS
- Apache HTTP Server 2.4
- MySQL 5.5.36
- PHP 5.4.26 (with the PDO extension)

System functionality

Below is a listing of the specific functionalities we implemented in each of our PHP pages.

players.php (Jacob)

- Displays a table of all players including information about each player
- Includes an HTML form for choosing attributes (projection), filtering results (selection), and ordering results (order by)
- Includes an option to delete a player

profiles.php (Jacob)

- Lists all information about a specific player
- Includes a dropdown to select from a list of all players
- Retrieves and displays first Google image result of that player
- Retrieves and displays relevant news articles for that player

teams.php (Marvin)

- Displays a table of all teams including information about each team and their division
- Includes an option to delete a team (deletion should be rejected if team has at least one player)

rosters.php (Jacob)

- Displays a table of players on a team including information about each player
- Displays a table of staff on a team including information about each staff member
- Displays a table of sponsors for a team
- Includes a dropdown menu to select from a list of all teams

games.php (Daniel)

- Shows a table of games along with the venue the game was played at and who refereed the game
- Displays an HTML form to only show games between two dates

stats.php (Jacob)

- Displays an HTML form to pick max/min/average of height, weight, number, draft year stats for ALL players
- Displays an HTML form to pick max/min/average of height, weight, number, draft year stats for players of EACH team where that team is sponsored by a selected company

update.php (Norman)

- Displays an HTML form to update information about a specific player

venues.php (Norman)

- Displays a table of all venues
- Displays a table of teams that have played at all venues

Chapter 2

Entity-Relationship Diagram

The only change in our ER diagram since the second project submission was relaxing a full participation constraint on NBAGame and the Referees relationship so that we could demonstrate both a situation where a cascading delete works and one where it doesn't (for the purposes of meeting project demo requirements).

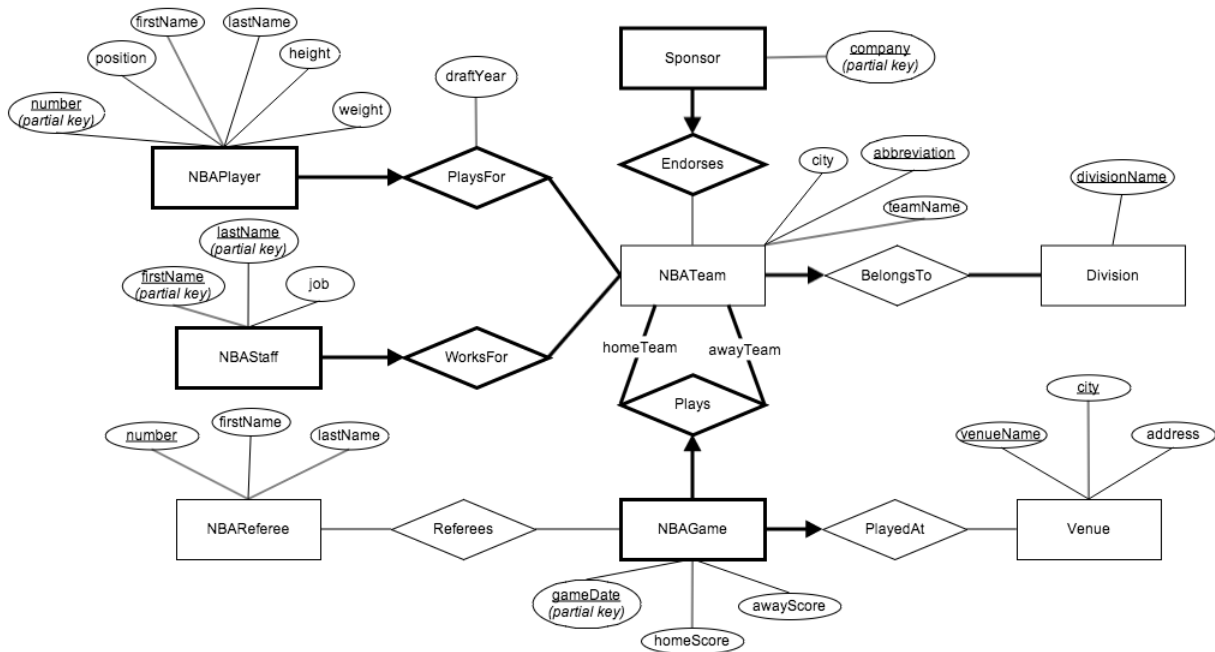


Figure 2.1: Entity-relationship diagram

Chapter 3

SQL Table Schemas

No changes were made to the schemas of our SQL tables, which are repeated below for convenience. Only additional **CHECK** constraints were added to the **CREATE TABLE** commands in the included `create_db.sql` script.

Our tables capture all aspects of our ER diagram except for the full participation constraints on NBATeam for the PlaysFor and WorksFor relationships.

Legend

- PRIMARY KEY = **Bold**
- FOREIGN KEY = *Italics*
- PRIMARY KEY and FOREIGN KEY = ***Bold Italics***

Division

Division(**divisionName**: VARCHAR(10))

```
CREATE TABLE `Division` (  
  `divisionName` VARCHAR(10),  
  PRIMARY KEY (`divisionName`)  
);
```

Venue

Venue(**venueName**: VARCHAR(30), **city**: VARCHAR(30), address: VARCHAR(50))

```
CREATE TABLE `Venue` (  
  `venueName` VARCHAR(30),  
  `city` VARCHAR(30),  
  `address` VARCHAR(50),  
  PRIMARY KEY (`venueName`, `city`)  
);
```

NBATeam__BelongsTo

NBATeam__BelongsTo(**abbreviation**: CHAR(3), city: VARCHAR(30), teamName: VARCHAR(30), *divisionName*: VARCHAR(10))

- *divisionName* NOT NULL
- *divisionName* REFERENCES Division

```
CREATE TABLE `NBATeam_BelongsTo` (
  `abbreviation` CHAR(3),
  `city` VARCHAR(30),
  `teamName` VARCHAR(30),
  `divisionName` VARCHAR(10) NOT NULL,
  PRIMARY KEY (`abbreviation`),
  FOREIGN KEY (`divisionName`) REFERENCES `Division` (`divisionName`)
);
```

NBAPlayer__PlaysFor

NBAPlayer__PlaysFor(**number**: INT, position: CHAR(2), firstName: VARCHAR(30), lastName: VARCHAR(30), height: INT, weight: INT, draftYear: YEAR(4), **team**: CHAR(3))

- **team** NOT NULL
- **team** REFERENCES NBATeam__BelongsTo(**abbreviation**) ON DELETE CASCADE
- height in inches
- weight in pounds

```
CREATE TABLE `NBAPlayer_PlaysFor` (
  `number` INT,
  `position` CHAR(2),
  `firstName` VARCHAR(30),
  `lastName` VARCHAR(30),
  `height` INT,
  `weight` INT,
  `draftYear` YEAR(4),
  `team` CHAR(3) NOT NULL,
  PRIMARY KEY (`number`, `team`),
  FOREIGN KEY (`team`) REFERENCES `NBATeam_BelongsTo` (`abbreviation`)
    ON DELETE CASCADE,
  CHECK (`draftYear` >= 1946 AND `draftYear` <= YEAR(CURDATE()) AND
    `number` >= 0 AND `number` <= 99 AND
    `height` >= 0 AND `weight` >= 0)
);
```

NBAStaff__WorksFor

NBAStaff__WorksFor(**firstName**: VARCHAR(30), **lastName**: VARCHAR(30), job: VARCHAR(30), **team**: CHAR(3))

- *team* NOT NULL
- *team* REFERENCES NBATeam_BelongsTo(**abbreviation**) ON DELETE CASCADE

```
CREATE TABLE `NBASTaff_WorksFor` (
  `firstName` VARCHAR(30),
  `lastName` VARCHAR(30),
  `job` VARCHAR(30),
  `team` CHAR(3) NOT NULL,
  PRIMARY KEY (`firstName`, `lastName`, `team`),
  FOREIGN KEY (`team`) REFERENCES `NBATeam_BelongsTo` (`abbreviation`)
    ON DELETE CASCADE
);
```

Sponsor__Endorses

Sponsor__Endorses(**company**: VARCHAR(30), *team*: CHAR(3))

- *team* NOT NULL
- *team* REFERENCES NBATeam_BelongsTo(**abbreviation**) ON DELETE CASCADE

```
CREATE TABLE `Sponsor_Endorses` (
  `company` VARCHAR(30),
  `team` CHAR(3) NOT NULL,
  PRIMARY KEY (`company`, `team`),
  FOREIGN KEY (`team`) REFERENCES `NBATeam_BelongsTo` (`abbreviation`)
    ON DELETE CASCADE
);
```

NBAGame__Plays__PlayedAt

NBAGame__Plays__PlayedAt(**gameDate**: DATE, homeScore: INT, awayScore: INT, *homeTeam*: CHAR(3), *awayTeam*: CHAR(3), *venueName*: VARCHAR(30), *city*: VARCHAR(30))

- *homeTeam* NOT NULL
- *awayTeam* NOT NULL
- *venueName* NOT NULL
- *city* NOT NULL
- *homeTeam* REFERENCES NBATeam_BelongsTo(**abbreviation**) ON DELETE CASCADE
- *awayTeam* REFERENCES NBATeam_BelongsTo(**abbreviation**) ON DELETE CASCADE
- *venueName*, *city* REFERENCES Venue

```
CREATE TABLE `NBAGame_Plays_PlayedAt` (
  `gameDate` DATE,
  `homeScore` INT,
  `awayScore` INT,
  `homeTeam` CHAR(3) NOT NULL,
  `awayTeam` CHAR(3) NOT NULL,
  `venueName` VARCHAR(30) NOT NULL,
  `city` VARCHAR(30) NOT NULL,
```

```

PRIMARY KEY (`gameDate`, `homeTeam`, `awayTeam`),
FOREIGN KEY (`homeTeam`) REFERENCES `NBATeam_BelongsTo` (`abbreviation`)
    ON DELETE CASCADE,
FOREIGN KEY (`awayTeam`) REFERENCES `NBATeam_BelongsTo` (`abbreviation`)
    ON DELETE CASCADE,
FOREIGN KEY (`venueName`, `city`) REFERENCES `Venue` (`venueName`, `city`),
CHECK (`gameDate` >= '1946-01-11' AND
    `homeScore` >= 0 AND `awayScore` >= 0)
);

```

NBAReferee

NBAReferee(**number**: INT, firstName: VARCHAR(30), lastName: VARCHAR(30))

```

CREATE TABLE `NBAReferee` (
    `number` INT,
    `firstName` VARCHAR(30),
    `lastName` VARCHAR(30),
    PRIMARY KEY (`number`),
    CHECK (`number` >= 0 AND `number` <= 99)
);

```

Referees

Referees(*refNumber*: INT, *gameDate*: DATE, *homeTeam*: CHAR(3), *awayTeam*: CHAR(3))

- *refNumber* REFERENCES NBAReferee(**number**)
- *gameDate*, *homeTeam*, *awayTeam* REFERENCES NBAGame_Plays_PlayedAt(*gameDate*, *homeTeam*, *awayTeam*)

```

CREATE TABLE `Referees` (
    `refNumber` INT,
    `gameDate` DATE,
    `homeTeam` CHAR(3),
    `awayTeam` CHAR(3),
    PRIMARY KEY (`refNumber`, `gameDate`, `homeTeam`, `awayTeam`),
    FOREIGN KEY (`refNumber`) REFERENCES `NBAReferee` (`number`),
    FOREIGN KEY (`gameDate`, `homeTeam`, `awayTeam`)
        REFERENCES `NBAGame_Plays_PlayedAt` (`gameDate`, `homeTeam`, `awayTeam`)
);

```

Chapter 4

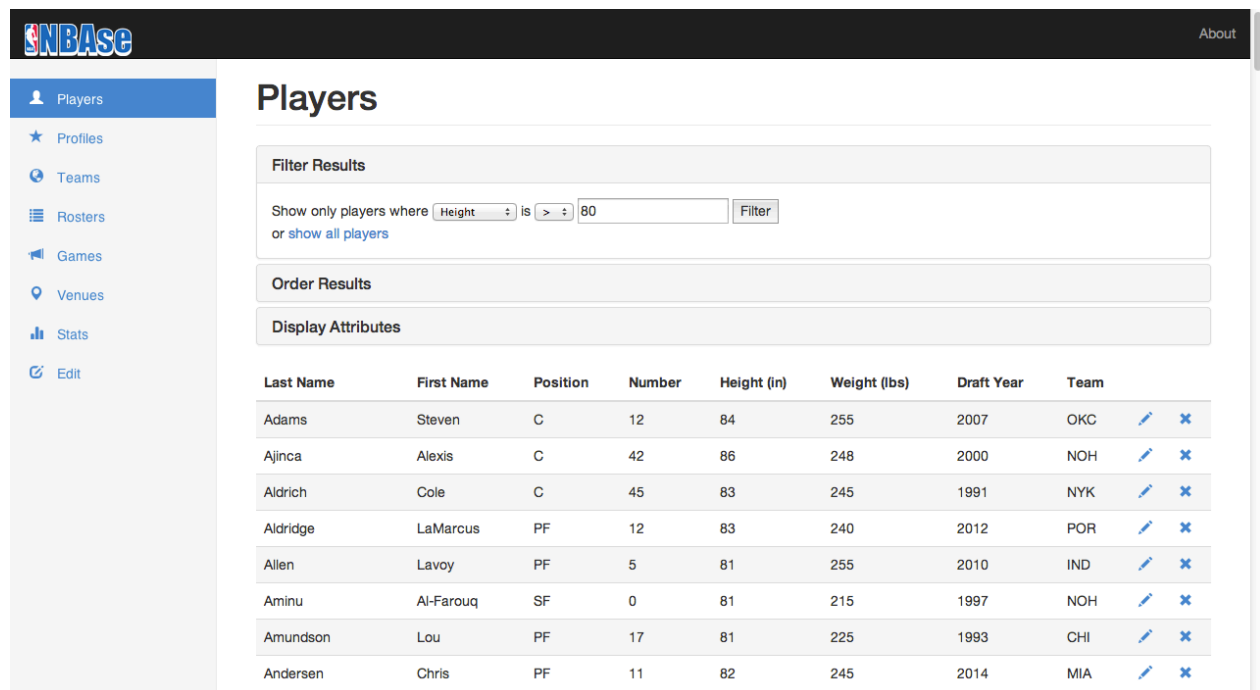
SQL Queries

Note that these are only example queries. The attributes in the SELECT clauses and the conditions in the WHERE clauses may vary depending on the user's input.

Selection and Projection Queries

File location: players.php

```
SELECT lastName, firstName, position, number, height, weight, draftYear, team
FROM NBAPlayer_PlaysFor
WHERE height > 80
ORDER BY lastName;
```



The screenshot shows the NBAse website interface. On the left is a sidebar with navigation links: Players, Profiles, Teams, Rosters, Games, Venues, Stats, and Edit. The main content area is titled 'Players'. It features a 'Filter Results' section with a dropdown menu set to 'Height', a comparison operator 'is >', and a text input field containing '80'. Below this is an 'Order Results' section and a 'Display Attributes' section. The main part of the page is a table listing players. The table has columns for Last Name, First Name, Position, Number, Height (in), Weight (lbs), Draft Year, and Team. Each row represents a player, and there are edit and delete icons for each entry.

Last Name	First Name	Position	Number	Height (in)	Weight (lbs)	Draft Year	Team
Adams	Steven	C	12	84	255	2007	OKC
Ajinca	Alexis	C	42	86	248	2000	NOH
Aldrich	Cole	C	45	83	245	1991	NYK
Aldridge	LaMarcus	PF	12	83	240	2012	POR
Allen	Lavoy	PF	5	81	255	2010	IND
Aminu	Al-Farouq	SF	0	81	215	1997	NOH
Amundson	Lou	PF	17	81	225	1993	CHI
Andersen	Chris	PF	11	82	245	2014	MIA

Figure 4.1: Selection query in players.php

Last Name	First Name	Position	Number	Height (in)	Weight (lbs)	Draft Year	Team
Adams	Steven	C	12				OKC
Ajina	Alexis	C	42				NOH
Aldrich	Cole	C	45				NYK
Aldridge	LaMarcus	PF	12				POR
Allen	Lavoy	PF	5				IND
Aminu	Al-Farouq	SF	0				NOH
Amundson	Lou	PF	17				CHI
Andersen	Chris	PF	11				MIA

Figure 4.2: Projection query in players.php

Join Queries

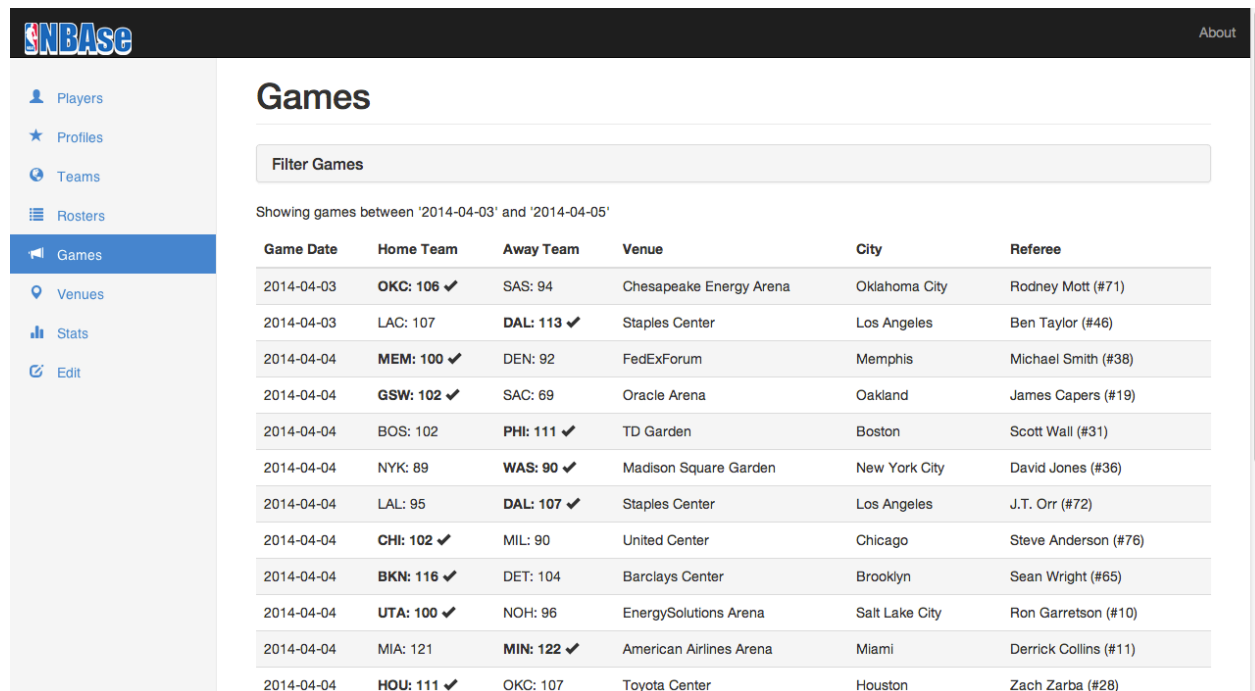
File location: games.php

```
SELECT *
FROM NBAGame_Plays_PlayedAt NPP, NBAReferee NR, Referees R
WHERE NR.number = R.refNumber AND
      R.gameDate = NPP.gameDate AND
      R.homeTeam = NPP.homeTeam AND
      R.awayTeam = NPP.awayTeam
ORDER BY npp.gameDate
```

Division Query

File location: venues.php

```
SELECT *
FROM NBATeam_BelongsTo T
WHERE NOT EXISTS
  (SELECT V.venueName
   FROM Venue V
   WHERE NOT EXISTS
     (SELECT DISTINCT G.venueName
      FROM NBAGame_Plays_PlayedAt G
      WHERE V.venueName = G.venueName AND
            (G.homeTeam = T.abbreviation OR G.awayTeam = T.abbreviation)))
```

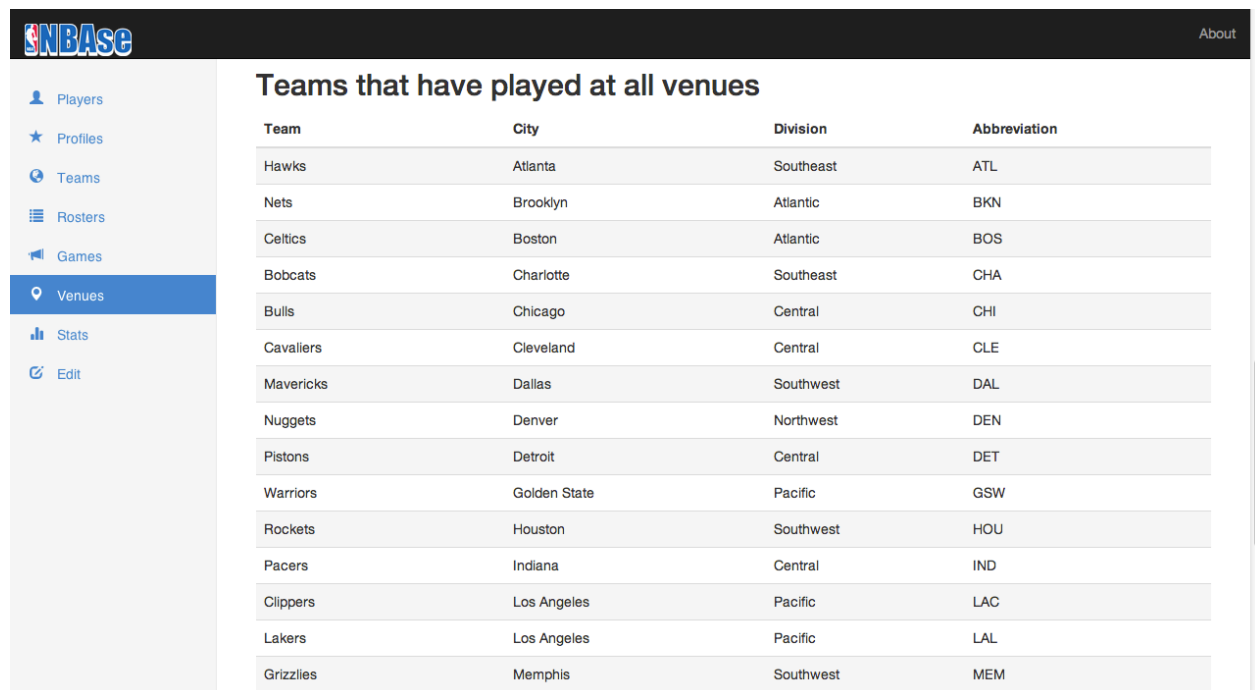
Games

Filter Games

Showing games between '2014-04-03' and '2014-04-05'

Game Date	Home Team	Away Team	Venue	City	Referee
2014-04-03	OKC: 106 ✓	SAS: 94	Chesapeake Energy Arena	Oklahoma City	Rodney Mott (#71)
2014-04-03	LAC: 107	DAL: 113 ✓	Staples Center	Los Angeles	Ben Taylor (#46)
2014-04-04	MEM: 100 ✓	DEN: 92	FedExForum	Memphis	Michael Smith (#38)
2014-04-04	GSW: 102 ✓	SAC: 69	Oracle Arena	Oakland	James Capers (#19)
2014-04-04	BOS: 102	PHI: 111 ✓	TD Garden	Boston	Scott Walli (#31)
2014-04-04	NYK: 89	WAS: 90 ✓	Madison Square Garden	New York City	David Jones (#36)
2014-04-04	LAL: 95	DAL: 107 ✓	Staples Center	Los Angeles	J.T. Orr (#72)
2014-04-04	CHI: 102 ✓	MIL: 90	United Center	Chicago	Steve Anderson (#76)
2014-04-04	BKN: 116 ✓	DET: 104	Barclays Center	Brooklyn	Sean Wright (#65)
2014-04-04	UTA: 100 ✓	NOH: 96	EnergySolutions Arena	Salt Lake City	Ron Garretson (#10)
2014-04-04	MIA: 121	MIN: 122 ✓	American Airlines Arena	Miami	Derrick Collins (#11)
2014-04-04	HOU: 111 ✓	OKC: 107	Toyota Center	Houston	Zach Zarba (#28)

Figure 4.3: Join query in games.php



Teams that have played at all venues

Team	City	Division	Abbreviation
Hawks	Atlanta	Southeast	ATL
Nets	Brooklyn	Atlantic	BKN
Celtics	Boston	Atlantic	BOS
Bobcats	Charlotte	Southeast	CHA
Bulls	Chicago	Central	CHI
Cavaliers	Cleveland	Central	CLE
Mavericks	Dallas	Southwest	DAL
Nuggets	Denver	Northwest	DEN
Pistons	Detroit	Central	DET
Warriors	Golden State	Pacific	GSW
Rockets	Houston	Southwest	HOU
Pacers	Indiana	Central	IND
Clippers	Los Angeles	Pacific	LAC
Lakers	Los Angeles	Pacific	LAL
Grizzlies	Memphis	Southwest	MEM

Figure 4.4: Division query in venue.php

Aggregation Query

File location: stats.php

```
SELECT MAX(height) as result
FROM NBAPlayer_PlaysFor
```

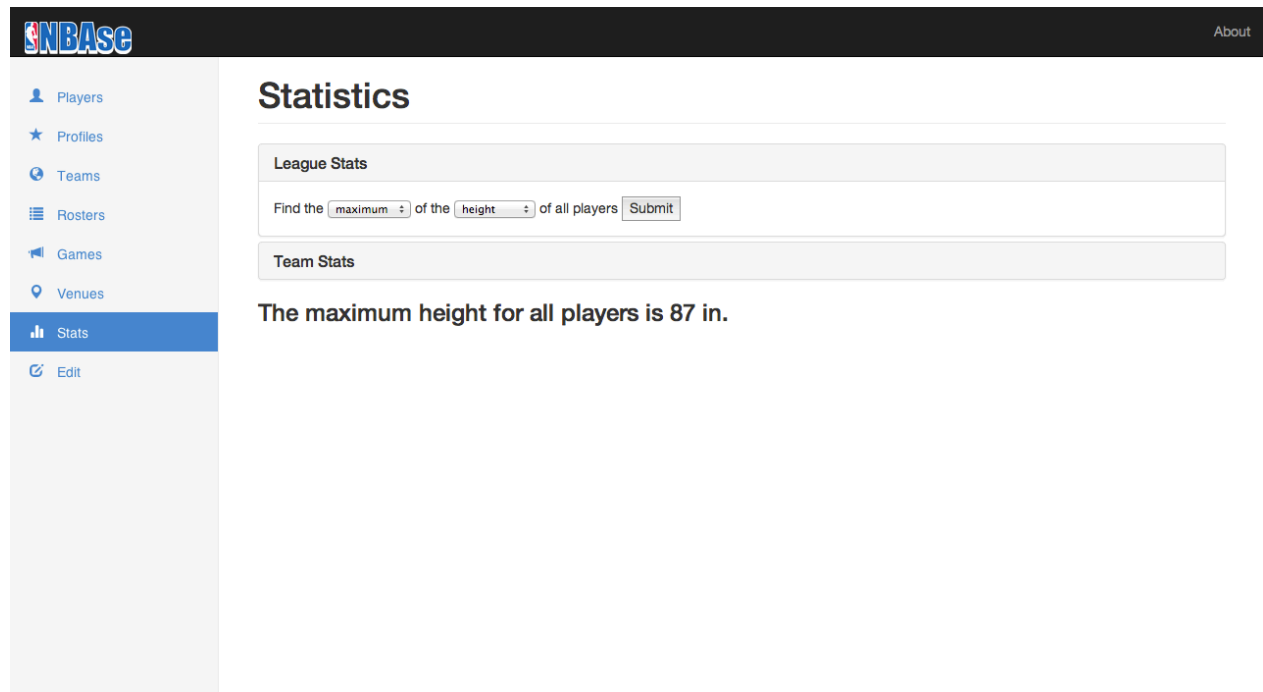


Figure 4.5: Aggregation query in stats.php

Nested Aggregation with Group-By Query

File location: stats.php

```
SELECT team, AVG(draftYear) as result
FROM NBAPlayer_PlaysFor
WHERE team IN
    (SELECT abbreviation
     FROM NBATeam_BelongsTo N, Sponsor_Endorses S
     WHERE N.abbreviation = S.team AND S.company = 'Mercedes Benz')
GROUP BY team
```

Delete Operation

File location: delete_team.php

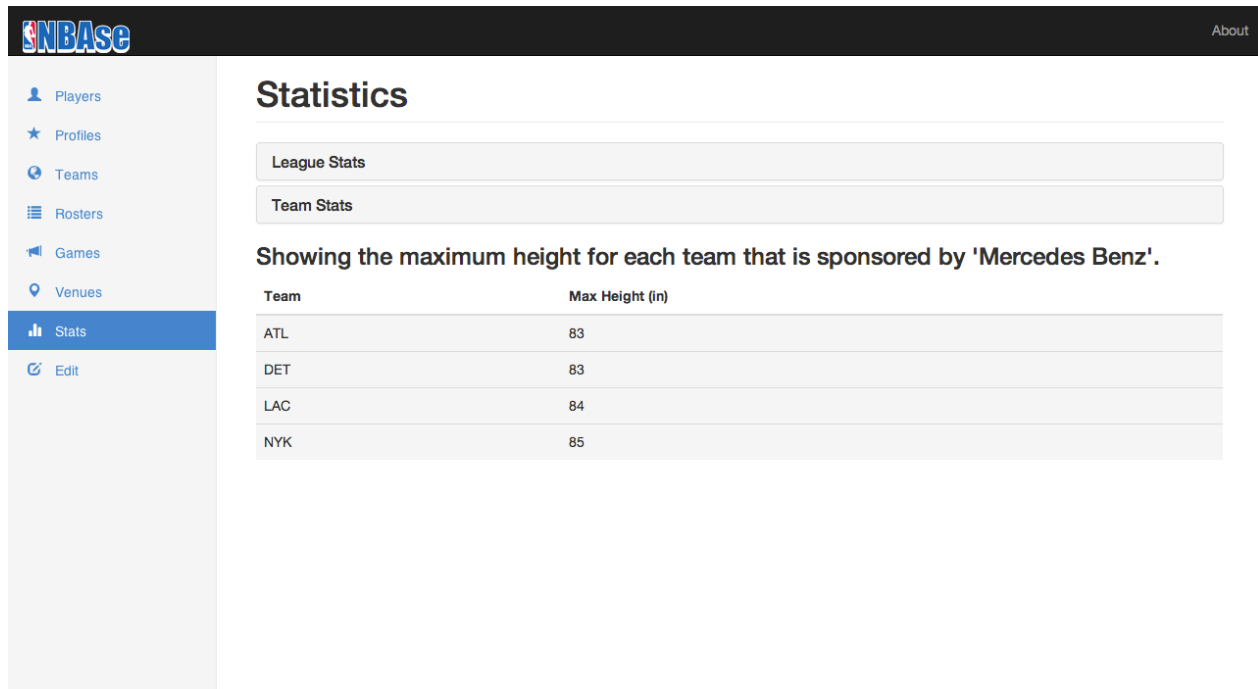


Figure 4.6: Nested aggregation with group-by query in stats.php

```
DELETE FROM NBATeam_BelongsTo
WHERE abbreviation = 'TOR'
```

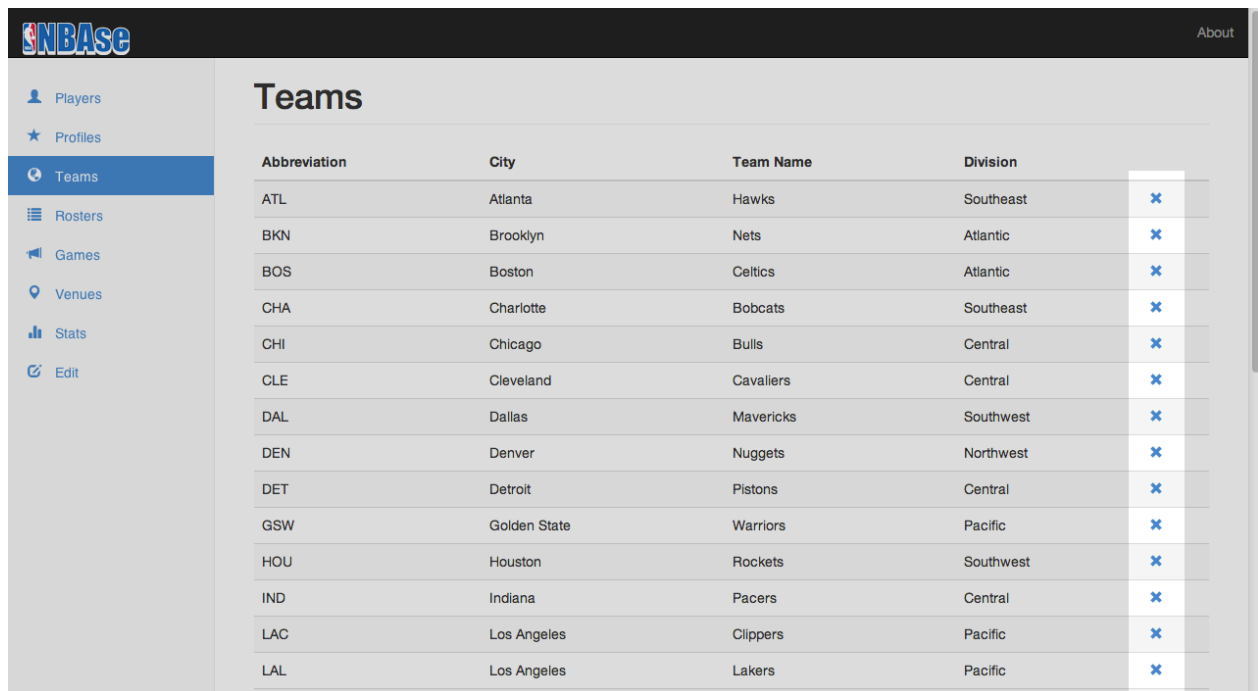
File location: delete_player.php

```
DELETE FROM NBAPlayer_PlaysFor
WHERE team = 'DAL' AND number = 41
```

Update Operation

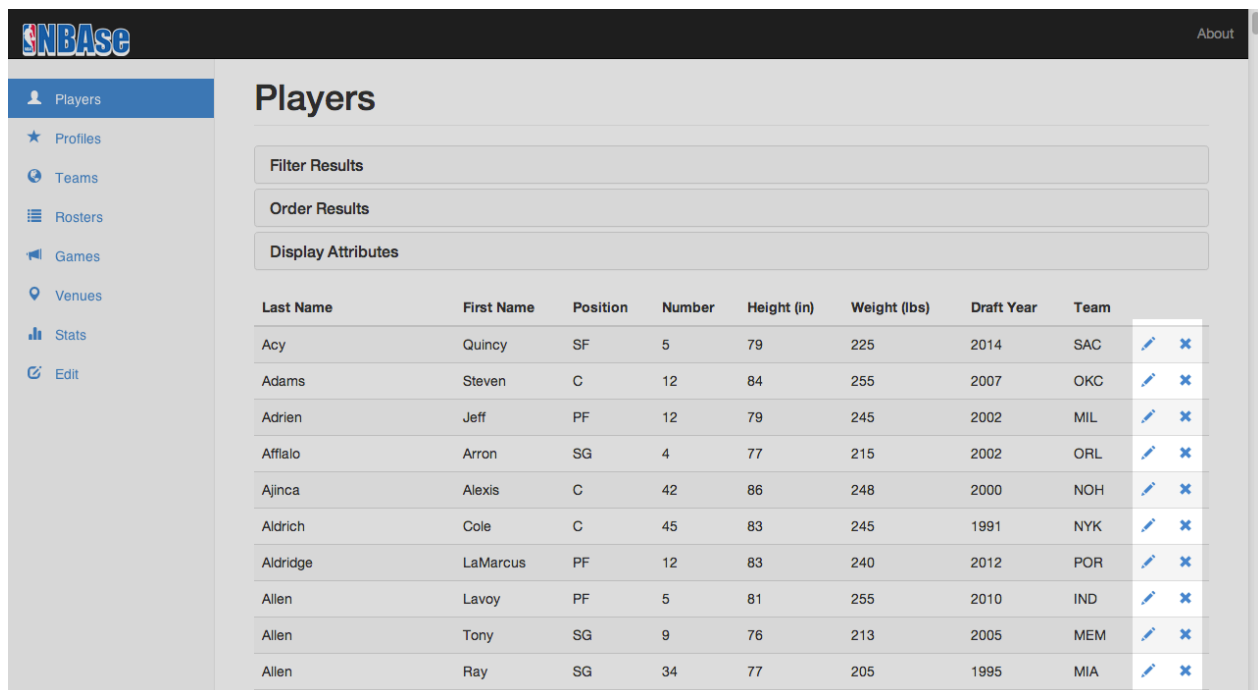
File location: update.php

```
UPDATE NBAPlayer_PlaysFor
SET firstName = 'Aaron',
    lastName = 'Brooks',
    team = 'DEN',
    number = 0,
    position = PG,
    weight = 161,
    height = 84,
    draftYear = 2012
WHERE team = 'DEN' AND number = 0;
```



Abbreviation	City	Team Name	Division	
ATL	Atlanta	Hawks	Southeast	X
BKN	Brooklyn	Nets	Atlantic	X
BOS	Boston	Celtics	Atlantic	X
CHA	Charlotte	Bobcats	Southeast	X
CHI	Chicago	Bulls	Central	X
CLE	Cleveland	Cavaliers	Central	X
DAL	Dallas	Mavericks	Southwest	X
DEN	Denver	Nuggets	Northwest	X
DET	Detroit	Pistons	Central	X
GSW	Golden State	Warriors	Pacific	X
HOU	Houston	Rockets	Southwest	X
IND	Indiana	Pacers	Central	X
LAC	Los Angeles	Clippers	Pacific	X
LAL	Los Angeles	Lakers	Pacific	X

Figure 4.7: Delete operation in delete_team.php



Last Name	First Name	Position	Number	Height (in)	Weight (lbs)	Draft Year	Team		
Acy	Quincy	SF	5	79	225	2014	SAC		X
Adams	Steven	C	12	84	255	2007	OKC		X
Adrien	Jeff	PF	12	79	245	2002	MIL		X
Afflalo	Arron	SG	4	77	215	2002	ORL		X
Ajinca	Alexis	C	42	86	248	2000	NOH		X
Aldrich	Cole	C	45	83	245	1991	NYK		X
Aldridge	LaMarcus	PF	12	83	240	2012	POR		X
Allen	Lavoy	PF	5	81	255	2010	IND		X
Allen	Tony	SG	9	76	213	2005	MEM		X
Allen	Ray	SG	34	77	205	1995	MIA		X

Figure 4.8: Delete operation in delete_player.php

Figure 4.9: Update operation in update.php

Other Queries and Extra Features

These are miscellaneous queries that were used in the project that were not explicitly required, but included here for completeness.

We also implemented retrieval of Google Images and Google News articles for each player as shown in the following screenshot.

File location: venues.php

```
INSERT INTO Venue
VALUES('Rogers Arena', 'Vancouver', '800 Griffiths Way')
```

File location: rosters.php

```
SELECT *
FROM NBAPlayer_PlaysFor
WHERE team = 'TOR';

SELECT *
FROM NBASTaff_WorksFor
WHERE team = 'TOR'
ORDER BY job DESC;

SELECT company
FROM NBATeam_BelongsTo N, Sponsor_Endorses S
WHERE N.abbreviation = S.team AND team = 'TOR';
```

File location: teams.php

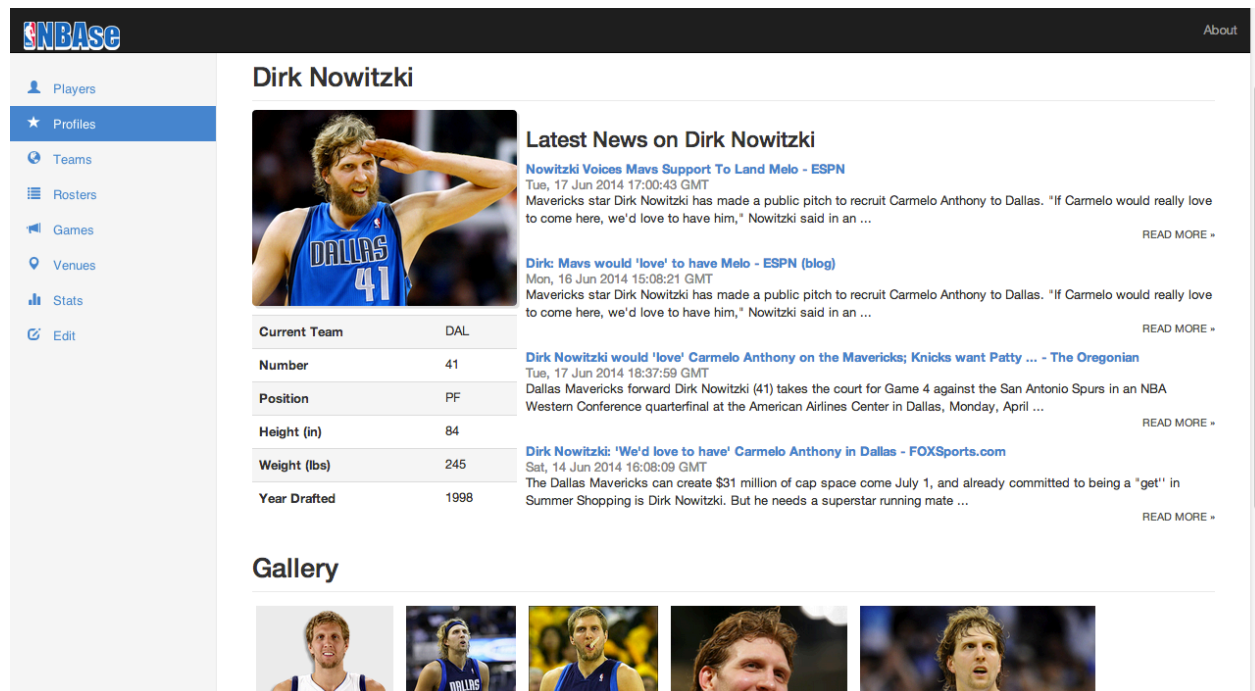


Figure 4.10: Google Images and Google News retrieval in profiles.php

```
SELECT city, abbreviation, teamName, divisionName
FROM NBATeam_BelongsTo
```

File location: update.php

```
SELECT firstName, lastName, number, team
FROM NBAPlayer_PlaysFor
ORDER BY firstName, lastName;

SELECT *
FROM NBATeam_BelongsTo;

SELECT *
FROM NBAPlayer_PlaysFor
WHERE number = 0 AND team = 'DAL';

SELECT *
FROM NBATeam_BelongsTo
WHERE abbreviation = 'DAL';
```

File location: forms/rosters_select.php

```
SELECT abbreviation, teamName, city
FROM NBATeam_BelongsTo
```

File location: forms/stats_team.php

```
SELECT DISTINCT company  
FROM Sponsor_Endorses
```


Chapter 5

Functional Dependencies

`NBATeam_BelongsTo` is not in BCNF because `teamName` \rightarrow `abbreviation`, `city`, `divisionName` violates BCNF since `teamName` is not a superkey of the table.

`NBAGame_Plays_PlayedAt` is not in BCNF because `venueName`, `city`, `gameDate` \rightarrow `homeTeam`, `awayTeam`, `homeScore`, `awayScore` violates BCNF since `venueName`, `city`, `gameDate` is a superkey of the table.

All other tables are in BCNF because all of their non-trivial functional dependencies have attributes on the LHS that are superkeys of the table.

Division

No non-trivial functional dependencies were contained in the `Division` table.

Venue

1. `venueName`, `city` \rightarrow `address`

- Meaning in English: The name of the venue along with the city determines the street address of that venue.

NBATeam__BelongsTo

1. `abbreviation` \rightarrow `city`, `teamName`, `divisionName`

- Meaning in English: The 3-letter abbreviation of a team determines the city, team name, and division that the team is in.

2. `teamName` \rightarrow `abbreviation`, `city`, `divisionName`

- Meaning in English: The team name determines the 3-letter abbreviation, city, and division that the team is in.

NBAPlayer__PlaysFor

1. number, team -> firstName, lastName, position, height, weight, draftYear
 - Meaning in English: The jersey number and the team of a player determines the full name, position, height, weight, and draft year of that player

NBAStaff__WorksFor

1. lastName, firstName, team -> job
 - Meaning in English: The full name of a staff member along with the team that they work for determines their job.

Sponsor__Endorses

No non-trivial functional dependencies were contained in the **Sponsor_Endorses** table.

NBAGame__Plays__PlayedAt

1. gameDate, homeTeam, awayTeam -> homeScore, awayScore, venueName, city
 - Meaning in English: The date of the NBA game, along with the home team and away team that played at that game determines the home score, away score, venue name, and city that the game was played at.
2. venueName, city, gameDate -> homeTeam, awayTeam, homeScore, awayScore
 - Meaning in English: The venue name, city, and game date determines the home team, away team, home score, and away score of that game.

NBAReferee

1. number -> firstName, lastName
 - Meaning in English: The jersey number of a referee determines his or her full name.

Referees

No non-trivial functional dependencies were contained in the **Referees** table.

Chapter 6

SQL Table Contents

The first 10 rows of each SQL table is included below for convenience.

Division

```
mysql> select * from division limit 10;
```

```
+-----+
| divisionName |
+-----+
| Atlantic     |
| Central      |
| Northwest    |
| Pacific      |
| Southeast    |
| Southwest    |
+-----+
```

6 rows in set (0.00 sec)

Venue

```
mysql> select * from venue limit 10;
```

```
+-----+-----+-----+
| venueName          | city        | address          |
+-----+-----+-----+
| Air Canada Centre  | Toronto     | 40 Bay St        |
| American Airlines Arena | Miami      | 601 Biscayne Blvd |
| American Airlines Center | Dallas     | 2500 Victory Ave |
| Amway Center       | Orlando     | 400 West Church St |
| AT&T Center        | San Antonio | 1 AT&T Center Pkwy |
| Bankers Life Fieldhouse | Indianapolis | 125 S Pennsylvania St |
| Barclays Center     | Brooklyn    | 620 Atlantic Avenue |
| BMO Harris Bradley Center | Milwaukee  | 1001 N 4th St     |
| Chesapeake Energy Arena | Oklahoma City | 100 W Reno Ave    |
| EnergySolutions Arena | Salt Lake City | 301 W South Temple |
+-----+-----+-----+
```

10 rows in set (0.00 sec)

NBATEam__BelongsTo

```
mysql> select * from nbateam_belongsto limit 10;
```

abbreviation	city	teamName	divisionName
ATL	Atlanta	Hawks	Southeast
BKN	Brooklyn	Nets	Atlantic
BOS	Boston	Celtics	Atlantic
CHA	Charlotte	Bobcats	Southeast
CHI	Chicago	Bulls	Central
CLE	Cleveland	Cavaliers	Central
DAL	Dallas	Mavericks	Southwest
DEN	Denver	Nuggets	Northwest
DET	Detroit	Pistons	Central
GSW	Golden State	Warriors	Pacific

10 rows in set (0.00 sec)

NBAPlayer__PlaysFor

```
mysql> select * from nbaplayer_playsfor limit 10;
```

number	position	firstName	lastName	height	weight	draftYear	team
0	PG	Jeff	Teague	74	181	1995	ATL
0	C	Andray	Blatche	83	260	2010	BKN
0	PG	Avery	Bradley	74	180	1993	BOS
0	C	Bismack	Biyombo	81	245	1992	CHA
0	SG	C.J.	Miles	78	231	2012	CLE
0	SF	Shawn	Marion	79	228	2007	DAL
0	PG	Aaron	Brooks	84	161	2012	DEN
0	C	Andre	Drummond	82	270	1998	DET
0	PF	Glen	Davis	81	289	1999	LAC
0	SF	Nick	Young	79	210	1992	LAL

10 rows in set (0.00 sec)

NBAStaff__WorksFor

```
mysql> select * from nbastaff_worksfor limit 10;
```

firstName	lastName	job	team
Adrian	Griffin	Assistant Coach	CHI
Alex	McKechnie	Assistant Coach	TOR
Alvin	Gentry	Assistant Coach	LAC
Andy	Greer	Assistant Coach	CHI
Armond	Hill	Assistant Coach	LAC
Bernie	Bickerstaff	Assistant Coach	CLE
Bill	Bayno	Assistant Coach	TOR

```

| Bob      | Bender      | Assistant Coach | MIL |
| Bob      | Beyer       | Assistant Coach | CHA |
| Bob      | Beyer       | Assistant Coach | DET |
+-----+-----+-----+-----+
10 rows in set (0.00 sec)

```

Sponsor_Endorses

```
mysql> select * from sponsor_endorses limit 10;
```

```

+-----+-----+
| company          | team |
+-----+-----+
| Hertz            | ATL  |
| Love's Country's | ATL  |
| Mercedes Benz    | ATL  |
| Northwest Ford Stores | ATL  |
| Sandridge Energy | ATL  |
| State Farm Insurance | ATL  |
| SWBC             | ATL  |
| Texas Ford Dealers | ATL  |
| Anheuser-Busch   | BKN  |
| Audi             | BKN  |
+-----+-----+
10 rows in set (0.00 sec)

```

NBAGame_Plays_PlayedAt

```
mysql> select * from nbagame_plays_playedat limit 10;
```

```

+-----+-----+-----+-----+-----+-----+-----+
| gameDate | homeScore | awayScore | homeTeam | awayTeam | venueName          | city          |
+-----+-----+-----+-----+-----+-----+-----+
| 2013-10-29 | 97 | 87 | IND | ORL | Bankers Life Fieldhouse | Indianapolis |
| 2013-10-29 | 116 | 103 | LAL | LAC | Staples Center          | Los Angeles |
| 2013-10-29 | 107 | 95 | MIA | CHI | American Airlines Arena | Miami       |
| 2013-10-30 | 98 | 94 | CLE | BKN | Quicken Loans Arena     | Cleveland   |
| 2013-10-30 | 118 | 109 | DAL | ATL | American Airlines Center | Dallas      |
| 2013-10-30 | 113 | 102 | DET | WAS | The Palace of Auburn Hills | Detroit     |
| 2013-10-30 | 125 | 94 | GSW | LAL | Oracle Arena            | Oakland     |
| 2013-10-30 | 96 | 83 | HOU | CHA | Toyota Center           | Houston     |
| 2013-10-30 | 120 | 115 | MIN | ORL | Target Center           | Minneapolis |
| 2013-10-30 | 90 | 95 | NOH | IND | Smoothie King Center    | New Orleans |
+-----+-----+-----+-----+-----+-----+-----+
10 rows in set (0.00 sec)

```

NBAReferee

```
mysql> select * from nbareferee limit 10;
```

```

+-----+-----+-----+
| number | firstName | lastName |
+-----+-----+-----+
| 6 | Tony | Brown |
| 7 | Derrick | Stafford |
| 8 | Marc | Davis |
| 10 | Ron | Garretson |
| 11 | Derrick | Collins |

```

12	Violet	Palmer
13	Monty	McCutchen
14	Ed	Malloy
15	Bennett	Salvatore
16	David	Guthrie

```

+-----+
10 rows in set (0.00 sec)

```

Referees

```
mysql> select * from referees limit 10;
```

refNumber	gameDate	homeTeam	awayTeam
45	2013-10-29	IND	ORL
8	2013-10-29	LAL	LAC
73	2013-10-29	MIA	CHI
68	2013-10-30	CLE	BKN
37	2013-10-30	DAL	ATL
30	2013-10-30	DET	WAS
20	2013-10-30	GSW	LAL
14	2013-10-30	HOU	CHA
44	2013-10-30	MIN	ORL
8	2013-10-30	NOH	IND

```

+-----+
10 rows in set (0.00 sec)

```

Chapter 7

Demo Script

Note: Times for each section are approximate.

Before the demo

- For Norman: Print 3 copies of `project-final-report` which should contain:
 - ER diagram
 - relation instances (table of data)
 - SQL for all queries used in demo
 - SQL for creating tables
- For Norman: Have windows on your laptop open with:
 - Amazon EC2 dashboard
 - Apache HTTP Server config file: `/opt/bitnami/apache2/conf/httpd.conf`
 - Apache HTTP Server config file: `/opt/bitnami/apache2/conf/bitnami/bitnami.conf`
 - MySQL config file: `/opt/bitnami/mysql/my.cnf`
 - Terminal to restart `apache` and/or `mysql` with commands:
 - * `sudo bash ctlscript.sh restart apache`
 - * `sudo bash ctlscript.sh restart mysql`

Setup (2 minutes)

- Run scripts to create and populate database
- Show TA database instances before and after

Selection and Projection Query (2 minutes)

- Navigate to **Players** page
1. From the **Filter Results** menu, specify a selection constraint (any is fine)
 2. Repeat the previous step with a different selection constraint
 - Demonstrate type checking on user input (i.e. input must be a number ≥ 0)
 3. *Optional:* Order the results by some attribute in the **Order Results** menu
 4. Choose some attributes to display in the **Display Attributes** menu

Join Query (2 minutes)

- Navigate to **Games** page
1. Show TA that data has been joined from 4 tables: `nbagame_plays_playedat`, `nbareferee`, and `referees`
 2. If necessary to show a second example, navigate to **Rosters** page and show the list of sponsors for any team
 - This query joins data from 2 tables: `nbateam_belongsto` and `sponsor_endorses`

Division Query (2 minutes)

- Navigate to **Venues** page
1. Show TA *Teams that have played at all venues* section (and explain how this is a division query if necessary)
 2. Add a new venue under the **Add a Venue** menu
 3. Return to **Venues** page, show TA that there are no longer any teams under the *Teams that have played at all venues* section

Aggregation Query (2 minutes)

- Navigate to **Stats** page
1. From the **League-Wide** menu, choose an aggregate operator and an attribute
 - Show that this result is consistent with our relation instance
 2. Repeat the previous step with a different operator and attribute
 - Show that this result is consistent with our relation instance

Nested Aggregation with Group By (2 minutes)

- While still on the **Stats** page
1. Show TA nested aggregation query on printout
 2. From the **Team-Wide** menu, choose an aggregate operator, an attribute, and a sponsor
 - Show that the results are consistent with our relation instances
 3. Repeat the previous step with different parameters
 - Show that the results are consistent with our relation instances

Delete Operation (4 minutes)

- Navigate to **Teams** page
- 1. Explain the constraints for our tables
 - Deleting a team should delete all players and games that reference that team (ON DELETE CASCADE)
 - Cannot delete a game that is referenced by the referees table (ON DELETE NO ACTION)
 - Deleting a team should fail if a game has at least one referee
- 2. Delete a team that participates in a game with a referee
 - Show that this deletion fails (e.g. show that the team still exists and/or any players & games associated with that team still exist)
 - Show that error message is located in popup box
- 3. Delete a team that only participates in games without referees
 - Show that this deletion succeeds (e.g. show that the team is gone from **Teams** page and that there are no players on the **Players** page with that team)
- Navigate to **Players** page
- 1. Delete a player from the table (deletion without cascade)

Update Operation (2 minutes)

- Navigate to **Edit** page
- 1. Choose any player to edit
- 2. Attempt to change that player's draft year to a year that is greater than the current year
 - Show TA that this update is rejected since it violates a constraint
 - Show that error message is located in popup box
- 3. Reattempt to change that player's draft year to a valid year
 - Show that this update succeeded (e.g. navigate to **Players** page and show the player with new draft year)
- 4. Show additional type checking for the update form
 - First and Last names must have only alphabet characters and have length ≥ 1
 - Position is selected from dropdown menu
 - Number must be numeric and have value: $0 \leq \text{value} \leq 99$
 - Note: Could also attempt to update player number to a number that already exists on that team (violates primary key constraint)
 - Height must be numeric with value ≥ 0
 - Weight must be numeric with value ≥ 0
 - Draft year must be numeric with $1946 \leq \text{value} \leq \text{currentYear}$
 - Team is selected from dropdown

Extra Features (2 minutes)

- Navigate to **Players** page
1. Click on any player from list of players
 2. Show that the page displays unique information from the database about that player
 3. Explain that the profile picture is dynamically retrieved from Google images
 4. Explain that the latest news for each player is dynamically retrieved from Google news
 5. Show the profile page of another (one or more) players