Video Game Sales Database Group 8

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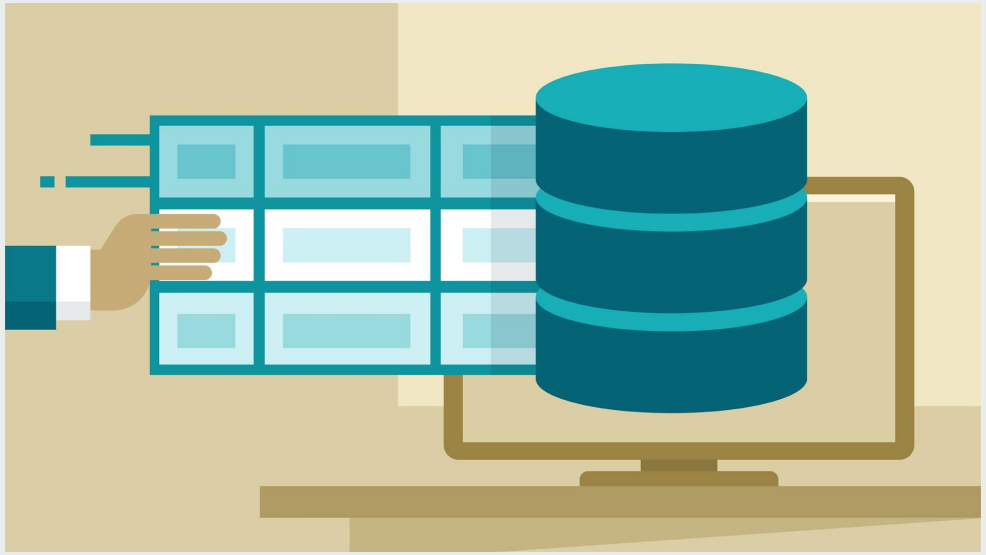
- CS 564, Summer 2020 : Professor Nguyen



STEP 1 : PICK AN APPLICATION

1. Motivation and Domain

I. Motivation

- Analyze and predict sales trends in game market
- Video game market is rapidly growing and expanding
- Provide meaningful demographic data in gaming industry
- Integrate relations between categorical information through queries

1. Motivation and Domain

II. The Need for Database & DBMS

- Millions of games are sold every year
- To track the success of a game, platform, genre, or company, necessary to look in context of its competition in various categories
- Efficient data storage/retrieval & data processing for users
- Intuitive UI/UX allows users to extract meaningful information from raw data through queries
- Fast, and flexible data access and data manipulation

2. Application Description

I. The Type of Application

- Standalone application

- Stored data access/manipulation/user queries.

- Supports access/modification of data as well as scalability to large datasets (big data)

2. Application Description

III. Datasets

- Obtained videogamessales.csv from Kaggle.com
- Dataset contains the names of video games, the platform on which they are released, the year of publication, genre, publisher, and sales data for each region.
- **Reason:**

i. 11 columns of data and 16591 rows

ii. Dataset well-organized and clean

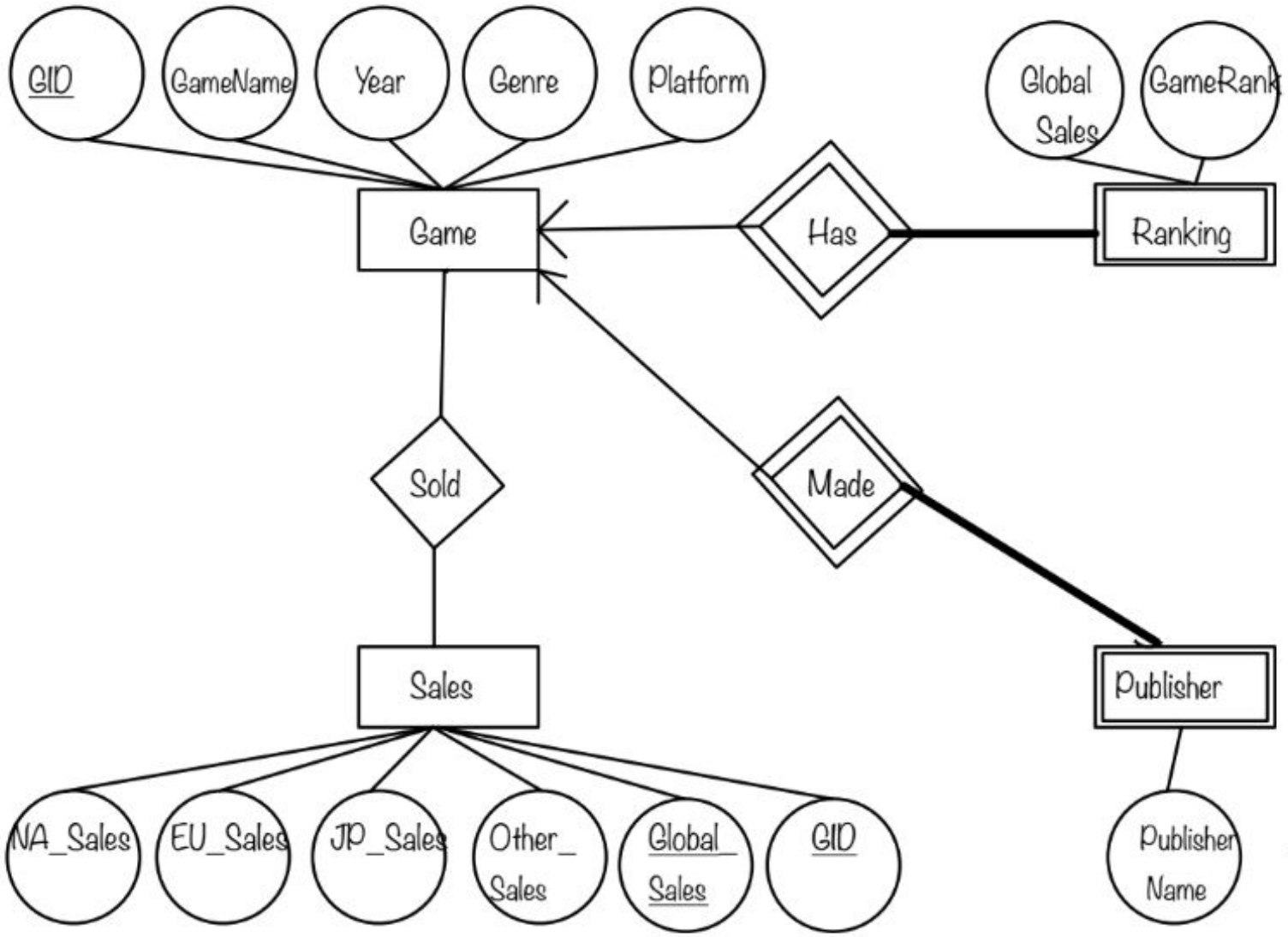
iii. Single source no multiple source integration will be required

3. Project Management

Week	Work	In charge
2	**Checkpoint 1** 1. Motivation & Project Description 2. Dataset Selection & Explanation 3. ER Diagram	 Hyukjoon Nate Tae
3	**Checkpoint 2 (06/28)** 1. Revise ER Diagram 2. Relational Schema 3. Non-trivial Functional Dependencies 4. Update Changes to DB	 Hyukjoon Nate Tae All
4	1. Revise Relational Schema 2. Normalization Process 3. Data Standardization 4. Plan Implementation	Hyukjoon Nate Tae Hyukjoon
5	**Checkpoint 3 (07/12)** 1. Refine Relational Schema 2. Normalization Process 3. Data Standardization 4. Implement Database	 Hyukjoon Nate Tae All
6	**Checkpoint 4 (07/19)** 1. SQL Queries 2. Interface 3. Stored Procedures 4. Complete Implementation 5. Evaluation 6. Write Final Report 7. Prepare Final Presentation 8. Complete Presentation Video	 All All All All All All All All
7	**Presentations**	All

STEP 2 : CONCEPTUAL DESIGN

1. ER Diagram


GID
GameName
Year
Genre
Platform
Global Sales
GameRank
Game
Has
Ranking
Sold
Made
Sales
Publisher
NA_Sales
EU_Sales
JP_Sales
Other_ Sales
Global_ Sales
GID
Publisher Name

STEP 3 : RELATIONAL SCHEMA

1. Entity Sets

TABLE 1. Game (GID: BIGINT, GameName: String, Platform: String, Year: String, Genre: String)

- GID – BIGINT;
- GameName - String; ≤ 135 Characters
- Platform – String; ≤ 15 Characters
- Year - String ≤ 5 characters (Some games has no data for year)
- Genre - String; (Action, Adventure, Fighting, Misc, Platform, Puzzle, Racing, Role-Playing, Shooter, Simulation, Sports, Strategy)
- Primary Key : GID

1. Entity Sets

TABLE 2. Sales (GID: int, NA_Sales: double, EU_Sales: double, JP_Sales: double, Other_Sales: double, Global_Sales: double)

- GID – BIGINT; (Primary)
- NA_Sales – Positive double; 0.0 ≤ Sales ≤ 100,000
- EU_Sales – Positive double; 0.0 ≤ Sales ≤ 100,000
- JP_Sales – Positive double; 0.0 ≤ Sales ≤ 100,000
- Other_Sales – Positive double; 0.0 ≤ Sales ≤ 100,000
- Global_Sales – Positive double; 0.0 ≤ Sales ≤ 100,000 (Primary)
- Primary Key : GID, Global_Sales
- Foreign Key : (GID) references Game(GID)

1. Entity Sets

TABLE 3. Publisher (GID: int, PublisherName: String)

- GID – BIGINT; ≤ # of rows in table (Primary)
- PublisherName - String; ≤ 50 Characters
- Primary Key : GID
- Foreign Key : (GID) references Game(GID)

1. Entity Sets

TABLE 4. Ranking (GID: int, GameRank: int, Global_Sales: double)

- GID – Unique Ranking; ≤ # of rows in table (primary)
- GameRank - Unique Ranking; ≤ # of rows in table (Primary)
- Global_Sales – Positive double; 0.0 ≤ Sales ≤ 100,000
- Primary Key : GID
- Foreign Key : (GID, Global_Sales) references Sales(GID, Global_Sales)

STEP 4 : NORMALIZATION PROCESS

ENSURE 3NF

- Games Table was in neither BCNF nor 3NF initially
- **PROBLEM:** GameName was a non-unique, non-candidate key because there were duplicate elements with many non-trivial functional dependencies
  - ex) There were some games with identical names published in the same year (duplicates & data anomalies)
- **SOLUTION :** We made all columns (attributes) functionally dependent on the GID which was the unique ranking assigned to each game
- Now GID is primary key
- For Sales table: Global_Sales is sum of all regional sales so we had to make both GID and Global_Sales as primary key
- Guarantees lossless decomposition & dependency preserving

```
/* Update GameRank of Ranking*/
CREATE TEMPORARY TABLE temp
    select *
    from Ranking;

update Ranking
    inner join temp
    on temp.gid = ranking.gid
    set ranking.gamerank= temp.gid;

drop table temp;
```

NON-TRIVIAL FUNCTIONAL DEPENDENCIES

RELATION	FUNCTIONAL DEPENDENCIES	3NF ACHIEVED?
Game	GID → GameName, Platform, Year, Genre GameName, Platform → GID	Yes, GID is the candidate key in the relation GID is a prime attribute
Sales	GID,Global_Sales → NA_Sales, EU_Sales, JP_Sales, Other_Sales NA_Sales, EU_Sales, JP_Sales, Other_Sales → Global_Sales	Yes, (GID, Global_Sales) is a superkey, and Global_Sales is a prime attribute.
Publisher	GID →PublisherName	Yes, Relation with 2 attributes is always in BCNF, which means it is also 3NF
Ranking	GID → GameRank, Global_Sales	Yes, GID is the candidate key in the relation

Step 5,6: Pick a DBMS and implement database

1. BACK-END DBMS: MySQL

- Relational DBMS based on Structured Queries
- Scalable through multi-threading supports big data
- Simple syntax & DDL/DML covered in lecture
- GUI Support (MySQL Workbench) Easy to Use & high functionality
- Bridges gap between logical model and machine (physical data independence & logical data independence)
- Supports .csv

Step 5,6: Pick a DBMS and implement database

2. FRONT-END GUI: JavaFX

- Team members have experience from CS400
- FXML intuitive & easy to use
- Can be integrated with back-end MySQL
- Enables UI tests
- Built-in functionalities (buttons, frames, panels, etc)

EVALUATION (TESTING)

Objective:

Make sure that games can be added, removed, searched for, global sales correctly increases upon incrementing regional sales, and rank will update after changing sales data.

Method:

- Calculate the expected result based on CSV file
- Compare the result from the database with expected result
- Repeat this comparison for every stored procedures and queries used in the application

STORED PROCEDURES:

updateRank

```
/* UPDATE RANK procedure */
delimiter //
drop procedure if exists updateRank;
create procedure updateRank()
begin

    drop table if exists temp;
    CREATE TEMPORARY TABLE temp
    select * from
    (select gid,
        row_number() over (
            order by Global_Sales desc
        ) r

    from ranking
    order by global_sales desc) h;

    /* Update ranking*/
    update Ranking
        inner join temp
        on temp.gid = ranking.gid
    set ranking.gamerank= temp.r;

    drop table temp;
end //
delimiter ;
```

GID	GameRank	GameName
1525	1525	Digimon World
1526	1526	Rise of the Tomb Raider
1527	1527	Need for Speed Carbon
1528	1528	Yoshi's Woolly World
1529	1529	Mega Man Battle Network 3...
1530	1530	FIFA Street
1531	1531	Resident Evil Zero
1533	1533	Tom Clancy's Rainbow Six: ...
1534	1534	Pirates of the Caribbean: T...
1535	1535	Transformers
1536	1536	Guitar Hero: Aerosmith
1537	1537	Mystery Case Files: MillionHeir
1538	1538	Valkyria Chronicles
1539	1539	Midnight Club 3: DUB Editio...
1540	1540	Champions of Norrath
1541	1541	Watch Dogs
1542	1542	Imagine: Wedding Designer
1543	1543	Metal Gear Solid V: Ground ...
1544	1544	Yakuman
1545	1545	Assassin's Creed Syndicate
1546	1546	Army Men 3D
1547	1547	WWE '13

GID	GameRank	GameName
1525	1524	Digimon World
1526	1525	Rise of the Tomb Raider
1527	1526	Need for Speed Carbon
1528	1527	Yoshi's Woolly World
1529	1528	Mega Man Battle Network 3...
1530	1529	FIFA Street
1531	1530	Resident Evil Zero
1533	1531	Tom Clancy's Rainbow Six: ...
1534	1532	Pirates of the Caribbean: T...
1535	1533	Transformers
1536	1534	Guitar Hero: Aerosmith
1537	1535	Mystery Case Files: MillionHeir
1538	1536	Valkyria Chronicles
1539	1537	Midnight Club 3: DUB Editio...
1540	1538	Champions of Norrath
1541	1539	Watch Dogs
1542	1540	Imagine: Wedding Designer
1543	1541	Metal Gear Solid V: Ground ...
1544	1542	Yakuman
1545	1543	Assassin's Creed Syndicate
1546	1544	Army Men 3D
1547	1545	WWE '13
1548	1546	Twisted Metal 4
1549	1547	Manhunt
1550	1548	Kid Icarus: Uprising
1551	1549	Silent Hill 2
1552	1550	Tomb Raider: Underworld
1553	1551	Castlevania: Symphony of ...

STORED PROCEDURES:

updateGlobalSales

```
/*This procedure is used to update the Global_Sales of games*/
delimiter $$
drop procedure if exists updateGlobalSales;
create procedure updateGlobalSales()
begin
    update Sales
    set Global_Sales = round (NA_Sales + EU_Sales + JP_Sales + Other_Sales, 2);
end $$
delimiter ;
```

GID	NA_Sales	EU_Sales	JP_Sales	Other_Sales	Global_Sales
1	41.49	29.02	3.77	8.46	82.74
2	29.08	3.58	6.81	0.77	40.24
3	15.85	15.85	3.79	3.31	35.82
4	15.75	11.01	3.28	2.96	33
5	11.27	8.89	10.22	1	31.37
6	23.2	2.26	4.22	0.58	30.26
7	11.38	9.23	6.5	2.9	30.01
8	14.03	9.2	2.93	2.85	29.02
9	14.59	7.06	4.7	2.26	28.62
10	26.93	0.63	0.28	0.47	28.31
11	9.07	11	1.93	2.75	24.76
12	9.81	7.57	4.13	1.92	23.42
13	9	6.18	7.2	0.71	23.1
14	8.94	8.03	3.6	2.15	22.72
15	9.09	8.59	2.53	1.79	22
16	14.97	4.94	0.24	1.67	21.82
17	7.01	9.27	0.97	4.14	21.4
18	9.43	0.4	0.41	10.57	20.81
19	12.78	3.75	3.54	0.55	20.61
20	4.75	9.26	4.16	2.05	20.22
21	6.42	4.52	6.04	1.37	18.36
22	10.83	2.71	4.18	0.42	18.14
23	9.54	3.44	3.84	0.46	17.28
24	9.63	5.31	0.06	1.38	16.38
25	8.41	5.49	0.47	1.78	16.15
26	6.06	3.9	5.38	0.5	15.85
27	5.57	3.28	5.65	0.82	15.32
28	3.44	5.36	5.32	1.18	15.3
29	6.85	5.09	1.87	1.16	14.98

GID	NA_Sales	EU_Sales	JP_Sales	Other_Sales	Global_Sales
1	41.49	29.02	3.77	8.46	82.74
2	29.08	29.08	6.81	0.77	40.24
3	15.85	12.88	3.79	3.31	35.83
4	15.75	11.01	3.28	2.96	33
5	11.27	8.89	10.22	1	31.38
6	23.2	2.26	4.22	0.58	30.26
7	11.38	9.23	6.5	2.9	30.01
8	14.03	9.2	2.93	2.85	29.01
9	14.59	7.06	4.7	2.26	28.61
10	26.93	0.63	0.28	0.47	28.31
11	9.07	11	1.93	2.75	24.75
12	9.81	7.57	4.13	1.92	23.43
13	9	6.18	7.2	0.71	23.09
14	8.94	8.03	3.6	2.15	22.72
15	9.09	8.59	2.53	1.79	22
16	14.97	4.94	0.24	1.67	21.82
17	7.01	9.27	0.97	4.14	21.39
18	9.43	0.4	0.41	10.57	20.81
19	12.78	3.75	3.54	0.55	20.62
20	4.75	9.26	4.16	2.05	20.22
21	6.42	4.52	6.04	1.37	18.35
22	10.83	2.71	4.18	0.42	18.14
23	9.54	3.44	3.84	0.46	17.28
24	9.63	5.31	0.06	1.38	16.38
25	8.41	5.49	0.47	1.78	16.15
26	6.06	3.9	5.38	0.5	15.84
27	5.57	3.28	5.65	0.82	15.32
28	3.44	5.36	5.32	1.18	15.3
29	6.85	5.09	1.87	1.16	14.97
30	9.03	4.28	0.13	1.32	14.76

STORED PROCEDURES:

searchGame

```
/* SEARCH procedure */
delimiter $$
drop procedure if exists searchGame;
create procedure searchGame (in gName varchar(135))
begin
    select r.gamerank, g2.gid, g2.GameName, g2.platform, g2.year, g2.genre, p.publishername,
        s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
    from Ranking r, sales s, publisher p, game g2,
        (select g.gid, g.GameName, g.platform, g.year, g.genre
        from Game g
        where g.GameName like concat('%',gName,'%'))g1
    where r.gid=s.gid and s.gid=p.gid and p.gid=g2.gid and g2.gid=g1.gid;
end $$
delimiter ;
```

```
call searchGame('call of duty: modern warfare 3');
```

sult Grid | Filter Rows: | Export: | Wrap Cell Content:

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
30	30	Call of Duty: Modern Warfare 3	X360	2011	Shooter	Activision	9.03	4.28	0.13	1.32	14.76
38	38	Call of Duty: Modern Warfare 3	PS3	2011	Shooter	Activision	5.54	5.82	0.49	1.62	13.46
1038	1039	Call of Duty: Modern Warfare 3	PC	2011	Shooter	Activision	0.41	0.98	0	0.33	1.72
2350	2352	Call of Duty: Modern Warfare 3	Wii	2011	Shooter	Activision	0.6	0.21	0	0.08	0.89
5916	5920	Call of Duty: Modern Warfare 3: Defiance	DS	2011	Shooter	Activision	0.21	0.07	0	0.02	0.3

```
call searchGame('call of duty:');
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
30	30	Call of Duty: Modern Warfare 3	X360	2011	Shooter	Activision	9.03	4.28	0.13	1.32	14.76
32	32	Call of Duty: Black Ops	X360	2010	Shooter	Activision	9.67	3.73	0.11	1.13	14.64
34	34	Call of Duty: Black Ops 3	PS4	2015	Shooter	Activision	5.77	5.81	0.35	2.31	14.24
35	35	Call of Duty: Black Ops II	PS3	2012	Shooter	Activision	4.99	5.88	0.65	2.52	14.03
36	36	Call of Duty: Black Ops II	X360	2012	Shooter	Activision	8.25	4.3	0.07	1.12	13.73
37	37	Call of Duty: Modern Warfare 2	X360	2009	Shooter	Activision	8.52	3.63	0.08	1.29	13.51
38	38	Call of Duty: Modern Warfare 3	PS3	2011	Shooter	Activision	5.54	5.82	0.49	1.62	13.46
41	41	Call of Duty: Black Ops	PS3	2010	Shooter	Activision	5.98	4.44	0.48	1.83	12.73
56	56	Call of Duty: Modern Warfare 2	PS3	2009	Shooter	Activision	4.99	3.69	0.38	1.63	10.69

```
call searchGame('no game exist');
```

esult Grid | Filter Rows: | Export: | Wrap Cell Content:

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales

STORED PROCEDURES:

insertGame

```
/* INSERT procedure*/
delimiter $$
drop procedure if exists insertGame;
create procedure insertGame(in gameName varchar (135), in platform varchar(10), in gameYear varchar (5),
                            in genre varchar(20), in publisherName varchar(40), in NA_Sales double,
                            in EU_Sales double, in JP_Sales double, in Other_Sales double)
begin

    declare gid BIGINT default (select max(GID) from Game);
    declare global_Sales double default 0.0;
    declare insertGID BIGINT;

    /* Assign unique GID for this new data*/
    set gid = gid + 1;
    /* Calculation for global_variables*/
    set global_Sales = round (NA_Sales + EU_Sales + JP_Sales + Other_Sales, 2);

    set insertGID =(
        select GID
        from Ranking r
            natural join
            (select g.gid, g.GameName, g.platform
            from Game g
            where g.GameName = gameName)g1
            natural join
            Sales s
        where g1.GameName = gameName
            and g1.Platform = Platform);
```

```
    if insertGid is null then

        /* Insert data into each table*/
        insert into Game (GID, GameName, Platform, Year, Genre)
            values (gid, gameName, platform, gameYear, genre);
        insert into Publisher (GID, PublisherName)
            values (gid, publisherName);
        insert into Sales (GID, NA_Sales, EU_Sales, JP_Sales, Other_Sales, Global_Sales)
            values (gid, NA_Sales, EU_Sales, JP_Sales, Other_Sales, global_Sales);
        insert into Ranking (GID, GameRank, Global_Sales)
            values (gid, 0, global_Sales);

        call updateRank;
    end if;
end $$
delimiter ;
```

STORED PROCEDURES:

insertGame (cont.)

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
2	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77
3	3	Mario Kart Wii	Wii	Nintendo	2008	Racing	35.83	15.85	12.88	3.79	3.31
4	4	Wii Sports Resort	Wii	Nintendo	2009	Sports	33	15.75	11.01	3.28	2.96

```
call insertGame('Test', 'Test', '2020', 'Action', 'CS', 50, 50, 50, 50);
```

sult Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	16601	Test	Test	CS	2020	Action	200	50	50	50	50
2	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
3	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77
4	3	Mario Kart Wii	Wii	Nintendo	2008	Racing	35.83	15.85	12.88	3.79	3.31

```
call insertGame('Test1', 'Test1', '2020', 'Sports', '564', 20, 23.02, 21.01, 0.07);
```

esult Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	16601	Test	Test	CS	2020	Action	200	50	50	50	50
2	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
3	16602	Test1	Test1	564	2020	Sports	64.1	20	23.02	21.01	0.07
4	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77

```
call insertGame('Test1', 'Test1', '2019', 'Racing', '564', 60, 100, 21.01, 0.07); /* Existing game cannot be inserted */
```

esult Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	16601	Test	Test	CS	2020	Action	200	50	50	50	50
2	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
3	16602	Test1	Test1	564	2020	Sports	64.1	20	23.02	21.01	0.07
4	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77
5	3	Mario Kart Wii	Wii	Nintendo	2008	Racing	35.83	15.85	12.88	3.79	3.31

STORED PROCEDURES:

removeGame

```
/* DELETE procedure*/
delimiter $$
drop procedure if exists deleteGame;
create procedure deleteGame(in deleteGameName varchar (135),
                            in deletePlatform varchar(15))
begin
    declare deleteGid BIGINT default 0;
    declare printStmt varchar(135);

    set deleteGid =(
        select GID
        from Game
        where GameName = deleteGameName
            and Platform = deletePlatform);

    set printStmt = 'No game exists';

    if deleteGid is null then
        select printStmt;
    else
        delete
        from Game
        where gid = deleteGid;

        call updateRank;
    end if;
end $$
delimiter ;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	16601	Test	Test	CS	2020	Action	200	50	50	50	50
2	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
3	16602	Test1	Test1	564	2020	Sports	64.1	20	23.02	21.01	0.07
4	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77
5	3	Mario Kart Wii	Wii	Nintendo	2008	Racing	35.83	15.85	12.88	3.79	3.31

```
call deleteGame('Test1', 'Test1');
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	16601	Test	Test	CS	2020	Action	200	50	50	50	50
2	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
3	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77
4	3	Mario Kart Wii	Wii	Nintendo	2008	Racing	35.83	15.85	12.88	3.79	3.31
5	4	Wii Sports Resort	Wii	Nintendo	2009	Sports	33	15.75	11.01	3.28	2.96

```
call deleteGame('Test', 'Test');
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
2	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77
3	3	Mario Kart Wii	Wii	Nintendo	2008	Racing	35.83	15.85	12.88	3.79	3.31
4	4	Wii Sports Resort	Wii	Nintendo	2009	Sports	33	15.75	11.01	3.28	2.96

STORED PROCEDURES:

updateSales

```
/* Update sales of a game */
delimiter $$
drop procedure if exists updateSales;
create procedure updateSales(in updateGameName varchar(135), in updatePlatform varchar (15),
                             in updateNA double, in updateEU double, in updateJP double, in updateOthers double)
begin
 declare updateGID BIGINT default 0;

    set updateGID =(
        select GID
        from Game
        where GameName = updateGameName
            and Platform = updatePlatform);

    if updateGID is not null then

        update Sales
        set NA_Sales = updateNA,
            EU_Sales = updateEU,
            JP_Sales = updateJP,
            Other_Sales = updateOthers
        where GID = updateGID;

        call updateGlobalSales;
        call updateRank;
    end if;

end $$
delimiter ;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	1	Wii Sports	Wii	Nintendo	2006	Sports	82.74	41.49	29.02	3.77	8.46
2	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77

```
230 •   call updateSales('Wii Sports', 'Wii', 81.00, 40.15, 28.61, 4.00);
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
1	1	Wii Sports	Wii	Nintendo	2006	Sports	153.76	81	40.15	28.61	4
2	2	Super Mario Bros.	NES	Nintendo	1985	Platform	40.24	29.08	3.58	6.81	0.77

```
231 •   call updateSales('Wii Sports', 'Wii', 10.00, 10.15, 8.61, 0.10);
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

GameRank	GID	GameName	Platform	PublisherName	Year	Genre	Global_Sales	NA_Sales	EU_Sales	JP_Sales	Other_Sales
4	5	Pokemon Red/Pokemon Blue	GB	Nintendo	1996	Role-Playing	31.38	11.27	8.89	10.22	1
5	6	Tetris	GB	Nintendo	1989	Puzzle	30.26	23.2	2.26	4.22	0.58
6	7	New Super Mario Bros.	DS	Nintendo	2006	Platform	30.01	11.38	9.23	6.5	2.9
7	8	Wii Play	Wii	Nintendo	2006	Misc	29.01	14.03	9.2	2.93	2.85
8	1	Wii Sports	Wii	Nintendo	2006	Sports	28.86	10	10.15	8.61	0.1

QUERIES:

Display games order by rank

```
/* Display game by rank */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre,
    p.publishername, s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
order by r.gamerank;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	29.02	3.77	8.46	82.74
2	2	Super Mario Bros.	NES	1985	Platform	Nintendo	29.08	3.58	6.81	0.77	40.24
3	3	Mario Kart Wii	Wii	2008	Racing	Nintendo	15.85	12.88	3.79	3.31	35.82
4	4	Wii Sports Resort	Wii	2009	Sports	Nintendo	15.75	11.01	3.28	2.96	33
5	5	Pokemon Red/Pokemon Blue	GB	1996	Role-Playing	Nintendo	11.27	8.89	10.22	1	31.37
6	6	Tetris	GB	1989	Puzzle	Nintendo	23.2	2.26	4.22	0.58	30.26
7	7	New Super Mario Bros.	DS	2006	Platform	Nintendo	11.38	9.23	6.5	2.9	30.01
8	8	Wii Play	Wii	2006	Misc	Nintendo	14.03	9.2	2.93	2.85	29.02
9	9	New Super Mario Bros. Wii	Wii	2009	Platform	Nintendo	14.59	7.06	4.7	2.26	28.62
10	10	Duck Hunt	NES	1984	Shooter	Nintendo	26.93	0.63	0.28	0.47	28.31
11	11	Nintendogs	DS	2005	Simulation	Nintendo	9.07	11	1.93	2.75	24.76
12	12	Mario Kart DS	DS	2005	Racing	Nintendo	9.81	7.57	4.13	1.92	23.42

QUERIES:

Display top game per platform

```
/* Display top game by platform */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre,
    p.publishername, s.na_sales, s.eu_sales, s.jp_sales, s.other_sales,
    s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
group by g.platform
having r.gamerank <= all (select r2.gamerank
                          from Game g2, Ranking r2
                          where g.platform = g2.platform
                          and g2.GID = r2.GID
                          and g.GID <> g2.GID
                          )
order by g.platform;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
90	90	Pac-Man	2600	1982	Puzzle	Atari	7.28	0.45	0	0.08	7.81
12632	12637	Policenauts	3DO	1995	Adventure	Konami Digital Entertainment	0	0	0.06	0	0.06
33	33	Pokemon X/Pokemon Y	3DS	2013	Role-Playing	Nintendo	5.17	4.05	4.34	0.79	14.35
638	638	Sonic Adventure	DC	1998	Platform	Sega	1.26	0.61	0.46	0.08	2.42
7	7	New Super Mario Bros.	DS	2006	Platform	Nintendo	11.38	9.23	6.5	2.9	30.01
5	5	Pokemon Red/Pokemon Blue	GB	1996	Role-Playing	Nintendo	11.27	8.89	10.22	1	31.37
26	26	Pokemon Ruby/Pokemon Sapphire	GBA	2002	Role-Playing	Nintendo	6.06	3.9	5.38	0.5	15.85
108	108	Super Smash Bros. Melee	GC	2001	Fighting	Nintendo	4.41	1.04	1.39	0.22	7.07
144	144	Sonic the Hedgehog 2	GEN	1992	Platform	Sega	4.47	1.2	0.16	0.19	6.03
13522	13527	Sonic the Hedgehog 2 (8-bit)	GG	1992	Platform	Sega	0	0	0.04	0	0.04
47	47	Super Mario 64	N64	1996	Platform	Nintendo	6.91	2.85	1.91	0.23	11.89
2	2	Super Mario Bros.	NES	1985	Platform	Nintendo	29.08	3.58	6.81	0.77	40.24
6679	6683	Samurai Shodown II	NG	1994	Fighting	SNK	0	0	0.25	0	0.25
84	84	The Sims 3	PC	2009	Simulation	Electronic Arts	0.98	6.42	0	0.71	8.11
14552	14559	Blue Breaker: Ken Yorimo Hohoe...	PCFX	1996	Role-Playing	NEC	0	0	0.03	0	0.03
53	53	Gran Turismo	PS	1997	Racing	Sony Computer Entertainment	4.02	3.87	2.54	0.52	10.95
18	18	Grand Theft Auto: San Andreas	PS2	2004	Action	Take-Two Interactive	9.43	0.4	0.41	10.57	20.81
17	17	Grand Theft Auto V	PS3	2013	Action	Take-Two Interactive	7.01	9.27	0.97	4.14	21.4
34	34	Call of Duty: Black Ops 3	PS4	2015	Shooter	Activision	5.77	5.81	0.35	2.31	14.24
91	91	Grand Theft Auto: Liberty City St...	PSP	2005	Action	Take-Two Interactive	2.9	2.83	0.24	1.75	7.72
714	715	Minecraft	PSV	2014	Misc	Sony Computer Entertainm...	0.28	0.79	0.87	0.32	2.25
889	890	Virtua Fighter 2	SAT	1995	Fighting	Sega	0.34	0.26	1.3	0.03	1.93
1262	1263	Sonic CD	SCD	1993	Platform	Sega	1	0.36	0.09	0.05	1.5
19	19	Super Mario World	SNES	1990	Platform	Nintendo	12.78	3.75	3.54	0.55	20.61
9221	9225	Doukyuusei	TG16	1995	Adventure	NEC	0	0	0.14	0	0.14
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	29.02	3.77	8.46	82.74
109	109	Mario Kart 8	WiiU	2014	Racing	Nintendo	3.13	2.07	1.27	0.49	6.96
3931	3933	Final Fantasy	WS	2000	Role-Playing	SquareSoft	0	0	0.51	0	0.51
16	16	Kinect Adventures!	X360	2010	Misc	Microsoft Game Studios	14.97	4.94	0.24	1.67	21.82
80	80	Halo 2	XB	2004	Shooter	Microsoft Game Studios	6.82	1.53	0.05	0.08	8.49
102	102	Call of Duty: Black Ops 3	XOne	2015	Shooter	Activision	4.52	2.09	0.01	0.67	7.3

QUERIES:

Display top game per genre

```
/* Display top game by Genre */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre, p.publishername,
    s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
group by g.genre
having r.gamerank <= all (select r2.gamerank
                          from Game g2, Ranking r2
                          where g.genre = g2.genre
                          and g2.GID = r2.GID
                          and g.GID <> g2.GID
                          )
order by g.genre;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
17	17	Grand Theft Auto V	PS3	2013	Action	Take-Two Interactive	7.01	9.27	0.97	4.14	21.4
51	51	Super Mario Land 2: 6 Golden Coins	GB	1992	Adventure	Nintendo	6.16	2.04	2.69	0.29	11.18
40	40	Super Smash Bros. Brawl	Wii	2008	Fighting	Nintendo	6.75	2.61	2.66	1.02	13.04
8	8	Wii Play	Wii	2006	Misc	Nintendo	14.03	9.2	2.93	2.85	29.02
2	2	Super Mario Bros.	NES	1985	Platform	Nintendo	29.08	3.58	6.81	0.77	40.24
6	6	Tetris	GB	1989	Puzzle	Nintendo	23.2	2.26	4.22	0.58	30.26
3	3	Mario Kart Wii	Wii	2008	Racing	Nintendo	15.85	12.88	3.79	3.31	35.82
5	5	Pokemon Red/Pokemon Blue	GB	1996	Role-Playing	Nintendo	11.27	8.89	10.22	1	31.37
10	10	Duck Hunt	NES	1984	Shooter	Nintendo	26.93	0.63	0.28	0.47	28.31
11	11	Nintendogs	DS	2005	Simulation	Nintendo	9.07	11	1.93	2.75	24.76
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	29.02	3.77	8.46	82.74
166	166	Pokemon Stadium	N64	1999	Strategy	Nintendo	3.18	1.24	0.94	0.09	5.45

QUERIES:

Display top game per year

```
/* Display top game by Year */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre, p.publishername,
    s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
group by g.year
having r.gamerank <= all (select r2.gamerank
                          from Game g2, Ranking r2
                          where g.year = g2.year
                          and g2.GID = r2.GID
                          and g.GID <> g2.GID
                          )
order by g.year desc;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
180	180	Madden NFL 2004	PS2	N/A	Sports	Electronic Arts	4.26	0.26	0.01	0.71	5.23
5955	5959	Imagine: Makeup Artist	DS	2020	Simulation	Ubisoft	0.27	0	0	0.02	0.29
14386	14393	Phantasy Star Online 2 Episode 4: Deluxe Package	PS4	2017	Role-Playing	Sega	0	0	0.03	0	0.03
222	222	FIFA 17	PS4	2016	Sports	Electronic Arts	0.28	3.75	0.06	0.69	4.77
34	34	Call of Duty: Black Ops 3	PS4	2015	Shooter	Activision	5.77	5.81	0.35	2.31	14.24
45	45	Grand Theft Auto V	PS4	2014	Action	Take-Two Interactive	3.8	5.81	0.36	2.02	11.98
17	17	Grand Theft Auto V	PS3	2013	Action	Take-Two Interactive	7.01	9.27	0.97	4.14	21.4
35	35	Call of Duty: Black Ops II	PS3	2012	Shooter	Activision	4.99	5.88	0.65	2.52	14.03
30	30	Call of Duty: Modern Warfare 3	X360	2011	Shooter	Activision	9.03	4.28	0.13	1.32	14.76
16	16	Kinect Adventures!	X360	2010	Misc	Microsoft Game Studios	14.97	4.94	0.24	1.67	21.82
4	4	Wii Sports Resort	Wii	2009	Sports	Nintendo	15.75	11.01	3.28	2.96	33
3	3	Mario Kart Wii	Wii	2008	Racing	Nintendo	15.85	12.88	3.79	3.31	35.82
14	14	Wii Fit	Wii	2007	Sports	Nintendo	8.94	8.03	3.6	2.15	22.72
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	29.02	3.77	8.46	82.74
11	11	Nintendogs	DS	2005	Simulation	Nintendo	9.07	11	1.93	2.75	24.76
18	18	Grand Theft Auto: San Andreas	PS2	2004	Action	Take-Two Interactive	9.43	0.4	0.41	10.57	20.81
105	105	Need for Speed Underground	PS2	2003	Racing	Electronic Arts	3.27	2.83	0.08	1.02	7.2
25	25	Grand Theft Auto: Vice City	PS2	2002	Action	Take-Two Interactive	8.41	5.49	0.47	1.78	16.15
29	29	Gran Turismo 3: A-Spec	PS2	2001	Racing	Sony Computer Entert...	6.85	5.09	1.87	1.16	14.98
133	133	Pokémon Crystal Version	GB	2000	Role-Playing	Nintendo	2.55	1.56	1.29	0.99	6.39
13	13	Pokemon Gold/Pokemon Silver	GB	1999	Role-Playing	Nintendo	9	6.18	7.2	0.71	23.1
31	31	Pokémon Yellow: Special Pikachu Edition	GB	1998	Role-Playing	Nintendo	5.89	5.04	3.12	0.59	14.64
53	53	Gran Turismo	PS	1997	Racing	Sony Computer Entert...	4.02	3.87	2.54	0.52	10.95
5	5	Pokemon Red/Pokemon Blue	GB	1996	Role-Playing	Nintendo	11.27	8.89	10.22	1	31.37
188	188	Donkey Kong Country 2: Diddy's Kong Quest	SNES	1995	Platform	Nintendo	2.1	0.74	2.2	0.11	5.15
72	72	Donkey Kong Country	SNES	1994	Platform	Nintendo	4.36	1.71	3	0.23	9.3
58	58	Super Mario All-Stars	SNES	1993	Platform	Nintendo	5.99	2.15	2.12	0.29	10.55
51	51	Super Mario Land 2: 6 Golden Coins	GB	1992	Adventure	Nintendo	6.16	2.04	2.69	0.29	11.18
232	232	The Legend of Zelda: A Link to the Past	SNES	1991	Action	Nintendo	2.42	0.91	1.15	0.13	4.61
19	19	Super Mario World	SNES	1990	Platform	Nintendo	12.78	3.75	3.54	0.55	20.61
6	6	Tetris	GB	1989	Puzzle	Nintendo	23.2	2.26	4.22	0.58	30.26
23	23	Super Mario Bros. 3	NES	1988	Platform	Nintendo	9.54	3.44	3.84	0.46	17.28

QUERIES:

Display top game in North America by year

```
/* Display top game in North America by year */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre, p.publishername,
    s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
    and s.NA_Sales > all (select s2.NA_Sales
                          from Game g2, Sales s2
                          where g.year = g2.year
                              and g2.GID = s2.GID
                              and g.GID <> g2.GID
                          )
group by g.year
order by g.year desc;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
180	180	Madden NFL 2004	PS2	N/A	Sports	Electronic Arts	4.26	0.26	0.01	0.71	5.23
5955	5959	Imagine: Makeup Artist	DS	2020	Simulation	Ubisoft	0.27	0	0	0.02	0.29
272	272	Uncharted 4: A Thief's End	PS4	2016	Shooter	Sony Computer Entertainment	1.3	2.07	0.18	0.65	4.2
34	34	Call of Duty: Black Ops 3	PS4	2015	Shooter	Activision	5.77	5.81	0.35	2.31	14.24
50	50	Pokemon Omega Ruby/Pokemon Alpha Sapphire	3DS	2014	Role-Playing	Nintendo	4.23	3.37	3.08	0.65	11.33
24	24	Grand Theft Auto V	X360	2013	Action	Take-Two Interactive	9.63	5.31	0.06	1.38	16.38
36	36	Call of Duty: Black Ops II	X360	2012	Shooter	Activision	8.25	4.3	0.07	1.12	13.73
30	30	Call of Duty: Modern Warfare 3	X360	2011	Shooter	Activision	9.03	4.28	0.13	1.32	14.76
16	16	Kinect Adventures!	X360	2010	Misc	Microsoft Game Studios	14.97	4.94	0.24	1.67	21.82
4	4	Wii Sports Resort	Wii	2009	Sports	Nintendo	15.75	11.01	3.28	2.96	33
3	3	Mario Kart Wii	Wii	2008	Racing	Nintendo	15.85	12.88	3.79	3.31	35.82
14	14	Wii Fit	Wii	2007	Sports	Nintendo	8.94	8.03	3.6	2.15	22.72
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	29.02	3.77	8.46	82.74
12	12	Mario Kart DS	DS	2005	Racing	Nintendo	9.81	7.57	4.13	1.92	23.42
18	18	Grand Theft Auto: San Andreas	PS2	2004	Action	Take-Two Interactive	9.43	0.4	0.41	10.57	20.81
111	111	Mario Kart: Double Dash!!	GC	2003	Racing	Nintendo	4.12	1.77	0.87	0.19	6.95
25	25	Grand Theft Auto: Vice City	PS2	2002	Action	Take-Two Interactive	8.41	5.49	0.47	1.78	16.15
39	39	Grand Theft Auto III	PS2	2001	Action	Take-Two Interactive	6.99	4.51	0.3	1.3	13.1
226	226	Tony Hawk's Pro Skater 2	PS	2000	Sports	Activision	3.05	1.41	0.02	0.2	4.68
13	13	Pokemon Gold/Pokemon Silver	GB	1999	Role-Playing	Nintendo	9	6.18	7.2	0.71	23.1
31	31	Pokémon Yellow: Special Pikachu Edition	GB	1998	Role-Playing	Nintendo	5.89	5.04	3.12	0.59	14.64
85	85	GoldenEye 007	N64	1997	Shooter	Nintendo	5.8	2.01	0.13	0.15	8.09
5	5	Pokemon Red/Pokemon Blue	GB	1996	Role-Playing	Nintendo	11.27	8.89	10.22	1	31.37
423	423	Killer Instinct	SNES	1995	Fighting	Nintendo	2.26	0.72	0.12	0.1	3.2
72	72	Donkey Kong Country	SNES	1994	Platform	Nintendo	4.36	1.71	3	0.23	9.3
58	58	Super Mario All-Stars	SNES	1993	Platform	Nintendo	5.99	2.15	2.12	0.29	10.55
51	51	Super Mario Land 2: 6 Golden Coins	GB	1992	Adventure	Nintendo	6.16	2.04	2.69	0.29	11.18
255	255	Sonic the Hedgehog	GEN	1991	Platform	Sega	3.03	0.91	0.26	0.13	4.34

QUERIES:

Display top game in Europe by year

```
/* Display top game in Europe by year */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre, p.publishername,
    s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
    and s.EU_Sales >= all (select s2.EU_Sales
                           from Game g2, Sales s2
                           where g2.GID = s2.GID
                               and g.year = g2.year
                               and g.GID <> g2.GID
                           )
group by g.year
order by g.year desc;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
378	378	FIFA Soccer 2004	PS2	N/A	Sports	Electronic Arts	0.59	2.36	0.04	0.51	3.49
5955	5959	Imagine: Makeup Artist	DS	2020	Simulation	Ubisoft	0.27	0	0	0.02	0.29
14386	14393	Phantasy Star Online 2 Episode 4: Deluxe Package	PS4	2017	Role-Playing	Sega	0	0	0.03	0	0.03
222	222	FIFA 17	PS4	2016	Sports	Electronic Arts	0.28	3.75	0.06	0.69	4.77
78	78	FIFA 16	PS4	2015	Sports	Electronic Arts	1.11	6.06	0.06	1.26	8.49
45	45	Grand Theft Auto V	PS4	2014	Action	Take-Two Interactive	3.8	5.81	0.36	2.02	11.98
17	17	Grand Theft Auto V	PS3	2013	Action	Take-Two Interactive	7.01	9.27	0.97	4.14	21.4
35	35	Call of Duty: Black Ops II	PS3	2012	Shooter	Activision	4.99	5.88	0.65	2.52	14.03
38	38	Call of Duty: Modern Warfare 3	PS3	2011	Shooter	Activision	5.54	5.82	0.49	1.62	13.46
16	16	Kinect Adventures!	X360	2010	Misc	Microsoft Game Studios	14.97	4.94	0.24	1.67	21.82
4	4	Wii Sports Resort	Wii	2009	Sports	Nintendo	15.75	11.01	3.28	2.96	33
3	3	Mario Kart Wii	Wii	2008	Racing	Nintendo	15.85	12.88	3.79	3.31	35.82
14	14	Wii Fit	Wii	2007	Sports	Nintendo	8.94	8.03	3.6	2.15	22.72
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	29.02	3.77	8.46	82.74
11	11	Nintendogs	DS	2005	Simulation	Nintendo	9.07	11	1.93	2.75	24.76
138	138	World of Warcraft	PC	2004	Role-Playing	Activision	0.07	6.21	0	0	6.28
105	105	Need for Speed Underground	PS2	2003	Racing	Electronic Arts	3.27	2.83	0.08	1.02	7.2
25	25	Grand Theft Auto: Vice City	PS2	2002	Action	Take-Two Interactive	8.41	5.49	0.47	1.78	16.15
29	29	Gran Turismo 3: A-Spec	PS2	2001	Racing	Sony Computer Entert...	6.85	5.09	1.87	1.16	14.98
224	224	Driver 2	PS	2000	Action	Atari	2.36	2.1	0.02	0.25	4.73
13	13	Pokemon Gold/Pokemon Silver	GB	1999	Role-Playing	Nintendo	9	6.18	7.2	0.71	23.1
31	31	Pokémon Yellow: Special Pikachu Edition	GB	1998	Role-Playing	Nintendo	5.89	5.04	3.12	0.59	14.64

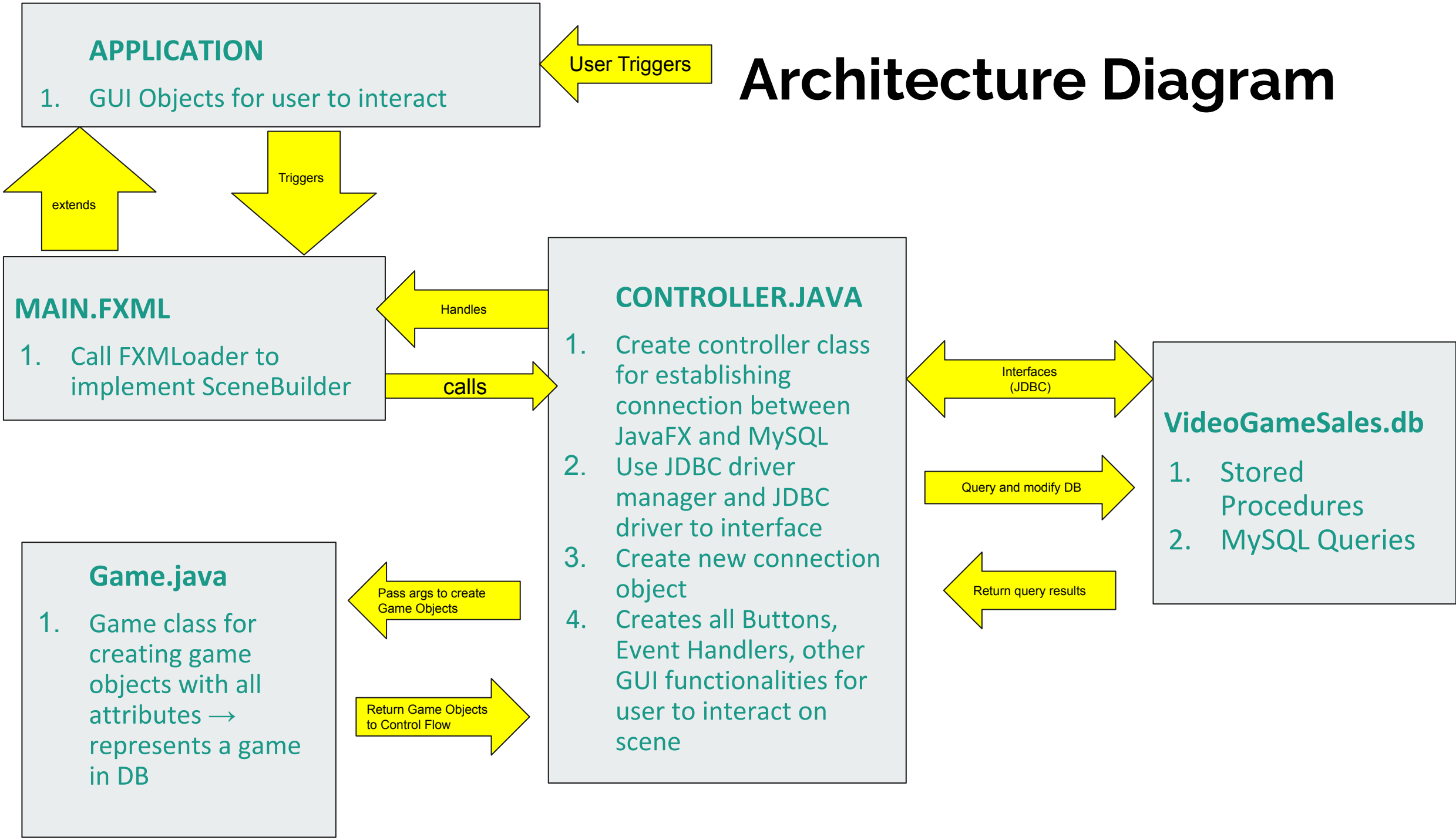
QUERIES:

Display top game in Japan by year

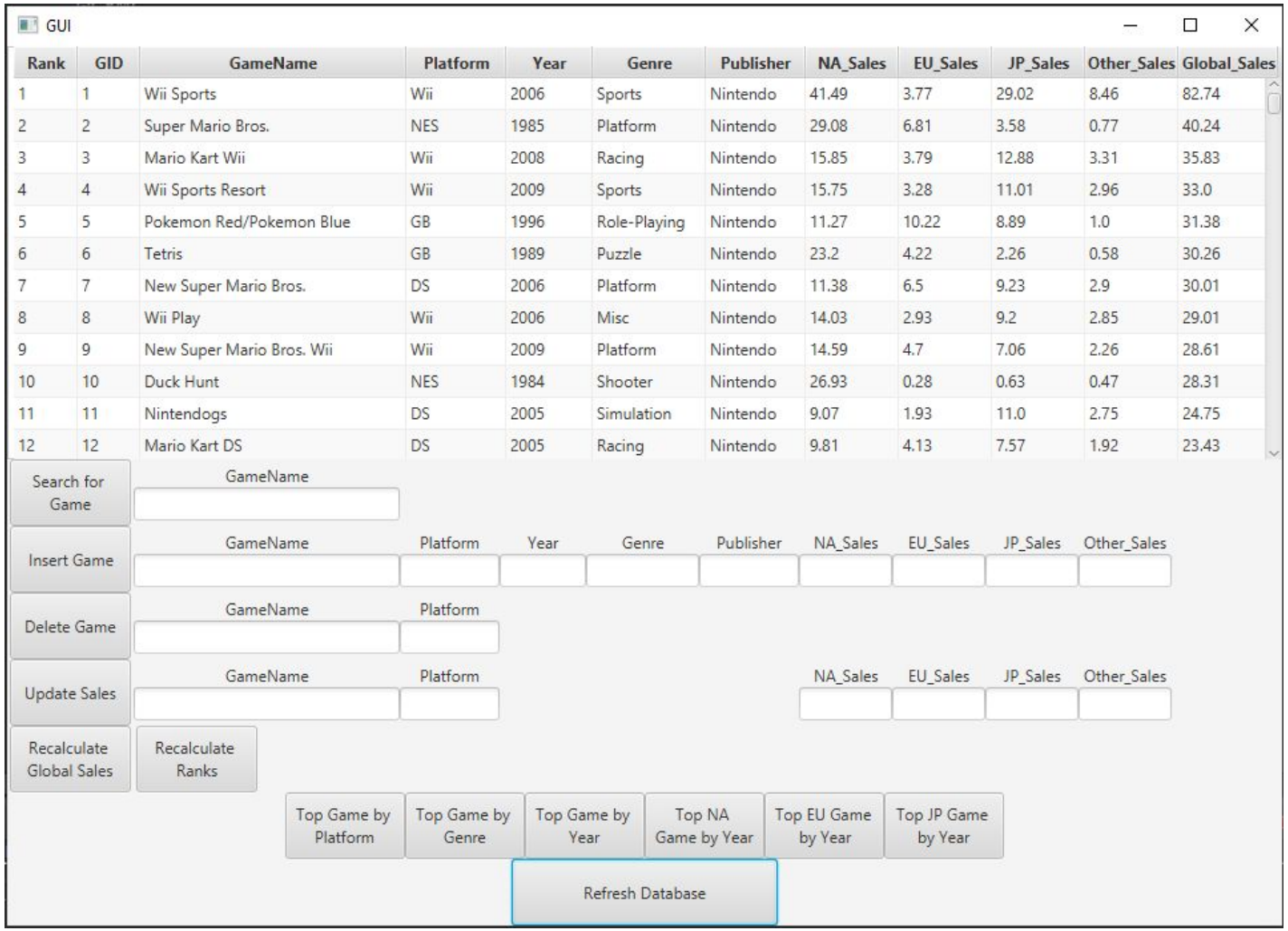
```
/* Display top game in Japan by year */
select r.gamerank, g.gid, g.GameName, g.platform, g.year, g.genre, p.publishername,
    s.na_sales, s.eu_sales, s.jp_sales, s.other_sales, s.global_sales
from Ranking r, Game g, Publisher p, Sales s
where g.GID = r.GID
    and g.GID = p.GID
    and g.GID = s.GID
    and s.JP_Sales >= all (select s2.JP_Sales
                           from Game g2, Sales s2
                           where g2.GID = s2.GID
                               and g.year = g2.year
                               and g.GID <> g2.GID
                           )
group by g.year
order by g.year desc;
```

gamerank	gid	GameName	platform	year	genre	publishername	na_sales	eu_sales	jp_sales	other_sales	global_sales
2295	2297	Rhythm Heaven	Wii	N/A	Misc	Unknown	0.13	0	0.77	0.01	0.9
5955	5959	Imagine: Makeup Artist	DS	2020	Simulation	Ubisoft	0.27	0	0	0.02	0.29
14386	14393	Phantasy Star Online 2 Episode 4: Deluxe Package	PS4	2017	Role-Playing	Sega	0	0	0.03	0	0.03
1568	1570	Yokai Watch 3	3DS	2016	Action	Level 5	0	0	1.27	0	1.27
415	415	Monster Hunter X	3DS	2015	Action	Capcom	0.25	0.19	2.78	0.04	3.26
420	420	Yokai Watch 2 Ganso/Honke	3DS	2014	Role-Playing	Nintendo	0.03	0	3.18	0	3.22
33	33	Pokemon X/Pokemon Y	3DS	2013	Role-Playing	Nintendo	5.17	4.05	4.34	0.79	14.35
74	74	Animal Crossing: New Leaf	3DS	2012	Simulation	Nintendo	2.01	2.32	4.36	0.41	9.09
43	43	Mario Kart 7	3DS	2011	Racing	Nintendo	4.74	3.91	2.67	0.89	12.21
27	27	Pokemon Black/Pokemon White	DS	2010	Role-Playing	Nintendo	5.57	3.28	5.65	0.82	15.32
9	9	New Super Mario Bros. Wii	Wii	2009	Platform	Nintendo	14.59	7.06	4.7	2.26	28.62
162	162	Monster Hunter Freedom Unite	PSP	2008	Role-Playing	Capcom	0.47	0.57	4.13	0.34	5.5
14	14	Wii Fit	Wii	2007	Sports	Nintendo	8.94	8.03	3.6	2.15	22.72
7	7	New Super Mario Bros.	DS	2006	Platform	Nintendo	11.38	9.23	6.5	2.9	30.01
42	42	Animal Crossing: Wild World	DS	2005	Simulation	Nintendo	2.55	3.52	5.33	0.88	12.27
181	181	Dragon Quest VIII: Journey of the Cursed King	PS2	2004	Role-Playing	Square Enix	0.65	0.75	3.61	0.2	5.21
175	175	Final Fantasy X-2	PS2	2003	Role-Playing	Electronic Arts	1.92	1.08	2.11	0.17	5.29
26	26	Pokemon Ruby/Pokemon Sapphire	GBA	2002	Role-Playing	Nintendo	6.06	3.9	5.38	0.5	15.85
87	87	Final Fantasy X	PS2	2001	Role-Playing	Sony Comput...	2.91	2.07	2.73	0.33	8.05
243	243	Dragon Quest VII: Warriors of Eden	PS	2000	Role-Playing	Enix Corporat...	0.2	0.14	4.1	0.02	4.47
13	13	Pokemon Gold/Pokemon Silver	GB	1999	Role-Playing	Nintendo	9	6.18	7.2	0.71	23.1
31	31	Pokémon Yellow: Special Pikachu Edition	GB	1998	Role-Playing	Nintendo	5.89	5.04	3.12	0.59	14.64

Architecture Diagram



FRONT-END DEMONSTRATION



Rank	GID	GameName	Platform	Year	Genre	Publisher	NA_Sales	EU_Sales	JP_Sales	Other_Sales	Global_Sales
1	1	Wii Sports	Wii	2006	Sports	Nintendo	41.49	3.77	29.02	8.46	82.74
2	2	Super Mario Bros.	NES	1985	Platform	Nintendo	29.08	6.81	3.58	0.77	40.24
3	3	Mario Kart Wii	Wii	2008	Racing	Nintendo	15.85	3.79	12.88	3.31	35.83
4	4	Wii Sports Resort	Wii	2009	Sports	Nintendo	15.75	3.28	11.01	2.96	33.0
5	5	Pokemon Red/Pokemon Blue	GB	1996	Role-Playing	Nintendo	11.27	10.22	8.89	1.0	31.38
6	6	Tetris	GB	1989	Puzzle	Nintendo	23.2	4.22	2.26	0.58	30.26
7	7	New Super Mario Bros.	DS	2006	Platform	Nintendo	11.38	6.5	9.23	2.9	30.01
8	8	Wii Play	Wii	2006	Misc	Nintendo	14.03	2.93	9.2	2.85	29.01
9	9	New Super Mario Bros. Wii	Wii	2009	Platform	Nintendo	14.59	4.7	7.06	2.26	28.61
10	10	Duck Hunt	NES	1984	Shooter	Nintendo	26.93	0.28	0.63	0.47	28.31
11	11	Nintendogs	DS	2005	Simulation	Nintendo	9.07	1.93	11.0	2.75	24.75
12	12	Mario Kart DS	DS	2005	Racing	Nintendo	9.81	4.13	7.57	1.92	23.43

Conclusion

Back-end:

Broad/comprehensive overview of all the topics we had learned throughout the semester.

i. Develop ER & relational schema from a given dataset

ii. Normalize our data to eliminate data anomalies and duplicate data.

iii. Think as DB designers (queries) & DB implementers (B+Tree)

iv. How to implement queries and stored procedures efficiently

v. How data is internally indexed/organized in the back-end by B+trees

Conclusion

Front-end:

i. Learned GUI design & implementation

ii. Think from the user's perspective → Considering functionalities a typical user might need

iii. Interface GUI (JavaFX) with DB

iv. Learned to call queries and stored procedures from Java

v. Enhance UI/UX

vi. Communication skills and teamwork through modularization and incremental design.