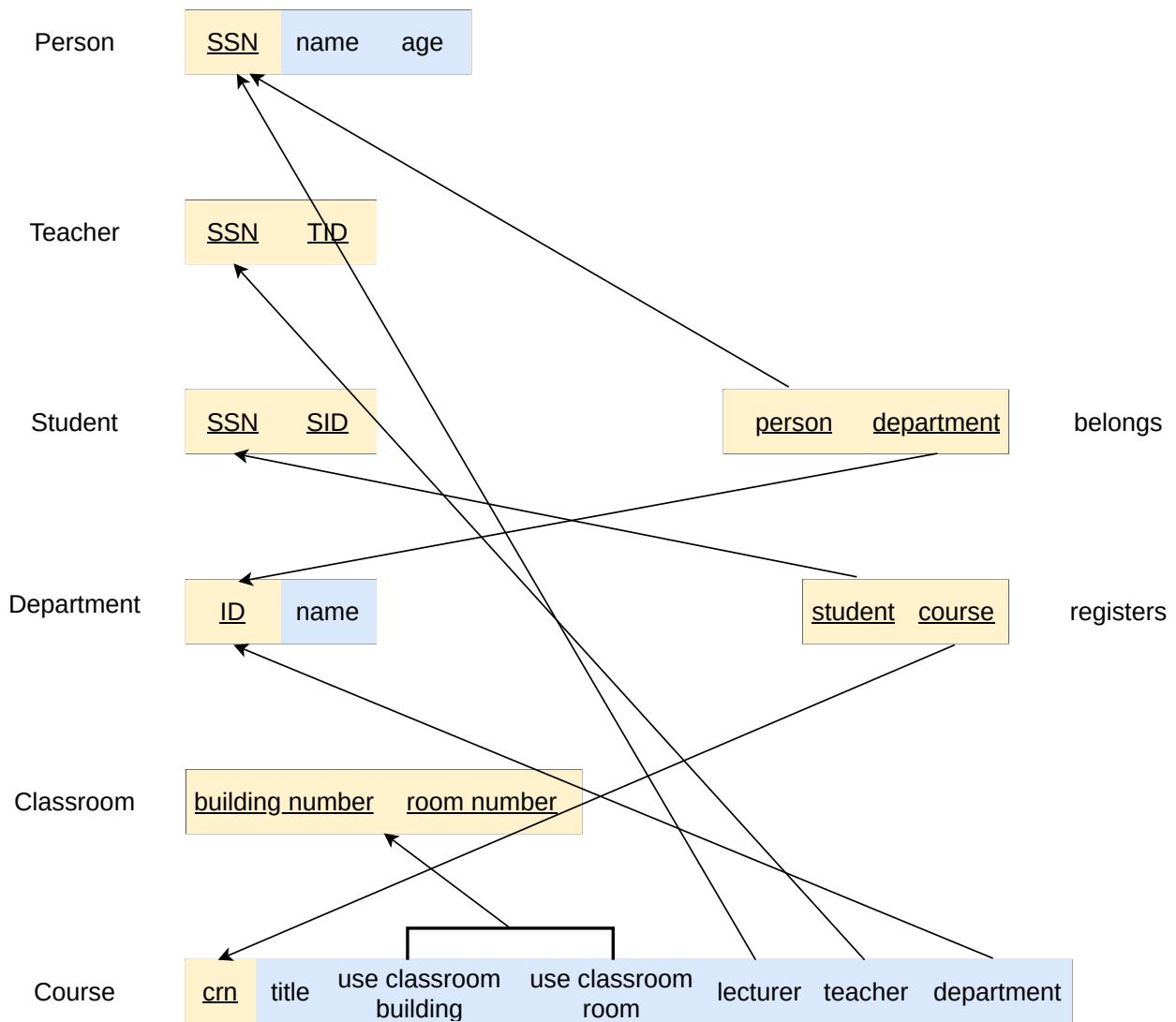


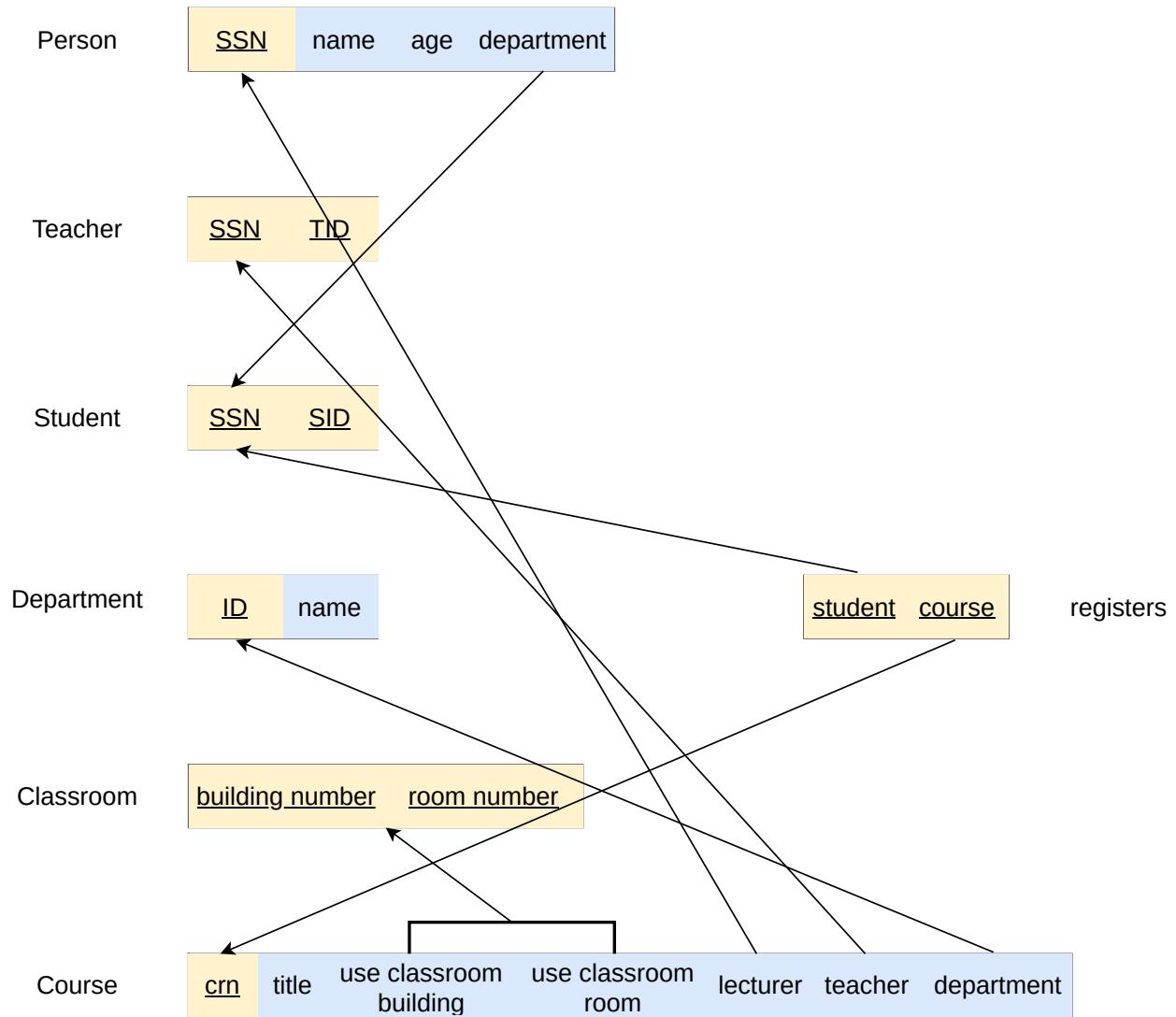
Author Information

- Name: 鍾博丞
- Student ID: 408410120
- E-mail: my072814638@csie.io

Part 3A



Part 3B



Part 4A

The screenshot shows a dual-monitor setup. The left monitor displays a MySQL command-line interface (CLI) window titled 'relational_schema: mysql -- Konssole'. The right monitor displays a Visual Studio Code (VS Code) window titled 'partA.sql - HW2B - Visual Studio Code'.

MySQL CLI (Left Monitor):

```
> mysql -u otischung -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 10
Server version: 10.11.2-MariaDB Arch Linux

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> -- Create database and use the database
MariaDB [(none)]> CREATE DATABASE `actor`;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> USE `actor`;
Database changed
MariaDB [actor]>
MariaDB [actor]> -- Add entities to tables
MariaDB [actor]> CREATE TABLE `Person` (
    ->     ssn VARCHAR(50) NOT NULL,
    ->     name VARCHAR(50) NOT NULL,
    ->     age INT NOT NULL,
    ->     PRIMARY KEY ( `ssn` )
    -> );
Query OK, 0 rows affected (0.003 sec)

MariaDB [actor]> explain actor;
ERROR 1146 (42S02): Table 'actor.actor' doesn't exist
MariaDB [actor]> explain Person;
+-----+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| ssn   | varchar(50) | NO  | PRI | NULL   |       |
| name  | varchar(50) | NO  |     | NULL   |       |
| age   | int(11)    | NO  |     | NULL   |       |
+-----+-----+-----+-----+-----+
3 rows in set (0.000 sec)

MariaDB [actor]>
```

Visual Studio Code (Right Monitor):

The VS Code window shows the file structure for a project named 'partA'. The 'partA.sql' file is open and contains the SQL code for creating the 'actor' database and its 'Person' table.

```
-- Run on active connection | Select block
1  -- Create database and use the database
2  CREATE DATABASE `actor`;
3  USE `actor`;
4
5  -- Add entities to tables
6  CREATE TABLE `Person` (
7      `ssn` VARCHAR(50) NOT NULL,
8      `name` VARCHAR(50) NOT NULL,
9      `age` INT NOT NULL,
10     PRIMARY KEY ( `ssn` )
11 );
12 |
```

The bottom status bar of the VS Code window indicates the file is saved and shows the path: '/DATA/workspace/CCU_private_workspace/Database/partA/partA.sql'.

Part 4B

Part 4C

MariaDB [actor]> CREATE TABLE `Movie` (

```
  -->   `title` VARCHAR(50) NOT NULL,
```

```
  -->   `release_year` INT NOT NULL,
```

```
  -->   `rating` INT NOT NULL,
```

```
  -->   PRIMARY KEY (`title`)
```

```
  --> );
```

Query OK, 0 rows affected (0.003 sec)

MariaDB [actor]> explain Movie;

| Field | Type | Null | Key | Default | Extra |
|--------------|-------------|------|-----|---------|-------|
| title | varchar(50) | NO | PRI | NULL | |
| release_year | int(11) | NO | | NULL | |
| rating | int(11) | NO | | NULL | |

3 rows in set (0.001 sec)

MariaDB [actor]> CREATE TABLE `act` (

```
  -->   `person_ssn` VARCHAR(50),
```

```
  -->   `movie_title` VARCHAR(50),
```

```
  -->   PRIMARY KEY (`person_ssn`, `movie_title`),
```

```
  -->   FOREIGN KEY(`person_ssn`)
```

```
  -->     REFERENCES `Person`(`ssn`)
```

```
  -->     ON DELETE CASCADE,
```

```
  -->     ON UPDATE CASCADE,
```

```
  -->   FOREIGN KEY(`movie_title`)
```

```
  -->     REFERENCES `Movie`(`title`)
```

```
  -->     ON DELETE CASCADE
```

```
  -->     ON UPDATE CASCADE
```

```
  --> );
```

Query OK, 0 rows affected (0.004 sec)

MariaDB [actor]> explain act;

| Field | Type | Null | Key | Default | Extra |
|-------------|-------------|------|-----|---------|-------|
| person_ssn | varchar(50) | NO | PRI | NULL | |
| movie_title | varchar(50) | NO | PRI | NULL | |

2 rows in set (0.001 sec)

MariaDB [actor]>

Part 4D, 4E

After insert values and delete table "Movie". The table "act" has a foreign key pointing to the table "Movie". Thus, we also have to drop the table "act".

The screenshot shows a dual-pane interface of Visual Studio Code. The left pane is a MySQL terminal window titled 'relational_schema /mysql - Konsola'. It displays a series of SQL commands and their results:

```
File Edit View Bookmarks Plugins Settings Help
File Edit Selection View Go Run Terminal Help
New Tab Split View
--> FOREIGN KEY ('movie_title')
-->   REFERENCES 'Movie'('title')
-->   ON DELETE CASCADE
-->   ON UPDATE CASCADE
--> );
Query OK, 0 rows affected (0.004 sec)

MariaDB [actor]> explain act;
+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| person_ssn | varchar(50) | NO  | PRI | NULL   |
| movie_title | varchar(50) | NO  | PRI | NULL   |
+-----+-----+-----+-----+
2 rows in set (0.001 sec)

MariaDB [actor]> INSERT INTO `Person`(`ssn`, `age`, `name`)
->   VALUES ('1234567', 58, 'John Travolta');
Query OK, 1 row affected (0.001 sec)

MariaDB [actor]> DROP TABLE `act`;
Query OK, 0 rows affected (0.003 sec)

MariaDB [actor]> DROP TABLE `Movie`;
Query OK, 0 rows affected (0.003 sec)

MariaDB [actor]> show tables;
+-----+
| Tables_in_actor |
+-----+
| Person          |
+-----+
1 row in set (0.000 sec)

MariaDB [actor]> explain Person;
+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| ssn   | varchar(50) | NO  | PRI | NULL   |
| name  | varchar(50) | NO  |     | NULL   |
| age   | int(11)    | NO  |     | NULL   |
+-----+-----+-----+-----+
3 rows in set (0.000 sec)

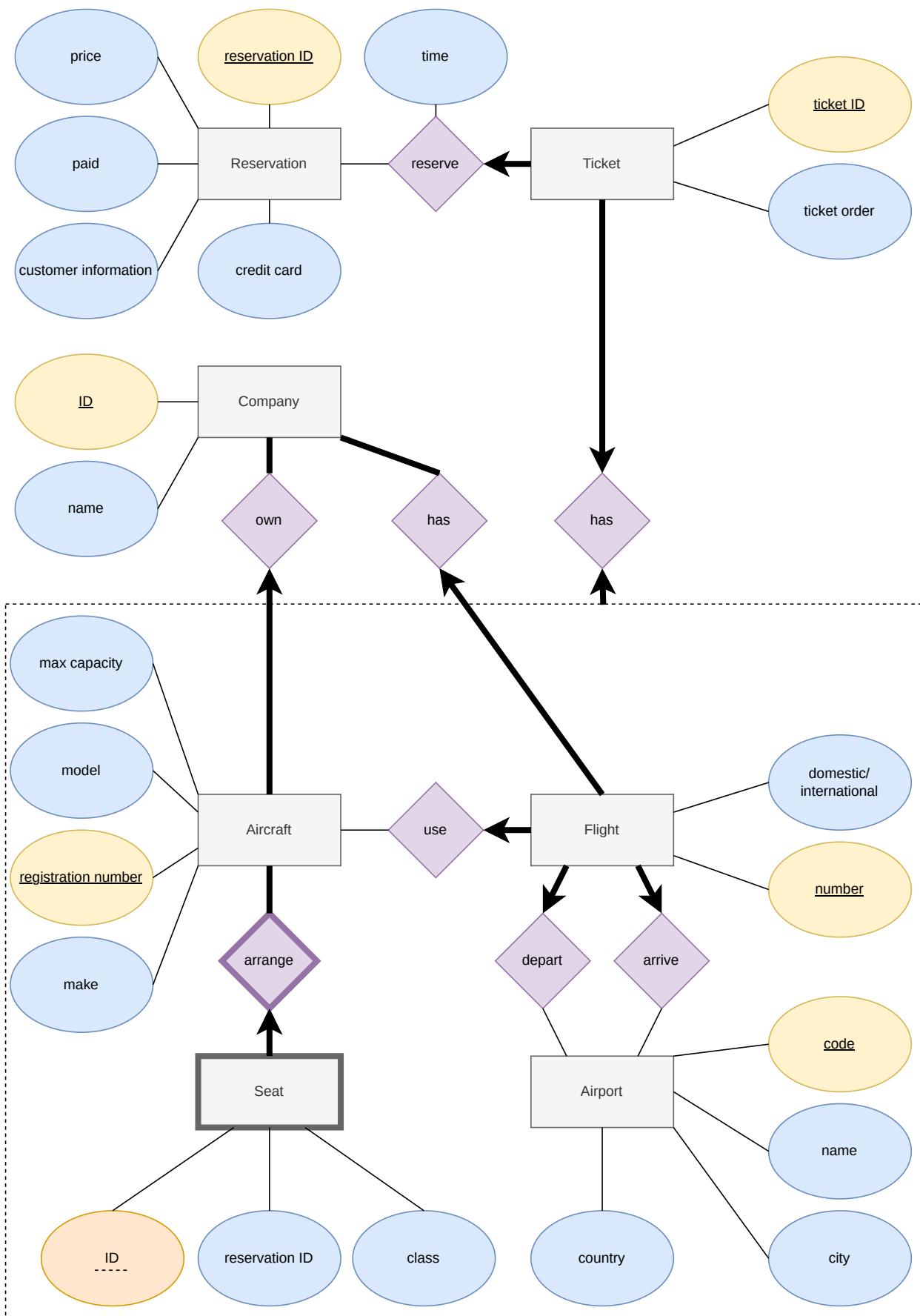
MariaDB [actor]> 
```

The right pane is a code editor titled 'part4c.sql - HW2B - Visual Studio Code'. It contains the following SQL script:

```
1 -- Use the database
2 USE `actor`;
3
4 -- Add relations to tables
5 CREATE TABLE `act` (
6   `person_ssn` VARCHAR(50),
7   `movie_title` VARCHAR(50),
8   PRIMARY KEY (`person_ssn`, `movie_title`),
9   FOREIGN KEY (`person_ssn`)
10   REFERENCES `Person`(`ssn`)
11   ON DELETE CASCADE
12   ON UPDATE CASCADE,
13   FOREIGN KEY (`movie_title`)
14   REFERENCES `Movie`(`title`)
15   ON DELETE CASCADE
16   ON UPDATE CASCADE
17 );
18 
```

Part 5B

ER Diagram



Design Pattern

- (*Requirement*) The reservation system will create a unique ID for identifying a single reservation.
- (**Total Participation**) Each reservation contains at least one ticket.
 - (**Total Participation**) (**One-to-many**) Each ticket contains exactly one departure and one arrival.
 - If your flight requires a layover at an intermediate airport, you will receive two tickets.
 - For example: TPE to GOT (瑞典 - 哥德堡 - 蘭德維特機場). You'll get two tickets: TPE to FRA (德國 - 法蘭克福機場), and FRA to GOT.
- (*Requirement*) Each seat records reservation ID.
 - (*Requirement*) For each flight, the system should store a list of available seats.
 - If the reservation ID of a record in the table Seat is NULL, then it means that the seat has not been reserved by anyone yet.
 - The reservation system can retrieve seat information by matching the seat's reservation ID with the desired reservation ID to be queried.
- (*Requirement*) Each flight has three seat classes: First Class, Business Class, and Economy class. We set the "class" attribute in the "Seat" entity.
- The seat is a weak entity because it is meaningless without being assigned by an aircraft.

Relationship

Reservation = Ticket

- (*Requirement*) Customers can make reservations without reserving seats.
 - Again, transfer flights cause multiple tickets.
- (*Hypothesis*) (**Total Participation**) (**One-to-many**) Each ticket belongs to exactly one reservation.

Ticket = Aggregation[Aircraft, Flight, Airport, Seat]

- (*Requirement*) (**Total Participation**) (**One-to-many**) Each seat can only be reserved for one customer and thus each ticket is assigned by exactly one aggregation of flight, aircraft, departure, arrival, and seat, and *vice versa*.

Company = Flight

- (*Requirement*) Each company has many flights.
 - (*Hypothesis*) (**Total Participation**) There is no airline that has zero flights.
- (*Hypothesis*) (**Total Participation**) (**One-to-many**) Each flight belongs to exactly one airline.

Company = Aircraft

- (*Requirement*) Each company has an ID and owns many aircraft.
 - (*Hypothesis*) (**Total Participation**) There is no airline that owns zero aircraft.
- (*Hypothesis*) (**Total Participation**) (**One-to-many**) Each aircraft belongs to exactly one airline.

Flight = Aircraft

- (*Hypothesis*) Each aircraft can be used for different flights, or not be used for any flight.
- (*Hypothesis*) (**Total Participation**) (**One-to-many**) Each flight uses exactly one aircraft.

Aircraft = Seat

- (*Requirement*) (**Total Participation**) (**One-to-many**) The seat arrangements are associated with aircraft.
- (*Hypothesis*) (**Total Participation**) Each aircraft has multiple seats and has at least one seat.

Flight = Airport

- (*Requirement*) (**Total Participation**) (**One-to-many**) Each flight departs from and arrives at registered airports.
 - Here we define that each ticket contains only a one-way trip, which means there is only exactly one departure and one arrival.
- (*Hypothesis*) An airport may be used for many flights, or not be used for any flight.

SQL Explaination

HW2B: mysql - Konsole

```

--> FOREIGN KEY ('flight_number')
--> REFERENCES 'Flight'('number')
--> ON DELETE CASCADE
--> ON UPDATE CASCADE
--> FOREIGN KEY ('aircraft_registration_number', 'seat_id')
--> REFERENCES 'Seat'('aircraft_registration_number', 'id')
--> ON DELETE CASCADE
--> ON UPDATE CASCADE
--> );
Query OK, 0 rows affected (0.005 sec)

MariaDB [airline_reservation_system]> explain Reservation;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| reservation_id | int(11) | NO | PRI | NULL |
| price | double | NO | NULL |
| paid | tinyint(4) | NO | 0 |
| customer_information | text | NO | NULL |
| credit_card | varchar(20) | YES | NULL |
+-----+-----+-----+-----+-----+
5 rows in set (0.000 sec)

MariaDB [airline_reservation_system]> explain Company;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| company_id | int(11) | NO | PRI | NULL |
| name | text | NO | NULL |
+-----+-----+-----+-----+-----+
2 rows in set (0.001 sec)

MariaDB [airline_reservation_system]> explain Aircraft;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| registration_number | int(11) | NO | PRI | NULL |
| max_capacity | int(11) | NO | NULL |
| model | text | NO | NULL |
| make | text | NO | NULL |
| belongs_to | int(11) | NO | MUL | NULL |
+-----+-----+-----+-----+-----+
5 rows in set (0.000 sec)

MariaDB [airline_reservation_system]> 

```

File Edit View Bookmarks Plugins Settings Help

File Edit Selection View Go Run Terminal Help

EXPLORER

part5.sql part6.sql

```

1 -- Run on active connection | Select block
2 -- Create database and use the database
3 CREATE DATABASE `airline_reservation_system`;
4 USE `airline_reservation_system`;
5
6 -- Add entities to tables
7 CREATE TABLE `Reservation` (
8     .reservation_id INT NOT NULL PRIMARY KEY,
9     .price DECIMAL(10,2),
10    .paid TINYINT NOT NULL DEFAULT 0 COMMENT '0 means not paid, 1 means paid',
11    .customer_information TEXT NOT NULL,
12    .credit_card VARCHAR(20)
13 );
14
15 CREATE TABLE `Company` (
16     .company_id INT NOT NULL PRIMARY KEY,
17     .name TEXT NOT NULL
18 );
19
20 CREATE TABLE `Aircraft` (
21     .registration_number INT NOT NULL PRIMARY KEY,
22     .max_capacity INT NOT NULL,
23     .model TEXT NOT NULL,
24     .make TEXT NOT NULL,
25     .belongs_to INT NOT NULL,
26     FOREIGN KEY (belongs_to)
27     REFERENCES `Company`(`company_id`)
28     ON DELETE CASCADE
29     ON UPDATE CASCADE
30 );
31
32 CREATE TABLE `Airport` (
33     .code VARCHAR(16) NOT NULL PRIMARY KEY,
34     .name TEXT NOT NULL,
35     .country TEXT NOT NULL,
36     .city TEXT NOT NULL
37 );
38
39 CREATE TABLE `Seat` (
40     .aircraft_registration_number INT NOT NULL,
41     .id INT NOT NULL,
42     .reservation_id INT,
43     PRIMARY KEY (`aircraft_registration_number`, `id`),
44     FOREIGN KEY (aircraft_registration_number)
45     REFERENCES `Aircraft`(`registration_number`)
46     ON DELETE CASCADE
47     ON UPDATE CASCADE
48 ) COMMENT = 'This is a weak entity';
49
50 CREATE TABLE `Flight` (
51     .number INT NOT NULL PRIMARY KEY,
52     .route TINYINT UNSIGNED NOT NULL COMMENT '0: Domestic, 1: International',
53     .airline INT NOT NULL,
54     .aircraft INT NOT NULL,
55     .depart VARCHAR(16) NOT NULL,
56     .arrive VARCHAR(16) NOT NULL,
57     FOREIGN KEY (airline)
58     REFERENCES `Company`(`company_id`)
59     ON DELETE CASCADE
60     ON UPDATE CASCADE,
61     FOREIGN KEY (aircraft_use)
62     REFERENCES `Aircraft`(`registration_number`)
63     ON DELETE CASCADE
64     ON UPDATE CASCADE,
65     FOREIGN KEY (depart)

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL SQL CONSOLE

File Edit Selection View Go Run Terminal Help

part5.sql part6.sql

HW2B: mysql - Konsole

```

+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| registration_number | int(11) | NO | PRI | NULL |
| max_capacity | int(11) | NO | NULL |
| model | text | NO | NULL |
| make | text | NO | NULL |
| belongs_to | int(11) | NO | MUL | NULL |
+-----+-----+-----+-----+-----+
5 rows in set (0.000 sec)

MariaDB [airline_reservation_system]> explain Airport;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| code | varchar(16) | NO | PRI | NULL |
| name | text | NO | NULL |
| country | text | NO | NULL |
| city | text | NO | NULL |
+-----+-----+-----+-----+-----+
4 rows in set (0.001 sec)

MariaDB [airline_reservation_system]> explain Seat;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| aircraft_registration_number | int(11) | NO | PRI | NULL |
| id | int(11) | NO | PRI | NULL |
| reservation_id | int(11) | YES | NULL |
| class | tinyint(3) unsigned | NO | NULL |
+-----+-----+-----+-----+-----+
4 rows in set (0.001 sec)

MariaDB [airline_reservation_system]> explain Flight;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| number | int(11) | NO | PRI | NULL |
| route | tinyint(3) unsigned | NO | NULL |
| airline | int(11) | NO | MUL | NULL |
| aircraft_use | int(11) | NO | MUL | NULL |
| depart | varchar(16) | NO | MUL | NULL |
| arrive | varchar(16) | NO | MUL | NULL |
+-----+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [airline_reservation_system]> 

```

File Edit View Bookmarks Plugins Settings Help

File Edit Selection View Go Run Terminal Help

EXPLORER

part5.sql part6.sql

```

1 -- Run on active connection | Select block
2 -- Create database and use the database
3 CREATE DATABASE `airline_reservation_system`;
4 USE `airline_reservation_system`;
5
6 -- Add entities to tables
7 CREATE TABLE `Reservation` (
8     .reservation_id INT NOT NULL PRIMARY KEY,
9     .price DECIMAL(10,2),
10    .paid TINYINT NOT NULL DEFAULT 0 COMMENT '0 means not paid, 1 means paid',
11    .customer_information TEXT NOT NULL,
12    .credit_card VARCHAR(20)
13 );
14
15 CREATE TABLE `Company` (
16     .company_id INT NOT NULL PRIMARY KEY,
17     .name TEXT NOT NULL
18 );
19
20 CREATE TABLE `Aircraft` (
21     .registration_number INT NOT NULL PRIMARY KEY,
22     .max_capacity INT NOT NULL,
23     .model TEXT NOT NULL,
24     .make TEXT NOT NULL,
25     .belongs_to INT NOT NULL,
26     FOREIGN KEY (belongs_to)
27     REFERENCES `Company`(`company_id`)
28     ON DELETE CASCADE
29     ON UPDATE CASCADE
30 );
31
32 CREATE TABLE `Airport` (
33     .code VARCHAR(16) NOT NULL PRIMARY KEY,
34     .name TEXT NOT NULL,
35     .country TEXT NOT NULL,
36     .city TEXT NOT NULL
37 );
38
39 CREATE TABLE `Seat` (
40     .aircraft_registration_number INT NOT NULL,
41     .id INT NOT NULL,
42     .reservation_id INT,
43     PRIMARY KEY (`aircraft_registration_number`, `id`),
44     FOREIGN KEY (aircraft_registration_number)
45     REFERENCES `Aircraft`(`registration_number`)
46     ON DELETE CASCADE
47     ON UPDATE CASCADE
48 ) COMMENT = 'This is a weak entity';
49
50 CREATE TABLE `Flight` (
51     .number INT NOT NULL PRIMARY KEY,
52     .route TINYINT UNSIGNED NOT NULL COMMENT '0: Domestic, 1: International',
53     .airline INT NOT NULL,
54     .aircraft INT NOT NULL,
55     .depart VARCHAR(16) NOT NULL,
56     .arrive VARCHAR(16) NOT NULL,
57     FOREIGN KEY (airline)
58     REFERENCES `Company`(`company_id`)
59     ON DELETE CASCADE
60     ON UPDATE CASCADE,
61     FOREIGN KEY (aircraft_use)
62     REFERENCES `Aircraft`(`registration_number`)
63     ON DELETE CASCADE
64     ON UPDATE CASCADE,
65     FOREIGN KEY (depart)

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL SQL CONSOLE

MySQL Workbench - HW2B: mysql - Konsole

```

| name | text | NO | | NULL | |
| country | text | NO | | NULL | |
| city | text | NO | | NULL | |
+-----+-----+-----+-----+-----+
4 rows in set (0.001 sec)

MariaDB [airline_reservation_system]> explain Seat;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| aircraft_registration_number | int(11) | NO | PRI | NULL |
| id | int(11) | NO | PRI | NULL |
| reservation_id | int(11) | YES | NULL |
| class | tinyint(3) unsigned | NO | NULL |
+-----+-----+-----+-----+
4 rows in set (0.001 sec)

MariaDB [airline_reservation_system]> explain Flight;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| number | int(11) | NO | PRI | NULL |
| route | tinyint(3) unsigned | NO | MUL | NULL |
| airline | int(11) | NO | MUL | NULL |
| aircraft_use | int(11) | NO | MUL | NULL |
| depart | varchar(16) | NO | MUL | NULL |
| arrive | varchar(16) | NO | MUL | NULL |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [airline_reservation_system]> explain Ticket;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| ticket_id | int(11) | NO | PRI | NULL |
| ticket_order | smallint(5) unsigned | NO | 0 |
| reservation_id | int(11) | NO | MUL | NULL |
| reserve_time | int(11) | NO | MUL | NULL |
| flight_number | int(11) | NO | MUL | NULL |
| aircraft_registration_number | int(11) | NO | MUL | NULL |
| seat_id | int(11) | NO | NULL |
+-----+-----+-----+-----+
7 rows in set (0.001 sec)

MariaDB [airline_reservation_system]> 

```

File Edit Selection View Go Run Terminal Help

EXPLORER ... part5.sql part6.sql

- HW2B
 - part5.pdf
 - part5.sql
 - part5b.sql
 - part4.sql
 - part4b.sql
 - part4c.sql
 - part4d.sql
 - part5e.sql
 - part6.sql
 - README.md

part5.sql - HW2B - Visual Studio Code

```

65 FOREIGN KEY (`Airport`)
66 REFERENCES `Airport`(`code`)
67 ON DELETE CASCADE,
68 ON UPDATE CASCADE,
69 FOREIGN KEY (`arrive`)
70 REFERENCES `Airport`(`code`)
71 ON DELETE CASCADE,
72 ON UPDATE CASCADE
73 );
74
75 CREATE TABLE `Ticket` (
76   `ticket_id` INT NOT NULL PRIMARY KEY,
77   `ticket_order` SMALLINT UNSIGNED NOT NULL DEFAULT 0,
78   `reservation_id` INT NOT NULL,
79   `reserve_time` INT NOT NULL,
80   `flight_number` INT NOT NULL,
81   `aircraft_registration_number` INT NOT NULL,
82   `seat_id` INT NOT NULL,
83   FOREIGN KEY (`reservation_id`)
84   REFERENCES `Reservation`(`reservation_id`)
85   ON DELETE CASCADE,
86   ON UPDATE CASCADE,
87   FOREIGN KEY (`flight_number`)
88   REFERENCES `Flight`(`number`)
89   ON DELETE CASCADE,
90   ON UPDATE CASCADE,
91   FOREIGN KEY (`aircraft_registration_number`, `seat_id`)
92   REFERENCES `Seat`(`aircraft_registration_number`, `id`)
93   ON DELETE CASCADE
94   ON UPDATE CASCADE
95 );
96

```

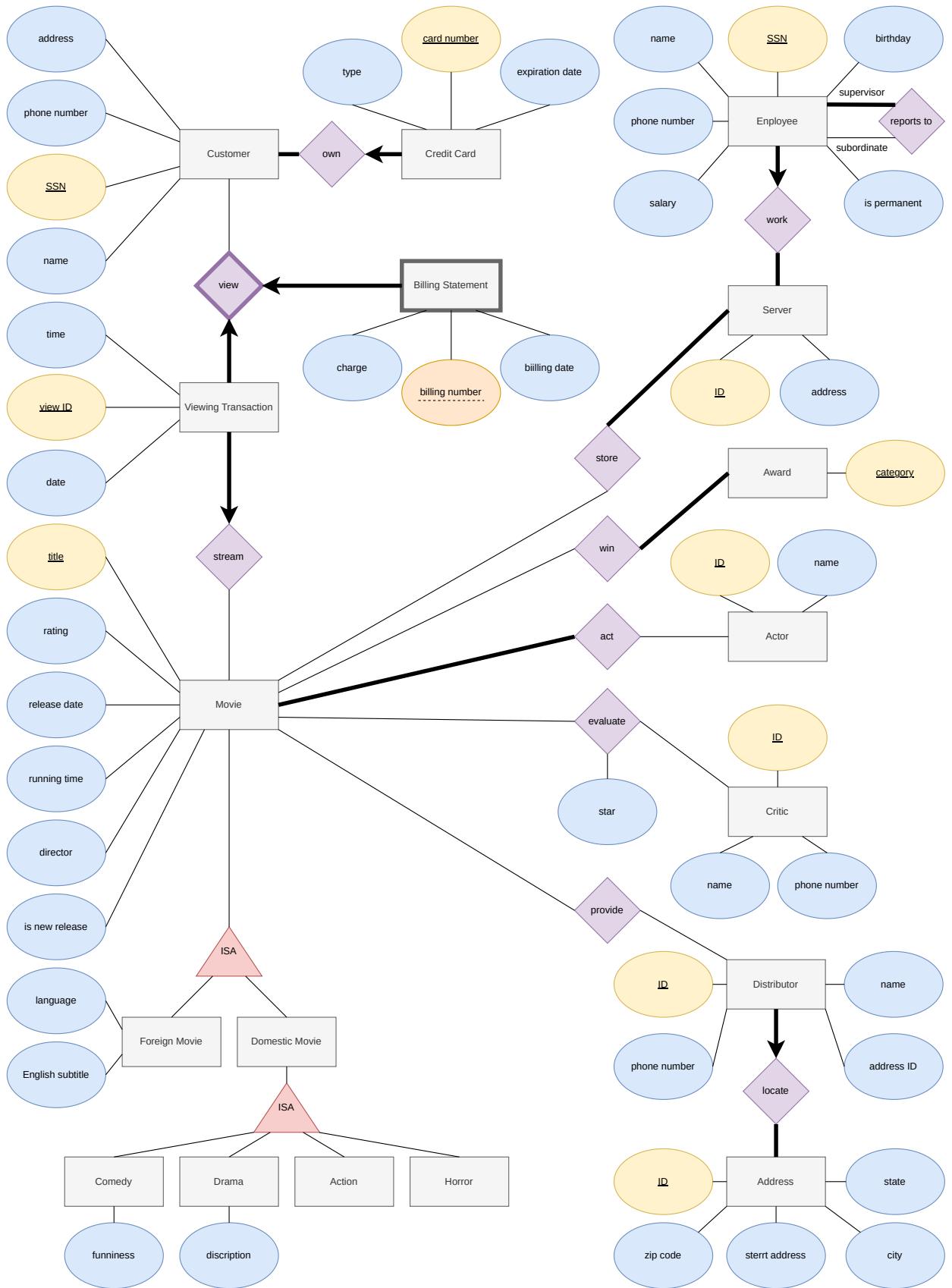
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL SQL CONSOLE

~ /DATA/workspace/CCL_private_workspace/Database/HW2B > MariaDB

13:46:58 14:51 PM 1/8/23

Part 6B

ER Diagram



Design Pattern

Customer = Viewing Transaction = Movie

- A unique viewing transaction is created when a customer views a movie.
 - (*Requirement*) Each customer can view movies from a video server.
 - (*Hypothesis*) (**Total Participation**) (**One-to-many**) Each view transaction streams exactly one movie.
 - (*Hypothesis*) A movie may be viewed by one, multiple, or zero customers.
 - (*Hypothesis*) (**Total Participation**) (**One-to-many**) Each view transaction is created for exactly one customer.
 - (*Hypothesis*) A customer may view one, multiple, or zero movies.

Customer = Viewing Transaction = Billing Statement

- (*Requirement*) Each customer receives one bill statement after each viewing transaction.
- (*Requirement*) (**Weak Entity**) A billing number is unique for a particular customer. It is not unique across different customers.

Release Charge Information

- (*Requirement*) We define a new attribute "is new release" to mark the movie.
 - We then further use this information to determine the fee.
- (*Requirement*) We have to check the "view" relation table if the customer *has seen this movie* when creating a new viewing transaction in order to determine the fee.

Relationship

Movie = Critic

- (*Requirement*) Each movie could be viewed by one or more critics, which means a movie may not be viewed by any critics.
- (*Hypothesis*) A critic may evaluate zero, one, or multiple movies.

Movie = Award

- (*Requirement*) A movie may have won one or more academy awards, which means a movie may not win any awards.
- (*Hypothesis*) (**Total Participation**) An award must be given to at least one movie.

Movie = Server

- (*Requirement*) Each movie is stored on a number of different video servers.
- (*Hypothesis*) (**Total Participation**) A video server must store at least one movie.

Movie = Distributor

- (*Requirement*) Each movie can be supplied by only one distributor, which means that a movie can be supplied by multiple distributors or no distributors.
- (*Requirement*) One distributor might provide several movies, which means that a distributor might not provide any movies.

Movie = Actor

- (*Requirement*) (**Total Participation**) A movie has one or more actors.
- (*Hypothesis*) An actor may act in one, multiple, or zero movies.

Server = Employee

- (*Requirement*) (**Total Participation**) (**One-to-many**) An employee works at the location of one of the video servers.
- (*Hypothesis*) (**Total Participation**) A video server must have at least one employee.

Distributor = Address

- (*Hypothesis*) (**Total Participation**) (**One-to-many**) A distributor is located at exactly one address.
- (*Hypothesis*) (**Total Participation**) The table "Address" is created for the table "Distributor". Thus, an address must contain at least one distributor.

Customer = Credit Card

- (*Requirement*) (**Total Participation**) Each customer must have one or more credit cards.
- (*Hypothesis*) (**Total Participation**) (**One-to-many**) A credit card belongs to exactly one customer.

SQL Explanation

HW2B: mysql — Konsole

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New Tab Split View

Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed

MariaDB [mod]> explain Movie;

| Field | Type | Null | Key | Default | Extra |
|----------------|---------------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |
| rating | tinyint(3) unsigned | NO | | NULL | |
| release_date | int(11) | NO | | NULL | |
| running_time | int(11) | NO | | NULL | |
| director | text | NO | | NULL | |
| is_new_release | tinyint(3) unsigned | NO | | NULL | |

6 rows in set (0.000 sec)

MariaDB [mod]> explain Foreign_Movie;

| Field | Type | Null | Key | Default | Extra |
|------------------|---------------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |
| language | text | NO | | NULL | |
| english_subtitle | tinyint(3) unsigned | NO | | NULL | |

3 rows in set (0.000 sec)

MariaDB [mod]> explain Domestic_Movie;

| Field | Type | Null | Key | Default | Extra |
|-------|--------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |

1 row in set (0.000 sec)

MariaDB [mod]> explain Comedy_Movie;

| Field | Type | Null | Key | Default | Extra |
|-----------|--------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |
| funniness | double | NO | | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]>

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New Tab Split View

MariaDB [mod]> explain Drama_Movie;

| Field | Type | Null | Key | Default | Extra |
|-------------|--------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |
| description | text | NO | | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]> explain Action_Movie;

| Field | Type | Null | Key | Default | Extra |
|-------|--------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |

1 row in set (0.000 sec)

MariaDB [mod]> explain Horror;

| Field | Type | Null | Key | Default | Extra |
|-------|--------------|------|-----|---------|-------|
| title | varchar(300) | NO | PRI | NULL | |

1 row in set (0.000 sec)

MariaDB [mod]> explain Customer;

| Field | Type | Null | Key | Default | Extra |
|--------------|-------------|------|-----|---------|-------|
| ssn | varchar(16) | NO | PRI | NULL | |
| name | text | NO | | NULL | |
| phone_number | text | NO | | NULL | |
| address | text | NO | | NULL | |

4 rows in set (0.000 sec)

MariaDB [mod]> explain Credit_Card;

| Field | Type | Null | Key | Default | Extra |
|-----------------|-------------|------|-----|---------|-------|
| card_number | varchar(32) | NO | PRI | NULL | |
| type | text | NO | | NULL | |
| expiration_date | int(11) | NO | | NULL | |
| owner | varchar(16) | NO | MUL | NULL | |

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MariaDB [mod]> explain Credit_Card;

| Field | Type | Null | Key | Default | Extra |
|-----------------|-------------|------|-----|---------|-------|
| card_number | varchar(32) | NO | PRI | NULL | |
| type | text | NO | | NULL | |
| expiration_date | int(11) | NO | | NULL | |
| owner | varchar(16) | NO | MUL | NULL | |

4 rows in set (0.000 sec)

MariaDB [mod]> explain Billing_Statement;

| Field | Type | Null | Key | Default | Extra |
|----------------|-------------|------|-----|---------|-------|
| buyer | varchar(16) | NO | PRI | NULL | |
| billing_number | int(11) | NO | PRI | NULL | |
| charge | int(11) | NO | | NULL | |
| billing_date | int(11) | NO | | NULL | |

4 rows in set (0.000 sec)

MariaDB [mod]> explain Viewing_Transaction;

| Field | Type | Null | Key | Default | Extra |
|---------|--------------|------|-----|---------|-------|
| view_id | int(11) | NO | PRI | NULL | |
| viewer | varchar(16) | NO | MUL | NULL | |
| movie | varchar(300) | NO | MUL | NULL | |
| time | int(11) | NO | | NULL | |
| date | int(11) | NO | | NULL | |

5 rows in set (0.000 sec)

MariaDB [mod]> explain Server;

| Field | Type | Null | Key | Default | Extra |
|---------|---------|------|-----|---------|-------|
| id | int(11) | NO | PRI | NULL | |
| address | text | NO | | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]>

HW2B: mysql - Konsole

MariaDB [mod]> explain Employee;

| Field | Type | Null | Key | Default | Extra |
|--------------|---------------------|------|-----|---------|-------|
| ssn | varchar(16) | NO | PRI | NULL | |
| name | text | NO | | NULL | |
| birthday | int(11) | NO | | NULL | |
| phone_number | text | NO | | NULL | |
| salary | int(11) | NO | | NULL | |
| is_permanent | tinyint(3) unsigned | NO | | NULL | |
| works_at | int(11) | NO | MUL | NULL | |

7 rows in set (0.000 sec)

MariaDB [mod]> explain Award;

| Field | Type | Null | Key | Default | Extra |
|----------|--------------|------|-----|---------|-------|
| category | varchar(300) | NO | PRI | NULL | |

1 row in set (0.000 sec)

MariaDB [mod]> explain Actor;

| Field | Type | Null | Key | Default | Extra |
|-------|-------------|------|-----|---------|-------|
| id | varchar(16) | NO | PRI | NULL | |
| name | text | NO | | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]> explain Critic;

| Field | Type | Null | Key | Default | Extra |
|--------------|---------|------|-----|---------|-------|
| id | int(11) | NO | PRI | NULL | |
| name | text | NO | | NULL | |
| phone_number | text | NO | | NULL | |

3 rows in set (0.000 sec)

MariaDB [mod]>

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2 rows in set (0.000 sec)

MariaDB [mod]> explain Critic;

| Field | Type | Null | Key | Default | Extra |
|---------------------------|----------------------|------|-----|---------|-------|
| <code>id</code> | <code>int(11)</code> | NO | PRI | NULL | |
| <code>name</code> | <code>text</code> | NO | | NULL | |
| <code>phone_number</code> | <code>text</code> | NO | | NULL | |

3 rows in set (0.000 sec)

MariaDB [mod]> explain Address;

| Field | Type | Null | Key | Default | Extra |
|-----------------------------|--------------------------|------|-----|---------|-------|
| <code>id</code> | <code>int(11)</code> | NO | PRI | NULL | |
| <code>zip_code</code> | <code>varchar(16)</code> | NO | | NULL | |
| <code>state</code> | <code>text</code> | NO | | NULL | |
| <code>city</code> | <code>text</code> | NO | | NULL | |
| <code>street_address</code> | <code>text</code> | NO | | NULL | |

5 rows in set (0.000 sec)

MariaDB [mod]> explain Distributor;

| Field | Type | Null | Key | Default | Extra |
|---------------------------|----------------------|------|-----|---------|-------|
| <code>id</code> | <code>int(11)</code> | NO | PRI | NULL | |
| <code>name</code> | <code>text</code> | NO | | NULL | |
| <code>phone_number</code> | <code>text</code> | NO | | NULL | |
| <code>address_id</code> | <code>int(11)</code> | NO | MUL | NULL | |

4 rows in set (0.000 sec)

MariaDB [mod]> explain store;

| Field | Type | Null | Key | Default | Extra |
|---------------------|---------------------------|------|-----|---------|-------|
| <code>movie</code> | <code>varchar(300)</code> | NO | PRI | NULL | |
| <code>server</code> | <code>int(11)</code> | NO | PRI | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]>

HW2B: mysql - Konsole

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2 rows in set (0.000 sec)

MariaDB [mod]> explain reports_to;

| Field | Type | Null | Key | Default | Extra |
|--------------------------|--------------------------|------|-----|---------|-------|
| <code>supervisor</code> | <code>varchar(16)</code> | NO | PRI | NULL | |
| <code>subordinate</code> | <code>varchar(16)</code> | NO | PRI | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]> explain win;

| Field | Type | Null | Key | Default | Extra |
|--------------------|---------------------------|------|-----|---------|-------|
| <code>movie</code> | <code>varchar(300)</code> | NO | PRI | NULL | |
| <code>award</code> | <code>varchar(300)</code> | NO | PRI | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]> explain act;

| Field | Type | Null | Key | Default | Extra |
|--------------------|---------------------------|------|-----|---------|-------|
| <code>movie</code> | <code>varchar(300)</code> | NO | PRI | NULL | |
| <code>actor</code> | <code>varchar(16)</code> | NO | PRI | NULL | |

2 rows in set (0.000 sec)

MariaDB [mod]> explain evaluate;

| Field | Type | Null | Key | Default | Extra |
|---------------------|----------------------------------|------|-----|---------|-------|
| <code>movie</code> | <code>varchar(300)</code> | NO | PRI | NULL | |
| <code>critic</code> | <code>int(11)</code> | NO | PRI | NULL | |
| <code>star</code> | <code>tinyint(3) unsigned</code> | NO | | NULL | |

3 rows in set (0.000 sec)

MariaDB [mod]>

HW2B: mysql - Konsole

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part5.sql part6.sql

```

123 CREATE TABLE `Address` (
124   `id` INT NOT NULL PRIMARY KEY,
125   `zip_code` VARCHAR(16) NOT NULL,
126   `state` TEXT NOT NULL,
127   `city` TEXT NOT NULL,
128   `street_address` TEXT NOT NULL
129 );
130
131 CREATE TABLE `Distributor` (
132   `id` INT NOT NULL PRIMARY KEY,
133   `name` TEXT NOT NULL,
134   `phone_number` TEXT NOT NULL,
135   `address_id` INT NOT NULL,
136   FOREIGN KEY (`address_id`)
137     REFERENCES `Address`(`id`)
138     ON DELETE CASCADE
139     ON UPDATE CASCADE
140 );
141
142 -- Add relations to tables
143 CREATE TABLE `store` (
144   `movie` VARCHAR(300) NOT NULL,
145   `server` INT NOT NULL,
146   PRIMARY KEY (`movie`),
147   FOREIGN KEY (`movie`)
148     REFERENCES `Movie`(`title`)
149     ON DELETE CASCADE
150     ON UPDATE CASCADE
151   FOREIGN KEY (`server`)
152     REFERENCES `Server`(`id`)
153     ON DELETE CASCADE
154     ON UPDATE CASCADE
155 );
156
157 CREATE TABLE `reports_to` (

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL SQL CONSOLE

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part5.sql part6.sql

```

179 FOREIGN KEY (`award`)
180   REFERENCES `Award`(`category`)
181   ON DELETE CASCADE
182   ON UPDATE CASCADE
183 );
184
185 CREATE TABLE `act` (
186   `movie` VARCHAR(300) NOT NULL,
187   `actor` VARCHAR(16) NOT NULL,
188   PRIMARY KEY (`movie`),
189   FOREIGN KEY (`movie`)
190     REFERENCES `Movie`(`title`)
191     ON DELETE CASCADE
192     ON UPDATE CASCADE
193   FOREIGN KEY (`actor`)
194     REFERENCES `Actor`(`id`)
195     ON DELETE CASCADE
196     ON UPDATE CASCADE
197 );
198
199 CREATE TABLE `evaluate` (
200   `movie` VARCHAR(300) NOT NULL,
201   `critic` INT NOT NULL,
202   `star` TINYINT UNSIGNED NOT NULL,
203   PRIMARY KEY (`movie`, `critic`),
204   FOREIGN KEY (`movie`)
205     REFERENCES `Movie`(`title`)
206     ON DELETE CASCADE
207     ON UPDATE CASCADE,
208   FOREIGN KEY (`critic`)
209     REFERENCES `Critic`(`id`)
210     ON DELETE CASCADE
211     ON UPDATE CASCADE
212 );
213

```

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HW2B: mysql — Konsole

MariaDB [mod]> show create table supervisor;

```
+-----+-----+
| Field | Type   |
+-----+-----+
| supervisor | varchar(16) |
| subordinate | varchar(16) |
+-----+-----+
2 rows in set (0.000 sec)
```

MariaDB [mod]> explain win;

```
+-----+-----+
| Field | Type   |
+-----+-----+
| movie | varchar(300) |
| award | varchar(300) |
+-----+-----+
2 rows in set (0.000 sec)
```

MariaDB [mod]> explain act;

```
+-----+-----+
| Field | Type   |
+-----+-----+
| movie | varchar(300) |
| actor | varchar(16) |
+-----+-----+
2 rows in set (0.000 sec)
```

MariaDB [mod]> explain evaluate;

```
+-----+-----+
| Field | Type   |
+-----+-----+
| movie | varchar(300) |
| critic | int(11) |
| star | tinyint(3) unsigned |
+-----+-----+
3 rows in set (0.000 sec)
```

MariaDB [mod]> explain provide;

```
+-----+-----+
| Field | Type   |
+-----+-----+
| movie | varchar(300) |
| distributor | int(11) |
+-----+-----+
2 rows in set (0.000 sec)
```

MariaDB [mod]>

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EXPLORER

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