Base de Datos Avanzada

Edher Nuño
Miguel Ochoa

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Universidad Autónoma de Guadalajara

Problemática

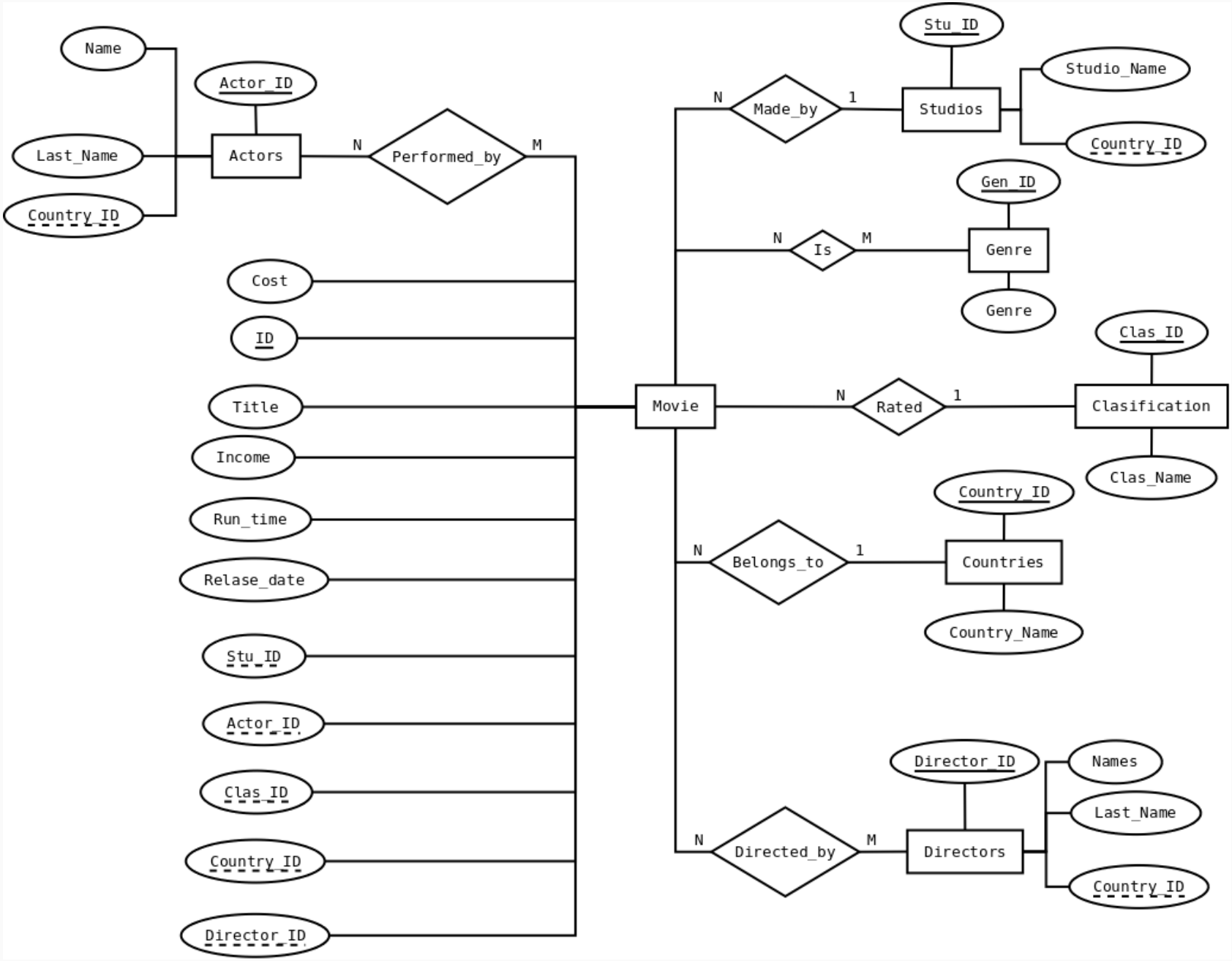
Problema

Colección de peliculas con :

- Entradas repetidas sin control.
- Pocas a nulas referencias para intercambio.
    a) Estudio.
    b) Director.
- Información de parametros.
    a) Duración.
    b) Budget vs Revenue.

Diseño de la base de datos.

Diagrama Entidad-Relación



Implementación

Implementación

```
CREATE TABLE
COUNTRY (ID INTEGER
NOT NULL GENERATED
ALWAYS AS IDENTITY
(START WITH 1
INCREMENT BY 1),
NAME VARCHAR(30)
UNIQUE NOT NULL,
PRIMARY KEY(ID) );
```

Crea la tabla de paises con el campo ID como llave primaria y generada automáticamente

Implementación

db2 LIST TABLES FOR SCHEMA MOVIEINDEX

```
Table/View                      Schema          Type  Creation time
------------------------------- --------------- ----- --------------------------
ACTOR                           MOVIEINDEX      T     2018-08-08-14.44.32.714018
CLASIFICATION                   MOVIEINDEX      T     2018-08-08-14.44.32.933873
COUNTRY                         MOVIEINDEX      T     2018-08-08-14.44.32.083194
DIRECTOR                        MOVIEINDEX      T     2018-08-08-14.44.32.505958
GENDERS                         MOVIEINDEX      T     2018-08-08-14.44.32.312163
MOVIE                           MOVIEINDEX      T     2018-08-08-15.15.57.504164
STUDIO                          MOVIEINDEX      T     2018-08-08-15.15.57.273201

  7 record(s) selected.
```

Implementación

db2 DESCRIBE TABLE MOVIEINDEX.MOVIE

Column name	Data type schema	Data type name	Column Length	Scale	Nulls
ID	SYSIBM	INTEGER	4	0	No
NAME	SYSIBM	VARCHAR	50	0	No
DURATION	SYSIBM	INTEGER	4	0	No
COST	SYSIBM	DOUBLE	8	0	No
INCOME	SYSIBM	DOUBLE	8	0	No
RELEASE_DATE	SYSIBM	DATE	4	0	No
CLASIFICATIONID	SYSIBM	INTEGER	4	0	No
COUNTRYID	SYSIBM	INTEGER	4	0	No
STUDIOID	SYSIBM	INTEGER	4	0	No
DIRECTORID	SYSIBM	INTEGER	4	0	No

10 record(s) selected.

Tablas

ID	NAME
1	France
2	Mexico
3	Germany
4	China
5	Cuba
6	Rusia
7	Sweden
8	Canada
9	England
10	Poland
11	Spain
12	Australia
13	New Zeland
14	Japan
15	USA
16	Hungary
17	Austria

17 record(s) selected.

(a) Country Table

ID	NAME	NATIONALITYID
1	Universal	15
2	FOX	15
3	Tequila	2
4	Vodka Studio	6
5	Sorry Studio	8
6	Kiwis Studio	13
7	Copys	4
8	Disney	15
9	Pixar	15
10	Dream Works	15

10 record(s) selected.

(b) Studio Table

ID	NAME	LASTNAME	NATIONALITYID
1	Steven	Spielberg	15
2	Tod	Browning	15
3	Ishirou	Honda	14
4	Michael	Curtiz	16
5	Robert	Wise	15
6	Ridley	Scott	15
7	Michael	Haneke	17
8	Akira	Kurosawa	14
9	George	A. Romero	15
10	Robert	Wiene	10

10 record(s) selected.

(c) Director Table

Figura 1: Tablas en la MOVIESDB parte 1

Tablas

ID	NAME
1	Aventure
2	Terror
3	Drama
4	Action
5	Comedy
6	Science fiction
7	Romance
8	Animation
9	Suspense
10	Art
11	Documentary

11 record(s) selected.

(a) Gender Table

ID	NAME	LASTNAME	NATIONALITYID
1	Sam	Neill	15
2	Laura	Dern	15
3	Jeff	Goldblum	15
4	Bela	Lugosi	16
5	Dwight	Frye	15
6	Haruo	Nakajima	14
7	Akira	Takarada	14
8	Humphrey	Bogart	15
9	Ingrid	Bergman	7
10	Michael	Rennie	9
11	Sigourney	Weaver	15
12	Isabelle	Huppert	1
13	Toshirou	Mifune	14
14	Machiko	Kyou	14
15	Masayuki	Mori	14
16	Duane	Jones	15
17	Judith	ODea	15
18	Werner	Krauss	3
19	Conrad	Veidt	3

19 record(s) selected.

(b) Actor Table

ID	SHORT_NAME	NAME
1	G	General Audiences
2	PG	Parental Guidance Suggested
3	PG-13	Parents Strongly Cautioned
4	R	Restricted
5	NC-17	Adults Only

5 record(s) selected.

(c) Clasification Table

Figura 2: Tablas en la MOVIESDB parte 2

Vistas

Vistas

Country	Movie Name	Relase Date
USA	Jurassic Park	1993-06-09
Japan	Rashomon	1950-08-25
. . .	. . .	. . .

(a) Vista: Peliculas por paises

Name	Duration	Cost	Income	Release Date	Clasification	Studio	Director
Jurassic Park	127	$63 Millones	$920.1 Millones	1993-06-09	PG-13	Universal	Steven Spielberg
Jurassic Park	127	$63 Millones	$920.1 Millones	1993-06-09	PG-13	Universal	Steven Spielberg
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .

(b) vista1

Vistas

Para esta Base de Datos se implementaron 5 *Vistas:*

- *COUNTRYID_MOVIES* : Permite ver las entradas de la tabla pelicula ordenadas en base al país de origen (alfabéticamente). El resultado de esta *vista* se presenta en ejemplo en la figura 4.
- *TOP_INCOME_MOVIES* : Permite ver una lista de las 10 peliculas con mayores ingresos.
- *LOWEST_INCOME_MOVIES* : Permite ver una lista de las 10 peliculas con menores ingresos.

Vistas

- *TOP_EXPENSIVE_MOVIES*: Muestra todas las entradas de la tabla *MOVIE* ordenadas por su costo.
- *MOVIES_REVENUES* : Muestra una lista de las peliculas con mayores ganancias, un ejmplo de esta vista se muestra en la figura 6.

Vistas

COUNTRY	MOVIENAME	RELEASE_DATE
France	La Pianiste	03/28/2002
Germany	Das Cabinet des Dr. Caligari	03/19/1921
Japan	Godzilla	12/03/1954
Japan	Rashomon	08/25/1950
USA	Jurassic Park	06/09/1993
USA	Night of the Living Dead	10/01/1968
USA	Alien	05/25/1979
USA	The Day the Earth Stood Still	09/17/1951
USA	Dracula	02/12/1931

Figura 4: Vista de peliculas en base a su país de origen.

Vistas

NAME	DURATION	COST	INCOME	RELEASE_DATE	CLASIFICATION	STUDIO	DIRECTORID
Jurassic Park	127	+6.30000000000000E+007	+9.20100000000000E+008	06/09/1993	Parents Strongly Cautioned	Universal	Steven
Dracula	72	+3.55000000000000E+005	+3.55000000000000E+005	02/12/1931	Parents Strongly Cautioned	Universal	Tod
Godzilla	96	+1.00000000000000E+006	+1.50000000000000E+006	12/03/1954	Parents Strongly Cautioned	Toho	Ishirou
The Day the Earth Stood Still	92	+1.20000000000000E+006	+1.20000000000000E+006	09/17/1951	Parents Strongly Cautioned	FOX	Robert
Alien	117	+1.10000000000000E+007	+1.04931801000000E+008	05/25/1979	Restricted	FOX	Ridley
La Pianiste	131	+3.00000000000000E+006	+9.80137500000000E+006	03/28/2002	Restricted	Arte France Cinéma	Michael
Rashomon	88	+2.50000000000000E+005	+9.65680000000000E+004	08/25/1950	Parents Strongly Cautioned	Toho	Akira
Night of the Living Dead	96	+1.14000000000000E+005	+3.00000000000000E+007	10/01/1968	Restricted	Image Ten	George
Das Cabinet des Dr. Caligari	78	+1.80000000000000E+004	+1.80000000000000E+004	03/19/1921	Restricted	Decla-Bioscop	Robert

Figura 5: Vista de peliculas en base sus Recaudaciones.

Vistas

NAME	DURATION	COST	INCOME	RELEASE_DATE	CLASIFICATION	STUDIO	DIRECTOR
Jurassic Park	127	+6.30000000000000E+007	+9.20100000000000E+008	06/09/1993	Parents Strongly Cautioned	Universal	Steven
Dracula	72	+3.55000000000000E+005	+3.55000000000000E+005	02/12/1931	Parents Strongly Cautioned	Universal	Tod
Godzilla	96	+1.00000000000000E+006	+1.50000000000000E+006	12/03/1954	Parents Strongly Cautioned	Toho	Ishirou
The Day the Earth Stood Still	92	+1.20000000000000E+006	+1.20000000000000E+006	09/17/1951	Parents Strongly Cautioned	FOX	Robert
Alien	117	+1.10000000000000E+007	+1.04931801000000E+008	05/25/1979	Restricted	FOX	Ridley
La Pianiste	131	+3.00000000000000E+006	+9.80137500000000E+006	03/28/2002	Restricted	Arte France Cinéma	Michael
Rashomon	88	+2.50000000000000E+005	+9.65680000000000E+004	08/25/1950	Parents Strongly Cautioned	Toho	Akira
Night of the Living Dead	96	+1.14000000000000E+005	+3.00000000000000E+007	10/01/1968	Restricted	Image Ten	George
Das Cabinet des Dr. Caligari	78	+1.80000000000000E+004	+1.80000000000000E+004	03/19/1921	Restricted	Decla-Bioscop	Robert

Figura 6: Vista de peliculas en base sus Ganancias.

Index

Index

Para agilizar el resultado de las peticiones a las vistas mencionadas se implementaron los siguientes *Index*:

```
CREATE INDEX COUNTRY_ID  ON MOVIEINDEX.COUNTRY(NAME);
CREATE INDEX INCOME  ON MOVIEINDEX.MOVIE(INCOME);
CREATE INDEX COST ON MOVIENDEX.MOVIE(COST);
CREATE INDEX MOVIE_INDEX ON MOVIEINDEX.MOVIE(NAME);
```

Store Procedures

Store Procedures

Se utilizaron 5 procedimientos almacenados:

1. Un procedimietno carga los datos a la tabla que vincula a los actores a cada pelicula.
2. Un procedimiento carga los datos a la tabla que vincula a los generos con cada pelicula.
3. Un procedimiento generar una lista de las peliculas con sus generos.
4. Un procedimiento generar una lista de las peliculas con sus actores.
5. Un procedimiento para calcular las ganancias de las peliculas.

Store Procedures

Procedimiento 1:

```
CREATE or REPLACE PROCEDURE MOVIEINDEX.MOVIE_ACTOR ( IN MOVIENAME VARCHAR(50), IN ACTORNAME VARCHAR(50) )
LANGUAGE SQL
P1:BEGIN
    DECLARE ACTOR_ID int;
    DECLARE MOVIE_ID int;

    DECLARE cursor1 CURSOR FOR SELECT ID FROM MOVIEINDEX.MOVIE WHERE MOVIENAME = MOVIEINDEX.MOVIE.NAME;
    DECLARE cursor2 CURSOR FOR SELECT ID FROM MOVIEINDEX.ACTOR WHERE ACTORNAME = MOVIEINDEX.ACTOR.NAME;
    OPEN cursor1;
        FETCH FROM cursor1 INTO ACTOR_ID;
    CLOSE cursor1;
    OPEN cursor2;
        FETCH FROM cursor2 INTO MOVIE_ID;
    CLOSE cursor2;

    INSERT INTO MOVIEINDEX.ACTOR_MOVIE (ACTORDID, MOVIEDID) VALUES (ACTOR_ID, MOVIE_ID);
END P1
@
```

Store Procedures

Procedimiento 2:

```
CREATE or REPLACE PROCEDURE MOVIEINDEX.MOVIE_GENDER ( IN MOVIENAME VARCHAR(50), IN GENDERNAME VARCHAR(50)
LANGUAGE SQL
P1:BEGIN
  DECLARE GENDER_ID int;
  DECLARE MOVIE_ID int;

  DECLARE cursor1 CURSOR FOR SELECT ID FROM MOVIEINDEX.MOVIE WHERE MOVIENAME = MOVIEINDEX.MOVIE.NAME;
  DECLARE cursor2 CURSOR FOR SELECT ID FROM MOVIEINDEX.GENDER WHERE GENDERNAME = MOVIEINDEX.GENDER.NAME;
    OPEN cursor1;
        FETCH FROM cursor1 INTO GENDER_ID;
    CLOSE cursor1;
    OPEN cursor2;
        FETCH FROM cursor2 INTO MOVIE_ID;
    CLOSE cursor2;

    INSERT INTO MOVIEINDEX.GENDER_MOVIE (GENDERID, MOVIEID) VALUES (GENDER_ID, MOVIE_ID);
END P1
@
```

Store Procedures

Procedimiento 3:

```
CREATE or REPLACE PROCEDURE MOVIEINDEX.GENDERS_PER_MOVIE ( IN MOVIENAME VARCHAR(50), OUT GENDERS INT )
LANGUAGE SQL
P5:BEGIN
    DECLARE MOVIEID int;

    DECLARE cursor1 CURSOR FOR SELECT ID FROM MOVIEINDEX.MOVIE WHERE MOVIEINDEX.MOVIE.NAME = MOVIENAME;
    OPEN cursor1;
        FETCH FROM cursor1 INTO MOVIEID;
    CLOSE cursor1;

    DECLARE cursor2 CURSOR FOR SELECT COUNT(*) AS GENDERS_IN FROM MOVIEINDEX.MOVIE,
    MOVIEINDEX.GENDER_MOVIE, MOVIEINDEX.GENDER
    WHERE MOVIEINDEX.MOVIE.ID = MOVIEID AND
    MOVIEINDEX.GENDER_MOVIE.MOVIEDID = MOVIEID AND
    MOVIEINDEX.GENDER.ID = MOVIEINDEX.GENDER_MOVIE.GENDERID;
    OPEN cursor2;
        FETCH FROM cursor2 INTO GENDERS;
    CLOSE cursor2;
END P5
@
```

Store Procedures

Procedimiento 4:

```
CREATE or REPLACE PROCEDURE MOVIEINDEX.ACTOR_IN_MOVIE ( IN MOVIENAME VARCHAR(50), OUT ACTORS INT )
LANGUAGE SQL
P4:BEGIN
    DECLARE MOVIEID int;

    DECLARE cursor1 CURSOR FOR SELECT ID FROM MOVIEINDEX.MOVIE WHERE MOVIEINDEX.MOVIE.NAME = MOVIENAME;
    OPEN cursor1;
        FETCH FROM cursor1 INTO MOVIEID;
    CLOSE cursor1;

    DECLARE cursor2 CURSOR FOR SELECT COUNT(*) AS ACTORS_IN FROM MOVIEINDEX.MOVIE,
    MOVIEINDEX.ACTOR_MOVIE,
    MOVIEINDEX.ACTOR WHERE MOVIEINDEX.MOVIE.ID = MOVIEID AND
    MOVIEINDEX.ACTOR_MOVIE.MOVIEDID = MOVIEID AND
    MOVIEINDEX.ACTOR.ID = MOVIEINDEX.ACTOR_MOVIE.ACTORID;
    OPEN cursor2;
        FETCH FROM cursor2 INTO ACTORS;
    CLOSE cursor2;
END P4
@
```

Store Procedures

Procedimiento 5:

```
CREATE or REPLACE PROCEDURE MOVIEINDEX.REVENUE ( IN MOVIENAME VARCHAR(50), OUT TOTAL FLOAT )
LANGUAGE SQL
P1:BEGIN

    DECLARE cursor1 CURSOR FOR SELECT SUM(INCOME - COST) AS MOVIEREVENUE FROM MOVIEINDEX.MOVIE WHERE MOVIE
    OPEN cursor1;
        FETCH FROM cursor1 INTO TOTAL;
    CLOSE cursor1;
END P1
@
```

Triggers

Triggers

Los 5 *Triggers* considerados son:

1. Validación de dato en actualizaciones para el campo *INCOME* en la tabla *MOVIE*.
2. Validación de dato en inserciones para el campo *INCOME* en la tabla *MOVIE*.
3. Validación de dato en inserciones para el campo *COST* en la tabla *MOVIE*.
4. Validación de dato en actualizaciones para el campo *COST* en la tabla *MOVIE*.
5. Validación de dato en inserciones para el campo *DURATION* en la tabla *MOVIE*.

Triggers

Trigger 1:

```
CREATE OR REPLACE TRIGGER INCOME_MOVIE
    BEFORE UPDATE OF INCOME ON MOVIEINDEX.MOVIE
    REFERENCING OLD AS OLD_MOVIE
                NEW AS NEW_MOVIE
    FOR EACH ROW MODE DB2SQL
    WHEN (NEW_MOVIE.INCOME < OLD_MOVIE.INCOME )
    BEGIN ATOMIC
        SIGNAL SQLSTATE '75001' ('INVALID INCOME, IT MOST BE HIGHER THAN THE LAST ONE')
    END;
```

Triggers

Trigger 2:

```
CREATE OR REPLACE TRIGGER VALID_INCOME
    BEFORE INSERT ON MOVIEINDEX.MOVIE
    REFERENCING NEW AS NEW_MOVIE
    FOR EACH ROW MODE DB2SQL
    WHEN (NEW_MOVIE.INCOME <= 0)
    BEGIN ATOMIC
        SIGNAL SQLSTATE '75001' ('INCOME MUST BE MORE THAN 0')
    END;
```

Triggers

Trigger 3:

```
CREATE OR REPLACE TRIGGER VALID_COST
    BEFORE INSERT ON MOVIEINDEX.MOVIE
    REFERENCING NEW AS NEW_MOVIE
    FOR EACH ROW MODE DB2SQL
    WHEN (NEW_MOVIE.COST <= 0)
    BEGIN ATOMIC
        SIGNAL SQLSTATE '75001' ('COST MUST BE MORE THAN 0')
    END;
```

Triggers

Trigger 4:

```
CREATE OR REPLACE TRIGGER COST_MOVIE
    BEFORE UPDATE OF COST ON MOVIEINDEX.MOVIE
    REFERENCING OLD AS OLD_MOVIE
                NEW AS NEW_MOVIE
    FOR EACH ROW MODE DB2SQL
    WHEN (NEW_MOVIE.COST < OLD_MOVIE.COST )
    BEGIN ATOMIC
        SIGNAL SQLSTATE '75001' ('INVALID COST, IT MOST BE HIGHER THAN THE LAST ONE')
    END;
```

Triggers

Trigger 5:

```
CREATE OR REPLACE TRIGGER VALID_DURATION
    BEFORE INSERT ON MOVIEINDEX.MOVIE
    FOR EACH ROW MODE DB2SQL
    WHEN (MOVIE.DURATION <= 0)
    BEGIN ATOMIC
        SIGNAL SQLSTATE '75001' ('DURATION MUST BE MORE THAN 0')
    END;
```