

## Entrega 2

### 1. Diagrama E/R

En la Figura 1 se presenta el Diagrama E/R diseñado para el problema.

### 2. Esquema relacional

A continuación se muestra el esquema relacional del diagrama expuesto anteriormente.

- ports (pid integer, name character varying(100), cid integer)
- cities (cid integer, name character varying(100), region character varying(100))
- facilities (fid integer, type character varying(50), rut character varying(50), pid integer, capacity integer)
- facility\_history\_entries (fheid integer, fid integer, closed\_on timestamp without time zone, opened\_on timestamp without time zone, closeBoss\_rut character varying(50))
- employees (rut character varying(50), name character varying(100), age integer, sex character varying(50), fid integer)
- ships (license\_plate character varying(50), name character varying(100), country character varying(100))
- shipyard\_permits (spid integer, fid integer, license\_plate character varying(50), arrival\_date timestamp without time zone, departure\_date timestamp without time zone)
- dock\_permits (dpid integer, fid integer, license\_plate character varying(50), arrival\_date timestamp without time zone, description character varying(400))

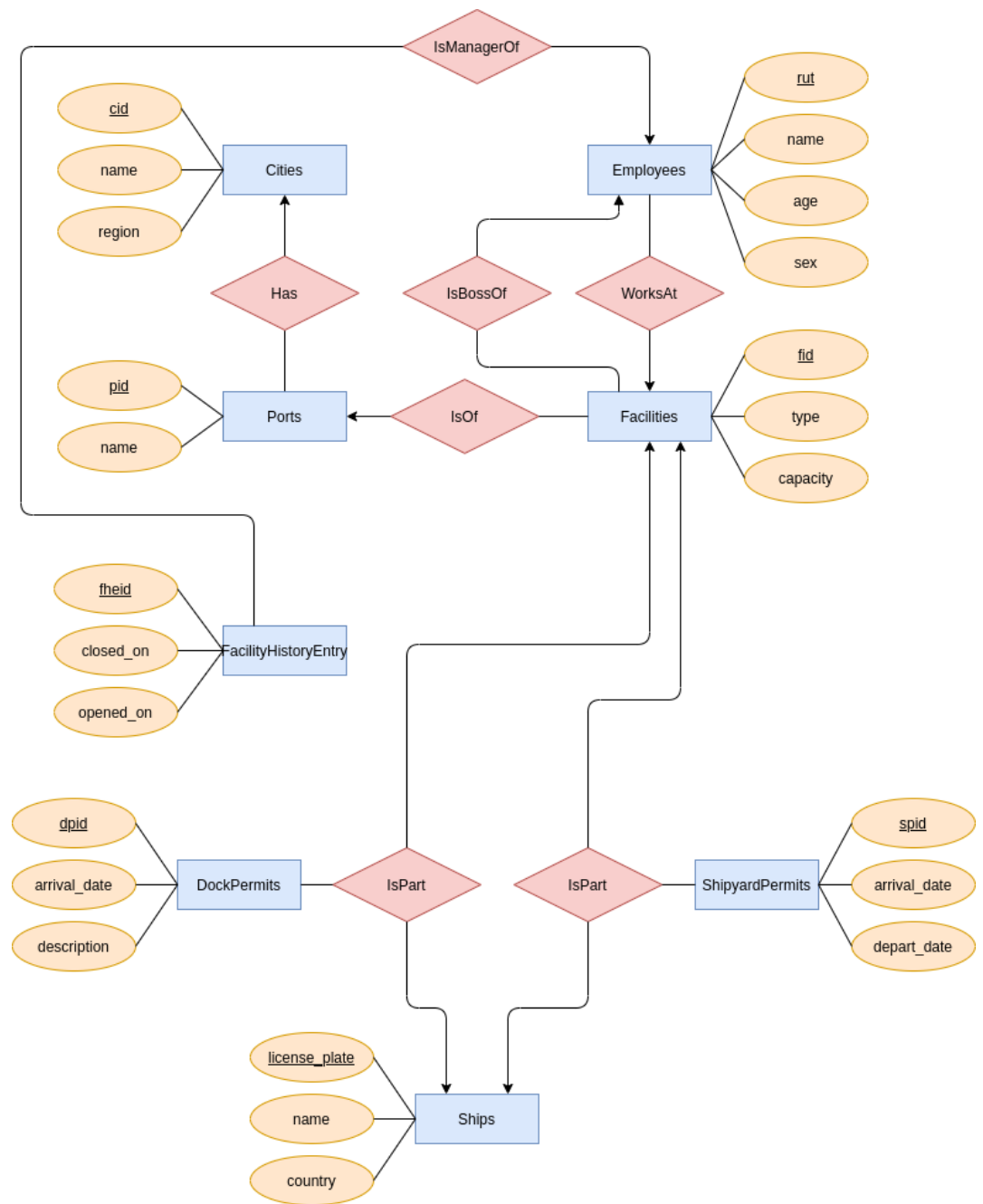


Figura 1: Diagrama E/R

### 3. Justificación del modelo

El modelo se diseñó para cumplir con las restricciones de 3NF. A continuación se muestran las dependencias funcionales para cada tabla en la base de datos:

- ports (pid, name, cid)
  - $pid \rightarrow name, cid$
- cities (cid, name, region)
  - $cid \rightarrow name, region$
- facilities (fid, type, rut, pid, capacity)
  - $fid \rightarrow type, rut, pid, capacity$
- facility\_history\_entries (fheid, fid, closed\_on, opened\_on, close\_boss\_rut)
  - $fheid \rightarrow fid, closed\_on, opened\_on, close\_boss\_rut$
- employees (rut, name, age, sex, fid)
  - $rut \rightarrow name, age, sex, fid$
- ships (license\_plate, name, country)
  - $license\_plate \rightarrow name, country$
- shipyard\_permits (spid, fid, license\_plate, arrival\_date, departure\_date)
  - $spid \rightarrow fid, license\_plate, arrival\_date, departure\_date$
- dock\_permits (dpid, fid, license\_plate, arrival\_date, description)
  - $dpid \rightarrow fid, license\_plate, arrival\_date, description$

Como se puede ver que el modelo propuesto no presenta anomalías. Se cumple que para cada tabla  $R_i$  en el modelo se da que *para toda dependencia funcional no trivial  $X \rightarrow Y$ ,  $X$  es llave*. Por lo tanto, el modelo está en BCNF y por consecuencia está también en 3NF.

#### 4. Consultas SQL

A continuación se incluyen las consultas SQL implementadas en la página web:

1. Muestre todos los puertos junto la ciudad a la que son asignados.

```
SELECT name, cid  
FROM ports ;
```

2. Muestre todos los jefes de las instalaciones del puerto con nombre 'Mejillones'.

```
SELECT facilities.boss_rut  
FROM (SELECT pid FROM ports WHERE UPPER(name) LIKE "%MEJILLONES %")  
AS puertos, facilities WHERE puertos.pid = facilities.pid;
```

3. Muestre todos los puertos que tienen al menos un astillero.

```
SELECT DISTINCT pid  
FROM facilities  
WHERE UPPER(type) LIKE "%SHIPYARD %";
```

4. Muestre todas las veces en que el barco 'Calypso' ha atracado en 'Arica'.

```
SELECT atraques.arrival_date  
FROM (SELECT facilities.fid FROM (SELECT ports.pid FROM cities, ports  
WHERE UPPER(cities.name) LIKE "%ARICA %" AND cities.cid = ports.cid)  
AS puertos, facilities WHERE puertos.pid = facilities.pid) AS instalaciones, (SE-  
LECT arrival_date, fid FROM shipyard_permits, ships WHERE UPPER(ships.name)  
LIKE "%CALYPSO %" UNION SELECT arrival_date, fid FROM dock_per-  
mits, ships WHERE UPPER(ships.name) LIKE "%CALYPSO %") AS atraques  
WHERE atraques.fid = instalaciones.fid;
```

5. Muestre la edad promedio de los trabajadores de cada puerto.

```
SELECT puertos.pid, AVG(employees.age)  
FROM (SELECT ports.pid, facilities.fid FROM ports, facilities WHERE ports.pid  
= facilities.pid) AS puertos, employees  
WHERE puertos.fid = employees.fid  
GROUP BY puertos.pid;
```

6. Muestre el puerto que ha recibido más barcos en Agosto del 2020.

```
SELECT pid  
FROM (SELECT COUNT(*), pid FROM (SELECT f.pid, t.license_plate FROM  
facilities as f, ((SELECT license_plate, fid FROM dock_permits WHERE arri-  
val_date ≥ '2020-08-01' AND arrival_date < '2020-09-01') UNION (SELECT  
license_plate, fid FROM shipyard_permits WHERE arrival_date ≥ '2020-08-01'  
AND arrival_date < '2020-09-01')) as t WHERE f.fid=t.fid) AS t1 GROUP BY  
pid) as t4, (SELECT MAX(count) FROM (SELECT COUNT(*), pid FROM
```

```

(SELECT f.pid, t.license_plate FROM facilities as f, ((SELECT license_plate,
fid FROM dock_permits WHERE arrival_date ≥ '2020-08-01' AND arrival_da-
te < '2020-09-01') UNION (SELECT license_plate, fid FROM shipyard_permits
WHERE arrival_date ≥ '2020-08-01' AND arrival_date < '2020-09-01')) as t WHE-
RE f.fid=t.fid) AS t1 GROUP BY pid) AS t3) AS t5 WHERE t4.count=t5.max;

```