Projeto BD - Parte 2

Base de Dados - L20

Grupo 115

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1 | Modelo Relacional

ivm(serial_number, manuf)

shelve(serial_number, manuf, nr, name, height)

- serial_number, manuf: FK(ivm.serial_number, ivm.manuf)
- name: FK(category.name)
- IC-4: A product can only be replenished on a shelf where it's category is presented.
- IC-6: A shelve can only exist in 'ambient_temp_shelf', 'warm_shelf' or 'cold_shelf' at any time.
- IC-7: A shelve must exist in one of 'ambient_temp_shelf', 'warm_shelf', and 'cold_shelf'.

ambient_temp_shelf(serial_number, manuf, nr)

- serial_number, manuf, nr: FK(shelve.serial_number, shelve.manuf, shelve.nr)

warm_shelf(serial_number, manuf, nr)

- serial_number, manuf, nr: FK(shelve.serial_number, shelve.manuf, shelve.nr)

cold_shelf(serial_number, manuf, nr)

- serial_number, manuf, nr: FK(shelve.serial_number, shelve.manuf, shelve.nr)

replenishment_event(instant, nr, serial_number, manuf, ean, tin, units)

- serial_number, manuf, nr, ean: FK(planogram.serial_number, planogram.manuf, planogram.nr, planogram.ean)
- tin: FK(retailer.tin)
- IC-3: The attribute units of a replenishment_event can't exceed the number of units specified in the corresponding planogram.
- IC-5: The retailer referenced in the replenishment_event relation must be responsible for the category of the product in the planogram relation.

product(ean, descr)

- IC-8: Every product (ean) must participate in an has relation.

category(name)

- IC-9: No category can exist at the same time in 'simple_category' and in 'super_category'
- IC-10: Every category must exist in either 'simple_category' or 'super_category'

simple_category(name)

- name: FK(category.name)

super_category(name)

- name: FK(category.name)
- IC-11: Every super_category must exist in an has-other relation

retailer(tin, name)

- UNIQUE(name)

point_of_retail(address, name)

has(ean, name)

- ean: FK(product.ean)

- name: FK(category.name)

responsible-for(<u>name, tin, serial_number, manuf</u>)

- name: FK(category.name)
- tin: FK(retailer.tin)
- serial_number, manuf: FK(ivm.serial_number, ivm.manuf)

installed-at(<u>serial_number, manuf</u>, address, nr):

- serial_number, manuf: FK(ivm.serial_number, ivm.manuf)
- address: FK(point_of_retail.address)

planogram(<u>ean, nr, serial_number, manuf</u>, faces, units, loc):

- ean: FK(product.ean)
- serial_number, manuf, nr: FK(shelve.serial_number, shelve.manuf, shelve.nr)

has-other(<u>category_name</u>, super_category_name):

- category_name: FK(category.name)
- super_category_name: FK(super_category.name)

- IC-1: category_name and super_category_name must differ
- IC-2: There can't be any cycles in the categories hierarchy

No Modelo Relacional em cima apresentado a numeração das restrições de integridade foi reutilizada do diagrama Entidade-Associação proposto no enunciado do projeto. Assim sendo, as IC-1/2/3/4/5 do modelo apresentado equivalem às RI-1/2/4/5/6, respetivamente, do diagrama Entidade-Associação proposto. Para além destas restrições de integridade, viu-se a necessidade de complementar este modelo com restrições de integridade adicionais, sendo estas as IC-6/7/8/9/10/11.

2 | Álgebra Relacional

1. $\pi_{ean,desc}(\sigma_{instant>'2021/12/31' \wedge units>10 \wedge name='Barras\ Energeticas'}(product \bowtie replenishment\_event \bowtie has))$
2. $\pi_{serial\_number,manuf}(\sigma_{ean=9002490100070}(planogram))$
3. $G_{count()}(\sigma_{super\_category\_name='Sopas\ Take-Away'}(has\_other))$
4. $total\_units \leftarrow_{ean} G_{SUM(units)\ as\ sum\_units}(replenishment\_event)$
   $max\_units \leftarrow G_{MAX(sum\_units)}(total\_units)$
   $\pi_{ean,desc}(\sigma_{sum\_units=max\_units}(product \bowtie total\_units))$

3 | SQL

1.
```sql
SELECT DISTINCT ean, descr
FROM product NATURAL JOIN replenishment_event NATURAL JOIN has
WHERE instant > '2021/12/31' AND units > 10 AND name = 'Barras
Energeticas';
```

2.
```sql
SELECT DISTINCT serial_number, manuf
FROM planogram
WHERE ean = 9002490100070;
```

3.
```sql
SELECT COUNT(*)
FROM has_other
WHERE super_category_name = 'Sopas Take-Away';
```

4.
```sql
SELECT ean, descr
FROM product NATURAL JOIN (
    SELECT ean
    FROM replenishment_event
    GROUP BY ean
    HAVING SUM(units) >= ALL (
        SELECT SUM(units)
        FROM replenishment_event
        GROUP BY ean
    )
);
```

Nota: Embora a projeção em álgebra relacional seja equivalente à operação "SELECT DISTINCT" em SQL, decidimos, nos casos em que não faria diferença no resultado, usar a operação "SELECT".