

CS-323 : Project deliverable

This is our first deliverable for the *Bookshelf* project of the introduction to database course (spring 2016 - Pr. Anastasia Ailamaki), which sums up our ER-model and schema. It also contains some justifications.

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Part I

Delivrable 1

1 Justifications

We started to take a look at the given data and tried to understand how tables were connected at a first glance by drawing a really simplified diagram. Once this was done, we started to look at more deeply to the data : how are they stored? May they be empty? Are they all relevant? Our major decision was not to drop any table, but only add and remove some fields to entities.

First, for everything that is related to publications, we quickly figured out how things were working. Therefore, we quickly decided to drop some of the unused id (such as its publication author or its publication content). As a primary key, we made the choice to inflate it using constraints. Furthermore, we also decided to separate the price into two fields, one for the amount and one for the currency, this solution being much more efficient while looking for some price range for instance.

Even though both publications and titles have each one a related type field we did not find it relevant to split them into different tables and/or explicit a IS-A relationship because of the way the datas are gathered.

Another part of the work was to analyse how tables were connected to remove potential redundancy. For instance, an award has a category but also a type, and a category has a type. These two types being always the same, we needed to drop out some content, what we've done by removing the type entry in a award. We also realise that, for instance in the author table, among the 80'000 birth places, only 10% were unique so we have started thinking about changing this attribute into a placeID and create a places table. There were some advantages (no redundancy, less space consumed) but some drawbacks (2 queries instead of one for each author) that finally made us stay with the given configuration (however, if another would be using a place, we will have done that).

Furthermore, to write properly the creation of the table, we needed to know exactly what entry may be null, and which ones could not. This was done by inspecting carefully the data and reading correctly the instructions. Then, the dilemma was for notes and web pages tables. Indeed, for note, we only have two entries : the ID and the raw note, whereas for a website, there are an ID, an URL but also some other IDs to relate it to other entities : among these 7 IDs, only one The type of each entry is explained in the following paragraph. Our final has been not the change the structure of these two tables since there is no WebpageID entry in tables as there is for note, but whether a web page is directly connected to the ID of its corresponding entity. Therefore, it implies to add an entry into these 7 tables, and we decided not to do this for practical reasons. Besides, we also thought about simply adding a simply URL entry into the note table, but this solution was also not satisfactory since before insert we would need to do a map from web page to note (not that hard) but since primary keys are only unique in one table, an author and a publication may have the same ID and this would imply much more work to know which website belongs to who.

As publications and titles both have a type we used an enum as a compromise between having a raw string field and creating normalisation for it. This avoids the redundancy and increase data consistency. Note that it would not be an option if the dataset usage would include adding new types (normalising is better in this case).

Last but not least, some intensive parsing has also been performed to know exactly how many characters were required for instance for each field, since we have encountered some difficulties with Cyrillic. We quickly realised that we should definitely parse these values before inserting them, it presents the advantages of being less memory consuming (6 characters become 1) and also the process of conversion is only done one time.

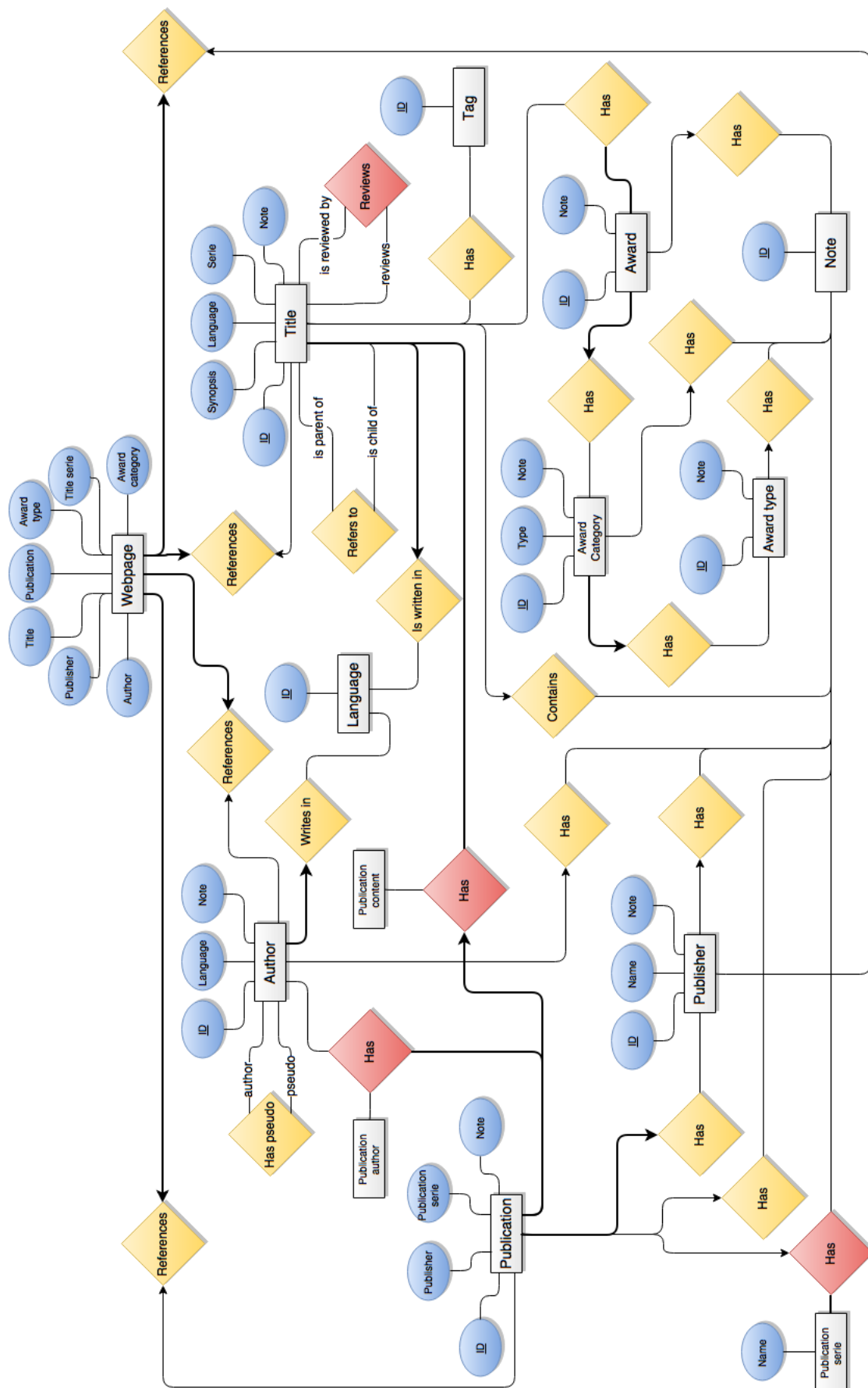
2 ER model

This entity-relation model only contains fields which are either directly use for relation or as primary key (underline then). For a more complete view of the table, refers to the next section. Fields are coloured in blue, direct relationships in yellow, relationships through a table in red.

Note : If you find this diagram too small, a larger version is available online at the following address :

<https://documents.epfl.ch/users/s/so/soccard/private/DBMS>

(access restricted to the db2016 group as defined in the EPFL AD directory).



3 SQL schema

3.1 Entities

```
CREATE TYPE PUBLICATION_TYPE AS ENUM ('ANTHOLOGY', 'COLLECTION', 'MAGAZINE',
    'NONFICTION', 'NOVEL', 'OMNIBUS', 'FANZINE', 'CHAPBOOK');
```

```
CREATE TYPE TITLE_TYPE AS ENUM ('ANTHOLOGY', 'BACKCOVERART', 'COLLECTION',
    'COVERART', 'INTERIORART', 'EDITOR', 'ESSAY', 'INTERVIEW', 'NOVEL',
    'NONFICTION', 'OMNIBUS', 'POEM', 'REVIEW', 'SERIAL', 'SHORTFICTION',
    'CHAPBOOK');
```

```
CREATE TABLE authors
(
    id            INT PRIMARY KEY NOT NULL,
    name          VARCHAR(256)    NOT NULL,
    legal_name    VARCHAR(256),
    last_name     VARCHAR(256),
    pseudonym     INT, -- fk
    birth_place   VARCHAR(256),
    birth_date    DATE,
    death_date    DATE,
    email         VARCHAR(256),
    image         VARCHAR(256),
    language_id   INT, -- fk
    note_id       INT -- fk
)
```

```
CREATE TABLE publications
(
    id            INT PRIMARY KEY          NOT NULL,
    title         VARCHAR(256)             NOT NULL,
    date_pub      DATE                    NOT NULL,
    publisher_id   INT                     NOT NULL, -- fk
    pages         INT,
    preface       INT,
    packaging_type VARCHAR(16)             NOT NULL,
    type          PUBLICATION_TYPE        NOT NULL,
    isbn          BIGINT,
    cover         VARCHAR(256),
    price         FLOAT,
    currency       VARCHAR(8),
    pub_series_id INT, -- fk
    pub_series_num INT,
    note_id       INT -- fk
)
```

```

CREATE TABLE titles
(
  id            INT PRIMARY KEY NOT NULL,
  title         VARCHAR(256)    NOT NULL,
  translator    VARCHAR(256),
  synopsis      INT, -- fk
  note_id       INT, -- fk
  series_id     INT, -- fk
  series_num    INT,
  story_length  VARCHAR(256),
  type          TITLE_TYPE,
  parent        INT             NOT NULL DEFAULT 0, -- fk
  language_id   INT, -- fk
  graphic       BOOLEAN         NOT NULL
)

```

```

CREATE TABLE languages
(
  id      INT PRIMARY KEY NOT NULL,
  name    VARCHAR(256)    NOT NULL,
  code    CHAR(3)         NOT NULL UNIQUE,
  script  BOOLEAN
)

```

```

CREATE TABLE notes
(
  id      INT PRIMARY KEY NOT NULL,
  note    TEXT             NOT NULL
)

```

```

CREATE TABLE webpages
(
  id                INT PRIMARY KEY NOT NULL,
  author_id         INT, -- fk
  publisher_id      INT, -- fk
  title_id          INT, -- fk
  url               VARCHAR(256)    NOT NULL UNIQUE,
  publications_series_id INT, -- fk
  award_type_id     INT, -- fk
  title_series_id   INT, -- fk
  award_category_id INT -- fk
)

```

```

CREATE TABLE tags
(
  id      INT PRIMARY KEY NOT NULL,
  name    VARCHAR(256)    NOT NULL
)

```

```

CREATE TABLE titles_series
(
  id      INT PRIMARY KEY NOT NULL,
  title    VARCHAR(256)    NOT NULL,
  parent   INT DEFAULT 0, -- fk
  note_id  INT -- fk
)

```

```
CREATE TABLE awards
(
  id          INT PRIMARY KEY NOT NULL,
  title       VARCHAR(256)     NOT NULL,
  date        DATE             NOT NULL,
  category_id INT              NOT NULL, -- fk
  note_id     INT -- fk
)
```

```
CREATE TABLE awards_categories
(
  id          INT PRIMARY KEY NOT NULL,
  name        VARCHAR(256)     NOT NULL,
  type_id     INT              NOT NULL, -- fk
  ordr        INT,
  note_id     INT -- fk
)
```

```
CREATE TABLE awards_types
(
  id          INT PRIMARY KEY NOT NULL,
  code        CHAR(2) UNIQUE,
  name        VARCHAR(256)     NOT NULL,
  note_id     INT, -- fk
  awarded_by  VARCHAR(256)     NOT NULL,
  awarded_for VARCHAR(256)     NOT NULL,
  short_name  VARCHAR(256)     NOT NULL UNIQUE,
  poll        BOOLEAN          NOT NULL,
  non_genre   BOOLEAN          NOT NULL
)
```

```
CREATE TABLE publishers
(
  id          INT PRIMARY KEY NOT NULL,
  name        VARCHAR(512)     NOT NULL,
  note_id     INT -- fk
)
```

```
CREATE TABLE publications_series
(
  id          INT PRIMARY KEY NOT NULL,
  name        VARCHAR(512)     NOT NULL,
  note_id     INT -- fk
)
```

3.2 Relations

```
CREATE TABLE publications_authors
(
  publication_id INT NOT NULL, -- fk
  author_id     INT NOT NULL, -- fk
  CONSTRAINT pk_publications_authors PRIMARY KEY (publication_id, author_id)
)
```

```
CREATE TABLE titles_awards
(
  title_id INT NOT NULL, -- fk
  award_id INT NOT NULL, -- fk
  CONSTRAINT pk_titles_awards PRIMARY KEY (title_id, award_id)
)
```

```
CREATE TABLE titles_tags
(
  title_id INT NOT NULL, -- fk
  tag_id   INT NOT NULL, -- fk
  CONSTRAINT pk_titles_tags PRIMARY KEY (title_id, tag_id)
)

CREATE TABLE reviews
(
  title_id  INT NOT NULL, -- fk
  review_id INT NOT NULL, -- fk
  CONSTRAINT pk_reviews PRIMARY KEY (title_id, review_id)
)

CREATE TABLE publications_contents
(
  title_id          INT NOT NULL, -- fk
  publication_id INT NOT NULL, -- fk
  CONSTRAINT pk_publications_contents PRIMARY KEY (title_id, publication_id)
)
```

3.3 Foreign keys

3.3.1 Authors

ALTER TABLE authors ADD FOREIGN KEY (language_id) REFERENCES languages (id) ON DELETE SET NULL;	ALTER TABLE authors ADD FOREIGN KEY (pseudonym) REFERENCES authors (id) ON DELETE CASCADE;
ALTER TABLE authors ADD FOREIGN KEY (note_id) REFERENCES notes (id) ON DELETE SET NULL;	

3.3.2 Publication authors

ALTER TABLE publications_authors ADD FOREIGN KEY (publication_id) REFERENCES publications (id) ON DELETE CASCADE;	ALTER TABLE publications_authors ADD FOREIGN KEY (author_id) REFERENCES authors (id) ON DELETE CASCADE;
--	--

3.3.3 Publications

ALTER TABLE publications ADD FOREIGN KEY (publisher_id) REFERENCES publishers (id) ON DELETE SET NULL;	ALTER TABLE publications ADD FOREIGN KEY (pub_series_id) REFERENCES publications_series (id) ON DELETE SET NULL;
ALTER TABLE publications ADD FOREIGN KEY (note_id) REFERENCES notes (id) ON DELETE SET NULL;	

3.3.4 Publication contents

```
ALTER TABLE publications_contents
ADD FOREIGN KEY (title_id)
REFERENCES titles (id)
ON DELETE CASCADE;
```

```
ALTER TABLE publications_contents
ADD FOREIGN KEY (publication_id)
REFERENCES publications (id)
ON DELETE CASCADE;
```

3.3.5 Publishers

```
ALTER TABLE publishers
ADD FOREIGN KEY (note_id)
REFERENCES notes (id)
ON DELETE SET NULL;
```

3.3.6 Publication series

```
ALTER TABLE publications_series
ADD FOREIGN KEY (note_id)
REFERENCES notes (id)
ON DELETE SET NULL;
```

3.3.7 Titles

```
ALTER TABLE titles
ADD FOREIGN KEY (synopsis)
REFERENCES notes (id)
ON DELETE SET NULL;
```

```
ALTER TABLE titles
ADD FOREIGN KEY (series_id)
REFERENCES titles_series (id)
ON DELETE SET NULL;
```

```
ALTER TABLE titles
ADD FOREIGN KEY (parent)
REFERENCES titles (id)
ON DELETE SET DEFAULT;
```

```
ALTER TABLE titles
ADD FOREIGN KEY (language_id)
REFERENCES languages (id)
ON DELETE SET NULL;
```

```
ALTER TABLE titles
ADD FOREIGN KEY (note_id)
REFERENCES notes (id)
ON DELETE SET NULL;
```

3.3.8 Reviews

```
ALTER TABLE reviews
ADD FOREIGN KEY (title_id)
REFERENCES titles (id)
ON DELETE CASCADE;
```

```
ALTER TABLE reviews
ADD FOREIGN KEY (review_id)
REFERENCES titles (id)
ON DELETE CASCADE;
```

3.3.9 Webpages

```
ALTER TABLE webpages
ADD FOREIGN KEY (author_id)
REFERENCES authors (id)
ON DELETE CASCADE;
```

```
ALTER TABLE webpages
ADD FOREIGN KEY (title_id)
REFERENCES titles (id)
ON DELETE CASCADE;
```

```
ALTER TABLE webpages
ADD FOREIGN KEY (award_type_id)
REFERENCES awards_types (id)
ON DELETE CASCADE;
```

```
ALTER TABLE webpages
ADD FOREIGN KEY (award_category_id)
REFERENCES awards_categories (id)
ON DELETE CASCADE;
```

```
ALTER TABLE webpages
ADD FOREIGN KEY (publisher_id)
REFERENCES publishers (id)
ON DELETE CASCADE;
```

```
ALTER TABLE webpages
ADD FOREIGN KEY (publications_series_id)
REFERENCES publications_series (id)
ON DELETE CASCADE;
```

```
ALTER TABLE webpages
ADD FOREIGN KEY (title_series_id)
REFERENCES title_series (id)
ON DELETE CASCADE;
```

3.3.10 Title awards

```
ALTER TABLE titles_awards
ADD FOREIGN KEY (title_id)
REFERENCES titles (id)
ON DELETE CASCADE;
```

```
ALTER TABLE titles_awards
ADD FOREIGN KEY (award_id)
REFERENCES awards (id)
ON DELETE CASCADE;
```

3.3.11 Title tags

```
ALTER TABLE titles_tags
ADD FOREIGN KEY (title_id)
REFERENCES titles (id)
ON DELETE CASCADE;
```

```
ALTER TABLE titles_tags
ADD FOREIGN KEY (tag_id)
REFERENCES tags (id)
ON DELETE CASCADE;
```

```
ALTER TABLE title_series
ADD FOREIGN KEY (parent)
REFERENCES title_series (id)
ON DELETE SET DEFAULT;
```

```
ALTER TABLE title_series
ADD FOREIGN KEY (note_id)
REFERENCES notes (id)
ON DELETE SET NULL;
```

3.3.12 Awards

```
ALTER TABLE awards
ADD FOREIGN KEY (category_id)
REFERENCES awards_categories (id)
ON DELETE SET NULL;
```

```
ALTER TABLE awards
ADD FOREIGN KEY (note_id)
REFERENCES notes (id)
ON DELETE SET NULL;
```

3.3.13 Award categories

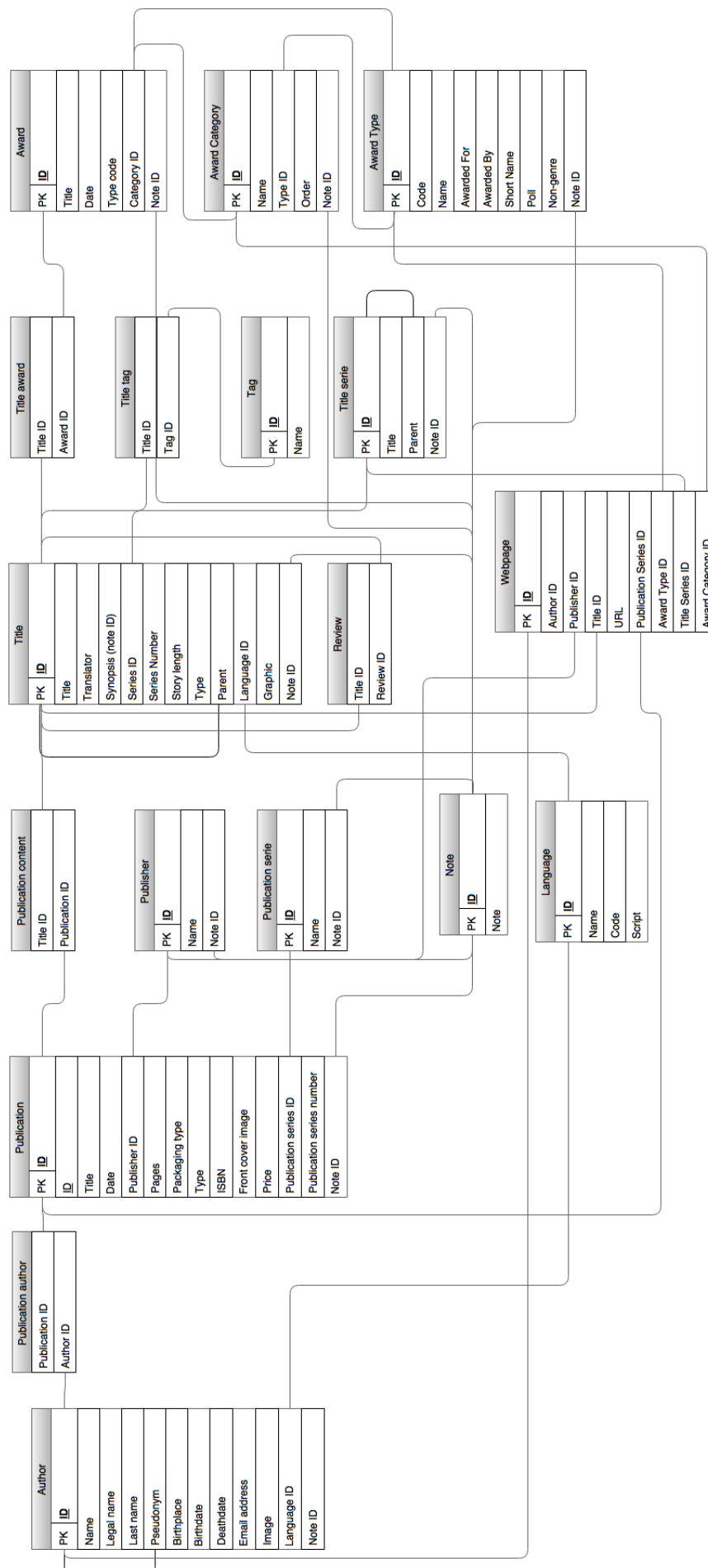
```
ALTER TABLE awards_categories
ADD FOREIGN KEY (type_id)
REFERENCES awards_types (id)
ON DELETE SET NULL;
```

```
ALTER TABLE awards_categories
ADD FOREIGN KEY (note_id)
REFERENCES notes (id)
ON DELETE SET NULL;
```

3.3.14 Award types

```
ALTER TABLE awards_types  
ADD FOREIGN KEY (note_id)  
REFERENCES notes (id)  
ON DELETE SET NULL;
```

4 Appendix : Relational Model



Part II

Deliverable 2

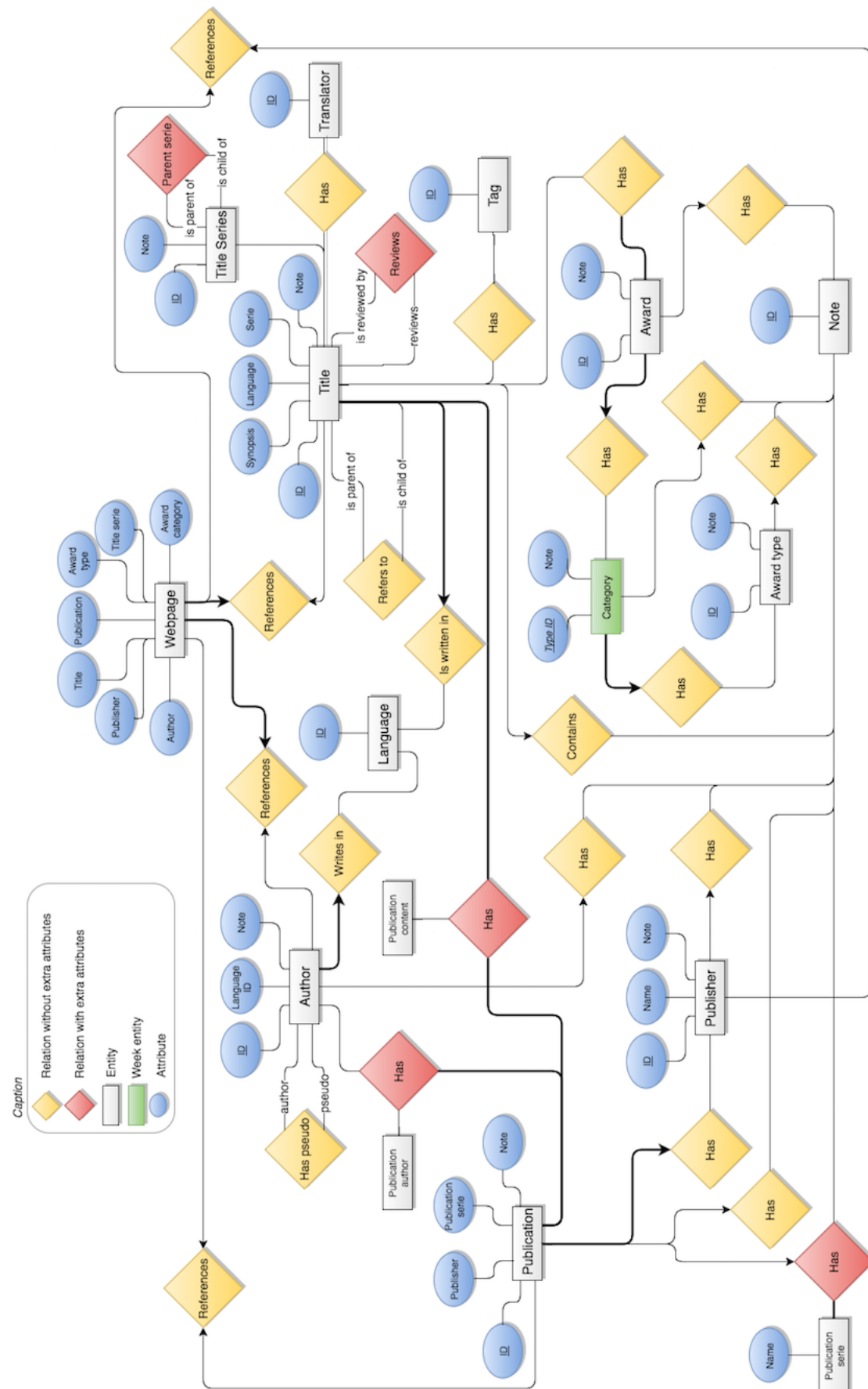
5 Modifications and improvements

5.1 Justifications

We are now considering **Award_Category** as a weak entity of **Award_Type** since it doesn't make sense for a category to exist without type. Therefore, the primary key of the category is now not only **cat_ID** but also a tuple containing **cat_ID** and **type_ID**. This leads us to store again in our Award table the **type_ID** attribute to make the connection between awards and their categories.

After analyzing the data, the graphic attribute may be null, we lead us to remove the NOT NULL constraint on this attribute.

5.2 New ER Model



6 Queries implementation

1. For every year, output the year and the number of publications for said year.

(a) Description of logic : We are using the `DATE_PART` function provided by Postgresql to extract the year of the date stored for each publication. Then we simply do a `GROUP BY` on the year and count the number of entries.

(b) SQL statement :

```
SELECT DATE_PART('year', p.date_pub) AS year, COUNT(*) AS count
FROM publications p
GROUP BY DATE_PART('year', p.date_pub)
ORDER BY year ASC;
```

(c) Results (partial):

year	count
2005	8667
2006	8166
2007	11970
2008	14204
2009	15526
2010	19150
2011	22470
2012	22317
2013	22923
2014	21219
2015	17206
2016	1590
8888	445
9999	4

2. Output the names of the ten authors with most publications.

(a) Description of logic : This query simply joins the authors and their publications and then `GROUP BY` on the authors name. We just have to count the number of entries, `ORDER BY` that count and set a limit to 10.

(b) SQL statement :

```
SELECT a.name, COUNT(*) AS count
FROM publications_authors p
INNER JOIN authors a ON p.author_id = a.id
GROUP BY a.name
ORDER BY count DESC
LIMIT 10;
```

(c) Results :

name	count
uncredited	2912
Isaac Asimov	2389
Edgar Rice Burroughs	2287
Robert A. Heinlein	1878
Arthur C. Clarke	1512
Andre Norton	1505
Stephen King	1504
Robert Silverberg	1481
Philip K. Dick	1398
Terry Pratchett	1354

3. What are the names of the youngest and oldest authors to publish something in 2010?

- (a) Description of logic : Slightly more complicated this query uses nested subqueries to first select publications of 2010, then to select the maximum and minimum birth dates of author that have some publication of 2010.
- (b) SQL statement :

```
SELECT a.name
FROM authors a
WHERE a.birth_date = (
  SELECT MAX(a.birth_date) AS max
  FROM publications_authors pa
  JOIN authors a ON pa.author_id = a.id
  WHERE pa.publication_id IN (
    SELECT pub.id
    FROM publications pub
    WHERE DATE_PART('year', pub.date_pub) = '2010'
  )) OR
a.birth_date = (
  SELECT MIN(a.birth_date) AS max
  FROM publications_authors pa
  JOIN authors A ON pa.author_id = a.id
  WHERE pa.publication_id IN (
    SELECT pub.id
    FROM publications pub
    WHERE DATE_PART('year', pub.date_pub) = '2010'
  ));
```

- (c) Results :

name
Robert Henryson
Gavin Douglas
Greg Kurzawa
Laramie Sasseville
Brooke Vaughn
Pancham Yadav
Euripides
Aubrey Smith
Augustin Lardy
Livy
Michel Saint-Romain
Gan Bao
Timothy F. Mitchell
Gottfried von Strassburg

4. How many comics (graphic titles) have publications with less than 50 pages, less than 100 pages, and more (or equal) than 100 pages?

- (a) Description of logic : After joining titles and publications, filtering them using the graphic field of titles and setting the condition on the number of pages, we just have to count the number of entries.
- (b) SQL statement :

```
SELECT COUNT(*)
FROM titles t
JOIN publications_contents AS pc ON t.id = pc.title_id
JOIN publications AS p ON pc.publication_id = p.id
WHERE t.graphic = 'YES'
AND p.Pages < 50;
```

```

SELECT COUNT(*)
FROM titles t
JOIN publications_contents AS pc ON t.id = pc.title_id
JOIN publications AS p ON pc.publication_id = p.id
WHERE t.graphic = 'YES'
AND p.Pages < 100;

```

```

-----

SELECT COUNT(*)
FROM titles t
JOIN publications_contents AS pc ON t.id = pc.title_id
JOIN publications AS p ON pc.publication_id = p.id
WHERE t.graphic = 'YES'
AND p.Pages >= 100;

```

(c) Results :

count
153
count
202
count
194

5. For every publisher, calculate the average price of its published novels (the ones that have a dollar price).

(a) Description of logic : This query joins the publications and authors via the `publications_authors` table. Then it filters the publications to keep only the ones that have a price in dollar. Finally it groups everything on the authors name and do an average on the price.

(b) SQL statement :

```

ELECT pr.name, AVG(p.price) AS average
FROM publications p
JOIN publishers pr ON p.publisher_id = pr.id
WHERE p.currency = '$'
GROUP BY pr.name
ORDER BY average DESC;

```

(c) Results (partial, 10 first):

name	avg	
Library Fellows of the Whitney Museum of American Art	2200	
The Pennyroyal Press	1000	
Pickering	Chatto	795
Epic Ink Books	500	
The Book Club of California	375	
Tradition Books	357	
Charnel House	344.88235294117646	
Subterranean Press	PS Publishing	300
Sirius Science Fiction	262.5	
Kluwer Academic Publishers	259	

6. What is the name of the author with the highest number of titles that are tagged as science fiction?

(a) Description of logic : This query use a subquery. This subquery links authors with their publications, the publications with their titles and finally the titles with their tags. A simple filter on tags to keep only the ones that have the keyword `sf` (meaning science fiction), then group by authors name, count the entries for each authors and order by this counter. Then the main query is there to keep the name without the counter.

(b) SQL statement :

```
SELECT a.name
FROM authors a
JOIN (
    SELECT a.name AS n, COUNT(*) AS count_sf
    FROM authors a
    JOIN publications_authors pa ON a.id = pa.author_id
    JOIN publications p ON pa.publication_id = p.id
    JOIN publications_contents pc ON pc.publication_id = p.id
    JOIN titles t ON pc.title_id = t.id
    JOIN titles_tags tt ON t.id = tt.title_id
    JOIN tags ON tt.tag_id = tags.id
    WHERE tags.name LIKE '%sf%'
    OR tags.name LIKE '%science-fiction%'
    GROUP BY a.name
    ORDER BY count_sf DESC
    LIMIT 1)
c ON c.n = a.name;
```

(c) Results :

name
Robert A. Heinlein

7. List the three most popular titles (i.e., the ones with the most awards and reviews).

(a) Description of logic : Here we order the titles on their number of awards and reviews and then simply sum them and order them on that total.

(b) SQL statement :

```
SELECT t.title, count_awards + count_reviews as total
FROM titles t
JOIN (
    SELECT ta.title_id, COUNT(ta.award_id) AS count_awards
    FROM titles_awards ta
    GROUP BY ta.title_id) c ON c.title_id = t.id
JOIN (
    SELECT r.title_id, COUNT(r.review_id) AS count_reviews
    FROM reviews r
    GROUP BY r.title_id) d ON d.title_id = t.id
ORDER BY total DESC
LIMIT 3;
```

(c) Results :

title	total
The Wonderful Wizard of Oz	100
The Dispossessed: An Ambiguous Utopia	43
Neuromancer	33

7 Interface

7.1 Screenshots

7.1.1 Menu

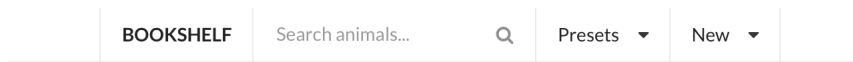


Figure 1: Menu view

7.1.2 Selection

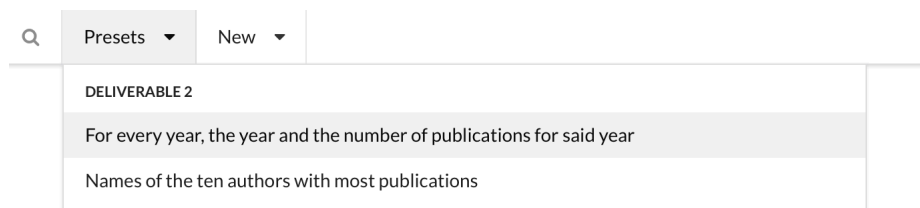


Figure 2: Selection view

7.1.3 Preset

BOOKSHELF	Search animals...	Q	For every year, the year and the number of publications for said year ▼	New ▼
Name				Count
uncredited				2912

Figure 3: Preset view

7.1.4 Search





BOOKSHELF	Rowling	Q	Presets ▾	New ▾
	Authors	J. K. Rowling Yate, Gloucestershire, England, UK		
		Joanne K. Rowling		
	Publications	J. K. Rowling: The Wizard Behind Harry Potter nonfiction		
		The Subversive Harry Potter: Adolescent Rebellion and Containment in the J.K. Rowling Novels nonfiction		
		How to Analyze the Works of J. K. Rowling nonfiction		
		J. K. Rowling: Extraordinary Author nonfiction		
		Titles	Readings on J. K. Rowling	
	Cover: An Interview with J. K. Rowling			
	J. K. Rowling's Books: An Overview			
	Muggles and Magic: J. K. Rowling and the Harry Potter Phenomenon			

Figure 4: Search view

7.1.5 Insert

×

Save a new title

Title

Synopsis

Note

Series

Select serie ▾

Series number

Story length

Select length ▾

Type

Select type ▾

Parent

Select parent ▾

Language

Select language ▾

☐ Graphic

Review

Select reviewee ▾

Tags

Select tags ▾

Awards

Select awards ▾

Submit

Figure 5: Insert view

7.1.6 Result

BOOKSHELF	J. K. Rowling: The Wizard	Q	Presets ▼	New ▼
Publisher id 449				
Date pub 1075590000000				
Price 5.99				
Note id 265214				
Pages 228				
Cover http://ecx.images-amazon.com/images/I/515XR75EP2L.jpg				
Id 356324				
Currency \$				
Title J. K. Rowling: The Wizard Behind Harry Potter				
Type nonfiction				
Preface pages 11				
Packaging type tp				

Figure 6: Result view

7.2 Implementation details

Part III

Deliverable 3