

Udiddit, a social news aggregator

Introduction

Udiddit, a social news aggregation, web content rating, and discussion website, is currently using a risky and unreliable Postgres database schema to store the forum posts, discussions, and votes made by their users about different topics.

The schema allows posts to be created by registered users on certain topics, and can include a URL or a text content. It also allows registered users to cast an upvote (like) or downvote (dislike) for any forum post that has been created. In addition to this, the schema also allows registered users to add comments on posts.

Here is the DDL used to create the schema:

```
CREATE TABLE bad_posts (  
    id SERIAL PRIMARY KEY,  
    topic VARCHAR(50),  
    username VARCHAR(50),  
    title VARCHAR(150),  
    url VARCHAR(4000) DEFAULT NULL,  
    text_content TEXT DEFAULT NULL,  
    upvotes TEXT,  
    downvotes TEXT  
);  
  
CREATE TABLE bad_comments (  
    id SERIAL PRIMARY KEY,  
    username VARCHAR(50),  
    post_id BIGINT,  
    text_content TEXT  
);
```

Part I: Investigate the existing schema

As a first step, investigate this schema and some of the sample data in the project's SQL workspace. Then, in your own words, outline three (3) specific things that could be improved about this schema. Don't hesitate to outline more if you want to stand out!

- The posts table should be normalized
- The upvotes and downvotes column in the posts table does not respect first normal form
- users should be a separate table
- topics should be a separate table
- votes should be a separate table
- The comments table's post_id column should have a foreign key constraint that references the id column of the posts table
- There should be an index for the topic on the posts table
- There should be an index for the user on the posts table
- There should be an index for the post_id column in the comments table

Part II: Create the DDL for your new schema

Having done this initial investigation and assessment, your next goal is to dive deep into the heart of the problem and create a new schema for Udiddit. Your new schema should at least reflect fixes to the shortcomings you pointed in the previous exercise. To help you create the new schema, a few guidelines are provided to you:

1. Guideline #1: here is a list of features and specifications that Udiddit needs in order to support its website and administrative interface:
 - a. Allow new users to register:
 - i. Each username has to be unique
 - ii. Usernames can be composed of at most 25 characters
 - iii. Usernames can't be empty
 - iv. We won't worry about user passwords for this project
 - b. Allow registered users to create new topics:
 - i. Topic names have to be unique.
 - ii. The topic's name is at most 30 characters
 - iii. The topic's name can't be empty
 - iv. Topics can have an optional description of at most 500 characters.
 - c. Allow registered users to create new posts on existing topics:
 - i. Posts have a required title of at most 100 characters
 - ii. The title of a post can't be empty.
 - iii. Posts should contain either a URL or a text content, **but not both**.
 - iv. If a topic gets deleted, all the posts associated with it should be automatically deleted too.
 - v. If the user who created the post gets deleted, then the post will remain, but it will become dissociated from that user.
 - d. Allow registered users to comment on existing posts:
 - i. A comment's text content can't be empty.
 - ii. Contrary to the current linear comments, the new structure should allow comment threads at arbitrary levels.
 - iii. If a post gets deleted, all comments associated with it should be automatically deleted too.
 - iv. If the user who created the comment gets deleted, then the comment will remain, but it will become dissociated from that user.
 - v. If a comment gets deleted, then all its descendants in the thread structure should be automatically deleted too.
 - e. Make sure that a given user can only vote once on a given post:
 - i. Hint: you can store the (up/down) value of the vote as the values 1 and -1 respectively.
 - ii. If the user who cast a vote gets deleted, then all their votes will remain, but will become dissociated from the user.

- iii. If a post gets deleted, then all the votes for that post should be automatically deleted too.
2. Guideline #2: here is a list of queries that Uddidit needs in order to support its website and administrative interface. Note that you don't need to produce the DQL for those queries: they are only provided to guide the design of your new database schema.
- a. List all users who haven't logged in in the last year.
 - b. List all users who haven't created any post.
 - c. Find a user by their username.
 - d. List all topics that don't have any posts.
 - e. Find a topic by its name.
 - f. List the latest 20 posts for a given topic.
 - g. List the latest 20 posts made by a given user.
 - h. Find all posts that link to a specific URL, for moderation purposes.
 - i. List all the top-level comments (those that don't have a parent comment) for a given post.
 - j. List all the direct children of a parent comment.
 - k. List the latest 20 comments made by a given user.
 - l. Compute the score of a post, defined as the difference between the number of upvotes and the number of downvotes
3. Guideline #3: you'll need to use normalization, various constraints, as well as indexes in your new database schema. You should use named constraints and indexes to make your schema cleaner.
4. Guideline #4: your new database schema will be composed of five (5) tables that should have an auto-incrementing id as their primary key.

Once you've taken the time to think about your new schema, write the DDL for it in the space provided here:

```
CREATE TABLE users (  
  id SERIAL PRIMARY KEY,  
  username VARCHAR(25) UNIQUE NOT NULL,  
  last_login TIMESTAMPTZ DEFAULT NULL,  
  CONSTRAINT username_not_empty CHECK (LENGTH(username) > 0)  
);  
  
CREATE TABLE topics (  
  id SERIAL PRIMARY KEY,  
  name VARCHAR(30) UNIQUE NOT NULL,  
  description VARCHAR(500) DEFAULT NULL,  
  CONSTRAINT topic_name_not_empty CHECK (LENGTH(name) > 0)
```

```

);

CREATE TABLE posts (
    id SERIAL PRIMARY KEY,
    user_id BIGINT,
    topic_id BIGINT NOT NULL,
    title VARCHAR(150) NOT NULL,
    url VARCHAR(4000) DEFAULT NULL,
    text_content TEXT DEFAULT NULL,
    created_at TIMESTAMPTZ NOT NULL DEFAULT CURRENT_TIMESTAMP,
    CONSTRAINT post_belongs_to_user
        FOREIGN KEY (user_id) REFERENCES users(id) ON DELETE SET NULL,
    CONSTRAINT post_belongs_to_topic
        FOREIGN KEY (topic_id) REFERENCES topics(id) ON DELETE CASCADE,
    CONSTRAINT url_or_content
        CHECK (url IS NOT NULL OR text_content IS NOT NULL)
);

CREATE INDEX posts_by_user ON posts (user_id);
CREATE INDEX posts_by_topic ON posts (topic_id);
CREATE INDEX post_urls ON posts (url) WHERE url IS NOT NULL;

CREATE TABLE comments (
    id SERIAL PRIMARY KEY,
    user_id BIGINT,
    post_id BIGINT NOT NULL,
    parent_id BIGINT DEFAULT NULL,
    text_content TEXT NOT NULL,
    created_at TIMESTAMPTZ NOT NULL DEFAULT CURRENT_TIMESTAMP,
    CONSTRAINT comment_belongs_to_user
        FOREIGN KEY (user_id) REFERENCES users(id) ON DELETE SET NULL,
    CONSTRAINT comment_belongs_to_post
        FOREIGN KEY (post_id) REFERENCES posts(id) ON DELETE CASCADE,
    CONSTRAINT comment_can_have_parent
        FOREIGN KEY (parent_id) REFERENCES comments(id) ON DELETE
CASCADE,
    CONSTRAINT comment_not_empty CHECK (LENGTH(text_content) > 0)
);

CREATE INDEX comments_by_user ON comments (user_id);
CREATE INDEX comments_by_post ON comments (post_id);
CREATE INDEX comments_by_parent ON comments (parent_id);

CREATE TABLE votes (
    id SERIAL PRIMARY KEY,
    user_id BIGINT,
    post_id BIGINT NOT NULL,
    vote SMALLINT NOT NULL,
    CONSTRAINT vote_belongs_to_user
        FOREIGN KEY (user_id) REFERENCES users(id) ON DELETE SET NULL,
    CONSTRAINT vote_belongs_to_post
        FOREIGN KEY (post_id) REFERENCES posts(id) ON DELETE CASCADE,
    CONSTRAINT vote_is_up_or_down CHECK (vote = 1 OR vote = -1)
);

CREATE INDEX votes_by_post ON votes (post_id);

```



Part III: Migrate the provided data

Now that your new schema is created, it's time to migrate the data from the provided schema in the project's SQL Workspace to your own schema. This will allow you to review some DML and DQL concepts, as you'll be using INSERT...SELECT queries to do so. Here are a few guidelines to help you in this process:

1. Topic descriptions can all be empty
2. Since the bad_comments table doesn't have the threading feature, you can migrate all comments as top-level comments, i.e. without a parent
3. You can use the Postgres string function **regexp_split_to_table** to unwind the comma-separated votes values into separate rows
4. Don't forget that some users only vote or comment, and haven't created any posts. You'll have to create those users too.
5. The order of your migrations matter! For example, since posts depend on users and topics, you'll have to migrate the latter first.
6. Tip: You can start by running only SELECTs to fine-tune your queries, and use a LIMIT to avoid large data sets. Once you know you have the correct query, you can then run your full INSERT...SELECT query.
7. **NOTE:** The data in your SQL Workspace contains thousands of posts and comments. The DML queries may take at least 10-15 seconds to run.

Write the DML to migrate the current data in bad_posts and bad_comments to your new database schema:

```
# Migrate topics
INSERT INTO topics (name)
SELECT DISTINCT topic FROM bad_posts;

# Migrate users
INSERT INTO users (username)
SELECT username FROM bad_posts
UNION
SELECT regexp_split_to_table(upvotes, ',') FROM bad_posts
UNION
SELECT regexp_split_to_table(downvotes, ',') FROM bad_posts
UNION
SELECT username FROM bad_comments;

# Migrate posts
INSERT INTO posts (user_id, topic_id, title, url, text_content)
SELECT u.id, t.id, bp.title, bp.url, bp.text_content
FROM bad_posts bp
JOIN users u on bp.username = u.username
```

```

        JOIN topics t on bp.topic = t.name;

# Migrate votes
INSERT INTO votes (user_id, post_id, vote)
SELECT u.id, bp.id, 1
    FROM (SELECT id, regexp_split_to_table(upvotes, ',') AS username FROM
bad_posts) bp
        JOIN users u ON u.username = bp.username
UNION
SELECT u.id, bp.id, -1
    FROM (SELECT id, regexp_split_to_table(downvotes, ',') AS username FROM
bad_posts) bp
        JOIN users u on u.username = bp.username;

# Migrate comments
INSERT INTO comments (user_id, post_id, text_content)
SELECT u.id, p.id, bc.text_content
FROM bad_comments bc
    JOIN users u ON bc.username = u.username
    JOIN posts p ON bc.post_id=p.id;

```