SnipMan

Organize your Code Snippets

Group 42

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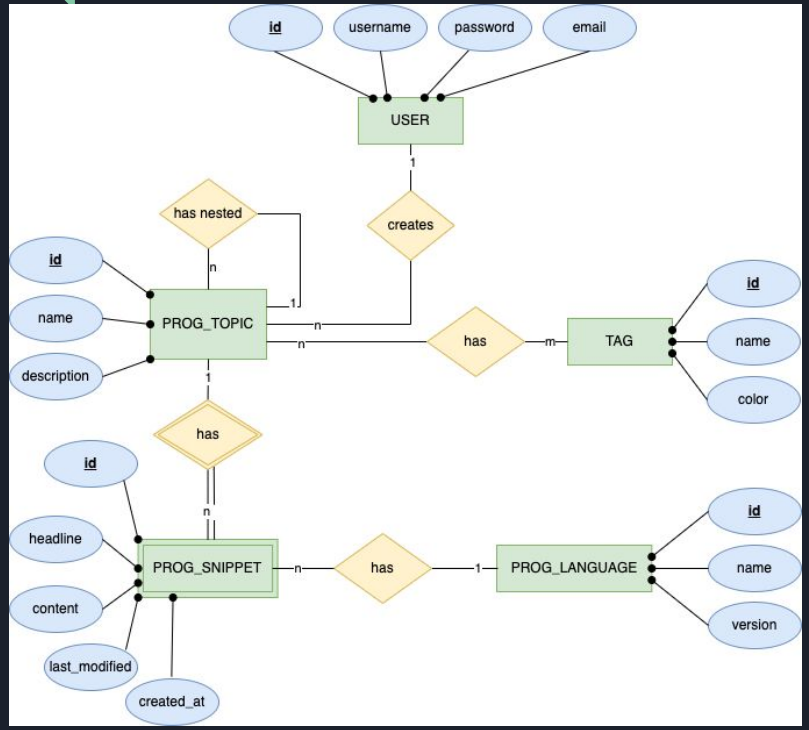
Overview

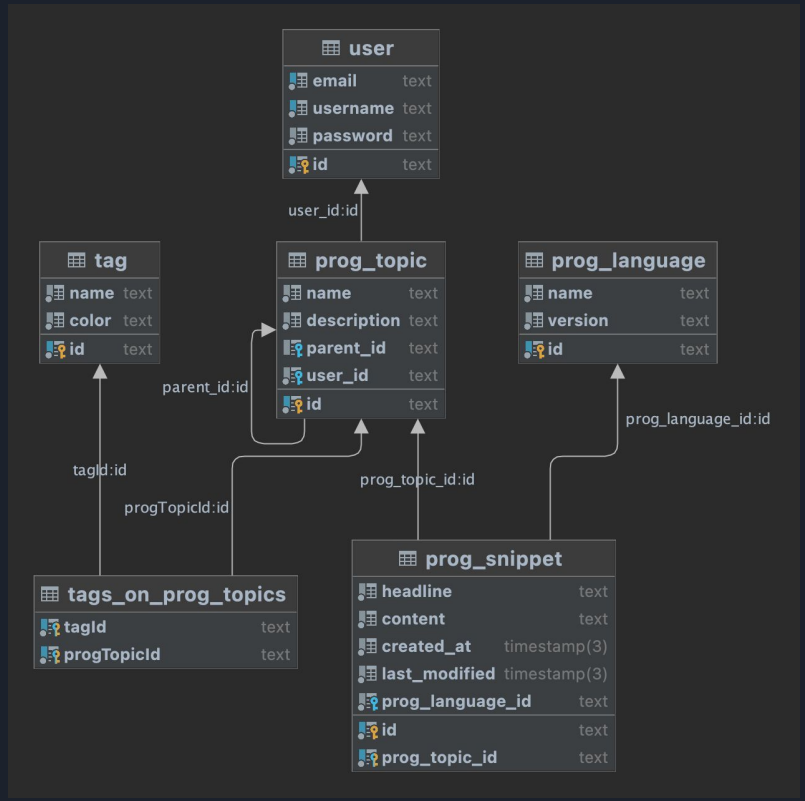
Comparison of RDBMS model and NoSQL Design

Performance Implications of NoSql for Reports

Query Comparison

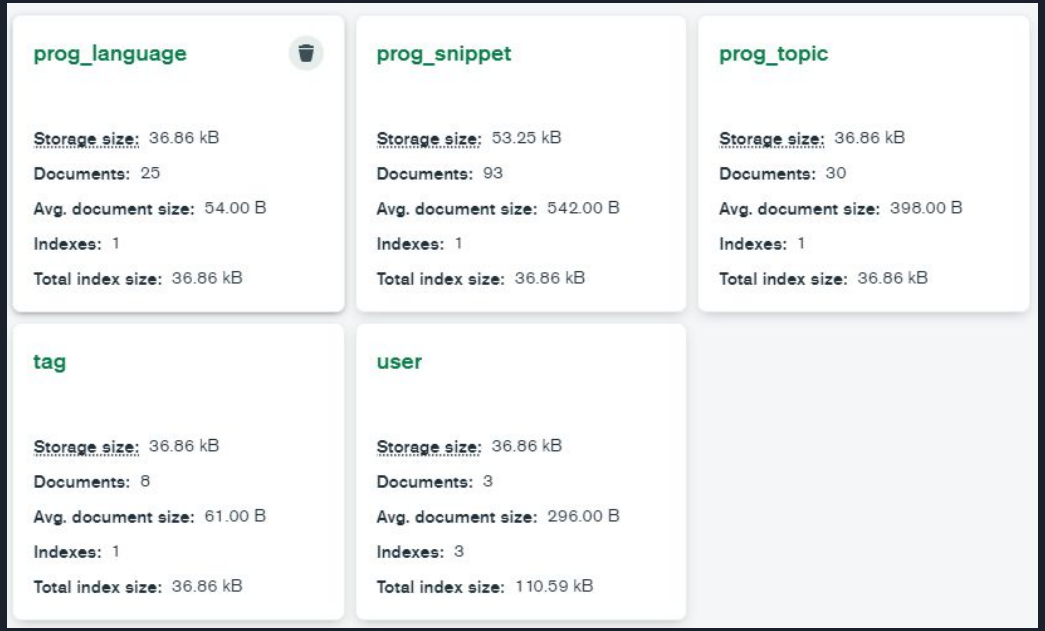
Comparison of **RDBMS model** and NoSQL Design





Comparison of RDBMS model and **NoSQL Design**

- One collection for each data model



Comparison of RDBMS model and **NoSQL Design**

- **User** collection
- Topics big and nested -> only IDs

```
_id: ObjectId('62ab09fb89987f389fc218c5')
email: "Laverne_Carroll71@hotmail.com"
username: "Laverne_Carroll71"
password: "Kp4qWYmHlf0zlkG"
prog_topic_ids: Array
  0: ObjectId('62ab09fb89987f389fc218c8')
  1: ObjectId('62ab09fb89987f389fc218c9')
```

- **Tag** collection for efficient queries
- Tiny documents, mostly read with topics, rarely writen
  - also embedded in topics (see next slide)

```
_id: ObjectId('62ab09fc89987f389fc218e6')
name: "svelte-components"
color: "#18771a"
```

Comparison of RDBMS model and **NoSQL Design**

- **Topics** collection
- Snippets not limited in size, may get very big -> only IDs
- Nesting depth of topics not limited -> only parent ID
  - No parent -> root topic
- Tags needed on every topic read -> embedded

Comparison of RDBMS model and **NoSQL Design**

- **Snippet** collection
- Weak entity, but may get big -> related topic ID saved
- Programming Languages are tiny + needed on most reads -> embedded
- User Email needed for report -> included in document

- **Programming** Languages similar to Tags - tiny documents
  - Own collection for efficient query
  - Embedded in snippet

Comparison of **RDBMS model** and **NoSQL Design**

- More flexible data models using NoSQL
- The NoSQL design made it possible to customize the stored documents' structure to be ideal for our exact use cases
- Data that is accessed together is stored together (mostly)

Performance Implications of NoSQL for Reports

Active Users Report (Péter)

- Programming Language and User Email address embedded
- Projection and filtering before data joining
- TTL Index for *prog_snippet.created_at*

Dominant Languages Report (Simon)

- Programming Languages are embedded -> no join necessary
- Lookup still needed for snippets (Snippets not embedded on Topics)
- Projecting and matching
    - In particular before lookup

Query Comparison - **Active Users**

No joins (lookups) are necessary, as we embedded `user_email` and `prog_language` into snippets

Joins of `prog_topic`, `relevant_snippets` and user are necessary, to access `user_email`

```sql
--- Initial filtering for snippets with given lang and timestamp
WITH relevant_snippets AS (
    SELECT id, prog_topic_id
    FROM prog_snippet
    WHERE prog_language_id = ${progLanguageId}
    AND created_at BETWEEN (now() - INTERVAL '1 month') AND now()
),
--- After filter, perform join and aggregation to access the relevant user info
report_result AS (
    SELECT "user".email AS user_email
    FROM prog_topic
    JOIN "user" ON "user".id = prog_topic.user_id
    JOIN relevant_snippets ON relevant_snippets.prog_topic_id = prog_topic.id
    GROUP BY user_email
    HAVING COUNT(relevant_snippets.id) >= 3
)
--- Order the result set by the email address
SELECT user_email
FROM report_result
ORDER BY user_email;
```

```javascript
db.prog_snippet.aggregate([
  // 1. Keep only the relevant fields, get the creation date as ISO string
  {
    $project: {
      _id: 1,
      prog_language_name: "$prog_language.name",
      prog_snippet_created_at: {
        $convert: { input: "$created_at", to: "string" }
      },
      user_email: 1
    }
  },
  // 2. Keep only the relevant snippets
  {
    $match: {
      $expr: {
        $and: [
          { $eq: ["$prog_language_name", progLanguageName] },
          { $gte: ["$prog_snippet_created_at", oneMonthAgo] },
          { $lte: ["$prog_snippet_created_at", now] }
        ]
      }
    }
  },
  // 3. Group by email, assign it to doc _id, as it is unique at this stage
  { $group: { _id: "$user_email", count: { $sum: 1 } } },
  // 4. Keep only those emails where the snippet count is at least 3
  { $match: { $expr: { $gte: ["$count", 3] } } },
  // 5. Keep only the email field, without the count
  { $project: { _id: 0, email: "$_id" } },
  // 6. Sort by email
  { $sort: { email: 1 } }
]);
```

Query Comparison - **Dominant Languages**

```
--- 2. Select snippets that are in relevant topics
--- and create a column for the length of their content
WITH relevant_snippets AS (
    SELECT prog_language_id, LENGTH(content) as local_len
    FROM prog_snippet
    WHERE prog_topic_id IN
--- 1. Select relevant topics for given tag id
        (SELECT progTopicId
        FROM tags_on_prog_topics
        WHERE tagId = ${tagId}))
--- 3. Join with prog language and group snippets by language
--- create an aggregate column with the sum of the grouped snippets
--- Order by the length and take the first 10
SELECT name, version, SUM(local_len) as length
FROM relevant_snippets
JOIN prog_language
    ON prog_language.id = relevant_snippets.prog_language_id
GROUP BY prog_language_id, name, version
ORDER BY length DESC
LIMIT 10
```

- **SQL**: Join with prog_language necessary to obtain name & version
- **NoSQL**: NOT necessary (embedded)
- Lookup of prog_snippet still needed in **NoSQL** (too large to embed)

Query Comparison - **Dominant Languages**

```
db.progTopic.aggregate([
  {
    // 1 .filter topics with the given tag name
    $match: {
      tags: {
        $elemMatch: { name: tagName },
      },
    },
  },
  {
    // 2. only keep snippet id arrays
    $project: {
      _id: 0,
      prog_snippet_ids: 1,
    },
  },
  {
    // 3. join snippets that are associated with the topics
    // as prog_snippet_ids is an array, prog_snippets is also an array (of snippets)
    $lookup: {
      from: 'prog_snippet',
      localField: 'prog_snippet_ids',
      foreignField: '_id',
      as: 'prog_snippets',
    },
  },
  {
    // 4. only keep snippet arrays
    $project: {
      _id: 0,
      prog_snippets: 1,
    },
  },
  {
    // 5. create a document for each snippet
    $unwind: '$prog_snippets',
  },
  {
    // 6. keep only the relevant fields
    $project: {
      lang: '$prog_snippets.prog_language',
      content: '$prog_snippets.content',
    },
  },
  {
    // 7. group by language
    // create an aggregate length field with the sum of the length of the content
    $group: {
      _id: '$lang',
      length: {
        $sum: { $strLenCP: '$content' },
      },
    },
  },
  {
    // 8. map fields to create wanted output format
    $project: {
      _id: 0,
      name: '$_id.name',
      version: '$_id.version',
      length: 1,
    },
  },
  {
    // 9. sort by length descending and name ascending
    $sort: {
      length: -1,
      name: 1,
    },
  },
  {
    // 10. only take the first 10 results
    $limit: 10,
  },
],);
```

Thank You
for Your Attention