NoSQL

Problem Statement 3:

Your task is to build a NoSQL database for a content management system. The database should store articles, authors, and reader comments. Design a schema that allows efficient retrieval of articles by a specific author and their associated comments.

NoSQL Data Model for a Content Management System (Using MongoDB)

The schema is designed to optimize queries for retrieving articles by a specific author and their associated comments efficiently.

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1. Authors Collection

Stores details about authors.

```
{
  "_id": "auth001",
  "name": "John Doe",
  "email": "john@example.com",
  "bio": "Tech writer and blogger",
  "joined_at": "2023-06-15T10:00:00Z"
}
```

- Contains basic author details.
- Index on `_id` for quick lookups when querying articles by an author.

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2. Articles Collection

Stores article details and embeds comments for efficient retrieval.

```
{
  "_id": "art001",
  "title": "The Rise of NoSQL",
  "content": "NoSQL databases are becoming increasingly popular due to...",
  "author_id": "auth001",
  "published_at": "2024-02-01T12:00:00Z",
  "tags": ["NoSQL", "Databases", "Tech"],
  "comments": [
    {
      "comment_id": "cmt001",
      "user": "Alice",
      "text": "Great insights on NoSQL!",
      "timestamp": "2024-02-01T14:00:00Z"
    },
    {
      "comment_id": "cmt002",
      "user": "Bob",
      "text": "Can you cover more on MongoDB performance tuning?",
      "timestamp": "2024-02-01T15:30:00Z"
    }
  ]
}
```

- Author ID as a reference allows efficient retrieval of articles by an author.
- Embedded comments ensure fast access when fetching an article with its comments.
- Tags for topic-based filtering.

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3. Query: Retrieve Articles by a Specific Author with Comments

```
db.articles.find({ author_id: "auth001" }).sort({ published_at: -1 });
```

- Uses an index on `author_id` for efficient lookups.
- Sorts articles by `published_at` for latest-first retrieval.

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4. Query: Fetch a Specific Article and Its Comments

```
db.articles.findOne({ _id: "art001" }, { title: 1, content: 1, comments: 1
});
```

- Retrieves only the required fields, reducing overhead.

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5. Indexing Strategy for Performance Optimization

```
db.articles.createIndex({ author_id: 1 });
db.articles.createIndex({ published_at: -1 });
```

- Index on `author_id` speeds up queries fetching articles by an author.
- Index on `published_at` optimizes sorting for recent articles.

Advantages of This Schema

Fast Retrieval – Articles and comments are stored together, reducing joins.
Efficient Author Queries – Indexed for quick lookups.
Scalability – Supports large comment volumes without affecting performance.

This model ensures optimal query performance while maintaining scalability.