Министерство науки и высшего образования Российской Федерации
федеральное государственное автономное образовательное учреждение высшего образования
«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО»
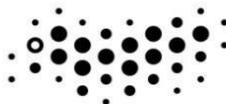
Отчет

по лабораторной работе по теме: "**Создание базы данных в MongoDB**"

по дисциплине «**Проектирование баз данных**»

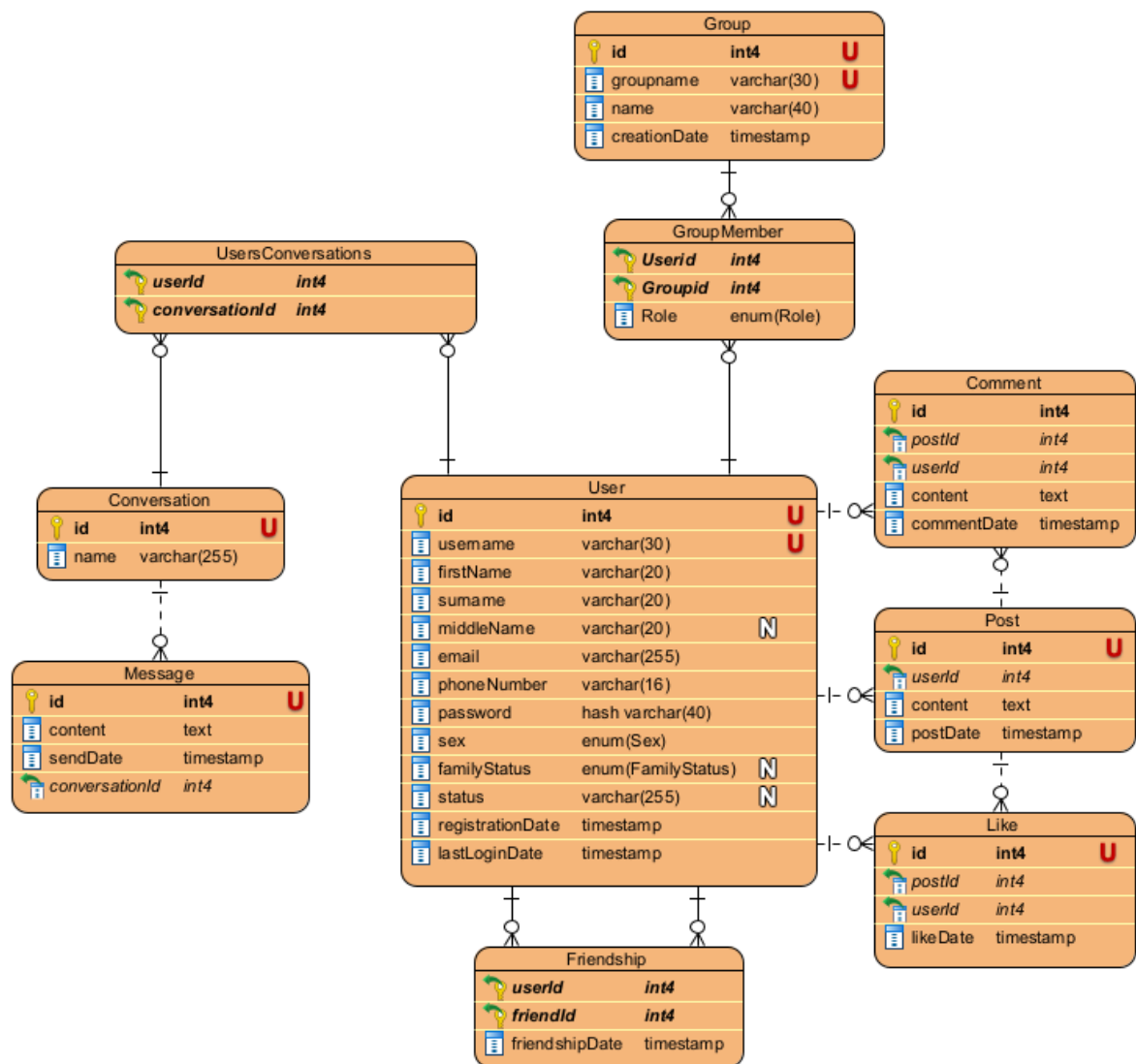Автор: Юрпалов С. Н.

Факультет: ИТиП

Группа: M34051

УНИВЕРСИТЕТ ИТМО

Санкт-Петербург 2023

Исходная архитектура данных:

Group

🔑 **id**	**int4**	**U**
📄 groupname	varchar(30)	**U**
📄 name	varchar(40)	
📄 creationDate	timestamp	

UsersConversations

🔑 *userId*	*int4*	
🔑 *conversationId*	*int4*	

GroupMember

🔑 *Userid*	*int4*	
🔑 *Groupid*	*int4*	
📄 Role	enum(Role)	

Comment

🔑 **id**	**int4**	
📄 *postId*	*int4*	
📄 *userId*	*int4*	
📄 content	text	
📄 commentDate	timestamp	

Conversation

🔑 **id**	**int4**	**U**
📄 name	varchar(255)	

User

🔑 **id**	**int4**	**U**
📄 username	varchar(30)	**U**
📄 firstName	varchar(20)	
📄 surname	varchar(20)	
📄 middleName	varchar(20)	**N**
📄 email	varchar(255)	
📄 phoneNumber	varchar(16)	
📄 password	hash varchar(40)	
📄 sex	enum(Sex)	
📄 familyStatus	enum(FamilyStatus)	**N**
📄 status	varchar(255)	**N**
📄 registrationDate	timestamp	
📄 lastLoginDate	timestamp	

Post

🔑 **id**	**int4**	**U**
📄 *userId*	*int4*	
📄 content	text	
📄 postDate	timestamp	

Message

🔑 **id**	**int4**	**U**
📄 content	text	
📄 sendDate	timestamp	
📄 *conversationId*	*int4*	

Like

🔑 **id**	**int4**	**U**
📄 *postId*	*int4*	
📄 *userId*	*int4*	
📄 likeDate	timestamp	

Friendship

🔑 *userId*	*int4*	
🔑 *friendId*	*int4*	
📄 friendshipDate	timestamp	

Создание коллекций и заполнение данных в MongoDB

User

Изменения: нет.

```json
[
  {
    "_id": 1,
    "firstName": "Ivan",
    "surname": "Ivanov",
    "middleName": "Ivanovich",
    "phoneNumber": "+78005553535",
    "email": "ivan@mail.ru",
    "password": "password1",
    "sex": "MALE",
    "familyStatus": "SINGLE",
    "status": "Meaningful quote",
    "registrationDate": "2023-09-26T11:00:00.000+00:00",
    "lastLoginDate": "2023-09-26T11:00:00.000+00:00",
  },
  {
    "_id": 2,
    "firstName": "Elena",
    "surname": "Petrova",
    "middleName": "Sergeevna",
    "phoneNumber": "+78005553536",
    "email": "elena@mail.ru",
    "password": "password2",
    "sex": "FEMALE",
    "familyStatus": "MARRIED",
    "status": "Inspiring words",
    "registrationDate": "2023-09-26T11:15:00.000+00:00",
    "lastLoginDate": "2023-09-26T11:15:00.000+00:00",
  },
  {
    "_id": 3,
    "firstName": "Alex",
    "surname": "Smith",
    "middleName": "John",
    "phoneNumber": "+78005553537",
    "email": "alex@mail.ru",
    "password": "password3",
    "sex": "MALE",
    "familyStatus": "DIVORCED",
    "status": "Life is an adventure"
```

DatabaseArchitectureLabWorks.User

Documents   Aggregations   Schema   Indexes   Validation

Filter ⧉   🕐 ▾   Type a query: { field: 'value' }   Explain   Reset   **Find**   ‹/›   Options ▸

⊕ **ADD DATA** ▾   ⧉ **EXPORT DATA** ▾   1 – 16 of 16 ↻ ‹ ›   ☰ {} ⊞

```
_id: 1
firstName: "Ivan"
surname: "Ivanov"
middleName: "Ivanovich"
phoneNumber: "+78005553535"
email: "ivan@mail.ru"
password: "password1"
sex: "MALE"
familyStatus: "SINGLE"
status: "Meaningful quote"
registrationDate: "2023-09-26T11:00:00.000+00:00"
lastLoginDate: "2023-09-26T11:00:00.000+00:00"
```

Group

Изменения: таблица GroupMember интегрирована в виде объекта userIdsRoles

```json
{
  {
    "_id": 1,
    "groupname": "Music Fans",
    "name": "Group1",
    "creationDate": "2023-09-26T11:00:00.000+00:00",
    "userIdsRoles": {
      "1": "ADMIN",
      "3": "MODERATOR",
      "4": "MEMBER",
      "8": "MEMBER"
    }
  },
  {
    "_id": 2,
    "groupname": "Outdoor Adventures",
    "name": "Group2",
    "creationDate": "2023-09-26T11:15:00.000+00:00",
    "userIdsRoles": {
      "5": "ADMIN",
      "6": "MODERATOR",
      "7": "MEMBER",
      "10": "MEMBER"
    }
  },
  {
    "_id": 3,
    "groupname": "Gaming Community",
    "name": "Group3",
    "creationDate": "2023-09-26T11:30:00.000+00:00",
    "userIdsRoles": {
      "3": "ADMIN",
      "9": "MODERATOR",
      "11": "MEMBER",
      "13": "MEMBER"
    }
  },
  {
    "_id": 4,
    "groupname": "Art Enthusiasts"
```

Documents   Aggregations   Schema   Indexes   Validation

Filter ⧉ ◷ ▾   Type a query: { field: 'value' }   Explain   Reset   Find   ◂▸   Options ▸

⊕ ADD DATA ▾   ⬚ EXPORT DATA ▾   1 – 10 of 10 ⟳   ‹ ›

```
_id: 1
groupname: "Music Fans"
name: "Group1"
creationDate: "2023-09-26T11:00:00.000+00:00"
▾ userIdsRoles: Object
    1: "ADMIN"
    3: "MODERATOR"
    4: "MEMBER"
    8: "MEMBER"
```

Conversation

Изменения: таблица UsersConversations интегрирована в виде поля participantIds, поле conversationId из Message в виде поля messageIds.

```
1  [
2      {
3          "_id": 1,
4          "name": "Family Chat",
5          "participantIds": [1, 3, 5],
6          "messageIds": [1, 2, 3]
7      },
8      {
9          "_id": 2,
10         "name": "Friends Chat",
11         "participantIds": [1, 4, 6],
12         "messageIds": [4, 5, 6]
13     },
14     {
15         "_id": 3,
16         "name": "Work Chat",
17         "participantIds": [3, 7, 9],
18         "messageIds": [7, 8, 9]
19     },
20     {
21         "_id": 4,
22         "name": "Study Group",
23         "participantIds": [1, 2, 8],
24         "messageIds": [10, 11, 12]
25     },
26     {
27         "_id": 5,
28         "name": "Travel Plans",
29         "participantIds": [5, 10, 11],
30         "messageIds": [13, 14, 15]
31     },
32     {
33         "_id": 6,
34         "name": "Tech Enthusiasts",
35         "participantIds": [6, 12, 15],
36         "messageIds": [16, 17, 18]
37     },
38     {
39         "_id": 7,
40         "name": "Fitness Motivation"
```

Documents   Aggregations   Schema   Indexes   Validation

Filter 🕐 ▾   Type a query: { field: 'value' }   Explain   Reset   Find   ‹/›   Options ▸

⊕ ADD DATA ▾   ☑ EXPORT DATA ▾   1 – 10 of 10 ⟳ ‹ › ▤ {} ⊞

```
    _id: 1
    name: "Family Chat"
  ▾ participantIds: Array (3)
        0: 1
        1: 3
        2: 5
  ▾ messageIds: Array (3)
        0: 1
        1: 2
        2: 3
```

Message

Изменения: удалено поле conversationId.

```
 1   _id;content;sendDate
 2   1;Hello, how's everyone doing?;2023-09-26 14:00:00
 3   2;I just wanted to share some exciting news!;2023-09-26 14:15:00
 4   3;Has anyone tried the new restaurant downtown?;2023-09-26 14:30:00
 5   4;Great job on completing the project ahead of schedule!;2023-09-26 14:45:00
 6   5;I found this interesting article about AI.;2023-09-26 15:00:00
 7   6;Just got back from an amazing trip to Bali.;2023-09-26 15:15:00
 8   7;Let's meet at the gym tomorrow morning.;2023-09-26 15:30:00
 9   8;Here's my secret family recipe for lasagna.;2023-09-26 15:45:00
10   9;Any movie recommendations for this weekend?;2023-09-26 16:00:00
11   10;I'm really into jazz music lately.;2023-09-26 16:15:00
12   11;Join us for a hike this Saturday!;2023-09-26 16:30:00
13   12;Who's up for some multiplayer gaming tonight?;2023-09-26 16:45:00
14   13;I'm working on a new art project. Stay tuned!;2023-09-26 17:00:00
15   14;Let's plan a photography outing next week.;2023-09-26 17:15:00
16   15;My dog just learned a new trick!;2023-09-26 17:30:00
```

DatabaseArchitectureLabWorks.Message

15
DOCUMENTS

1
INDEXES

Documents   Aggregations   Schema   Indexes   Validation

Filter 🕐 ▾   Type a query: { field: 'value' }   Explain   Reset   Find   ‹/›   Options ▸

⊕ ADD DATA ▾   ☑ EXPORT DATA ▾   1 – 15 of 15 ⟳ ‹ › ▤ {} ⊞

```
    _id: 1
    content: "Hello, how's everyone doing?"
    sendDate: 2023-09-26T11:00:00.000+00:00
```

Post

Изменения: поля userId, postId из Comment и Like интегрированы в соответствующие объекты – userIdLikeId, userIdCommentIds.

```json
[
  {
    "_id": 1,
    "content": "Hello world!",
    "postDate": "2023-09-26T11:00:00.000+00:00",
    "userIdlikeId": {
      "1": 1,
      "3": 5,
      "11": 7
    },
    "userIdcommentIds": {
      "1": [1],
      "3": [5],
      "11": [7]
    }
  },
  {
    "_id": 2,
    "content": "Lorem ipsum dolor sit amet.",
    "postDate": "2023-09-26T11:15:00.000+00:00",
    "userIdlikeId": {
      "4": 2,
      "6": 6,
      "8": 9
    },
    "userIdcommentIds": {
      "4": [2],
      "6": [6],
      "8": [9]
    }
  },
  {
    "_id": 3,
    "content": "Vestibulum ante ipsum primis in faucibus orci luct
    "postDate": "2023-09-26T11:30:00.000+00:00",
    "userIdlikeId": {
      "10": 3,
      "12": 8,
      "14": 10
```

DatabaseArchitectureLabWorks.Post

10 DOCUMENTS   **1** INDEXES

Documents   Aggregations   Schema   Indexes   Validation

Filter   🕐 ▼   Type a query: { field: 'value' }   Explain   Reset   **Find**   ⟨/⟩   Options ▶

⊕ ADD DATA ▼   ⬚ EXPORT DATA ▼   1 – 10 of 10 ⟳ ‹ › ☰ {} ⊞

```
    _id: 1
    content: "Hello world!"
    postDate: "2023-09-26T11:00:00.000+00:00"
  ▾ userIdlikeId: Object
      1: 1
      3: 5
      11: 7
  ▾ userIdcommentIds: Object
    ▾ 1: Array (1)
        0: 1
    ▾ 3: Array (1)
        0: 5
    ▾ 11: Array (1)
        0: 7
```

Comment

Изменения: удалены поля postId, userId.

```json
{
  "_id": 1,
  "content": "Lorem ipsum!",
  "commentDate": "2023-09-26T11:00:00.000+00:00"
},
{
  "_id": 2,
  "content": "Dolor sit amet!",
  "commentDate": "2023-09-26T11:15:00.000+00:00"
},
{
  "_id": 3,
  "content": "Consectetur adipiscing elit!",
  "commentDate": "2023-09-26T11:30:00.000+00:00"
},
{
  "_id": 4,
  "content": "Sed do eiusmod tempor incididunt!",
  "commentDate": "2023-09-26T11:45:00.000+00:00"
},
{
  "_id": 5,
  "content": "Ut labore et dolore magna aliqua!",
  "commentDate": "2023-09-26T12:00:00.000+00:00"
},
{
  "_id": 6,
  "content": "Ut enim ad minim veniam!",
  "commentDate": "2023-09-26T12:15:00.000+00:00"
},
{
  "_id": 7,
  "content": "Quis nostrud exercitation ullamco laboris!",
  "commentDate": "2023-09-26T12:30:00.000+00:00"
},
{
  "_id": 8,
  "content": "Nisi ut aliquip ex ea commodo consequat!",
  "commentDate": "2023-09-26T12:45:00.000+00:00"
```

DatabaseArchitectureLabWorks.Comment

10 DOCUMENTS   1 INDEXES

Documents   Aggregations   Schema   Indexes   Validation

Filter   🕐 ▾   Type a query: { field: 'value' }   Explain   Reset   Find   ‹›   Options ▸

⊕ ADD DATA ▾   ⬈ EXPORT DATA ▾   1 – 10 of 10   ↻   ‹ ›   ☰ {} ⊞

```
_id: 1
content: "Lorem ipsum!"
commentDate: "2023-09-26T11:00:00.000+00:00"
```

```
_id: 2
content: "Dolor sit amet!"
commentDate: "2023-09-26T11:15:00.000+00:00"
```

Like

Изменения: удалены поля postId, userId.

```
 1  ⊟[
 2    ⊟  {
 3          "_id": 1,
 4          "likeDate": "2023-09-26T11:00:00.000+00:00"
 5       },
 6    ⊟  {
 7          "_id": 2,
 8          "likeDate": "2023-09-26T11:15:00.000+00:00"
 9       },
10    ⊟  {
11          "_id": 3,
12          "likeDate": "2023-09-26T11:30:00.000+00:00"
13       },
14    ⊟  {
15          "_id": 4,
16          "likeDate": "2023-09-26T11:45:00.000+00:00"
17       },
18    ⊟  {
19          "_id": 5,
20          "likeDate": "2023-09-26T12:00:00.000+00:00"
21       },
22    ⊟  {
23          "_id": 6,
24          "likeDate": "2023-09-26T12:15:00.000+00:00"
25       },
26    ⊟  {
27          "_id": 7,
28          "likeDate": "2023-09-26T12:30:00.000+00:00"
29       },
30    ⊟  {
31          "_id": 8,
32          "likeDate": "2023-09-26T12:45:00.000+00:00"
33       },
34    ⊟  {
35          "_id": 9,
36          "likeDate": "2023-09-26T13:00:00.000+00:00"
37       },
38    ⊟  {
39          "_id": 10,
40          "likeDate": "2023-09-26T13:15:00.000+00:00"
```

DatabaseArchitectureLabWorks.Like

10 DOCUMENTS   **1** INDEXES

Documents Aggregations Schema Indexes Validation

Filter   🕐 ▾   Type a query: { field: 'value' }   Explain Reset **Find** ‹/› Options ▸

⊕ ADD DATA ▾   ⬈ EXPORT DATA ▾   1 – 10 of 10 ⟳ ‹ ›

```
_id: 1
likeDate: "2023-09-26T11:00:00.000+00:00"
```

Friendship

Изменения: friendId типа integer заменён на friendIds с типом Array.

```
 1  [
 2      {
 3          "_id": 1,
 4          "userId": 1,
 5          "friendIds": [1, 2, 3]
 6      },
 7      {
 8          "_id": 2,
 9          "userId": 2,
10          "friendIds": [2, 3, 4]
11      },
12      {
13          "_id": 3,
14          "userId": 3,
15          "friendIds": [3, 4, 5]
16      },
17      {
18          "_id": 4,
19          "userId": 4,
20          "friendIds": [4, 5, 6]
21      },
22      {
23          "_id": 5,
24          "userId": 5,
25          "friendIds": [5, 6, 7]
26      },
27      {
28          "_id": 6,
29          "userId": 6,
30          "friendIds": [6, 7, 8]
31      },
32      {
33          "_id": 7,
34          "userId": 7,
35          "friendIds": [7, 8, 9]
36      },
37      {
38          "_id": 8,
39          "userId": 8,
40          "friendIds": [8, 9, 10]
```

DatabaseArchitectureLabWorks.Friendship

16 DOCUMENTS   1 INDEXES

Documents   Aggregations   Schema   Indexes   Validation

Filter 🔗 🕐 ▾   Type a query: { field: 'value' }   Explain   Reset   Find   ‹/›   Options ▸

⊕ ADD DATA ▾   ☑ EXPORT DATA ▾   1 – 16 of 16 ⟳ ‹ ›

```
_id: 1
userId: 1
▾ friendIds: Array (3)
    0: 1
    1: 2
    2: 3
```

Создание Index

Create Index ✕

DatabaseArchitectureLabWorks.User

Index fields

| lastLoginDate ▼ | -1 (desc) ▼ | ➕ ➖ |
| registrationDate ▼ | -1 (desc) ▼ | ➕ ➖ |

∨ Options

☐ **Create unique index**
A unique index ensures that the indexed fields do not store duplicate values; i.e. enforces uniqueness for the indexed fields.

☑ **Index name**
Enter the name of the index to create, or leave blank to have MongoDB create a default name for the index.

| UserDates | *Optional* |

☐ **Create TTL**
TTL indexes are special single-field indexes that MongoDB can use to

[Cancel] [**Create Index**]

DatabaseArchitectureLabWorks.User

16 DOCUMENTS **1** INDEXES

Documents   Aggregations   Schema   **Indexes**   Validation

[Create Index]   [⟳ Refresh]

VIEWING **INDEXES** SEARCH INDEXES

Name and Definition ⇅	Type ⇅	Size ⇅	Usage ⇅	Properties ⇅
∨ UserDates	REGULAR ⓘ	20.5 KB	0 (since Sun Nov 19 2023)	COMPOUND ⓘ
lastLoginDate ↓ registrationDate ↓				
› _id_	REGULAR ⓘ	20.5 KB	5 (since Sun Nov 19 2023)	UNIQUE ⓘ

Создание View

DatabaseArchitectureLabWorks.User

16 DOCUMENTS   1 INDEXES

Documents   **Aggregations**   Schema   Indexes   Validation

Pipeline $lookup $project   Explain   Export   Run   More Options

Untitled – modified   SAVE   + CREATE NEW   EXPORT TO LANGUAGE   PREVIEW   {} STAGES   TEXT

```
1  [
2    {
3      $lookup: {
4        from: "Friendship",
5        localField: "_id",
6        foreignField: "userId",
7        as: "friendship"
8      }
9    },
10   {
11     $project: {
12       _id: 1,
13       registrationDate: 1,
14       friendshipCount: { $size: { $first: "$friendship.friendIds" }}
15     }
16   }
17 ]
```

PIPELINE OUTPUT
Sample of 10 documents

OUTPUT OPTIONS

```
_id: 1
registrationDate: "2023-09-26T11:00:00.000+00:00"
friendshipCount: 3
```

```
_id: 2
registrationDate: "2023-09-26T11:15:00.000+00:00"
friendshipCount: 3
```

```
_id: 3
registrationDate: "2023-09-26T11:30:00.000+00:00"
friendshipCount: 3
```

```
_id: 4
registrationDate: "2023-09-26T11:45:00.000+00:00"
friendshipCount: 3
```

- DatabaseArchitectureLabWo...
  - Comment
  - Conversation
  - Friendship
  - Group
  - Like
  - Message
  - Post
 - User
  - **UserFriendsCount**
- admin
- config
- local

Filter   Type a query: { field: 'value' }   Explain   Reset   Find   Options

EXPORT DATA   1 – 16 of 16

```
_id: 1
registrationDate: "2023-09-26T11:00:00.000+00:00"
friendshipCount: 3
```

```
_id: 2
registrationDate: "2023-09-26T11:15:00.000+00:00"
friendshipCount: 3
```

```
_id: 3
registrationDate: "2023-09-26T11:30:00.000+00:00"
friendshipCount: 3
```

```
_id: 4
registrationDate: "2023-09-26T11:45:00.000+00:00"
friendshipCount: 3
```

```
_id: 5
registrationDate: "2023-09-26T12:00:00.000+00:00"
friendshipCount: 3
```