

Министерство науки и высшего образования Российской Федерации
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО
ОБРАЗОВАНИЯ

**«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ ИТМО»**

ФАКУЛЬТЕТ СРЕДНЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ

**ОТЧЕТ
О ЛАБОРАТОРНОЙ РАБОТЕ № 7**

По теме: MongoDB

По дисциплине: Основы проектирования баз данных

Специальность 09.02.07 «Информационные системы и программирование»

Дисциплина «Технологии разработки и защиты баз данных»

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Санкт-Петербург
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Цель работы: овладеть практическими навыками и умениями реализации баз данных в MongoDB.

Задание:

1. Попытаться уменьшить размер модели реляционной базы данных, с которой Вы работали.
2. Реализовать Вашу модель в MongoDB.
3. Заполнить модель данными, настолько, чтобы все запросы реализуемые Вами в пункте 4 выдавали непустые строки.
4. Реализовать минимум 40% Ваших запросов, сделанных в работе по реляционным базам данных в MongoDB.

Ниже представлены логи процесса реализации модели в MongoDB

```
> use Library;
>
>
> db.createCollection("book_instance");
>
> db.book_instance.insert(
...   {
...     "Libr_id": 1,
...     "Status_book": true,
...     "book": {
...       "name": "Prestiplenie i nakazanie",
...       "date_edition": new Date(1934, 1, 4, 6, 12),
...       "authors": "Dostoevskiy",
...       "count_instance": 6,
...       "id_book": 1
...     },
...     "Tabel_num": 1
...   }
... );
>
>
WriteResult({ "nInserted" : 1 })
>
> db.book_instance.insert(
...   {
...     "Libr_id": 2,
...     "Status_book": false,
...     "book": {
...       "name": "Voyna i mur",
```

```

...     "date_edition": new Date(1732, 14, 11, 6, 12),
...     "authors": "Lev Tolstoy",
...     "count_instance": 3,
...     "id_book": 2
...   },
...   "Tabel_num": 3
... }
... );
>
>
WriteResult({ "nInserted" : 1 })
> db.book_instance.insert(
...   {
...     "Libr_id": 3,
...     "Status_book": false,
...     "book": {
...       "name": "Vishneviy sad",
...       "date_edition": new Date(1912, 8, 3, 6, 12),
...       "authors": "Chehov",
...       "count_instance": 8,
...       "id_book": 7
...     },
...     "Tabel_num": 6
...   }
... );
>
>
WriteResult({ "nInserted" : 1 })
> db.book_instance.insert(
...   {
...     "Libr_id": 4,
...     "Status_book": true,
...     "book": {
...       "name": "Vishneviy sad",
...       "date_edition": new Date(1912, 8, 3, 6, 12),
...       "authors": "Chehov",
...       "count_instance": 8,
...       "id_book": 7
...     },
...     "Tabel_num": 4
...   }
... );
>
>
WriteResult({ "nInserted" : 1 })
>

```

```

>
> db.createCollection("readers");
>
>
> db.readers.insert(
...   {
...     "number_passport": 400052525,
...     "number_ticket": 1,
...     "fio": "Dominic Mussalyamov",
...     "address": "Olgino",
...     "numper_phone": 8963143244,
...     "date_birth": new Date(2001, 8, 8, 6, 12),
...     "education": "Srednee",
...   }
... );
WriteResult({ "nInserted" : 1 })
> db.readers.insert(
...   {
...     "number_passport": 40963666,
...     "number_ticket": 2,
...     "fio": "Kirill Romanov",
...     "address": "Leninsliy",
...     "numper_phone": 89535763521,
...     "date_birth": new Date(2001, 03, 8, 6, 12),
...     "education": "Srednee",
...   }
... );
> db.get_book.insert(
...   {
...     book_instance: "5f85b8fc86e275a58572f61b",
...     readers: "5f85be4f86e275a58572f61e",
...     "date_get": new Date('2018-12-26'),
...     "date_back": new Date('2019-01-30'),
...     "sum": 100
...   }
... );
> db.get_book.insert(
...   {
...     book_instance: ObjectId("5f85b8fc86e275a58572f61b"),
...     readers: ObjectId("5f85b8fc86e275a58572f61b"),
...     "date_get": new Date('2018-11-05'),
...     "date_back": new Date('2018-12-30'),
...     "sum": 30
...   }
... )
> db.get_book.insert(

```

```

...     {
...         book_instance: "5f85b8fc86e275a58572f61b",
...         readers: "5f85b8fc86e275a58572f61b",
...         "date_get": new Date('2018-11-05'),
...         "date_back": new Date('2018-12-30'),
...         "sum": 30
...     }
... );
WriteResult({ "nInserted" : 1 })
> db.readers.insert(
...     {
...         "number_passport": 4083525,
...         "number_ticket": 3,
...         "fio": "Ilay Karpenko",
...         "address": "Petroga",
...         "numper_phone": 89535763556,
...         "date_birth": new Date(2001, 05, 12, 6, 12),
...         "education": "Srednee",
...     }
... );
@(shell):3:15
> db.readHall.insert(
...     {
...         "datetime_open": new Date('2019-01-12 09:00:00'),
...         "datetime_open": new Date('2019-01-12 21:00:00')
...     }
... )
WriteResult({ "nInserted" : 1 })
> db.readHall.insert(
...     {
...         "datetime_open": new Date('2019-01-13 09:00:00'),
...         "datetime_open": new Date('2019-01-13 21:00:00')
...     }
... );
WriteResult({ "nInserted" : 1 })
> db.readHall.insert(
...     {
...         "datetime_open": new Date('2019-01-14 12:00:00'),
...         "datetime_open": new Date('2019-01-14 18:00:00')
...     }
... );
WriteResult({ "nInserted" : 1 })
> db.createCollection("recording");
{"ok" : 1 }
> db.recording.insert(
...     {

```

```

...     readers: ObjectId("5f85be0e86e275a58572f61d"),
...     readHall: ObjectId("5f85e1d486e275a58572f625"),
...     "datetime_open": new Date('2019-01-14 12:00:00'),
...     "datetime_closed": new Date('2019-01-14 18:00:00')
...   }
... );
WriteResult({ "nInserted" : 1 })
> db.recording.insert(
...   {
...     readers: ObjectId("5f85be4f86e275a58572f61e"),
...     readHall: ObjectId("5f85e21086e275a58572f627"),
...     "datetime_open": new Date('2019-01-16 09:00:00'),
...     "datetime_closed": new Date('2019-01-18 18:00:00')
...   }
... )
WriteResult({ "nInserted" : 1 })

> db.Librar.insert(
...   {
...     "address": "Petroga",
...     readHall: ObjectId("5f85e21086e275a58572f627"),
...     "datetime_open": new Date('2019-01-16 09:00:00'),
...     "datetime_closed": new Date('2019-01-18 18:00:00'),
...     "Librarian": {
...       _id: 1,
...       "fio": "Alexandra Dadaria",
...       "graphic_work": "5/7",
...       "numper_phone": 9893475893,
...       "number_passport": 40023414,
...       "date_birth": new Date(1994-04-15),
...       "education": "Srednee"
...     }
...   }
... )
WriteResult({ "nInserted" : 1 })
> db.Librar.insert(
...   {
...     "address": "Petroga",
...     readHall: ObjectId("5f85e1f886e275a58572f626"),
...     "datetime_open": new Date('2019-01-17 12:00:00'),
...     "datetime_closed": new Date('2019-01-19 21:00:00'),
...     "Librarian": {
...       _id: 2,
...       "fio": "Chesnokova Irina",
...       "graphic_work": "3/7",
...       "numper_phone": 98934758743,

```

```

...         "number_passport": 400123324,
...         "date_birth": new Date(1992-10-03),
...         "education": "Srednee"
...     }
... }
... );
WriteResult({ "nInserted" : 1 })
> db.Librar.insert(
... {
...     "address": "Olgino",
...     readHall: ObjectId("5f85e1d486e275a58572f625"),
...     "datetime_open": new Date('2019-12-01 9:00:00'),
...     "datetime_closed": new Date('2020-01-19 21:00:00'),
...     "Librarian": {
...         _id: 3,
...         "fio": "Vera Brejneva",
...         "graphic_work": "1/7",
...         "numper_phone": 98938677743,
...         "number_passport": 405784324,
...         "date_birth": new Date(1967-04-15),
...         "education": "Srednee"
...     }
... }
... );
WriteResult({ "nInserted" : 1 })
> db.createCollection("registration");
{ "ok" : 1 }
> db.registration.insert(
... {
...     Librar: ObjectId("5f85e75a86e275a58572f62b"),
...     readers: ObjectId("5f85be0e86e275a58572f61d"),
...     "datetime_open": new Date('2019-12-01 9:00:00'),
...     "datetime_closed": new Date('2020-01-19 21:00:00')
... }
... );
WriteResult({ "nInserted" : 1 })
> db.registration.insert(
... {
...     Librar: ObjectId("5f85e75a86e275a58572f62b"),
...     readers: ObjectId("5f85bea886e275a58572f61f"),
...     "datetime_open": new Date('2020-01-16 9:00:00'),
...     "datetime_closed": new Date('2020-03-19 21:00:00')
... }
... );
WriteResult({ "nInserted" : 1 })
> db.registration.insert(

```

```

...    {
...      Librar: ObjectId("5f85e75a86e275a58572f62b"),
...      readers: ObjectId("5f85be4f86e275a58572f61e"),
...      "datetime_open": new Date('2020-01-09 9:00:00'),
...      "datetime_closed": new Date('2020-02-30 21:00:00')
...    }
... );
WriteResult({ "nInserted" : 1 })
> db.registration.insert(
...    {
...      Librar: ObjectId("5f85e7f786e275a58572f62c"),
...      readers: ObjectId("5f85be4f86e275a58572f61e"),
...      "datetime_open": new Date('2020-02-01 9:00:00'),
...      "datetime_closed": new Date('2020-02-30 21:00:00')
...    }
... );
WriteResult({ "nInserted" : 1 })
> db.registration.insert(
...    {
...      Librar: ObjectId("5f85e7f786e275a58572f62c"),
...      readers: ObjectId("5f85be0e86e275a58572f61d"),
...      "datetime_open": new Date('2020-04-14 9:00:00'),
...      "datetime_closed": new Date('2020-05-01 21:00:00')
...    }
... );
WriteResult({ "nInserted" : 1 })

////////////////////////////////////
.....
.....
////////////////////////////////////

Запросы:
>
> db.get_book.find({sum: {$gt: 30, $lt: 200}}).sort({$natural: -1});
> db.book_instance.find({"book.count_instance": {$gt: 3}}, {_id: 0}).limit(2)
> db.Librar.find({"Librarian.education": {$exists: ["Srednee", "Vishee"]}}).sort({"Librarian._id": 1});
> db.registration.find({readers: ObjectId("5f85be4f86e275a58572f61e")}).limit(2);

```

Запросы к модели базы данных в MongoDB:

Вывод записей, у которых читатели выплатили сумму штрафа не более чем 200р и не менее, чем 30 упорядоченное по убыванию:

```
> db.get_book.find({sum: {$gt: 30, $lt: 200}}).sort({$natural: -1});
```



```
WriteResult({ "nInserted" : 1 })
> db.get_book.find({sum: {$gt: 30, $lt: 200}}).sort({$natural: -1});
{ "_id" : ObjectId("5f85db8386e275a58572f622"), "book_instance" : "5f85b8fc86e275a58572f61b", "readers" : "5f85be4f86e275a58572f61e", "date_get" : ISODate("2018-12-26T00:00:00Z"), "date_back" : ISODate("2019-01-30T00:00:00Z"), "sum" : 50 }
{ "_id" : ObjectId("5f85d9f386e275a58572f621"), "id_book" : "5f85b8fc86e275a58572f61b", "id_reader" : "5f85be4f86e275a58572f61e", "date_get" : ISODate("2018-12-26T00:00:00Z"), "date_back" : ISODate("2019-01-30T00:00:00Z"), "sum" : 80 }
>
```

Вывод информации о книгах, у которых количество экземпляров больше 3. С исключением идентификатора и ограничением 2 записями:

```
> db.Librar.find({"Librarian.education": {$exists: ["Srednee", "Vishee"]}).sort({"Librarian._id": 1});
```

```
> db.book_instance.find({"book.count_instance": {$gt: 3}), {"_id": 0}).limit(2);
{ "Libr_id" : 1, "Status_book" : true, "book" : { "name" : "Prestiplenie i nakazanie", "date_edition" : ISODate("1934-02-04T03:12:00Z"), "authors" : "Dostoevskiy", "count_instance" : 6, "id_book" : 1 }, "Tabel_num" : 1 }
{ "Libr_id" : 3, "Status_book" : false, "book" : { "name" : "Vishneviy sad", "date_edition" : ISODate("1912-09-03T03:12:00Z"), "authors" : "Chehov", "count_instance" : 8, "id_book" : 7 }, "Tabel_num" : 6 }
>
```

Вывод информации о библиотеках, у работников, которых образование либо Среднее, либо Высшее, отсортированное по возрастанию идентификатора работников библиотеки

```
> db.Librar.find({"Librarian.education": {$exists: ["Srednee", "Vishee"]}).sort({"Librarian._id": 1});
```

```
> db.Librar.find({"Librarian.education": {$exists: ["Srednee", "Vishee"]}).sort({"Librarian._id": 1});
{ "_id" : ObjectId("5f85e6c386e275a58572f62a"), "address" : "Petroga", "readHall" : ObjectId("5f85e21086e275a58572f627"), "datetime_open" : ISODate("2019-01-16T06:00:00Z"), "datetime_closed" : ISODate("2019-01-18T15:00:00Z"), "Librarian" : { "_id" : 1, "fio" : "Alexandra Dadari", "graphic_work" : "5/7", "numper_phone" : 9893475893, "number_passport" : 40023414, "date_birth" : ISODate("1970-01-01T00:00:01.975Z"), "education" : "Srednee" } }
{ "_id" : ObjectId("5f85e75a86e275a58572f62b"), "address" : "Petroga", "readHall" : ObjectId("5f85e1f886e275a58572f626"), "datetime_open" : ISODate("2019-01-17T09:00:00Z"), "datetime_closed" : ISODate("2019-01-19T18:00:00Z"), "Librarian" : { "_id" : 2, "fio" : "Chesnokova Irina", "graphic_work" : "3/7", "numper_phone" : 98934758743, "number_passport" : 400123324, "date_birth" : ISODate("1970-01-01T00:00:01.979Z"), "education" : "Vishee" } }
{ "_id" : ObjectId("5f85e7f786e275a58572f62c"), "address" : "Olgino", "readHall" : ObjectId("5f85e1d486e275a58572f625"), "datetime_open" : ISODate("2019-12-01T06:00:00Z"), "datetime_closed" : ISODate("2020-01-19T18:00:00Z"), "Librarian" : { "_id" : 3, "fio" : "Vera Brejneva", "graphic_work" : "1/7", "numper_phone" : 98938677743, "number_passport" : 405784324, "date_birth" : ISODate("1970-01-01T00:00:01.948Z"), "education" : "Srednee" } }
>
```

Вывод информации о проделанных записях читателя с уникальным идентификатором, ограниченными 2 записями

```
> db.registration.find({readers: ObjectId("5f85be4f86e275a58572f61e"})).limit(2);
```

```
> db.registration.find({readers: ObjectId("5f85be4f86e275a58572f61e"})).limit(2);
{ "_id" : ObjectId("5f85e92386e275a58572f62f"), "Librar" : ObjectId("5f85e75a86e275a58572f62b"), "readers" : ObjectId("5f85be4f86e275a58572f61e"), "datetime_open" : ISODate("2020-01-09T06:00:00Z"), "datetime_closed" : ISODate("1970-01-01T00:00:00Z") }
{ "_id" : ObjectId("5f85e95c86e275a58572f630"), "Librar" : ObjectId("5f85e7f786e275a58572f62c"), "readers" : ObjectId("5f85be4f86e275a58572f61e"), "datetime_open" : ISODate("2020-02-01T06:00:00Z"), "datetime_closed" : ISODate("1970-01-01T00:00:00Z") }
>
```

```
> db.readers.aggregate(
```

```

... [
...   {$lookup:{
...     from: "get_book",
...     localField: "_id",
...     foreignField: "readers",
...     as:"get_book"
...   }}
... ]
... ).pretty();
@(shell):5:7
> db.readers.aggregate(
...   [
...     {$lookup:{
...       from: "get_book",
...       localField: "_id",
...       foreignField: "readers",
...       as:"get_book"
...     }}
...   ]
[... ).pretty();
{
  "_id" : ObjectId("5f8846a1fea0ca8f3d58645f"),
  "number_passport" : 400052525,
  "number_ticket" : 1,
  "fio" : "Dominic Mussalyamov",
  "address" : "Olgino",
  "numper_phone" : 8963143244,
  "date_birth" : ISODate("2001-09-08T02:12:00Z"),
  "education" : "Srednee",
  "get_book" : [ ]
}
{
  "_id" : ObjectId("5f8846a7fea0ca8f3d586460"),
  "number_passport" : 40963666,
  "number_ticket" : 2,
  "fio" : "Kirill Romanov",
  "address" : "Leninsliy",
  "numper_phone" : 89535763521,
  "date_birth" : ISODate("2001-04-08T02:12:00Z"),
  "education" : "Srednee",
  "get_book" : [ ]
}
{
  "_id" : ObjectId("5f884705fea0ca8f3d586464"),
  "number_passport" : 4083525,
  "number_ticket" : 3,
  "fio" : "Ilay Karpenko",
  "address" : "Petroga",
  "numper_phone" : 89535763556,
  "date_birth" : ISODate("2001-06-12T02:12:00Z"),
  "education" : "Srednee",
  "get_book" : [ ]
}
>

```

```

> db.get_book.aggregate([

```

```
{ $group: { _id: "get_books", total_sum: { $sum: "$sum" } } },  
  { $match: { sum: { $gt: 30, $lt: 200 } } }  
]  
);
```

Вывод: в ходе выполнения лабораторной работы были освоены практические навыки реализации баз данных в MongoDB.