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федеральное государственное автономное образовательное учреждение
высшего образования
«САНКТ-ПЕТЕРБУРГСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ ИТМО»
Факультет среднего профессионального образования

ОТЧЁТ
ПО ПРАКТИЧЕСКОЙ РАБОТЕ № 7
по теме: Знакомство с MongoDB
по дисциплине: Основы проектирования баз данных

Специальность 09.02.07 Информационные системы и программирование

Проверил:
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Дата: «_____» _____ 2020г.
Оценка _____

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Санкт-Петербург 2020

ЦЕЛЬ РАБОТЫ

Цель практической работы №7: овладеть практическими навыками и умениями реализации баз данных в MongoDB.

ЗАДАНИЕ

Для выполнения работы Вам потребуется:

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

ВЫПОЛНЕНИЕ

1) Схема физической модели БД, спроектированной с использованием CA Erwin Data Modeler представлена на рисунке №1.

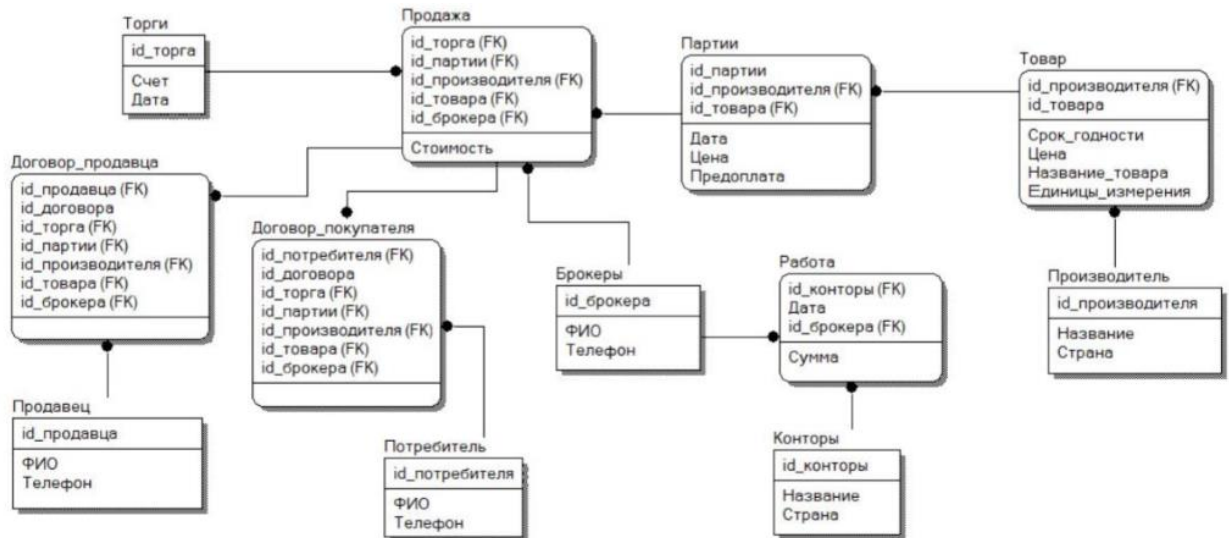


Рисунок 1 Модель базы данных

2) Логи реализации модели:

> use database;

switched to db dataabse

> db.createCollection('office');

{ "ok" : 1 }

> db.office.insert({name: 'ForexClub', country: 'USA'});

WriteResult({ "nInserted" : 1 })

> db.office.insert({name: 'FxPro', country: 'Sweden'});

WriteResult({ "nInserted" : 1 })

> db.office.insert({name: 'GlobalFX', country: 'Norway'});

WriteResult({ "nInserted" : 1 })

> db.office.insert({name: 'Fibo Group', country: 'Canada'});

WriteResult({ "nInserted" : 1 })

```

> db.office.insert({ name: 'Finam', country: 'USA'});
WriteResult({ "nInserted" : 1 })
> db.office.insert({ name: 'Nord FX', country: 'Sweden'});
WriteResult({ "nInserted" : 1 })
> db.office.insert({ name: 'XM', country: 'USA'});
WriteResult({ "nInserted" : 1 })
> db.office.insert({ name: 'FBS', country: 'China'});
WriteResult({ "nInserted" : 1 })

> db.createCollection('broker');
{ "ok" : 1 }

> db.broker.insert({ name: 'Adam Stenton', phoneNumber: '+7(921)123-12-12',
officeID: '5f9684ead98438480629bc2a'});
WriteResult({ "nInserted" : 1 })

> db.broker.insert({ name: 'Anna Stenton', phoneNumber: '+7(921)456-34-23',
officeID: '5f9684ead98438480629bc2c'});
WriteResult({ "nInserted" : 1 })

> db.broker.insert({ name: 'Harry Potter', phoneNumber: '+7(921)789-56-34',
officeID: '5f9684ead98438480629bc2b'});
WriteResult({ "nInserted" : 1 })

> db.broker.insert({ name: 'Donald Trump', phoneNumber: '+7(921)012-78-45',
officeID: '5f9684ead98438480629bc2d'});
WriteResult({ "nInserted" : 1 })

> db.broker.insert({ name: 'Vladimir Putin', phoneNumber: '+7(921)345-90-56',
officeID: '5f9684ead98438480629bc2e'});
WriteResult({ "nInserted" : 1 })

> db.broker.insert({ name: 'Loxozavr', phoneNumber: '+7(921)678-12-67',
officeID: '5f9684ead98438480629bc2b'});
WriteResult({ "nInserted" : 1 })

```

```
> db.broker.insert({name: 'Prosto zavr', phoneNumber: '+7(921)901-34-78',  
officeID: '5f9684ead98438480629bc2f'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.broker.insert({name: 'Pushok Tushokovich', phoneNumber: '+7(921)234-56-  
89', officeID: '5f9684ead98438480629bc30'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.broker.insert({name: 'Abba Cadabra', phoneNumber: '+7(921)567-78-90',  
officeID: '5f9684ebd98438480629bc31'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.createCollection('auction');
```

```
{ "ok" : 1 }
```

```
> db.auction.insert({date: new Date('2020-10-02'), managerResponse: true, sales:  
['5f9692abd98438480629bc99', '5f9692abd98438480629bc9a']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.auction.insert({date: new Date('2020-07-12'), managerResponse: false, sales:  
['5f9692abd98438480629bc9b', '5f9692abd98438480629bc9c']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.auction.insert({date: new Date('2021-11-02'), managerResponse: true, sales:  
['5f9692abd98438480629bc9d', '5f9692abd98438480629bc9e',  
'5f9692abd98438480629bc9f']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.auction.insert({date: new Date('2019-05-01'), managerResponse: false, sales:  
['5f9692aed98438480629bca0']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.auction.insert({date: new Date('2021-12-12'), managerResponse: true, sales:  
['5f9692abd98438480629bc99', '5f9692abd98438480629bc9a']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.auction.insert({date: new Date('2020-11-10'), managerResponse: false, sales:  
['5f9692abd98438480629bc9b']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.auction.insert({date: new Date('2020-02-25'), managerResponse: true, sales:
['5f9692abd98438480629bc9c', '5f9692abd98438480629bc9d',
'5f9692abd98438480629bc9e']});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.createCollection('consignment');
```

```
{ "ok" : 1 }
```

```
> db.consignment.insert({prepayment: true, status: 'In stock', brokerID:
'5f9688e3d98438480629bc32', products: [{productID:
'5f968972d98438480629bc54', amount: 25}, {productID:
'5f968972d98438480629bc55', amount: 40}, {productID:
'5f968972d98438480629bc56', amount: 40}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: false, status: 'Sold', brokerID:
'5f9688e3d98438480629bc33', products: [{productID:
'5f968972d98438480629bc55', amount: 30}, {productID:
'5f968972d98438480629bc56', amount: 150}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: true, status: 'In stock', brokerID:
'5f9688e3d98438480629bc34', products: [{productID:
'5f968972d98438480629bc56', amount: 15}, {productID:
'5f968972d98438480629bc57', amount: 50}, {productID:
'5f968972d98438480629bc5a', amount: 10}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: false, status: 'Sold', brokerID:
'5f9688e3d98438480629bc35', products: [{productID:
'5f968972d98438480629bc57', amount: 50}, {productID:
'5f968972d98438480629bc58', amount: 10}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: false, status: 'Sold', brokerID:
'5f9688e3d98438480629bc36', products: [{productID:
'5f968972d98438480629bc58', amount: 100}, {productID:
'5f968972d98438480629bc59', amount: 60}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: true, status: 'In stock', brokerID:
'5f9688e3d98438480629bc37', products: [{productID:
'5f968972d98438480629bc59', amount: 40}, {productID:
'5f968972d98438480629bc5a', amount: 40}, {productID:
'5f968972d98438480629bc56', amount: 150}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: false, status: 'Sold', brokerID:
'5f9688e3d98438480629bc38', products: [{productID:
'5f968972d98438480629bc5a', amount: 70}, {productID:
'5f968974d98438480629bc5b', amount: 90}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.consignment.insert({prepayment: true, status: 'Sold', brokerID:
'5f9688e3d98438480629bc39', products: [{productID:
'5f968974d98438480629bc5b', amount: 65}, {productID:
'5f968972d98438480629bc54', amount: 100}, {productID:
'5f968972d98438480629bc55', amount: 50}]});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.createCollection('company');
```

```
{ "ok" : 1 }
```

```
> db.company.insert({name: 'Samsung', country: 'China'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.company.insert({name: 'Apple', country: 'USA'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.company.insert({name: 'Huawei', country: 'China'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.company.insert({name: 'Yandex', country: 'Russia'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.company.insert({name: 'Google', country: 'USA'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.company.insert({name: 'Microsoft', country: 'USA'});
```

```
WriteResult({ "nInserted" : 1 })
```



```

> db.company.insert({name: 'Sony', country: 'Japan'});
WriteResult({ "nInserted" : 1 })
> db.company.insert({name: 'Amazon', country: 'USA'});
WriteResult({ "nInserted" : 1 })

> db.createCollection('product');
{ "ok" : 1 }

> db.product.insert({name: 'Share', productionDate: new Date('2020-10-02'),
expirationDate: new Date('2020-12-02'), measure: 'Dollar', companyID:
'5f96890ad98438480629bc42', price: 100});
WriteResult({ "nInserted" : 1 })

> db.product.insert({name: 'Future', productionDate: new Date('2020-05-11'),
expirationDate: new Date('2020-11-11'), measure: 'Dollar', companyID:
'5f96890ad98438480629bc43', price: 115});
WriteResult({ "nInserted" : 1 })

> db.product.insert({name: 'Bond', productionDate: new Date('2020-07-02'),
expirationDate: new Date('2020-10-02'), measure: 'Rouble', companyID:
'5f96890ad98438480629bc44', price: 95});
WriteResult({ "nInserted" : 1 })

> db.product.insert({name: 'Share', productionDate: new Date('2020-01-30'),
expirationDate: new Date('2020-09-10'), measure: 'Dollar', companyID:
'5f96890ad98438480629bc45', price: 150});
WriteResult({ "nInserted" : 1 })

> db.product.insert({name: 'Future', productionDate: new Date('2020-05-06'),
expirationDate: new Date('2020-11-19'), measure: 'Rouble', companyID:
'5f96890ad98438480629bc46', price: 200});
WriteResult({ "nInserted" : 1 })

> db.product.insert({name: 'Bond', productionDate: new Date('2020-09-01'),
expirationDate: new Date('2020-10-27'), measure: 'Euro', companyID:
'5f96890ad98438480629bc47', price: 210});
WriteResult({ "nInserted" : 1 })

```

```
> db.product.insert({ name: 'Share', productionDate: new Date('2020-10-26'),  
expirationDate: new Date('2020-12-01'), measure: 'Dollar', companyID:  
'5f96890ad98438480629bc48', price: 180});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.product.insert({ name: 'Share', productionDate: new Date('2020-07-30'),  
expirationDate: new Date('2020-09-05'), measure: 'Euro', companyID:  
'5f96890ad98438480629bc47', price: 160});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.createCollection('work');
```

```
{ "ok" : 1 }
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 140, officeID:  
'5f9684ead98438480629bc2a'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 100, officeID:  
'5f9684ead98438480629bc2b'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 200, officeID:  
'5f9684ead98438480629bc2c'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 230, officeID:  
'5f9684ead98438480629bc2d'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 200, officeID:  
'5f9684ead98438480629bc2e'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 160, officeID:  
'5f9684ead98438480629bc2f'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({ data: new Date('2020-10-27'), amount: 155, officeID:  
'5f9684ead98438480629bc30'});
```

```
WriteResult({ "nInserted" : 1 })
```

```
> db.work.insert({data: new Date('2020-10-27'), amount: 160, officeID:
'5f9684ebd98438480629bc31'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 170, officeID:
'5f9684ead98438480629bc2a'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 190, officeID:
'5f9684ead98438480629bc2b'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 250, officeID:
'5f9684ead98438480629bc2c'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 230, officeID:
'5f9684ead98438480629bc2d'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 290, officeID:
'5f9684ead98438480629bc2e'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 140, officeID:
'5f9684ead98438480629bc2f'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 180, officeID:
'5f9684ead98438480629bc30'});
WriteResult({ "nInserted" : 1 })

> db.work.insert({data: new Date('2020-10-28'), amount: 250, officeID:
'5f9684ebd98438480629bc31'});
WriteResult({ "nInserted" : 1 })
```

3) Запросы:

1. Показать всю работу, которая проводилась в определенный промежуток времени

```
db.work.find({data: {$gt: new Date('2020-10-26'), $lt: new Date('2020-10-28')}}), {_id: 0})
```

```
> db.work.find({data: {$gt: new Date('2020-10-26'), $lt: new Date('2020-10-28')}}), {_id: 0})
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 140, "officeID" : "5f9684ead98438480629bc2a" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 100, "officeID" : "5f9684ead98438480629bc2b" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 200, "officeID" : "5f9684ead98438480629bc2c" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 230, "officeID" : "5f9684ead98438480629bc2d" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 200, "officeID" : "5f9684ead98438480629bc2e" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 160, "officeID" : "5f9684ead98438480629bc2f" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 155, "officeID" : "5f9684ead98438480629bc30" }
{ "data" : ISODate("2020-10-27T00:00:00Z"), "amount" : 160, "officeID" : "5f9684ebd98438480629bc31" }
```

2. Вывести все партии, у которых статус "Проданы" и была предоплата

```
db.consignment.find({$and: [{status: 'Sold'}, {prepayment: true}]}, {_id: 0});
```

```
> db.consignment.find({$and: [{status: 'Sold'}, {prepayment: true}]}, {_id: 0}).pretty();
{
  "prepayment" : true,
  "status" : "Sold",
  "brokerID" : "5f9688e3d98438480629bc39",
  "products" : [
    {
      "productID" : "5f968974d98438480629bc5b",
      "amount" : 65
    },
    {
      "productID" : "5f968972d98438480629bc54",
      "amount" : 100
    },
    {
      "productID" : "5f968972d98438480629bc55",
      "amount" : 50
    }
  ]
}
```

3. Для каждого офиса вывести сколько было произведено работы

```
db.work.aggregate([{$group: {_id: "$officeID", "amount": {$sum: "$amount"}}}])
```

```
> db.work.aggregate([{$group: {_id: "$officeID", "amount": {$sum: "$amount"}}}])
{ "_id" : "5f9684ead98438480629bc2e", "amount" : 490 }
{ "_id" : "5f9684ead98438480629bc2c", "amount" : 450 }
{ "_id" : "5f9684ead98438480629bc2d", "amount" : 460 }
{ "_id" : "5f9684ebd98438480629bc31", "amount" : 410 }
{ "_id" : "5f9684ead98438480629bc2a", "amount" : 310 }
{ "_id" : "5f9684ead98438480629bc30", "amount" : 335 }
{ "_id" : "5f9684ead98438480629bc2b", "amount" : 290 }
{ "_id" : "5f9684ead98438480629bc2f", "amount" : 300 }
```

4. Для каждого типа товара вывести самую высокую цену

```
db.product.aggregate([{$group: {_id: "$name", maxPrice: {$max: "$price"}}}])
```

```
> db.product.aggregate([{$group: {_id: "$name", maxPrice: {$max: "$price"}}}])
{ "_id" : "Future", "maxPrice" : 200 }
{ "_id" : "Share", "maxPrice" : 180 }
{ "_id" : "Bond", "maxPrice" : 210 }
```

5. Вывести всех брокеров заданной фирмы

```
db.broker.find({officeID: "5f9684ead98438480629bc2b"}, {_id: 0})
```

```
> db.broker.find({officeID: "5f9684ead98438480629bc2b"}, {_id: 0})
{ "name" : "Harry Potter", "phoneNumber" : "+7(921)789-56-34", "officeID" : "5f9684ead98438480629bc2b" }
{ "name" : "Loxozavr", "phoneNumber" : "+7(921)678-12-67", "officeID" : "5f9684ead98438480629bc2b" }
```

6. Вывести партии, в которых есть хоть один продукт с количеством больше 30

```
db.consignment.find({products: {$elemMatch: {amount: {$gte: 30}}}})
```

```
> db.consignment.find({products: {$elemMatch: {amount: {$gte: 30}}}}, {_id: 0})
{ "prepayment" : true, "status" : "In stock", "brokerID" : "5f9688e3d98438480629bc32", "products" : [ { "productID" : "5f968972d98438480629bc54", "amount" : 25 }, { "productID" : "5f968972d98438480629bc55", "amount" : 40 }, { "productID" : "5f968972d98438480629bc56", "amount" : 40 } ] }
{ "prepayment" : false, "status" : "Sold", "brokerID" : "5f9688e3d98438480629bc33", "products" : [ { "productID" : "5f968972d98438480629bc55", "amount" : 30 }, { "productID" : "5f968972d98438480629bc56", "amount" : 150 } ] }
{ "prepayment" : true, "status" : "In stock", "brokerID" : "5f9688e3d98438480629bc34", "products" : [ { "productID" : "5f968972d98438480629bc56", "amount" : 15 }, { "productID" : "5f968972d98438480629bc57", "amount" : 50 }, { "productID" : "5f968972d98438480629bc5a", "amount" : 10 } ] }
{ "prepayment" : false, "status" : "Sold", "brokerID" : "5f9688e3d98438480629bc35", "products" : [ { "productID" : "5f968972d98438480629bc57", "amount" : 50 }, { "productID" : "5f968972d98438480629bc58", "amount" : 10 } ] }
{ "prepayment" : false, "status" : "Sold", "brokerID" : "5f9688e3d98438480629bc36", "products" : [ { "productID" : "5f968972d98438480629bc58", "amount" : 100 }, { "productID" : "5f968972d98438480629bc59", "amount" : 60 } ] }
{ "prepayment" : true, "status" : "In stock", "brokerID" : "5f9688e3d98438480629bc37", "products" : [ { "productID" : "5f968972d98438480629bc59", "amount" : 40 }, { "productID" : "5f968972d98438480629bc5a", "amount" : 40 }, { "productID" : "5f968972d98438480629bc56", "amount" : 150 } ] }
{ "prepayment" : false, "status" : "Sold", "brokerID" : "5f9688e3d98438480629bc38", "products" : [ { "productID" : "5f968972d98438480629bc5a", "amount" : 70 }, { "productID" : "5f968974d98438480629bc5b", "amount" : 90 } ] }
{ "prepayment" : true, "status" : "Sold", "brokerID" : "5f9688e3d98438480629bc39", "products" : [ { "productID" : "5f968974d98438480629bc5b", "amount" : 65 }, { "productID" : "5f968972d98438480629bc54", "amount" : 100 }, { "productID" : "5f968972d98438480629bc55", "amount" : 50 } ] }
```

ВЫВОД

В лабораторной работе №7 были получены практические навыки создания базы данных в MongoDB, заполнение их рабочими данными и выполнение запросов.