Министерство науки и высшего образования Российской Федерации
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
“НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО”

ФАКУЛЬТЕТ СРЕДНЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ

ОТЧЕТ
ПО ЛАБОРАТОРНОЙ РАБОТЕ № 8
«Знакомство с MongoDB»

Специальность 09.02.07 «Информационные системы и программирование»

Дисциплина «Основы проектирования баз данных»

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1 ИНДИВИДУАЛЬНОЕ ЗАДАНИЕ

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 модель в MongoDB.

3) Заполнить модель данными, чтобы все запросы пункта 4) выдавали непустые строки.

4) Реализовать минимум 40% запросов, сделанных в работе по реляционным базам данных в MongoDB.

Выполнение задания:

1. Новая модель данных:

Коллекция Workers:

работники {

_id работника :

стаж работы :

дата рождения :

номер телефона :

почта сотрудника :

}

Коллекция Animals:

животные {

id животного :

дата рождения :

пол :

имя :

зона обитания : {

_id

название

местоположение

}

вид животного : (млекопитающие, птицы, рептилии)

доп характеристики : {

case птицы

место зимовки

город зимовки

case рептилии

температура тела

длительность спячки

}

массив вольеров : [{id, тип вольера, кол-во животных}, {id, тип вольера, кол-во животных}, {id, тип вольера, кол-во животных}]

рацион []

кормление :[{

[завтрак, _id работника]

[обед, _id работника]

[ужин, _id работника]

дата кормления

}]

аллергии

лечение животного : [{

_id работника (ветеринара)

оценка здоровья

мед. отчет

дата

}]

}

2. Логи процесса реализации модели в MongoDB:

Заполнение коллекции работников:

db.workers.insert({_id : 1, experience : 5, dob : new Date(1997, 4, 1), phone_number : “89213043881”, email : “flar78@gmail.com”})

db.workers.insert({_id : 2, experience : 10, dob : new Date(1995, 3, 4), phone_number : “89348756122”, email : “loghorrean74@yandex.ru”})

db.workers.insert({_id : 3, experience : 7, dob : new Date(1987, 12, 30), phone_number : “89516782394”, email : “litota@gmail.com”})

```
> db.workers.find().pretty()
{
        "_id" : 1,
        "experience" : 5,
        "dob" : ISODate("1997-04-01T21:00:00Z"),
        "phone_number" : "89213043881",
        "email" : "flar78@gmail.com"
}
{
        "_id" : 2,
        "experience" : 10,
        "dob" : ISODate("1995-03-04T21:00:00Z"),
        "phone_number" : "89348756122",
        "email" : "loghorrean74@yandex.ru"
}
{
        "_id" : 3,
        "experience" : 7,
        "dob" : ISODate("1987-12-30T21:00:00Z"),
        "phone_number" : "89516782394",
        "email" : "litota@gmail.com"
}
```

Заполнение коллекции животных:

db.animals.insert({ _id : 1, dob : new Date(2015, 5, 5), gender : "male", name : "Dave", habitat : [{_id : 1, habitat_name : "Farm", habitat_characteristics : "Green land with grass and animals"}], type : "bird", characteristics : {wintering_place : "Russia", wintering_city : "Moscow"}, aviary : [{_id : 1, aviary_type : "summer", animal_number : 1}], ration : ["seeds"], feeding : [{breakfast : {food : "seeds", worker_id : 1}, lunch : {food : "none", worker_id : 1}, dinner : {food : "seeds", worker_id : 1}}], allergics : "none", treatment : [{worker_id : 2, assessment : "normal", report : "Animal is healthy", treatment_date : "none"}], kind_of_animal : “chicken” })

```
"_id" : 1,
"dob" : ISODate("2015-06-04T21:00:00Z"),
"gender" : "male",
"name" : "Dave",
"habitat" : [
        {
                "_id" : 1,
                "habitat_name" : "Farm",
                "habitat_characteristics" : "Green land with grass and animals"
        }
],
"type" : "bird",
"characteristics" : {
        "wintering_place" : "Russia",
        "wintering_city" : "Moscow"
},
"aviary" : [
        {
                "_id" : 1,
                "aviary_type" : "summer",
                "animal_number" : 1
        }
],
"ration" : [
        "seeds"
],
"feeding" : [
        {
                "breakfast" : {
                        "food" : "seeds",
                        "worker_id" : 1
                },
                "lunch" : {
                        "food" : "none",
                        "worker_id" : 1
                },
                "dinner" : {
                        "food" : "seeds",
                        "worker_id" : 1
                }
        }
],
"allergics" : "none",
"treatment" : [
        {
                "worker_id" : 2,
                "assessment" : "normal",
                "report" : "Animal is healthy",
                "treatment_date" : "none"
        }
],
"kind_of_animal" : "chicken"
```


db.animals.insert({ _id : 2, dob : new Date(2016, 7, 5), gender : "male", name : "Peter", habitat : [{_id : 2, habitat_name : "Ocean", habitat_characteristics : “A blue world with fish and sea animals"}], type : "mammals", aviary : [{_id : 2, aviary_type : "winter", animal_number : 3}], ration : ["fish", “meat”], feeding : [{breakfast : {food : [“tuna”, “trout”], worker_id : 1}, lunch : {food : "meat", worker_id : 1}, dinner :

{food : "herring", worker_id : 1}}], allergics : [“pollen”, “flowers”], treatment : [{worker_id : 2, assessment : "within normal", report : "Animal is healthy", treatment_date : "none"}], kind_of_animal : “walrus” })


```
"_id" : 2,
"dob" : ISODate("2016-07-05T21:00:00Z"),
"gender" : "male",
"name" : "Peter",
"habitat" : [
        {
                "_id" : 2,
                "habitat_name" : "Ocean",
                "habitat_characteristics" : "A blue world with fish and sea animals"
        }
],
"type" : "mammal",
"aviary" : [
        {
                "_id" : 2,
                "aviary_type" : "winter",
                "animal_number" : 3
        }
],
"ration" : [
        "fish",
        "meat"
],
"feeding" : [
        {
                "breakfast" : {
                        "food" : [
                                "tuna",
                                "trout"
                        ],
                        "worker_id" : 1
                },
                "lunch" : {
                        "food" : "meat",
                        "worker_id" : 1
                },
                "dinner" : {
                        "food" : "herring",
                        "worker_id" : 1
                }
        }
],
"allergics" : [
        "pollen",
        "flowers"
],
"treatment" : [
        {
                "worker_id" : 2,
                "assessment" : "within normal",
                "report" : "Animal is healthy",
                "treatment_date" : "none"
        }
],
"kind_of_animal" : "walrus"
```

db.animals.insert({ _id : 3, dob : new Date(2019, 10, 8), gender : "female", name : "Arina", habitat : [{_id : 3, habitat_name : "Forest", habitat_characteristics : "A dark place with a lot of trees and predators"}], type : "mammal", aviary : [{_id : 3, aviary_type : "winter", animal_number : 1}], ration : ["meat", “birds”], feeding : [{breakfast : {food : "hare", worker_id : 1}, lunch : {food : "deer", worker_id : 1}, dinner : {food : "hare", worker_id : 1}}], allergics : "none", treatment : [{worker_id : 2, assessment : "within normal", report : "Animal is healthy", treatment_date : "none"}], kind_of_animal : “wolf” })


```
"_id" : 3,
"dob" : ISODate("2019-10-08T21:00:00Z"),
"gender" : "female",
"name" : "Arina",
"habitat" : [
        {
                "_id" : 3,
                "habitat_name" : "Forest",
                "habitat_characteristics" : "A dark place with a lot of trees and predators"
        }
],
"type" : "mammal",
"aviary" : [
        {
                "_id" : 3,
                "aviary_type" : "winter",
                "animal_number" : 1
        }
],
"ration" : [
        "meat",
        "birds"
],
"feeding" : [
        {
                "breakfast" : {
                        "food" : "hare",
                        "worker_id" : 1
                },
                "lunch" : {
                        "food" : "deer",
                        "worker_id" : 1
                },
                "dinner" : {
                        "food" : "hare",
                        "worker_id" : 1
                }
        }
],
"allergics" : "none",
"treatment" : [
        {
                "worker_id" : 2,
                "assessment" : "within normal",
                "report" : "Animal is healthy",
                "treatment_date" : "none"
        }
],
"kind_of_animal" : "wolf"
```


db.animals.insert({ _id : 4, dob : new Date(2015, 3, 18), gender : "male", name : "Griffin", habitat : [{_id : 4, habitat_name : "Desert", habitat_characteristics : "A dry

land with a lot of sand and bugs"}], type : "reptile", characteristics : {body_temperature : 20, hibernation : 120}, aviary : [{_id : 4, aviary_type : "summer", animal_number : 6}], ration : ["invertebrates"], feeding : [{breakfast : {food : "spiders", worker_id : 1}, lunch : {food : "mollusks", worker_id : 1}, dinner : {food : "shrooms", worker_id : 1}}], allergics : "bees, some medicines", treatment : [{worker_id : 2, assessment : "great", report : "Animal is healthy", treatment_date : "none"}], kind_of_animal : “lizard” })


```
"_id" : 4,
"dob" : ISODate("2015-03-18T21:00:00Z"),
"gender" : "male",
"name" : "Griffin",
"habitat" : [
        {
                "_id" : 4,
                "habitat_name" : "Desert",
                "habitat_characteristics" : "A dry land with a lot of sand and bugs"
        }
],
"type" : "reptile",
"characteristics" : {
        "body_temperature" : 20,
        "hibernation" : "120"
},
"aviary" : [
        {
                "_id" : 4,
                "aviary_type" : "summer",
                "animal_number" : 6
        }
],
"ration" : "invertebrates",
"feeding" : [
        {
                "breakfast" : {
                        "food" : "spiders",
                        "worker_id" : 1
                },
                "lunch" : {
                        "food" : "mollusks",
                        "worker_id" : 1
                },
                "dinner" : {
                        "food" : "shrooms",
                        "worker_id" : 1
                }
        }
],
"allergics" : "bees, some medicines",
"treatment" : [
        {
                "worker_id" : 2,
                "assessment" : "great",
                "report" : "Animal is healthy",
                "treatment_date" : "none"
        }
],
"kind_of_animal" : "lizard"
```

db.animals.insert({ _id : 5, dob : new Date(2017, 3, 19), gender : "female", name : "Osoka", habitat : [{_id : 1, habitat_name : "Farm", habitat_characteristics : "Green land with grass and animals"}], type : "mammal", aviary : [{_id : 1, aviary_type : "summer", animal_number : 2}], ration : "hay", feeding : [{breakfast : {food : "hay", worker_id : 1}, lunch : {food : "grass", worker_id : 1}, dinner : {food : "dried grass", worker_id : 1}}], allergics : "none", treatment : [{worker_id : 2, assessment : "low health", report : “required taking medicines for ailments", procedure : “Taking medicines 2 times a day”, treatment_date : new Date(2020, 2, 20)}], kind_of_animal : “rabbit” })


```
"_id" : 5,
"dob" : ISODate("2017-03-19T21:00:00Z"),
"gender" : "female",
"name" : "Osoka",
"habitat" : [
        {
                "_id" : 1,
                "habitat_name" : "Farm",
                "habitat_characteristics" : "Green land with grass and animals"
        }
],
"type" : "mammal",
"aviary" : [
        {
                "_id" : 1,
                "aviary_type" : "summer",
                "animal_number" : 2
        }
],
"ration" : "hay",
"feeding" : [
        {
                "breakfast" : {
                        "food" : "hay",
                        "worker_id" : 1
                },
                "lunch" : {
                        "food" : "grass",
                        "worker_id" : 1
                },
                "dinner" : {
                        "food" : "dried grass",
                        "worker_id" : 1
                }
        }
],
"allergics" : "none",
"treatment" : [
        {
                "worker_id" : 2,
                "assessment" : "low health",
                "report" : "required taking medicines for ailments",
                "procedure" : "Taking medicines 2 times a day",
                "treatment_date" : ISODate("2020-02-20T21:00:00Z")
        }
],
"kind_of_animal" : "rabbit"
```

3. Текст запросов со скриншотами запроса и результата:

Запрос 1: вывести id, вид и дату рождения млекопитающих, родившихся раньше 2016 года:

```
> db.animals.find({dob : {$gt : ISODate("2016-12-31T00:00:00Z")}, type : "mammal"}, {_id : 1, kind_of_animal : 1, dob : 1})
{ "_id" : 3, "dob" : ISODate("2019-10-08T21:00:00Z"), "kind_of_animal" : "wolf" }
{ "_id" : 5, "dob" : ISODate("2017-03-19T21:00:00Z"), "kind_of_animal" : "rabbit" }
```

Запрос 2: вывести id вольера, кол-во животных в нем и id этого животного в случаях, когда в вольере проживает больше одного животного:

```
> db.animals.find({"aviary.animal_number" : {$gt : 1}}, {"aviary._id" : 1, "aviary.animal_number" : 1, "_id" : 1}).sort({"aviary._id" : 1}).pretty()
{ "_id" : 5, "aviary" : [ { "_id" : 1, "animal_number" : 2 } ] }
{ "_id" : 2, "aviary" : [ { "_id" : 2, "animal_number" : 3 } ] }
{ "_id" : 4, "aviary" : [ { "_id" : 4, "animal_number" : 6 } ] }
>
```

Запрос 3: вывести информацию по животным женского пола, родившихся раньше 2015 года:

```
> db.animals.find({gender : "female", dob : {$gt : ISODate("2016-12-31T00:00:00Z")}}, {_id : 1, dob : 1, gender : 1, name : 1, kind_of_animal : 1}).pretty()
{
        "_id" : 3,
        "dob" : ISODate("2019-10-08T21:00:00Z"),
        "gender" : "female",
        "name" : "Arina",
        "kind_of_animal" : "wolf"
}
{
        "_id" : 5,
        "dob" : ISODate("2017-03-19T21:00:00Z"),
        "gender" : "female",
        "name" : "Osoka",
        "kind_of_animal" : "rabbit"
}
```

Запрос 4: вывести id и виж животных, которых хотя бы раз кормил работник зоопарка с id = 1:

```
> db.animals.find({$or : [{"feeding.breakfast.worker_id" : 1}, {"feeding.lunch.worker_id" : 1}, {"feeding.dinner.worker_id" : 1}]}, {_id : 1, kind_of_animal : 1}).pretty()
{ "_id" : 1, "kind_of_animal" : "chicken" }
{ "_id" : 2, "kind_of_animal" : "walrus" }
{ "_id" : 3, "kind_of_animal" : "wolf" }
{ "_id" : 4, "kind_of_animal" : "lizard" }
{ "_id" : 5, "kind_of_animal" : "rabbit" }
```

Запрос 5: вывести id зон обитания, которая является фермой и все id животных женского пола на ней:

```
> db.animals.find({gender : "female", "habitat.habitat_name" : "Farm"}, {"habitat._id" : 1, "_id" : 1, "kind_of_animal" : 1}).pretty()
{
        "_id" : 5,
        "habitat" : [
                {
                        "_id" : 1
                }
        ],
        "kind_of_animal" : "rabbit"
}
```

Запрос 6: вывести id, имена и виды млекопитающих женского пола, родившихся раньше 2019 года:

```
> db.animals.find({gender : "female", type : "mammal", dob : {$lt : ISODate("2019-00-00T00:00:00Z")}}, {"name" : 1, "_id" : 1, "kind_of_animal" : 1, gender : 1}).pretty()
{
        "_id" : 5,
        "gender" : "female",
        "name" : "Osoka",
        "kind_of_animal" : "rabbit"
}
```