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Course name: A level **SUBJECT: DATABASE TECHNOLOGIES**

Topic: MongoDB **DATE: 15/5/2020**

Indexing array and objects

Multikey Index cont.’d

Multikey Indexes on array fields with Objects

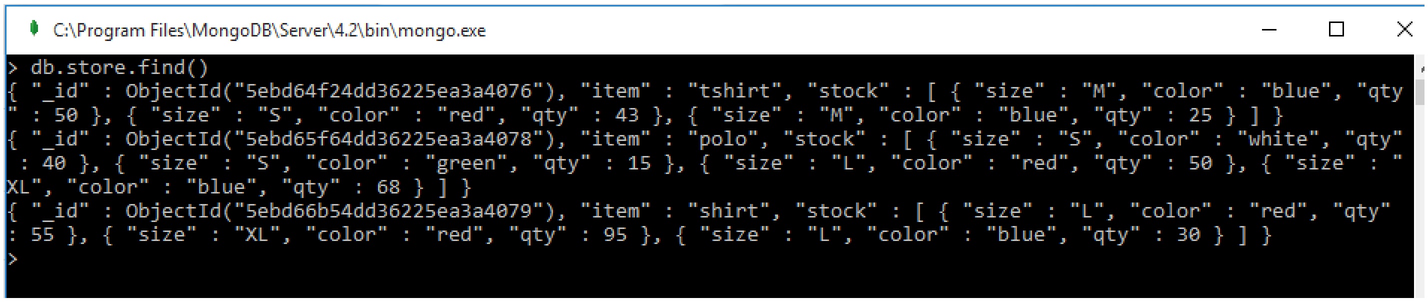
We may also create multikey indexes on array fields that contain nested objects i.e. creating Index inside an array object in a document.

Lets consider the collection **stock** having the documents as under:

```
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
```

```
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty" : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "XL", "color" : "blue", "qty" : 68 } ] }
```

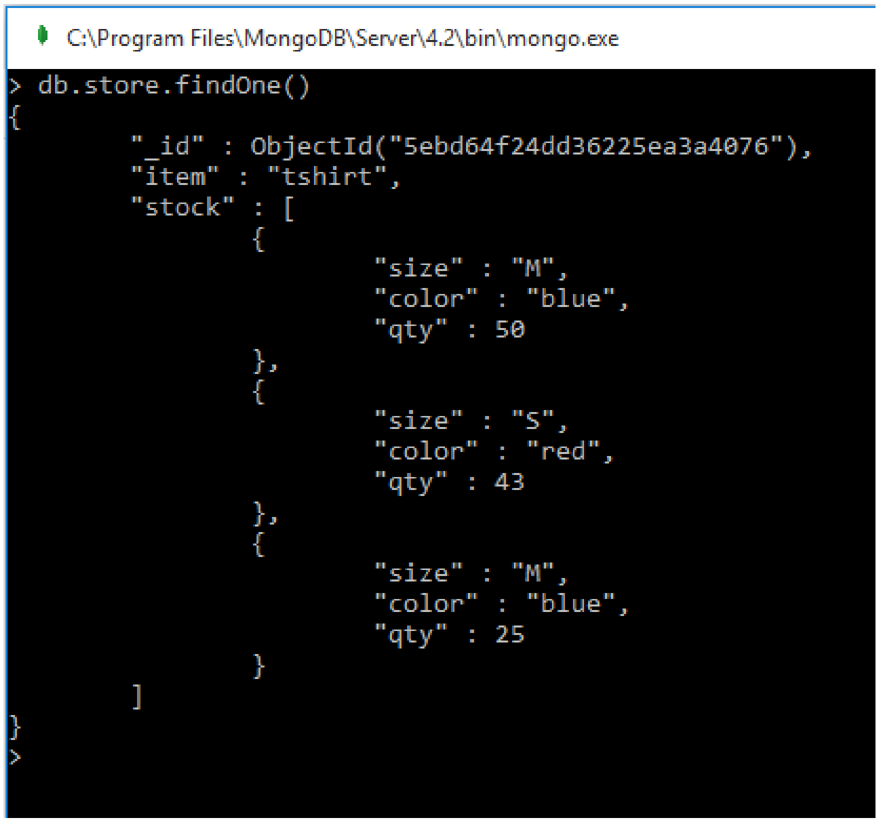
```
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty" : 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
```



```
> db.store.find()
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty
" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty"
: 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
>
```

This **stock** collection has an array **stock** which is an object having 3 fields **"size" , "color"** and **"qty" .**

Lets display only one document using findOne() from the stock collection.

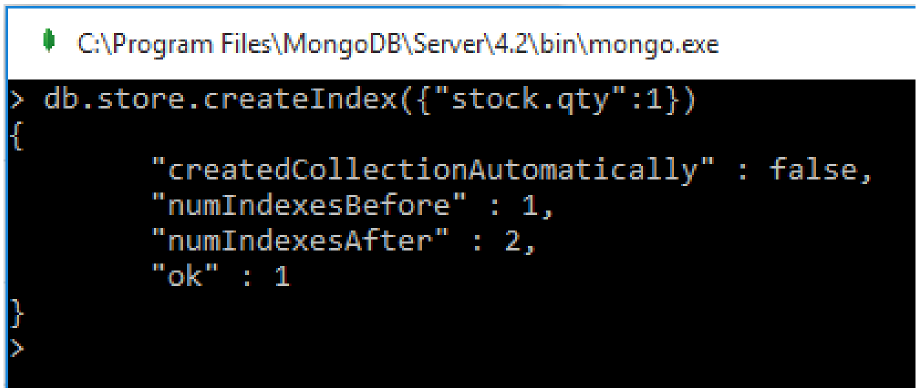


```
> db.store.findOne()
{
        "_id" : ObjectId("5ebd64f24dd36225ea3a4076"),
        "item" : "tshirt",
        "stock" : [
                {
                        "size" : "M",
                        "color" : "blue",
                        "qty" : 50
                },
                {
                        "size" : "S",
                        "color" : "red",
                        "qty" : 43
                },
                {
                        "size" : "M",
                        "color" : "blue",
                        "qty" : 25
                }
        ]
}
>
```

This clearly shows that the **stock** is an array object which has **size, color** and **qty** (quantity) fields. Store owner always want to query quantity available for each color and size. Therefore, they may use query command on finding **stock.qty** or **stock.size** data frequently. In order to meet the demand & supply ratio, it is good to create an index on these fields.

To create a simple multikey index on the array object field **stock.qty,** command will be

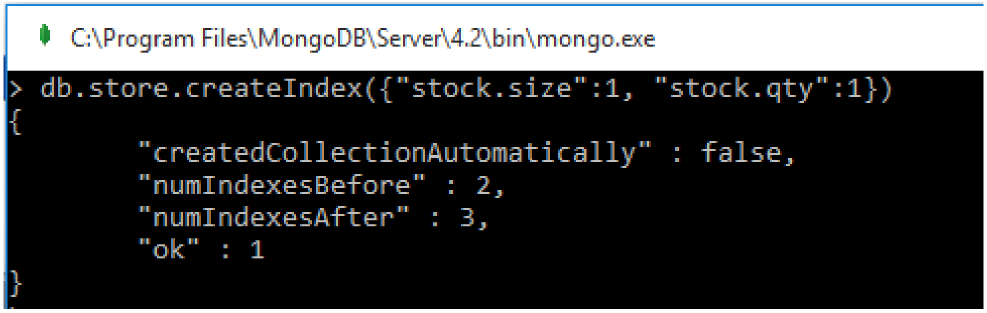
```
db.store.createIndex({"stock.qty":1})
```



```
> db.store.createIndex({"stock.qty":1})
{
        "createdCollectionAutomatically" : false,
        "numIndexesBefore" : 1,
        "numIndexesAfter" : 2,
        "ok" : 1
}
>
```

We can also create a compound multikey index on the stock.size and stock.qty fields on store collection using the following command:

db.store.createIndex({ "stock.size": 1, "stock.qty": 1 })

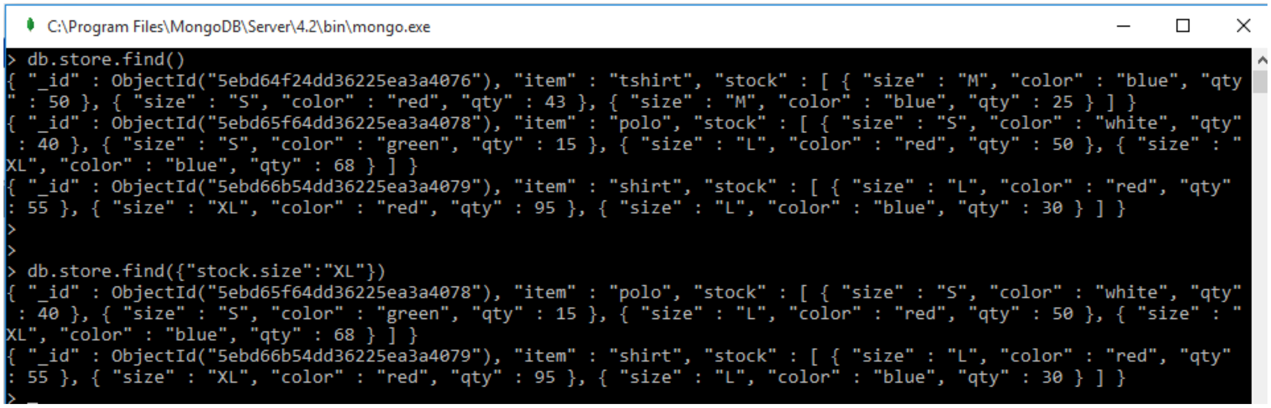


```
> db.store.createIndex({"stock.size":1, "stock.qty":1})
{
        "createdCollectionAutomatically" : false,
        "numIndexesBefore" : 2,
        "numIndexesAfter" : 3,
        "ok" : 1
}
```

These kind of compound multikey index may support queries with predicates that include both indexed fields as well as predicates that include only the index prefix "**stock.size**".

Example-1

db.store.find({"stock.size":"XL"})

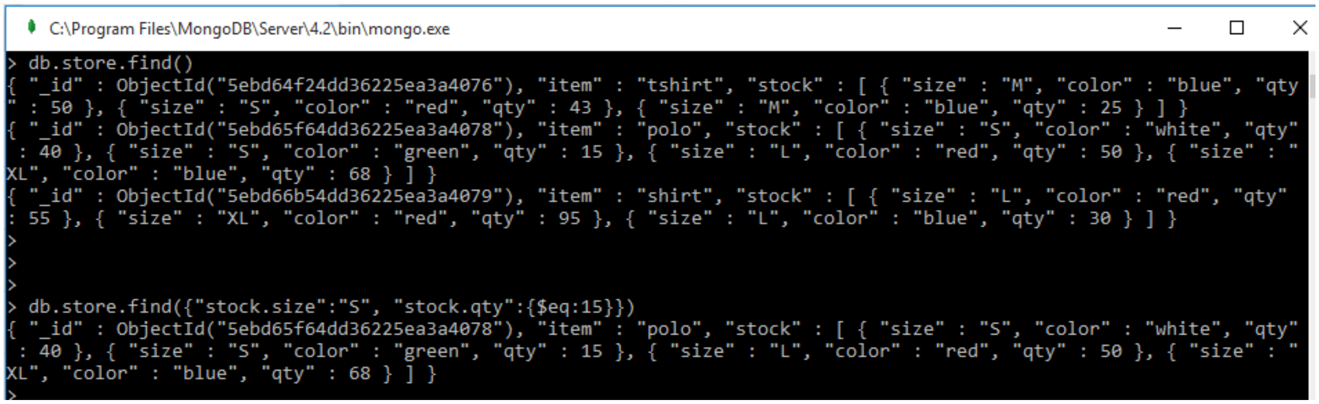


```
> db.store.find()
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty
" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty"
: 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
>
>
> db.store.find({"stock.size":"XL"})
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty"
: 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
> _
```

This is to find all stock of size XL in the collection.

Example-2

db.store.find({"stock.size":"S", "stock.qty":{$eq:15}})



```
> db.store.find()
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty
" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty"
: 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
>
>
>
> db.store.find({"stock.size":"S", "stock.qty":{$eq:15}})
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
>
```

This query will list all items with size=S and stock quantity equal to 15.

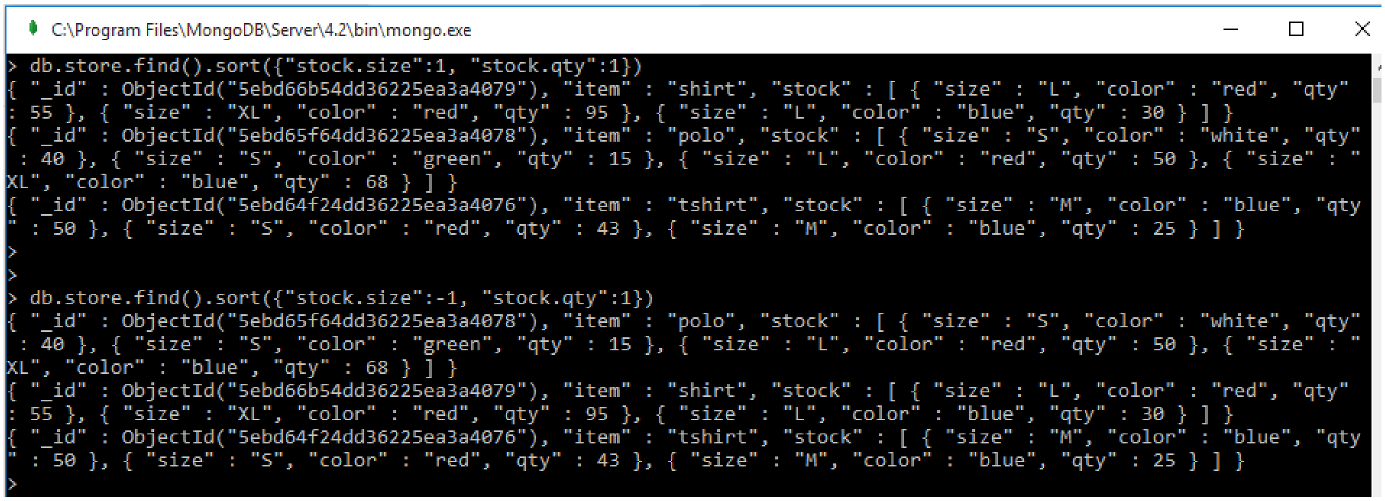
- **Another use of the compound multikey index is to speedup sort operations.**

Example-3

We are executing following two commands, we may see the difference in the output. Commands only differ in the sorting order of array field size ascending and descending

db.store.find().sort({"stock.size":1, "stock.qty":1})

db.store.find().sort({"stock.size":-1, "stock.qty":1})

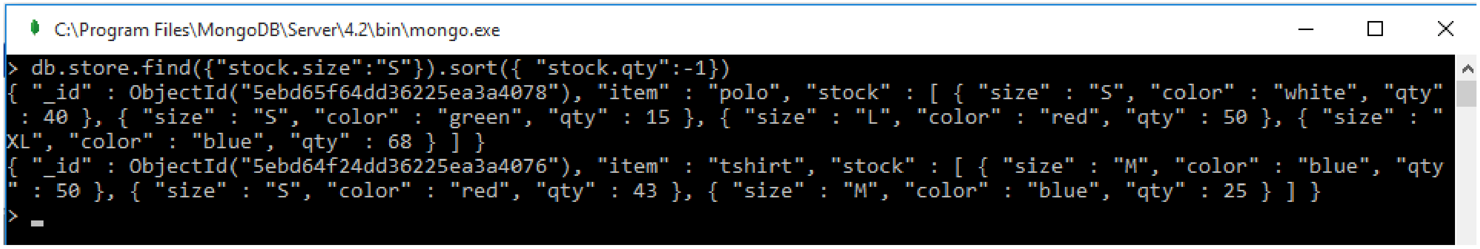


```
> db.store.find().sort({"stock.size":1, "stock.qty":1})
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty"
: 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty
" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
>
>
> db.store.find().sort({"stock.size":-1, "stock.qty":1})
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd66b54dd36225ea3a4079"), "item" : "shirt", "stock" : [ { "size" : "L", "color" : "red", "qty"
: 55 }, { "size" : "XL", "color" : "red", "qty" : 95 }, { "size" : "L", "color" : "blue", "qty" : 30 } ] }
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty
" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
>
```

Example-4

db.store.find({"stock.size":"S"}).sort({ "stock.qty":-1})

will first find Stock with M size then sort it on Qty in descending order.



```
> db.store.find({"stock.size":"S"}).sort({ "stock.qty":-1})
{ "_id" : ObjectId("5ebd65f64dd36225ea3a4078"), "item" : "polo", "stock" : [ { "size" : "S", "color" : "white", "qty"
 : 40 }, { "size" : "S", "color" : "green", "qty" : 15 }, { "size" : "L", "color" : "red", "qty" : 50 }, { "size" : "
XL", "color" : "blue", "qty" : 68 } ] }
{ "_id" : ObjectId("5ebd64f24dd36225ea3a4076"), "item" : "tshirt", "stock" : [ { "size" : "M", "color" : "blue", "qty
" : 50 }, { "size" : "S", "color" : "red", "qty" : 43 }, { "size" : "M", "color" : "blue", "qty" : 25 } ] }
> _
```

Assignments

1. How to create index on Array Objects? What are their uses.
2. Give an example of sorting using Compound multikey index on array objects?