
MongoDB

Introduction

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<https://go.bysika.cz/mongo>

Agenda

- NoSQL Introduction
 - Usage of NoSQL
 - MongoDB Overview
 - History, development, present
 - Architecture, Data Types
 - Tools
 - MongoDB Installation
 - Backup & Restore
 - Administration
 - User Management
 - Roles
-

NoSQL Introduction

What is NoSQL

A **NoSQL** database provides a mechanism for storage and retrieval of data which is modeled in means other than the tabular relations used in relational databases. ...

NoSQL databases are increasingly used in **big data** and **real-time** web applications.

NoSQL vs RDBMs

NoSQL databases disrupted the database market by offering a more flexible, scalable, and less expensive alternative to **relational** databases. They also were built to better handle the requirements of Big Data applications.

Distributed systems

Distributed systems provide horizontal scalability and high availability solutions much less expensive than traditional solutions.

That is a main reason for their rising popularity.

ACID vs BASE

ACID

- Atomicity
- Consistency
- Isolation
- Durability

BASE

- Basically Available
 - Soft state
 - Eventual consistency
-

NoSQL Usage

Where to use NoSQL

- Big Data
- High Availability Systems
- Unstructured Data

Advantages Disadvantages

Advantages

- Speed
- Scalability
- Cost

Disadvantages

- No Transactions
 - No Joins
-

NoSQL Categories

- Key Value store - Redis
- Column oriented
- Graph database - Neo4j
- Document oriented - MongoDB

Key Value Store

Redis

Advantages

- Ultra fast
- Simplicity
- Scalability, Replication

Disadvantages

- Absence of advanced querying

Graph database

Neo4j

Advantages

- Optimized graph queries
- Shortest path algorithms, ...

Disadvantages

- Slow on selects throw all the data

Document oriented

MongoDB

Advantages

- Document structure

Disadvantages

- Data Overhead

MongoDB

MongoDB

- History
- Architektura
- Data Storage
- Data Types
- Tools

Historie MongoDB

- 2007 - started development by 10gen Inc.
- 2009 - Open sourced
- 2013 - 10gen Inc. renamed to MongoDB Inc.

MongoDB Architecture

MongoDB stores data as documents in a binary representation called **BSON** (Binary JSON). Documents that share a similar structure are typically organized as collections.

You can think of collections as being analogous to a table in a relational database: documents are similar to rows, and fields are similar to columns.

Data Types

Every data in MongoDB are serialized to binary JSON - BSON.

Data Types

- Null
- Numbers (ints, longs, doubles)
- String
- Object
- Array
- ObjectId

And more

Tools

Official

- mongostat
- mongotop
- MongoDB Compass
- MongoDB Atlas
- MongoDB Cloud Manager

Community

- MongoClient
 - AdminMongo
-

mongostat

The mongostat utility provides a quick overview of the status of a currently running mongod or mongos instance.

mongostat is functionally similar to the UNIX/Linux file system utility vmstat, but provides data regarding mongod and mongos instances.

mongotop

mongotop provides a method to track the amount of time a MongoDB instance spends reading and writing data.

mongotop provides statistics on a per-collection level. By default, mongotop returns values every second.

MongoDB Compass

Desktop Client

- Desktop client
- All platforms (Linux, OSX, Win)
- Official MongoDB client

localhost:27017
Community version 3.1.8
8 DBs | 15 Collections | C

filter

admin

test

enron_mail

messages

local

startup_log

mongodb

fanclub

people

users

test

big

flightStats

flightStats-cut

test

test_val

article

yelp

business

checkin

review

tip

user

mongodb://localhost:27017/test.flightStats-cut (localhost:27017)

flightStats-cut

DOCUMENTS 10.0k | total size 6.5 MB | avg. size 684 B | INDEXES 1 | total size 566.9 KB | avg. size 566.9 KB

{}

APPLY RESET

Query returned 9,993 documents. This report is based on a sample of 100 documents (1.00%).

_id

string

EWB-EV-4467-542273341

EWB-EV-4382-544626614

LGA-9E-3457-542758157

JFK-9E-4093-544640472

LGA-ZW-3910-545111616

JFK-SE-41-544640167


EWB-YX-4904-544626872

LGA-ZW-3815-544184788

arrivalAirportF


String (100%)

string



carrierFsCode

string



codeshares

array

undefined

document

Array of documents with 3 nested fields

Array lengths

min: 1, average: 2.73, max: 11

MongoDB Compass

adminMongo

Web Client

- Simple MongoDB Web client
- Responsive User Interface
- Simple monitoring
- Open Source

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Connections

Database: Blog / Collection - data

Database Objects

Local

Blog

data

posts

users

CMS

admin

media

pages

users

Connections

Local

MongoLab

Home / Local (connection) / Blog (database) / data (collection)

New Document

Search Documents

Reset

Manage Indices

{
 "_id": "56a97ecdf752feba4759947e",
 "street": "2 Avenue",
 "zipcode": "10075",
 "building": "1408"
}

{
 "_id": "56a97ecdf752feba4759947f",
 "street": "2 Avenue",
 "zipcode": "10075",
 "building": "1408"
}

{
 "_id": "56a97ecdf752feba47599480",
 "street": "2 Avenue",
 "zipcode": "10075",
 "building": "1408"
}

{
 "_id": "56a97ed1f752feba47599481",
 "street": "2 Avenue",
 "zipcode": "10075",
 "building": "1408"
}

{
 "_id": "56a97ed2f752feba47599482",
 "street": "2 Avenue",
 "zipcode": "10075",
 "building": "1408"
}

Delete

Edit

Delete

Edit

Delete

Edit

Delete

Edit

Delete

Edit

1

2

3

4

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MongoClient

Advance Web Client

- Advance DB management
- Import/Export
- Backup/Restore
- MongoDB Shell (in browser)
- Open Source

objects

10.3.10.54 : 27017

objectsDB ▾

Database Stats

Management

Database Dump/Restore BETA

File Management

Admin Queries

Easy Edit

Collections Add

Search for something...

Refresh Collections

Settings

Disconnect

Browse

Home / Browse

aytsv01

The server is up for 1179158 seconds

The performances which are shown here are coming from `serverStatus` and `stats` queries. Therefore, before having a look at below graphs consider `mongoclient` is already executing `serverStatus` at regular intervals. See [here](#) for more info

Mongod version is 3.2.1

Process id is 2678

Process name is mongod

0 Collections

0 Objects

0.00 MBs Data Size

0.00 MBs Storage Size

0 Indexes

0.00 MBs Index Size

0.00 MBs File Size

0 Extents

Memory Usage

Time	Virtual (MB)	Mapped (MB)	Current (MB)
07:29:30	280	100	0
07:29:40	280	100	0
07:29:50	280	100	0
07:30:00	280	100	0
07:30:10	280	100	0
07:30:20	280	100	0
07:30:30	280	100	0
07:30:40	280	100	0
07:30:50	280	100	0

Connections, Available: 808

Time	Active	Total Created
07:30:00	7500	0
07:30:10	7500	0
07:30:20	7500	0
07:30:30	7500	0
07:30:40	7500	0
07:30:50	7500	0

Network

Time	Incoming MB	Outgoing MB	Total Requests
07:29:30	2500000	2500000	0
07:29:40	2500000	2500000	0
07:29:50	2500000	2500000	0
07:30:00	2500000	2500000	0
07:30:10	2500000	2500000	0
07:30:20	2500000	2500000	0
07:30:30	2500000	2500000	0
07:30:40	2500000	2500000	0
07:30:50	2500000	2500000	0

MongoClient

Installation & Management

Install MongoDB Linux

From Ubuntu / Debian Repository

```
$ sudo apt-get install mongodb
```

Install MongoDB Linux

From official MongoDB repository

1. Add MongoDB repository
2. Update
3. And install

\$ sudo apt-get mongodb-org

Install MongoDB on Windows

Download and install Windows binary.

MongoDB & Docker

```
$ docker run --name my-mongo -d mongo  
1df0635e48e46102dadd80e732e7d14d77012
```

```
$ docker exec -ti my-mongo mongo  
MongoDB shell version v3.4.2  
connecting to: mongodb://127.0.0.1:27017  
MongoDB server version: 3.4.2
```

```
>
```

Backup & Restore

Backup & restore

Use **mongodump** for backups

Use **mongorestore** for restores

Don't use **mongoexport** and
mongoimport for backups!

Backup & Restore

Backup

mongodump [<options>]

Restore

mongorestore <backup> [<options>]

Backup examples

`mongodump --out /backup/01`

`mongodump --archive /backup/01.dump`

Restore example

`mongorestore /backup/01`

`mongorestore /backup/01.dump`

Import & Export

JSON & CSV

Need to choose DB and Collection

Select some fields

Can apply query, limits, sorts, ...

Import & Export

Backup

mongoexport [**<options>**]

Restore

mongoimport **<file>** [**<options>**]

Export examples

```
$ mongoexport --quiet --collection  
currencies
```

```
{ "_id" : { "$oid" : "58d95db350d5da4475a96853" }, "  
name" : "US Dollar", "code" : "USD" }  
{ "_id" : { "$oid" : "58d95dc150d5da4475a96854" }, "  
name" : "Swiss Franc", "code" : "CHF" }
```

```
$ mongoexport --collection currencies \  
--out out.json
```

Import examples

```
$ mongoimport --collection currencies  
out.json
```

User Management

Default Settings

By default **no access policy** are enabled.

You need enable those explicitly by parameter or in config.

Enable Client Access Control

By parameter:

```
$ mongod --auth
```

Or in config (/etc/mongo.conf)

```
auth = true
```

Roles

Basic roles

- read
- readWrite
- root

You can also create own role

Create Admin

```
use admin
db.createUser({
  user: "root",
  pwd: "root_passwd",
  roles: ["root"]
})
```

Connect to auth DB

```
$ mongo
> use admin
> db.auth("root", "root_passwd")
>
```

```
$ mongo --authenticationDatabase admin
> db.auth("root", "root_passwd")
>
```

Create User

```
db.createUser({  
    user: "read", pwd: "read_passwd",  
    roles: [{role: "read", "db": "test"}]  
})
```

```
db.createUser({  
    user: "write", pwd: "write_passwd",  
    roles: [{role: "readWrite", "db":  
"test"}]  
})
```

Get User

```
> db.getUser("write")
{
  "_id" : "admin.write",
  "user" : "write",
  "db" : "admin",
  "roles" : [
    {"role":"readWrite","db":"test"}
  ]
}
```

Grant Role

```
use admin
db.grantRolesToUser(
    "some_user",
    [
        { role: "readWrite", db: "test" }
    ]
)
```

Revoke Role

```
use admin
db.revokeRolesFromUser(
    "some_user",
    [
        { role: "readWrite", db: "test" }
    ]
)
```

Change password

```
use admin
```

```
db.changeUserPassword("some_user", "new")
```

Resources

- <https://docs.mongodb.com>
- <https://go.bysika.cz/mongo>
 - Slides
 - Links to related content, eg.: tools, docs, books, ...

Thank you & Questions

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