

NoSQL Databases

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Lab #1

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MongoDB

<https://www.mongodb.com/>

MongoDB is a non-relational, document-oriented database management system, belonging to the NoSQL family.

The first version was released in 2009, so it's relatively new.

Most important differences compared to the traditional relational databases:

1. no join operation
2. flexible schemas, i.e. it's not obligatory that all documents in a collection must have the same structure

There is no join, but there are alternatives, e.g. embedding. Of course, join can be done on the application side too, using several queries.

MongoDB

New fields (*properties*) can be added any time, dynamically to a „record“, there is no need for ALTER TABLE.

If you know the JSON serialization format, then the MongoDB documents and queries will be familiar right away.

For better performance, you can add indexes to fields.

| SQL databases | MongoDB |
|---------------|------------------|
| database | database |
| table | collection |
| row / record | document |
| column | field / property |

MongoDB terminology

JSON

JSON can be often used as an alternative of XML

- also text-based, easily readable for humans
- also hierarchical
- can also be used for communication between applications
- simpler than XML
- not as verbose, shorter
- can be written / read faster

XML:

```
<Person>
  <FirstName>Homer</FirstName>
  <LastName>Simpson</LastName>
  <Relatives>
    <Relative>Grandpa</Relative>
    <Relative>Marge</Relative>
    <Relative>The Boy</Relative>
    <Relative>Lisa</Relative>
  </Relatives>
</Person>
```

JSON:

```
{
  "firstName": "Homer",
  "lastName": "Simpson",
  "relatives": [ "Grandpa", "Marge", "The Boy", "Lisa" ]
}
```

XML:

```
<persons>
  <person>
    <name>Ford Prefect</name>
    <gender>male</gender>
  </person>
  <person>
    <name>Arthur Dent</name>
    <gender>male</gender>
  </person>
  <person>
    <name>Tricia McMillan</name>
    <gender>female</gender>
  </person>
</persons>
```

JSON:

```
[
  {
    "name": "Ford Prefect",
    "gender": "male"
  },
  {
    "name": "Arthur Dent",
    "gender": "male"
  },
  {
    "name": "Tricia McMillan",
    "gender": "female"
  }
]
```

XML:

```
<settings>  
  <path>/home/luke/Dropbox/Public</path>  
  <user_id>123456</user_id>  
  <auto_sync>True</auto_sync>  
</settings>
```

JSON:

```
{  
  "path": "/home/luke/Dropbox/Public",  
  "user_id": 123456,  
  "auto_sync": true  
}
```

JSON Syntax Rules

JSON syntax is a subset of the JavaScript object notation syntax.

- Data is in name/value pairs
- Data is separated by comma
- Curly brackets holds objects
- Square brackets holds arrays

JSON Values

JSON values can be:

- A number (integer or floating point)
- A string (in double quotes)
- A Boolean (true or false)
- An array (in square brackets)
- An object (in curly brackets)
- null

Installation under Ubuntu Linux #1

We'll install MongoDB under Linux, but it's also available for Windows and Mac OS X.

MongoDB only provides packages for 64-bit LTS (long-term support) Ubuntu releases.

If you want to install the latest version under Ubuntu, then don't use the official Ubuntu repositories. Install it directly from the developers of MongoDB:

<https://docs.mongodb.com/manual/installation/>

Installation under Ubuntu Linux #2

```
$ systemctl enable mongod  
$ systemctl status mongod  
$ systemctl start mongod  
$ systemctl stop mongod
```

By default, the server listens on port 27017.

If the server is not running and you cannot start it, it may be because of the presence of the lock file that was not deleted due to a dirty shutdown. Path of the lock file:

```
/var/lib/mongodb/mongod.lock
```

Installation under Manjaro Linux

Let's see how to install MongoDB under another distribution, namely Manjaro (which is getting more and more popular). Manjaro is based on Arch Linux.

Issue the following command:

```
$ sudo pacman -S mongodb-bin mongodb-tools-bin
```

MongoDB won't start automatically. First, it must be enabled and started manually:

```
$ systemctl enable mongodb  
$ systemctl start mongodb
```

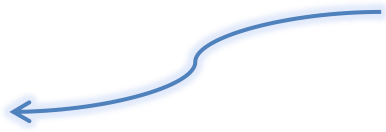
From now on, MongoDB will start automatically after a reboot.

After the installation

Let's verify if you can connect to the server:

```
$ mongo
MongoDB shell version: v4.2.0
connecting to: mongodb://127.0.0.1:27017
>
```

no error, everything
is OK



Important directories / files:

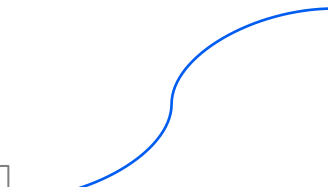
/var/lib/mongodb

/var/lib/mongodb/mongod.lock

/var/log/mongodb/mongod.log

/etc/mongod.conf

place of the
binary databases



lock file



log file



configuration file

