Multimedia im Netz
Online Multimedia
Winter semester 2015/16

Tutorial 09 – Major Subject

Today's Agenda

- Discussion: Intellectual Property and Fair Use
- MongoDB:
  - Syntax
  - Statements: Parallels to SQL
  - NodeJS modules
- Break-Out:
  - Database queries
- Quiz

Fair Use – Pros and Cons

- Research for arguments **for and against “fair use”** of copyrighted material on the web.
- Starting articles:
  http://t3n.de/news/fair-use-klausel-kommentar-662049/
  https://www.youtube.com/yt/copyright/de/fair-use.html
  http://www.dmlp.org/legal-guide/fair-use

- Group A: Pros
  Group B: Cons

- Discussion after 15 minutes.

- Possible focus:
  - Can you take a picture at a museum and post it to your Facebook timeline?
  - Can we use copyrighted material in the tutorial slides?

MongoDB

- huMONGOus
- "NoSQL"
  - No SQL
  - Not only SQL → not meant to replace SQL entirely
- No "schemas", i.e. no structured constraints regarding the data
- No "join" paradigm, but aggregation possible.
- Document Driven / Object
  - Different types of documents in the same collection
  - Deep Query ability
  - Index on any attribute
- High Scalability
- JSON Interface

https://www.mongodb.com/nosql-explained

Potential reasons for a shift to NoSQL

- NoSQL handles multi-structured data more easily
  - Example: Storing arrays in a table column
  - Especially important during the development, when data structures change all the time
- Capacity
  - Scaling out is easier with NoSQL databases
- Many relational systems are proprietary on larger scale
- Direct mapping to objects

Terminology

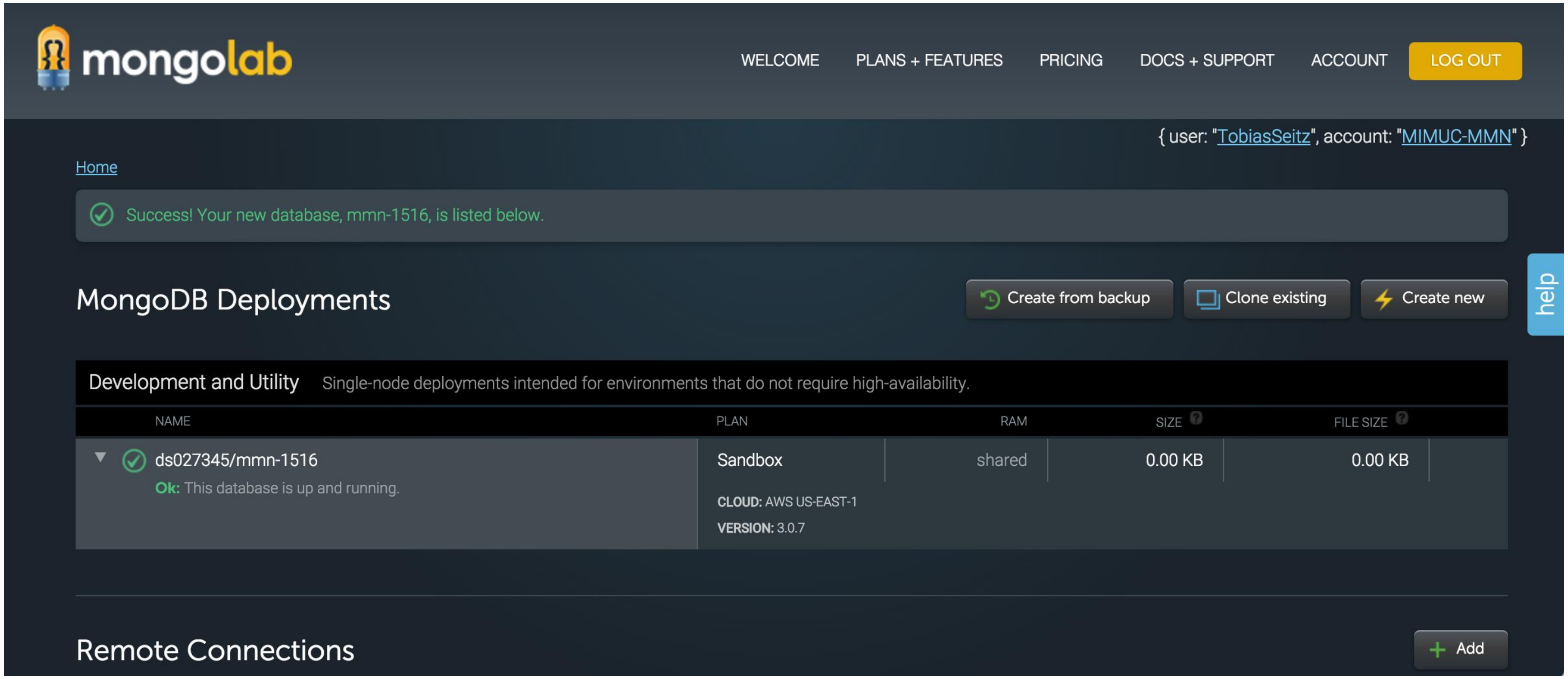
SQL	MongoDB
database	database
table	collection
row	document
column	field
index	index
table joins	embedded documents and linking
primary key	primary key
UNIQUE column	Automatically generated _id field

Install MongoDB on your machine

- Download here and run locally:
  http://www.mongodb.org/downloads
- Start daemon:
  ```
  $ /path/to/your/mongo/installation/bin/mongod
  ```
- Launch mongo:
  ```
  $ mongo [-u username -p [password]]
  ```
- Create a database:
  ```
  $ use mmn
  ```
- Verify:
  ```
  $ show dbs
  ```

Alternative: mongolab.com

Attention: You need Mongo Version > 3.0 on your machine!
Verify by typing `mongo --version` in a terminal



{ user: "TobiasSeitz", account: "MIMUC-MMN" }

Success! Your new database, mmn-1516, is listed below.

MongoDB Deployments

Development and Utility — Single-node deployments intended for environments that do not require high-availability.

NAME	PLAN	RAM	SIZE	FILE SIZE
ds027345/mmn-1516 **Ok:** This database is up and running.	Sandbox **CLOUD:** AWS US-EAST-1 **VERSION:** 3.0.7	shared	0.00 KB	0.00 KB

Remote Connections

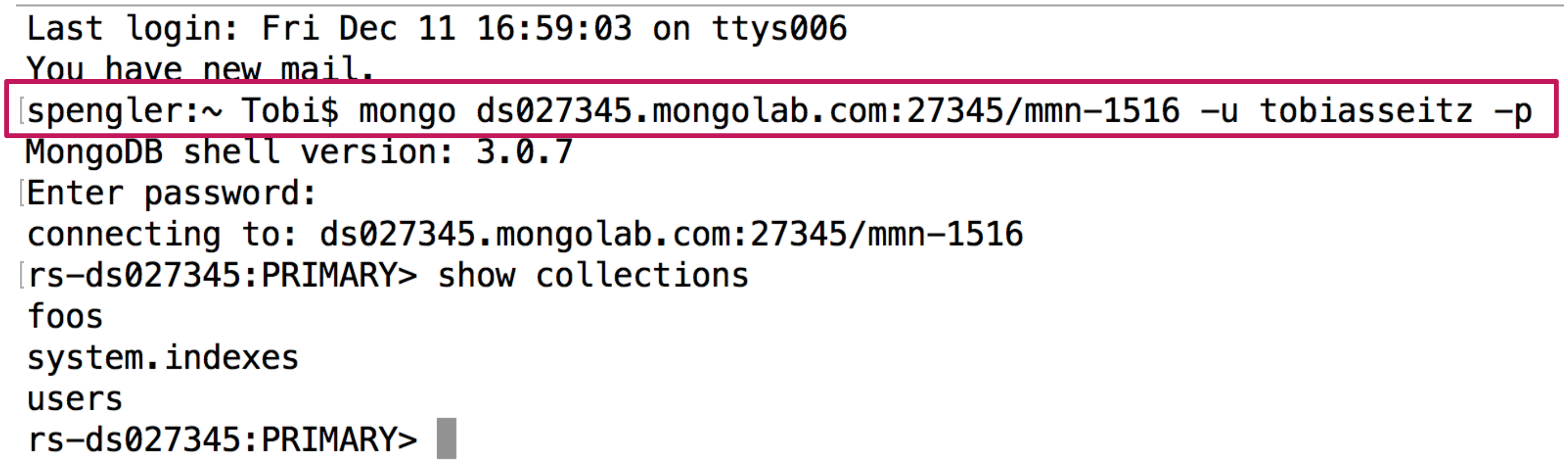
Using mongo client from CIP Pool

1. Open a terminal and perform steps 1-3 from this tutorial:
   https://docs.mongodb.org/v3.0/tutorial/install-mongodb-on-linux/
2. Navigate to the **bin** folder of the mongodb sources
   ```
   cd ~/mongodb/…/bin
   ```
3. Launch mongo client:
   ```
   ./mongo <address from mongolab.com> -u <username> -p
   ```

If you have time and want to enable mongo permanently:

1. Type **pwd** to find out the full, absolute path of the folder containing the mongo binary
2. Open the .bashrc_local file in your home directory with a text editor, like so:
   ```
   gedit ~/.bashrc_local
   ```
3. Put a new line in there and replace <…> with your correct path:
   ```
   export PATH=<output from pwd>:$PATH
   ```
4. Save the file, close the terminal, re-open the terminal.
5. Type mongo --version to see if it works.

Try the connection to mongolab.com



```
Last login: Fri Dec 11 16:59:03 on ttys006
You have new mail.
spengler:~ Tobi$ mongo ds027345.mongolab.com:27345/mmn-1516 -u tobiasseitz -p
MongoDB shell version: 3.0.7
Enter password:
connecting to: ds027345.mongolab.com:27345/mmn-1516
rs-ds027345:PRIMARY> show collections
foos
system.indexes
users
rs-ds027345:PRIMARY> 
```

Basics

- There is a global object named db
  - “collections” are accessible via db’s attributes
  - collections are also objects that have a number of methods

```
db.users.find()
```

global Object
currently used database

property
name of the collection

property
method of the collection

Creating Collections

- Collections are created **implicitly in MongoDB** (as are databases)
- Alternative:
  `db.createCollection("collectionName")`

SQL	MongoDB
CREATE TABLE users (id MEDIUMINT **NOT NULL** AUTO_INCREMENT, user_id Varchar(30), age Number, status char(1), **PRIMARY KEY** (id))	**db.users.insert**({ **user_id**: "abc123", **age**: 55, **status**: "A" })

Inserting Data

- Inserts are Javascript / JSON Objects
- Multiple objects can be wrapped into an array and then inserted

SQL	MongoDB
INSERT INTO users	**db.users.insert(**
(user_id, age, status)	{
VALUES	user_id: "bcd001",
("bcd001", 45, "A")	age: 45,
	status: "A"
	})

Breakout: Inserting Data

- Pull the changes from the tutorials repository
  `git pull origin master`

- Open the file here:
  tutorials-15-16/tutorial09/breakout/**users.json**
  (https://github.com/MIMUC-MMN/tutorials-15-16/blob/master/tutorial09/breakout/users.json)

- Copy the file content and launch a mongo query in the console to insert the data to the "users" collection

- Timeframe: 5 Minutes

Multiple types in the same collection

-
  ```
  db.foos.insert({foo:'bar'});
  db.foos.insert({foo: 847});
  db.foos.insert({foo: new Date()});
  ```

  ```
  { "_id" : ObjectId("566965c6ce9e741b3fe6b219"),
    "foo" : "bar" }
  { "_id" : ObjectId("566965dbce9e741b3fe6b21a"),
    "foo" : 847 }
  { "_id" : ObjectId("566965e5ce9e741b3fe6b21b")
    "foo" : ISODate("2015-12-10T11:45:41.224Z")
  }
  ```

- Con: Developers have to be careful to prevent inconsistencies
- Pro: Mongo is really flexible!

db.collection.find(query, projection)

- query:
  - Similar to SQL “where” clause
  - Optional
  - object (selection)
  - Example: { status : "A"}

- projection
  - Similar to column list in SQL
  - Indicate which fields of a document the query should return.
  - Example: { status : true, _id: false }

https://docs.mongodb.org/v3.0/reference/method/db.collection.find/

Querying with .find()

SQL	MongoDB
SELECT * FROM users	db.users.find()
SELECT id, user_id, status FROM users	db.users.find({ }, { user_id: 1, status: 1 })
SELECT user_id, status FROM users	db.users.find({ }, { user_id: 1, status: 1, _id: 0 })

SELECT * FROM users
WHERE status = "A"
	db.users.find({ status: "A" })

SELECT user_id, status FROM users
WHERE status = "A"
	db.users.find({ status: "A" },
	{ user_id: 1, status: 1, _id: 0 })

Pretty print the output: `db.collection.find().pretty()`

http://docs.mongodb.org/manual/reference/sql-comparison/

Operators

- Operators are “special keys” inside queries in MongoDB
- You cannot write ‘someKey’ != ‘someValue’.
- Most common operators:
  - **$ne, $gt, $lt, $gte, $lte**
  - **$and, $or**
  - **$in**
- Example:

SQL	MongoDB

SELECT * FROM users
WHERE **age > 50**
	db.users.find(
	{ **age : { $gt : 50}** })

http://docs.mongodb.org/manual/reference/operator/

Breakout: Querying

- Continue with the users collection from before.

- Do the following queries:
  1. Find all users with status A and who are older than 30 years.
  2. Find all users with either status B or who are older than 30 years.
  3. Only query the name of users who are younger than 30 years.

- Time frame: 5-10 minutes

Update & Delete

db.collection.update(**query, update, options**)

SQL	MongoDB
UPDATE users SET status = "C" WHERE age > 25	db.users.update({ age: { $gt: 25 } }, { $set: { status: "C" } }, { multi: true })
UPDATE users SET age = age + 3 WHERE status = "A"	db.users.update({ status: "A" } , { $inc: { age: 3 } }, { multi: true })

db.collection.remove()

SQL	MongoDB
DELETE FROM users WHERE status = "D"	db.users.remove({ status: "D" })
DELETE FROM users	db.users.remove({})

Breakout: Update

- Continue with the users collection from before

- Update Caroline’s age to 56.

- Insert a new user with age 100.
- Remove all users with age > 70.

NodeJS and MongoDB

- There are a couple of implementations for NoSQL/MongoDB drivers and middleware in NodeJS
- For MongoDB, the most prevalent examples are
  - monk (https://www.npmjs.com/package/monk)
  - mongoose (https://www.npmjs.com/package/mongoose)
- In the tutorial, we use monk because it is very simple. Mongoose is more sophisticated. If you plan to do a larger project, we suggest you consider mongoose instead of monk.

Using monk as MongoDB layer

- Connecting to the database:
```
var db = require('monk')('localhost/databasename');
```

- We can make the connection object available to all routes like this.
```
app.use(function(req,res,next){
    req.db = db;
    next();
});
```
This has to come early in the middleware chain

Basic Operations

- Accessing a collection:

```
var users = db.get('users');
```

- Queries are asynchronous:

Callback function

```
users.find({},function(err,docs){
  if(err){
    // there was an error
  }
  // do something with the documents
});
```

Accessing the DB from Middleware

MongoDBTest/routes/users.js

```
var express = require('express');
var router = express.Router();

router.get('/', function(req, res, next) {
  var users = req.db.get('users');
  users.find({},function(e,docs){
      if(!e){
          res.json(docs);
      }
      else{
          next(e);
      }
  });
});

module.exports = router;
```

Note: it’s not necessary to require monk here! Why?

Round-Up

1. What will be logged first?

```
router.get('/', function(req, res, next) {
    var users = req.db.get('users');
    users.find({},function(e,docs){
        console.log("I found some users.");
    });
    console.log("I'm feeling quizzical.")
});
```

2. Where is the conceptual error here?

```
router.get('/spottheerror',function(req,res){
    req.db.get('users').find({},function(e,docs){
         res.send("Now I have some data");
    });
    res.send("Ok, request received");
});
```

Thanks!

What are your questions?