

B4M36DS2: Database Systems 2

<http://www.ksi.mff.cuni.cz/~svoboda/courses/2016-1-B4M36DS2/>

Practical Class 2

Riak Key-Value Store

Martin Svoboda

svoboda@ksi.mff.cuni.cz

24. and 25. 10. 2016

Charles University in Prague, Faculty of Mathematics and Physics

Czech Technical University in Prague, Faculty of Electrical Engineering

Riak Overview

RiakKV

- **Highly available distributed key-value store**
- <http://basho.com/products/riak-kv/>

Data model

Instance (→ bucket types) → **buckets** → **objects**

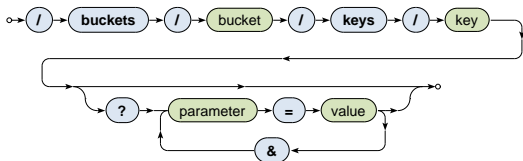
- **Bucket** = logical **collection of objects**
- **Object** = **key-value pair** with metadata
 - **Key** is a Unicode string
 - **Value** can be anything (text, binary object, image, ...)
 - Each object is also associated with **metadata**

CRUD Operations

HTTP API

- All the user requests are submitted as **HTTP requests** with an appropriately selected **method** and specifically constructed **URL, headers, and data**

URL pattern of HTTP requests for all the CRUD operations



Optional parameters (depending on the operation)

CRUD Operations

Basic operations on objects

- **Create**: POST or PUT methods
 - **Inserts a key-value pair** into a given bucket
 - Key is specified manually, or will be generated automatically
- **Read**: GET method
 - **Retrieves a key-value pair** from a given bucket
- **Uppdate**: PUT method
 - **Updates a key-value pair** in a given bucket
- **Delete**: DELETE method
 - **Removes a key-value pair** from a given bucket

HTTP API

cURL tool

- Allows to **transfer data from / to a server using HTTP** (or other supported protocols)

Options

- `-X command, --request command`
 - **HTTP request method to be used** (GET, ...)
- `-d data, --data data`
 - **Data to be sent** to the server (implies the **POST method**)
- `-H header, --header header`
 - **Extra headers** to be included when sending the request
- `-i, --include`
 - Include received headers when printing the response

Tutorial: RiakKV



First Steps

Remotely connect to our NoSQL server

- SSH and SFTP access
- PuTTY and WinSCP on Windows
- **147.32.83.196:22**

Check Riak cluster status

- `curl -v http://localhost:10011/ping`
- *And with higher permissions...*
 - `riak ping`
 - `riak-admin test`
 - `riak-admin status`
 - `riak-admin status | grep ring_members`

Read and Write Operations

Insert object for a new actor

- Prefix all the bucket names with your `login`

```
curl -i -X PUT
  -H 'Content-Type: text/plain'
  -d 'Ivan Trojan, 1964'
  http://localhost:10011/buckets/login_actors/keys/trojan
```

Retrieve the previously inserted actor

- Examine the response body and headers as well

```
curl -i -X GET
  http://localhost:10011/buckets/login_actors/keys/trojan
```


Bucket Operations

List all the buckets

- Only buckets with at least one object will be included

```
curl -i -X GET  
http://localhost:10011/buckets?buckets=true
```

List all the keys in the bucket of actors

- Note that this operation cannot be executed efficiently

```
curl -i -X GET  
http://localhost:10011/buckets/login_actors/keys?keys=true
```

Update and Delete Operations

Update our actor object

```
curl -i -X PUT
  -H 'Content-Type: application/json'
  -d '{ "name" : "Ivan Trojan", "year" : 1964 }'
  http://localhost:10011/buckets/login_actors/keys/trojan
```

Check the updated actor object

- Use different virtual nodes as well
- localhost:10011, localhost:10012, localhost:10013

Remove the actor object

```
curl -i -X DELETE
  http://localhost:10011/buckets/login_actors/keys/trojan
```

Sample Data

Insert objects for new actors

- Put the data into `login_actors` bucket
- Use `application/json` content type

```
{ "name" : "Ivan Trojan", "year" : 1964 }
```

```
{ "name" : "Jiří Macháček", "year" : 1966 }
```

```
{ "name" : "Jitka Schneiderová", "year" : 1973 }
```

```
{ "name" : "Zdeněk Svěrák", "year" : 1936 }
```

Sample Data

Insert objects for new movies

- Put the data into `login_movies` bucket
- Use `application/json` content type once again

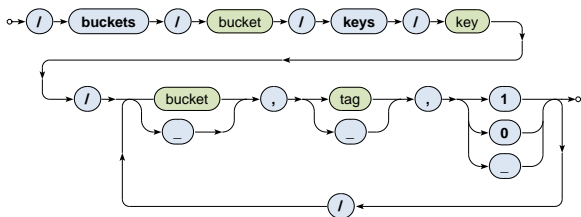
```
{
  "title" : "Vratné lahve", "year" : 2006,
  "actors" : [ "Zdeněk Svěrák", "Jiří Macháček" ]
}
```

```
{
  "title" : "Samotáři", "year" : 2000,
  "actors" : [ "Jitka Schneiderová", "Ivan Trojan", "Jiří Macháček" ]
}
```

```
{
  "title" : "Medvídek", "year" : 2007,
  "actors" : [ "Jiří Macháček", "Ivan Trojan" ]
}
```

Links and Link Walking

Links = directed relationships between objects



Parameters

- *Bucket* – assumes only a given target bucket
- *Tag* – considers only a given link tag
- *Keep* – whether the objects should be included in the output

Links and Link Walking

Create new links actor → movie

```
curl -i -X PUT
  -H 'Content-Type: application/json'
  -H 'Link: </buckets/login_movies/keys/samotari>; riaktag="tmovie"'
  -H 'Link: </buckets/login_movies/keys/medvidek>; riaktag="tmovie"'
  -d '{ "name" : "Ivan Trojan", "year" : 1964 }'
  http://localhost:10011/buckets/login_actors/keys/trojan
```

Check the updated actor object

- Verify the presence of links in particular

Traverse the links from the actor

```
curl -i -X GET
  http://localhost:10011/buckets/login_actors/keys/trojan
  /login_movies,tmovie,1
```

Links and Link Walking

Add all the links movie \rightarrow actor

Express a more complicated link walking

- Find all the actors that appeared in movies where *Trojan* starred

Search 2.0: Yokozuna

Create a full-text index for the bucket of actors

```
curl -i -X PUT
  -H 'Content-Type: application/json'
  -d '{ "schema" : "_yz_default" }'
  http://localhost:10011/search/index/login_iactors
```

```
curl -i -X PUT
  -H 'Content-Type: application/json'
  -d '{ "props" : { "search_index" : "login_iactors" } }'
  http://localhost:10011/buckets/login_actors/props
```

Verify the bucket properties

```
curl -i -X GET
  http://localhost:10011/buckets/login_actors/props
```


Search 2.0: Yokozuna

Reinsert objects for all the actors

- Note that the JSON field names were changed so that they correspond to the Yokozuna JSON extractor and Czech accented characters were removed

```
{ "name_s" : "Ivan Trojan", "year_i" : 1964 }
```

```
{ "name_s" : "Jiri Machacek", "year_i" : 1966 }
```

```
{ "name_s" : "Jitka Schneiderova", "year_i" : 1973 }
```

```
{ "name_s" : "Zdenek Sverak", "year_i" : 1936 }
```

Search 2.0: Yokozuna

Find all the actors born in 1964

```
curl -i -X GET
'http://localhost:10011/search/query/
  login_iactors?wt=json&omitHeader=true&q=year_i:1964'
```

Express a more complicated full-text query

- Find all the actors that were born in 1960 or later and their name contains substring *de*

References

Riak documentation

- <http://docs.basho.com/riak/kv/2.1.4/>