NDBI040: **Modern Database Concepts**

http://www.ksi.mff.cuni.cz/~svoboda/courses/191-NDBI040/

Practical Class 6

RiakKV

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19. 11. 2019

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Riak Overview

RiakKV

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

Data model

$$\text{Instance } (\rightarrow \text{bucket types}) \rightarrow \textbf{buckets} \rightarrow \textbf{objects}$$

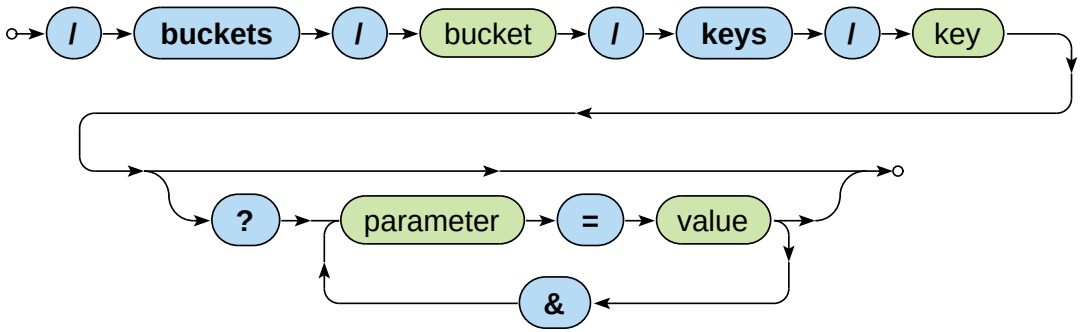
- **Bucket** = logical **collection of objects**
- **Object** = **key-value pair** with metadata
  - Key is a Unicode string, **unique within a bucket**
  - Value can be anything (text, binary object, image, …)
  - Each object is also associated with metadata

CRUD Operations

HTTP API

- All the user requests are submitted as **HTTP requests** with appropriately selected / constructed **methods**, **URLs**, **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
- **Update**: `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`
  - Prints both headers and (not just) body of a response

First Steps

Remotely connect to our NoSQL server

- SSH and SFTP access
- PuTTY and WinSCP on Windows
- **nosql.ms.mff.cuni.cz:42222**

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 both response body and headers

```
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

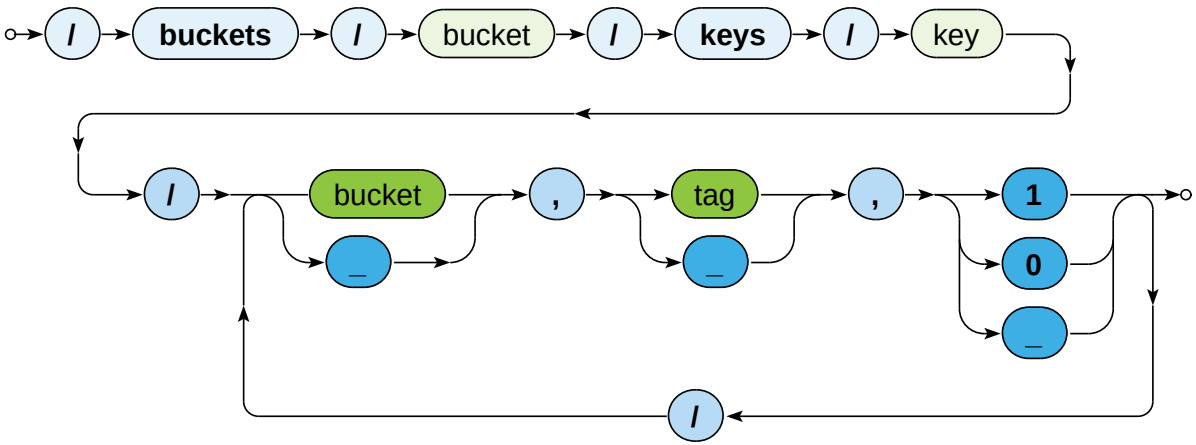
```
{
  "title" : "Vratné lahve", "year" : 2006,
  "actors" : [ "Zdeněk Svěrák", "Jiří Macháček" ]
}
```

```
{
  "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 result

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 query

- Find all the actors who appeared in movies where *Trojan* stared

Search 2.0

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 new bucket properties

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

Search 2.0

Reinsert objects for all the actors

- Note that names of fields were changed…
  - Suffixes recognizable by the JSON extractor were added
  - 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

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 who were born in 1960 or later and their name contains substring *de*

References

Riak documentation

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

Search queries (Apache Solr query syntax)

- http://docs.basho.com/riak/kv/2.1.4/developing/usage/search/
- https://lucene.apache.org/solr/guide/6_6/the-standard-query-parser.html