Learning ElasticSearch

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http://xinh.org/5el

Also available at

ElasticWho?

ElasticSearch is a flexible and powerful open source, distributed real-time search and analytics engine.

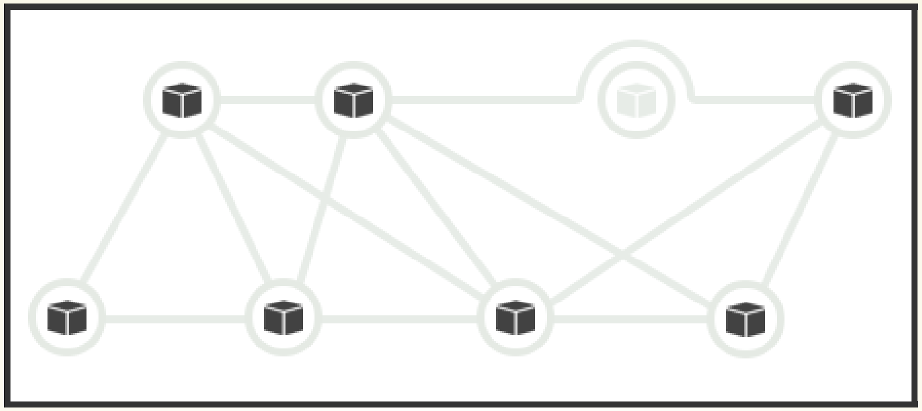
Features

- Real time analytics
- Distributed
- High availability
- Multi tenant architecture
- Full text
- Document oriented
- Schema free
- RESTful API
- Per-operation persistence

Distributed

Start small and scale horizontally out of the box. For more capacity, just add more nodes and let the cluster reorganize itself.

High Availability



ElasticSearch clusters detect and remove failed nodes, and reorganize themselves.

Multi Tenancy

```
$ curl -XPUT http://localhost:9200/people

$ curl -XPUT http://localhost:9200/gems

$ curl -XPUT http://localhost:9200/gems/document/pry-0.5.9

$ curl -XGET http://localhost:9200/gems/document/pry-0.5.9
```

A cluster can host multiple indices which can be queried independently, or as a group.

Document Oriented

```json
{
    "_id": "pry-0.5.9",
    "_index": "gems",
    "_source": {
        "authors": [
            "John Mair (banisterfiend)"
        ],
        "autorequire": null,
        "bindir": "bin",
        "cert_chain": [],
        "date": "Sun Feb 20 11:00:00 UTC 2011",
        "default_executable": null,
        "description": "attach an irb-like session to any object at runtime",
        "email": "jrmair@gmail.com"
    }
}
```

Store complex real world entities in Elasticsearch as structured JSON documents.

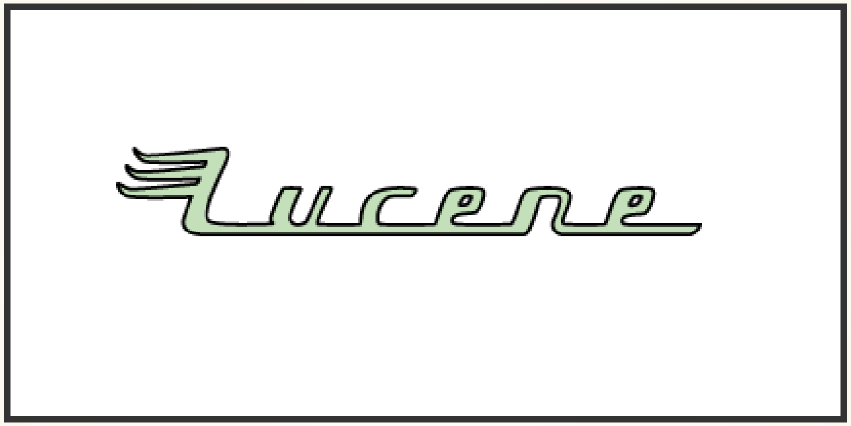
RESTful API

Almost any operation can be performed using a simple RESTful interface using **JSON** over **HTTP**.

- curl -X GET
- curl -X PUT
- curl -X POST
- curl -X DELETE

Apache Lucene

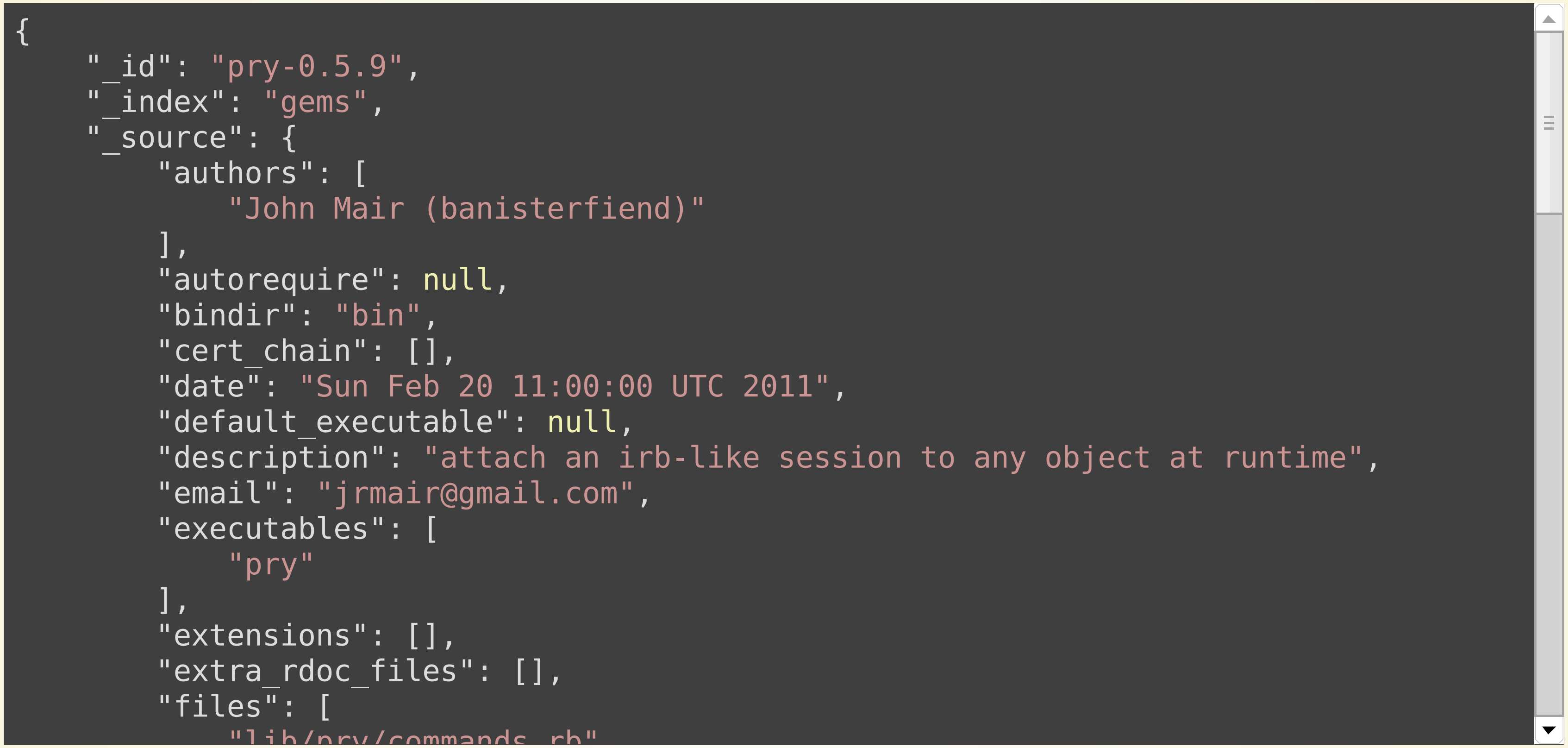
ElasticSearch is built on top of Apache Lucene. Lucene is a high performance, full-featured Information Retrieval library, written in Java.



ElasticSearch Terminology

Document

$ curl -XGET http://localhost:9200/gems/document/pry-0.5.9



```
{
    "_id": "pry-0.5.9",
    "_index": "gems",
    "_source": {
        "authors": [
            "John Mair (banisterfiend)"
        ],
        "autorequire": null,
        "bindir": "bin",
        "cert_chain": [],
        "date": "Sun Feb 20 11:00:00 UTC 2011",
        "default_executable": null,
        "description": "attach an irb-like session to any object at runtime",
        "email": "jrmair@gmail.com",
        "executables": [
            "pry"
        ],
        "extensions": [],
        "extra_rdoc_files": [],
        "files": [
            "lib/pry/commands.rb"
```

In ElasticSearch, everything is stored as a Document. Document can be addressed and retrieved by querying their attributes.

Document Types

Lets us specify document properties, so we can differentiate the objects.

Shard

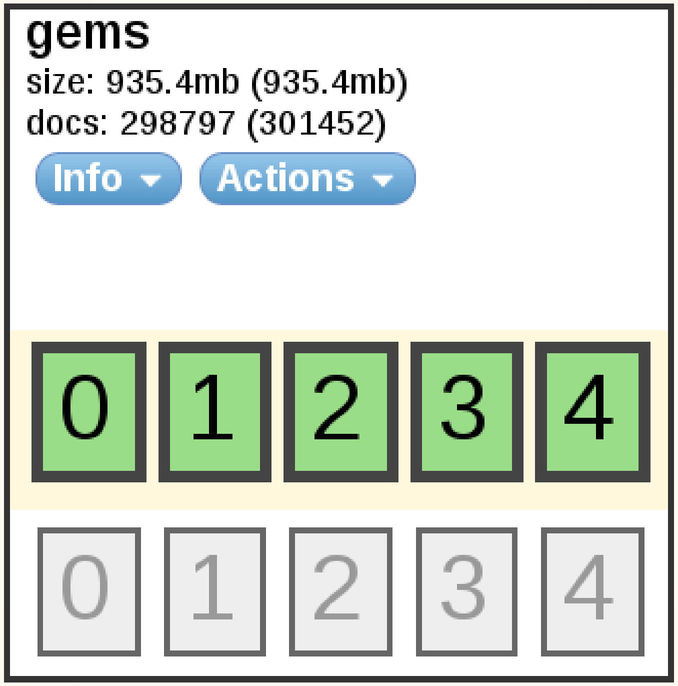
Each Shard is a separate *native* Lucene Index. Lets us overcome RAM limitations, hard disk capacity.

Replica

An exact copy of primary Shard. Helps in setting up HA, increases query throughput.

Index

ElasticSearch stores its data in logical Indices. Think of a table, collection or a database.



gems

size: 935.4mb (935.4mb)

docs: 298797 (301452)

An Index has atleast 1 primary Shard, and 0 or more Replicas.

Cluster

A collection of cooperating ElasticSearch nodes. Gives better availability and performance via Index Sharding and Replicas.

ElasticSearch Workshop

Download and start

Download ElasticSearch from
http://www.elasticsearch.org/download

```
# service elasticsearch start
```

```
# /etc/init.d/elasticsearch start
```

```
# ./bin/elasticsearch -f
```

ElasticSearch Plugins

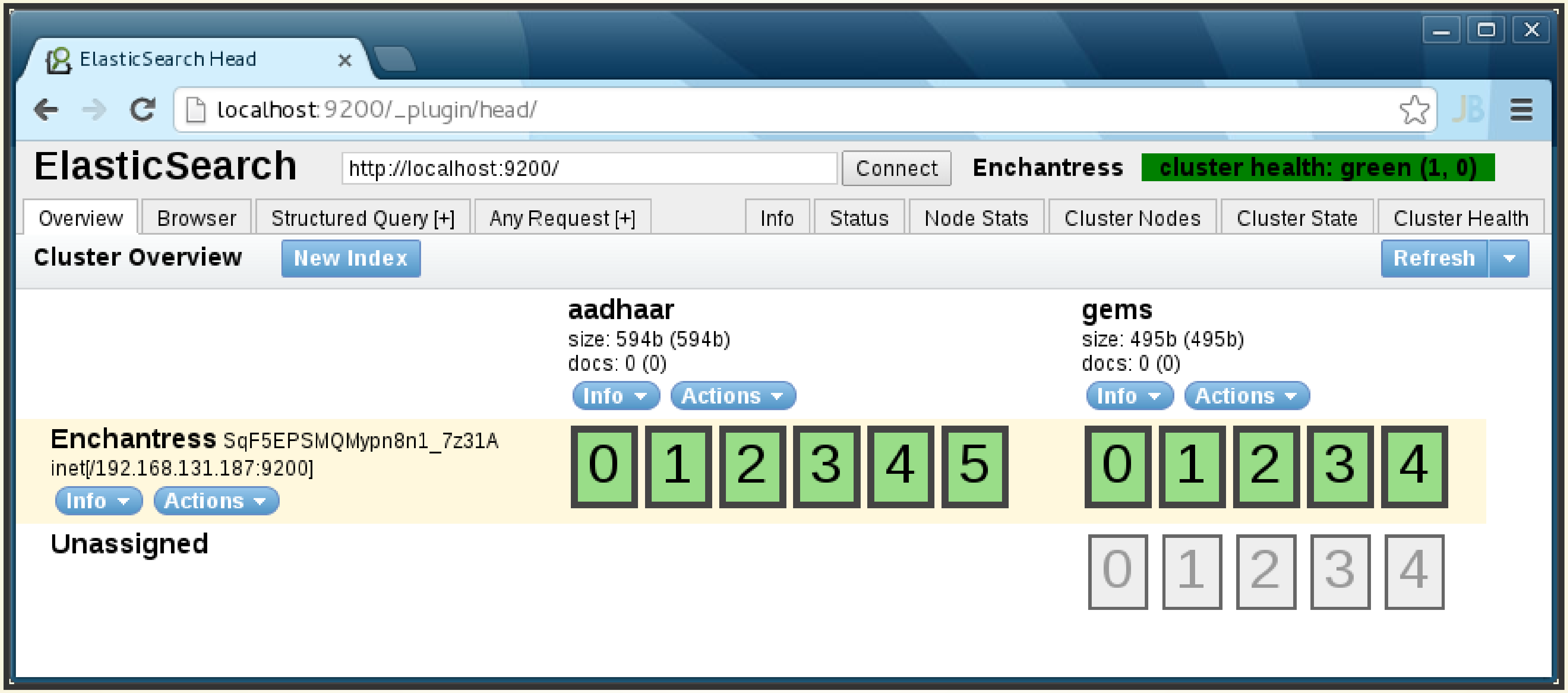
A site plugin to view contents of ElasticSearch cluster.

```
# cd /usr/share/elasticsearch
# ./bin/plugin -install mobz/elasticsearch-head
```

```
# cd /opt/elasticsearch-0.90.2
# ./bin/plugin -install mobz/elasticsearch-head
```

Restart ElasticSearch. Plugins are detected and loaded on service startup.

elasticsearch-head



localhost:9200/_plugin/head/

ElasticSearch http://localhost:9200/ Enchantress cluster health: green (1, 0)

Cluster Overview

aadhaar
size: 594b (594b)
docs: 0 (0)

gems
size: 495b (495b)
docs: 0 (0)

Enchantress SqF5EPSMQMypn8n1_7z31A
inet[/192.168.131.187:9200]

aadhaar: 0 1 2 3 4 5

gems: 0 1 2 3 4

Unassigned

gems: 0 1 2 3 4

RESTful interface

```
$ curl -XGET 'http://localhost:9200/'
```

```
{
  "ok" : true,
  "status" : 200,
  "name" : "Drake, Frank",
  "version" : {
    "number" : "0.90.2",
    "snapshot_build" : false,
    "lucene_version" : "4.3.1"
  },
  "tagline" : "You Know, for Search"
}
```

Create Index

```
$ curl -XPUT 'http://localhost:9200/gems'
```

```
{
  "ok":true,
  "acknowledged":true
}
```

Cluster status

```
$ curl -XGET 'localhost:9200/_status'
```

```
{"ok":true,"_shards":{"total":20,"successful":10,"failed":0},
"indices":{"gems":{"index":{"primary_size":"495b","primary_size_in_bytes":495,
"size":"495b","size_in_bytes":495},"translog":{"operations":0},
"docs":{"num_docs":0,"max_doc":0,"deleted_docs":0},"merges":
{"current":0,"current_docs":0,"current_size":"0b","current_size_in_bytes":0,
"total":0,"total_time":"0s","total_time_in_millis":0,"total_docs":0,
"total_size":"0b","total_size_in_bytes":0},
...
...
...
```

Pretty Output

```
$ curl -XGET 'localhost:9200/_status?pretty'
```

```
$ curl -XGET 'localhost:9200/_status' | python -mjson.tool
```

```
$ curl -XGET 'localhost:9200/_status' | json_reformat
```

```
{
    "ok": true,
    "_shards": {
        "total": 20,
        "successful": 10,
        "failed": 0
    },
    "indices": {
        "gems": {
            "index": {
                "primary_size": "495b",
                "primary_size_in_bytes": 495,
                "size": "495b",
                "size_in_bytes": 495
            },
...
```

Delete Index

```
$ curl -XDELETE 'http://localhost:9200/gems'
```

```
{
  "ok":true,
  "acknowledged":true
}
```

Create custom Index

```
{
    "settings" : {
        "index" : {
            "number_of_shards" : 6,
            "number_of_replicas" : 0
        }
    }
}
```

```
$ curl -XPUT 'http://localhost:9200/gems' -d @body.json
```

```
{
  "ok":true,
  "acknowledged":true
}
```

Index a document

```
{
  "name": "pry",
  "platform": "ruby",
  "rubygems_version": "1.5.2",
  "description": "attach an irb-like session to any object at runtime",
  "email": "anurag@example.com",
  "has_rdoc": true,
  "homepage": "http://banisterfiend.wordpress.com"
}
```

```
$ curl -XPOST 'http://localhost:9200/gems/test/' -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"test",
  "_id":"lsJgxiwET6eg",
  "_version":1
}
```

Get document

```
$ curl -XGET 'http://localhost:9200/gems/test/lsJgxiwET6eg' | python -mjson.tool
```

```
{
    "_id": "lsJgxiwET6eg",
    "_index": "gems",
    "_source": {
        "description": "attach an irb-like session to any object at runtime",
        "email": "anurag@example.com",
        "has_rdoc": true,
        "homepage": "http://banisterfiend.wordpress.com",
        "name": "pry",
        "platform": "ruby",
        "rubygems_version": "1.5.2"
    },
    "_type": "test",
    "_version": 1,
    "exists": true
}
```

Index another document

```
{
  "name": "grit",
  "platform": "jruby",
  "rubygems_version": "2.5.0",
  "description": "Ruby library for extracting information from a git repository.",
  "email": "mojombo@github.com",
  "has_rdoc": false,
  "homepage": "http://github.com/mojombo/grit"
}
```

```
$ curl -XPOST 'http://localhost:9200/gems/test/' -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"test",
  "_id":"ijUOHi2cQc2",
  "_version":1
}
```

Custom Document IDs

```
{
  "name": "grit",
  "platform": "jruby",
  "rubygems_version": "2.5.1",
  "description": "Ruby library for extracting information from a git repository.",
  "email": "mojombo@github.com",
  "has_rdoc": false,
  "homepage": "http://github.com/mojombo/grit"
}
```

```
$ curl -XPUT 'http://localhost:9200/gems/test/grit-2.5.1' -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"test",
  "_id":"grit-2.5.1",
  "_version":1
}
```

IDs are unique across Index. Composed of DocumentType and ID.

Document Versions

```
$ curl -XPUT 'http://localhost:9200/gems/test/grit-2.5.1' -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"test",
  "_id":"grit-2.5.1",
  "_version":2
}
```

Searching Documents

```
{
  "query": {
    "term": {"name": "pry"}
  }
}
```

```
$ curl -XPOST http://localhost:9200/gems/_search -d @body.json | python -mjson.tool
```

```
{
  "_shards": {
    "failed": 0,
    "successful": 6,
    "total": 6
  },
  "hits": {
    "hits": [
      {
        "_id": "MWkKgzsMRgK",
        "_index": "gems",
        "_score": 1.4054651,
        "_source": {
          "description": "attach an irb-like session to any object at runtime",
          "email": "anurag@example.com",
          "has_rdoc": true,
          "homepage": "http://banisterfiend.wordpress.com",
          "name": "pry",
          "platform": "ruby",
          "rubygems_version": "1.5.2"
        }
```

Counting Documents

```
{
  "term": {"name": "pry"}
}
```

```
$ curl -XGET http://localhost:9200/gems/test/_count -d @body.json
```

```
{
    "_shards": {
        "failed": 0,
        "successful": 6,
        "total": 6
    },
    "count": 1
}
```

Update a Document

```
{
  "doc": {
   "platform": "macruby"
  }
}
```

```
$ curl -XPOST http://localhost:9200/gems/test/grit-2.5.1/_update -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"test",
  "_id":"grit-2.5.1",
  "_version":4
}
```

The partial document is merged using simple recursive merge.

Update via Script

```
{
    "script" : "ctx._source.platform = vm_name",
    "params" : {
        "vm_name" : "rubinius"
    }
}
```

```
$ curl -XPOST http://localhost:9200/gems/test/grit-2.5.1/_update -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"test",
  "_id":"grit-2.5.1",
  "_version":5
}
```

Delete Document

```
$ curl -XDELETE 'http://localhost:9200/gems/test/grit-2.5.1'
```

```
{
  "ok":true,
  "found":true,
  "_index":"gems",
  "_type":"test",
  "_id":"grit-2.5.1",
  "_version":6
}
```

Put Mapping

```
{
  "gem" : {
    "properties" : {
      "name" :        {"type" : "string", "index": "not_analyzed"},
      "platform" :    {"type" : "string", "index": "not_analyzed"},
      "rubygems_version" : {"type" : "string", "index": "not_analyzed"},
      "description" : {"type" : "string", "store" : "yes"},
      "has_rdoc" :    {"type" : "boolean"}
    }
  }
}
```

```
$ curl -XPUT 'http://localhost:9200/gems/gem/_mapping' -d @body.json
```

```
$ curl -XGET 'http://localhost:9200/gems/_mapping' | python -mjson.tool
```

Index Document with Mapping

```
{
  "name": "grit",
  "platform": "ruby",
  "rubygems_version": "2.5.1",
  "description": "Ruby library for extracting information from a git repository.",
  "email": "mojombo@github.com",
  "has_rdoc": false,
  "homepage": "http://github.com/mojombo/grit"
}
```

```
$ curl -XPUT 'http://localhost:9200/gems/gem/grit-2.5.1' -d @body.json
```

```
{
  "ok":true,
  "_index":"gems",
  "_type":"gem",
  "_id":"grit-2.5.1",
  "_version":1
}
```

Matching documents

```
{
  "query": {
    "match" : {
        "description" : "git repository"
    }
  }
}
```

```
$ curl -XPOST http://localhost:9200/gems/gem/_search -d @body.json
```

Highlighting

```
{
 "query": {
  "match" : {
    "description" : "git repository"
  }
 },
 "highlight" : {
    "fields" : {
      "description" : {}
    }
  }
}
```

```
$ curl -XPOST http://localhost:9200/gems/gem/_search -d @body.json
```

```
"highlight": {
 "description": [
  "Ruby library for extracting information from a <em>git</em> <em>repository</em>."
 ]
}
```

Search Facets

```
{
  "query": { "match_all" : {} },
  "facets" : {
    "gem_names" : {
      "terms" : { "field": "name" }
    }
  }
}
```

```
$ curl -XPOST http://localhost:9200/gems/_search -d @body.json
```

```
...
  "facets": {
    "gem_names": {
      "_type": "terms",
      "missing": 0,
      "other": 0,
      "terms": [
        {
          "count": 2,
          "term": "pry"
        },
        {
          "count": 2,
          "term": "grit"
        },
        {
          "count": 1,
          "term": "abc"
        }
      ],
      "total": 5
```

(Lab)
Analyzing Aadhaar's Datasets

Download Public Dataset

Download from Aadhaar Public Data Portal at
https://data.uidai.gov.in

Download Tools

```
$ git clone https://github.com/gnurag/aadhaar
```

Prepare Data & Configure

```
# gem install yajl-ruby tire activesupport

$ git clone https://github.com/gnurag/aadhaar
$ cd aadhaar/data
$ unzip UIDAI-ENR-DETAIL-20121001.zip
$ cd ../bin
$ vi aadhaar.rb
```

Configuration

```
AADHAAR_DATA_DIR = "/path/to/aadhaar/data"
ES_URL           = "http://localhost:9200"
ES_INDEX         = 'aadhaar'
ES_TYPE          = "UID"
BATCH_SIZE       = 1000
```

Index

```
$ ruby aadhaar.rb
```

Running Examples

```
$ curl -XPOST http://localhost:9200/aadhaar/UID/_search -d
@template.json | python -mjson.tool
```

Additional Notes

Index Aliases

Group multiple Indexes, and query them together.

```
curl -XPOST 'http://localhost:9200/_aliases' -d '
{
    "actions" : [
        { "add" : { "index" : "index1", "alias" : "master-alias" } }
        { "add" : { "index" : "index2", "alias" : "master-alias" } }
    ]
}'
```

```
curl -XPOST 'http://localhost:9200/_aliases' -d '
{
    "actions" : [
        { "remove" : { "index" : "index2", "alias" : "master-alias" } }
    ]
}'
```

Document Routing

Control which Shard the document will be placed and queried from.

Parents & Children

```
$ curl -XPUT http://localhost:9200/gems/gem/roxml?parent=rexml -d '{
    "tag" : "something"
}'
```

Custom Analyzers

Boosting Search Results

ElasticSearch Ecosystem

A wide range of site plugins, analyzers, river plugins available from the community.

THE END

@gnurag / github