Search

Under the Hood

Agenda

- basic introduction to Elasticsearch
- the pre-work needed to prepare the search index
- capabilities and limitations of Elasticsearch

What is Elasticsearch ?

Document Storage

- stores data as JSON
- row = document
- table = index
- column = field

```
PUT candidates_demo/_doc/CN_10003
{
  "fullName": "Nero Newbie",
  "summary": "A newbie in the IT Industry",
  "location": [40.71, 74.00],
  "currentFunction": "FN_100001",
  "likelyToJump": false,
  "yearsOfExperience": 3,
  "jobHistories": [
    {
      "jobTitle": "Jr. Software Engineer",
      "industry": "IND_100001",
      "industryName": "IT Engineering",
      "yearsOfExperience": 2,
      "current": true
    },
    {
      "jobTitle": "Intern",
      "industry": "IND_100001",
      "industryName": "IT Engineering",
      "yearsOfExperience": 1,
      "current": false
    }
  ]
}
```

Search Engine

- analyzes/tokenize the document during insert
- uses this index during search to optimize the results

Others...

- log aggregation
- app monitoring
- machine learning
- data analytics

Building the Search Database

Responsibilities: Data Team

- ingest
- profile the data
- cleanup

Responsibilities: Data Team

- ingest
- profile the data
- cleanup
- data warehouse (Redshift)

Responsibilities: Data Team

- ingest
- profile the data
- cleanup
- data warehouse (Redshift)

candidate_profile

id	full_name	summary	location_lat	location_lon	is_likely_to_jump	job_exp	cur_func
CN_10001	Olaf Oldtimer	An oldtimer in the IT Industry	40.71	74.00	TRUE	15	FN_100001
CN_10002	Marco Midd	Worked as a Software Engineer for quite a while	40.71	74.00	TRUE	10	FN_100001
CN_10003	Nero Newbie	A newbie in the IT Industry	40.71	74.00	FALSE	3	FN_100001

candidate_job_history

id	cand_id	job_title	industry_id	is_current	years_exp
JH_10001	CN_10001	Sr. Software Engineer	IND_100001	TRUE	10
JH_10002	CN_10001	Jr. Tech Support	IND_100002	FALSE	5
JH_10003	CN_10002	Sr. Software Engineer	IND_100001	TRUE	5
JH_10004	CN_10002	Jr. Software Engineer	IND_100001	FALSE	4
JH_10005	CN_10002	Intern	IND_100001	FALSE	1
JH_10006	CN_10003	Jr. Software Engineer	IND_100001	TRUE	2
JH_10007	CN_10003	Intern	IND_100001	FALSE	1

ref_industry

id	name
IND_100001	IT Engineering
IND_100002	IT Support

Responsibilities: Product Team

- unload the data from the Data Warehouse (Redshift) to AWS S3

candidate_profile

id	full_name	summary	location_lat	location_lon	is_likely_to_jump	job_exp	cur_func
CN_10001	Olaf Oldtimer	An oldtimer in the IT Industry	40.71	74.00	TRUE	15	FN_100001
CN_10002	Marco Midd	Worked as a Software Engineer for quite a while	40.71	74.00	TRUE	10	FN_100001
CN_10003	Nero Newbie	A newbie in the IT Industry	40.71	74.00	FALSE	3	FN_100001

candidate_job_history

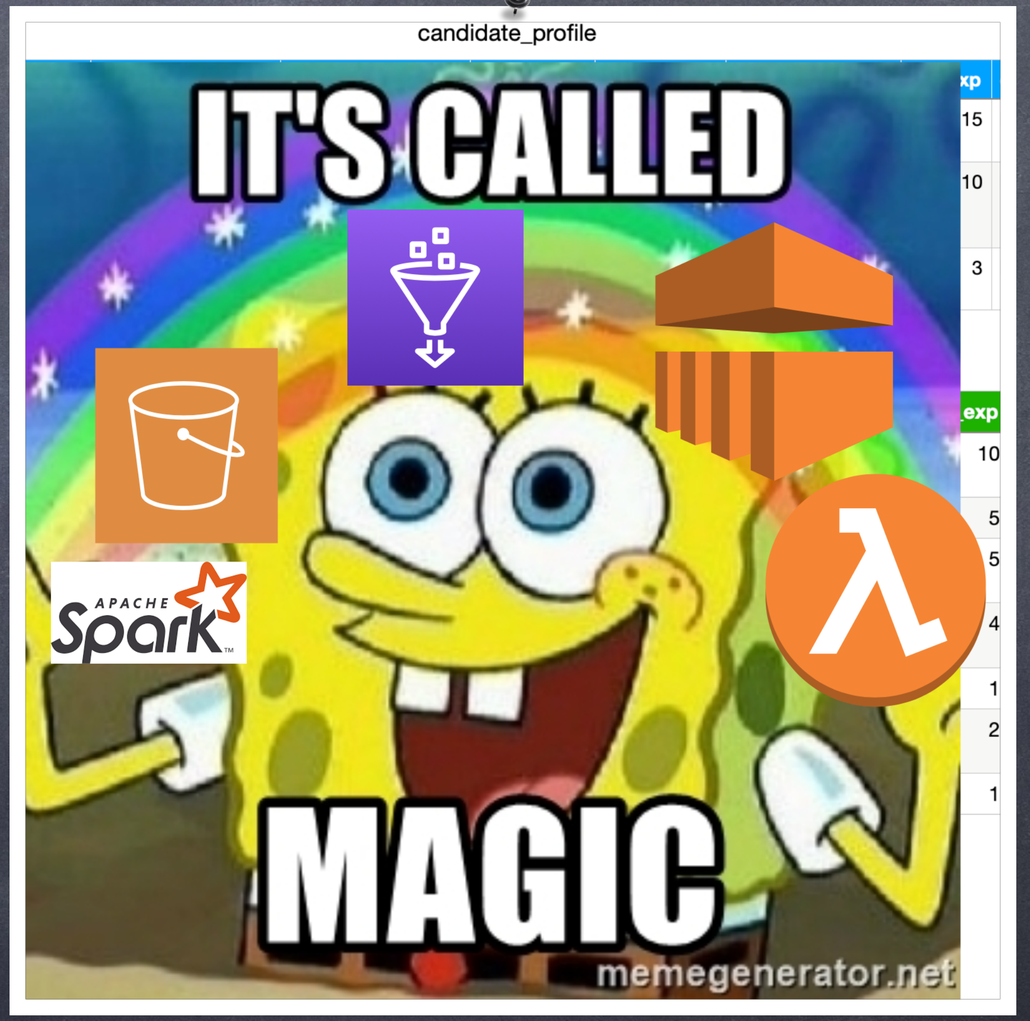
id	cand_id	job_title	industry_id	is_current	years_exp
JH_10001	CN_10001	Sr. Software Engineer	IND_100001	TRUE	10
JH_10002	CN_10001	Jr. Tech Support	IND_100002	FALSE	5
JH_10003	CN_10002	Sr. Software Engineer	IND_100001	TRUE	5
JH_10004	CN_10002	Jr. Software Engineer	IND_100001	FALSE	4
JH_10005	CN_10002	Intern	IND_100001	FALSE	1
JH_10006	CN_10003	Jr. Software Engineer	IND_100001	TRUE	2
JH_10007	CN_10003	Intern	IND_100001	FALSE	1

ref_industry

id	name
IND_100001	IT Engineering
IND_100002	IT Support

Responsibilities: Product Team

- unload the data from the Data Warehouse (Redshift) to AWS S3
- process the data using Spark (AWS Glue or EMR works)



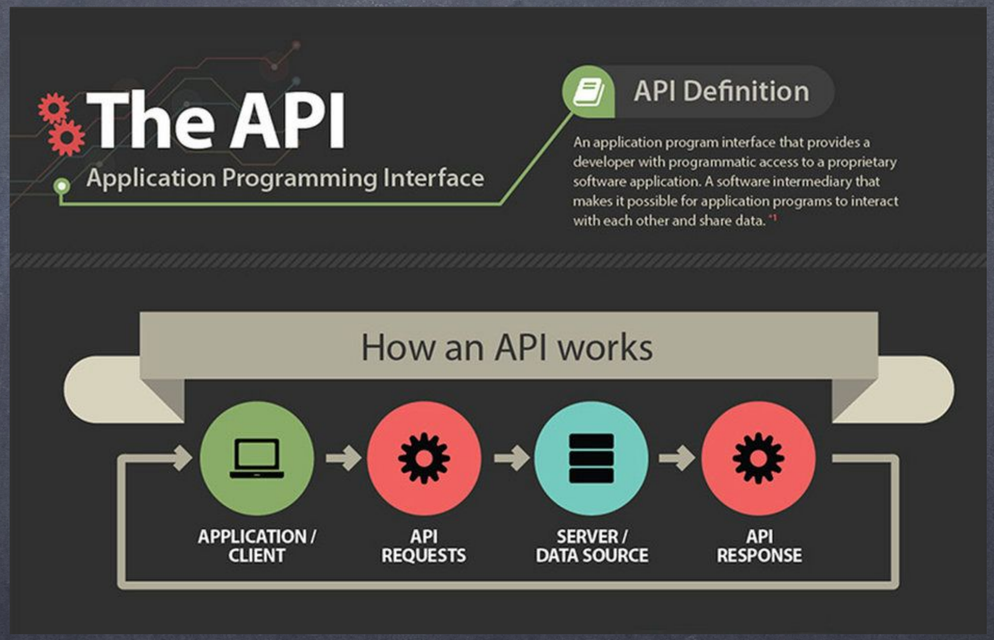
Responsibilities: Product Team

- unload the data from the Data Warehouse (Redshift) to AWS S3
- process the data using Spark (AWS Glue or EMR works)
- insert into Elasticsearch Service

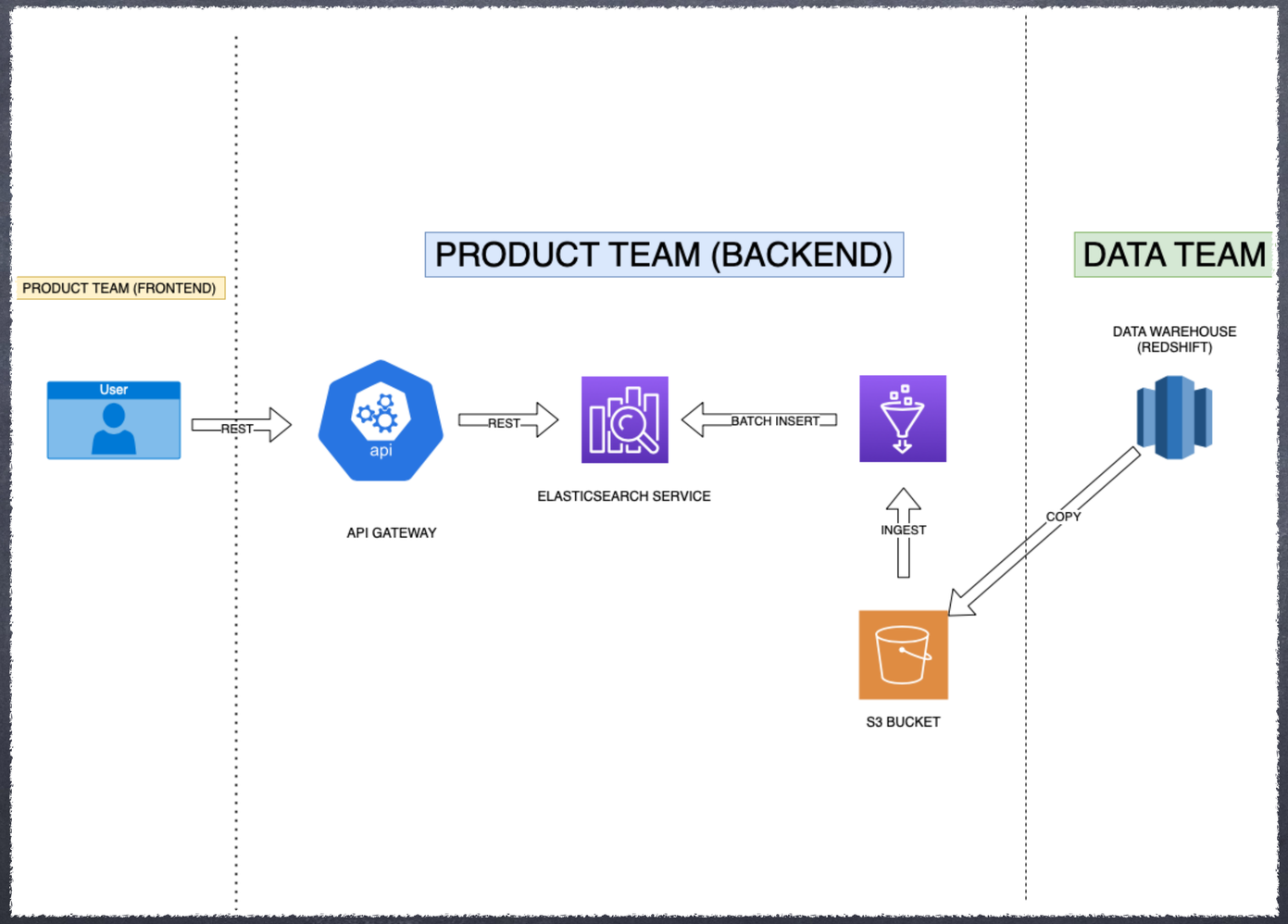
```
PUT candidates_demo/_doc/CN_10003
{
  "fullName": "Nero Newbie",
  "summary": "A newbie in the IT Industry",
  "location": [40.71, 74.00],
  "currentFunction": "FN_100001",
  "likelyToJump": false,
  "yearsOfExperience": 3,
  "jobHistories": [
    {
      "jobTitle": "Jr. Software Engineer",
      "industry": "IND_100001",
      "industryName": "IT Engineering",
      "yearsOfExperience": 2,
      "current": true
    },
    {
      "jobTitle": "Intern",
      "industry": "IND_100001",
      "industryName": "IT Engineering",
      "yearsOfExperience": 1,
      "current": false
    }
  ]
}
```

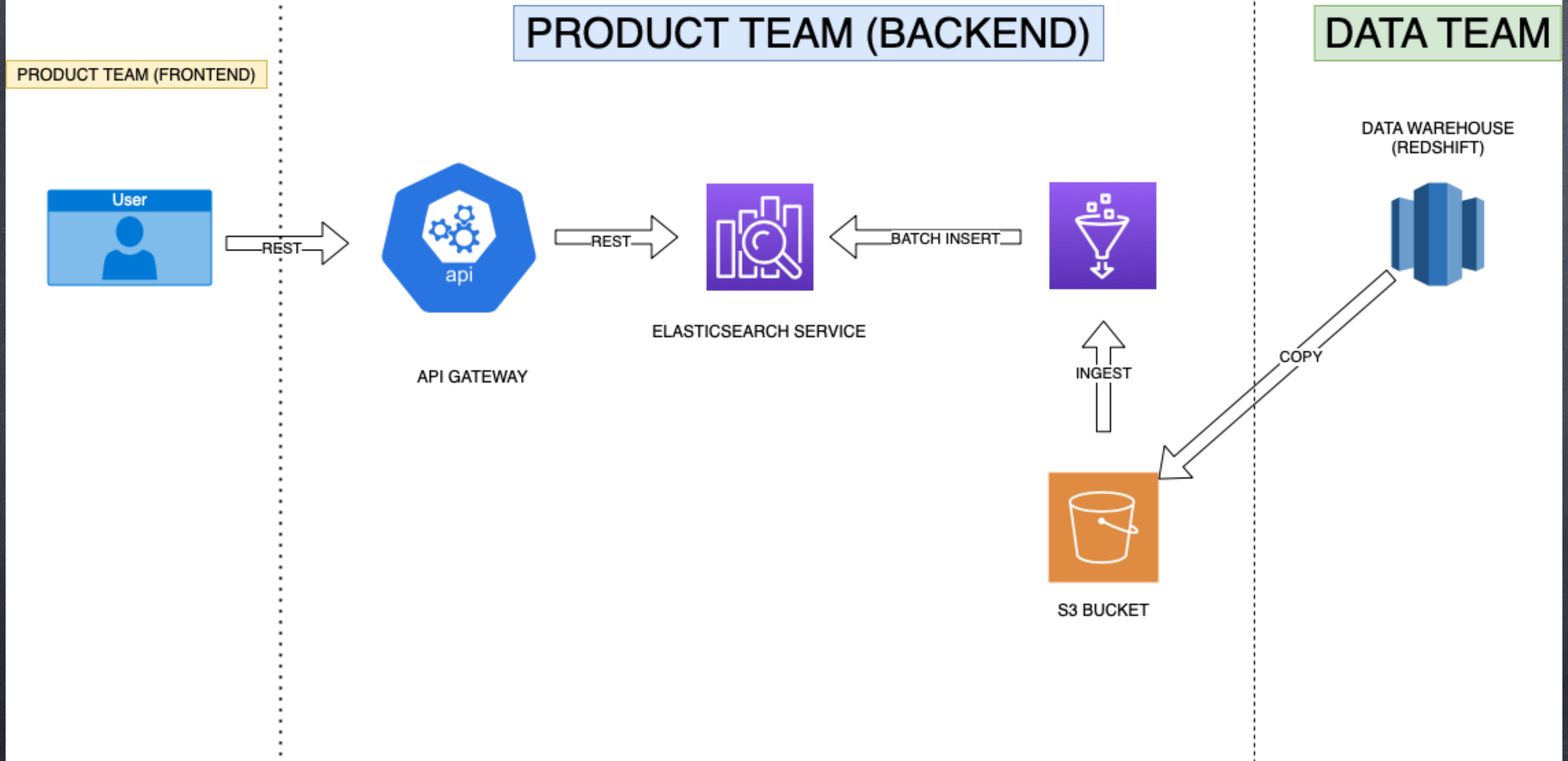
Responsibilities: Product Team

- unload the data from the Data Warehouse (Redshift) to AWS S3
- process the data using Spark (AWS Glue or EMR works)
- insert into Elasticsearch Service
- serve the data to the User via REST API



Overall Architecture




PRODUCT TEAM (BACKEND)
DATA TEAM
PRODUCT TEAM (FRONTEND)
DATA WAREHOUSE
(REDSHIFT)
User
REST
api
REST
BATCH INSERT
ELASTICSEARCH SERVICE
API GATEWAY
INGEST
COPY
S3 BUCKET

Capabilities and Limitations

Capabilities

- perform complex queries (geospatial, range, nested, composite)

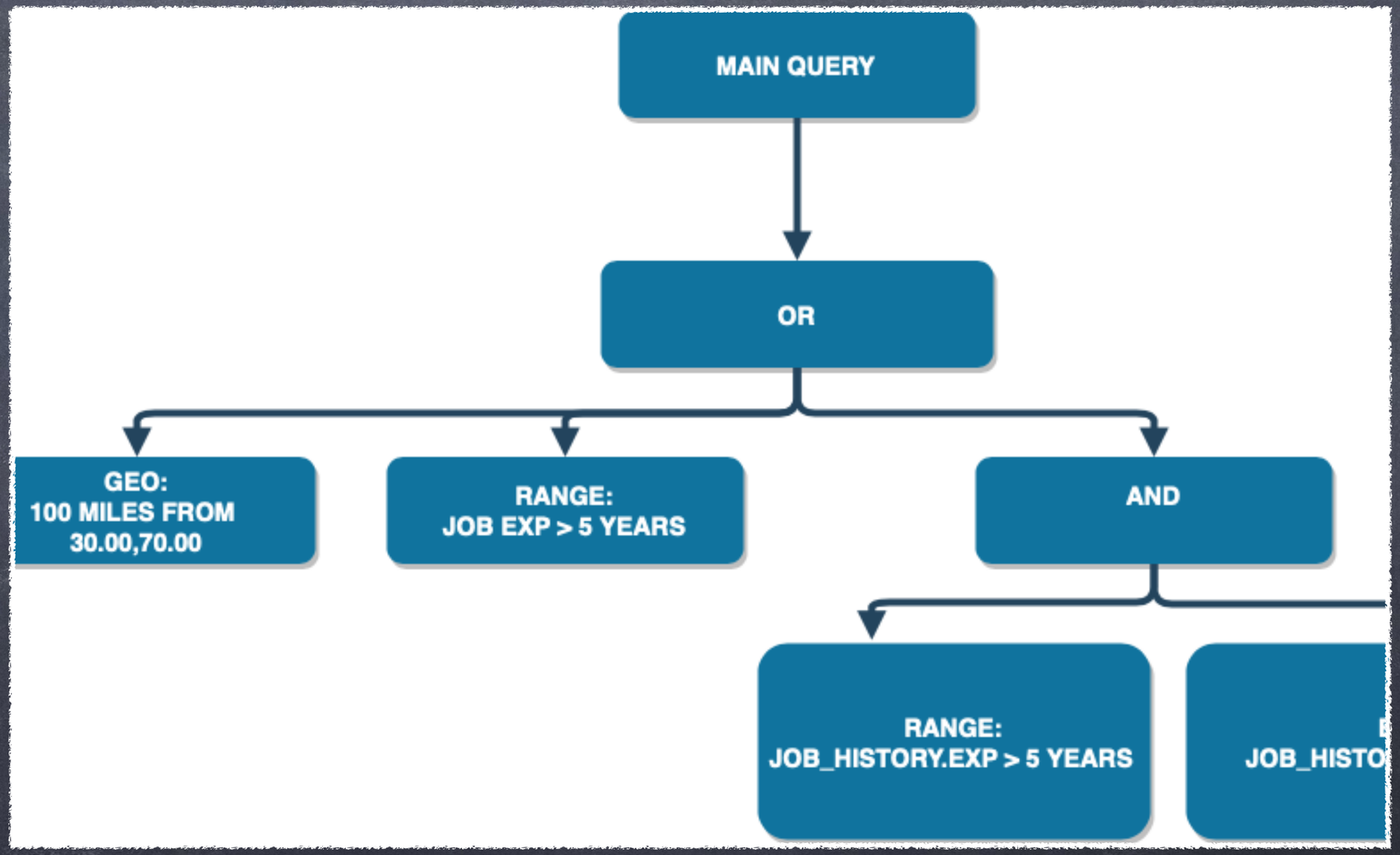
```
GET candidates_demo/_search
{
  "explain": false,
  "query": {
    "bool": {
      "should": [
        {
          "constant_score": {
            "filter": {
              "term": {
                "likelyToJump": {
                  "value": true
                }
              }
            },
            "boost": 1
          }
        },
        {
          "constant_score": {
            "filter": {
              "range": {
                "yearsOfExperience": {
                  "gte": 15
                }
              }
            },
            "boost": 1.5
          }
        }
      ]
    }
```

```
GET candidates_demo/_search
{
  "explain": false,
  "query": {
    "bool": {
      "should": [
        {
          "constant_score": {
            "filter": {
              "term": {
                "likelyToJump": {
                  "value": true
                }
              }
            },
            "boost": 1
          }
        },
        {
          "constant_score": {
            "filter": {
              "range": {
                "yearsOfExperience": {
                  "gte": 15
                }
              }
            },
            "boost": 1.5
          }
        }
      ]
    }
  }
}
```

```
# GET candidates_demo/_search
{
  "took" : 3,
  "timed_out" : false,
  "_shards" : {
    "total" : 5,
    "successful" : 5,
    "skipped" : 0,
    "failed" : 0
  },
  "hits" : {
    "total" : {
      "value" : 2,
      "relation" : "eq"
    },
    "max_score" : 2.5,
    "hits" : [
      {
        "_index" : "candidates_demo",
        "_type" : "_doc",
        "_id" : "CN_10001",
        "_score" : 2.5,
        "_source" : {
          "fullName" : "Olaf Oldtimer",
          "summary" : "An oldtimer in the IT Industry",
          "location" : [
            40.71,
            74.0
          ],
          "currentFunction" : "FN_100001",
          "likelyToJump" : true,
          "yearsOfExperience" : 15,
          "jobHistories" : [
            {
```

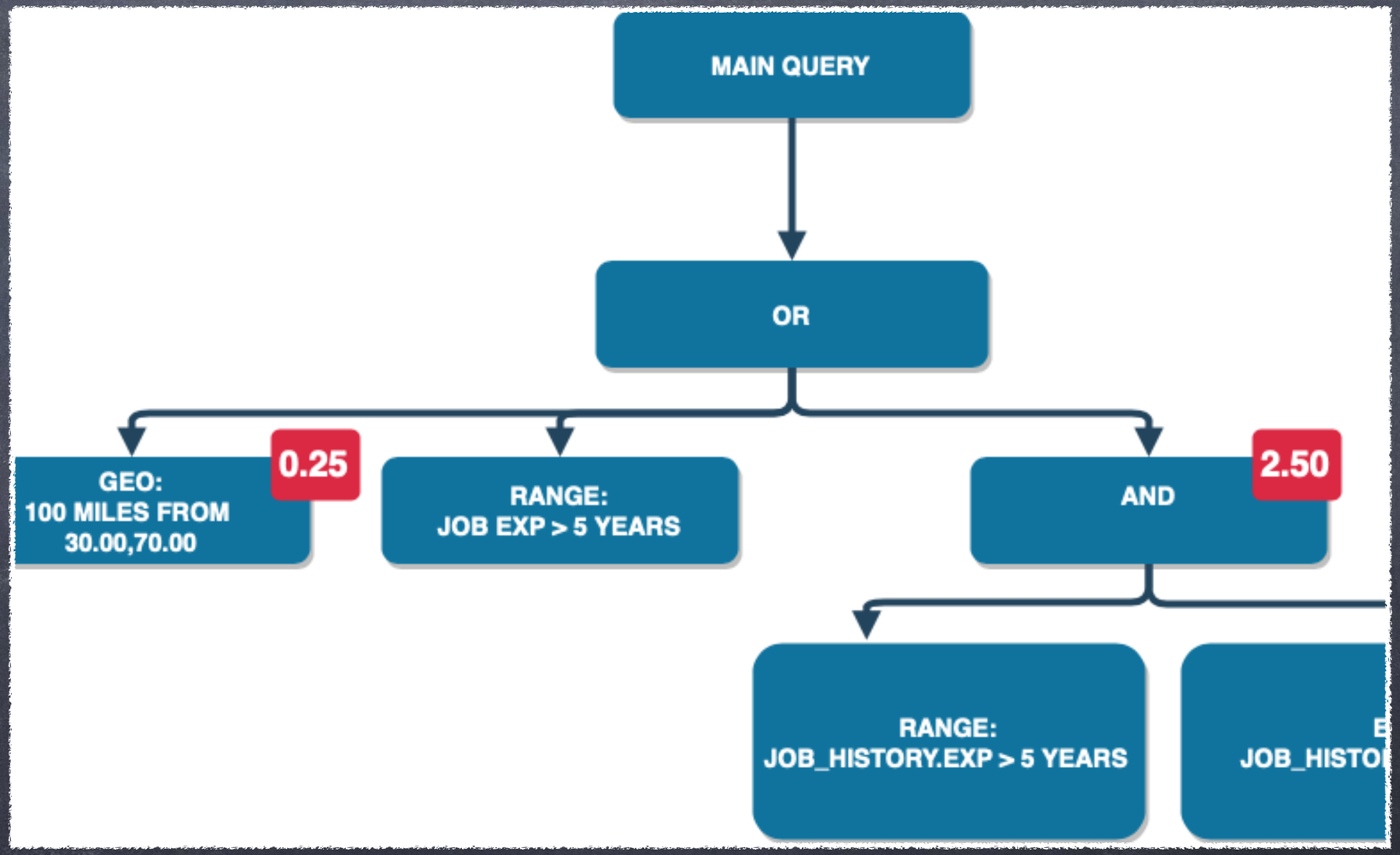
Capabilities

- perform complex queries (geospatial, range, nested, composite)



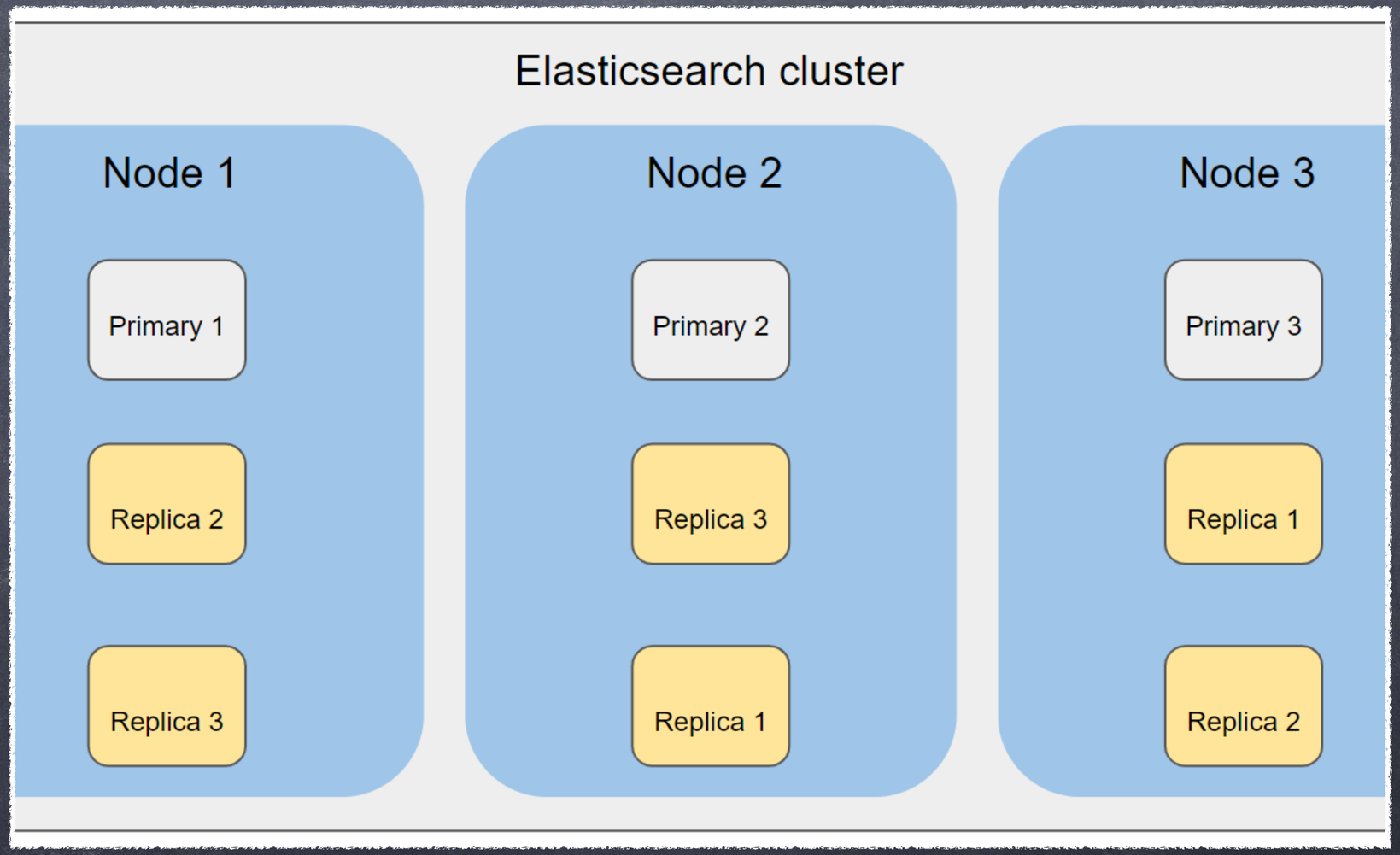
Capabilities

- perform complex queries (geospatial, range, nested, composite)
- add weights to influence the score



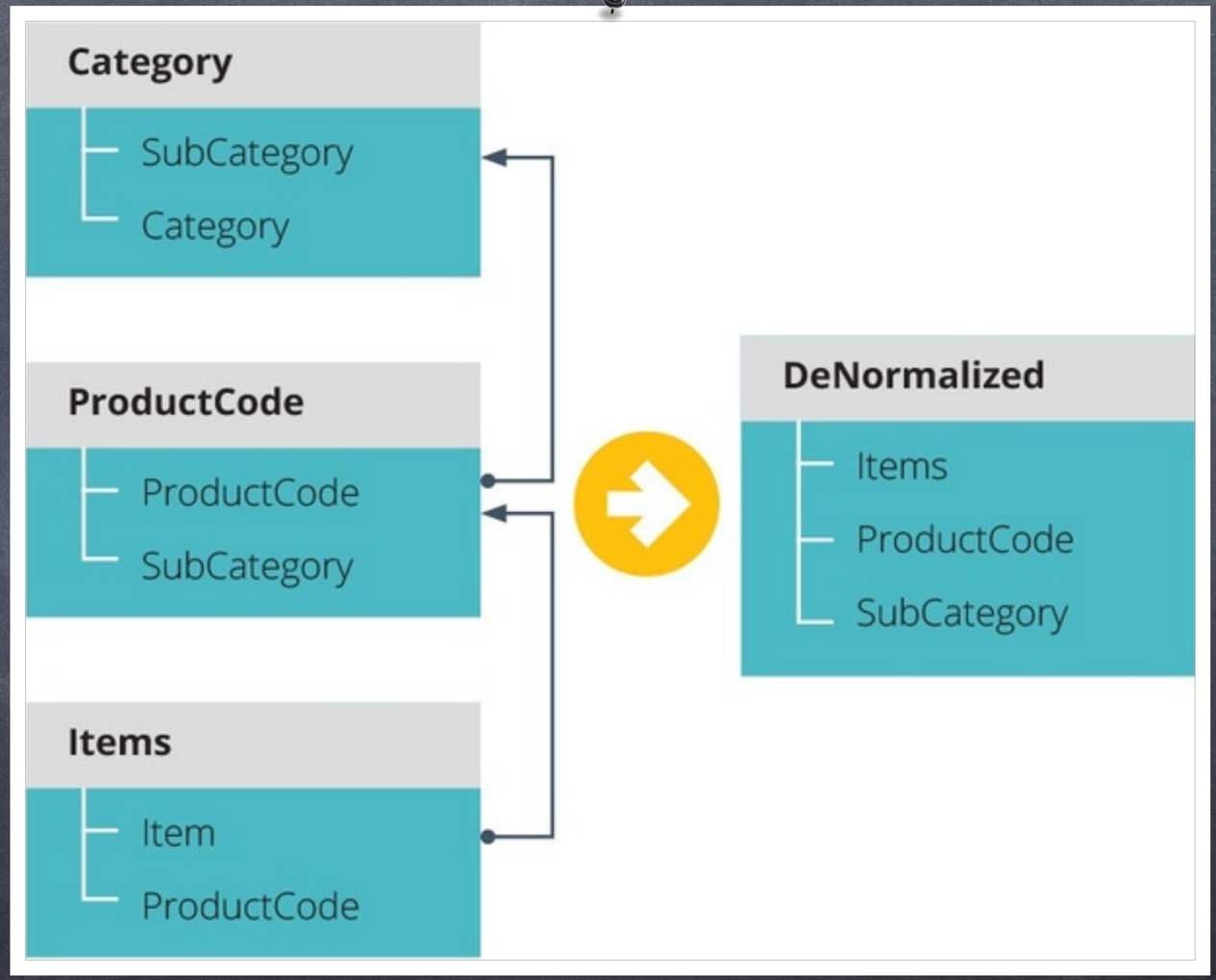
Capabilities

- perform complex queries (geospatial, range, nested, composite)
- add weights to influence the score
- infinite scalability



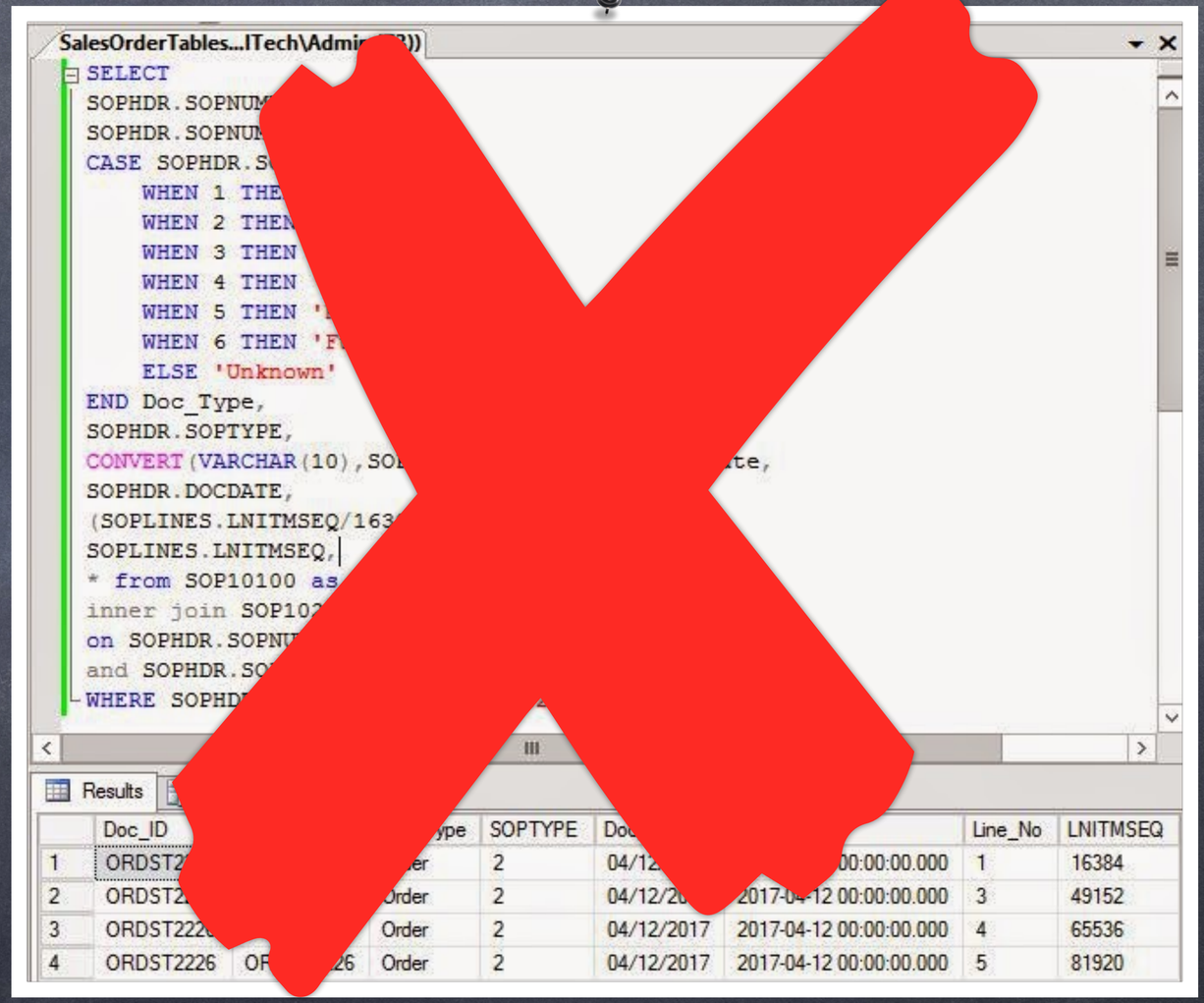
Limitations

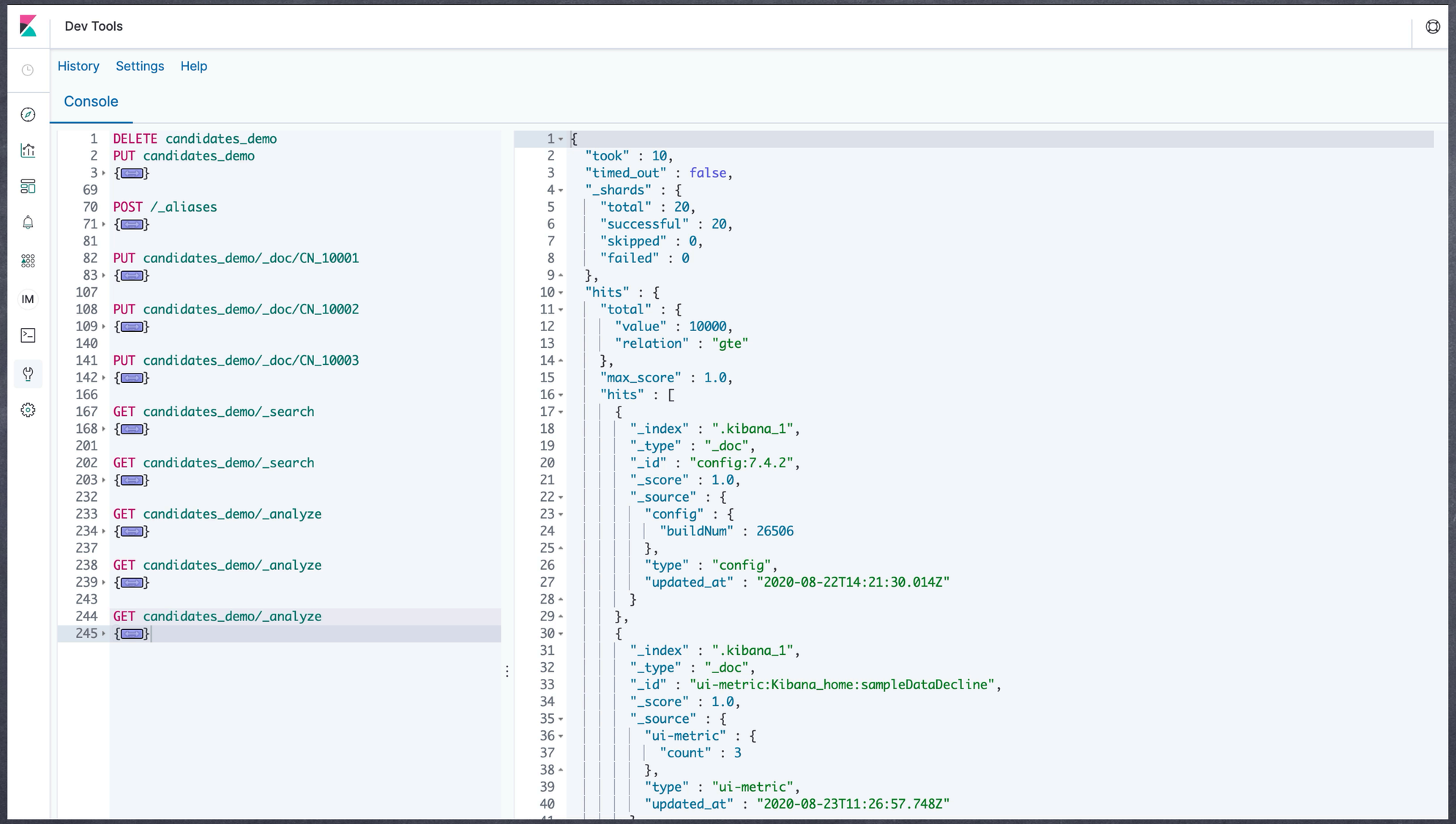
- joins (denormalization)



Limitations

- ad hoc queries (update, recreate and re-insert the index every time we have a new query to support)





"The End."

-LM Bibera