Big Data Ingestion Using Hadoop : 1038-A

Faculty Advisor and Sponsor:
Dr. Rohit Aggarwal

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Team Members and Roles

Aditya Kannan

Software Engineer and Project Manager

Ekta Jaiswal

Data Engineer

Vikal Gupta

Software Developer and Reporting Analyst

Agenda

- Data Scenario today
- Why this project and Objective
- Business Questions to be answered
- Project Infrastructure
- Project Workflow
- Learnings and Conclusion

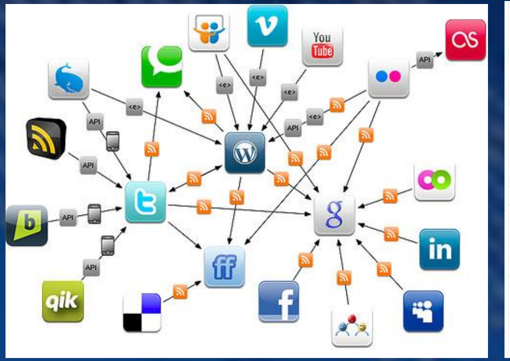
Data Scenario today

- According to IBM, 80% of data generated today is unstructured

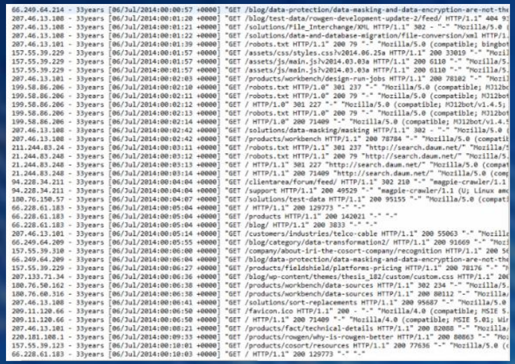
Outsourcing Data

Video Streaming Data

Social Media Data



Logs Data



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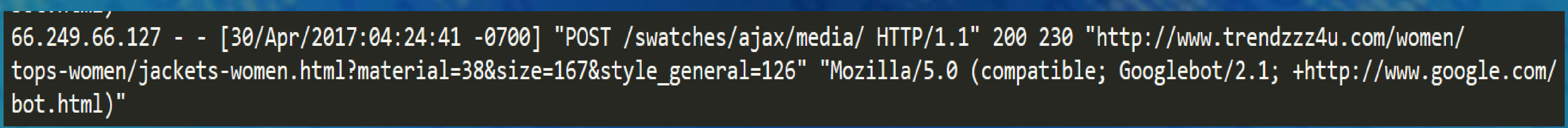
157.55.39.123 - 33years [06/Jul/2014:00:10:01 +0000] "GET /products/cosort/resources HTTP/1.1" 200 77636 "-" "Mozilla/5.0 (c
66.228.61.183 - 33years [06/Jul/2014:00:10:03 +0000] "GET / HTTP/1.1" 200 129773 "-" "-"
```

- Need to process unstructured data to structured data

Why this Project ?

- To learn and implement big data technologies which are used to process log data
- Clickstream Log Data as the data source
- What is Clickstream data?

  Clickstream Data is user navigation data on any website



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tops-women/jackets-women.html?material=38&size=167&style_general=126" "Mozilla/5.0 (compatible; Googlebot/2.1; +http://www.google.com/
bot.html)"
```

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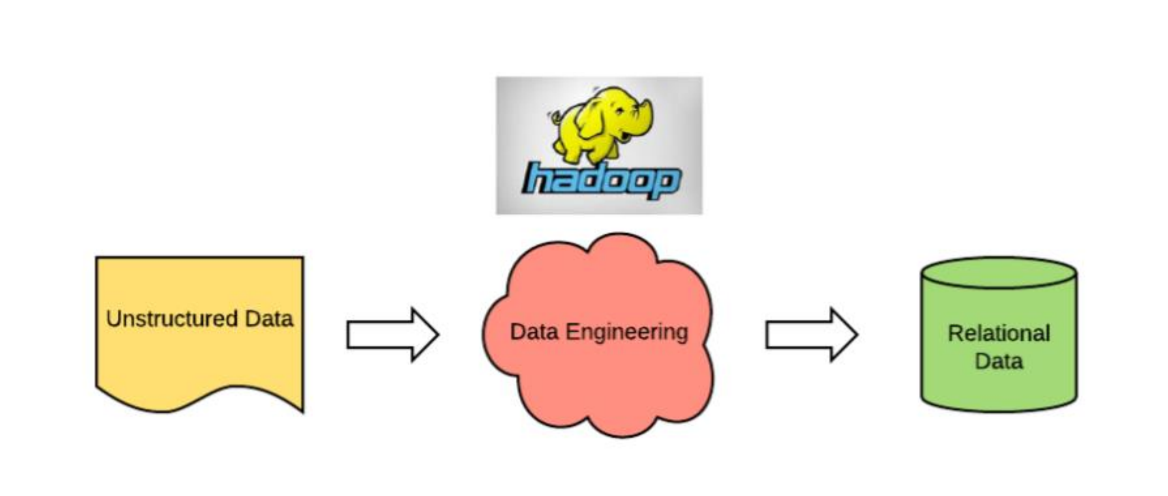
- Big data world comprises of many technologies
- Focus of this project is to learn and implement Apache Hadoop ecosystem



- Hadoop is primarily used for Data Engineering by many companies notably Amazon, eBay, Walmart

Business Questions to be answered

- Most popular browsing time
- Most popular product category
- Weekly Distribution of Clicks per page
- Customer Conversion Rate

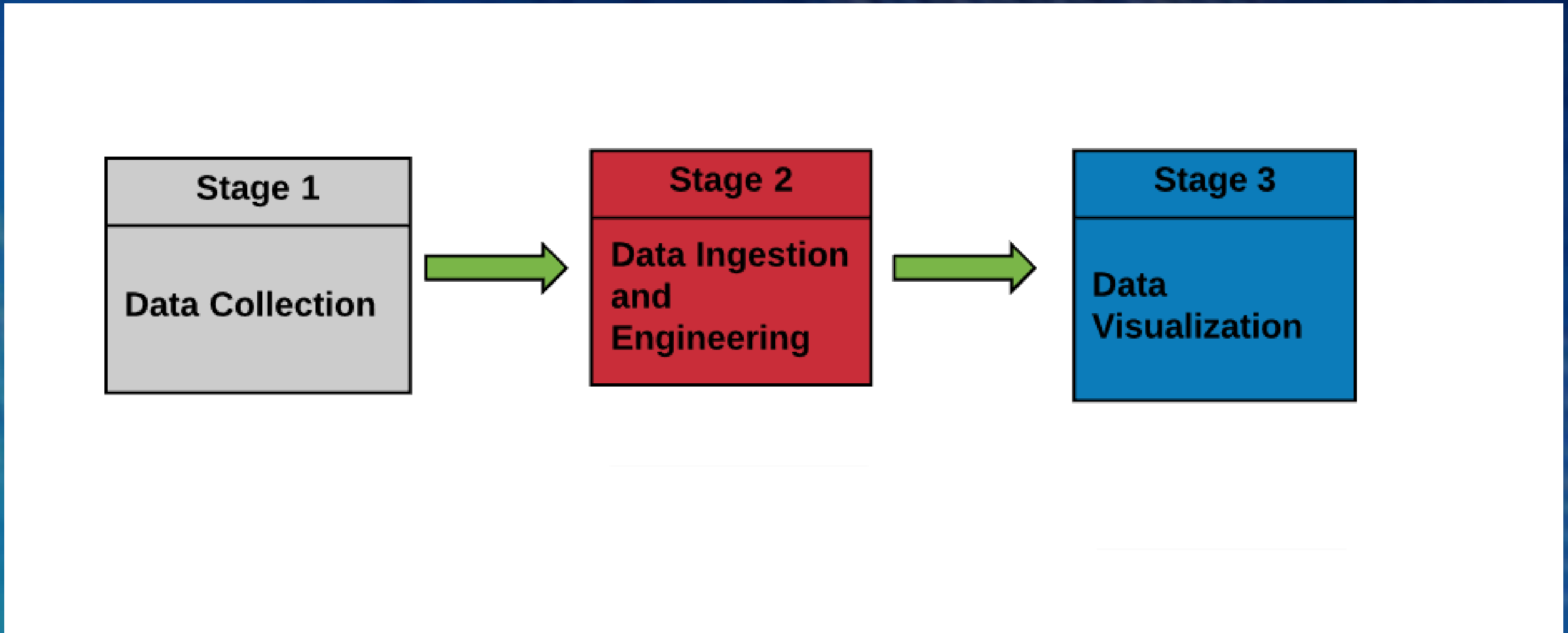
Project Infrastructure

Major components of infrastructure

- eCommerce Website Setup: Magento eCommerce platform, goDaddy cPanel hosting
- Apache Hadoop Setup: Multi Node Cloudera Hadoop cluster on aws EC2
- Data Collection Server: Divolte.js setup on aws EC2 to track custom events from website

Project Workflow

- Primarily three stages
- Performed several iterations of the below workflow



Stage 1

Data Collection

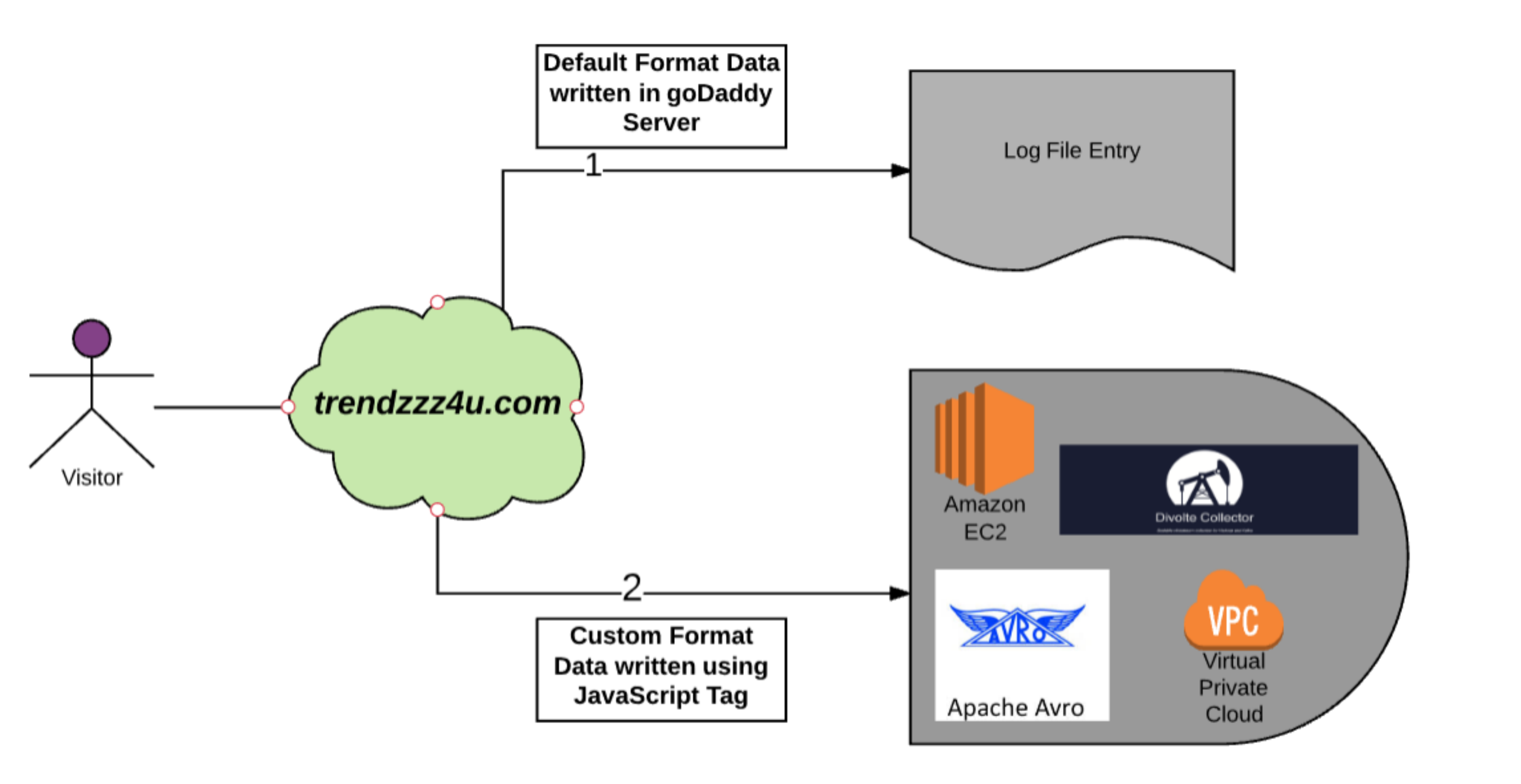
Stage 2

Data Ingestion and Engineering

Stage 3

Data Visualization

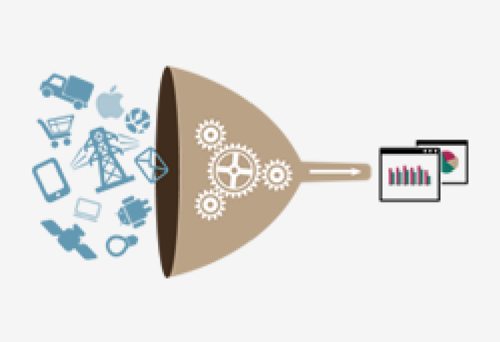
Stage 1 : Data Collection



Two Ways to track Website Visitor

Stage 2: Data Ingestion and Engineering

- The process of accessing and importing data for immediate usage or storage in a database is called as Data Ingestion



- Build Data Pipeline
- Transfer files from local Filesystem to HDFS (Hadoop File System)

E.g. Apache Sqoop is a popular tool used in big data ecosystem to transfer bulk data

jargons

- Data engineering is a process of converting unstructured data to meaningful relational data using set of sophisticated tools or procedures
  - ✓ ELT Process (Extract Load Transform)
  - ✓ Focus on data transformation using Map Reduce

E.g. Components used in this project:

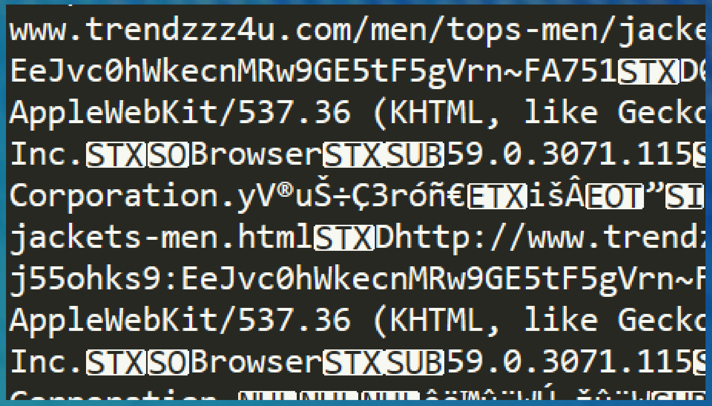
- Apache Hive
- Apache Pig
- Python

Apache Hive

- It provides a SQL like interface to query data stored in various databases and file system

Application in our project: Avro File (Data Source)

Before



```
www.trendzzz4u.com/men/tops-men/jacke
EeJvc0hWkecnMRw9GE5tF5gVrn~FA751STXD
AppleWebKit/537.36 (KHTML, like Geck
Inc.STXSOBrowserSTXSUB59.0.3071.115
Corporation.yV®uŠ÷Ç3róñ€ETXišÂEOT”SI
jackets-men.htmlSTXDhttp://www.trend
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Inc.STXSOBrowserSTXSUB59.0.3071.115
```
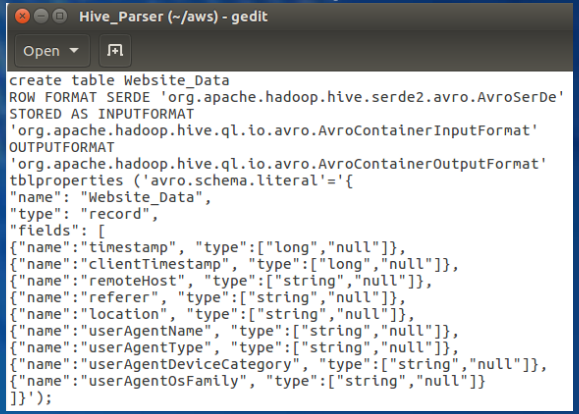
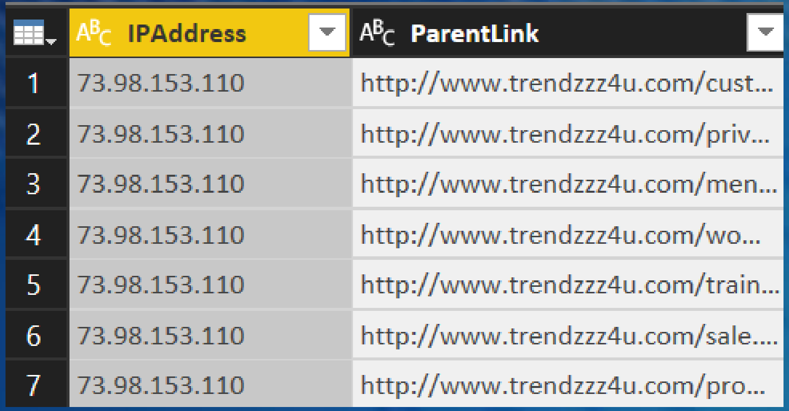

Run Script



```
create table Website_Data
ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.avro.AvroSerDe'
STORED AS INPUTFORMAT
'org.apache.hadoop.hive.ql.io.avro.AvroContainerInputFormat'
OUTPUTFORMAT
'org.apache.hadoop.hive.ql.io.avro.AvroContainerOutputFormat'
tblproperties ('avro.schema.literal'='{
"name": "Website_Data",
"type": "record",
"fields": [
{"name":"timestamp", "type":["long","null"]},
{"name":"clientTimestamp", "type":["long","null"]},
{"name":"remoteHost", "type":["string","null"]},
{"name":"referer", "type":["string","null"]},
{"name":"location", "type":["string","null"]},
{"name":"userAgentName", "type":["string","null"]},
{"name":"userAgentType", "type":["string","null"]},
{"name":"userAgentDeviceCategory", "type":["string","null"]},
{"name":"userAgentOsFamily", "type":["string","null"]}
]}');
```

After



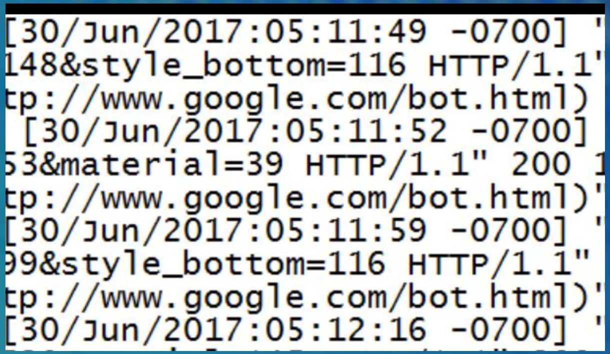
	IPAddress	ParentLink
1	73.98.153.110	http://www.trendzzz4u.com/cust...
2	73.98.153.110	http://www.trendzzz4u.com/priv...
3	73.98.153.110	http://www.trendzzz4u.com/men...
4	73.98.153.110	http://www.trendzzz4u.com/wo...
5	73.98.153.110	http://www.trendzzz4u.com/train...
6	73.98.153.110	http://www.trendzzz4u.com/sale....
7	73.98.153.110	http://www.trendzzz4u.com/pro...

Apache Pig and Python

- It is a high level platform for creating programs on Hadoop. The language used is called as Pig Latin

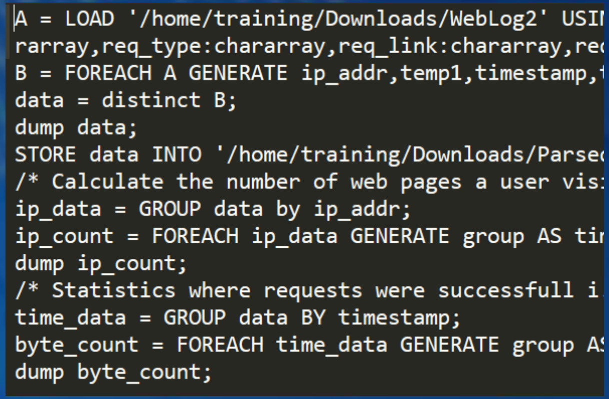
Application in our project: Web Server Log File (Data Source)

Before



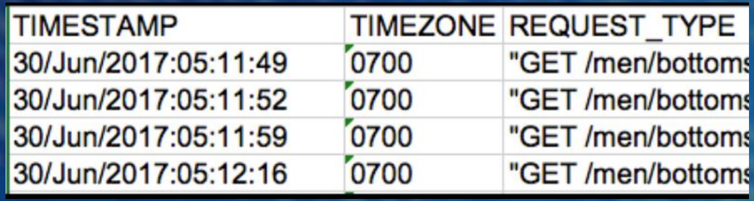
```
[30/Jun/2017:05:11:49 -0700] '
148&style_bottom=116 HTTP/1.1'
tp://www.google.com/bot.html)
 [30/Jun/2017:05:11:52 -0700]
53&material=39 HTTP/1.1" 200 1
tp://www.google.com/bot.html)'
[30/Jun/2017:05:11:59 -0700] '
99&style_bottom=116 HTTP/1.1"
tp://www.google.com/bot.html)'
[30/Jun/2017:05:12:16 -0700] '
```

Run Script



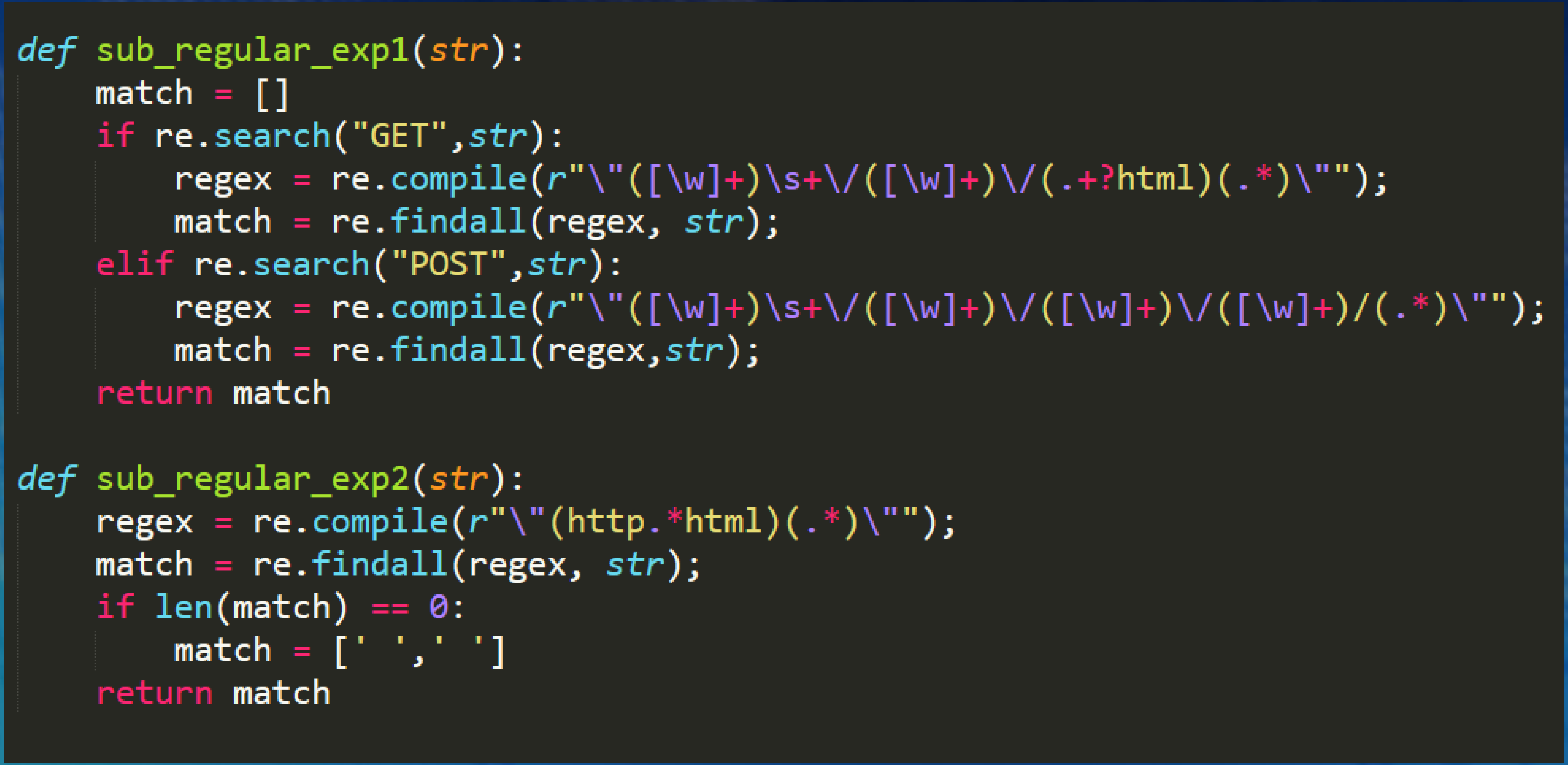
```
A = LOAD '/home/training/Downloads/WebLog2' USI
rarray,req_type:chararray,req_link:chararray,re
B = FOREACH A GENERATE ip_addr,temp1,timestamp,
data = distinct B;
dump data;
STORE data INTO '/home/training/Downloads/Parse
/* Calculate the number of web pages a user vis
ip_data = GROUP data by ip_addr;
ip_count = FOREACH ip_data GENERATE group AS ti
dump ip_count;
/* Statistics where requests were successfull i
time_data = GROUP data BY timestamp;
byte_count = FOREACH time_data GENERATE group A
dump byte_count;
```

After



TIMESTAMP	TIMEZONE	REQUEST_TYPE
30/Jun/2017:05:11:49	0700	"GET /men/bottoms
30/Jun/2017:05:11:52	0700	"GET /men/bottoms
30/Jun/2017:05:11:59	0700	"GET /men/bottoms
30/Jun/2017:05:12:16	0700	"GET /men/bottoms

Sample of Python Script



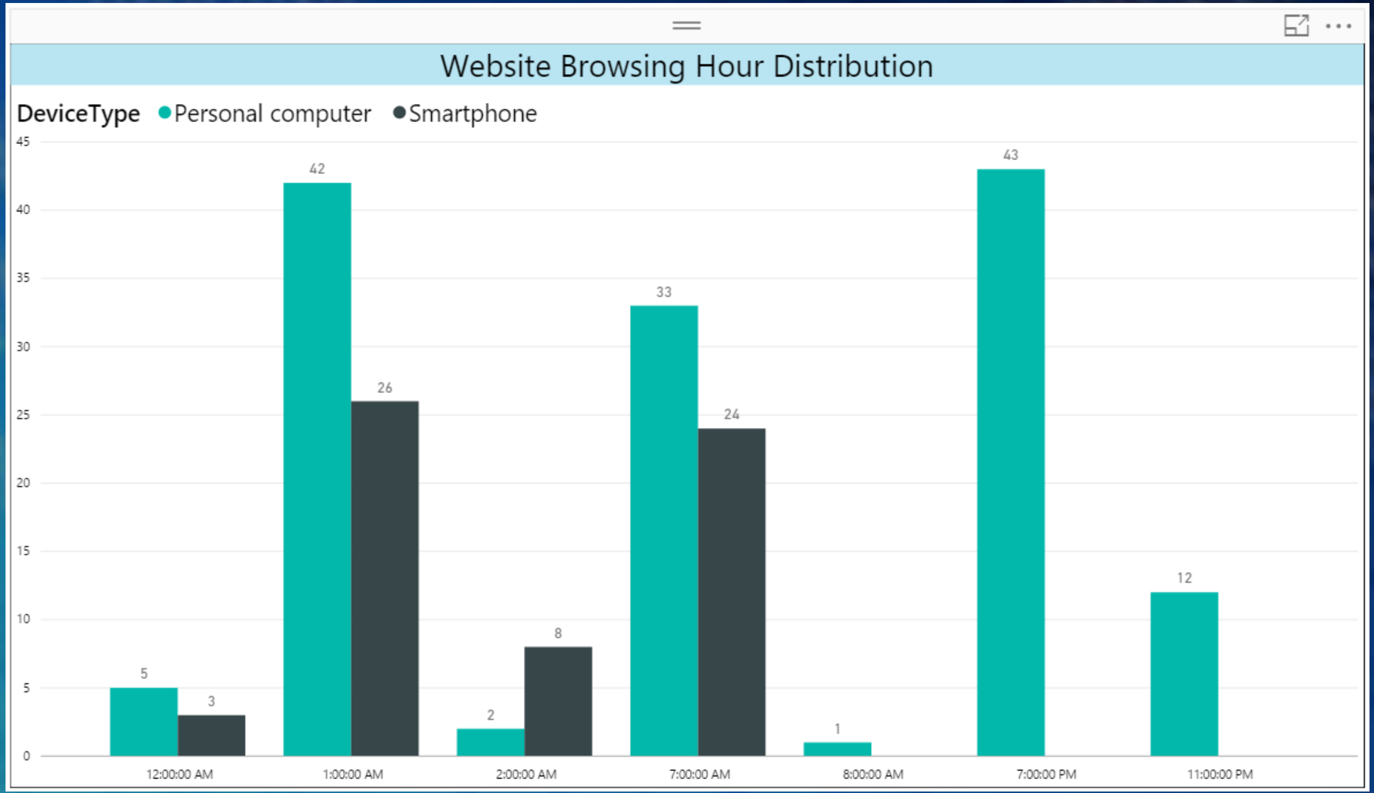
```
def sub_regular_exp1(str):
    match = []
    if re.search("GET",str):
        regex = re.compile(r"\"([\w]+)\s+\/([\w]+)\/(.+?html)(.*)\"");
        match = re.findall(regex, str);
    elif re.search("POST",str):
        regex = re.compile(r"\"([\w]+)\s+\/([\w]+)\/([\w]+)\/([\w]+)/(.*)\"");
        match = re.findall(regex,str);
    return match

def sub_regular_exp2(str):
    regex = re.compile(r"\"(http.*html)(.*)\"");
    match = re.findall(regex, str);
    if len(match) == 0:
        match = [' ',' ']
    return match
```

Stage 3: Data Visualization

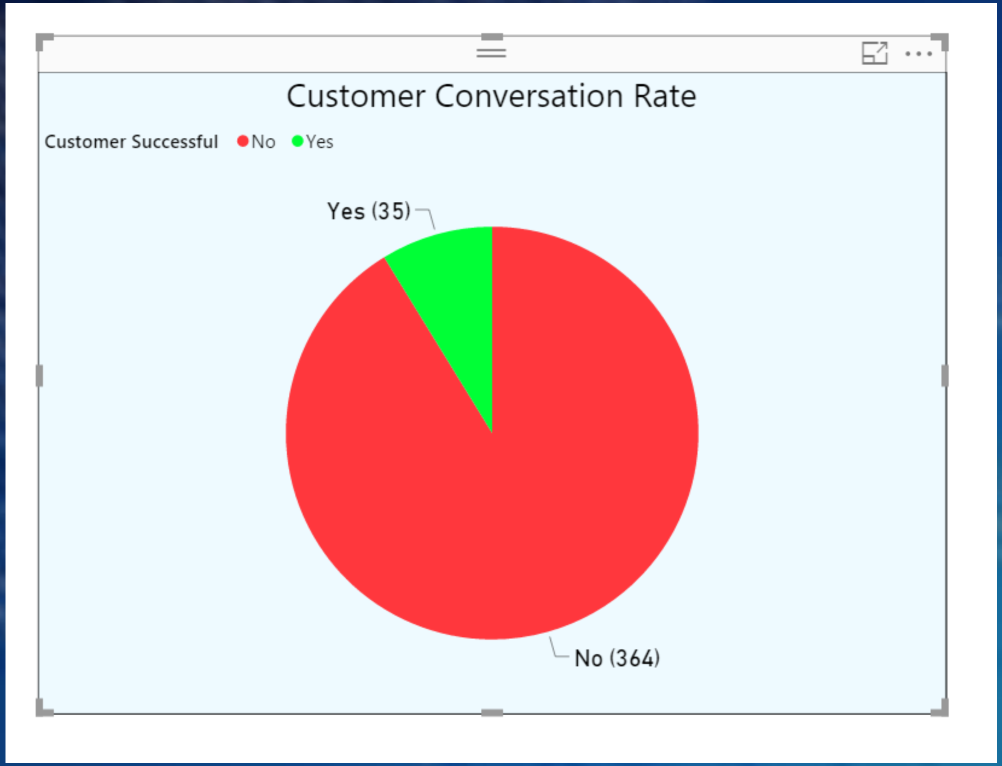
- Final stage of the process
- Structured Data exported from Hadoop to csv format
- Use of Business Intelligence tools such as Tableau and Power BI

Sample Reports

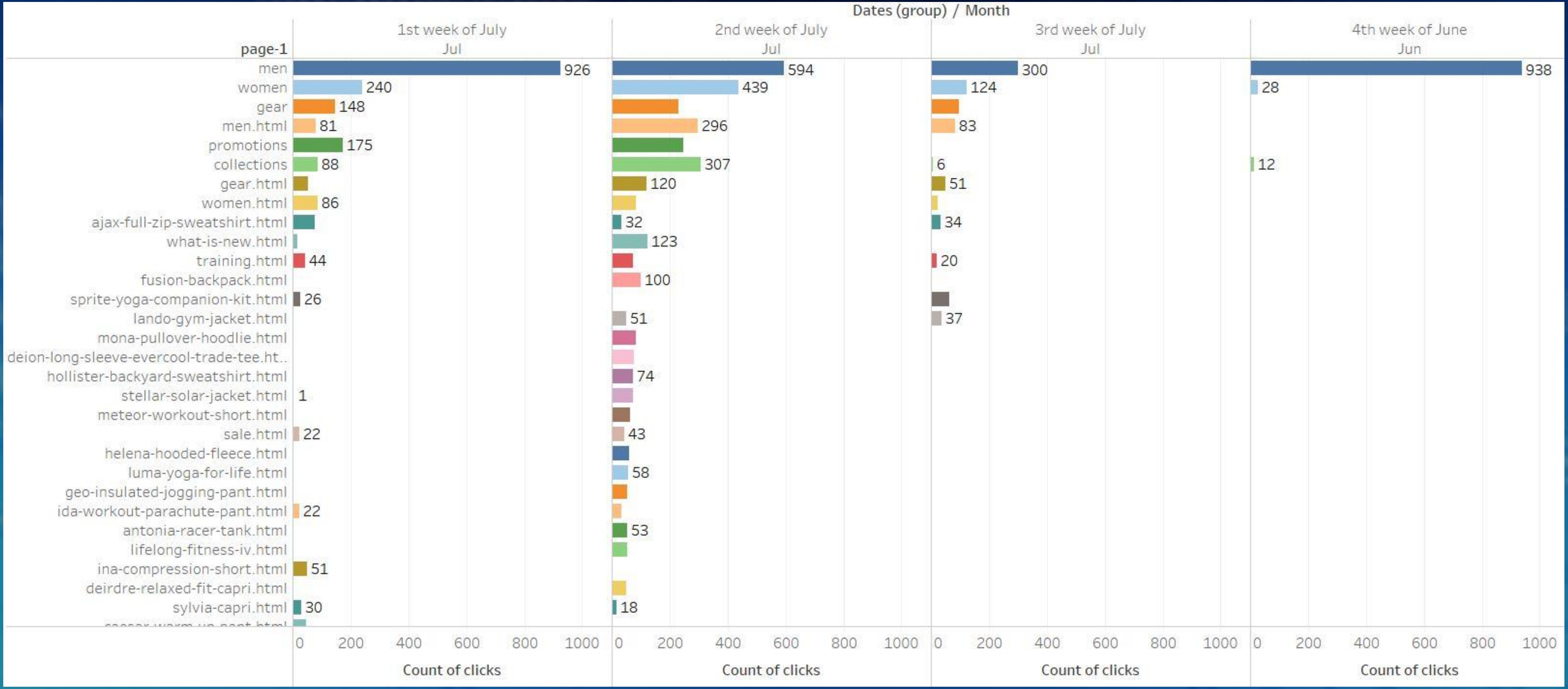
Website Browsing Hour Distribution



Customer Conversion Rate



Weekly Distribution of Clicks per page



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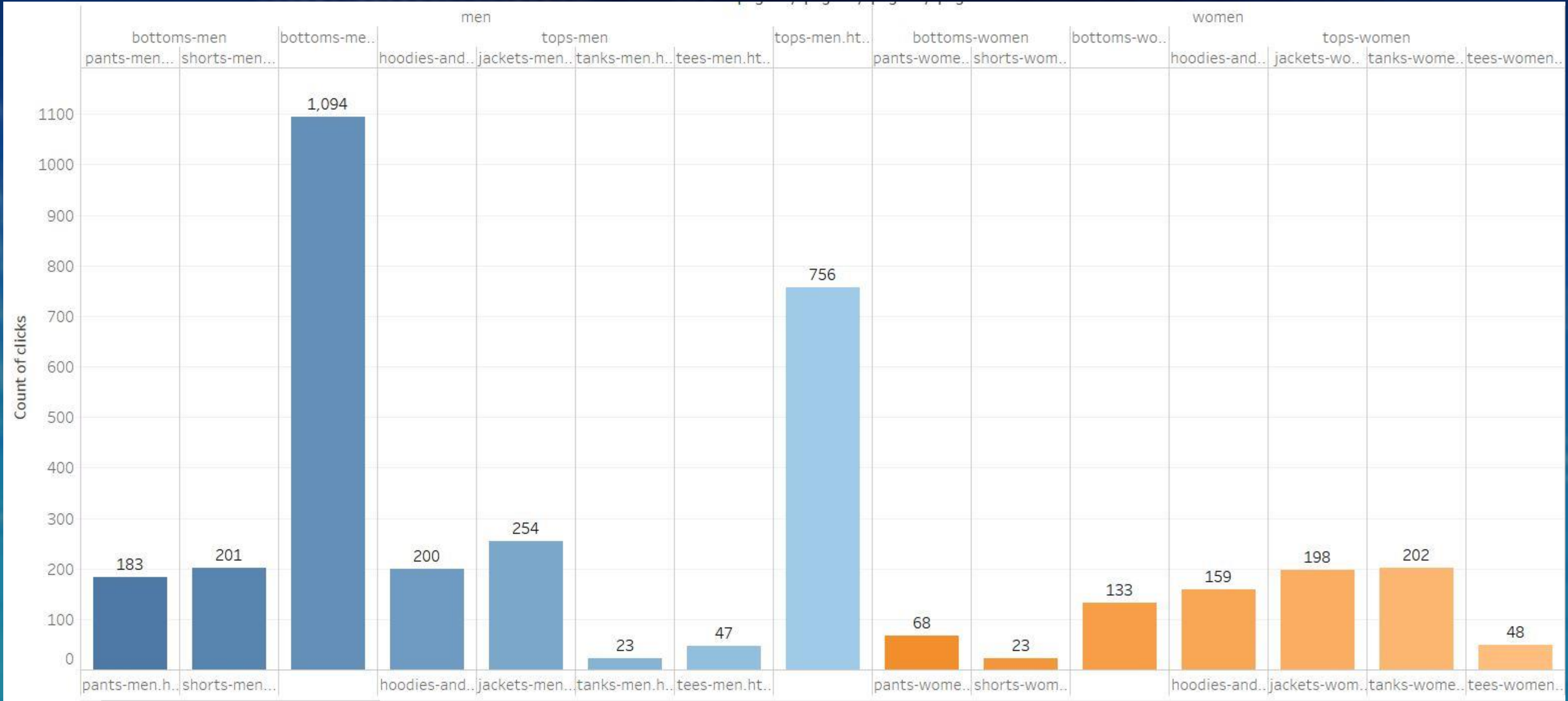
Most Popular Product Category

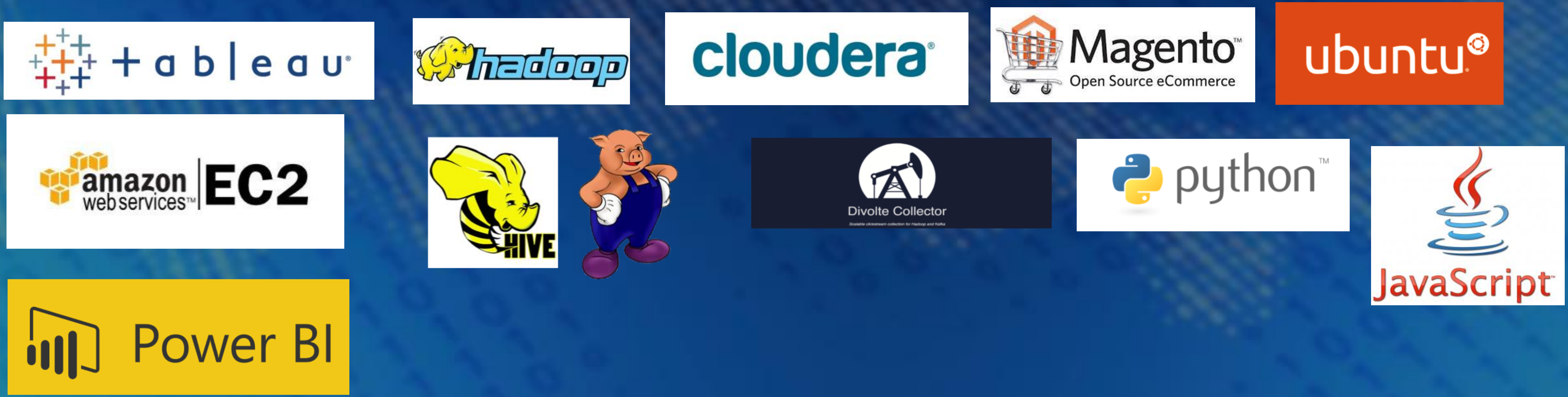


Challenges Faced

- eCommerce Website Setup
- Multi-node cluster creation on Amazon Ec2
- Cloudera Hadoop Installation on cluster
- Parsing links to get detailed information about Product Category and sub-category

Learnings and Conclusion

- Implementation of an end to end project
- Technology Stack worked on:



Special Thanks

- Thanks to our entire Capstone Faculty team and Sponsor for timely guidance
- Bi-weekly progress reports helped us to get a reality check of the project
- Great learning experience

Any Questions?

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Thank You!!!

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