

ElasticLog with ES in CloudEdge

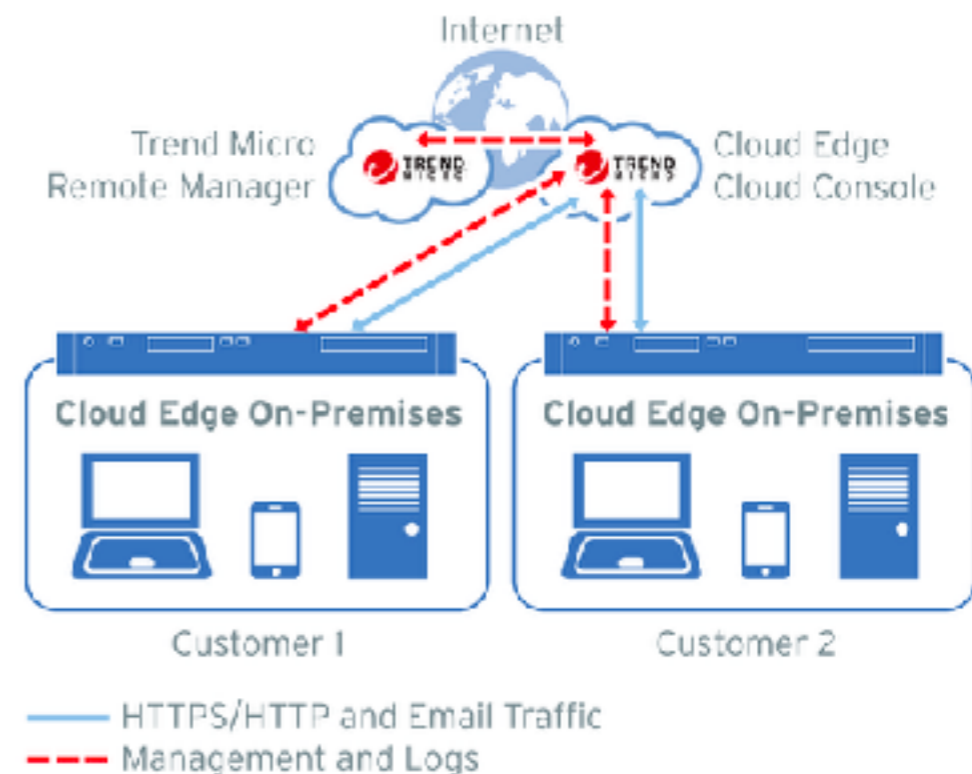
Bruce Zhao





CloudEdge

- A hybrid Unified Threat Management (UTM) appliance.
- Firewall, IPS, URL filter, web security, email security, application control, bandwidth control, user VPN, etc.
- Combination of on-premise appliance and cloud service.





Project ElasticLog



Internet

Bandwidth

Security

Policy

```

2018-06-27 16:04:45 +0800      nj-host-ken      202.45.67.178   Allen Fang (RD-CN)   102.34.23.43
88      6      1504      0      3      qq-policy      4      1051149 ken.java      Virus007
www.google.com /find.php?c=bcda      81      60,58,33,35      1357      0

2018-06-27 16:04:45 +0800      nj-host-ethan    10.64.69.252    Ming Chen (QA-CN)    67.32.45.67
21      6      1504      0      1      Default 9      1055988 mfile.mp3      Virus007      www.sina
.com      /find.php?c=bcda      21      21,18,31,45      9892      0

2018-06-27 16:04:45 +0800      nj-host-james    10.204.16.66    Ethan She (RD-CN)    10.204.1.1
2543    17      2412      0      1      allow-web      13      1054202 ken.java      KidVirus002
www.baidu.com /index.html      81      60,58,33,35      9892      0

2018-06-27 16:04:45 +0800      nj-host-ken      64.67.32.142    Allen Fang (RD-CN)    102.34.23.43
22      17      1170      0      2      qq-policy      5      1055988 ken.java      KidVirus002
www.sina.com /index.html      60      21,18,31,45      25436      1

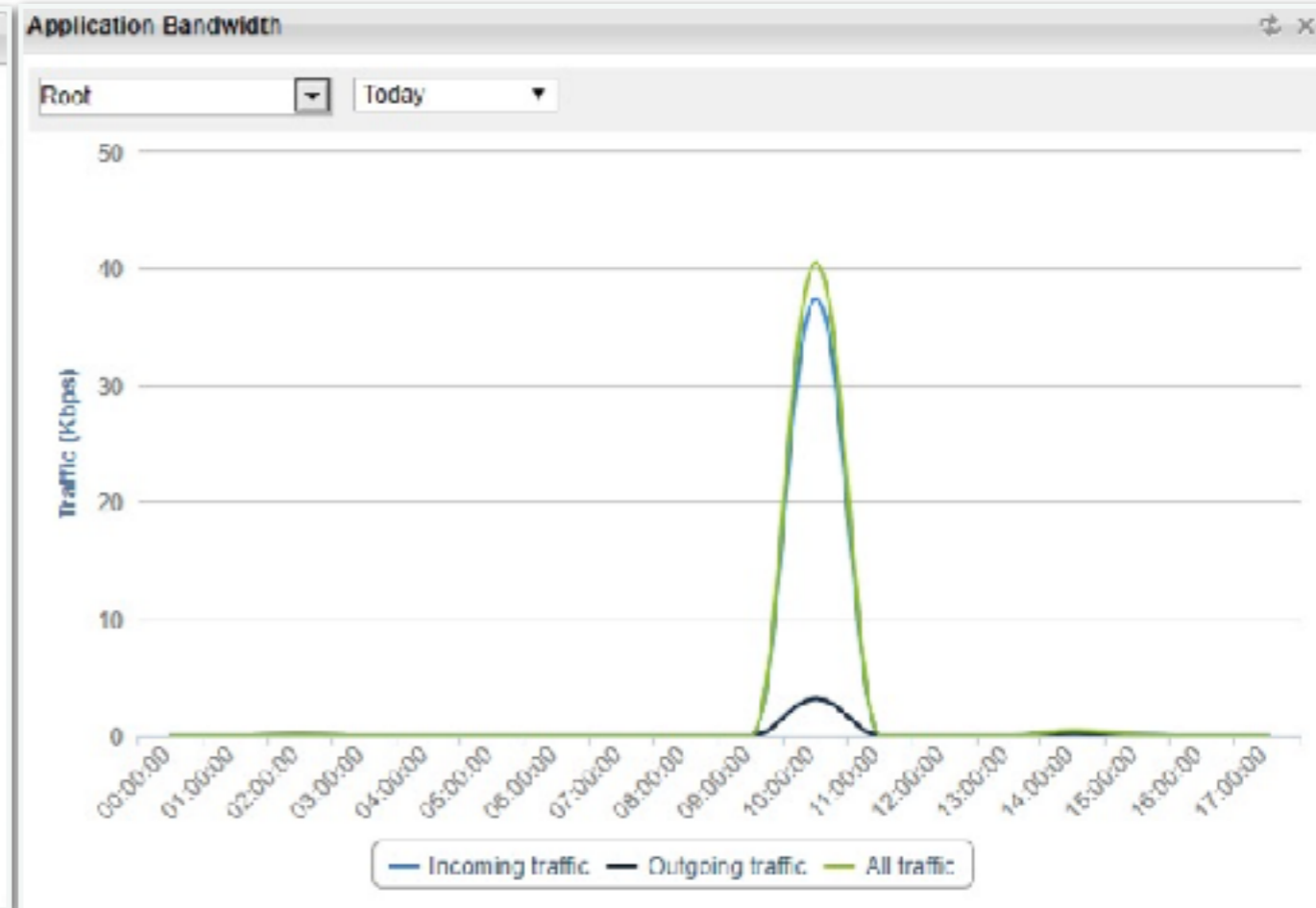
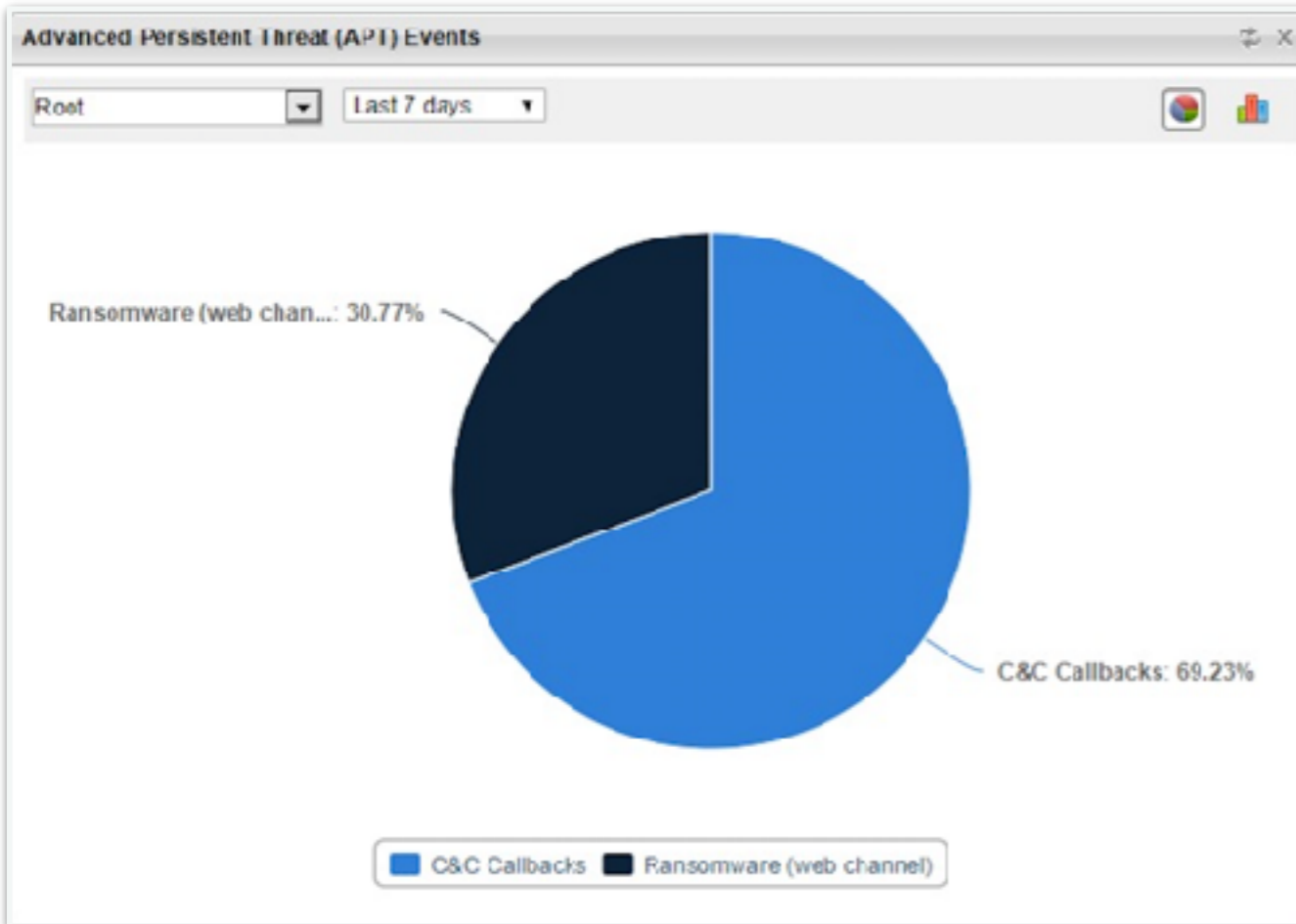
2018-06-27 16:04:45 +0800      nj-host-ken      202.45.67.178   Ethan She (RD-CN)    90.32.24.159
21      17      1521      0      1      qq-policy      15      1055988 jamesc.conf      Virus008
www.sina.com /search.htm      81      21,18,31,45      6789      1

```

Continuous Structured Data



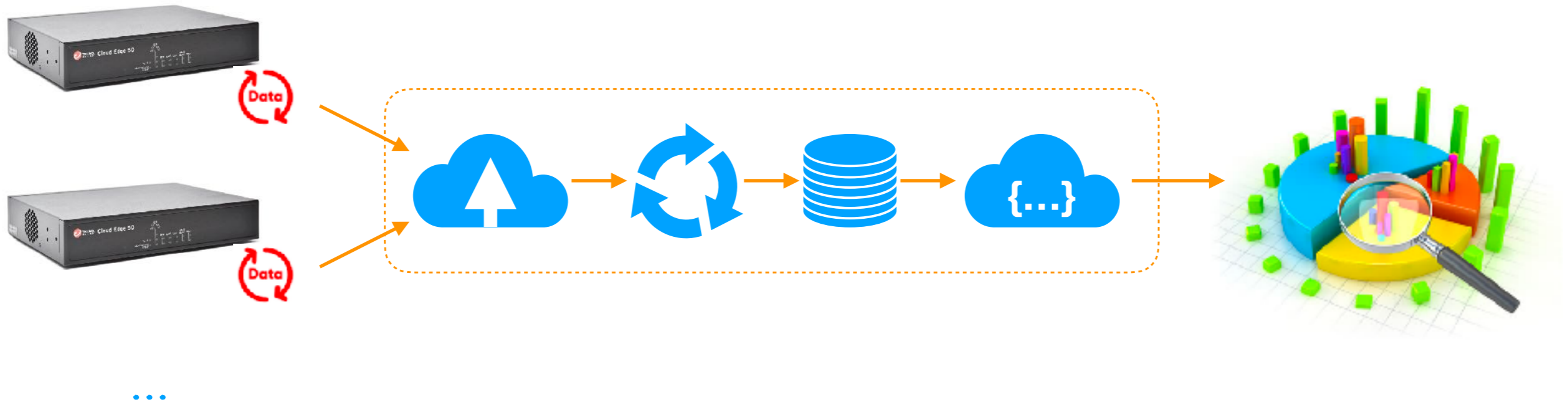
Project ElasticLog



Data Analytics



Project ElasticLog



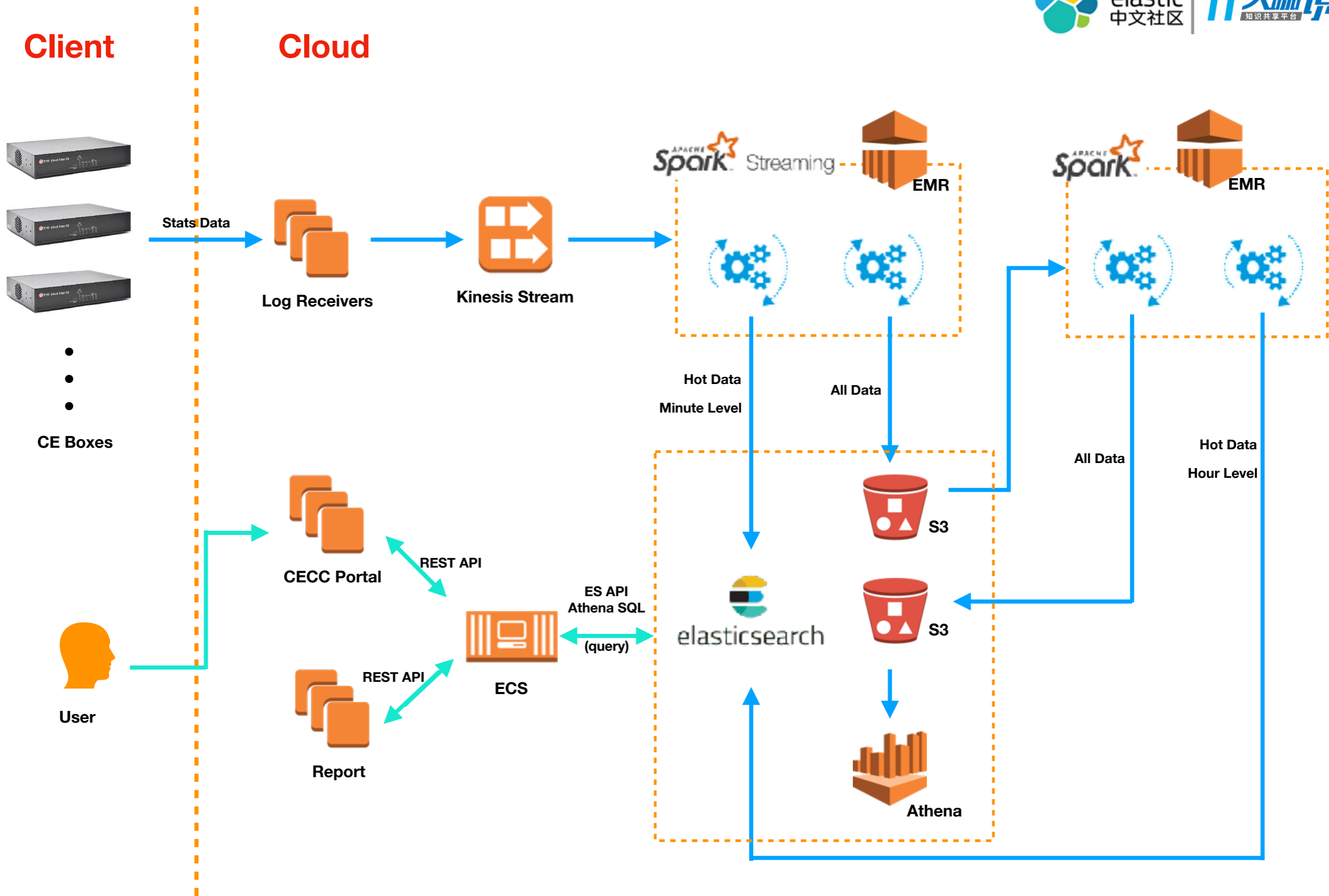
A scalable big data system built on AWS



Project ElasticLog

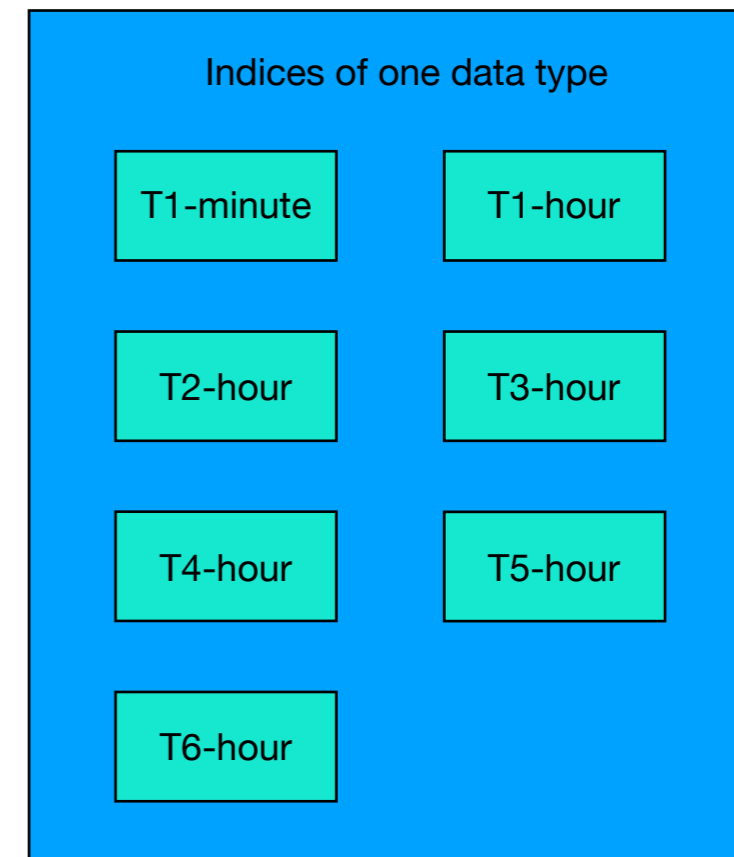


- **1,300,000** data per minute, will increase to **5** * 1,300,000 at the end of this year.
- Provide second-level query for **6 month** data, most queries will hit the **1st month** data.
- Data MUST be **accurate**. No less no more.



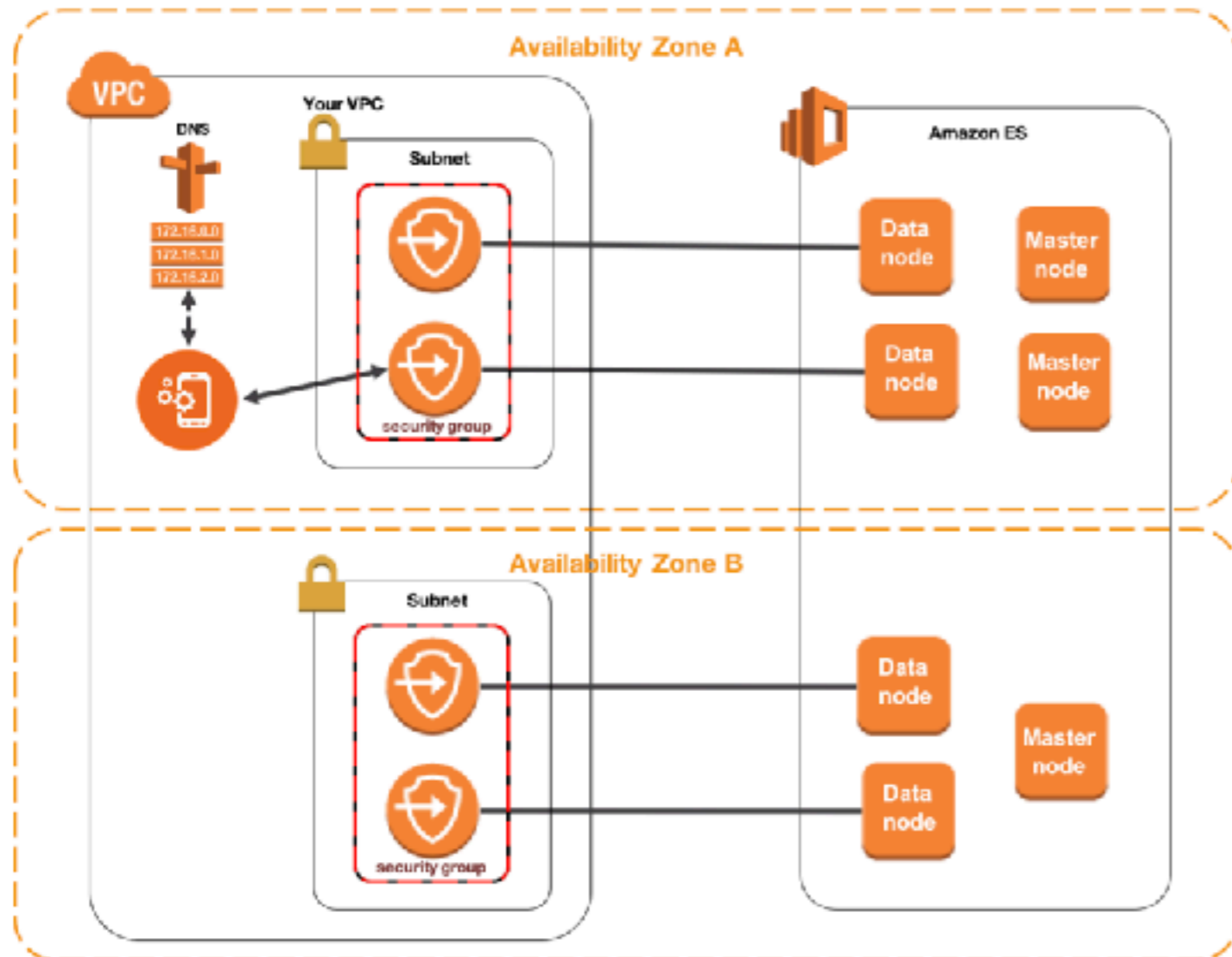
ES in ElasticLog

- Hot data storage and query
 - 1,300,000 data injection per minute
 - 1 month data
 - Second-level query
- One cluster
 - Build on AWS
 - 3 dedicated master nodes + 10 data nodes
 - Master node: M4.large, Data node: C4.2Xlarge
 - Cost: \$7622 per month
- Roll index by week
 - 28 indices at most
 - 200 primary shards, 1 replica





ES on AWS



- Why is AWS ES?
 - All cloud services are on AWS
 - AWS ES is a managed service
- AWS ES
 - Easy to use
 - Zone awareness
 - VPC + Security Group
 - Blue/Green deployment
 - Monitor + Auto-Snapshot

Best Practices in ES

- Index Design
- Shard Allocation
- Fast Injection in Spark
- Data Deduplication



Index Design



One Index

VS



Time-based Index

- Unable to update some mapping settings, e.g., primary shard number
- Unable to scale out flexibly and rapidly
- Better for fixed/small data set

- How to determine the interval?
 - Data amount
 - Change frequency
 - Try weekly-split by default
- How to implement?
 - Index template



```
{
  "facet_internet_access_minute": {
    "template": "ce-index-access-v1-*",
    "order": 0,
    "settings": {
      "number_of_shards": 5
    },
    "aliases": {
      "{index}-query": {}
    },
    "mappings": {
      "es_doc": {
        "dynamic": "strict",
        "_all": {
          "enabled": false
        },
        "_source": {
          "enabled": false
        },
        "properties": {
          "CLF_Timestamp": {
            "type": "long"
          },
          "CLF_CustomerID": {
            "type": "keyword"
          },
          "CLF_ClientIP": {
            "type": "ip",
            "ignore_malformed": true
          }
        }
      }
    }
  }
}
```

- DO NOT use multiple doc_type in one index
 - Fields that have the same names in different types must have the same mapping definition
 - Not support in 6.0
- Set _source=false
 - Suppose you only care about metric results, not raw documents content
 - Will save disk space and reduce IO
- Set _all=false
 - Suppose you know exactly what fields you want to query

```

{
  "facet_internet_access_minute": {
    "template": "ce-index-access-v1-*",
    "order": 0,
    "settings": {
      "number_of_shards": 5
    },
    "aliases": {
      "{index}-query": {}
    },
    "mappings": {
      "es_doc": {
        "dynamic": "strict",
        "_all": {
          "enabled": false
        },
        "_source": {
          "enabled": false
        },
        "properties": {
          "CLF_Timestamp": {
            "type": "long"
          },
          "CLF_CustomerID": {
            "type": "keyword"
          },
          "CLF_ClientIP": {
            "type": "ip",
            "ignore_malformed": true
          }
        }
      }
    }
  }
}

```



- Set dynamic=strict
 - Suppose your data is structured-data
 - Avoid dirty-data injection
- Set not_analyzed for String
 - Suppose you only care about full match
 - Improve injection performance and disk space
 - Use “keyword” in 5.x

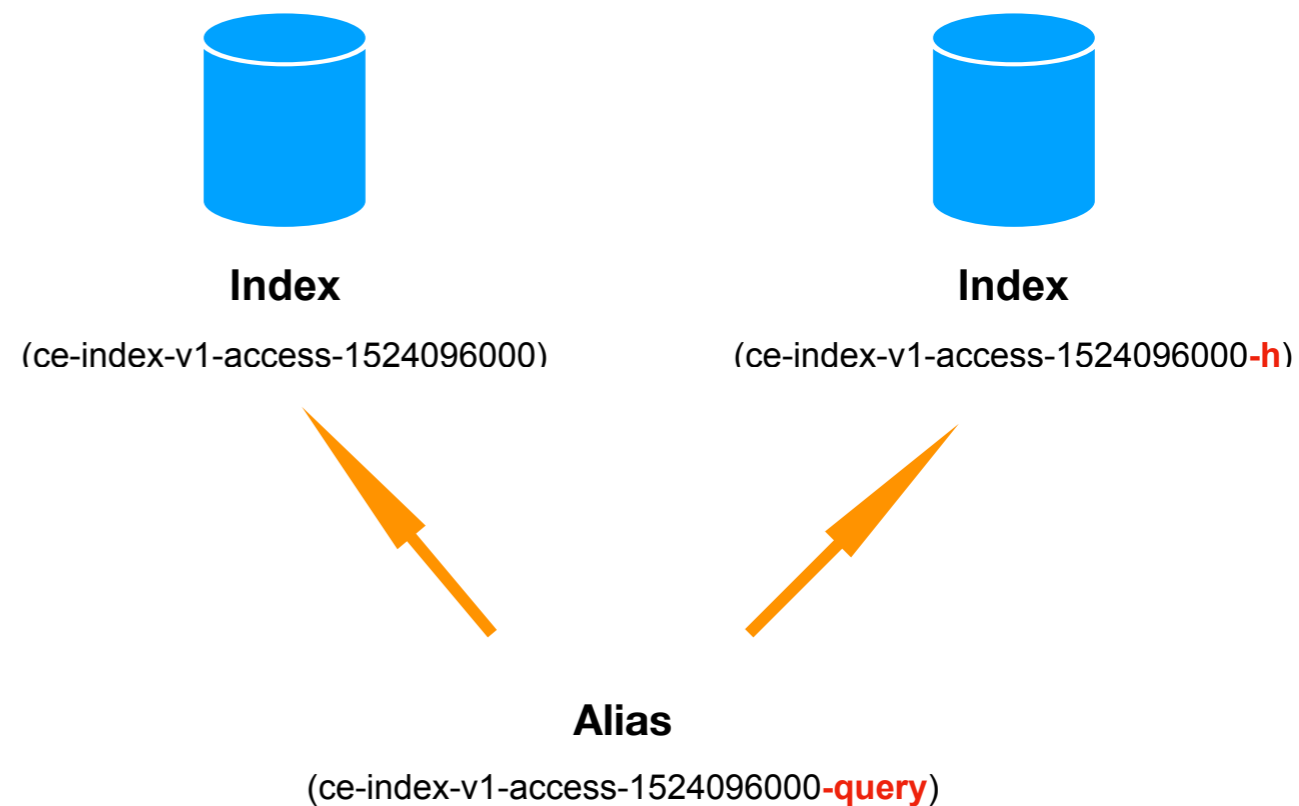
```

{
  "facet_internet_access_minute": {
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    },
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          },
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          }
        }
      }
    }
  }
}

```

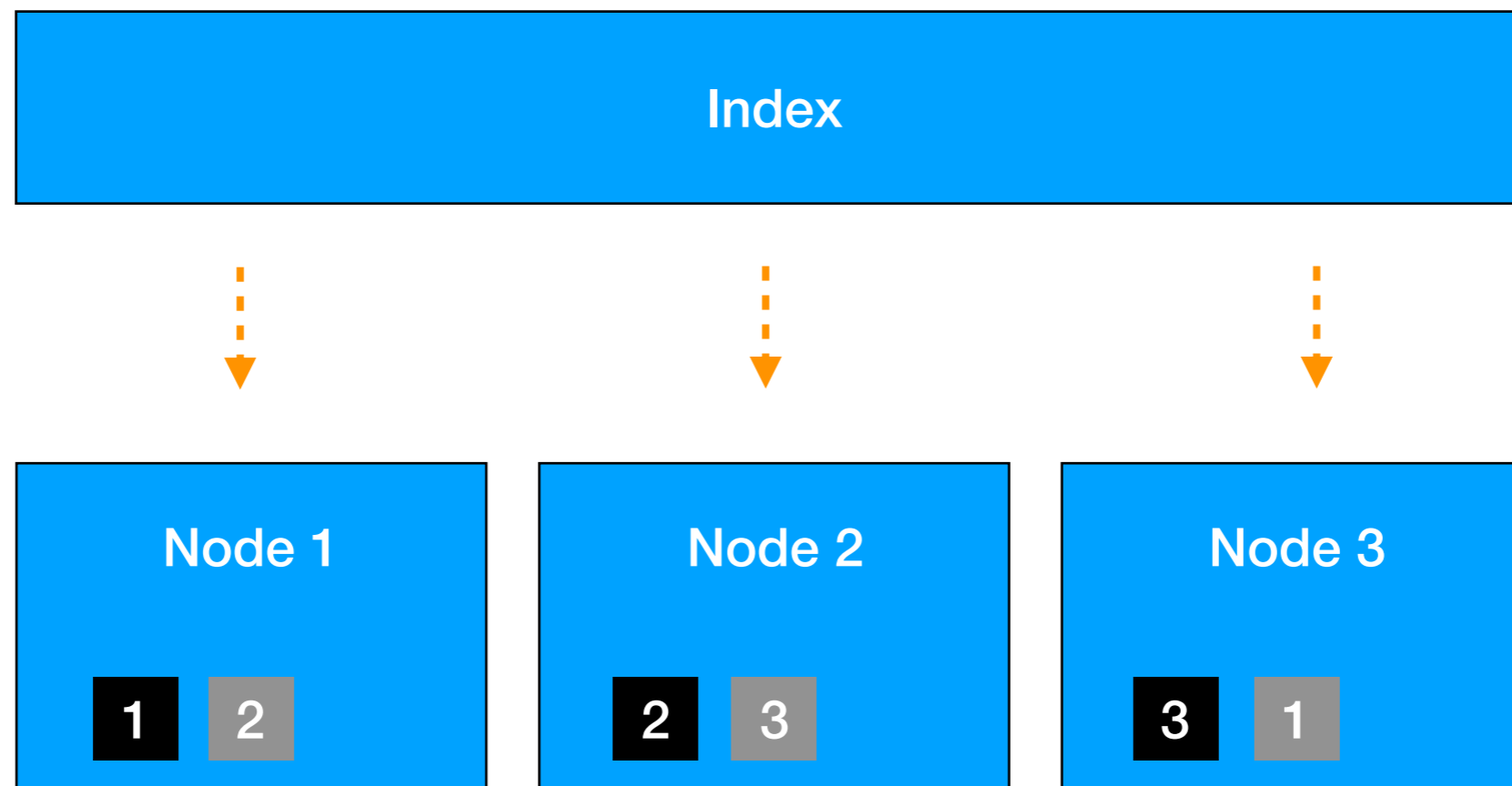


How to switch from one index to the other one without downtime?



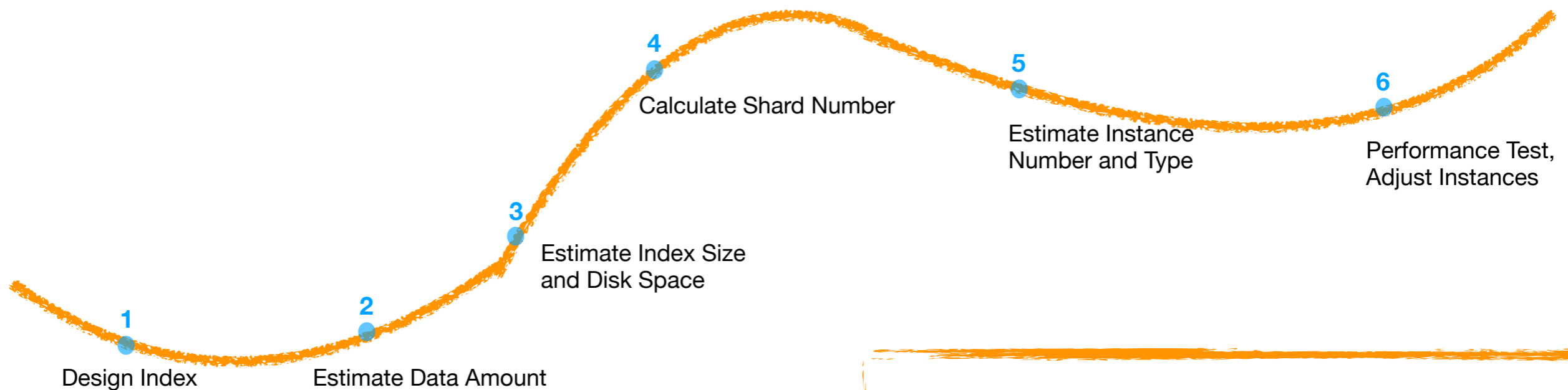


Shard Allocation





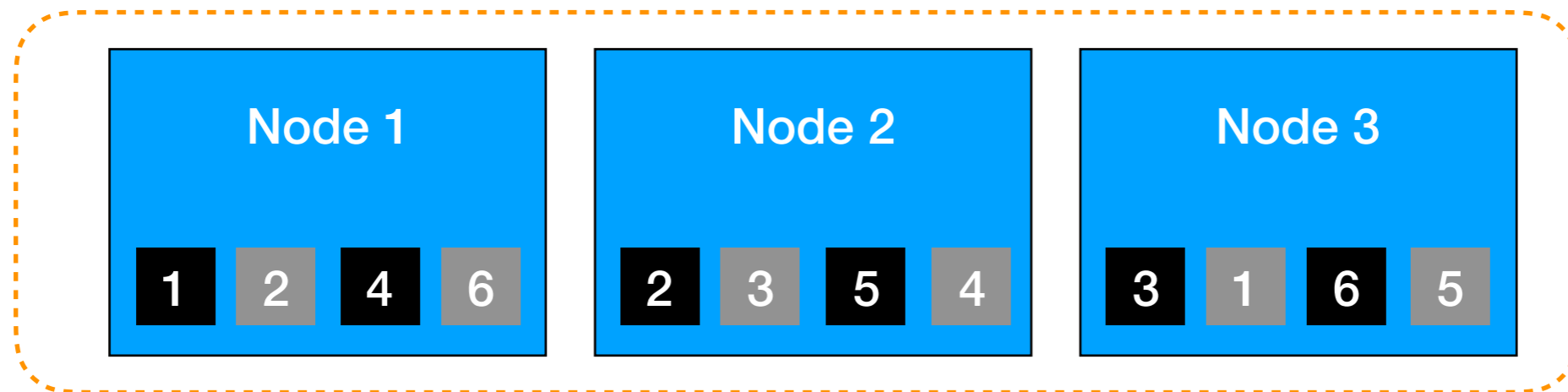
Shard Allocation



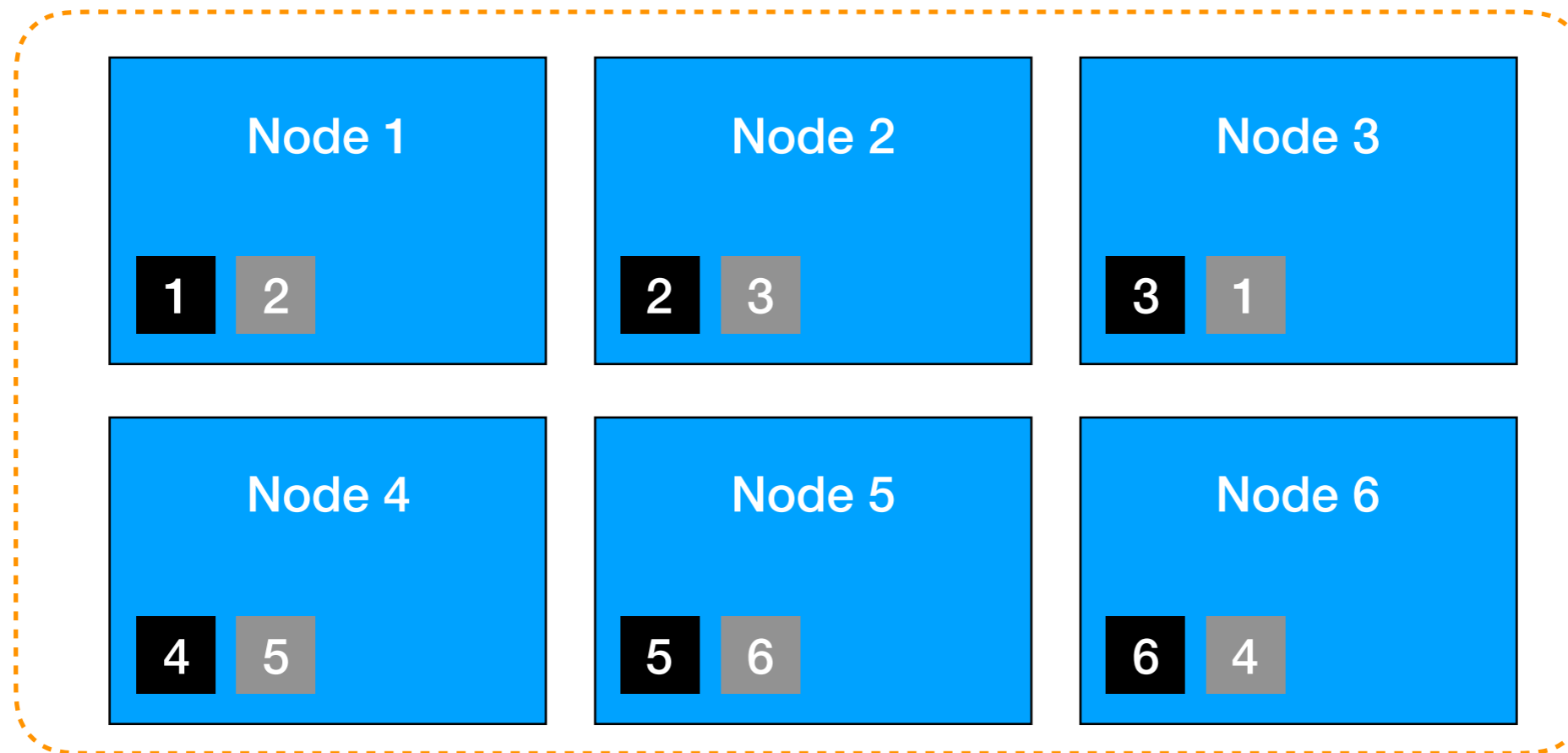
- Each shard size should be less than 30GB
- $\text{Shard Number} = k * \text{Data Nodes Number}$ ($k = \text{a small integer}$)
- Suppose you have an small index, and you have enough instances in the cluster, try to use default shard number



Shard Allocation



C4.2Xlarge



C4.Xlarge

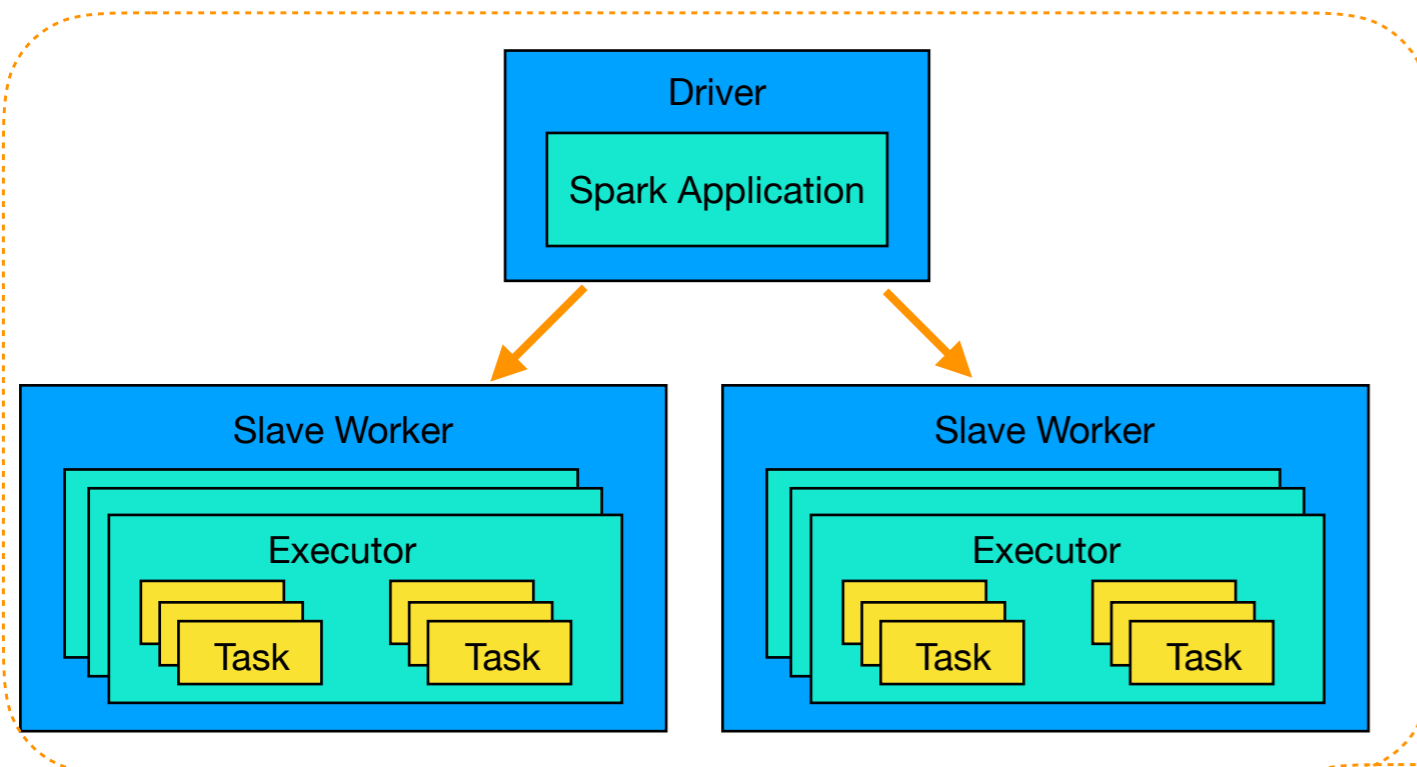


Fast Injection in Spark

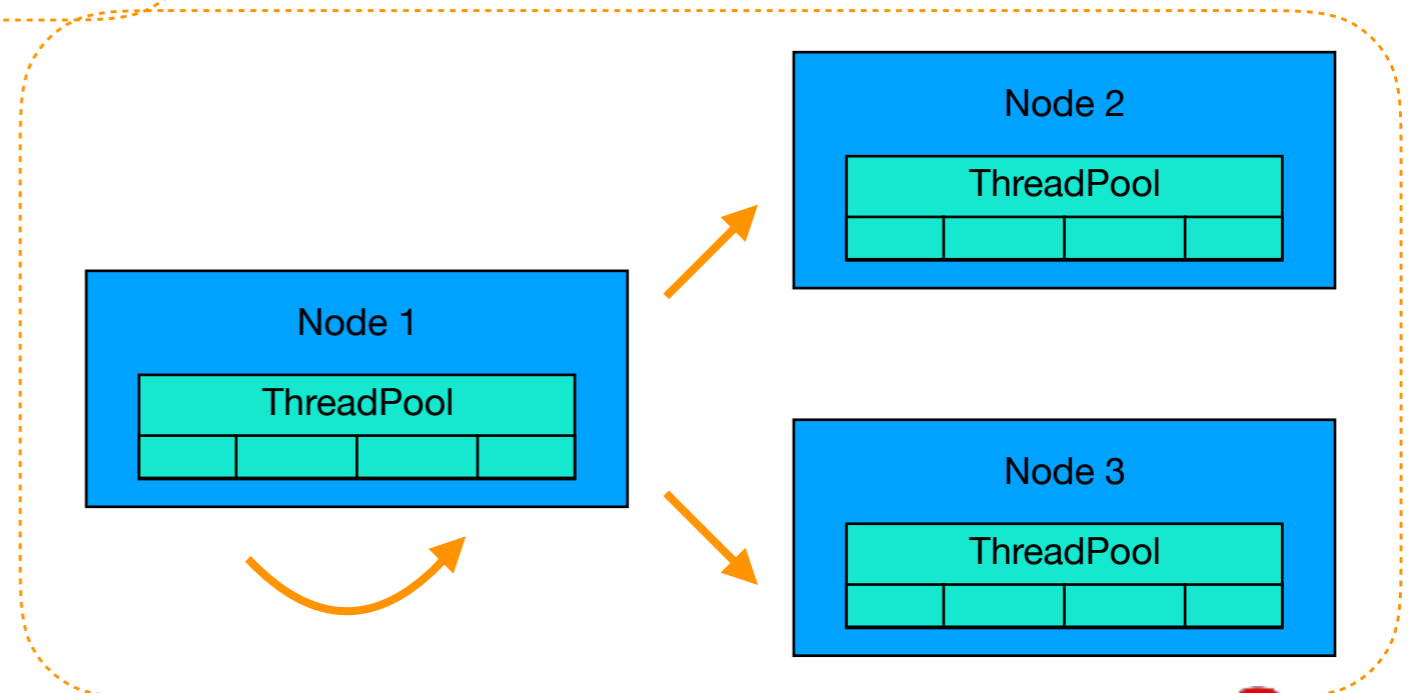




Fast Injection in Spark

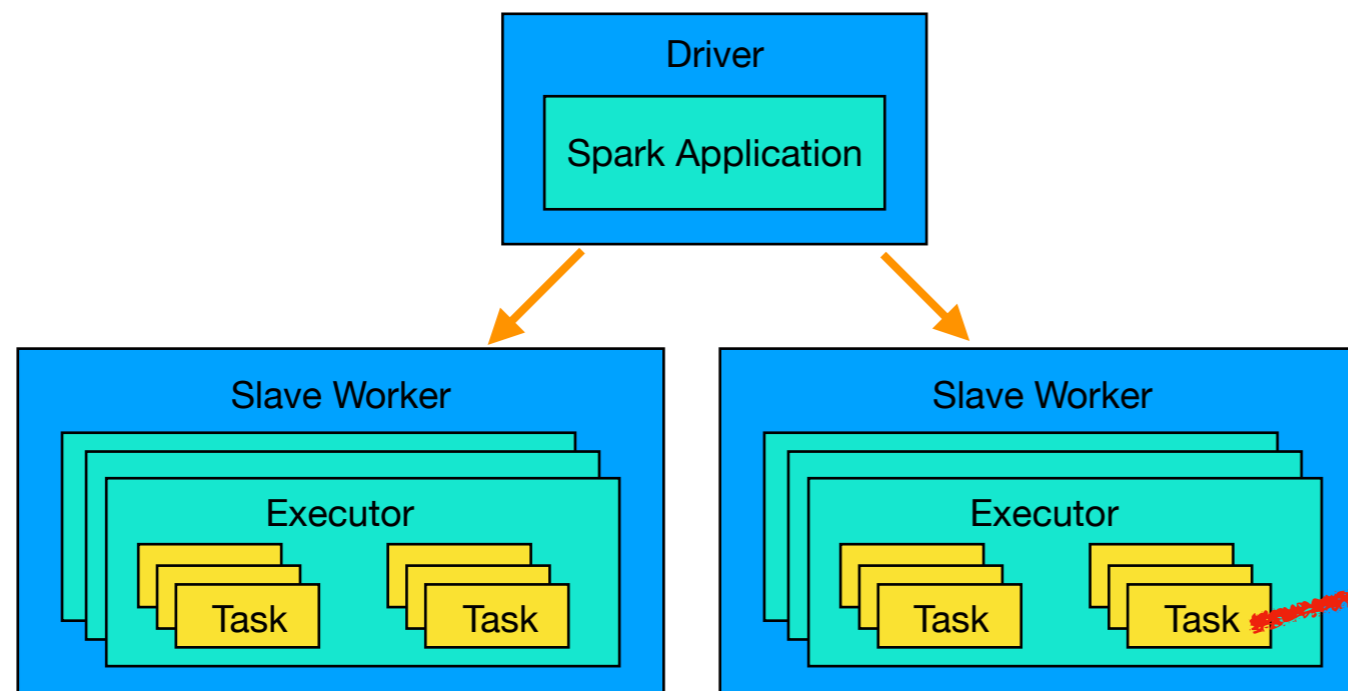
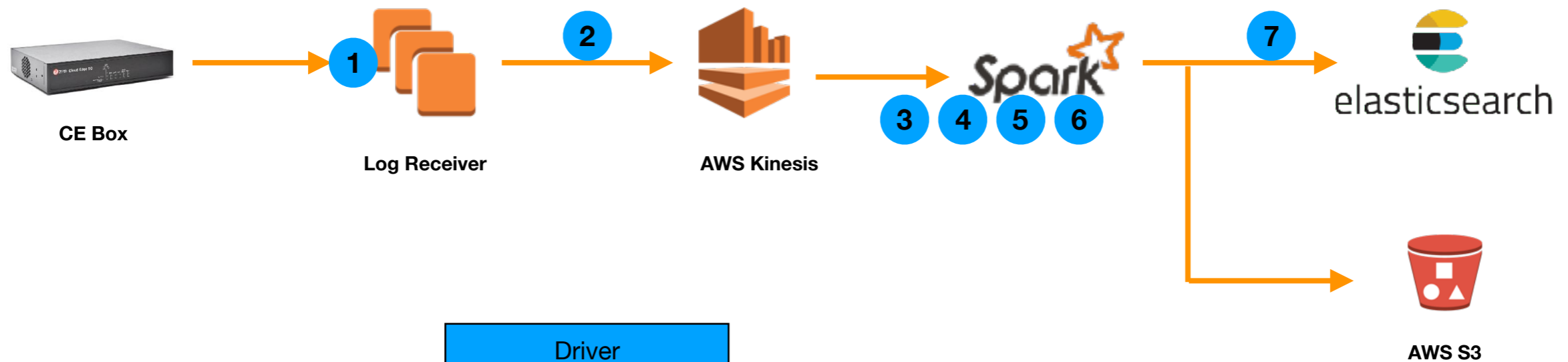


Number of Spark Task
=
Number of vCores





Data Deduplication



Task will retry for 3 times for any failure



Data Deduplication

- Use a custom unique ID
- Use aggregation to find out duplication and delete those documents
- Do distinct query





Data Deduplication

- Step 1: Add a “hash” field in all documents
- Step 2: Check duplication

```
curl -XGET http://stg-elasticlog.ap-northeast-1.es.amazonaws.com/ce-index-v1-access-1524096000/_search?pretty -d '{
  "size": 0,
  "aggs": {
    "duplicate": {
      "terms": {
        "field": "hash",
        "min_doc_count": 2,
        "size": 5000
      },
      "aggs": {
        "documents": {
          "top_hits": {
            "size": 2
          }
        }
      }
    }
  }
}
```

- Do not affect injection
- Can be asynchronous

- Step 3: Bulk delete



Data Deduplication

- Storage size increased heavily
- Will be slower or even failed to do aggregation when data amount is more than 0.3 billion



Field “hash” is unique!

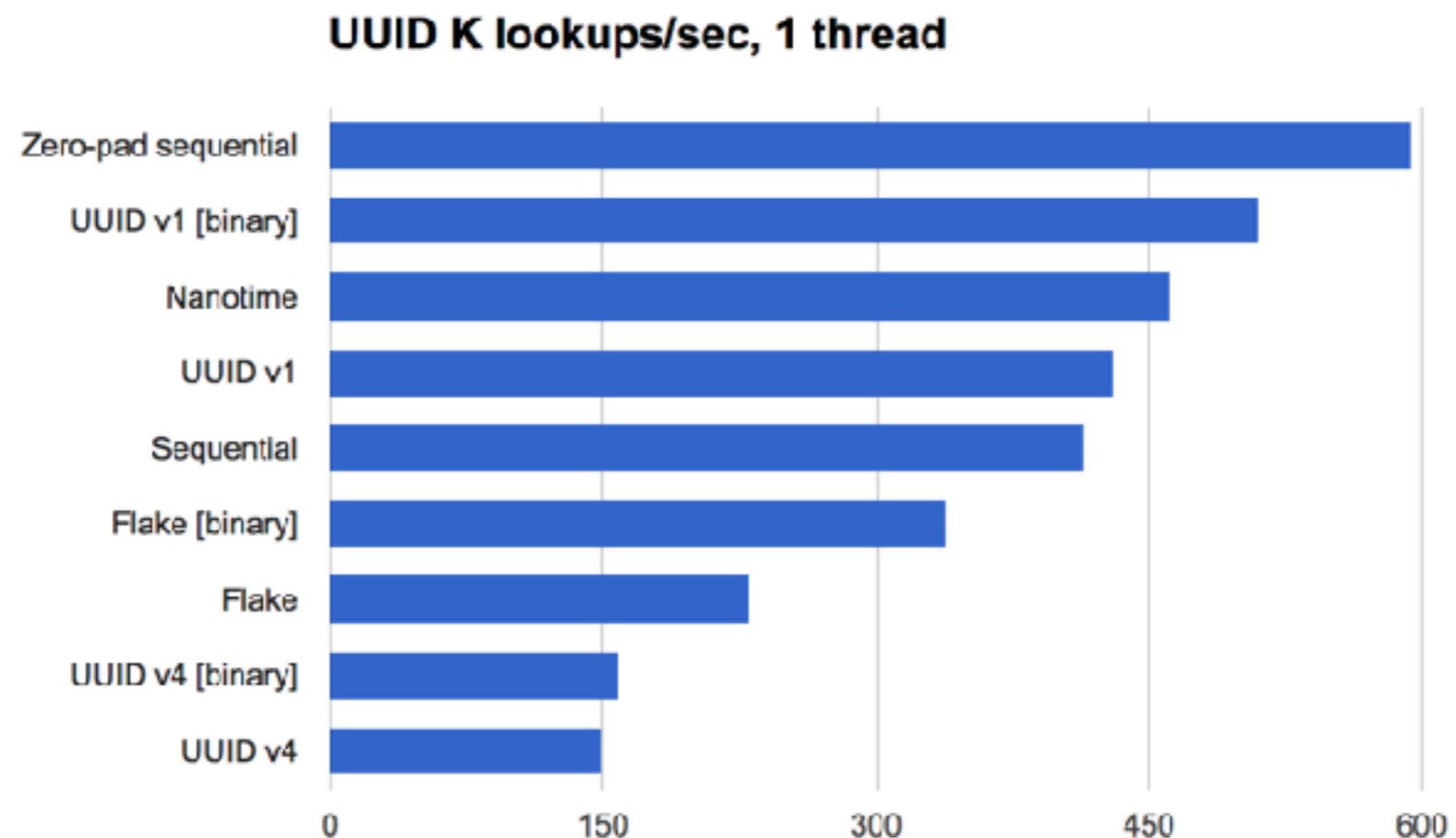


- Unfriendly to compression
- High-Cardinality



Data Deduplication

- Auto-generated IDs are 20 character long, URL-safe, Base64-encoded GUID strings
- For custom ID, try to pick up an ID that is friendly to Lucene



(<http://blog.mikemccandless.com/2014/05/choosing-fast-unique-identifier-uuid.html>)

Q&A



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