Big Data Engineering With MapReduce and Hive

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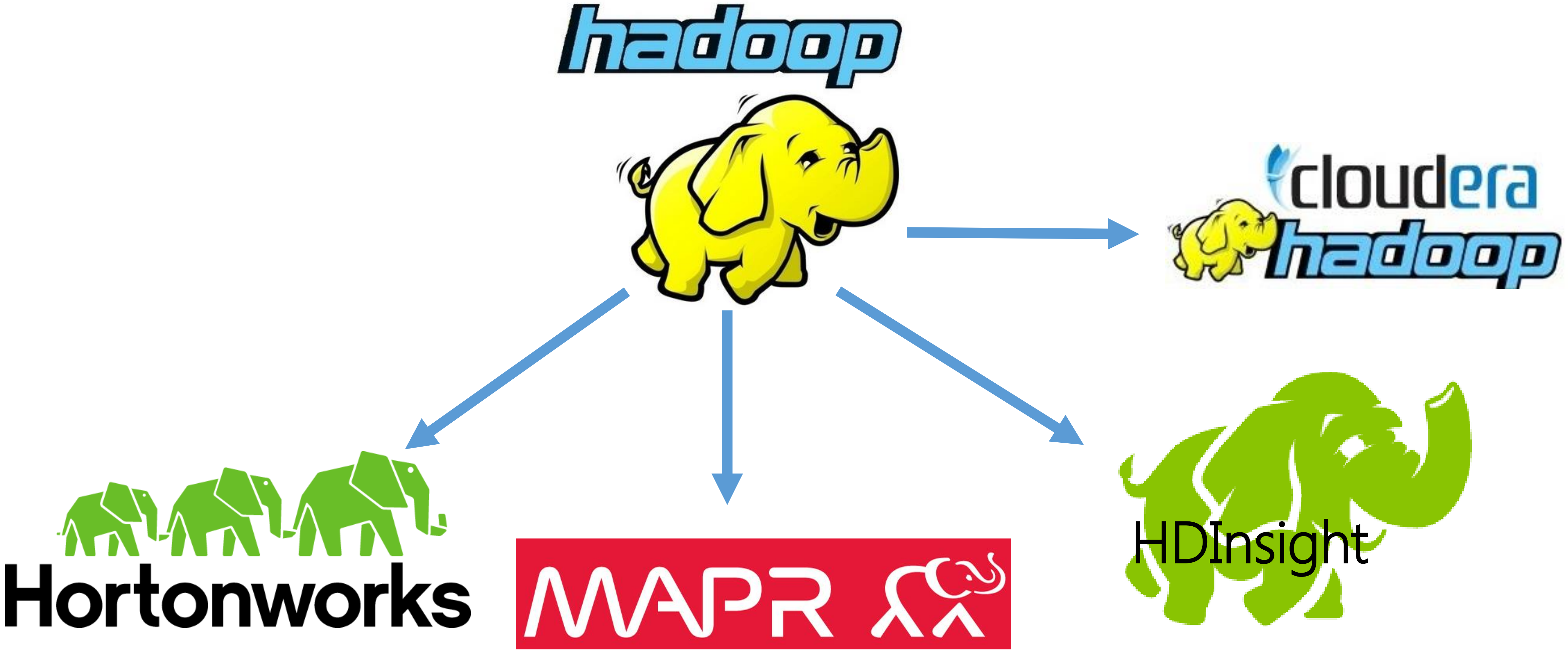
Agenda

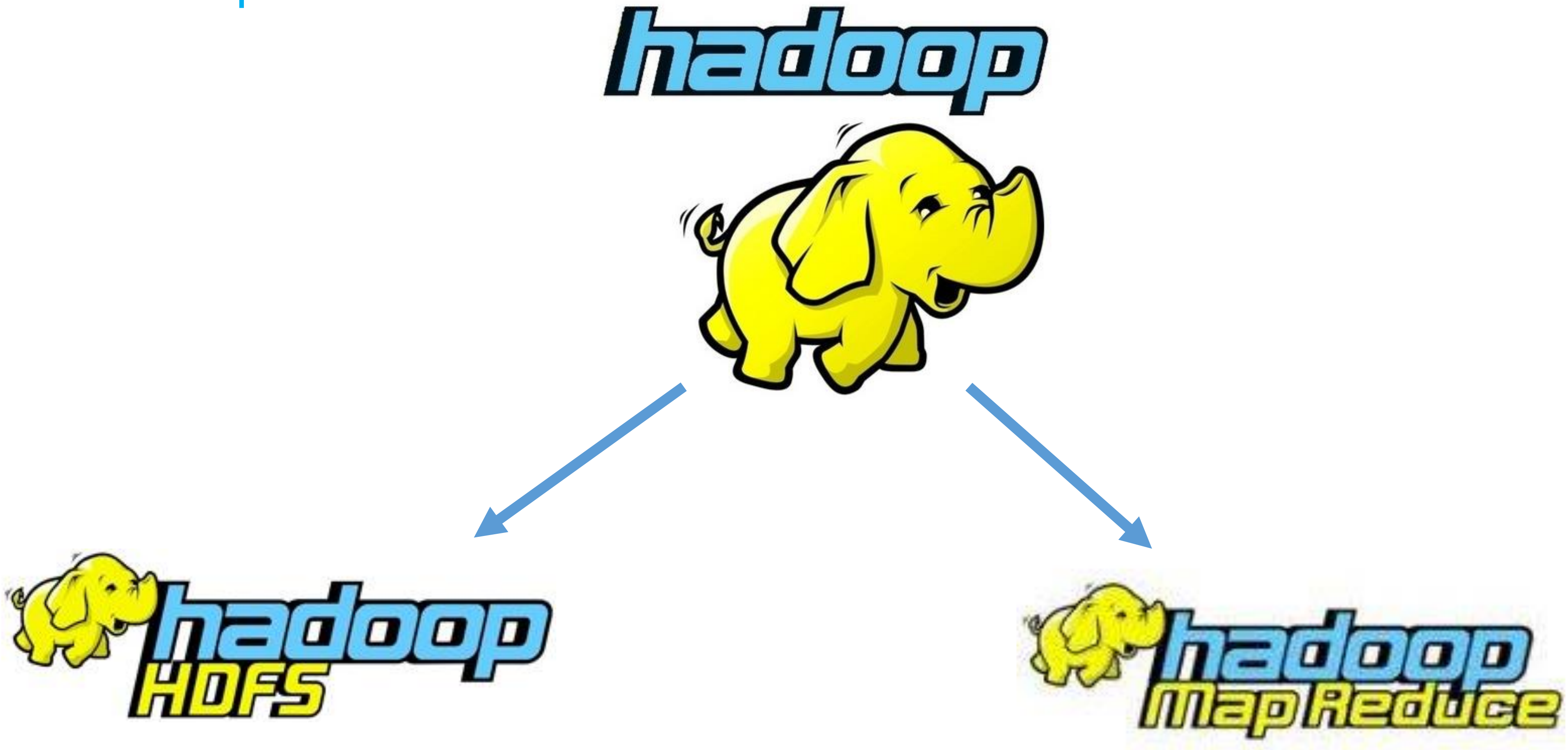
hadoop

HIVE

Hadoop Implementations

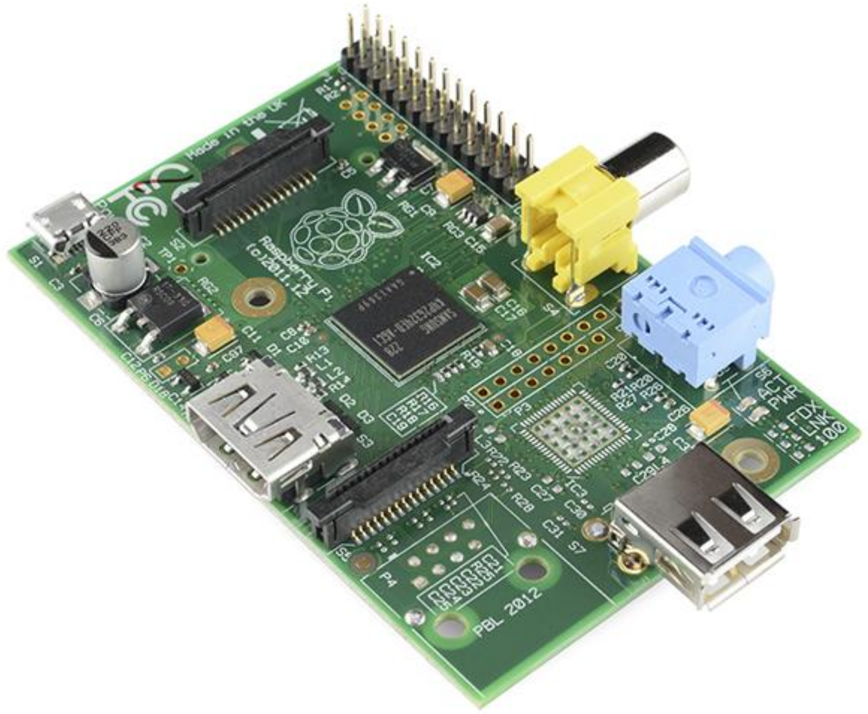


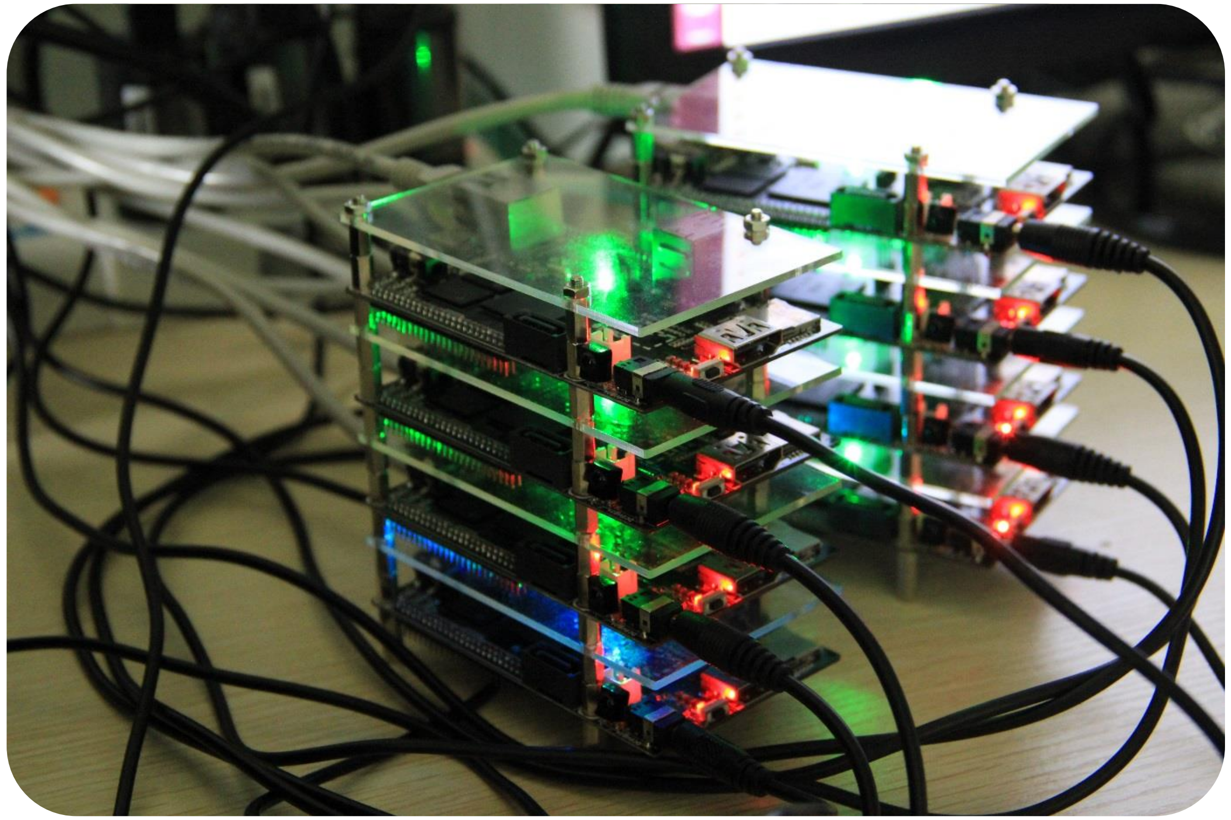
Hadoop



Turn back the clock, the mainframe

Distributed Computing





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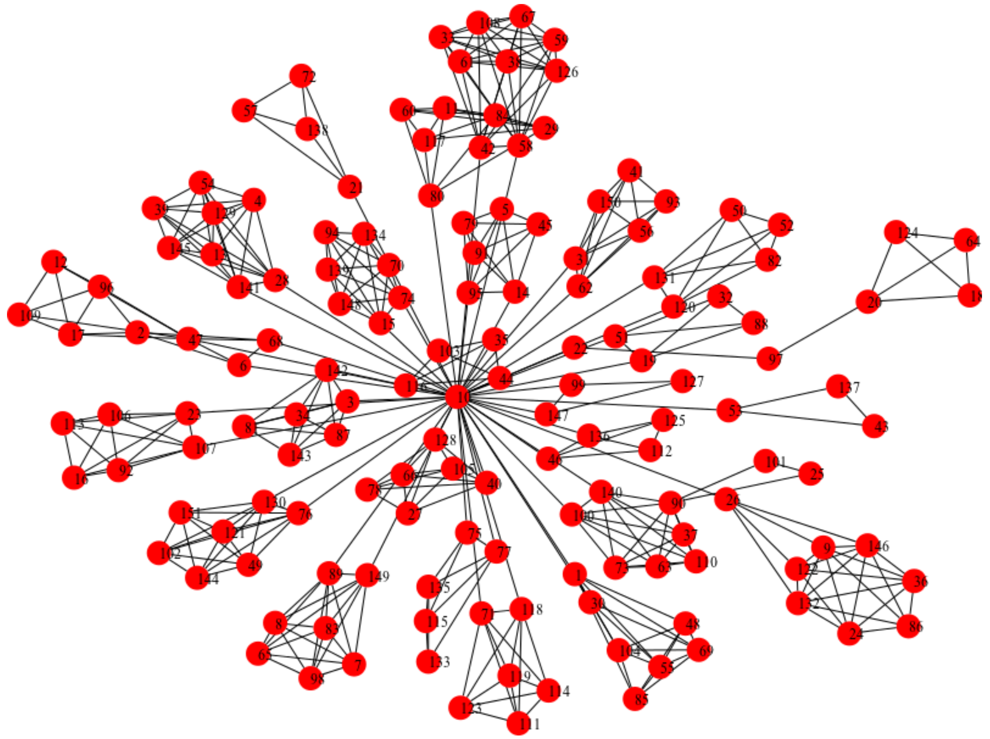
Cloud Computing



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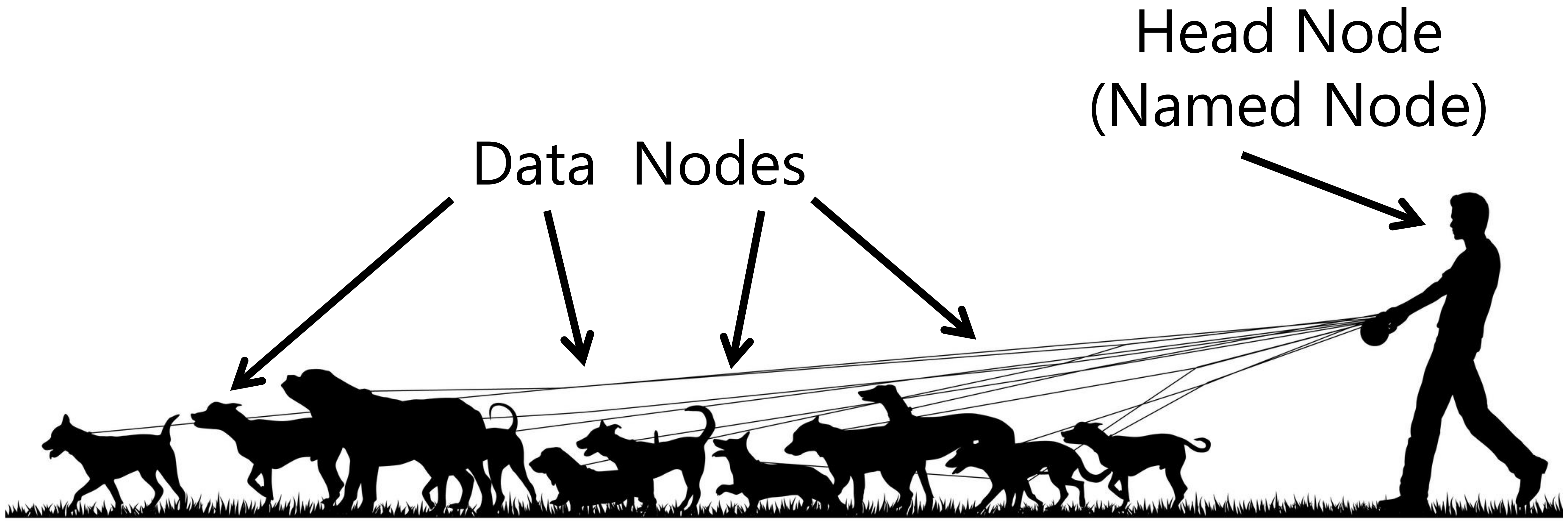
If dogs were servers…



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HDFS & MapReduce

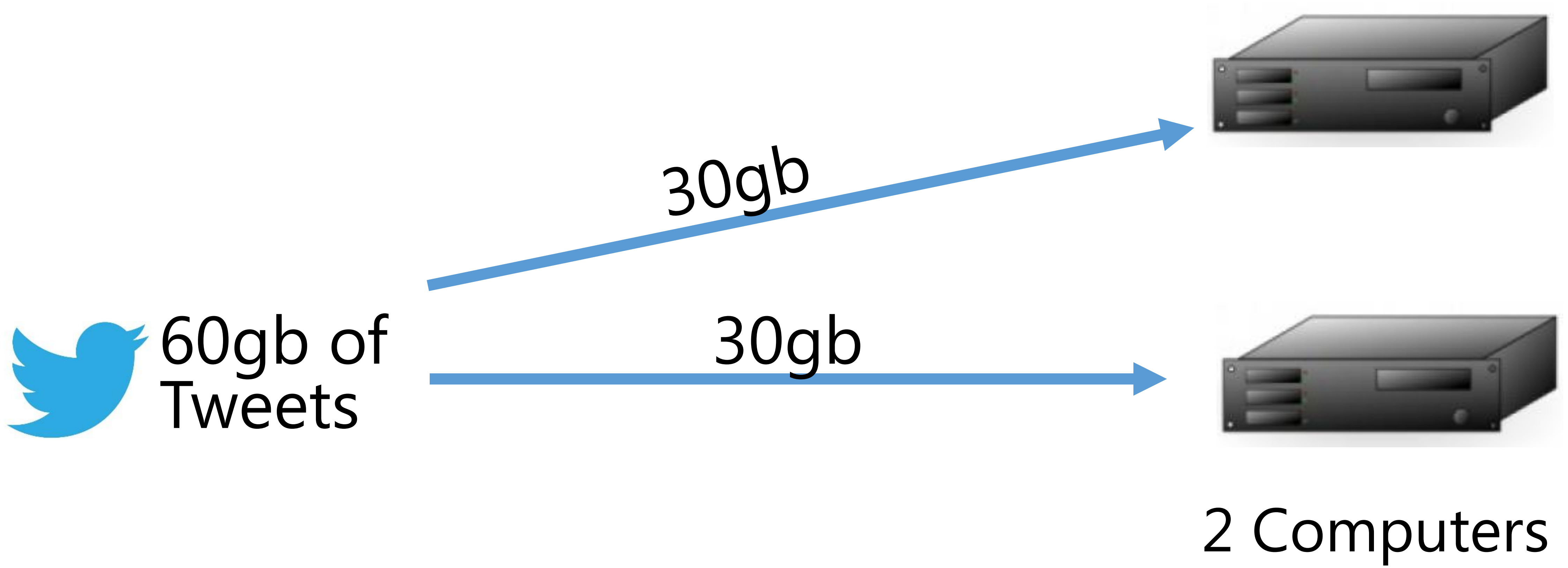
60gb of Tweets

$\xrightarrow{\text{60gb}}$

1 Computer

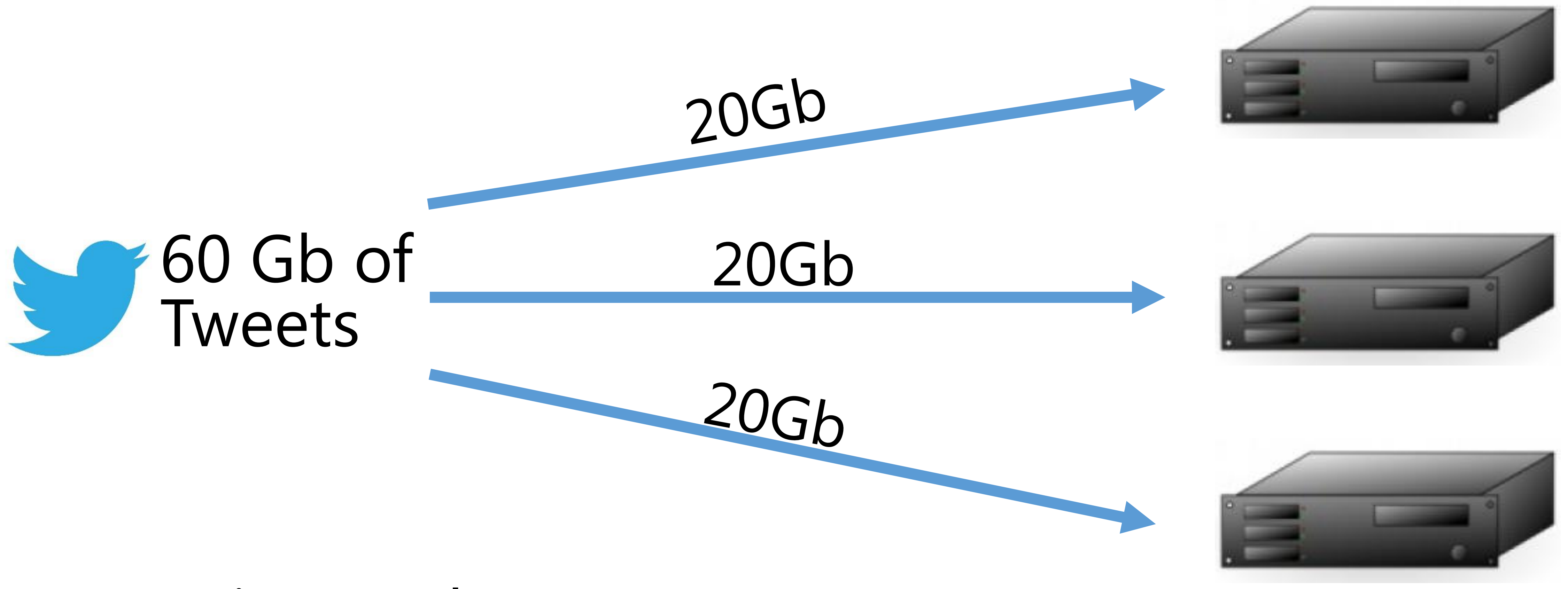
Processing: 30 hours

HDFS & MapReduce



Processing: 15 hours

HDFS & MapReduce



Processing: 10 hours

3 Computers

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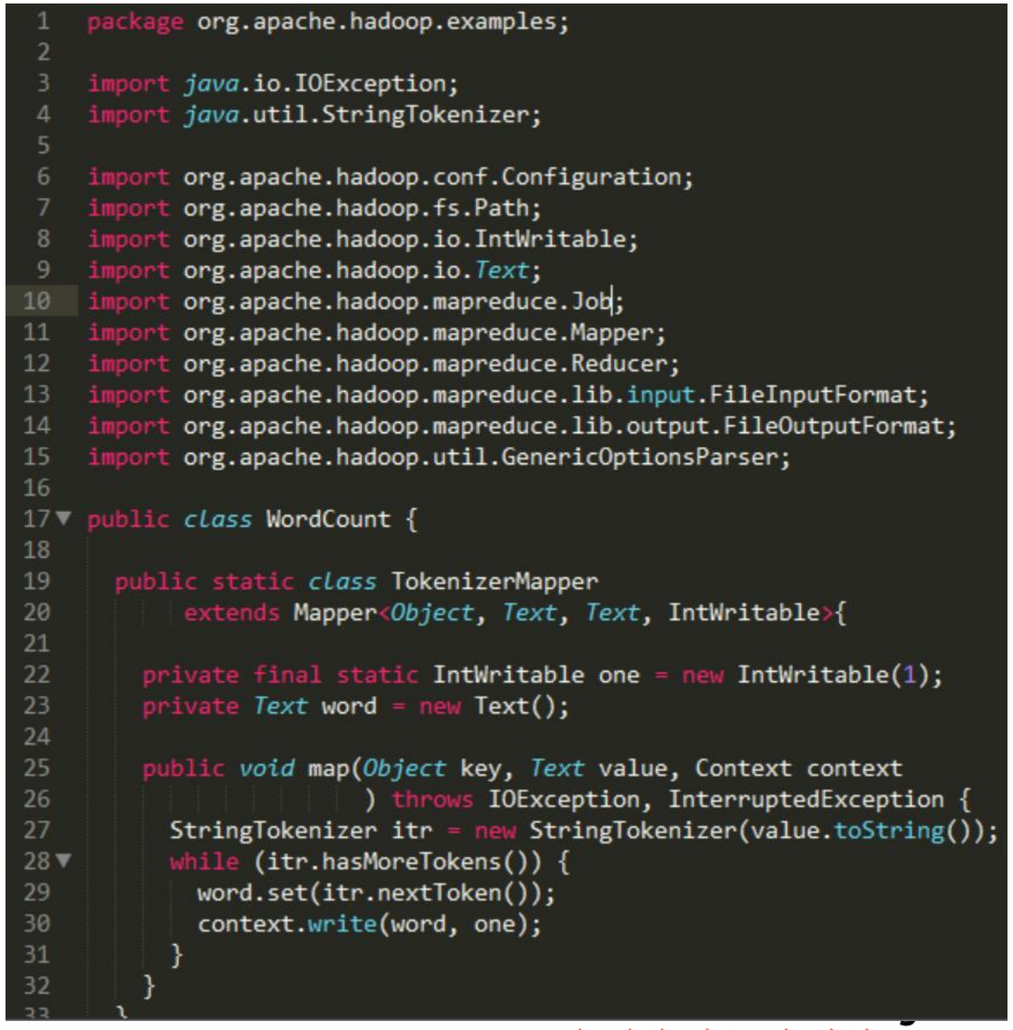
Most cases, linear scaling of processing power

Number of Computers	Processing Time (hours)
1	30
2	15
3	10
4	7.5
5	6
6	5
7	4.26
8	3.75
9	3.33

Limitations with MapReduce

- ~200 lines of code to do anything
- Slow
- Troubleshooting multiple computers
- Good devs are scarce
- Expensive certifications



```java
package org.apache.hadoop.examples;

import java.io.IOException;
import java.util.StringTokenizer;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import org.apache.hadoop.util.GenericOptionsParser;

public class WordCount {

  public static class TokenizerMapper
       extends Mapper<Object, Text, Text, IntWritable>{

    private final static IntWritable one = new IntWritable(1);
    private Text word = new Text();

    public void map(Object key, Text value, Context context
                    ) throws IOException, InterruptedException {
      StringTokenizer itr = new StringTokenizer(value.toString());
      while (itr.hasMoreTokens()) {
        word.set(itr.nextToken());
        context.write(word, one);
      }
    }
```

Ambari: Cluster provisioning, management, and monitoring

Avro (Microsoft .NET Library for Avro): Data serialization for the Microsoft .NET environment

HBase: Non-relational database for very large tables

HDFS: Hadoop Distributed File System

Hive: SQL-like querying

Mahout: Machine learning

MapReduce and YARN: Distributed processing and resource management

Oozie: Workflow management

Pig: Simpler scripting for MapReduce transformations

Sqoop: Data import and export

Storm: Real-time processing of fast, large data streams

Zookeeper: Coordinates processes in distributed systems

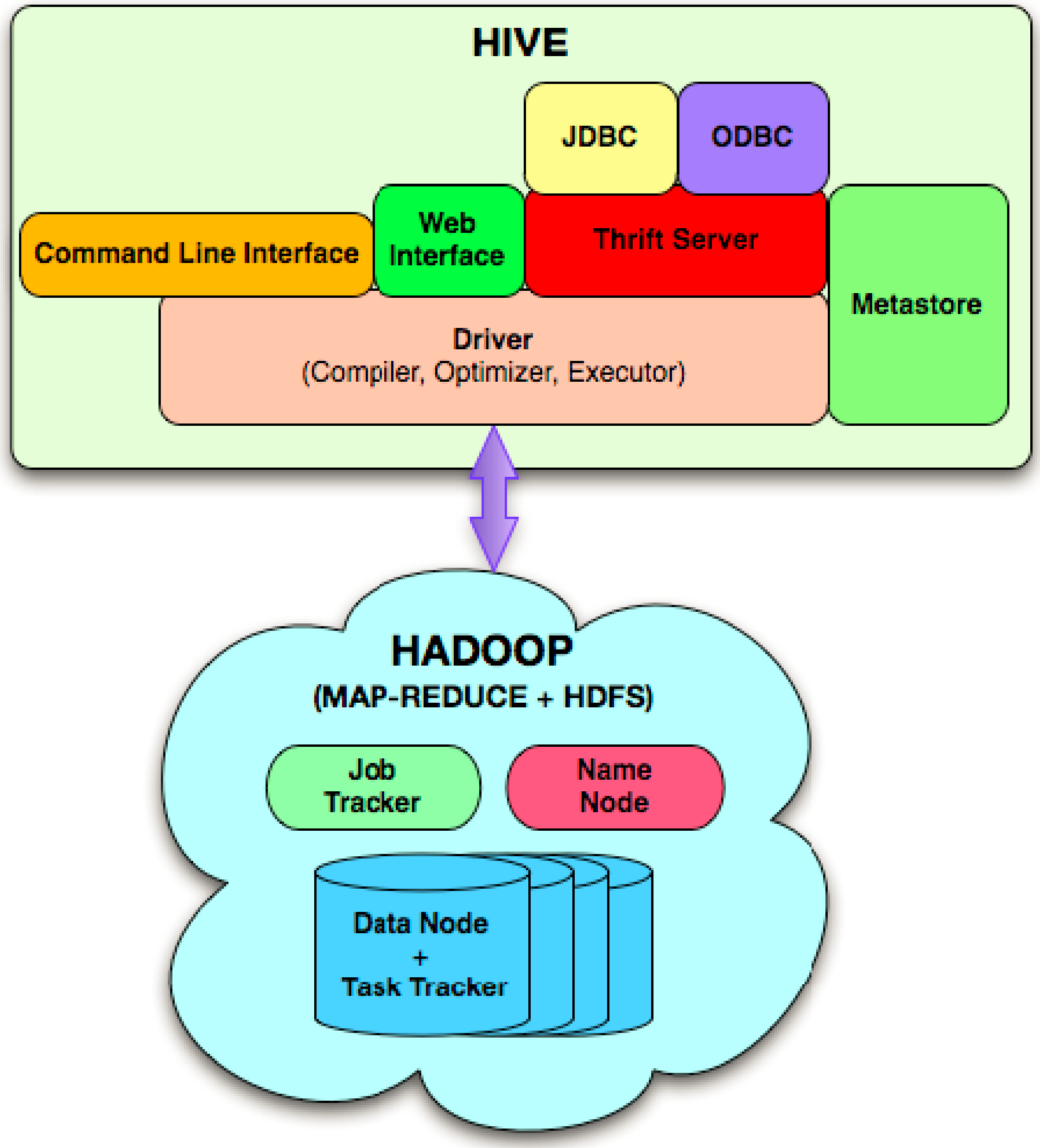
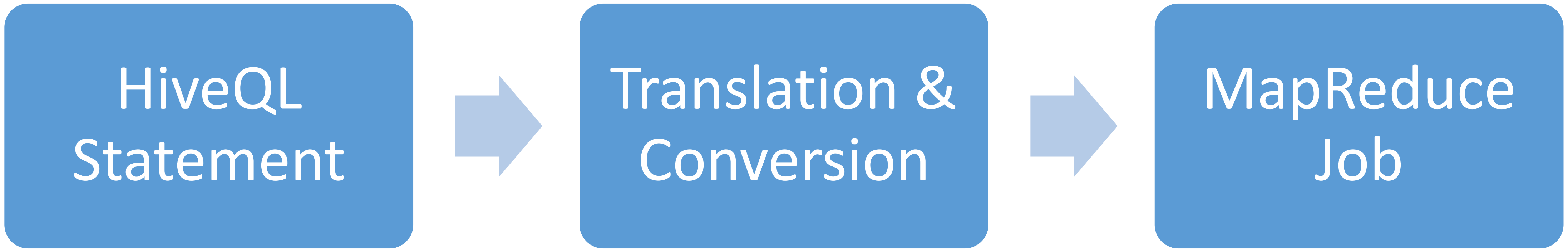
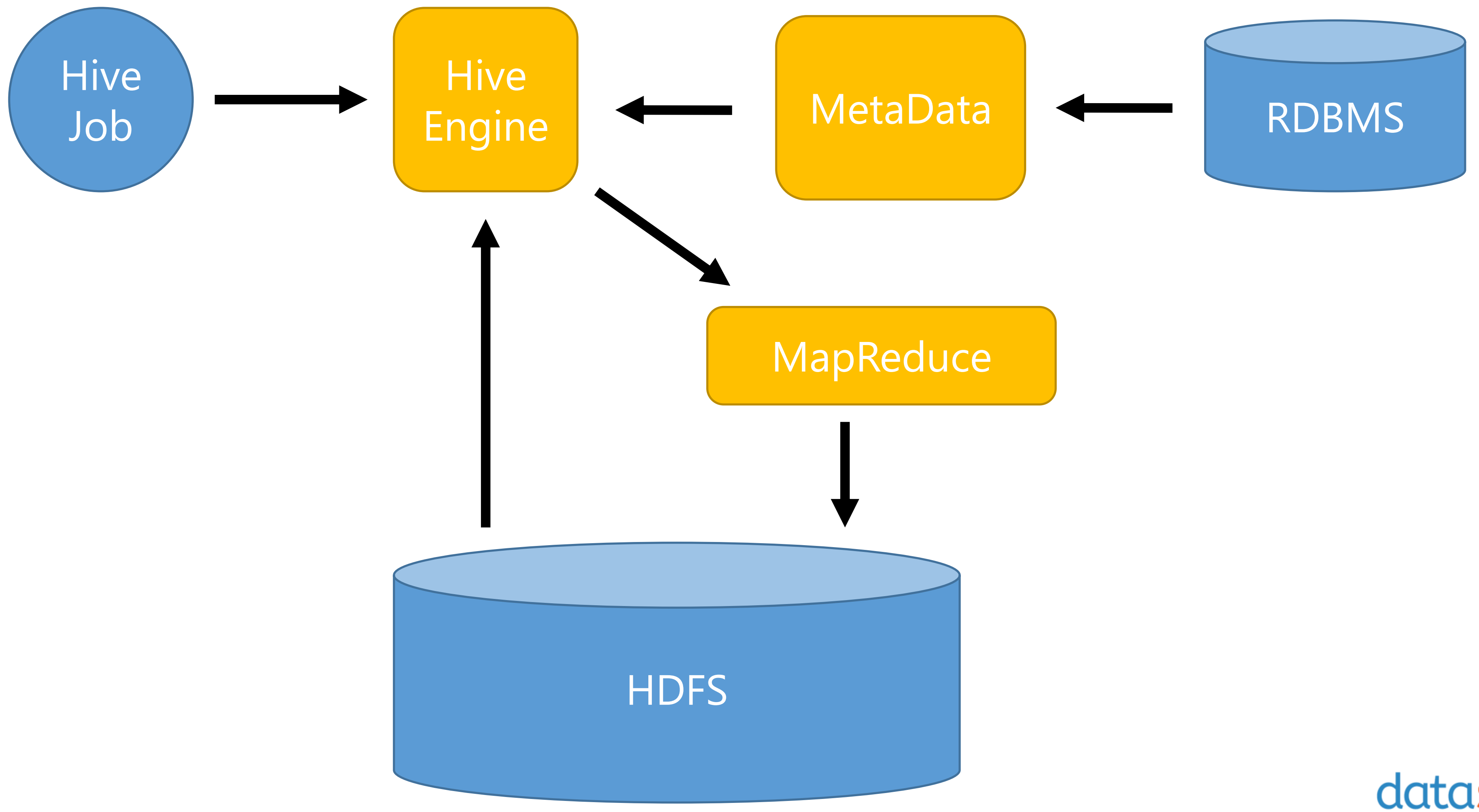


Fig. 1: Hive System Architecture

Hive Jobs



Hive Architecture



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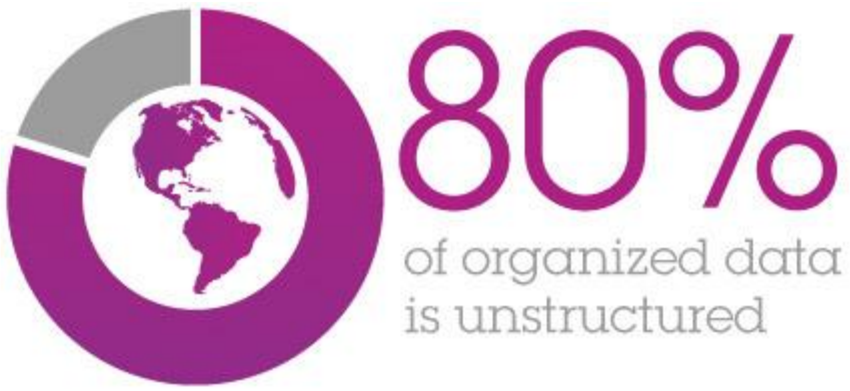
Data File = Unstructured Data

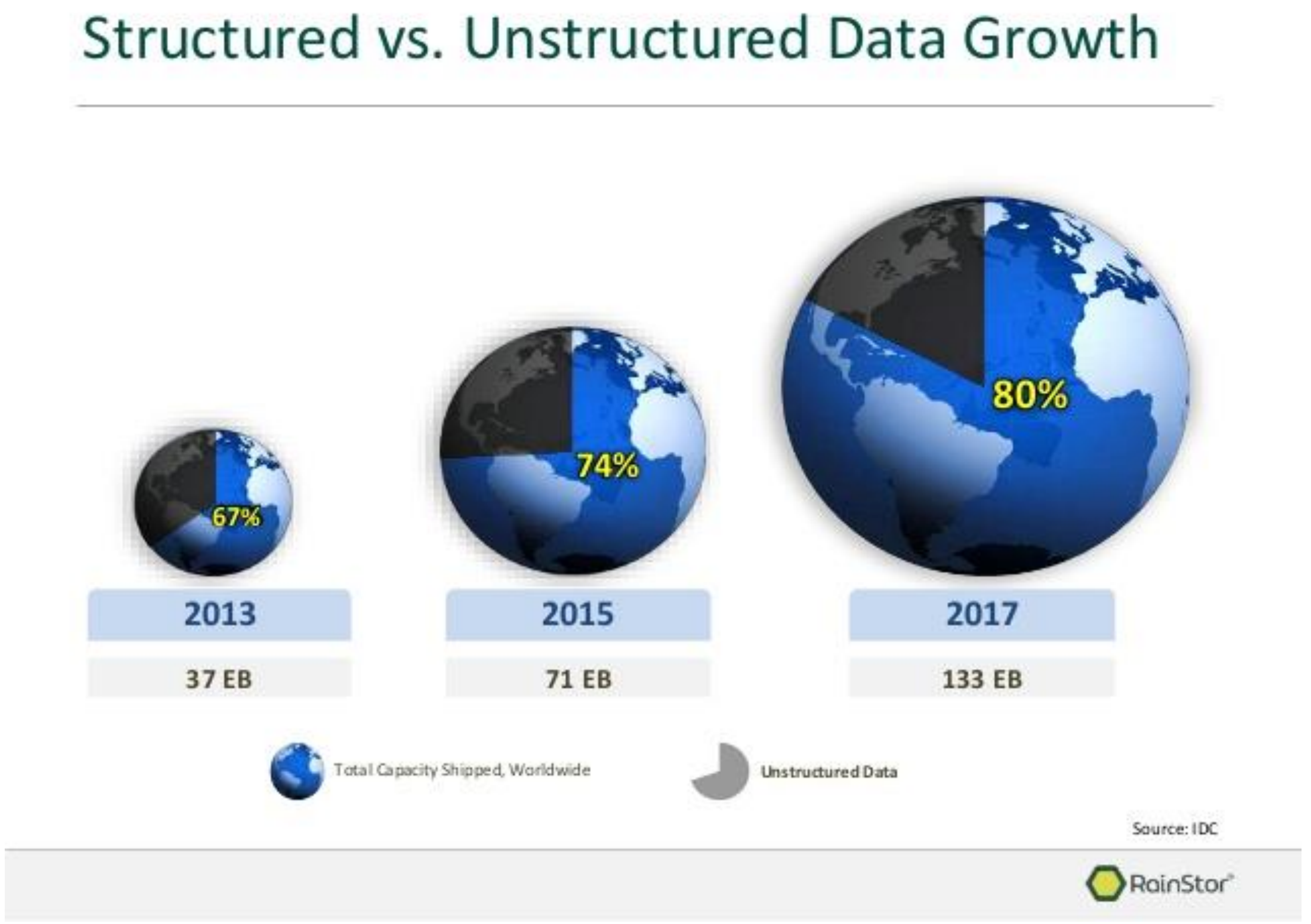
Data File + Metadata File/DB = Structured Data

Why Hive?

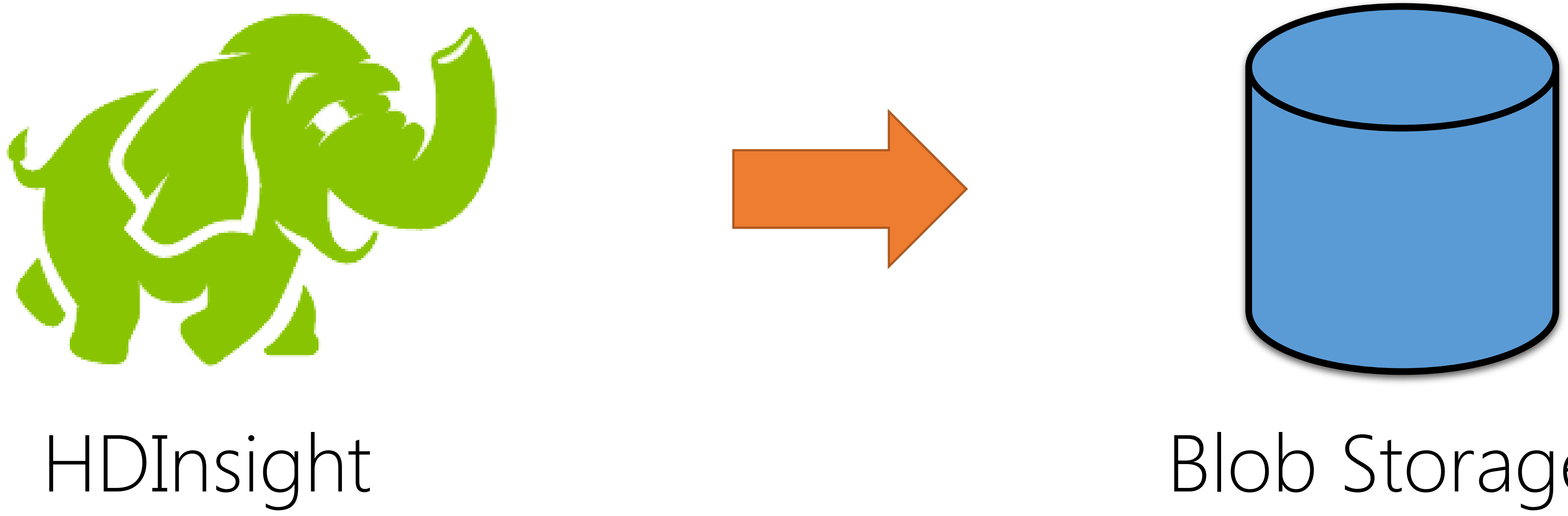
- SQL spoken here (HiveQL)
- ODBC driver
- BI Integration
- Supports only Structured Data

Limitations





Azure Blob Storage



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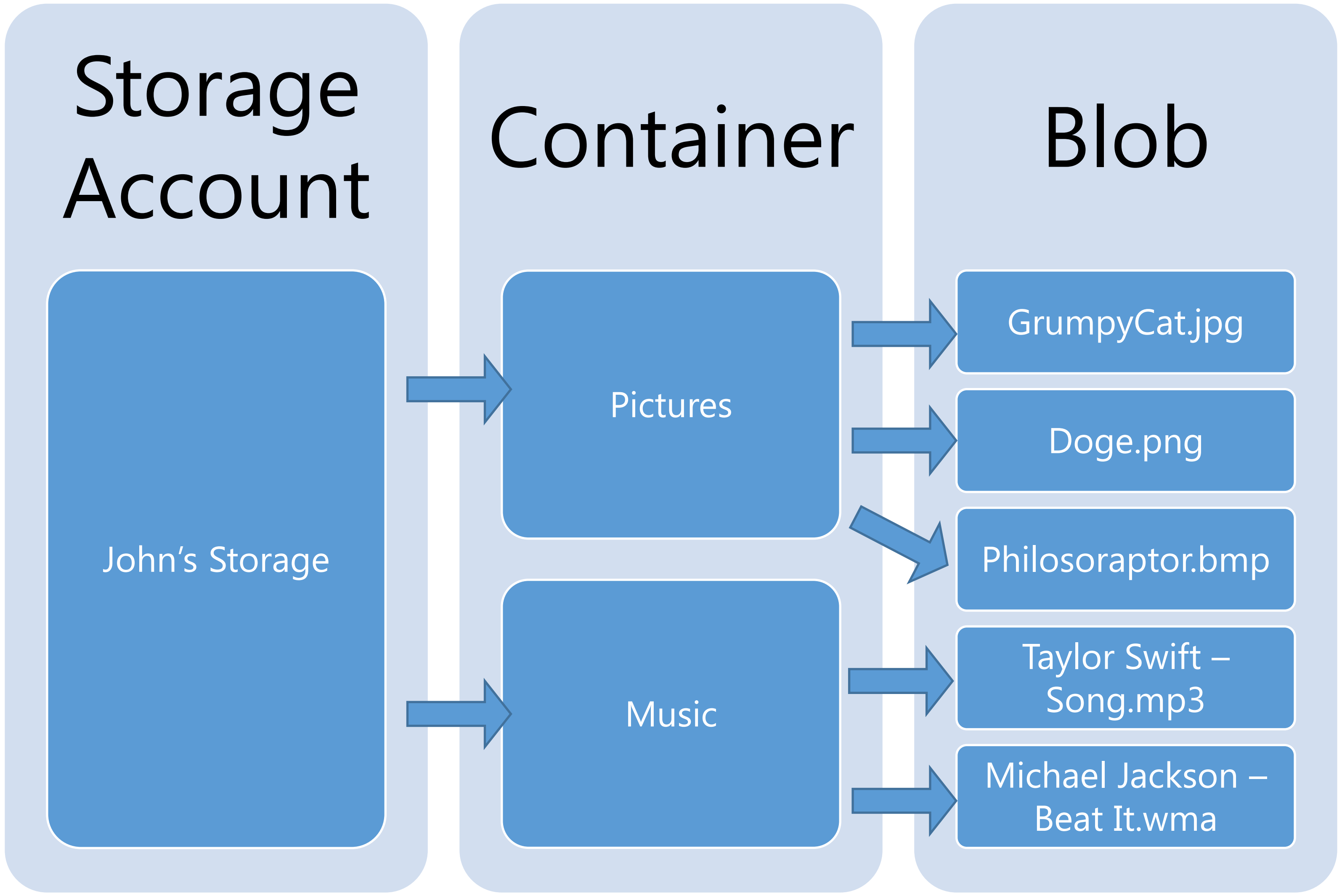

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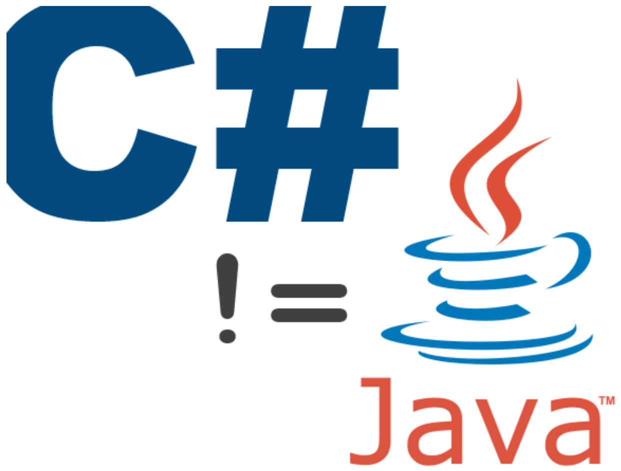
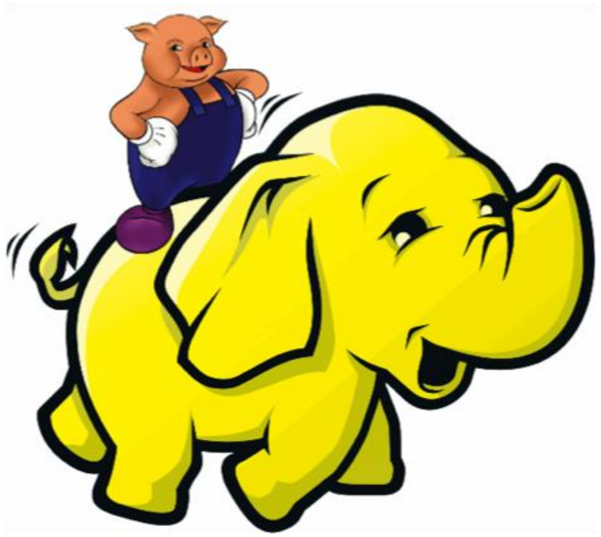
When to Use Each



VS

VS



C#
Java
MapReduce

Hive

Pig

Questions?

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