Apache Hadoop HDFS

Presentation

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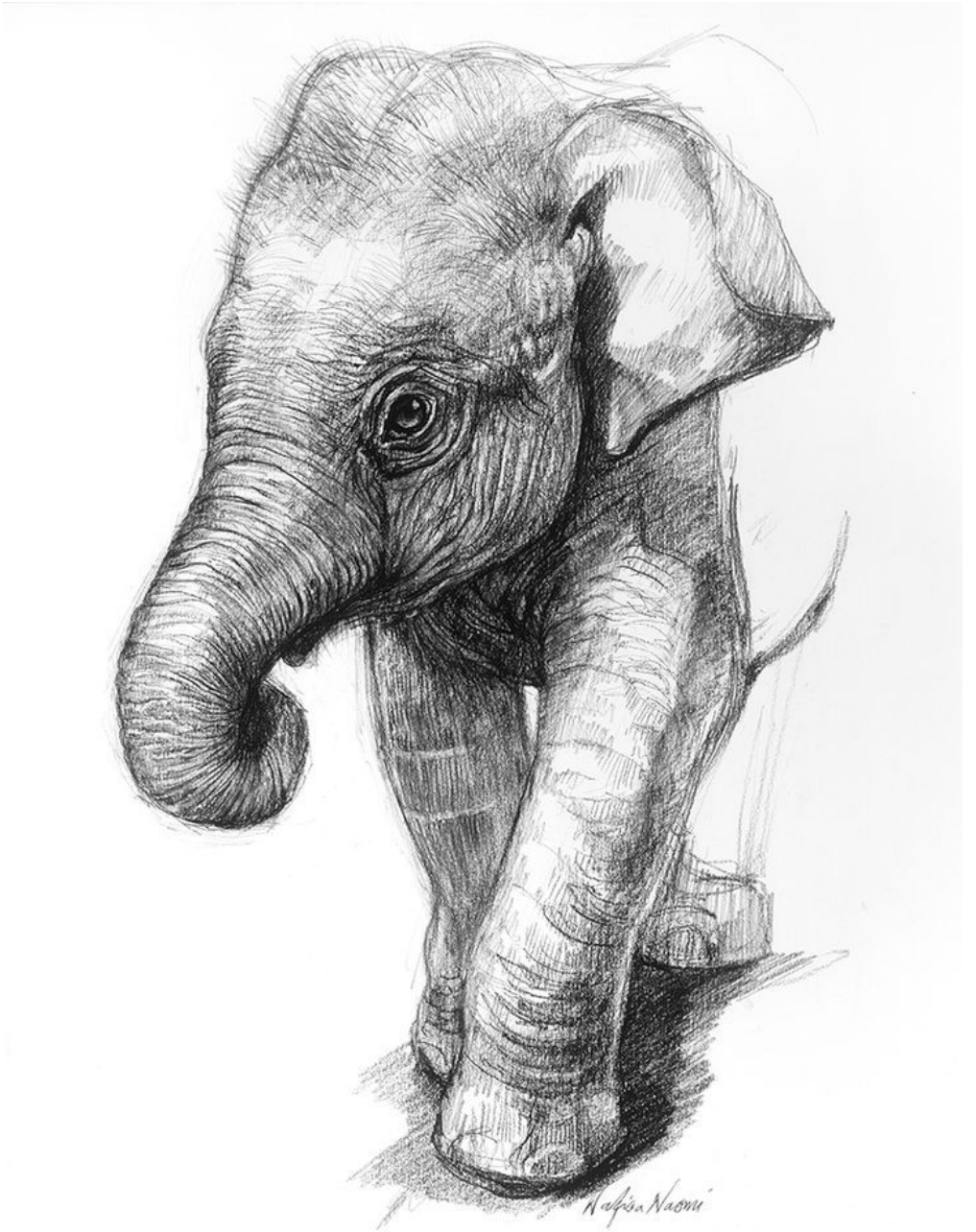


Agenda

1. Apache Hadoop
2. Usage
3. Motivation & Goal
4. Architecture
5. Hadoop Distributed File System (HDFS)
6. Conclusions
7. Bibliography

Apache Hadoop

- ***"Apache Hadoop is a framework written in Java for scalable, distributed software. It is based on the MapReduce algorithm from Google Inc. as well as suggestions from the Google file system and makes it possible to perform intensive computing processes with large amounts of data in the petabyte range on computer clusters to carry out a test.“***

- *I'm sure you're wondering what the word "Hadoop" means. The first pronounced word of the child by the Lucene inventor, Doug Cutting, was "Hadoop."*

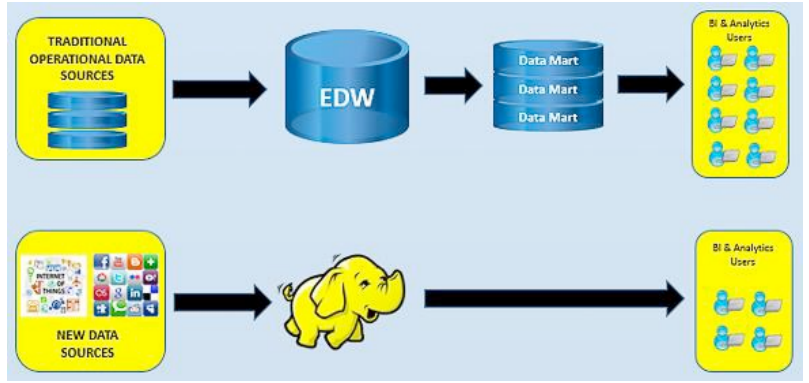
Usage

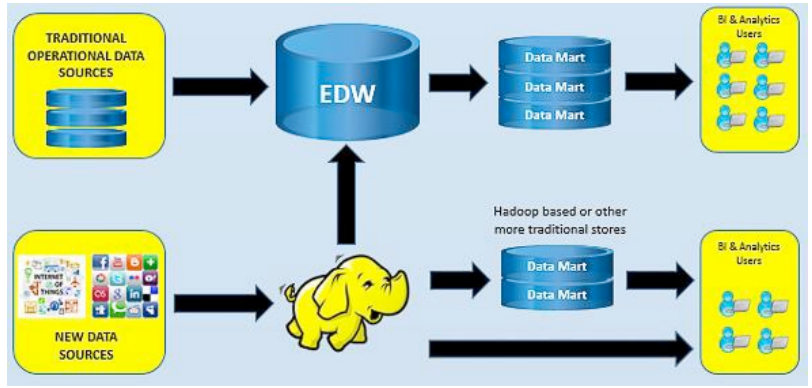
The Three Hadoop Applications in Data Warehousing

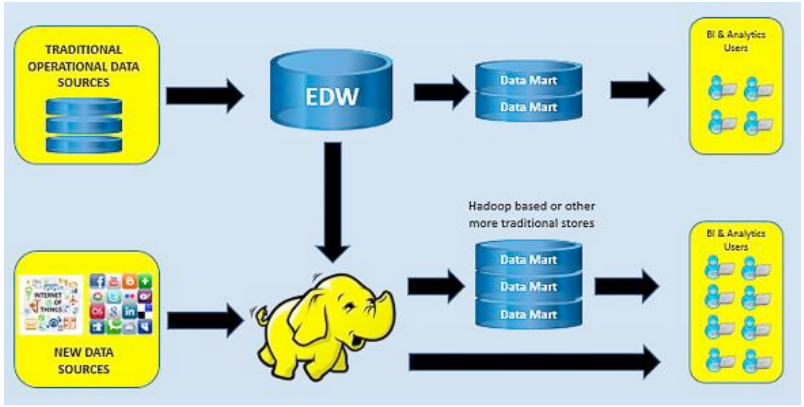
1. **Hadoop as a new data storage device**

2. **Hadoop as a data platform and additional Input for the Enterprise Data Warehouse.**

3. **Hadoop as a data platform and Basis for BI and Analytics.**







Motivation

Apache Hadoop is open-source!

1. **The automatic collection** of data (log files, share prices, social security, etc.)Networks, ...) generates huge amounts of data
2. **Storage** capacities of hard disks are strong in the last decades risen
3. **Average access** times and transfer rates have proved to be comparatively low bettered
4. **The time to read** out a complete hard disk is getting longer and longer. 2000: 40 GB, 32 MB/s, 9.5 ms → 21 minutes 2009: 1000 GB, 125 MB/s, 8.5 ms → 136 minutes
5. **Multiple independent computers** with their own disk memories become clusters connected (distributed storage of data)
6. **Parallel processing** of large amounts of data possible, e.g. Petabytes

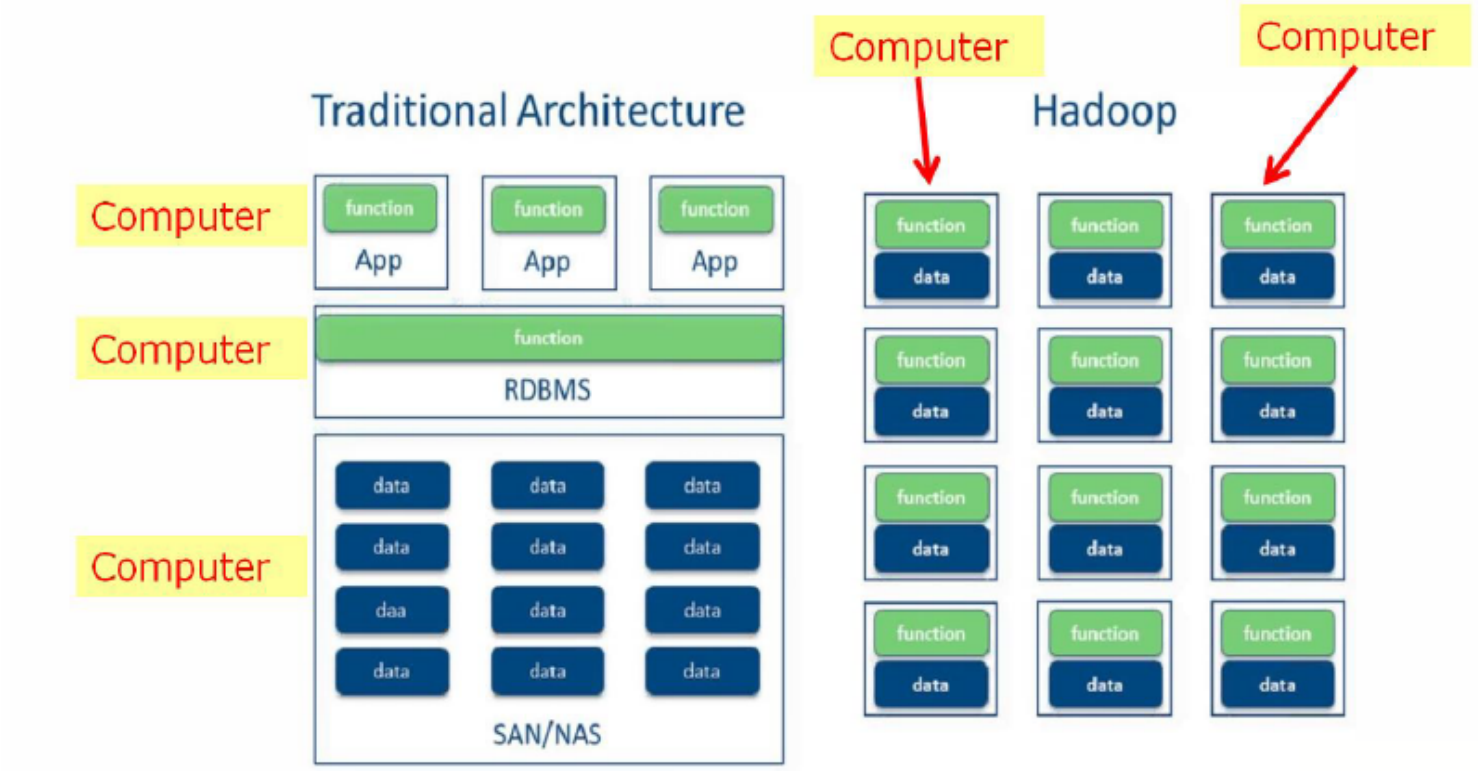
What can Hadoop do?

Master Big Data

- Hadoop can handle intensive computing processes with large amounts of data (Big Data, Petabyte range) on computer clusters. A computer cluster is a "collection" of several computers.
- Therefore, large amounts of data (including unstructured data) can be distributed securely and fault-tolerant on up to several thousand servers inside one clusters.
- Hadoop was originally created to address problems of RDBMS and DWH.

Hadoop Architecture

Master Big Data



Hadoop Distributed File System

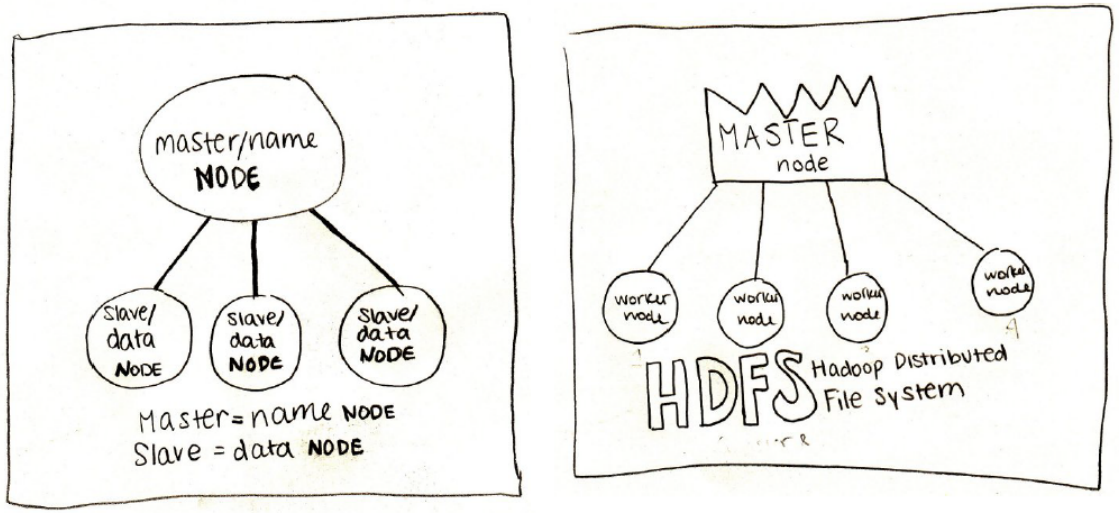
HDFS Design

- HDFS is a filesystem designed for storing very large files with streaming data access patterns, running on clusters of commodity hardware.
- **Very Large files**
- **Streaming data access** (write once ready many times)
- **Commodity Software** (low cost servers)

Hadoop Distributed File System

HDFS Architecture

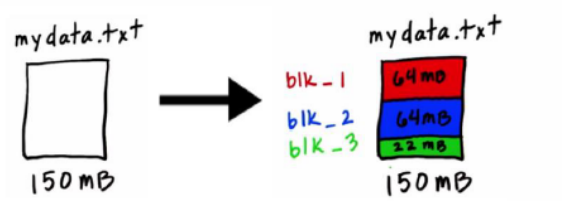
- In an HDFS cluster, there is ONE master node and many worker nodes.
- The **master node** is called the **Name Node (NN)** manages the file systems' operations
- Workers are called **Data Nodes (DN)**. Data nodes actually store the data. They are the workhorses.

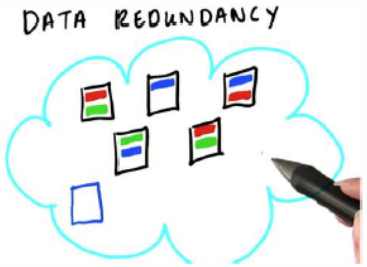


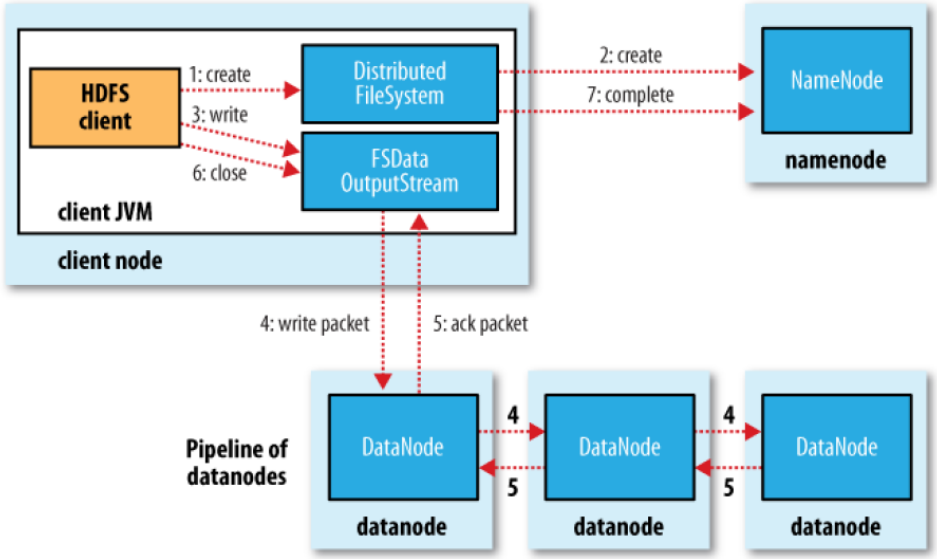
Hadoop Distributed File System

HDFS Architecture

- The Hadoop Filesystem (HDFS) divides files into blocks. A file can, for example, be divided into three blocks (blk_1, blk_2, blk_3). These blocks are then distributed among the different nodes and racks.







Conclusions

Apache's Hadoop open-source project

- Complete new topic, great start with the VM
- **Challenges of Hadoop (HDFS)**
  - Lot's of small Data
  - Super fast data access
  - Multiple writers
  - There's a widely acknowledged talent gap
  - Full data management and governance.

- *Hadoop Illuminated, Kerzner et. al.(2018)*
- *Hadoop; The Definite Guide, White (2012)*

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