Week 10
Distributed Computing With Hadoop Introduction

Mastering Cloud Computing

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(based on material by Paul Talaga)

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Distributed Computing

Recall W03.2 “Distributed Computing” lecture

Needs management of distribution of work:

- Compute resources (CPU/RAM)
- Long-Term Storage (Filesystem)
- User-supplied “algorithm” or “work”
- Scheduling/dependency

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Hadoop Platform

Provides framework/API for distributed computing

- http://hadoop.apache.org/
- https://en.wikipedia.org/wiki/Apache_Hadoop

Hides away distributed back-end

Provide consolidated abstractions for:

- workload distribution
- storage
- application development

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Hadoop Core

Hadoop is built atop some core components:

- Hadoop Common: Common shared libraries, runtime
- Hadoop Distributed File System (HDFS) - Storage abstraction across multiple nodes providing a single filesystem environment
- Hadoop YARN (Yet Another Resource Negotiator): Compute management layer, or “distributed OS” for your Hadoop cluster

Hadoop Architecture

At its core - Java application, platform independent

Data-centric

Core tools & frameworks

Cluster built out of “nodes” that provide resources - execution time, disk space, etc.

Application development system, to build distributed solutions to user data problems

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Hadoop Common

Basic primitives for programming environment:

- Core data types
- Exceptions
- Data structures
- IPC primitives
- Logic, math, computation runtime
- Data handling/encoding/transfer

HDFS - File System

Filesystem abstraction for Hadoop clusters

Manage storage efficiently for:

- Very large files
- Streaming data access
- Built on commodity hardware
- High availability
- Concurrent access

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HDFS - Limitations

Doesn’t work as well for

- Many small files
- Low-latency data access

In these cases, you may always use another storage abstraction or engine

HDFS - Architecture

Built from nodes, which are server processes deployed to nodes in your cluster

namenode - HDFS metadata stored here, connects namespace to blocks in data store

datanode - The content of your files are broken into “blocks” and stored across these

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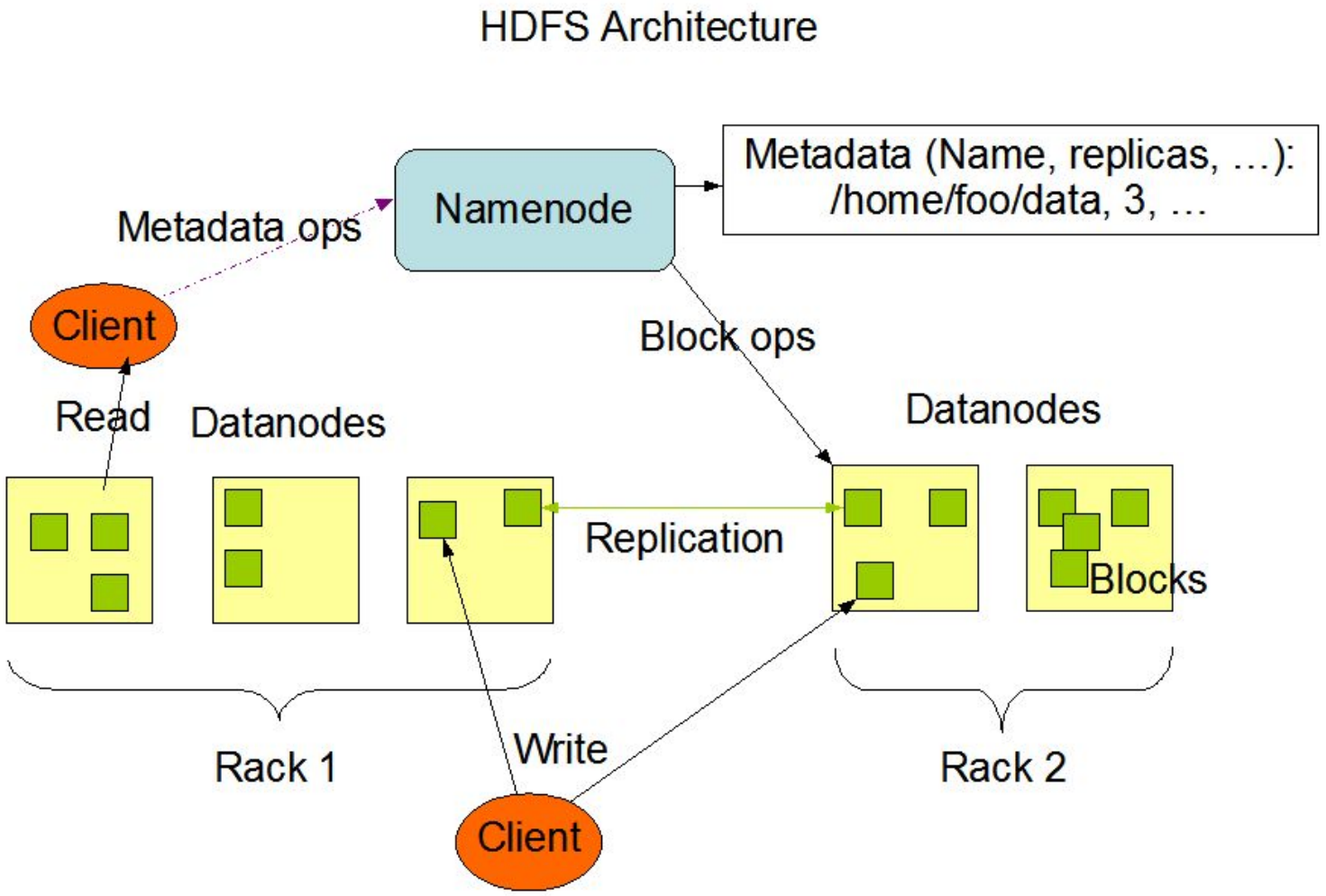
HDFS - Architecture Visual



Taken from: http://hortonworks.com/apache/hdfs/#section_2

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YARN - Concepts

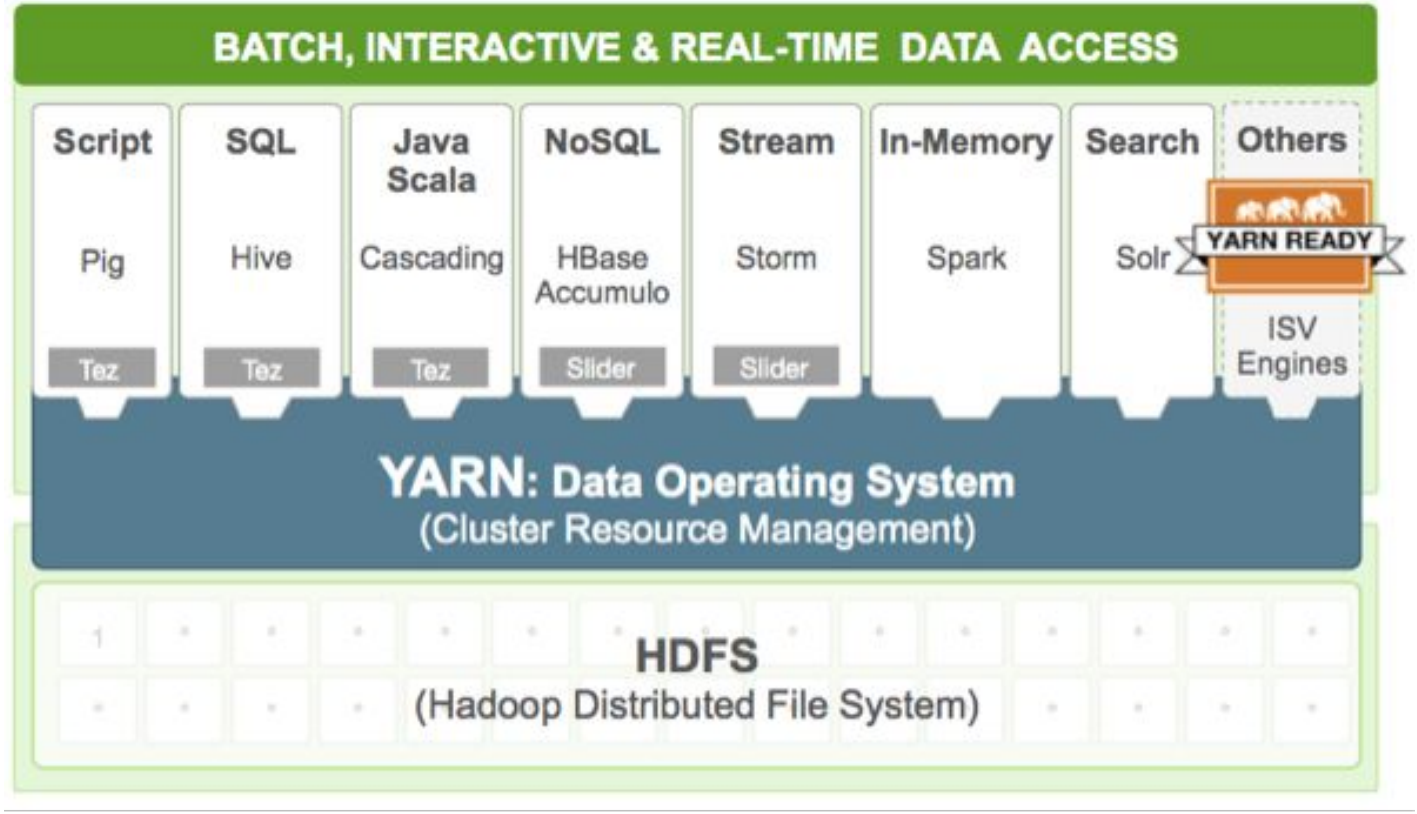
The platform development layer for Hadoop - or “Cluster OS”

In the above regard, it almost acts as a means of IaaS(M)

PaaS-like layers built atop this to provide “application interfaces” to Hadoop users.

Examples include: MapReduce, Spark

Hadoop, HDFS, YARN - Visual



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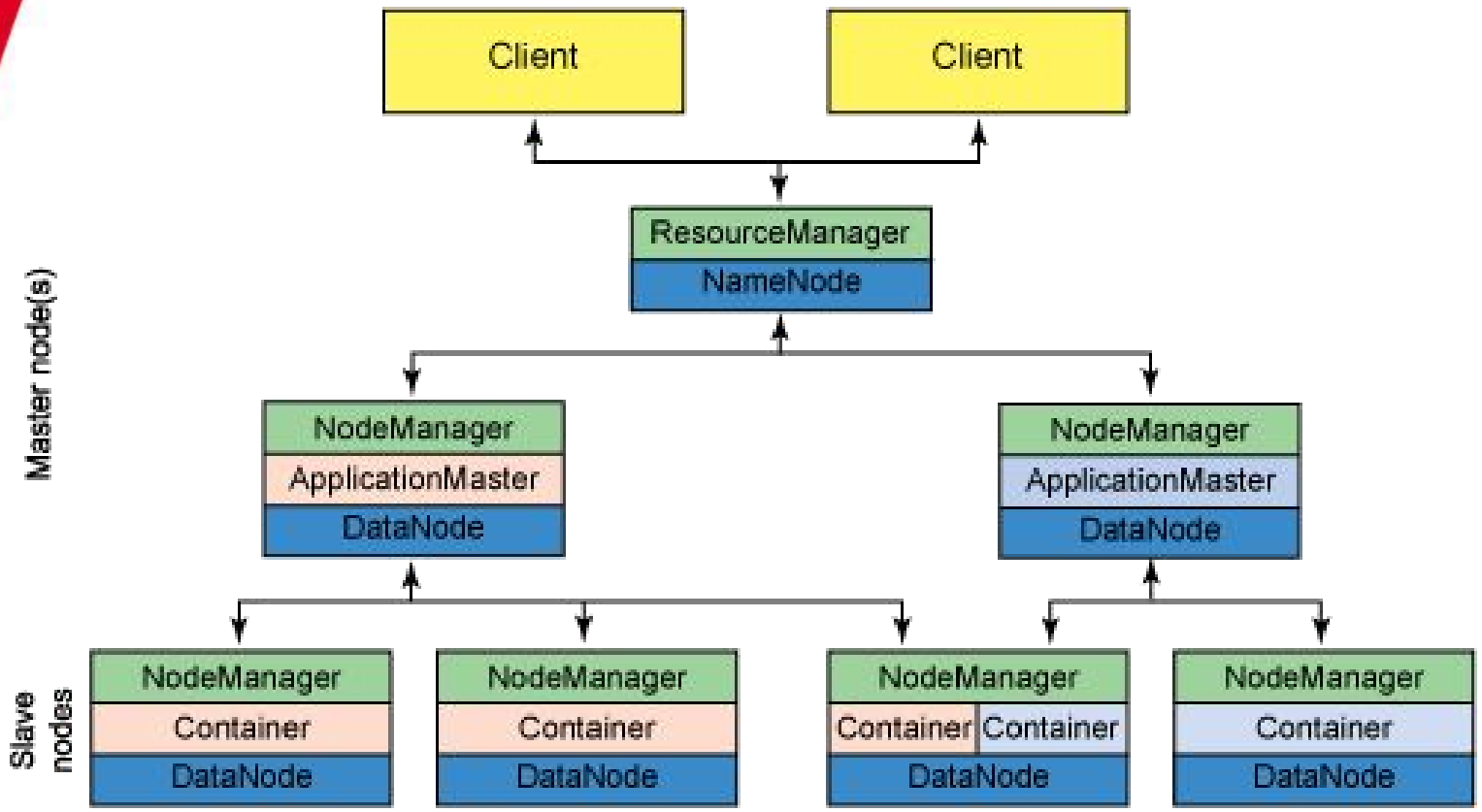
YARN - Architecture

ResourceManager - Manages the compute resources in the cluster, receives work from clients

NodeManager - Manages workload within an execution node in the cluster. Instantiates containers to execute workloads, distributes to other NodeManagers on-demand

YARN - Architecture



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