BIG DATA

Hadoop Ecosystem

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Hadoop Ecosystem Overview

PES UNIVERSITY ONLINE

What we have learnt so far..

HDFS – for storage

And MapReduce (Hadoop) for computation

So where does it all fit in the bigger scheme of a Big Data architecture

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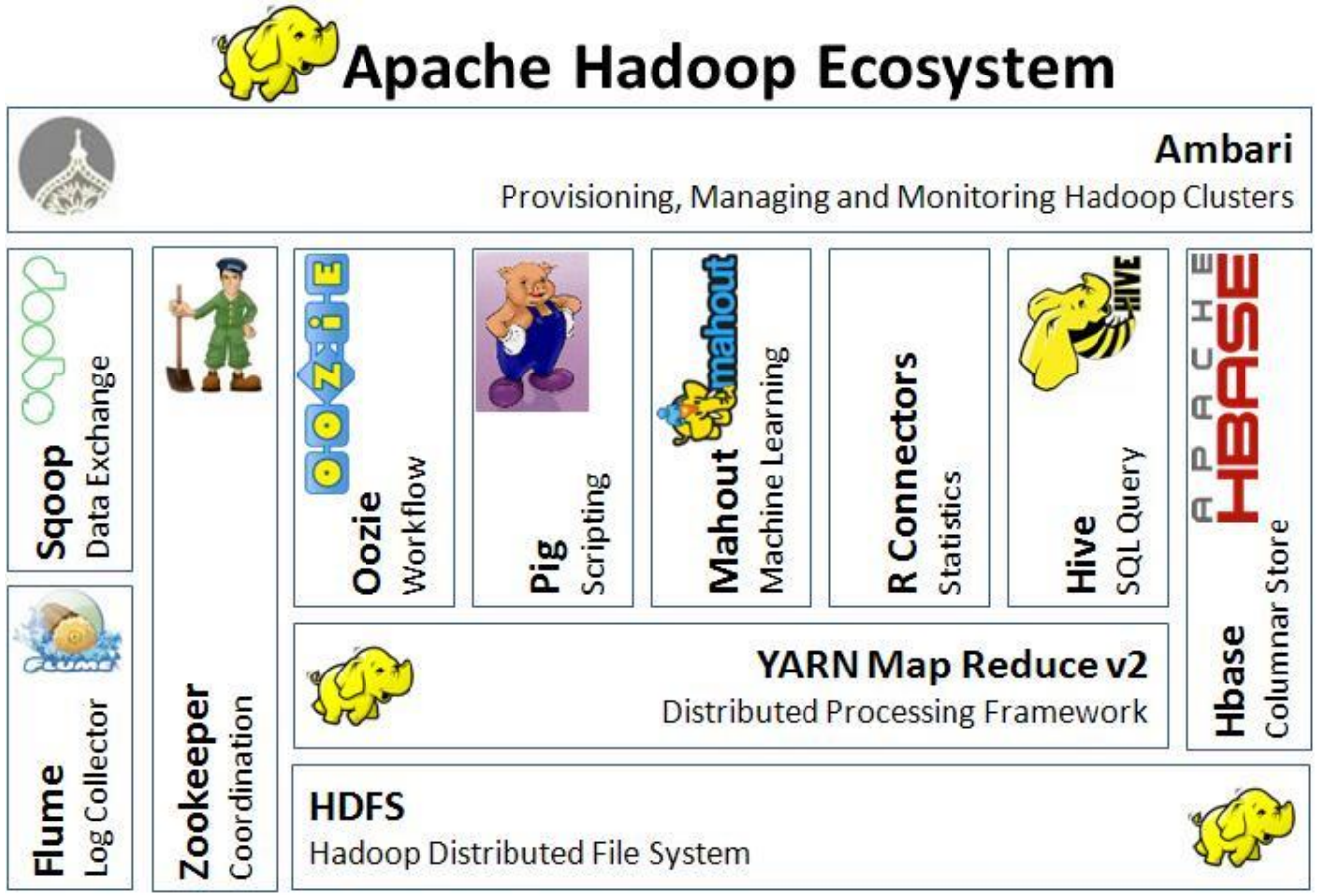

www.facebook.com/hadoopers

Hadoop Workflows: Oozie

Oozie: Motivational exercise

- Suppose we want to build a recommendation system like in AMAZON

  - What inputs would we need?
  - How often would we need to update the recommendations (every hour? Every day? EVERY week?)
  - Is it enough to just build a recommendation algorithm?
    - Let's assume that we have a MAGIC "RECOMMENDATION ALGORITHM" that can work PROVIDED the right inputs are given to it.

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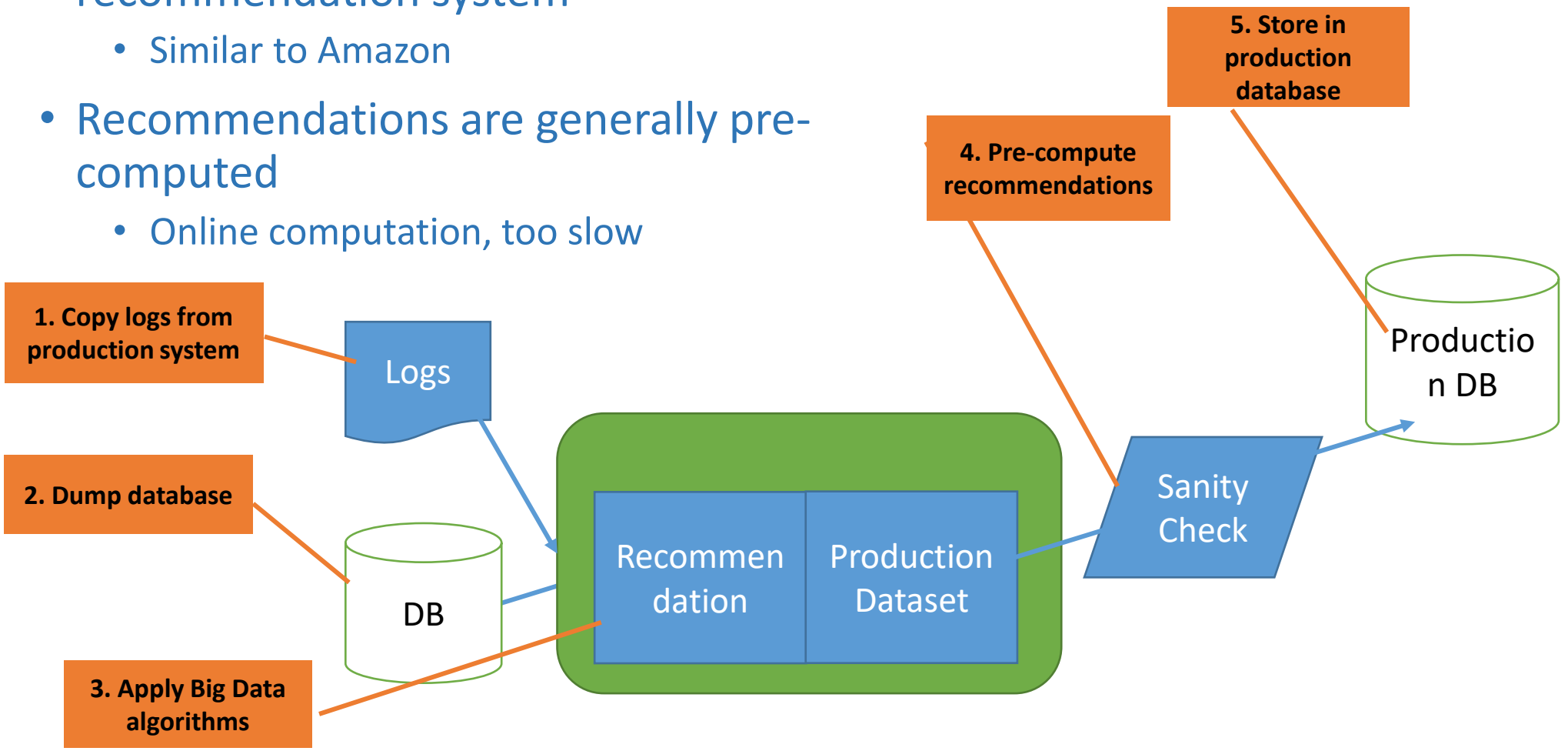
- We want to use the sales to build a recommendation system
  - Similar to Amazon
- Recommendations are generally pre-computed
  - Online computation, too slow



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Workflow Definition

- The sequence of steps is called a *Workflow*
- Workflows are common in data centers
- Users would like to
  - Specify the steps
  - Specify when the steps are to be run
    - Maybe periodically
  - Run the Workflow
  - What to do in case of error

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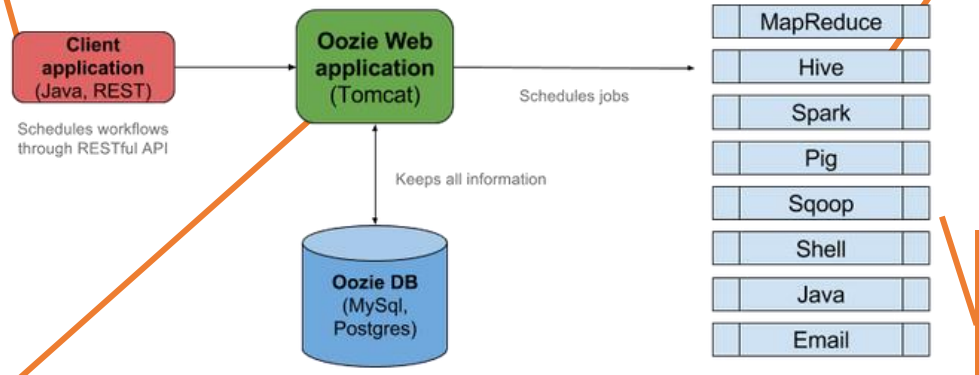
Oozie Architecture

1. User submits Workflow (XML)



3. Some of the applications supported by Oozie

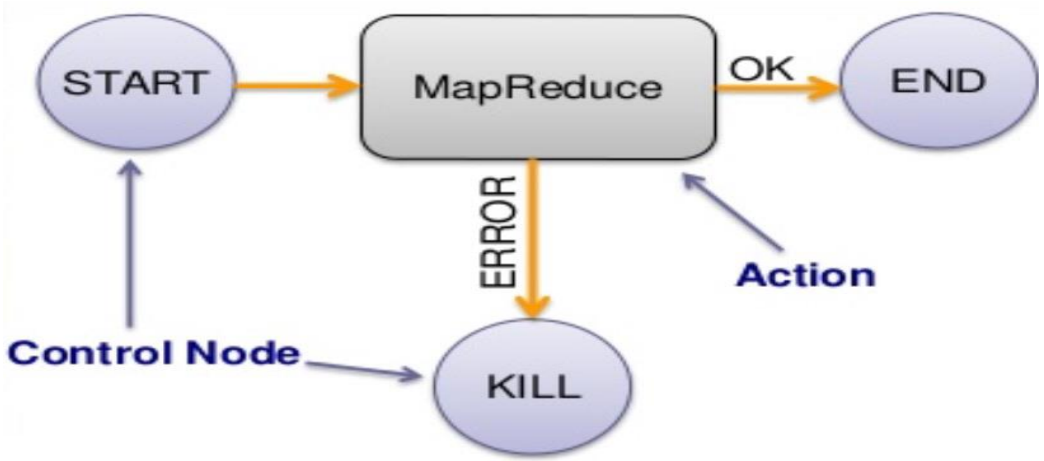
2. Oozie: Tomcat application

4. Workflow can include any of these applications

Image courtesy: https://oyermolenko.blog/2017/10/01/scheduling-jobs-in-hadoop-through-oozie/

Oozie Workflow (pictorial)

- **Action nodes**
  - Does something, e.g., run Mapreduce
  - Every action node has a normal exit and an error exit
- **Control nodes**
  - Start is the beginning of a Workflow
  - End and kill are the end
  - Other control nodes
    - Fork (start parallel tasks) and Join (merge parallel tasks)
    - Decision: like switch



DAG Expressing Workflow

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Oozie References

- T1 – Chapter 2.6.1.2
- T2 – Chapter 7.5

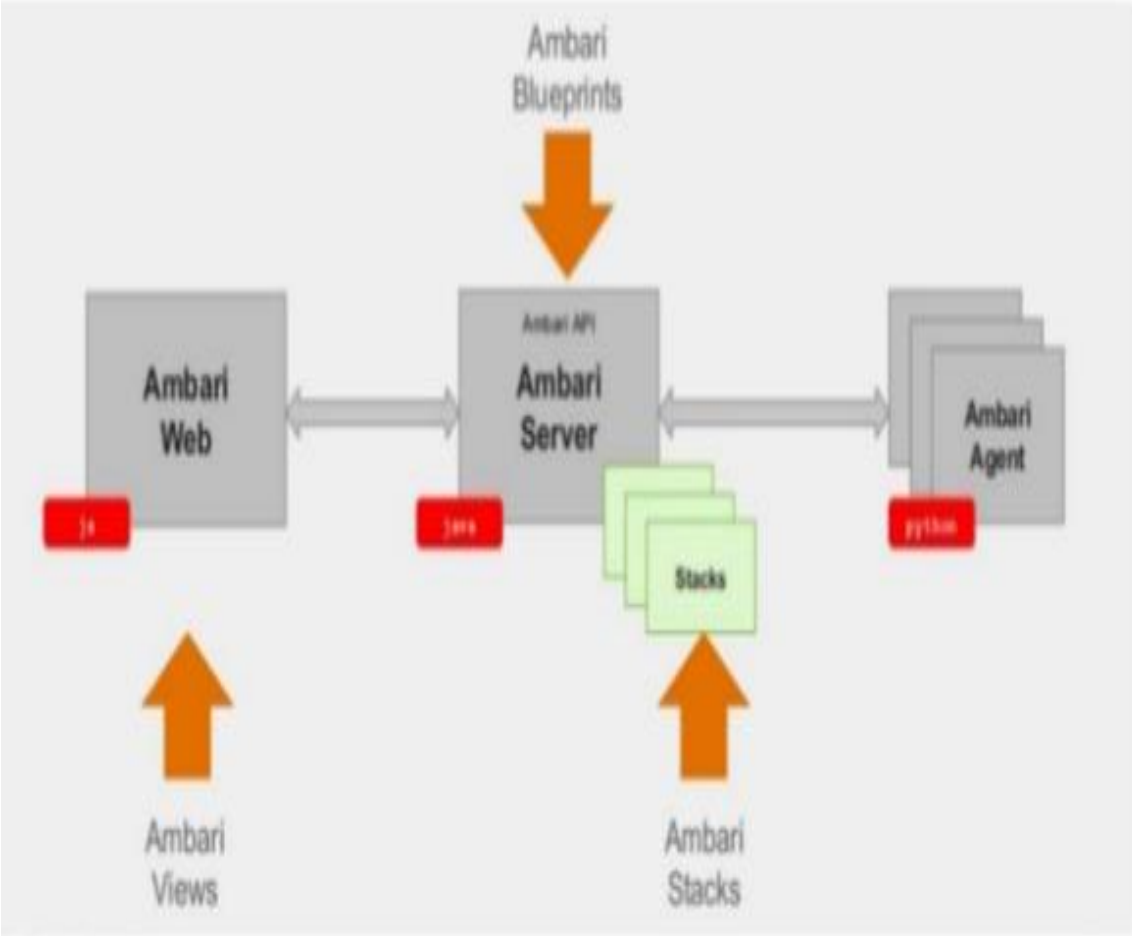
- http://oozie.apache.org/docs/4.3.0/index.html
  - Official Oozie Homepage
- https://oyermolenko.blog/2017/10/01/scheduling-jobs-in-hadoop-through-oozie/
  - A very good introduction to Oozie

Hadoop Workflows: Ambari

Ambari : Deploy and Manage Hadoop Clusters

- Simplifies Installation, Configuration and Management
- Easy, efficient, repeatable creation of clusters
- Manages and Monitors clustering

Ambari Architecture



- **Ambari Stacks**
  Describes the applications to be installed,
  eg, Hadoop, its components and its structure
- **Ambari Blueprints**
  Creation of the cluster
- **Ambari Views**
  User interface

Source: https://www.slideshare.net/hortonworks/managing-enterprise-hadoop-clusters-with-apache-ambari

Ambari Stacks

What do we need to define in Ambari to install a cluster ?

Term	Meaning
Stack	Set of services, where to get the software packages, e.g. HDP (Hortonworks Data Platform)
Service	Components that make up the service e.g, HDFS
Component	Building blocks of the service – Namenode, Datanode
Category	Master, slave, client

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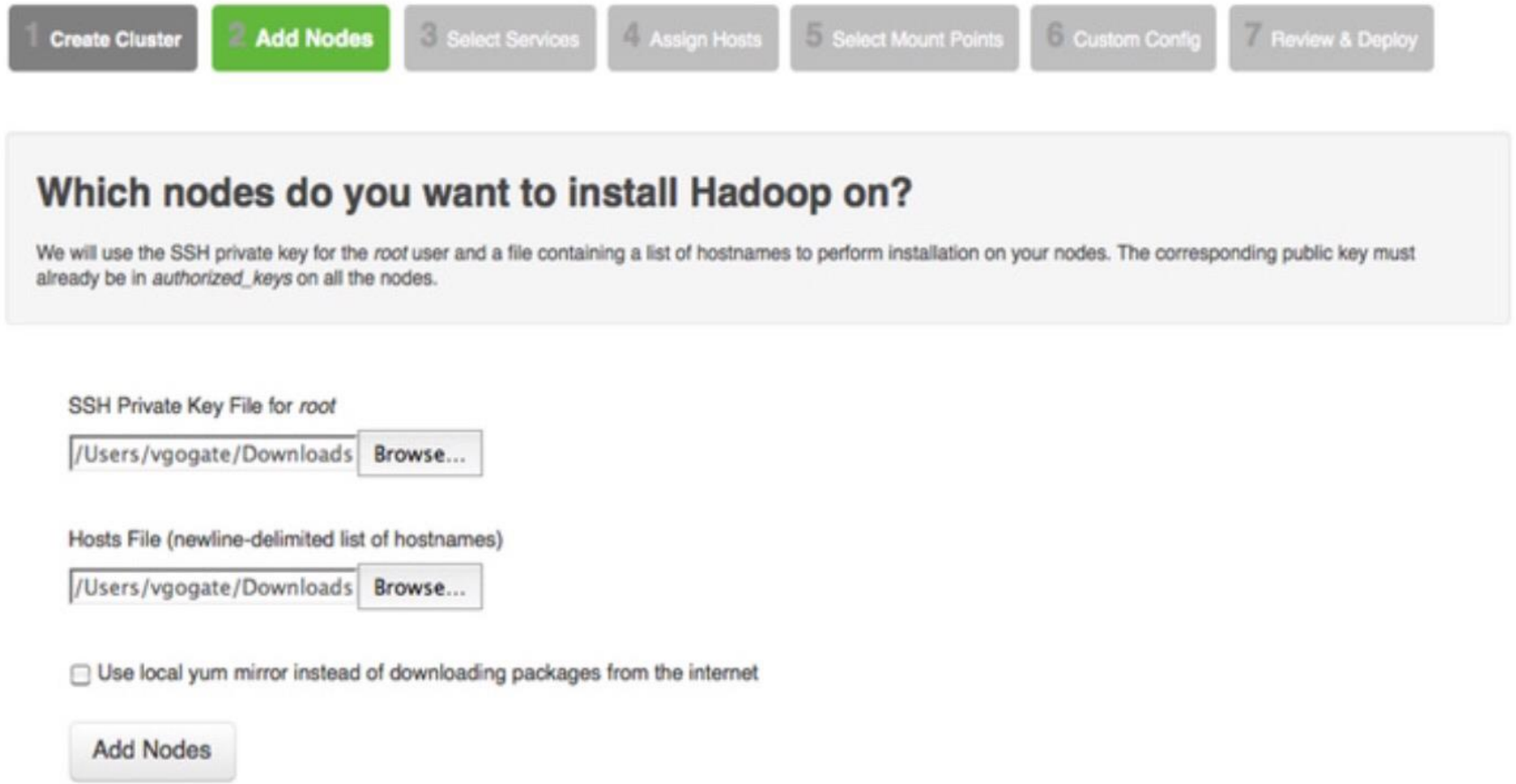

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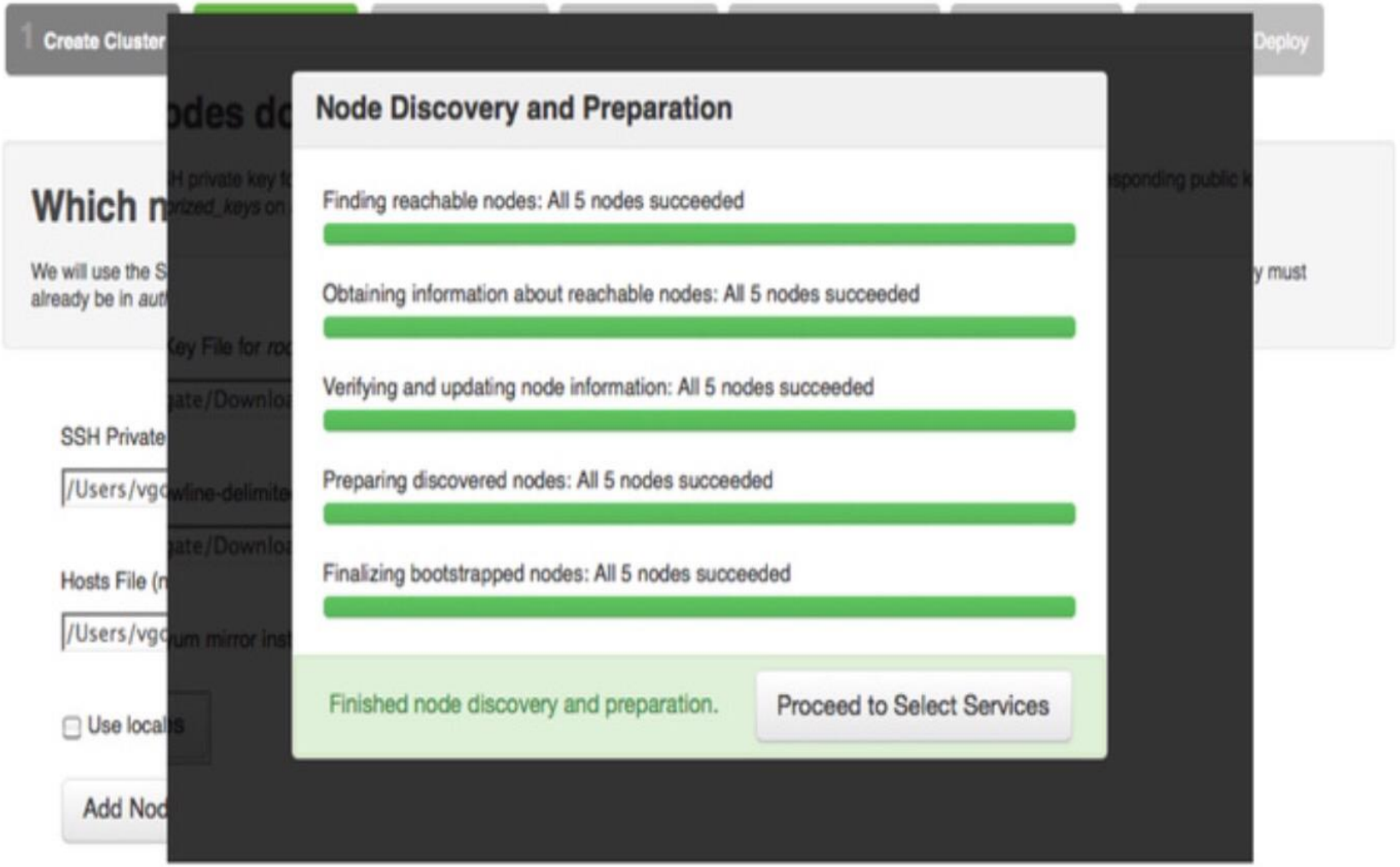

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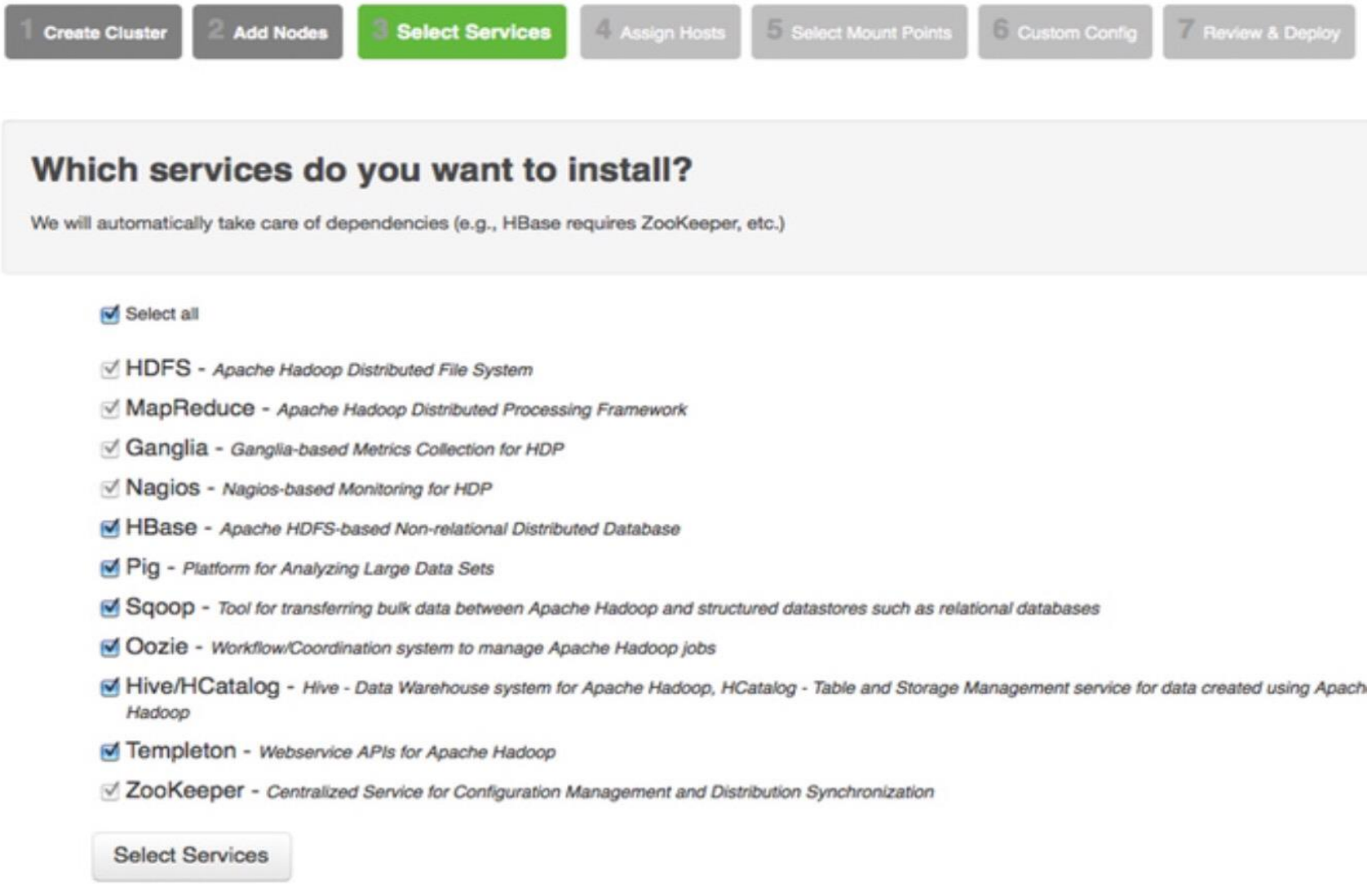

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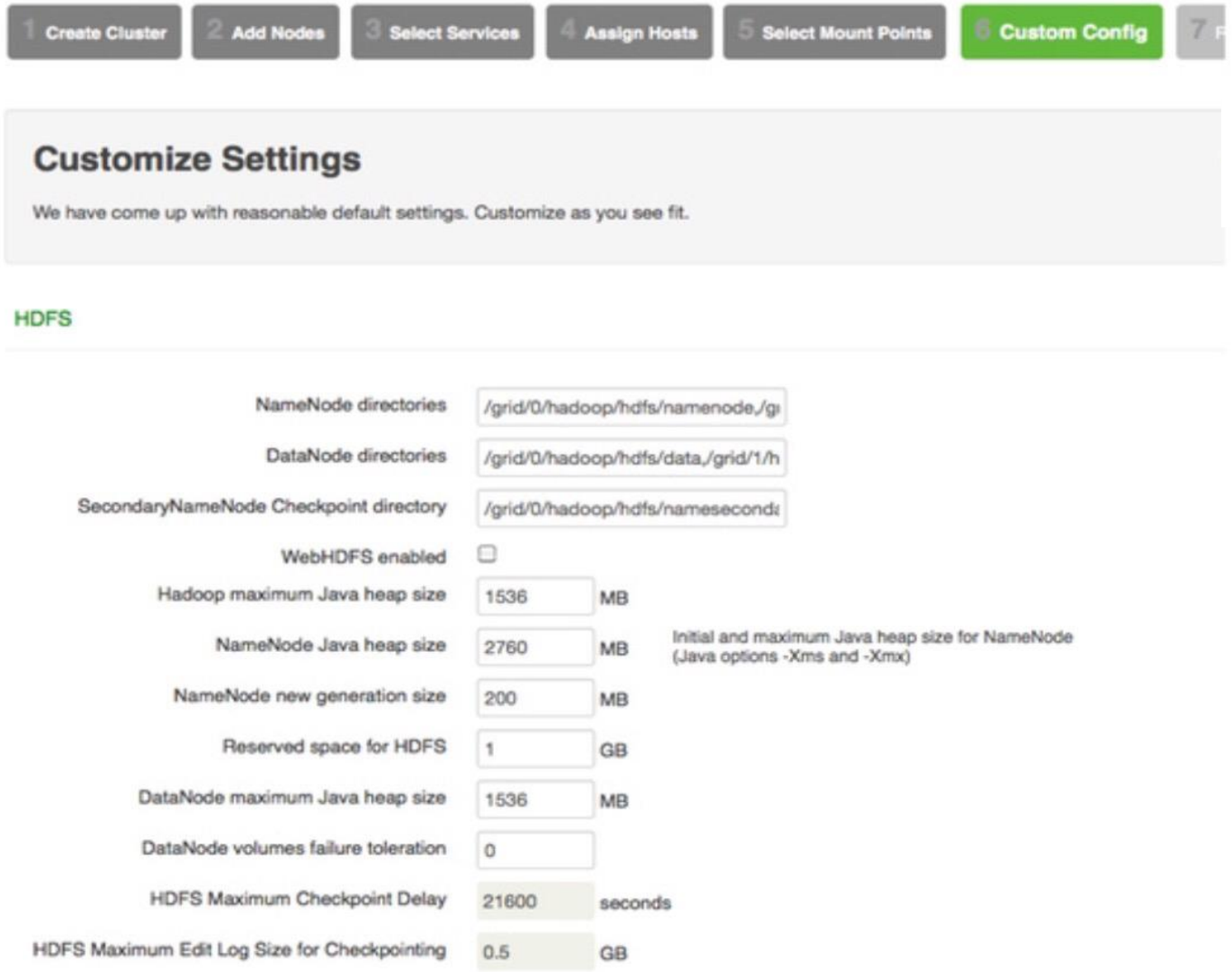

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Hadoop Ecosystem

Pig : Building High-Level Dataflows over Map Reduce

Disadvantages of MapReduce

- For Data analysis, Map-Reduce is too low-level
- Writing Map and Reduce code requires retraining.

- Something SQL-Like may be better
  - HIVE is an option (which we will look at later)
  - But how about a scripting language

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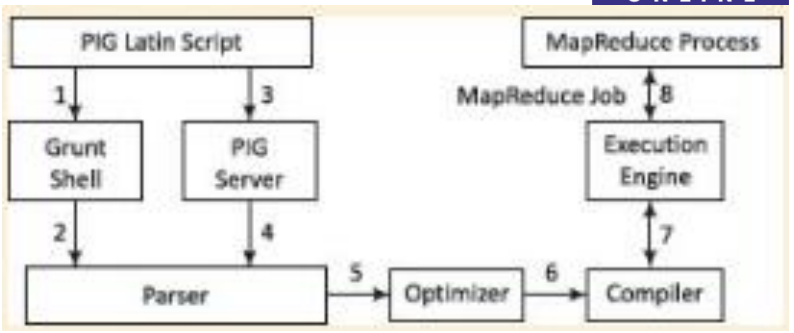
PIG Introduction

- Complex data transformations using scripts
  - Builtin operators – join, group, filter, limit…
- Interactive shell → Grunt
- Language → Pig Latin



- Scripts are internally converted to Map Reduce jobs.

- Created @Yahoo

Image courtesy: Big Data Analytics,
Rajkamal, Preeti Saxena

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Example Data Analysis Task

- Find the top 10 most popular IPL matches in each venue.

Visits

User	matchId	Time
RajniKan	Match 400	2:00
RajniKan	Match 201	5:00
Superman	Match 42	10:05
Spiderman	Match 108	13:03

MatchInfo

matchId	Venue	Winner
Match 108	Chennai	CSK
Match 201	Bengaluru	RCB
Match 42	Kolkata	DC
Match 400	Mumbai	RCB

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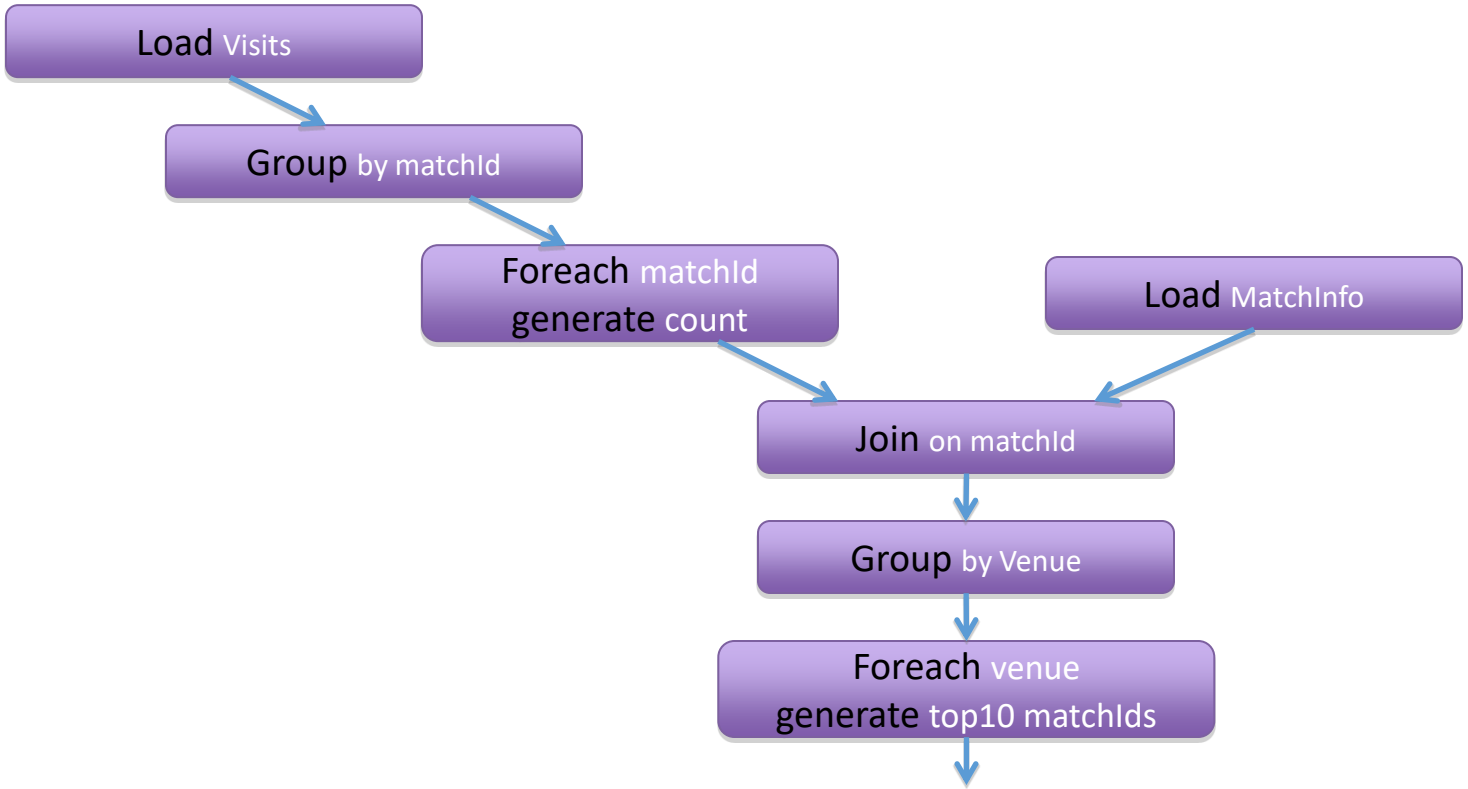
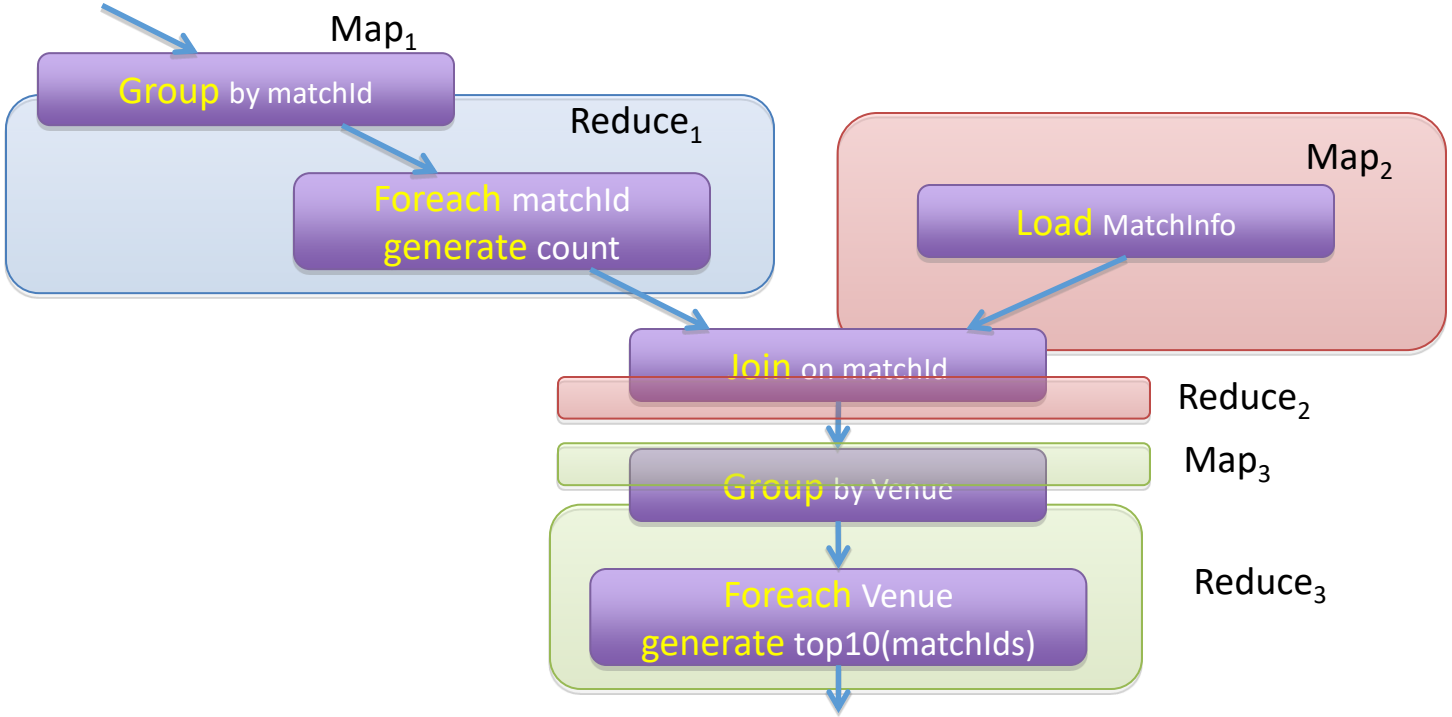
Data Flow



Compilation into Map-Reduce



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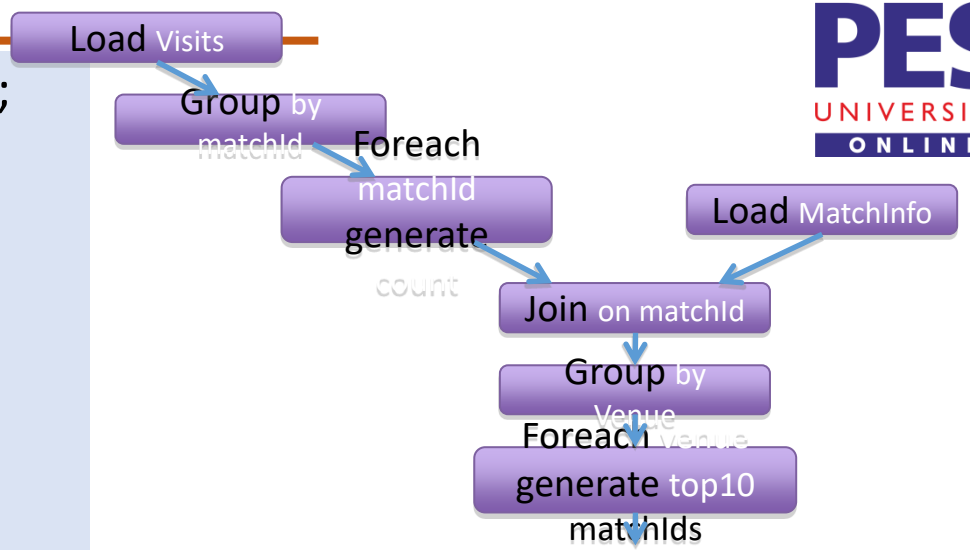
In Pig Latin

- visits = load '/ipldata/visits' as (user,matchid, time);
- gMatches = group visits by matchId;
- matchPopularity = foreach gMatches generate matchId, count(visits);

- matchInfo = load '/ipldata/matchInfo' as (url, venue, winner);
- venueCounts = join gMatches by matchId, matchInfo by matchId;
- gVenues = group venueCounts by venue;
- topMatches = foreach gVenues generate top(matchPopularity,10);

- store topMatches into '/data/topMatches';



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Pig References

- T1 – Chapter 4.6 – you are not expected to memorize the syntax of Pig. Just the basics and how it is converted to map reduce tasks. Please go through the entire section if you want to learn to code.
- T2 – Chapter 7.5

SQOOP

Why Sqoop ?

- Sometimes we need to use data periodically from a
  - Data warehouse
  - SQL database
- For performing analytics
- And store the data back into an SQL database
- SQOOP → SQL to Hadoop provides this functionality

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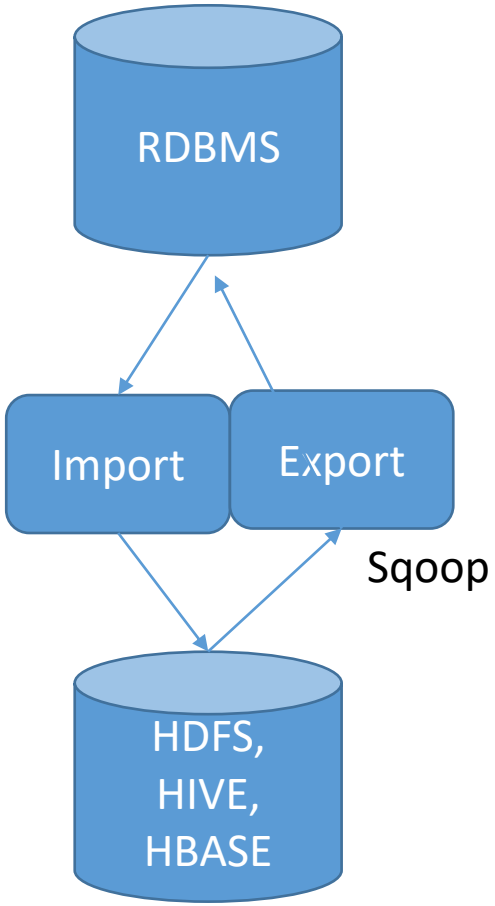
What is SQOOP?

- Bulk Data Transfer Tool – voluminous data
- Import/Export data to/from SQL
  - Defines schema for import
- Integrates with Oozie as an action
- Support plugins for data sources
  - Let's say a newer database that is not supported by default.



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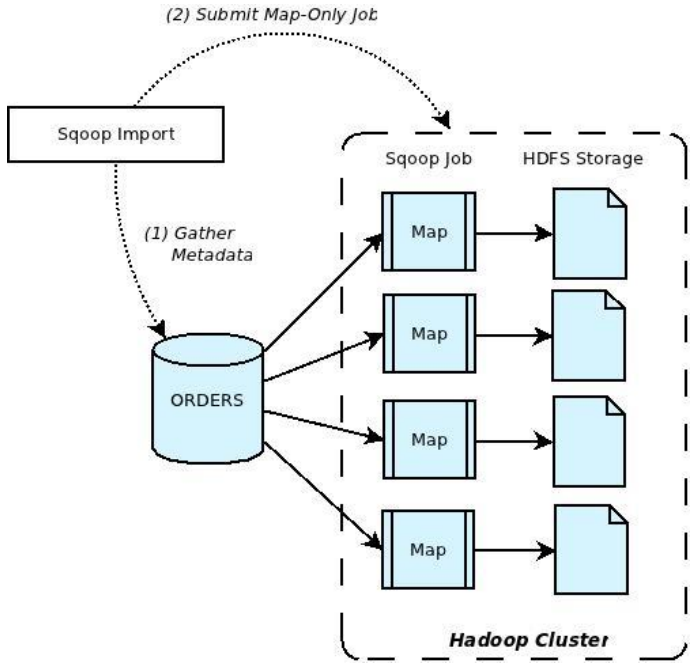
How does sqoop work? (IMPORT)

- Step 1
  - Inspects database to gather necessary metadata on data being imported
- Step 2
  - Transfers the data
    - Map only hadoop job
    - Stores data to hdfs directory
    - Imports into csv file, with newline as record separator



https://blogs.apache.org/sqoop/entry/apache_sqoop_overview

FLUME

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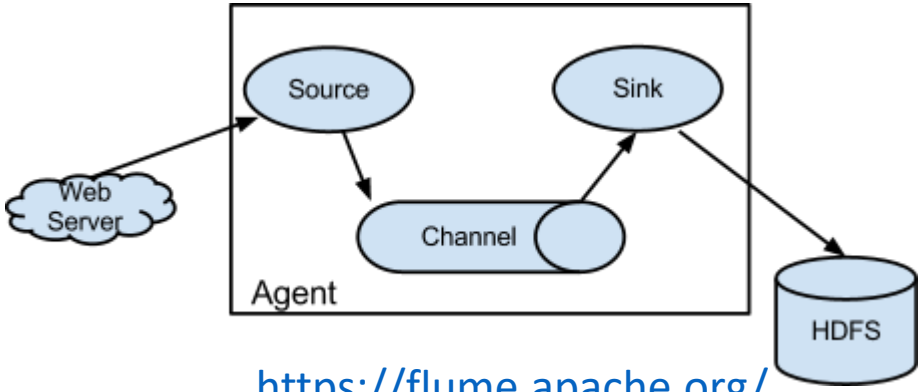
What is Flume ?

- Meant for collecting large amounts of streaming data
  - Events
  - Logs – like web server logs
- Architecture
  - Sources – accept data from an application
  - Sinks – receive data and store into HDFS
  - Channels – connect sources to sinks
  - Agents run the sources and sinks within Flume



https://flume.apache.org/

THANK YOU

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