Introduction to Hadoop & MapReduce

Lab Instructions

Agenda

- HDFS command line tools
- Alternatives to HDFS command line tools
- Hadoop MapReduce jobs
- Lab Senarios

Accessing HDFS Via The Command Line

- HDFS is not a general purpose file system
  - HDFS files cannot be accessed through the host OS
  - End users typically access HDFS via the `hadoop fs` command
- Example:
  - Display the contents of the /user/fred/sales.txt file

```
hadoop fs -cat /user/fred/sales.txt
```

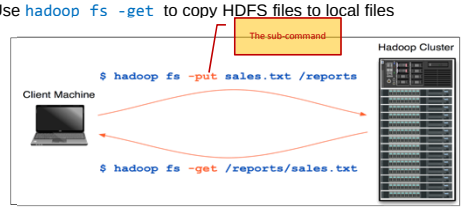
  - Create a directory (below the root) called reports

```
hadoop fs -mkdir /reports
```

hdfs dfs commands perform similar functions with minute differences

Copying Local Data To And From HDFS

- Remember that HDFS is separated from your local filesystem
  - Use `hadoop fs -put` to copy local files to HDFS
  - Use `hadoop fs -get` to copy HDFS files to local files



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More Command Examples

- Copy file input.txt from the local disk to the user's home directory in HDFS

```
hadoop fs -put input.txt /user/cloudera/input.txt
```

  - This is equivalent to `hadoop fs -put input.txt input.txt`
- Get a directory listing of the HDFS root directory

```
hadoop fs -ls /
```

- Delete the file /reports/sales.txt

```
hadoop fs -rm /reports/sales.txt
```

- Delete an entire directory and all of its subdirs (be careful not to do this at the root level)

```
hadoop fs -rm -r /dualcore/example/
```

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Are There Alternatives to the Command Line Interface?

- Web UI:
  - On the Hadoop NameNode, access the following URL:
  - http://localhost:50070 (suppose the localhost is a NameNode)
- Via Hue (running over http on an edge node)
  - Hue (Hadoop User Experience) is a Cloudera product that is supported in a variety of Hadoop distributions.
  - On our VMs, username =**cloudera** and Password = **cloudera**
  - http://localhost:8888

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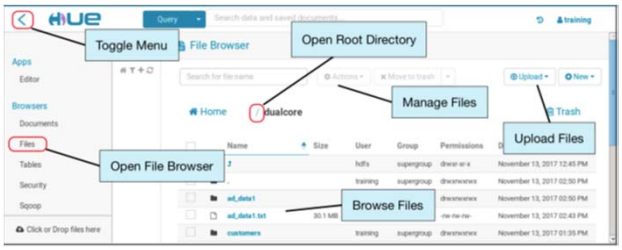
Review Question

- HDFS command line tool

Hue HDFS File Manager



Run MapReduce Jobs

- MapReduce code for Hadoop is typically written in Java
- Minimally, MapReduce applications specify the input/output locations and supply *map* and *reduce* functions.
  - The rest is handled by the Hadoop MapReduce framework and the user can monitor the progress by a JabTracker
  - E.g.
  - `hadoop jar /usr/joe/wordcount.jar org.myorg.WordCount /usr/joe/wordcount/input /usr/joe/wordcount/output`

Source: http://hadoop.apache.org/docs/stable1/mapred_tutorial.html#Usage

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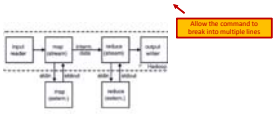
Hadoop Streaming

- Alternatively, Hadoop MapReduce can leverage Hadoop streaming.
  - Example (if written in Python)

```
hadoop jar /path/to/Hadoop-streaming.jar \
-file /path/to/mapper.py -mapper /path/to/mapper.py \
-file /path/to/reducer.py -reducer /path/to/reducer.py \
-input /path/to/input \
-output /path/to/output
```

Java jar file that streams data to/from external scripts

Allow the command to break into multiple lines



http://hadoop.apache.org/docs/stable1/mapred_tutorial.html#Hadoop

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Labs: Scenario Explanation

- Hands-On exercises throughout the course will reinforce the topics being discussed
  - Exercises simulate the kind of tasks often performed using the tools you will learn about in class
  - Most exercises depend on data generated in earlier exercises
- Scenario: Dualcore Inc. is a leading electronics retailer
  - More than 1,000 brick and mortar stores
  - Dualcore also has a thriving e-commerce Web site
- Dualcore has hired you to help find value in their data
  - You will process and analyze data from internal and external sources
  - Identify opportunities to increase revenue
  - Find new ways to reduce costs
  - Help other departments achieve their goals

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Labs: Fact Sheet

- Name: Dualcore
- Locations: 1,057 (all in the continental United States)
- Employees: 60,000
  - Concentrated near headquarters in the Bay Area, with many more elsewhere in California and on the West coast
  - Headquartered in Palo Alto, Ca. 94305
  - Numbers generally decrease eastward throughout US
- History
  - Company founded in 1985
  - 500 brick-and-mortar locations closed recently
  - E-commerce division has grown significantly and now accounts for a majority of revenue
- Products
  - PCs, servers, tablet devices, electronics (like DVD players and televisions), and related accessories (like printers, disks, batteries, cables and adapters)

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Labs: Important!

- Most lab exercises depend on data generated in earlier exercises
- Therefore, you cannot proceed with an exercise unless you've completed the one that precedes it
- If you are unable to complete one of the exercises (or suspect you may have made a mistake), there is a procedure for automatically "catching up", described in the lab manual

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Lab 01 – Using HDFS

- During this course, you will perform numerous Hands-On exercises using the Cloudera Training Virtual Machine (VM)
- The VM has Hadoop installed in pseudo-distributed mode
  - Simply a cluster comprised of a single node
  - Typically used for testing code before deploying to a large cluster
- Read the general notes first in the lab handout
- In the lab titled "Using HDFS" you will begin to get acquainted with the Hadoop tools. You will manipulate files in HDFS, the Hadoop Distributed File System.

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