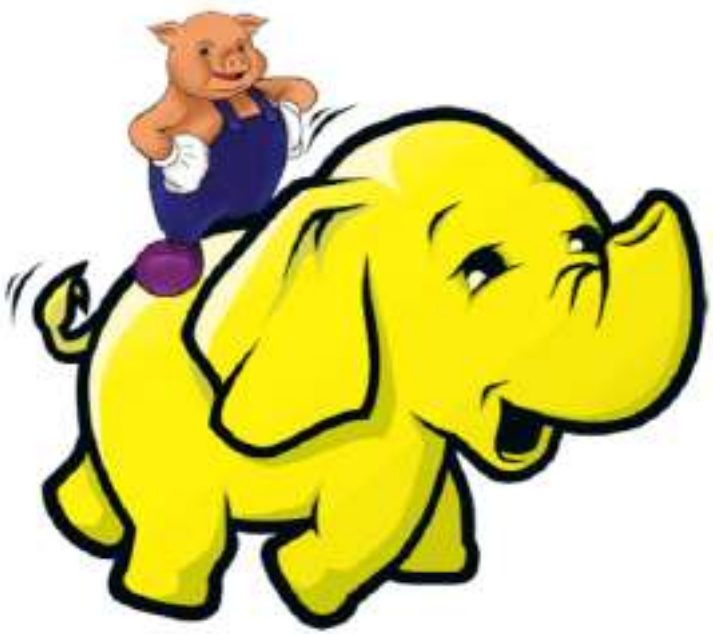
ntroduction to Pig

opics Covered

- About Pig
- Pig Latin
- The Grunt Shell
- *Demo: Understanding Pig*
- Pig Latin Relation Names and Field Names
- Pig Data Types
- Defining a Schema
- *Lab: Getting Started with Pig*
- The GROUP Operator
- *Lab: Exploring Data with Pig*

bout Pig

- It is an engine for executing programs on top of Hadoop
- It provides a language, Pig Latin, to specify these programs

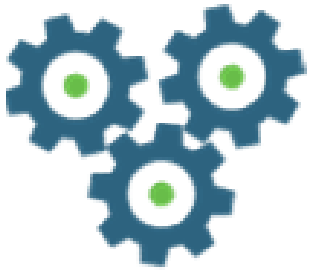


ig Latin

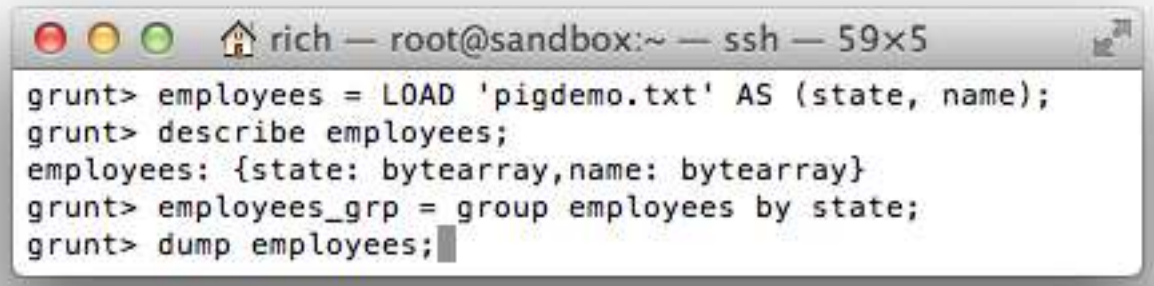
- ligh-level data-flow scripting language
- ig executes in a unique fashion:
  - During execution, each statement is processed by the Pig interpreter
  - If a statement is valid, it gets added to a **logical plan** built by the interpreter
  - The steps in the logical plan do not actually execute until a DUMP or STORE command is used

he Grunt Shell

- Is an interactive shell for entering Pig Latin statements
- Is started by running the **pig** executable



Grunt shell



emo: Understanding Pig

ig Latin Relation Names

- A **relation** is the result of a processing step
- The name given to a relation is called an **alias**
- For example, **stocks** is an alias:

```
stocks = LOAD 'mydata.txt'
         USING TextLoader();
```

ig Latin Field Names

- Relations can define and use field names, which are associated with an alias

- For example:

```
salaries = LOAD 'salary.data'
          USING PigStorage(',')
          AS (gender, age, income, zip);
highsalaries = FILTER salaries BY income >
1000000;
```

ig Data Types

nt

ong

float

louble

chararray

ytearray

oolean

latetime

igdecimal

iginteger

ig Complex Types

Tuple: ordered set of values

(OH,Mark,Twain,31225)

Bag: unordered collection of tuples

{

(OH,Mark,Twain,31225),

(UK,Charles,Dickens,42207),

(ME,Robert,Frost,11496)

}

Map: collection of key/value pairs

[state#OH,name#Mark Twain,zip#31225]

efining a Schema

```
customers = LOAD 'customer_data' AS (
firstname: chararray,
lastname:chararray,
house_number:int,
street:chararray,
phone:long,
payment:double);
```

```
salaries = LOAD 'salaries.txt' AS
(gender:chararray,
 details:bag{
    (age:int,salary:double,zip:long)
});
```

ab: Getting Started with Pig

he GROUP Operator

salaries

gender	age	salary	zip
F	17	41000.00	95103
M	19	76000.00	95102
F	22	95000.00	95103
F	19	60000.00	95105
M	19	14000.00	95102
M	17	35000.00	95103

salariesbyage

group	salaries
17	{(F,17,41000.0,95103), (M,17,35000.0,95103)}
19	{(M,19,76000.0,95102), (F,19,60000.0,95105), (M,19,14000.0,95102)}
22	{(F,22,95000.0,95103)}

```
salariesbyage = GROUP salaries BY age;
```

```
grunt> DESCRIBE salariesbyage;
salariesbyage: {group:int,
                salaries:{(gender: chararray, age: int,salary: double,zip: int)}}
```

ROUP ALL

salaries

gender	age	salary	zip
F	17	41000.00	95103
M	19	76000.00	95102
F	22	95000.00	95103
F	19	60000.00	95105
M	19	14000.00	95102
M	17	35000.00	95103

allsalaries

group	salaries
all	{(F,17,41000.0,95103), (M,19,76000.0,95102), (F,22,95000.0,95103), (F,19,60000.0,95105), (M,19,14000.0,95102), (M,17,35000.0,95103)}

```
allsalaries = GROUP salaries ALL;
```

```
grunt> DESCRIBE allsalaries;
allsalaries: {
    group: chararray,
    salaries: {(gender: chararray,age: int,salary: double,zip: int)}}
```

elations without a Schema

salaries

$0	$1	$2	$3
F	17	41000.00	95103
M	19	76000.00	95102
F	22	95000.00	95103
F	19	60000.00	95105
M	19	14000.00	95102
M	17	35000.00	95103

salariesgroup

group	salaries
95103	{(F,17,41000.0,95103), (F,22,95000.0,95103) (M,17,35000.0,95103)}
95102	{(M,19,76000.0,95102), (M,19,14000.0,95102)}
95105	{(F,19,60000.0,95105)}

```
salariesgroup = GROUP salaries BY $3;
```

```
grunt> DESCRIBE salariesgroup;
salariesgroup: {group:bytearray,
                salaries:{()}}
```

he FOREACH…GENERATE Operator

salaries

gender	age	salary	zip
M	66	41000.00	95103
M	58	76000.00	57701
F	40	95000.00	95102
M	45	60000.00	95105
F	28	55000.00	95103

→

A

age	salary
66	41000.00
58	76000.00
40	95000.00
45	60000.00
28	55000.00

```
A = FOREACH salaries GENERATE age, salary;
```

```
grunt> DESCRIBE A;
A: {age: int, salary: double}
```

pecifying Ranges in FOREACH

```
salaries = LOAD 'salaries.txt' USING
PigStorage(',') AS (gender:chararray,
age:int,salary:double,zip:int);
C = FOREACH salaries GENERATE age..zip;
D = FOREACH salaries GENERATE age..;
E = FOREACH salaries GENERATE ..salary;
```

```
customer = LOAD 'data/customers';
F = FOREACH customer GENERATE $12..$23;
```

ield Names in FOREACH

```
salaries = LOAD 'salaries.txt' USING
PigStorage(',') AS (gender:chararray,
age:int,salary:double,zip:int);
C = FOREACH salaries GENERATE zip, salary;
C: {zip: int,salary: double}
```

```
D = FOREACH salaries GENERATE zip,
    salary * 0.10;
D: {zip: int,double}
```

```
E = FOREACH salaries GENERATE zip,
    salary * 0.10 AS bonus;
E: {zip: int,bonus: double}
```

OREACH with Groups

salaries

gender	age	salary	zip
M	66	41000.00	95103
M	58	76000.00	95102
F	40	95000.00	95102
M	45	60000.00	95105
F	28	55000.00	95103

salariesbygender

group	salaries
M	{(M,66,41000.0,95103), (M,58,76000.0,95102), (M,45,60000.0,95105)}
F	{(F,40,95000.0,95102), (F,28,55000.0,95103)}

```
salariesbygender = GROUP salaries BY gender;
```

J

group	COUNT(salaries)
M	3
F	2

```
J = FOREACH salariesbygender
      GENERATE group,
      COUNT(salaries);
```

he FILTER Operator

salaries

gender	age	salary	zip
F	17	41000.00	95103
M	19	76000.00	95102
F	22	95000.00	95103
F	19	60000.00	95105
M	19	14000.00	95102
M	17	35000.00	95103

G

gender	age	salary	zip
M	19	76000.0	95102
F	22	95000.0	95103
F	19	60000.0	95105

```
G = FILTER salaries BY salary >= 50000.0;
```

he LIMIT Operator

```
employees = LOAD 'pigdemo.txt' AS
(state:chararray, name:chararray);

emp_group = GROUP employees BY state;

L = LIMIT emp_group 3;
```

esson Review

List two Pig commands that cause a logical plan to execute.

Which Pig command stores the output of a relation into a folder in HDFS?

```
,2004-05-13,22.90,400
,2004-05-12,22.60,400000
,2004-05-11,22.80,2600
,2004-05-10,23.00,3800
,2004-05-07,23.55,2900
,2004-05-06,24.00,2200
```

```
ices = load 'prices.csv' using PigStorage(',')
 (symbol:chararray, date:chararray, price:double, volume:int
```

plain what each of the following Pig commands or relations do:

```
describe prices;
A = group prices by symbol;
B = foreach prices generate symbol as x, volume as y;
C = foreach A generate group, SUM(prices.volume);
D = foreach prices generate symbol..price;
```

ab: Exploring Data with Pig

dvanced Pig Programming

opics Covered

The ORDER BY Operator

The CASE Operator

The DISTINCT Operator

Using PARALLEL

The FLATTEN Operator

Lab: Splitting a Dataset

Nested FOREACH

- Performing an Inner, Outer and Replicated Joins
- *Lab: Joining Datasets*
- *Lab: Preparing Data for Hive*
- DataFu Library
- *Lab: Analyzing Clickstream Dat*
- *Lab: Analyzing Stock Market Data using Quantiles*

he ORDER BY Operator

salaries

gender	age	salary	zip
M	66	41000.00	95103
M	58	76000.00	95102
F	40	95000.00	95102
M	45	60000.00	95105
F	28	55000.00	95103

byage

gender	age	salary	zip
F	28	55000.0	95103
F	40	95000.0	95102
M	45	60000.0	95105
M	58	76000.0	95102
M	66	41000.0	95103

```
byage = ORDER salaries BY age ASC;
```

he CASE Operator

salaries

gender	age	salary	zip
M	66	41000.0	95103
M	58	76000.0	95102
F	40	95000.0	95102
M	45	20000.0	95105
F	28	55000.0	95103

bonuses

salary	bonus
41000.0	2050.0
76000.0	7600.0
95000.0	9500.0
20000.0	0.0
55000.00	2750.0

```
bonuses = FOREACH salaries GENERATE salary, (
        CASE
                WHEN salary >= 70000.00 THEN
                        salary * 0.10
                WHEN salary < 70000.00
                         AND salary >= 30000.0 THEN
                        salary * 0.05
                WHEN salary < 30000.0 THEN 0.0
        END) AS bonus;
```

arameter Substitution

```
stocks = load '$INPUTFILE' USING
PigStorage(',');


pig -p INPUTFILE=NYSE_daily_prices_A.csv
myscript.pig
```

```
pig -param_file stock.params
myscript.pig
```

he DISTINCT Operator

employees

$0	$1
SD	Rich
NV	Barry
SD	Rich
CO	George
CA	Ulf
SD	Rich
CA	Ulf
CO	George

unique_emp

$0	$1
CA	Ulf
CO	George
NV	Barry
SD	Rich

```
unique_emp = DISTINCT employees;
```

sing PARALLEL

PARALLEL determines the number of reducers to use in a particular operation

```
A = LOAD 'data1';
B = LOAD 'data2';
C = JOIN A by $1, B by $3 PARALLEL 20;
D = ORDER C BY $0 PARALLEL 5;
```

he FLATTEN Operator

employees

name	location	states{}
Rich	remote	{(SD),(CA)}
Ulf	onsite	{(CA)}
Tom	remote	{(OH),(NY)}
Barry	remote	{(NV),(NY)}

flat_employees

name	location	state
Rich	remote	SD
Rich	remote	CA
Ulf	onsite	CA
Tom	remote	OH
Tom	remote	NY
Barry	remote	NV
Barry	remote	NY

```
flat_employees = FOREACH employees
GENERATE name, location, FLATTEN(states) AS
state;
```

ab: Splitting a Dataset