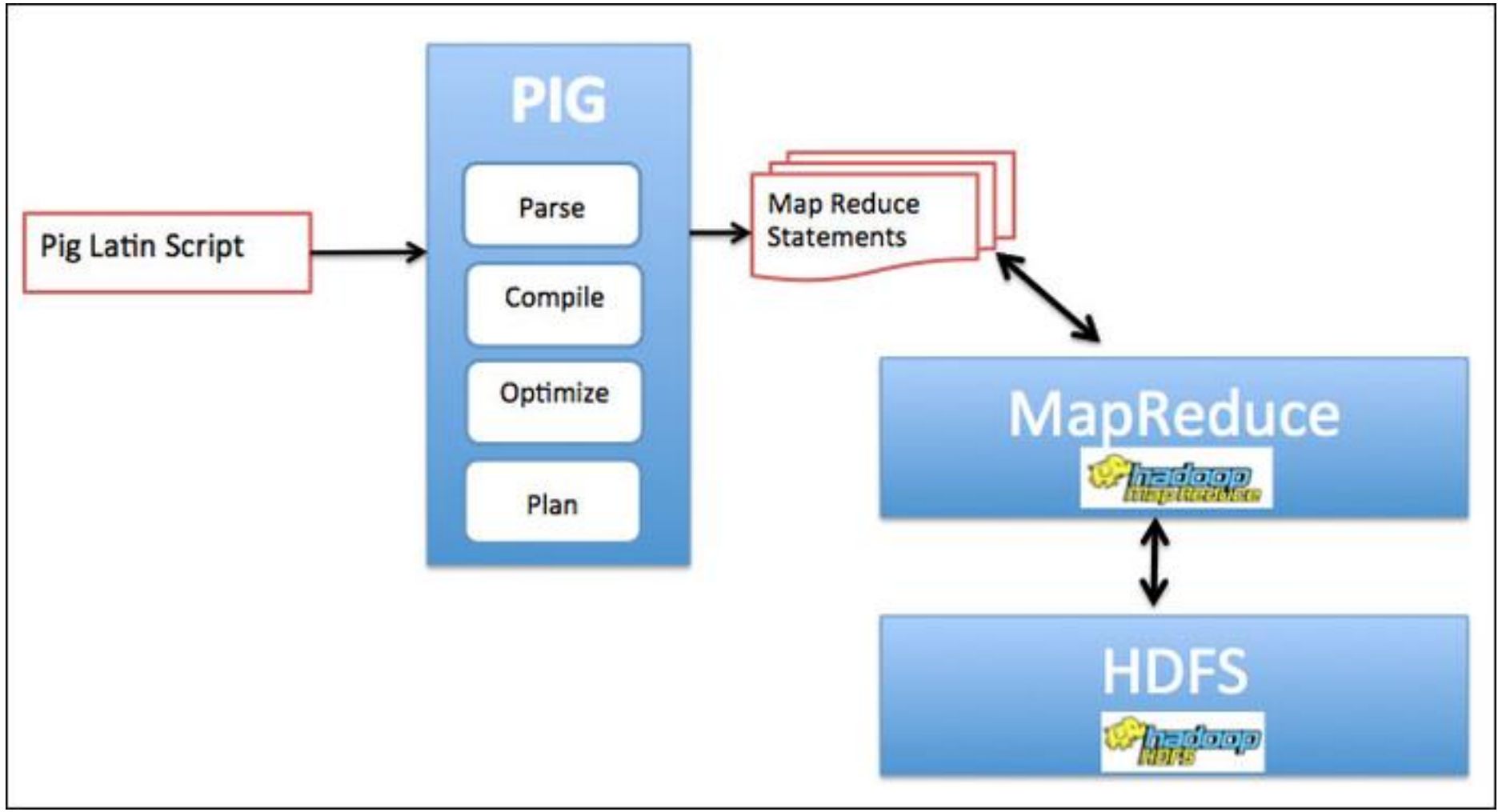
Apache Pig

What is Pig?

- Apache Pig is an abstraction over MapReduce.
- It is a tool/platform which is used to analyze larger sets of data representing them as data flows.
- Pig is generally used with **Hadoop**; we can perform all the data manipulation operations in Hadoop using Apache Pig.
- To write data analysis programs, Pig provides a high-level language known as **Pig Latin**.
- This language provides various operators using which programmers can develop their own functions for reading, writing, and processing data.

Pig Architecture & Components



- To analyze data using **Apache Pig,** programmers need to write scripts using Pig Latin language.
- All these scripts are internally converted to Map and Reduce tasks.
- Apache Pig has a component known as **Pig Engine** that accepts the Pig Latin scripts as input and converts those scripts into MapReduce jobs.

Features of Pig

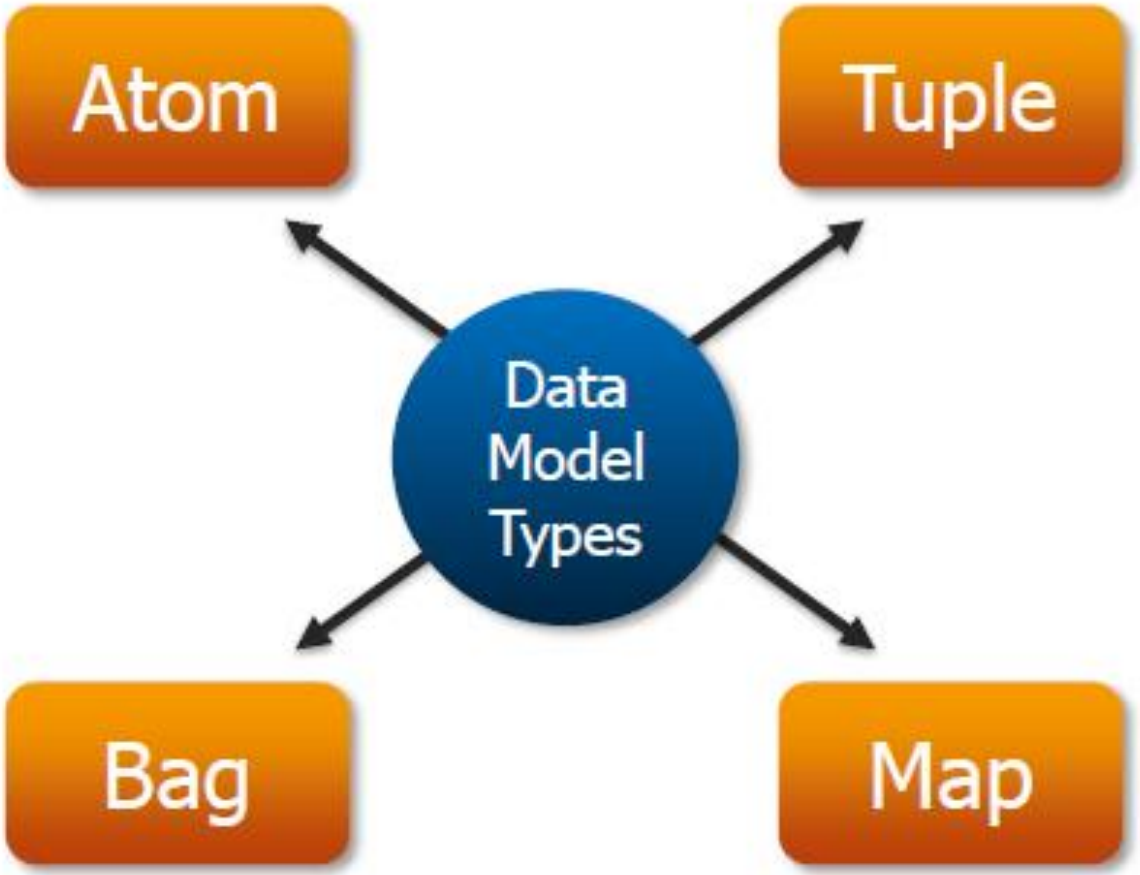
- **Rich set of operators:** It provides many operators to perform operations like join, sort, filer, etc.
- **Ease of programming:** Pig Latin is similar to SQL and it is easy to write a Pig script if you are good at SQL.
- **UDF's:** Pig provides the facility to create **User-defined Functions** in other programming languages such as Java and invoke or embed them in Pig Scripts.
- **Handles all kinds of data:** Apache Pig analyzes all kinds of data, both structured as well as unstructured. It stores the results in HDFS.

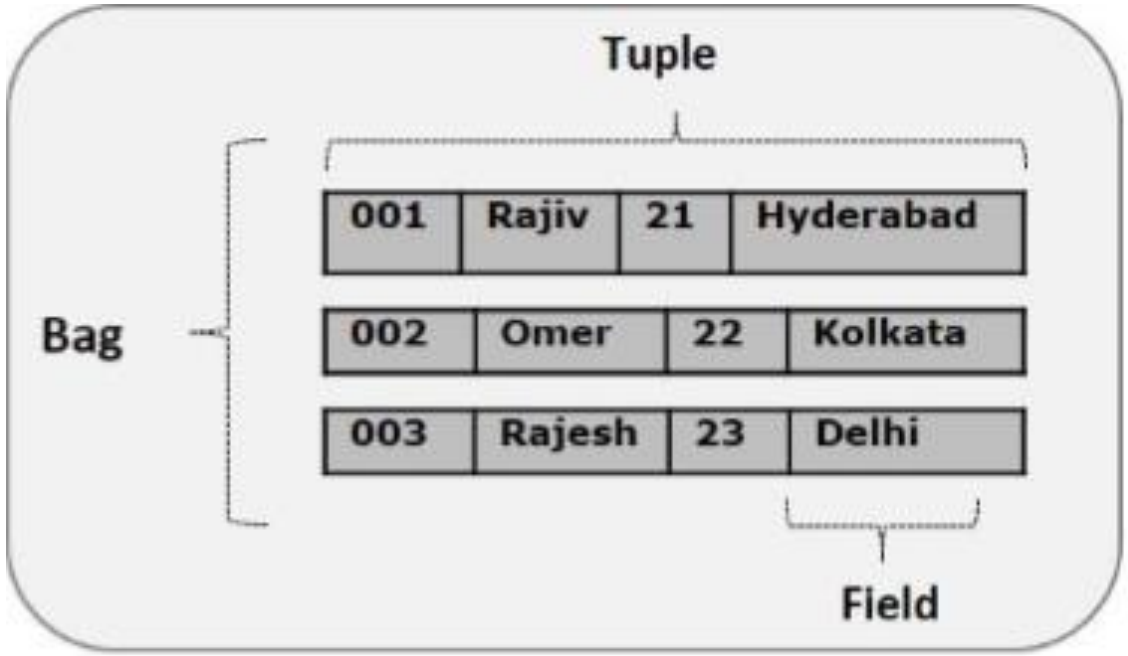
Apache Pig Vs Hive

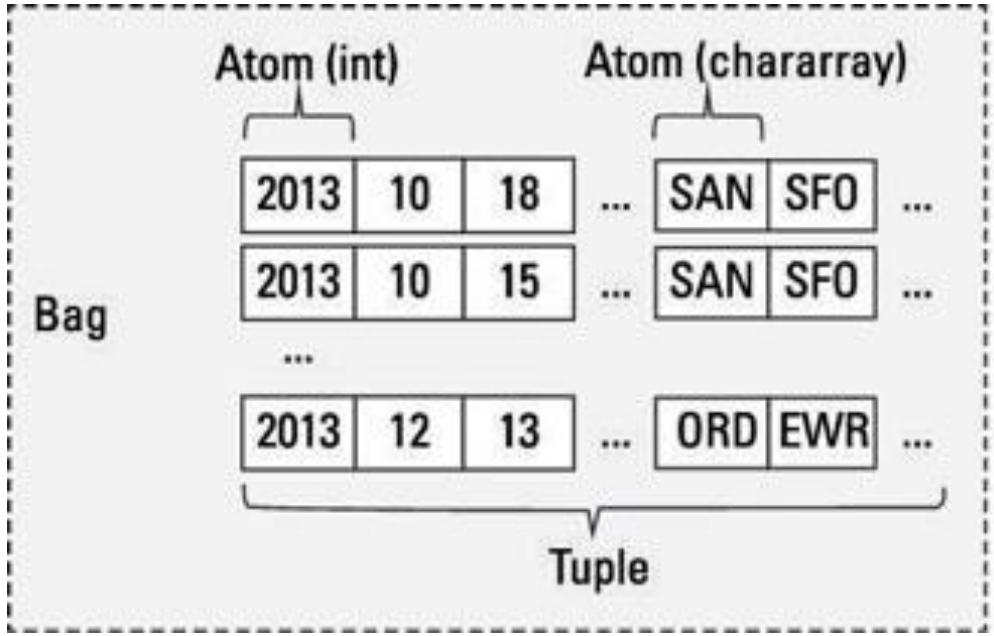
- Both Apache Pig and Hive are used to create MapReduce jobs. And in some cases, Hive operates on HDFS in a similar way Apache Pig does.

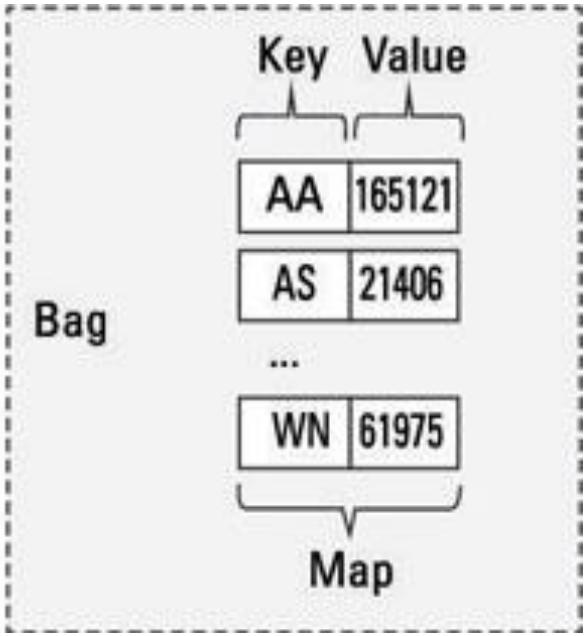
Apache Pig	Hive
Apache Pig uses a language called **Pig Latin**. It was originally created at **Yahoo**.	Hive uses a language called **HiveQL**. It was originally created at **Facebook**.
Pig Latin is a data flow language.	HiveQL is a query processing language.
Pig Latin is a procedural language and it fits in pipeline paradigm.	HiveQL is a declarative language.
Apache Pig can handle structured, unstructured, and semi-structured data.	Hive is mostly for structured data.

Pig Latin – Data Model




Tuple
Bag
001
Rajiv
21
Hyderabad
002
Omer
22
Kolkata
003
Rajesh
23
Delhi
Field


Atom (int)
Atom (chararray)
Bag
2013
10
18
...
SAN
SFO
2013
10
15
2013
12
13
ORD
EWR
Tuple


Key
Value
Bag
AA
165121
AS
21406
WN
61975
Map

Pig Execution Modes

- You can run Apache Pig in two modes.
- Local Mode
  - In this mode, all the files are installed and run from your local host and local file system. There is no need of Hadoop or HDFS. This mode is generally used for testing purpose.
- MapReduce Mode
  - MapReduce mode is where we load or process the data that exists in the Hadoop File System (HDFS) using Apache Pig. In this mode, whenever we execute the Pig Latin statements to process the data, a MapReduce job is invoked in the back-end to perform a particular operation on the data that exists in the HDFS.

Invoking the Grunt Shell

- Local Mode
- $ pig –x local
- MapReduce mode
- $ pig -x mapreduce (or) pig

Execution Mechanisms

- Interactive Mode (Grunt shell) – You can run Apache Pig in interactive mode using the Grunt shell. In this shell, you can enter the Pig Latin statements and get the output (using Dump operator).

- Batch Mode (Script) – You can run Apache Pig in Batch mode by writing the Pig Latin script in a single file with .pig extension.

- Embedded Mode (UDF) – Apache Pig provides the provision of defining our own functions (User Defined Functions) in programming languages such as Java, and using them in our script.

- Interactive Mode:

grunt> customers= LOAD '/home/cloudera/customers.txt' USING PigStorage(',');

grunt> dump customers;

- Batch Mode (Local):

[cloudera@quickstart ~]$ cat **pig_samplescript_local.pig**

customers= LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int,name:chararray,age:int,address:chararray,salary:int);

dump customers;

[cloudera@quickstart ~]$ **pig -x local pig_samplescript_local.pig**

- Batch Mode (HDFS):

[cloudera@quickstart ~]$ cat **pig_samplescript_global.pig**

```
customers= LOAD '/training/customers.txt' USING PigStorage(',') as
(id:int,name:chararray,age:int,address:chararray,salary:int);
dump customers;
```

[cloudera@quickstart ~]$ **pig -x mapreduce pig_samplescript_global.pig**

Pig Latin Basics

Adobe Acrobat Document

Diagnostic Operators

- The **load** statement will simply load the data into the specified relation in Apache Pig. To verify the execution of the **Load** statement, you have to use the Diagnostic Operators.
- Pig Latin provides four different types of diagnostic operators:
  - Dump operator
  - Describe operator
  - Explanation operator
  - Illustration operator

- Dump operator
- The Dump operator is used to run the Pig Latin statements and display the results on the screen. It is generally used for debugging Purpose.

```
grunt> customers= LOAD '/home/cloudera/customers.txt' USING
PigStorage(',') as
(id:int,name:chararray,age:int,address:chararray,salary:int);
grunt> dump customers;
```

customers.txt

- Describe operator
- The **describe** operator is used to view the schema of a relation/bag.

grunt> customers= LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int,name:chararray,age:int,address:chararray,salary:int);

grunt> describe customers;

```
customers: {id: int,name: chararray,age: int,address: chararray,salary: int}
```

- Explain operator
- The **explain** operator is used to display the logical, physical, and MapReduce execution plans of a relation/bag.

```
grunt> customers= LOAD '/home/cloudera/customers.txt' USING
PigStorage(',') as
(id:int,name:chararray,age:int,address:chararray,salary:int);
grunt> explain customers;
```

- Illustrate operator
- The **illustrate** operator is used to display the logical, physical, and MapReduce execution plans of a relation/bag.

```
grunt> customers= LOAD '/home/cloudera/customers.txt' USING
PigStorage(',') as
(id:int,name:chararray,age:int,address:chararray,salary:int);
grunt> illustrate customers;
```

Grouping & Joining

Group Operator

- The GROUP operator is used to group the data in one or more relations. It collects the data having the same key.

- grunt> **student_details** = LOAD '/home/cloudera/students.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);
- grunt> **student_groupdata** = GROUP student_details by ***age***;

students.txt

- grunt> dump **student_groupdata;**

```
(21,{(4,Preethi,Agarwal,21,9848022330,Pune),(1,Rajiv,Reddy,21,9848022337,Hyderabad)})
(22,{(3,Rajesh,Khanna,22,9848022339,Delhi),(2,siddarth,Battacharya,22,9848022338,Kolkata)})
(23,{(6,Archana,Mishra,23,9848022335,Chennai),(5,Trupthi,Mohanthy,23,9848022336,Bhuwaneshwar)})
(24,{(8,Bharathi,Nambiayar,24,9848022333,Chennai),(7,Komal,Nayak,24,9848022334,trivendram)})
```

- grunt> describe **student_groupdata;**

```
student_groupdata: {group: int,student_details: {(id: int,firstname:
chararray,lastname: chararray,age: int,phone: chararray,city:
chararray)}}
```

- grunt> Illustrate **student_groupdata;**

Grouping by Multiple Columns

- grunt> **student_details** = LOAD '/home/cloudera/students.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);

- grunt> **student_multiplegroup** = GROUP student_details by (***age, city***);

- grunt> dump student_multiplegroup;

```
((21,Pune),{(4,Preethi,Agarwal,21,9848022330,Pune)})
((21,Hyderabad),{(1,Rajiv,Reddy,21,9848022337,Hyderabad)})
((22,Delhi),{(3,Rajesh,Khanna,22,9848022339,Delhi)})
((22,Kolkata),{(2,siddarth,Battacharya,22,9848022338,Kolkata)})
((23,Chennai),{(6,Archana,Mishra,23,9848022335,Chennai)})
((23,Bhuwaneshwar),{(5,Trupthi,Mohanthy,23,9848022336,Bhuwaneshwar)})
((24,Chennai),{(8,Bharathi,Nambiayar,24,9848022333,Chennai)})
((24,trivendram),{(7,Komal,Nayak,24,9848022334,trivendram)})
```

Join Operator

- The **JOIN** operator is used to combine records from two or more relations.
- Types of Joins:
  - Self-join
  - Inner-join
  - Outer join : left join, right join, full join

customers.txt

orders.txt

Self Join

- **customers** = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- **orders** = LOAD '/home/local/orders.txt' USING PigStorage(',') as (oid:int, date:chararray, customer_id:int, amount:int);

- grunt> **customers1** = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- grunt> **customers2** = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);

- grunt> **customers3** = JOIN customers1 BY id, customers2 BY id;

- grunt> Dump customers3;

Inner Join (equijoin)

- grunt> customers = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- grunt> orders = LOAD '/home/cloudera/orders.txt' USING PigStorage(',') as (oid:int, date:chararray, customer_id:int, amount:int);
- grunt> customer_orders = JOIN customers BY id, orders BY customer_id;
- grunt> dump customer_orders;

Left Outer Join

- The **left outer Join** operation returns all rows from the left table, even if there are no matches in the right relation.

- grunt> customers = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- grunt> orders = LOAD '/home/cloudera/orders.txt' USING PigStorage(',') as (oid:int, date:chararray, customer_id:int, amount:int);
- grunt> outer_left = JOIN customers BY id LEFT OUTER, orders BY customer_id;
- grunt> Dump outer_left;

Right Outer Join

- The **right outer join** operation returns all rows from the right table, even if there are no matches in the left table.
- grunt> customers = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- grunt> orders = LOAD '/home/cloudera/orders.txt' USING PigStorage(',') as (oid:int, date:chararray, customer_id:int, amount:int);

- grunt> outer_right = JOIN customers BY id RIGHT, orders BY customer_id;

- grunt> Dump outer_right;

Full Outer Join

- The **full outer join** operation returns rows when there is a match in one of the relations.
- grunt> customers = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- grunt> orders = LOAD '/home/cloudera/orders.txt' USING PigStorage(',') as (oid:int, date:chararray, customer_id:int, amount:int);

- grunt> outer_full = JOIN customers BY id FULL OUTER, orders BY customer_id;

- grunt> Dump outer_full;

Cross Operator

- grunt> customers = LOAD '/home/cloudera/customers.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, address:chararray, salary:int);
- grunt> orders = LOAD '/home/cloudera/orders.txt' USING PigStorage(',') as (oid:int, date:chararray, customer_id:int, amount:int);

- grunt> cross_data = CROSS customers, orders;

- grunt> Dump cross_data;

Combining & Splitting

Union Operator

- The **UNION** operator of Pig Latin is used to merge the content of two relations. To perform UNION operation on two relations, their columns and domains must be identical.

Student_data1.txt

Student_data2.txt

- grunt> student1 = LOAD '/home/cloudera/student_data1.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, phone:chararray, city:chararray);
- grunt> student2 = LOAD '/home/cloudera/student_data2.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, phone:chararray, city:chararray);
- grunt> student = UNION student1, student2;
- grunt> dump student;

Split Operator

- he **SPLIT** operator is used to split a relation into two or more relations.

student_details.txt

- grunt> student_details = LOAD '/home/cloudera/student_details.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);

- *Let us now split the relation into two, one listing the students age less than 23, and the other listing the students having the age between 23 and 25.*

- SPLIT student_details into student_details1 if age<23, student_details2 if (age>23 and age<25);

- grunt> Dump student_details1;

- grunt> Dump student_details2;

Filtering

Filter Operator

- The **FILTER** operator is used to select the required tuples from a relation based on a condition.
- grunt> student_details = LOAD '/home/cloudera/student_details.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);
- grunt> filter_data = FILTER student_details BY city == 'Chennai';
- grunt> dump filter_data;

student_details.txt

Distinct Operator

- The **DISTINCT** operator is used to remove redundant (duplicate) tuples from a relation.
- grunt> student_details = LOAD '/home/cloudera/student_details.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);
- grunt> distinct_data = DISTINCT student_details;
- grunt> dump distinct_data;

student_details.txt

Foreach Operator

- The **FOREACH** operator is used to generate specified data transformations based on the column data.

  grunt> student_details = LOAD '/home/cloudera/student_details.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray,age:int, phone:chararray, city:chararray);

- get the id, age, and city values of each student from the relation **student_details** and store it into another relation named **foreach_data** using the **foreach** operator.
- grunt> foreach_data = FOREACH student_details GENERATE id,age,city;
- grunt> Dump foreach_data;

Sorting

Order By

student_details.txt

- The **ORDER BY** operator is used to display the contents of a relation in a sorted order based on one or more fields.
- grunt> student_details = LOAD '/home/cloudera/student_details.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);
- grunt> order_by_data = ORDER student_details BY age DESC;

Limit Operator

- grunt> student_details = LOAD '/home/cloudera/student_details.txt' USING PigStorage(',') as (id:int, firstname:chararray, lastname:chararray, age:int, phone:chararray, city:chararray);
- grunt> limit_data = LIMIT student_details 4;

Pig Latin Built-In Functions

- Eval Functions
- String Functions
- Date-time Functions
- Math Functions

Eval Functions

- Avg()
- CONCAT()
- COUNT()
- COUNT_STAR()
- DIFF()
- MAX()
- MIN()
- SIZE()
- SUBTRACT()
- SUM()

AVG()

- Computes the average of the numeric values in a single-column bag.
- grunt> A = LOAD '/home/cloudera/student.txt' USING PigStorage(',') as (name:chararray, term:chararray, gpa:float);
- grunt> DUMP A;

  (John,fl,3.9F)
  (John,wt,3.7F)
  (John,sp,4.0F)
  (John,sm,3.8F)
  (Mary,fl,3.8F)
  (Mary,wt,3.9F)
  (Mary,sp,4.0F)
  (Mary,sm,4.0F)
- grunt> B = GROUP A BY name;
- grunt> DUMP B;

  (John,{(John,fl,3.9F),(John,wt,3.7F),(John,sp,4.0F),(John,sm,3.8F)})
  (Mary,{(Mary,fl,3.8F),(Mary,wt,3.9F),(Mary,sp,4.0F),(Mary,sm,4.0F)})
- grunt> C = FOREACH B GENERATE A.name, AVG(A.gpa);
- grunt> DUMP C;

  ({(John),(John),(John),(John)},3.850000023841858)
  ({(Mary),(Mary),(Mary),(Mary)},3.925000011920929)

CONCAT()

- Concatenates two expressions of identical type.
- grunt>A = LOAD ‘/home/Cloudera/data.txt' as (f1:chararray, f2:chararray, f3:chararray);
- grunt>DUMP A;

  (apache,open,source)

  (hadoop,map,reduce)

  (pig,pig,latin)
- grunt>X = FOREACH A GENERATE CONCAT(f2,f3);
- grunt>DUMP X;

  (opensource)

  (mapreduce)

  (piglatin)

COUNT

- Computes the number of elements in a bag.
- Note: You cannot use the tuple designator (*) with COUNT; that is, COUNT(*) will not work.

- grunt>A = LOAD '/home/cloudera/c.txt' USING PigStorage(',') as (f1:int, f2:int, f3:int);
- grunt>DUMP A;

  1,2,3
  4,2,null
  8,3,4
  4,3,null
  7,5,null
  8,4,3
- grunt>B = GROUP A BY f1;
- grunt>DUMP B;

  (1,{(1,2,3)})
  (4,{(4,2,1),(4,3,3)})
  (7,{(7,2,5)})
  (8,{(8,3,4),(8,4,3)})
- grunt>X = FOREACH B GENERATE COUNT(A);
- grunt>DUMP X;

  (1L)
  (2L)
  (1L)
  (2L)

COUNT_STAR

- Computes the number of elements in a bag.
- COUNT_STAR includes NULL values in the count computation (unlike COUNT, which ignores NULL values).
- Example
- In this example COUNT_STAR is used the count the tuples in a bag.
- grunt>X = FOREACH B GENERATE COUNT_STAR(A);

DIFF

- Compares two fields in a tuple.
- grunt> A = LOAD '/home/Cloudera/data.txt' AS (B1:bag{T1:tuple(t1:int,t2:int)},B2:bag{T2:tuple(f1:int,f2:int)});
- grunt> DUMP A;
  ({(8,9),(0,1)},{(8,9),(1,1)})
  ({(2,3),(4,5)},{(2,3),(4,5)})
  ({(6,7),(3,7)},{(2,2),(3,7)})
- grunt> DESCRIBE A;
  a: {B1: {T1: (t1: int,t2: int)},B2: {T2: (f1: int,f2: int)}}
- grunt> X = FOREACH A DIFF(B1,B2);
- grunt> dump X;
  ({(0,1),(1,1)})
  ({})
  ({(6,7),(2,2)})

MAX

- Computes the maximum of the numeric values or chararrays in a single-column bag. MAX requires a preceding GROUP ALL statement for global maximums and a GROUP BY statement for group maximums.
- ***Example***
  - In this example the maximum GPA for all terms is computed for each student (see the GROUP operator for information about the field names in relation B).

- grunt> A = LOAD ‘home/Cloudera/student.txt' AS (name:chararray, session:chararray, gpa:float);
- grunt> DUMP A;

  (John,fl,3.9F)

  (John,wt,3.7F)

  (John,sp,4.0F)

  (John,sm,3.8F)

  (Mary,fl,3.8F)

  (Mary,wt,3.9F)

  (Mary,sp,4.0F)

  (Mary,sm,4.0F)
- grunt> B = GROUP A BY name;
- grunt> DUMP B;

  (John,{(John,fl,3.9F),(John,wt,3.7F),(John,sp,4.0F),(John,sm,3.8F)})

  (Mary,{(Mary,fl,3.8F),(Mary,wt,3.9F),(Mary,sp,4.0F),(Mary,sm,4.0F)})
- grunt> X = FOREACH B GENERATE group, MAX(A.gpa);
- grunt> DUMP X;

  (John,4.0F)

  (Mary,4.0F)

MIN

- Computes the minimum of the numeric values or chararrays in a single-column bag. MIN requires a preceding GROUP… ALL statement for global minimums and a GROUP … BY statement for group minimums.
- ***Example***
  - In this example the minimum GPA for all terms is computed for each student (see the GROUP operator for information about the field names in relation B).

- grunt> A = LOAD ‘/home/Cloudera/student.txt' AS (name:chararray, session:chararray, gpa:float);
- grunt> DUMP A;

  (John,fl,3.9F)
  (John,wt,3.7F)
  (John,sp,4.0F)
  (John,sm,3.8F)
  (Mary,fl,3.8F)
  (Mary,wt,3.9F)
  (Mary,sp,4.0F)
  (Mary,sm,4.0F)
- grunt> B = GROUP A BY name;
- grunt> DUMP B;

  (John,{(John,fl,3.9F),(John,wt,3.7F),(John,sp,4.0F),(John,sm,3.8F)})
  (Mary,{(Mary,fl,3.8F),(Mary,wt,3.9F),(Mary,sp,4.0F),(Mary,sm,4.0F)})
- grunt> X = FOREACH B GENERATE group, MIN(A.gpa);
- grunt> DUMP X;

  (John,3.7F)
  (Mary,3.8F)

SIZE

- Computes the number of elements based on any Pig data type.

- ***Example***
- In this example the number of characters in the first field is computed.

- grunt> A = LOAD 'data' as (f1:chararray, f2:chararray, f3:chararray);
  (apache,open,source)
  (hadoop,map,reduce)
  (pig,pig,latin)
- grunt> X = FOREACH A GENERATE SIZE(f1);
- grunt> DUMP X;
  (6L)
  (6L)
  (3L)

SUM

- Computes the sum of the numeric values in a single-column bag. SUM requires a preceding GROUP ALL statement for global sums and a GROUP BY statement for group sums.
- ***Example***
- In this example the number of pets is computed.

- grunt> A = LOAD ‘/home/Cloudera/data' AS (owner:chararray, pet_type:chararray, pet_num:int);
- grunt> DUMP A;

  (Alice,turtle,1)
  (Alice,goldfish,5)
  (Alice,cat,2)
  (Bob,dog,2)
  (Bob,cat,2)
- grunt> B = GROUP A BY owner;
- grunt> DUMP B;

  (Alice,{(Alice,turtle,1),(Alice,goldfish,5),(Alice,cat,2)})
  (Bob,{(Bob,dog,2),(Bob,cat,2)})
- grunt> X = FOREACH B GENERATE group, SUM(A.pet_num);
- DUMP X;

  (Alice,8L)
  (Bob,4L)

String Functions

- ENDSWITH
- STARTSWITH
- SUBSTRING
- EqualsIgnoreCase
- UPPER
- LOWER
- REPLACE
- TRIM, RTRIM, LTRIM

ENDSWITH , STARTSWITH

- ENDSWITH - This function accepts two String parameters, it is used to verify whether the first string ends with the second. string.
- STARTSWITH - This function accepts two string parameters. It verifies whether the first string starts with the second.
- **emp.txt**

emp.txt

- grunt> emp_data = LOAD ‘/home/cloudera/emp.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, city:chararray);
- grunt> emp_endswith = FOREACH emp_data GENERATE (id,name),ENDSWITH (name, 'n');
- grunt> Dump emp_endswith;
- grunt> startswith_data = FOREACH emp_data GENERATE (id,name), STARTSWITH (name,’Ro’);
- grunt> Dump startswith_data;

SUBSTRING()

- This function returns a substring from the given string.

- EMP.TXT

  001,Robin,22,newyork

  002,Stacy,25,Bhuwaneshwar

  003,Kelly,22,Chennai

- grunt> emp_data = LOAD ‘/home/Cloudera/emp.txt' USING PigStorage(',')as (id:int, name:chararray, age:int, city:chararray);

- grunt> substring_data = FOREACH emp_data GENERATE (id,name), SUBSTRING (name, 0, 2);

- grunt> Dump substring_data;

  ((1,Robin),Rob)

  ((2,Stacy),Sta)

  ((3,Kelly),Kel)

EqualsIgnoreCase()

- The **EqualsIgnoreCase()** function is used to compare two strings and verify whether they are equal. If both are equal this function returns the Boolean value **true** else it returns the value **false**.

emp.txt

- grunt> emp_data = LOAD ‘/home/Cloudera/emp.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, city:chararray);
- grunt> equals_data = FOREACH emp_data GENERATE (id,name), EqualsIgnoreCase(name, 'Robin');
- grunt> Dump equals_data;
- ((1,Robin),true)
  ((2,BOB),false)
  ((3,Maya),false)
  ((4,Sara),false)
  ((5,David),false)
  ((6,Maggy),false)
  ((7,Robert),false)
  ((8,Syam),false)
  ((9,Mary),false)
  ((10,Saran),false)
  ((11,Stacy),false)
  ((12,Kelly),false)

UPPER(), LOWER()

- UPPER- This function is used to convert all the characters in a string to uppercase.
- LOWER- This function is used to convert all the characters in a string to lowercase.

emp.txt

- grunt> emp_data = LOAD '/home/cloudera/emp.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, city:chararray);

- grunt> upper_data = FOREACH emp_data GENERATE (id,name), UPPER(name);
- grunt> Dump upper_data;

- grunt> lower_data = FOREACH emp_data GENERATE (id,name), LOWER(name);
- grunt> Dump lower_data;

REPLACE()

- This function is used to replace all the characters in a given string with the new characters.

emp.txt

- grunt> emp_data = LOAD ‘/home/cloudera/emp.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, city:chararray);

- grunt> replace_data = FOREACH emp_data GENERATE (id,city),REPLACE(city,'Bhuwaneshwar','Bhuw');

- grunt> Dump replace_data;

((1,newyork),newyork)
((2,Kolkata),Kolkata)
((3,Tokyo),Tokyo)
((4,London),London)
((5,Bhuwaneshwar),Bhuw)
((6,Chennai),Chennai)
((7,newyork),newyork)
((8,Kolkata),Kolkata)
((9,Tokyo),Tokyo)
((10,London),London)
((11,Bhuwaneshwar),Bhuw)
((12,Chennai),Chennai)

TRIM(), RTRIM(), LTRIM()

- The **TRIM()** function accepts a string and returns its copy after removing the unwanted spaces before and after it.
- The function **LTRIM()** is same as the function **TRIM()**. It removes the unwanted spaces from the left side of the given string (heading spaces).
- The function **RTRIM()** is same as the function **TRIM()**. It removes the unwanted spaces from the right side of a given string (tailing spaces).

emp.txt

- grunt> emp_data = LOAD ‘/home/cloudera/emp.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, city:chararray);
- grunt> trim_data = FOREACH emp_data GENERATE (id,name), TRIM(name);
- grunt> ltrim_data = FOREACH emp_data GENERATE (id,name), LTRIM(name);
- grunt> rtrim_data = FOREACH emp_data GENERATE (id,name), RTRIM(name);
- grunt> Dump trim_data;
- grunt> Dump ltrim_data;
- grunt> Dump rtrim_data;

Date-time Functions

- ToDate()
- GetDay()
- GetMonth()
- GetYear()

ToDate()

- This function is used to generate a **DateTime** object according to the given parameters.

- **date.txt**

  001,1989/09/26 09:00:00

  002,1980/06/20 10:22:00

  003,1990/12/19 03:11:44

- grunt> date_data = LOAD ‘/home/cloudera/date.txt' USING PigStorage(',') as (id:int,date:chararray);

- grunt> todate_data = foreach date_data generate ToDate(date,'yyyy/MM/dd HH:mm:ss') as (date_time:DateTime);

- grunt> Dump todate_data;

  (1989-09-26T09:00:00.000+05:30)

  (1980-06-20T10:22:00.000+05:30)

  (1990-12-19T03:11:44.000+05:30)

GetDay()

- This function accepts a date-time object as a parameter and returns the current day of the given date-time object.

- **date.txt**

  001,1989/09/26 09:00:00

  002,1980/06/20 10:22:00

  003,1990/12/19 03:11:44

UDF’S

User Defined Functions

- Apache Pig provides extensive support for **U**ser **D**efined **F**unctions (UDF's).
- Using these UDF's, we can define our own functions and use them.
- The UDF support is provided in six programming languages. Java, Jython, Python, JavaScript, Ruby and Groovy.

Creating UDF’S

- Open Eclipse and create a new project.
- Convert the newly created project into a Maven project.
- Copy the pom.xml. This file contains the Maven dependencies for Apache Pig and Hadoop-core jar files.

pom.xml

Java code

```
import java.io.IOException;
import org.apache.pig.EvalFunc;
import org.apache.pig.data.Tuple;
 import java.io.IOException;
import org.apache.pig.EvalFunc;
import org.apache.pig.data.Tuple;

public class Sample_Eval extends EvalFunc<String>{
  public String exec(Tuple input) throws IOException {
    if (input == null || input.size() == 0)
    return null;
    String str = (String)input.get(0);
    return str.toUpperCase();
  }
}
```

Registering the Jar file

- grunt> REGISTER '/home/cloudera/sample_udf.jar';
- grunt> DEFINE Sample_Eval sample_eval();
- grunt> emp_data = LOAD '/home/cloudera/pigdata.txt' USING PigStorage(',') as (id:int, name:chararray, age:int, city:chararray);
- grunt> Upper_case = FOREACH emp_data GENERATE sample_eval(name);