Apache Spark Release 1.5

Patrick Wendell

About Me @pwendell

U.C. Berkeley PhD, left to co-found Databricks

Coordinate community roadmap

Release manager of Spark since 0.7
(but not for 1.5!)

About Databricks

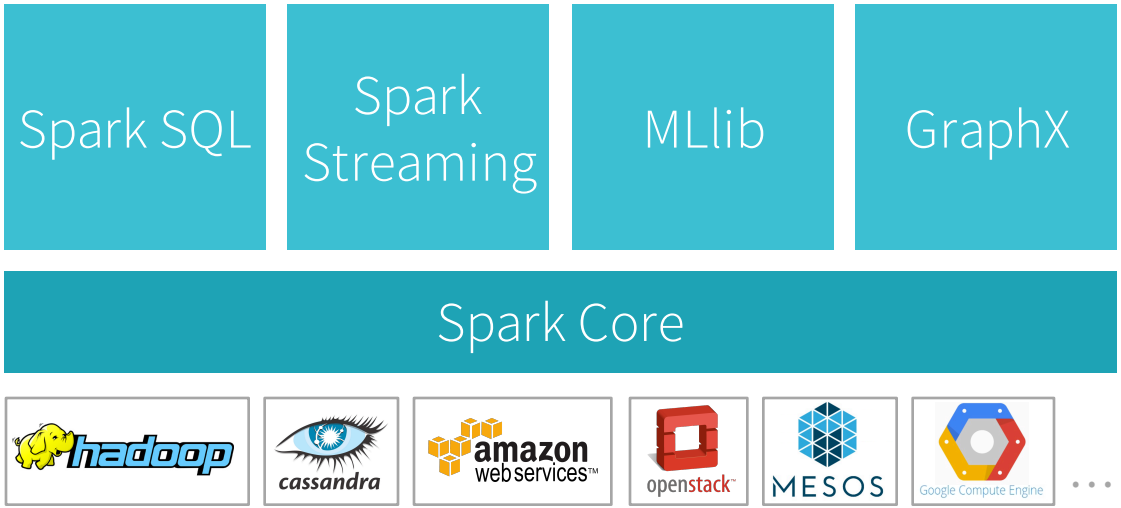
Founded by Spark team, donated Spark to Apache in 2013

Collaborative, cloud-hosted data platform powered by Spark

Free 30 day trial to check it out
https://databricks.com/

We're hiring!

Apache Spark Engine



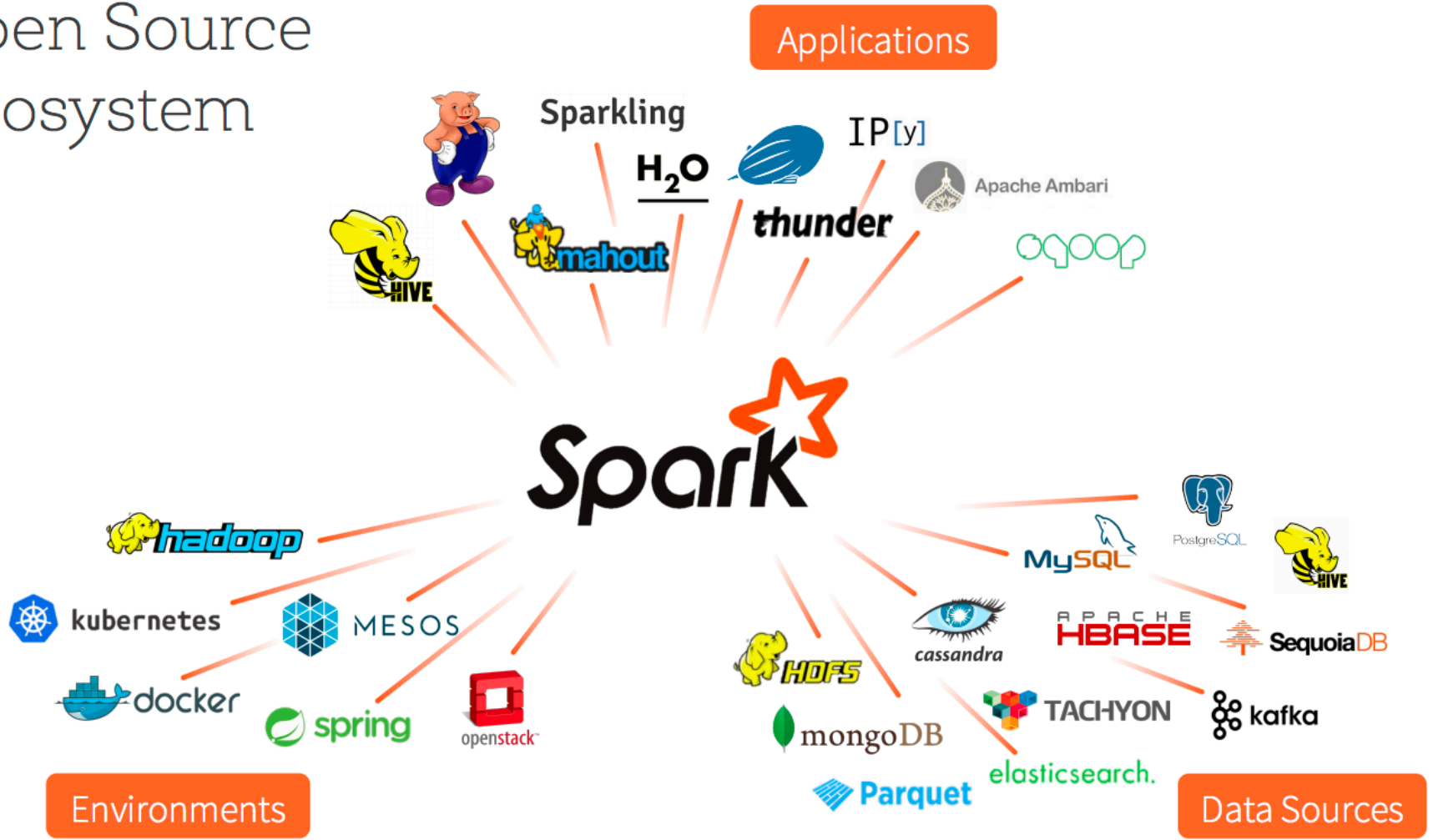
Scale out, fault tolerant

Python, Java, Scala, and R APIs

Standard libraries

Unified engine across diverse workloads & environments

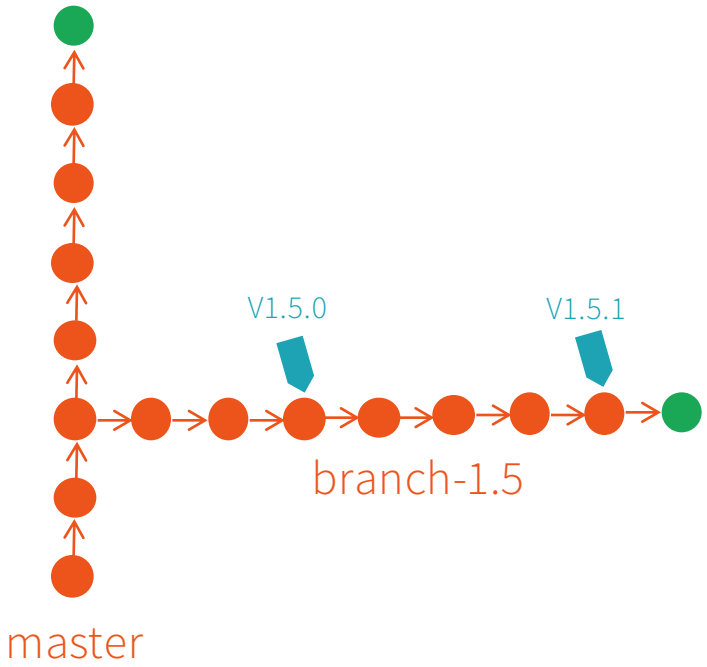
Open Source Ecosystem



Users

Distributors & Apps

Spark's 3 Month Release Cycle



For production jobs, use the latest release

To get unreleased features or fixes, use nightly builds

people.apache.org/~pwendell/spark-nightly/

Some Directions in 2015

Data Science

Simple, fast interfaces for data processing

Platform APIs

Growing the ecosystem

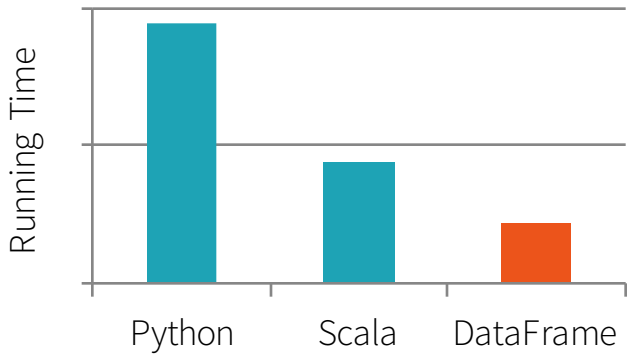
Data Science Updates

DataFrames: added March 2015

R support: out in Spark 1.4

ML pipelines: graduates from alpha

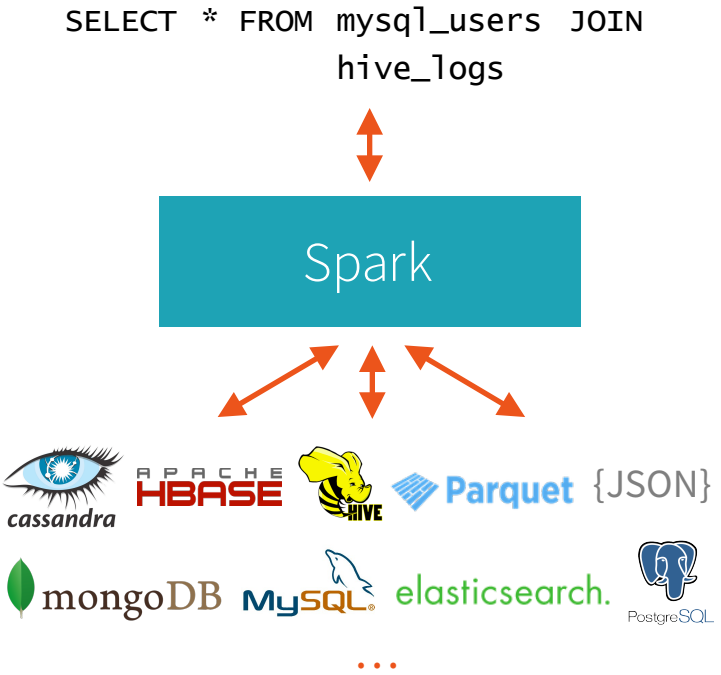
```
df = jsonFile("tweets.json")

df[df["user"] == "patrick"]
  .groupBy("date")
  .sum("retweets")
```



Platform APIs

Data Sources

- Smart data sources supporting query pushdown
- Access with DataFrames & SQL



Platform APIs

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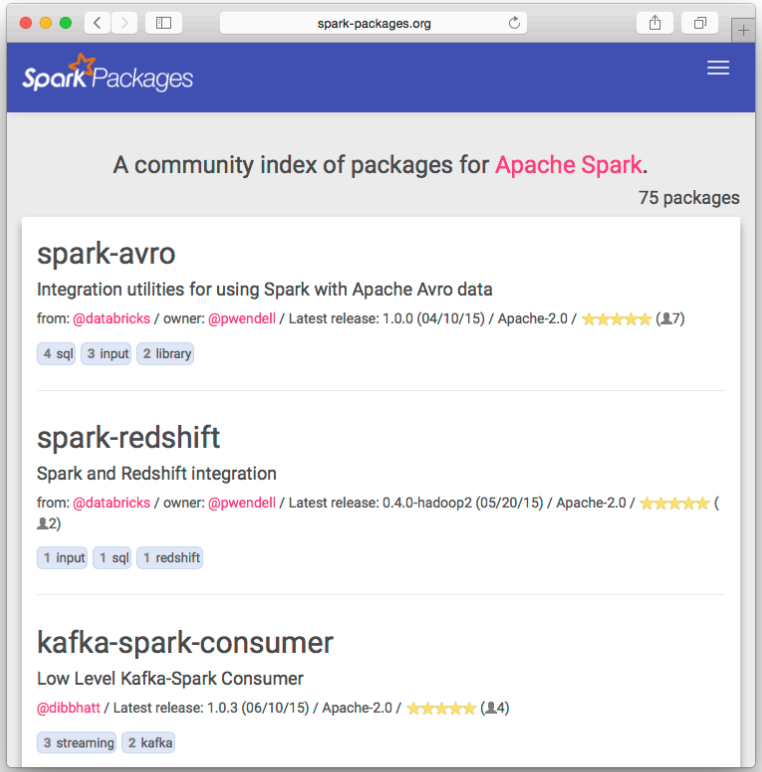
Spark Packages

- Community site with 100+ libraries
- spark-packages.org



Spark 1.5

Exposing Execution Concepts

Reporting of memory allocated during aggregations and shuffles [SPARK-8735]

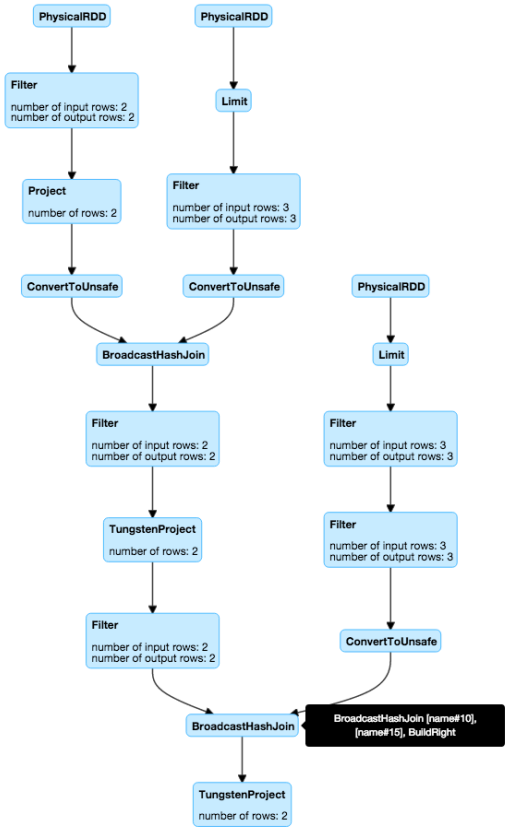
Tasks

Index ▲	ID	Attempt	Status	Locality Level	Executor ID / Host	Launch Time	Duration	GC Time	Peak Execution Memory
0	20	0	SUCCESS	PROCESS_LOCAL	0 / 192.168.0.209	2015/07/29 19:39:28	0.3 s		42.6 KB
1	21	0	SUCCESS	PROCESS_LOCAL	1 / 192.168.0.209	2015/07/29 19:39:28	0.3 s		80.4 KB

Exposing Execution Concepts

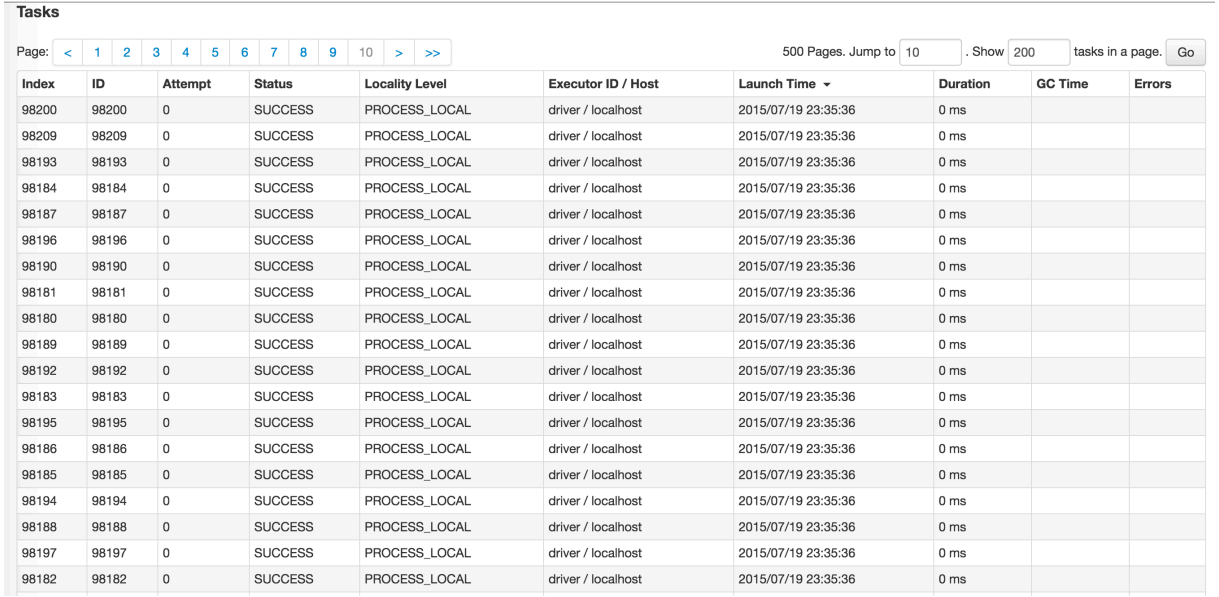
Metrics reported back for nodes of physical execution tree [SPARK-8856]

Full visualization of DataFrame execution tree (e.g. queries with broadcast joins) [SPARK-8862]



Exposing Execution Concepts

Pagination for jobs with large number of tasks [SPARK-4598]



Tasks

Page: < 1 2 3 4 5 6 7 8 9 10 > >>

500 Pages. Jump to 10 . Show 200 tasks in a page. Go

Index	ID	Attempt	Status	Locality Level	Executor ID / Host	Launch Time	Duration	GC Time	Errors
98200	98200	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98209	98209	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98193	98193	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98184	98184	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98187	98187	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98196	98196	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98190	98190	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98181	98181	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98180	98180	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98189	98189	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98192	98192	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98183	98183	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98195	98195	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98186	98186	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98185	98185	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98194	98194	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98188	98188	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98197	98197	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		
98182	98182	0	SUCCESS	PROCESS_LOCAL	driver / localhost	2015/07/19 23:35:36	0 ms		

Project Tungsten: On by default in Spark 1.5

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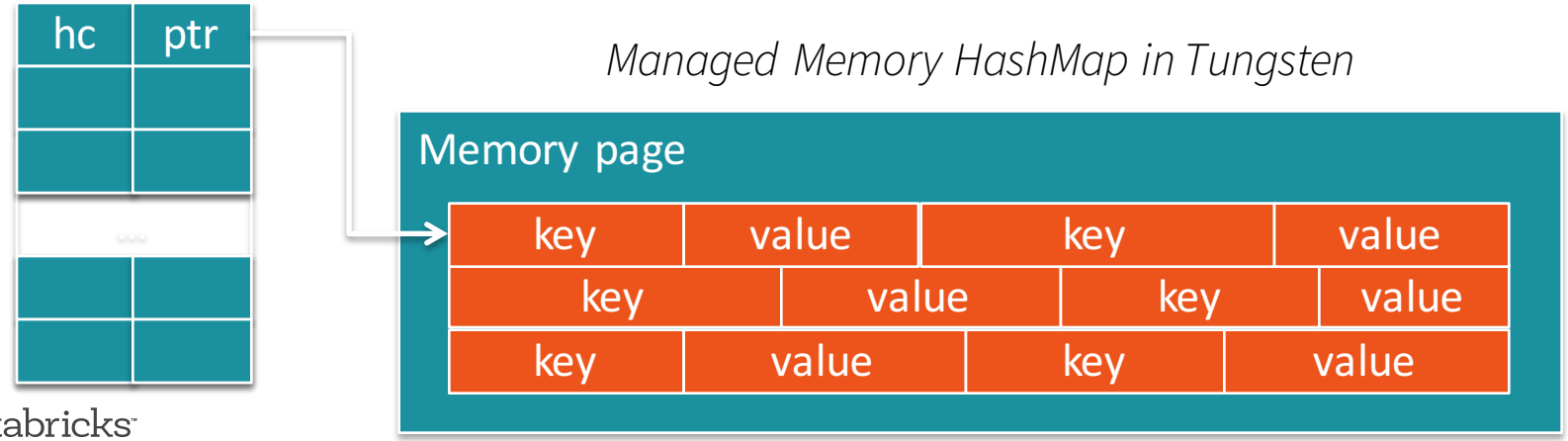
Binary processing for memory management (all data types):

- External sorting with managed memory
- External hashing with managed memory



Project Tungsten: On by default in Spark 1.5

Code generation for CPU efficiency

- Code generation on by default and using Janino [SPARK-7956]
- Beef up built-in UDF library (added ~100 UDF's with code gen)

AddMonths
ArrayContains
Ascii
Base64
Bin
BinaryMathExpression
CheckOverflow
CombineSets
Contains
CountSet
Crc32
DateAdd
DateDiff
DateFormatClass
DateSub
DayOfMonth
DayOfYear
Decode
Encode
EndsWith
Explode
Factorial
FindInSet
FormatNumber
FromUTCTimestamp
FromUnixTime
GetArrayItem
GetJsonObject
GetMapValue
Hex
InSet
InitCap
IsNaN
IsNotNull
IsNull
LastDay
Length
Levenshtein
Like
Lower
MakeDecimal
Md5
Month
MonthsBetween
NaNvl
NextDay
Not
PromotePrecision
Quarter
RLike
Round
Second
Sha1
Sha2
ShiftLeft
ShiftRight
ShiftRightUnsigned
SortArray
SoundEx
StartsWith
StringInstr
StringRepeat
StringReverse
StringSpace
StringSplit
StringTrim
StringTrimLeft
StringTrimRight
TimeAdd
TimeSub
ToDate
ToUTCTimestamp
TruncDate
UnBase64
UnaryMathExpression
Unhex
UnixTimestamp

Performance Optimizations in SQL/DataFrames

Parquet

- Speed up metadata discovery for Parquet [SPARK-8125]
- Predicate push down in Parquet [SPARK-5451]

Joins

- Support broadcast outer join [SPARK-4485]
- Sort-merge outer joins [SPARK-7165]

Window functions

- Window functions improved memory use [SPARK-8638]

First Class UDAF Support

Public API for UDAF's [SPARK-3947]

Disk spilling for high cardinality aggregates [SPARK-3056]

```
abstract class UserDefinedAggregateFunction {
    def initialize(
      buffer: MutableAggregationBuffer)
    def update(
      buffer: MutableAggregationBuffer,
      input: Row)
    def merge(
      buffer1: MutableAggregationBuffer,
      buffer2: Row)
    def evaluate(buffer: Row)
}
```

Interoperability with Hive and Other Systems

Support for connecting to Hive 0.12, 0.13, 1.0, 1.1, or 1.2 metastores! [SPARK-8066, SPARK-8067]

Read Parquet files encoded by Hive, Impala, Pig, Avro, Thrift, Spark SQL object models [SPARK-6776, SPARK-6777]

Multiple databases in datasource tables [SPARK-8435]

Spark Streaming

Backpressure for bursty inputs [SPARK-7398]

Python integrations: Kinesis [SPARK-8564], MQTT [SPARK-5155], Flume [SPARK-8378], Streaming ML algorithms [SPARK-3258]

Kinesis: reliable stream without a write ahead log [SPARK-9215]

Kafka: Offsets shown in the Spark UI for each batch [SPARK-8701]

Load balancing receivers across a cluster [SPARK-8882]

Package Releases Coinciding With Spark 1.5

spark-redshift Redshift as a datasource for convenient import/export

spark-indexedrdd An RDD with indexes for low latency retrieval

magellan A library for geospatial analysis with Spark

spark-tfocs convex solver package

www.spark-packages.org

ML: SparkR and Python API Extensions

Allow calling linear models from R [SPARK-6805]

Python binding for power iteration clustering [SPARK-5962]

Python bindings for streaming ML algorithms [SPARK-3258]

ML: Pipelines API

New algorithms KMeans [SPARK-7879], Naive Bayes [SPARK-8600], Bisecting K-Means [SPARK-6517], Multi-layer Perceptron (ANN) [SPARK-2352], Weighting for Linear Models [SPARK-7685]

New transformers (close to parity with SciKit learn): CountVectorizer [SPARK-8703], PCA [SPARK-8664], DCT [SPARK-8471], N-Grams [SPARK-8455]

Calling into single machine solvers (coming soon as a package)

ML: Improved Algorithms

LDA improvements (*more topics, better parameter tuning, etc*) [SPARK-5572]

Sequential pattern mining [SPARK-6487]

Tree & ensemble enhancements [SPARK-3727] [SPARK-5133] [SPARK-6684]

GMM enhancements [SPARK-5016]

QR factorization [SPARK-7368]

Find out More: Spark Summit 2015 Talks

https://spark-summit.org/2015/

Some notable talks:

- Spark Community Update
- ML Pipelines
- Project Tungsten
- SparkR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Thanks!