MANGO SOLUTIONS

Spark, R and Sparklyr

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About Mango

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EARL17
ENTERPRISE APPLICATIONS OF THE R LANGUAGE
LONDON
12-14 September
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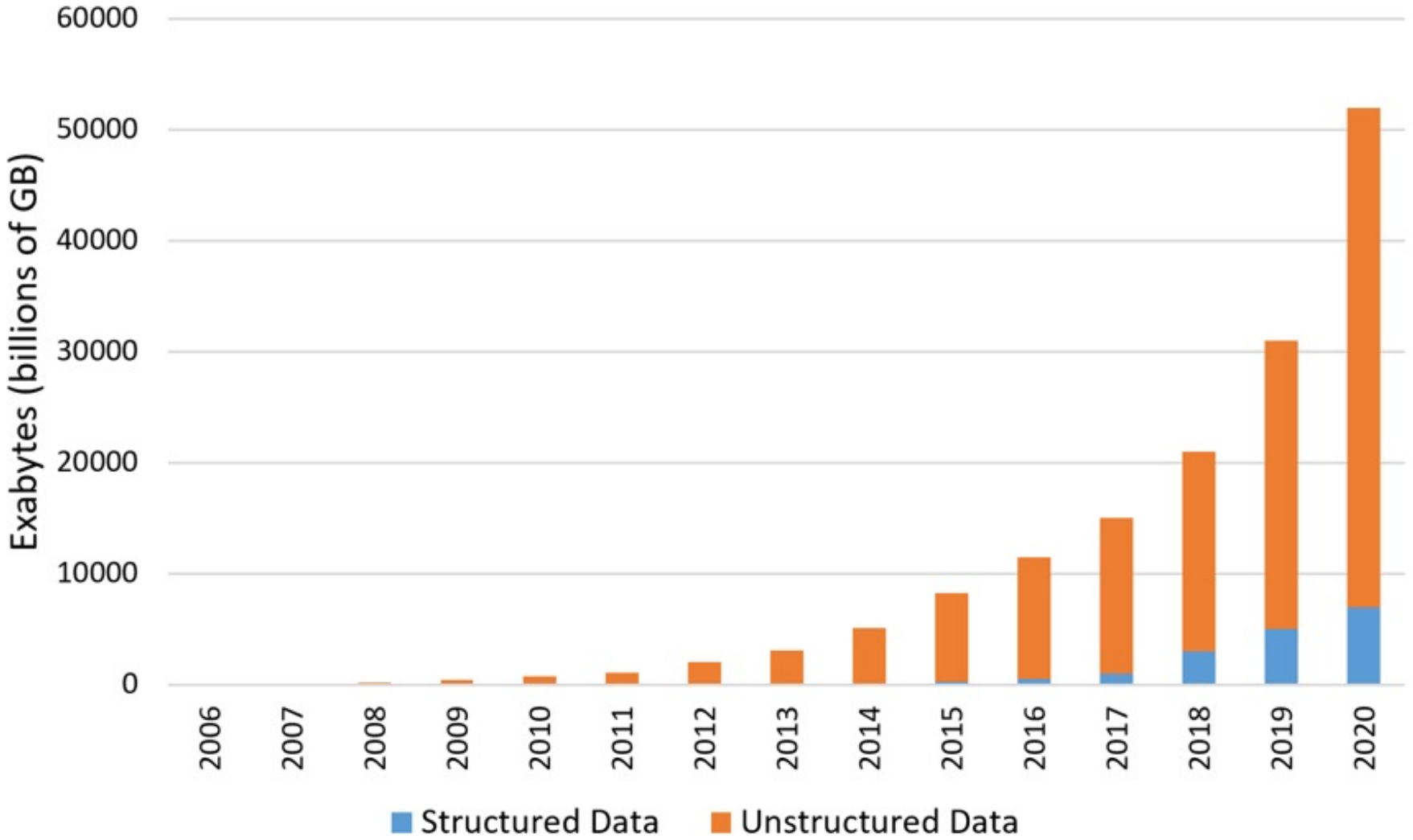
SAN FRANCISCO
5-7 June
Holiday Inn Golden Gateway
BOSTON
November


The Rise of
Big Data

Lots of Vs

- Created by Doug Laney in 2001
- Describe data characteristics
  - Volume
  - Variety
  - Velocity
  - (Veracity)

The Cambrian Explosion...of Data



Source: Patrick Cheesman

The Boeing 787 produces over 500GB of data during every flight

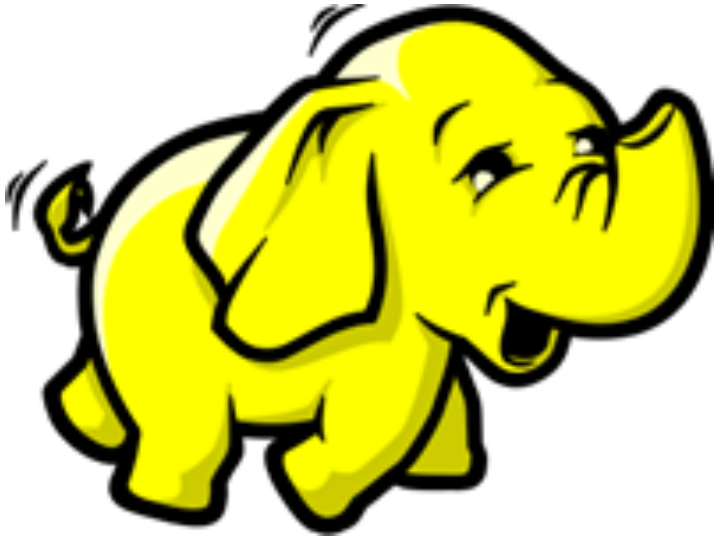
BY MATTHEW HUMPHRIES
03.07.2013 :: 7:26AM EDT @MTHWGEEK

With the introduction of the 787 Dreamliner (**battery and electrical problems aside**), Boeing produced a commercial jet that's packed full of tech. The windows have an electrical dimming system, engine noise has been reduced with a clever wave pattern design around each jet engine exhaust, and the aircraft even employs **accelerometers to counteract turbulence**.


The Yellow
Elephant

Apache Hadoop

- Grew out of Google File System 2003
- Attributed to Doug Cutting @ Yahoo!
- Named after a toy elephant
- Released in 2006



Apache Hadoop

- HDFS (Hadoop Distributed File system)
  - Distributed, scalable file system
  - Store (and access) large files across machines
  - Written in Java
- MadReduce
  - Programming Model for processing parallelizable problems
  - Map > Shuffle > Reduce steps

Hadoop Deployments

- Many (most?) hadoop deployments do not achieve an acceptable ROI
- An answer looking for a question
- Skillsets needed to get the most out of the infrastructure are extremely difficult to recruit for
- IT & Data Silos

MapReduce Woes

- Disc bound and expensive
- Not suited to modern analytics
- Can be slow
- Java is only native API
- Scarcity of resources

R & Big Data

What is R?

- The most popular analytic language in the world
- Programming language for modelling
- Aligned with the Data Science movement

- But …
  - Single Threaded
  - Memory Bound


Spark

Spark

- Open source cluster computing framework
- Relies on in memory processing
- One of the most contributed-to big data projects of the past few years
- Started in the AMPLab at UC Berkeley in 2009

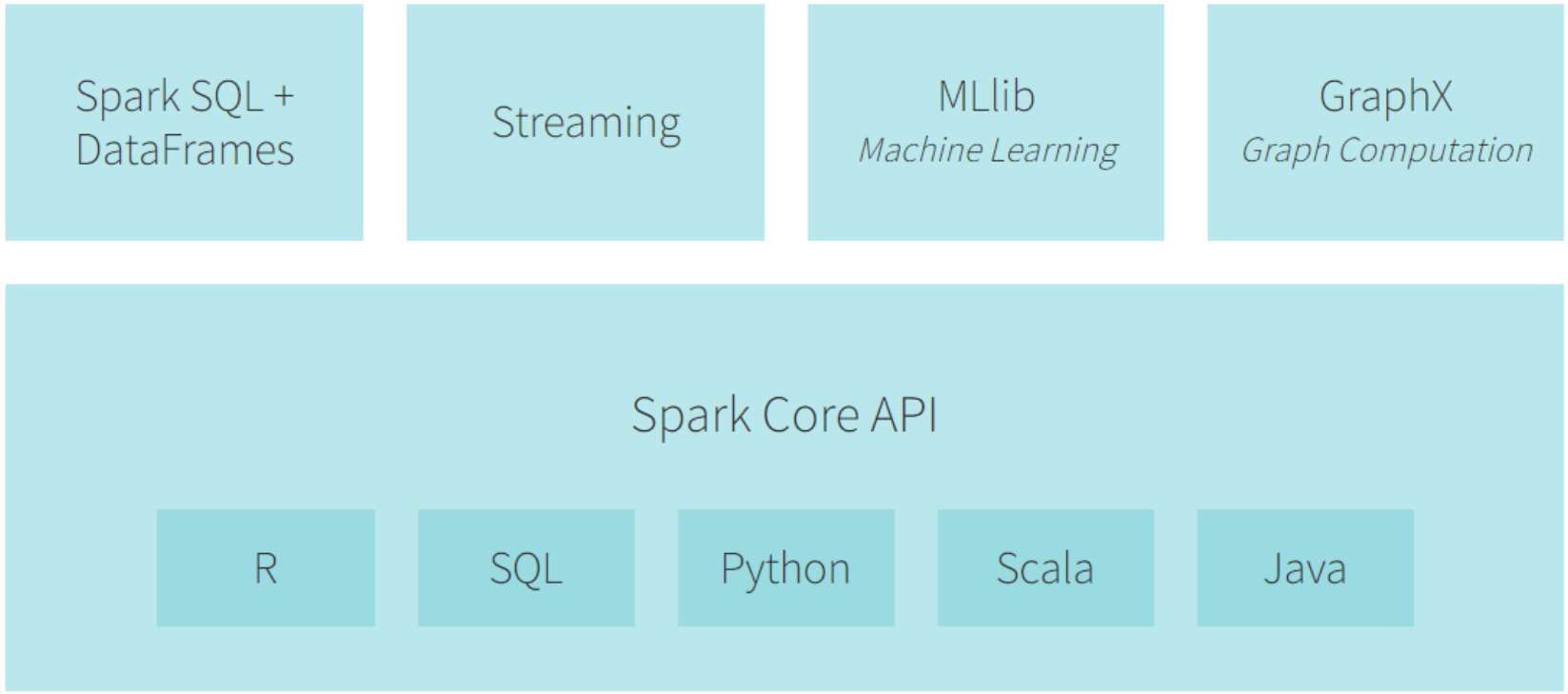
What problem does it solve?

- In memory makes for very fast data processing
- Minimal disk IO
- High level programming abstraction
- Reduces the amount of code
- In turn makes it more suitable for exploratory work

How does it do it?

- Provides a core programming abstraction called RDD (Resilient Distributed Dataset)
- Data split over memory on multiple machines
- The RDD API has been extended to include DataFrames
- Can deploy ad-hoc processing clusters as well as integrate with HDFS/Hadoop

Spark Ecosystem



Spark and Hadoop

- Very complementary technologies
- Spark is already included in all the major Hadoop distributions
- Easier to use and faster than Map/Reduce
- Suitable to exploratory work which used to be very difficult


Spark and R

Spark and R

- Originally supported languages Scala, Java and Python
- SparkR was a separate project, integrated into Spark as of v1.4
- Lets you create and work with MASSIVE data frames over a cluster of machines

SparkR

- Limited capability
- Unfamiliar code structures
- New implementations (e.g. of lm)

Sparklyr

- Designed by Rstudio
- Based on the dplyr patterns so familiar to users
- Still under very active development
- Can set up and install spark locally itself for learning/experimentation
- Filter and aggregate Spark datasets then bring them into R for analysis and visualization
- Use Spark distributed ML library from R

What’s in it for you?

- If you’ve ever run out of memory in R or need to interface with a Hadoop cluster, Spark and Sparklyr may be the solution for you.
- Allows you to create and work with vast datasets
- You can work interactively or create batch jobs, all using a familiar R/dplyr syntax

Workshop Environment

- Username: user<n>
- Password: …
- Host: http://spark2.mangodatalabs.com
- Host: http://spark3.mangodatalabs.com

spark.mangodatalabs.com:8787

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File Edit Code View Plots Session Build Debug Profile Tools Help user75

Go to file/function Addins Project: (None)

Console ~/

```
R version 3.3.3 (2017-03-06) -- "Another Canoe"
Copyright (C) 2017 The R Foundation for Statistical Computing
Platform: x86_64-redhat-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
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  Natural language support but running in an English locale

R is a collaborative project with many contributors.
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Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

>
```

Environment History Spark

Import Dataset List

Global Environment

Environment is empty

Files Plots Packages Help Viewer

New Folder Upload Delete Rename More

Home

Name	Size	Modified
R		

Creating a spark context

- library(sparklyr)
- config <- spark_config()
- config$spark.executor.cores <- 2
- config$spark.executor.memory <- “4G”
- config$spark.ui.port <- “<portnumber>”
- sc <- spark_connect(master = “spark://…:7077”, config = config,
  app_name = “<your_name>”)