# Privacy Enabled Big Data Analytics in the Cloud

Humboldt Colloquium – Tel-Aviv September 2016

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# My German Experience

DAAD
Deutscher Akademischer Austauschdienst
German Academic Exchange Service

Westfälische Wilhelms-Universität Münster

Heinrich Heine Universität Düsseldorf

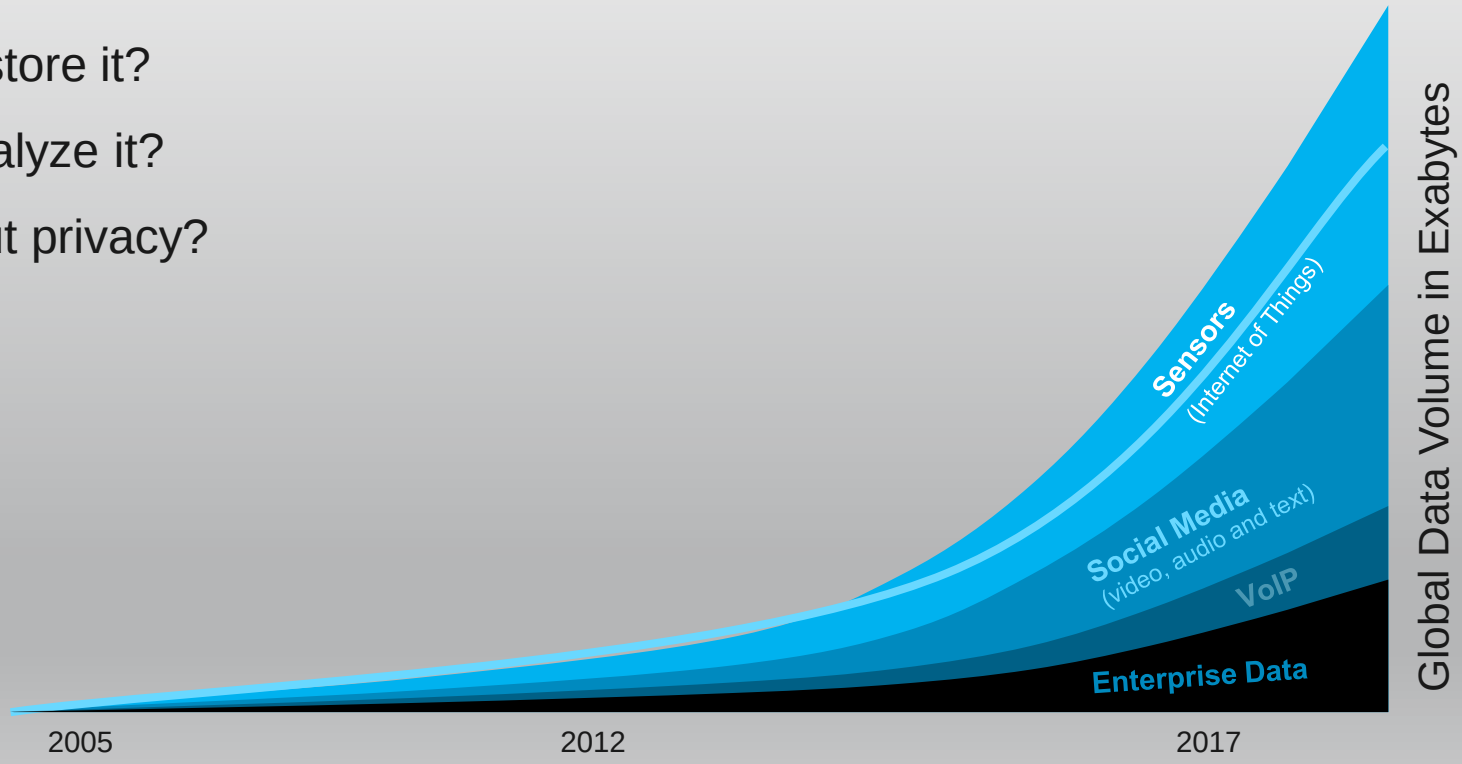
EEIPDI

Max Planck Institute for Mathematics

Institut des Hautes Études Scientifiques
*Fondation reconnue d'utilité publique*

# Big Data Challenges

- Where to store it?
- How to analyze it?
- What about privacy?

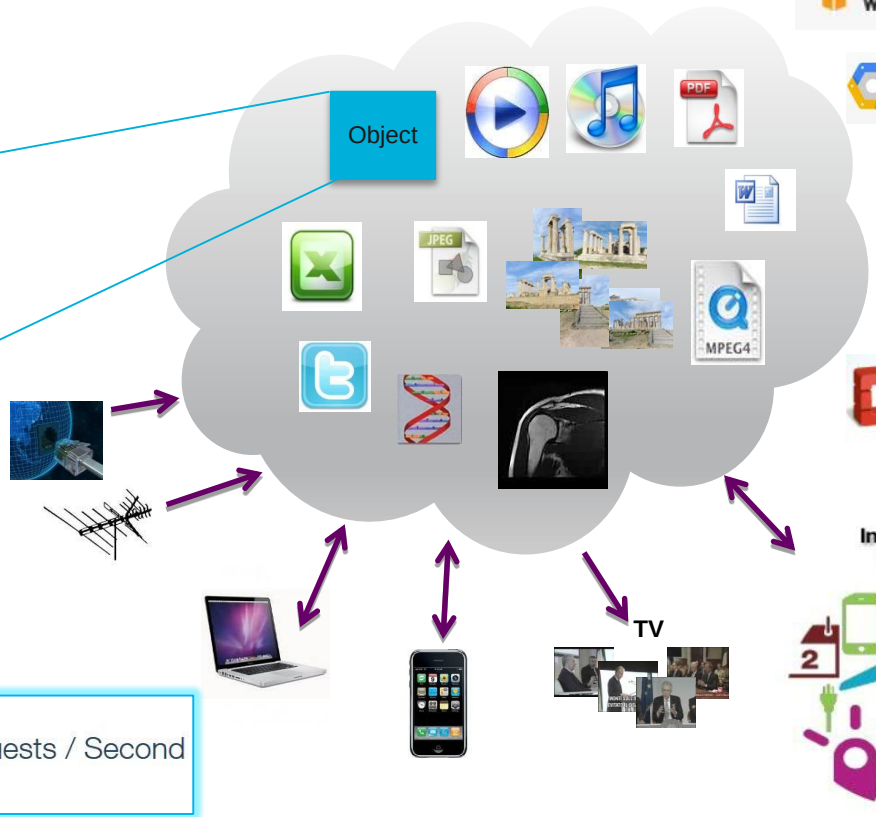


# Cloud Object Store

**Object**

Data
(unstructured / semi-structured)

Metadata




amazon web services

Google Cloud Platform

Microsoft Azure

SOFTLAYER an IBM Company

openstack CLOUD SOFTWARE

AWS Blog

Amazon S3 – Two Trillion Objects, 1.1 Million Requests / Second

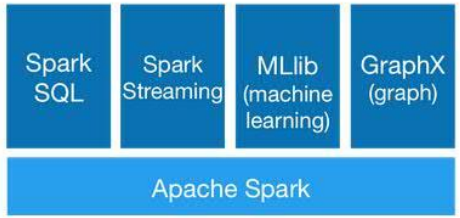
by Jeff Barr | on 18 APR 2013 | in Amazon S3 | Permalink | Comments

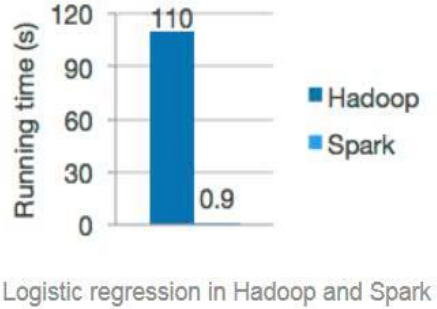
# Apache Spark

**Fast and general open-source engine for large-scale data processing**

- Run programs up to 100x faster than Hadoop MapReduce in memory, or 10x faster on disk
- Write applications quickly in Scala, Python, Java, or R
- Combines SQL, streaming and complex analytics (machine learning, graph processing)
- Runs on Apache Mesos, Hadoop YARN cluster manager, standalone, or in the cloud. It can access diverse data sources (HDFS, S3, Openstack Swift Object Store)
- Built by a wide set of developers from over 200 companies. Since 2009, more than 1000 developers have contributed to Spark

https://spark.apache.org/



Logistic regression in Hadoop and Spark

# Privacy Concepts

From European Union Data Protection Directive

- **Personal data** – “any information relating to an identified or identifiable **natural person**”
- Data subject (person) has the right to be informed when his personal data is being processed
- **Consent** – Data may be processed only when the data subject has given his consent
- **Proportionality** – The data processed and the time for which it is stored should be no more than required for the stated purpose

**Data Security**
*“Protecting data from destructive forces and from the unwanted actions of unauthorized users.”*
Wikipedia

**Data Privacy**
*Ensuring that personal data is used and stored only as is needed to provide the approved user services.*

# Privacy Enabled Analytics Architecture