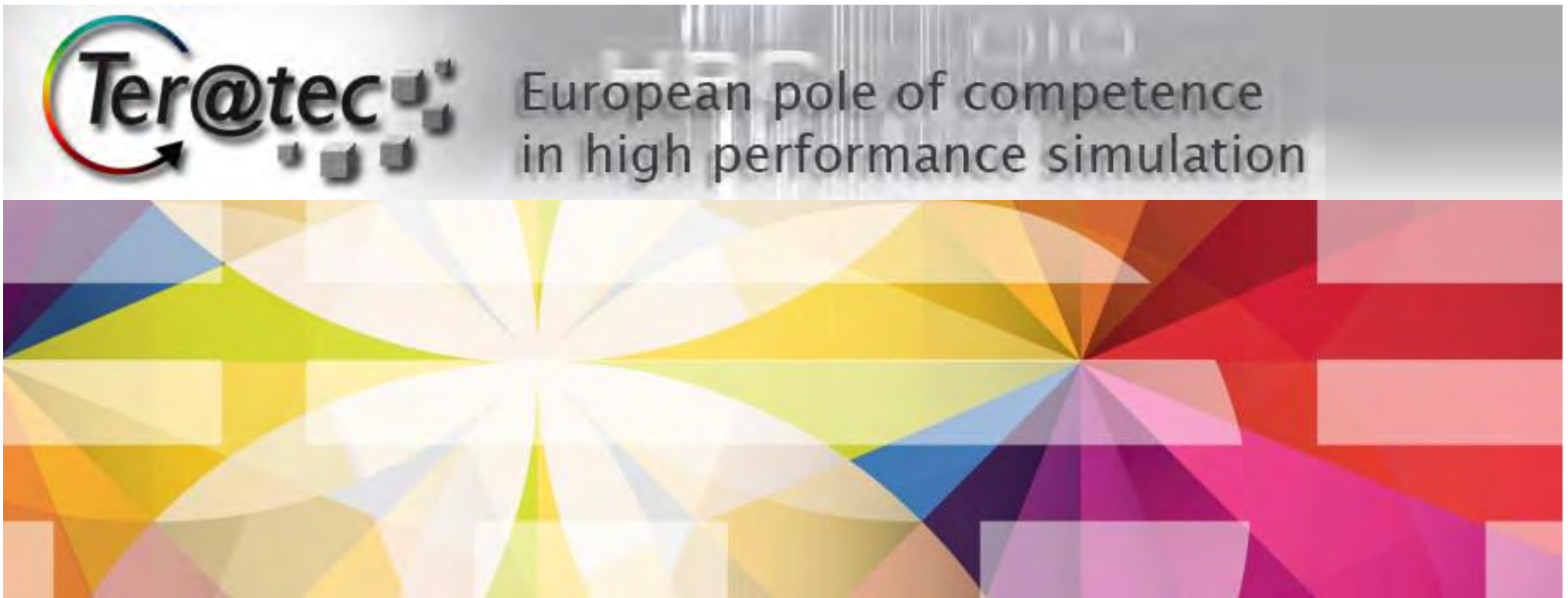


# Addressing Open Source Big Data, Hadoop, and MapReduce limitations



# Agenda

- What is Big Data / Hadoop ?
- Limitations of the existing hadoop distributions
- Going enterprise with Hadoop

# How Big are Data ?

**90 %** of data in the world has been created  
**last 2 years**



Data

Media

Content

Machine

Social

IDC says the digital universe will represent

**40 zettabytes in 2020**

1 000 000 000 000 000 000 000



yesterday

Today

And so what ?

The unseen  
information

Hadoop

NOSQL

un-structured data

Social

Open data

HDFS

PIG, HIVE

HBASE

Hortonworks, Cloudera, Splunk

...

# What can you do with big data?

## Financial Services

- Fraud detection
- Risk management
- 360° View of the Customer



## Utilities

- Weather impact analysis on power generation
- Transmission monitoring
- Smart grid management

## Transportation

- Weather and traffic impact on logistics and fuel consumption



## IT

- Transition log analysis for multiple transactional systems
- Cybersecurity

## Health & Life Sciences

- Epidemic early warning system
- ICU monitoring
- Remote healthcare monitoring



## Retail

- 360° View of the Customer
- Click-stream analysis
- Real-time promotions

## Telecommunications

- CDR processing
- Churn prediction
- Geomapping / marketing
- Network monitoring



## Law Enforcement

- Real-time multimodal surveillance
- Situational awareness
- Cyber security detection



**The Big Data Ecosystem**

**Infrastructure**

- NoSQL Databases**: 10gen, DATASTAX, COUCHBASE, CLOUDANT, basho, HYPERTABLE, Neo4j, etc.
- Hadoop Related**: cloudera, HADAPT, Hortonworks, infochimps, MAPR, Zettaset, MORTAR, IBM, Microsoft, GREENPLUM, amazon, Qu boie, etc.
- NewSQL Databases**: MarkLogic, paradigm, memsql, SQLFire, DRAWINGS, VoltDB, nuodb, etc.
- MPP Databases**: VERTICA, kognitio, PARACCEL, GREENPLUM, TERADATA, N, NETEZZA, InfiniDB, SQL Server, etc.
- Management / Monitoring**: OUTER THOUGHT, oceanSYNc, StackIQ, boundary, DATADOG, etc.
- Cluster Services**: LexisNexis, HPCC Systems, Acunu, Security, Stormpath, IMPERVA, TRACE VECTOR, codefortytwo, DATAGUISE, etc.
- Storage**: Cleversafe, panasas, nimblestorage, AMPLIDATA, Compuverde, etc.
- Crowdsourcing**: CROWD COMPUTING, CrowdFlower, amazon, mechanicalturk, etc.
- Collection / Transport**: aspera, nodeable, etc.

**Analytics**

- Analytics Solutions**: Palantir, platfora, Pervasive, Datameer, KARMA SPHERE, Databricks, DIGITAL REASONING, dataspora, PRECOG, etc.
- Data Visualization**: Quid, visual.ly, ACTUATE, Kitenga, centrifuge, metaLayer, Ayasdi, ClearStory, +tableau, ISS, Quantum4D, etc.
- Statistical Computing**: SKYTREE, Prior Knowledge, REVOLUTION, SAS, SPSS, MATLAB, etc.
- Sentiment Analysis**: GENERAL SENTIMENT, crimson hexagon, etc.
- Location / People / Events**: RapLeaf, FlipTop, Recorded Future, Place IQ, RADIUS, etc.
- Real-Time**: CONTINUITY, ParStream, feedzai, etc.
- Crowdsourced Analytics**: DataKind, kaggle, etc.
- SMB Analytics**: sumail, RJMetrics, custora, etc.
- Analytics Services**: THINK BIG, McKinsey & Company, OPERA, etc.
- Big Data Search**: elasticsearch, Autonomy, etc.
- IT Analytics**: splunk, sumologic, etc.

**Applications**

- Ad Optimization**: DataXu, aggregate knowledge, m6d, ai Match, MediaMath, bluekai, rocketfuel, lifetrade, TURN, across, etc.
- Publisher Tools**: VISUAL, Yieldex, yieldbot, etc.
- Marketing**: LATTICE ENGINES, Sailthru, bloomreach, CLICKFOX, etc.
- Industry Applications**: NEXT BIG SOUND, KNEWTON, zest cash, wonga, numberFire, Mile Sense, Climate Solutions, Bloomberg, BILL GUARD, etc.
- Application Service Providers**: collective, etc.
- Data Sources**: Data Marketplaces (factual, DataMarket, Windows Azure Marketplace), Personal Data (premise, knoema, Gnip, infochimps, etc.), Withings, JAWBONE, RunKeeper, BASIS, Nike, fitbit, etc.

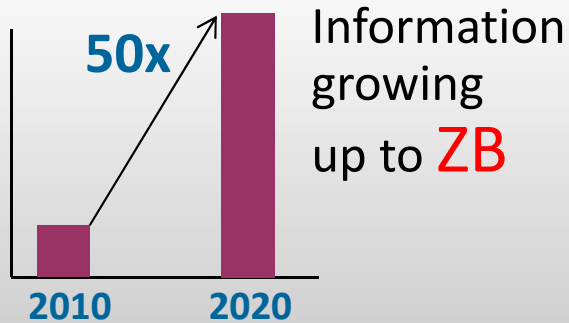
**Cross Infrastructure / Analytics**: SAP, sas, IBM, Google, ORACLE, Microsoft, vmware, amazon, Hadoop, META MARKETS, TERADATA, Autonomy, NetApp, etc.

**Open Source Projects**

- Framework**: Hadoop, MapReduce, HDFS, etc.
- Query / Data Flow**: Hive, Pig, etc.
- Data Access**: Cassandra, SciDB, HBASE, CouchDB, Squirrel, etc.
- Coordination / Workflow**: ZooKeeper, talend, COZIE, etc.
- Real-Time**: Storm, etc.
- Statistical Tools**: SciPy, etc.
- Machine Learning**: Mahout, etc.
- Cloud Deployment**: etc.

# Market definition

## Volume



## Velocity



Process information of  
**30 billions**  
of RFID chips

## Variety



**80%** of  
worldwide  
data are  
unstructured



## Veracity

**1/3** makers do not trust their information system to make decisions.

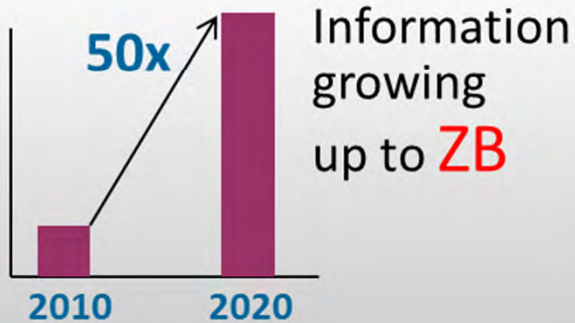
**83%** of CIO says analytics is the first path to competitiveness\*

\*IBM CIO Study



# Hadoop scope

## Volume



## Velocity



## Variety

**80%** of worldwide data are unstructured

**Hadoop focus on processing huge volume of different type of data**



# Do not confuse Big Data and Hadoop



## ➡ Big data is a generic term:

**Big data** is the term for a collection of [data sets](http://en.wikipedia.org/wiki/Big_data) so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications ([http://en.wikipedia.org/wiki/Big\\_data](http://en.wikipedia.org/wiki/Big_data))

## ➡ Hadoop:

*Apache Hadoop is an open source framework that allows for distributed processing of large data sets across computing clusters and is the most widely used technology for Big [Data processing](#).*

*Hadoop framework has evolved into a set of tools and technologies to efficiently process, store and analyze huge amounts of varied data in a linear, scalable and reliable fashion.*

*It is important to understand that Hadoop is not a complete replacement for the traditional enterprise [Data Warehousing](#) and [Business Intelligence tools](#), but is a complementary approach to solve some of its challenges*

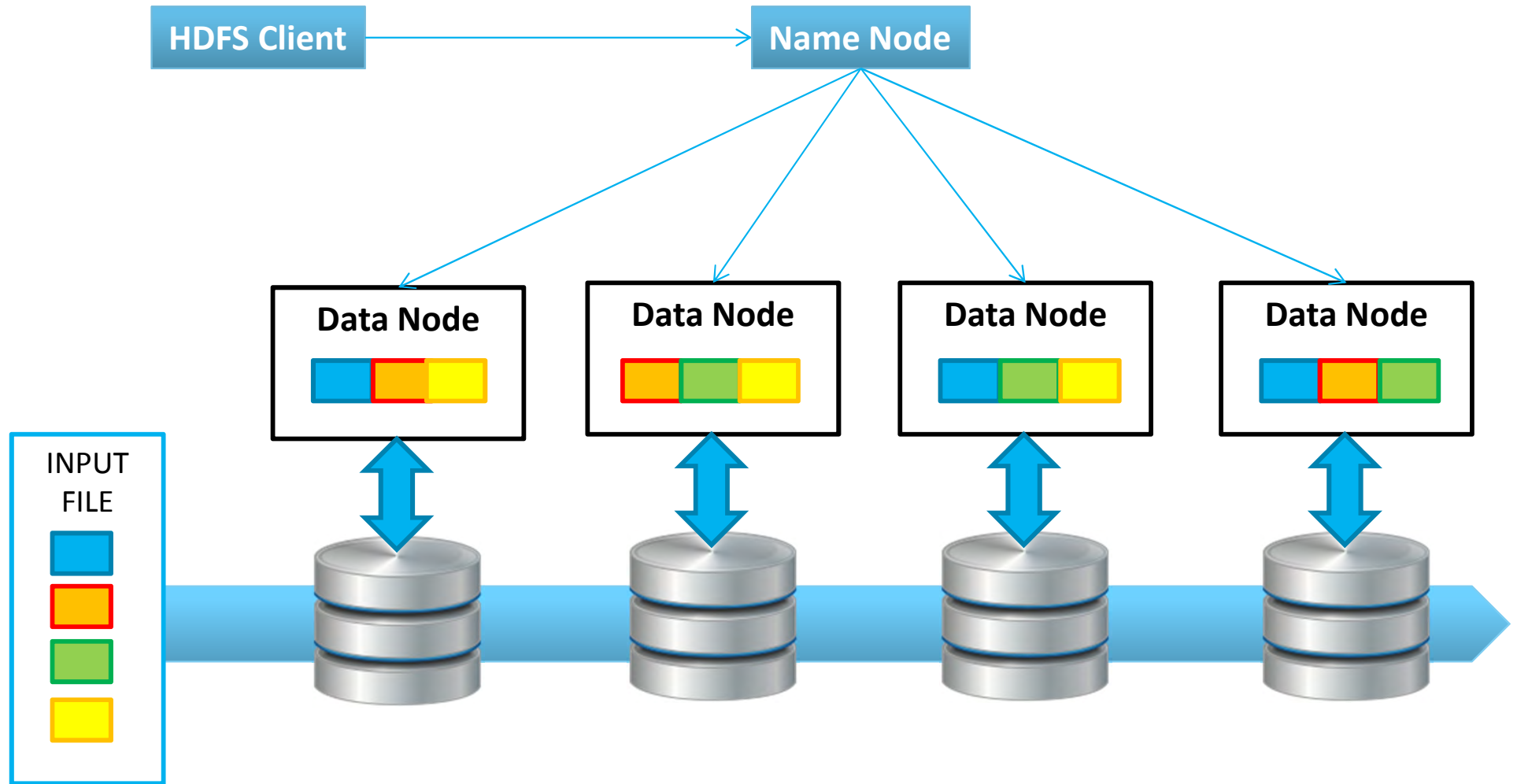
# Hadoop

Distributed data processing



Distributed data storage

# Hadoop HDFS



**Elastic Storage can replace HDFS**



# Hadoop Mapreduce

INPUT

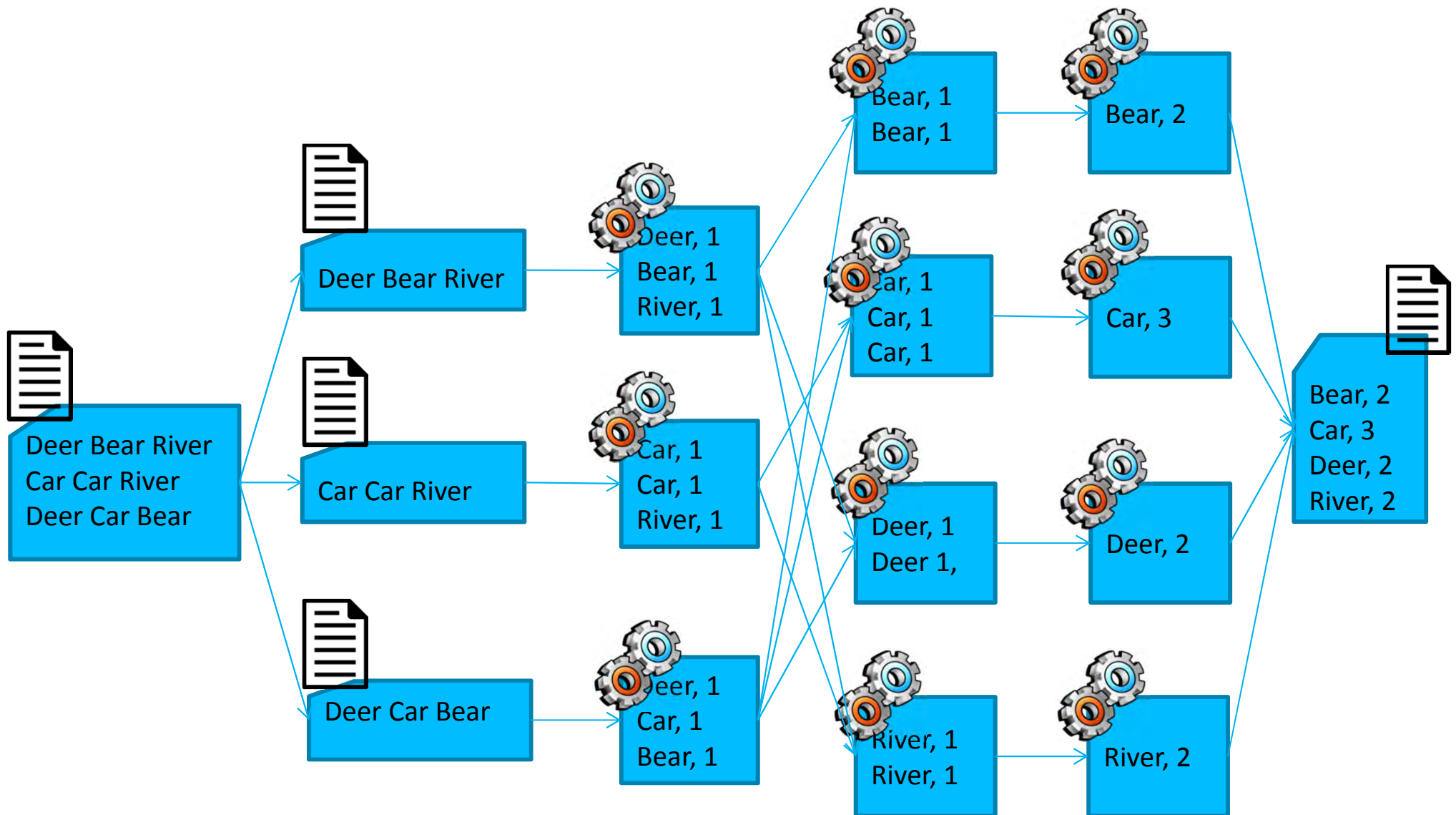
SPLIT

MAP

SHUFFLE

REDUCE

RESULT



# Is it HPC 2.0 ?

# It is HPDA...

## Traditionally

### GOVT, EDU & RESEARCH

Exotic and expensive

### BATCH

Command line driven workloads

### DEDICATED

Homogeneous Infrastructure dedicated to specific applications

### STRUCTURED DATA

problems involve mostly structured data



## Increasingly

### WIDESPREAD

Accessible to all  
Entertainment, Finance, Gaming, xSPs etc ...

### BATCH + REAL-TIME SOA

API driven – throughput and latency are key

### DEDICATED + SHARED

Heterogeneous infrastructure shared fluidly among groups and applications

### STRUCTURED + UNSTRUCTURED

Data types unstructured or semi-structured –  
email, video, documents, logs



# Common pain points



## High-Availability

- Limited HA features in the workload engine
- HDFS NameNode lacks automatic failover logic



## Not scalable

- Large performance overhead during job initiation
- Scalability concerns



## No resources sharing

- Resource silos associated with MapReduce applications
- No way to manage a shared services model tied to an SLA
- Single purpose clusters - under utilized resources



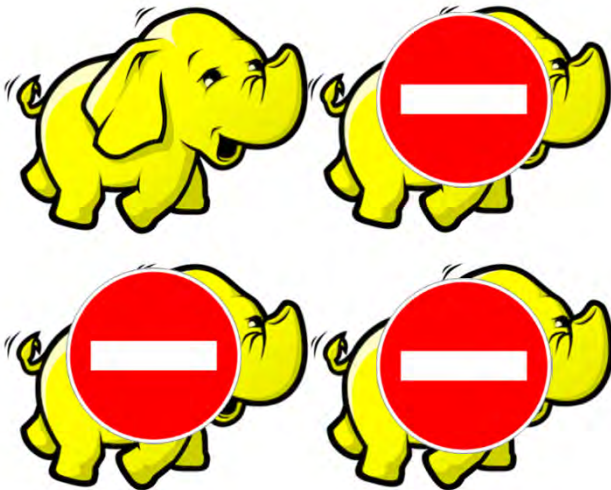


# Common pain points



## Lack of sophisticated scheduling engine

- Large jobs can still hog cluster resources
- Lack of real time resource monitoring
- Lack of granularity in priority management



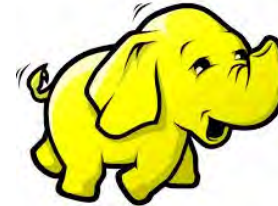
## Lack of application life cycle / rolling upgrades

- No ability to run multiple Hadoop middleware in parallel
- No ability to manage/deploy multiple Hadoop versions

# IBM Platform Symphony unique capabilities



**Multi-tenant**



**100% Hadoop**



**Performances**



**Scalable**

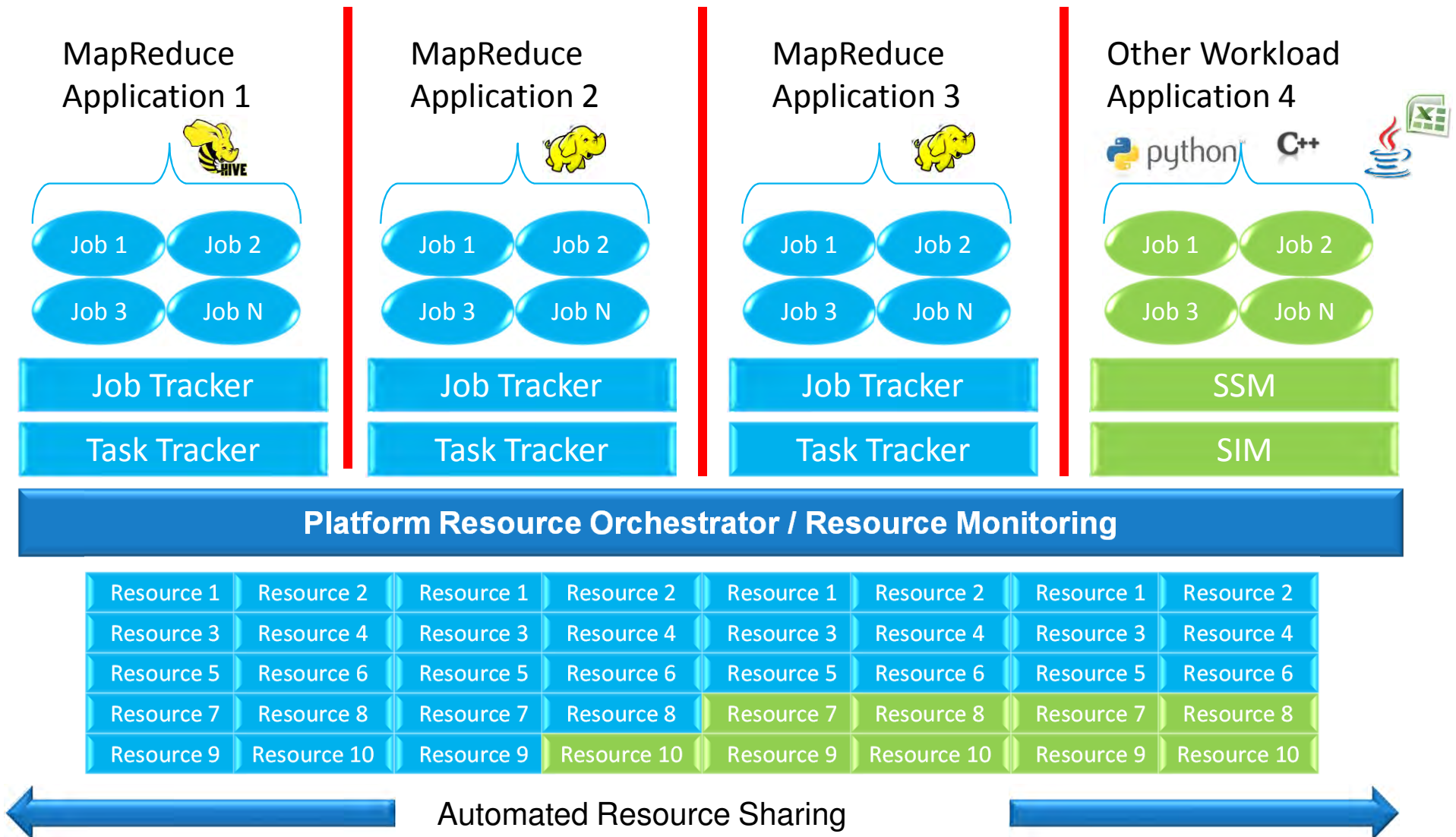


**Robustness**



**Production ready**

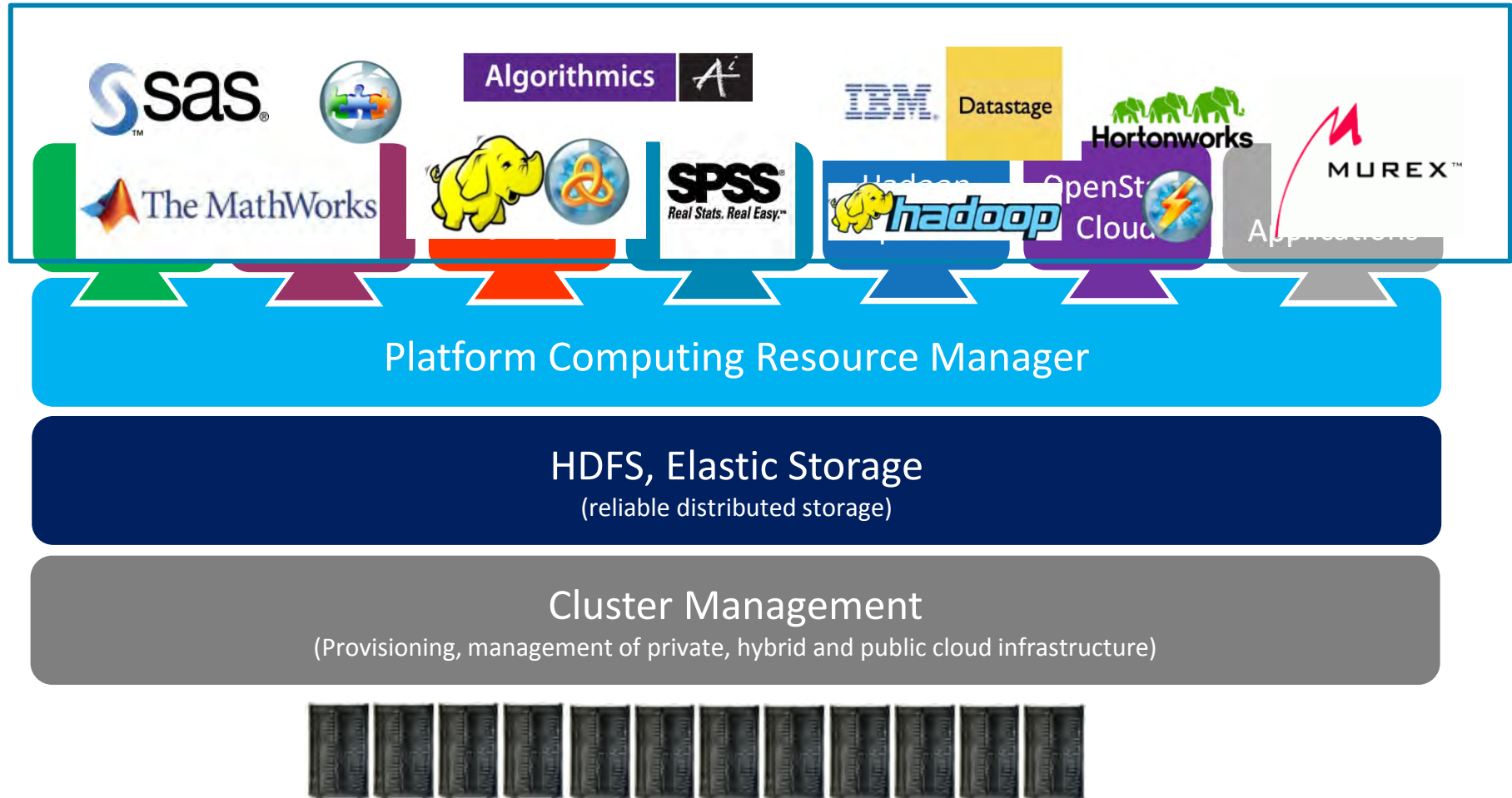
# Symphony brings unique capabilities to Big Data





## Multitenancy in IBM Platform Symphony

Customers need to support diverse applications – both Hadoop and non-Hadoop



With sophisticated multitenancy, customers can share a broader set of application types and scheduling patterns on a common resource foundation

# IBM InfoSphere BigInsights For Hadoop

**4x** performance gain on average over open source Hadoop<sup>1</sup>

**Audited STAC Report™**  
**Securities Technology Analysis Center**

**IBM InfoSphere BigInsights for Hadoop**

Powered by:  
**IBM Platform  
Computing**



**Open Source**



1. 4x is approximate value. See the STAC Report™ at <http://www.stacresearch.com/node/15370>. Testing involved the SWIM benchmark (<https://github.com/SWIMProjectUCB/SWIM>) and jobs derived from production workload traces. Testing was conducted in controlled laboratory conditions.

# A Single Dashboard

Manage multiple tenants including BigInsights and third party workloads

IBM Platform Symphony Advanced Edition Dashboard Admin ?

Workload Resources Settings Reports & Logs

## MapReduce Applications

Add Remove Modify Enable Disable

	Application	Status	Scheduling Policy	Prestart Application	Scheduling Affinity
<input checked="" type="radio"/>	Datameer	Enabled	R_PriorityScheduling	false	None
<input type="radio"/>	HBASE	Enabled	R_Proportion	false	None
<input type="radio"/>	MapReduce6.1	Enabled	R_PriorityScheduling	true	None
<input type="radio"/>	Sqoop	Enabled	R_Proportion	false	None
<input type="radio"/>	Streams_MR	Enabled	R_Proportion	false	None



# Transparent access

Applications think they have their own private cluster, but with configurable access to shared data

MapReduce Jobs in All Applications									
<div> <input type="button" value="New"/> <input type="button" value="Suspend"/> <input type="button" value="Resume"/> <input type="button" value="Kill"/> <input type="button" value="Change Priority"/> </div>									
<input type="checkbox"/>	Job ID	Job Name	Status	User	Priority	Application	Map Tasks	Reduce Tasks	Cr... ▼
<input type="checkbox"/>	403	TeraGen	Running	biadmin	5000	MapReduce6.1	<div></div>		20...
<input type="checkbox"/>	402	oozie:launc...	Running	biadmin	5000	MapReduce6.1	<div></div>		20...
<input type="checkbox"/>	401	Sleep job	Done	gord	5000	MapReduce6.1	<div></div>	<div></div>	20...
<input checked="" type="checkbox"/>	313	TeraSort	Done	gord	5000	MapReduce6.1	<div></div>	<div></div>	20...
<input type="checkbox"/>	312	TeraSort	Done	gord	5000	MapReduce6.1	<div></div>	<div></div>	20...
<input type="checkbox"/>	311	TeraGen	Done	gord	5000	MapReduce6.1	<div></div>		20...
<input type="checkbox"/>	104	Sleep job	Aborted	gord	5000	Sqoop	<div></div>	<div></div>	20...
<input type="checkbox"/>	103	Sleep job	Done	gord	5000	Sqoop	<div></div>	<div></div>	20...

# Flexible configuration of tenant applications

Easily solve problems that normally would prevent workloads from sharing infrastructure

Add Application

Application Name

User who starts job tracker and runs jobs

Default Job Priority  (1 is lowest, 10000 is highest)

Users

Available User Accounts:

eric  
groupA  
groupB  
groupC  
groupD  
groupF  
groupG

Add >  
< Remove

Users for this Application:

Admin  
@groupA  
vivian  
michael  
biadmin  
group

Resource Group

☒ ComputeHosts  
☒ ManagementHosts

Environment Variables

Variables	Value

Add Variable Remove Selected Variables

SSM Scheduling Policy

Policy Name

Task Low Water Mark

Delay slot release for this application (Seconds)

Work Directory

Environment Variables

Name	Value
<input type="checkbox"/> PMR_HOME	<input type="text" value="\${SOAM_HOME}/mapreduce"/>
<input type="checkbox"/> PMR_VERSION	<input type="text" value="6.1"/>
<input type="checkbox"/> SUB_WORK_DIR	<input type="text" value="\${log4cxx_autotindex}"/>

Add Variable Remove Selected Variables

Logging

Log Directory

Sub-directory naming convention (if used)

Log file naming convention (if used)

Session Type Definition

Add Remove

Service Definition

Priority

☐ Preemptive

Preemption Rank

☒ Abort session if client disconnects  
☐ Abort session if task fails

Recoverability

Logging History

Reduce Service to Slot Ratio

Resource Group Filter for Map Tasks

# Configurable, Dynamic Resource Sharing

Establish configurable resource sharing policies that ensure service levels while maximizing utilization

## Resource Plan

Resource Group: ComputeHosts ▼ Time Intervals and Settings ▼

► Slot allocation policy

Consumer	Model type: Ownership				Model type: Share	
	Owned Slots	Consumer Rank	Lend   Limit	Borrow   Limit	Share Ratio	Limit
PSMR61	192					
► SymTesting	0	0			<input checked="" type="checkbox"/> 1	
▼ SampleApplications	0	0			<input checked="" type="checkbox"/> 1	
► SOASamples	0	0	<input type="checkbox"/> <input type="text"/>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
► EclipseSamples	0	50	<input type="checkbox"/> <input type="text"/>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
Total	0	-	-	-	-	-
Balance	0	-	-	-	-	-
► SymExec	0	0			<input checked="" type="checkbox"/> 1	
▼ MapReduceConsumer	128	0			<input checked="" type="checkbox"/> 1	
► MapReduce61	64	0	<input checked="" type="checkbox"/> 32 <a href="#">Details</a>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
► Datameer	64	0	<input checked="" type="checkbox"/> 32 <a href="#">Details</a>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
► HBase	0	0	<input type="checkbox"/> <input type="text"/>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
► Streams_MR	0	0	<input type="checkbox"/> <input type="text"/>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
► Sqoop	0	0	<input type="checkbox"/> <input type="text"/>	<input type="checkbox"/> <input type="text"/>	<input checked="" type="checkbox"/> 1	
Total	128	-	-	-	-	-
Balance	0	-	-	-	-	-
Total	128	-	-	-	-	-
Balance	64	-	-	-	-	-

► [Expand All](#)  
▼ [Collapse All](#)

# USAA deploys a multitenant, shared infrastructure

## A shared environment for multiple Hadoop analytic applications

### Business problem

- Multiple lines of business deploying new applications driving infrastructure cost
- Rapid growth in storage requirements, traditional DW too expensive
- Need to facilitate rapid development and deployment of new Hadoop applications
- obtaining an information advantage
- Investing in commercial and in-house Hadoop based solutions to enhance existing data warehouse
- Concerned about uncontrolled growth of Hadoop environments as multiple lines deploy the technology

### Big Data Solution

- InfoSphere BigInsights for Hadoop Services and Analytics
- IBM Platform Symphony for multi-tenancy
- IBM Elastic Storage (GPFS FPO)



### Business Result

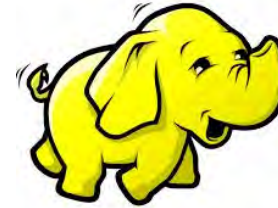
- Significant infrastructure cost avoidance – Approx 30 applications on a shared infrastructure
- Estimated 4x performance gain on average



# IBM Platform Symphony unique capabilities



**Multi-tenant**



**100% Hadoop**



**Performances**



**Scalable**



**Robustness**



**Production ready**

Contact: Emmanuel Lecerf, Big Data expert EMEA  
[Emmanuel.lecerf@fr.ibm.com](mailto:Emmanuel.lecerf@fr.ibm.com)

