

# Information On Demand **2013**

**November 3 – 7**

Mandalay Bay | Las Vegas, NV

**#ibmiod**

## **Big Data Strategies with DB2 for z/OS** **IDZ-3640**

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*IBM Corporation*



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# Agenda

- Big Data in an Information Driven economy
- Why start with System z
- DB2 for z/OS and InfoSphere BigInsights /Hadoop
- Summary / Call to action

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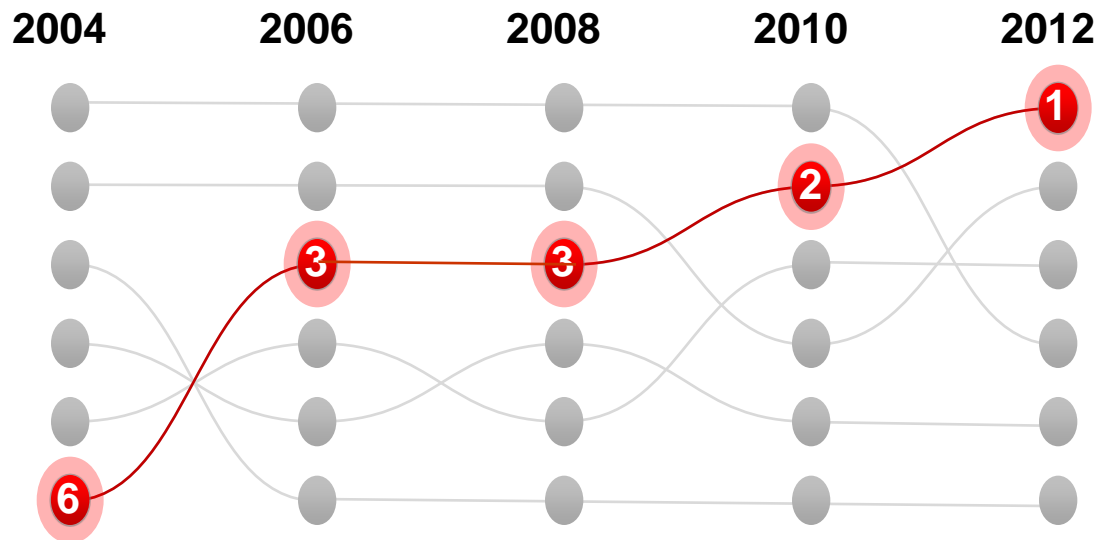
# On a Smarter Planet, Unprecedented Changes are Occurring



- Business models under constant pressure
- Customers are more demanding and connected
- Great relationships trump great products

# Technology is Transforming Business and IT Collaboration

## Factors Impacting Organizations



### 1. Technology Factors

1. Technology Factors
2. People Skills
3. Market Factors
4. Macro-economic Factors
5. Regulatory Concerns
6. Globalization

Source: IBM CEO Study 2012

# And Leaders are Responding by...



**Providing a  
Great Experience**



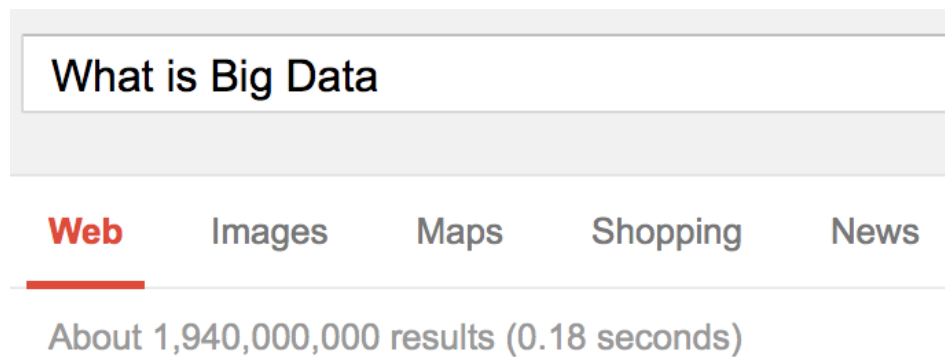
**Offering Value  
In Every  
Interaction**



**Innovating  
Across  
the Ecosystem**

## *But what is Big data?*

- *Google can give you nearly 2 Billion options*
- *Vendors have even more definitions*



## *Here is how Gartner defines Big Data*

- *Big data is high-volume, high-velocity and high-variety information assets that demand **cost-effective, innovative information processing for enhanced insight and decision making.***

Gartner research note "Survey Analysis - Big Data Adoption in 2013 Shows Substance Behind the Hype" Sept 12 2013  
Analyst(s): Lisa Kart, Nick Heudecker, Frank Buytendijk

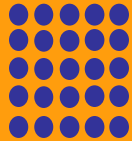


# We've Moved into a New Era of Computing - V<sup>4</sup>

Radical Flexibility

**12** terabytes

of Tweets  
create daily

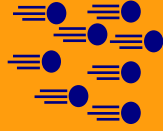


Volume

Extreme Scalability

**5** million

trade events  
per second



Velocity

**100's**

Of video feeds from  
surveillance cameras



Variety



Veracity

Only **1 in 3**

Decision  
makers trust  
their information

Information from everywhere

“We have for the first time an economy based on a key resource [Information] that is not only renewable, but self-generating.

Running out of it is not a problem, *but drowning in it is.*”

– John Naisbitt

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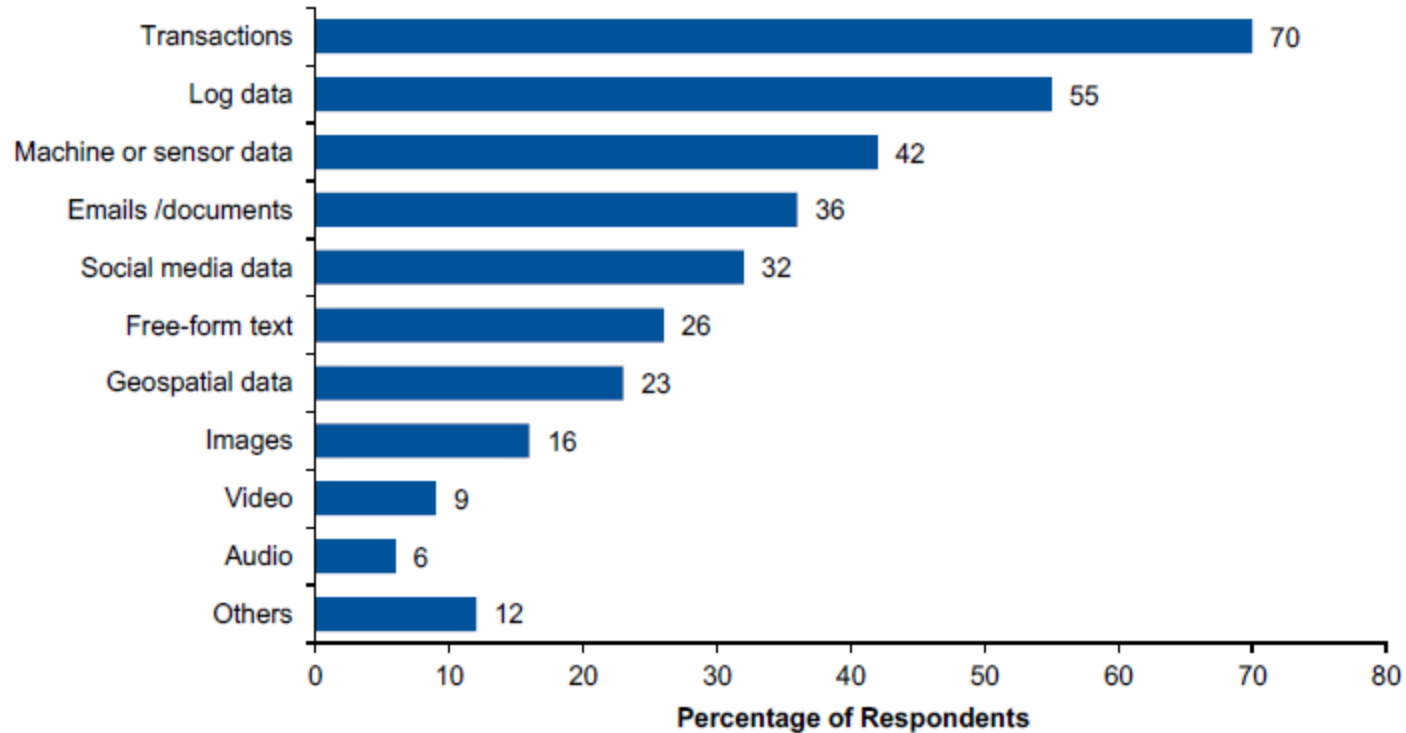
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# The Big Data Starting Point

*Types of Data Analysed*

Transactional sources are the dominant data types analyzed in big data initiatives



N =465 (multiple responses allowed)

Source: Gartner (September 2013)

Gartner research note "Survey Analysis - Big Data Adoption in 2013 Shows Substance Behind the Hype" Sept 12 2013

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# The Big Data Starting Point

Types of Big Data Analysed by Industry

Transactional sources are the dominant data types analyzed in big data initiatives

	Manufacturing and Natural Resources	Media/ Communications	Services	Government	Education	Retail	Banking	Insurance	Healthcare	Transportation	Utilities
Transactions	73%	62%	67%	67%	54%	93%	83%	81%	75%	79%	80%
Log data	44%	57%	58%	59%	54%	40%	66%	61%	33%	71%	60%
Machine or sensor data	53%	38%	35%	33%	31%	27%	27%	48%	42%	50%	40%
Emails /documents	27%	43%	43%	41%	46%	27%	34%	39%	17%	29%	20%
Social media data	32%	52%	39%	26%	54%	73%	27%	13%	-	50%	-
Free-form text	17%	24%	28%	30%	31%	20%	34%	35%	67%	21%	40%
Geospatial data	27%	14%	19%	19%	38%	27%	27%	26%	8%	29%	40%
Images	19%	24%	17%	11%	38%	13%	5%	16%	25%	7%	-
Video	8%	29%	12%	7%	31%	13%	-	6%	8%	7%	-
Audio	10%	19%	8%	4%	8%	-	-	6%	-	-	-
Other	8%	14%	13%	15%	8%	7%	10%	16%	42%	14%	-
n =	59	21*	127	27*	13*	15*	41	31	12*	14*	5*

Note: Highlighted cells indicate the top three data types by industry.  
Multiple responses allowed

Source: Gartner (September 2013)

Gartner research note "Survey Analysis - Big Data Adoption in 2013 Shows Substance Behind the Hype" Sept 12 2013  
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# ...and our webcast survey said...

• Have you already implemented or are you planning to implement any Big Data based initiatives within the next 6 months? Yes 31%  
No 69%

---

• How would you rate the value of being able to integrate insights from social media, telemetry, unstructured data into your analytics and decision making processes? High 50%  
Med 36%  
Low 14%

---

• Do you see the IBM System z platform as pivotal to the success of Big Data initiatives? Yes 90%  
No 10%

**Five key findings from the study about big data:**

1. Customer analytics are driving big data initiatives
2. Big data is dependent upon a scalable and extensible information foundation
3. Initial big data efforts are focused on gaining insights from internal data
4. Big data requires strong analytics capabilities
5. Adoption of big data is focused upon delivering measureable business value, which happens in four stages:
  - Educate: focusing on business as usual with casual understanding of big data;
  - Explore: developing strategy and roadmap based on business needs and challenges;
  - Engage: creating pilots to validate value and requirements; and
  - Execute: deploying two or more big data technologies and continuing to innovate



# The role of zEnterprise in Big Data



- A large percent of the data that is accessed for analytics originates/resides on IBM zEnterprise
  - 2/3 of business transactions for U.S. retail banks
  - 80% of world's corporate data
- Businesses that run on zEnterprise
  - 66 of the top 66 worldwide banks
  - 24 of the top 25 U.S. retailers
  - 10 of the top 10 global life/health insurance providers
- 1,300+ ISVs run zEnterprise today, more than 275 of these selling over 800 applications on Linux
- The downtime of an application running on System z equates to approximately 5 minutes per year
- The System z mainframe can run over a thousand virtual Linux images on a single frame the size of a refrigerator



# Majority of today's analytics based on relational / "Structured" Data

- Analytics and decision engines reside where the DWH / transaction data is
- "Noise" (veracity) surrounds the core business data
  - Social Media, emails, docs, telemetry, voice, video, content
- What data are you prepared to **TRUST?**
- Where do you put your trusted Data?



**"Circle of trust"**



# Demand for differently structured data to be seamlessly integrated, to augment analytics / decisions

- Analytics and decision engines reside where the DWH / transaction data is
- “Noise” (veracity) surrounds the core business data
  - Social Media, emails, docs, telemetry, voice, video, content
- Expanding our insights – getting closer to the “truth”
  - Lower risk and cost
  - Increased profitability

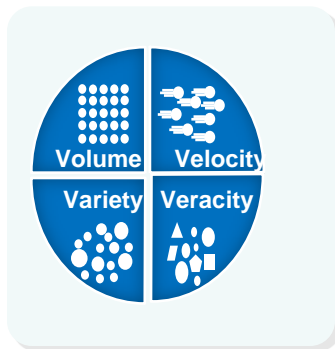


**“Circle of trust”  
widens**



# Forward Thinking Organizations are Creating Value From Big Data






*The power of Data coming together...*



*...with the power of Technology...*



*...to deliver Improved Business Outcomes*

-  1. **Enrich your information base**  
*with Big Data Exploration*
-  2. **Improve customer interaction**  
*with Enhanced 360° View of the Customer*
-  3. **Optimize operations**  
*with Operations Analysis*
-  4. **Gain IT efficiency and scale**  
*with Data Warehouse Augmentation*
-  5. **Prevent crime**  
*with Security and Intelligence Extension*

# Fraud Detection – Claiming disability allowance.



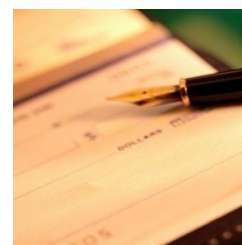
“Unable to work”

Work Status



“Dude – awesome vacation”

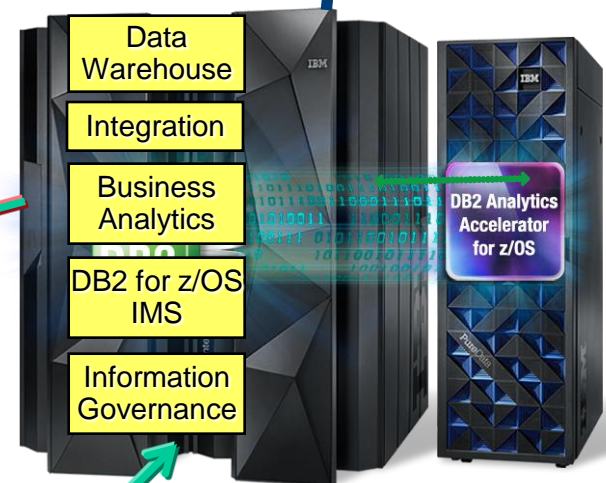
Facebook Post



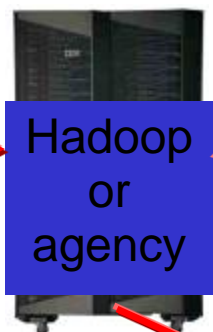
Deterrent for fraudsters – Cost Savings for the business

Make payment or investigate

**zEnterprise**

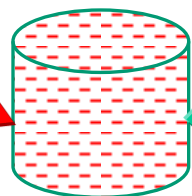


Data from Social Media sites analyzed with Text analytics



Refined Search parameters from OLTP environment

Result Set for further processing



Data Warehouse + modeling applications  
Result set uploaded or directly imported into OLTP DBMS



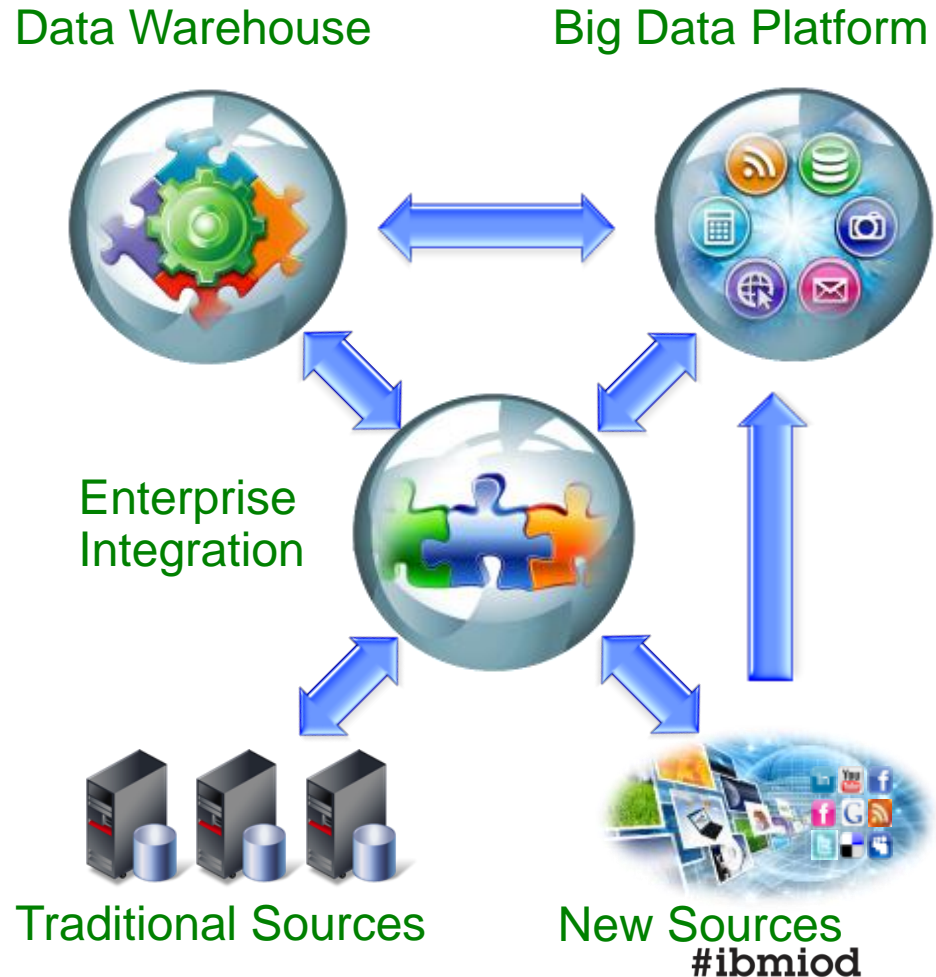
# Enterprise Integration and Governance... the key to success of incorporating Big Data

## ■ Information Integration

– Insights from big data must be incorporated into the warehouse and analytics/decision engines

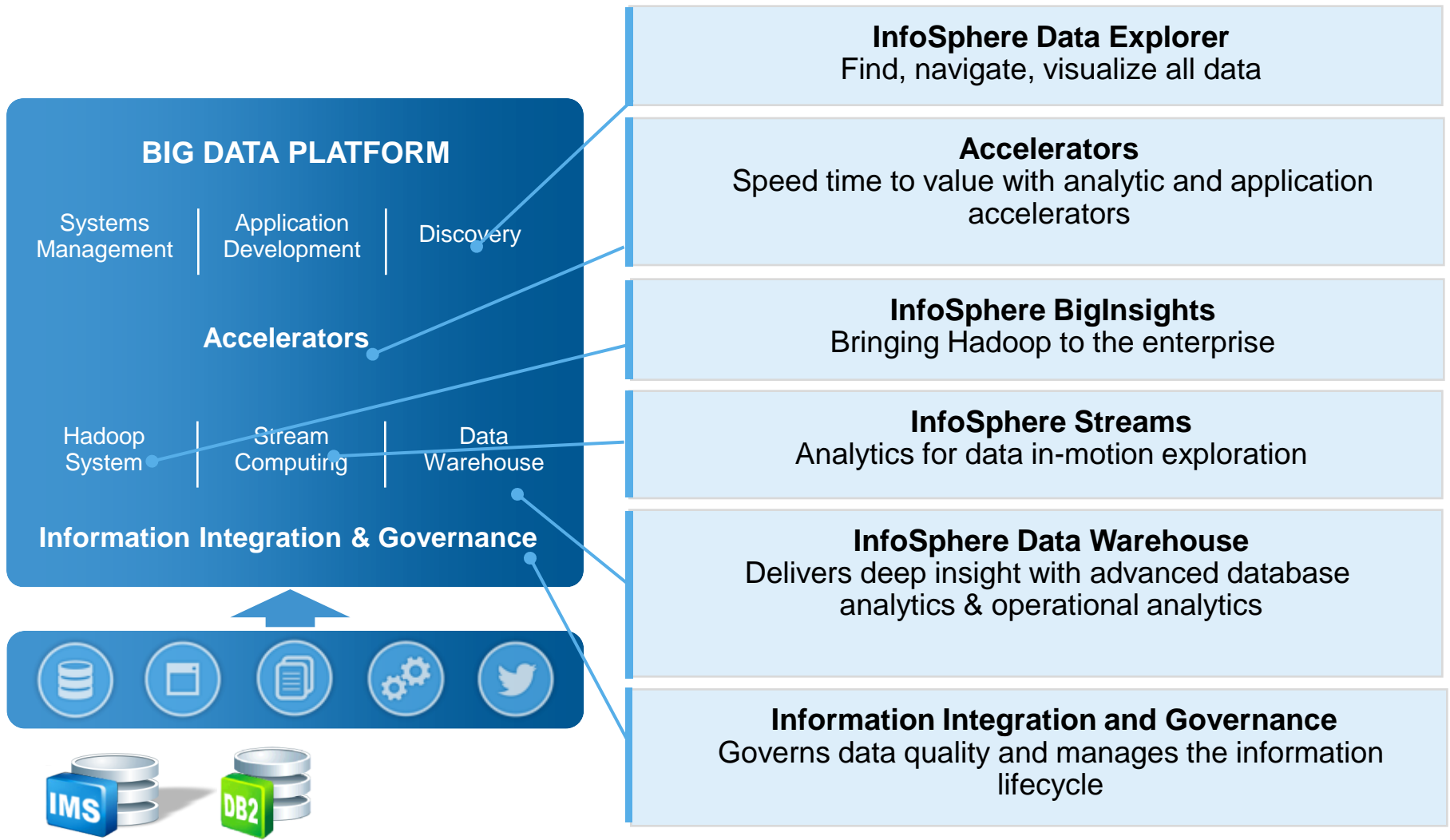
## ■ Information Governance

– Companies need to govern what comes in, and the insights that come out



# IBM BIG DATA PLATFORM

*Logical platform with many physical deployment options*



# IBM DB2 Analytics Accelerator v 4.1

*Do things you could never do before!*

## ▪ What is it?

- A high performance appliance that integrates Netezza technology with zEnterprise technology, to deliver dramatically faster business analytics

## • What does it do?

- Accelerates complex queries, up to 2000x faster
- Lowers the cost of storing, managing and processing historical data
- Minimizes latency
- Improves security and reduces risk
- Complements existing investments





# IBM PureData System for Hadoop

*Accelerate Hadoop analytics with appliance simplicity*

New

Accelerate Big Data projects with built-in expertise

- Explore new ways to use all data
- Unlock new insights from unstructured data
- Establish a cost efficient on-line data archive

Simplify with integrated system management

- InfoSphere BigInsights software
- Compute and Storage hardware

Ensure production grade security and governance

Easily integrate with other systems  
in the IBM big data platform

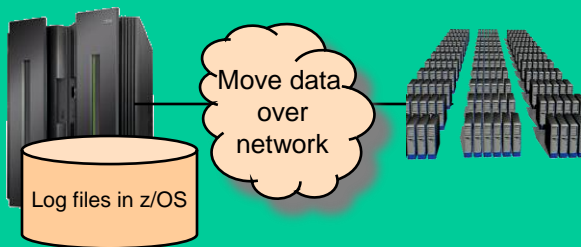


**CIO:Insight Apr 29 2013** ...Issues surrounding how long it takes to get a Hadoop application into production coupled with a lack of real-time capabilities are proving to be important barriers to deployment. As a result, the respondents are reporting that both the number of Hadoop applications and the size of the overall Hadoop environment remain relatively small.

# Approaches

1

Processing done outside z  
(Extract and move data)

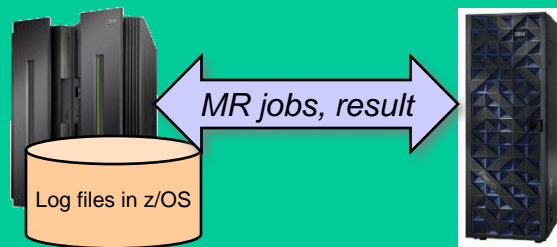


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Additional infrastructure.  
Challenges with scale,  
governance, ingestion.

2

Processing in Appliance  
(z remains the master)

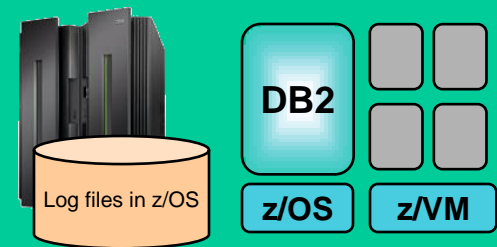


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“IDAA like” approach with  
PureData System for  
Hadoop.  
High speed load.  
z is the control point.

3

Processing done on  
System z  
(MR cluster on zLinux)

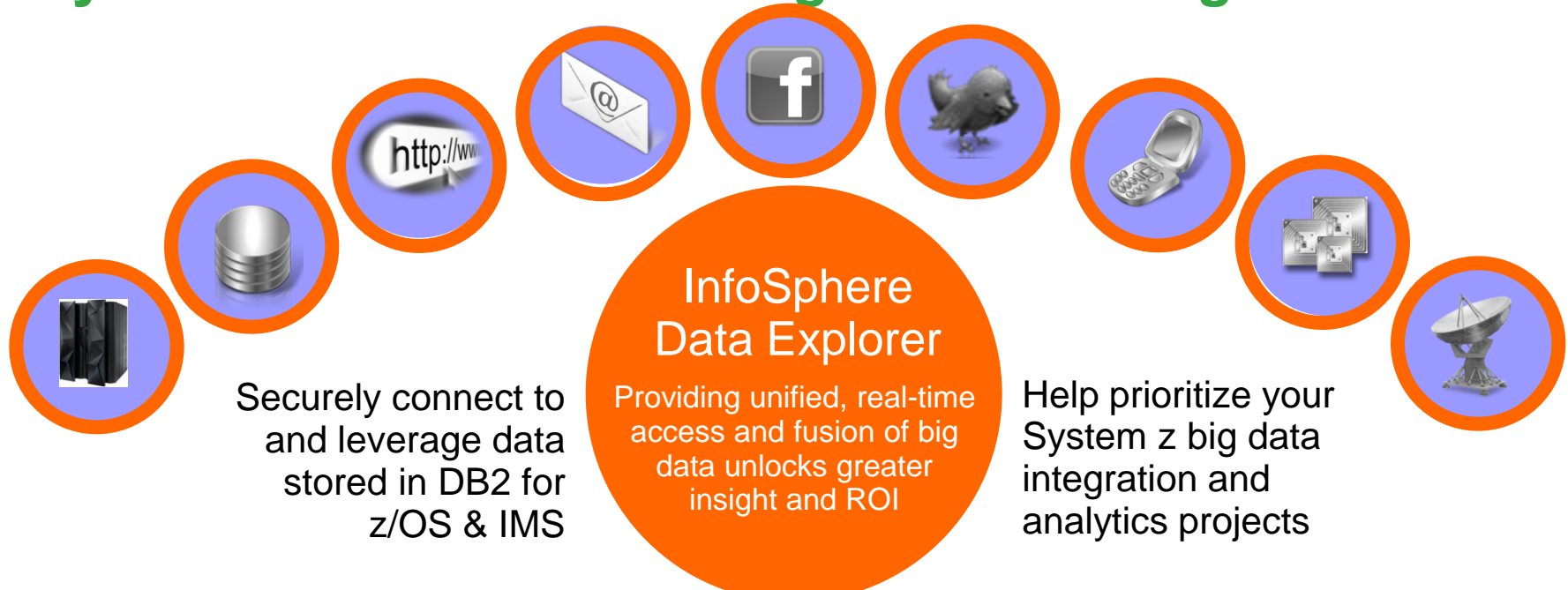


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Provision new node quickly  
Near linear scale.  
High speed load.  
z is the control point.

Hadoop for Linux on  
System z  
• Apache site  
• Veristorm - zDooop

# Data Explorer : visualization & discovery across all your data sources : “Integration at the glass”



Improve customer service & reduce call times



Increase productivity & leverage past work increasing speed to market



Analyze customer information & data to unlock true customer value



Identify areas of information risk & ensure data compliance



Create unified view of ALL information for real-time monitoring



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# What does a Big Data platform do?



## Analyze a Variety of Information

Novel analytics on a broad set of mixed information that could not be analyzed before

## Analyze Information in Motion

Streaming data analysis  
Large volume data bursts & ad-hoc analysis



## Analyze Extreme Volumes of Information

Cost-efficiently process and analyze petabytes of information  
Manage & analyze high volumes of structured, relational data

## Discover & Experiment

Ad-hoc analytics, data discovery & experimentation

## Manage & Plan

Enforce data structure, integrity and control to ensure consistency for repeatable queries

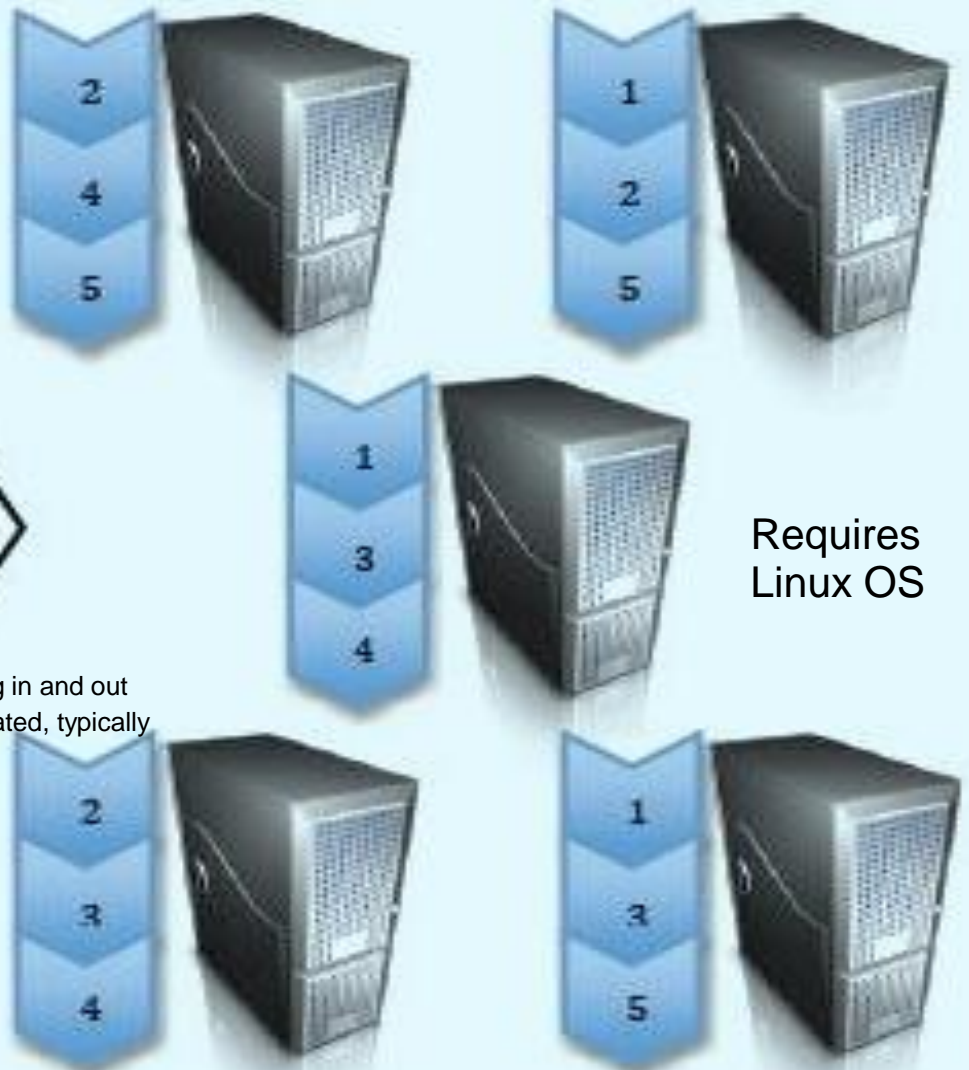
*H*

# How is Big Data Managed

## Hadoop Distributed File System (HDFS)



- Write once, read many
- Optimized for streaming in and out
- Each file block is replicated, typically three times



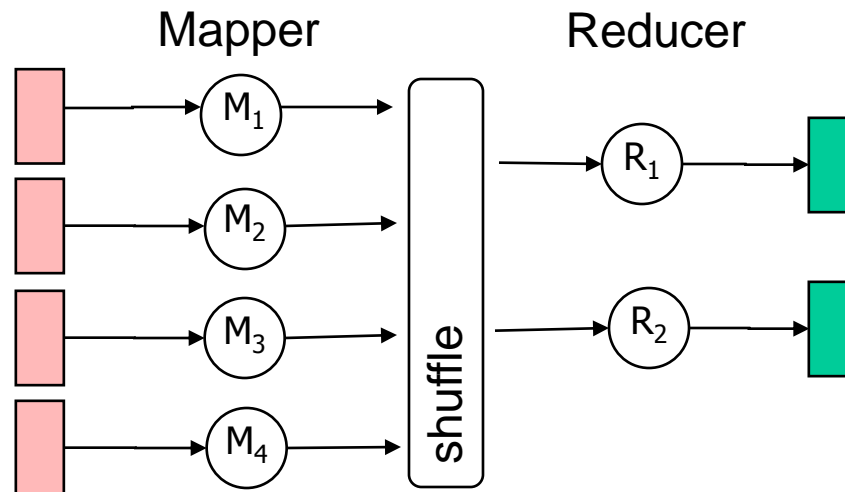
Requires Linux OS



HDFS breaks incoming files into blocks and stores them redundantly across the cluster.

# MapReduce

- A simple, yet powerful framework for parallel computation
  - Applicable to many problems, flexible data format
- Basic steps:
  - Do parallel computation (Map) on each block (split) of data in an HDFS file and output a stream of (key, value) pairs to the local file system
  - Redistribute (shuffle) the map output by key
  - Do another parallel computation on the redistributed map output and write results into HDFS (Reduce)



# Managing big data volumes is only half the battle

- Real benefit derived from big data integration with traditional corporate data
  - Fitting the insight gained from analyzing these new types of information into their existing business processes and operations.
- Database vendors now integrating Hadoop into their products
  - DB2 LUW, Oracle, SQL server, HP, Teradata
- System z **must** continue to position as a competitive BI/BA

Real-time  
Traffic Flow  
Optimization



Precise fraud &  
risk detection



Understand and  
act on customer  
sentiment



Accurate and timely  
threat detection



Predict and act on  
intent to purchase



Low-latency network  
analysis

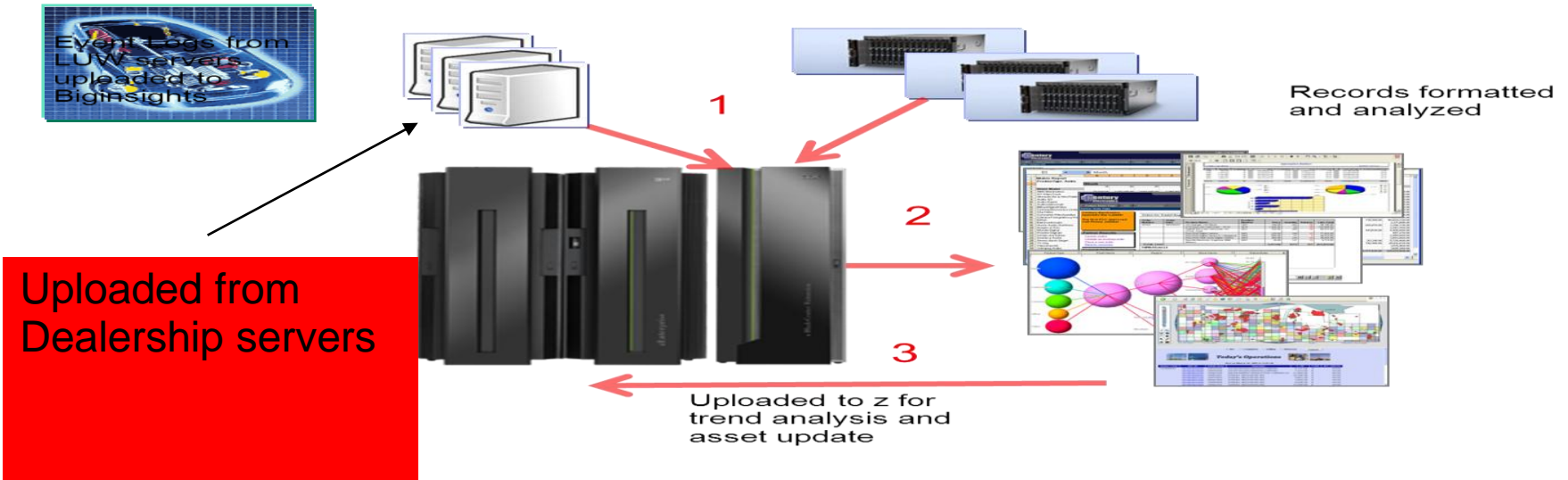


## A use case to access BigInsights from DB2

- BigInsights ingests data that usually is not ingested by established structured data analysis systems like DB2 for z/OS ,.e.g., email from all clients sent to an insurance company
- DB2 kicks off a Hadoop job on BigInsights that analyzes the emails and identifies customers who have expressed dissatisfaction with our service and the word ‘cancel’, ‘terminate’, ‘switch’ or synonyms thereof, or names of our competitors.
- BigInsights job runs successfully, creates a file of results (names and email addresses of customers at risk) and terminates.
- DB2 reads the BigInsights result file using it’s “user defined function” methodology.
- DB2 joins the result with the Agent table and alerts the agents of the at-risk customers. The agents upon the at-risk customer and offer a promotion to stave off defection.

# Scenario 1: Automobile manufacturer

Challenge / Customer pain point	Current technologies	Bigdata/Biginsights
<p><b>Manufacturers need to be proactive in responding to potential quality and safety issues with vehicles</b></p> <p><b>The Sheer number and differing formats of these logs makes it impossible for customers to investigate and identify potential issues or failures in a pre-emptive way</b></p> <p><b>Almost impossible.</b></p>	<ul style="list-style-type: none"> <li>- Tracking of claims and Warranty repairs coming in from dealerships</li> <li>- On board computer data is used by dealerships and only uploaded to manufacturer when requested.</li> </ul>	<p><b>Solution:</b></p> <ol style="list-style-type: none"> <li><b>1. Automatically upload Onboard vehicle data to Hadoop.</b></li> <li><b>2. Uses BigInsights tooling and templates to establish baseline parameters and queries to identify potential problems or failure trends</b></li> <li><b>3. Upload result set to z for integration with Warranty claims details to identify trends</b></li> </ol> <p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>• <b>Proactive response to potential issues</b></li> <li>• <b>Cost reductions with fewer warranty claims before identification..</b></li> </ul>





# Generic table UDF

- Existing DB2 TUDF requires the table schema to be specified at create time
  - Different BigInsight Analytic tasks return different number and types of columns.
  - This approach could require the user to create up to one table udf per analytic function defined on zDB2 but run on BigInsights
- **Generic TUDF does not specify output table schema at create time but at reference time**
  - The same table udf may be invoked by different analytic functions defined on zDB2, the schema on the DB2 is specified at the time of query
  - Inability to handle analytic algorithms where the schema is known only at execution time, e.g., dimension reductions, where the reduced number of dimensions are known only after the analytics is run.



## Example of generic table function

```
CREATE FUNCTION hdfs_Read (handle VARCHAR (1000) )  
RETURNS GENERIC TABLE  
LANGUAGE C PARAMETER STYLE SQL... ;
```

```
SELECT TX.*  
FROM TABLE ( hdfs_Read( 'http://172.16.134.134:8080/data/sample.csv ' )  
             AS TX (Seller varchar(20),  
                  Year INT,  
                  Total decimal(15,2));
```

```
SELECT TX.*  
FROM TABLE ( hdfs_Read( 'http://172.16.134.134:8080/data/weather.csv ' )  
             AS TX (City varchar(20),  
                  High_temperature Decimal(5,2));
```

# HDFS\_Read

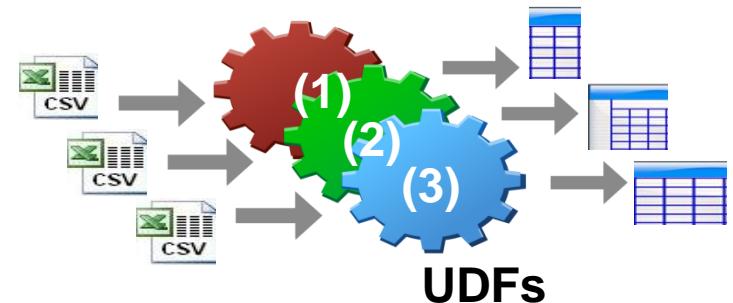
- It is a generic table UDF packaged with bigInsight
- Connect IBM BigInsights platform via REST API.
- Read a file from HDFS in delimited form and returns a table based on the schema specified in the query.
- HDFS\_READ will use the BigInsights REST API for the data transfer.
- HDFS\_READ function will take two arguments:
  - `>>-HDFS_READ--(--FILE-URL--, -option-string)------  
----><`
  - URL: Server address and path of the file in the HDFS
  - Option-string: specify "DELIMITER"

# Example CSV file with SQL

- The following is an example of a CSV file.

```
1997,Ford, E350,"ac, abs, moon",3000.00
1999,Chevy, "Venture ""Extended Edition""", "",4900.00
1996,Jeep,Grand Cherokee,"MUST SELL!
air, moon roof, loaded",4799.00
2000,Toyota,Camry,,6700.0
```

Using Generic  
table functions  
simplifies the  
analytic process!



- Example SQL statement:

```
SELECT *
FROM TABLE ( HDFS_Read('http://bigins.example.com/path/to/file.csv', '') )
AS TX (YEAR INT, Make VARCHAR(10), Model VARCHAR(30),
Description VARCHAR(40));
```

- Result

YEAR	MAKE	MODEL	DESCRIPTION
1997	Ford	E350	ac, abs, moon
1999	Chevy	Venture "Extended Edition"	(empty string)
1996	Jeep	Grand Cherokee	MUST SELL! air, moon roof, loaded
2000	Toyota	Camry	(null)

# JAQL\_SUBMIT

- JAQL\_SUBMIT function enables invocation of IBM BigInsights Jaql from a DB2 application.
  - `JAQL_SUBMIT(jaql-script, return-string, url, timeout-string)`
- **jaql-script** - contains one or more Jaql queries, with or without parameter declarations.
- **return-string** - location for the output of the Jaql script.
- **url** - of a Jaql server that accepts requests from this DB2 client, executes those queries, and returns results.
- **timeout-string** - Maximum time (in seconds) to wait for results from the Jaql server.
- Result of the function is VARCHAR(512). Upon successful completion of the Jaql script, the function returns the return-string which is the location for the output of the Jaql script so that the Jaql\_Submit UDF could be nested inside the HDFS\_Read.
- If the Jaql script fails then the empty string will be returned.

# An example

```
Select *
From Table(hdfs_read(Jaql_submit('read(hdfs("receipts.dat"))
-> transform { seller: $.Emisor.rfc,
                amount: $.Conceptos }
-> group by $seller =$.seller
    into {$seller, total:sum($.amount)})
-> write (del(location=''/tmp/test1.csv''))',
'http://kea.svl.ibm.com:8080/data/controller/dfs/tmp/test1.csv
',
'http://kea.svl.ibm.com:8080', '1000'), '') )
AS TX (seller varchar(10),
      total decfloat );
```

# What's Next

- Future Phases
  - Use Emerging Big SQL Standard
    - DB2 for zOS will interact with HDFS Big SQL environments
  - Efficient bulk data transfer from DB2 to BigInsight
  - Efficient bulk data transfer from BigInsight to DB2 tables:
    - Jaql JDBC module to insert data into zDB2 using multiple Hadoop Reduce tasks

# Section Summary

- Overview IBM BigData platform
- Use cases of integrating Bigdata with DB2 for zOS
- Functions to access bigInsight from DB2 V11
  - Generic Table Function
  - Big Data Job Submit udf based on BI REST API
  - HDFS\_Read to read file from bigInsight based on BI REST API



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- Big Data in an Information Driven economy
- Why start with System z
- DB2 for z/OS and InfoSphere BigInsights /Hadoop
- **Summary / Call to action**

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# Slashing Time to Value / Gaining deeper insights with IBM zEnterprise



Banco do Brasil purchases the **largest ever** DB2 Analytics Accelerator solution to drive customer insight from operational data. The 120-way system can hold 1.28 Petabytes of data. Queries that previously took **11 hours to run now complete in 26 seconds**, over 1500 times faster!

Banca Carige chooses System z to provide real time analytics as part of their Big Data client solution



# Implementing a Mission Critical Big Data Application



## Big Data Exploration

Find, visualize, understand  
all big data to improve  
decision making



**JOHN DEERE**

Information On Demand 2013



GPS & sensor information volumes exceeded the capabilities of the existing system. It was redesigned as an enterprise mission critical application using DB2 for z/OS and System z data sharing to now provide the availability and scalability to meet the current and future requirements for this solution.

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# Take Action Now!

## Conclusion / Call to action:

- For additional information including whitepapers and demos, please visit:
  - [IBM big data for z web site](#)
  - [Smarter Computing](#)
  - [Information Management System z](#)
- Education
  - Free online education at [bigdatauniversity.com](http://bigdatauniversity.com)
  - 70,000+ registered students
- Further developments:
  - Future webcast and announcements
  - World of DB2 for z/OS
- **Wanting to experiment on a big data integration project ? Partner with IBM Silicon Valley Laboratory. ([mtsimmon@us.ibm.com](mailto:mtsimmon@us.ibm.com) / [jacopi@us.ibm.com](mailto:jacopi@us.ibm.com))**
- **Develop your own big data strategy** –Contact your local IBM sales representative to get started.



## **New Analyst Webcast !**

**“Big Data : Past, Present and Future - *An analyst’s perspective*”**

**January 21 2014, 11:00am ET**

**Speakers : Carl Olofson IDC, Mark Simmonds IBM**

**Register here :**

**[www.ibm.com/software/os/systemz/webcast/21jan/](http://www.ibm.com/software/os/systemz/webcast/21jan/)**

**And receive this complimentary white paper :**

***“The Mainframe as a Key Platform for Big Data and Analytics”  
by Carl Olofson, IDC Analyst.***

# Useful URLs

- [ibm.com/bigdata/z](http://ibm.com/bigdata/z)
- [ibm.com/smarterplanet](http://ibm.com/smarterplanet)
- [ibm.com/software/os/systemz](http://ibm.com/software/os/systemz)

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## Big Data Strategies with DB2 for z/OS IDZ-3640

**Mark Simmonds – WW Product Marketing and IT architect**

**Joachim Limburg – Director DB2 for z/OS**

*IBM Corporation*



# Thank You

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