The IBM Enterprise Linux Server – A solution to your IT challenges

Going beyond today: Extending the platform for cloud, mobile and analytics

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Envision possibilities…

How can we better unlock the value of our data?

I want to implement analytics, but I need a fast, flexible platform…

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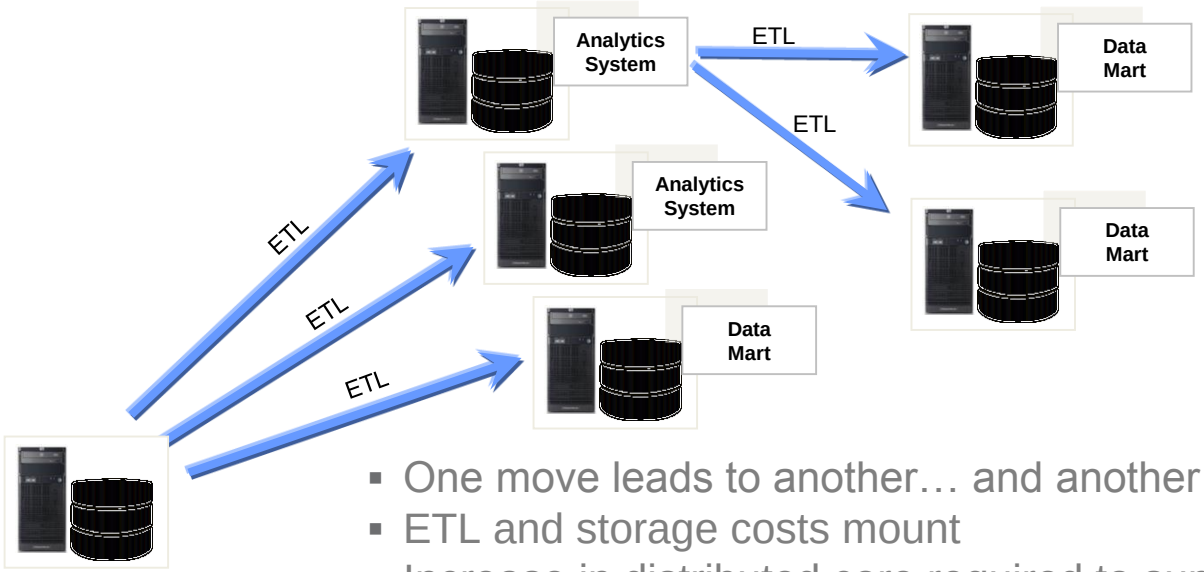
A big challenge today is "The ETL Problem"* – data is always being moved somewhere else…



- One move leads to another… and another… and another
- ETL and storage costs mount
- Increase in distributed core required to support the data
- Security may be overlooked
- Each new copy is further removed from the source – *which is the "truth"?*

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* See http://www.clabbyanalytics.com/uploads/ETLfinal.pdf

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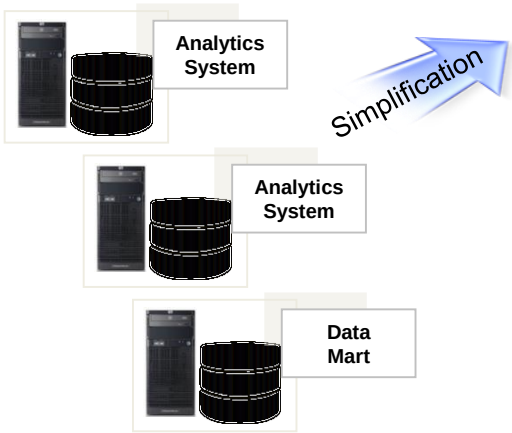
Consolidation on the Enterprise Linux Server reduces costs and improves overall agility

Consolidate the ever-growing proliferation of data copies onto a single, easily managed platform



A single platform to manage and administer

Benefits

- Concentrate data into one single source of truth
- Surround data with highest levels of security
- Simplify management
- Provide consistency to informational data
- Enable application queries on real-time data

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Consolidate Oracle on distributed servers onto ELS – save on hardware *and* software costs

- Oracle is most widely used distributed database
- Oracle is fully supported on the Enterprise Linux Server platform

IBM Case Studies	Distributed cores to ELS core
Major Transportation Company: Software costs reduced by 84%	**46 : 1**
Middle East Bank: Software costs reduced by 76%	**50 : 1**

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DB2 for Linux, Unix, and Windows (DB2 LUW) offers tremendous value

Low Cost	Simple	Reliable
Unparalleled automation, compression, and virtual appliances	*Easy Development,XML support, and virtual appliances*	*World class audit & security features, high availability, andworkload management*

"My DBAs have been playing with DB2 and they're blown away. I've got two guys who have a lot of experience with Oracle and SQL server and they were a little leery about DB2 when I hired them. But they're very happy with the capabilities and functionality so far."

— Kevin Barber, director, data systems, UA College of Pharmacy

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Enterprise Linux Server supports a complete analytics portfolio on one platform

Data Store
DB2 LUW

Big Data (Hadoop)
InfoSphere BigInsights

Business Intelligence and Reporting
IBM Cognos Enterprise

Predictive Analytics, Modeling, Scoring
IBM SPSS

BLU Acceleration
DB2 LUW

IBM Enterprise Linux Server

Optionally add IBM PureData Systems to significantly accelerate complex query times

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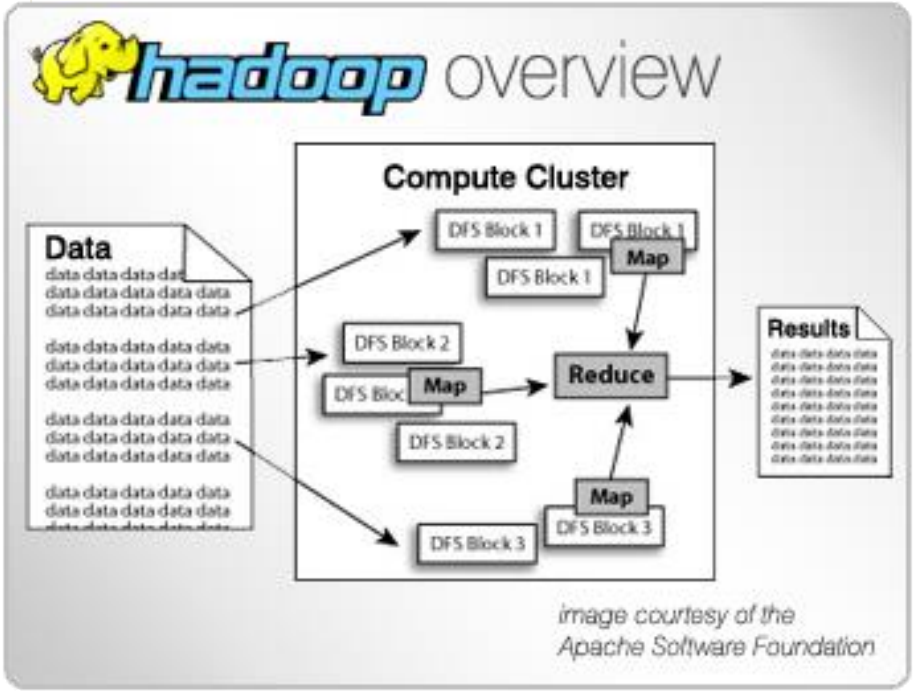
Hadoop works with DB2 to parallel process massive amounts of unstructured data

Hadoop:

- A framework for distributed storage and processing of very large data sets across clusters of Linux guests
- Takes advantage of massively parallel processing
- Uses simple programming models based on MapReduce



IBM BigInsights

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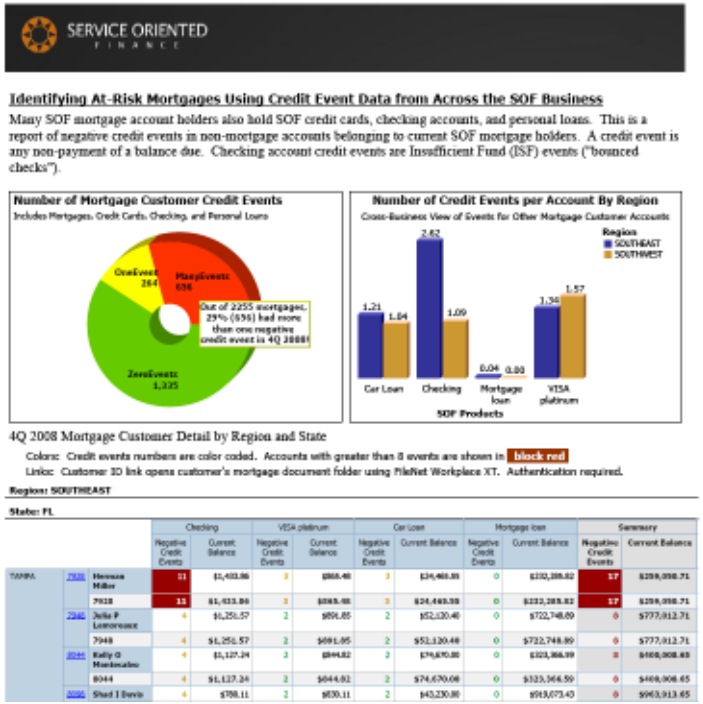
Business intelligence and descriptive analytics with IBM Cognos provides clear insight

Descriptive Analytics:

- Provides reports/dashboards
  - Aggregate and drill-down on data using different dimensional attributes such as by date, geography, demographics, etc.
- Visualize data using interactive charts, graphs, maps and other objects

IBM Cognos Enterprise



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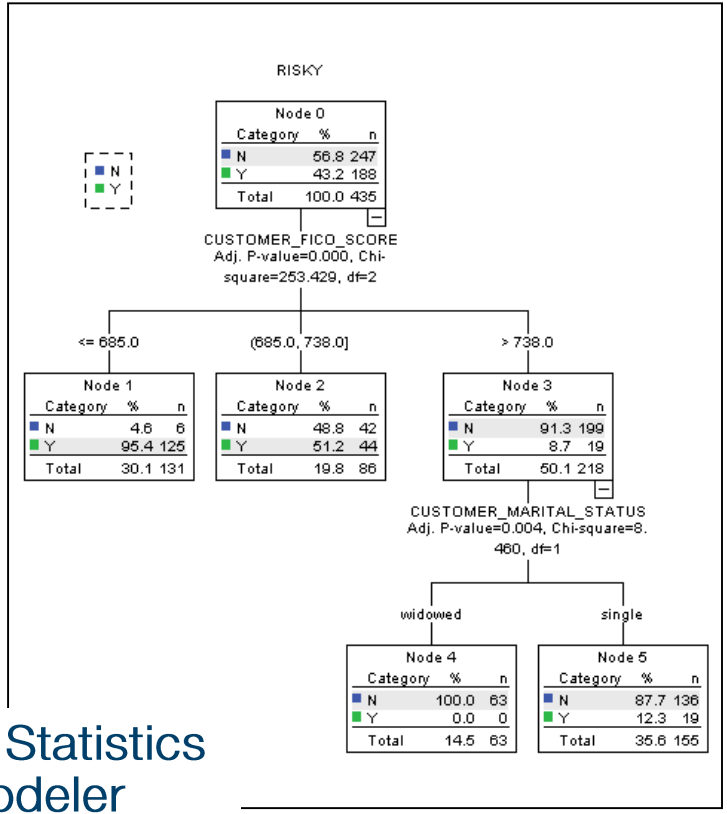
Predictive analytics truly opens up avenues for fast business insight

Predictive Analytics:

- Predicts what might happen
- Provides scores that helps in optimized decision support
  - Build models using historical data and mathematical algorithms such as clustering or classification
- Some models provide rules that can be integrated into business processes



IBM SPSS Statistics and Modeler

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Accelerate data analysis with BLU Acceleration

Fast Answers. Simply Delivered.

What is BLU Acceleration?

- In-memory analytic database integrated into DB2 LUW
- Multiple IBM innovations included
  - In-memory processing of columnar data without the limitations of memory size
  - Analyze compressed data with actionable compression
  - CPU Acceleration

BLU Acceleration

Analyze more data faster and more efficiently

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Row-organized data can be inefficient for some analytic workloads

- Analytics queries often operate on only a small number or even a single column value across a very large number of rows
- Retrieving all column values is inefficient when only a small number of columns (maybe just 1) are needed

Row Organized Customer Table

	CUST_ID	FIRST	LAST	AGE	SEX
Row 1	466	Steve	Miller	49	M
Row 2	467	Pat	Smith	32	F
Row 3	478	Tina	Jones	27	F
Row...	479	Rick	Miller	42	M
Row N	481	Tom	Smith	36	M

Each colored row represents a data page

Query:

```
Select AVG(AGE) from Customer
```

I/O

466	Steve	Miller	49	M
467	Pat	Smith	32	F
478	Tina	Jones	27	F
479	Rick	Miller	42	M
481	Tom	Smith	36	M

Not efficient!

AVG=37.2

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Column-organized data is better suited and more efficient for some analytic workloads

- BLU Acceleration organizes data into columns
  - Column values for many records are combined into “pages” and stored on disk
- One I/O operation (to disk or RAM) can retrieve a column value for many rows
- Great for analytical workloads
  - When SPECIFIC columns are accessed for MANY records
  - No indexes required – columns are essentially “self indexing”

Column Organized Customer Table

CUST_ID	FIRST	LAST	AGE	SEX
Col A	Col B	Col C	Col …	Col N
466	Steve	Miller	49	M
467	Pat	Smith	32	F
478	Tina	Jones	27	F
479	Rick	Miller	42	M
481	Tom	Smith	36	M

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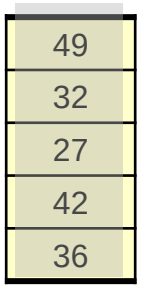

AVG=37.2

Very Efficient!

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Envision possibilities…

How can I make running our business more agile and fast?

Should I move my deployments to a cloud platform?

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Cloud computing can be implemented in different ways

We need a platform that meets these requirements…

Elastic and scalable
Easy to administer
Easy to use
Always available
Very secure
Fast
Pay-as-you-go feature
Meets client service requirements
Runs what clients want

Private or public? Some workloads or all workloads? How do we decide?

- Low cost of entry
- **Pay-per-use**
- **Elastic**

Off-Premises
(Public Cloud)

- **Fully customizable**
- **Owned and managed**
- **Secure by design**

On-Premises
(Private Cloud)

Use a fact-based, best fit approach!

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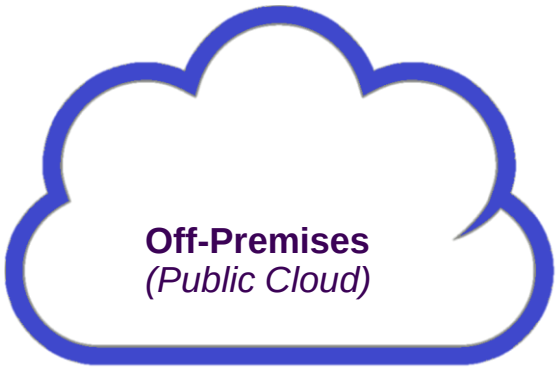
Public clouds can be appropriate for some types of distributed workloads



- Applications with data that is NOT extremely sensitive, or mandated to be on-site for company or government security reasons
- Applications that are priced per user, not per core
- Eliminate the function/service internally and/or take advantage of a richer, external offering
  - E.g., BlueMix hosted on Softlayer (for app development, Twitter data mining, etc.)

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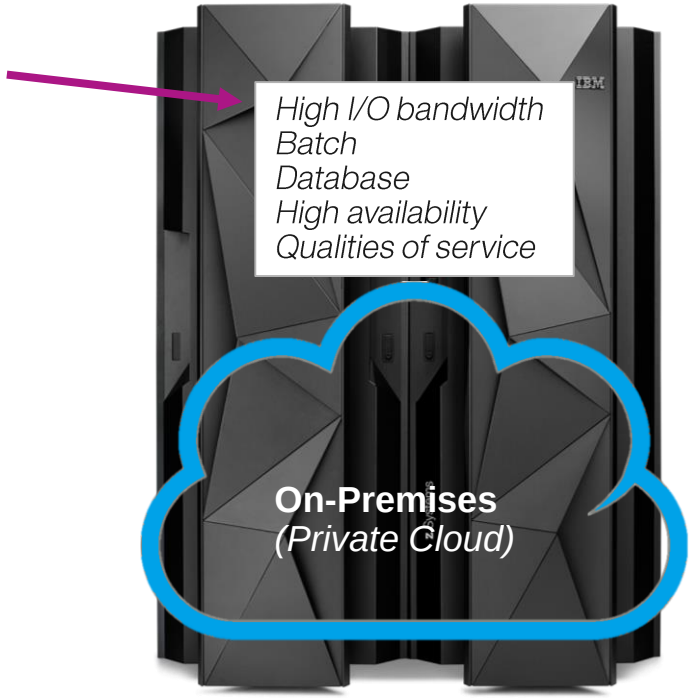
Some distributed workloads are best fit on secure private cloud platforms…

… on Enterprise Linux Server!

- Platform design imperatives mean many types of workloads are best fit on Enterprise Linux Server
- Workloads priced by core are typically much cheaper on Enterprise Linux Server
  - E.g., Oracle
- Enterprise Linux Server is designed for consolidation of large numbers of low utilization servers



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Centralizing the private cloud on Enterprise Linux Server has huge advantages

- Designed to run huge numbers of workloads
- Most secure, most complete virtualization infrastructure
- Mature workload management guaranteeing service requirements
- Always available, completely reliable, and cost efficient
- Supports applications for easy deployment and management of all types of workloads, including complex business workloads

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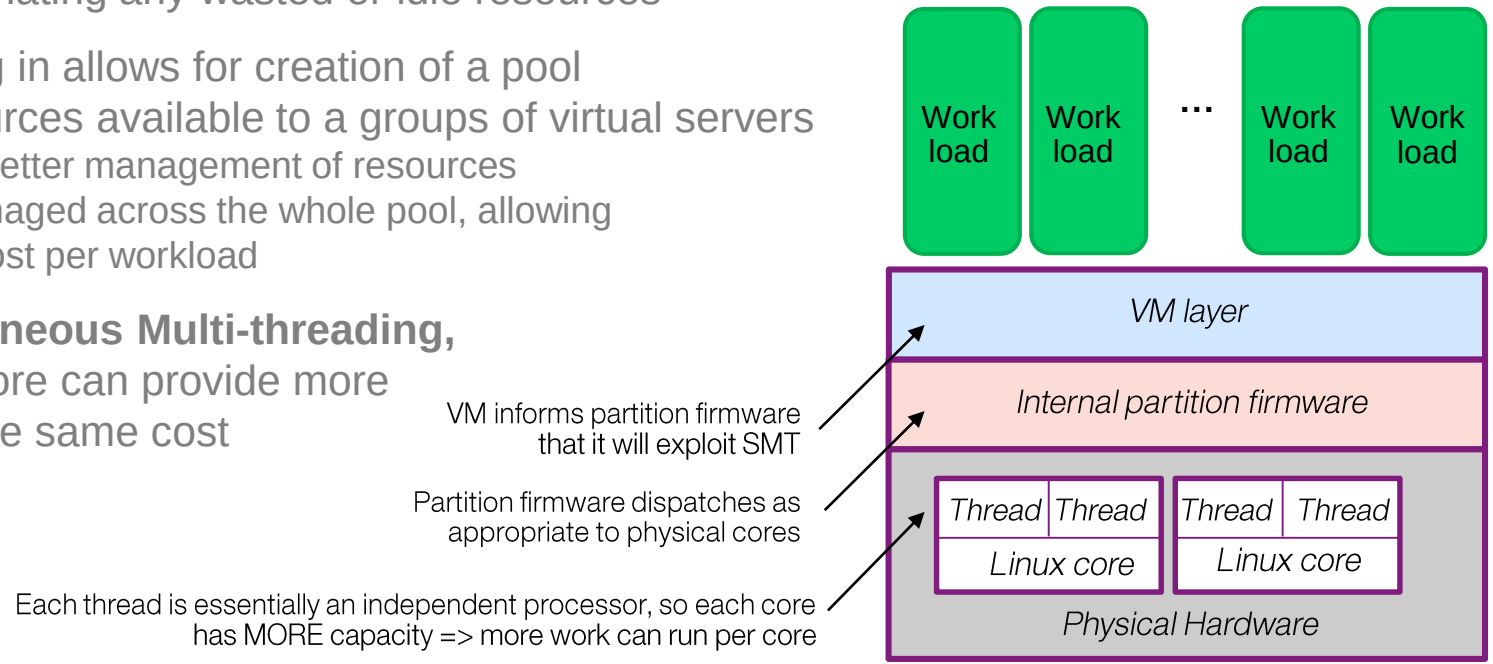
Several factors help make ELS a cost effective platform for private cloud computing

- Consolidation of many workloads drives system **utilization** to very high levels – virtually eliminating any wasted or idle resources
- **CPU Pooling** in allows for creation of a pool of CPU resources available to a groups of virtual servers
  - Allows for better management of resources
  - Cost is managed across the whole pool, allowing for better cost per workload
- With **Simultaneous Multi-threading,** each Linux core can provide more capacity at the same cost



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OpenStack is open source cloud computing software

- Open, Modular Design
  - Flexible architecture with open components enables options
- Vendor Interoperability
  - High quality, multi-vendor & user community = freedom from lock-in
- Rapid Innovation
  - Large community effort enables faster developmental effort

Platinum Sponsors

nebula, rackspace, redhat, suse, IBM, hp, at&t, ubuntu

Gold Sponsors

NetApp, CISCO, YAHOO!, DreamHost, Cloud Computing Association in Taiwan, intel, DELL, JUNIPER NETWORKS, MIRANTIS, MORPHLABS, vmware, ERICSSON, cloudscaling, NEC, Piston Cloud Computing, eNovance Cloud & Managed Services Provider

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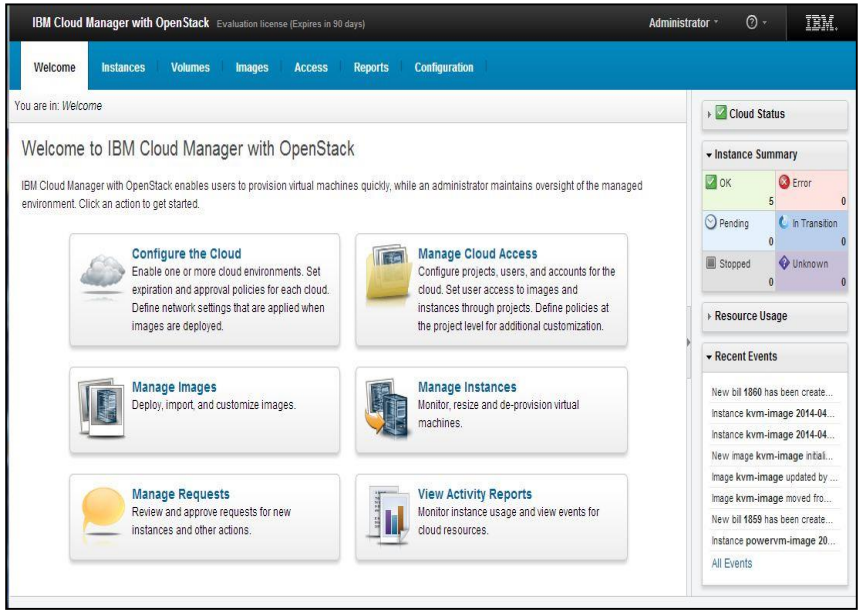
IBM Cloud Manager with OpenStack includes self-service provisioning and management…

…for a first-class private cloud on Enterprise Linux Server

- Easy to deploy and use cloud management software based on OpenStack
- Self-service portal with role-based access control
- Automated provisioning of virtual servers and virtual image management
- Monitoring & metering, resource expiration and project approval policies
- Supports all major hypervisors



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IBM provides a set of custom patterns to quickly deploy complex cloud workloads on ELS

- Standardizes and automates deployment to reduce errors/fix
- Reduces need for deep product skills
- Improves quality of delivery
- Reduces labor costs

12 patterns
for key middleware portfolio

WAS Network Deployment
WAS Liberty
ODM Decision Server
ODM Decision Center
Integration Bus
DB2

Business Process Server
Business Process Center
Business Monitor
WebSphere Portal
WebSphere MQ
MobileFirst Platform

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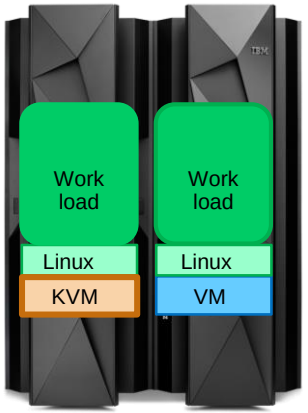
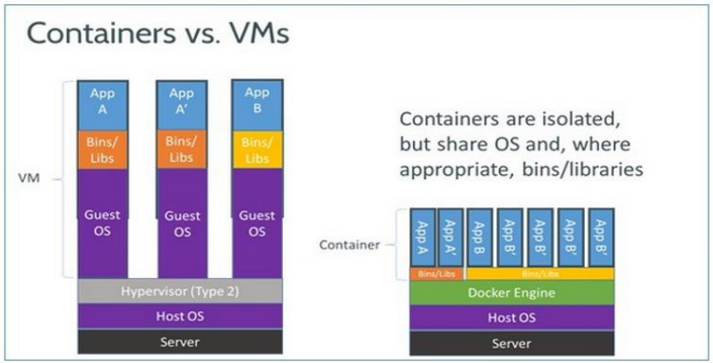
IBM continues to update and open the Enterprise Linux Server platform

- IBM announced support for **KVM** (Kernel-based Virtual Machine)*
  - Offers an alternative to current VM virtualization layer
  - Familiar, open source virtualization software



- IBM also announced intension to support **Docker***
  - An open-source project that automates the deployment of applications inside software containers
  - Provides an additional layer of abstraction and automation of operating system–level virtualization on Linux**



* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only

** Source: Wikipedia

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Packaged solution enables easy, low-cost adoption of cloud computing

openstack™

IBM Enterprise Cloud System

Builds on top of IBM Enterprise Linux Server

Adds storage and cloud management software

Includes trusted, 24/7 IBM Support

- Factory Integrated
- Delivered in 45 Days
- Rapid production deployment

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Envision possibilities…

Is my business ready
for the mobile revolution?

What's the best technology
for supporting and managing
mobile computing?

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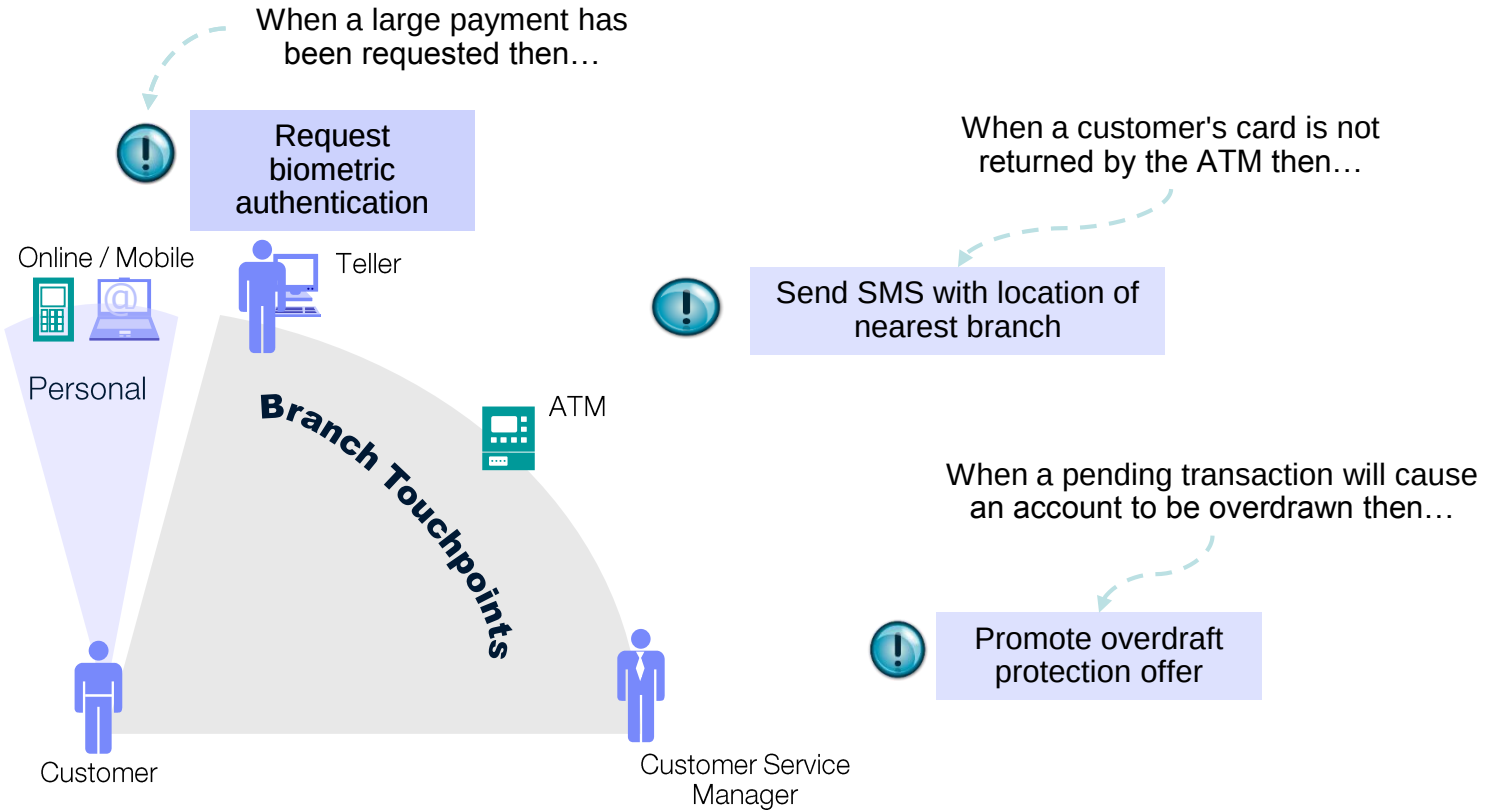
Mobile is changing the way customers interact – yielding far more possibilities for business



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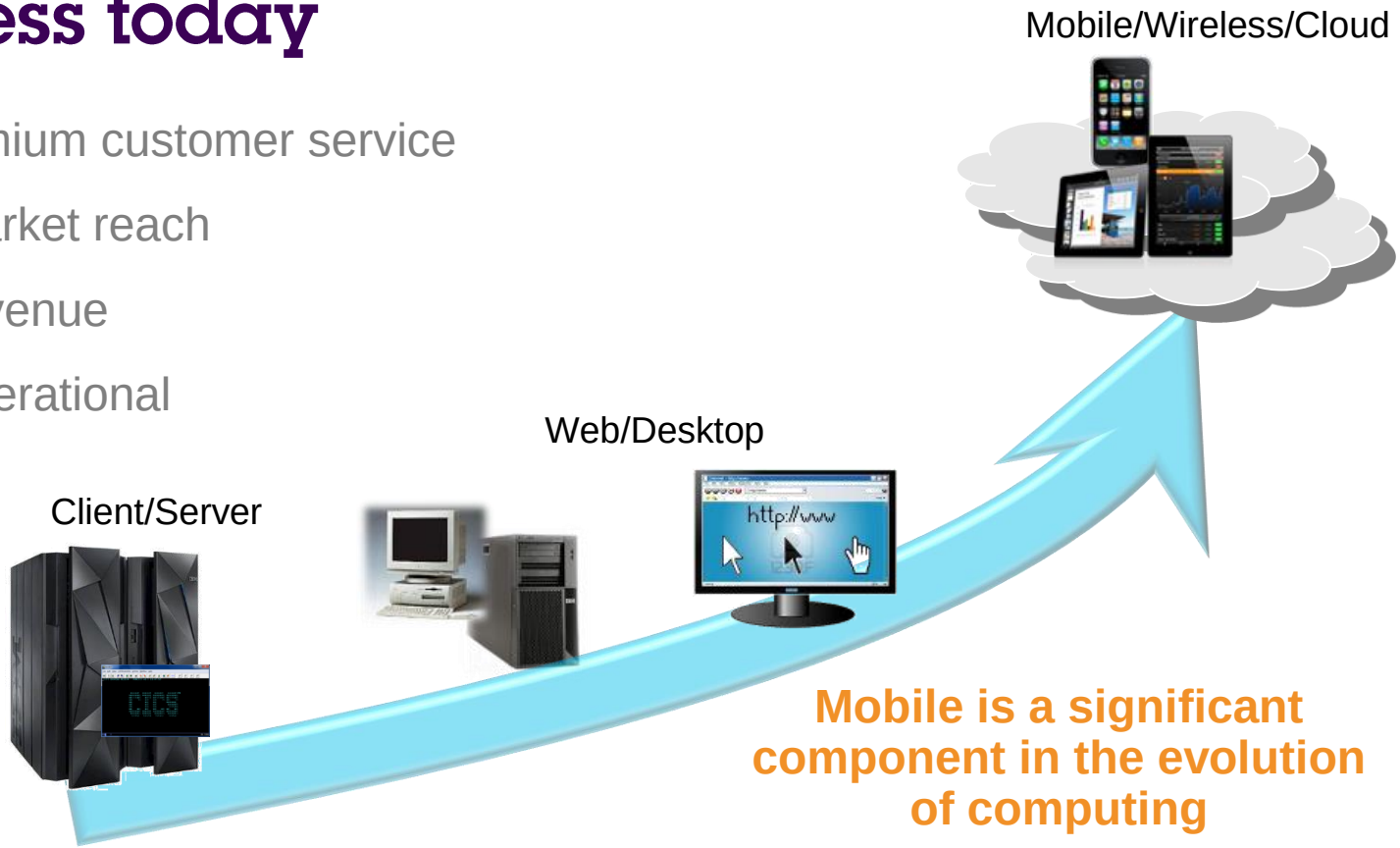
A mobile strategy is critically important to business today

- Enables premium customer service
- Broadens market reach
- Increases revenue
- Increases operational efficiency



Mobile is a significant component in the evolution of computing

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But the mobile revolution will put huge demands on business and IT – *are you ready?*

- Inconsistent peaks 24/7 are common
- Increased system load
- New versions of apps occur weekly vs. yearly
- Development, control and support of apps and multiple devices is not standard
- Security and privacy are paramount

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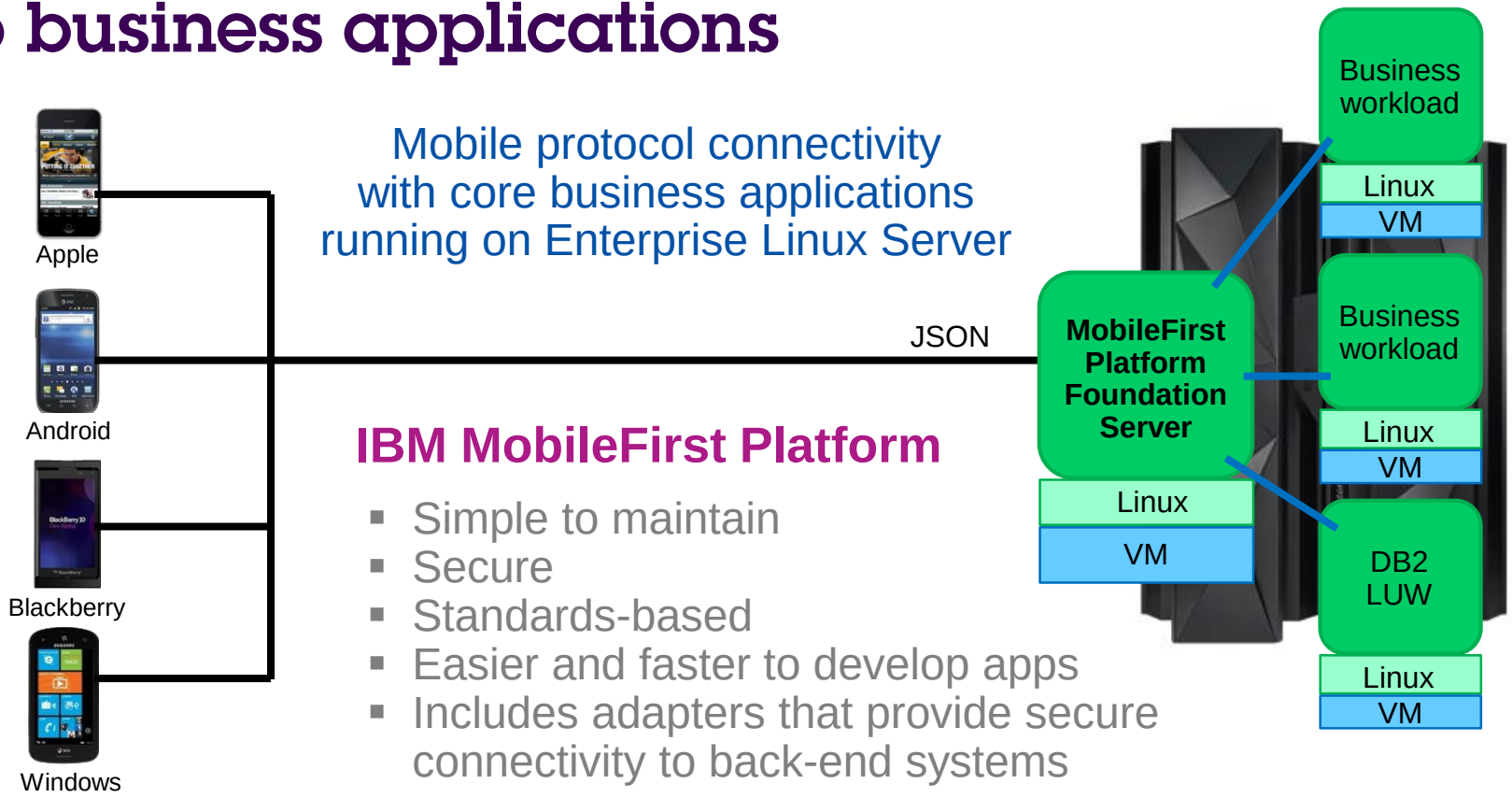
MobileFirst provides centralized connectivity to business applications



IBM MobileFirst Platform

- Simple to maintain
- Secure
- Standards-based
- Easier and faster to develop apps
- Includes adapters that provide secure connectivity to back-end systems

JSON stands for JavaScript Object Notation

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Envision possibilities…

How can I extend the Linux platform to add additional capability?

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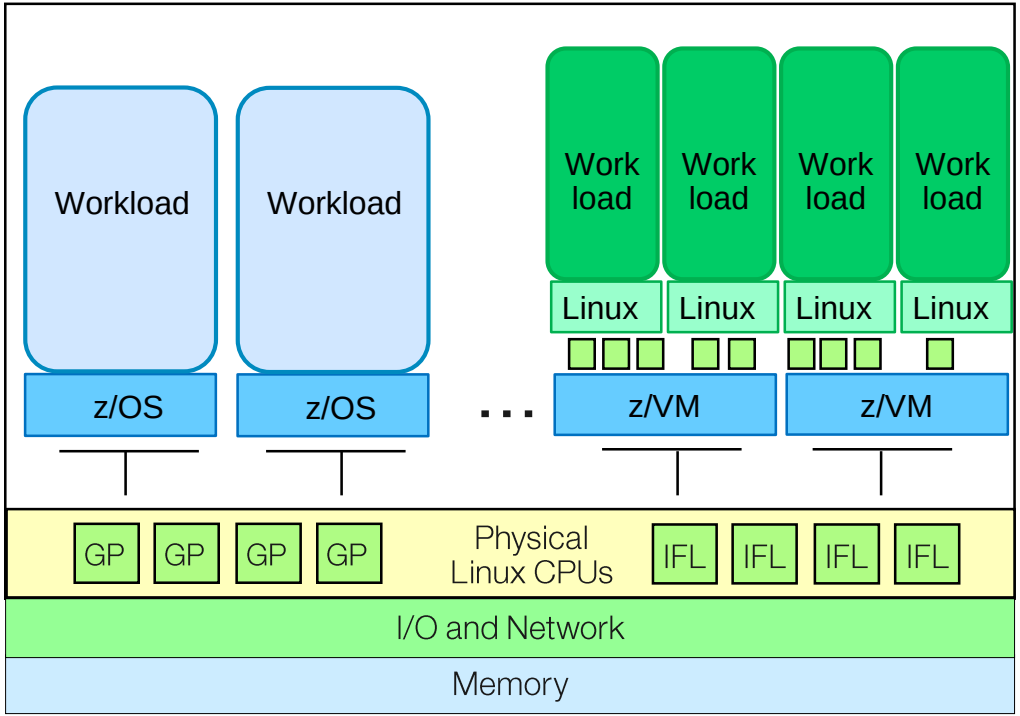
Extend the Linux platform to include z/OS workloads

- Linux workloads can run alongside traditional enterprise workloads on a single centralized mainframe platform
- Run DB2 for z/OS instead of DB2 LUW for a superior business database management system



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DB2 for z/OS is an optimized, first class platform for operational as well as deep analytics

Many concurrent queries of varying complexity

- DB2 Cost Based Optimizer provides best access path and query execution plan
- z/OS Workload Management optimizes resource sharing to minimize impact on high priority workloads

Intermediate and complex analytical queries

- Data is partitioned to increase parallelism and compressed to increase I/O performance
- DB2 Cost Based Optimizer decides best execution plan for each query
  - Complex queries may be decomposed into parallel operations
  - Queries may be automatically rewritten to take advantage of pre-computed partial results in materialized query tables (MQT)

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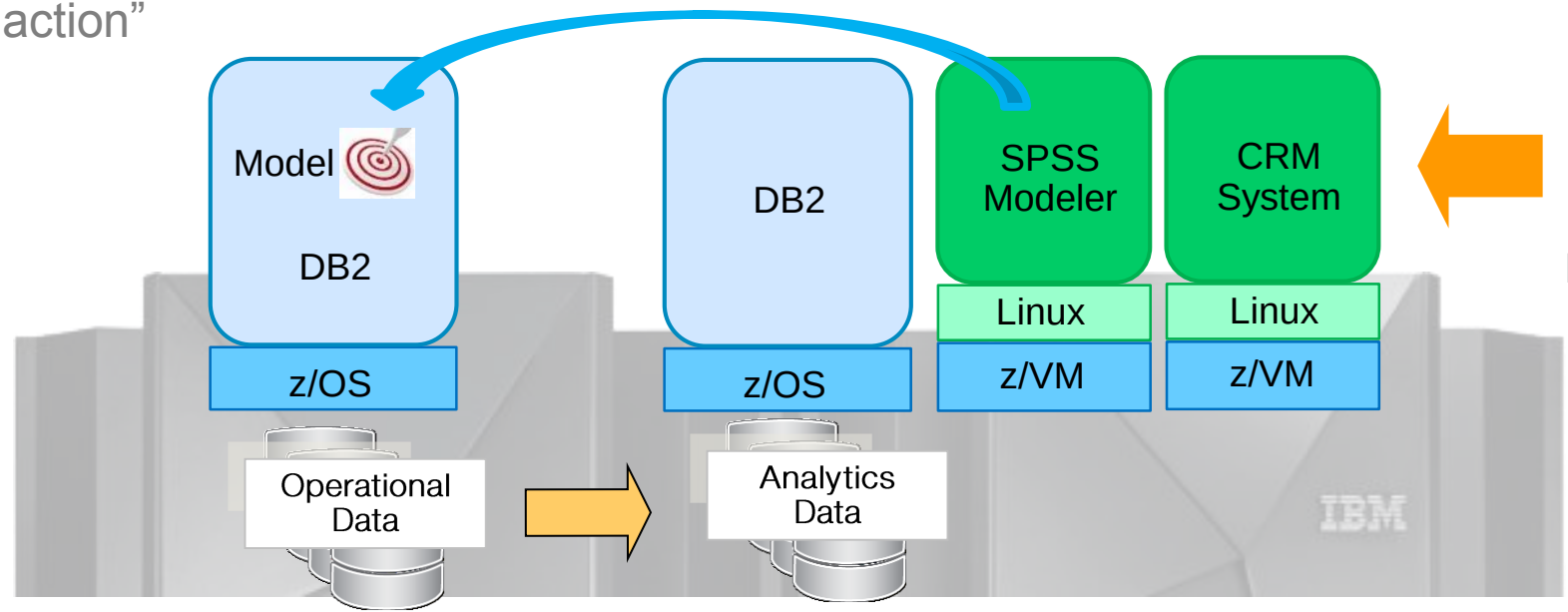
Predictive analytics feeds into in-transaction scoring to improve business outcomes

- Instantaneous and accurate decision based on real-time information or events
- Reduce risk by putting high risk customers on “watch”
- Increase satisfaction of valued customers by providing offers using “next-best action”



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Add IBM DB2 Analytics Accelerator to significantly speed up complex analytics queries

Breakthrough technology enabling new opportunities

- A workload-optimized, blade-based appliance based on Netezza Technology that runs queries in seconds versus hours
  - Storage integrated into the hardware rack
  - Eliminate table indexing and query tuning
- Integrated with DB2 for z/OS, and transparent to applications
  - Pre-load data from DB2 for z/OS into Accelerator at over 4.5 TB/hr
  - Maintain a single copy of data in Accelerator and update incrementally
- Significantly speeds up the response time
- Drives down the costs of data warehousing and business analytics

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DB2 and the Analytics Accelerator score a big win over the competition

Standalone
Pre-integrated
Competitor V4

$151

per Report per Hour
(3yr TCA at discount)

(75% on software,
50% on hardware)

Full Unit

z13 with 1GP
+ 3 zIIP

IBM DB2 Analyti
Accelerator
(N3001-010)

IBM z Systems

$40

per Report per Hour
(3yr TCA at no discount)

2x Better performance

3.8x Better price performance

Estimated for systems compared

Estimated Workload Time*	226 mins
Reports per Hour	42,787
Competitor Full Unit (HW+SW+Storage) using discounted pricing	$6,451,161

Workload Time	105 mins
Reports per Hour	92,095
z13 (1 GP + 3 zIIP, HW+SW+ Storage) + Accelerator V4.1 with PDA N3001-010 hardware	$3,652,131

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* Competitor Full Unit workload time estimated from Eighth Unit measurements assuming perfect linearity. Actual results will vary.
Comparing test results of an IBM zEnterprise Analytics System 9700 with an estimated performance on competitor full unit configuration (version available as of 12/31/2014), for a materially identical 10 TB BIDAY "Fixed Execution" workload in a controlled laboratory environment. BIDAY "Fixed Execution" workload measures elapsed time for executing 161,166 concurrent reports using 80 concurrent users. Intermediate and complex reports are automatically redirected to IBM DB2 Analytics Accelerator for z/OS (powered by N3001-010 hardware or Mako).. Price comparison of 3YR Total Cost of Acquisition (TCA) based on U.S. prices current as of December 31, 2014, including hardware, software, and maintenance. Used discounted pricing for competitor with 50% hardware discount and 75% software discount. Compared prices exclude applicable taxes, and are subject to change without notice. Competitor configuration: Full Unit including competitor recommended software options and features. IBM configuration: z13 platform with 1CP and 3 zIIPs with 128GB memory and DB2 Analytics Accelerator Full Rack (N3001-10) with 7 S-blades (140 Intel E5-2680v2 2.8GHz cores and 128 GB RAM), 2 Hosts (1 active – 1 passive) with 20 Intel E5-4650v2 2.4GHz cores each and 12 disk enclosures, each with 24 600GB SAS drives . Results may not be typical and will vary based on actual workload, configuration, applications, queries and other variables in a production environment. Users of this document should verify the applicable data for their specific environment.

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Kenya Power taps IBM to implement an integrated data-warehousing/analytics solution

Consolidates its IT assets
to better support business operation

Achieves better control
of business performance

Meets the requirements
established by the government

Business challenge: With scattered data in disparate systems, Kenya Power and Lighting Co. Ltd. lacked an efficient data-warehousing and reporting solution, which caused poor data quality and a high incidence of fraudulent energy use.

Solution: Kenya Power implemented IBM zEnterprise Analytics System 9710 solution, IBM Information Management and IBM Business Analytics software to build an integrated data-warehousing and analytics solution. IBM Global Business Services – Business Consulting Services delivered KPI replacement.

Solution components

Services
IBM® Global Business Services® – Business Consulting Services

Hardware
IBM zEnterprise® BC12 (zBC12)
IBM System Storage® DS8870

Software
IBM InfoSphere® DataStage®
IBM InfoSphere QualityStage®
IBM Cognos® Business Intelligence
IBM SPSS® Modeler
IBM DB2® for z/OS®

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eThekwini Municipality (South Africa)

Business challenge

Aiming to modernize its user interfaces, the Municipality wanted an open system backed by enterprise-class support, and offering very high availability and performance.

Solution

Upgraded to an IBM z114 with 5 Linux cores (SUSE Linux Enterprise Server) and one processor running z/OS

"…if we put the SUS Linux Enterprise Server workload on Windows instead, we would need at least 30 production servers and 30 servers for Disaster Recovery, each with OS and software licenses. Instead, we need to license just five IFLs for SUSE Linux Enterprise Server… Naturally, there are also significant energy savings in consolidating to our z114 than running a distributed Windows landscape."

- Roney Moodly, Deputy Head, Service Delivery at eThekwini Municipality

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Envision possibilities…

With the Enterprise Linux Server, I have lots of options for new and exciting workloads…

…including analytics,
cloud and mobile computing

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