

A decorative graphic in the top left corner consists of several overlapping circles of various colors (yellow, orange, red, purple, blue) that are divided into segments, resembling a stylized sun or a cluster of data points.

# DB2 for z/OS

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# Agenda

- How DB2 fits with changing industry demands
  - Cloud, Analytics and Mobile
- DB2 11 overview and business value
- Looking ahead to DB2 Cypress
- Wrap up with Q&A



# Market Opportunities and Challenges

## Incorporating Big Data



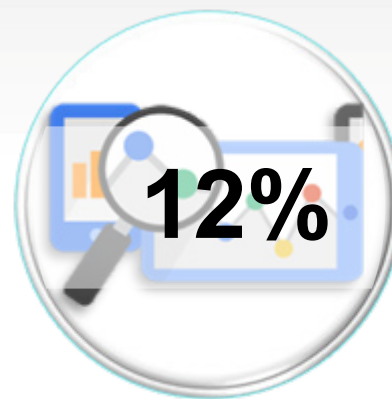
*...into their normal operations are planning to use data integration and data warehouses to do it <sup>(2)</sup>*

## Cloud/Mobile Ready



*...software will be built for cloud delivery in 2014 <sup>(3)</sup>*

## Data Analyzed



*... of the data companies already have, leaving 88% of it on the cutting-room floor <sup>(4)</sup>*

## Infrastructure Ready



*...organizations fully prepared for new digital trends like cloud, mobile, social and analytics (CAMS)<sup>(1)</sup>*

### Sources

1. Gartner, "Big Data Adoption in the Logical Data Warehouse", Mark A. Beyer | Ted Friedman - Date published : 02/07/2013
2. IDC, "Directions 2014, Information is Everywhere", Robert Mahowald, Date published: 03/17/2014
3. Forrester, "The Forrester Wave: Big Data Hadoop Solutions" Mike Gualtieri and Noel Yuhanna, Date published: 02/28/2014
4. IBM\_Institute\_for\_Business\_Value - Date published : 09/01/2014




# DB2 for z/OS Strategic Roadmap

Support the next wave of applications ....




## Analytics

Real time analytics  
integrated with OLTP



## Mobile

Easy app  
development,  
Enterprise mobile  
scale



## Cloud

Self provisioning,  
Multi-tenancy, Self  
managing,  
guaranteed SLAs

while enhancing the unique value of System z



# Enterprises Rely on information in DB2 for z/OS

66 out of the top 66 banks in the world

9 of the top 10 global life/health insurance providers

24 of the top 25 US retailers



Up to 4.8M connected threads



Zero unplanned downtime for over 11 years



World's largest SAP system



World's largest known peak RDBMS workload  
1.1 Billion SQL statements per hour



620M accounts, 120M online users



World's largest banking benchmark result, a record 9,445 transactions per second

Land Registry  
Cymraeg



World's largest known transaction processing RDBMS >40 TB



# Driving the Future



*The last 20 years we've had zero downtime during the holiday shopping season and you know that's a key testament to not only the way VisaNet was architected but the partner we have in IBM."*

*Jim McCarthy, SVP Visa Inc.*

***"At WalMart, we have been doing Big Data on the Mainframe long before anyone ever starting talking about Big Data"***



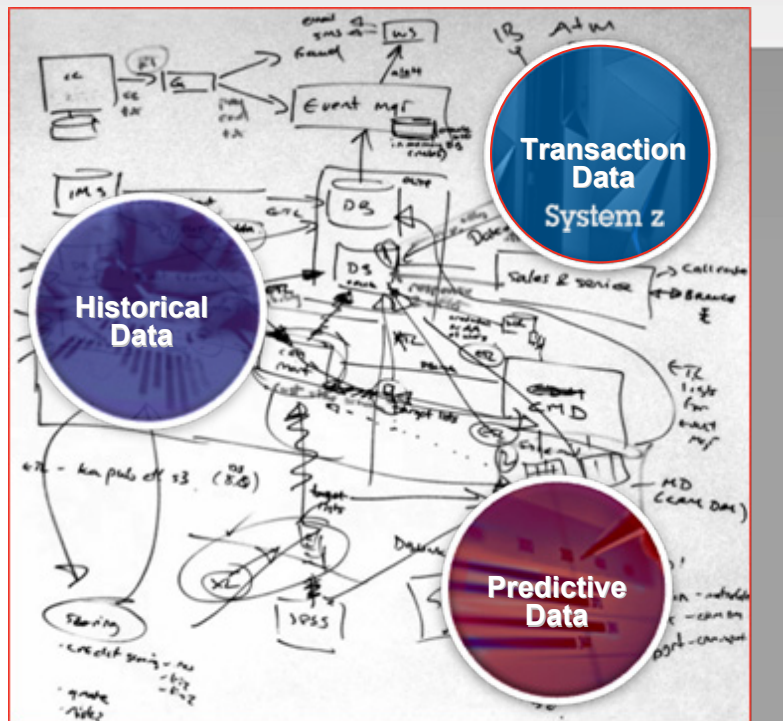
**RANDY FRERKING**  
ENTERPRISE TECHNICAL EXPERT  
WALMART



***What took days now takes minutes using the DB2 Analytics Accelerator. We have never before seen such an instant change to our business model.***

***Eric Smith, CEO Swiss Re Americas***

# Challenges with traditional analytics processing



## Significant complexity

Data is move from operational databases to separated data warehouses/data marts to support analytics

## Analytics latency

Transactional data is not readily or easily available for analytics when created

## Lack of synchronization

Data is not easily aggregated and users are not assured they have access to “fresh” data. Logistics are difficult.

## Data duplication

Multiple copies of the same data is proliferated throughout the organization. Security exposure is magnified.

## Excessive costs

An IT infrastructure that was not designed nor can support real-time analytics

**60-80% of operational data resides on System z**

# Clients find value in running analytical and transactional on one platform

## Extract, Transform and Load (ETL)

### Multiple copies of data

Redundancy, inconsistency, complexity and cost

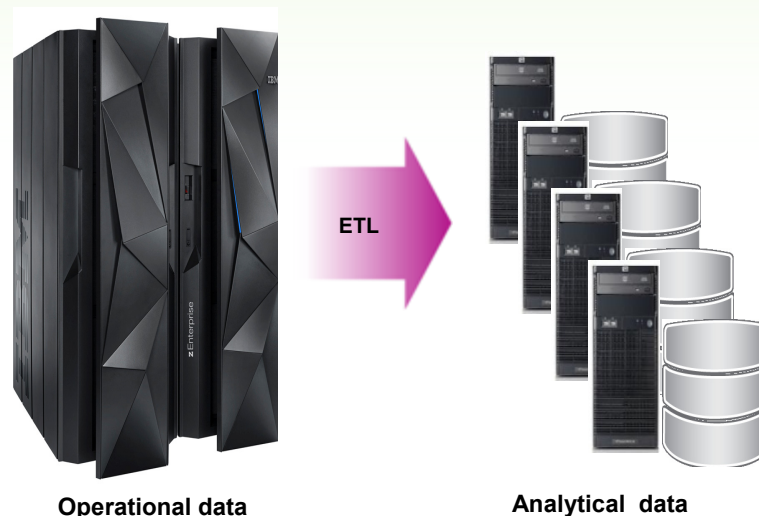
### Significant compute power

Increases cost

### Transaction and analytics isolation

Increases time to insight

1TB ETL per day, Initial copy plus three derivatives costs **>\$8 million** over 4 years

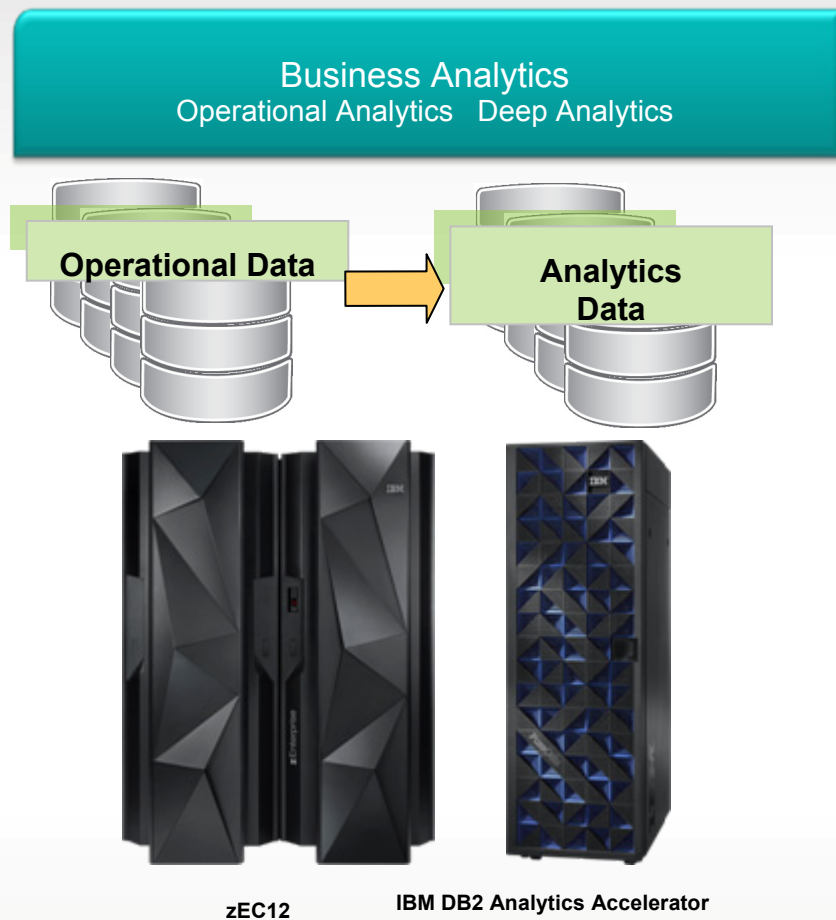


Clients report using 30% - 40% of System z cycles to move data

With this strategy, IT costs grow faster than business growth



# *The best fit solution - Move analytics closer to the data*



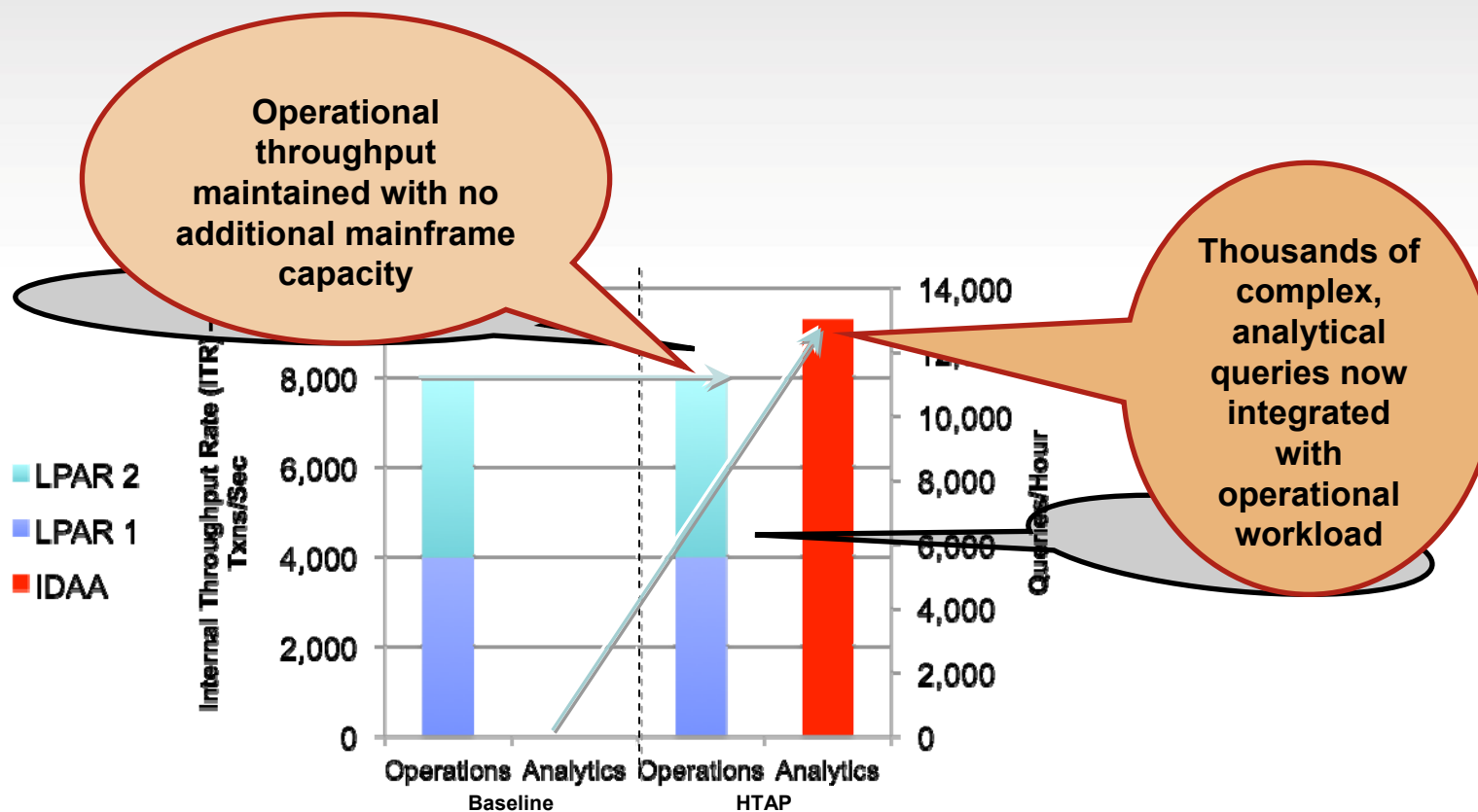
**Real-time “transactional analytics” increases customer value with every interaction:**

- Increase strategic lifetime value, profitability, and loyalty
- Improve delivery of service and customer satisfaction
- Increase revenue generating actions, such as up sell, cross sell and retention
- Optimizes applicable events that drive enterprise business



# HTAP operations and analytics co-location

## Benchmark Results



# Summary and Key Takeaways

- **Many organizations are trying to deliver instantaneous, on-demand customer service** with IT systems designed to provide after-the-fact intelligence
- **Achieving insight with every transaction demands** a holistic implementation of an integrated data lifecycle with business-critical systems
- **System z has the vision, strategy and technology** to fuse transactions and analytics by eliminating the latency and complexity pitfalls that develop with a distributed approach
- **Truly transformational business opportunities** require truly transformational infrastructure - and that infrastructure is System z





# Why Deploy Clouds on System z



## Optimized Workload Deployment

- Increased efficiency for workload deployment
- “Shared everything” architecture
- Consolidates monitoring and performance management
- Deploy on the best suited platform
- Multiple O/S Support for Heterogeneous clouds



## Secure Infrastructure with Security Built in

- Highest security rating
- Each processor has its own cryptographic coprocessor
- End to End encryption
- Hypervisors managed as firmware
- Unparalleled audit and compliance capabilities

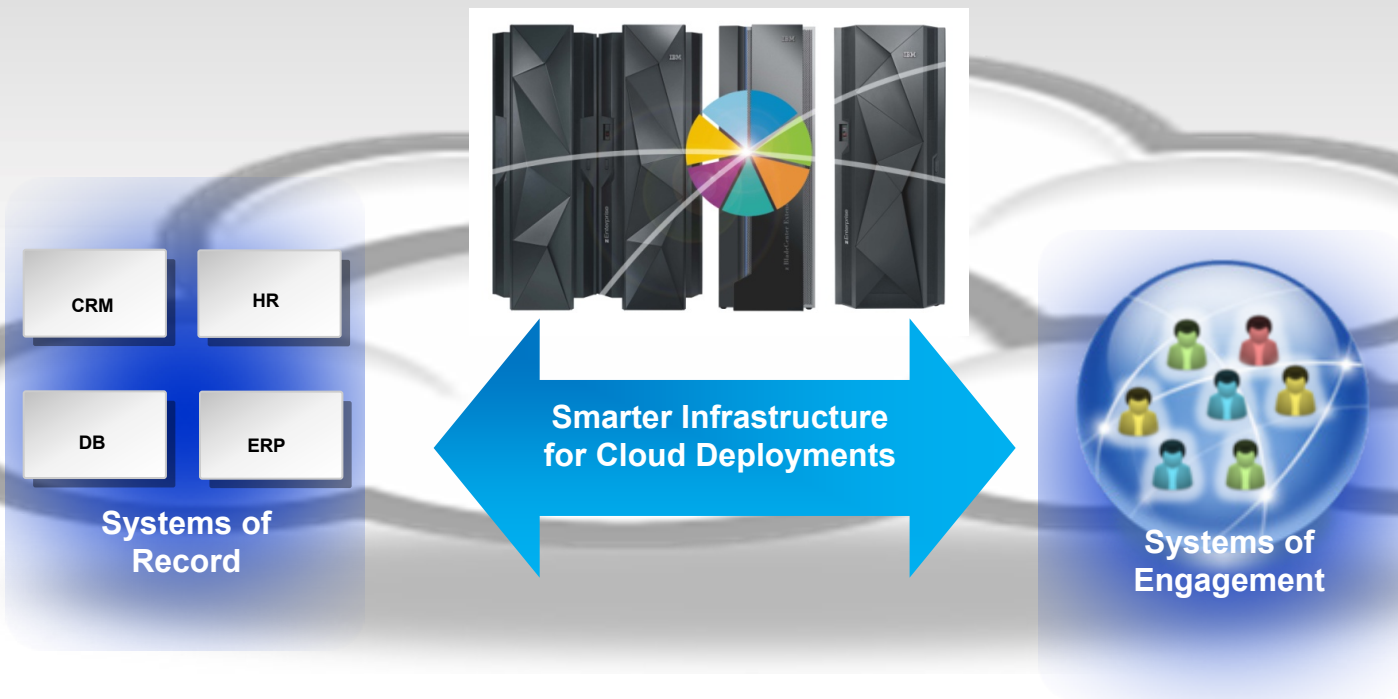


## Resilience with RAS designed in

- Engineered to rarely fail and to rapidly recover
- Built in hardware redundancy
- High degrees of elasticity / scalability
- Guaranteed application performance (QoS)
- Active monitoring for abnormal behavior



# Cloud Operating Environment



### Workloads

- Transactional
- Analytics
- Structured Data
- Audit & Regulatory Compliance

***State-full***

### Workloads

- Mobile
- Social Applications / Collaboration
- Unstructured Data
- Internet of Things

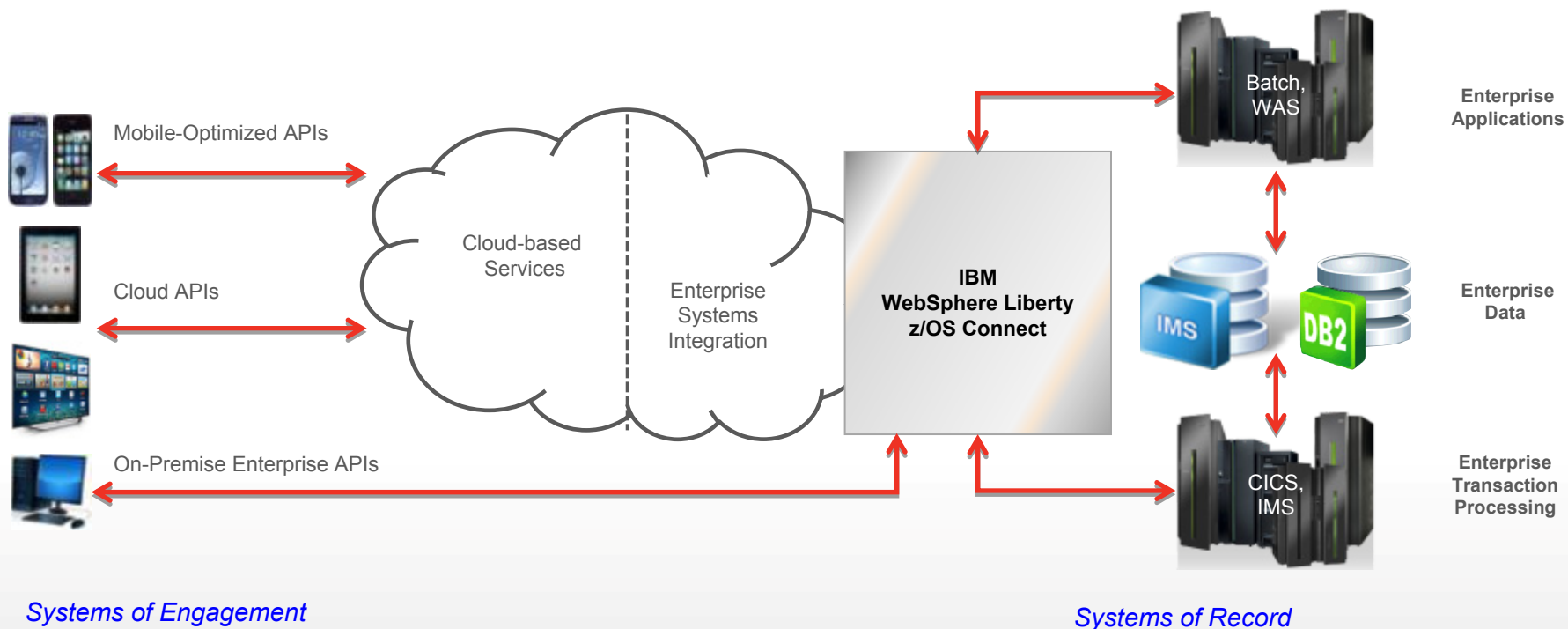
***State-less***

zEnterprise will play a vital role in both Systems of Record and Systems of Engagement



# **z/OS Connect - *Mobile integration simple and secure***

*IBM WebSphere Liberty z/OS Connect* – Shipped with WAS, CICS, and IMS  
*Unifies z/OS connectors* – a common solutions for mobile, cloud, and web  
*Simplified integration* – discover, manage, securely access z/OS assets

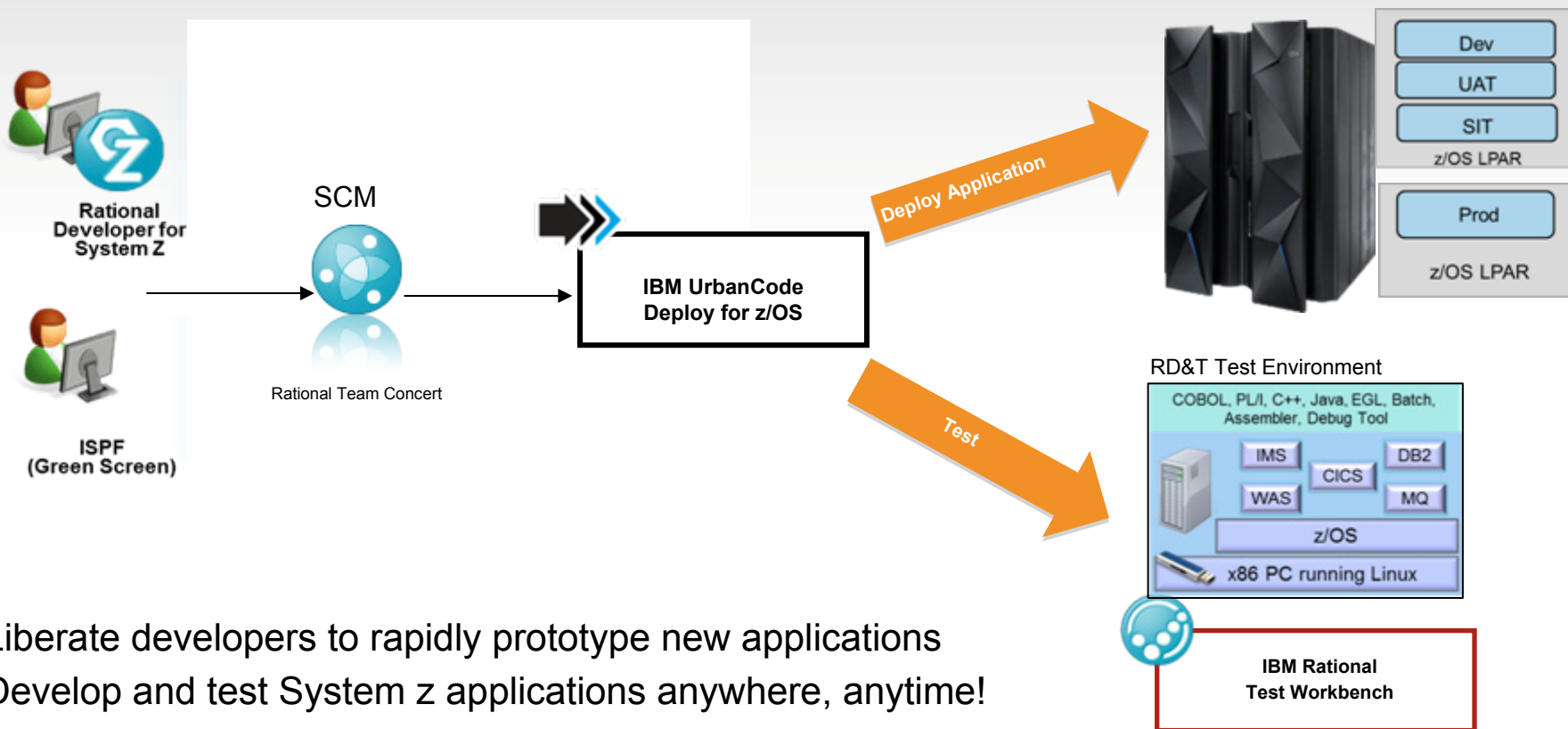


*Systems of Engagement*

*Systems of Record*

# Developer Self Service

IBM UrbanCode Deploy extends provisioning for Systems of Record



- Liberate developers to rapidly prototype new applications
- Develop and test System z applications anywhere, anytime!
- Free up mainframe development MIPS for production capacity
- Eliminate costly delays by reducing dependencies on operations staff

# Mobile Is Changing Interactions And How Work Gets Done

## People are transacting on mobile

The average mobile phone user checks their phone 150 times a day

## This data is helping organizations deliver new value

By 2020, 90% of new passenger cars sold will have some form of vehicle mobile platform, up from 10% in 2012.

## But the experience of mobile is not yet meeting expectations

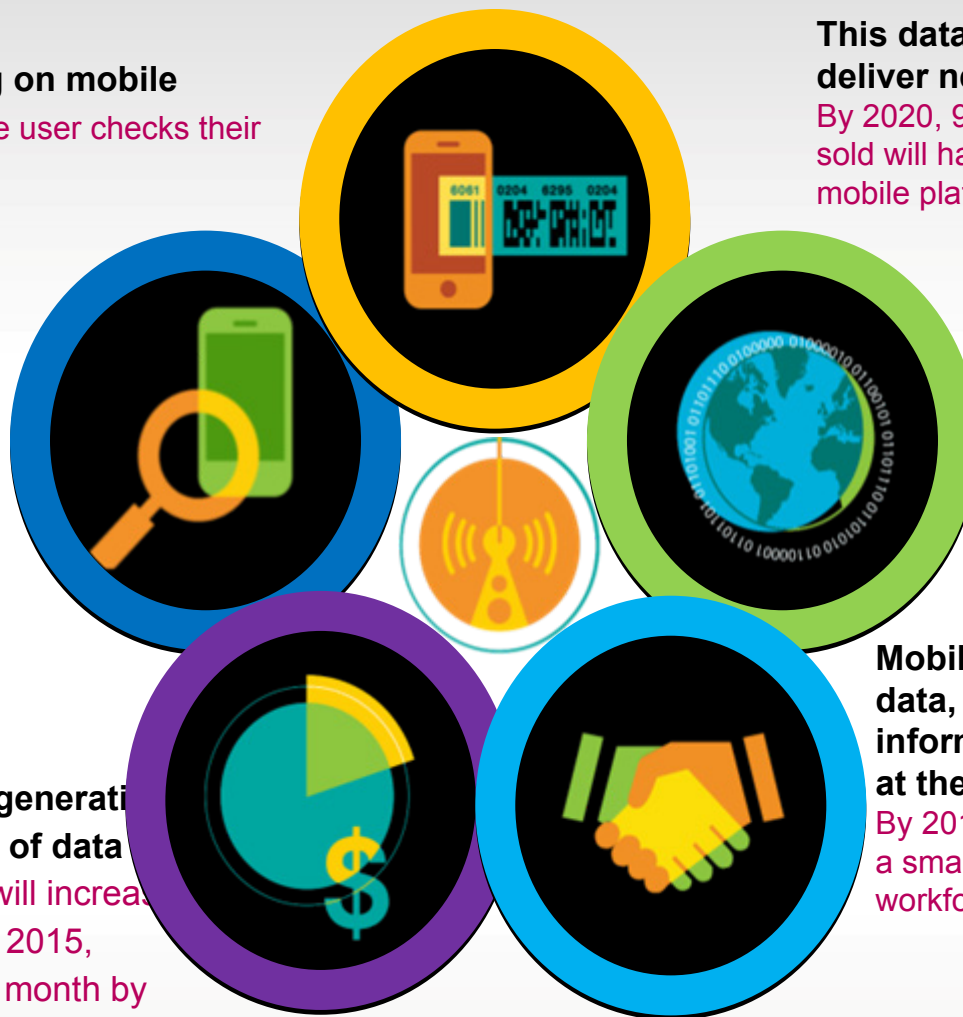
80% of apps are used once then deleted

## Mobile transactions are generating unprecedented amounts of data

Global mobile data traffic will increase 26-fold between 2010 and 2015, reaching 6.3 exabytes per month by 2015

## Mobile enterprises leverage this data, putting the right information into the right hands at the right times

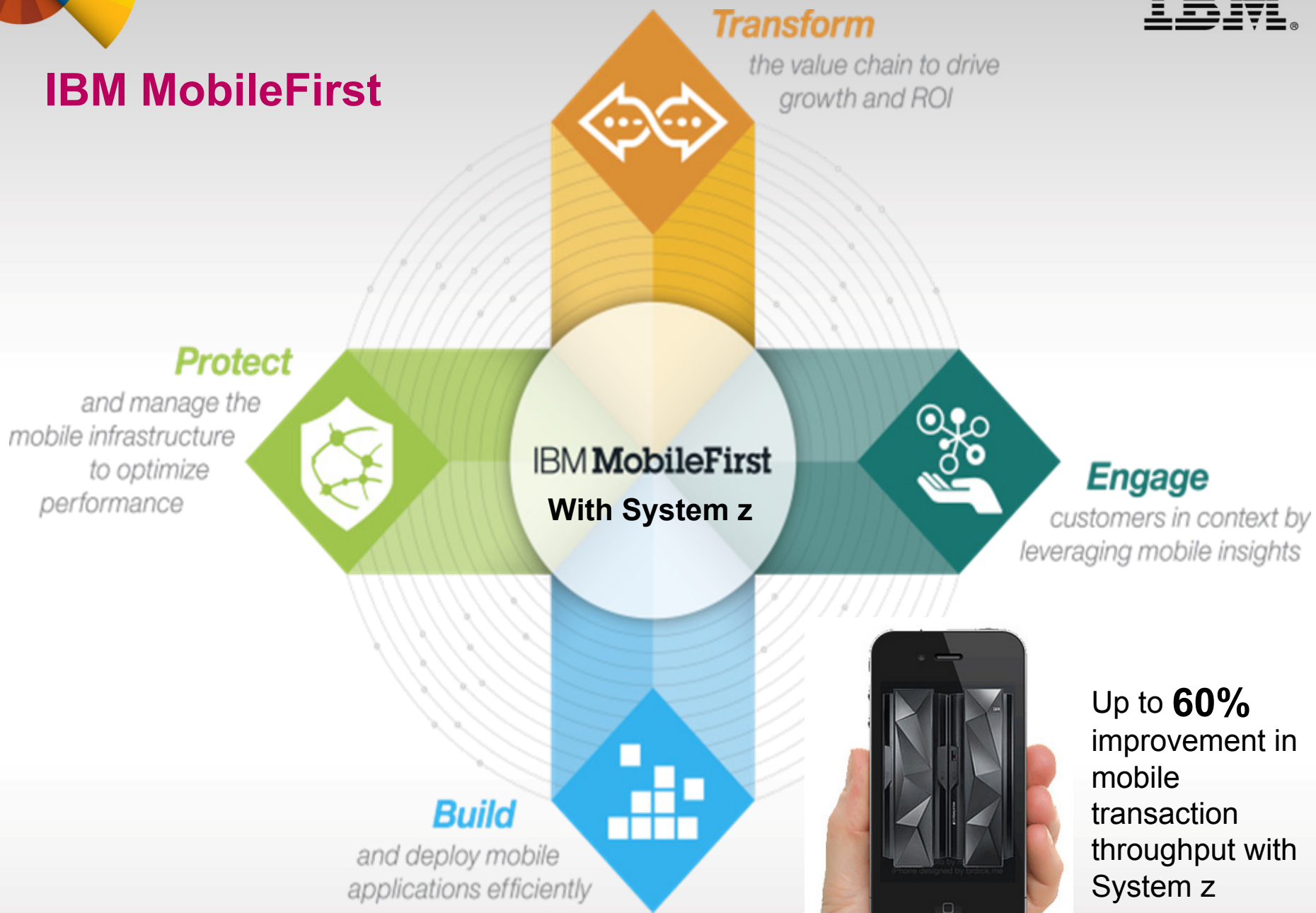
By 2015, 2/3 of the workforce will own a smartphone, and 40% of the workforce will be mobile







# IBM MobileFirst



Up to **60%** improvement in mobile transaction throughput with System z



# DB2 for z/OS Enterprise-class JSON Database

## *Agility with DB2 qualities of service*

- Combines data from systems of engagement with core enterprise data
- Maintains JSON simplicity and agility
- Leverages DB2 Qualities of Service
  - Security
  - Management, operations
  - High Availability
- Delivers the best of both worlds

# Building mobile apps on the zEnterprise



1

## Advanced application development

IBM Worklight integrated with Rational Developer for z

2

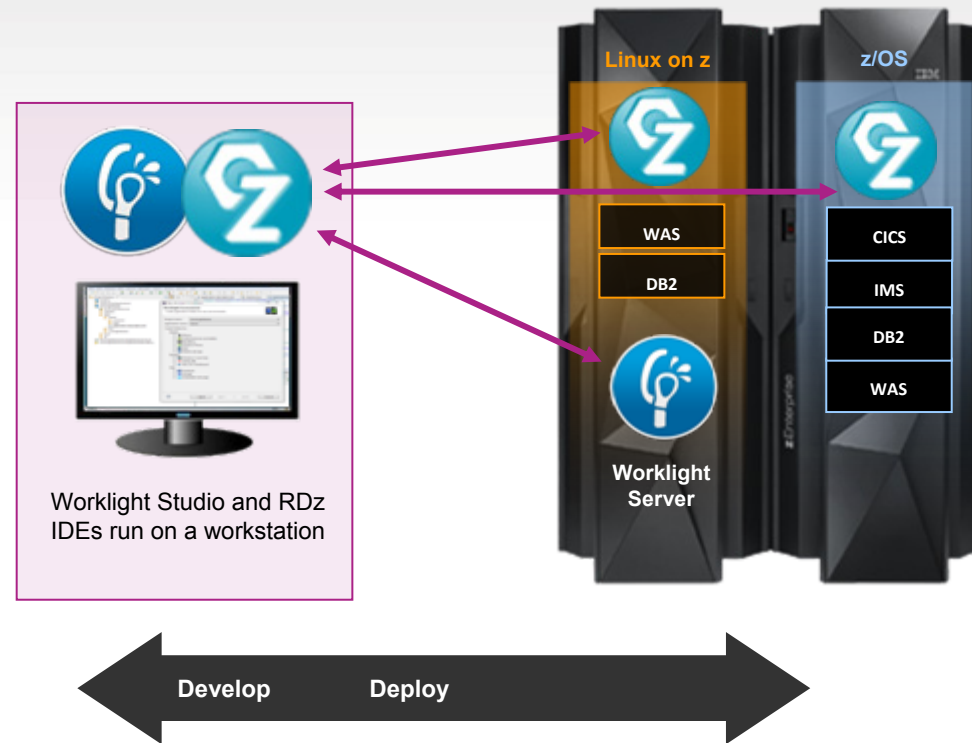
## Developer mobile tools with programming models

WebSphere Application Server Developer Tools for Eclipse

3

## Application determination for support of mobile

Rational Asset Analyzer



# Connecting mobile apps on the zEnterprise



1

Mobile protocol connectivity to System z applications

z/OS Connect  
API Management  
DB2 NoSQL

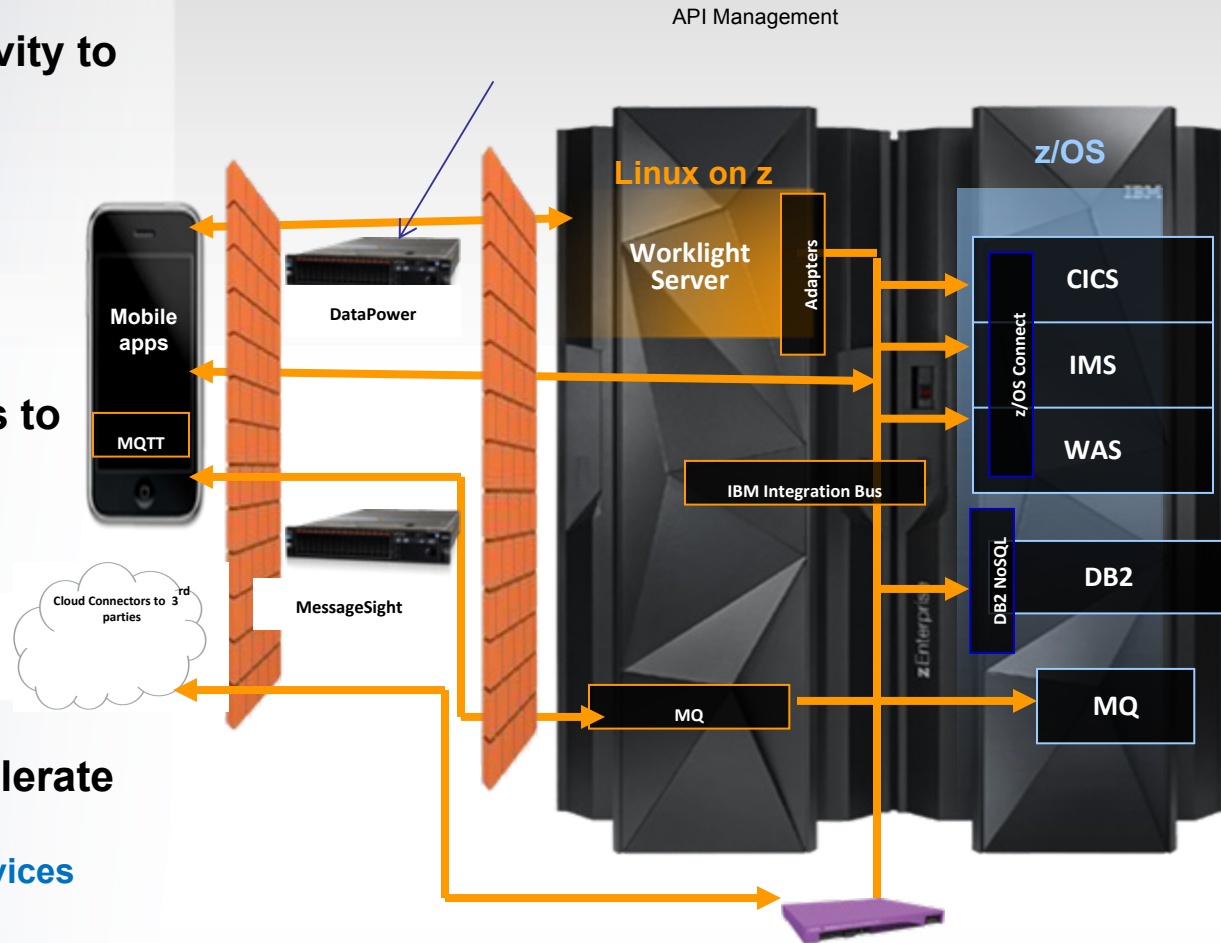
2

Extending enterprise apps to mobile

3

Scalable services to accelerate and enrich mobile apps

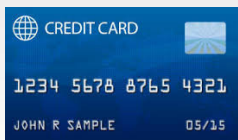
IBM Bluemix Mobile Cloud Services



*Unmatched scale to support millions of transactions per day*

# What are DB2 customers doing with mobile?

## Growing business and customer satisfaction



### Location-based promotions

- Find the nearest restaurant, hotel, or business
- Customer specific discounts based past purchase history

### Optimize machines, logistics, customer usage

- Capture/track equipment location, movement and usage
  - Higher productivity and uptime
  - Better manage logistics and communication across fleet
  - Easy customer dashboard to access machinery and usage data
- Geo fencing keeps equipment on site and on hand



### Simplify tax collection

- Tablet-based tax collection using GPS location
- Improved tax collection rate



**Tracking and billing** every text/call/download – Billions per second



# UK's saving and mortgage **Nationwide** transforms from a legacy core system to a modern, real-time, multi-channel banking system

## Challenges

Nationwide knew that it needed to transform its service offerings to embrace new channels and personalized products. Customers demanded an always-on, multi-channel banking system



## Solution

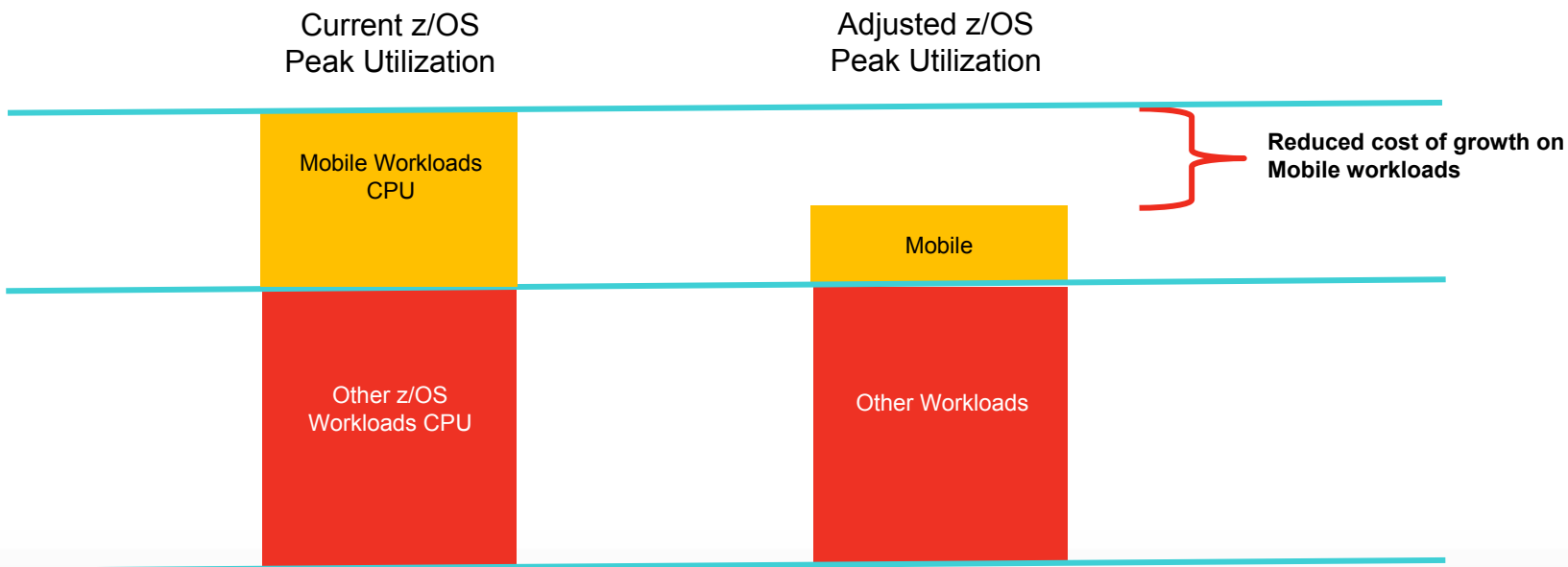
Used DB2 for z/OS to enable to operate in real-time and across multiple channels with resiliency and stability for managing millions of accounts. Used IBM security tools to manage different levels of access rights with ease.

## Benefits

24/7 availability to support anytime, anywhere banking services, shorter time-to-market for new accounts, and ample scalability to support Nationwide's ambitious growth plans.

# Grow mobile transactions on z/OS with System z Mobile Workload Pricing

- Reduce z/OS peak MSUs attributable to mobile workloads -- up to 60%
- No Infrastructure Changes Required... (such as separate LPARs)





# DB2 11: The Database for Enterprise OLTP and Analytics

## ***Affordable for every workload with out-of-the-box savings***

- Up to 10% for complex OLTP
- Up to 15% for update intensive batch
- Up to 40% for queries

## ***Business critical analytics***

- Expanded SQL, XML and analytics capabilities
- Big data integration
- In-transaction real-time scoring
- Advanced QMF analytic capabilities with mobile support

## ***Enhanced Resiliency and Continuous Availability***

- Fewer planned outages, fewer REORGs, faster recovery
- Cost effective archiving, access warm/cold data in single query

## ***Simpler, faster upgrades for faster ROI***

- 16x faster catalog migration
- No application changes required for DB2 upgrade
- Repeatable testing with real workloads and integrated cloning



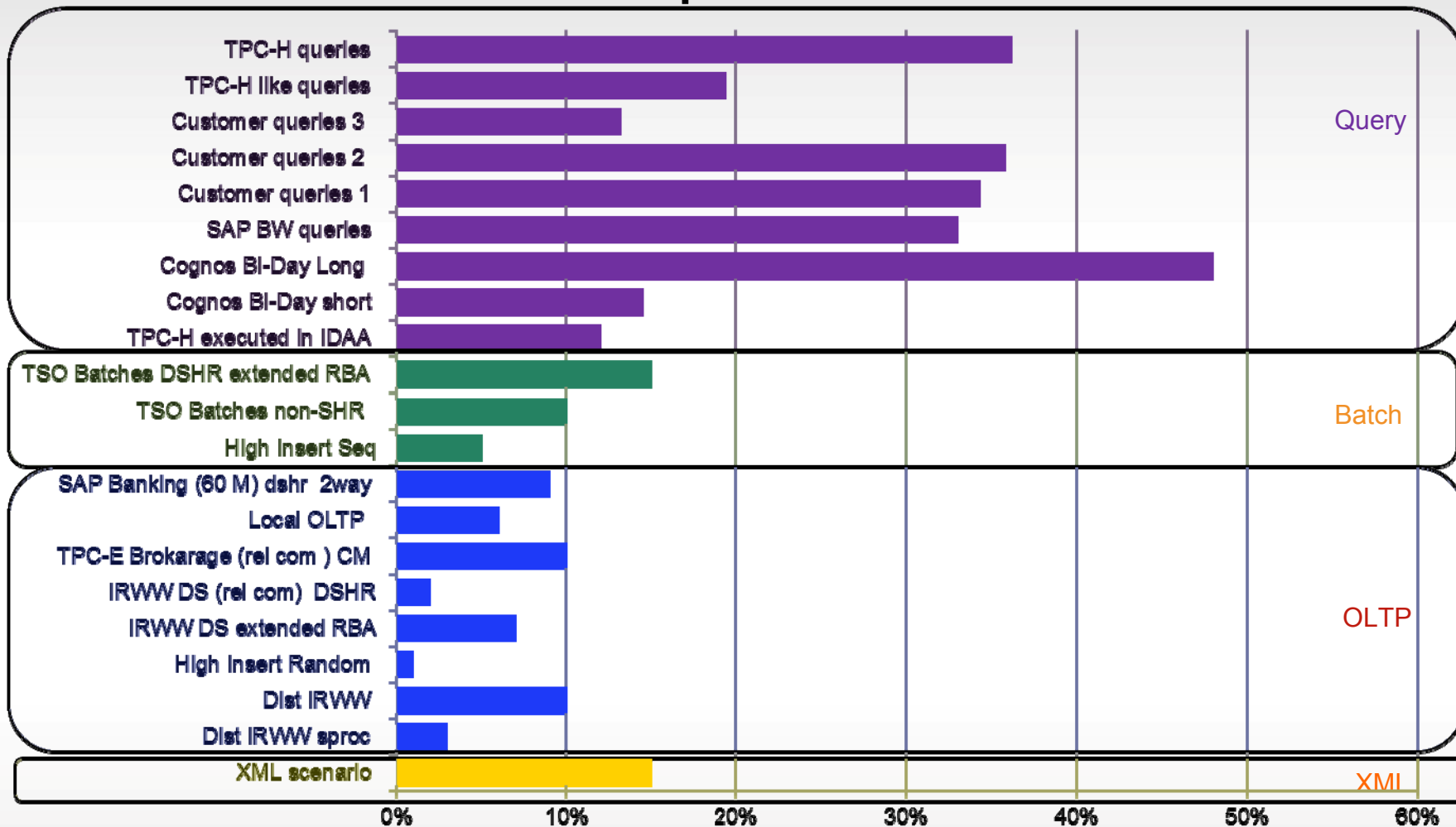
Announce  
Oct. 1, 2013

GA  
Oct. 25, 2013



# Impressive DB2 11 Performance Results!

## DB2 11 % CPU Improvement From DB2 10





# Upgrade to DB2 11 for z/OS to achieve more operational analytics throughput for the same cost



IBM internal analytics workload (BI Day)

Workload consisted of 160,860 Cognos BI Day simple reports. Both tests used 10 CPs and ran at 100% utilization. Results may vary based on customer workload profiles/characteristics.

# RAS and Usability Improvement Highlights

- Logging capacity and performance: RBA/LRSN optionally expands to 10 bytes
- BIND / DDL / Online REORG concurrency with persistent threads
  - Avoid having to shut down apps to get a REBIND through, e.g. for application upgrades
- More online schema changes
  - Alter partitioning limit keys
  - DROP column
  - Point in time recovery support for deferred schema changes
- Autonomics improvements
  - Automatic index pseudo delete cleanup
  - Overflow row reduction
  - Optimizer externalizes missing stats to enable automated RUNSTATS
- Data sharing improvements
  - Group buffer pool write-around
  - Restart light enhancements
  - Index split performance and other indexing improvements
  - Full LRSN spin avoidance
- Plan management improvements - APREUSE(WARN) support
- ACCESS DATABASE ... MODE(STATS) option to externalize RTS statistics

99.999% availability because  
your business never stops.<sup>1</sup>



# Summary of Utilities Improvements



- Over 40 new enhancements!
- Availability
  - Online data repartitioning
    - REORG REBALANCE SHRLEVEL(CHANGE)
    - Online ALTER of limit keys
  - Online REORG availability improvements
    - SWITCH phase reduction
    - Improved drain processing
  - Part level inline image copies for REORG
- Usability
  - Online REORG automated mapping tables
  - REORG delete unused PBG datasets
  - System cloning improvements
- CPU reduction
  - More zIIP offload for LOAD and RUNSTATS
- Performance
  - Faster LOAD processing via increased parallelism
  - Inline statistics improvements, reduced need for RUNSTATS
  - Optimizer input to statistics collection
  - REORG option to avoid sorting data for clustering
  - Improved buffer pool efficiency



# Expanded SQL and Analytics Capabilities

- Global variables
- SQLPL improvements: array data type, autonomous transactions
- Alias support for sequence objects
- Temporal data enhancements
  - Support for views
  - Special register support
  - Integrated auditing support (planned)
- Transparent archive query
- SQL Grouping Sets, including Rollup, Cube
- Unicode column support for EBCDIC tables
- Hadoop access via table UDF
- JSON support



# Easier DB2 Version Upgrade

- Application Compatibility (APPLCOMPAT)
  - New feature to ease DB2 version upgrades – avoid impact to applications
  - New mechanism to identify applications affected by SQL changes in the new release
  - Seamless mechanism to make changes at an application (package) level or system level
- Faster ENFM processing
  - Lab measurement showed 18x faster in V11 vs. V10 using a large customer catalog
- Access path stability improvements
- Higher code quality stability levels
- SQL Capture/Replay tooling can help testing of DB2 version upgrades
- Migration Planning Workshops (MPW)
  - See the DB2 11 MPW community in DeveloperWorks for latest info

**“We have seen some really good results regarding CPU savings - we have been so impressed with the product stability and have already moved an internal production system to DB2 11”**

**Stefan Korte GAD**



# QMF 11: Today's Business Analytics

**QMF Analytics for TSO** brings unprecedented charting and statistical analysis capabilities directly to the mainframe

## ***Faster up and running***

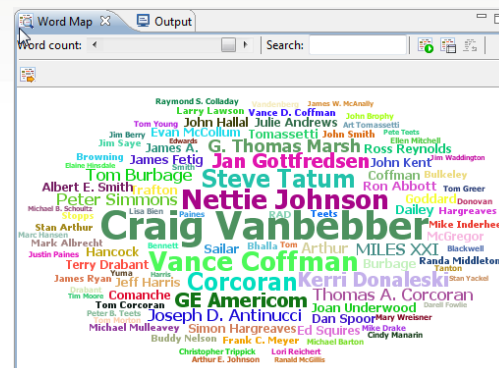
- Adhoc Reports and Quick Reports
- Quickly and easily create sophisticated reporting objects using an open canvas

## ***Analytics on unstructured data sources***

- Extract entities from unstructured data sources (either file-based or database-based)
- Displays the results graphically

## ***Increased support for the business user***

- Save result sets with query objects for offline use
- Mobile device support for iPad and Android tablets





# DB2 11 Planning



- Dual mode migration (CM, ENFM, NFM)
- DB2 10 is the platform for migration
- z/OS 1.13 or above. z10 or above.
- No pre-V9 bound packages
- DB2 Connect V10.5 FP2 is the recommended level for V11
  - This level is required to exploit most new V11 features
  - Any in-service level DB2 Connect supports V11
- Sysplex query parallelism support is removed
- DB2 11 Migration Planning Workshop (MPW)
  - Free, 1-day education
  - DB2 11 MPW Community on DeveloperWorks, <http://ibm.co/IIJxw8>





# DB2 11 for z/OS

## Strong uptake out of the gate

- Over 100 customers \*
- 75% of ESP customers are migrating
- Faster migration success

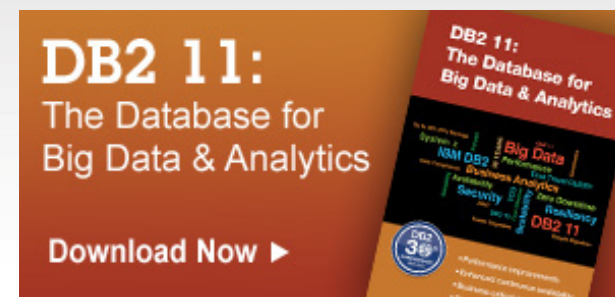
## First customers in production

- Out-of-the-box quality/stability
- 25% fewer PMRs vs DB2 10
- 45% fewer APARs

## DB2 10

- Withdraw from Marketing: July 6, 2015
- End of Service: Sept 30, 2017

Latest Information at [World of DB2](#)

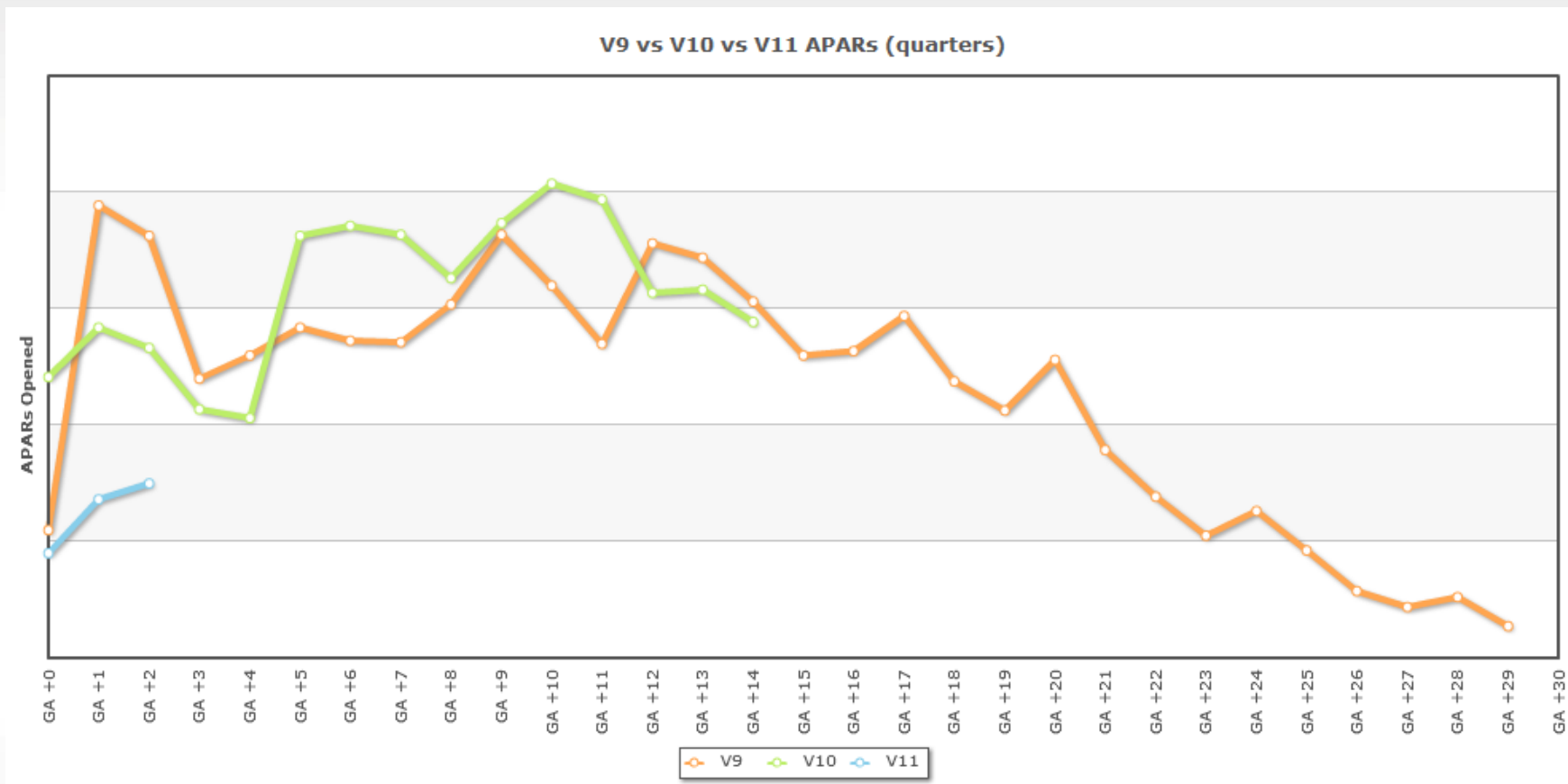


***Fastest SAP certification  
in history!***





# DB2 11 Out-of-the-box stability



**45% fewer APARs**

# DB2 11 Customer Successes



*“We have been so impressed with the **product stability** and have already moved **into production**”*  
 Stefan Korte - GAD

I am particularly excited about **Transparent Archiving** which is a new DB2 11 feature. There are **enormous potential cost saving benefits** here that will benefit all DB2 shops”  
 Conrad Wolf - Golden Living



*DB2 11 helps improve our efficiency and cost effectiveness, delivering 10% CPU savings in our batch processing workloads.*  
*“DB2 11 also continues to **raise the standard for availability.**”*  
 Frank Peterson – JN Data

**“Higher availability, Performance, lower CPU consumption amongst other new features were the benefits we are seeing with DB2 11.**  
 Paulo Sahadi, IT Executive, Banco do Brasil





# In-Memory Database

- In-memory DBMS have existed for over a decade
- Concepts apply for both row and column store formats
- DB2 for z/OS incorporates extensive in-memory technology and operates almost exclusively on in-memory data

## **Keeps frequently accessed data in memory (buffer pools)**

- Avoids disk I/O: > 90% of data accessed in memory without I/O
- Prefetch mechanisms avoid I/O waits
- Option to pin a table in memory

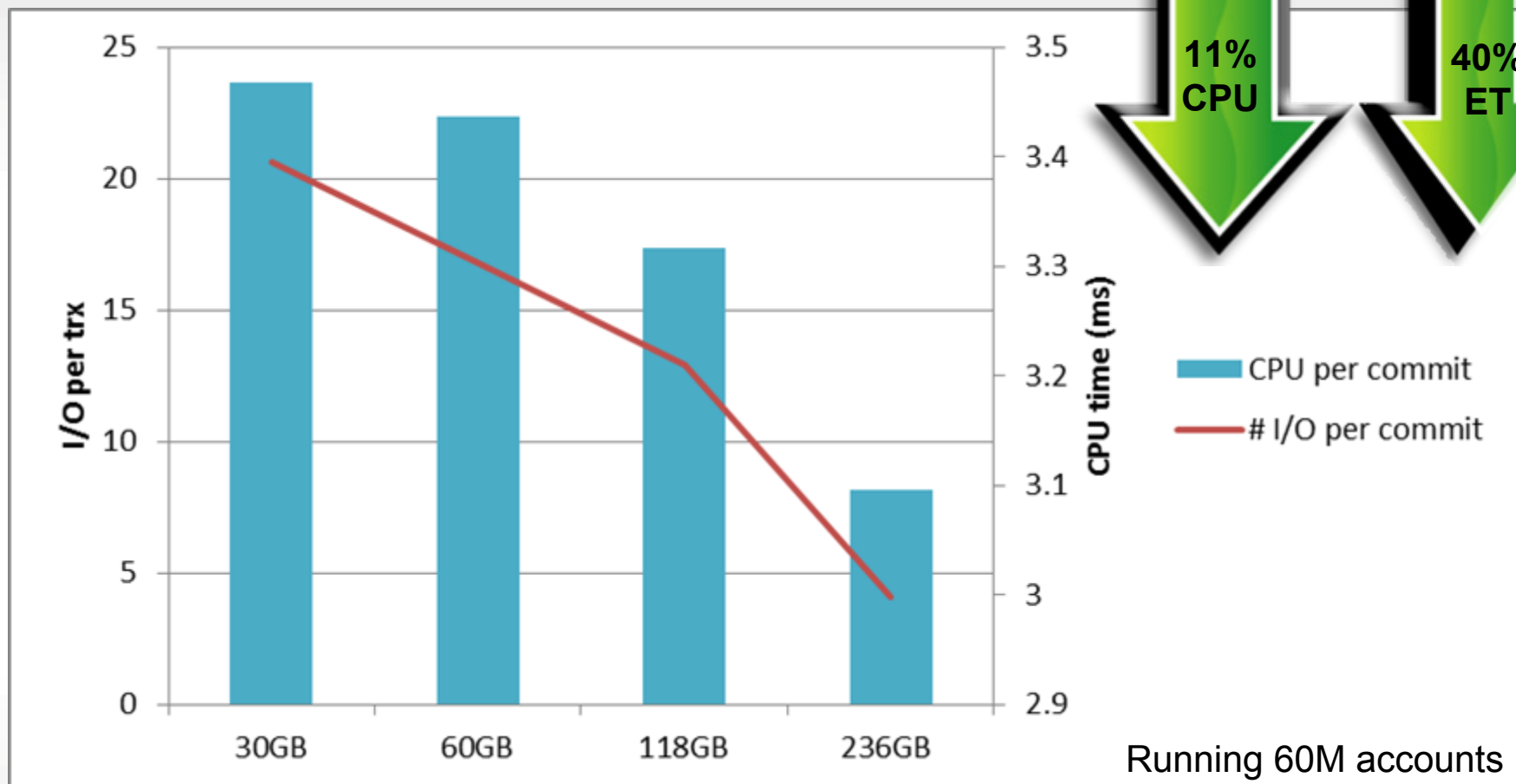
## **Writes all data changes (INSERT, UPDATE, DELETE) to memory**

- Persistently writes log records to disk by commit time  
→ Same behavior as In-Memory Databases
- System z servers support TB sized memories
  - As memory sizes increase, DB2 will evolve accordingly
- Extremely efficient memory usage across the cluster



# More memory improves performance and saves CPU

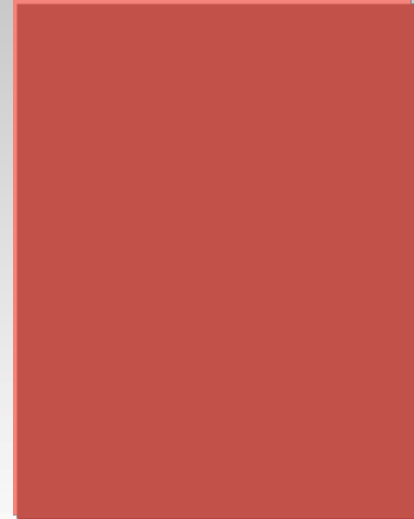
*SAP Banking Day Posting with large local buffer pools*



Banking (60M account) workload with 2 way data sharing  
 40% elapsed time (ET) improvement ; 11% CPU reduction from 30GB LBP to 236GB LBP  
 Both members with same GBP size (64GB)



# DB2 11 Resources



- IBM Information Center / Knowledge Center
- DB2 11 Technical Overview Redbook (SG24-8180)
- DB2 11 Performance Topics Redbook (SG24-8222)
- DB2 11 links: <https://www.ibm.com/software/data/db2/zos/family/db211/>
  - Links to DB2 11 Announcement Letter, webcasts and customer case studies
  - Whitepaper: “DB2 11 for z/OS: Unmatched Efficiency for Big Data and Analytics”
  - Whitepaper: “How DB2 11 for z/OS Can Help Reduce Total Cost of Ownership”
- Free eBook available for download
  - <http://ibm.co/160vQgM>
- SAP and DB2 11:
  - “DB2 11 for SAP Mission Critical Solutions”:  
<http://scn.sap.com/docs/DOC-50807>
  - “DB2 11 with SAP Performance Report”:  
<http://www-03.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP102394#!>



# DB2 Cypress Themes



- Performance
  - Out-of-the-box: queries, OLTP, batch, utilities
  - Expanded in-memory processing
  - HW/SW integration into the future on z
  - Dramatic insert performance improvements
- DBA productivity, autonomies
  - More schema and partition flexibility
  - Escalating mobile, internet-of-things: Extreme scale, flexible tables, indexes
  - Self-optimizing system
    - More transparent SQL optimization
    - Temporal catalog for powerful problem diagnosis capabilities
    - Easier management, higher availability for massive tables
- Application enablement
  - Cloud-based developer self-service database provisioning (DBaaS)
  - SQL improvements
  - IDAA, Analytics, XML, Spatial, NoSQL, and BigData improvements



# Conclusion

## DB2 for z/OS Strategic Roadmap

Support the next wave of applications ....




### Analytics

Real time analytics  
integrated with OLTP



### Mobile

Easy app  
development,  
Enterprise mobile  
scale



### Cloud

Self provisioning,  
Multi-tenancy, Self  
managing,  
guaranteed SLAs

while enhancing the unique value of System z







**Thank You**