

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

# DB2 11 for z/OS Overview

Speaker Name and Title



# DB2 for z/OS Customer Trends

- Proliferation of mobile and other network-connected devices is driving increases in:
  - transaction workloads
  - data volumes
  - 24x7 requirements
- Continued focus on cost containment and resource efficiency
- Competitive pressures continue to drive an increasing need for innovation, analytics, and data integration
- DB2 for z/OS has leading edge capabilities to support these requirements and DB2 11 makes important improvements





# DB2 11 Major Themes



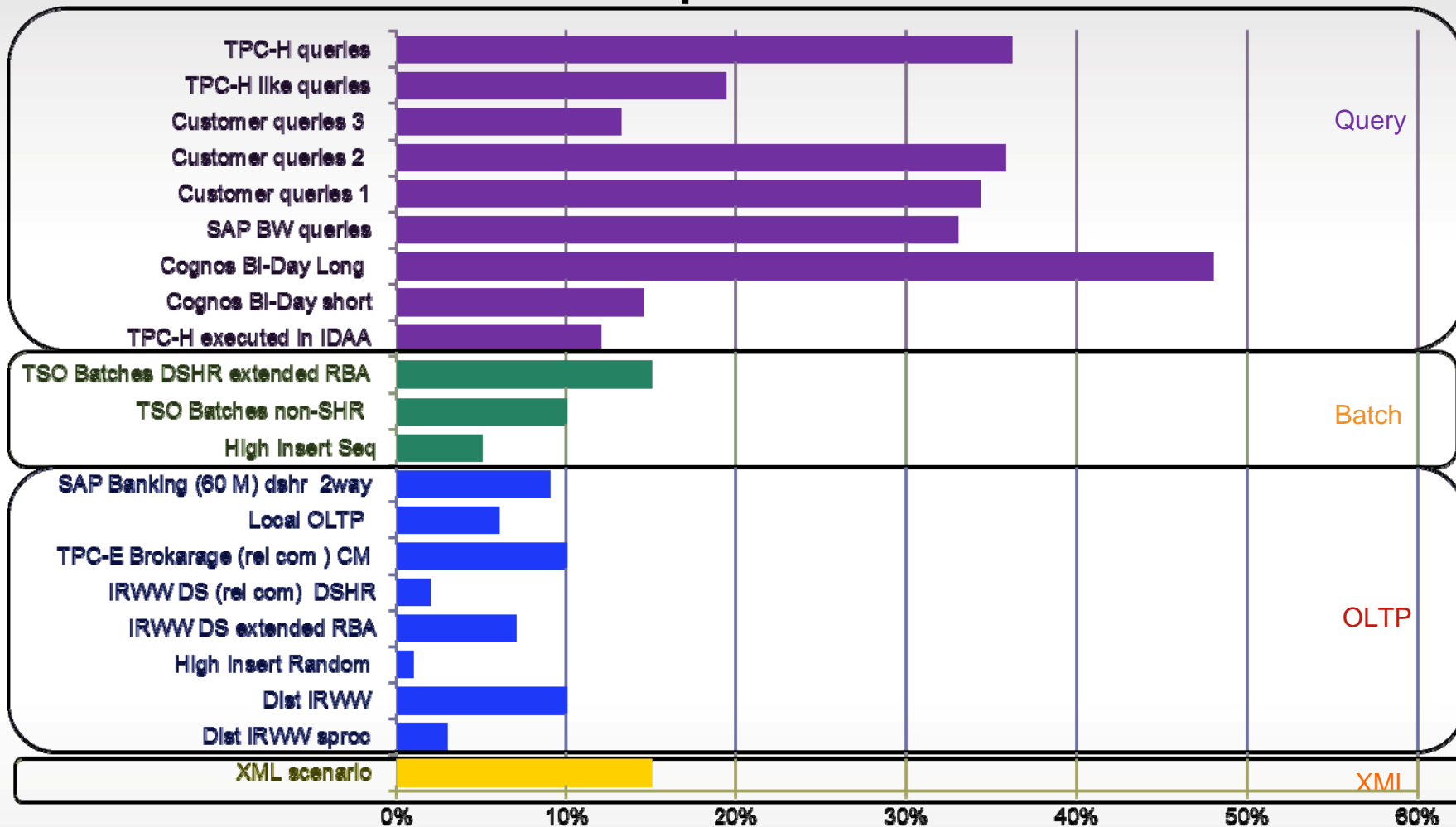
- **Out-of-the-box CPU Savings**
  - Improving efficiency, reducing costs, no application changes
  - Up to 10% for complex OLTP
  - Up to 10% for update intensive batch
  - Up to 40% for queries
  - Additional performance improvements through use of new DB2 11 features
- **Enhanced Resiliency and Continuous Availability**
  - Improved autonomies which reduces costs and improves availability
  - Making more online changes without affecting applications
  - Online REORG improvements, less disruption
  - DROP COLUMN, online change of partition limit keys
  - Extended log record addressing capacity - 1 yottabyte (or 1B petabytes)
  - BIND/REBIND, DDL break into persistent threads
- **Enhanced business analytics**
  - Expanded SQL, XML, and analytics capabilities
  - Temporal and SQLPL enhancements
  - Transparent archiving
  - Hadoop integration, NoSQL and JSON support
- **Simpler, faster DB2 version upgrades**
  - No application changes required for DB2 upgrade
  - Access path stability improvements
  - Product quality/stability – raised the bar





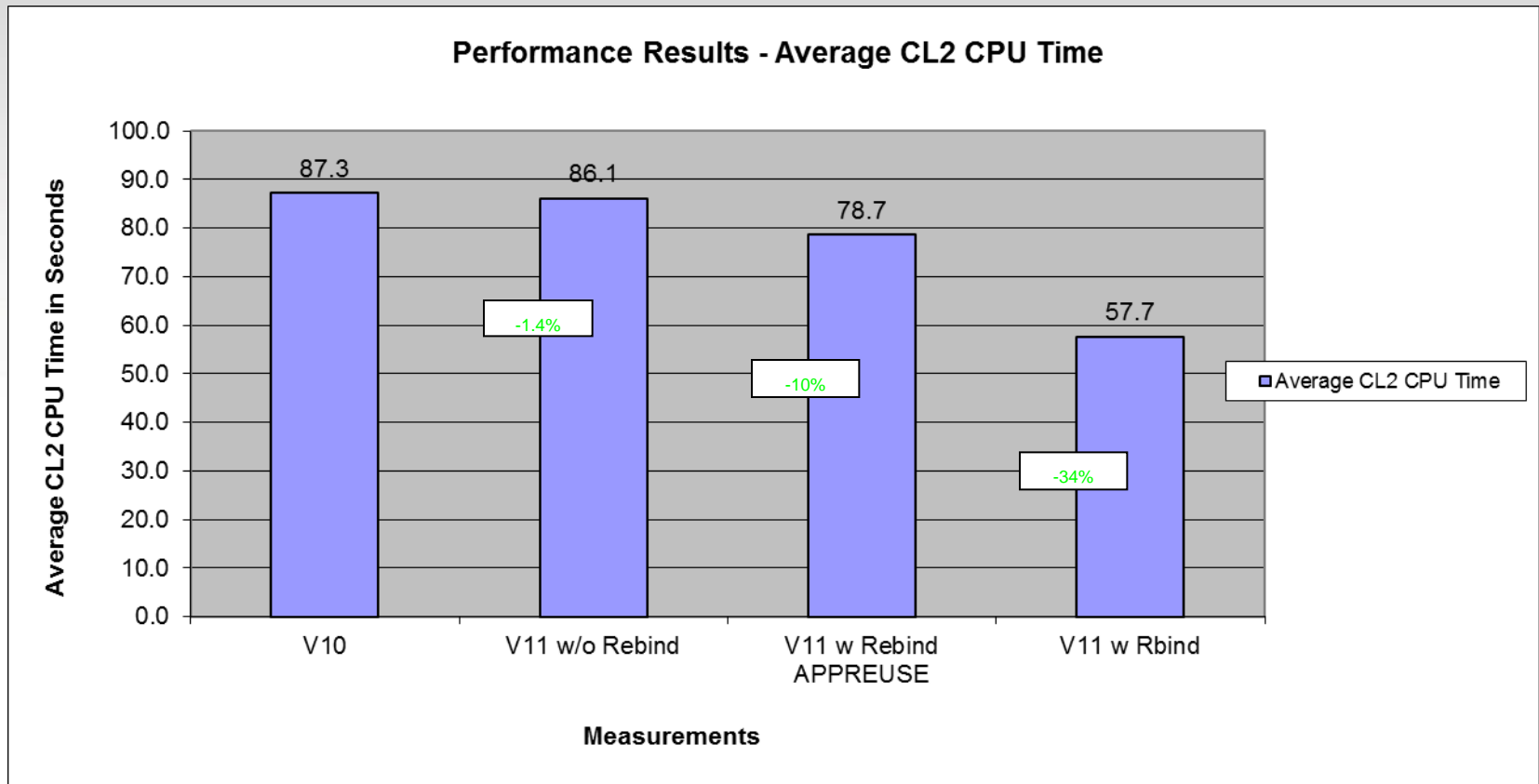
# Impressive DB2 11 Performance Results!

## DB2 11 % CPU Improvement From DB2 10





# TPC-H Using Static SQLPL



- 10% out-of-box improvement with DB2 11 when rebinding with APREUSE
- 34% improvement in DB2 11 when rebinding to obtain DB2 11 AP



# Performance Improvements no REBIND needed – Partial List



- DDF performance improvements
  - Reduced SRB scheduling on tcp/ip receive using new CommServer capabilities
  - Improved autocommit OLTP performance
- INSERT performance
  - Latch contention reduction
  - CPU reduction for Insert column processing and log record creation
  - Data sharing LRSN spin avoidance
  - Page fix/free avoidance in GBP write
- Automatic index pseudo delete cleanup
- IFI 306 filtering capabilities to improve Replication capture performance
- DGTT performance improvements
  - Avoid incremental binds for reduced cpu overhead \*
- Utilities performance improvements
- Java stored procedures: multi threaded JVMs, 64-bit JVM – more efficient

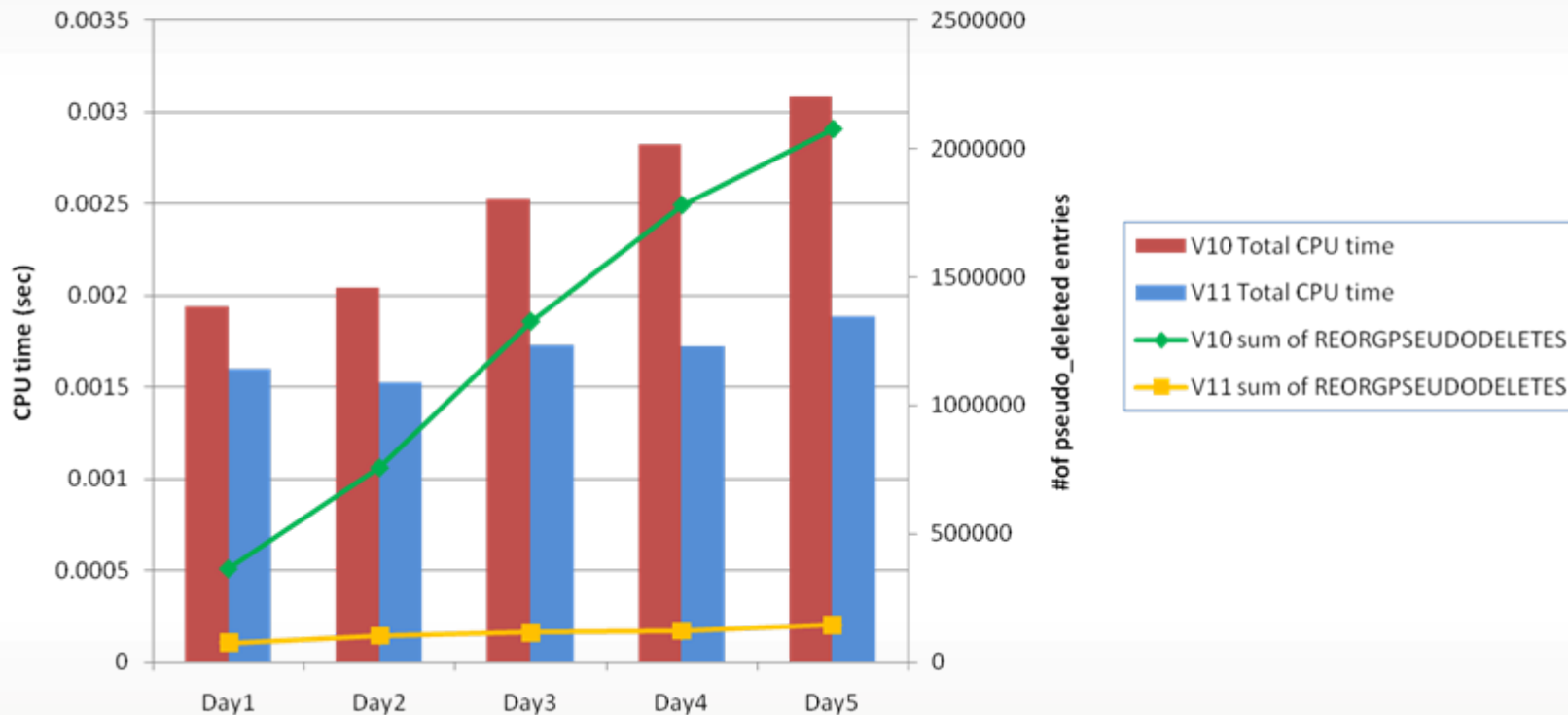


# DB2 11 Auto Pseudo Delete Cleanup



- Up to 39% DB2 CPU reduction per transaction in DB2 11 compared to DB2 10
- Up to 93% reduction in Pseudo deleted entries in DB2 11
- Consistent performance and less need of REORG in DB2 11

### WAS Portal Workload 5 Days Performance





# Performance Improvements

## REBIND required – Partial List



- Query transformation improvements – less expertise required for performant SQL
- Enhanced duplicate removal
  - Lots of queries require duplicate removal: e.g. DISTINCT, GROUP BY, etc.
  - Dup elimination via sorting can be expensive
  - New techniques: Index duplicate removal, early out
- In-memory techniques
  - In-memory, reusable workfile
  - Sparse index (limited hash join support)
  - Non-correlated subquery using MXDTCACH
  - Correlated subquery caching
- Select list do-once
  - Non column expressions in the select list can be executed once rather than per-row
- Column processing improvements
  - Xproc (generated machine code) for column processing
- DPSI performance improvements
- Data de-compression optimizations
- Optimizer CPU and I/O cost balancing improvements
- DRDA package based continuous block fetch





# Performance Improvements

## Sysprog, DBA, or appl effort required – Partial List



- Suppress-null indexes
  - Index entries not created when all values for indexed columns are NULL
  - Reduced index size, improved insert/update/delete performance, compatibility with other DBMSes
  - Improved utility and CREATE INDEX performance
- New PCTFREE FOR UPDATE attribute to reduce indirect references
- DGTT performance improvements
  - Non logged DGTTs
- Extended optimization - selectivity overrides (filter factor hints)
  - Improve optimizer's ability to find the cheapest access path
  - Collect filter factors for predicates in a Selectivity Profile
- Open dataset limit raised to 200K



# DB2 11 and zEC12 Synergy



- Faster CPU – 1.25x compared to z196
  - 5.5GHz processors, bigger/faster cache
  - 25% reduction measured with DB2 workloads
- 50% More System Capacity to help consolidation
  - Up to 3TB real memory per server
  - Excellent synergy with DB2 10 and 11 scalability
- New Features that DB2 11 Exploits
  - FLASH Express and pageable 1MB frames, used for:
    - Buffer pool control blocks
    - DB2 executable code
  - 2GB frame support for buffer pools
    - Performance improvement expected for extremely large memory sizes
- New zEC12 GA2 features that benefit DB2
  - zEDC Express for enhanced DB2 SMF data compression
  - RoCE Express for faster, cheaper z/OS to z/OS DRDA communication
    - Preliminary measurements show up to 2x DRDA transaction throughput increase





# 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>



# Security Enhancements



- Remove inconsistencies between DB2 and RACF access controls
  - Automatic DB2 cache refresh when RACF changes are made
    - Package auth cache, dynamic statement cache, user authentication cache
  - Support BIND OWNER when using RACF exit
  - Support auto REBIND using owner's authid when using RACF exit
  - Dynamic SQL authorisation checking improvements
- Bind plan option to ensure the program is authorized to use the plan
  - New PROGAUTH bind option
- Remove column masking restrictions for GROUP BY and DISTINCT



# Summary of Utilities Improvements

- 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
- Inline statistics improvements, reduced need for RUNSTATS
- Optimizer input to statistics collection
- REORG option to avoid sorting data for clustering
- DSNACCOX performance

Over 40 new enhancements!





# Key utilities performance numbers



- Up to 81% zIIP-eligible CPU with RUNSTATS COLGROUP
- Up to 40% zIIP-eligible CPU in REORG & LOAD with inline distribution stats
- REORG SWITCH phase outage reduced by up to 91%
- Up to 71% elapsed time reduction for REORG of subset of partitions
  - SORTNPSI option retrofitted to V9 & V10
- RECOVER from part-level image copies reduced CPU by up to 50%, elapsed by up to 40%
- LOAD from single input dataset elapsed time reduced by up to 70%
- Crossloader support for FETCH CONTINUE for LOB & XML data
  - 28% CPU reduction



# SWITCH phase impact relief

## – reduced application impact



- Easier drain acquisition
- Prevent new claims on all target partitions whilst waiting for drains
  - Faster drain acquisition for part-level REORG
- New `DRAIN_ALLPARTS` option to momentarily drain all data parts
  - Eliminates claim-drain “deadlocks” for part-level REORG with NPSIs
- Restructure SWITCH phase processing for outage reduction
  - SWITCH phase ET reduction of 91% measured when reorging 20 parts
- New `SWITCHTIME` parameter to determine earliest point at which drain processing will be attempted
  - Govern timing of drain without the need to schedule separate `–ALTER UTILITY` command



# Expanded SQL and Analytics Capabilities

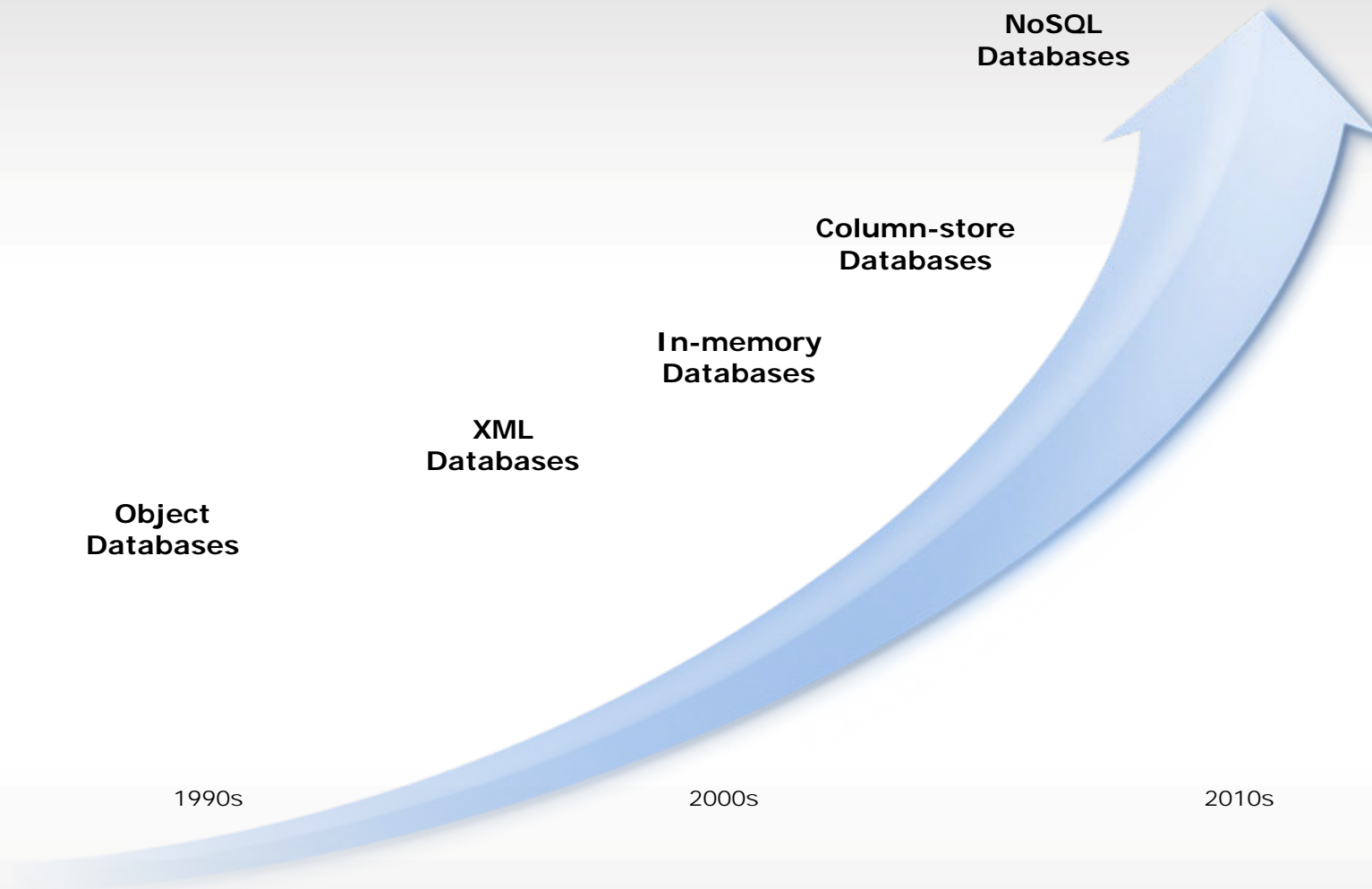


- Global variables
- SQLPL improvements: array data type, autonomous transactions
- Alias support for sequence objects
- Temporal data enhancements
  - Support for views
  - Special register support
  - Integrated auditing support (planned)
- Transparent archive query
- SQL Grouping Sets, including Rollup,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





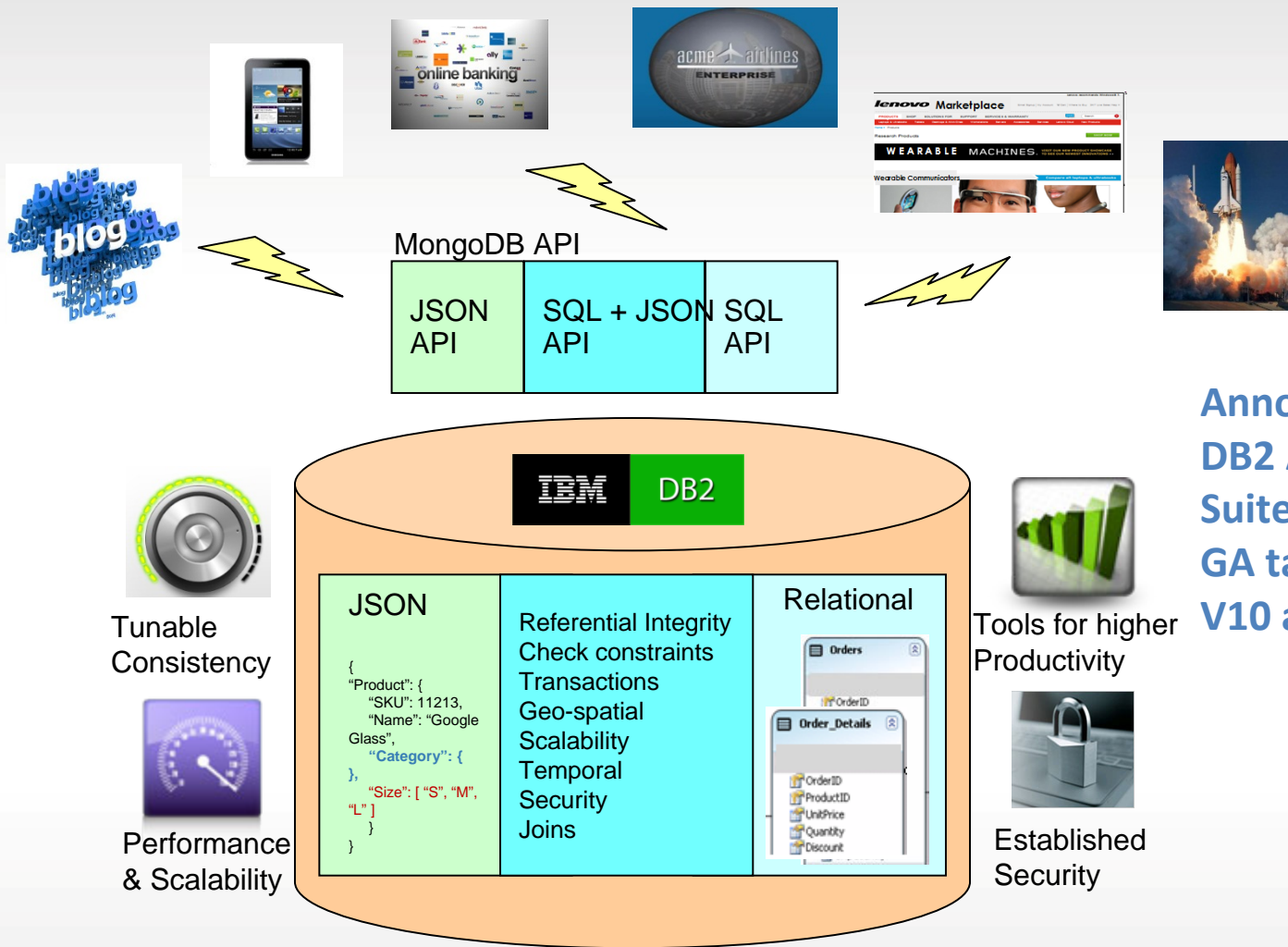
# New Technology Emerges





# JSON Database Technology Preview

*Providing the best of both worlds*



Announced in  
DB2 Accessories  
Suite for z/OS,  
GA target Dec. 6  
V10 and V11



# Why is System z Important for Big Data and Analytics?



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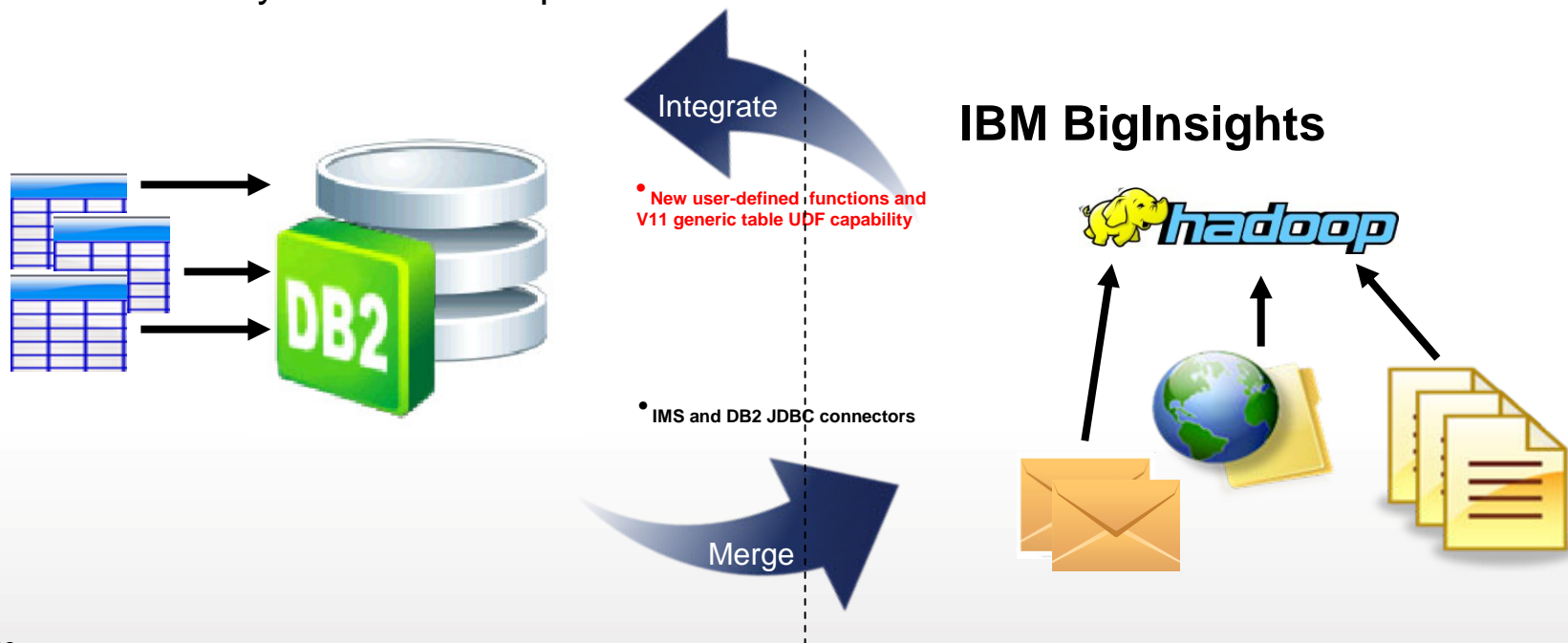


# Integrating Big Data Analytics with DB2 for z/OS



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- Unstructured data sources are growing fast
- Two significant needs:
  1. Merge this data with trusted OLTP data from zEnterprise data sources
  2. **Integrate this data so that insights from Big Data sources can drive business actions**
- Connectors to allow BigInsights to easily & efficiently access DB2 data
- DB2 is providing the connectors & the DB capability to allow DB2 apps to easily and efficiently access hadoop data sources

New V11 features enable this





# XML Enhancements



- New Features
  - Basic xQuery (retrofit to v10)
  - COBOL samples for XML (published on Developerworks website)
- Feature Enhancements
  - Implicitly add doc node during insert/update
  - Crossloader support
  - Fix error reporting position predicate
  - Support xquery constructor as the source expression of insert and replace
- Performance Enhancements
  - Binary XML validation (*retrofit to DB2 V10*)
  - Partial validation after update
  - Date/Time Predicate Pushdown
  - XQuery(FLWOR) and XMLQUERY enhancement
  - Optimize Index Search Keys
  - XML Operator Improvements, use less storage and CPU
  - XQuery deferred construction
  - XMLTABLE pushdown cast
  - Avoid validation of validated binary XML data during LOAD



# 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**



# DB2 11 Optimized for SAP



- **Immediate SAP certification for DB2 11 at GA!**

- See SAP Note 1850403
- Easy migration from DB2 10:
  - No new SAP service packs required
  - Facilitated online DB2 migration

- **Save with CPU reductions**

- **Low latency connectivity from SAP app server**

- **Federated and consistent cloning of SAP business processes spanning multiple SAP/DB2 systems**

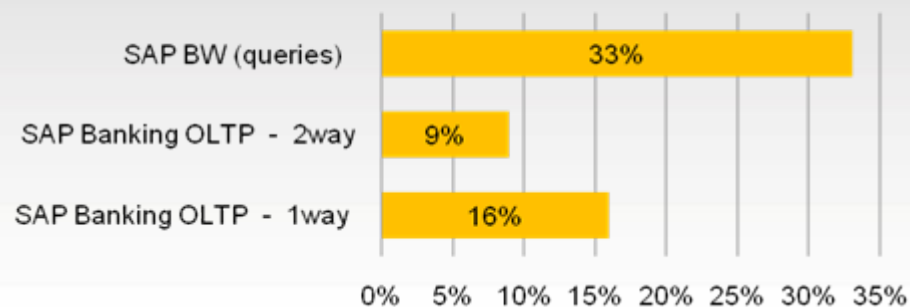
- **Online data maintenance**

- Better online REORG, online repartitioning

- **Better scaling**

- Larger log RBAs, larger statement cache

Sample CPU reductions from DB2 10



**DB2 11 SAP Certified at GA - the fastest ever certification for any DB2 for z/OS release in history**



# DB2 11 ESP Highlights



<b>ESP Start</b>	<b>February 2013</b>
<b>First Code Drop</b>	<b>March 2013</b>
<b>“Regular” service process</b>	<b>July 2013</b>
<b>GA</b>	<b>October 25, 2013</b>

## Core - 21 WW Customers

### Geography

- 11 EMEA
- 9 NA
- 1 SA

### Industry

- 7 Banking
- 5 Insurance
- 3 Healthcare
- 2 Financial Markets
- 1 Automotive

## Extended – 6 WW Customers

### Geography

- 3 EMEA
- 2 NA
- 1 SA

### Industry

- 3 Banking
- 2 Computer Services
- 1 Professional Services





# DB2 11 ESP Client Feedback



- Excellent quality and stability
- Good performance and CPU savings
  - ✓ DRDA workload up to 20% CPU reduction
  - ✓ CICS workload up to 18% CPU reduction
  - ✓ Batch workload up to 20% CPU reduction
- Full menu of functions, including
  - Utility improvements
  - Transparent archiving
  - Large RBA/LSRN
  - Optimizer and migration improvements
  - Big Data Integration
  - JSON Support for modern workloads

# DB2 11 for z/OS - over 30 quotes

## DB2 11 - SPEED & COST

"The Archive Transparency feature addresses an issue we have needed to resolve for a long time at the Bank and will reduce."

**Paulo Sahadi, IT Executive Banco do Brasil**

bankdata



"We have seen some really good results regarding CPU savings while running IMS-driven batch workload in our ESP test environment with DB2 11 CM/NFM - we have been so impressed with the **product stability** and have already moved an internal **production system to DB2 11**"

**Stefan Korte GAD**



# DB2 11 Early Support Program (ESP)

*CPU savings, very high quality, production level stability*

*“We have been involved in several DB2 for z/OS ESP’s. This one will rank as one of, if not the smoothest one yet.” – Large NA retailer*

*“Overall they are very satisfied and astonished about the system stability of DB2 V11. In V10 they experienced this in another way.”  
– European Insurance*

*“We have seen very few problems in [Installation, Migration, and Performance]. Overall, it has been a very pleasant experience!!... The quality of the code is clearly much higher than for the ESP for DB2 10...” - European Banking/FSS*

*“Good code stability, no outages, no main failures, only a few PMRs....” – European Banking*



# DB2 11 Early Support Program (ESP)

*CPU savings, very high quality, production level stability*

*“ Higher availability, performance, lower CPU consumption amongst other new features were the benefits perceived by Banco do Brazil with DB2 11 for z/OS. During our testing with DB2 11 we noticed improved performance, along with stability. ”*

- Paulo Sahadi, IT Executive, Banco do Brasil

*“We have seen some incredible performance results with DB2 11, a major reduction of CPU time, 3.5% before REBIND and nearly 5% after REBIND. This will significantly bring down our operating costs”*

*– Conrad Wolf, Golden Living*

*“I saw a significant performance improvement in recovery of catalog and directory. (V10 5:53 minutes, V11 2:50 minutes) That rocks! ... **DB2 11 is the best version I have ever seen.**”*

*- European Gov't*

***“Overall, we have been impressed** with the new version of DB2.”*

*– NA Manufacturer*



# ESP Customer Experiences



- **Stadtwerke Bielefeld GmbH**

- Major business benefits: Performance and SAP feature exploitation. Expecting to move to DB2 11 as soon as SAP certification complete
- “The SAP IS-U unbilled revenue batch workload showed an elapsed time reduction of about 20% in Conversion Mode” -- Bernd Klawa, Stadtwerke Bielefeld DB2 DBA

- **JN Data**

- Major business benefits: Operational enhancements, extended log addressing, DBA productivity improvements
- “We love autonomics. DB2 11 has some really nice features for reducing the burden on the DBA” -- Frank Petersen, JN Data DB2 Systems Programmer

- **BMW Group**

- Major business benefits: Forthcoming zEC12 upgrade will allow use of 2GB page frames, ability to break into persistent threads and undertake more dynamic schema change will help business agility
- “Virtual storage isn’t a big limitation for us any more, but we expect the CPU savings in DB2 11 to provide the major business benefit for us” -- BMW Group DB2 for z/OS Product Manager



# 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



# DB2 11 Resources



- Information Center
- DB2 11 Technical Overview Redbook (SG24-8180)
  - Draft version available, final version coming soon.
- DB2 11 links: <https://www.ibm.com/software/data/db2/zos/family/db211/>
  - Link to DB2 11 Announcement Letter
  - Links to webcasts
  - 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”
- DB2 11 Migration Planning Workshop
  - <http://ibm.co/IIJxw8>
- Free eBook available for download
  - <http://ibm.co/160vQgM>







# DB2 Cypress Themes



- In-memory processing
  - HW/SW integration into the future on z
  - Out-of-the-box performance improvement
- “Mobile-scale” data bases
  - More schema flexibility
  - Extreme scale tables, indexes
  - Higher data ingest rates
- Cloud enablement
  - Developer self-service, cloud-based provisioning, deployment
  - Self-optimizing system
    - More transparent SQL optimization
    - Temporal catalog for powerful problem diagnosis capabilities
    - Easier management of large tables
- Analytics and Big Data
- Extend System z leadership for continuous availability





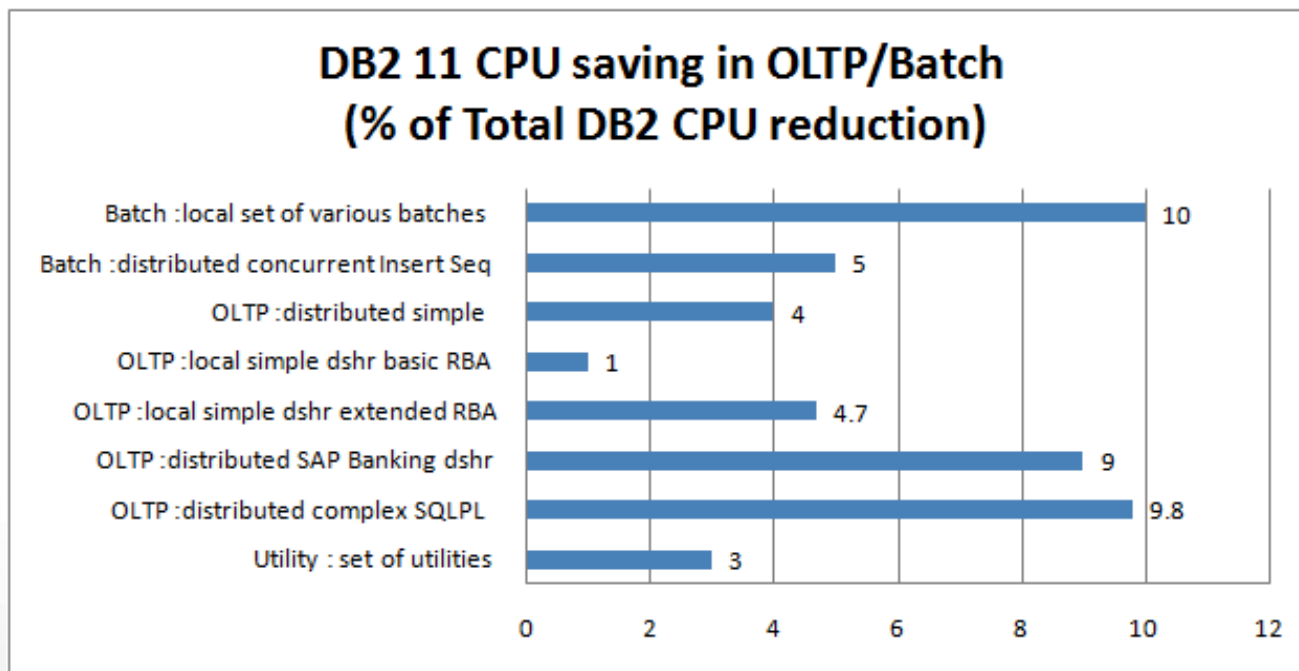


**Thank You**



# DB2 11 OLTP/Batch Performance Expectations

- These are results from IBM testing
- Performance expectations vary depending on many factors, including
  - Access path selection, Read/Write ratio, Number of rows returned
  - Number and type of columns returned, Number of partitions touched
  - Schema - Number of partitions defined, DPSI, etc
  - RELEASE option, data compression

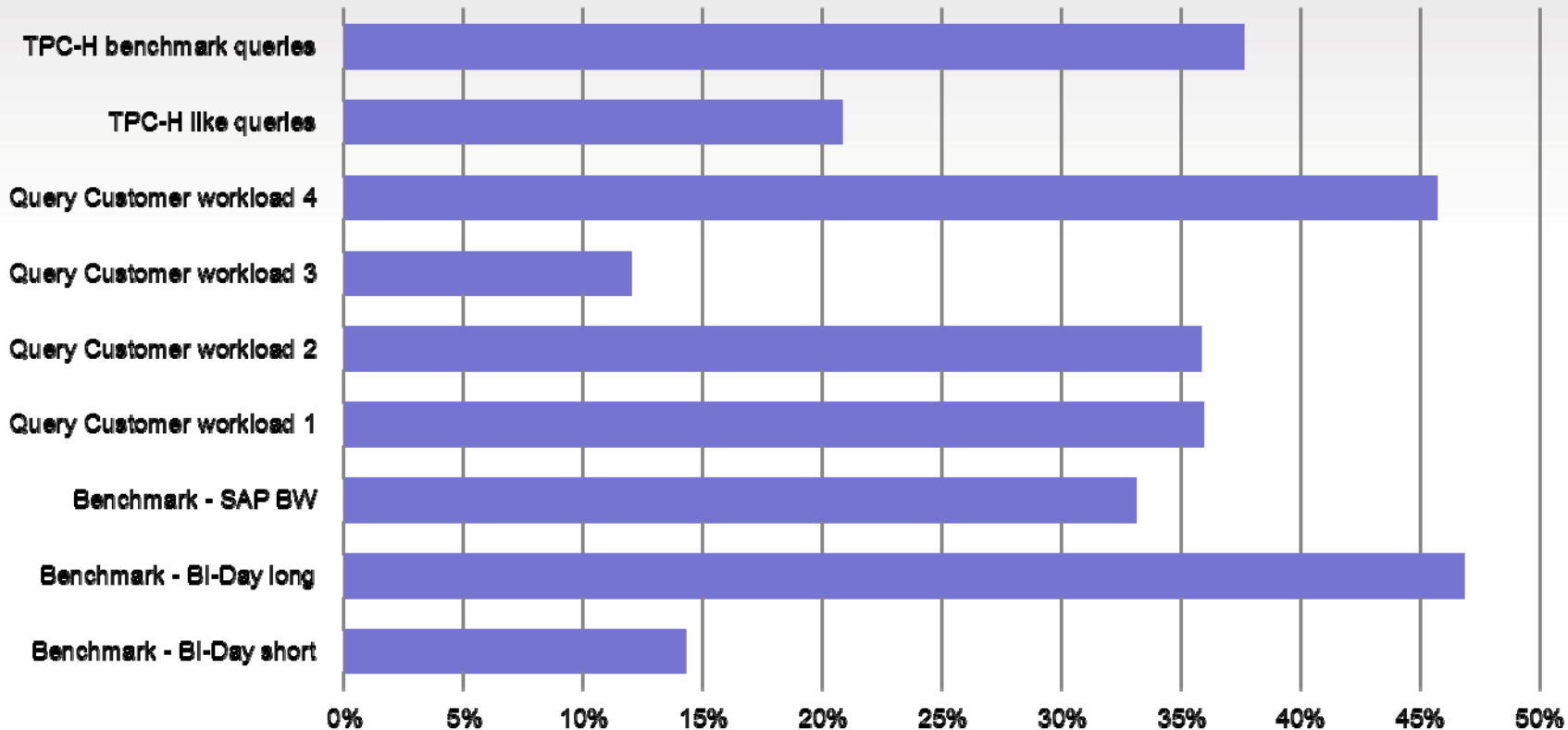




# Significant CPU Reduction in Query Workloads



## DB2 11 Query Workloads - **After REBIND w/o APREUSE** % of DB2 Class 2 CPU Reduction from DB2 10

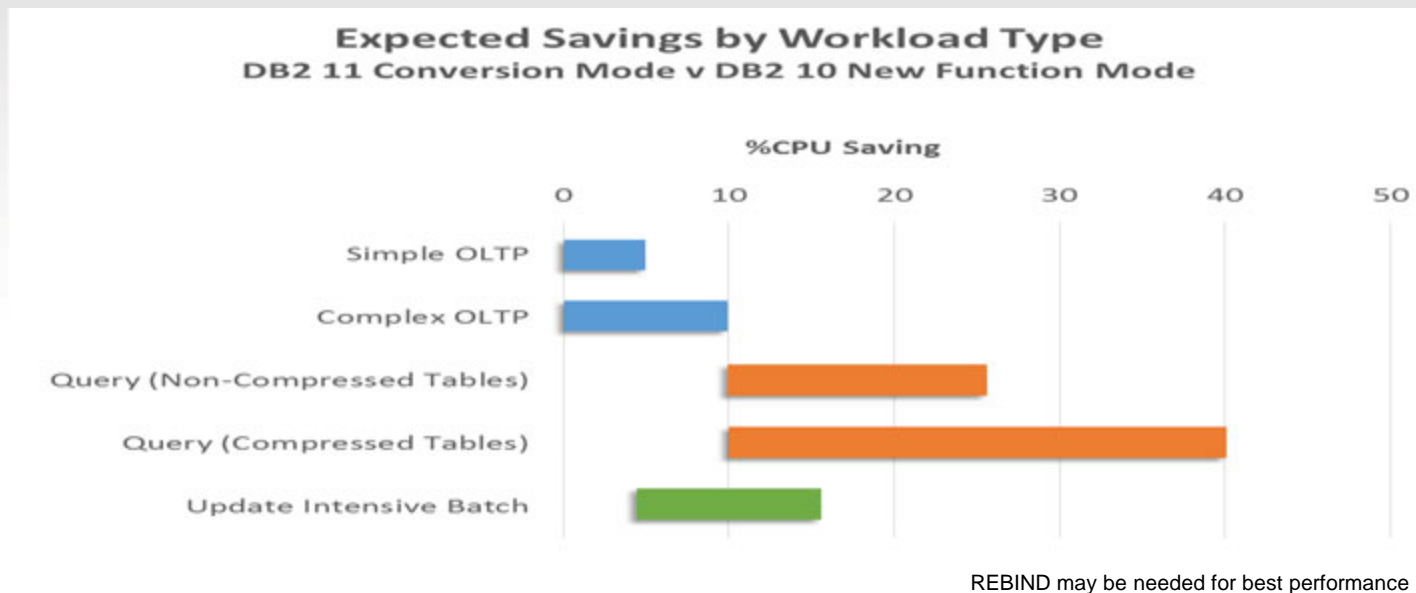


- Most performance improvements are also available with APREUSE
- New and improved access path choices may be available without APREUSE



# DB2 11 Affordable for Every Type of Workload

- Out-of-the-box CPU Savings



- **DB2 base LOAD and REORG inline statistics collection** now executed under enclave SRBs, so are **now zIIP eligible**
- **More potential savings with application or system changes**
  - Log replication capture
  - Data sharing using extended log record format
  - Up to 20-90% CPU savings from pureXML performance enhancements

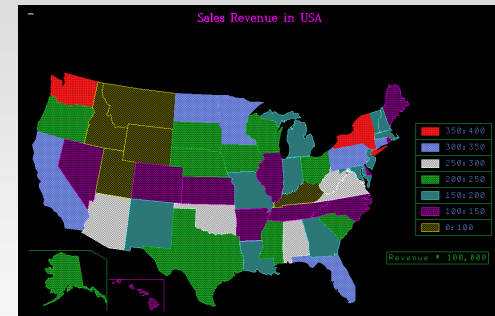


# QMF 11: Business Analytics for the System z Enterprise



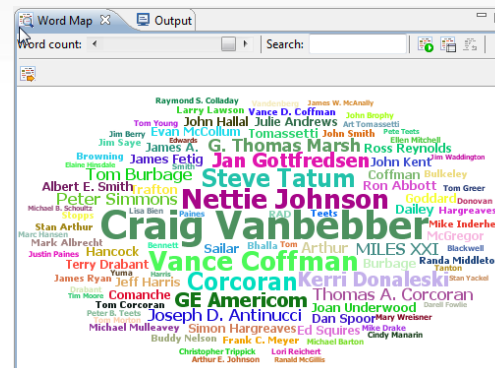
## QMF Analytics for TSO

- Brand new component available in QMF Enterprise Edition 11
- Delivers unprecedented charting and statistical analysis capabilities directly to the mainframe
- Completely menu driven



## Faster up and running with QMF reporting

- Adhoc Reports and Quick Reports
- Allows users to quickly and easily create their own sophisticated reporting objects using an open canvas



## Analytics on unstructured data sources

- Text Analytics allows users to extract entities from unstructured data sources (either file-based or database-based) and display the results graphically



## Increased support for the business user

- Dynamarts allow users to save their result sets with the objects for offline use
- Mobile device support for iPad and Android tablets





# Appendix

- Original but now unused slides(s)



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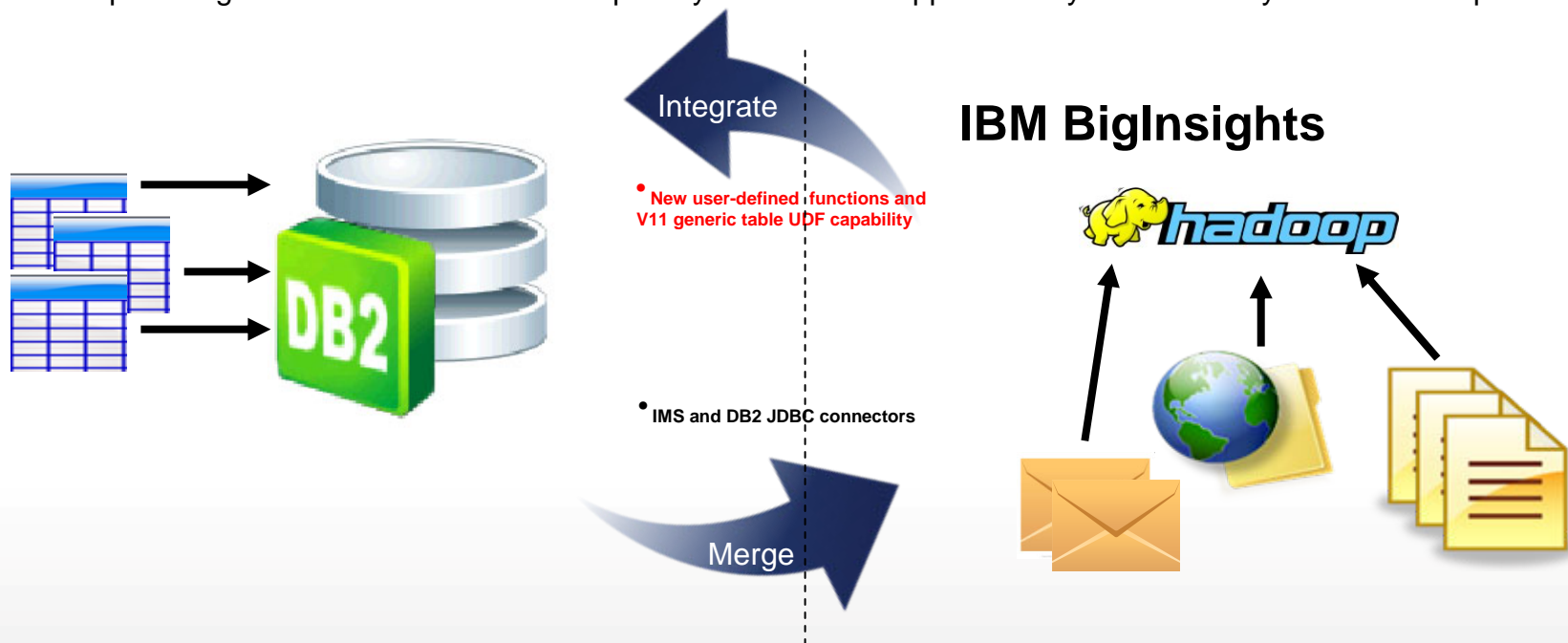
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