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DB2 11 For z/OS Overview

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IBM DB2 for z/OS Development

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Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon many factors, including considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve results similar to those stated here.

DB2 for z/OS Customer Trends

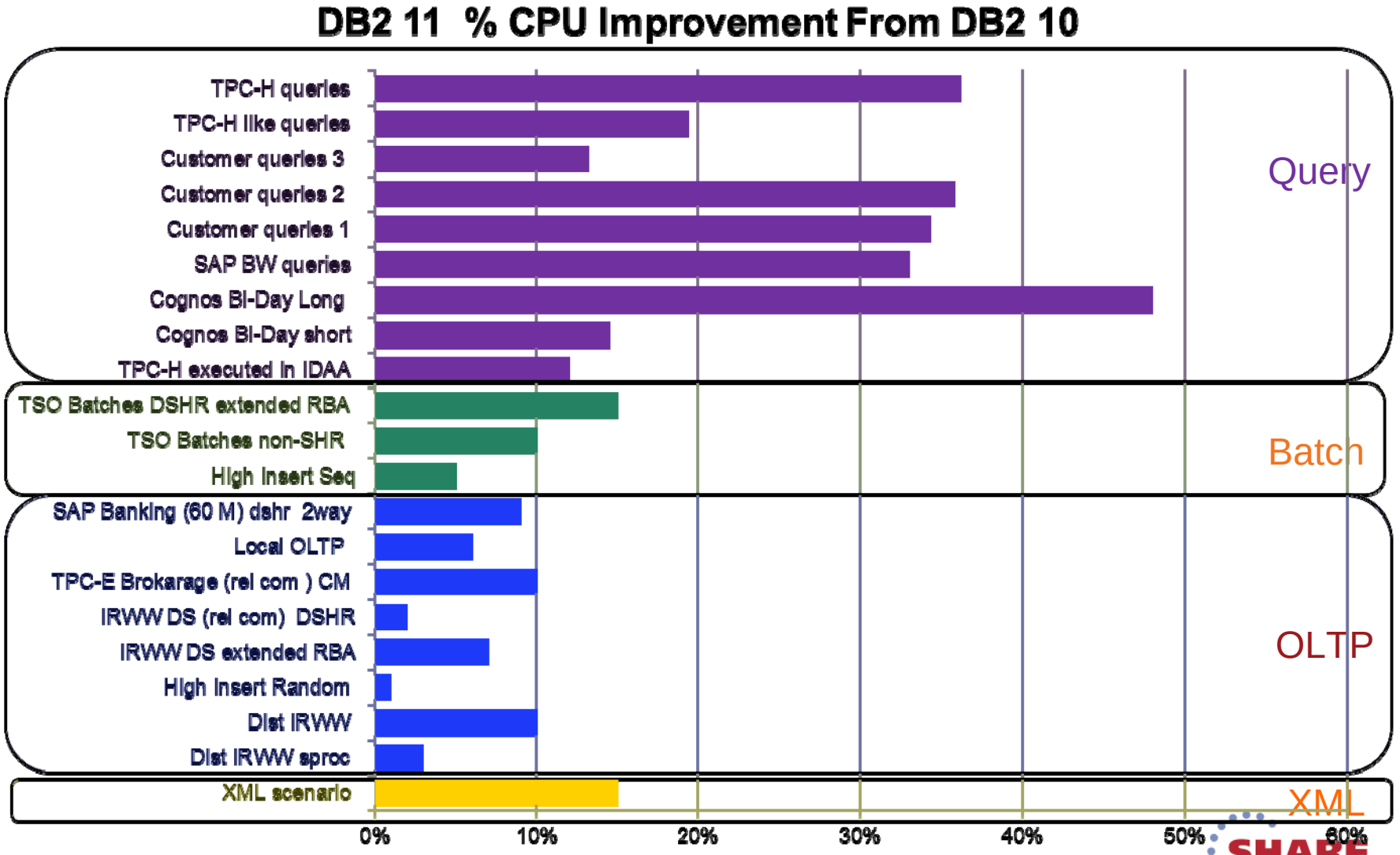
- **Proliferation of mobile and other network-connected devices is driving increases in:**
  - **transaction workloads**
  - **data volumes**
  - **24x7 requirements**
- **Continued focus on cost containment and resource efficiency**
- **Competitive pressures continue to drive an increasing need for 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

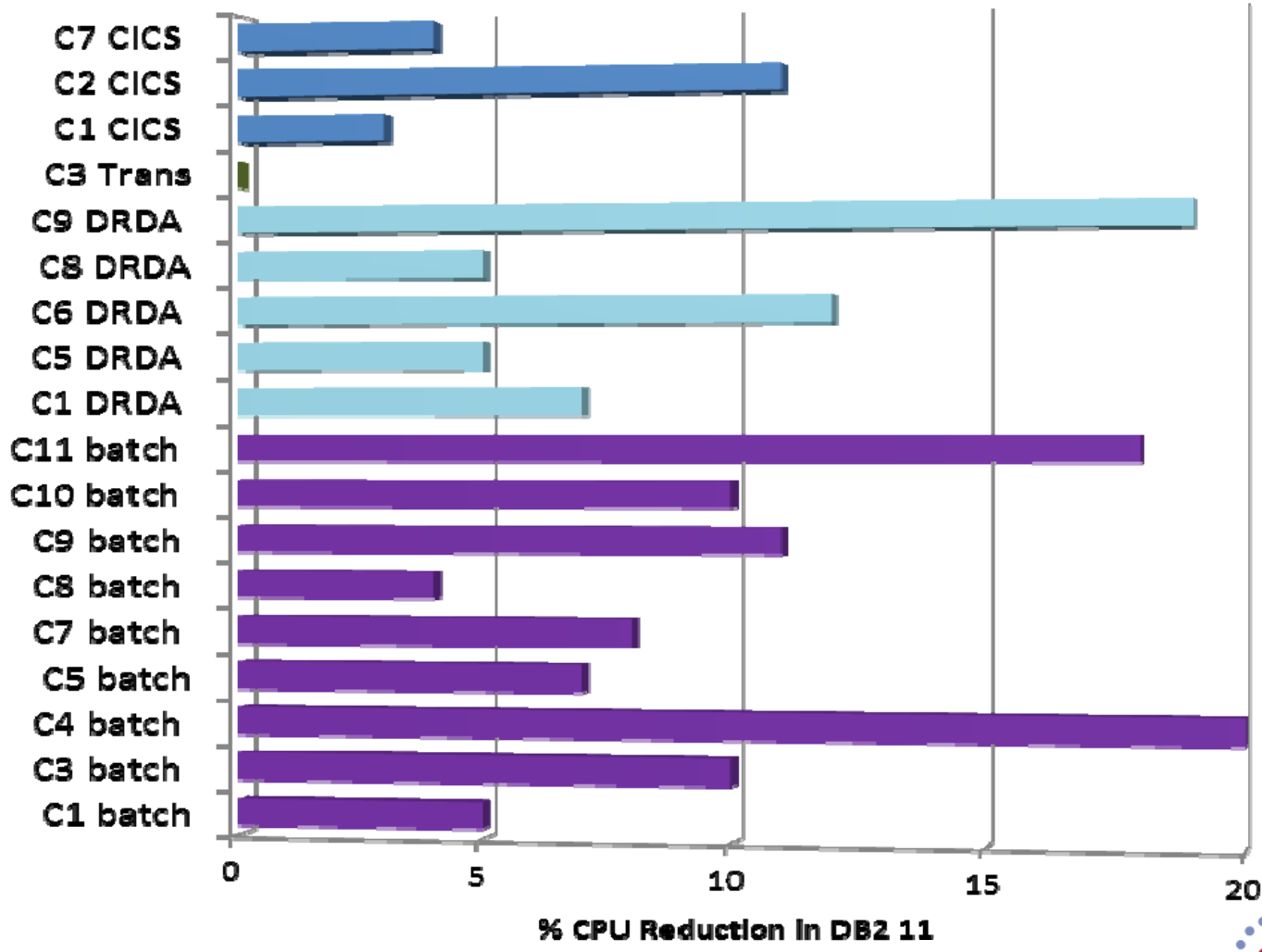
- **Out-of-the-box CPU Savings**
  - Improving efficiency, reducing costs, no application changes
  - Up to 10% for complex OLTP
  - Up to 10% for update intensive batch
  - Up to 40% for queries
  - Additional performance improvements through use of new DB2 11 features
- **Enhanced Resiliency and Continuous Availability**
  - 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 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

GA
Oct. 25,
2013

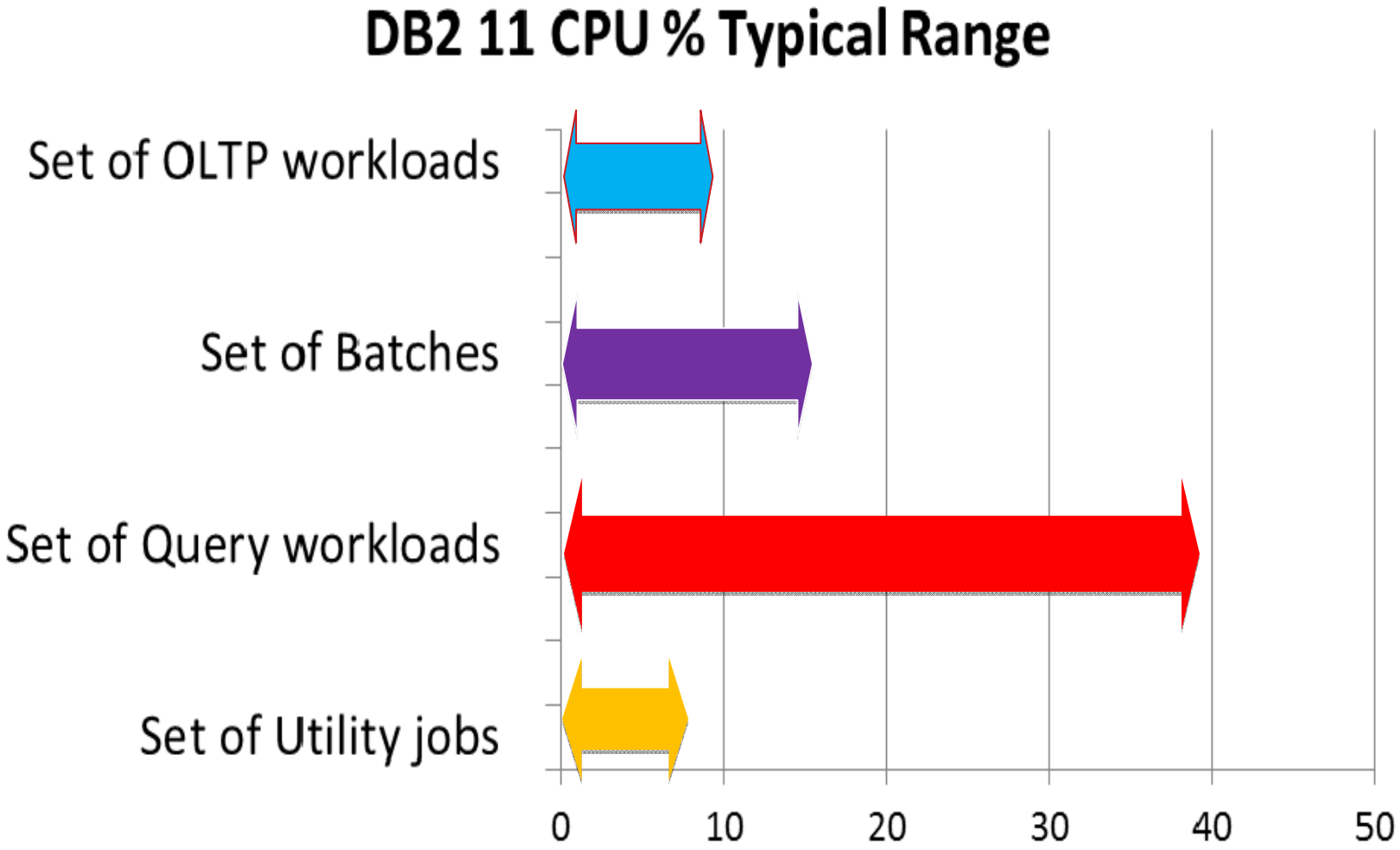
Selected DB2 11 Performance Results



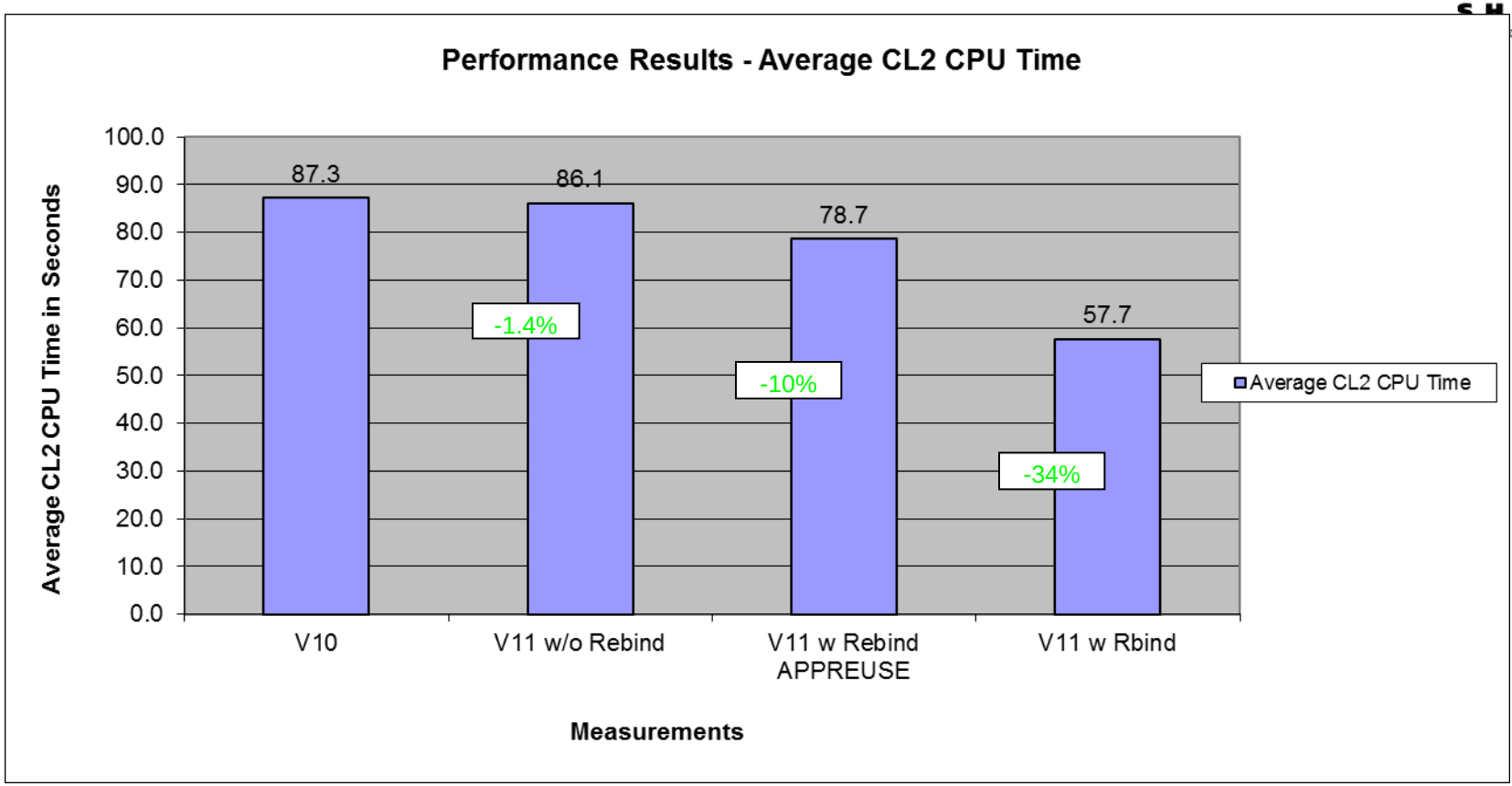
Selected DB2 11 ESP Customer Results



DB2 11 Expected Performance Improvement



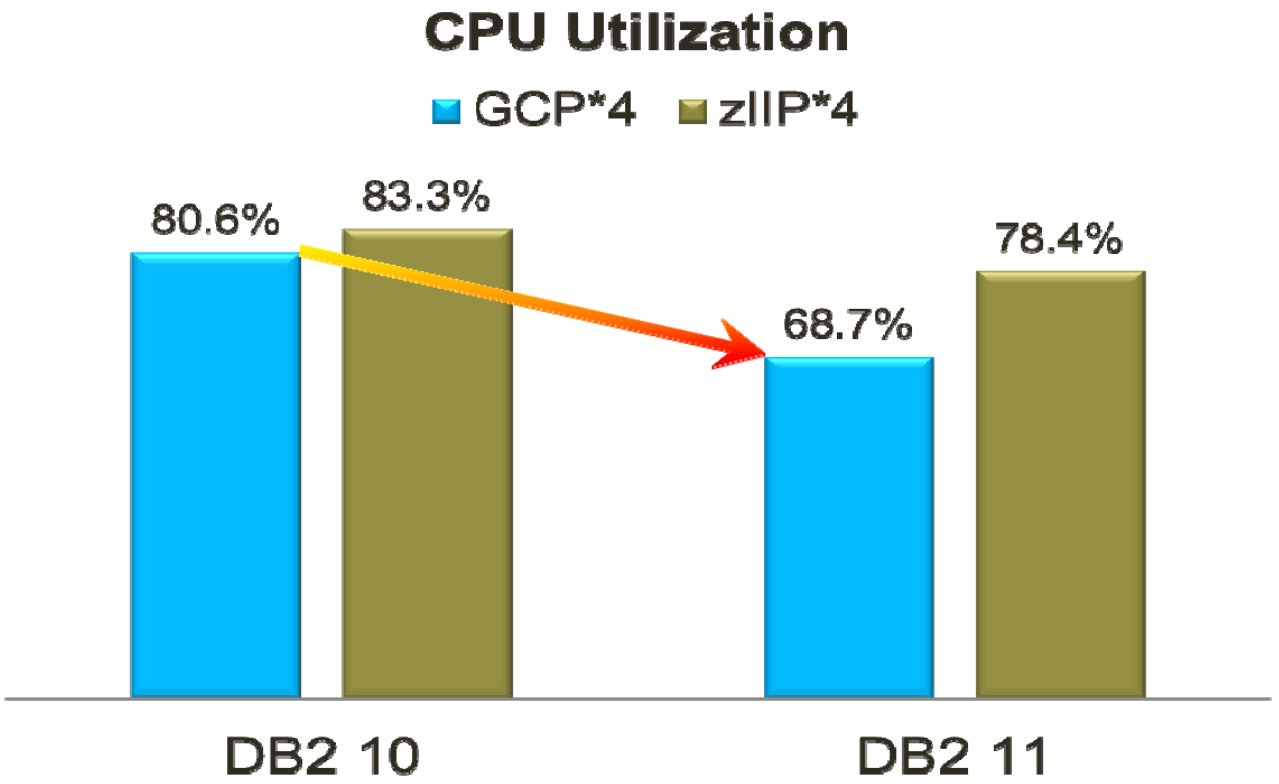
TPC-H Using Static SQLPL



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

Overall CPU and Cost Reduction

- **A case study with SAP Banking workload (OLTP-DRDA)**
- **Essential to have enough zIIP capacity with DB2 10 and 11**
  - More DB2 system tasks are running as zIIP eligible in DB2 11



Please see the details in http://w3-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102394

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

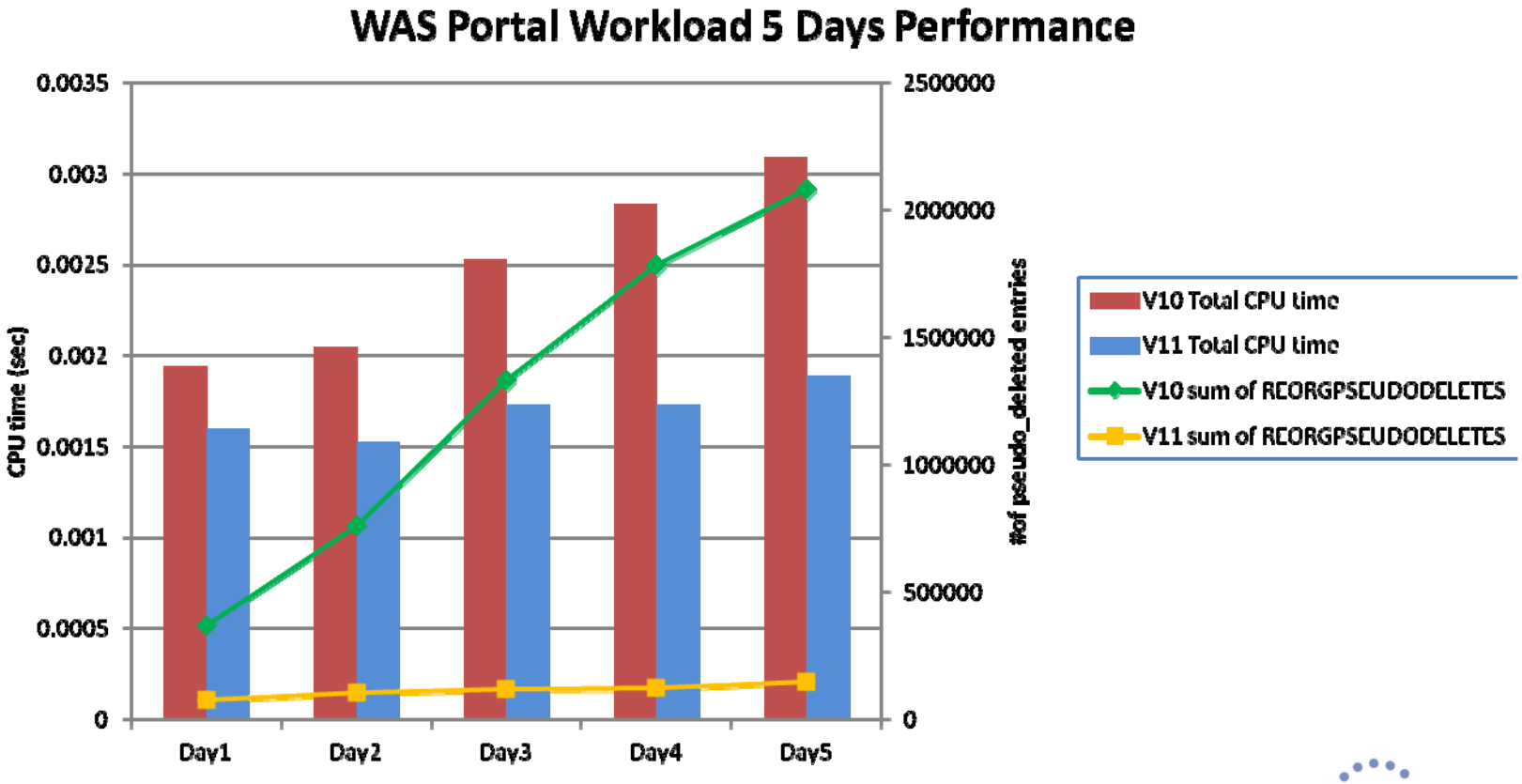
- INSERT performance
  - Latch contention reduction
  - CPU reduction for Insert column processing and log record creation
  - Data sharing LRSN spin avoidance

Performance Improvements
no REBIND needed – Partial List continued

- 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
  - LOAD parallelism
  - REORG PART
- Java stored procedures:
  - multi threaded JVMs replace multiple single thread JVMs
  - 64-bit JVM

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



Performance Improvements
REBIND required – Partial List

- Query transformation improvements – less expertise and less tuning 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 (Max Data Caching)
  - Correlated subquery caching

Complete your session evaluations online at www.SHARE.org/AnaheimEval

Performance Improvements
REBIND required – Partial List (contined)

- 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 application 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
- Open dataset limit raised to 200K

Performance Improvements

Sysprog, DBA, or application effort required – Partial List

- 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

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

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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 some deferred schema changes

99.999% availability because your business never stops.[1]

- 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
- -ACCESS DATABASE … MODE(STATS) option to externalize RTS statistics

Security Enhancements

- Remove inconsistencies between DB2 and RACF access controls
  - Automatic DB2 cache refresh for RACF changes
    - 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 authorization 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

- 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
- 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

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

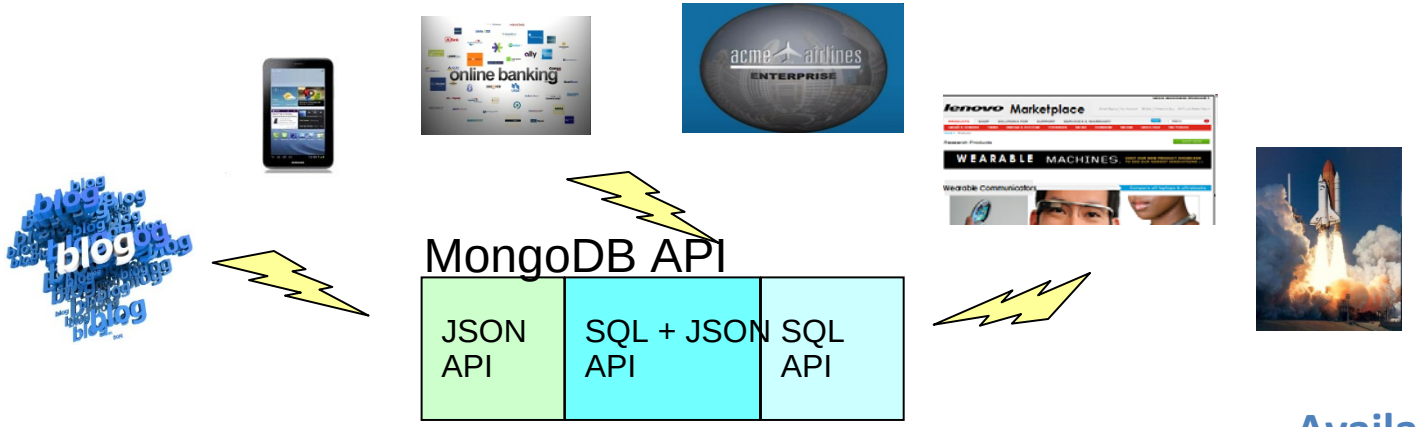
- Easier drain acquisition
- Prevent new claims on all target partitions whilst waiting for drains
  - Faster drain acquisition for part-level REORG
- New DRAIN_ALLPARTS option to momentarily drain all data parts
  - Obtains table space drain before obtaining partition drains
  - Eliminates claim-drain “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
- Transparent archive query
- SQL Grouping Sets, including Rollup, Cube
- Unicode column support for EBCDIC tables
- JSON support (Limited)

JSON Database Technology

Providing the best of both worlds



Available December 2013

DB2 V10 and V11 APARs:

PM97869 and PM98357

XML Enhancements

- New Features
  - Basic xQuery (*retrofit to DB2 10*)
  - COBOL samples for XML (published on Developerworks website)
- Feature Enhancements
  - Implicitly add doc node during insert/update
  - Crossloader support
  - Fix error reporting position predicate (no error if predicate eliminates data)
  - Support xquery constructor as the source expression of insert and replace
- Performance Enhancements
  - Binary XML validation *(retrofit to DB2 10)*
  - 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

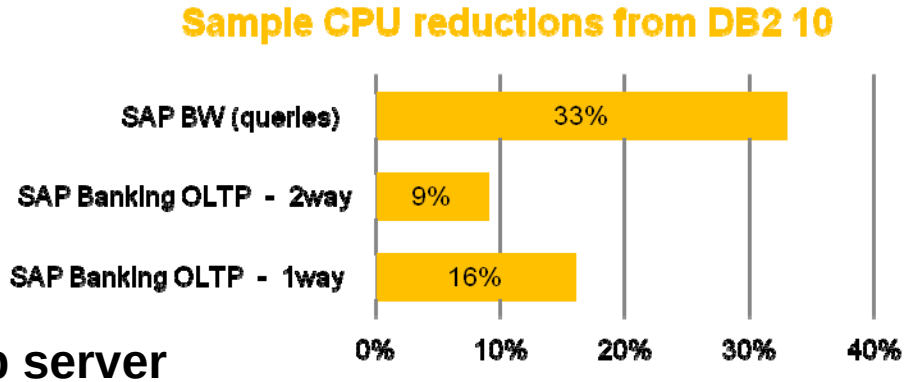
Easier DB2 Version Upgrade

- Application Compatibility (APPLCOMPAT BIND option)
  - 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
  - APPLCOMPAT(V10R1) or APPLCOMPAT(V11R1)
  - Default set by APPLCOMPAT ZPARM
- Faster ENFM processing
  - Lab measurement showed 18x faster in V11 vs. V10 using a large customer catalog
- Access path stability improvements
- Excellent code stability levels
- Migration Planning Workshops (MPW)
  - See the DB2 11 MPW community in DeveloperWorks for latest info

- DB2 11 is in production at several sites

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



- **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, reduced CPU

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

DB2 11 ESP Highlights

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

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

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in Anaheim

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*

- Areas of ESP customer focus:
  - Utility improvements
  - Transparent archiving
  - Large RBA/LSRN
  - Optimizer and migration improvements
  - Big Data Integration
  - JSON Support

DB2 11 ESP Customer Performance Evaluations

- 14 customers have provided performance data to SVL analysis, mostly favorable
  - DRDA workload 0 to 20% CPU reduction
  - CICS workload 3 to 18% CPU reduction
  - Batch workload 3 to 20% CPU reduction
  - Not enough data from complex queries to analyze
  - No obvious virtual or real storage issue
  - A few CPU increase reported, but not with comparable workloads

- Some had difficulties on getting the consistent results
  - Environment, nature of workloads, minor access path changes, etc.

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DB2 11 Early Support Program (ESP)

Customer comments:

*"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 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 Resources

- IBM Information Center / Knowledge Center
- DB2 11 Technical Overview Redbook (SG24-8180)
- DB2 11 Performance Topics Redbook (SG24-8222) – coming soon
- 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
  - “DB2 11 for z/OS – The Database for Big Data and Analytics”
  - 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/atsmastr.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
  - Insert performance improvements
- DBA productivity, autonomics
  - More schema and partition flexibility
  - Stay ahead of mobile, internet-of-things: Extreme scale tables, indexes
  - Self-optimizing system
    - More transparent SQL optimization
    - 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

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Thank You