

# Getting the most from DB2 and SAP on System z

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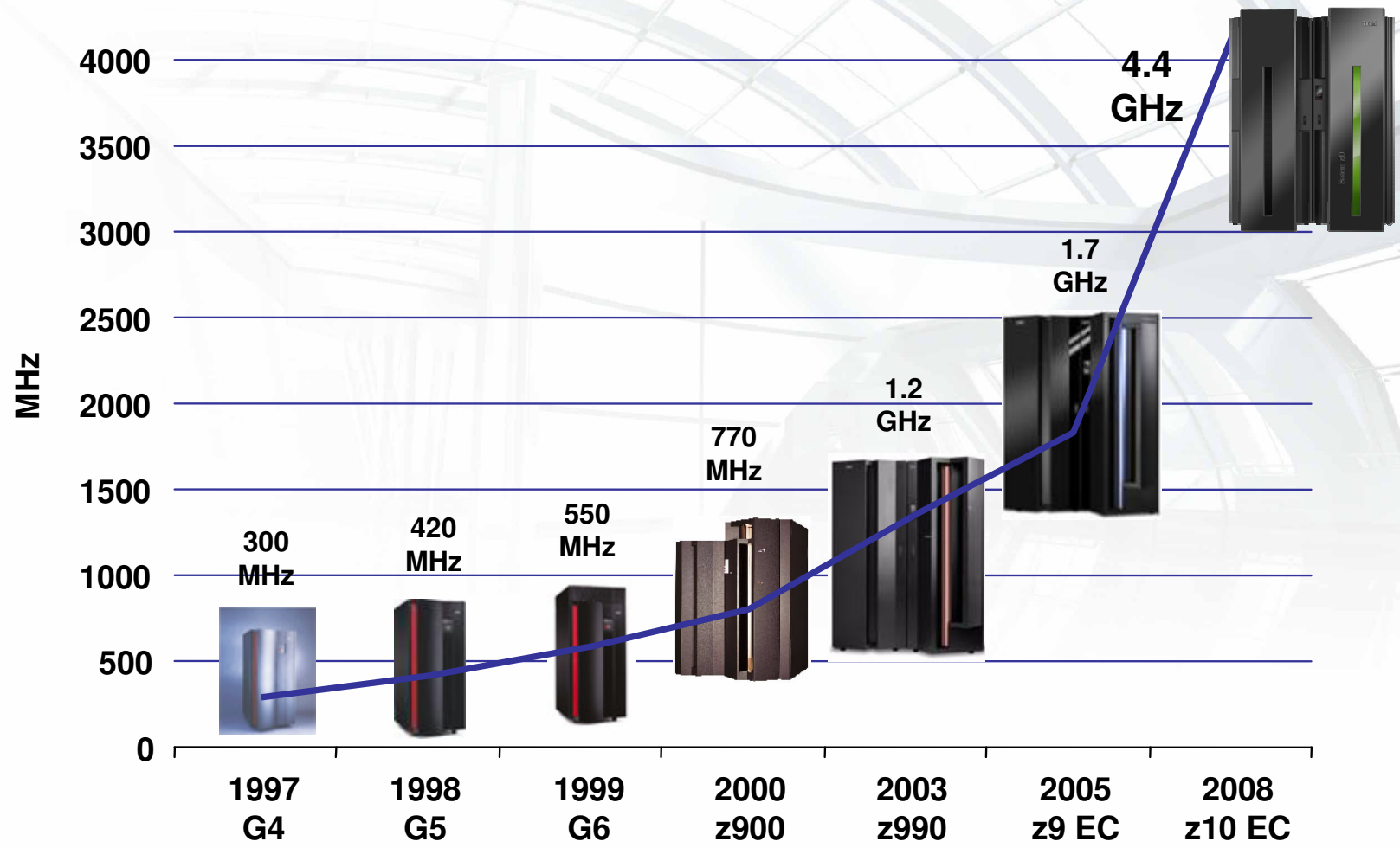
# Agenda

- **System z10 enhancements for SAP**
- **DB2 for z/OS Value Unit Edition**
- **SAP exploiting DB2 9 for z/OS**
- **Accelerated SAP Unicode conversion with DB2 for z/OS**
- **Simplified DB2 connectivity for SAP**

# Topic

## System z10 enhancements for SAP

# IBM z10 EC Continues the CMOS Mainframe Heritage



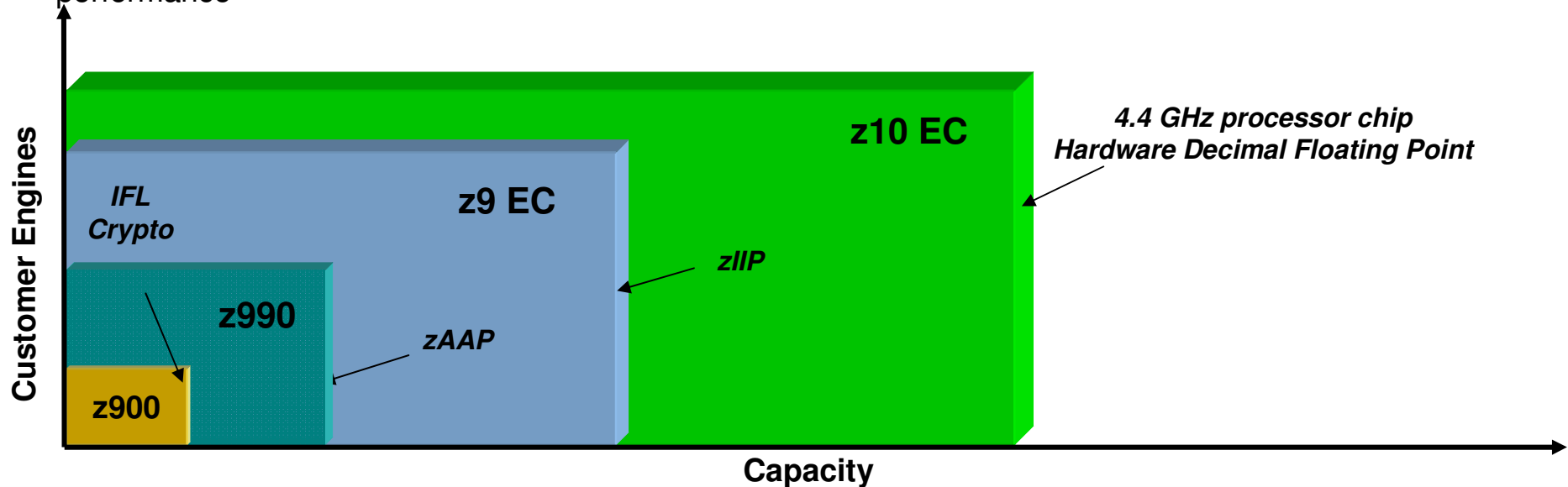
- G4 - 1<sup>st</sup> full-custom CMOS S/390®
- G5 - IEEE-standard BFP; branch target prediction
- G6 - Cu BEOL

- IBM eServer™ zSeries® 900 (z900) - Full 64-bit z/Architecture®
- IBM eServer zSeries 990 (z990) - Superscalar CISC pipeline
- z9 EC - System level scaling

- z10 EC - Architectural extensions

# Designed for improved server performance and scalability with faster and more processors and improved dispatching synergy

- The z10 EC can deliver, on average, up to 50% more performance in a n-way configuration than an IBM System z9<sup>®</sup> Enterprise Class (z9<sup>™</sup> EC) n-way
  - ▶ **The uniprocessor can deliver up to 62% more performance than z9 EC uniprocessor \***
- The z10 EC 64-way can deliver up to 70% more server capacity than the largest z9 EC\*\*
- Introducing HiperDispatch for improved synergy with z/OS<sup>®</sup> operating system to help deliver scalability and performance



## *Significant capacity for traditional growth and consolidation*

\* LSPR mixed workload average running z/OS 1.8 - z10 EC 701 versus z9 EC 701

\*\* This is a comparison of the z10 EC 64-way and the z9 EC S54 and is based on LSPR mixed workload average running z/OS 1.8

\* All performance information was determined in a controlled environment.

# Helping to drive down the cost of IT

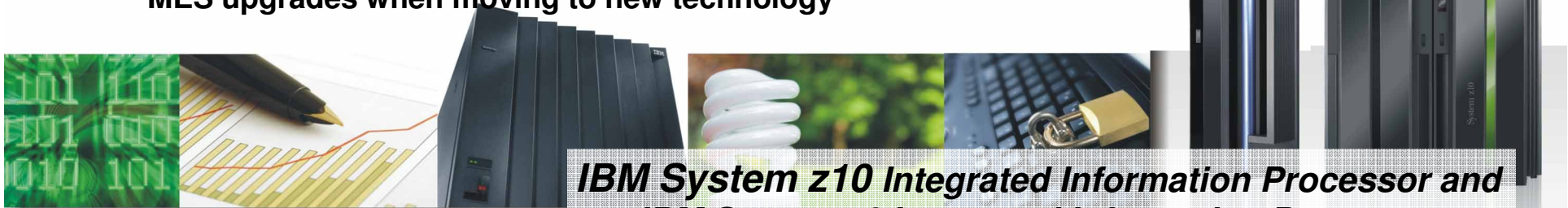
## *Now even more workloads can benefit from zIIP*

- zIIP can help to integrate data across the enterprise by optimizing resources and lowering the cost of ownership for eligible data and transaction processing workloads
  - ▶ Centralized data serving – First to exploit zIIP were workloads such as BI, ERP, and CRM applications running on distributed servers with remote connectivity to DB2® V8
  - ▶ Network encryption – zIIP becomes an IPsec encryption engine helpful in creating highly secure connections in an enterprise
  - ▶ Serving XML data – zIIP is enabled for XML parsing, first to exploit this is inserting and saving DB2 9 XML data over DRDA®
  - ▶ Remote mirror – zIIP becomes a data mirroring engine with zIIP assisted z/OS Global Mirror function (zGM, formerly XRC) helpful in reducing server utilization at recovery site (with z/OS V1.8 and above)
  - ▶ Exploiting of zIIPs by ISVs
- zIIPs offer economics to help you
  - ▶ PLUS zIIP price is same for z10 EC as z9 EC and we offer no charge MES upgrades when moving to new technology

Available  
9/07

new!

new!



**IBM System z10 Integrated Information Processor and  
IBM System z9 Integrated Information Processor**

# Just in time capacity gives you control

- **Permanent and temporary offerings – with you in charge**
  - ▶ Permanent offerings – Capacity Upgrade on Demand (CUoD), Customer Initiated Upgrade (CIU)
  - ▶ Temporary offerings include On/Off Capacity on Demand (On/Off CoD) , Capacity Backup Upgrade (CBU) and a new one – Capacity for Planned Event (CPE)
- **No customer interaction with IBM at time of activation**
  - ▶ Broader customer ability to order temporary capacity
- **Multiple offerings can be in use simultaneously**
  - ▶ All offerings on Resource Link™
  - ▶ Each offering independently managed and priced
- **Flexible offerings may be used to solve multiple situations**
  - ▶ Configurations based on real time circumstances
  - ▶ Ability to dynamically move to any other entitled configuration
- **Offerings can be reconfigured or replenished dynamically**
  - ▶ Modification possible even if offering is currently active
  - ▶ Some permanent upgrades permitted while temporary offerings are active
- **Policy based automation capabilities**
  - ▶ Using Capacity Provisioning Manager with z/OS 1.9
  - ▶ Using scheduled operations via HMC





# Helping to get you connected to your world

- Improved performance and flexibility for connectivity
- Broad set of options to meet your needs
- Excellent investment protection when you upgrade to the z10 EC

## Within the server

- HiperSockets™ **new!**
  - Multi Write Facility **new!**
  - Layer2 support
- Integrated console controller
- Integrated communications controller support

## To the Data

- FICON/FCP
  - FICON Express4
  - **FICON Express2**
  - **FICON Express**  
(Required for FCV)
- ESCON®

\* Note: Red items carry forward on a Machine MES only, not available for new system orders



## To the Network

- OSA-Express3<sup>1</sup> **new!**
  - 10 Gigabit Ethernet
- OSA-Express2
  - 1000BASE-T Ethernet
  - Gigabit Ethernet LX and SX
  - 10 Gigabit Ethernet LR

## For Clustering

- InfiniBand Coupling Links **new!**
- ICB-4
- ISC-3 (peer mode only)
- IC (define only)
- STP - NTP Client Support
- Support for n-2 and above servers

<sup>1</sup> Planned availability 2Q08



# Topic

## DB2 for z/OS Value Unit Edition

# DB2 for z/OS Value Unit Edition - OVERVIEW

- **DB2 for z/OS VUE for Net New Workload on z/OS**
  - ▶ Offering DB2 for z/OS as OTC (one-time charge) for eligible net new workloads on z/OS
  - ▶ Unique orderable z/OS OTC and S&S Product Numbers
    - ◆ Announce Feb 26<sup>th</sup>
    - ◆ V9 GA Feb 29<sup>th</sup>
    - ◆ V8 GA Mar 28<sup>th</sup>
  - ▶ Net new workloads limited to those that qualify for System z New Application License Charge (zNALC)
  - ▶ The new workload can only run in a new zNALC partition, machine or sysplex
- **DB2 for z/OS as OTC**
  - ▶ Purchase DB2 up front along with new applications (capital vs expense)
  - ▶ Control z/OS stack costs (pay only for what you use)

## DB2 for z/OS Value Unit Edition – Offering

### Net New DB2 Workload on z/OS offering available OTC

- **Unique orderable z/OS OTC and S&S products (PIDs)**
  - ✓ IPLA license with unique terms & conditions
    - Effectively license is tied to machine
  - ✓ Must be net new workload that meet zNALC qualifications
- **Use existing zOTC price curve that matches MLC PSLC today**
  - ✓ Like DB2 Utilities Suite
- **Use existing zNALC terms to define qualified workloads**
  - ✓ zNALC is System z New Application License Charge
  - ✓ Qualified Applications are those that IBM considers 'new workload,' such as Java language business applications running under WAS, SAP, PeopleSoft, Siebel or data warehousing
  - ✓ Running on a zNALC qualified LPAR, machine, or Sysplex
  - ✓ zNALC offering excludes existing z/OS workloads
  - ✓ VUE offering excludes existing qualified workloads

# Topic

## SAP exploiting DB2 9 for z/OS

# Major DB2 9 functionality used by SAP customers

- **Partition-by-growth universal tablespaces**
- **CATMAINT utility to facilitate DB2 subsystem cloning**
- **Backup and recovery enhancements, e.g.**
  - ▶ Tape support in BACKUP SYSTEM and RESTORE SYSTEM
  - ▶ Support for incremental FlashCopy
  - ▶ Recover individual tablespace from volume-level backup
- **Dynamic index ANDing for SAP BI**
- **In general, less CPU consumption than DB2 V8**
  - ▶ 5% less CPU in SAP SD benchmark
  - ▶ DB2 utilities consume less CPU

## DB2 9 Table Option APPEND

### Problem

All of the following applies:

- Critical, high insert rate workload needs better performance and all the conventional tuning steps have already been applied.
- Clustering is either not beneficial or more frequent reorganizations are acceptable
- Insert algorithm introduced by PQ87381 is still not fast enough or the prerequisites cannot be satisfied:
  - MEMBER CLUSTER
  - FREEPAGE=PCTFREE=0

### Solution

CREATE TABLE ... APPEND YES | NO

ALTER TABLE ... APPEND YES | NO

- The APPEND YES results in a fast insert at the end of the table or appropriate partition at the expense of data organization and rapid table space growth.
- After populating with the APPEND option in effect, clustering can be achieved by running the REORG utility providing a clustering index has been explicitly defined.

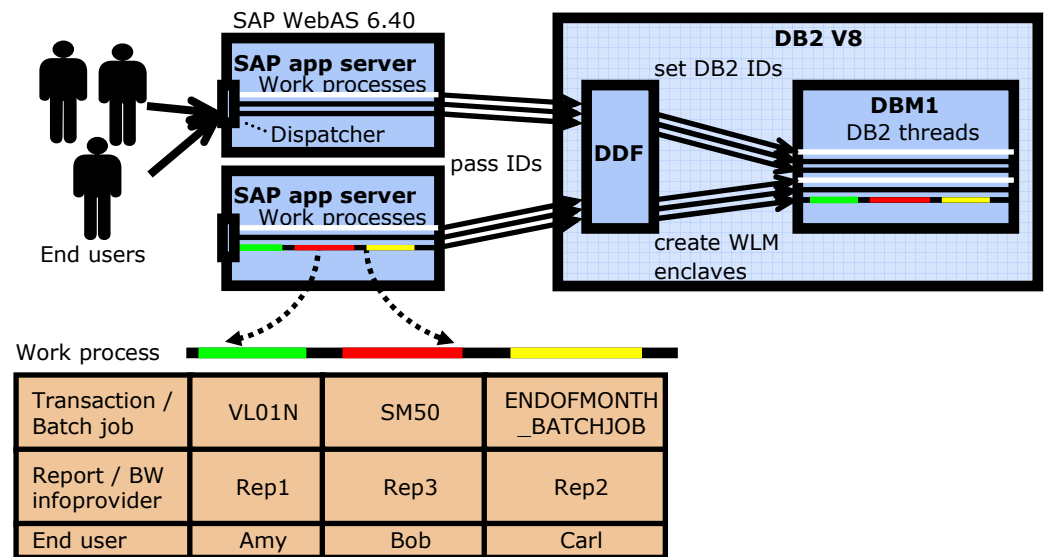
→ SAP DDIC

# DB2 9: Granular DB2 tracing

- **New keywords for Start Trace command**

- ▶ Location, Collid, Package, Userid, Appname, ...
- ▶ Wildcard support
- ▶ Also Exclude option (e.g. Xplan)

- **Allows you to turn on traces for individual SAP reports, transaction codes and end users**





## Auditing based on SAP IDs

- **Start audit trace for certain SAP report, transaction code or end user**
  
- **Audit trace records contain SAP relevant information in the following DB2 client identifiers:**
  - ▶ Application/transaction name (IFCID field QWHCEUTX)
  - ▶ Workstation name (IFCID field QWHCEUWN)
  - ▶ End user ID (IFCID field QWHCEUID)
  
- **AUDIT attribute of table needs to be set**
  - ▶ SAP DDIC supports it
    - SAP 7.10 SP5
    - SAP 7.00 SP14
    - SAP 6.40 SP22
    - SAP 6.20 SP64

→ SAP DDIC

## DB2 9 MERGE Statement

### Problem

For a set of input rows update the target table when the key exists and insert the rows for which keys do not exist

→ ABAP MODIFY statement

E.g.

- For activities whose description has been changed, update the description in table **archive**.
- For new activities, insert into **archive**.

Prior to V9 this has been coded as a loop over conditional INSERT and UPDATE statements

### Solution

```
MERGE INTO archive AR
  USING VALUES (:hv_activity, :hv_description) FOR :hv_nrows ROWS
  AS AC (ACTIVITY, DESCRIPTION)
  ON (AR.ACTIVITY = AC.ACTIVITY)
  WHEN MATCHED THEN UPDATE SET DESCRIPTION = AC.DESCRPTION
  WHEN NOT MATCHED THEN INSERT (ACTIVITY, DESCRIPTION)
  VALUES (AC.ACTIVITY, AC.DESCRPTION)
NOT ATOMIC CONTINUE ON SQLEXCEPTION
```

→ SAP DBSL

## DB2's industry leading availability for SAP Java

- **For SAP Java stack, DB2 driver for JDBC provides new native failover capabilities**
  - ▶ Existing native failover based on sysplex workload balancing not ideal for SAP's long-running DB2 threads
- **Transparent to SAP**
  - Not a single line of SAP code needs to be changed
- **Enhancements rolled out in recent fixpaks of DB2 Connect 9 and 9.5**
- **For details, refer to SAP Note 1085521**

# DB2 JDBC failover for SAP unplanned outages

- **To cover unplanned outages**
  - ▶ Delivered through DB2 Connect 9 FP3 Special Build 17965 (JCC 3.4.7699)
  - ▶ Supports both DB2 for z/OS V8 and 9
    - APARs PK35632 and PK47633
  - ▶ Optimized for SAP workload
    - All processes connect to same DB2 member
  
- **Concept is based on DB2 DDF location alias**
  - ▶ Define location alias in DDF for all DB2 members eligible for failover
    - Sample DSNJU003 statement:  
`DDF LOCATION=DSGG, ALIAS=SGGAL: 8188, PORT=8162, RESPORT=8163`
  - ▶ Adapt URL that SAP uses to connect to DB2 using JDBC
    - Specify DDF location alias and location port
      - For primary DB2 member
      - For secondary member(s) using new connection properties  
`clientRerouteAlternateServerName` and  
`clientRerouteAlternatePortNumber`

# Seamless and cascaded failover for SAP Java

- **To cover planned outages and to enable cascaded failover**
  - ▶ Delivered through DB2 Connect 9.5 FP1 Special Build
  - ▶ Supports both DB2 for z/OS V8 and 9
    - APARs PK41236
  - ▶ Planned to be certified by SAP soon
  
- **Optimized for SAP workload**
  - ▶ Seamless failover for JDBC threads using **KEEPDYNAMIC (YES)**
  - ▶ Cascaded failover
    - Precedence of DB2 members as specified in the URL string is always honored
  
- **Extension to approach for JDBC failover for unplanned outages**

# Seamless and cascaded failover for SAP Java

## ■ JDBC seamless failover

- ▶ To trigger seamless failover, issue command `-STOP DDF MODE (QUIESCE)`
  - DDF lets DB2 thread continue processing until commit
  - Then terminates thread under the cover
  - JDBC driver notices this and establishes connection to another DB2 member
- ▶ Completely transparent to application code
  - Specify new connection attribute `enableSeamlessFailover=YES` and `queryCloseImplicit=NO` in URL string
  - No negative SQL code

## ■ JDBC cascaded failover

- Enabled by setting new connection attribute `enableClientAffinitiesList=YES` in URL string
- Only DB2 members in `clientRerouteAlternateServerName` are considered as failover targets
- JDBC strictly honors the failover sequence of DB2 members as specified in this list

# Miscellaneous

- **RENAME INDEX old-index-name TO new-index-name** → **SAP Banking & BI**
  - ▶ Online operation, no moving of data
  - ▶ Invalidates cached statements that depend on the source index
  
- **Online ALTER TABLE ALTER COLUMN SET DEFAULT** → **SAP MDM**
  
- **BIGINT** → **SAP Java**
  
- **VARBINARY, BINARY** → **SAP Java**
  
- **Index compression** → **SAP DDIC**

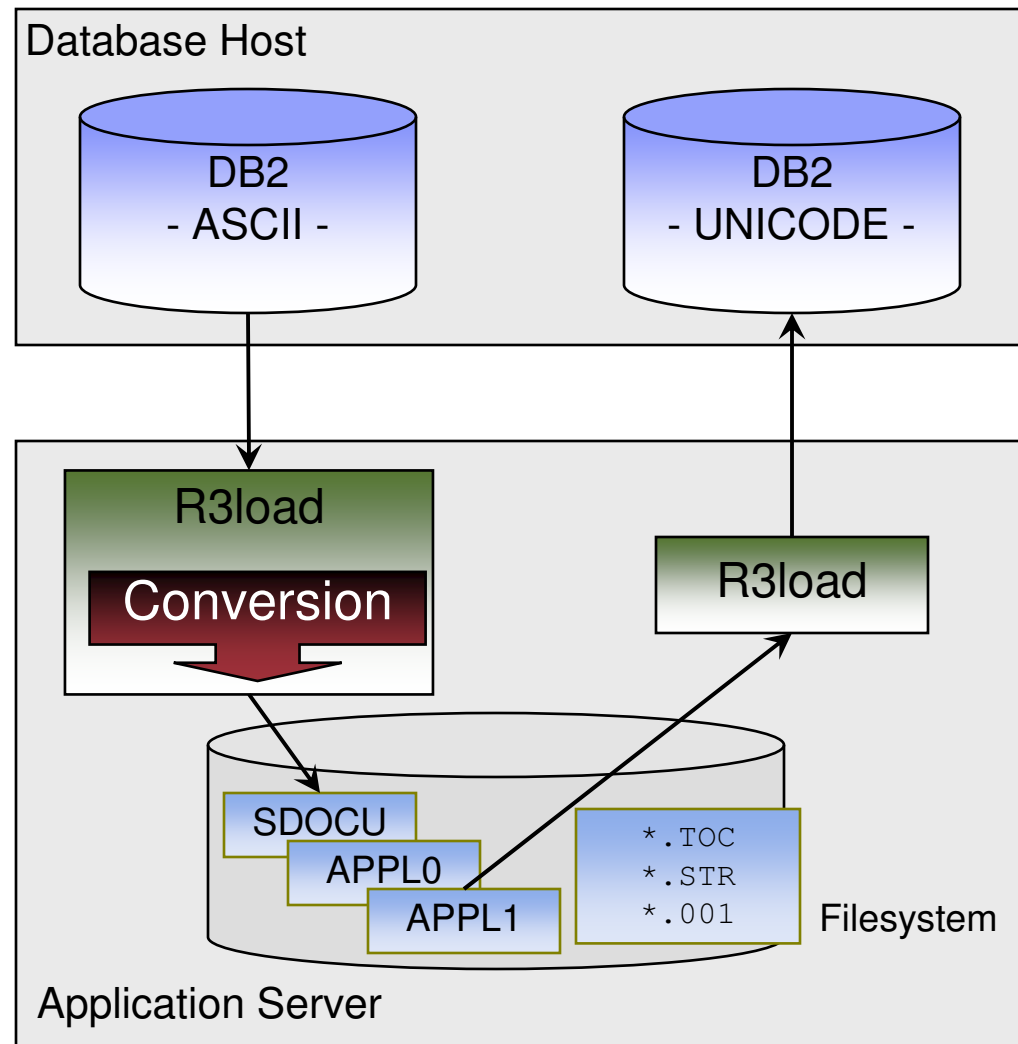


# Topic

## Accelerated SAP Unicode conversion with DB2 for z/OS

# SAP Database Conversion

- **Unicode conversion is like SAP homogeneous system copy**
  
- **The actual conversion is done by R3load during the export phase**
  - ▶ R3load uses result of pre-conversion phase:
    - Export Control Table
    - Vocabulary
    - Language List
  
- **Native DB2 system copy methods cannot be used**



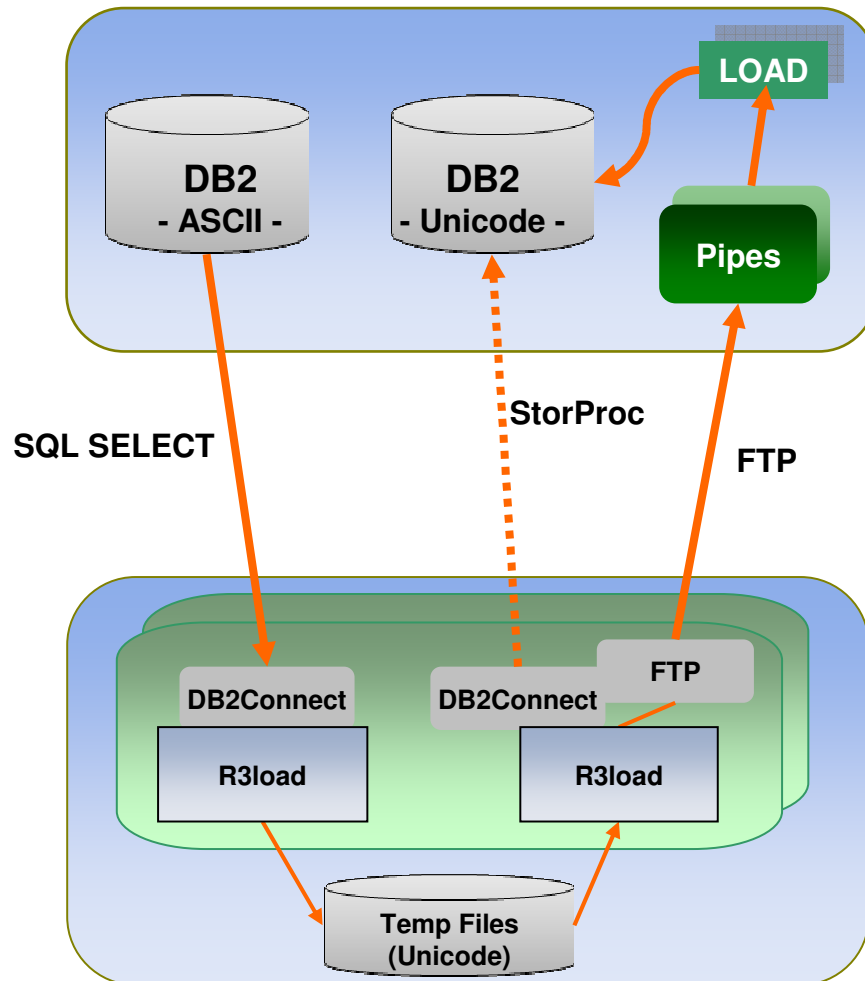
# Tuning Knobs

- **Using Fast Load option** [see next slide]
- **Utilize optimal number of parallel export and import jobs**
- **House-keeping**
  - ▶ Archiving of old data
  - ▶ BI: Cleanup of staging area
- **Unsorted export**
  - ▶ Consider only if a appropriate primary index is not available, in particular for SAP BI fact tables
  - SAP note 954268
- **Create indexes after load**
  - ▶ Utilize REBUILD INDEX for big tables to avoid contention on the DB2 catalog
  - SAP note 1066611
- **Switch off logging**
- **Build compression dictionary via online REORG**
  - SAP note 1022334

**Only applicable  
for standard load  
process**

**Not needed with  
fast load option**

# Fast Load Option



- **R3load preformats data using internal DB2 record format**
  - ▶ Using FTP to transmit data into pipe on z/OS
  - ▶ DB2 load utility reads from pipe
- **Load utility handles compression and runstats on the fly**

## Today

- Using *BatchPipes for OS/390* (separate product)

## Tomorrow

- Using USS pipes (no installation, no configuration)

# Fast Load: Performance Measurements in POK Lab

- IMPORT Phase**

Application Server: p595 w/ 16 CPs

System z9	# of streams	%CPU util	Throughput [GB/hour]	
2094-708 (8 CPs)	40	60%	<b>150</b>	Standard procedure
2094-708 (8 CPs)	46	75%	<b>380</b>	<b>Fast load</b> incl. compression
2094-712 (12 CPs)	62	72%	<b>500</b>	<b>Fast load</b> incl. compression

## Fast Load: Restrictions / Cookbook

- **Statement of Direction: USS Pipes support to be expected 4Q08**
  - ▶ Search for beta customers to start testing Fast Load with USS pipes in Sept/Oct timeframe (z/OS 1.8 + 1.9, DB2 V8 + 9)
  
- **Prereq & restriction:**
  - ▶ Fast Load is not supported with Windows application servers
  
- **For always current information and list of required PTFs please see**
  - ▶ ***SAP Unicode Conversion on DB2 for z/OS – Cookbook***  
on SAP Developer Network <https://sdn.sap.com/irj/sdn/db2>

# Topic

## **Simplified DB2 connectivity for SAP**



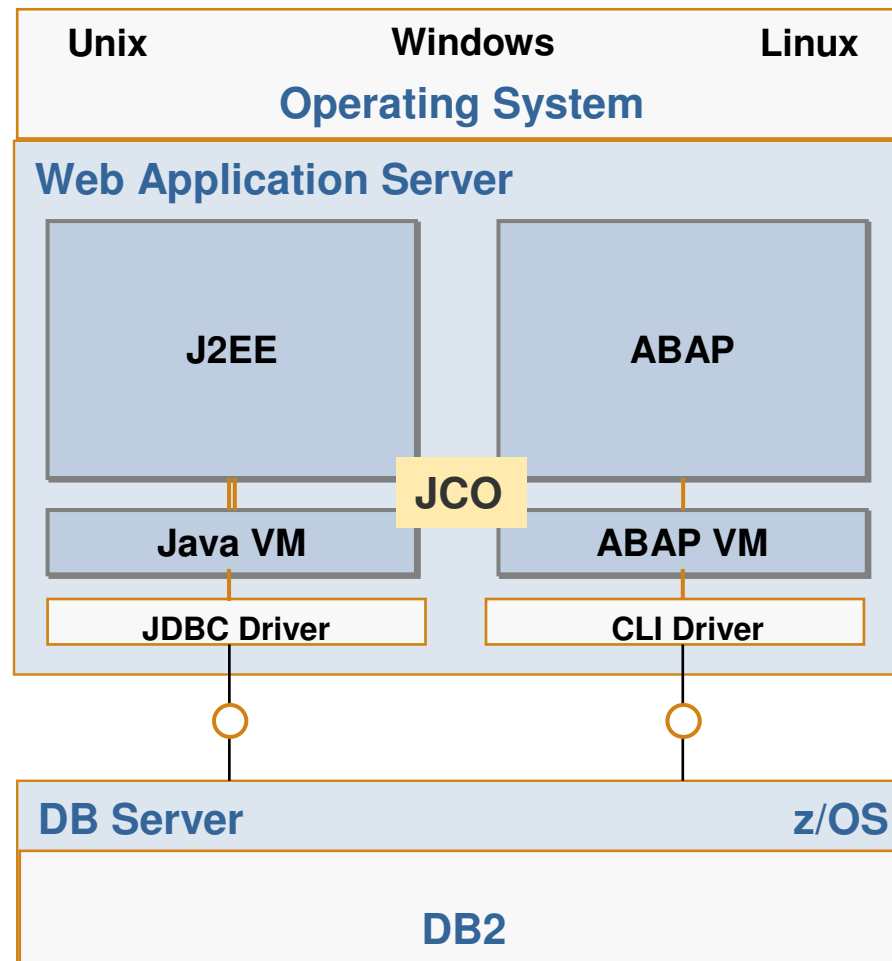
## DB2 Connect 9 introduced CLI driver

- **CLI driver is standalone driver**
  - ▶ Basically a ZIP file
  - ▶ Small footprint: ~20 MB
  - ▶ Can be copied to any directory
    - No installation necessary, no database instance, no OS user ID
  
- **Comes with try-and-buy license**
  - ▶ Can be shipped on SAP DVDs
  - ▶ OEM customers get their permanent license file from SAP
  - ▶ IBM customers need to order their permanent license from IBM
  
- **Component of DB2 Connect**
  - ▶ Licensing requirement does not change
  - ▶ Need license for DB2 Connect Enterprise Edition or equivalent (but not Personal Edition)

# Strategic connectivity for SAP

- **CLI driver**
  - ▶ For ABAP and MDM workload
  
- **JDBC driver**
  - ▶ For Java workload
  - ▶ Standalone driver similar to CLI driver
  - ▶ Existed in earlier releases of DB2 Connect already
  
- **Latest release of DB2 Connect**
  - ▶ Basic idea:
    - Customers can stay on certified fixpaks of previous DB2 Connect releases
    - After grace period, only fixpaks of latest DB2 Connect release are certified
  
- **All customers can download CLI and JDBC drivers from SAP market place**

# SAP NetWeaver 7.1 AS on DB2 for z/OS



## Advantages of this new approach

- **CLI and JDBC drivers easier to deploy**
- **CLI and JDBC drivers shipped with SAP and automatically configured**
  - ▶ Try&buy license speeds up deployment of new SAP systems
- **CLI and JDBC drivers can be upgraded on the fly**
  - ▶ Exception: SAP app server on Windows
- **Small disk footprint**
- **Different releases of DB2 Connect can be installed on same OS**
- **SAP app server can invoke CLI driver directly without context switching**
  - ▶ Benefits performance
- **Customers and SAP can earlier take advantage of latest DB2 Connect releases**

## Transition to DB2 Connect 9.5 CLI and JDBC Drivers

- **SAP NetWeaver 7.1 only supports CLI and JDBC drivers**
- **SAP NetWeaver 7.0 SR3 and latest NetWeaver 2004 patch collection only supports CLI and JDBC drivers**
- **Up to SAP NetWeaver 7.0 SR2: CLI driver can be optionally used**
  - ▶ See SAP Note 1031213
- **Upgrading to SAP NetWeaver 7.1 or 7.0 SR3**
  - ▶ CLI driver automatically installed
- **Upgrading to SAP NetWeaver 7.0 SR2 or 2004**
  - ▶ CLI driver is kept if it is already installed

# Questions?

# References

- **SAP developer network: SAP on DB2 for z/OS**
  - ▶ [www.sdn.sap.com/irj/sdn/db2](http://www.sdn.sap.com/irj/sdn/db2)
    - Streamlining DB2 Connect for SAP
- **IBM Website: SAP on DB2 UDB for z/OS on IBM System z**
  - ▶ [www.ibm.com/servers/eserver/zseries/software/sap](http://www.ibm.com/servers/eserver/zseries/software/sap)
- **SAP whitepaper „SAP on IBM DB2 for z/OS: Best Practice for Installing or Migrating to DB2 9“**
  - ▶ [service.sap.com/solutionmanagerbp](http://service.sap.com/solutionmanagerbp)
- **IBM redbook „Enhancing SAP by using DB2 9 for z/OS“**
  - ▶ [www.redbooks.ibm.com](http://www.redbooks.ibm.com), SG24-7239
- **IBM whitepaper „SAP Transaction Banking: Measurements of IBM System z DB Server Using DB2 V9.1 for z/OS“**
  - ▶ [www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP101003](http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP101003)
- **IBM whitepaper „The ideal platform for SAP NetWeaver Business Intelligence - System z9 and DB2 for z/OS“**
  - ▶ [www.ibm.com/solutions/sap/doc/content/resource/technical/1996216130.html](http://www.ibm.com/solutions/sap/doc/content/resource/technical/1996216130.html)
- **DB2 Value Unit Edition**
  - ▶ [www.ibm.com/software/data/db2/zos/edition-vue.html](http://www.ibm.com/software/data/db2/zos/edition-vue.html)

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