

This is an overview of what is beyond DB2® for z/OS Version 8 (V8). DB2 V8 became generally available March 2004, bringing extensive integration and synergy with System z9 and zSeries hardware, with middleware and with applications. Data support, application development and query enhancements are added for e-business, building upon the traditional enterprise of choice characteristics of availability, exceptional scalability, and performance. DB2 V8 has been re-engineered for e-business on demand, with many fundamental changes in architecture and structure. Key improvements enhance scalability, application porting, security, and continuous availability. Management for very large databases is made much easier, 64-bit virtual storage support makes management simpler and improves scalability and availability. This new version breaks through many old limitations in the definition of DB2 objects. These enhancements include SQL improvements, schema evolution, longer names for tables and columns, longer SQL statements, enhanced Java and Unicode support, enhanced utilities, more log data sets, and a lot more.

DB2 for z/OS Version 8 News

- New function

- now {
- Cross loader with LOBs
 - Built in functions ASCII, TIMESTAMPDIFF
 - DSN1COPY with 1000 OBIDs
 - QMF with multirow fetch
 - Online Check Index
 - z/OS 1.7 up to 7257 extents
 - LOAD, UNLOAD with LOBs
 - IBM System z9 Integrated Information Processor (IBM zIIP)
- New and updated books: Library refresh Apr. 2005, Mar. 2006
Messages, Codes became separate books August 2005
 - Redbooks: Design Guidelines for High Performance and Availability, Business Value, Performance Topics, WebSphere, MLS, Disaster Recovery, others updated ...
 - Customer information on the web

- Cross loader with LOBs PQ90263
- Built in functions ASCII, TIMESTAMPDIFF PQ95795
- DSN1COPY with 1000 OBIDs PK05758
- QMF with multirow fetch PQ99482
- Online Check Index PQ92749 & PQ96956
- z/OS 1.7 up to 7257 extents PK07590 PK10594
- LOAD, UNLOAD with LOBs PK10278 open
- zIIP PQ18454 open, ...
- ✓DB2 for z/OS and WebSphere: The Perfect Couple, SG24-6319
<http://www.redbooks.ibm.com/redbooks/pdfs/sg246319.pdf>
- ✓Achieving the Highest Parallel Sysplex Availability DB2, REDP-3960,
<http://www.redbooks.ibm.com/redpapers/pdfs/redp3960.pdf>
- ✓Planning for Multilevel Security & Common Criteria (GA22-7509)
<http://publibz.boulder.ibm.com/epubs/pdf/e0z2e111.pdf> & [e0z2e121.pdf](http://publibz.boulder.ibm.com/epubs/pdf/e0z2e121.pdf) (z/OS 1.7)
- ✓Multilevel Security & DB2 Row-Level Security Revealed, SG24-6480
<http://www.redbooks.ibm.com/redpieces/pdfs/sg246480.pdf>
- Ready for Java <http://www.redbooks.ibm.com/redbooks/pdfs/sg246435.pdf>
- Large Objects <http://www.redbooks.ibm.com/redbooks/pdfs/sg246571.pdf>
- Stored Procedures <http://www.redbooks.ibm.com/redbooks/pdfs/sg247083.pdf>
- Webcast <http://www.ibm.com/software/os/zseries/webcast/mar1/>
- ✓Cross-Platform SQL Reference V2 Sept 2004
<http://ibm.com/developerworks/db2/library/techarticle/0206sqlref/0206sqlref.html>
- ✓Disaster Recovery with DB2 for z/OS , SG24-6370
<http://www.redbooks.ibm.com/redbooks/pdfs/sg246370.pdf>
- ✓DB2 for z/OS V8 publications update on web new in April 2005 one August 2005

IBM System z9, z/OS & DB2 for z/OS

✓ **System z9 Integrated Information Processor (zIIP)**

- ✓ **Enhanced channels (MIDAW)**
- ✓ **Enhanced Cryptography**
- ✓ Faster Processors
- ✓ Up to 54 Processors
- ✓ More memory, better value; 64 bit virtual storage
- ✓ ...



- ✓ Backup and restore
- ✓ Multilevel Security
- ✓ Unicode conversion
- ✓ Compression
- ✓ zSeries Application Assist Processor
- ✓ z/Architecture new instructions
- ✓ WLM enhanced
- ...

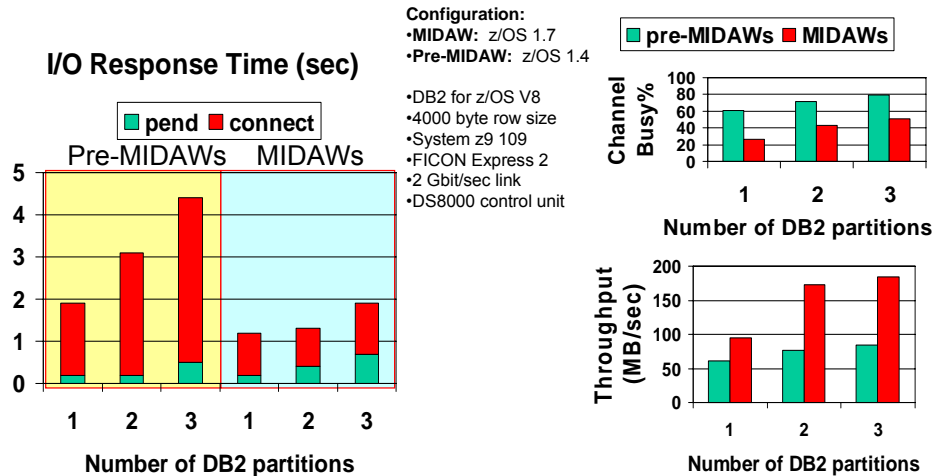
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The latest System z9 processor improvement for DB2 is the zIIP. IBM announced cryptography improvements in late 2005. Channel enhancements (MIDAW) and improved DS8000 performance were included with the System z9 announcement. DB2 uses the latest improvements in hardware and operating system to provide better performance, improved value, more resilience and better function.

DB2 benefits from large real memory support, faster processors, and better hardware compression. DB2 uses Parallel Access Volume and Multiple Allegiance features of the IBM DS8000 and Enterprise Storage Server™. FlashCopy® can be used for DB2 backup and restore. DB2 makes unique use of the z/Architecture™ instruction set, and recent instructions provide improvements in reliability, performance and availability. DB2 continues to deliver synergy with hardware data compression, FICON™ (fiber connector) channels, disk storage, advanced networking function, and Workload Manager (WLM).

ibm.com/software/db2zos/ Click on Support, then on Frequently Asked Questions. Qualify the search with z990 to get the answer.

Parallel DB2 Table Scan, EF 4K (single channel)



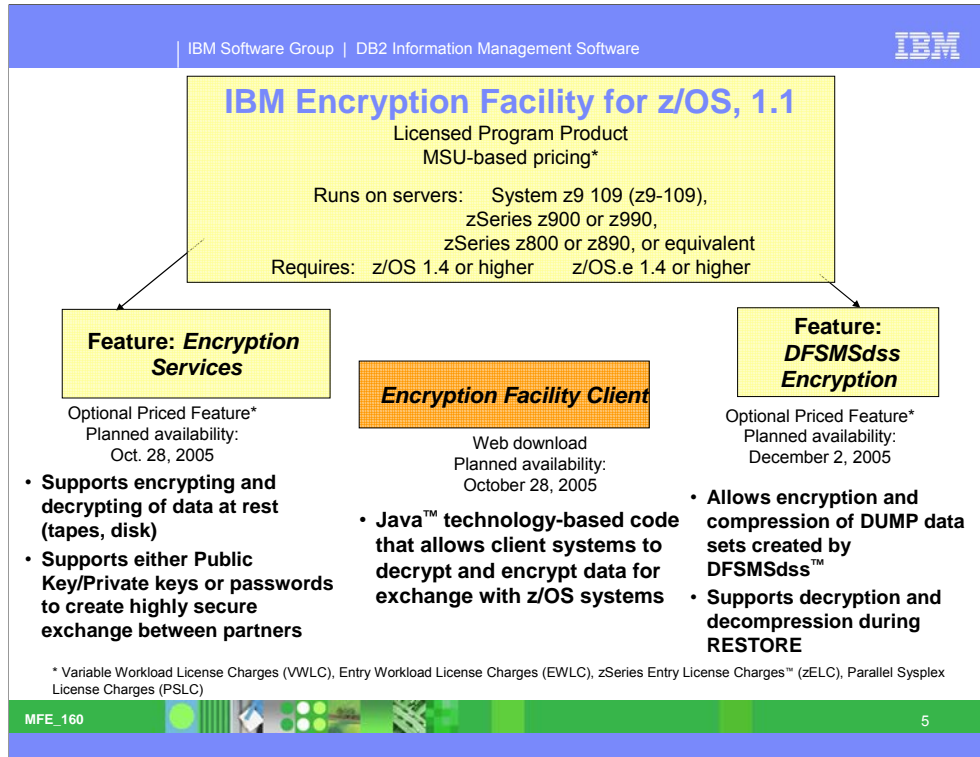
These are some preliminary measurements with new processors, new software, new channel configurations and new disks. Note the sustained scan rates of 100 megabytes per second or 170 MB / sec. for parallel access on one channel.

Configuration: MIDAW: z/OS 1.7 Pre-MIDAW: z/OS 1.4

DB2 for z/OS V8 4000 byte row size System z9 109

FICON Express 2 2 Gbit/sec link DS8000 control unit

This document contains performance information. 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 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 throughput or performance improvements equivalent to the numbers stated here.



The Encryption Services feature supports encrypting and decrypting of data at rest (tapes, disk) and supports either Public Key/Private keys or passwords to create highly secure exchange between partners.

The Encryption Facility Client is Java™ technology-based code that allows client systems to decrypt and encrypt data for exchange with z/OS systems.

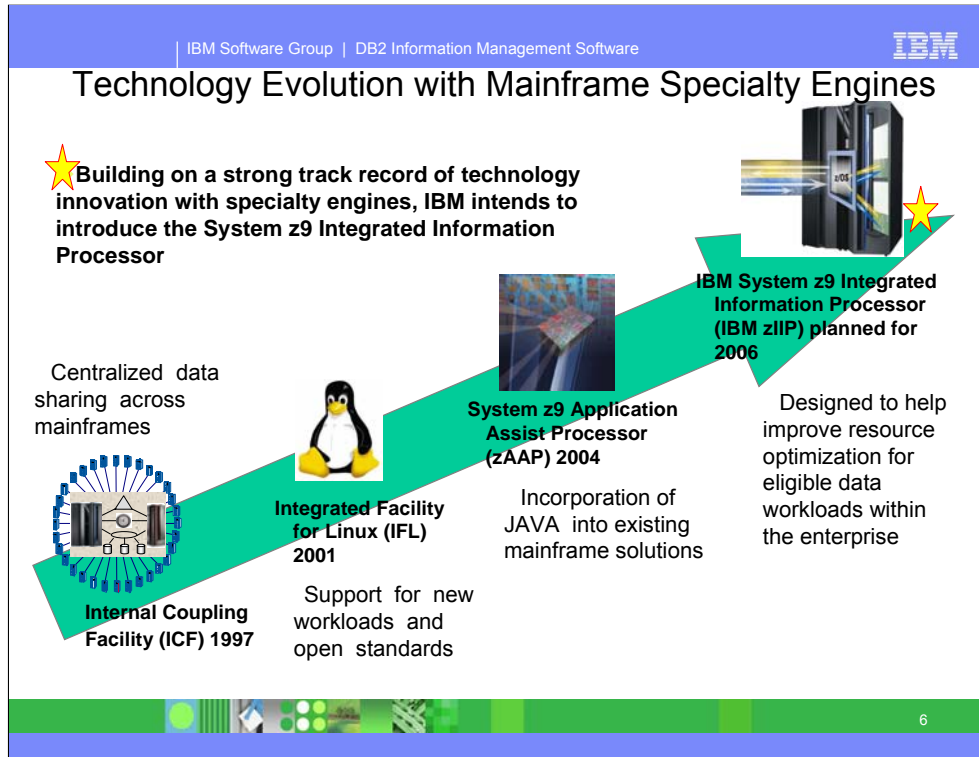
The DFSMSdss Encryption feature allows encryption and compression of DUMP data sets created by DFSMSdss™. It supports decryption and decompression during RESTORE.

•Variable Workload License Charges (VWLC), Entry Workload License Charges (EWLC), zSeries Entry License Charges™ (zELC), Parallel Sysplex License Charges (PSLC)

<http://www.ibm.com/systems/systemz9/feature092705/>

http://www.ibm.com/servers/eserver/zseries/zos/encryption_facility/

http://www.ibm.com/common/ssi/rep_ca/3/897/ENUS205-243/ENUS205-243.PDF



System z zIIP web site <http://www.ibm.com/systems/z/feature012406/>

This site includes a zIIP FAQ: http://www.ibm.com/systems/z/faq/pdf/ziip_faq.pdf and a press release with later information:

<http://www.ibm.com/press/us/en/pressrelease/19157.wss>

Webcast on IBM System z9, zIIP, DB2 Vnext

<http://www.ibm.com/servers/systems/z/2006/>

Link to the white paper, Why Data Serving on the Mainframe:

<http://www.ibm.com/systems/z/feature012406/whitepaper.html>

Article in ESJ: <http://www.esj.com/news/article.aspx?EditorialsID=1603>

Article in ComputerWorld

http://www.computerworld.com/hardwaretopics/hardware/mainframes/story/0,10801,108080,00.html?source=NLT_ERP&nid=108080

ADT: <http://www.adtmag.com/article.asp?id=17854>

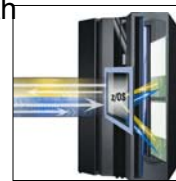
Article in NetworkWorld: <http://www.networkworld.com/news/2006/020606-ibm-db2.html?nettx=020606netflash&code=nlflash21301>

This is a blog discussion by Willie Favero, an IBMer on the DB2 team:

<http://blogs.ittoolbox.com/database/db2zos/archives/007533.asp>

New IBM System z9 Integrated Information Processor (IBM zIIP)

- New specialty engine for the System z9 mainframe (planned for 2006) designed to help:
 - Customers integrate data across the enterprise
 - Improve resource optimization and lower the cost of ownership for eligible data serving workloads
- z/OS manages and directs work between the general purpose processor and the zIIP
 - Number of zIIPs per z9-109 not to exceed number of standard processors. No changes anticipated to DB2 for z/OS V8 applications
- DB2 for z/OS V8 will be first IBM user of the zIIP with:
 - System z9 109
 - z/OS 1.6 or later
 - DB2 for z/OS V8
- Webcast: ibm.com/servers/systems/z/2006/



The System z9 Integrated Information Processor (zIIP) is the latest customer inspired specialty engine planned for the IBM System z9 mainframe. The zIIP is designed to help improve resource optimization and lower the cost of portions of eligible workloads, enhancing the role of the System z9 mainframe as the data hub of the enterprise.

The zIIP's execution environment will accept eligible work from z/OS, which will manage and direct the work between the general purpose processor and the zIIP. DB2 for z/OS V8 will exploit the zIIP capability for portions of eligible workloads. The zIIP will be available on the System z9 mainframe, and its introduction can help increase the value that customers may derive from the System z9 mainframe over previous generations of the IBM mainframe.

In addition to exploiting zIIP, IBM plans for future versions of DB2 to include functional enhancements that further exploit the mainframe capabilities, including areas such as security, application development, usability and performance.

DB2 V8 and IBM zIIP can add value to database work

- Portions of the following DB2 for z/OS V8 workloads may benefit from zIIP*:

- 1 - ERP, CRM, Business Intelligence or other enterprise applications
 - Via DRDA over a TCP/IP connection



New Specialty Engine

- 2 - Data warehousing applications*
 - Requests that utilize star schema parallel queries

- 3 - DB2 for z/OS V8 utilities*
 - Internal DB2 utility functions used to maintain index maintenance structures

* The zIIP is designed so that a program can work with z/OS to have all or a portion of its enclave Service Request Block (SRB) work directed to the zIIP. The above types of DB2 V8 work are those executing in enclave SRBs, of which portions can be sent to the zIIP.

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The zIIP is designed so that a program can work with z/OS to have all or a portion of its enclave Service Request Block (SRB) work directed to the zIIP. The above types of DB2 V8 work are those executing in enclave SRBs, of which portions can be sent to the zIIP. Not all of this work will be offloaded. z/OS will direct the work between the general processor and the zIIP. The zIIP is designed so a software program can work with z/OS to dispatch workloads to the zIIP with no anticipated changes to the application. (2)

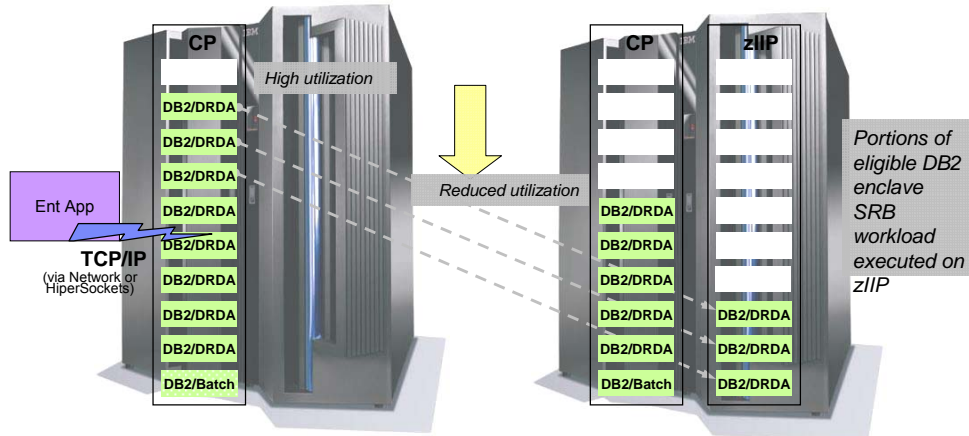
IBM DB2 for z/OS version 8 will be the first IBM software able to take advantage of the zIIP. Initially, the following workloads can benefit:

- Select query processing of BI, ERP or CRM network-connected applications; (3)
- BI application query processing utilizing DB2 star-schema parallel query capabilities; and (4)
- Functions of specified DB2 utilities that perform index maintenance structures. (5)

For more, see <http://www.ibm.com/press/us/en/pressrelease/19157.wss>

Example 1: Enterprise Applications

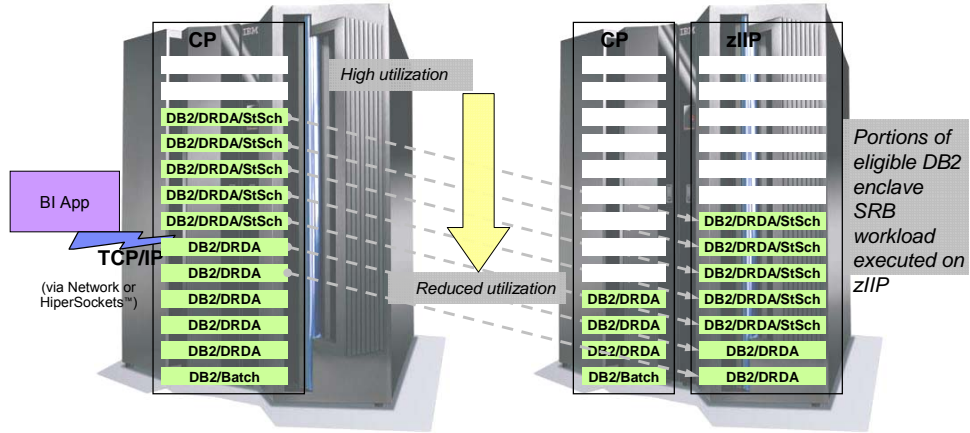
Enterprise Applications that access DB2 for z/OS V8 via DRDA over a TCP/IP connection will have portions of these SQL requests directed to the zIIP



For illustrative purposes only
Actual workload redirects may vary

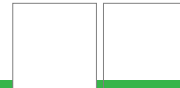
Example 2.0: Business Intelligence Applications

Complex star schema parallel queries via DRDA over a TCP/IP connection will have portions of this work directed to the zIIP



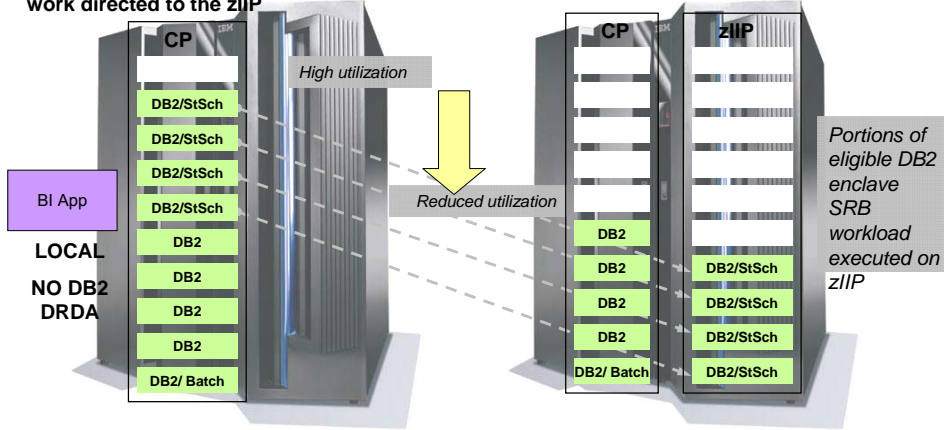
For illustrative purposes only

Actual workload redirects may vary depending on how long the queries run, how much parallelism is used, and the number of zIIPs and CPs employed



Example 2.5: Business Intelligence Applications (local - no DRDA)

Complex star schema parallel queries via LOCAL connection will have portions of this work directed to the zIIP

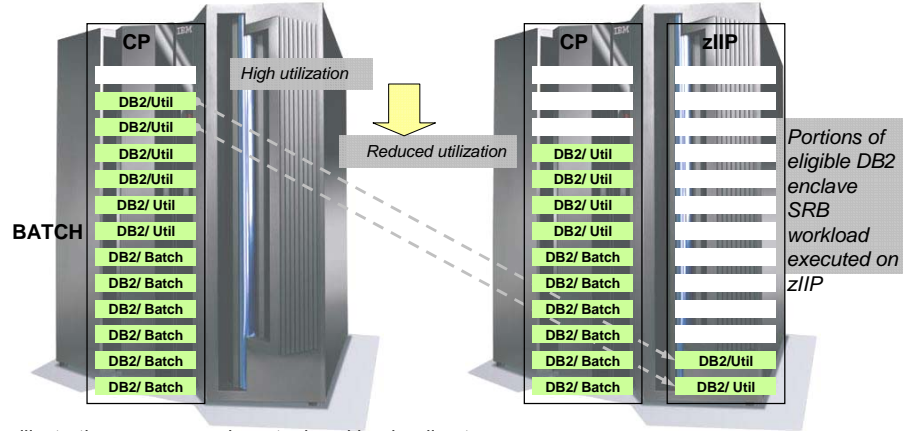


For illustrative purposes only

Actual workload redirects may vary depending on how long the queries run and how much parallelism is used

Example 3: DB2 for z/OS utilities

DB2 for z/OS utilities used to maintain index structures



For illustrative purposes only, actual workload redirects may vary.

Only the portion of the DB2 utilities used to maintain index structures (within LOAD, REORG, and REBUILD) is redirected



How does the zIIP work

The zIIP is designed so that a program can work with z/OS to have all or a portion of its enclave Service Request Block (SRB) work directed to the zIIP. The types of DB2 V8 work listed below are those executing in enclave SRBs, portions of which can be sent to the zIIP.

Example 1 = Distributed SQL requests (DRDA)

Queries that access DB2 for z/OS V8 via DRDA over a TCP/IP connection are dispatched within z/OS in enclave SRBs. z/OS directs a portion of this work to the zIIP.

Example 2 = Complex parallel query (BI)

Complex star schema parallel queries will now use enclave SRBs. z/OS directs a portion of this work to the zIIP.

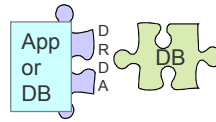
Example 3 = DB2 utilities for index maintenance

DB2 utilities LOAD, REORG, and REBUILD will now use enclave SRBs for the portion of the processing that is related to index maintenance. z/OS directs a portion of this work to the zIIP.



What is DRDA?

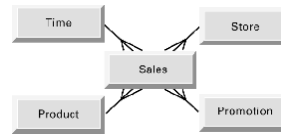
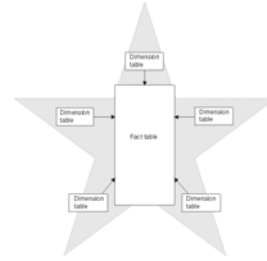
- DRDA = Distributed Relational Database Architecture. It is an architecture, developed by IBM, that enables relational data to be distributed among multiple platforms – ‘any app to any db and any db to any db’. DRDA is the architecture only – applications and APIs accomplish the actual implementation.



- DRDA is native to DB2 for z/OS – and this is good, because this reduces the need for additional gateway products which may affect performance and availability.
- In 1998 the Open Group adopted DRDA as the open standard for database access interoperability.
- An application or DB can be written to DRDA standards directly or use another application to request DRDA for it (DB2 Connect is an example of a DRDA application requestor)
- Can DRDA be accessed without TCP/IP? – yes, APPC/LU6.2 (Advanced Peer-to-Peer Communications – SNA (Systems Network Architecture)) is an example of another communications protocol that may access DRDA – though this is rare.
- Can TCP/IP access DB2 for z/OS without DRDA? – yes, proprietary gateway applications may be used to access DB2 for z/OS – these too are rare.
- **So.... regarding the zIIP:** if the DB2 for z/OS V8 work load comes over TCP/IP and is DRDA compliant (and most all DBAs and ISVs will know if the app uses TCP/IP and DRDA) then a portion of that DB2 workload is eligible to be redirected to the zIIP – you need BOTH TCP/IP and DRDA.

What is Star Schema?

- Star schema = a relational database schema for representing multidimensional data. This data schema is sometimes graphically represented as a 'star'. The data is stored in a central fact table (the center of the 'star') and is surrounded by additional dimension tables holding information on each perspective of the data (the points of the 'star').
- Complex star schema parallel queries are the acts of joining several dimensions of a star schema data set (like promotion vs product). These complex queries can be quite long.
- **So.... regarding zIIP:** if the work load uses that part of DB2 for z/OS V8 that utilizes joining of star schemas (and most all DBAs and ISVs will know if the app uses star schemas) then a significant portion of that DB2 workload is eligible to be redirected to the zIIP

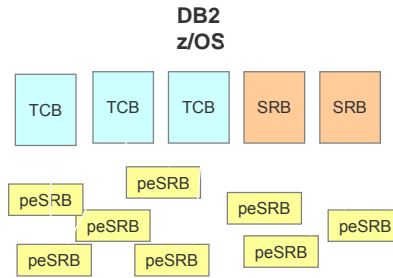


What is index maintenance?

- An **index** is a feature in a database that allows quick access to the rows in a table. The index is created using one or more columns of the table. Not only is the index smaller than the original table (due to having fewer columns), it can be searched/ queried against more efficiently.
- As the data in a large database is manipulated, over time the original indexes become less efficient and therefore have to be updated and maintained. For large databases this can be a very big task.
 - Load--loads your tables
 - Rebuild Index--creates or rebuilds your indexes
 - Reorg Index--reorders your indexes
- So.... regarding the zIIP: Portions of the LOAD, REORG, and REBUILD index utilities that perform index maintenance are eligible to be redirected to the zIIP.

What are enclave SRBs?

- z/OS dispatches DB2 work in either TCB (Task Control Block) mode if request is local or SRB (Service Request Block) mode if request is distributed. Under these modes of operation parallel tasks are assigned the same importance as the originating address space.



- Preemptible enclaves are used to do the work on behalf of the originating TCB or SRB address space. Enclaves are grouped by common characteristics and service requests and since they are preemptible, the z/OS dispatcher (and WLM) can interrupt these tasks for more important ones (ie manage a transaction end-to-end). There are two types of preemptible SRBs: client SRBs and enclave SRBs.
- If the DB2 for z/OS V8 request is coming in over distributed (ie DRDA over TCP/IP) then that work is executed in enclave SRBs.
- If the request is coming over local/ native connection, then that work is distributed between TCBs, client SRBs, and enclave SRBs (star schema queries and Index maintenance now use enclave SRBs)
- So..... regarding the zIIP, only the enclave SRB work (not the client SRB work) is eligible to be redirected to the zIIP.
- DB2 V8 knows how its work is dispatched and directs z/OS 1.6 to dispatch (redirect) a portion of the eligible work to the zIIP.

Important technical notes

- Utilization of the zIIP is expected to be transparent to the application.
 - No anticipated changes to applications that use DB2 for z/OS V8
- The enclave SRB interface is available upon request to non-IBM vendors as well.
 - ISVs are interested



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graph LR
    A[DB2 Performance Expert V2] --> C[OMEGAMON XE for DB2 Performance Expert on z/OS V3.1]
    B[OMEGAMON XE for DB2 V300] --> C
    B --> D[OMEGAMON XE for DB2 Performance Monitor on z/OS V3.1]
    E[DB2 Performance Monitor V8] --> D
    F[DB2 Buffer Pool Analyzer V2] --> G[DB2 Buffer Pool Analyzer V3.1]
  
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Taking the best from both products means to combine unique functions with the existing ones of the other offering, to replace identical functions with one of both solutions and to add / implement missing functions into existing components. The target, of course, is to keep as much functions as possible either coming from OMEGAMON or coming from DB2 PM/PE. We also considered the actuality (newest DB2 version support as well the effort) to be spent to provide the functions.

For simplification you might say, the new product is the DB2 PM/PE base services and functions (reporting, PWH, and DB2 API access) with the infrastructure, the integration capability and end user interface of OMEGAMON.

Although we prefer to sell OMEGAMON XE for DB2 PE, we still see a need to offer performance monitoring with and without specific buffer pool analysis, buffer pool expert advices, and buffer pool simulation because of market needs. Therefore we will continue to offer the OMEGAMON XE for DB2 PE and the OMEGAMON XE for DB2 PM as separate offerings. However, our intention is to add specific expert functions only to the OMEGAMON XE for DB2 PE and to support only base monitoring support to OMEGAMON XE for DB2 PM too, i.e. new DB2 functions and versions will be added to the PM and PE, but new specific expert functions will be added to PE only.

<http://www.ibm.com/software/tivoli/products/omegamon-xe-db2-peex-zos/>

DB2 for z/OS Vnext news

- ❑ Integration ➤ XML, Unicode, LOBs
- ❑ Availability  
- ❑ Scalability ➤ SQL for DB2 family 
- ❑ Productivity
- ↪ Total cost of ownership ➤ Data Definition On Demand

<ftp://ftp.software.ibm.com/software/data/db2zos/VNEXT.pdf>

These are primary areas for our next version, carrying on some of the key deliveries from the prior work. Migration to Vnext will be from DB2 for z/OS Version 8 and will prereq z/OS 1.7


Data definition on demand extends the theme of online schema revolution from V8. Additional Unicode enhancements continue the work from V7 and V8. XML work across the DB2 family is a much larger step than in V7 or V8. SQL Procedures become more consistent across the family. While V7 and V8 removed many differences from DB2 for Linux, Unix & Windows, Vnext takes the next big step to improved consistency. Utility enhancements help with new function, more LOB and XML support, better performance and improved availability, removing the BUILD2 step from online reorg.

Release Vision: The vision for DB2 for z/OS Vnext is to enhance DB2's ability to handle new and enterprise applications. Vnext improves the ability to handle new applications with XML, large objects, and many SQL and security improvements. Vnext builds upon and extends DB2 traditional strengths and the ground-breaking Version 8 in many areas: online schema evolution, Unicode, XML, DB2 family SQL, utilities, security and 64-bit virtual storage.

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