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Session: 400618 (31GI)

iSeries

DB2 UDB for iSeries: V5R3 Overview

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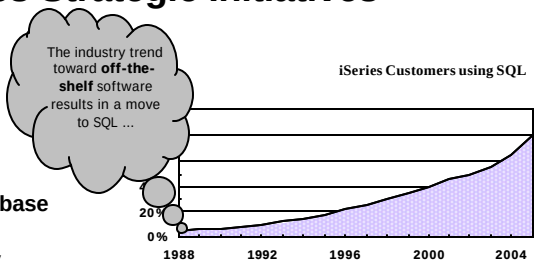
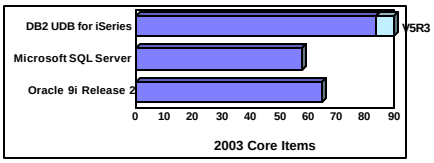
DB2 UDB for iSeries Strategic Initiatives

Openness - Industry Standard Support
- Accomodate ISVs
- Portability/Compatibility
- Flexibility

Continued LEADERSHIP in database technologies
- Consistency across DB2 family
- Shared R & D across IBM Labs

Continued Leveraging of iSeries Strengths
- Availability
- Scalability
- Usability - Total Cost of Ownership
- Application Flexibility





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DB2 UDB for iSeries V5R3 Enhancements

Application Flexibility & Portability
- Enhanced SQL Standards support
  - INTERSECT
  - GET DIAGNOSTICS
- Improved DB2 Family Compatibility
  - SEQUENCE Object
  - UTF encodings for Unicode
  - Column Encryption
  - Instead Of Triggers
- Native .NET Provider

Server Consolidation
- Database Migration Toolkits

OnDemand & Availability
- Online & Parallel Reorganize
- "Ragged" Save While Active
- Journal Enhancements

Performance
- SQL Query Engine enhancements
  - Star Join enhancements
  - Constraint Awareness
  - OnDemand Stats Generation
- Faster SQL Deletes
- Faster Stored Procedure Call Processing

Usability
- iSeries Navigator Enhancements
  - Index Evaluator
  - Reorg Table Manager
  - RI Constraint Manager
- Enhanced RPG SQL Precompiler

Application Development Enhancements

Application Development Enhancements - SQL & RPG

- Enhanced ILE RPG SQL Precompiler
  - V5 qualified subfield names support based on the RPG IV D-spec QUALIFIED keyword (only 1 level of qualification - arrays not supported)
  - Conditional precompilation: /If, /Define, /Include, and other directives
  - Support for Nested /Copy
  - Properly parse source members with sub procedures (eliminates out of sequence error)
  - Allow use of array data structures on blocked Fetch & Insert
  - Support for host structure in Update statements (cannot be array data structure)
  - Allow use of LIKEDS & LIKEREC (second optional parameter of LIKEREC not supported)
  - New COMPILEOPT parameter on CRTSQLRPGI to eliminate two-step compile process
  - Support for RPG logical (indicator) variable (application responsible for only allowing values of 0 or 1)
  - Some restrictions still remain...
    - Free-format SQL & support for qualified names (greater than 1 level)
    - Support for proper scoping of local variables (multi-pass)

Application Development Enhancements - .NET

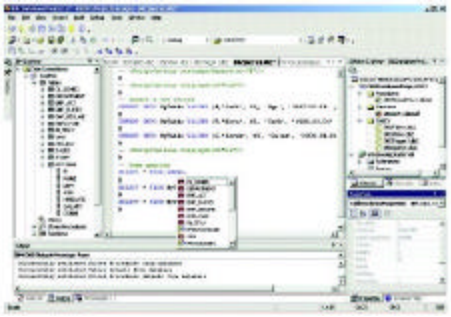
- Native .NET provider for iSeries
  - Packaged in the iSeries Access for Windows V5R3 Client

- <u>V5R3 Functionality Includes:</u>
  - Connection Pooling
  - Stored Procedures
  - SQL & SYS Naming formats
  - Unicode & LOBs
  - Isolation Level/Commitment Ctl
  - Tracing
  - Compression

- <u>Restrictions:</u>
  - Package Support (Ext Dynamic)
  - Datalink Columns
  - CMD/PGM call
  - Data Queues
  - Blocked Inserts
  - AutoCommit restricted to isolation level (*none)

Application Development Enhancements - .NET

- DB2 Application Development "Stinger" Technology
  - Improved DB2 .NET Data Provider with better performance and support for DB2 UDB for iSeries servers - part of DB2 Connect
  - Enhanced DB2 add-ins for Microsoft Visual Studio
    - Integrate DB2 into Microsoft Development Tooling
    - Ease Creation of DB2 Objects:
      - Stored Procedures
      - Triggers
      - User Defined Functions



  - ibm.com/iseries/db2/awp.html
  - ibm.com/servers/enable/site/education/ibo/view.html?oc#db2

Application Development Enhancements
Java & Web Services

- Support for Scrollable stored procedure result sets (all SQL interfaces)
- Toolbox JDBC Driver Enhancements
  - Enhanced AutoCommit - isolation level other than *NONE can now be used
  - Enhanced XA (distributed transaction support)
- Native JDBC Driver Enhancements
  - Improved performance of character data processing
  - Connection refusal for connections/jobs using 65535 CCSID to prevent confusion on "Row not found" errors
- DB2 Web Services
  - Actually available on Post GA V5R2 with WAS Express
  - Support for SQL Select, Insert, Update, & Delete statements along with
  - Stored Procedure Calls
  - WORF component handles invocation and XML formatting out of results
  - More details at:
  - ibm.com/servers/enable/site/education/abstracts/db2web_abs.html

Application Development Enhancements

OLE DB, ODBC, CLI

- Enhanced OLE DB provider
  - SQL-only provider (IBMDASQL) including MTS Support
  - Support for commitment control
  - Support for SQL packages (ie, Extended Dynamic)
- ODBC Driver Enhancements
  - Enhanced MTS & XA Transaction Support
  - Enhanced AutoCommit
  - ODBC driver for Linux applications
- CLI Improvements
  - Column-wise binding to complement existing row-wise binding support
  - SQLGetInfo enhanced to return SQL_Keywords and Connection_Job_Name
  - New Connection Attributes for:
    - Setting minimum and maximum values for precision & scale
    - Unicode SQL statements (SQL_ATTR_UCS2 - also available on V5R2)
    - Hex literals designation

DB2 & SQL Enhancements

New Column Types & Attributes

- Binary & VarBinary data types
- Large Decimals - up to 63 digits precision
- New Unicode support: UTF-16 & UTF-8 encodings
  - Enhances performance in unicode-based environments like Java by eliminating EBCDIC to Unicode conversion
  - Examples:
    - UTF-16: name GRAPHIC(10) CCSID(1200)
    - UTF-8: name CHAR(10) CCSID(1208)
    - UCS-2 : name GRAPHIC(10) CCSID(13488)

New functions for Column Encryption/Decryption

- Encrypt & Decrypt SQL scalar functions
  - Requires the IBM Cryptographic Access Provider 128-bit product
  - Column Requirements:
    - Data Type Requiremetns: BINARY/VARBINARY, CHAR/VARCHAR FOR BIT DATA, BLOB, and DDS CHAR/VARCHAR with CCSID(65535)
    - Length Requirements:
      - Extra 8 bytes & total length must be rounded to 8-byte boundary (replace 8 with 16, if BLOB or double-byte CCSID)
      - 32-byte hint can optionally be stored with encrypted value
      - Example: 6-byte employee id with no hint needs to be stored in a 16-byte column

```
CREATE TABLE emp(
  id VARCHAR(16) FOR BIT DATA,
  name VARCHAR(50))

SET ENCRYPTION PASSWORD = 'protect'

INSERT INTO emp VALUES(ENCRYPT('112233'), 'BOB SANDERS' )

SELECT DECRYPT_CHAR(id), name FROM emp
```

New functions for Column Encryption/Decryption

- Encrypt & Decrypt SQL scalar functions
  - Password management
    - When connected to remote databases, password is sent in the clear may consider using communication encryption (eg, IPSEC or SSL)
    - Best option would be to store the password in OS/400 validation list
      - Encryption password would be stored in the encrypted data value and the list entry name could be table name or some other identifier
      - Validation list suggestions:
        - » Make Public authority *EXCL
        - » Programs would need authority to access validation list, best to use program adopted authority
    - Password Hint (if stored) retrieved with GETHINT function
      SELECT GETHINT(id) FROM...
  - Native program access:
    - Encryption: Use Before or Instead Of Triggers to intercept write requests and then have the trigger execute the Encrypt function against sensitive columns
    - Decryption: Define SQL View containing decrypt and then open SQL View as a logical file to read unencrypted data

Sequence Object

- Another DB2 construct that supports the automatic generation of column values
  - Viewed as a superset of V5R2 identity columns
  - Generated values easily shared across tables
  - Can create constant sequence to be used as Global DB2 variables
- Example:

```
CREATE SEQUENCE order_seq
  START WITH 1 INCREMENT BY 1 NO MAX VALUE

INSERT INTO orders(ordnum,custnum)
      VALUES (NEXT VALUE FOR order_seq, 123)

VALUES NEXT VALUE FOR order_seq INTO :hostvar

UPDATE orders SET ordnum = :hostvar
  WHERE custnum = 123
```

Sequence Object

- Sequence values can be used to generate non-numeric key
  CREATE SEQUENCE s START WITH 1001; ...
  ID='N'||CAST(NEXT VALUE FOR s AS CHAR(4))
- Customizable Sequence Attributes
  - START WITH & INCREMENT BY
  - MINVALUE & MAXVALUE
  - CYCLE & NO CYCLE
  - CACHE & NO CACHE - To improve performance, DB2 allocates a block of sequence values at the job/connection level.
  - ORDER & NO ORDER - ORDER ensures that values are returned in the actual order that they are requested independent of the job/connection. NO ORDER is the default. ORDER also disables caching.
- Sequence attributes can be changed with the ALTER SEQUENCE statement

CREATE SEQUENCE s1 NO CACHE ORDER
Job1: NEXT VALUE FOR s1 => VALUE = 1
Job 2: NEXT VALUE FOR s1 => VALUE = 2
Job 1: NEXT VALUE FOR s1 => VALUE = 3
Job 1: NEXT VALUE FOR s1 => VALUE = 4
Job 2: NEXT VALUE FOR s1 => VALUE = 5

CREATE SEQUENCE s1 CACHE 20 NO ORDER
Job1: NEXT VALUE FOR s1 => VALUE = 1
Job 2: NEXT VALUE FOR s1 => VALUE = 21
Job 1: NEXT VALUE FOR s1 => VALUE = 2
Job 1: NEXT VALUE FOR s1 => VALUE = 3
Job 2: NEXT VALUE FOR s1 => VALUE = 22

INSERT & SELECT enhancements

- INSERT row expression values for blocked inserts
  INSERT INTO table1 VALUES (11,'TESTING'), (2,'ADMINSTRATION')
- EXCEPT & INTERSECT operators
  - Return all rows that are in t1, but not t2
    (SELECT cusnum FROM orders2003) EXCEPT DISTINCT
    (SELECT cusnum FROM orders2004)
  - All rows that exist in t1 & t2
    (SELECT cusnum FROM orders2003) INTERSECT DISTINCT
    (SELECT cusnum FROM orders2004)
- Named Column Joins
  SELECT * FROM t1 INNER JOIN t2 USING (c1, c2)
- Lateral Correlation
  SELECT * FROM t1,TABLE(SELECT * FROM t2 WHERE t1.c1=t2.c1) AS t3

Stored Procedure Enhancements

- Faster call processing
  - Up to 50% performance improvement on repeated calls within a connection
  - Improved processing of long SQL procedure names
  - Improved procedure resolution with unqualified procedure calls & *SYS naming
- External Procedure Enhancements
  - Support for Service Program Objects
  - Improved external program marking
- More efficient code generation for SQL Procedure (function & triggers)
- DB2 Family Compatability:
  - WITH HOLD clause for FOR loop

```
FOR v1 AS c1 CURSOR WITH HOLD FOR
   SELECT firstname, lastname FROM emp
DO
    SET fullname = firstname || ' ' || lastname;

    INSERT INTO namelist VALUES (fullname);
     ...
END FOR;
```


Stored Procedure Enhancements

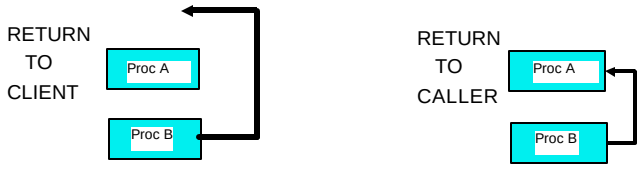
- Result Set Enhancements
  - Scrollable stored procedure result sets (cursor result sets only)
  - Result Set Consumer Control

```
RETURN TO CLIENT
   DECLARE c1 CURSOR FOR WITH RETURN TO CLIENT SELECT * FROM t1

   SET RESULT SETS WITH RETURN TO CLIENT FOR CURSOR x1

RETURN TO CALLER
   DECLARE c1 CURSOR FOR WITH RETURN TO CALLER SELECT * FROM t1

   SET RESULT SETS WITH RETURN TO CALLER FOR ARRAY :array1 FOR :hv1 ROWS
```



- Now available on V5R2 - just load the latest V5R2 Database Group PTF

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Richer SQL function set

REPLACE	Returns a string where a given string is replaced with another string.	**SELECT REPLACE('ABCXYZ','ABC','123') FROM t1** returns '123XYZ'.
EXTRACT	Returns the specified portion of a datetime value.	**SELECT EXTRACT(YEAR FROM** datecol**) FROM t1** returns the year from the date.
INSERT	Returns a string where one substring is deleted and another substring is inserted.	**SELECT INSERT(**'INSERTING',1,3,'XX'**) FROM** t1 returns 'XXERTING'
REPEAT	Returns a string composed of another string repeated n times	**SELECT REPEAT('ABC', 2) FROM t1** returns 'ABCABC'.
DAYNAME	Returns the name of the day of the week.	**SELECT DAYNAME(** datecol**) FROM** t1 returns the name of the day from the date
MONTHNAME	Returns the month name from a datetime value.	**SELECT MONTHNAME(** datecol**) FROM** t1 returns the name of the month from the date.
RIGHT	Returns the rightmost N characters from a string.	**SELECT RIGHT(**'ABCXYZ',3**) FROM** t1 returns 'XYZ'.
TIMESTAMP_ISO	Returns a timestamp based on a date, time, or timestamp argument.	**SELECT TIMESTAMP_ISO(** datecol**) FROM** t1 returns the timestamp from datecol.

- Other new functions include: MULTIPLY_ALT, BIT_LENGTH, OCTET_LENGTH, DATABASE

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Miscellaneous DB2 Enhancements

- DATE, TIME, & TIMESTAMP literals
- LOCALTIME & LOCALTIMESTAMP special registers
- Limit Improvements
  - 256 Tables in a View
  - 1.7 TB table size limit
- CPYFRMIMPF support for BLOBs (V5R2 PTF available: SI08237)
- Easier database creation script management with RUNSQLSTM
  - Severity level of 20 now causes DROP errors to be ignored
- New Exit Point for Database Open: QIBM_QDB_OPEN
  - Offers more info & control than Object-Level Auditing
    - Exit Program can cancel the Open operation if it considers acces s to be unauthorized
    - Exit Program can differentiate between Opens caused by query versus application
  - Exit Point available on V5R2 PTF (SI17353 & SI17578)

INSTEAD OF Triggers

- New Trigger type can be used to change the semantics of INSERTs, UPDATEs, & DELETE operations against a view
  - Certain views contain transformations that make the view read-only, but application really wants to use the View for all I/O operations
  - Not part of V5R3 GA, delivered with V5R3 DB Group PTF #4 (ibm.com/iseries/db2/iot.html)
    - New trigger type not viewable with iSeries Navigator or DSPFD, etc in V5R3
    - All view types are NOT supported in V5R3 (eg, views referencing more than one table not supported until next release)
  - Example:

```
CREATE VIEW my_logins(system, login, passwd) AS
 SELECT system,login,decrypt_char(passwd) FROM regusers WHERE userid=USER

CREATE TRIGGER insert_my_logins INSTEAD OF INSERT ON my_logins
   REFERENCING NEW AS n  FOR EACH ROW MODE DB2SQL
      INSERT INTO regusers VALUES (USER,n.system,n.login,Encrypt(n.passwd))

CREATE TRIGGER update_my_logins INSTEAD OF UPDATE ON my_logins
 REFERENCING OLD AS o NEW AS n  FOR EACH ROW MODE DB2SQL
  UPDATE reguser SET system=n.system,login=n.login,passwd=Encrypt(n.passwd)
    WHERE system=o.system AND login=o.login  AND userid=USER
```


Performance Enhancements

V5R3 DB2 Performance Enhancements

- Enhanced SQE Capabilities
- Caching of Deterministic UDF Calls - SQE Only
- Faster Stored Procedure Call Processing
- Improved SQL Function & Procedure Expressions
- Faster DELETE without WHERE clause statements
  - CLRPFM used when used with "No Commit" isolation level
  - Special ALTER TABLE used when run with Isolation Level/Commit
- Enhanced Database Monitor
  - Ability to suppress monitor records for short-running SQL requests
  - Filter to eliminate DB2 generated SQL statements
  - More diagnostic details on events that force Full Open/ODP Creation
- Parallel Reorganize

V5R3 SQE Enhancements

- Elimination of the following V5R2 restrictions:
  - View References
  - UNION
  - Subqueries
  - Derived Tables & Common Table expressions
  - Update & Delete-capable statements
  - *Remaining SQE restrictions:*
    - LIKE Predicate
    - LOB columns
    - Sort sequences
    - UDTFs
    - ALWCPYDTA(*NO) & SENSITIVE Cursors
    - Logical File References
    - Select/Omit Logical Files
    - Non-SQL interface

V5R3 SQE Enhancements

- Star Join Recognition (ie, Lookahead Predicate Generation)
- Check Constraint Awareness
  - SQE Stats Manager can use constraints to improve accuracy of Filter Factors & Cardinality
  - SQE Optimizer will rewrite query to avoid execution when input data is out of range
    Constraint Def: CHECK(col1 BETWEEN 1 AND 100)
    Original Query: SELECT * FROM t2 WHERE col1=:hv

    Rewritten Query:
    *SELECT * FROM t2 WHERE (:hv BETWEEN 1 AND 100) AND col1 = :hv*
- RI Constraint Awareness
  - SQE Optimizer can rewrite query to eliminate join combinations
- Immediate on-demand statistics generation
- Result Set Caching
- Customized Visual Explain for SQE access methods
- "Enhanced" Index Advisor (requires latest Database Group PTF)

Performance - New QAQQINI Options

Option	Description	Possible values
SQL_STMT_COMPRESS_MAX*	Allows the user to adjust background access plan compression when using SQL packages	Integer(1-255, **2**)
IGNORE_DERIVED_INDEX	Allows SQE to process SQL statement even when an unsupported index type exists over the table(s)	***NO**, *YES
SQL_FAST_DELETE_COUNT *	Allows user to control when & how V5R3 SQL Fast Delete support is used	*NONE, ***OPTIMIZE**, Integer
CACHE_RESULTS *	Allows SQE to use cached results sets from previously run queries	***SYSTEM** , *JOB,*NONE

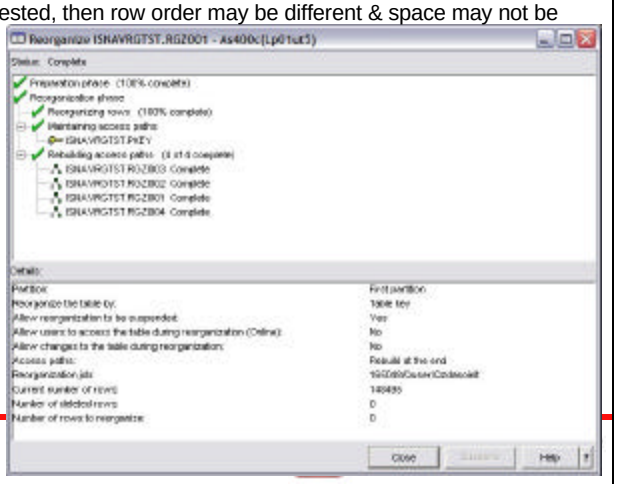
* - Only available on V5R3, no PTFs for prior releases

Performance - Enhanced DB Monitor capabilties

- New options to make analysis & collection of monitor date more efficient
  - Only collect Monitor Data for long running SQL statements - based on Optimizer's *Estimated* Runtime
    - QAQQINI Option: DATABASE_MONITOR_THRESHOLD (supported on V5R2)
      Only those queries whose estimated runtime exceeds this threshold value (in seconds) will be included in the database monitor collection
      Default Value: All Statements (ie, 2147483647 seconds)
  - Eliminate SQL statements generated by DB2
    - QAQQINI Option: SQL_DBMON_OUTPUT (supported on V5R2)
      Possible Values: *USER, *SYSTEM, *ALL
      Default Value: *USER
  - Table Filter - only collect statements referencing certain tables
    STRDBMON OUTFILE(o) COMMENT('TABLEFILTER(lib1/tab1,lib2/tab3)')
    - V5R2 PTFs: SI15035, SI15139, SI15140, SI15142, SI15143, SI15154, SI15155, SI15157
    - V5R3 PTFs: SI15955, SI16331, SI16332, SI16333

Online & Parallel Reorganize

- New Reorganize capabilities activated with new parameter ALWCANCEL(*YES)
  - ALWCANCEL(*YES) requires file to be journaled
  - New parameter, LOCK, controls the concurrent access
  - If Exclusive lock not requested, then row order may be different & space may not be reclaimed
- Parallel capabilities rely on DB2 SMP licensed feature being installed & activated
- New Index Rebuild parameter RBDACCPTH
  - RI & Unique indexes always maintained

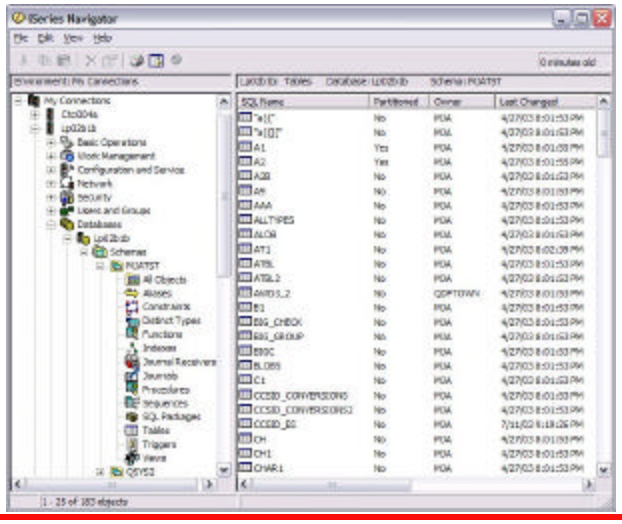


Online & Parallel Reorg Comparison

	ALWCANCEL(*NO)		ALWCANCEL(*YES)		
	KEYFILE (*NONE)	**KEYFILE (*FILE or keyfile)**	**KEYFILE (*RPLDLTRCD)**	**KEYFILE (*NONE)**	**KEYFILE (*FILE or keyfile)**
Cancel and restart	No	No	Yes	Yes	Yes
Concurrent Access	No	No	Yes	Yes	Yes
Parallel processing	Only index rebuilds	Only index rebuilds	Data movement and index rebuilds	Data movement and index rebuilds	Data movement and index rebuilds
Non-parallel performance	Very fast	Fast	Very fast	Slower	Slowest
Temporary storage	Double data storage	Double data storage	Journal receiver storage	Journal receiver storage	Journal receiver storage
LIFO KEYFILE index processing	N/A	Duplicates reversed	N/A	N/A	Duplicate ordering preserved
Index processing (non-KEYFILE)	Synchronous or asynchronous rebuilds	Synchronous or asynchronous rebuilds	Maintain indexes or synchronous or asynchronous rebuilds	Maintain indexes or synchronous or asynchronous rebuilds	Maintain indexes or synchronous or asynchronous rebuilds
Final row position exact	Yes	Yes	Only if LOCK(*EXCL) and not restarted	Only if LOCK(*EXCL) and not restarted	Only if LOCK(*EXCL) and not restarted
Amount of CPU & I/O used	Smallest	Next smallest	Smallest	More	Most
Variable length segment reorganize	Good	Good	Worse	Worse	Worse
Allows referential integrity parents and FILE LINK CONTROL DataLinks	Yes	Yes	No	No	No
Allows QTEMP & Database Cross Ref Files	Yes	Yes	No	No	No
HABP replication cost	Minimal - one journal entry	Minimal - one journal entry	More - journal entires for all rows moved	Most - journal entires for all rows moved	Most - journal entires for all rows moved

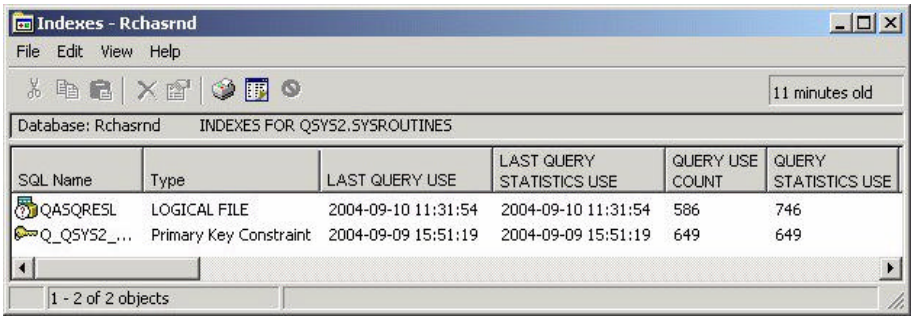
Tools & Utilities

iSeries Navigator Enhancements



- Index Evaluator
- DB2 Object Type Folders
- Show Related (graphical DSPDBR)
- Constraint Management Interface (graphical WRKPFCST)
- Reorganize Table Manager
- SQE Aware Visual Explain
- Run SQL Enhancements
  - Font Chooser
  - Integrated support for Graphical Debugger
  - Sortable Explainable Stmts
  - Run & Explain support for Stored Proc calls
- New Show Command
- Improved Multi-tasking Support

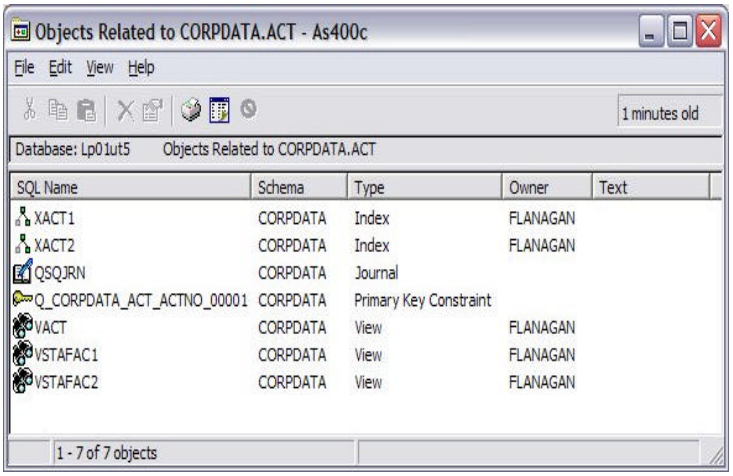
iSeries Navigator - Index Evaluator



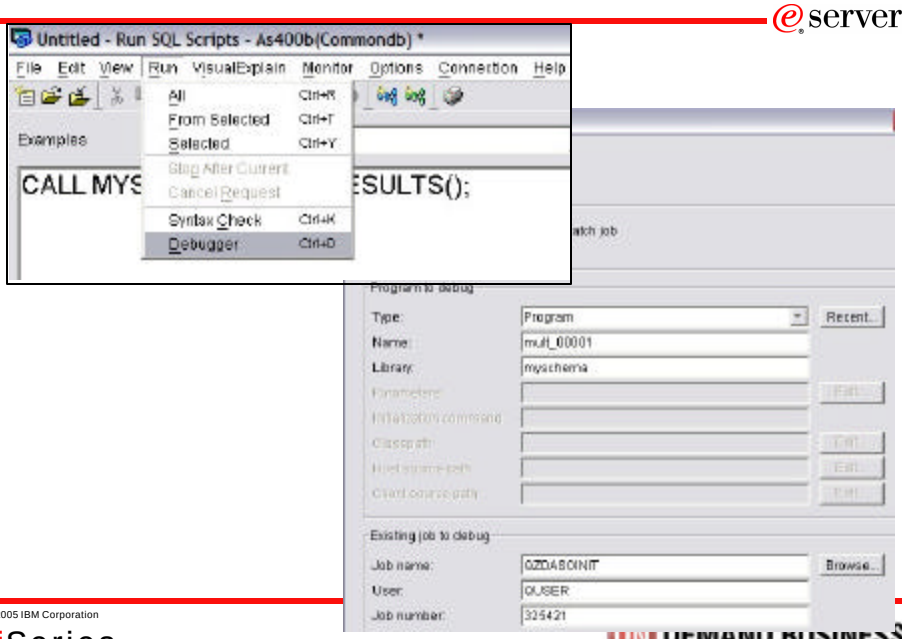
Required PTFs:

- V5R3 usage requires iSeries Access V5R3 Fixpak #2 and the following V5R3 Server PTFs: SI12938 & SI12873
- V5R2 usage requires iSeries Access V5R3 Fixpak #3 & V5R2 Server PTF SI16313

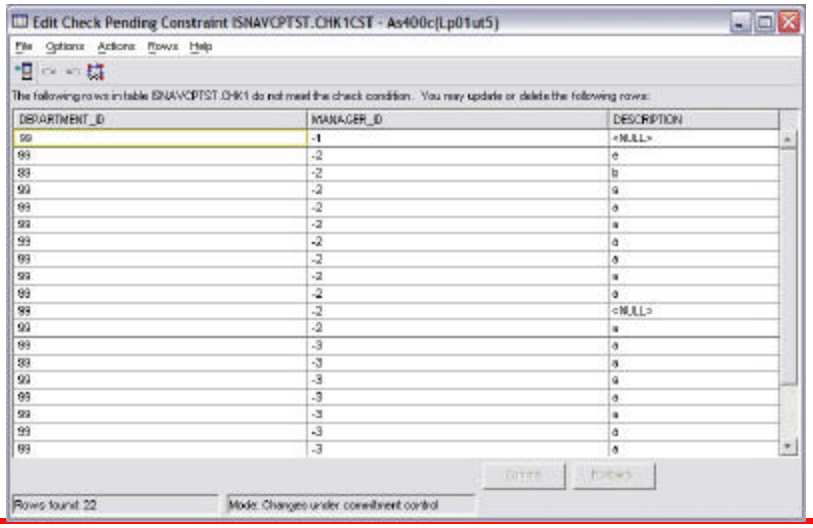
iSeries Navigator - Show Related



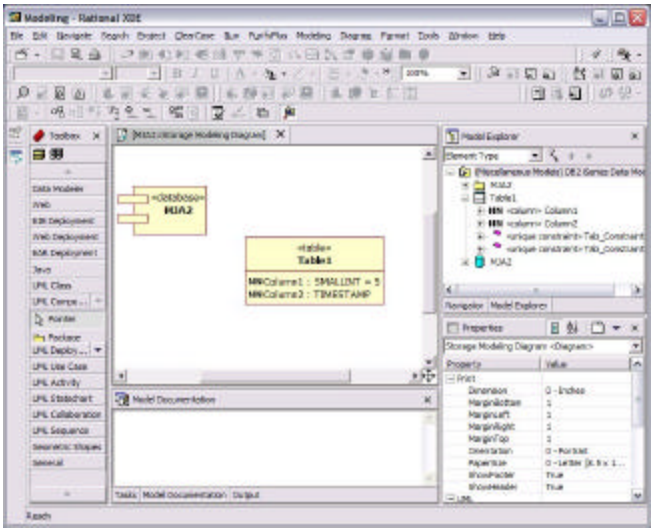
iSeries Navigator - Graphical Procedure Debugger



iSeries Navigator - RI Constraint Management



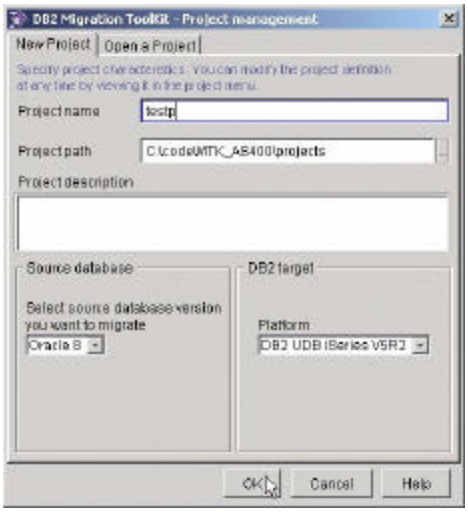
Rational XDE Modeler & DB2 UDB for iSeries



Rational Suite, v2003.06.12 - ibm.com/software/awdtools/developer/rosexde/

DB2 MTK Enhancements

- Migration Toolkit Enhancements
  - Support for V5R3 enhancements, Sequence objects big improvement for Oracle migrations
  - Re-engineering of existing SQL Server & Sybase Migration Tool into the "Oracle" MTK architecture and interface
  - Informix Database Support
  - Free Download at: ibm.com/servers/enable/site/db2/porting.html



SWG Utilities for DB2 UDB for iSeries

- DB2 UDB Extenders for iSeries
  - Support for XML Schemas & NOT FENCED UDFs
  - Leverages XML Toolkit for iSeries XML parser
  - Decomposition of XML now supports non-unique XML elements & attributes
  - UDFs now support language encoding parameter
- DB2 QMF for Distributed Edition 8.1
  - Follow on to QMF for Windows with new browser client based on WebSphere
  - Recent GA- http://ibm.com/common/ssi/fcgi-bin/ssialias?subtype=ca&infotype=an&appname=iSource&supplier=897&letternum=ENUS204-028
  - Download Evaluation version at : http://www.ibm.com/qmf
- DB2 Development Center
  - Support for Java & External Stored Procedures
- Websphere Information Integrator (formerly DB2 Information Integrator)

New Table Types for DB2 UDB

- Materialized Query Tables (MQTs)
  - Only creation of MQTs supported with V5R3 GA
  - PTFs released in April 2005 (ibm.com/iseries/db2/mqt.html) enable query optimizer awareness of MQTs
    - MQTs must be maintained & refreshed by the user
    - **Read white paper** (ibm.com/servers/enable/site/education/abstracts/438a_abs.html)
- Partitioned Tables
  - ONLY should be used in cases where single table limit of 1.7 TB or 4.2 billion rows will be exceeded
  - Partition tables should not be used to improve performance
    - Limited optmizer awareness of partitions, especially the CQE query optimizer
    - Fast delete of rows in a partition is supported
  - If you are considering using partitioned tables in V5R3, then…
    - **Read white paper** (ibm.com/servers/enable/site/education/abstracts/2c52_abs.html)
    - Contact the DB2 Solutions Enablement Team (rchudb@us.ibm.com)

Additional Information

- DB2 UDB for iSeries home page - ibm.com/iseries/db2
- Newsgroups
  - USENET: comp.sys.ibm.as400.misc, comp.databases.ibm-db2
  - iSeries Network SQL & DB2 Forum - http://www.iseriesnetwork.com/Forums/main.cfm?CFApp=59
- Education Resources - Classroom & Online
  - http://www.iseries.ibm.com/db2/gettingstarted.html
  - http://ibm.com/servers/enable/site/education/ibo/view.html?oc#db2
- DB2 UDB for iSeries Publications
  - Online Manuals: http://www.iseries.ibm.com/db2/books.htm
  - Porting Help: http://ibm.com/servers/enable/site/db2/porting.html
  - DB2 UDB for iSeries Redbooks (http://ibm.com/redbooks)
    - Stored Procedures, Triggers, and UDFs on DB2 UDB for iSeries (SG24-6503)
    - Preparing for the V5R2 SQL Query Engine (SG24-6598)
    - Modernizing iSeries Application Data Access (SG24-6393)
  - ***SQL/400 Developer's Guide*** by Paul Conte & Mike Cravitz
    - http://as400network.com/str/books/Uniquebook2.cfm?NextBook=183

DB2 UDB Family Certifications

Certified Database Associate - DB2 UDB Family (Test 700)

- ***Website*:** ibm.com/certify/certs/dbdaudv81.shtml
- ***Education Resources:*** ibm.com/certify/tests/edu700.shtml
- ***Online Tutorial:***
  www7b.boulder.ibm.com/dmdd/library/tutorials/db2cert/db2cert_V8_tut.html

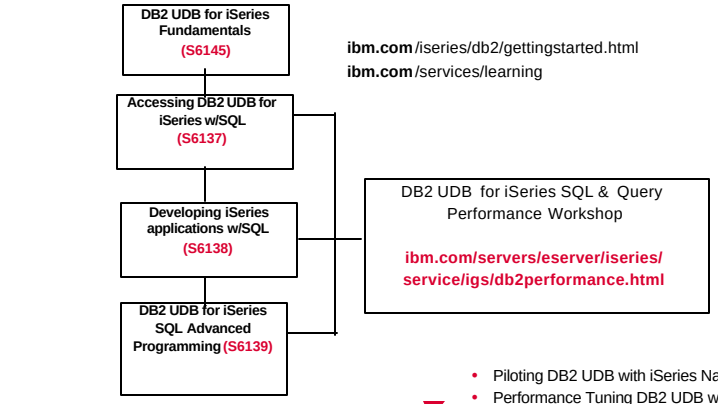
Certified Application Developer - DB2 UDB Family (Test 703)

- ***Website***: ibm.com/certify/certs/dbapudv81.shtml
- ***Education Resources***: ibm.com/certify/tests/edu703.shtml

➢ **Sample Tests:** certify.torolab.ibm.com/ice

➢ Exams were refreshed & updated for DB2 UDB for iSeries

Education Roadmap



ibm.com/iseries/db2/gettingstarted.html
ibm.com/services/learning

- Piloting DB2 UDB with iSeries Navigator
- Performance Tuning DB2 UDB with iSeries Navigator & Visual Explain
- Integrating XML and DB2 UDB for iSeries

ƒ Self-study iSeries Navigator tutorials for DB2 UDB at:
ibm.com/servers/enable/site/education/ibo/view.html?oc#db2

APPENDIX

Application Development Enhancements

Cursor Sensitivity

- Cursor sensitivity controls if database recognizes table changes (insert, update, delete) after a cursor has been opened
  - ASENSITIVE - Default, DB2 can choose any setting. Updateable cursors always default to SENSITIVE
  - INSENSITIVE - Cursor will be insensitive to changes and behave as a read-only cursor by creating a temporary result file to process
  - SENSITIVE - Cursor implementation will have some sensitivity to changes. Prevents temporary copies and usage of DB2 SMP
- Interface (get more details in Sensitivity article at: ibm.com/iseries/db2/sqe.html)
  - Embedded SQL: New keywords on DECLARE CURSOR & PREPARE ATTRIBUTES
  - OLE DB "Cursor Sensitivity" connection property (0 -Asensitive/1 - Insensitive/2 -Sensitive)
    - Static Cursors are always insensitive (same for ODBC)
    - Forward Only cursors can never be sensitive (same for ODBC)
  - ODBC: SQL_ATTR_CURSOR_SENSITIVITY attribute on SQLSetStatementAttr (ODBC 3.0) or CURSORSENSITIVITY Connection keyword for ODBC 2.0
  - JDBC: "Cursor sensitivity" connection property (asensitive/insensitive/sensitive)
    - Insenstive value only recognized with TYPE_FORWARD_ONLY result set type
    - Sensitivie value only recognize with TYPE_SCROLL_SENSITIVE result set type

Application Development Enhancements

Improved SQL Diagnostics & Dynamic Cursor Control

- Dynamic Cursor Control with Cursor Attributes on PREPARE
  - Allows you to adjust the sensitivity, scrolling, lock holding, and result set attributes of an existing cursor
  - PREPARE s1 ATTRIBUTES :hv1 FROM :stmt
- New GET DIAGNOSTICS statement
  - Superset of all SQL error & diagnostic interfaces
  - Provides functionality & information similar to ODBC "SQLGet" functions like SQLGetConnectAttr & SQLGetStmtAttr
  - Examples:

Statement Info:

```
GET DIAGNOSTICS rcount = ROW_COUNT,
                rcmd = COMMAND_FUNCTION,
                rnbr = NUMBER,
                rmore = MORE
```

Connection Info:

```
GET DIAGNOSTICS rcname = CONNECTION_NAME,
                rcsts = CONNECTION_STATUS,
                rnbr = DB2_PRODUCT_ID
```


Journal Enhancements

- Ehanced Save While Active support - SAVACTWAIT(*NOCMTBDY)
- New CHGJRNOBJ command to adjust journal attributes on the fly
- New journal sequence maximum - *MAXOPT3
- FRCAPPPTH(*YES) & JRNSTATE(*INACTIVE) settings are now ignored
- RCVJRNE now supports 1024 journal receviers
- NEW Defaults for Journal Commands & Settings
  - CRTJRNRCV: THRESHOLD default changes from *NONE to 1.5 GB
  - CRTJRN: MNGRCV default changes from *USER to *SYSTEM
  - APYJRNCHG/RMVJRNCHG: CMTBDY default changed to *YES
  - AUDIT Journal: Uses RCVSIZOPT(*MAXOPT1)
  - SMAPP(EDTRCYAP): *SYSDFT drops from 90 to 60 minutes
- New Journal Minimal Data Checksum to increase data integrity of journal apply
- Journal Performance Improvements
  - Faster long-running ROLLBACKs
  - Remote Journal Super Bundling
  - RCVJRNE Performance Improved 15-20%

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