

# IBM System z Technology Summit



## *Administering and Optimizing Your DB2 9 & DB2 10 for z/OS Environment with Tools*

Tom Kisielewicz ([takisiel@us.ibm.com](mailto:takisiel@us.ibm.com))

Feb 24, 2011



# Disclaimer/Trademarks

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements, or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

**The information on the new products is intended to outline our general product direction and it should not be relied on in making a purchasing decision. The information on the new products is for informational purposes only and may not be incorporated into any contract. The information on the new products is not a commitment, promise, or legal obligation to deliver any material, code or functionality. The development, release, and timing of any features or functionality described for our products remains at our sole discretion.**

This information may contain examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious, and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

**Trademarks** The following terms are trademarks or registered trademarks of other companies and have been used in at least one of the pages of the presentation:

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both: DB2 Universal Database, eServer, FlashCopy, IBM, IMS, iSeries, Tivoli, z/OS, zSeries, Guardium, IBM Smart Analytics Optimizer, Data Encryption Tool for IMS and DB2 Databases, DB2 Administration Tool / DB2 Object Compare for z/OS, DB2 Audit Management Expert for z/OS, DB2 Automation Tool for z/OS, DB2 Bind Manager for z/OS, DB2 Change Accumulation Tool for z/OS, DB2 Cloning Tool for z/OS, DB2 High Performance Unload for z/OS, DB2 Log Analysis Tool for z/OS, DB2 Object Restore for z/OS, DB2 Path Checker for z/OS, DB2 Query Management Facility for z/OS, DB2 Query Monitor for z/OS, DB2 Recovery Expert for z/OS, DB2 SQL Performance Analyzer for z/OS, DB2 Table Editor for z/OS, DB2 Utilities Enhancement Tool for z/OS, DB2 Utilities Suite for z/OS, InfoSphere Change Data Capture, InfoSphere Data Event Publisher, InfoSphere Replication Server, Optim Data Growth Solution for z/OS, Optim Development Studio, Optim pureQuery Runtime, Optim Query Workload Tuner, Optim Test Data Management Solution for z/OS, Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS

EMC and TimeFinder are trademarks of EMC Corporation

Hitachi is a trademark of Hitachi Ltd

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

# DB2 10 for z/OS: Out-of-the-Box Savings

## Up to 20% CPU reductions for transactions, queries, and batch

- Out-of-the-box CPU reductions of 5-10% for traditional workloads
- Out-of-the box CPU reductions of up to 20% for new workloads
- Up to additional 10% CPU savings using new functions

## Scales with less complexity and cost

- 5-10x more concurrent users – up to 20,000 per subsystem
- Significant scale-up capabilities in addition to existing scale-out support
- Consolidate to fewer LPARs and subsystems

## Improved operational efficiencies and lower administration cost

- Automatic diagnostics, tuning, and compression

## Even better performance

- Elapsed time improvement for small LOBS and Complex Queries



# IBM DB2 Tools: Are you ready for DB2 10?

- Exploit DB2 10 performance savings out-of-the-box
- Optimize Performance Across Multi-Platform Applications
- Lower CPU costs while reducing batch windows
- Higher data availability through simplified recovery operations



**DB2 Utilities Suite 10** drives down costs with *autonomics*, page sampling and further offloads processing to zIIPs and FlashCopy. Developed in conjunction with DB2 10 to provide maximum data integrity and exploit all new functions out of the box.

## All New with DB2 10!

**Tivoli OMEGAMON XE for DB2 Performance Expert 5.1** extends its insight into distributed workloads and offers a robust infrastructure to support DB2 10 subsystem consolidation, with lower monitoring overhead. The recommended performance monitor of DB2 10!

**DB2 Administration Tool/Object Compare 10.1** extends the value of DB2 10 with new capabilities that allow DBAs to quickly exploit DB2 10 features like schema evolution. Reduces the overhead of many routine tasks.

**QMF 10** delivers built-in visualizations and reports that dramatically extend the value to end users. A new metadata layer simplifies the process to understand and create reports.

**DB2 Sort 1.1** lowers the cost of DB2 Utility sort processing by exploiting advanced features of System z and z/OS while optimizing overall system efficiency. Significantly reduces batch windows.

**DB2 High Performance Unload 4.1** reduces the cost of extracting DB2 10 data with support for TCP/IP Pipes and the new internal format as well as a new native XML data unload capability.

# Roadmap to Exploit DB2 10 for z/OS

*Accelerate your ability to leverage compelling DB2 10 features*

## ➔ Administer DB2 Performance Savings

Optimize Dynamic Infrastructure Performance

Drive DB2 Efficiency and Productivity

Recover DB2 Advanced Technology

*Accelerate Time to Value*



## DB2 Administration Tool V10.1

### ▪ Things you can do

- Query DB2 Catalog via menus/drilldowns
  - Display DDL – single objects
  - GEN – DDL hierarchy
  - Display TS/IX status
  - Space Management Functions
  - View Authorizations
  - Canned Performance Queries
  - Create/Run Utility JCL
  - Create/Manage DB2 objects(Alter, ALC, Redefine...)
  - Create/Run scripts using Work Statement List(WSL)
  - MIGRATE objects/data - masking
  - Much more.....
- 
- With Object Compare
    - Compare objects to find differences
    - Create WSL to synch objects

## DB2 Administration Tool V10.1

- **Drive immediate DB2 10 out-of-the-box Performance Savings**
- **Exploit DBA-managed Performance Improvements**
  - INCLUDE additional Columns in Indexes to Exploit Index Only Access
  - Convert LOBs to INLINE to boost performance
- **Time Travel with Temporal Data – “as of”**
  - Record changes in history – System Time
  - Define, update and query events in past or future – Business Time
  - Browse Temporal Data “as of” a point in time with DB2 Table Editor 4.3
- **Extend Administration Capabilities**
  - Manage new Security models
  - Manage Autonomic Statistics collection

# DB2 Admin Tool V10.1 **INCLUDE** Index non-key Column

- **Purpose**
  - Decrease index maintenance
  - Decrease physical storage
  - Index only access
- **Only supported on UNIQUE indexes**
- **Places the object in RBDP (Rebuild Pending)**
- **INCLUDE COLUMN syntax available**
  - CREATE INDEX
  - ALTER INDEX



# DB2 Admin Tool V10.1 INCLUDE Index non-key Column

```

DB2 Admin ----- DSNT Redefine Index ----- Row 1 to 5 of 5
Command ==> Scroll ==> PAGE

Commands: CONTINUE ORIGINAL
Line commands: nnn A|D - Sequence & order R - Remove the column I - Include
A - Ascending D - Descending RA - Random U - Update expression/XML pattern
B - Business Time without overlaps

CREATE INDEX TEAM76 . TD76XA32_LCN >
      ON TEAM76.TD76TB32_LCN
Unique . . . . . YES      Where Not Null . . . . . Cluster . . . . . YES
Buffer Pool . . . . . BP16  Close Rule . . . . . YES      Copy Allowed . . . . . NO
Piece Size . . . . . 2097152 Define . . . . . YES      Defer . . . . .
Partitioned . . . . . Padded . . . . . Compress . . . . . NO

Select Column Name      Col Type      Length  Scale N  ColSeq  Ord  OldSeq  Ord
      *              *              *      * *      * *      * *
-----
      LOC_NO           SMALLINT           2      0 N      1 A      1 A
      LOCATION          CHAR              20      0 N
      ADDRESS           VARCHAR           30      0 N
      TOWN              VARCHAR           30      0 N
      POSTCODE          CHAR              10      0 N
I
***** END OF DB2 DATA *****
    
```

# DB2 Admin Tool V10.1 INCLUDE Index non-key Column

```

DB2 Admin ----- DSNT Redefine Index ----- Row 1 to 5 of 5
Command ==> Scroll ==> PAGE

Commands: CONTINUE ORIGINAL
Line commands: nnn A|D - Sequence & order R - Remove the column I - Include
A - Ascending D - Descending RA - Random U - Update expression/XML pattern
B - Business Time without overlaps

CREATE INDEX TEAM76 . TD76XA32_LCN >
ON TEAM76.TD76TB32_LCN
Unique . . . . . YES Where Not Null . . . Cluster . . . . . YES
Buffer Pool . . . . . BP16 Close Rule . . . . . YES Copy Allowed . . . NO
Piece Size . . . . . 2097152 Define . . . . . YES Defer . . . . .
Partitioned . . . . . Padded . . . . . Compress . . . . . NO

Select Column Name Col Type Length Scale N ColSeq Ord OldSeq Ord
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
-----
LOC_NO SMALLINT 2 0 N 1 A 1 A
* POSTCODE CHAR 10 0 N 30 I
LOCATION CHAR 20 0 N
ADDRESS VARCHAR 30 0 N
TOWN VARCHAR 30 0 N
***** END OF DB2 DATA *****

```

# DB2 Admin Tool V10.1 INCLUDE Index non-key Column

```
DB2 Admin ----- Edit Statement ----- Columns 00001 00072
Command ==> _                               Scroll ==> CSR

***** ***** Top of Data *****
000001 -- Created by DBA104 on 2011/01/13 at 10:15
000002 -- Generated by apply exec by DBA104 on 2011/01/13 at 10:15
000003 --#ADMIN PROCESS ALTER
000004 ALTER INDEX TEAM76.TD76XA32_LCN
000005     ADD INCLUDE COLUMN (POSTCODE) ;
000006 COMMIT ;
000007 --#ADMIN PROCESS REBUILD
000008 LISTDEF ADBLD1
000009 INCLUDE INDEXSPACES
000010 INDEX "TEAM76"."TD76XA32_LCN";
000011 REBUILD INDEX LIST ADBLD1;
000012 -- End of Apply statements
***** ***** Bottom of Data *****
```

## DB2 Admin Tool V10.1 INLINE LOB

- **INLINE LOB data stored in base table space**
  - Must be a universal table space
- **Purpose – improve application performance**
  - Minimize I/O to read LOB data
  - Saves CPU time to access LOB data
- **zPARM – LOB\_INLINE\_LENGTH – defines default max length**
  - Default = 0
- **CREATE TABLE, CREATE TYPE, and ALTER TABLE**
- **Data is moved during the next process that modifies the data or thru a REORG**

## DB2 Admin Tool V10.1 INLINE LOB

## OMPE

ZPSYS		VTS	02	V510./C DSNT 01/13/11 12:30:36		25
+ Double Byte CCSID	=	65534				
+ New Function Mode	=	YES				
+ IFCIDS In UNICODE	=	NO		zIIP Support is Present	=	YES
+ Divide Option (DECDIV3)	=	NO		Change Data Capture (CHGDC)	=	NO
+ WTO Routing (ROUTCDE)	=	01		Enable DPROP (EDPROP)	=	NO
+ Site Type (SITETYP)	=	LOCAL		3990-3 Seq Cache (SEQCACH)	=	SEQ
+ Automatic Rebind (ABIND)	=	YES		Automatic Rebind Explain (ABEXP)	=	YES
+ CacheDynSql (CACHEDYN)	=	YES		PackageAuthCache (CACHEPAC)	=	5242K
+ CurDegSpeReg (CDSSRDEF)	=	ANY		Describe Sqlda (DESCSTAT)	=	YES
+ MaxKptDynSql (MAXKEEPD)	=	5000		RelCurW/hold (RELCURHL)	=	N/A
+ UtilCacheOpt (SEQPRES)	=	YES		ExtSecurity (EXTSEC)	=	YES
+ Max DBM1 stg for log	=	0		Default WLM Envir = DSNTWLM		
+ Default BP for indexes	=	BP0		Default BP for user data	=	BP0
+ Limit restart backout	=	AUTO		Restart backout limit	=	5
+ Ext query blks DB2 server	=	100		Extra query blks DB2 requester	=	100
+ Stg for lob - per system	=	2048		Stg for lob - per agent	=	10K
+ Rollup Accting For DDF	=	10		Sliding Secondary DB2 Managed	=	YES
+ Measured Usage Pricing	=	NO		Amount Of Space Above MVS	=	65M
+ Default Space Table Sp	=	0		Use Vsam Var. CI For DB2 Mgt	=	YES
+ Rollup Accting (PTASKROL)	=	YES		Default Space Index Sp	=	0
+ <b>LOB Inline Len (QWP1LBIL)</b>	=	<b>0</b>		PLAN MGMT SCOPE (QWP4PMSC)	=	STATIC
+ DSNHDECP Default Values:						

# DB2 Admin Tool V10.1 INLINE LOB

```

DB2 Admin ----- DSNT ALTER Table ----- 12:40
Command ==>

DB2 Admin ALTER                                     Schema . : TEAM80   >
                                                    Name . . : BOOK_BASE_TABLE   >
Column name . . BOOK_TEXT                          > (column number 3)
Column type . . CLOB                                (CHAR,DECIMAL,INTEGER,SMALLINT,etc.)
Data length . . 38664
Inline length . 200_                                (0-32680 BLOB or CLOB, 0-16340 DBCLOB)
Precision . . . . . (FLOAT and DECIMAL only)
Scale . . . . . (DECIMAL and TIMESTAMP only)
Type schema . . (User-defined type schema)
Type name . . . (User-defined type name)
WITH TIME ZONE . (Yes/No - for TIMESTAMP only)

Allow Nulls . . NO (Yes-Nullable, No-NOT NULL)
FOR ? DATA . . . (B - Bit, S - SBCS, M - Mixed, or blank)
WITH DEFAULT . . YES (Yes, No, L (SECLABEL) or enter value below)
Default value . .

GENERATED . . . (A-ALWAYS, D-DFLT, I-ALWAYS AS IDENT, J-DFLT AS IDENT,
                E-ALWAYS AS UPD TIMESTAMP, F-DFLT AS UPD TIMESTAMP)
FIELDPROC
  
```

# DB2 Admin Tool V10.1 INLINE LOB

```
DB2 Admin ----- Edit Statement ----- Columns 00001 00072
Command ==> _                               Scroll ==> CSR

***** ***** Top of Data *****
000001 -- Created by DBA104 on 2011/01/13 at 12:46
000002 -- Generated by apply exec by DBA104 on 2011/01/13 at 12:46
000003 --#ADMIN PROCESS CREATE
000004 ALTER TABLE TEAM80.BOOK_BASE_TABLE
000005     ALTER COLUMN BOOK_TEXT
000006     SET INLINE LENGTH 200 ;
000007 -- End of Apply statements
***** ***** Bottom of Data *****
```

# DB2 Admin Tool V10.1 Temporal Table(Time)

- **Temporal Table**
  - Records a period of time when a row is valid
  - System Time or Business Time
- **Benefits**
  - **control the management of application data based upon time.**
  - Application programmers can specify a **search criteria** based upon the time the data existed or was valid. Simplifies DB2 application development requiring **data versioning**.
  - Customers can **satisfy new compliance laws** faster and cheaper because DB2 will automatically manage the different versions of data



## DB2 Admin Tool V10.1 Temporal Table

- **Business period (Application Period Temporal Table)**
  - 2 columns maintained by the application (timestamp or date)
  - Indicate a period of time the row is valid (user-specified)
- **System period**
  - Implemented by creating a temporal table, a history table, and enabling versioning.
  - 2 columns maintained by the system (timestamp)
  - Old rows are archived to another table → History table (Versioning)
    - Can delete rows that are no longer needed
  - Table with the active rows → System Period Temporal Table
  - Queries automatically rewritten to include a UNION to access historical data
- **Bi-temporal table – is both a System Period Temporal Table and an Application Temporal Table**

# DB2 Admin Tool V10.1 Temporal Table

```

DB2 Admin ----- DSNT Alter Table ----- 13:53
Command ==>

Table schema . . . : TEAM76 >
Table name . . . : TD76TB11_PARTTB >

  AUDIT . . . . . NONE          (None, Changes, or All)
  DATA CAPTURE . . . . . NONE      (None/Changes)
  VALIDPROC . . . . . NULL         (NULL/Program name)
  RESTRICT ON DROP . . . . . NO      (Yes/No)
  VOLATILE . . . . . NO            (Yes/No)
  APPEND . . . . . NO              (Yes/No)

ALTER TABLE with any of the above changes OR select one of the options below

                                     More:  -
- DROP FOREIGN KEY                   ADD PARTITION
  ADD CHECK constraint                ADD CLONE
  DROP CHECK constraint               DROP CLONE
  ADD UNIQUE constraint                ADD VERSIONING
  DROP UNIOUE constraint              DROP VERSIONING
  ADD PERIOD
  ACTIVATE ROW ACCESS CONTROL         DEACTIVATE COLUMN ACCESS CONTROL
  DEACTIVATE ROW ACCESS CONTROL       DEACTIVATE COLUMN ACCESS CONTROL

```

# DB2 Admin Tool V10.1 Temporal Table

```

DB2 Admin ----- DSNT Tables, Views, and Aliases ----- Row 1 from 2
Command ==> _                                           Scroll ==> PAGE

Commands: GRANT  MIG  ALL
Line commands:
C - Columns  A - Auth  L - List  X - Indexes  S - Table space  D - Database
V - Views    T - Tables P - Plans  Y - Synonyms  SEL - Select prototyping
? - Show all line commands

Sel   Name                Schema  T DB Name  TS Name  Cols  Rows  Chks  C
      *                  *      * *      *      *      *    *    * *
-----
POLICY                IOD07S  T DSN00330 POLICY    8      5     1
POLICY_HIST           IOD07S  H DSN00331 POLICYRH  8      7     0
***** END OF DB2 DATA *****

```

# DB2 Admin Tool V10.1 Bi-Temporal Table

```

DB2 Admin -- DSNT Columns in Table IOD07S.POLICY          ----- Row 1 to 8 of 8
Command ==> _                                           Scroll ==> PAGE

Line commands:
T - Tables  X - Indexes  A - Auth  GR - Grant  H - Homonyms  I - Interpret
UR - Update runstats  LAB - Label  COM - Comment  DI - Distribution stats
? - Show all line commands

Select Column Name          Col No Col Type Length Scale  Null Def FP      Col Card
* * * * *                  * * * * *
-----
CLIENT                      1 CHAR           4      0 N   N   N           1
TYPE                        2 CHAR           4      0 N   N   N           3
COPAY                       3 SMALLINT       2      0 N   N   N           2
EFF_BEG                      4 DATE            4      0 N   N   N           5
EFF_END                      5 DATE            4      0 N   N   N           5
SYS_BEG                      6 TIMESTMP       13     12 N   Q   N           2
SYS_END                      7 TIMESTMP       13     12 N   R   N           1
TRANS_ID                    8 TIMESTMP       13     12 Y   X   N           2
***** END OF DB2 DATA *****

```

# DB2 Table Editor V4.3 - Temporal Table Versioning

```

ETI$EDIT  V4R3  ----- Browse Table Rows ----- 2011/01/13 17:47:27
Option ==> _____ Scroll ==> PAGE
----->
Table ==> POLICY > Creator ==> I0D07S >
----->
          Row 1 of 5
----->
CLIENT TYPE COPAY  SYS_BEG
C882  POS      15  2010-11-08-09.12.42.283751061000
C882  PPO      10  2010-11-08-09.01.29.965116760000
C882  POS      10  2010-11-08-09.12.42.283751061000
C882  HMO      15  2010-11-08-09.12.42.283751061000
C882  HMO      10  2010-11-08-09.12.42.283751061000
***** Bottom of Data *****

```

**CURRENT DATA**

Valid Option Commands: (Edit, Find, FORM, ZOOM)

# DB2 Table Editor V4.3 - Temporal Table Versioning

```

ETI$EDIT  V4R3  ----- Browse Table Rows ----- 2011/01/13 17:48:11
Option ==> _____ Scroll ==> PAGE
-----< >-----
                                     Row 1 of 5
Table ==> POLICY > Creator ==> I0D07S >
-----
CLIENT TYPE COPAY  SYS_END  N
C882  POS    15  9999-12-31-24.00.00.000000000000 Y
C882  PPO    10  9999-12-31-24.00.00.000000000000 Y
C882  POS    10  9999-12-31-24.00.00.000000000000 Y
C882  HMO    15  9999-12-31-24.00.00.000000000000 Y
C882  HMO    10  9999-12-31-24.00.00.000000000000 Y
***** Bottom of Data *****

```

**CURRENT DATA**

Valid Option Commands: (Edit, Find, FORM, ZOOM)

# DB2 Table Editor V4.3 - Temporal Table Versioning

```

ETI$EDIT  V4R3  ----- Browse Table Rows ----- 2011/01/13 17:50:21
Option ==> _____ Scroll ==> PAGE
-----< >-----
                                     Row 1 of 7
Table ==> POLICY_HIST > Creator ==> IOD07S >
-----
                                     END = BEG in Current
CLIENT TYPE COPAY  SYS_END  IN
C882 PPO 10 2010-11-08-09.01.29.965116760000 Y
C882 HMO 10 2010-11-08-09.03.31.374399156000 Y
C882 HMO 15 2010-11-08-09.05.31.408412852000 Y
C882 HMO 15 2010-11-08-09.09.31.741915622000 Y
C882 HMO 15 2010-11-08-09.10.26.280157593000 Y
C882 HMO 15 2010-11-08-09.12.42.283751061000 Y
C882 HMO 10 2010-11-08-09.12.42.283751061000 Y
***** Bottom of Data *****
                                     History data
Valid Option Commands: (Edit, Find, FORM, ZOOM)
    
```

# Roadmap to Exploit DB2 10 for z/OS

*Accelerate your ability to leverage compelling DB2 10 features*

## Administer DB2 Performance Savings

### ➔ Optimize Dynamic Infrastructure Performance

Drive DB2 Efficiency and Productivity

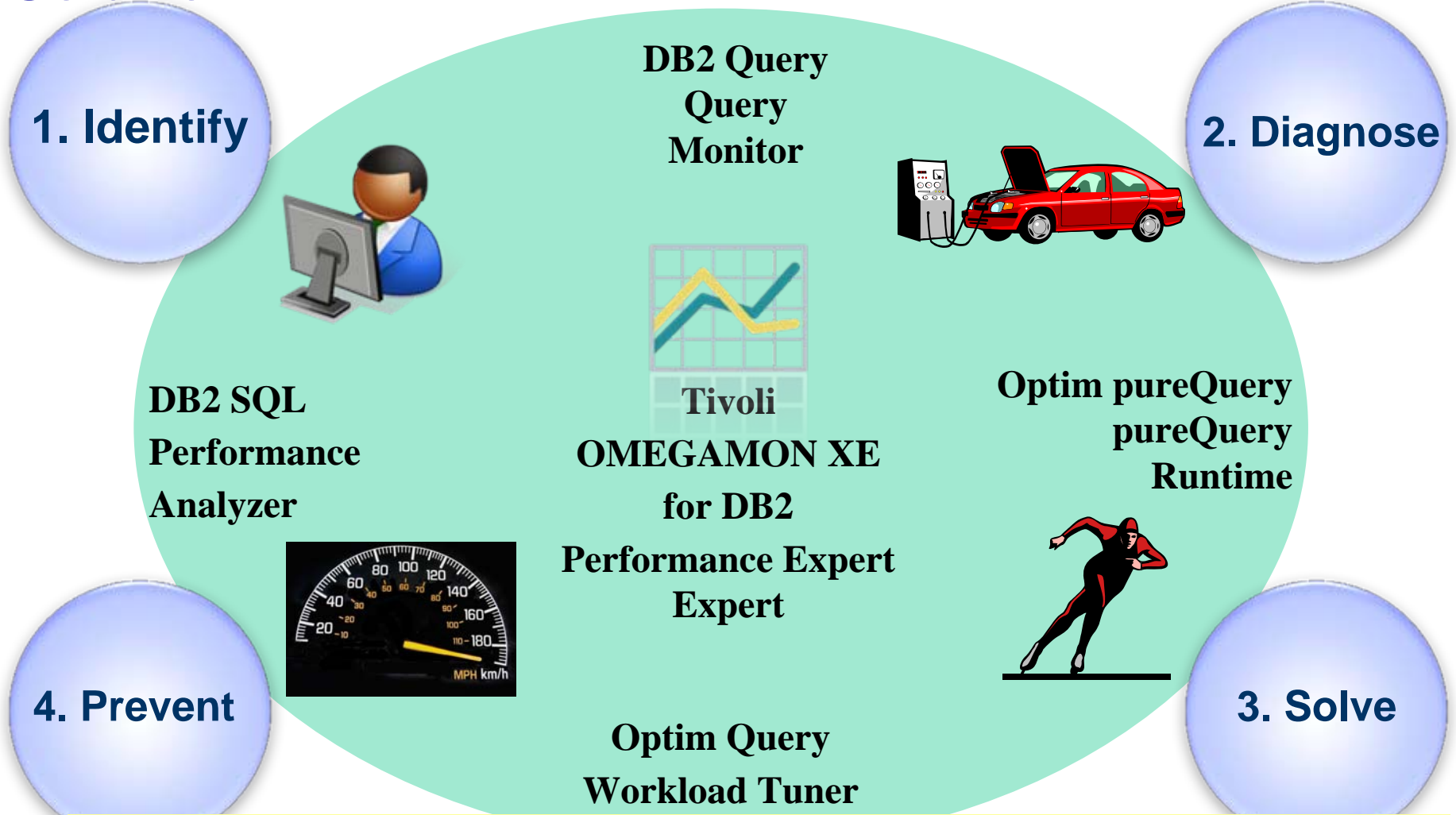
Recover DB2 Advanced Technology

*Accelerate Time to Value*





# IBM DB2 Performance Management Tools Solution



Identify, diagnose, solve and prevent performance problems

# Tivoli OMEGAMON XE for DB2 Performance Expert V510

## 1. Complete DB2 10 for z/OS support

- Support of all new and changed performance metrics
  - Statistics (more buffer pools, virtual storage, 64bit values, SQL statement cache extensions)
  - Accounting (Lock/latch wait time separated)
  - New ZPARMS
  - Performance traces
- Used by DB2 V10 Beta customers

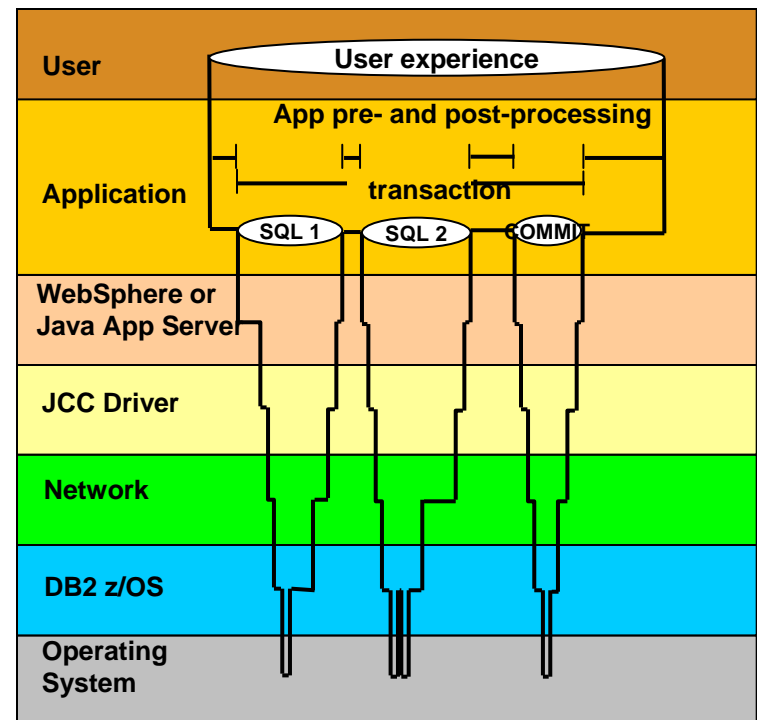
## 2. Less overhead

## 3. End-to-End SQL Monitoring (Extended Insight into application response time)

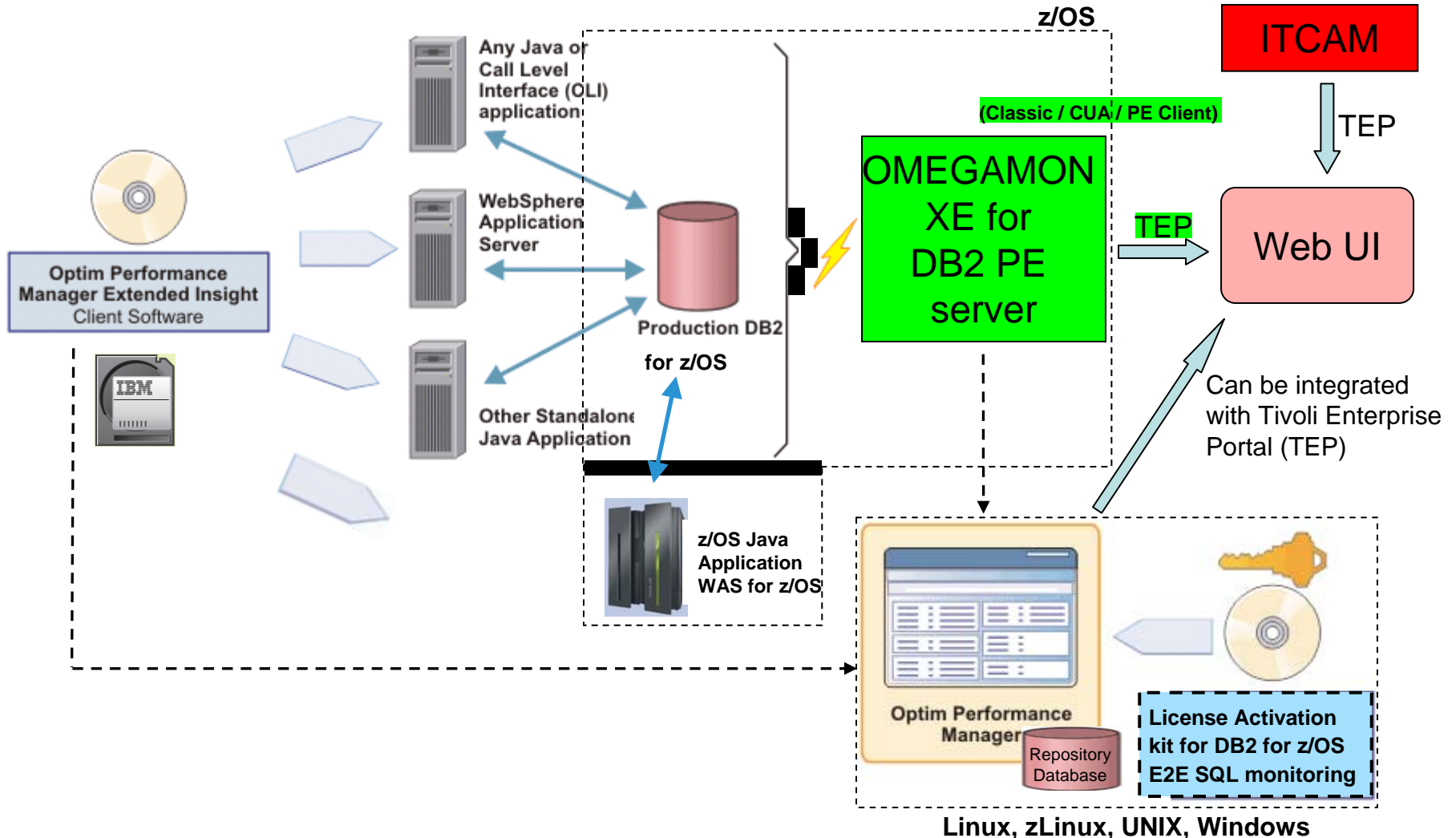
# OMEGAMON DB2 PE 5.1 Extended Insight

## Zoom into selected workload and see the TOP SQL list

- **OMEGAMON PE's Extended Insight** is an advanced way to monitor the database workload (SQL) of your applications and solutions
  - **Get total response times and response time breakdown (appl, driver, network, data server) per defined workload/cluster (e.g. per system, application, user)**
  - **Compare workload from various servers / applications**
  - **Select a time period for analysis**
  - **Get top SQL statements per defined workload**
  - **Identify top clients contributing in the workload**



# Architectural Overview OMEGAMON XE for DB2 PE ... using the integrated Optim Performance Manager



## OMEGAMON DB2 PE 5.1 Extended Insight Zoom into selected workload and see the TOP SQL list

Optim Performance Manager TSCHAFFL | Log out | About | ?

Task Manager | Manage Database Connections | Welcome - My Optim Central

Extended Insight Dashboard: OMP1D911

Locate the source of performance problems, determine how those problems affect different parts of the workload, and analyze the workload. Response Time Details: 9.152.205.30

**Top SQL statements executed by Java or CLI applications like SAP, Cognos, DataStage or WebSphere**

- Zoom in on a selected SQL

**Graph** | Grid

Selected layer: Average End-to-End Response Time | Show Maximum

**SQL Statements** | Clients

Show highest 10 by Average Data Server Time (sec)

Statement Text	Statement Executions	Average Data Server Time (sec)
SELECT 'PVT_40K' AS WKLID, '...	1	0.504
SELECT 'PVT_40K' AS WKLID, '...	1	0.474
SELECT 'PVT_40K' AS WKLID, '...	1	0.518
SELECT 'PVT_40K' AS WKLID, '...	1	1.393
N/P	1	1.023

Display this list by the selected graph layer

**Detail Area for Average End-to-End Response Time**

**End-to-End Response Time**

Overall average response time per transaction:	0.075 sec
Maximum response time:	15.282 sec
Maximum Time of running transactions	10.688 sec
Number of transactions:	61,245
Statements:	65,344

**Time Distribution (%)**

**Transaction Throughput**

**Statement Throughput**

# OMEGAMON DB2 PE 5.1 Extended Insight Select Static or Dynamic SQL and zoom into SQL details

Extended Insight Analysis Dashboard: OMP1D911

Back

Locate the source of performance problems, determine how those problems affect different parts of the workload, and analyze the performance of individual SQL statements, clients, and partitions.

Response Time Details: 9.152.205.30

Graph Grid

Selected layer: No layer selected Show Maximum

**SQL Statement Text**

Statement Text	Statement Executions	Average Data Server Time (sec)
SELECT 'PVT_40K' AS WKLDID, '...	1	0.504
SELECT 'PVT_40K' AS WKLDID, '...	1	0.474
SELECT 'PVT_40K' AS WKLDID, '...	1	0.518
SELECT 'PVT_40K' AS WKLDID, '...	1	1.393
N/P	1	1.023

Display this list by the selected graph layer

Statement information

```
SELECT 'PVT_40K' AS WKLDID, '100319#13:45:21:250' AS TIME, '1' AS STMTNR, '40000' AS LENGTH, '0' AS LB, '0' AS TB, 'false' AS TABNEWLINE, COUNT(*) AS COUNT FROM LGQ#0002 WHERE A=0001000 OR A=0001000 OR...
```

Statement Performance

- Number of Executions: 1
- Average end-to-end elapsed time: 0
- Average client time: 0
- Average driver time: 088 sec
- Average network time: 0 sec
- Average data server time: 0.3 sec

Open Optim Query Tuner to analyze this SQL statement.

Statement Time Distribution (%)

- Client time: 97.33%
- Driver time: 2.67%
- Network time: 0%
- Data server time: 0%

**Tune SQL with Optim Query Workload Tuner**

Package name: N/P  
Section number: 0  
Package name: N/P  
Section number: 0  
Package Consistency token: N/P  
Package Version: N/P  
Collection: N/P

Java class	Java package	Method	Source line number	Build version	Source expression	Method Signature	Application Name	Metadata File

**Java class, package and method shown if pureQuery Is installed.**

Transfer Volume

- Average bytes transferred locally: 0 bytes
- Average bytes transferred remotely: 41.369 KB
- Average rows returned: 0
- Average number of round trips: 1

Statement Outcome

- Failure rate (with negative SQL code): 0 %
- First SQL code: N/P

# Roadmap to Exploit DB2 10 for z/OS

*Accelerate your ability to leverage compelling DB2 10 features*

**Administer DB2 Performance Savings**

**Optimize Dynamic Infrastructure Performance**

 **Drive DB2 Efficiency and Productivity**

Recover DB2 Advanced Technology

*Accelerate Time to Value*



## DB2 Automation Tool V3.1

- **Automate Utility Processing for DBA**
  - Define an object profile with ALL the table spaces
  - Define a utility profile for REORG with the proper options
  - Define an exception profile to include proper objects
  - Tie the three profiles together in a job profile
  - Job profile is placed in job scheduler to run at a desired frequency
  - Jobs are generated using the REORG utility profile for table spaces that meet the exception profile criteria



## DB2 Automation Tool V3.1 with DB2 V10

### ▪ **Autonomic Statistics**

- Exploit real-time, sampling driven Statistics collection
- Invoke RUNSTATS with new Profile option

### ▪ **FlashCopy Image Copy**

- Reduce Batch-windows
- Reduce CPU consumption with Storage-based Backups
- Drive improved Recovery Time Objectives

### ▪ **Avoid Unnecessary Reorgs(Exception Processing)**

- Set REORG thresholds based on DB2 10 Best Practices
- Detect when Indexes are insensitive to Clustering

# DB2 Automation Tool V3.1

## RUNSTAT Profile

```

AUTOTOOL V3R1 ----- Runstats Options ----- 2011/01/21 11:41:58
Option ==> _____ Scroll ==> PAGE
Commands END - Return to the previous screen.
Press <PF7/PF8> to scroll for additional options.
Creator: DBA104      Name: AUTONOMIC STATS      User: DBA104
                                      More:      -

Numcols              ==> 1 (Number)
Count                ==> 10 (Number)
Histogram Numcols    ==> _____ (Number)
      Numquantiles . ==> _____ (Number)
Save Stats in Repository ==> N (Y - Yes, N - No)
Profile . . . . . ==> - (Blank - Not used,
                        U - Use,
                        I - use Include npi,
                        D - Delete,
                        P - uPdate,
                        S - Set,
                        E - set from Existing stats)

Optional Skeletals:  -- BEFORE --      -- AFTER --
JCL Skeletal . . . . ==> _____ ==> _____ (8 Character Name)
Control Cards Skeletal ==> _____ ==> _____ (8 Character Name)
Step End Skeletal . . . ==> _____ ==> _____ (8 Character Name)
    
```

Define the set of statistics to be collected when running autostats

**Autonomic statistics** – stored procedures used to determine whether statistics should be collected or recollected

# DB2 Automation Tool V3.1 FLASHCOPY

```

AUTOTOOL V3R1 ----- Image Copy Options ----- 2011/01/21 12:43:46
Option ==> _____
Creator: DBA104      Name: AUTONOMIC STATS      User: DBA104

Enter the Image Copy options to associate with this utility profile

                Take Image Copy          View/Update Options

Local Primary . . . . . ==> N (Y - Yes,    ==> N (Y - Yes,
                        N - No)           N - No)
Local Backup      ==> N (Y - Yes,    ==> N (Y - Yes,
                        N - No)           N - No)
Recovery Site Primary . . . ==> N (Y - Yes,    ==> N (Y - Yes,
                        N - No)           N - No)
Recovery Site Backup      ==> N (Y - Yes,    ==> N (Y - Yes,
                        N - No)           N - No)
FlashCopy          ==> N (Y - Yes,    ==> N (Y - Yes,
                        N - No)           N - No)
    
```

## Flashcopy –

Save CPU and elapse time

Create with COPY, REORG, LOAD, REBUILD INDEX

Can be used by RECOVER

# DB2 Automation Tool V3.1 FLASHCOPY Options

```

AUTOTOOL V3R1 ----- FlashCopy Options ----- 2011/01/21 12:47:08
Option ==> _____
  Tablespace Reorg FlashCopy
  Creator: DBA104      Name: AUTONOMIC STATS      User: DBA104

Update DSN create spec . => Y (Y - Yes, N - No)
CONSISTENT . . . . . => N (Y - Yes, N - No)
Unit Type              => _____ (SYSDA - DISK - etc.)
Catalog Options
DISP=Status . . . . . => _ (M - MOD, N - NEW, O - OLD, S - SHR)

      Normal Termination => _ (C - CATLG, D - DEL, K - KEEP, U - UNCATLG)

      Abnormal Termination => _ (C - CATLG, D - DEL, K - KEEP, U - UNCATLG)

Data Class . . . . . => _____ (8 character class)
Storage Class          => _____ (8 character class)
Management Class . . . => _____ (8 character class)
Expiration date *or*   => _____ (YYYYDDD - YYDDD)
Retention period       => _____ (4 digit number)
  
```

## COPY & LOAD w/ SHRLEVEL CHANGE

CONSISTENT copy – copy the object and back out uncommitted changes

# DB2 Automation Tool V3.1 FLASHCOPY w/ RECOVER

```

AUTOTOOL V3R1 ----- Recover Utility Profile Options ----- 2011/01/21 12:56:26
Option ==> _____
                                                    More: -
Exception Rule . . . . . ==> A (A - Accepted, R - Rejected, B - Both)

Utility ID . . . . . ==> RECOVER (16 characters)
TO method . . . . . ==> L (L - Log, C - Copy, E - Error)
Alter method options ==> N (Y - Yes, N - No)
Site . . . . . ==> L (L - Local, R - Recovery, blank)

Optional Skeletals: -- BEFORE -- -- AFTER --
JCL Skeletal . . . . . ==> _____ ==> _____ (8 Character Name)
Control Cards Skeletal ==> _____ ==> _____ (8 Character Name)
Step End Skeletal . . . . . ==> _____ ==> _____ (8 Character Name)

Rebuild Ix Statistics Optns ==> N (Y - Yes, N - No)
Online Rebuild Index ==> N (Y - Yes, N - No)
  Alter Online Rbld Options ==> N (Y - Yes, N - No)
Perform LOB Dependency checks ==> Y (Y - Yes, N - No)
  Exclude objects that failed Dependency check ==> Y (Y - Yes, N - No)
                                     Include Update
FlashCopy . . . . . ==> N (Y - Yes, N - No) ==> N (Y - Yes, N - No)
    
```

# DB2 Automation Tool V3.1 RECOVER BACKOUT

```

AUTOTOOL V3R1 ----- Recover Utility Log Options ----- 2011/01/21 12:54:05
Option ==> _____
Commands: END - Return to the previous screen.
          PF7/PF8 - Scroll for additional options.
Creator:  DLC           Name: RECOVER                       User: DBA104
                                                More:      +

Object event . . . . . ==> _ (Q - Quiesce, blank)
Event generation      ==> 00 (00 -1 -2 -3 ... -9)

Select point-in-time . . . ==> N (Y - Yes, N - No)
  Log RBA/LRSN        ==> _____ (blank = current)
  Log timestamp:
Select RESTOREBEFORE . . . ==> N (Y - Yes, N - No)
  RESTOREBEFORE Log RBA/LRSN ==> _____ (blank = none)
  RESTOREBEFORE Log timestamp

Verifyset . . . . . ==> Y (Y - Yes, N - No)
Backout               ==> N (Y - Yes, N - No)

Reuse existing datasets . . ==> N (Y - Yes, N - No, L - Log only)
Parallel object restores  ==> N (Y - Yes, N - No)
Max nbr of parallel objects ==> 0 (0 = optimal)
Nbr of dynamic tape drives ==> 0 (0 = optimal)
    
```

Read DB2 log backwards

# DB2 Automation Tool V3.1 Exceptions CLUSTERSENS and HASHACCESS

```

AUTOTOOL V3R1  ---- Update Exceptions Profile Display  --- 2011/01/21 13:03:51
Option  ==>  Scroll ==> PAGE
  Commands: END - Save and exit.
Line Commands: A - And  O - Or  S - Select  D - Deselect  R - Repeat
  CONDitions: LT|<|LE|<=|EQ|=|GT|>|GE|>=|NE|!=|<>  "*" indicates DAT stat
-----
Creator: DBA104      Profile: CROSS BRAND      User: DBA104
Share Option: U (U - Update, V - View, N - No)
Description: SEMINAR      Scroll Right for Column Help
Use Stats From: R (R - Repository,      Update Runstats Options: N (Y - Yes,
                  C - Catalog,              N - No)
                  U - Runstats,      Save Triggers in Repository: N (Y - Yes,
                  S - Shadow,          N - No)
                  H - History)      WTO number of triggered Objects: N (Y - Yes,
                                      N - No)
Combine IX/TS Exceptions if evaluating IX triggering a TS: N (Y - Yes, N - No)
-----
S Statistics Type--- *Column----- Cond -----Exception Value-----
-  REALTIME REORG TS  MASS_DELETES      -
-                   CLUSTERSENS      -
-                   HASHACCESS       -
-                   SCANACCESS       -
-  REALTIME REORG IX  REAL TIME STAT    -
-                   DAYS_SINCE_LAST  -
    
```

# DB2 Automation Tool V3.1 Cancel Readers Preventing Online Drains and Switch

```

AUTOTOOL V3R1 ----- Online Reorg options ----- 2011/01/21 13:09:31
Option ==> _____ Scroll ==> PAGE
Commands: END - Return to the previous screen.

Creator: DBA104      Name: ONLINE REORG      User: DBA104

Enter the options to associate with this utility profile

Sharelevel . . . . . ==> C      (R - Reference, C - Change, N - None)
Drain Wait   ==> _____ (blank, 0-1800 seconds)
Retry . . . . . ==> _____ (blank, 0-255)
Retry Delay  ==> _____ (blank, 1-1800 seconds)
Timeout . . . . . ==> I      (A - Abend, T - Term, N - None)
Force . . . . . ==> N      (A - All, R - Readers, N - None)
AUX . . . . . ==> N      (Y - Yes, N - No)

                Include                          Update
Deadline Options ==> N (Y - Yes, N - No) ==> N (Y - Yes, N - No)
Shrlevel Change Options ==> Y (Y - Yes, N - No) ==> N (Y - Yes, N - No)
    
```

**FORCE – actions to be taken when utility is draining the TS**

- NONE – no action – wait for claimers to commit
- READERS – read claimers are canceled
- ALL – readers and writers are canceled



## DB2 Utility Enhancement Tool V2.1

- **Offers a proactive way to cancel threads holding locks.**
  - View and cancel threads through ISPF panels
  - Cancel and block threads through:
    - Batch processing
    - DSNUTILB Intercept processing
- **Started Task ‘watches’ utilities on the DB2 SSIDs you specify**
  - Cancels threads on DB2 objects that match criterion you define
  - Extends utility functionality if using UET parameters
- **Enforces the use or disuse of utility parameters (Standardization)**

## DB2 Utility Enhancement Tool V2.1

- **Extends utility syntax for LOAD**
  - **CONSTANT** replace a given value for a particular field in the input records with another specified value being loaded at run-time
  - **VALUEIF** is a conditional parameter – if a condition is met a new value is used in its place
  - **PRESORT** by table object identifier (OBID) and by clustering index key
    - If no clustering index key is available sorts by the oldest defined index
    - Reduces elapsed time & CPU times
  - **DISCARDTO** – name of a flat file to write discarded data (rather than a DB2 table)



## DB2 Utility Enhancement Tool V2.1

- **Enhances the native DB2 REORG TABLESPACE**
  - Automatically sizes and creates the mapping table and mapping-table index that are required for the DB2 REORG TABLESPACE utility when the SHRLEVEL CHANGE option is specified
  - Automatically drops these objects when reorganization processing completes to preserve space
  - No changes to the existing utility JCL are required
- **Supports the standard DB2 restart of a DB2 utility for which interception is occurring or has occurred.**



## DB2 Utility Enhancement Tool V2.1

- **Enhances the native DB2 CHECK DATA syntax**
  - Supports discarding rows to a flat file
  - Automatically creates and sizes the discard table
    - Unloads from the discard table to a LOAD-format SYSREC file
    - Creates LOAD-format SYSPUNCH file
    - LOAD-format SYSREC / SYSPUNCH file can be used by other utilities
    - Automatically drops discard table
- **Supports the standard DB2 restart of a DB2 utility for which interception is occurring or has occurred.**



## DB2 Sort v1.1

- **High speed utility sort**
  - Process data stored in DB2 for z/OS
  - Improves sort performance
  - Eliminate many Sort Capacity Exceeded errors
- **DB2 Sort leverages the strengths of the System z platform, DB2 for z/OS and the DB2 Utilities Suite to drive:**
  - Significant savings in elapsed time and CPU during utility sort processing, especially LOAD, REORG, RUNSTATS, REBUILD IX, CHECK IX, CHECK DATA
  - Relief from application constraints of large volumes of data in highly-transactional workloads performing numerous insert, update and delete operations against DB2 for z/OS databases
  - Continued commitment from IBM to deliver DB2 solutions to provide the highest level of ROI

# Roadmap to Exploit DB2 10 for z/OS

*Accelerate your ability to leverage compelling DB2 10 features*

**Administer DB2 Performance Savings**

**Optimize Dynamic Infrastructure Performance**

**Drive DB2 Efficiency and Productivity**

**Recover DB2 Advanced Technology**

*Accelerate Time to Value*



# DB2 Recovery Expert V2.2 – Application Recovery

- **Provides Expert assist for performing many types of DB2 recoveries**
  - ISPF or GUI
  - Analyze the requested recovery
  - Provide a selection of possible recovery plans
    - Selecting for you, the needed recovery assets and utilities
  - Assists in selecting recovery points
  - Builds RECOVERY jobs
- **Includes a subset of DB2 Log Analysis services**
  - UNDOOn/ REDO recoveries
  - Quiet point analysis
- **Drop Recovery**
- **Dependency analysis**



# RECOVER BACKOUT with DB2 Recovery Expert 2.2

**Recovery Advisor**

**1. Location**  
**2. Objects**  
**3. Point in Time**  
**4. Recovery Plan**

**Generate and execute a plan to recover the selected objects.**  
 Click Generate to generate one or more recovery plans for the selected objects.  
 After generating, you can select a plan to review its details.  
 If it has been some time since you generated the recovery plans, you can click Validate to check whether the external resources required by the plans (such as image copy data sets) are still available.  
 Finally, select the plan you wish to use for recovery, and click Run to run it. To instead view

Recovery plans

Plans

- Plan 1: Using RECOVER with BACKOUT (cost = 0.37)
  - Job 1
    - Check Status
    - START DATABASE
    - Check Status
    - RECOVER
      - Table space ICTEST.SEG4K
      - Index PDDUDE.IX4KS
    - CHECK INDEX
    - Check Status
    - START DATABASE
    - Check Status
- Plan 2: Using RECOVER (cost = 0.57)
- Plan 3: Using DSN1COPY and RECOVER LOGONLY (cost = 0.69)
- Plan 4: Using undo SQL (cost = 50.75)
- Plan 5: Using RECOVER to IC and redo SQL (cost = 52.76)
- Plan 6: Using DSN1COPY of IC and redo SQL (cost = 52.85)
- Recovered Objects

Name	Value
Estimated number of cpu milliseconds	37
Estimated number of disk allocations	1
Estimated number of disk page copies	13
Estimated number of tape drive allocations	0
Estimated number of tape page copies	0
Estimated relative cost of the recovery p...	0.37
Log point	0001198632F1
Plan name	Using RECOVER with BACKOUT

**Drive RECOVER BACKOUT based on relative cost**



## DB2 Recovery Expert V2.2 – System Recovery

- **Provides backup and recovery solutions that leverage sophisticated storage processor capabilities**
- **The ability to backup and restore an entire DB2 subsystem almost instantaneously using fast replication storage hardware**
- **Individual DB2 objects or groups of DB2 objects can be restored from the system level backups**
- **Automated disaster recovery process**
  - Gathers resources needed at the local site and copying them to tape for use at the disaster site
  - Supports disaster recovery from both system backups and image copies
  - Object Profiles if you have DB2 Automation Tool

## DB2 Recovery Expert V2.2 – DB2 10

- **Exploit FlashCopy Image Copy**
  - Take Consistent Online Image Copies in seconds
  - Reduce CPU and Batch-windows
  - Improve Recovery Times
  - Automate Recovery Jobs
  - Native EMC Storage-based copies
  
- **Exploit RECOVER BACKOUT for faster recoveries**

# DB2 Log Analysis Tool V3.2

- Reads DB2 logs and DB2 pages directly
- No traces required
- Does NOT require DATA CAPTURE for any tables – does support
- Robust reports – General / Summary / Detail / Quiet Time / Impact
- Auditing updates to DB2 data and/or objects
- Validating SQL update activity without traces
- Migrating data changes between systems
- Help identify quiet times
- Isolate and reverses unwanted changes to tables
- Load data into DB2 tables for analysis
- Can view LOB / XML data

## DB2 Log Analysis Tool V3.2 – DB2 10

- **Undo and Redo / Reports on Temporal Data**
- **FlashCopy Image Copy**
- **New functions for updating XML columns**
- **XML columns with versioning**
- **INCLUDE column on an index**
- **INLINE LOB**
- **Greater precision for TIMESTAMP**
- **New Timestamp with TIME ZONE data type**
- **All new DB2 10 Log changes**

# Jump into DB2 10! The water's fine.



DB2 V8

DB2 9

DB2 10

Key Questions are WHEN? and HOW?

# Roadmap to Exploit DB2 10 for z/OS

*Accelerate your ability to leverage compelling DB2 10 features*

**Administer DB2 Performance Savings**

**Optimize Dynamic Infrastructure Performance**

**Drive DB2 Efficiency and Productivity**

**Recover DB2 Advanced Technology**

 *Accelerate Time to Value*



# Accelerate DB2 10 Time to Value

## DB2 Cloning Tool V2.2

- Exploit Storage-based copies to drastically reduce CPU and outages
- Create Subsystem and Object Clones to test DB2 10 with minimal effort
  - Automatically reduce number of Data Sharing Members
  - Convert Data Sharing to non-Data Sharing
  - Create Subsystem Clone from System Level Backup
  - Mask sensitive production data
- Supports native IBM, EMC and Hitachi Storage-based copies

## DB2 Query Monitor V2.3

- Track SQL Performance before and after Migration

## DB2 Path Checker V4.1

- Identify potential Access Path regressions
- Export SQL to Optim Query Workload Tuner or Data Studio for tuning
- Save packages with DB2 9 Plan Management before DB2 10 Migration

## DB2 Bind Manager V2.4

- Identify and Free unused Packages
- Reduce Bind impacts-processes only DB2 Binds

# Exploit DB2 10 for z/OS with IBM DB2 Tools

*Accelerate your ability to leverage compelling DB2 10 features with comprehensive Tools support*

**Data Encryption Tool for IMS and DB2 Databases**

**DB2 Administration Tool / DB2 Object Compare for z/OS**

**DB2 Audit Management Expert for z/OS**

**DB2 Automation Tool for z/OS**

**DB2 Bind Manager for z/OS**

**DB2 Change Accumulation Tool for z/OS**

**DB2 Cloning Tool for z/OS**

**DB2 High Performance Unload for z/OS**

**DB2 Log Analysis Tool for z/OS**

**DB2 Object Restore for z/OS**

**DB2 Path Checker for z/OS**

**DB2 Query Management Facility for z/OS**

**DB2 Query Monitor for z/OS**

**DB2 Recovery Expert for z/OS**

**DB2 SQL Performance Analyzer for z/OS**

**DB2 Table Editor for z/OS**

**DB2 Utilities Enhancement Tool for z/OS**

**DB2 Utilities Suite for z/OS**

**InfoSphere Change Data Capture**

**InfoSphere Data Event Publisher**

**InfoSphere Replication Server**

**InfoSphere Optim Data Growth Solution for z/OS**

**Optim Development Studio**

**Optim pureQuery Runtime**

**Optim Query Workload Tuner**

**InfoSphere Optim Test Data Management Solution for z/OS**

**Tivoli OMEGAMON XE for DB2 Performance Expert on z/OS**

Exploitation PTFs: <http://www-01.ibm.com/support/docview.wss?uid=swg21409518>





# IBM DB2 Tools and DB2 10 for z/OS

***Exploit out-of-the-box Savings***

***Extend Productivity***

***Accelerate Time to Value***



***Are your Tools ready for DB2 10?***

*Thank You!*