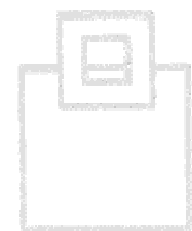
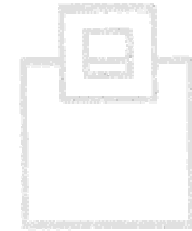
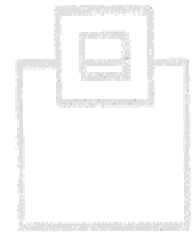
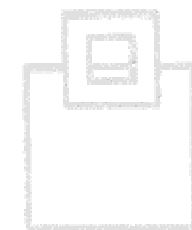
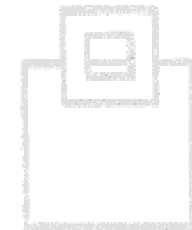
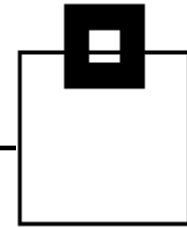


RealTime DBAExpert



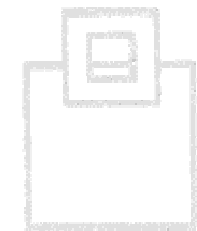
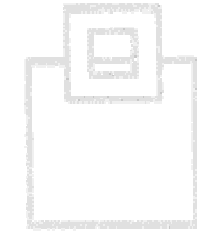
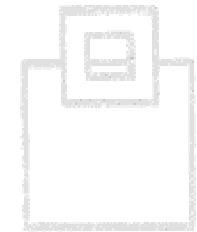
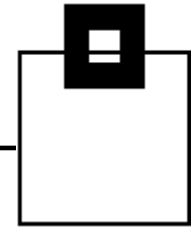
Agenda

- RealTime DBAExpert: Monitoring component
- Job Scheduler and WLM Integration
 - Control and Transparency
- Copies: Advantages/Disadvantages of different triggers
- RUNSTATS avoidance: good versus bad RS

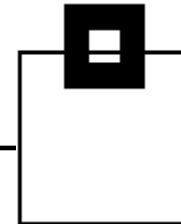


Agenda

- REBINDs: How to get only the good ones
- REORGs: How to secure
- Live example: Utilities On Demand

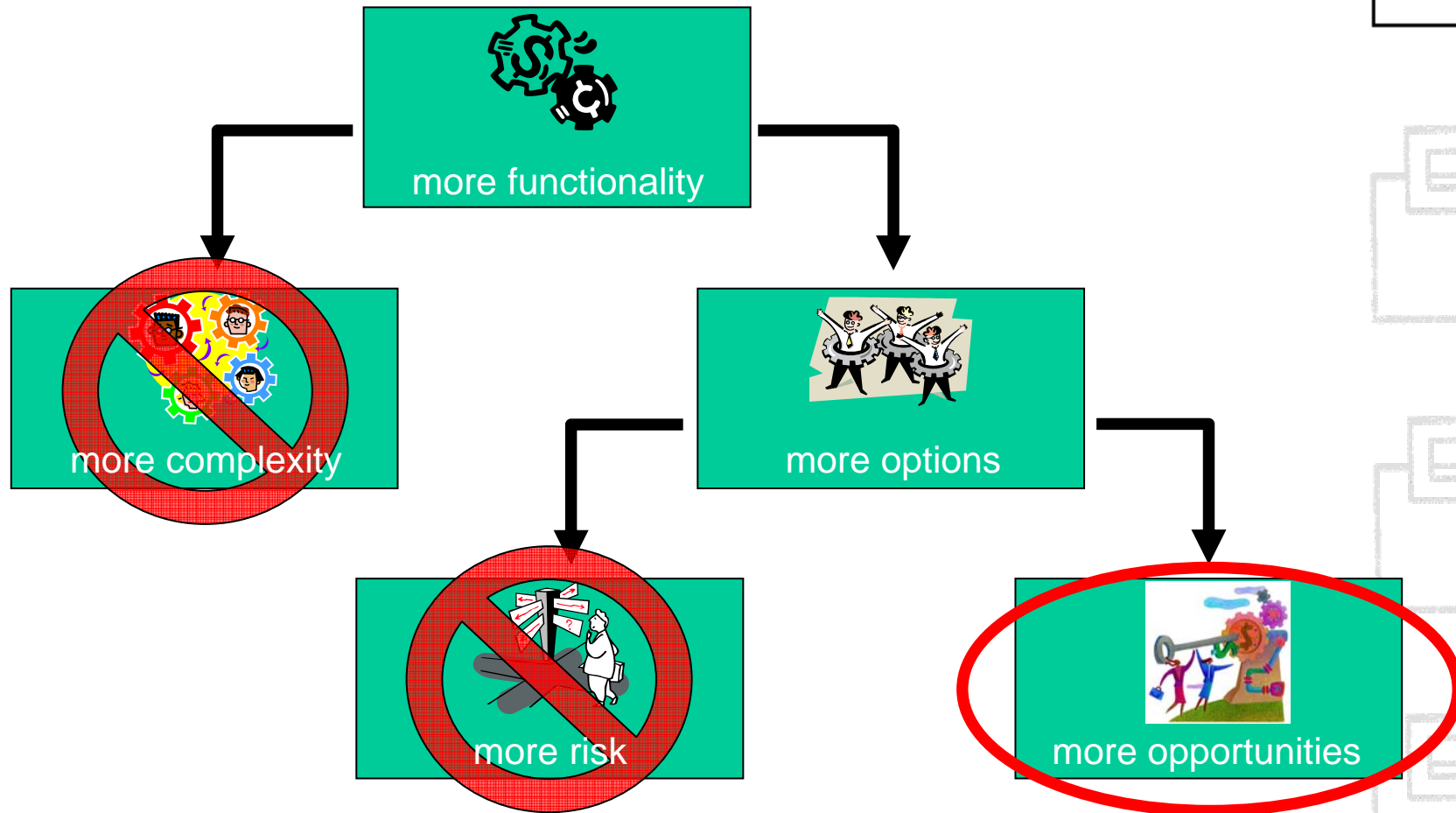


DB2 for z/OS maintenance: past, present, future



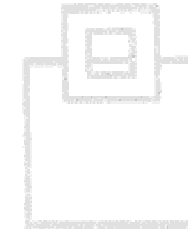
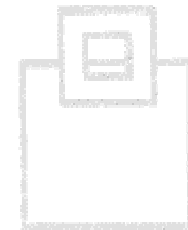
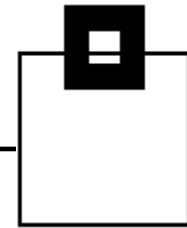
	level 1 <i>cyclic</i>	level 2 <i>re-active</i>	level 3 <i>automated</i>	level 4 <i>on demand</i>	level 5 <i>autonomic</i>
procedure	static maintenance jobs for all objects	generated maintenance jobs for specific objects	generated, threshold based maintenance jobs	dynamic maintenance jobs based on real-time data	dynamic maintenance integrated via SLA's
operation	manual job building	manual job building	automated, threshold based job generation	continuous, threshold based Job generation	continuous, DB2 based generation
execution	total maintenance, manual execution	selective maintenance, manual execution	selective maintenance, static execution	selective maintenance, automated execution	selective maintenance automated execution
manual intervention					

Your needs – Your decision!

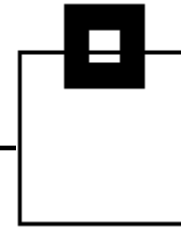


Opportunities only!

- Easy to install, easy to use
 - Wildcards
 - Defaults following IBM recommendations & ROT
- No hooks, no proprietary stuff
 - Official interfaces, official data sources
 - Plain utility syntax
 - Plain JCL
- Integration/Interface to YOUR needs
 - Naming conventions
 - Job scheduler
 - Utilities (IBM, BMC, CDB)
 - ...

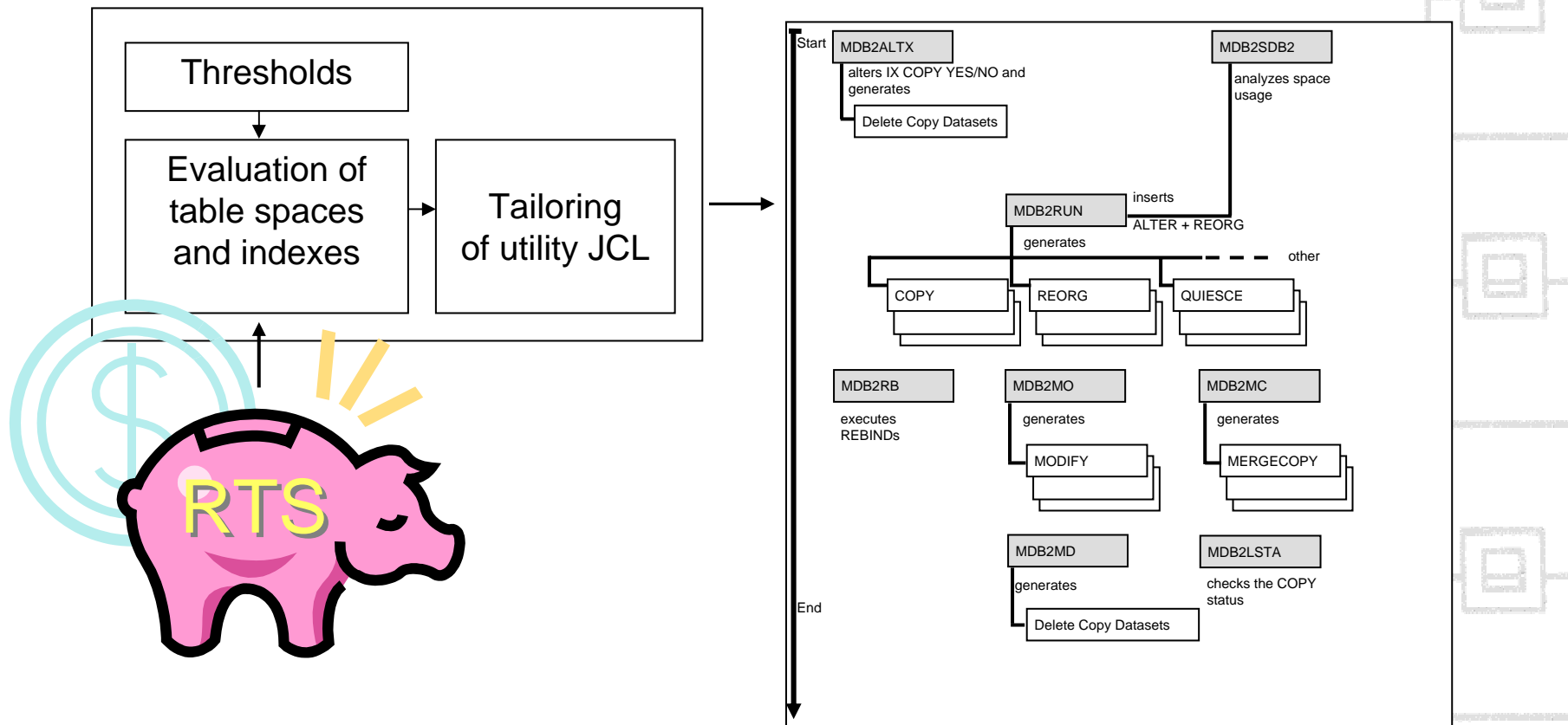


DB2 for z/OS Maintenance



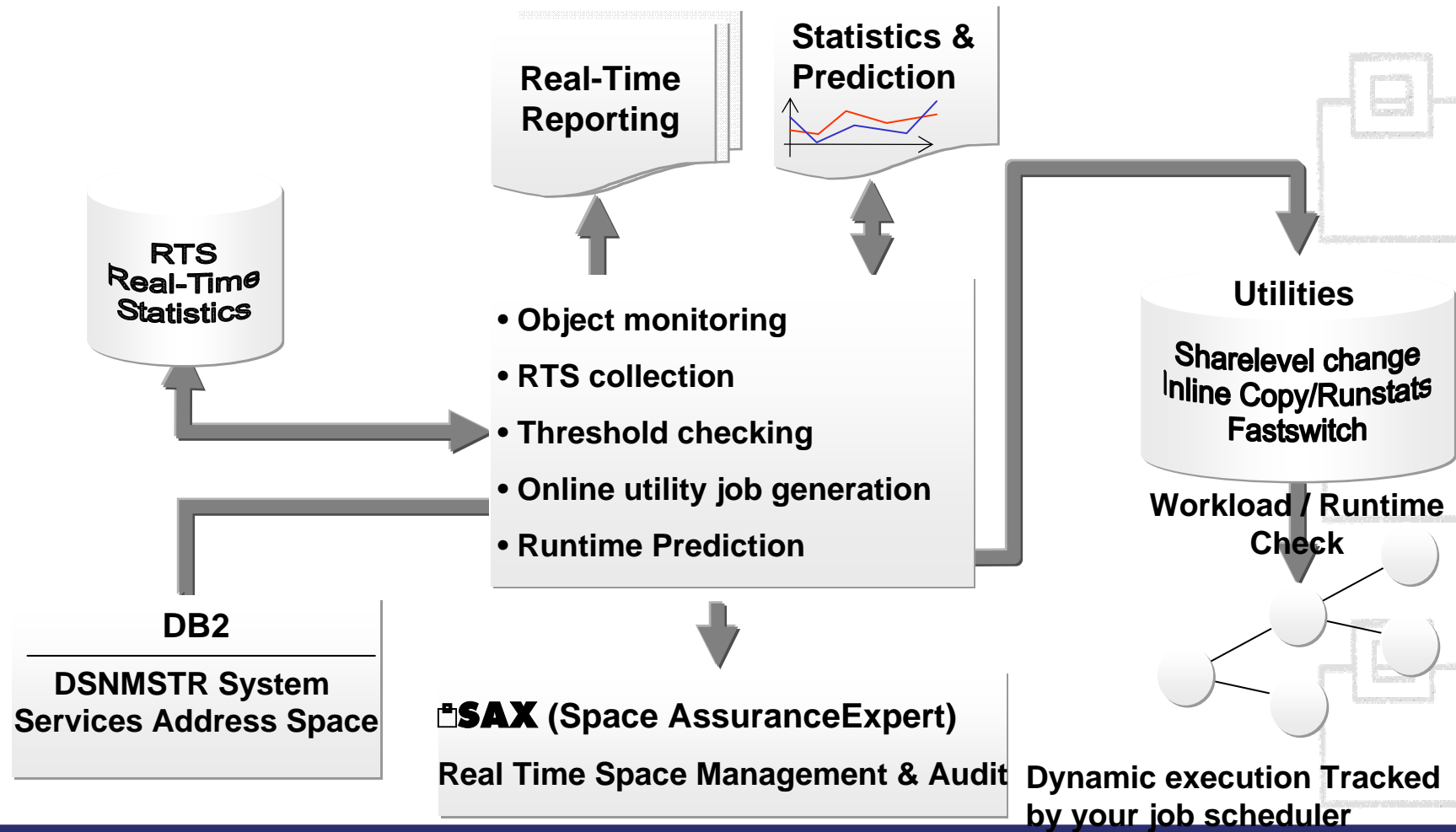
- Level 3 maintenance (batch)

Execution within your job scheduler



DB2 for z/OS Maintenance

- 24x7 DB2 maintenance



Controlled On-Demand Processing



```

RealTimeMaintain ----- Execution Modes ----- Row 1 of 5
Command ==> _____ Scroll ==> PAGE
                                         DB2: Q91A

Primary cmd: I(nsert), P(rint), L(ocate EXECUTION MODE), T(ime-Window Off)
Line      cmd: S(elect), I(nsert), D(elete), E(xcludes)

      0-+-2- 3-+-5- 6-+-8- 9-+-11 12+-14 15+-17 18+-20 21+-23 24 HOUR CLOCK
MON nnnnnn ***** ***pp pppp** **pppp pppp** ***** **nnnn
TUE nnnnnn ***** ***pp pppp** **pppp pppp** ***** **nnnn - Time of day
WED nnnnnn ***** ***pp pppp** **pppp pppp** ***** **nnnn in 1/2 hour
THU nnnnnn ***** ***pp pppp** **pppp pppp** ***** **nnnn steps
FRI nnnnnn ***** ***pp pppp** **pppp pppp** ***** **nnnn
SAT wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww
SUN wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww wwwwww

SP1 _____
SP2 _____
SP3 _____

EXECUTION MODE      ID      RO MAX      CO MAX      RS MAX  IXSPACE  EXCLUDES
-----
= NIGHT-TIME        n      180000
= NO-UTILS          z           0           0           0         Y         Y
= NON-PEAK-TIME    *      45000      90000      180000     N         Y
    
```

Controlled On-Demand Processing

```
RealTimeMaintain ----- WLM Control -----
Command ==> _____ DB2: Q91A

Primary cmd: W(LM control ON), C(current system load)

WLM CONTROL . . . . . : OFF
SHORT-TERM SYSTEM LOAD : - (0..100) at *** NEVER RUN ***

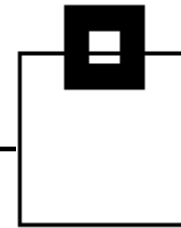
Specify your system characteristics to calculate current system load:

WORKLOAD STABILITY . . . 5 - 0 .. 9, recommended values are 5 .. 7
      IO BIAS . . . . 3 - 0 .. 9, recommended values are 3 .. 5
PEAK TOLERANCE . . . . D - 0 .. 9 or D, recommended is D(efault)
SRM WEIGHT . . . . . D - 0 .. 9 or D, recommended is D(efault)

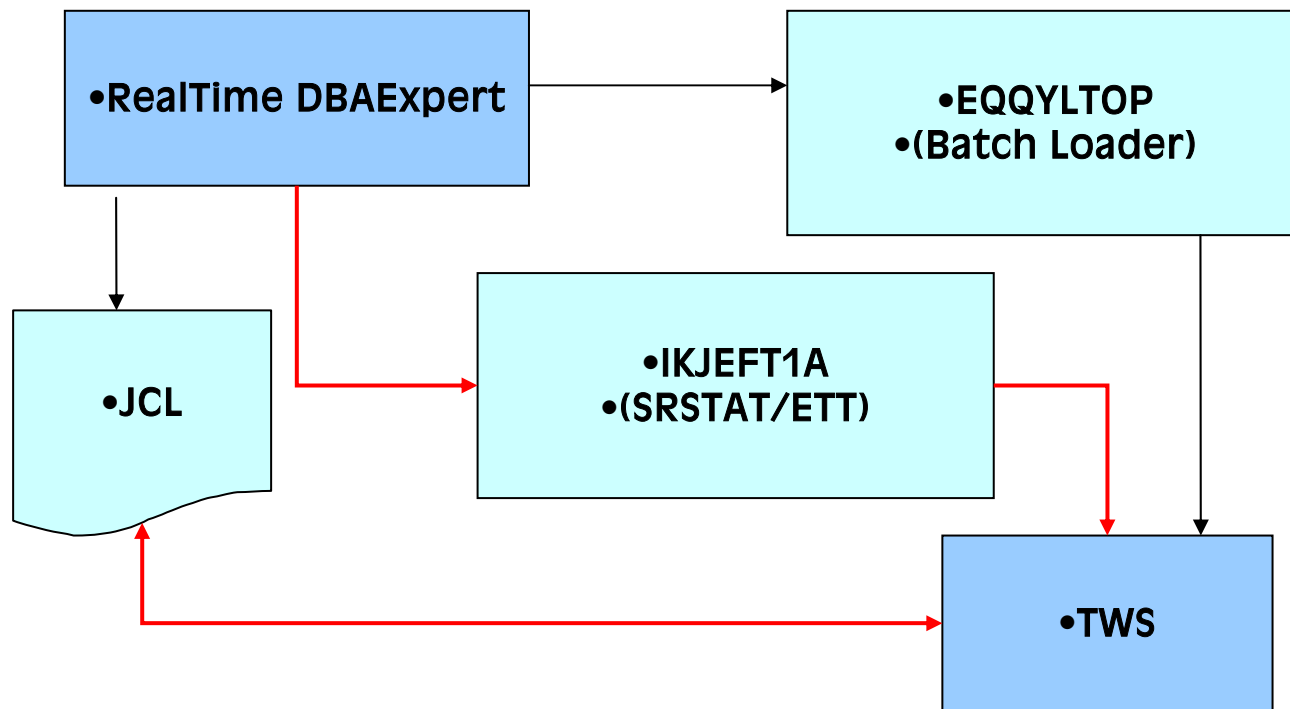
Specify your system load levels and actions to take:

WARNING LEVEL . . . . 65 - 50 .. 100, allow utility to run
      ACTION . . . . B - W(TO)/M(sg)/B(oth)/N(one)
EXCESSIVE LEVEL . . . . 75 - 50 .. 100, do not allow utility to run
      ACTION . . . . B - W(TO)/M(sg)/B(oth)/N(one)
```

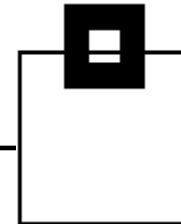
Dynamic Job Scheduler Interface



- Job scheduler interface (OPC-TME/TWS sample):

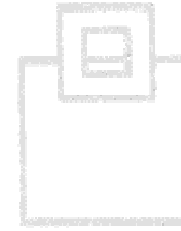


Transparent On-Demand Processing

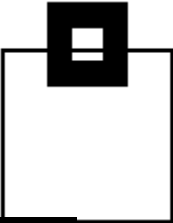


```
RT-InformationCenter ----- REORG Tablespace Details -----
Command ==> _____ DB2: Q91A
Primary cmd: R(eason list) More: +
DETAILS
REASON . . . . . : REORG Number of mass deletes
TIMESTAMP . . . . . : 2011-09-04-13.07.34   UT STAT : Pending Generation
UTILITY START . . . . . : n/a           END . . . : n/a
EXCEPTION REASON . . . . . : None       MAXPAGES : 30000
EXEC MODE . . . . . :                   EXEC ID  : p   ACTIVE . : NO
EXEC MODE SET BY . . . . . : INSTALL    AT . . . . : 2011-08-08-09.44.15
RUNSTATS REPORT . . . . . : No         UPDATE . . : All
OBJECT GROUP . . . . . : *           *       COPY . . . : Yes

RTS DATA
DATABASE . . . . . : IQA6DHUK   SPACE . . . . . : IQASB000
PARTITION . . . . . :           0   LAST REORG DATE . . . . . : 2011-07-18-09.02.42
NBR CHANGED ROWS . . . . . :           9   PCT CHANGED ROWS . . . . . :           100
NBR INDREF . . . . . :           0   PCT INDREF . . . . . :           0
NBR UNCLUSTINS . . . . . :           0   PCT UNCLUSTINS . . . . . :           0
NBR DISORGLOB . . . . . :           0   PCT DISORGLOB . . . . . :           0
NBR MASS DELETES . . . . . :           1   EXTENTS . . . . . :           3
TOTAL NBR ROWS . . . . . :           9   NACTIVE . . . . . :           204
```



Transparent On-Demand processing



```

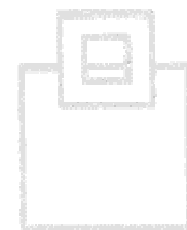
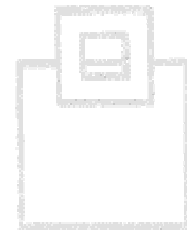
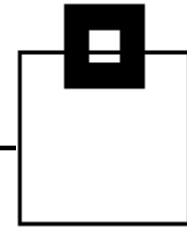
RT-InformationCenter ----- Object Statistics Summary ----- Row 16 of 67
Command ==> _____ Scroll ==> PAGE
                                           DB2: Q91A

Primary cmd: S(ort), P(rint)
Line      cmd: E(xpand), R(eporting)

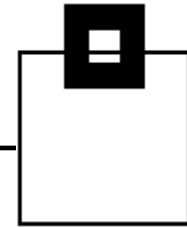
  DATABASE  DBID  SPACE      PSID/ PART IX | CO  CO AV  RS  RS AV  RO  RO AV
             ISOBID                               | ELAPS          ELAPS          ELAPS
-----
= IDUG0610   261  IDUG1AYT    302   0  Y |  0   0   1   49   0   0
= IDUG0610   261  IDUGB001    300   0  Y |  0   0   1   49   0   0
= IDUG0610   261  IDUSB001    297   0   |  0   0   1   51   0   0
= IDUG0610   261  IDUGA008    235   0  Y |  0   0   1   52   0   0
= IDUG0610   261  IDUSA008    232   0   |  0   0   1   53   0   0
= R510D001   263  R510X111     61   0  Y |  0   0   1   17   0   0
= DSNXSR     257  XSRANNIN     48   0  Y |  0   0   1   44   0   0
= DSNXSR     257  XSRXCP01     45   0  Y |  0   0   1   52   0   0
= DSNXSR     257  XSRXCC01     41   0  Y |  0   0   1   63   0   0
= DSNXSR     257  XSRXOP01     37   0  Y |  0   0   1   61   0   0
= DSNXSR     257  XSRXOG01     33   0  Y |  0   0   1   54   0   0
= DSNXSR     257  XSRH1MDN     29   0  Y |  0   0   1   49   0   0
= DSNXSR     257  XSRHIER0     27   0  Y |  0   0   1   49   0   0
= DSNXSR     257  XSRC1XXK     24   0  Y |  0   0   1   47   0   0
= DSNXSR     257  XSRCOMP0     22   0  Y |  0   0   1   45   0   0
  
```

Copy Utility Szenarios from fixed intervals to RTO based copies

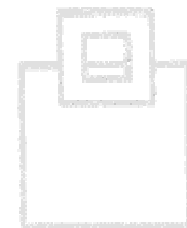
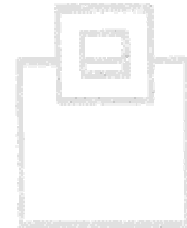
- Fixed intervals
- Update based
- Dependent Copies (Exceptions)
- RTO Based Copies



Copy Utility



- Goal:
 - Recovery Time Objectives (RTO)
>>The Recovery Time Objective is the time needed to recover or, saying it another way, how long you can afford to be without your objects, applications, or systems.<<



Copies by RTDX

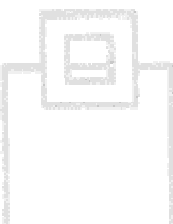
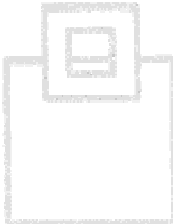
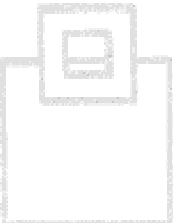
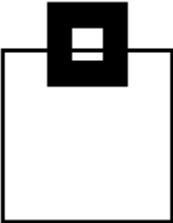
- Example: Fixed Interval

```
RealTimeMaintain ----- COPY Parameters -----
Command ==> _____ DB2: Q91A

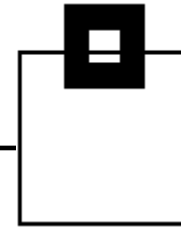
DATABASE . . . . : *          TABLESPACE . . . . : *

COPY OBJECT . . . . TP - TS/TP/V(riable)
COPY TYPE . . . . F - F(ull)/I(ncremental)/V(riable)/2(FLASHCOPY2)/
                    R(ecovery-based) (*)
COPY SHRLEVEL . . . C - R(eference)/C(hange)
COPY CONCURRENT . . N - Y(es includes QUIESCE before)/N(o)
MERGE INCR COPY . . _____ - Merge incremental copies if this number is reached
COPY CHECKPAGE . . . N - Y(es)/N(o)
IGNORE COPY YES IX . N - Y(es)/N(o)

(*): COPY TYPES = F or I are not valid for on-demand processing.
```



Copies by RTDX



- Example: Fixed Interval

```
RealTimeMaintain ----- Batch Calendar -----  
Command ==> _____ DB2: Q91A  
  
NOTE: This calendar is not used for on-demand processing.  
  
DATABASE . . . : *          TABLESPACE . . . : *          UTILITY . . . : CO  
  
Specify day interval to process IMAGECOPY entry for the above object group:  
DAY INTERVAL . . . . 1 - Number of days  
  
Specify day(s) of week by marking the fields below with an S:  
DAY OF WEEK . . . . MON TUE WED THU FRI SAT SUN  
  
Specify day(s) of month by marking the fields below with an S:  
DAY OF MONTH . . . . 01 02 03 04 05 06 07 08 09 10  
  
                        11 12 13 14 15 16 17 18 19 20  
  
                        21 22 23 24 25 26 27 28 29 30 31
```



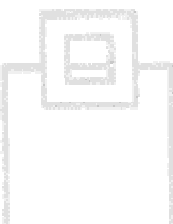
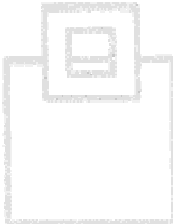
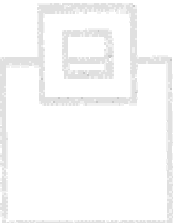
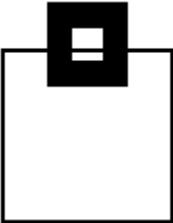
Copies by RTDX

- Example: Update-based

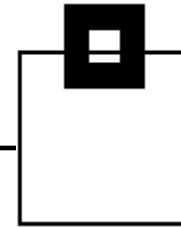
```

RealTimeMaintain ----- COPY Parameters -----
Command ==> _____ DB2: Q91A

DATABASE . . . : *      TABLESPACE . . . : *
+-----+
| ----- COPY TYPE Variable ----- |
| Command ==> _____ DB2: Q91A |
| Primary cmd: S(witch off on-demand thresholds) |
| COPY OBJECT MAX PAGES CLASS 1 1800 CLASS 2 90000 CLASS 3 > CLASS 2 |
|                                     BATCH ON-DEMAND BATCH ON-DEMAND BATCH ON-DEMAND |
| COPY TYPE INCR                      REG CRIT    REG CRIT    REG CRIT |
| PCT UPDATED PAGES . 0 50 _____ . 0 40 _____ . 0 30 _____ |
| PCT CHANGED ROWS . 0 _____ _____ . 0 _____ _____ . 0 _____ _____ |
| COPY TYPE FULL |
| PCT UPDATED PAGES . 10 50 _____ . 10 40 _____ . 10 30 _____ |
| PCT CHANGED ROWS . 20 _____ _____ . 20 _____ _____ . 20 _____ _____ |
+-----+
  
```



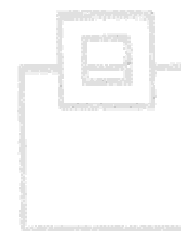
Copies by RTDX



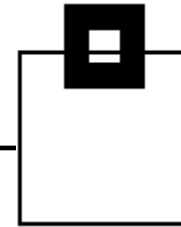
- Example: Update-based

```
RealTimeMaintain ----- COPY Parameters -----
Command ==> _____
+-----+
|----- COPY TYPE Variable -----|
| Command ==> _____ |
|                                     |
| Primary cmd: S(witch off on-demand thresholds) |
|                                     |
|          BATCH ON-DEMAND          |
| COPY TYPE FULL          REG  CRIT  |
|   DAYS NO COPY . . . 7          |
|   DAYS UNCOND COPY . . .          |
|   MIN NBR COPIES . . .          |
|     EXCL DSNUM 0 . . .          |
| COPY SETTINGS FOR BOTH BATCH AND ON-DEMAND |
|   NBR INCR COPY . . . 3          |
|   CHECK LOGRANGE . . . N          |
| COPY SETTINGS FOR ON-DEMAND |
|   MIN HOURS . . . . 12          |
|   COPY PEND AS CRIT . . . N          |
| COPY SETTINGS FOR BATCH |
|   DAYS COPY GAPS . . . 0          |
+-----+

```



Copies by RTDX



- Example: Dependent Copies (Exceptions)

```
RealTimeMaintain ----- REORG Dependent Actions -----
Command ==>                 
                                                    DB2: Q91A

DATABASE . . . : R510D001  TABLESPACE . . . : R510S*

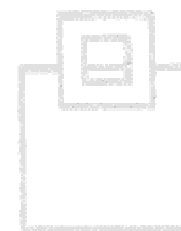
REORG LOG . . . . . N - Y(es)/N(o)/V(ariable)
  MAX PAGES LOG=YES . .                  - Valid only if REORG LOG = V

BEFORE REORG: QUIESCE . N - Y(es)/N(o)  WRITE . . . . .   - Y(es)/N(o)
                                     COPY . . . N - Y(es)/N(o)/  CONSIDER RI . . .   - Y(es)/N(o)
                                     L(ob only)  SHRLEVEL . . . . .   - C(hange)/R(ef)
                                     TYPE . . . . .   - F(ull)/I(ncr)
                                     CONCURRENT . . . . .   - Y(es)/N(o)
                                     CHECKPAGE . . . . .   - Y(es)/N(o)

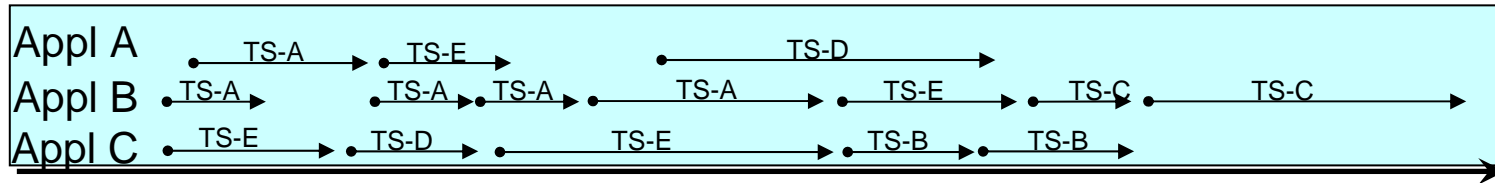
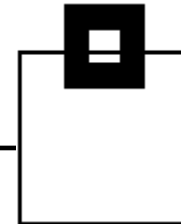
WHILE REORG:  COPY . . . Y - Y(es)/N(o)
             RUNSTATS . Y - Y(es)/N(o)

AFTER REORG: COPY . . . N - Y(es)/N(o)  CONCURRENT . . .   - Y(es)/N(o)
             RUNSTATS . N - Y(es)/N(o)
             REBIND . . N - Y(es)/N(o)

IGNORE COPY YES IX . . . N - Y(es)/N(o)
REORG DEPENDENT. . . . . Y - Y(es to avoid redundant copies or runstats)/N(o)
```

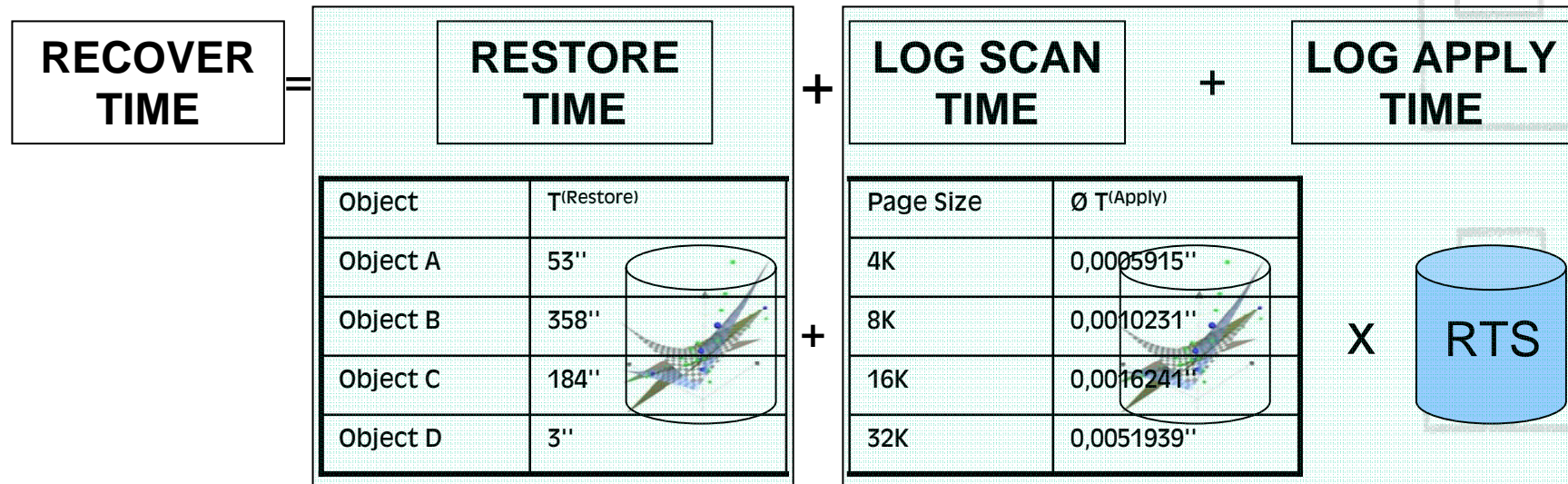
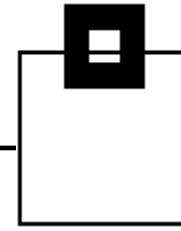


RTO-Based Copies



	Pages	%Updt
TS-A	5.000	2%
TS-B	50.000	10%
TS-C	500.000	50%

RTO-Based Copies



Copies by RTDX

- Example: RTO-Based

```

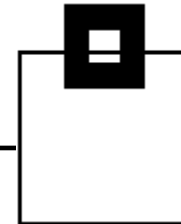
----- COPY TYPE Recovery-Based -----
Command ==> _____ DB2: Q91A
Primary cmd: S(witch off on-demand thresholds), R(ecovery Time Objectives)

RHC COPY THRESHOLDS          BATCH ON-DEMAND
                               REG  CRIT
RTO EXCEEDED . . . Y       Y   N   - T(olerance)/Y(es)/N(o)
UNREALISTIC RTO . . 25      25   _____ - Percent of restore time
INDEX COPY REQD . . N       N   N   - Y(es to check indexes)/N(o)
BACKUP MISSING . . W       W   N   - W(arning and Error)/E(rror)/N(o)
LOG MISSING . . . . W       W   N   - W(arning and Error)/E(rror)/N(o)

COPY INTERVAL
DAYS NO COPY . . . _____ n/a - If updates and no copy in this time
DAYS UNCOND COPY . _____ n/a - If no updates and no copy
MIN HOURS . . . . . n/a 12  n/a - Minimum hours between copies

COPY THRESHOLDS AND SETTINGS FOR BOTH BATCH AND ON-DEMAND
NBR INCR COPY . . . _____ - Full if this incremental count is reached
COPY APPLY PCT . . 75      - Full if copy apply time reaches this RTO pct
PCT UPDATED PAGES . 30     - Full if updates reach this percentage

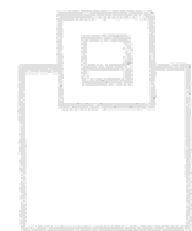
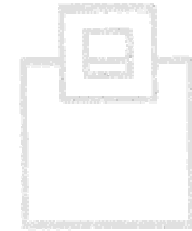
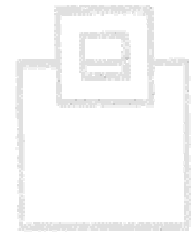
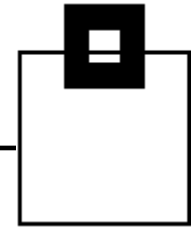
COPY SETTINGS FOR ON-DEMAND
COPY PEND AS CRIT . N      - Treat copy pending as a critical Y(es)/N(o)
  
```



Copies by RTDX

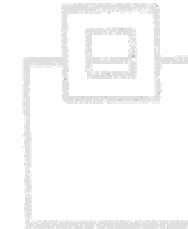
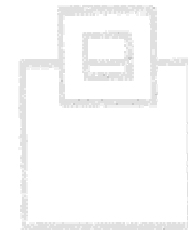
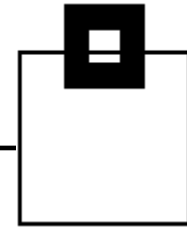
- Example: RTO-Based

```
Recovery HealthCheck ---- Recovery Time Objectives -----  
Command ==> _____  
  
Define your recovery time objectives (RTO) and tolerance for each  
class. The values defined here are used for the RTO health check.  
  
                SIZE                RTO                TOLERANCE  
-----  
CLASS 1 . . . . . 10000 KB 2 min 5 5 .. 50 %  
CLASS 2 . . . . . 50000 KB 5 min 10 5 .. 50 %  
CLASS 3 . . . . . 100000 KB 10 min 10 5 .. 50 %  
CLASS 4 . . . . . 250000 KB 25 min 10 5 .. 50 %  
CLASS 5 > CLASS 4 . . . . . 40 min 20 5 .. 50 %
```



REORG Utility

- Goal:
 - *>>REORG improves access performance and reclaims fragmented space.<<*



REORGs by RTDX

```

RealTimeMaintain ----- REORG Thresholds -----
Command ==> _____ DB2: Q91A
Primary cmd: S(witch off on-demand thresholds)
More: +
DATABASE . . . : *      TABLESPACE . . . : *

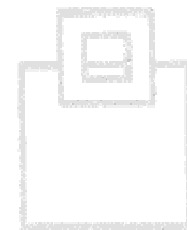
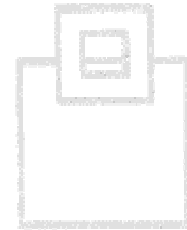
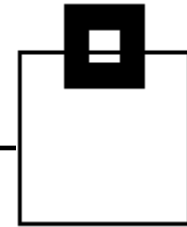
REORG TABLESPACE      BATCH      ON-DEMAND
                        REGULAR    CRITICAL
MIN PAGES . . . 64    64      _____ - No REORG if object is smaller
PCT CHANGED . . . _____ - Percentage changed rows
PCT INDREF . . . 10    10      _____ - Percentage FARINDREF+NEARINDREF
PCT UNCLUSTINS 10    10      _____ - Percentage unclustered inserts
                        -2 _____ - for objects > _____ pages
                        -3 _____ - for MEMBER CLUSTER
MASS DELETES . . . 0      0      _____ - Number of mass deletes

REORG LOB
PCT DISORGLob . . . 10    10      _____ - Percentage disorganized LOBs

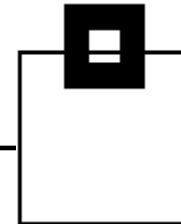
REORG INDEX
MIN PAGES . . . 32    32      _____ - No REORG if object is smaller
PCT CHANGED . . . _____ - Percentage changed rows
PCT APPENDED . . . 10    10      _____ - Percentage appended rows
PCT LEAFFAR . . . 10    10      _____ - Percentage LEAFFAR
PCT PSEUDODEL . . . 10    10      _____ - Percentage PSEUDO_DELETED_ENTRIES
  
```

RUNSTATS Utility

- Goal:
 - *>>The DB2 Optimizer gets the current statistics from DB2 catalog for the columns and tables identified in the SQL statements to select an access path.<<*



RUNSTATS AVOIDANCE by RTDX



- Example: Dependent RUNSTATS

```

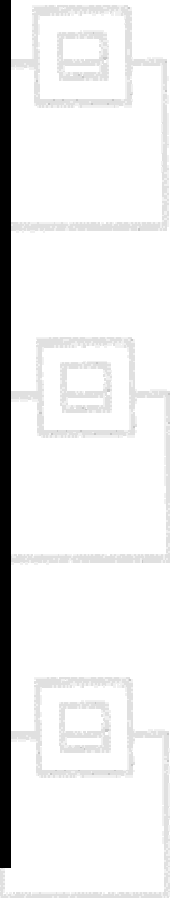
RealTimeMaintain ----- RUNSTATS Avoidance Settings ----- Row 1 of 1
Command ==> _____ Scroll ==> PAGE
                                         DB2: Q91A

Primary cmd: I(nsert), S(trategy overview), V(olatile control)
Line      cmd: S(elect), I(nsert)

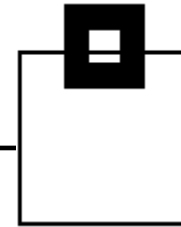
DATABASE . . . : *          TABLESPACE . . . : *

RUNSTATS SCHEDULING          BATCH          ON-DEMAND
  DAYS NO RUNSTATS . . .
  MIN HOURS. . . . . n/a
BATCH OPTIONS
  REBIND AFTER . . . . . N          - Y(es)/N(o)
  AFTER LOAD . . . . . Y           - Y(es)/N(o)
RUNSTATS AVOIDANCE          NON-PART      PART          LOB
  STRATEGY . . . . . DEFAULT      _____  Y

STRATEGY | DOWN | STEPS
          | DELAY % | MIN INTER MAX
-----|-----|-----
= DEFAULT | 1D 25 | 20K 10 100M
          |-----|-----
  
```



RUNSTATS AVOIDANCE by RTDX



■ Volatile Detection

```
RealTimeMaintain ----- RUNSTATS Volatile Detection -----
Command ==> _____
                                                    DB2: Q91A
                                                    More:      +
Primary cmd: P(art. inter step values), N(on-part. inter step values),
            R(efresh)

Allow volatile detection for

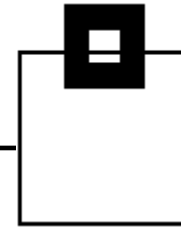
DEFINED VOLATILE OBJECTS  N  - Y(es)/N(o)

PARTITIONED OBJECTS. . . Y  - Y(es)/N(o)
STEPS:  MIN . . . . . 20 K - Low value for inter step calculation
        INTER . . . . . 10  - When an object with a type N entry in the
                               Volatile Control Table goes to the next
                               higher step then it will be removed from
                               the Volatile Control Table
        MAX . . . . . 100 M - High value for inter step calculation

NON-PARTITIONED OBJECTS. Y  - Y(es)/N(o)
STEPS:  MIN . . . . . 20 K - Low value for inter step calculation
        INTER . . . . . 10  - When an object with a type N entry in the
                               Volatile Control Table goes to the next
                               higher step then it will be removed from
```



RUNSTATS AVOIDANCE by RTDX

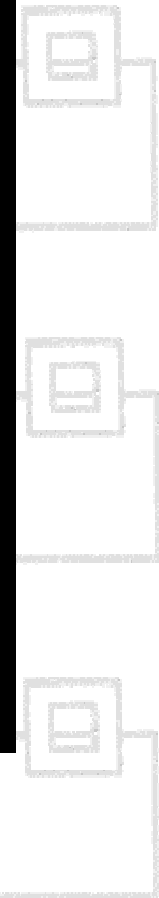


- Distinctive Sizes

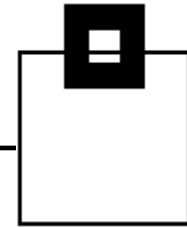
```
RealTimeMaintain ----- Intermediate steps display ----- Row 1 of 10
Command ==> _____ Scroll ==> PAGE
                                      DB2: Q91A

STRATEGY . . : PART

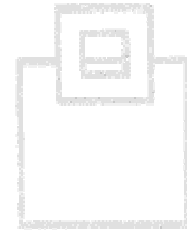
      INTERMEDIATE STEPS
      -----
          1      47 K
          2     110 K
          3     259 K
          4     609 K
          5       1 M
          6       3 M
          7       8 M
          8      18 M
          9      43 M
         10     100 M
      -----
```



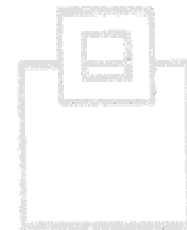
RS Utility with Access Path Management Option



- Goal:
 - PreCheck – ask the Optimizer for a potential improvement
 - Reduces & Secures REBINDs
 - Protects the dynamic statement cache (DSC)



→ Optimizer-Controlled Maintenance (incl. interface to DSC for explain analysis)



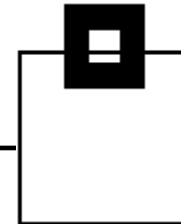
Controlled REBINDs by RTDX

```
ImpactExpert for DB2 z/OS ----- Programs Summary ----- Status 1 from 11
Command ==> _____ Scroll ==> CSR
Mode: REBIND ANALYSIS DB2: Q91A
Primary cmd: END, R(efresh), Z(oom)
Line cmd: S(elect)
```

```
COLLECTION : *
PACKAGE    : *
PLAN       : *
           -
```

Status	Programs	Statements
PROCESSED	195	1639
- IMPROVED	6	10
- CHANGED	14	35
- UNCHANGED	153	1551
- WORSENERD	22	43
NON-DETERMINABLE	24	0
- NO EXPLAINABLE SQL	24	
PLAN_TABLE ISSUES	1	11
- PLAN_TABLE DATA NOT FOUND	1	11
ERROR	1	6
- INCOMPLETE	1	

Controlled REBINDs by RTDX



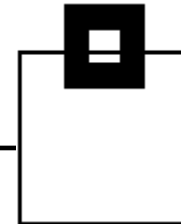
```

ImpactExpert for DB2 z/OS -- Worsened Programs (1/6) ----- Program 1 from 22
Command ==> _____ Scroll ==> CSR
Mode: REBIND ANALYSIS DB2: Q91A
Primary cmd: END, S(how prepared), Z(oom), L(ocate) programs
Line cmd: S(tatements), A(nalyze), R(EBIND prepare), Z(oom)

  Imp  Collection / Plan  Program  Job Submit Time  Rel  Rec  EX
  ---  -
S  WRS  RTDX0510  DSMDSLI  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMDSLX  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMD7LL  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMD7LX  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMWID  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMWIDB  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMWI8  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMWI8B  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMWI9  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  DSMWI9B  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  MDB2DBPD  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  MDB2DBV8  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  MDB2DBV9  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  MDB2DB06  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  MDB2SYST  2011-09-04-09.25.41  V9  NO
=  WRS  RTDX0510  MDB2SY8T  2011-09-04-09.25.41  V9  NO
  
```



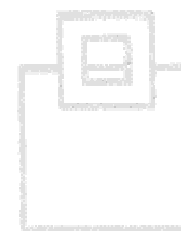
Controlled REBINDs by RTDX



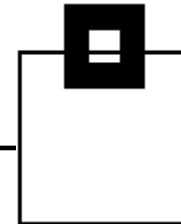
```
ImpactExpert for DB2 z/OS -- REBIND Overview (1/4) ----- Stmt 1 from 4
Command ==> _____ Scroll ==> CSR
Mode: REBIND ANALYSIS DB2: Q91A
Primary cmd: END, SE(tup Analyze), Z(oom), L(ocate) stmtno
Line cmd: S(elect), A(nalyze), D(ynamic analyze), E(dit and analyze),
        V(iew), Z(oom)

Job submit time . 2011-09-04-09.25.41 Bindtime . . 2011-08-29-14.42.40.794059
Collection/Plan . RTDX0510
Program . . . . . DSMDSL
Version . . . . .

      StmtNo  Imp  Bad access types      Bad access types      Explain
      -----  --  before REBIND         with REBIND           Hint  sqlcode
      -----  --  -----
=       328   EQ
=       376   EQ
=       389   EQ
=       1809  WRS  TS,SORT              TS,LP,SORT            0
      -----  --  -----
```



Controlled REBINDs by RTDX



```

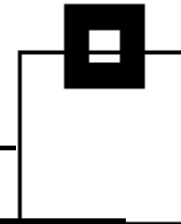
ImpactExpert for DB2 z/OS ----- Access Paths ----- LINE 00000001 COL 001 080
Command ==> _____ Scroll ==> PAGE
Mode: REBIND ANALYSIS DB2: Q91A
Primary cmd: END, C(atalog data), D(etails on/off), S(tatement text)

Collection . RTDX0510 Timestamp . 2011-09-04-09.26.09.960000
Package . . . DSMDSLL Contoken . . 18C05A2512B43BB0
StmtNo . . . 1809 Bindtime . . 2011-08-29-14.42.40.794059

Access path before REBIND -----| Access path with REBIND -----
TABLE QB PN AC MA ME IX PR | TABLE QB PN AC MA ME IX PR
INDEX TY CO TH ON FT | INDEX TY CO TH ON FT
-----|-----
SYSTABLESPACE 1 1 0 3 | SYSTABLESPACE 1 1 0 3
DSNDSX01 2 1 I 2 N | DSNDSX01 2 1 I 2 N
SYSTABLEPART 2 2 I 2 1 N | SYSTABLEPART 2 2 I 2 1 N
DSNDPX01 | DSNDPX01
SYSAUXRELS 3 1 R 0 N S | SYSAUXRELS 3 1 R 0 N S
SYSTABLES 3 2 I 2 1 N | SYSTABLES 3 2 I 2 1 N
DSNDTX01 | DSNDTX01
SYSTABLESPACE 3 3 I 2 1 N | SYSTABLESPACE 3 3 I 2 1 N
    
```



Automated Utility Control by RTDX

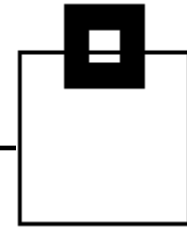


```

BatchControl for DB2/Utilities ----- Rule DB2 Abend ----- Row 6 from 27
Command ==> _____ Scroll ==> PAGE
                                      DB2: S910
Primary CMD : I(nsert), S(ort), F(ilter), L(ocate), P(rint) Script DEFAULT
Line CMD    : D(elete), U(pdate), I(nsert), R(estart), C(leanup)

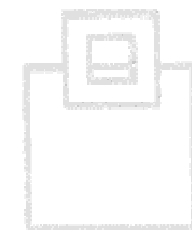
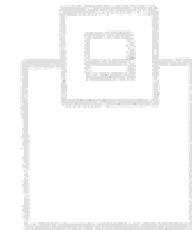
CMD UTILITY          SHRL PHASE      MVS-CC MVS-RC  WAKEUP DB2-REAS DB2-TYPE
-----
- REORG INDEX        NONE BUILD      S04E   *        NO      *          *
  DB2-NAME: *
  DESCRIPT: ABEND DURING REORG INDEX (BUILD PHASE)
-----
- REORG TABLESPACE *      *          S04E   *        NO      *          *
  DB2-NAME: *
  DESCRIPT: ABEND DURING REORG TABLESPACE
-----
- REORG TABLESPACE *      BUILD2    S04E   *        NO      *          *
  DB2-NAME: *
  DESCRIPT: ABEND DURING REORG TABLESPACE (BUILD2 PHASE, ONLINE REORG ONLY)
-----
- REORG TABLESPACE *      SWITCH    S04E   *        NO      *          *
  DB2-NAME: *
  DESCRIPT: ABEND DURING REORG TABLESPACE (SWITCH PHASE, ONLINE REORG ONLY)
-----
- REORG TABLESPACE NONE RELOAD    S04E   *        NO      *          *
  DB2-NAME: *
  DESCRIPT: ABEND DURING REORG TABLESPACE (RELOAD PHASE, ONLINE REORG ONLY)
  
```

Space Management by RTDX + SAX



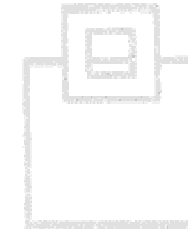
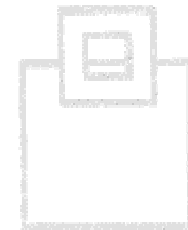
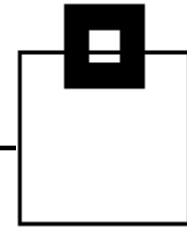
- Housekeeping
 - After MODIFY
 - Table-/Index-Space up/downsizing
 - Altering the space allocation
 - Setting a REORG request to apply the changes

- Manage all maintenance dependant spaces
 - Work data sets
 - Sort data sets
 - Copy data sets (including SMS MIGRAT level mgmt.)
 - Mapping table

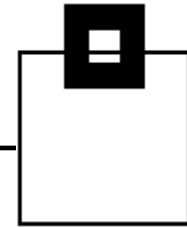


Space Audit and Management by RTDX - SAX

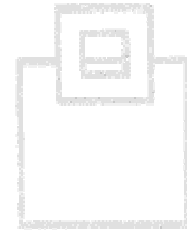
- „Monitors“ the database in real time (IFCID)
- Acts and/or reports in real time
 - Alter secondary quantity
 - Trigger a WTO
- Transparent Extent Monitoring/Management
- Proactive space monitoring
 - LPS
 - Storage groups (linear page Set Audit)
 - Partition Control
 - Empty partitions
 - Full partitions
 - Unused partitions



SAX – Storage Group Audit

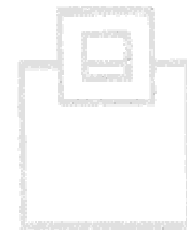


- Monitors SMS storage groups
 - Allows to trigger messages, or WTOs in case of
 - Max. % of utilization exceeded
 - Max. total freespace exceeded
 - Supports DB2 and non-DB2 related Storage Groups



E.g.

- DB2 Catalog and Directory TS & IS Storage Groups
- User TS & IS Storage Groups
- LOG Storage Groups
- Copy Storage Groups



LPS Audit by RTDX - SAX

Object type:	Maximum # of data sets:
LOB TS without DSSIZE	259
Non partitioned TS (except ...)	32
Non partitioned IX on TS with: <ul style="list-style-type: none"> ▪ LARGE or DSSIZE ▪ No more than 254 partitions 	254
Non partitioned IX on TS with: <ul style="list-style-type: none"> ▪ LARGE or DSSIZE ▪ More than 254 partitions 	If PIECESIZE is used: 4096 If no PIECESIZE is used: if DSSIZE <= 32 GB 4096 if DSSIZE > 32 GB 2048
Non partitioned IX	32
Partitioned IX	1 (ignore)
Partitioned TS	1 (ignore)

Extent Management by RTDX -SAX

```
Space AssuranceExpert ----- Extent Summary ----- Row 1 of 2
Command ==> _____ Scroll ==> PAGE
Enter one of the listed commands or press ENTER to refresh display.
Primary cmd: L(ocate DATABASE), S(ort), F(ilter), P(rint)
Line cmd: E(xpand), F(irst details), L(ast details), R(eporting)

  DATABASE  DBID SPACE  PSID/ PART I  DS  NUM  NUM | ..... CURRENT .....
           ISOBID      X  NUM ALTR WARN | EXT SQTY KB ALLOC KB
-----
= R510D001   263 R510S91   322   0    1    1  0 | 3    48    816
= UHRTD1     275 UHR1S11    2    0    1    8  0 | 6     4   12336
-----
```

Extent Management by RTDX - SAX

```

Space AssuranceExpert----- Extent Expand Tablespace ----- Row 1 of 1
Command ==> _____ Scroll ==> PAGE
                                         DB2: Q91A

Primary cmd: L(ocate TIMESTAMP), S(ort), F(orecast), P(rint)
Line      cmd: D(etails), O(ptions), R(eporting)

    DATABASE . : R510D001    DBID . . : 263    MAX ALLOC . : 2097152 KB
    TABLESPACE : R510S91    PSID . . : 322    MAX EXTENTS : 251
    PARTITION . : 0          DSNUM . . : 1      MAX VOLUMES : 59

    ALTER
    . AUDIT SQTY .
TIMESTAMP          EXT SQTY KB SQTY KB E | WARN % LASTEXT | ALLOC KB VOLS
-----
= 2011-09-04-14.07.27 3      48  2880 | 53 384 | 816 1
-----

```

Partition Control by RTDX - SAX

```
Space AssuranceExpert -- Partition Control Thresholds ----- Row 1 of 1
Command ==> _____ Scroll ==> PAGE
DB2: Q91A

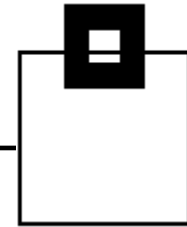
DATABASE . . . : UHRPBG      TABLESPACE . . . : *

          BATCH          ON-DEMAND
          REGULAR CRITICAL
MIN NBR EMPTY PARTS . . 5          5          3  - Minimum number of empty
          ACTION . . . . . M          partitions
          EMPTY AT END . . . Y          - W(to)/M(sg)/B(oth)
          Count only empty parts at end

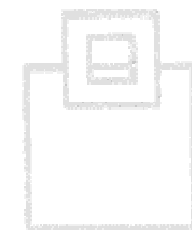
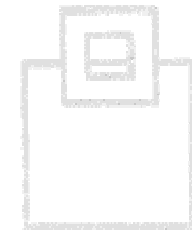
PERCENTAGE MAX PARTS . 90          90          95 - Percentage of allocated
          ACTION . . . . . M          partitions
          - W(to)/M(sg)/B(oth)
```

Optimizer-Controlled Maintenance

- Do it the cost based way



- ROI and TCO
 - Nobody runs a data center for itself
 - All processes of RTDX are aligned to the business needs
 - Main goals
 - Production Assurance
 - Cost Savings
 - Exploit existing technology you already paid for
 - Intuitive and integrative
- See customer experiences
- Get RTDX ROI Tool to forecast YOUR savings



Summary

- RealTime DBAExpert
 - Is easy to implement and easy to use
 - Follows YOUR needs
 - Covers Ad Hoc, Batch and On Demand Utilities
 - Allows to keep current strategies, but
 - Provides smooth transition/exploitation of technology enhancements
 - Aligns costs and benefits

