

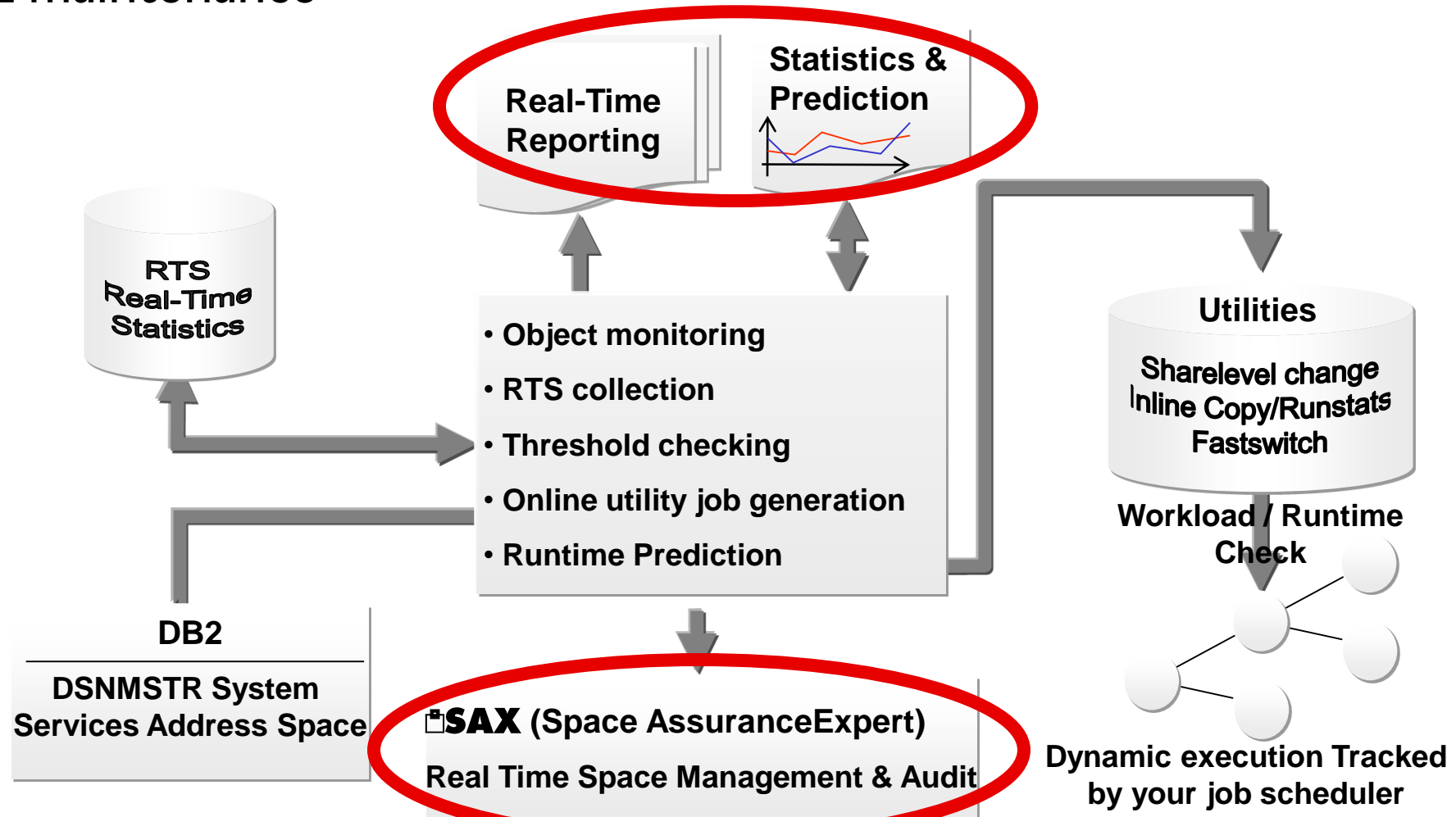
Space AssuranceExpert_{for Db2 z/OS}

a RealTime DBAExpert component

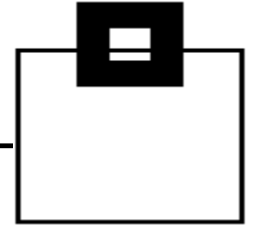


Db2 for z/OS Maintenance

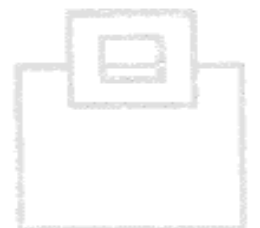
- 24x7 Db2 maintenance



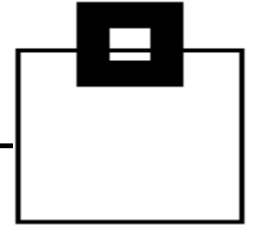
Space Audit and Management by RTDX - SAX



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



SAX – SMS Storage Group Audit



- Monitors SMS storage groups
 - Allows to trigger messages, or WTOs in case of
 - Max. % of utilization exceeds threshold
 - Max. total freespace falls below threshold
 - Supports Db2 and non-Db2 related SMS Storage Groups

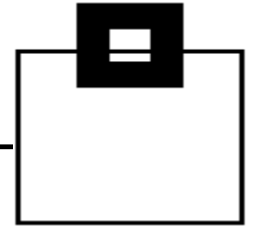


E.g.

- Db2 Catalog and Directory TS & IS Storage Groups
- User TS & IS Storage Groups
- LOG Storage Groups
- Copy Storage Groups



LPS Audit by RTDX - SAX



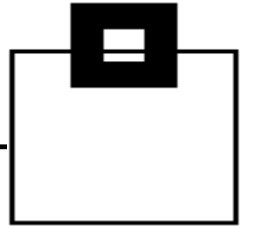
Object type: TABLESPACE	Maximum # of data sets:
LOB TS	254
Non partitioned TS	32
Partitioned TS	1 (percent used checked)
Partitioned By Growth TS	MAXPARTITIONS. LPS check if more than one. If on last partition then percent used.
Object type: INDEX	Maximum # of data sets:
Non partitioned IX on TS with: <ul style="list-style-type: none"> ▪ LARGE or DSSIZE ▪ More than 64 partitions 	MIN (4096, 2 power 32/(DSSIZE / TS PGSIZE)) Eg: 128 GB DSSIZE with 8 KB TS Page gives 256 Pieces (datasets) Or 4 GB DSSIZE with 4 KB TS Page gives 4096 Pieces (datasets)
Non partitioned IX otherwise	32
Partitioned IX	1 (percent used checked)



SAX – Sequences

- Monitors all defined non-cyclic Sequences
 - If they are approaching the end, or the start, you get a warning
 - For Identity columns, Doc Ids, and Sequences
- Monitors all numeric Primary Keys from two perspectives
 - Reading the Db2 Catalog for all numeric Primary keys
 - Reading the User data directly for all numeric Primary keys

The two sources complement each other and can be used or not used as desired. It is a trade off as to how good are the RUNSTATS?



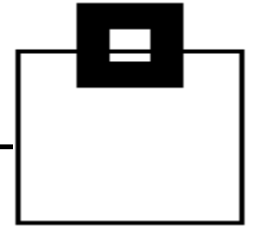
SAX – Control

- For LPS, Sequences, or Primary Keys you may define include and exclude rules to fine control exactly which objects should get which thresholds.
 - If you have “usual suspects” which are full, but now static. It makes good sense to exclude them to reduce any false alarms
 - If, for example, you have reorg mapping table indexes which are so small it could also make a lot of sense to exclude them

```
Space AssuranceExpert ----- SAX Control ----- Row 1 of 23
Command ==> _____ Scroll ==> PAGE
                                           Db2: DC10
Primary cmd: L(ocate CREATOR), S(ort), I(ns seq), P(ins Pk val), X(eXts/lps)
Line      cmd: E(xpand), D(elete), U(pdate), C(opy)

   I DATABASE SPACE
   CREATOR  NAME          IXCREAT  IXNAME          COLUMN          THR
-----
_  I
   *       *
_  E *       *
   *       *
_  I *       *
   *       *           *           *           *           40
```

Extent Management by RTDX -SAX



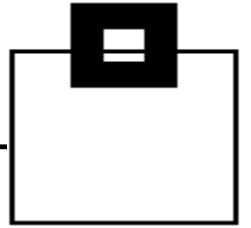
```
Space AssuranceExpert ----- Extent Summary ----- Row 1 of 43
Command ==> _____ Scroll ==> CSR
Db2: DC10

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 | EXTS SQTY KB ALLOC KB
-----
_ BIGINS      491 BIGINS    2   0    1   0   0 | 11   48 64512
_ DCXDB       304 MDUDETA  47   1    1   0   0 |  2    4  7200
_ DCXDB       304 MDUFITA  42   1    1   0   0 |  3    4  4320
_ DCXDB       304 MDUPRED  37   1    1   0   0 |  5    4 15120
_ DCXDB       304 MDUPT   27   1    1   0   0 |  4    4  7200
_ DSNDB01     1  SPT01   127  1    1   0   0 | 10    0 1245376
_ DSNDB01     1 SYSSPUXA   9   0    1   0   0 | 16    0  298800
_ DSNDB01     1 SYSSPUBX  17   0    1   0   0 | 15    0  298800
_ IQAD06P1   491 IQASA004  77   1    1   0   0 |  2  7200  7920
```



Extent Management by RTDX -SAX



```
Space AssuranceExpert ----- Extent Expand Tablespace ----- Row 1 of 3
Command ==> _____ Scroll ==> CSR
                                     Db2: DC10
Primary cmd: L(ocate TIMESTAMP), S(ort), T(able list), Z(oom table), F(orecast)
Line      cmd: D(etails), O(ptions), R(eporting)

DATABASE . : BIGINS      DBID . . : 491      MAX_ALLOC . : 2097152 KB
TABLESPACE : BIGINS      PSID . . : 2        MAX_EXTENTS : 251
PARTITION . : 0          DSNUM . . : 1        MAX_VOLUMES : 59
1stCREATOR : HEINRIC>    1stNAME . : BIGINS      >

      ALTER      | . AUDIT SQTY . |
TIMESTAMP      EXTS SQTY KB SQTY KB E | WARN % LASTEXT | ALLOC KB VOLS
-----|-----|-----|-----|-----|-----|-----|-----|
_ 2019-05-08-09.22.13      9      48      | 101      8064 | 46368      1
_ 2019-05-08-09.22.15     10      48      | 101      8736 | 55104      1
_ 2019-05-08-09.22.18     11      48      | 100      9408 | 64512      1
-----|-----|-----|-----|-----|-----|-----|
```



Extent Management by RTDX -SAX

```
Space AssuranceExpert ----- Extent Tablespace Details -----
Command ==> _____
                                                                    Db2: DC10
Primary cmd: O(options), T(able list), Z(oom table), R(eporting)

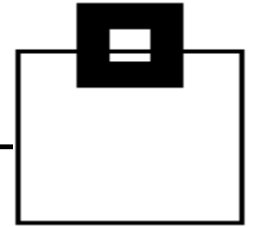
DETAILS
  DATABASE . : BIGINS      DBID . . : 491
  TABLESPACE . : BIGINS    PSID . . : 2
  PARTITION . : 0          DSNUM . . : 1
  1stCREATOR . : HEINRIC>  1stNAME . : BIGINS      >
  DATASET . . : DC10.DSNDBD.BIGINS.BIGINS.I0001.A001
  TIMESTAMP . : 2019-05-08-09.22.18
  EXCEPTION . : None

TRACE DATA      . BEFORE .. AFTER      .... MAX      AUDIT SQTY
  ALLOC . . . . : 55104    64512    2097152 KB  LASTTEXT : 9408 KB
  EXTENTS . . . : 10         11       251        WARN . . . : 100 %
  VOLUMES . . . : 1         1        59
  PRIQTY . . . . : 336 KB SECQTY . . : 9360 KB

CATALOG DATA
  PRIQTY . . . . : 256 KB SECQTY . . : 48 KB      STORETYPE: I
  DSSIZE . . . . : 0 KB  SECQTYI . : 48 KB      TYPE . . . . :

ALTER
  SECQTY . . . . : - KB  SQLCODE :
```

Linear Dataset Management by RTDX -SAX

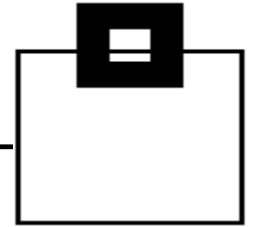


```
Space AssuranceExpert ----- Dataset Summary ----- Row 24 of 26
Command ==> _____ Scroll ==> CSR
Db2: DC10
Primary cmd: L(ocate DBNAME), S(ort), P(rint)
Line      cmd: E(xpand)

  DATABASE SPACE      PART I MAXIMUM CURRENT WARNING  PERC T INFO
          X  VALUE    VALUE  LEVEL   USED
-----
_ R510D0P1 R510SI09      1      32      1 Warning    4 G
_ R510D0P1 R510S13      1      32      1 Warning    4 G
_ SCHSAXD1 SCHSAXT1      2       3      2 Critical   67 G
-----
```



Linear Dataset Management by RTDX -SAX



```
Space AssuranceExpert ----- Dataset Expand Tablespace for PBG --- Row 1 of 138
Command ==> _____ Scroll ==> CSR
Db2: DC10
Primary cmd: L(ocate TIMESTAMP), S(ort), T(able list), Z(oom table), P(rint)

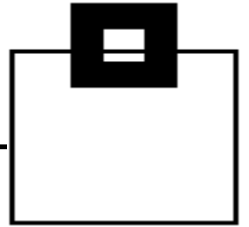
DATABASE . : SCHSAXD1      DBID . . . : 758      MAX ALLOC . : 1024 MB
TABLESPACE : SCHSAXT1     PSID . . . : 2          MAX EXTENTS : 251
                                         MAX VOLUMES : 59

TBCREATOR . : BOXWELL      TBNAME . . : SCHSAXTB

TIMESTAMP          MAXIMUM CURRENT PART WARNING PERC PERC PERC INFO
                   VALUE     VALUE   LEVEL  LEVEL USED WARN CRIT
-----
2019-04-15-12.54.15 1024     36     1 Warning  4     2     4 Last Part
2019-04-15-12.54.15 1024     44     1 Critical 5     2     4 Last Part
2019-04-15-12.54.15 1024     53     1 Critical 6     2     4 Last Part
2019-04-15-12.54.16 1024     63     1 Critical 7     2     4 Last Part
```

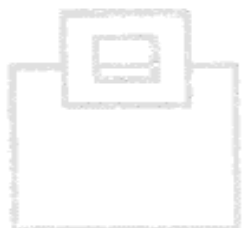


SMS Stogroup Management by RTDX -SAX

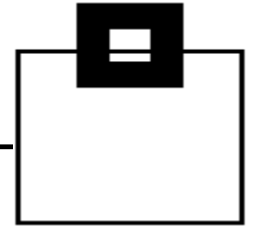


```
Space AssuranceExpert ----- SMS STOGROUP Summary ----- Row 1 of 1
Command ==> _____ Scroll ==> CSR
                                         Db2: DC10
Primary cmd: L(ocate STOGROUP), S(ort), P(rint)
Line      cmd: E(xpand), F(irst details), L(ast details)

   SMS      PERC      GB      MAX
   STOGROUP USED      FREE  TIMESTAMP
   -----
_  SGDBSA10   66      33  2019-02-19-11.37.46
   -----
```



SMS Stogroup Management by RTDX -SAX



```
Space AssuranceExpert ----- SMS STOGROUP Expand ----- Row 1 of 1
Command ==> _____ Scroll ==> CSR
                                         Db2: DC10
Primary cmd: L(ocate TIMESTAMP), S(ort), P(rint)
Line      cmd: D(etails)

SMS STOGROUP : SGDBSA10

      TIMESTAMP                PERC      GB      THRESHOLD  THRESHOLD
      -----                USED      FREE  USED PERC      GB FREE
      -----                -----
_  2019-02-19-11.37.46         66         33         90         888
      -----                -----
```



SMS Stogroup Management by RTDX -SAX

```
Space AssuranceExpert ----- SMS STOGROUP Details -----
Command ==> _____ Db2: DC10

DETAILS
SMS STOGROUP: SGDBSA10
TIMESTAMP . . : 2019-02-19-11.37.46
PERCENT USED:      66 THRESHOLD >:      90 % ALLOCATED
GB FREE . . . :    33 THRESHOLD <:      888 GB FREE

MVS ONLINE
VOLUMES . . . :    33 CAPACITY . . :    100157 MB FREE :    34546 MB
                   CAPACITY . . :    123561 CYL FREE :    42618 CYL

SMS ENABLED
VOLUMES . . . :    33 CAPACITY . . :    100157 MB FREE :    34546 MB
                   CAPACITY . . :    123561 CYL FREE :    42618 CYL

OTHER
VOLUMES . . . :    - CAPACITY . . :    - MB FREE :    - MB
                   CAPACITY . . :    - CYL FREE :    - CYL

OFFLINE
VOLUMES . . . :    -
```

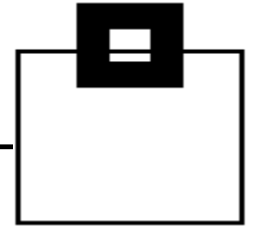
Sequence Management by RTDX -SAX

```
Space AssuranceExpert ----- SEQUENCES Summary ----- Row 101 of 140
Command ==> _____ Scroll ==> CSR
Db2: DC10

Primary cmd: L(ocate SCHEMA), S(ort), P(rint), C(ontrol)
Line cmd: E(xpand)

  SCHEMA  NAME                                TYPE                                COLNAME                                THRD  CURR
        PERC  PERC
-----
_ MIVPXML  MIVPCUSTX_#_C7Q                        PK Value                             CID                                    1     0
_ MVNXTES> T02SEQT1                      User-defined Sequence                 4    100
_ P11      IGBACUH1                              PK Value                             CUSTOMER_ID                          1     0
_ RBOPCIC  SEQD93GJ3T153LK                      Identity column                       4    50
_ RBOPCIC  SEQD93GJ3UPCZGA                      Identity column                       4    50
_ RBOPCWC  SEQD93GJ3XKLCT8                      Identity column                       4    50
_ RBOPCWC  SEQD93GJ3X5XCR6                      Identity column                       4    50
_ RBOPD1_> MIVPX1111_SUPER_L>             PK Value                             XCOUNT                                1     0
_ RBOPD1_> MIVPX1211_SUPER_L>             PK Value                             XCOUNT                                1     0
_ RBOPD1_> MIVPX1311_SUPER_L>             PK Value                             XCOUNT                                1     0
_ RBOPD1_> MIVPX1411_SUPER_L>             PK Value                             XCOUNT                                1     0
_ RBOPD5   MIVPX511P                              PK Value                             XCOUNT                                1     0
_ RBOPXML  MIVPCUSTX_#_C7Q                        PK Value                             CID                                    1     0
```


Sequence Management by RTDX -SAX

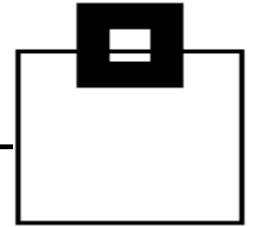


```
Space AssuranceExpert ----- SEQUENCES Expand ----- Row 2 of 863
Command ==> _____ Scroll ==> CSR
                                         Db2: DC10
Primary cmd: L(ocate TIMESTAMP), S(ort), P(rint)
TYPE      : User-defined Sequence
SCHEMA.NAME: MVNXTTEST.T02SEQT1

TIMESTAMP          ALTEREDTS          MINVALUE          MAXVALUE
  THRESHOLD%      CURRENT%          INCREMENT      MAXASSIGNEDVALUE
-----
2019-05-03-12.47.08 2018-09-20-09.35 -9999999999999999999 10
                   4                100                      0                10
```



Numeric Primary Key Management by RTDX -SAX



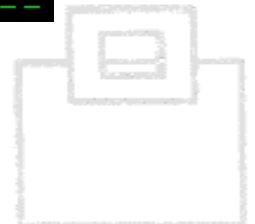
```
Space AssuranceExpert ----- PK Value Check Expand ----- Row 1 of 1
Command ==> _____ Scroll ==> CSR
Db2: DC10

Primary cmd: L(ocate TIMESTAMP), S(ort)

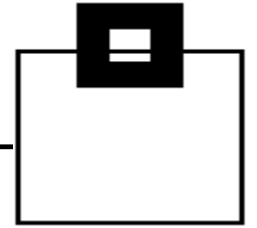
TYPE          : PK Value
INDEX.NAME    : P11.IGBACUH1

COL NAME      : CUSTOMER_ID          COLUMN SEQUENCE: 1

TIMESTAMP          STATSTS          MINVALUE          MAXVALUE
  THRESHOLD%      CURRENT%          PART          MAXASSIGNEDVALUE
-----
2019-02-19-11.37.43 0001-01-01-00.00          0          99999999999
                   1          0
-----
```



Partition Control by RTDX - SAX



```
RealTimeMaintain ----- Partition Control Thresholds -----
Command ==> _____ Db2: DC10

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

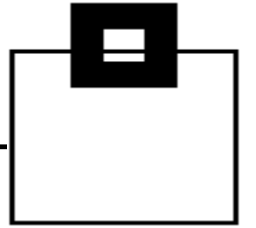
                BATCH          ON-DEMAND
                .              REGULAR CRITICAL
MIN NBR EMPTY PARTS. . 5      5      3 - Minimum number of empty
                .              .              . partitions
                ACTION . . . . . M      .              . - W(to)/M(sg)/B(oth)
                EMPTY AT END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

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



Summary

- RealTime DBAExpert – Space AssuranceExpert
 - Dynamic space assurance and alerting
 - Monitors physical data set limits (linear page set audit)
 - Monitors SMS storage groups
 - Avoids running out of extents
 - Monitors partitions – all types
 - Monitors sequences – all types
 - Monitors numeric primary keys



Space Assurance Expert for Db2 z/OS

