

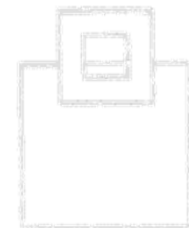
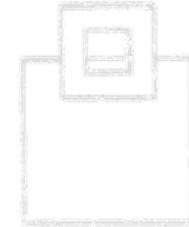
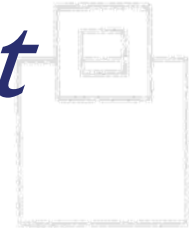
Development in a Virtualized Production Environment

—

True DB2 performance simulation covering

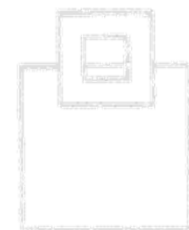
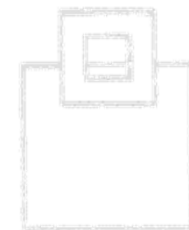
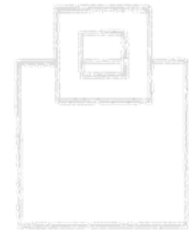
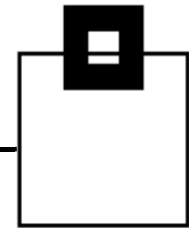
- Environment changes
- Schema changes
- Application changes

Ulf Heinrich
SEGUS, Inc
u.heinrich@segus.com

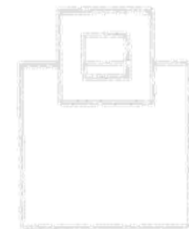
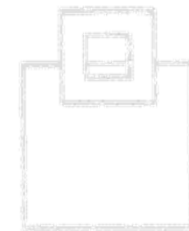
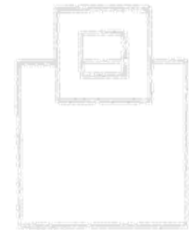
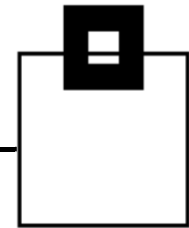
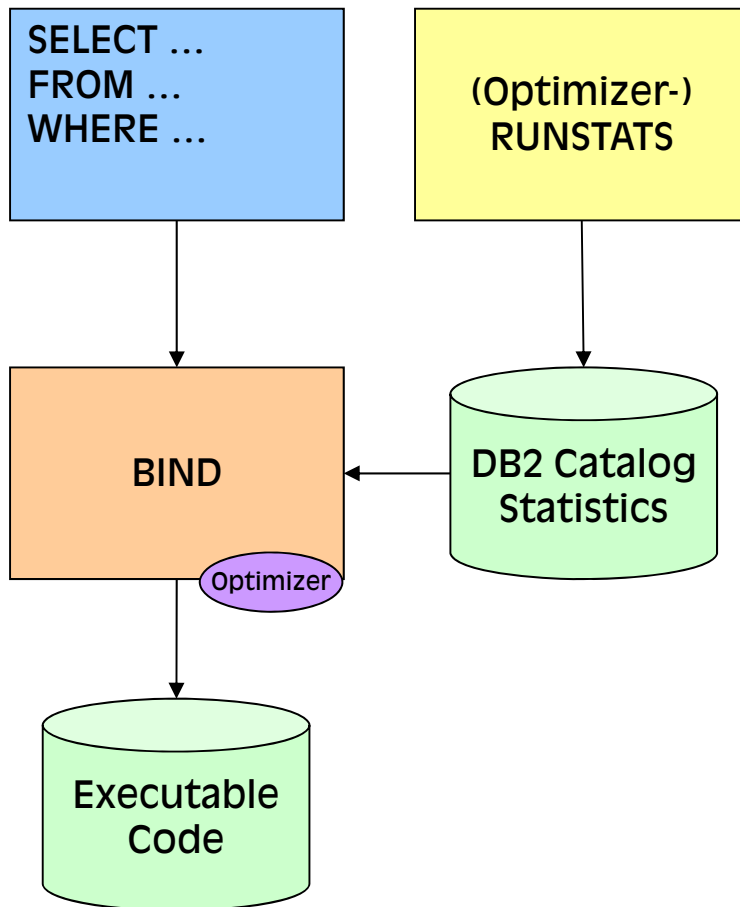


Agenda

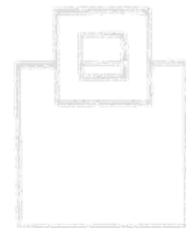
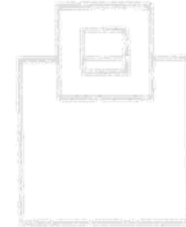
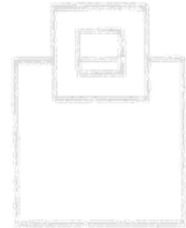
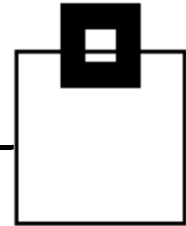
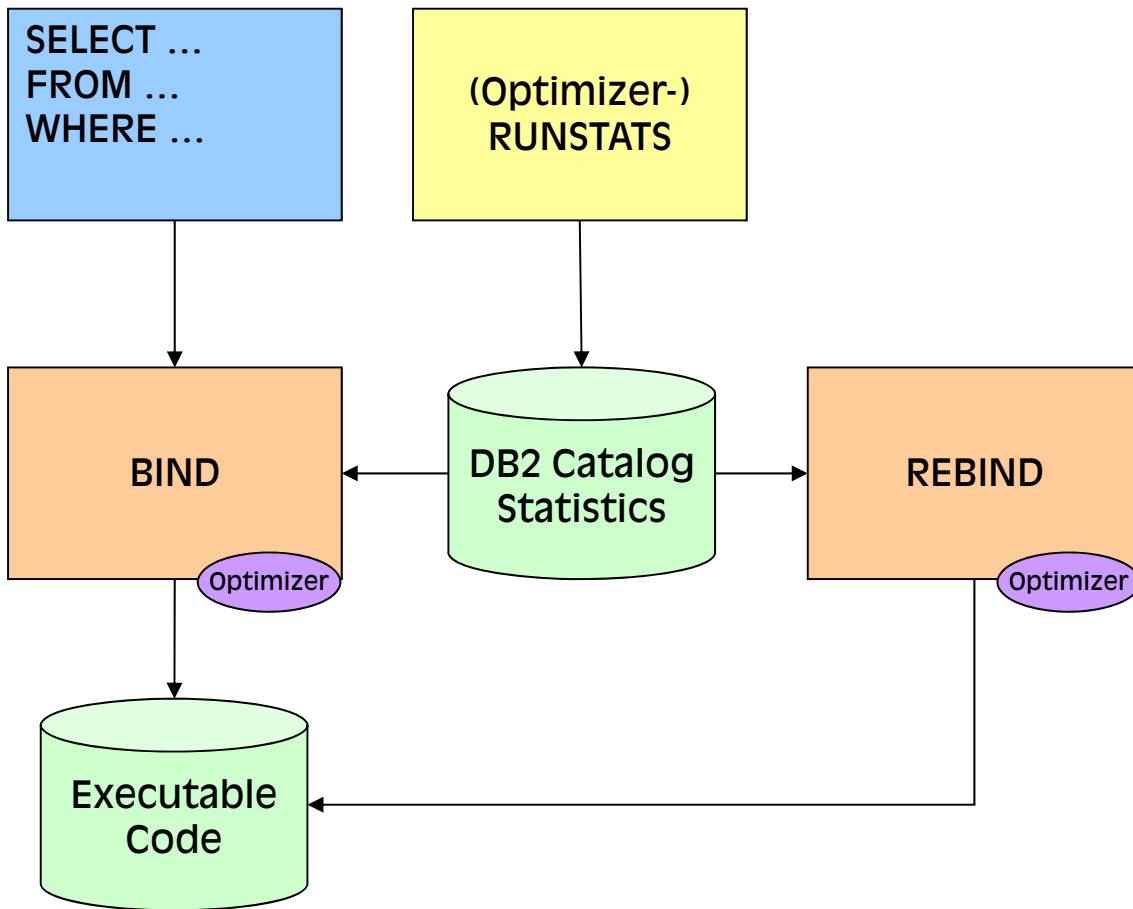
- What the DB2 Optimizer needs to make a choice
- How to model a production environment
- Compare access paths resulting from
 - Buffer pool changes
 - RID expansion
 - CPU changes
- Test “what if” you drop an index, or change the sort order of an index



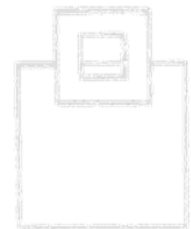
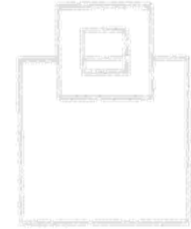
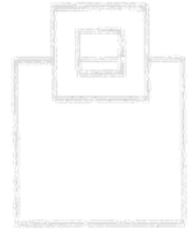
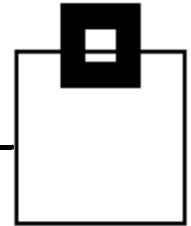
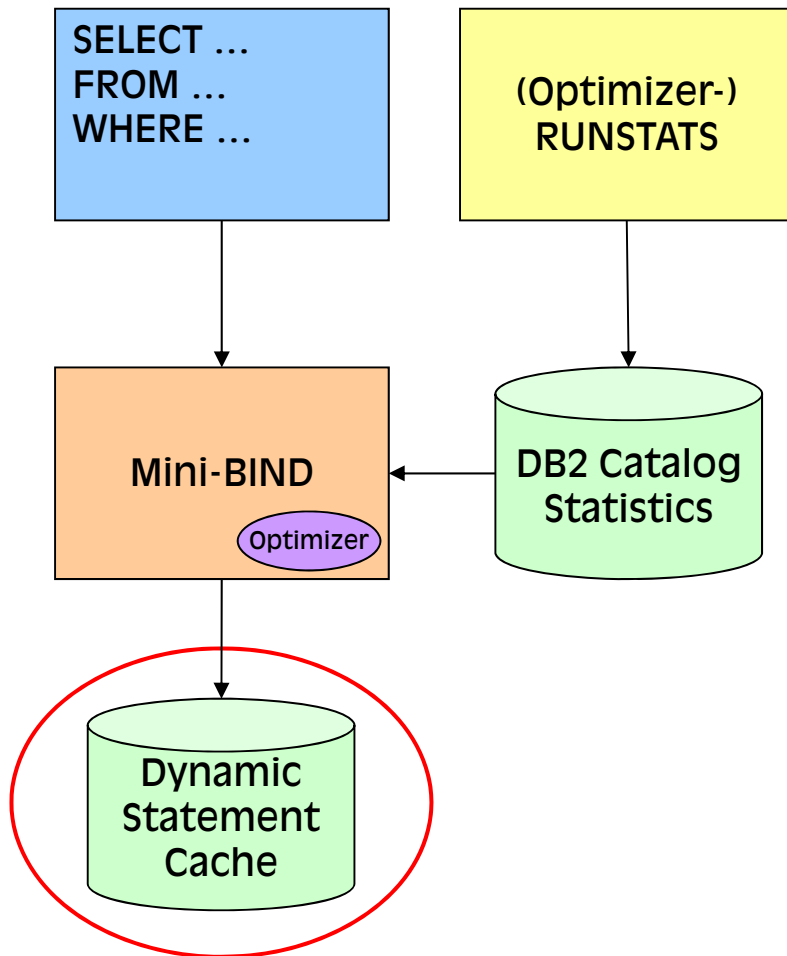
What the optimizer needs to make a choice



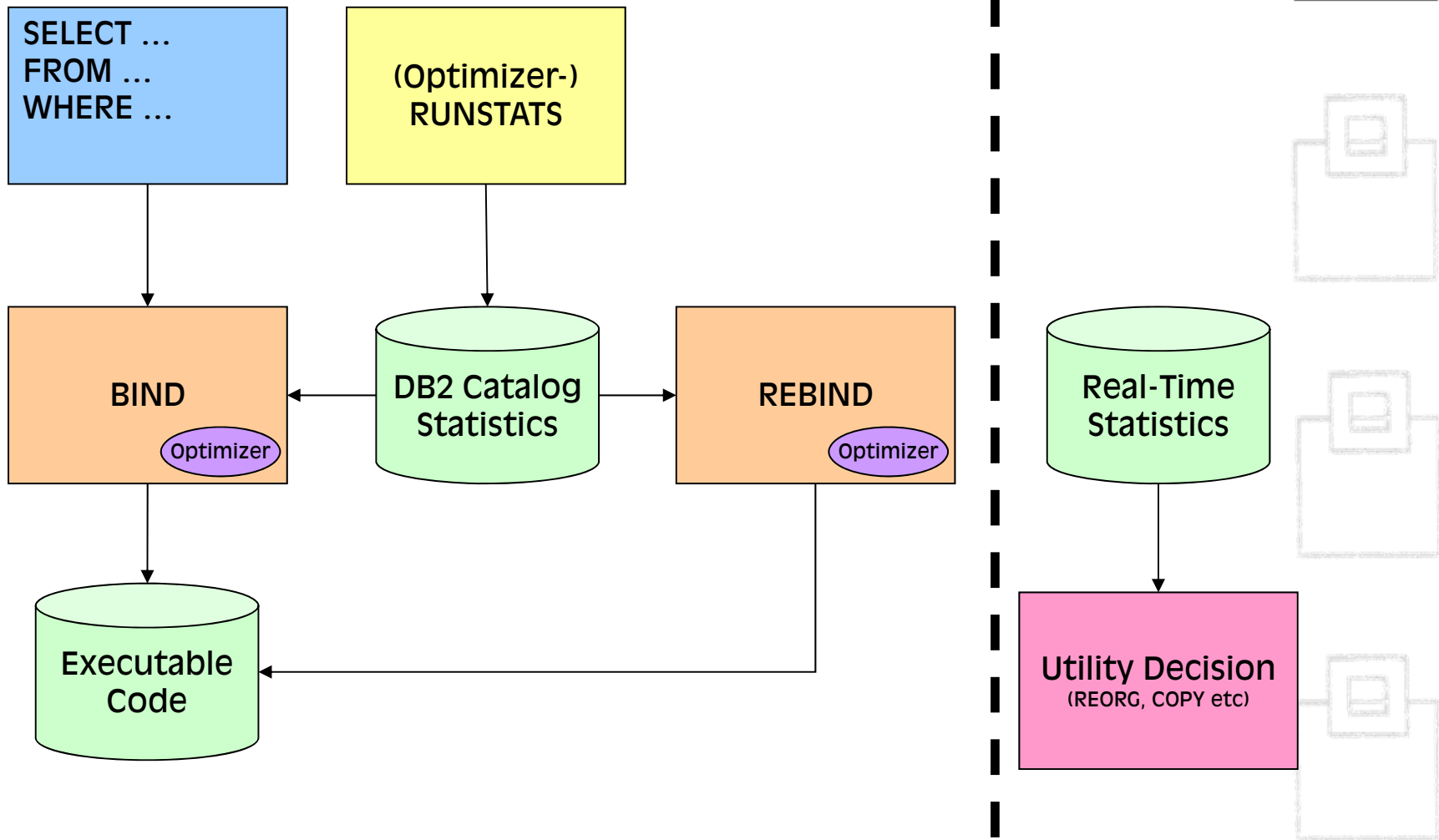
What the optimizer needs to make a choice



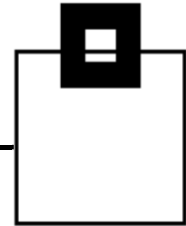
What the optimizer needs to make a choice



What the optimizer needs to make a choice



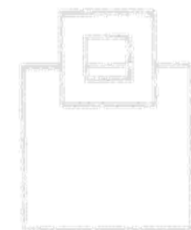
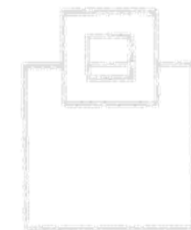
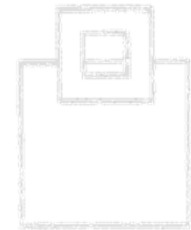
What the optimizer needs to make a choice



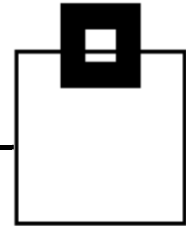
1st DDL:

```
SELECT ...  
FROM ...  
WHERE ...
```

- Which object are referenced in the SQL
 - SELECT **<columns>** FROM **<table>** or **<view>** or ...
 - WHERE **<local predicates>**
 - ORDER BY or GROUP BY or UNION or ... **<columns>**
- Which objects are defined and how
 - INDEX
 - PARTITIONING



What the optimizer needs to make a choice



2nd STATISTICS:

SYSCOLDIST / SYSKEYTGTDIST

CARDF
COLGROUPCOLNO /
KEYGROUPKEYNO
COLVALUE / KEYVALUE
FREQUENCYF
HIGHVALUE
LOWVALUE
NUMCOLUMNS / NUMKEYS
QUANTILENO
STATSTIME

SYSCOLUMNS / SYSKEYTARGETS

COLCARDF / CARDF
HIGH2KEY
LOW2KEY
n/a / STATS_FORMAT

* Columns are not updated by
RUNSTATS
_ Columns are not updatable

SYSCOLSTATS

COLCARD
HIGHKEY
LOWKEY

SYSINDEXES

CLUSTERING*
CLUSTERRATIO
CLUSTERRATIOF
DATAREPEATFACTORF
FIRSTKEYCARDF
FULLKEYCARDF
NLEAF
NLEVELS

SYSINDEXPART

LIMITKEY*

SYSROUTINES

CARDINALITY*
INITIAL_INSTS*
INITIAL_IOS*
INSTS_PER_INVOC*
IOS_PER_INVOC*

SYSTABLES

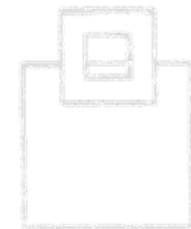
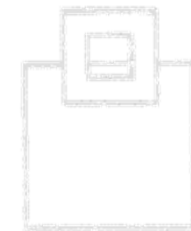
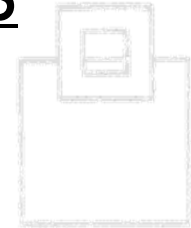
CARDF
EDPROC*
NPAGES
NPAGESF
PCTROWCOMP

SYSTABLESPACE

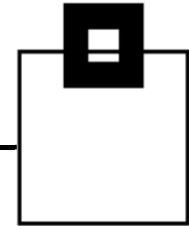
NACTIVE
NACTIVEF

SYSTABSTATS

CARDF
NPAGES

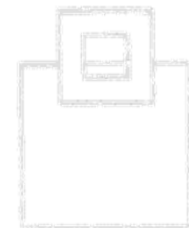
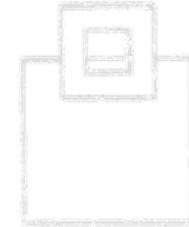
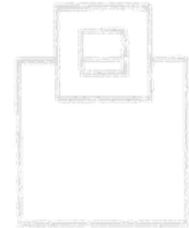


What the optimizer needs to make a choice

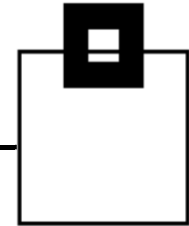


3rd ENVIRONMENT:

- CP speed
- # of CPUs
- BPs
- RID pool
- Sort pool

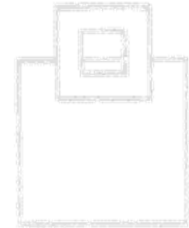
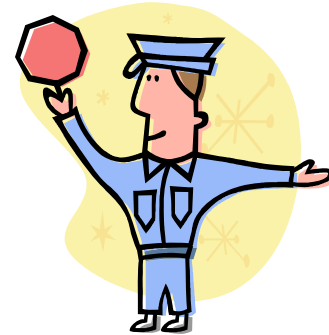


How to model a production environment



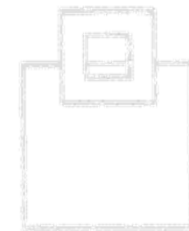
Create a Baseline...

- DDL
- STATISTICS
- ENVIRONMENTAL data



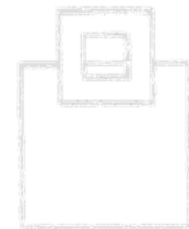
... allow to select any existing SQL along with the current access path details for comparison

- Production PLAN_TABLE
- Dynamic Statement Cache (DSC)



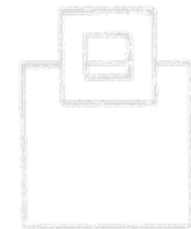
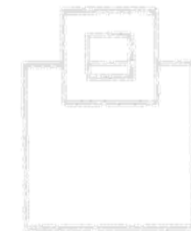
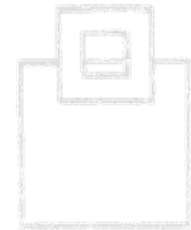
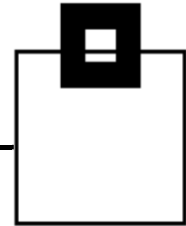
... and consider workload data

- DSC
- Monitor



How to model a production environment

- A Baseline represents a given system, or subset
- Do multiple Baselines to allow covering
 - Different systems
 - Different amounts of data
 - Different distribution
 - Different workload, or time frames
- Apply naming conversions if you need to allow
 - Multiplications of Baselines (e.g. for different users)
 - Merging multiple production environments

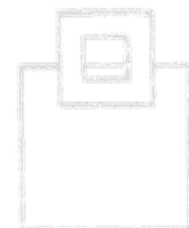
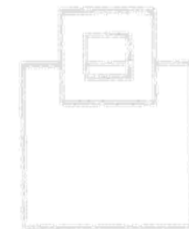
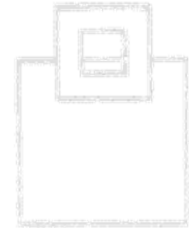
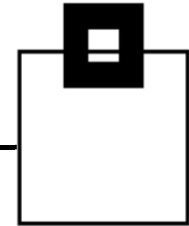


How to model a production environment

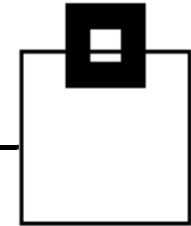
- A test/simulation environment that behaves exactly like the production environment

- This allows to pre-check the results from a
 - New application version
 - New DB2 version (or APARs affecting performance)
 - New statistics
 - RUNSTATS (especially with dynamic SQL)

- Keep control of your environment!
 - Quickly identify and understand performance changes (degradation)
 - Protect your production environment

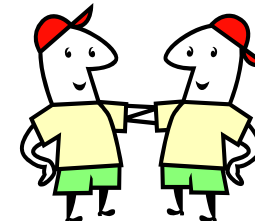
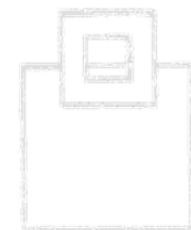
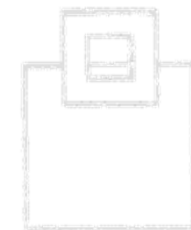
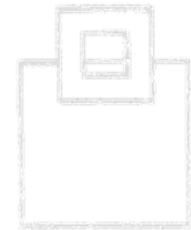


How to model a production environment

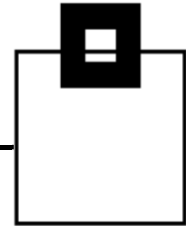


Gathering data for the simulation environment

- DB2P: Production
 - Extract all/subset DDL
 - Extract the relevant catalog statistics
 - Extract CP speed, # of CPs, BPs, RID & Sort pool
 - Static SQL:
 - Extract Packages and PLAN_TABLE data
 - Dynamic SQL:
 - Take a snapshot of the Dynamic Statement Cache
 - Explain all captured statements to a temporary PLAN_TABLE



How to model a production environment

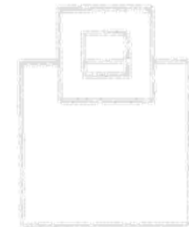
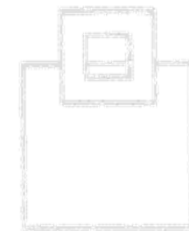
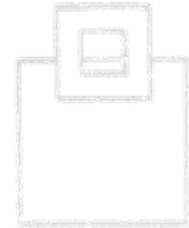


Applying data to the simulation environment

... Import the flat files:

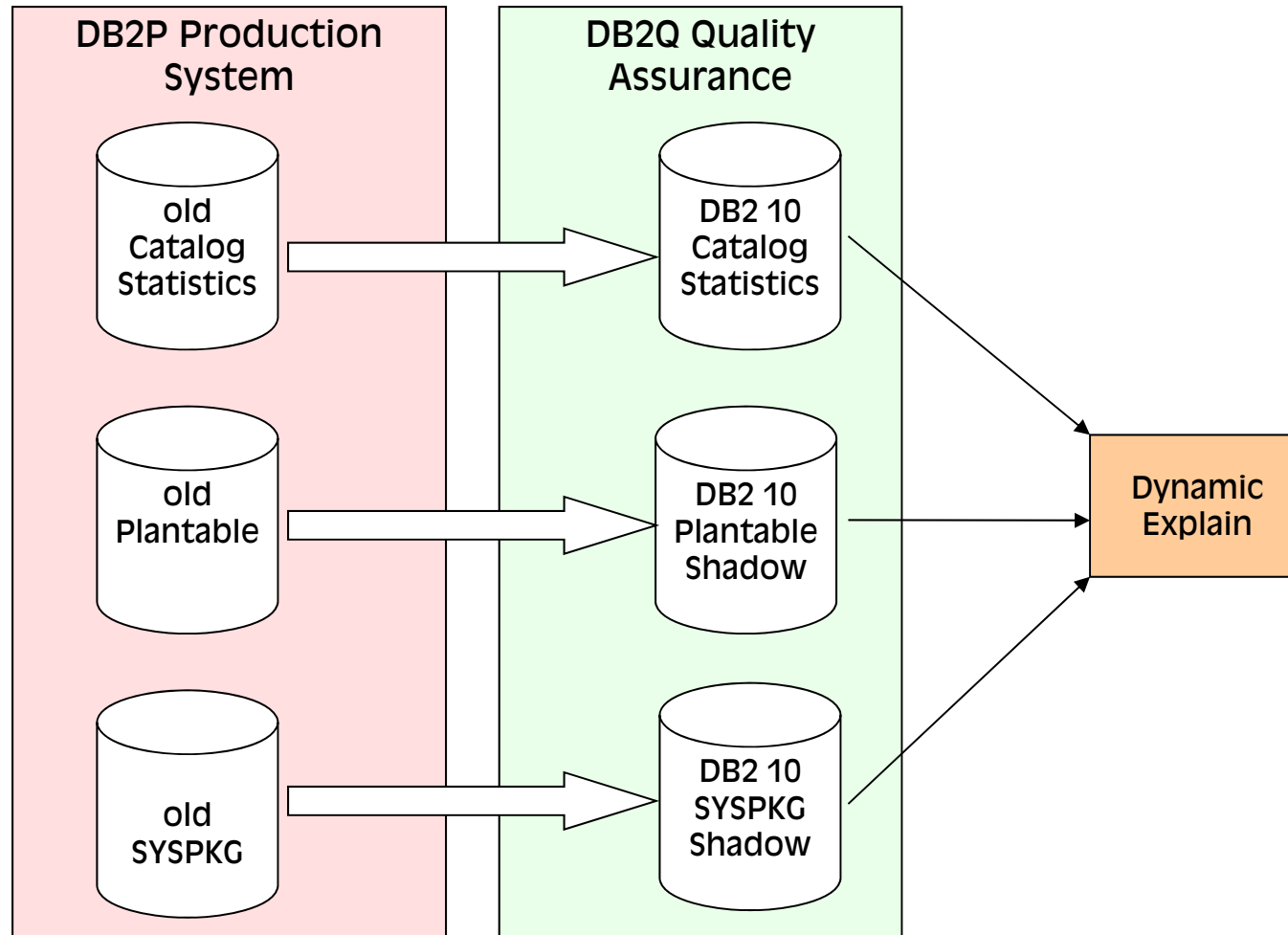
- Apply naming changes if desired

- DB2Q: Quality Assurance
 - Create DDL DEFINE NO
 - Update the relevant catalog statistics
 - Apply environment modeling
 - Static SQL:
 - Import Packages and PLAN_TABLE
 - Dynamic SQL:
 - Import captured SQL and PLAN_TABLE

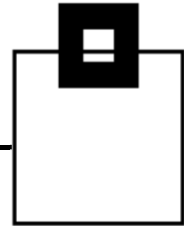


→ A true simulated environment, ready for any desired analysis/precheck

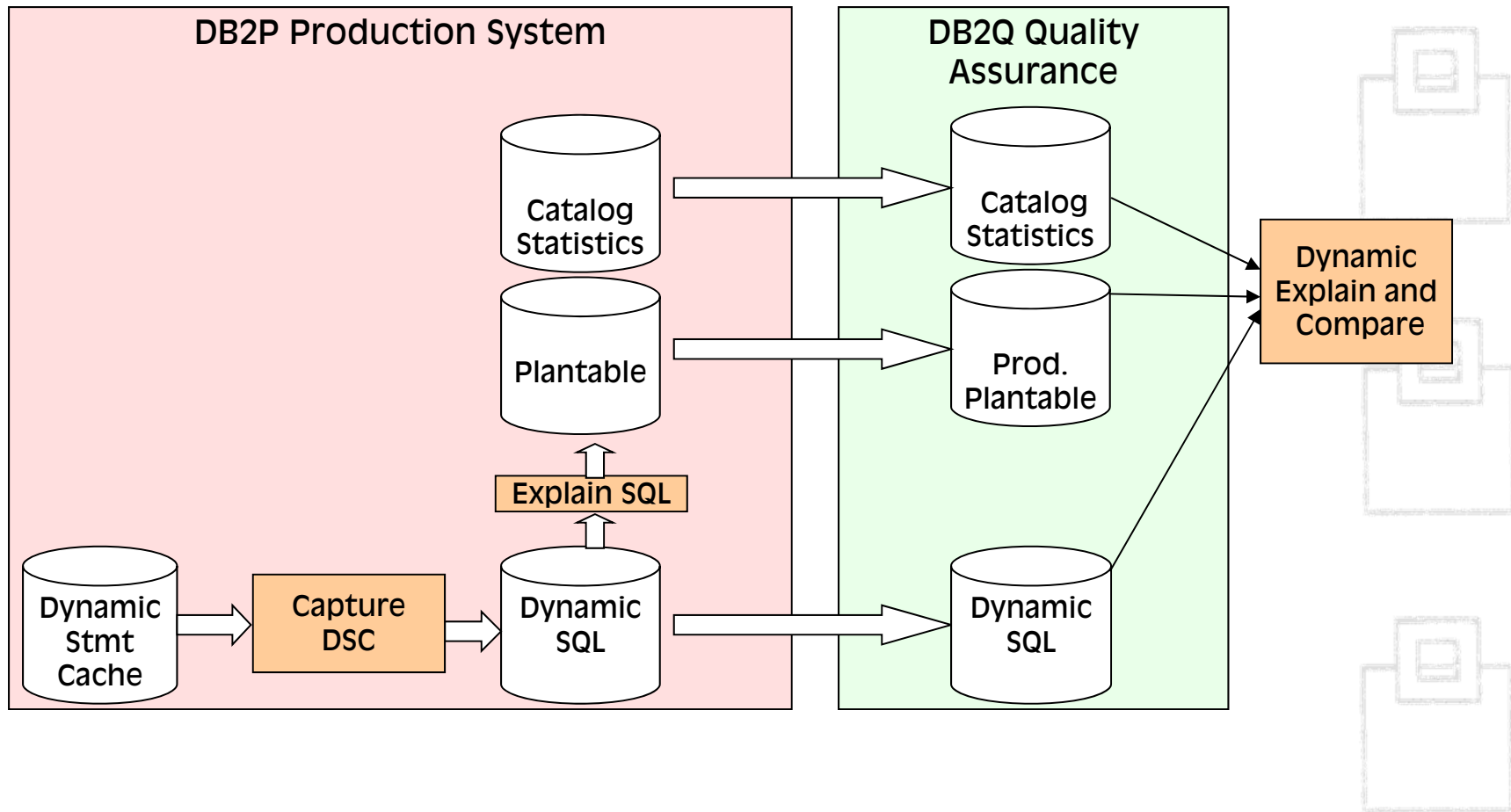
How to model a production environment



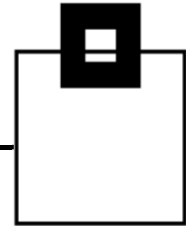
How to model a production environment



Dynamic SQL management and protection:



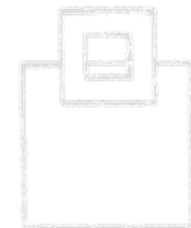
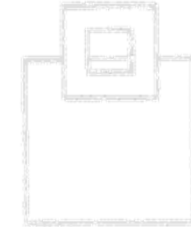
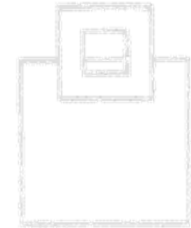
Compare Access Paths – Environment changes



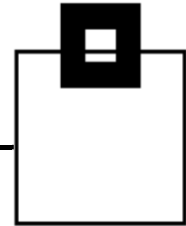
- CPU simulation
 - Copy production to test
 - Check a faster newer machine (Upsize)
 - Check a slower older machine (Downsize)

- ZPARM simulation
 - Change size of SRTPOOL
 - Change size of RID Pool
 - Change size of data cache or Star Join Pool

- BUFFERPOOL
 - Change size of any BUFFERPOOL

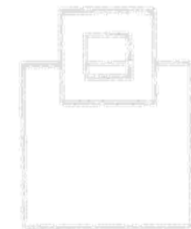
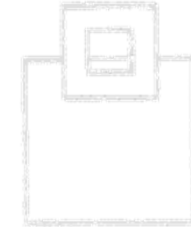
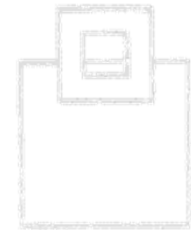


Compare Access Paths – Environment changes

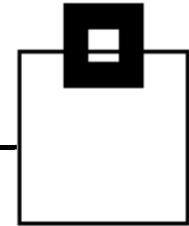


Production Modelling

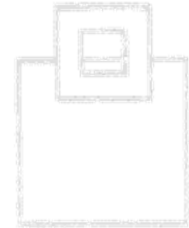
- Supports optimizer overrides for optimizer relevant system settings
 - New zparms
 - SIMULATED_CPU_SPEED
 - SIMULATED_COUNT
 - New SYSIBM.DSN_PROFILE_ATTRIBUTES
 - SORT_POOL_SIZE
 - MAX_RIDBLOCKS
 - For bufferpools
 - Same as the BP names shown at DSNTIP1
KEYWORDS value of 'BP8K0' corresponds to
BP BP8K0.



Compare Access Paths – Environment changes

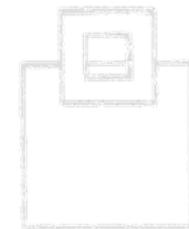


All changes can be done „on the fly“ with no restart of DB2

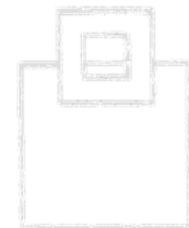


Before rushing off and changing everything think!

- Will my change affect anyone apart from me?
- Am I sure about that?
- Am I really sure?
- Ask just in case!



(e.g. We don't want to set BP0 to 350.000 in test etc.)



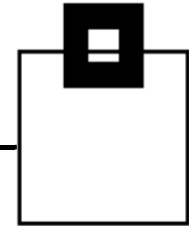
Compare Access Paths – Environment changes

```
ImpactExpert for DB2 z/OS ----- Statements Summary -----
Command ==>
Mode: EARLY PRECHECK DYNAMIC
Primary cmd: END, R(efresh), Z(oom)
Line      cmd: S(elect)

AUTHID      : *

-----
Status                               Statements
-----
PROCESSED                               8489
- IMPROVED                               50
- CHANGED                                44
- UNCHANGED                              8027
- WORSENERD                              360
- PREFETCH CHANGE                          8
NON-DETERMINABLE                          0
PLAN_TABLE ISSUES                          0
ERROR                                       11
- EXPLAIN ERROR                            11
-----
```


Compare Access Paths – Schema changes



How to reliably simulate index changes?

E.g.

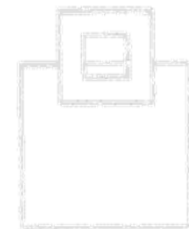
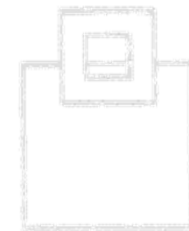
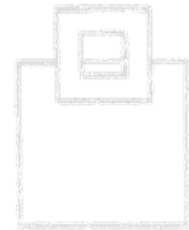
- Create index
- Drop Index
- Alter Index

→ DB2 9 for z/OS

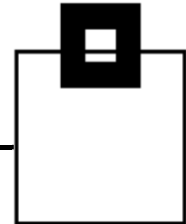
→ DB2 8 (retro fitted via APAR PK46687

- add PK67554 and PK64951 for NFM)

"Recommendation*: Do not manually insert data into or delete data from this table, it is intended to be used only by optimization tools."

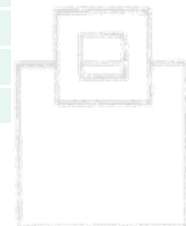
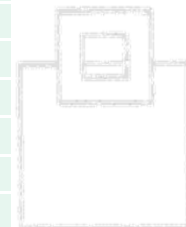
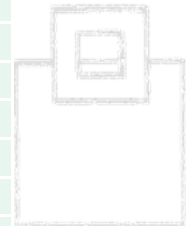


Compare Access Paths – Schema changes



How to build an entry yourself:

DSN_VIRTUAL_INDEXES*	SYSINDEXES	Description
TBCREATOR	TBCREATOR	Auth. ID of owner/schema of table on which the entry is simul.
TBNAME	TBNAME	Name of the table on which the entry is being simulated
IXCREATOR	IXCREATOR	Auth. ID/schema of the owner of the index
IXNAME	IXNAME	Name of the index to simulate
ENABLE		Whether entry will be considered ('Y') or not ('N')
MODE		Whether the index is being created ('C') or dropped ('D')
UNIQUERULE	UNIQUERULE	Index is uniqueness: D for No (duplicates are allowed); U for Yes
COLCOUNT	COLCOUNT	The number of columns in the key
CLUSTERING	CLUSTERING	Whether the index is clustered ('Y' or 'N')
NLEAF	NLEAF	# of active leaf pages in the index, or -1 if unknown
NLEVELS	NLEVELS	# of levels in the index tree, or -1 if unknown
INDEXTYPE	INDEXTYPE	The index type: '2' - NPSI; 'D' – DPSI
PGSIZE	PGSIZE	Size, in bytes, of the leaf pages in the index: 4K, 8K, 16K, 32K
FIRSTKEYCARDF	FIRSTKEYCARDF	# of distinct values of the first key column, or -1 if unknown
FULLKEYCARDF	FULLKEYCARDF	# of distinct values of the key, or -1 if unknown
CLUSTERRATIOF	CLUSTERRATIONF	Clustering ratio, or -1 if unknown
PADDED	PADDED	Index keys padded for varying-length column data ('Y' or 'N')
COLNO1		Column # of the first column in the index key
ORDERING1		Ordering ('A' or 'D') of the first column in the index key
COLNO _n		Column # repeated up to 64
ORDERING _n		Ordering ('A' or 'D') repeated up to 64



***Find DDL in member DSNTIJOS of your SDSNSAMP**

! needs to have the same schema name (authid) as the PLAN_TABLE !

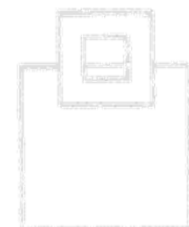
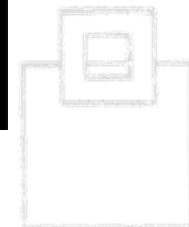
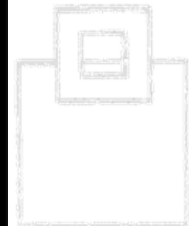
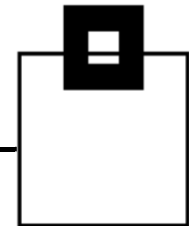
Compare Access Paths – Schema changes

```
SQPX or DB2 z/OS ----- Settings Menu ----- Version 6.10
Command ==> _____ DB2: F91D
Primary cmd: END

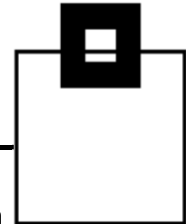
1. Administer groups, their privileges and users
2. Display users and their group privileges
3. Administer user specific settings

4. Administer DRDA settings
5. Administer product explain tables
6. Create or alter user explain tables

V. Administer virtual indexes
X. Exit Settings
```



Compare Access Paths – Schema changes



```
SQPX or DB2 z/OS ----- Filter Virtual Indexes -----
Command ==> _____ DB2: F91D

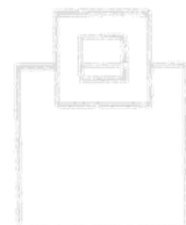
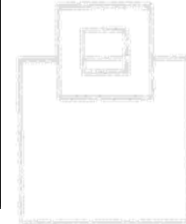
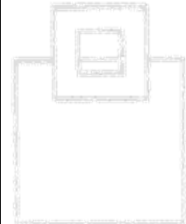
Primary cmd: END, C(reate table DSN_VIRTUAL_INDEXES)

Explain Tables
CREATOR : HEINRIC
Name    : DSN_VIRTUAL_INDEXES

Table
CREATOR : *
NAME    : *

Index
CREATOR : *
NAME    : *

Note : For table creator, table name, index creator, and index name,
wildcards '*' and '?' are allowed.
```



Compare Access Paths – Schema changes

```
SQPX or DB2 z/OS ----- Virtual Index Overview ----- Index 1 from 2
Command ==> _____ Scroll ==> CSR
DB2: F91D

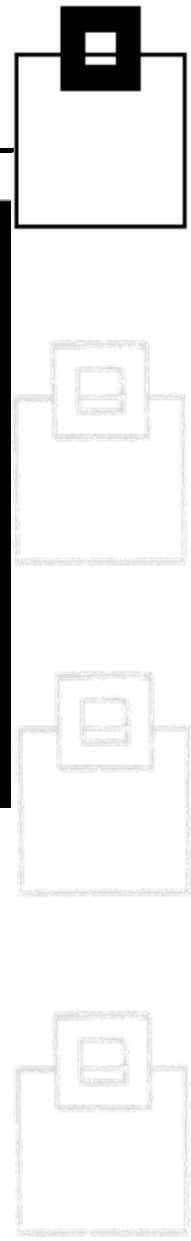
Primary cmd: END, N(ew), C(opy), L(ocate) index creator
Line      cmd: C(olumns), D(isable), E(nable), R(emove), U(pdate), Z(oom)

Explain table used : HEINRIC.DSN_VIRTUAL_INDEXES
```

Index Creator	Index Name	Table Creator	Table Name	Enable	Mode
HEINRIC	VRT_IX_20110809212	SYSIBM	SYSDATABASE	YES	CREATE
SYSIBM	DSNDDH01	SYSIBM	SYSDATABASE	YES	DROP

Compare Access Paths – Schema changes

```
SQPX or DB2 z/OS ----- Virtual Index Overview ----- Index 1 from 2
C                                                                    Scroll ==> CSR
                                                                    DB2: F91D
P
L
SQPX ----- New Virtual Index -----
New virtual index for object:
CREATOR : SYSIBM +
NAME    : SYSDATABASE +
MODE    : C      C(reate)/D(drop)
-----+-----
C HEINRIC  VRT_IX_20110809212  SYSIBM  SYSDATABASE  YES  CREATE
SYSIBM    DSNDDH01              SYSIBM  SYSDATABASE  YES  DROP
-----+-----
```



Compare Access Paths – Schema changes

```
SQPX or DB2 z/OS ----- New Virtual Create Index -----
Command ==> _____ DB2: F910

Index
  Creator      : HEINRIC      +      Mode      : CREATE
  Name         : VRT IX 20110823100954 +      Enable   : YES
on Table
  Creator      : SYSIBM      +
  Name         : SYSDATABASE  +

INDEXTYPE. . . : 2          2(Nonpartitioned) / D(ata-partitioned)
UNIQUERULE . . : D          D(uplicates allowed) / U(nique)
CLUSTERING . . : Y          Y(es) / N(o)
PADDED . . . . : N          Y(es) / N(o)

NLEAF. . . . . : -1          The number of active leaf pages in the index.
NLEVELS. . . . : -1          The number of levels in the index tree.
PGSIZE . . . . : 4 KB       Size of leaf pages in index: 4, 8, 16, or 32.

FIRSTKEYCARDF : -1          Number of distinct values of first key column.
FULLKEYCARDF  : -1          Number of distinct values of the key.
CLUSTERRATIOF : 0.5         Percentage of rows in clustering order.
```


Compare Access Paths – Schema changes

```

SQPX or DB2 z/OS ----- Select Columns for Virtual Index ----- Column 1 from 21
Command ==> _____ Scroll ==> CSR
MODE: DB2: F91D
Primary cmd: END, CAN(cel), L(ocate) colseq
Line cmd: S(elect), R(emove), Z(oom), 1 - 64 (Position in index)

Table creator:
Table name :

+
+
-----+-----+-----+-----+-----+-----+-----+-----+
Colno  Name          +  ColType      Length  Scale  Nulls  CCSID
-----+-----+-----+-----+-----+-----+-----+-----+
1      NAME          +  VARCHAR      24      0      N      1208
2      CREATOR       +  VARCHAR     128      0      N      1208
3      STGROUP       +  VARCHAR     128      0      N      1208
4      BPOOL         +  CHAR         8        0      N      1208
5      DBID          +  SMALLINT     2        0      N        0
6      IBMREQD       +  CHAR         1        0      N      1208
7      CREATEDBY    +  VARCHAR     128      0      N      1208
8      ROSHARE      +  CHAR         1        0      N      1208
9      TIMESTAMP    +  TIMESTMP    10       0      N        0
10     TYPE         +  CHAR         1        0      N      1208
11     GROUP_MEMBER +  VARCHAR     24       0      N      1208
12     CREATEDTS   +  TIMESTMP    10       0      N        0
13     ALTEREDTS   +  TIMESTMP    10       0      N        0
14     ENCODING_SCHEME + CHAR         1        0      N      1208
15     SBCS_CCSID  +  INTEGER     4        0      N        0
16     DBCS_CCSID  +  INTEGER     4        0      N        0
17     MIXED_CCSID +  INTEGER     4        0      N        0
18     INDEXBP     +  CHAR         8        0      N      1208
19     IMPLICIT    +  CHAR         1        0      N      1208
20     CREATORTYPE +  CHAR         1        0      N      1208
21     RELCREATED  +  CHAR         1        0      N      1208
-----+-----+-----+-----+-----+-----+-----+

```

Compare Access Paths – Schema changes

```

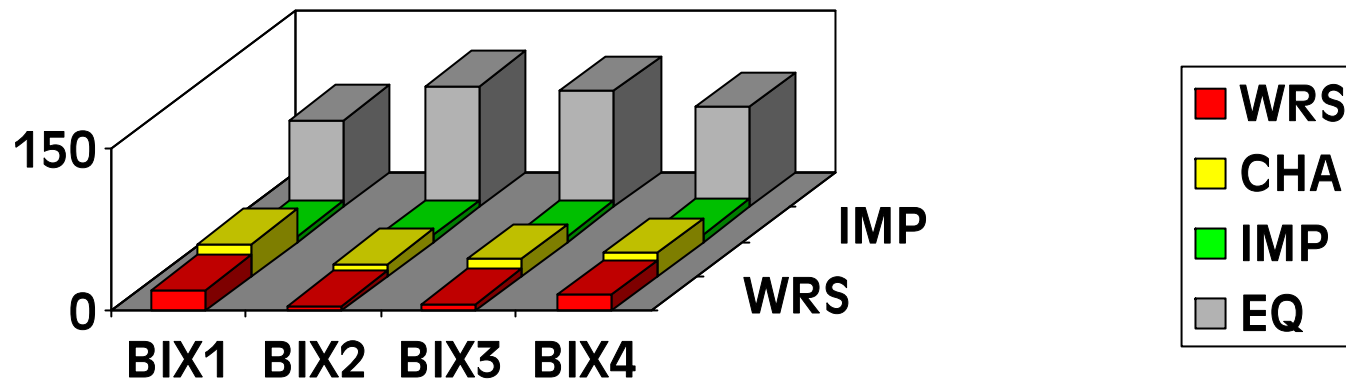
ImpactExpert for DB2 z/OS ----- Access Paths ----- LINE 00000001 COL 001 080
Command ==> _____ Scroll ==> CSR
Mode: REBIND ANALYSIS WITH/WITHOUT MIGRATION RULES DB2: Q91A
Primary cmd: END, C(atalog data), D(etails on/off), S(tatement text), T(ables),
            I(All Indexes), X(Used indexEs)

Collection . DDLGEN Timestamp . 2011-02-25-14.09.29.890000
Package . . . SQLDDL Contoken . . 18E9104F0C187370
StmtNo old . 2262 Bindtime . . 2011-02-25-14.08.59.956412
StmtNo new .

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
-----
SYSTABLES 1 1 I 1 0 N S ! SYSTABLES 1 1 I 3 0 N
DSNDTX02 ! VRT_IX_20110218115 VIRTUALLY CREATED
1 2 0 3 N !
!
Milliseconds: 5 ! Milliseconds: 1
Serviceunits: 10 ! Serviceunits: 2
-----
***** Bottom of Data *****

```

Compare Access Paths Metadata

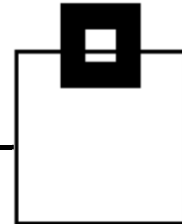


- Here are four batch runs with normal data spread
- The question is: Where are the data deltas and especially

Which combination gives the BEST results

- The answer is: Metadata analysis

Compare Access Paths Metadata



```

BIX6MENU ert for DB2 z/OS ----- Main Menu ----- Version 6.10
Command ==> _____ DB2: Q91A

Primary cmd: END, S(ettings), C(leanup), A(bout), F(ilter Jobs), H(istory)
Line      cmd: S(elect), I(nfo), F(ilter Jobs)

Scenario          Base          Recent          Dyn  Migr. Convert
                  Base          Recent          Expl Rules Qual. DRDA VOX
-----
- REBIND Analysis Catalog          -          YES  N          -          -          -
- Pre-BIND Local  Catalog          DBRM          YES  -          -          -          -
- Post-BIND Local History          Catalog          NO  -          -          -          -
- Pre-BIND Prod-Baseline Export (*)      DBRM          YES  -          Y          Y          N
- Post-BIND Prod-Baseline Export (*)      Catalog          NO  -          Y          Y          -
- Early Precheck Static Export (*)      -          YES  Y          N          Y          N
- Early Precheck Dynamic Export (*)      -          YES  Y          Y          -          N
- DSC Protection Export (*)      -          YES  -          N          -          -
- Dynamic SQL     DynStmtCache -          YES  -          -          -          -
- Static and dynamic SQL Trace          -          YES  -          -          -          -

- Plan_table compare Plan_table 1 Plan_table 2
- DBRM reconstruct Catalog

NOTE (*): Use export/import function to update BIX export tables.
    
```

Compare Access Paths Metadata

ImpactExpert for DB2 z/OS ----- Job Overview (5/5) ----- Job 16 from 113

Command ==> _____ Scroll ==> CSR

Mode: REBIND ANALYSIS WITH/WITHOUT MIGRATION RULES DB2: Q91A

Primary cmd: END, A(11), N(ew), R(efresh), Z(oom), L(ocate) submit time

Line cmd: P(rograms), C(ompare), D(elete), G(raphic), L(PLans),
S(tatements), Z(oom)

	Submit time	Submitter	Jobname	Stepname	PLTB owner	PTF Level	Mode
C	2011-02-25-14.13.14	BOXWELL	RBNDPACK	CHKRBIND	BOXWELL	PTF_10179 RC	P
C	2011-02-25-14.09.26	BOXWELL	RBNDPACK	CHKRBIND	BOXWELL	PTF_10179 RC	P
_	2011-02-07-16.08.26	DUDEK	RBNDPALE	CHKRBIND	IMPALE	PTF_10179 RC	P
_	2011-02-07-16.08.26	DUDEK	RBNDPAIR	CHKRBIND	IMPAIR	PTF_10179 RC	P
_	2011-02-07-14.19.40	DUDEK	RBNDPAC2	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-07-12.56.03	DUDEK	RBNDPAXX	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-07-12.56.03	DUDEK	RBNDPACK	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-07-11.08.49	DUDEK	RBNDPAC2	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-07-11.08.49	DUDEK	RBNDPAC1	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-03-14.32.42	DUDEK	RBNDPAC1	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-03-14.04.36	DUDEK	RBNDPACK	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-02-16.43.14	DUDEK	RBNDPACK	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-02-16.19.42	DUDEK	RBNDPACK	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-02-15.57.27	DUDEK	RBNDPACK	CHKRBIND	IMPACT	PTF_10179 RC	P
_	2011-02-02-14.04.59	DUDEK	RBNDPACK	CHKRBIND	IMPACT	PTF_10179 RC	P

Compare Access Paths Metadata

```
ImpactExpert for DB2 z/OS --- Meta-Data Analysis Expert ----- DB2: PDBG
Command ==> █
Mode: REBIND ANALYSIS

Primary cmd: END
Line cmd: I(mproved), C(hanged), U(nchanged), W(orsened)

COLLECTION : *
PACKAGE : *
PLAN : *

First run : 2011-03-20-00.30.02.200000
Second run : 2011-03-27-00.30.01.100000
```

		2nd run			
	Totals	IMPROVED	CHANGED	UNCHANGED	WORSENERD
1st run		78	1538	29362	296
_ IMPROVED	78	0	0	0	0
_ CHANGED	1520	0	-14	12	2
_ UNCHANGED	29384	0	30	-42	12
_ WORSENERD	292	0	2	8	-10

Compare Access Paths Metadata

```

ImpactExpert for DB2 z/OS ----- Job Overview (1/5) ----- Job 16 from 113
C +-----+
M ! Mode      : REBIND ANALYSIS WITH/WITHOUT MIGRATION RULES      !
P ! Submitter: BOXWELL      Submit time: 2011-02-25-14.09.26      DB2: Q91A !
L !
! Programs      Total :           23 (100%)                        !
! - Improved    0          0,00%                                !
! - Worsened    5          21,74%                                ! d
! - Changed     1          4,35%                                ! -
! - Unchanged   11         47,83%                                ! 7
G ! - Non-Dtrm.  4          17,39%                                ! 1
! - PLTA Iss.   2          8,70%                                ! 0
! - Errors      0          0,00%                                ! 0
!
! Statements    Total :           208 (100%)                       !
! - Improved    4          1,92%                                ! 0
! - Worsened   10          4,81%                                ! 0
! - Changed     3          1,44%                                ! 0
! - Unchanged  120         57,69%                                ! 0
! - Non-Dtrm.  10          4,81%                                ! 0
! - PLTA Iss.  61          29,33%                                ! 0
! - Errors      0          0,00%                                ! 0
+-----+
2011-02-02-14.04.59  DONE          0          0          0          0
  
```

Compare Access Paths Metadata

```
ImpactExpert for DB2 z/OS --- Meta-Data Analysis Expert ----- DB2: Q91A
Command ==> _____
Mode: REBIND ANALYSIS WITH/WITHOUT MIGRATION RULES

Primary cmd: END
Line   cmd: I(mproved), C(hanged), U(nchanged), W(orsened)

COLLECTION : *
PACKAGE    : *
PLAN       : *
First run  : 2011-02-25-14.09.26   Second run : 2011-02-25-14.13.14
                        2nd run
                        IMPROVED  CHANGED UNCHANGED  WORSENERD
Totals          0           0          137          0
1st run
I IMPROVED      4          -4           0           4           0
_ C  CHANGED      3           0          -3           3           0
_ U  UNCHANGED    120          0           0           0           0
_ W  WORSENERD    10           0           0          10          -10
```

Compare Access Paths Metadata

```
ImpactExpert for DB2 z/OS -- Statement Overview ----- Stmt 1 from 4
Command ==> _____ Scroll ==> CSR
Mode: REBIND ANALYSIS WITH/WITHOUT MIGRATION RULES          DB2: Q91A
Primary cmd: END, Z(oom), L(ocate) collid/plan
Line   cmd: S(tatement text), Z(oom), 1(First run), 2(Second run)
```

```
First run : 2011-02-25-14.09.26   Second run : 2011-02-25-14.13.14
```

	Collection/Plan +	Program +	Version/Contoken	+	StmtNo	SectNo
	-----	-----	-----		-----	-----
<u>2</u>	1 DDLGEN	SQLDDLD	CONTOKEN=18E9104F0C1873		2262	4
-	DDLGEN	SQLDDLD	CONTOKEN=18E9104F0C1873		4642	23
-	DDLGEN	SQLDDL	CONTOKEN=18E33349101C91		1862	21
-	DDLGEN	SQLDDL	CONTOKEN=18E33349101C91		2007	23
	-----	-----	-----		-----	-----

Compare Access Paths Metadata

```

ImpactExpert for DB2 z/OS ----- Access Paths ----- LINE 00000001 COL 001 080
Command ==> _____ Scroll ==> CSR
Mode: REBIND ANALYSIS WITH/WITHOUT MIGRATION RULES DB2: Q91A
Primary cmd: END, C(atalog data), D(etails on/off), S(tatement text), T(ables),
            I(All Indexes), X(Used indexEs)

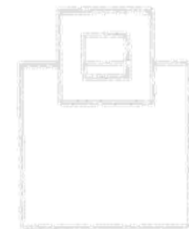
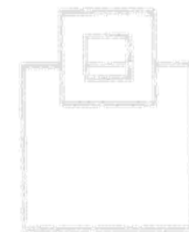
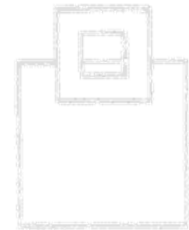
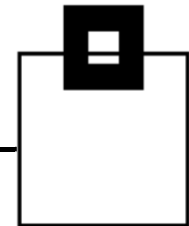
Collection . DDLGEN Timestamp . 2011-02-25-14.13.17.060000
Package . . . SQLDDL Contoken . . 18E9104F0C187370
StmtNo old . 2262 Bindtime . . 2011-02-25-14.08.59.956412
StmtNo new .

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
-----
SYSTABLES 1 1 I 1 0 N S ! SYSTABLES 1 1 I 1 0 N S
DSNDTX02 ! DSNDTX02
1 2 0 3 N ! 1 2 0 3 N
!
Milliseconds: 5 ! Milliseconds: 5
Serviceunits: 10 ! Serviceunits: 10
-----
***** Bottom of Data *****

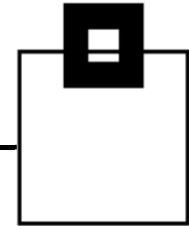
```

Conclusion

- Precheck any changes
 - Environment
 - Schema
 - Application
- Allow flexibility in developing and running your applications
- Insight out of the box into the effect of your desired changes before you apply them
- Cost efficiency and cost avoidance in development and operations

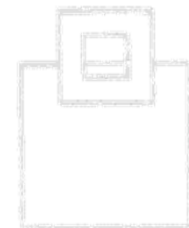
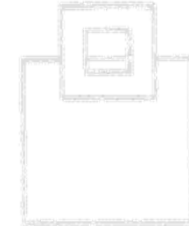
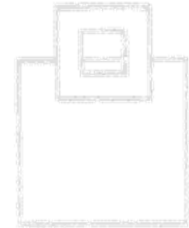


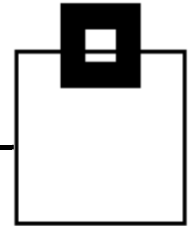
Assure Best Practices and precheck!



Before you apply

- Hardware modifications
- Environment setup changes
- New application release
- New DB2 code
 - Version
 - APAR
- Index modifications
 - Create
 - Drop
 - Change





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