

Cloning - What's new and faster?

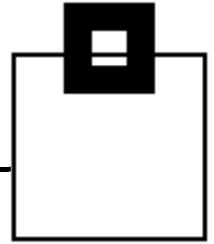


DB2 z/OS Database Cloning Using
Instant CloningExpert for DB2 z/OS

Ulf Heinrich – Director Solutions Delivery

SEGUS Inc

Agenda



Cloning basics

- What type of cloning is the right choice for a given requirement?
- What are the gotchas and where are the shortcuts?
- What to take care of – beyond DB2?

Instant Cloning Expert for DB2 z/OS – HSC key benefits

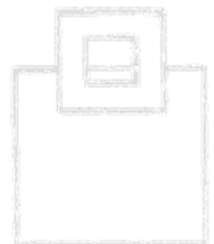
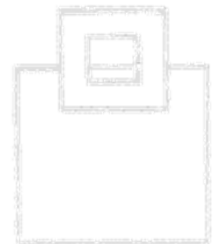
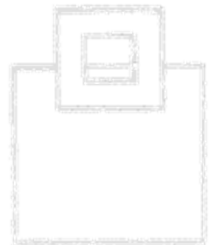
- What are the benefits using HSC?
- How can I exploit instant copy technology, like Flashcopy?
- DB2 cross-version cloning

HSC in-depth

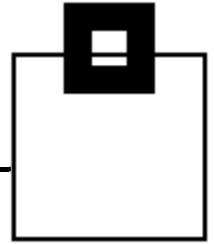
- XML scenario definition – the sky is the limit!
- Naming conversions – how do you want to be called today?
- The path to DB2 data sharing – how many members do you need?

Tips and Tricks

- Cloning costs considerations
- Do's and don't's

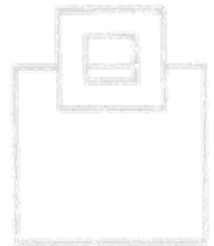
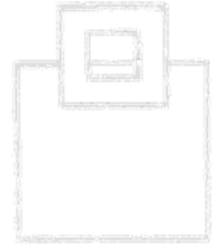
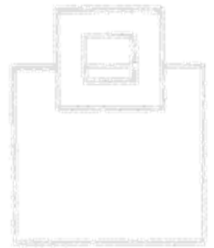


To Clone or not to Clone?

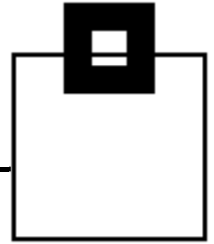


Cloning is used for different reasons:

- **Duplication of subsystems**
 - For (DR) Test and Quality Assurance (QA)
 - For Backup
 - For new Subsystem creation
 - For Audit, (Compliance) Reporting and Data Mining
 - Demo and training
- **Merge/Duplication of systems/data**
 - Consolidation of Systems (Mergers & Acquisitions)
 - Separation of test data, applications or business unit
- **(Refresh of an entire system or parts of it)**

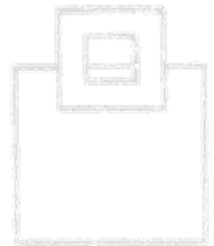
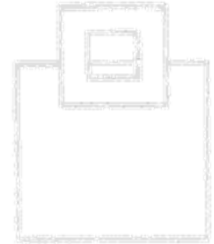
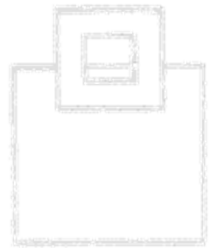


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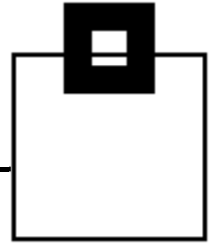


Advantages of cloning for:

- **DR tests, QA, development**
 - No effects on the real production system/data
- **New subsystem creation**
 - New system w/o starting from scratch reduces set up efforts
- **Audit, Reporting, Data Mining**
 - Shifts workload from production to the clone
 - Allows what if and point in time access to the data
- **Merge/Duplication of systems/data**
 - Reduces administration overhead and increase flexibility



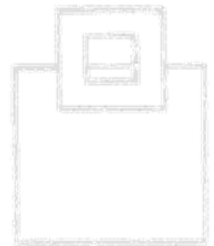
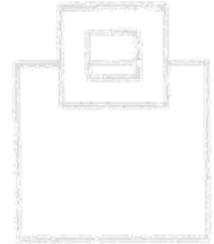
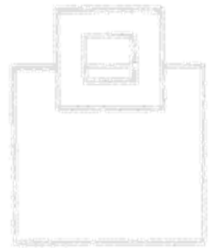
To Clone or not to Clone?



How to achieve those benefits?

Duplication of subsystems

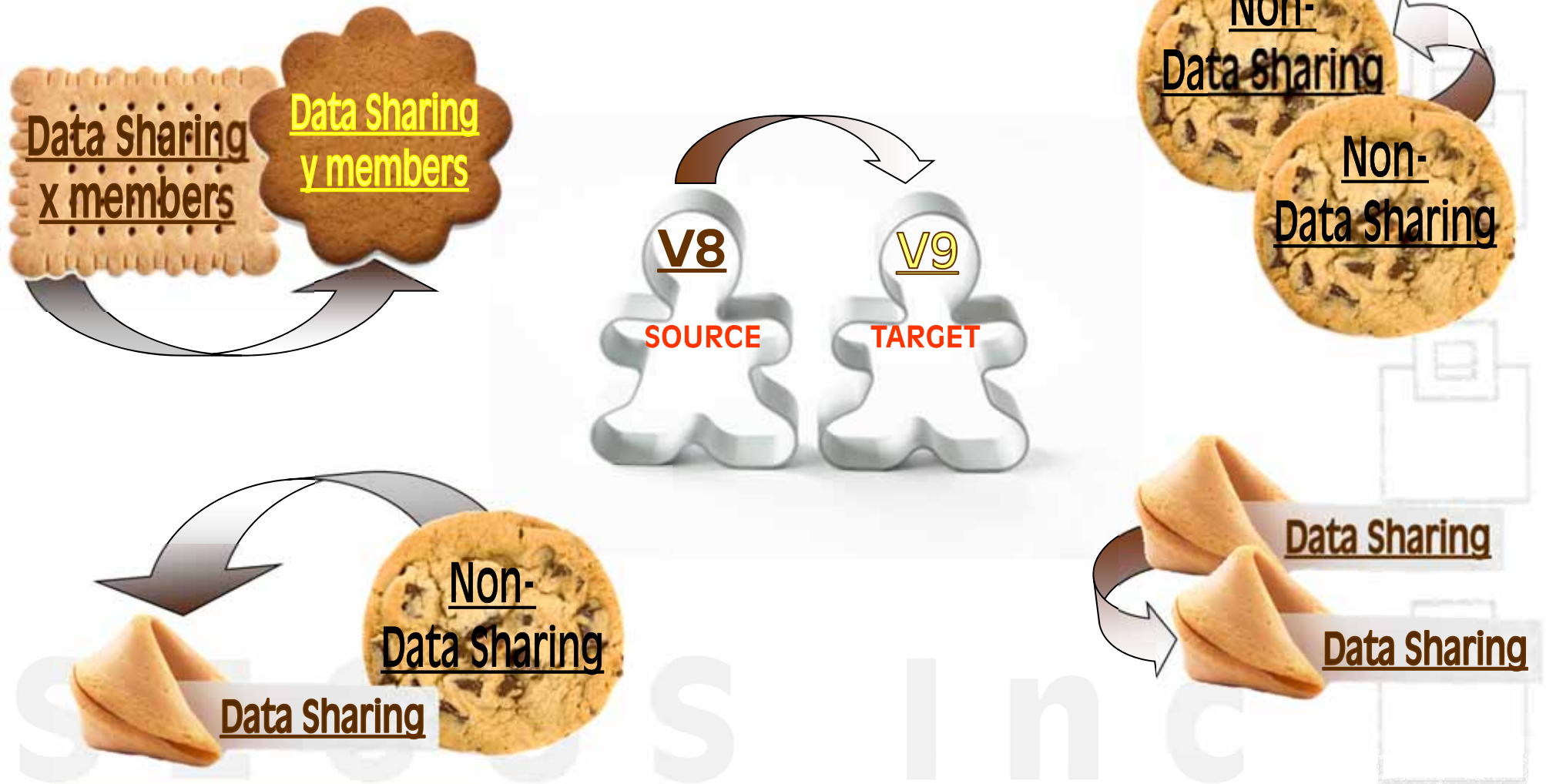
- For (DR) Test and Quality Assurance (QA)
- For Backup
- For new Subsystem creation
- For Audit, Reporting and Data Mining
- Demo and training



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The various flavors of cloning

Duplication of Subsystems



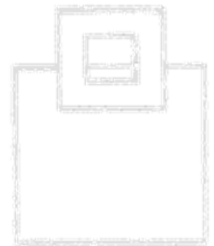
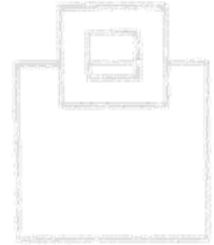
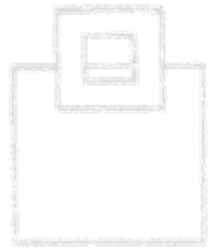
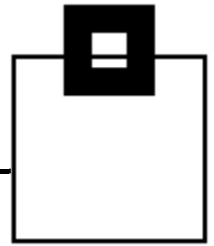
The various flavors of cloning

Yum, yum – now lets talk about technical details ...
until the coffee break ;-)

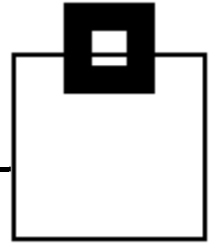
Duplication of Subsystems

1. Details about Source and Target
2. Scope of Cloning
3. Required Steps
4. Gotchas to watch out for

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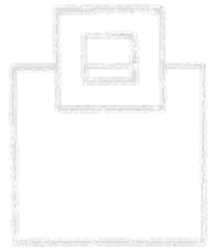


Duplication of Subsystems



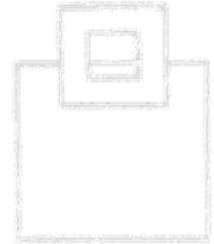
Details about Source and Target:

- All data of an entire system is duplicated
- If both, source and target are one and the same OS and database type (e.g. DB2 z/OS → DB2 z/OS)
 - Homogeneous System Copy

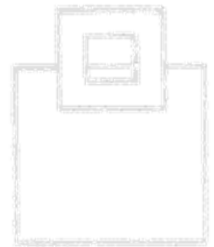


BTW:

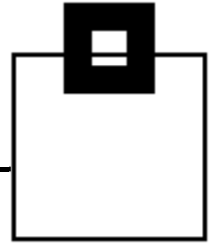
- If the target is different (e.g. DB2 LUW → DB2 z/OS)
 - Heterogeneous System Copy (not addressed today)



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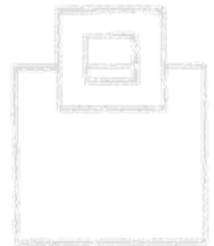
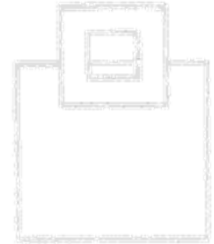
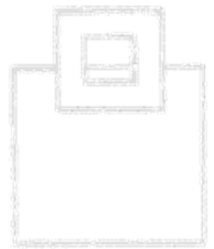
Duplication of Subsystems



Scope of Cloning

We are talking about *database* cloning. This usually doesn't include the subsystem /data sharing group setup, like

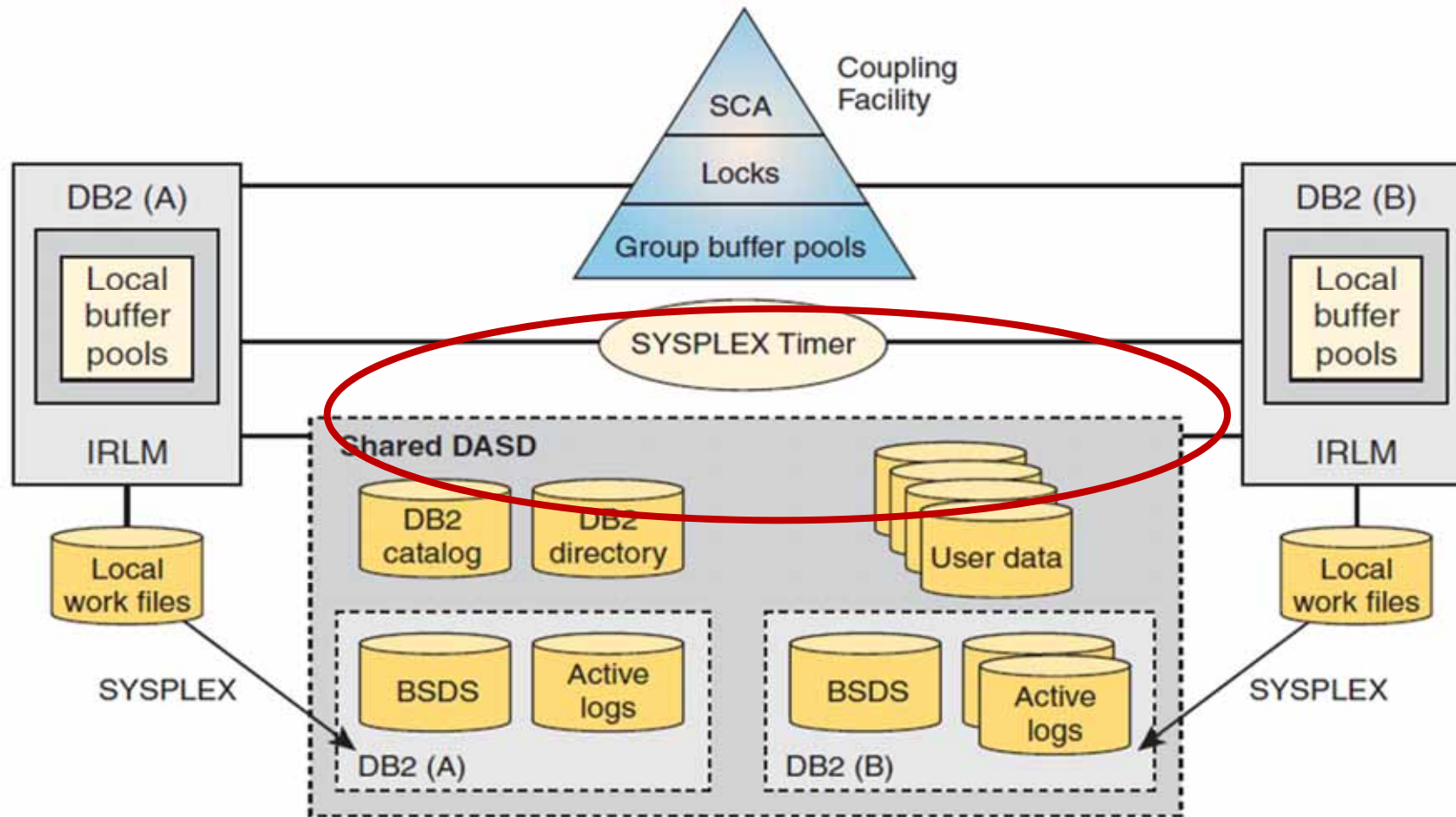
- z/OS subsystem definition
- DB2 address spaces set up
- RACF rules
- SMS storage group/class set up
- WLM definitions
- Coupling Facility structures
- ...



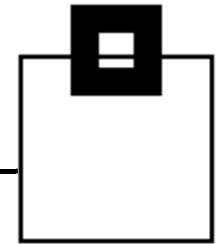
You may want to talk to your systems/operations colleagues.

Duplication of Subsystems

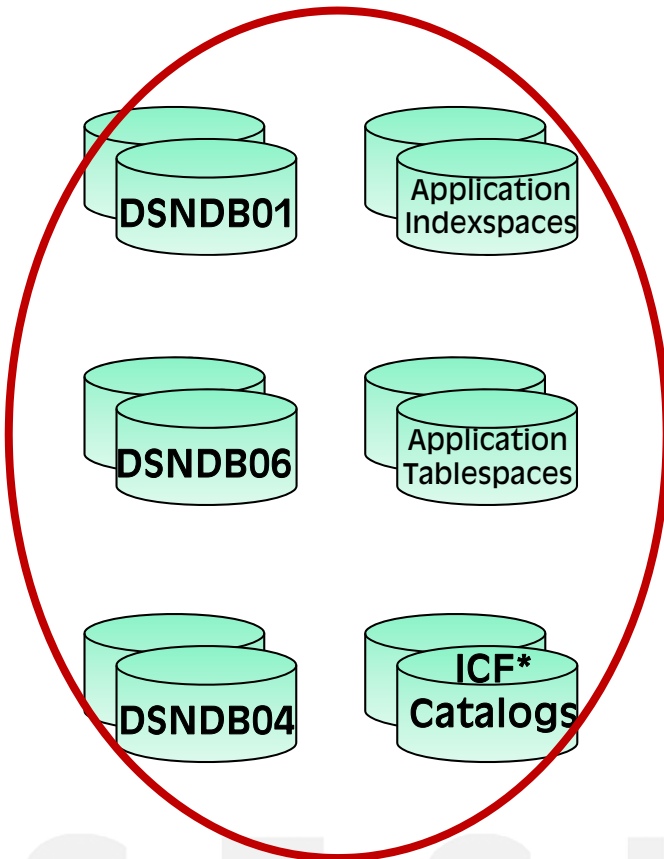
Scope of Cloning



The various ways of Cloning

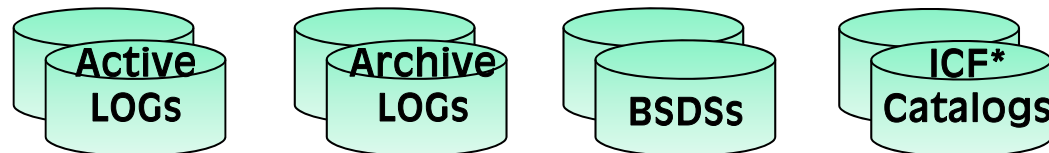


Scope of Cloning



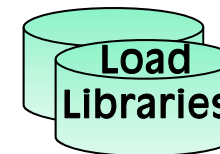
Note:

DSNZPARAM, DSNHDECP, BSDS, LOGs must be considered, but not cloned. Use them as a basis.



Optional:

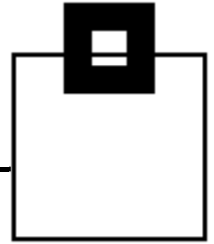
Including DB2 Load Libraries allows cross-version cloning



* Working on the volume level requires inclusion of ICF catalogs

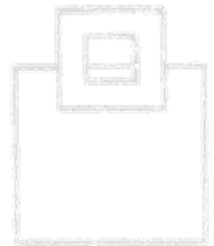
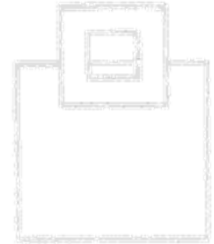
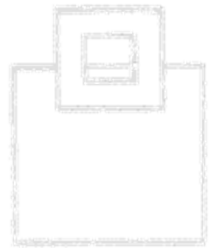
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Duplication of Subsystems

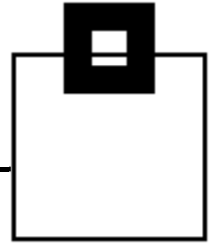


Required Steps

1. **Clone your source data**
 - Dump via ADRDSSU
 - Split Mirror systems and break the mirror
 - FLASH Copy / Disk dump and then Restore
 - Any other method...
2. **Stop the target system**
3. **Restore the source data**
4. **Rename (if naming should be different and/or target isn't isolated from source)**
5. **Adjust LOGs, BSDSs, DSNZPARM, DSNHDECP**
6. **Start target**
7. **Adjust DB2, like old naming (DB2 9 introduces NEWCAT)**



Duplication of Subsystems

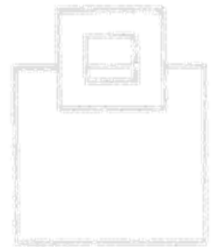
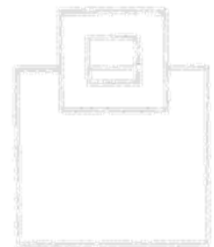
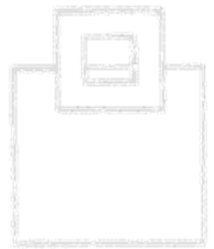


Gotchas to watch out for

- Don't burn time and resources

If you have the appropriate storage features, use them!

- Instant copies (like Flashcopy) can clone your TB-sized source system in a fraction of time
- Instant copies (like Flashcopy) don't burn CPU
- Backup System assures full DB2 interaction
 - Data consistency without downtime (QUIESCE)

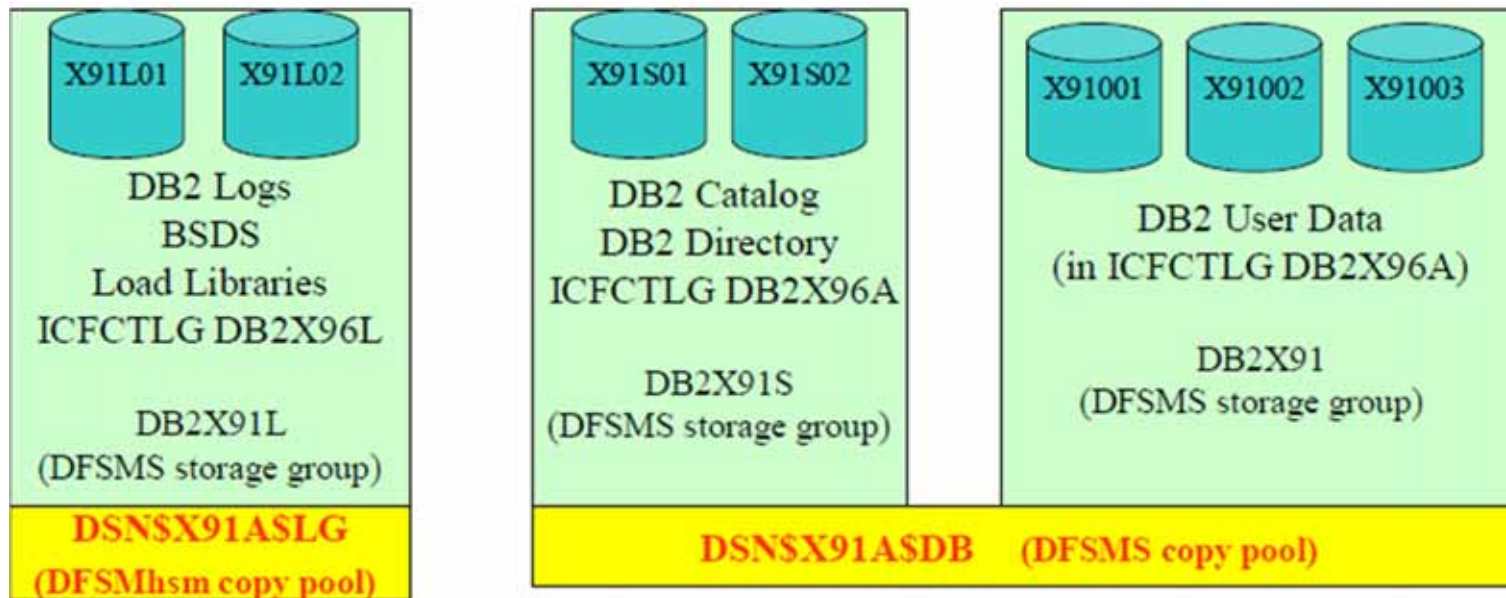


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Duplication of Subsystems

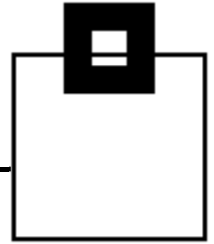
Gotchas to watch out for

- Assure a proper DFSMS definition if you want to exploit instant copy



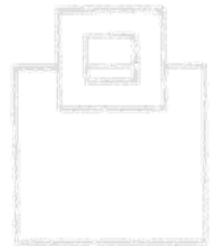
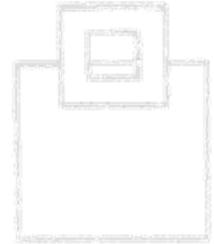
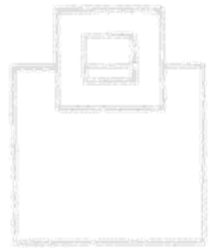
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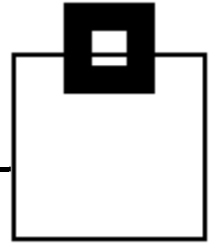
Gotchas to watch out for

- **Be careful with the RACF definitions**
 - If the target can access the source you can end up with corrupted source data!
- **Changing the DB2 subsystem type (non-data sharing/data sharing) requires additional steps**
 - Be very careful going to less members!
- **Cross-version cloning requires inclusion of the DB2 load libraries and changes the DB2 version of the target**



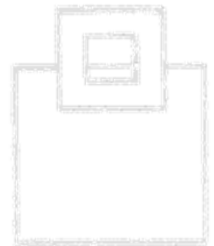
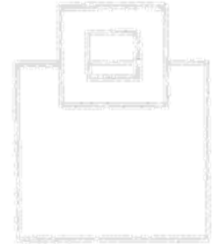
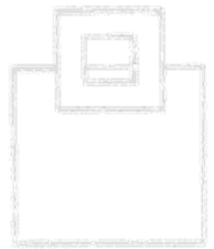
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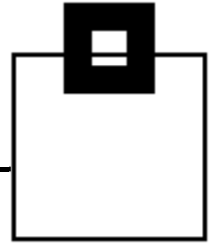
Bottom Line

- Cloning DB2 systems isn't rocket science, but a complex and error-prone process.
- Familiarize yourself with these procedures and define an easy to use step-by-step guide.
- Tools that supervise, manage, and optimize cloning lead to
 - More flexibility
 - Higher degree of automation
 - Exploitation of latest storage and DB2 features
 - Highest efficiency



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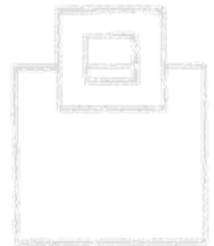
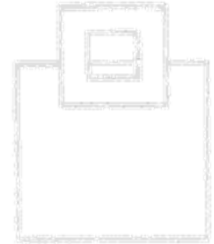
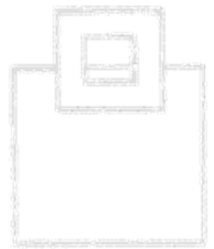
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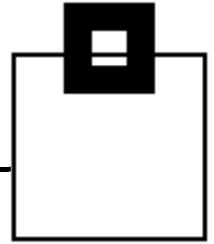
How does a tool manage those issues?

Instant CloningExpert for DB2 z/OS – HSC component

- Data set names – If on the same “system” duplicates
→ Super fast low level RENAME
- Subsystem parameters – In built “names” VCAT etc.
→ XML user exits for all parameters
- Manual Intervention – Issuing shutdown messages etc.
→ XML user exits for external event triggering
- Huge folder full of instructions – updates, errors etc.
→ Automated step-by-step customizable system

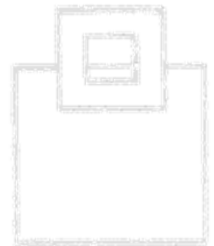
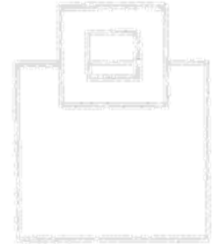
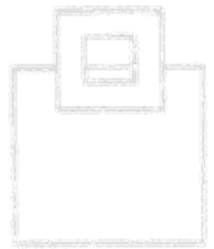


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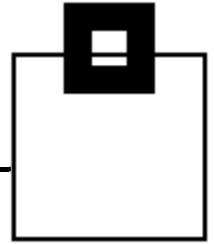


What are the key benefits of the **HSC** component?

- Supports and exploits storage subsystem instant copies like Backup systems or native
 - ESS Flashcopy
 - Timefinder
 - Snapshot
- Assures data consistency for cloned data taken from running source systems – no source outage
 - Supports rename – even changing the HLQ length
 - Guides and verifies the entire process
 - Takes care of special steps (e.g. V8 → V9, DS → NDS)

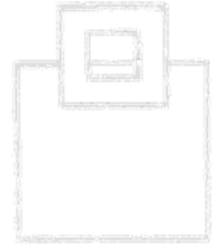
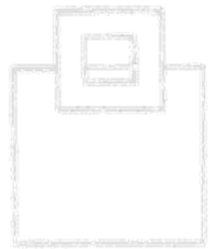


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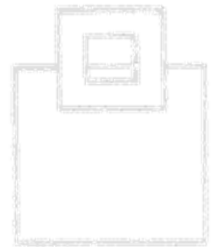
What are the key benefits of the **HSC** component?

- Guides and takes care of the various types of cloning
 - Non-data sharing to non-data sharing
 - Data sharing to data sharing
 - Non-data sharing to data sharing
 - Data sharing to non-data sharing
 - Data sharing x members to data sharing y members

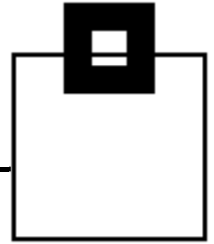


→ **One standardized, central solution for your cloning needs**

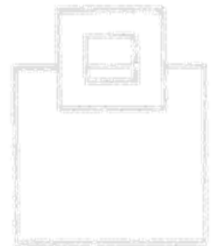
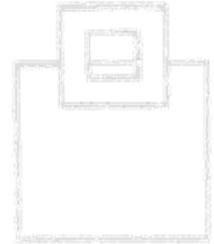
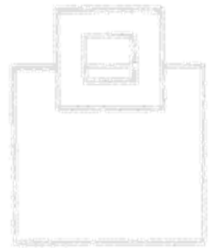
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Duplication of Subsystems

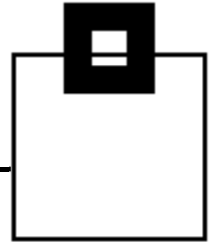


And now a quick walk through the
📁 **HSC** component



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Duplication of Subsystems



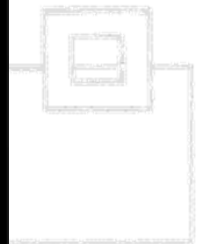
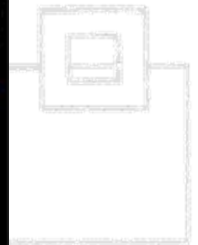
Screen Flow of the HSC component

```
Homogeneous System Copy ----- Scenario Selection ----- Row 1 to 3 of 3
Command ==> _____ Scroll ==> CSR

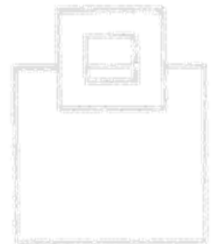
Primary cmd: L(ocate SCENARIO)
Line      cmd: S(elect), I(nfo), E(dit), C(reate), D(elete), V(alidate)

Select the Scenario for HSC:

SCENARIO TYPE DESCRIPTION
-----
_ DEFRFDR  D   CLONE FROM FULL VOLUME DUMP
_ DEFRFDRA D   CLONE FROM FULL VOLUME DUMP AUTOMATED
_ DEFSOFF  D   CLONE NDS WITH SOURCE DB2 OFFLINE
-----
```



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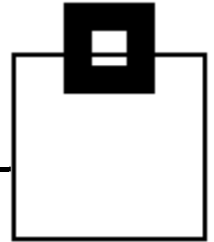


Duplication of Subsystems

Screen Flow of the HSC component

```
Homogeneous System Copy ----- Scenario Control Menu -----  
Command ==> _____  
MENU=ON SCENARIO=DEFRFRD SOURCE=UNSELECTED TARGET=UNSELECTED  
  
Execute options 1 through 15 in sequence.  
Press ENTER to proceed with Select DB2  
  
==> 1. Select DB2 - Select source  
2. Select DB2 - Select target  
3. Prepare - Define Datasets  
4. Gather Information - Get all needed Information  
5. Stop DB2 - Stop target DB2  
6. Restore - Restore volumes  
7. Rename - Rename all Datasets  
8. DSNZPARM+DSNHDECP - Assemble and linkedit  
9. Start DB2 - START Target DB2 ACCESS(MAINT)  
10. VCAT SWITCH - Switch VCAT for all DB2 USER DATA
```

Duplication of Subsystems



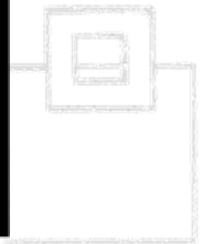
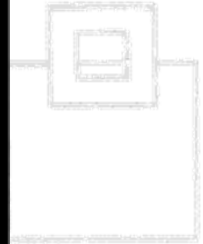
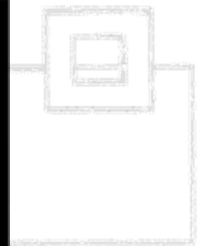
Screen Flow of the HSC component

```
Homogeneous System Copy ----- SOURCE Selection ----- Row 5 from 13
Command ==> _____ Scroll ==> CSR
MENU=ON SCENARIO=DEFRFRD SOURCE=UNSELECTED TARGET=UNSELECTED

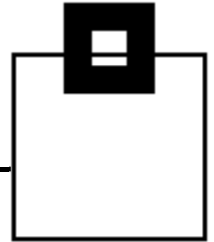
Primary cmd: L(ocate DB2)
Line      cmd: S(elect)

Select the SOURCE system for HSC:

  DB2      DESCRIPTION
  ----      -
- DSG8     S814+S815Data Sharing
- D81X     NDS V8
- D91X     V9 Non Data Sharing
- F98      F918 + F919 DTAT SHARING V9
- S710     NDS V7
- S810     NDS V8
- S91A     S91A V9 NDS
- TEST     Nur ein test,....
- TSD      TEST GETECPF for poland
***** Bottom of data *****
```

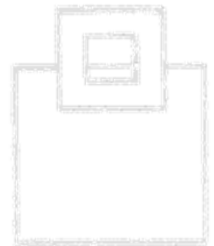
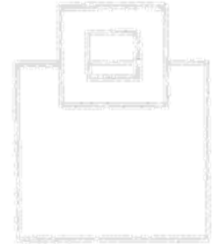
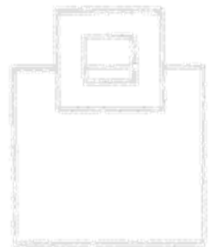


Duplication of Subsystems

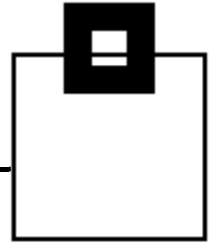


XML scenario framework of the  **HSC** component

```
000135 <ftailor wait="02" allmemb="t"> <!-- FTOPEN -->
000136 <finclude>HSTSTOP</finclude> <!-- FTINCL -->
000137 </ftailor> <!-- FTCLOSE -->
000138 </jobsubmitlist>
000139 <force>
000140 <ftailor temp="y"> <!-- FTOPEN -->
000141 <finclude>HSCVARS</finclude> <!-- FTINCL -->
000142 </ftailor>
000143 </force>
000144 <showmenu />
000145 <jobsubmitlist prefix="CKSP">
000146 <description>Wait for STOP2 DB2</description>
000147 <ftailor> <!-- FTOPEN -->
000148 <finclude>HSTCKSP</finclude> <!-- FTINCL -->
000149 </ftailor> <!-- FTCLOSE -->
000150 </jobsubmitlist>
000151 <showmenu />
000152 <displaypanel name="HSTRSBCK" confirm="y" />
000153 <showmenu />
000154 <force>
000155 <ftailor temp="y"> <!-- FTOPEN -->
000156 <finclude>HSCVARS</finclude> <!-- FTINCL -->
000157 </ftailor>
000158 </force>
000159 <jobsubmitlist prefix="PRST">
000160 <description>Rename/Restore DB2</description>
000161 <if var="HSTENV" operator="EQ" val="D">
```

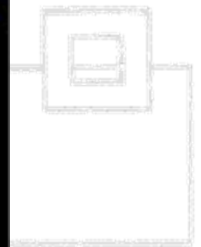


Duplication of Subsystems

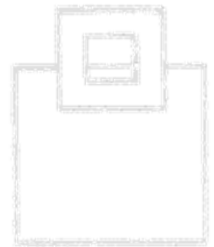


Screen Flow of the HSC component

```
Homogeneous System Copy ----- Shutdown -----  
Command ==>  
MENU=ON SCENARIO=DEFRFDR SOURCE=D81X TARGET=D91X  
  
Shutdown your DB2.  
  
    Stop the DB2 subsystem D91X  
    e.g.: -D91X STOP DB2  
  
Confirm SHUTDOWN completed . . N - Y(es)/N(o)
```



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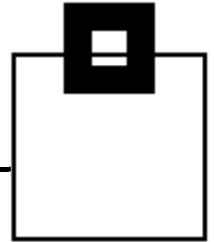


Duplication of Subsystems

Screen Flow of the HSC component

```
Homogeneous System Copy ----- Scenario Control Menu -----  
Command ==> _____  
MENU=ON SCENARIO=DEFRAFDR SOURCE=D81X TARGET=D91X  
  
Execute options 1 through 15 in sequence.  
Press ENTER to proceed with Cleanup  
  
DONE 6. Restore - Restore volumes  
DONE 7. Rename - Rename all Datasets  
DONE 8. DSNZPARM+DSNHDECP - Assemble and linkedit  
DONE 9. Start DB2 - START Target DB2 ACCESS(MAINT)  
DONE 10. VCAT SWITCH - Switch VCAT for all DB2 USER DATA  
DONE 11. Stop DB2 - STOP Target DB2  
DONE 12. Start DB2 - START Target DB2  
DONE 13. Work DB/WLM - Create/Rename  
==> 14. Cleanup - Delete work files  
15. Finished - Cloning completed
```

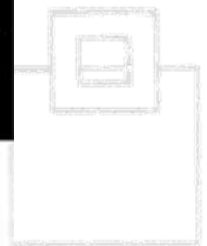
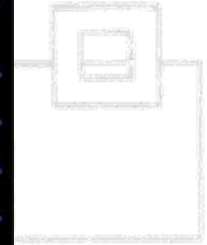
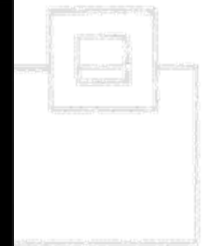
Duplication of Subsystems



Screen Flow of the HSC component

```
Homogeneous System Copy ----- Job Submit List ----- Job 00001 of 00010
Command ==> _____ Scroll ==> CSR
MODE=TEST MENU=ON AUTO=001 DB2:D91X
Primary cmd: SUB(mit), AUTO, J(ob status), G(et failed job), EXIT,
Line cmd: V(iew), E(dit), R(eset status)

Member Prompt Size Created StatusTime Status
-----
INIT0001 72 2010/04/22 2010/04/22 15:56:28 CC=0000
INIT0002 71 2010/04/22 2010/04/22 15:56:28 SUBMIT
INIT0003 106 2010/04/22 2010/04/22 15:49:41 GENERAT
INIT0004 108 2010/04/22 2010/04/22 15:49:41 GENERAT
INIT0005 113 2010/04/22 2010/04/22 15:49:42 GENERAT
INIT0006 72 2010/04/22 2010/04/22 15:49:43 GENERAT
INIT0007 70 2010/04/22 2010/04/22 15:49:44 WAIT#01
INIT0008 83 2010/04/22 2010/04/22 15:49:44 WAIT#01
INIT0009 83 2010/04/22 2010/04/22 15:49:45 WAIT#01
INIT0010 82 2010/04/22 2010/04/22 15:49:46 WAIT#01
**End**
```



To Clone or not to Clone?

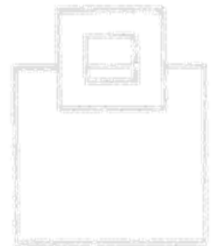
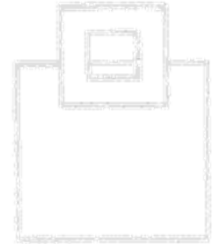
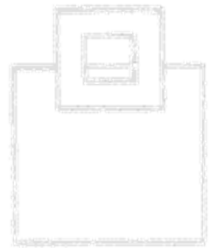
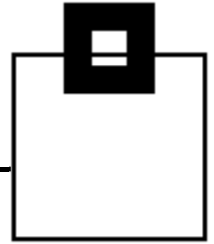
How to achieve those benefits (...continued)?

Merge/Duplication of systems/data

- Consolidation of Systems (Mergers & Acquisitions)
- Separation of test data, applications or business units

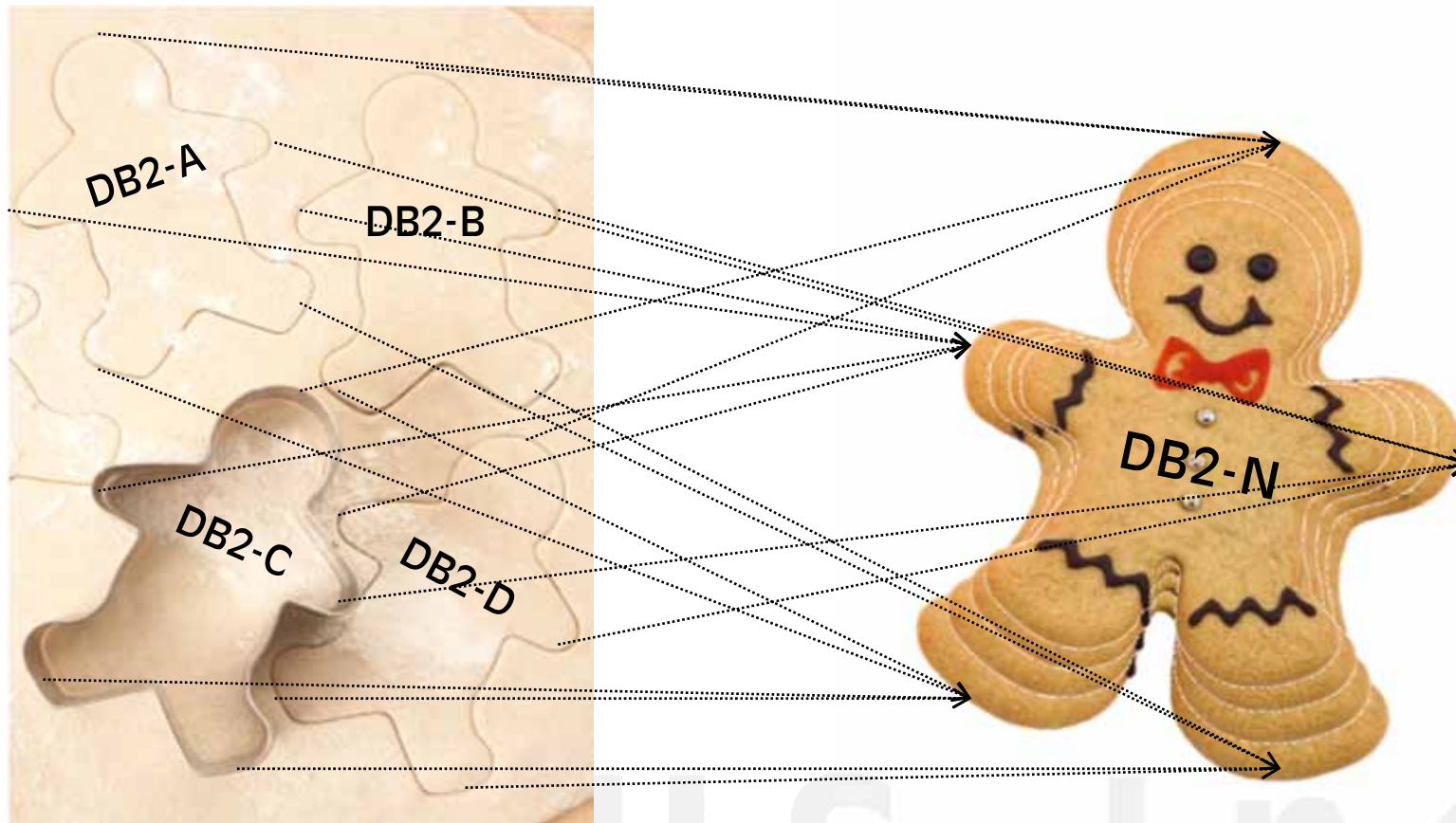
Refresh of an entire system or parts of it

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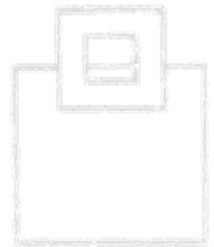
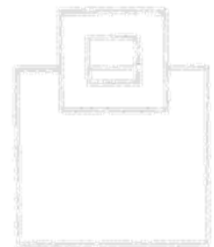
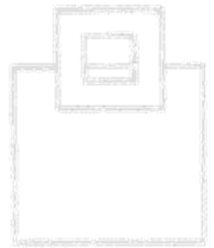
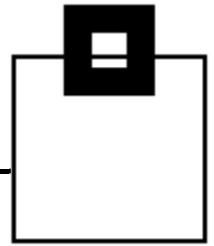
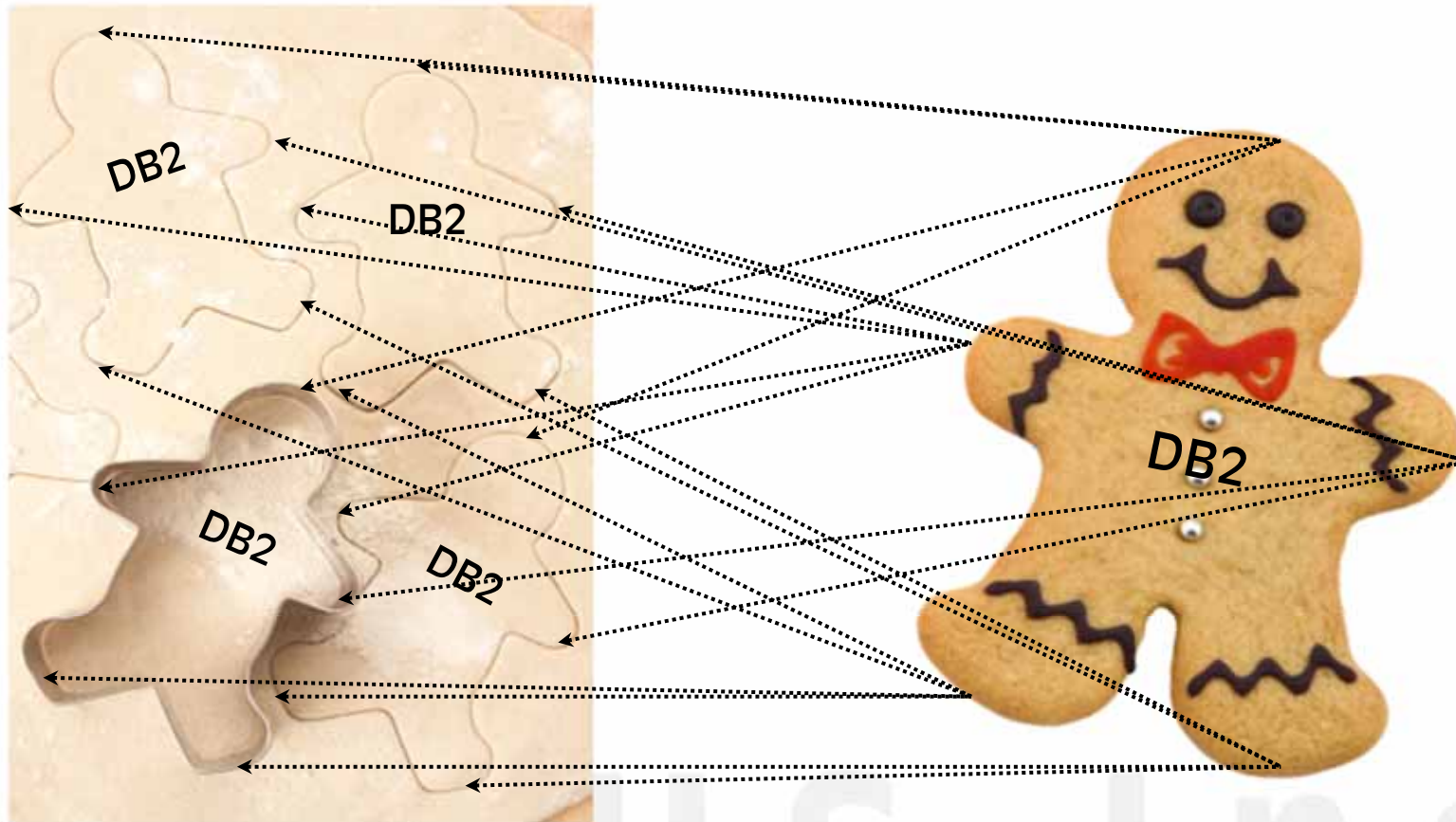
The various ways of cloning

Merge of systems/data



The various ways of cloning

Duplication of systems/data



The various ways of cloning

Refresh Cloning



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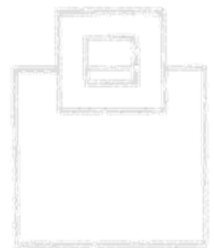
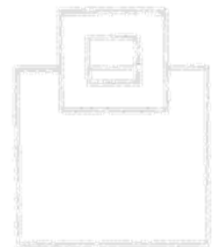
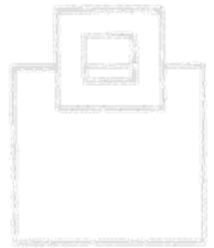
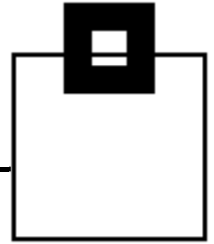
The various ways of cloning

Yum, yum, yum – not that long until the coffee break ;-)

Merge/Duplication of systems/data

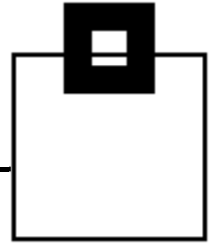
Refresh of an entire system or parts of it

1. Details about Source and Target
2. Scope of Cloning
3. Required Steps
4. Gotchas to watch out for



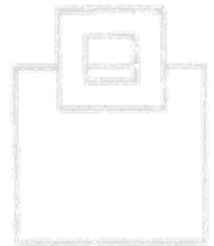
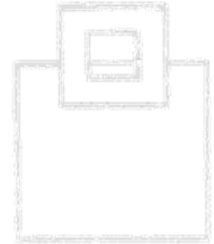
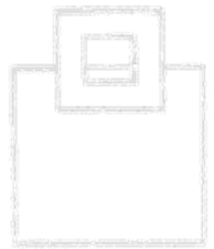
SEGUS inc

Merge/Duplication of systems/data



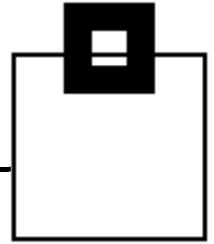
Details about Source and Target

- All or parts of data from a system is duplicated
 - Including/Excluding objects
- Source and target can be different or the same
 - Applying conversion allows to clone objects (e.g. DB) in one and the same DB2 subsystem
- Existing objects may only want to be refreshed



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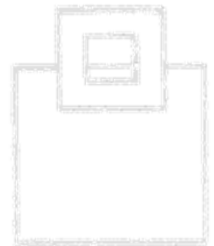
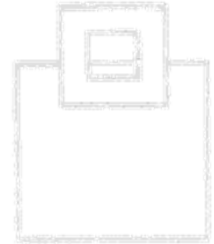
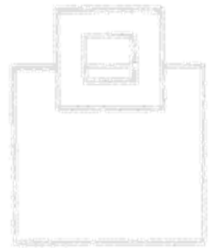
Merge/Duplication of systems/data



Scope of Cloning

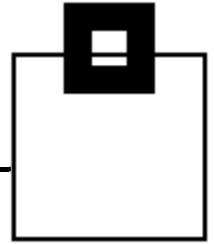
We are talking about *database* object cloning. This usually doesn't include the DB2 subsystem /data sharing groups

- Catalog and Directory
- Any other DB2 subsystem specific parts



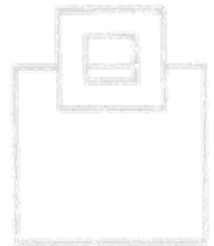
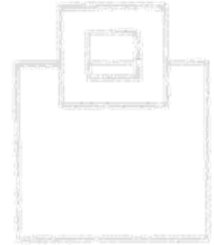
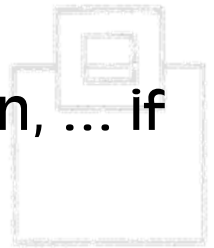
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Merge/Duplication of systems/data



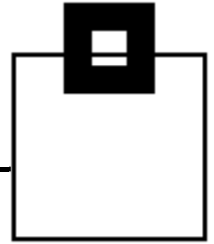
Required steps

1. Define scope of objects
2. Determine depending objects like indexes, views, authorization, ... if desired
3. Extract DDL for resulting source objects
4. Extract data from resulting source objects
5. Apply naming conversion if desired
6. Run DDL on target
7. Load data on target objects



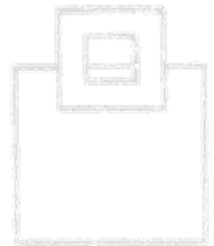
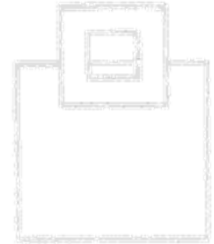
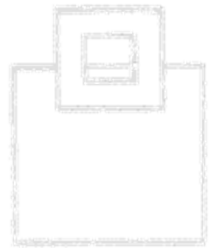
Note: Refresh only requires the data

Merge/Duplication of systems/data



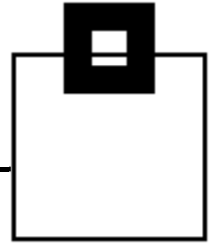
Gotchas to watch out for

- Don't burn time and resources
 - If you have the appropriate storage features, use them!
 - Instant copies (like Flashcopy2) can clone your TB sized source objects in a fraction of time
 - Instant copies (like Flashcopy2) don't burn CPU
 - DB2 supports Flashcopy2 for ONLINE CHECK INDEX maybe for copies one day, too ;-)



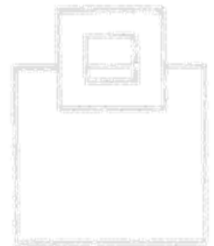
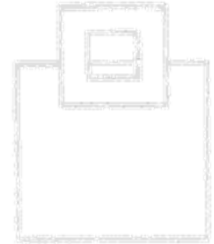
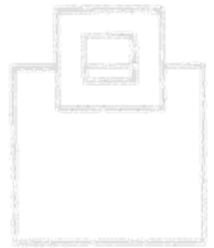
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Merge/Duplication of systems/data



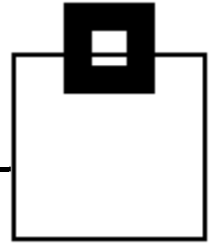
Gotchas to watch out for

- **Be careful with Sequences**
→ Manage them correctly
- **Be careful with XML (This is not supported by DSN1COPY)**
→ Use the cross loader for XML
- **Be careful with availability**
→ Use DB2 Clone Tables



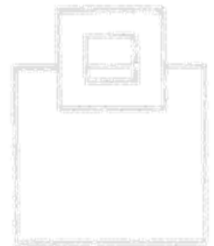
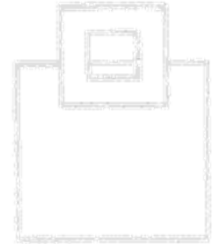
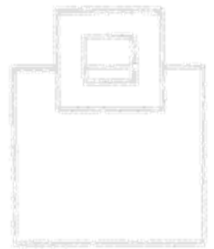
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Merge/Duplication of systems/data



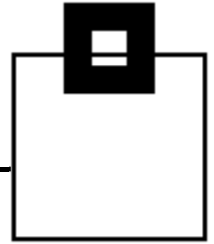
Gotchas to watch out for

- Be careful with user defined objects
 - DEFINE CLUSTER
- Be careful with Multi linear datasets in both directions
 - Multi on source – single on target
 - Single on source and multi on target
 - or even multi on source and multi on target but different number of used datasets
 - Delete all non-used data sets to avoid later problems



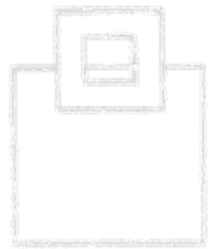
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Merge/Duplication of systems/data



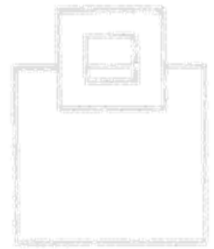
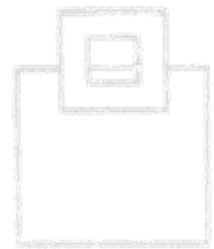
Bottom Line

- Cloning DB2 objects isn't rocket science, but there are some specialties to take care of
- Familiarize yourself with these procedures and define an easy to use step by step guide.



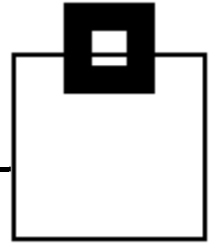
Tools that supervise, manage and optimize cloning lead to

- More flexibility
- Higher degree of automation
- Exploitation of latest storage and DB2 features
- Highest efficiency



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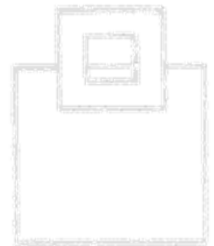
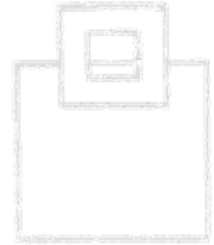
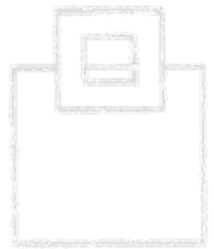
Merge/Duplication of systems/data



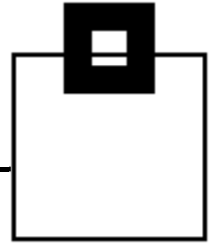
How does a tool manage those issues?

☐ **Instant CloningExpert for DB2 z/OS** – ☐ **HOC** component:

- DDL processing
→ High speed DSNTIAD
- Dataset names – If on the same “system” duplicates
→ flexible renaming and wildcard support
- Complex dependencies and structures
→ optional dependency support
- User defined objects and multi linear datasets
→ Out of the box dataset level management

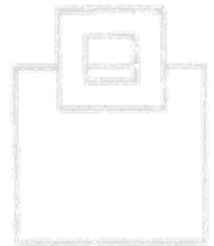
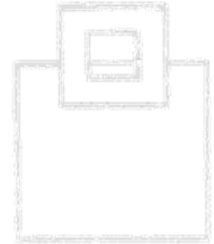
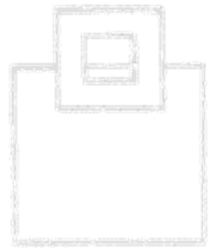


Merge/Duplication of systems/data



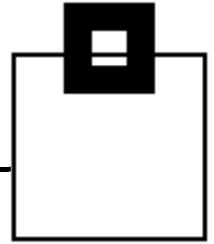
What are the key benefits of the **HOC** component?

- It supports DB2 copies and DSN1COPY
 - DSN1COPY jobs are generated with the appropriate OBIDXLAT option to translate the object IDs.
 - It takes care of
 - “normal” DDL
 - Stogroups
 - Sequences
- Basically anything valid up to DB2 10



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Merge/Duplication of systems/data



What are the key benefits of the **HOC** component?

It splits object and data cloning

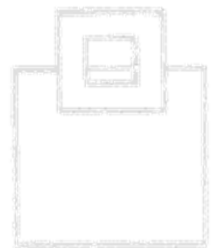
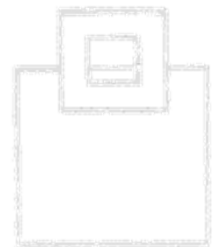
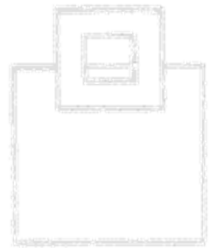
Copies DDL and/or data only using one of the methods below

1. Extract object data from source and generate DDL to run on target DB2
2. Data Copy using DSN1COPY based on Copies or VSAM DB2 Cluster

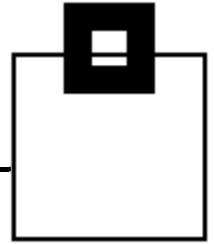
Refresh via DB2 Clone Tables for High Availability

→ One standardized, central solution for your cloning needs

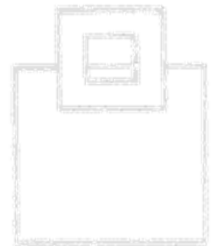
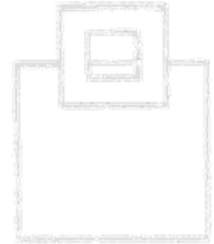
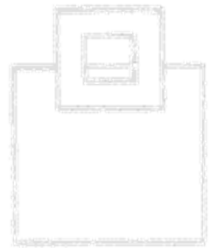
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Merge/Duplication of systems/data

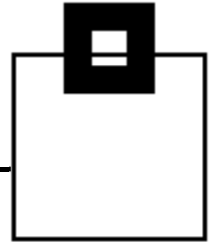


And now a quick walk through the
📁 **HOC** component



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Merge/Duplication of systems/data



Screen Flow of the HOC component

```
ADH0 nd Utility Generator ----- Main Menu ----- VERSION 1.10  
Command ==> _____ DB2: Q91A
```

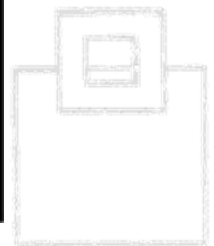
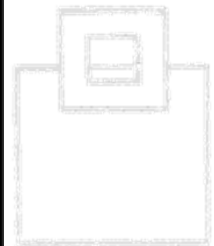
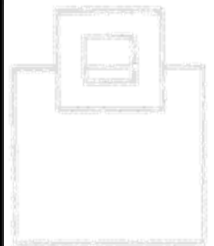
```
Primary cmd: END, ABOUT
```

1. Collect Object(s) via catalog browser
2. Run DDL-Generator for collected Object(s)
3. Generate Utility JCL for collected Object(s)

- S. Settings

- X. Terminate DDL and Utility Generator

```
(c) Copyright SOFTWARE ENGINEERING GMBH 1991-2010. All rights reserved.
```



Merge/Duplication of systems/data

Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Collect Objects -----
Command ==> _____ DB2: Q91A

Primary cmd : END, R(un), SE(up), +(ADD), S(how), RES(et)

ACTION (Run): DDL   DDL,RST,RSI,ROT,ROI,CO

OBJECT TYPE : D    D(atabase)           X(Auxiliary table)
               R(Tablespace)          I(ndex)
               T(able)                 A(lias)
               G(lobal temporary table) S(ynonym)
               M(aterialized query table) V(iew)

CREATOR      : _____
              _____

NAME         : _____
              _____

Notes: Wildcards '*' and '?' are allowed.
       Enter qualifier or creator in creator field.
       For database leave the creator field blank.
```

Merge/Duplication of systems/data

Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Database Overview ----- Database 1 from 128
Command ==> _____ Scroll ==> PAGE
MODE: CATALOG DB2: Q91A
Primary cmd: END, CAN(ce), Z(oom) +(Add All), L(ocate) name
Line cmd: T(ables), G(TTs), M(QTs), R(Tablesaces), Z(oom), +(Add)

  Creator      Name      Created by  Created timestamp
  DBID         Group_member  Type      StoGroup  Altered timestamp
          Encoding_scheme  Bufferpool  Index bufferpool
-----
+ BOXWELL      BOXWELLX    BOXWELL    2007-07-09-08.57.43.323074
  280          UNICOD      SYSDEF    2007-07-09-08.57.43.323074
          EBCDIC     FLT      BP0
          BP0
-----
+ BOXWELL      DIRKDB2     BOXWELL    2009-01-26-12.40.52.086554
  295          EBCDIC     SYSDEF    2009-01-26-12.40.52.086554
          EBCDIC     FLT      BP0
          BP0
-----
- CHRISTO      EXPHOPPE    CHRISTO    2009-08-27-14.52.51.947899
  301          EBCDIC     SYSDEF    2009-08-27-14.52.51.947899
          EBCDIC     FLT      BP0
          BP0
-----
+ DUDEK        DUDEKDB     DUDEK      2009-10-06-18.30.39.843413
  320          EBCDIC     SYSDEF    2009-10-06-18.30.39.843413
          EBCDIC     FLT      BP0
          BP0
-----
+ DUDEK        DUDEKUTF    DUDEK      2010-07-05-14.49.21.377269
  375          UNICOD      SYSDEF    2010-07-05-14.49.21.377269
          EBCDIC     FLT      BP0
          BP0
-----
+ DUDEK        DUDEKXML    DUDEK      2007-02-28-17.36.32.449190
  265          UNICOD      SYSDEF    2007-02-28-17.36.32.449190
          EBCDIC     FLT      BP0
          BP0
-----
+ DUDEK        IDATQB      DUDEK      2009-11-30-14.53.59.590595
  327          EBCDIC     SYSDEF    2009-11-30-14.53.59.590595
          EBCDIC     FLT      BP0
          BP0
```

Merge/Duplication of systems/data

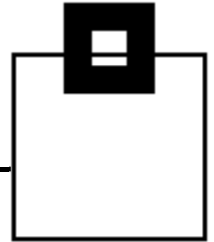
Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- DDL Generator Settings ----- Setting 1 from 10
Command ==> _____ Scroll ==> CSR
DB2: F91D
Primary cmd: END, CAN(ce), F(ilter), T(ext on/off), G(roup on/off),
             L(ocate) setting
Line      cmd: S(elect), R(eset to DEFAULT)

Profile: HEINRIC      Creator . .: HEINRIC
                Description: Default profile for RTDX

Category
Setting          Value      Valid Input
-----
-- READ INTERVAL FOR OBJECTS      250          50 to 2000
-- CURRENT SQLID                   &USERID      CHAR(08)
-- DEPENDENCY DDL                   Y             Y/N
-- GRANTS                           Y             Y/N
-- DEFINE                           Y             Y/N
-- GEN USER IDCAMS                   Y             Y/N/A
-- LITERAL APOST                     '             '/'
-- DECIMAL POINT                     .             ./,
-- TRIGGER DELIMITER                 $             CHAR(01)
-- TRACE                            OFF           ON/OFF
-----
```

Merge/Duplication of systems/data



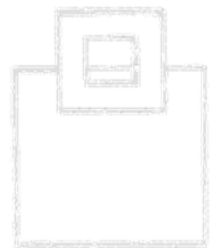
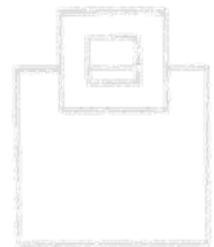
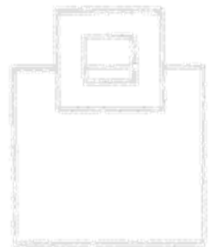
Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Collect Objects -----
C                                     DB2: Q91A
P  _ADHO ----- Status -----
A
O  SCANNING OBJECTS
   *****
   0% ----- 50% ----- 100%

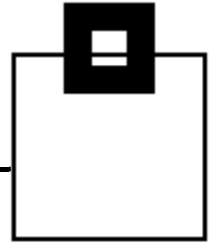
M(aterialized query table)  V(iew)

CREATOR      :
NAME         :

Notes: Wildcards '*' and '?' are allowed.
       Enter qualifier or creator in creator field.
       For database leave the creator field blank.
```

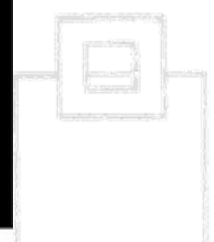
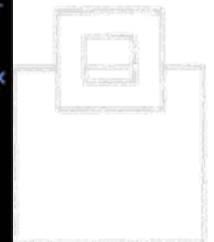


Merge/Duplication of systems/data

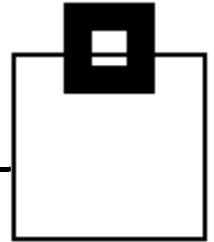


Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Change Data -----
EDIT      SYS10256.T013117.RA000.HEINRIC.R0103647      Columns 00001 00072
Command ==>                                           Scroll ==> CSR
***** ***** Top of Data *****
000001 -- GRANTS BP      "BP0"
000002 SET CURRENT SQLID = 'HENN' ;
000003 GRANT USE OF BUFFERPOOL BP0
000004 TO PUBLIC
000005 ;
000006 -- DATABASE      "ADB01"
000007 SET CURRENT SQLID = 'VOELKEN' ;
000008 CREATE DATABASE "ADB01"
000009 BUFFERPOOL BP0
000010 INDEXBP      BP0
000011 STOGROUP     SYSDEFLT
000012 CCSID EBCDIC
000013 ;
- - - - - 121 Line(s) not Displayed
000135 -- GRANTS DB      "DSNDB04"
000136 SET CURRENT SQLID = 'HENN' ;
000137 GRANT CREATETAB
000138 ,CREATETS
000139 ON DATABASE "DSNDB04"
000140 TO PUBLIC
000141 ;
000142 COMMIT ;
- - - - - 105 Line(s) not Displayed
000248 -- TABLESPACE     "ADB01"."AS13"
000249 SET CURRENT SQLID = 'VOELKEN' ;
000250 CREATE TABLESPACE "AS13"
000251 IN "ADB01"
000252 USING STOGROUP SYSDEFLT
000253 PRIQTY      12 SECQTY      4
000254 ERASE NO
000255 FREEPAGE     0
000256 PCTFREE      0
000257 GBPCACHE     CHANGED
000258 TRACKMOD     YES
000259 LOG          YES
```

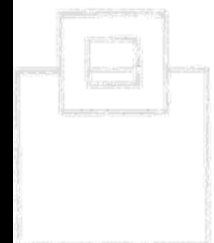
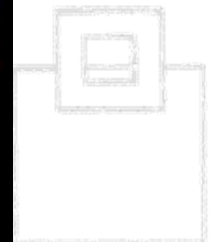


Merge/Duplication of systems/data



Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Change Data -----
EDIT      SYS10256.T013117.RA000.HEINRIC.R0103647      Columns 00001 00072
Command ==>                                           Scroll ==> CSR
000264          CLOSE YES
000265          COMPRESS YES
000266          CCSID EBCDIC
000267          MAXROWS 255
000268          SEGSIZE 4
000269          ;
-----
005850 -- TABLE          "VOELKEN"."AT131"          5580 Line(s) not Displayed
005851 SET CURRENT SQLID = 'HEINRIC' ;
005852 CREATE TABLE "VOELKEN"."AT131"
005853 ("XCOUNT"          INTEGER          NOT NULL
005854 WITH DEFAULT
005855 , "X01"          TIMESTAMP          NOT NULL
005856 WITH DEFAULT
005857 , "X02"          CHAR( 254)          NOT NULL
005858 FOR SBCS DATA
005859 WITH DEFAULT
005860 , "X03"          CHAR( 254)          NOT NULL
005861 FOR SBCS DATA
005862 WITH DEFAULT
005863 , "X04"          CHAR( 254)          NOT NULL
005864 FOR SBCS DATA
005865 WITH DEFAULT
005866 , "X05"          CHAR( 254)          NOT NULL
005867 FOR SBCS DATA
005868 WITH DEFAULT
005869 , "X06"          CHAR( 254)          NOT NULL
005870 FOR SBCS DATA
005871 WITH DEFAULT
005872 , "X07"          CHAR( 254)          NOT NULL
005873 FOR SBCS DATA
005874 WITH DEFAULT
005875 , "X08"          CHAR( 254)          NOT NULL
005876 FOR SBCS DATA
005877 WITH DEFAULT
005878 , "X09"          CHAR( 254)          NOT NULL
005879 FOR SBCS DATA
005880 WITH DEFAULT
```

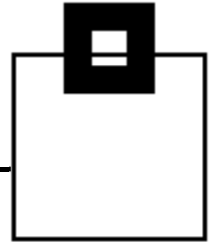


Merge/Duplication of systems/data

Screen Flow of the HOC component

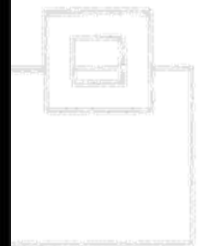
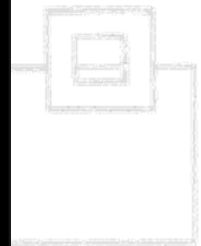
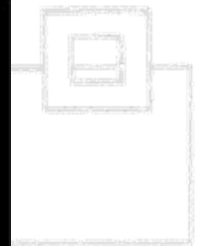
```
ADHO nd Utility Generator ----- Change Data -----
EDIT      SYS10256.T013117.RA000.HEINRIC.R0103647      Columns 00001 00072
Command ==>
005883      WITH DEFAULT
005884      , "X11"                                CHAR( 254)
005885                                             FOR SBCS DATA NOT NULL
005886      WITH DEFAULT
005887      , "X12"                                CHAR( 254)
005888                                             FOR SBCS DATA NOT NULL
005889      WITH DEFAULT
005890      , "X13"                                CHAR( 254)
005891                                             FOR SBCS DATA NOT NULL
005892      WITH DEFAULT
005893      , "X14"                                CHAR( 254)
005894                                             FOR SBCS DATA NOT NULL
005895      WITH DEFAULT
005896      , "X15"                                CHAR( 254)
005897                                             FOR SBCS DATA NOT NULL
005898      WITH DEFAULT
005899      , "X16"                                CHAR( 254)
005900                                             FOR SBCS DATA NOT NULL
005901      WITH DEFAULT
005902      , "X17"                                CHAR( 190)
005903                                             FOR SBCS DATA NOT NULL
005904      WITH DEFAULT
005905      )
005906      IN "ADB01"."AS13"
005907      AUDIT NONE
005908      DATA CAPTURE NONE
005909      CCSID EBCDIC
005910      NOT VOLATILE CARDINALITY
005911      APPEND NO
005912      ;
005913 -- INDEX          "VOELKEN"."AX131"
005914      CREATE UNIQUE INDEX          "VOELKEN"."AX131"
005915      ON "VOELKEN"."AT131"
005916      ("XCOUNT"          ASC
005917      )
005918      CLUSTER
005919      USING STOGROUP SYSDEFLT
005920      PRIQTY          12 SECQTY          4
005921      FRASE NO
```

Merge/Duplication of systems/data

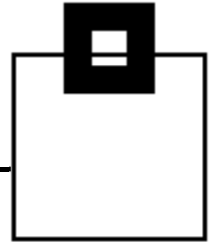


Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Change Data -----
EDIT          SYS10256.T013117.RA000.HEINRIC.R0103647          Columns 00001 00072
Command ==> _____ Scroll ==> CSR
005923          PCTFREE          0
005924          GBPCACHE CHANGED
005925          DEFINE YES
005926          COMPRESS NO
005927          BUFFERPOOL BP0
005928          CLOSE YES
005929          PIECESIZE          2 G
005930          COPY NO
005931          ;
-----
013476 -- GTT          "IDUG610"."ADB2_TODO_TABLE"          7544 Line(s) not Displayed
013477 -- CREATE GLOBAL TEMPORARY TABLE "IDUG610"."ADB2_TODO_TABLE"
013478 -- ("RTYPE"          CHAR(          1)
013479 --          FOR SBCS DATA          NOT NULL
013480 -- "QUALIFIER"          VARCHAR(          128)
013481 --          FOR SBCS DATA          NOT NULL
013482 -- "NAME1"          VARCHAR(          128)
013483 --          FOR SBCS DATA          NOT NULL
013484 -- "NAME2"          VARCHAR(          128)
013485 --          FOR SBCS DATA          NOT NULL
013486 -- "VERSION"          VARCHAR(          122)
013487 --          FOR SBCS DATA          NOT NULL
013488 -- "OWNER"          VARCHAR(          128)
013489 --          FOR SBCS DATA          NOT NULL
013490 -- "PLAN"          VARCHAR(          24)
013491 --          FOR SBCS DATA          NOT NULL
013492 -- "STMTNO"          INTEGER          NOT NULL
013493 -- "QUERYNO"          INTEGER          NOT NULL
013494 -- "CONTOKEN"          CHAR(          8)
013495 --          FOR SBCS DATA          NOT NULL
013496 -- "VTYPE"          CHAR(          1)
013497 --          FOR SBCS DATA          NOT NULL
013498 -- "DATASET"          CHAR(          44)
013499 --          FOR SBCS DATA          NOT NULL
013500 -- "MEMBER"          CHAR(          8)
013501 --          FOR SBCS DATA          NOT NULL
013502 -- "DDNAME"          CHAR(          8)
013503 --          FOR SBCS DATA          NOT NULL
```

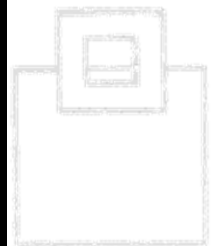
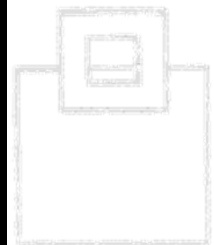
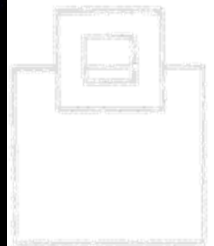


Merge/Duplication of systems/data

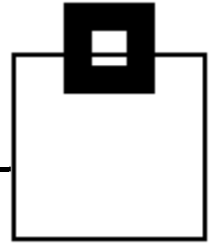


Screen Flow of the HOC component

```
ADHO nd Utility Generator ----- Change Data -----
EDIT      SYS10256.T013117.RA000.HEINRIC.R0103647      Columns 00001 00072
Command ==>                                           Scroll ==> CSR
013607 -- GRANTS ON      "IDUG610"."IDUGHGT0"
013608   SET CURRENT SOLID = 'IDUGIQA' ;
013609   GRANT ALTER,DELETE,INSERT,SELECT
013610   ON TABLE      "IDUG610"."IDUGHGT0"
013611   TO PUBLIC
013612 ;
013613 -- ALIAS          "IDUG610"."IQHGTTPACK"
013614   SET CURRENT SOLID = 'HEINRIC' ;
013615   CREATE ALIAS "IDUG610"."IQHGTTPACK"
013616   FOR      "IDUG610"."IDUGHGT0"
013617 ;
- - - - -
- - - - - 31837 Line(s) not Displayed
045455 -- RI FOR TABLE  "IDUG610"."IDUGH005"
045456   ALTER TABLE      "IDUG610"."IDUGH005"
045457   ADD CONSTRAINT IDUGHXX51
045458   FOREIGN KEY
045459   ( "BOUNDTS"
045460   , "PLNAME"
045461   , "NAME"
045462   )
045463   REFERENCES      "IDUG610"."IDUGH004"
045464   ( "BOUNDTS"
045465   , "PLNAME"
045466   , "NAME"
045467   )
045468   ON DELETE CASCADE      ENFORCED      ENABLE QUERY OPTIMIZATION
045469 ;
- - - - -
- - - - - 886 Line(s) not Displayed
046356 -- TRIGGER          "IQA_IDUGCOLL_610"."IDUGAR11"
046357 --#SET TERMINATOR $
046358 CREATE TRIGGER IQA_IDUGCOLL_610.IDUGAR11
046359   AFTER
046360   UPDATE OF X_RULESETNR ON IDUG610.IDUGA001
046361   REFERENCING NEW AS RSNEW
046362   OLD AS RSOLD
046363   FOR EACH ROW
046364   MODE DB2SQL
046365   BEGIN ATOMIC
```



Quick Summary



How to serve different needs of cloning?

☐ **Instant CloningExpert** consists of two components:

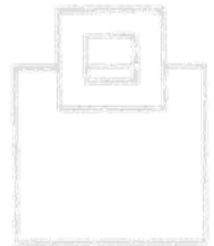
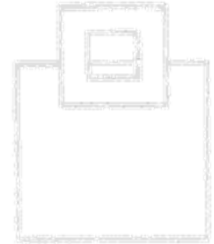
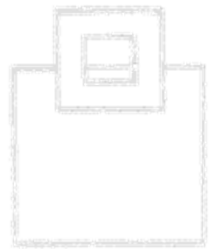
1st ☐ **HSC** component

→ Duplication of subsystem (Homogenous System Copy)

2nd ☐ **HOC** component

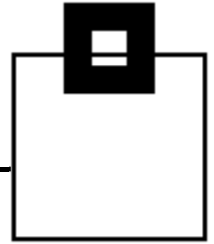
→ Merge/Duplication of systems/data

→ Refresh of an entire system or parts of it
(Homogenous Object Copy)



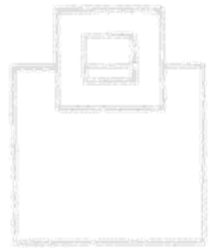
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The real world example



The Requirements:

- Merge multiple NDS production sites with the same subsystem name (DSN) into a new DS system



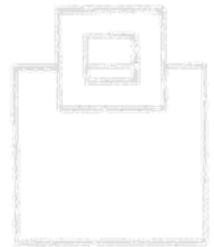
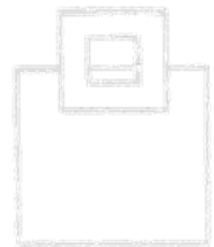
The Solution:

- ☐ **Instant CloningExpert for DB2 z/OS**

- Merging multiple Non Data Sharing DB2s to one Data Sharing Group

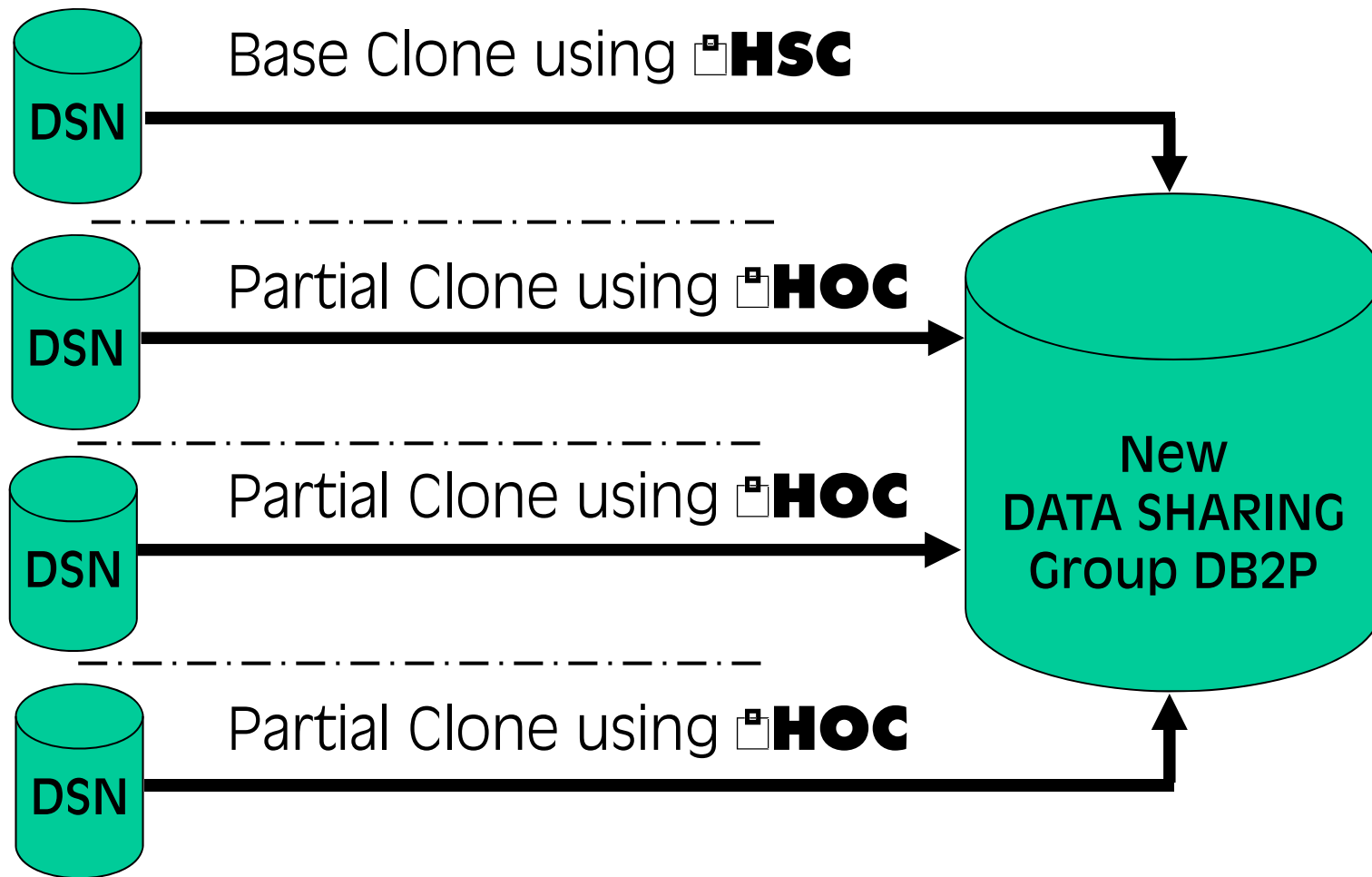
- ☐ **HSC** component creates the DS base system from the first production NDS system

- ☐ **HOC** component migrates data from additional systems



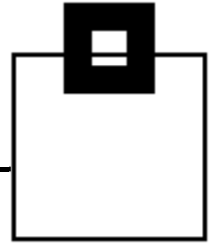
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The real world example



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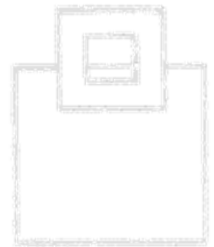
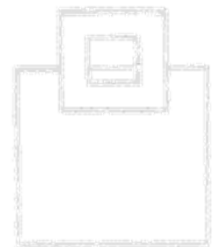
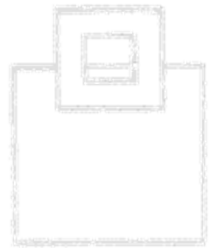
The real world example



The steps of the procedure:

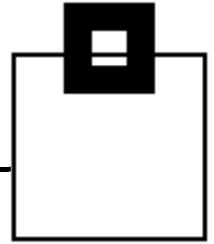
Base clone of first NDS DB2 using **HSC**:

- Backup system used for data consistency
- Restore source volumes and fast rename (new naming conventions applied DSN → DB2P)
- Start Target DB2 Access Maint and Alter/Switch VCAT
- Apply source Bufferpool-Settings



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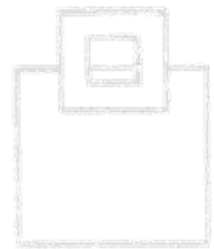
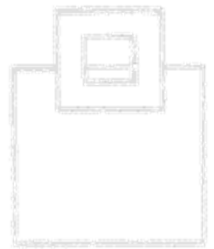
The real world example



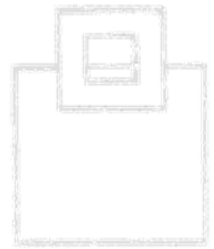
The steps of the procedure

Partial clone of second to last NDS DB2 using **HOC** :

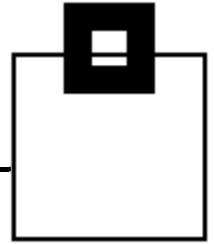
- Selection of source objects based on wildcards
- Depending objects discovered and included
- Full SHRLEVEL REFERENCE copies used (some objects data directly taken from DB2 VSAM Clusters)
- Objects defined on target using high speed DSNTIAD (new naming conventions applied)



Process applied to each NDS to merge



The real world example



The steps of the procedure

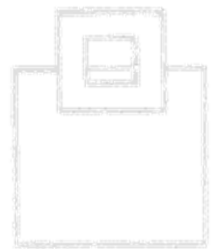
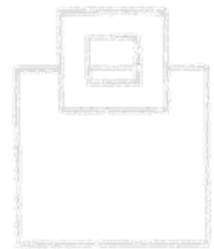
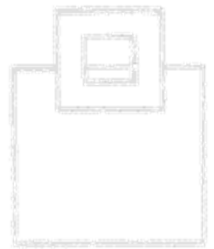
The scenario was tested and proofed in two simulation steps before the final going live.

After the initial set up access path checks were executed to validate performance. Since stress tests only allowed simulation of the workload, the customer used

▪ **Bind ImpactExpert for DB2 z/OS**

to verify all resulting access paths

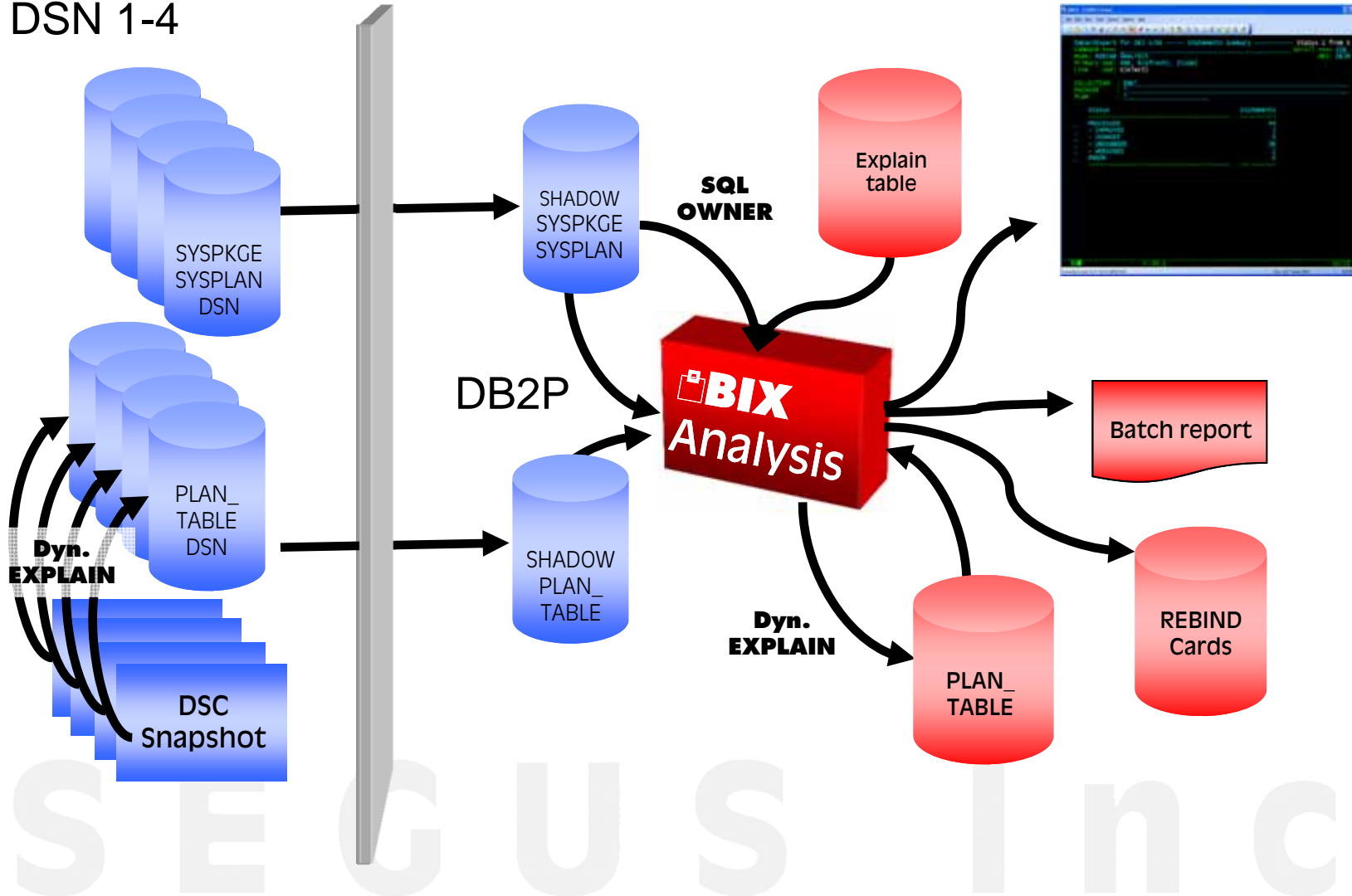
- for static SQL
- for dynamic SQL



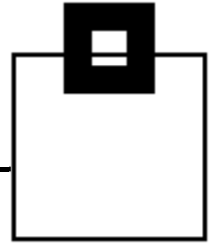
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The real world example

DSN 1-4



The real world example



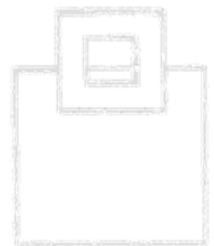
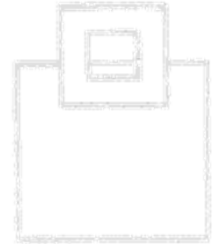
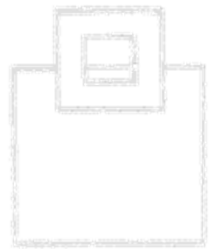
The steps of the procedure

Final production availability checks before AND after going live were processed using

Recovery AssuranceExpert:

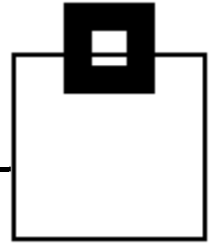
to checked the new environment created. This included

- Verifying the ZPARMS for the DS environment
- Verifying the coupling facility defined for the DS environment
- Verifying the recoverability of all objects
- Verifying the logging for the DS environment

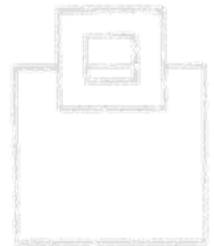
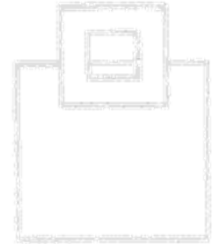
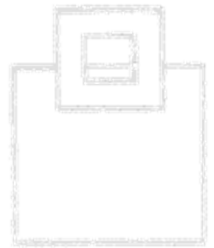


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Summary

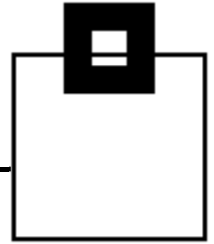


- Cloning is a powerful way to duplicate data or entire subsystems for multiple purposes
- It's important to understand what's required and choose the right scenario
- Exploiting instant copy technology can speed up cloning significantly
- Setting up standard procedures increases the degree of automation and makes the complex scenarios less error prone



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Summary



Instant CloningExpert

- Automates cloning even beyond DB2 tasks
- Supports the different flavors
- Exploits storage technology advantages
- Speeds up cloning
- Is flexible and easy to use
- Ensures consistency of your data



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