Cloning - What’s new and faster?

DB2 z/OS Database cloning using

**Instant CloningExpert for DB2 z/OS**
Agenda/Content to be addressed

- 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 CloningExpert for DB2 z/OS – ICE key benefits
  - What are the benefits using ICE?
  - How can I exploit instant copy technology, like Flashcopy?
  - DB2 cross-version cloning
Agenda/Content to be addressed

- HSC in-depth
  - XML scenario definition – the sky is the limit!
  - Naming conversion – 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
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 units

- (Refresh of an entire system or parts of it)
To Clone or not to Clone?

- 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
The various ways/flavors of Cloning

Duplication of Subsystems

Data Sharing x members

Data Sharing y members

Non-Data Sharing

Non-Data Sharing

V8

SOURCE

V9

TARGET

Data Sharing

Non-Data Sharing

Data Sharing

Non-Data Sharing
The various ways of Cloning

- Duplication of Subsystems
  - Details about Source and Target
  - Scope of Cloning
  - Required Steps
  - Gotchas to watch out for
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 (aka. HSC)

- BTW
  - If the target is different (e.g. DB2 LUW → DB2 z/OS)
    → Heterogeneous System Copy (not addressed today)
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:
DSNZPARM, 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
Duplication of Subsystems

- Required Steps
  - Clone your source data
    - Dump via ADRDSSU
    - Split Mirror systems and break the mirror
    - FLASH Copy / Disk dump and then Restore
    - Any other method...
  - Stop the target system
  - Restore the source data
  - Rename (if naming should be different and/or target isn’t isolated from source)
  - Adjust LOGs, BSDSSs, DSNZPARM, DSNHDECP
  - Start target
  - 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)
Duplication of Subsystems

- Gotchas to watch out for
  - Assure a proper DFSMS definition if you want to exploit instant copy

![Diagram showing DB2 Logs, BSDS, Load Libraries, ICFCTLG DB2X96L, DB2X91L (DFSMS storage group), DSN$X91ASLG (DFSMS hsm copy pool), DB2 Catalog, DB2 Directory, ICFCTLG DB2X96A, DB2X91S (DFSMS storage group), DB2 User Data (in ICFCTLG DB2X96A), DB2X91 (DFSMS storage group), and DSN$X91ASDB (DFSMS copy pool).]
Duplication of Subsystems

- 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 to include the DB2 load libraries and changes the DB2 version of the target
Duplication of Subsystems

- **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 technology and DB2 features
  - Highest efficiency
Duplication of Subsystems

- How does a tool manage those issues?
  - **Instant CloningExpert for DB2 z/OS - HSC** component:
    - Dataset 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
Duplication of Subsystems

- 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)
Duplication of Subsystems

- 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
Duplication of Subsystems

And now a quick walk through the HSC component
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(lete), V(alidate)

Select the Scenario for HSC:

<table>
<thead>
<tr>
<th>SCENARIO TYPE DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>_________________________</td>
</tr>
<tr>
<td>_ DEFRFDR D CLONE FROM FULL VOLUME DUMP</td>
</tr>
<tr>
<td>_ DEFRFDRA D CLONE FROM FULL VOLUME DUMP AUTOMATED</td>
</tr>
<tr>
<td>_ DEFSOFF D CLONE NDS WITH SOURCE DB2 OFFLINE</td>
</tr>
</tbody>
</table>
Duplication of Subsystems

Screen Flow of the HSC component

Homogeneous System Copy ----- Scenario Control Menu -----------------------------
Command ===> MENU=ON SCENARIO=DEFRFDR 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+DSNHDECZP - Assemble and linkedit
9. Start DB2 - START Target DB2 ACCESS(MAINT)
10. VCAT SWITCH - Switch VCAT for all DB2 USER DATA
Duplication of Subsystems

XML scenario framework of the **HSC** component

```xml
<ftailor wait="02" allmemb="t"> <!-- FTOPEN -->
  <finclude>HSTSTOP</finclude> <!-- FTINCL -->
</ftailor> <!-- FTCLOSE -->
</jobsubmitlist>

<force>
  <ftailor temp="y"> <!-- FTOPEN -->
    <finclude>HSCVARS</finclude> <!-- FTINCL -->
  </ftailor>
</force>

<showmenu />

<jobsubmitlist prefix="CKSP">
  <description>Wait for STOP2 DB2</description>
  <ftailor> <!-- FTOPEN -->
    <finclude>HSTCKSP</finclude> <!-- FTINCL -->
  </ftailor> <!-- FTCLOSE -->
</jobsubmitlist>

<showmenu />

<displaypanel name="HSTRSBCK" confirm="y"/>

<showmenu />

<force>
  <ftailor temp="y"> <!-- FTOPEN -->
    <finclude>HSCVARS</finclude> <!-- FTINCL -->
  </ftailor>
</force>

<jobsubmitlist prefix="PRST">
  <description>rename/restore DB2</description>
  <if var="HSTENV" operator="EQ" val="D">
```

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Duplication of Subsystems

Screen Flow of the HSC component

Homogeneous System Copy ---- SOURCE Selection --------------- Row 5 from 13
Command ===> Source Selection

MENU=ON SCENARIO=DEFRFDR 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

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)
Duplication of Subsystems

Screen Flow of the HSC component

Homogeneous System Copy ---- Scenario Control Menu -----------------------------
Command ==> _ Scenario Control Menu 
MENU=ON SCENARIO=DEFRFDR 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

<table>
<thead>
<tr>
<th>Member</th>
<th>Prompt</th>
<th>Size</th>
<th>Created</th>
<th>StatusTime</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>INIT0001</td>
<td></td>
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<td>2010/04/22</td>
<td>2010/04/22 15:56:28</td>
<td>CC=0000</td>
</tr>
<tr>
<td>INIT0002</td>
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<td>2010/04/22</td>
<td>2010/04/22 15:56:26</td>
<td>SUBMIT</td>
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<tr>
<td>INIT0003</td>
<td></td>
<td>106</td>
<td>2010/04/22</td>
<td>2010/04/22 15:49:41</td>
<td>GENERAT</td>
</tr>
<tr>
<td>INIT0004</td>
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<td>106</td>
<td>2010/04/22</td>
<td>2010/04/22 15:49:41</td>
<td>GENERAT</td>
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<tr>
<td>INIT0005</td>
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<td>113</td>
<td>2010/04/22</td>
<td>2010/04/22 15:49:42</td>
<td>GENERAT</td>
</tr>
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<td>GENERAT</td>
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<tr>
<td>INIT0007</td>
<td></td>
<td>70</td>
<td>2010/04/22</td>
<td>2010/04/22 15:49:44</td>
<td>WAIT#01</td>
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<tr>
<td>INIT0008</td>
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<td>83</td>
<td>2010/04/22</td>
<td>2010/04/22 15:49:44</td>
<td>WAIT#01</td>
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<td>INIT0010</td>
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<td>82</td>
<td>2010/04/22</td>
<td>2010/04/22 15:49:46</td>
<td>WAIT#01</td>
</tr>
</tbody>
</table>

**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
The various ways / flavors of Cloning

Merge of systems/data
The various ways/flavors of Cloning

Duplication of systems/data
The various ways / flavors of Cloning

Refresh Cloning
The various ways of Cloning

- Merge/Duplication of systems/data

- Refresh of an entire system or parts of it
  - Details about Source and Target
  - Scope of Cloning
  - Required Steps
  - Gotchas to watch out for
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

→ Homogeneous Object Cloning (aka. HOC)
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
Merge/Duplication of systems/data

- Required steps
  - Define scope of objects
  - Determine depending objects like indexes, views, authorization, ... if desired
  - Extract DDL for resulting source objects
  - Extract data from resulting source objects
  - Apply naming conversion if desired
  - Run DDL on target
  - 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 ;-)
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
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
Merge/Duplication of systems/data

Bottom Line

→ Cloning DB2 objects isn’t rocket science, but there are some specialities 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 technology and DB2 features
  - Highest efficiency
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
  - Object/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
What are the key benefits of the **HOC** component?

- Supports and exploits storage subsystem instant copies like **Flashcopy2**
- 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
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

- Extract object data from source and generate DDL to run on target DB2
- 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
Merge/Duplication of systems/data

And now a quick walk through the HOC component
.merge/duplication of systems/data

screen flow of the hoc component

adho nd utility generator ------ main menu ----------------- version 1.10
command ===>

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)
4. settings
x. terminate ddl and utility generator

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Merge/Duplication of systems/data

Screen Flow of the **HOC** component

ADHOC nd Utility Generator ------ Collect Objects ----------------------------- DB2: 091A
Command ===>
Primary cmd: END, R(un), SE(up), t(ADD), S(how), RES(et)
ACTION (Run): DDL DDL,RST,ROI,CO
OBJECT TYPE: D(database) R(Tablespace) T(able) G(lobal temporary table) M(aterialized query table) X(Auxiliary table) I(index) A(lias) S(ynonym) V(iew)
CREATOR
NAME

Notes: Wildcards 'X' 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

<table>
<thead>
<tr>
<th>Creator</th>
<th>Name</th>
<th>Group_member</th>
<th>Type</th>
<th>Encoding_scheme</th>
<th>Created by</th>
<th>Created timestamp</th>
<th>Altered timestamp</th>
<th>Index bufferpool</th>
<th>Created timestamp</th>
<th>Altered timestamp</th>
<th>Index bufferpool</th>
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<tbody>
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<td></td>
<td></td>
<td>SYSDEFLT</td>
<td>BP0</td>
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</tr>
</tbody>
</table>

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Merge/Duplication of systems/data

Screen Flow of the **HOC** component

<table>
<thead>
<tr>
<th>Category</th>
<th>Setting</th>
<th>Value</th>
<th>Valid Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>READ INTERVAL FOR OBJECTS</td>
<td></td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>CURRENT SQLID</td>
<td></td>
<td></td>
<td>50 to 2000</td>
</tr>
<tr>
<td>DEPENDENCY DDL</td>
<td></td>
<td></td>
<td>&amp;USERID</td>
</tr>
<tr>
<td>GRANTS</td>
<td></td>
<td></td>
<td>CHAR(06)</td>
</tr>
<tr>
<td>DEFINE</td>
<td></td>
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</tr>
<tr>
<td>GEN USER IDCAMS</td>
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<td>Y/N</td>
</tr>
<tr>
<td>LITERAL APOST</td>
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</tr>
<tr>
<td>DECIMAL POINT</td>
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<td>Y/N/A</td>
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<td></td>
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<td>ON/OFF</td>
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</table>
Merge/Duplication of systems/data

Screen Flow of the HOC component

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Merge/Duplication of systems/data

Screen Flow of the HOC component

```
ADHOC nd Utility Generator ----- Change Data --------------------
EDIT  SYS10256.T013117.RA000.HEINRIC.R010364?  Columns 00001 00072
Command ===) ___________________ Scroll ===) CSR

000001  -- GRANTS BP  "BP0"
000002  SET CURRENT SQLID = 'HENN'  ;
000003  GRANT USE OF BUFFERPOOL BP0
000004  TO PUBLIC
000005  ;
000006  -- DATABASE  "AD001"
000007  SET CURRENT SQLID = 'VOELKEN'
000008  CREATE DATABASE "AD001"
000009  BUFFERPOOL BP0
000010  INDEXBP BP0
000011  STOGROUP SYSDEFLT
000012  CCSID 0
000013  ;
000135  -- GRANTS DB  "DSNDB04"
000136  SET CURRENT SQLID = 'HENN'  ;
000137  GRANT CREATETAB
000138  ON DATABASE "DSNDB04"
000140  TO PUBLIC
000141  ;
000142  COMMIT ;
000248  -- TABLESPACE  "AD001","AS19"
000249  SET CURRENT SQLID = 'VOELKEN'  ;
000250  CREATE TABLESPACE "AS19"
000251  IN "AD001"
000252  USING STOGROUP SYSDEFLT
000253  PRIOTY 12 SECQTY 4
000254  ERASE NO
000255  FREEPAGE 0
000256  PGTFREE 0
000257  GBPACHE CHANGED
000258  TRACKMOD YES
000259  LOG... YES

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```
Merge/Duplication of systems/data

Screen Flow of the HOC component

```
ADHOC Utility Generator ----> Change Data
EDIT SYS10256.T013117.RA000.HEINRIC.R0103647
Command ==>   CSEL YES
000265    COMPRESS YES
000266    CSSID EBCDIC
000267    MAXROWS 255
000268    SEGSIZE 4
000269 ;
--- --- - - - - - - - - - - - - - - - - - - - 5580 Line(s) not Displayed
005850 -- TABLE "VOELKEN","AT131"
005851   SET CURRENT SOLID = 'HEINRIC'
005852   CREATE TABLE "VOELKEN","AT131"
005853      ("XCOUNT")
005854      WITH DEFAULT
005855      ","X01"
005856      WITH DEFAULT
005857      ","X02"
005858      WITH DEFAULT
005859      ","X03"
005860      WITH DEFAULT
005861      ","X04"
005862      WITH DEFAULT
005863      ","X05"
005864      WITH DEFAULT
005865      ","X06"
005866      WITH DEFAULT
005867      ","X07"
005868      WITH DEFAULT
005869      ","X08"
005870      WITH DEFAULT
005871      ","X09"
005872      WITH DEFAULT
005873      WITH DEFAULT
005874      WITH DEFAULT
005875      WITH DEFAULT
005876      WITH DEFAULT
005877      WITH DEFAULT
005878      WITH DEFAULT
005879      WITH DEFAULT
005880      WITH DEFAULT
```

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Merge/Duplication of systems/data

Screen Flow of the HOC component

```
ADHOC nd Utility Generator ---- Change Data
EDIT SYS10256.T013117.RA000.HEINRIC.R0103647
Command ==> 
005880 WITH DEFAULT 
005884 "X11" CHAR( 254) FOR SBCS DATA NOT NULL
005885 
005886 WITH DEFAULT 
005887 "X12" CHAR( 254) FOR SBCS DATA NOT NULL
005888 
005889 WITH DEFAULT 
005890 "X13" CHAR( 254) FOR SBCS DATA NOT NULL
005891 
005892 WITH DEFAULT 
005893 "X14" CHAR( 254) FOR SBCS DATA NOT NULL
005894 
005895 WITH DEFAULT 
005896 "X15" CHAR( 254) FOR SBCS DATA NOT NULL
005897 
005898 WITH DEFAULT 
005899 "X16" CHAR( 254) FOR SBCS DATA NOT NULL
005900 
005901 WITH DEFAULT 
005902 "X17" CHAR( 190) FOR SBCS DATA NOT NULL
005903 
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 SEQQTY 4
005921 
```

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Merge/Duplication of systems/data

Screen Flow of the **HOC** component

<table>
<thead>
<tr>
<th>ADHOC nd Utility Generator</th>
<th>Change Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDIT</td>
<td>SYS10256.T013117.RA000.HEINRIC.R0103647</td>
</tr>
</tbody>
</table>
| Command                    | Columns \(**00001** \(**00072**
|                           | Scroll \(**CSR**
|                           | 005926
|                           | 005924
|                           | 005925
|                           | 005926
|                           | 005922
|                           | 005926
|                           | 005929
|                           | 005930
|                           | ;
|                           | 013476
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|                           | 013478
|                           | 013479
|                           | 013480
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|                           | 013498
|                           | 013499
|                           | 013500
|                           | 013501
|                           | 013502

```
@13476 -- GTT                "IDUG610"."ADB2_TODO_TABLE"
@13477 CREATE GLOBAL TEMPORARY TABLE "IDUG610"."ADB2_TODO_TABLE"
@13478 ('RTYPE"                     CHAR(8) FOR SBCS DATA NOT NULL
@13479 "QUALIFIER"
@13480 "NAME1"
@13481 "NAME2"
@13482 "VERSION"
@13483 "OWNER"
@13484 "PLAN"
@13485 "STMTNO"
@13486 "QUERYNO"
@13487 "CONTOKEN"
@13488 "VTYPE"
@13489 "DATASET"
@13490 "MEMBER"
@13491 "DDNAME"
```
Screen Flow of the **HOC** component

```
ADHOC nd Utility Generator ---- Change Data ____________________________________________
EDIT SYST0256.T013117.RA000.HEINRIC.R010364? Columns 00001 00072

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" "IDUG610"
013614  SET CURRENT SOLID = 'HEINRIC';
013615  CREATE ALIAS "IDUG610" "IDUGHGT0"
013616  FOR "IDUG610","IDUGHGT0"
013617 ;
```

---

```
045455  -- RI FOR TABLE "IDUG610" "IDUG610"
045456  ALTER TABLE "IDUG610" "IDUG610"
045457  ADD CONSTRAINT IDUGHX51
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 ;
```

---

```
046356  -- TRIGGER "IQ1A_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 RSOOLD
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)
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
The real world example

Base Clone using HSC

Partial Clone using HOC

New DATA SHARING Group DB2P

Partial Clone using HOC
The real world example

- The steps of the procedure
  - Base clone of first NDS DB2 using \textbf{HSC}
    - Backup system used for data consistency
    - Restore source volumes and fast rename (new naming conventions applied DSN $\rightarrow$ DB2P)
    - Start Target DB2 Access Maint and Alter/Switch VCAT
    - Apply source Bufferpool-Settings
The real world example

The steps of the procedure

- Partial clone of second to last NDS DB2 using \texttt{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
The real world example

DSN 1-4

BIX Analysis

DB2P

SQL Explain

PLAN TABLE

SHADOW

SHADOW

SYSPKGE

SYSPLAN

SYSPKGE

SYSPLAN

DSN

DSN

DSC

Snapshot

Dyn. EXPLAIN

Dyn. EXPLAIN

PLAN TABLE

REBIND Cards

Batch report

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The real world example

The steps of the procedure

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

- **Recovery AssuranceExpert**

  to check 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 logging for the DS environment
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.
Summary

- **Instant CloningExpert - ICE**
  - 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

  → *Your Cookie Cutter for DB2*