Bill Anani – DB2 Systems Programmer

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How to Simplify SAP and DB2 for z/OS Upgrades and Maintenance

Agenda

Who is AIG?

Environment overview

DB2 and SAP upgrade and maintenance challenges

IBM DB2 Cloning Tool overview

How AIG uses Cloning Tool with DB2

How AIG uses Cloning Tool with SAP

Summary

Who is AIG?

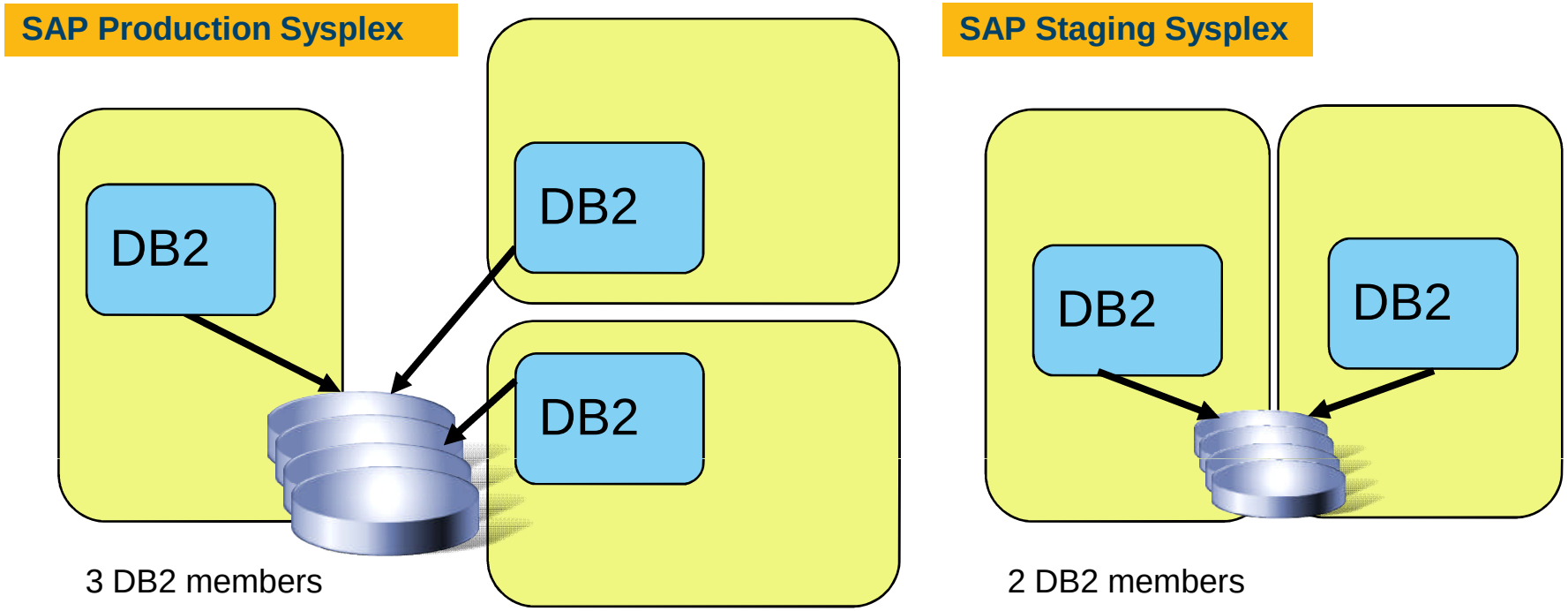
- American International Group, Inc. (AIG) has been in business for 90+ years
- Serves client in over 130+ countries worldwide
- 2012 Revenue of over $65B
- Over 18+M U.S. Employees use AIG retirement services
- Employs more than 63,000

More information can be found at www.aig.com

The AIG DB2 Environment

- AIG has a large DB2 SAP for z/OS environment of 167 subsystems
- Our DB2 applications also involve:
  - Websphere
  - Legacy applications
  - Other applications inherited by acquisition
- We have several DB2 environments:
  - Production
  - Sand box
  - Staging
  - Development
  - Test
- Currently a mix of DB2 9 and 10:
  - DB2 10 in production
  - Remaining subsystems in process of or have recently migrated from DB2 9 to DB2 10

AIG DB2 SAP Landscape

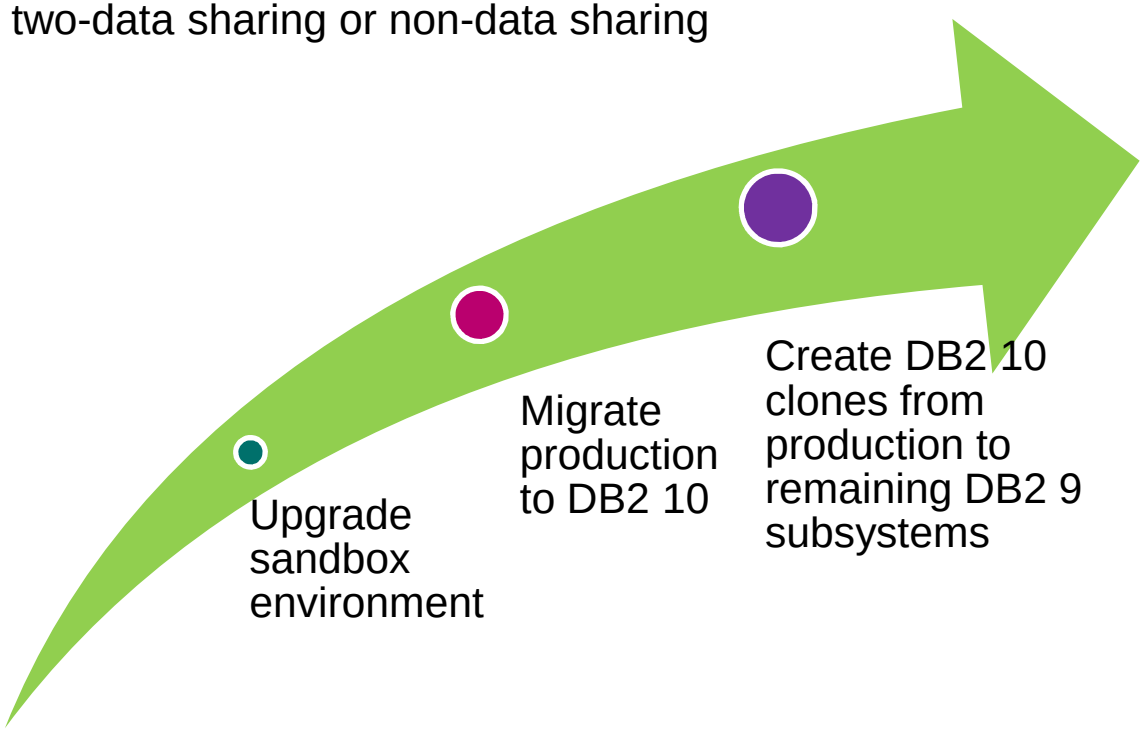


Challenges in managing DB2 Clones

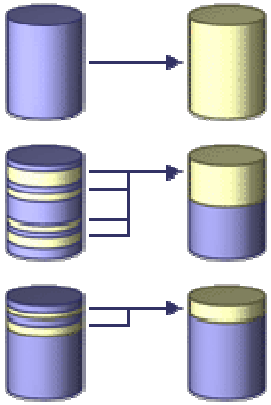
- AIG Complexity
  - Size: 167 subsystems for SAP, 230 total DB2 subsystems (including SAP)
  - Storage: 5 Terabytes of storage
  - When SAP was on distributed systems, cloning took an average of two weeks
    - Using Cloning Tool with DB2 for z/OS, significantly reduces time and effort (average is 2 hrs)
  - Because of Cloning Tool and DB2 z/OS, AIG now easily performs increased number of clones (average of 3 clones/week)
- The biggest challenge in managing AIG DB2/SAP environment is how AIG syncs up its environment:
  - AIG clones its production system to create test systems with different members in the other test environments
    - DB2 V9 prevented you dropping a member(s) from a data sharing group. This restriction has been removed in DB2 V10. In general, creating clones in DB2 is difficult on the same LPAR or non-isolated LPAR without a tool
  - DB2 is very sensitive to its identifiers, for example, dataset names referenced in the DB2 catalog, directory, and BSDS
    - Merely replicating the DB2 system does not make the target system independent without conditioning and can corrupt the source
- Being up-to-date on DB2 maintenance is important
  - AIG clones production to staging
  - Applies maintenance in staging
  - When all is tested, roll the maintenance to production

AIG DB2 Version Upgrade and Cloning

- DB2 Migration Process
  - Upgraded to DB2 10 in October 2013
  - Use sandbox environment to resolve any migration issues for minor landscape
    - Resolve any migration issues in sandbox
    - When confident, migrate production environment to DB2 10
    - Create DB2 10 clones for remaining DB2 9 subsystems
  - Clone from DB2 10 3-way data sharing production environment to either two-data sharing or non-data sharing



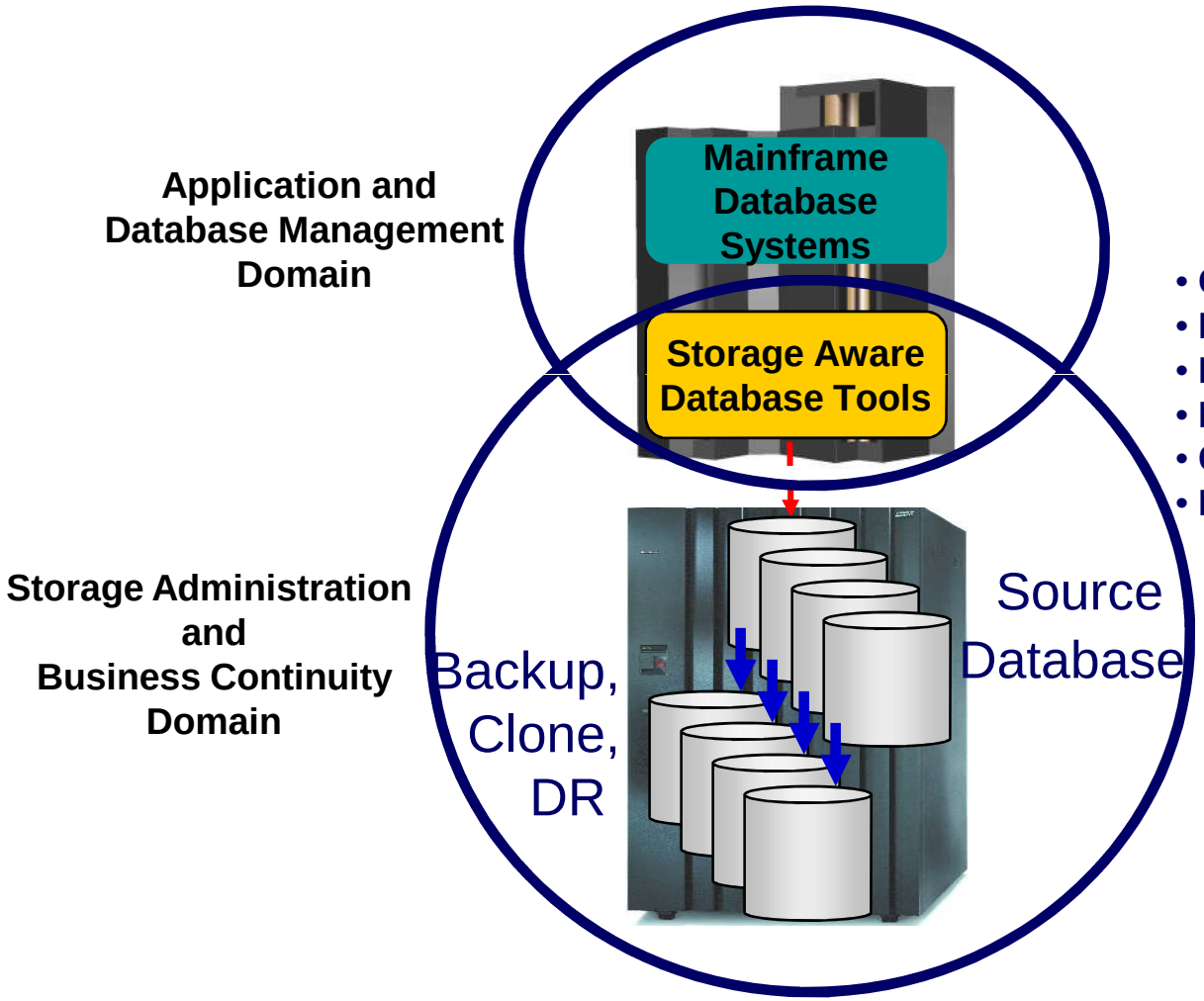
Overview - IBM DB2 Cloning Tool



- Creates Volume-based Clones
- Clones a DB2 subsystem (volume level) AND DB2 objects (Dataset level)
  - Renames and catalogs the data sets, fixes the volume internals, optionally updates all DB2 internal control information
  - No requirement for a clone in a separate LPAR
  - Supports DB2, PeopleSoft, and SAP

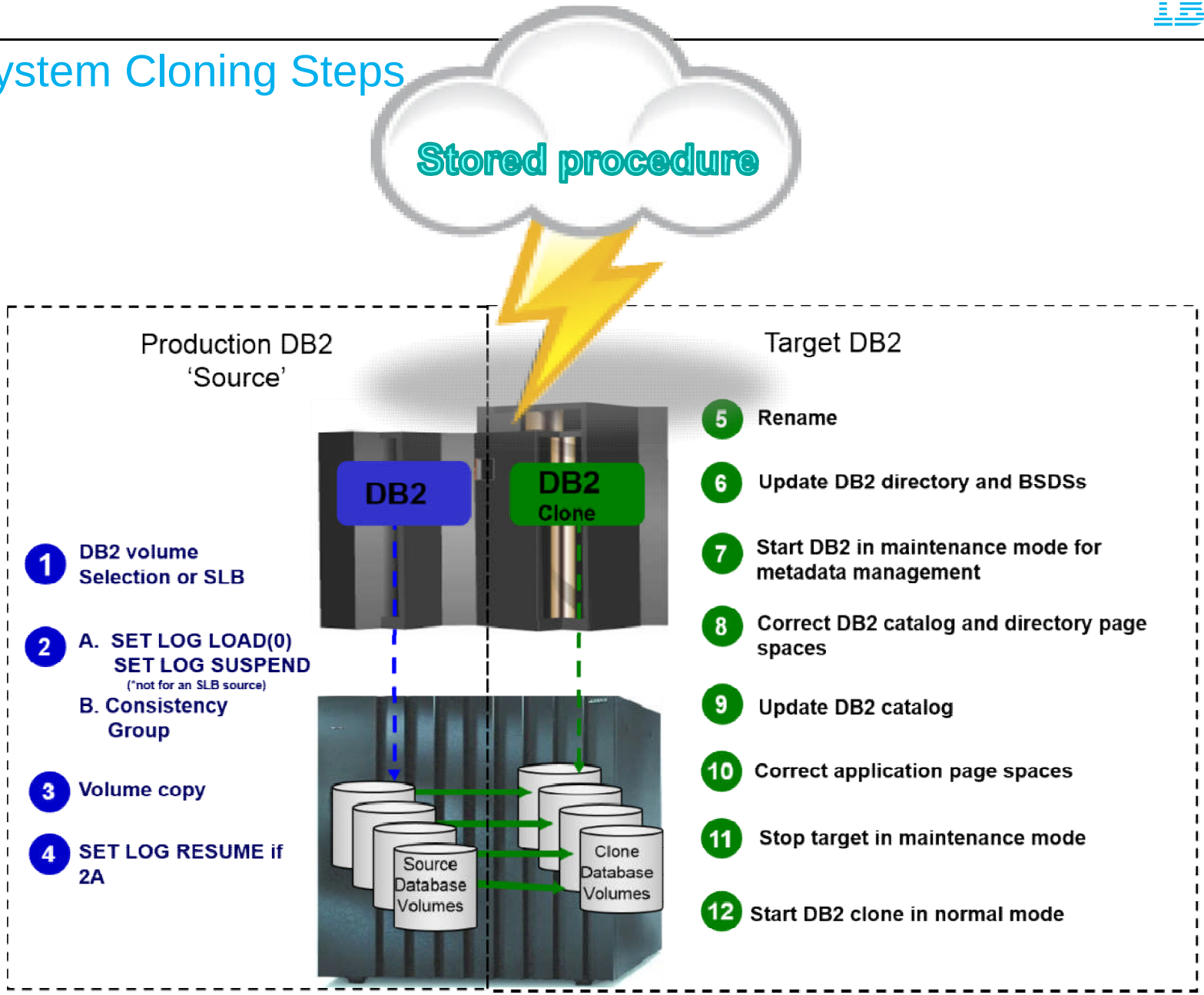
- Is extremely fast and cost effective
  - Disk vendor independent
    - Uses any snap, mirror or PIT copy, only volumes are eligible for cloning
  - Reduces production online downtime when cloning - takes just minutes or less
  - Dramatically reduces costs of traditional methods
    - Automates the cloning process, with less manual intervention and monitoring
    - No host CPU or I/O resources when using fast replication
    - Eliminates the need to shut down DB2
    - Provides virtually 24x7 access to customer data

DB2 Cloning Tool – how does it copy so fast?
Database and Storage Integration



- Organizational Integration
- New Backup Methods
- New Recovery Strategies
- Business Recovery Monitoring
- Cloning Automation
- Disaster Restart Solutions

DB2 System Cloning Steps



AIG DB2 SAP and other Applications and Cloning

- The DB2 SAP environment was well planned at AIG
  - Everything was geared for System Level Backups (SLB)s
    - This allows consistent capture of an entire DB2 system
  - Each DB2 system, its data and active logs were specified in unique copy pools
    - Everything was set in place so that it was made ready by the storage group to the database group that manages SAP
  - Do online clones and clones from backup tapes
    - 90% from backup tapes
    - SLBs are offloaded to tape (driven by IBM DB2 Recovery Expert for z/OS)
- Cloning processes used mainly for SAP, but have started also using for legacy subsystems and applications
  - Cloning done at object level
  - Used in production environment for quarterly reporting

AIG Customized ISPF Interface

- Since the tasks and methodology used are specific for our process, we created a customized ISPF interface to streamline our input to the process
  - When AIG first used Cloning Tool, batch was only available option
    - AIG customized ISPF screens for specific usage
  - Our AIG ISPF interface does not resemble the ISPF interface delivered with DB2 Cloning tool
  - AIG jobs and DB2 Cloning Tool jobs are created and sequenced in our required order

DB2 Cloning Tool Implementation at AIG
Technical Details

AIG customized panel for cloning on a sub-system level: Main Menu

Scenario: Clone production, which is three way data sharing, to development Sub-system, which is non-data sharing, from the tape backups.

```
SOXA --------------------  DB2 CLONE MAIN MENU --------------------
OPTION  ===> TAP_

  TAP - RTAP        - CLONE RESTORE FROM BACKUP ON TAPE
  DSD - RDSD        - CLONE RESTORE FROM BACKUP ON DASD
  ONL - RONL        - CLONE RESTORE FROM LIVE SOURCE DB2

  X   - EXIT        - EXIT
```

Clone to staging: For resolving any pages in LPL and GRECP status

Production sub-system is cloned to a staging, with three way data sharing sub-system, since all members must be cloned.

```
S0XA --------------------  DB2 TAPE CLONE MAIN MENU --------------------
OPTION  ===> PTD_

  PTD - PTOD        - PRODUCTION TO STAGE TO DEV
  PTQ - PTOQ        - PRODUCTION TO STAGE TO QA
  QTD - QTOD        - QA TO STAGE TO DEV
  DTD - DTOD        - DEV TO DEV (NO DATA SHARING)

  X   - EXIT        - EXIT
```

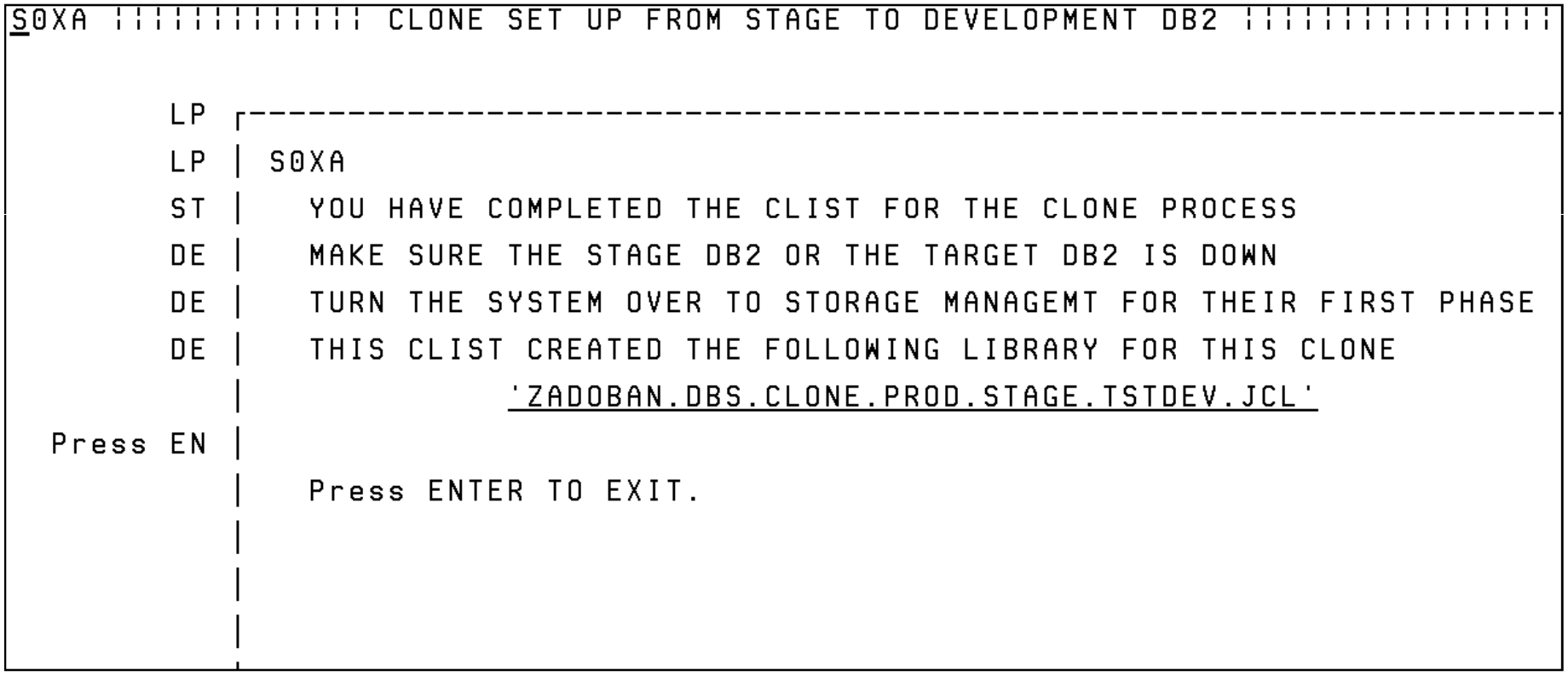
Note: LPL = Logical Page List
GRECP = Group Recovery Pending

Set up: Specify LPAR, SSID, User catalog Vol, TCPIP Port,..

```
S0XA ¦¦¦¦¦¦¦¦¦¦¦¦¦¦ CLONE SET UP FROM PRODUCTION TO STAGE DB2

        LPAR FOR PRIMARY STAGE DB2 SUBSYSTEM   ===> s0qa
        LPAR FOR PRODUCTION DB2 SUBSYSTEM      ===> s0pc
        PRODUCTION DB2 SUBSYSTEM PRIMARY SSID  ===> bwp1
        STAGE DB2 SUBSYSTEM PRIMARY SSID       ===> dbs1
        PROD VOL DB2CAT.lpar.ssid* LG USERCAT  ===> PBWPL1
        PROD VOL DB2CAT.lpar.ssid* SY USERCAT  ===> PBWPS1
        PROD VOL DB2CAT.lpar.ssid* US USERCAT  ===> PBWP72

  Press ENTER to submit.    PF3 to cancel.
```

```
S0XA ¦¦¦¦¦¦¦¦¦¦¦¦¦¦ CLONE SET UP FROM STAGE TO DEVELOPMENT DB2

        LPAR FOR THE DEVELOPMENT DB2 SUBSYSTEM ===> s0xa
        LPAR FOR THE STAGE DB2 BEING USED      ===> dbs1
        STAGE DB2 PRIMARY SSID                 ===> dbs1
        DEVELOPMENT DB2 SUBSYSTEM              ===> bq21
        DEVELOPMENT DB2 TCPIP PORT             ===> 5041
        DEVELOPMENT DB2 TCPIP RESPORT          ===> 5042

  Press ENTER to submit.    PF3 to cancel.
```

Generates the jobs for cloning: When hit Enter



Online Cloning at AIG – Customized ISPF Screens

Online Clone development to development, both non-data sharing.

```
S0XA ---------------------  DB2 CLONE MAIN MENU ---------------------
OPTION  ===>  onl_

  TAP - RTAP          - CLONE RESTORE FROM BACKUP ON TAPE
  DSD - RDSD          - CLONE RESTORE FROM BACKUP ON DASD
  ONL - RONL          - CLONE RESTORE FROM LIVE SOURCE DB2

  X   - EXIT          - EXIT
```

```
S0XA -------------- DB2 ONLINE CLONE MAIN MENU ----------------------
OPTION  ===>  DTD

  PTD - PTOD          - PRODUCTION TO STAGE TO DEV
  PTQ - PTOQ          - PRODUCTION TO STAGE TO QA
  QTD - QTOD          - QA TO STAGE TO DEV
  DTD - DTOD          - DEV TO DEV (NO DATA SHARING)

  X   - EXIT          - EXIT
```

Specify LPAR, SSID for Source & Target, ICF Catalog Vol, Target TCPIP port,…

```
S0XA !!!!!!!!!!!!!!!!!!!! CLONE SET UP FROM DEV TO DEV !!!

          TARGET LPAR                    ===> sap1
          SOURCE LPAR                    ===> s0da
          SOURCE DB2 SUBSYSTEM           ===> bd31
          TARGET DB2 SUBSYSTEM           ===> bd21
          TARGET TCPIP PORT              ===> 5111
          TARGET TCPIP RESPORT           ===> 5112
          SOURCE DB2CAT.LPAR.SSID LG     ===> DBD3L1
          SOURCE DB2CAT.LPAR.SSID SY     ===> DBD3S3
          SOURCE DB2CAT.LPAR.SSID US     ===> DBD305

   Press ENTER to submit.    PF3 to cancel.
```

Generates the jobs for cloning.

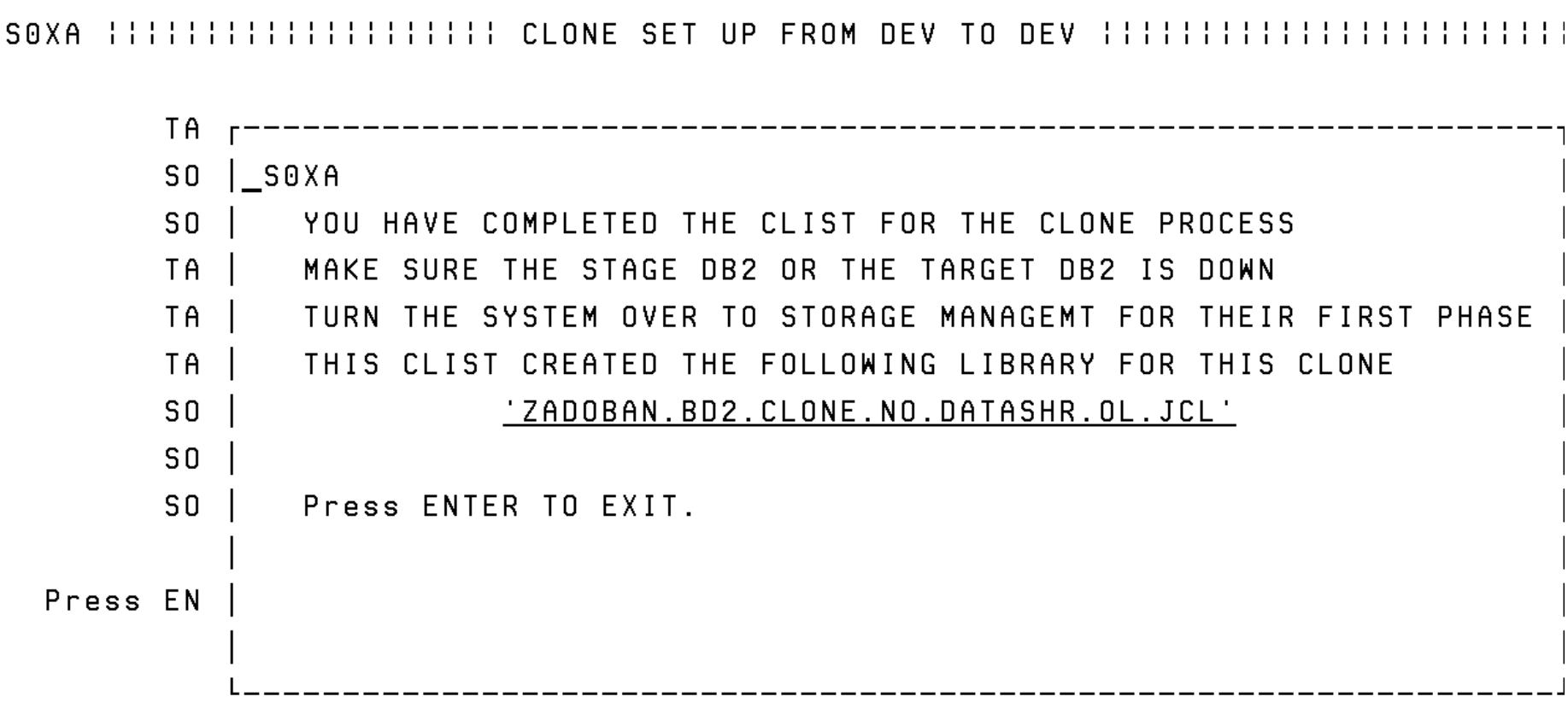


Table Space Cloning at AIG
Using the standard DB2 Cloning Tool ISPF interface

Tablespace Cloning: Profile specifies Source, Target and TCPIP server- Here we will view the profile, that has already been created.

```
                        DB2 Tablespace Clone Profile Display
Command ===>                                                     Scroll ===> PAGE

Commands:         C - Create
Line Commands: B - Build   D - Delete   E - Edit   R - Rename   V - View   C - Copy

Profile Like . . . *
Creator Like . . . *
                                                                   Row 1 of 2    >
                                                  Share
Cmd  Name                                Creator  Option     Description
____ DB2TN TO SCID CLONE                 ZADOBAN  UPDATE     DB2TN TO SCID CLONE
____ DB2T TO SCID CLONE                  ZADSGHA  UPDATE     DB2T TO SCID CLONE
```

View the Source:

```
                        View DB2 Tablespace Clone Profile
Option ===> 1_

Creator . . . : ZADSGHA       Name . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE                  >

1  Source job
2  Target job
3  Report job
4  TCPIP Server job
```

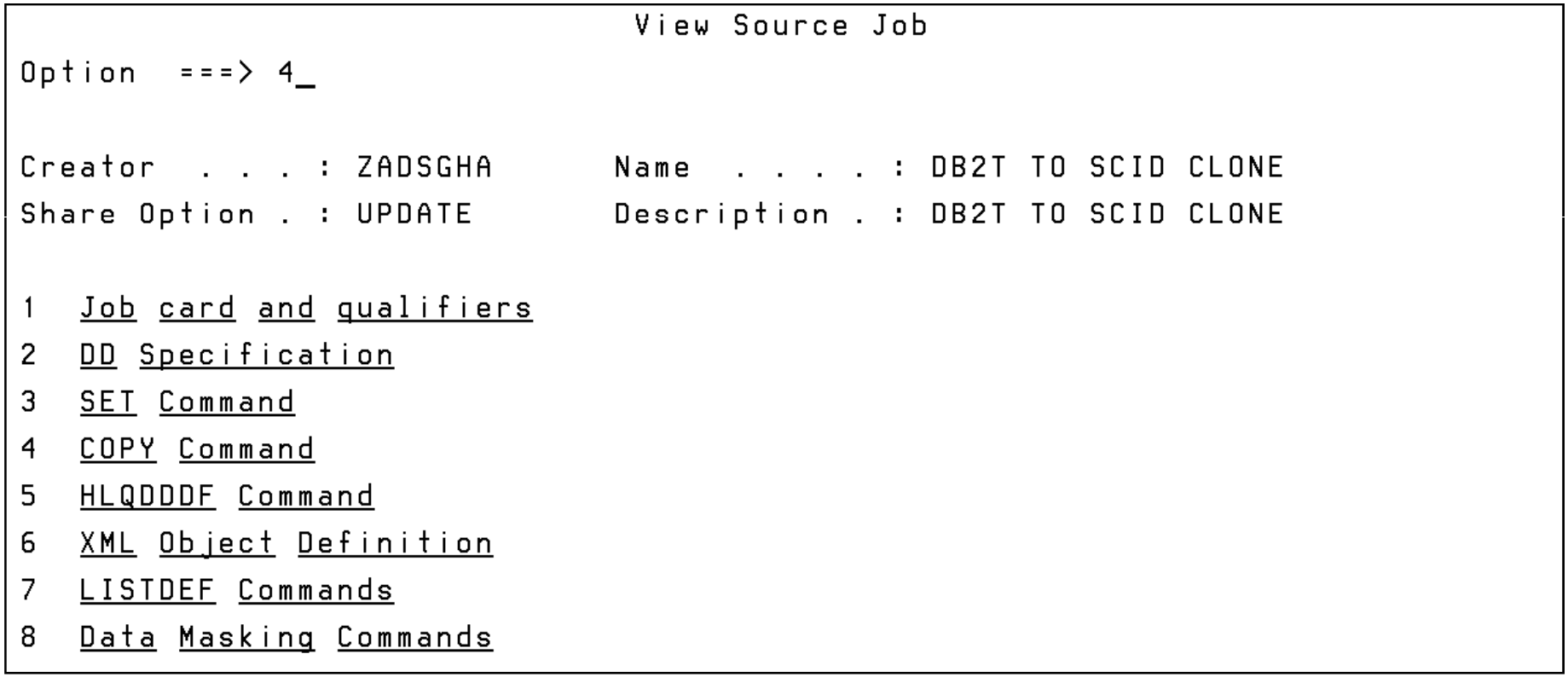
Set Command specifies the Source DB2 subsystem and the default SQLID. It can also over-ride several parameters in the PARMLIB CKZINI member.

```
Option  ===> 3_

Creator  . . . : ZADSGHA       Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE        Description . : DB2T TO SCID CLONE

1  Job card and qualifiers
2  DD Specification
3  SET Command
4  COPY Command
5  HLQDDDF Command
6  XML Object Definition
7  LISTDEF Commands
8  Data Masking Commands
```

SET Command:

```
                    DB2 tablespace clone SET Command
Command ===>

Commands: A - View ADVISORY-STATUS-VALUES R - View RESTRICT-STATUS-VALUES
          I - View TEMPLATE-VARIABLES I - View DB2 SSID

Creator  . . . : ZADSGHA      Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE
                                                              More:     +
LOCAL-SSID  . . . . . . . . . . . : DBT1      (asterisk to select from list)
ADVISORY-STATUS-VALUES  . . . . . : NO        (Yes/No)
DEFAULT-SQLID . . . . . . . . . . : ZADSSYS
DB2-COMMAND-RESPONSE-WAIT(secs) . : 60        (0-99999)
DB2-PLAN  . . . . . . . . . . . . : CKZPLAN
IP-VERSION6 . . . . . . . . . . . : NO        (Yes/No)
MAX-COPYRC  . . . . . . . . . . . : 0         (0, 4, or 8)
MAX-RC  . . . . . . . . . . . . . : 0         (0, 4)
MAX-SUBTASKS  . . . . . . . . . . : 5         (1-99)
SUBTASK-TERMINATION-WAIT  . . . . : 60        (0-9999)
MERGE-PRINT . . . . . . . . . . . : NO        (Yes/No)
RESTRICT-STATUS-VALUES  . . . . . : NO        (Yes/No)
TCPIP-SERVER-PORT . . . . . . . . : 65535     (1-65535)
TCPIP-STC-NAME  . . . . . . . . . : TCPIP
TEMPLATE-VARIABLE . . . . . . . . : NO        (Yes/No)
```

The COPY command specifies the **target** DB2 subsystem and also specifies whether Cloning Tool or the User will control the copy operation.



Copy Command: Source and Target have the same object names, and same exact structures, hence no need of Object Translate masks

```
                        DB2 tablespace clone COPY Command
Command ===> _

Commands: S - View SOURCE-PREFETCH-DATABASE-LIST O - View OBJECT-TRANSLATE
          T - View TARGET-PREFETCH-DATABASE-LIST J - View JOB-TEMPLATE
          D - View DDL-ATTRIBUTE-CHANGE L - View LOG-APPLY I - View DB2 SSID

Creator  . . . : ZADSGHA      Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE
                                                              More:     +
TARGET-DB2 SSID  . . . . . . . . . . : SCID      (asterisk to select from list)
  LOCATION . . . . . . . . . . . . . : SCID
  USERID . . . . . . . . . . . . . . :
  PASSWORD . . . . . . . . . . . . . .
  SERVER-IP  . . . . . . . . . . . . : [redacted]
  SERVER-PORT  . . . . . . . . . . . : [redacted]
  DEFVCAT  . . . . . . . . . . . . . : SCI
DATA-MOVER PGM . . . . . . . . . . . : ADRDSSU       (ADRDSSU, EMCAPI, or NONE)
  FASTREP  . . . . . . . . . . . . . : PREF          (PREF, REQ, or NONE)
  FCTOPPRCPRIMARY  . . . . . . . . . : NO            (Yes, No, PRESMIRREQ,
                                                      PRESMIRPREF, or
                                                      PRESMIRNONE)
  CMDDDNAME  . . . . . . . . . . . . :
PROCESS-DDL DDL-ENABLE . . . . . . . : NO          (Yes/No)
```

LISTDEF Commands specifies the set of table spaces/index spaces for refresh. *The DB2 Cloning Tool's LISTDEF is a subset of DB2 LISTDEF and obeys most LISTDEF rules and syntax.*

```
                                View Source Job
Option  ===> 7_

Creator  . . . : ZADSGHA      Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE

1  Job card and qualifiers
2  DD Specification
3  SET Command
4  COPY Command
5  HLQDDDF Command
6  XML Object Definition
7  LISTDEF Commands
8  Data Masking Commands
```

Configuring the LISTDEF Command:

```
                    DB2 Tablespace Clone LISTDEF Commands
Command ===> v_                                          Scroll ===> PAGE

Line Commands: V - View

Creator  . . . : ZADSGHA      Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE

List Name  . . : SACTEPRM

                                                          Row 1 of 1    >

  Incl Type       Obj  Object Specification     Object Specification
  Excl Spec Copy  Type Qualifier 1              Qualifier 2             PLevel
_ I    TS         TS   AAAAADB2                 SACTEPRM
```

LISTDEF command- View

```
                              View LISTDEF Command
Option ===> _

Creator  . . . : ZADSGHA      Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE

Include/Exclude  . . . . . . . . . : INCLUDE     (INCLUDE, EXCLUDE)
Type Specification . . . . . . . . : TABLESPACE  (TABLESPACE, INDEXSPACE)
Copy . . . . . . . . . . . . . . . : NO          (Yes/No)
Object Type  . . . . . . . . . . . : TABLESPACE  (DATABASE, TABLESPACE,
                                                  INDEXSPACE, TABLE, INDEX, or
                                                  STOGROUP)
Object Specification Qualifier 1 . : AAAAADB2                              >
Object Specification Qualifier 2 . : SACTEPRM                              >
Partlevel  . . . . . . . . . . . . :
RI . . . . . . . . . . . . . . . . : NO          (Yes/No)
LOB Indicator Keywords . . . . . . :             (ALL, LOB, BASE, XML, or
                                                  blank)
Cloned . . . . . . . . . . . . . . : NO          (Yes, No, or blank)
```

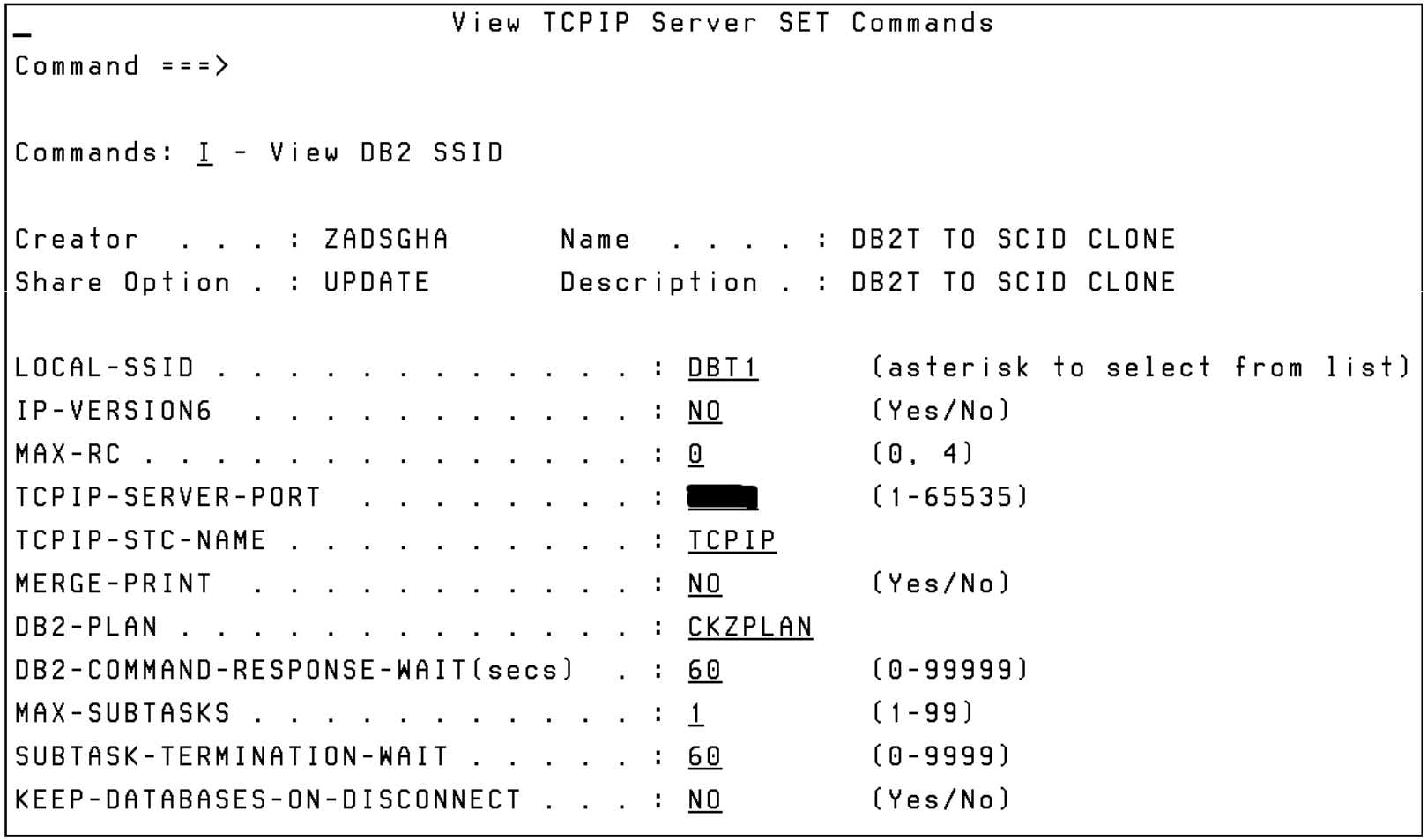
Configuring Target:

```
                        View DB2 Tablespace Clone Profile
Option ===> 2_

Creator  . . . : ZADSGHA      Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE       Description . : DB2T TO SCID CLONE          >

1  Source job
2  Target job
3  Report job
4  TCPIP Server job
```

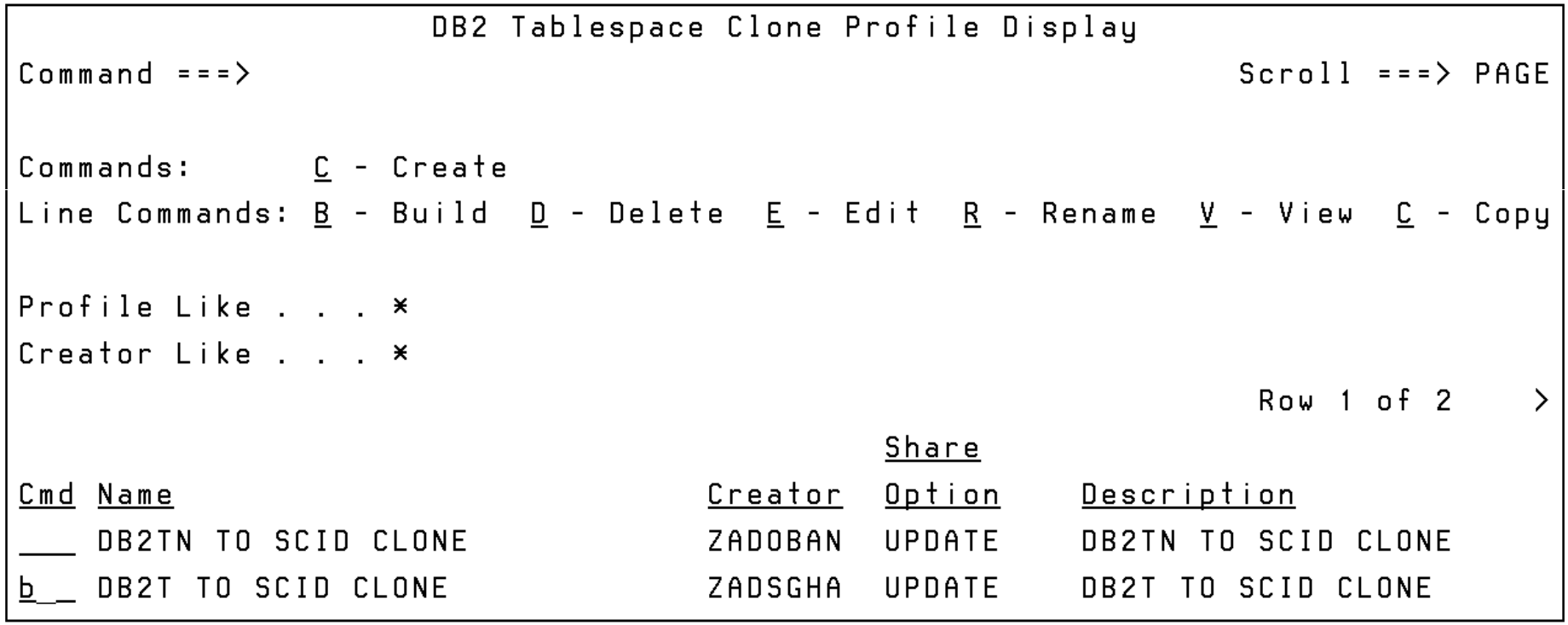
TCPIP Server Job Configuration:

```
                          View DB2 Tablespace Clone Profile
Option ===> 4_

Creator  . . . : ZADSGHA       Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE        Description . : DB2T TO SCID CLONE

1  Source job
2  Target job
3  Report job
4  TCPIP Server job
```

TCPIP Server Job:



Build JCL from the profile for table space refresh



Generate Source and Target jobs

```
                        Build DB2 tablespace clone jobs
Option ===> 1_

1  Generate Source and Target Jobs
2  Generate Report Job
3  Generate TCPIP Server Job
```

```
                        Generate Source and Target Jobs
Option  ===> _

Creator  . . . : ZADSGHA       Name  . . . . : DB2T TO SCID CLONE
Share Option . : UPDATE        Description . : DB2T TO SCID CLONE

Data set name  . . . . . . ZADOBAN.CKZ.TBSJCLLB
Source member name . . . . CKZSRCJB
Target member name . . . . CKZTGTJB

Processing options
  Enter "/" to select option
  /  Review Source Job
  /  Review Target Job
        n if jobs, LISTDEF, or MASKDEF already exist
     Warn if jobs, LISTDEF, or MASKDEF were edited outside the panels
```

Generated JCL to be run on the source side

```
EDIT       ZADOBAN.CKZ.TBSJCLLB(CKZSRCJB) - 01.00          Columns 00001 00072
Command ===>                                                  Scroll ===> CSR
000006 //S1      EXEC PGM=CKZ00500,REGION=0M
000007 //STEPLIB  DD  DISP=SHR,DSN=DB2.DDDD.CLONE.SCKZLOAD
000008 //         DD  DISP=SHR,DSN='DB2.DB2T.DSNEXIT'
000009 //         DD  DISP=SHR,DSN='DB2.DB2T.DSNLOAD'
000010 //CKZINI   DD  DISP=SHR,DSN=DB2.DDDD.CLONE.SCKZPARM(CKZINI)
000011 //CKZLOG   DD  SYSOUT=*
000012 //CKZPRINT DD  SYSOUT=*
000013 //CKZLSTDF DD  DISP=SHR,DSN=DB2.DDDD.CLONE.LISTDEF(LSTDMBR)
000014 //CKZSDBT1 DD  DISP=OLD,DSN=DB2.DDDD.CLONE.SYNCDB2(LSTDMBR)
000015 //CKZQDBT1 DD  DISP=OLD,DSN=DB2.DDDD.CLONE.SQLOUT(LSTDMBR)
000016 //CKZERROR DD  SYSOUT=*
000017 //CKZIN    DD  *
000018       SET                  -
000019           LOCAL-SSID(DBT1) -
000020           DEFAULT-SQLID(ZADSSYS) -
000021           TCPIP-SERVER-PORT(65535) -
000022           TCPIP-STC-NAME(TCPIP) -
000023           MAX-RC(0) -
000024           MAX-COPY-RC(0) -
000025           DB2-COMMAND-RESPONSE-WAIT(60) -
000026           DB2-PLAN(CKZPLAN) -
```

Generated JCL to be run on the Target side

```
EDIT       ZADOBAN.CKZ.TBSJCLLB(CKZTGTJB) - 01.00          Columns 00001 00072
Command ===>                                                Scroll ===> CSR
000006 //S1  _    EXEC PGM=CKZ00500,REGION=0M
000007 //STEPLIB  DD  DISP=SHR,DSN=DB2.DDDD.CLONE.SCKZLOAD
000008 //         DD  DISP=SHR,DSN='SCID.DSNEXIT'
000009 //         DD  DISP=SHR,DSN='SCID.DSNLOAD'
000010 //CKZINI   DD  DISP=SHR,DSN=DB2.DDDD.CLONE.SCKZPARM(CKZINI)
000011 //CKZLOG   DD  SYSOUT=*
000012 //CKZPRINT DD  SYSOUT=*
000013 //CKZIN    DD  DISP=OLD,DSN=DB2.DDDD.CLONE.SYNCDB2(LSTDMBR)
000014 //CKZQDBT1 DD  DISP=OLD,DSN=DB2.DDDD.CLONE.SQLOUT(LSTDMBR)
000015 //CKZERROR DD  SYSOUT=*
000016 //*
```

Control Cards

General Considerations

- **What's hiding in your production environment?**
  - Your production environment is probably not new
    - You have applications developed on site
    - You have third party vendor products
    - You have customized code created internally and some code externally to tailor applications to your environment
    - You have legacy code that has existed for years. Some of it may not even have source code.

- **How will the behavior of your existing applications change with the new version?**
  - Your new version has features, capabilities and (possibly) structures that did not exist in the previous version.
    - How will the behavior of the new version affect your existing applications?
    - How successfully will your existing applications interact with the new version?
    - Are your existing tests going to uncover all off the possible answers for the first two questions?

Summary

- Could not manage SAP and DB2 without the IBM DB2 Cloning Tool
  - AIG performs clones, mostly SAP clones on a daily basis
  - Having SAP environment set up to take advantage of fast replication technology was key to overall success
  - Significantly reduced time, effort, and resources to get environments in sync when using DB2 Cloning Tool with SAP
  - Ability to customize usage of Cloning Tool to apply to specific environments and goals was very valuable

- AIG also uses IBM DB2 Recovery Expert for z/OS
  - SLBs are offloaded to tape (driven by IBM DB2 Recovery Expert for z/OS)
  - Recovery Expert is the source for all cloning operations at AIG

"The first time I used Cloning Tool, I fell in love with the product!"
Bill Anani, DB2 System Programmer - AIG

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- Register for upcoming events