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IMS CATALOG IN PRACTICE

- » Rollout of the IMS Catalog to one FITS customer
- » Operating the IMS Catalog
- » IMS Catalog metadata enrichment and usage
- » Issues with the IMS Catalog

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Rollout of the IMS Catalog to one FITS customer

- » A few words on FITS and why we have started to rollout the IMS Catalog
- » Rollout plan
- » Setting up the IMS Catalog
- » Activating the IMS Catalog

A few words on FITS and why we have started to rollout IMS Catalog

- » FITS is an IT service provider for the finance industry
- » Most of the customers are German federal banks and insurance companies
- » FITS has several customers with IMS
- » Because of our role as IT service provider we have to be very careful with introducing new functions that may have an influence on the customers applications
- » IMS Catalog is definitely such a function
- » After a few month on testing in spring 2015 we decided to start the rollout of the IMS Catalog to one customer
- » This was decided with the goal to replace old Assembler applications of the customer that read information out of generated DBDs and PSBs
- » It also should establish a basis for IMS application modernization
- » To avoid running into a lot of problems in parallel, we decided to rollout the Catalog in two steps on the first development systems

Rollout plan

PHASE 1: Integration of the IMS Catalog into the ACBGEN process

- » Defining CATALOG=NO in the DFSDF000 PROCLIB member
- » Using an alternative DFSDFxxx member for the Catalog utilities
- » Catalog database is only accessible with DLIBATCH

Expectation: No influences on the customer's application expected

Goal of this step: Gaining experiences with the processes necessary for the operation of the IMS Catalog

Gathering information on the sizing of the IMS Catalog database datasets concerning the increase through ACBGENs

Time frame: June 2015 – August 2015

Rollout plan

PHASE 2: Activation of the IMS Catalog

- » Change the DFSDF000 member to CATALOG=YES
- » Alternative DFSDFxxx member for Catalog utilities becomes obsolete
- » Catalog database is now an online database
- » Replacement of the so far used processes to 24x7 online operation
- » Rollout to other systems after the end of this phase

Expectation: Errors in application programs will occur and have to be resolved together with the customer and maybe with the help of IBM

What happens: S0C4 in all transactions of the customer caused by a bug in IMS

Time frame: August 2015 – December 2015 (after fallback new attempt in September was successful, rollout of final PTF in February 2016)

Rollout plan

Status quo:

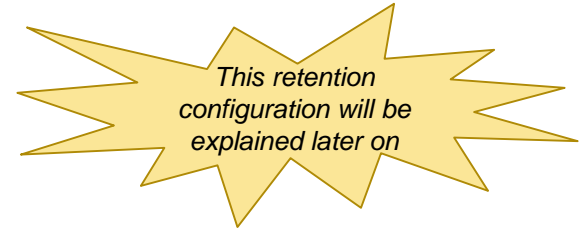
- » IMS Catalog is rolled out to six customer systems
- » Actually we have not decided when to go in production
- » No fix plan for other customers, but we have discussions with customers on topics that would require IMS Catalog
- » Even if there is no fix plan for other customers, we are working on enabling this as an FITS standard IMS component
- » But we have to create benefits for the customers to convince them to go this way with us even if we will have to resolve some problems and even if that might create some efforts on customer side
- » Therefor we are implementing some ISPF-based tooling that accesses IMS Catalog metadata and provides information that might be helpful for the customer's application developers

Setup of the IMS Catalog (Beginning of phase 1)

Step 1: Changing DFSDFxxx PROCLIB members

- » Adding CATALOG section to the DFSDF000 member:

```
*-----*
* IMS CATALOG SECTION                               *
*-----*
<SECTION=CATALOG>
  CATALOG=NO
  ALIAS=DFSC
  RETENTION=(INSTANCES=65535)
```



- » Creating an alternativ DFSDFxxx member for the Catalog utilities containing only the CATALOG section:

```
*-----*
* IMS CATALOG SECTION                               *
*-----*
<SECTION=CATALOG>
  CATALOG=YES
  ALIAS=DFSC
  RETENTION=(INSTANCES=65535)
```

Setup of the IMS Catalog

Step 2: DBDGEN, PSBGEN, ACBGEN and online change

- » DBDGEN the Catalog DBDs DFSCD000 and DFSCX000 (SDFSSRC contains the source)
- » PSBGEN the Catalog PSBs DFSCPL00, DFSCP000 and DFSCP001 (also contained in that library)
- » We knowingly do not use the already generated DBDs and PSBs IMS provides
- » ACBGEN and online change

ACBGEN is necessary because the Catalog otherwise will not contain its own DBDs and PSBs

Online change was done but is only necessary for phase 2

Setup of the IMS Catalog

Step 3: Register the Catalog databases with DBRC

» Even if it is possible we do not run Catalog without DBRC

```
INIT.DB DBD(DFSCD000) SHARELVL(3) TYPHALDB OLRCAP HIKEY
INIT.PART DBD(DFSCD000) PART(DFSCD01) -
  DSNPREFIX(██████████.DB.DFSCD000) -
  KEYSTRNG(X'FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF') -
  GENMAX(3) RECOVPD(21)
INIT.DB DBD(DFSCX000) NONRECOV NOICREQ SHARELVL(3) TYPHALDB HIKEY
INIT.PART DBD(DFSCX000) PART(DFSCX01) -
  DSNPREFIX(██████████.DB.DFSCX000) -
  KEYSTRNG(X'FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF')
```

- » The DBRC registration is necessary before the allocation of the Catalog database datasets because otherwise it is not possible to run the Catalog Populate utility (DFS3PU00) in analysis mode to calculate the size of the Catalog database datasets
- » We have only one partition defined for the Catalog, but you can define for instance two to have DBD and PSB entries in separate partitions

Setup of the IMS Catalog

Step 4: Analysis of the ACBLIB

- » Specify the PSB DFSCP000 with the Catalog Populate utility (DFS3PU00) to run an analysis of the ACBLIB
- » The output can be used as basis for the Catalog database dataset allocation

ESTIMATED SPACE REQUIREMENT TO HOLD INSERTED SEGMENTS			DSG	RECORDS
DSG	BLKSIZE	BLOCKS	---	-----
A	4096	16	L	221
B	4096	103	X	154
C	4096	437		
D	4096	6		

SECONDARY INDEX		RECORDS
-----		-----
DFSCX000		221

- » We have done the size calculation based on the type of system
- » Development systems will need a larger Catalog because more ACBGENs are done there until new or changed DBDs / PSBs are in their final version

Setup of the IMS Catalog

Step 5: Allocation of the Catalog database datasets

- » Allocate the OSAM datasets for the 4 DSGROUPs as well as the VSAM clusters for the primary index dataset and the ILDS for every partition of the main database
- » Allocate the VSAM cluster for every partition of the secondary index
- » Automatic creation of the datasets by running the Catalog Populate utility in load mode has the consequence that CIZES of primary and secondary index clusters as well as ILDS clusters are heterogeneous
- » If you want to use automatic creation you have to define correspondent values in the CATALOG section of the DFSDFXxx PROCLIB member



*Image source:
IBM presentation*

Setup of the IMS Catalog

Step 6: Defining image copy GDGs

» Why doing an image copy for the IMS Catalog? Cannot it be rebuilt?

Yes, it can – but not if you are using DB versioning and also not if you decide to have no more DBDLIB, PSBLIB and ACBLIB in version 14

» We are still not running version 14 and we also do not use DB versioning at the moment, but we wanted our processes around the IMS Catalog

- Not to be changed again and again,
- To be able operate 24x7 (phase 2),
- To be able to run even when IMS is not online due to maintenance (by changing only a parameter or procedure with the same list of parameters)

» That is why we have defined image copy GDGs

Setup of the IMS Catalog

Step 7: Initial load of the IMS Catalog and creating an image copy

- » You have to run Catalog Populate Utility (DFS3PU00) in load mode by specifying the PSB DFSCPL00
- » Providing the staging ACBLIB is not enough, you also have to provide the online ones because they can contain older instances of DBDs and / or PSBs
- » In some cases also metadata about not ACBGENed DBDs and PSBs is added into the IMS Catalog – but only in some special cases
- » Before version 14 it is not possible to load all DBDs and PSBs into the IMS Catalog without doing an ACBGEN for all the DBDs and PSBs
- » After the initial load you have to create an image copy

Activating the IMS Catalog (Beginning of phase 2)

Preparations

- » Setting up new processes for 24x7 operation
- » Creating a second set of database datasets for HALDB online reorganization
 DSGROUP A -> M, B -> N, C -> O, D -> P
 Primary index X -> Y
- » Checking whether DMB and PSB pools are large enough, because with the activation of the IMS Catalog DB PCBs for the IMS Catalog will be added to every PSB

Activation

- » Specify CATALOG=YES in the DFSDF000 PROCLIB member
- » Shutdown and warm start IMS



Operating the IMS Catalog

- » Overview over the most important Catalog utilities
- » ACBGEN followed by Catalog population
- » Clean up and reorganization
- » Backup and recovery

Overview over the most important Catalog utilities

- » The Catalog Populate utility (DFS3PU00) can run either in a DLIBATCH or in a BMP region
- » It provides the following modes:
 - Analysis Mode (PSB=DFSCP000): Analysis of the ACBLIB
 - Load Mode (PSB=DFSCPL00): Creation of all not manually allocated database datasets and initial load of the IMS Catalog
 - Update Mode (PSB=DFSCP001): Update of the IMS Catalog after ACBGEN
- » The utility creates for every new DBD or PSB a new Catalog record, changed DBDs and PSBs will be added to existing Catalog records
- » This means you will probably have more than one instance of a DBD or PSB within the IMS Catalog
 - This means not necessarily DB versioning!

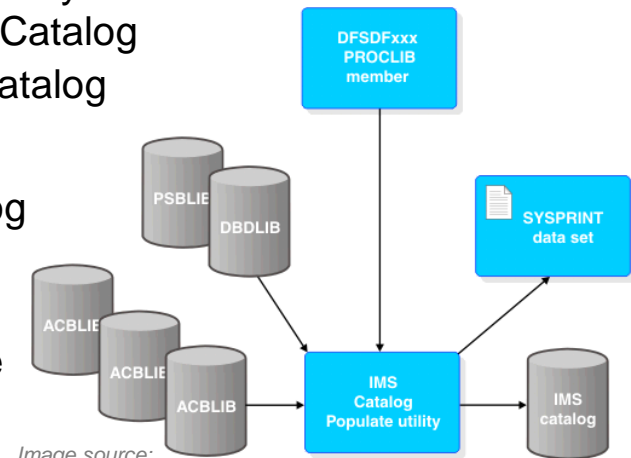


Image source:
IBM Knowledge Center

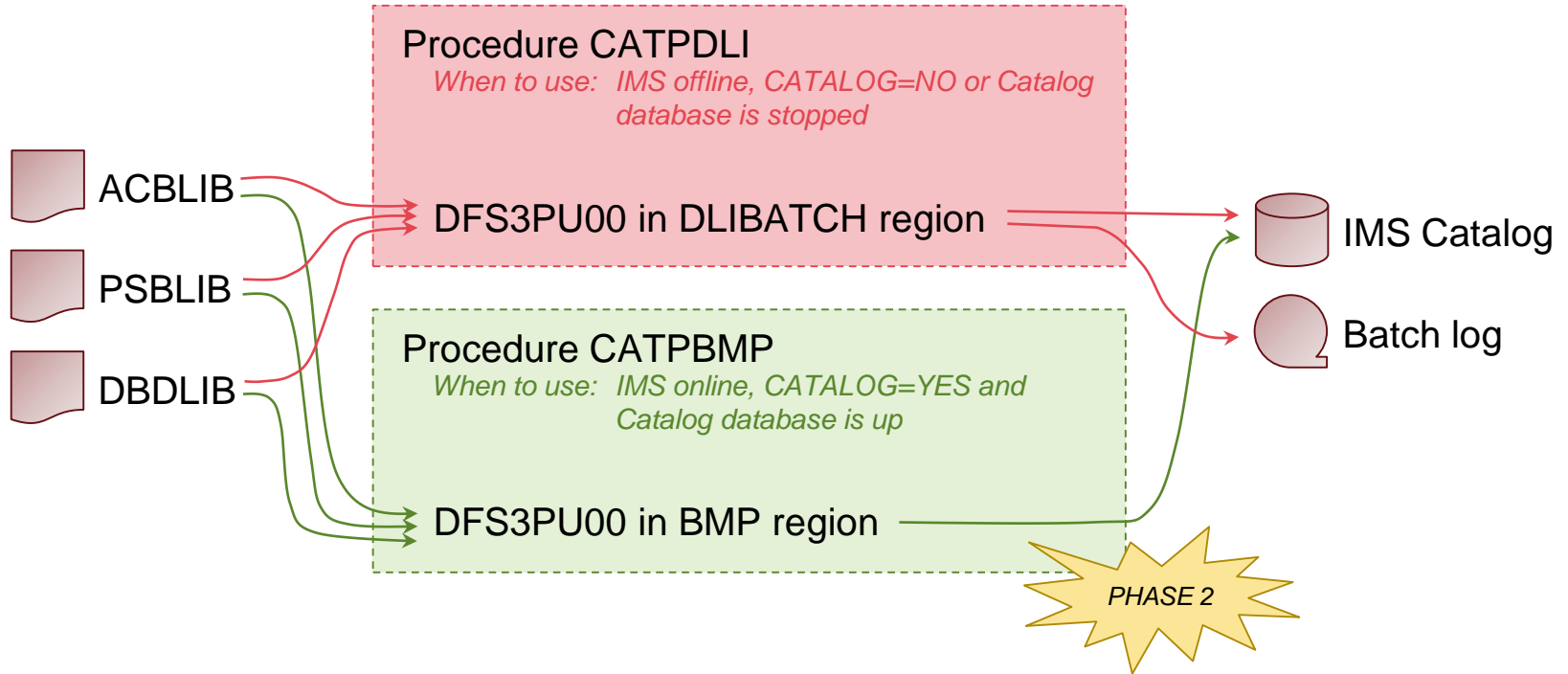
Overview over the most important Catalog utilities

- » The ACB Generation and Catalog Populate utility (DFS3UACB) runs both ACBGEN and Catalog population within one step
- » Therefore it calls the ACB Maintenance utility (DFSUACB0) and the Catalog Populate utility
- » IBM recommends the usage of the combined utility to keep ACBLIB and IMS Catalog in sync
- » Contrary to this recommendation we do not use the combined utility, because
 - It still does not inconsistency between ACBLIB and IMS Catalog if Catalog populate utility fails
 - It makes no difference between errors during the ACBGEN and the Catalog population – that is a problem for us as a provider, because we do not want to get a notification for every ACBGEN of the customer that fails, but we want to get one if the Catalog population fails
 - It heavily extends the duration of the ACBGEN because the Catalog Populate utility runs through the whole ACBLIB and this could upset the customer

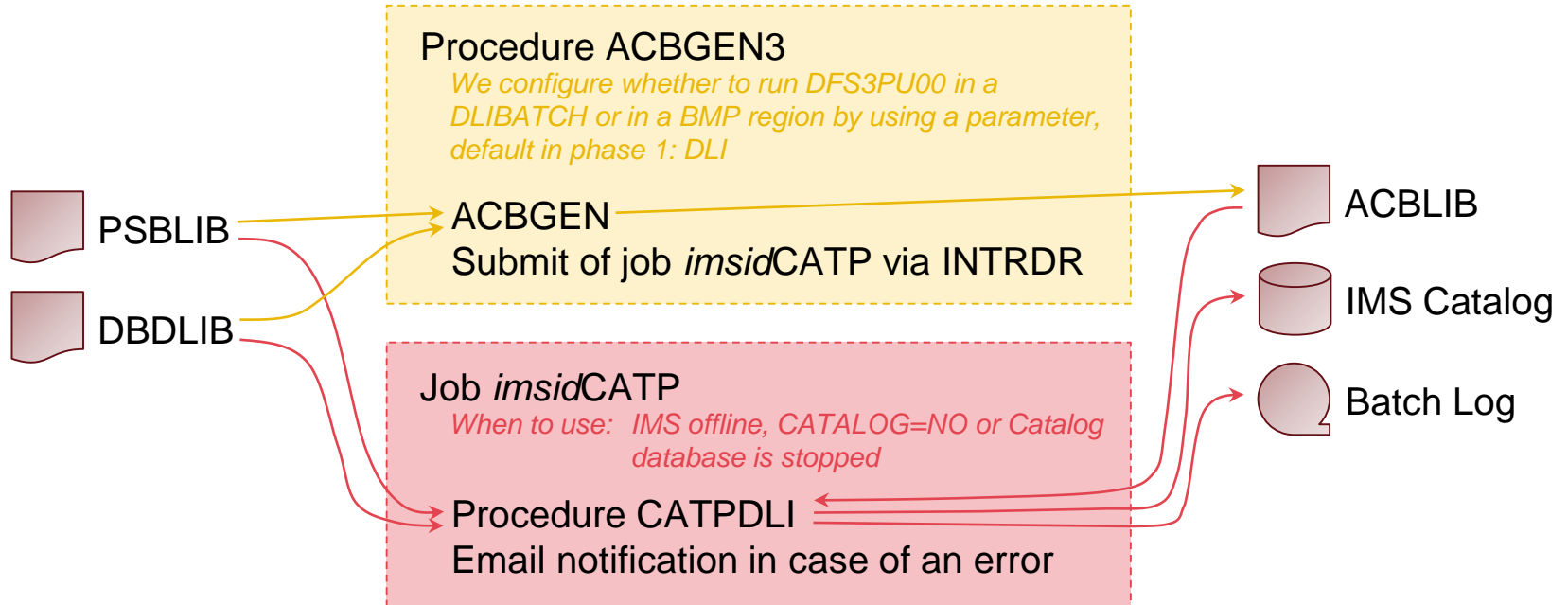
Overview over the most important Catalog utilities

- » The Catalog Record Purge utility (DFS3PU10) is used to delete old DBD and PSB instances from the IMS Catalog
- » It can either run in a DLIBATCH region or in a BMP region
- » You have to use PSB DFSCP001 with it
- » It still provides an analysis mode, but you have to activate it with a DD statement
- » The deletion of Catalog instances will be done, if the retention criterias specified in the DFSDF000 member will be fulfilled
- » You can change these criterias for single DBDs and / or PSBs with this utility
- » We do not use the utility in the normal way, because if the check of retention criterias was successful, the utility deletes the Catalog instance of a DBD or PSB no matter if it is still the instance representing the DBD or PSB in the active ACBLIB
- » Instead of a deletion based on the retention criterias we delete by specifying DELETE statements explicitly – the utility supports this also

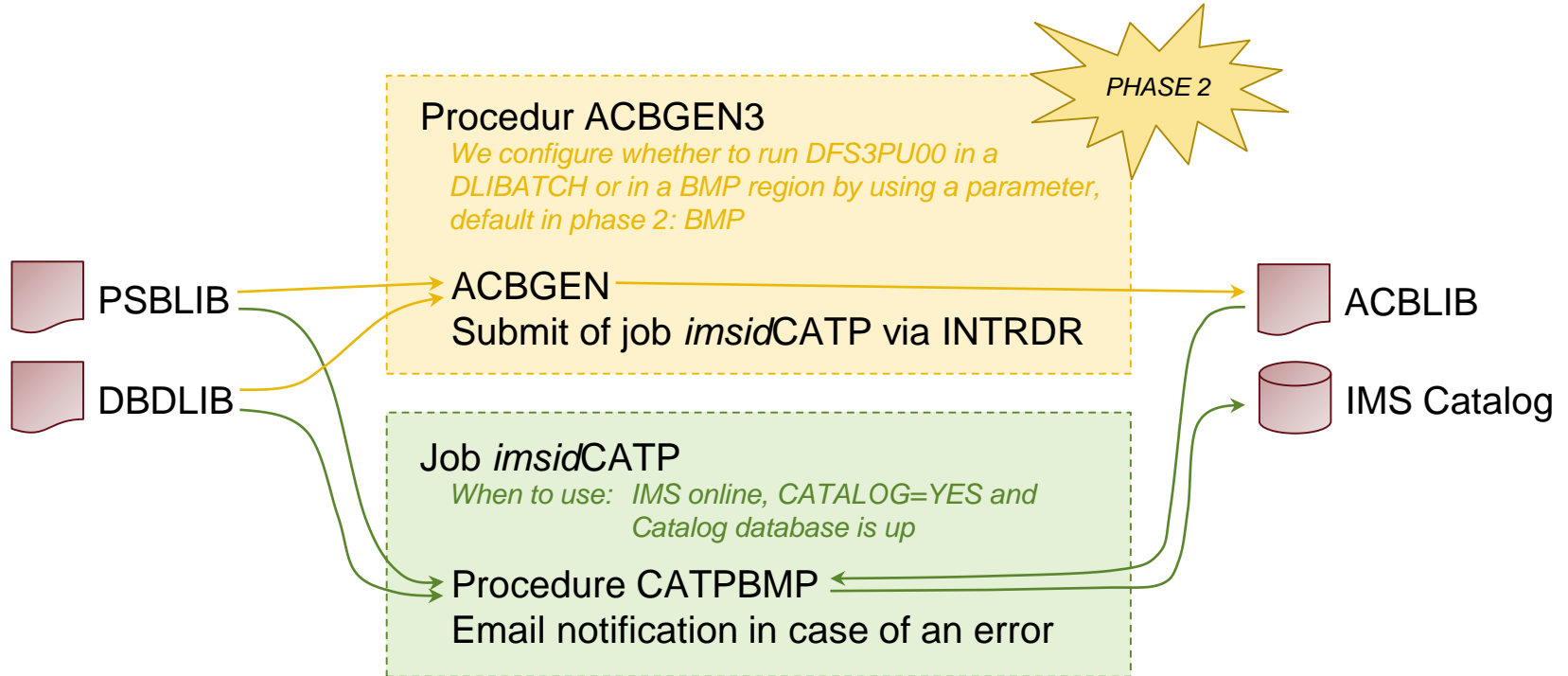
ACBGEN followed by Catalog population



ACBGEN followed by Catalog population



ACBGEN followed by Catalog population



ACBGEN followed by Catalog population

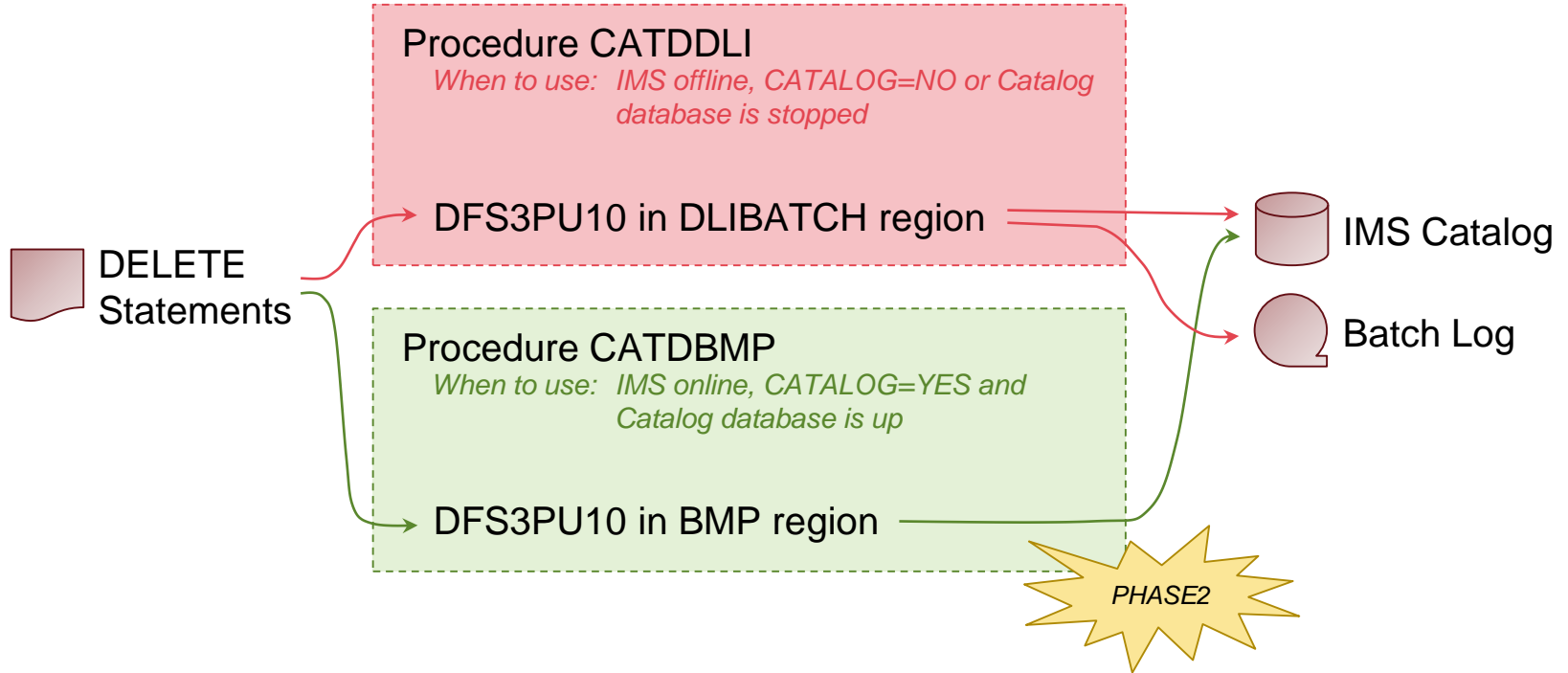
What to do after an error during the Catalog population?

- » You have to run the Catalog populate utility using staging ACBLIB and both online ACBLIBs as input
- » That is necessary because since the error an online change and new ACBGENs could be done

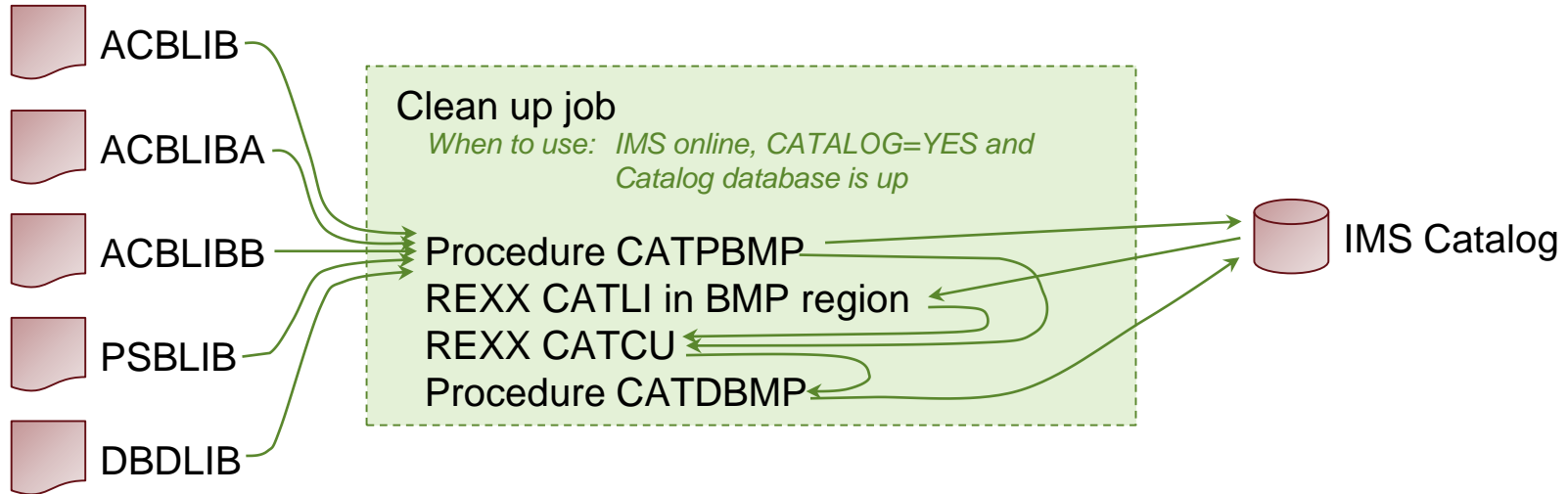
Clean up and reorganization

- » In phase 1 a complete rebuild of the IMS Catalog can be done instead of a clean up followed by a reorganization
- » In 24x7 online operation you have to use Catalog Record Purge utility (DFS3PU10) to delete DBD and PSB instances that are not needed anymore
- » As mentioned before we are using DELETE statements instead of the retention criterias to do this
- » The DELETE statements were generated by a REXX script named CATCU comparing the content of the three ACBLIBs to the instances that are in the IMS Catalog
- » Therefor a list of all instances of the three ACBLIBs created by the Catalog populate utility is used as input
- » A second REXX script named CATLI running in a DLIBATCH region or in a BMP region is listing all the instances that are in the IMS Catalog

Clean up and reorganization



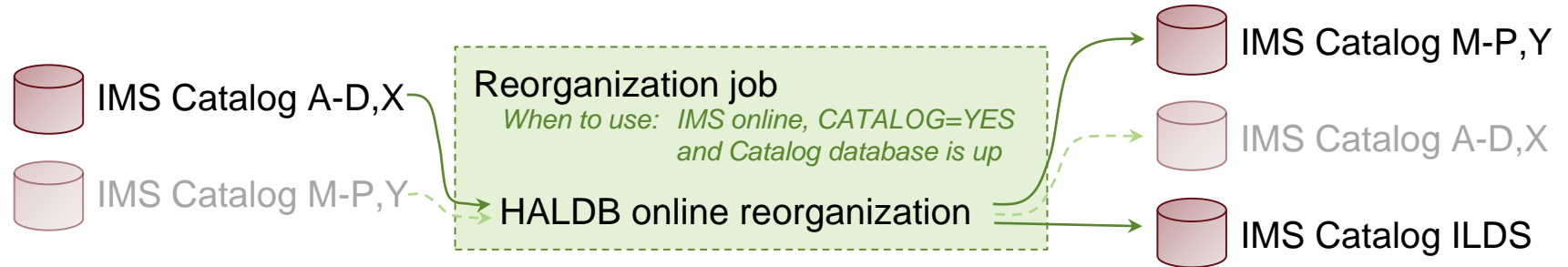
Clean up and reorganization



- » REXX script CATLI lists all DBD and PSB instances that are in the IMS Catalog
- » REXX script CATCU generates the DELETE Statements for the Catalog Record Purge utility

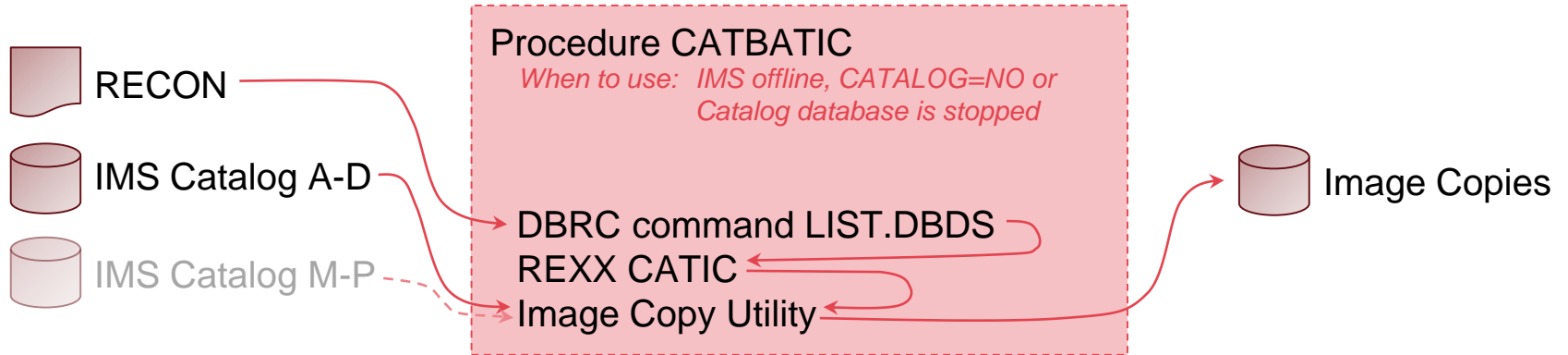
Clean up and reorganization

» Afterwards the following job is running the reorganization



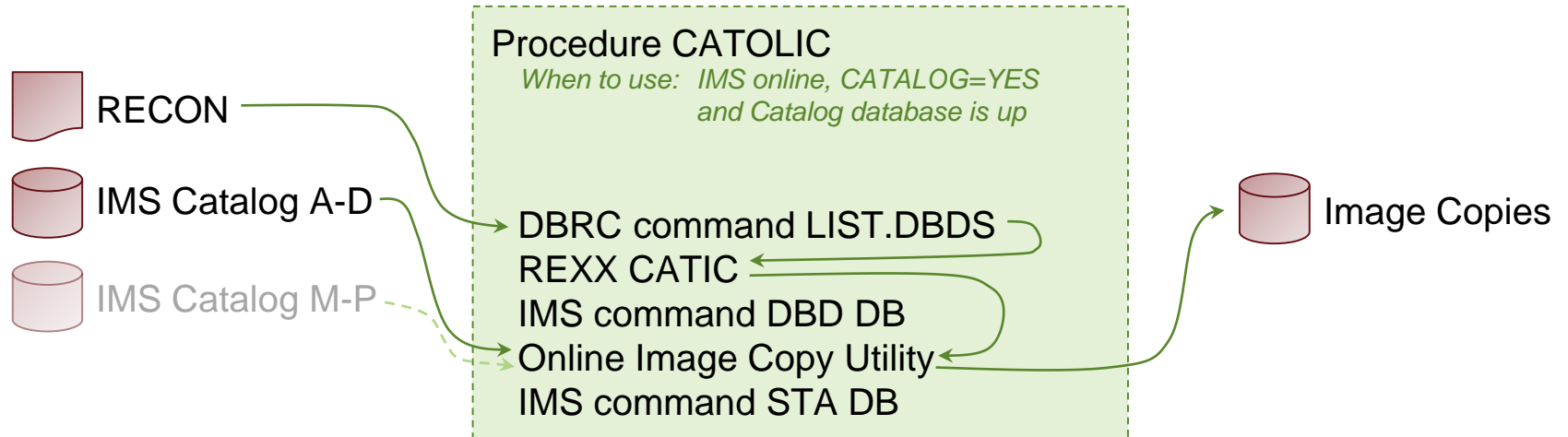
» This job will be followed by an image copy job

Backup and recovery



- » REXX script CATIC determines by using the response of the DBRC command whether Catalog datasets A-D or M-P are active and generates input statements for the IC utility

Backup and recovery



- » REXX script CATIC also checks whether a HALDB online reorganization is running
- » If this is the case, it periodically checks whether it has finished and gives back the control not before the HALDB online reorganization is complete

Backup and recovery

- » As long as you are not using DB versioning or you have replaced your DBDLIB, PSBLIB and ACBLIB in version 14, you can run a rebuild of the IMS Catalog instead of a recovery
- » If you have DB versioning activated or you have replaced your DBDLIB, PSBLIB and ACBLIB in version 14, you must run a recovery
- » Therefore ensure that your recovery job is able to handle
 - HALDB
 - DBDS Groups
 - Different active database datasets because of HALDB online reorganization
 - Secondary index



IMS Catalog metadata enrichment and usage

- » Metadata enrichment example **LIVE DEMO**
- » Metadata inquiry by a GUR call **LIVE DEMO**
- » Metadata usage through IMS Explorer **LIVE DEMO**
- » Metadata usage through self-implemented tooling **LIVE DEMO**

Metadata usage through self-implemented tooling

- » We are implementing a ISPF-based tooling based on the IMS Catalog to show all the metadata in the IMS Catalog in a way our customers application developers can take advantage on
- » The „IMS Catalog Viewer“ is fully implemented in REXX
- » It is a ISPF dialog application that calls IMS Region Controller directly to start BMP regions
- » Within these BMP REXX applications are querying metadata from the IMS Catalog using REXXTDLI and REXXIMS adapter
- » These REXX applications running under IMS control are using both traditional DL/I calls and the GUR call to retrieve data from the IMS Catalog
- » To be able to show the data in the ISPF application, ISPF tables are created and filled with information from the IMS Catalog

This slide and some screenshots have been added for the uploaded version of the presentation.

KOMMANDO ==> _____ SCROLL ==> PAGE

Auswahl des zu betrachtenden IMS: IMX1 Kunde: FITS LPAR: IZT1

Kommando SET DEFAULT IMSID <imsid> dient zur Definition des standardmaessig zu betrachtenden IMS

Auswahl der durchzufuehrenden Aktion: s DBD-Liste _ PSB-Liste bzw.

DBD-spezifische Aktionen:

- > Details zu DBD _____ aus dem Catalog laden
- > Source zu DBD _____ anzeigen
- > Struktur von DBD _____ visualisieren
- > Referenzierende PSBs zu DBD _____ ermitteln

PSB-spezifische Aktionen:

- > Details zu PSB _____ aus dem Catalog laden
- > Source zu PSB _____ anzeigen
- > PCBs von PSB _____ auflisten
- > Durch PSB _____ referenzierte DBDs ermitteln

Erstellung einer vollstaendigen Liste durch Selektion mit beliebigem Zeichen

Ressourcenspezifische Aktion durch Angabe des Ressourcennamens

KOMMANDO ==> _____ SCROLL ==> PAGE

DBDNAME : BNKCST ACBGEN : 15.07.15 13:06
 DBORG : HIDAM DSORG : VSAM (keine DS Groups)
 DDNAME : BNKCST
 ENCODING: Cp1047 EXITRTN : kein Exit
 KEYLEN : 24 Bytes
 PRIMIDX : BNKCSTP SECIDX : BNKCSTSA, BNKCSTSI, BNKCSTSE

Zeilenkommandos: D - Details anzeigen L - Logische Verknuepfungen ansehen
 S - Source betrachten R - PSBs mit Zugriff auflisten

Sortierung: / - aufsteigend bzw. \ - absteigend hinter Spaltennamen eingeben
 Filterung : Wert oder generischen Ausdruck unter Spaltennamen eingeben

Kommando RESET dient zur Ruecksetzung von Sortierung und Filterung

----- Liste aller Segmente -----

NR	/	NAME	EXTERNALNAME	LVL	PARENT	MIN	MAX	PTR	FLD
*	*	*	*	*	*	*	*	*	*
1		CUSTOMER	CUSTOMER	1		370	370	T	15
d		2 ACCOUNT	ACCOUNT	2	CUSTOMER	114	114	T	17
		3 ENTRY	ENTRY	3	ACCOUNT	325	325	T	19
		4 CARD	CARD	3	ACCOUNT	65	65	T	6
		5 TANLIST	TANLIST	2	CUSTOMER	5	5	T	2
		6 ITAN	ITAN	3	TANLIST	19	19	T	3

***** Bottom of data *****

KOMMANDO ==> _____ SCROLL ==> PAGE

DBDNAME : BNKCST ACBGEN : 15.07.15 13:06
 SEGMENT : ACCOUNT EXTNAME : ACCOUNT
 PARENT : CUSTOMER LEVEL : 2
 DSGROUP : keine DS Group EXITRTN : kein Exit ENCODING: Cp1047
 MINLEN : 114 Bytes MAXLEN : 114 Bytes ISRTRULE: LLL, LAST
 POINTER : [] HF [] HB [x] PCF [] PCL [x] PTF [] PTB
 [] LP [] LCF [] LCL [] LTF [] LTB [] Bidirectional Paired
 SECIDX : BNKCSTSA, BNKCSTSI

Zeilenkommandos: D - Details anzeigen R - PSBs mit Zugriff auflisten
 S - Source betrachten

Sortierung: / - aufsteigend bzw. \ - absteigend hinter Spaltennamen eingeben
 Filterung : Wert oder generischen Ausdruck unter Spaltennamen eingeben

Kommando RESET dient zur Ruecksetzung von Sortierung und Filterung

----- Liste aller Felder -----

<u>NAME</u>	<u>EXTERNALNAME</u>	<u>SEQ</u>	<u>POS</u>	<u>LEN</u>	<u>TYPE</u>	<u>DATATYPE</u>	<u>MAP</u>
*	*	*	*	*	*	*	*
— ACCNO	ACCOUNTNUMBER	U	1	8	X	LONG	NO
— ACCTYPE	ACCOUNTTYPE		50	30	C	CHAR	NO
— BALANCE	BALANCE		84	8	P	DEC(14,2)	NO
— BIC	BIC		9	11	C	CHAR	NO
— CREDINTR	CREDITINTEREST		92	5	P	DEC(9,6)	NO
— CURRENCY	CURRENCY		112	3	C	CHAR	NO
— IBAN	IBAN		20	34	C	CHAR	NO
— INTRACIV	INTERESTACCOUNTINGIN...		110	2	X	SHORT	NO
— OVERDRFT	OVERDRAFTAMOUNT		97	8	P	DEC(14,2)	NO
— *CATVIEW							



Issues with the IMS Catalog

- » Update on IMS Catalog issues represented during the GSE Meeting subsequent to the Symposium last year **EXTERNAL PRESENTATION**



Do you have any questions?