

IMS Tools – What's New?

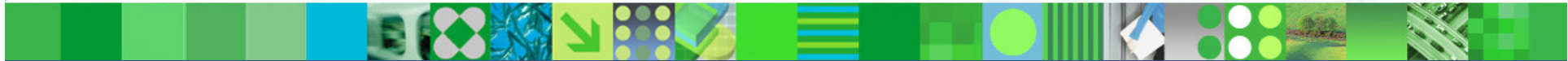
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Agenda

- Announcement Feb 9, 2010
- IMS Configuration Manager
- What is a solution pack?
 - What is the IMS Fast Path Solution Pack?
 - What is the IMS Database Solution Pack
 - What is the IMS Recovery Solution Pack
 - What is the IMS Performance Solution Pack
 - What is the IMS Tools BASE
- IMS Database Solution Pack
 - IMS Database Reorganization Expert

IMS Tools Announcements – Feb 9, 2010

		Planned GA Date
• IMS Configuration Manager for z/OS, V1.3	(5655-L69)	Feb 19, 2010
• IMS Database Reorganization Expert for z/OS, V4.1	(5655-S35)	Feb 19, 2010
• IMS High Performance Image Copy for z/OS, V4.2	(5655-N45)	Feb 19, 2010
• IMS Fast Path Solution Pack for z/OS, V1.1	(5655-W14)	Feb 19, 2010
• IMS Performance Solution Pack for z/OS, V1.1	(5655-S42)	Feb 19, 2010
• IMS Database Solution Pack for z/OS, V1.1	(5655-S77)	Feb 19, 2010
• IMS Recovery Solution Pack for z/OS, V1.1	(5655-V86)	Mar 12, 2010
• IMS Tools Base for z/OS, V1.1	(5655-V93)	Feb 19, 2010



IMS Configuration Manager: Overview

From IMS Parameter Manager to IMS Configuration Manager

- IMS Configuration Manager is a rebranding of IMS Parameter Manager
- Represents the introduction of significant new features and a refocus of the product
- Focus changes from managing IMS parameters to managing IMS resources
- Retains most parameter management functionality
- Adds ability to edit, browse, and install IMS resources
- Leverages DRD

Dynamic resource definition

- IMS V10 introduced dynamic resource definitions (DRD)
- DRD allows IMS resources (transactions, programs, database and fast path routing codes) to be installed dynamically
- DRD means you can introduce changes more frequently with no down time to IMS
- DRD means you no longer need to perform SYSGENs

No SYSGENs: the challenges

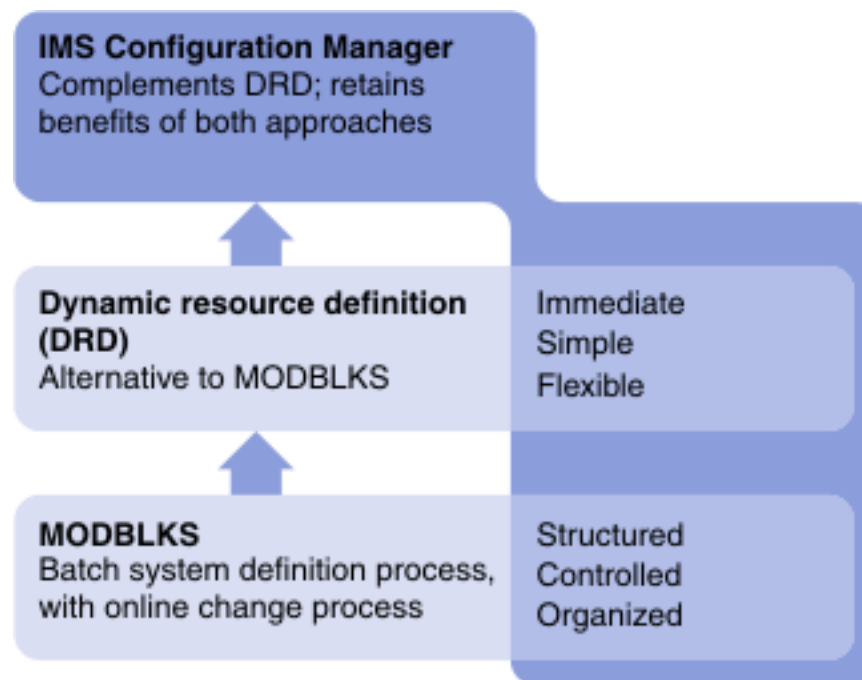
- Organizations may have established processes around their IMSGEN
 - Do they change these processes to gain the benefits of DRD?
- With DRD, they no longer have source for your resource definitions.
 - How do they modify resource definitions offline? How do they annotate changes to resource definitions?
- With DRD all changes are either permanent or temporary
 - How do they tell the difference between a permanent change and an ad hoc one? How do they relate a change to a logical change request and how do they restore a system to a previous state?
- What if updates to some of their applications still come as stage 1 source?

Introduction to IMS Configuration Manager

- IMS Configuration Manager consists of a resource manager and a parameter manager
- The resource manager provides offline management of IMS resources with an online resource installer that leverages the capabilities of the IMS Operations Manager (OM)
- The parameter manager provides a robust smart editor for IMS parameters, syntax checking, and an edit history

Benefits

- Create and update IMS resources with more frequently and more reliably while providing unparalleled levels of availability
- Provide greater autonomy for application developers
- Deskill the process of managing resources and parameters
- Integrate DRD into existing change management processes
- Automate install and backout with an intelligent resource installer
- A complete audit history of all install activity performed through the product

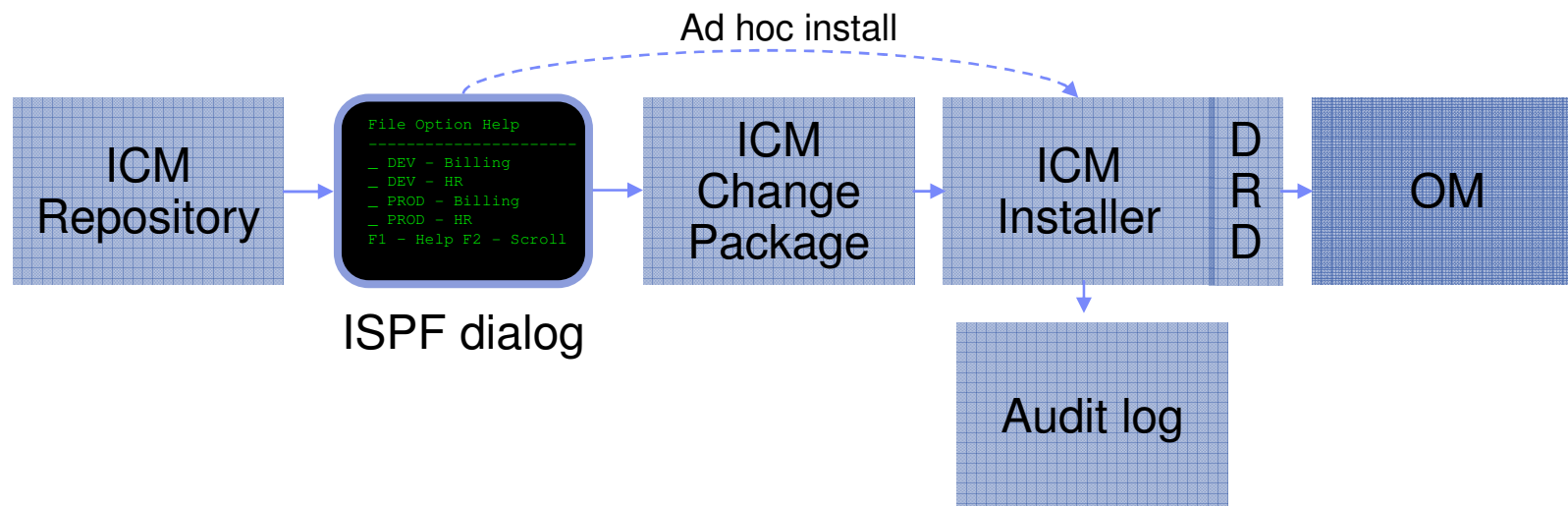


ICM Processes - Takeup



- Seamless transformation of stage 1 source into an IMS Configuration Manager repository
- Maintain logical structure of resource definitions and annotations
- Update existing definitions through additional take ups (e.g. if you receive applications updates from other vendors)

ICM Processes – updating resources



- An ISPF dialog is provided to edit and manage resources
- An audit log is maintained of all changes made through ICM

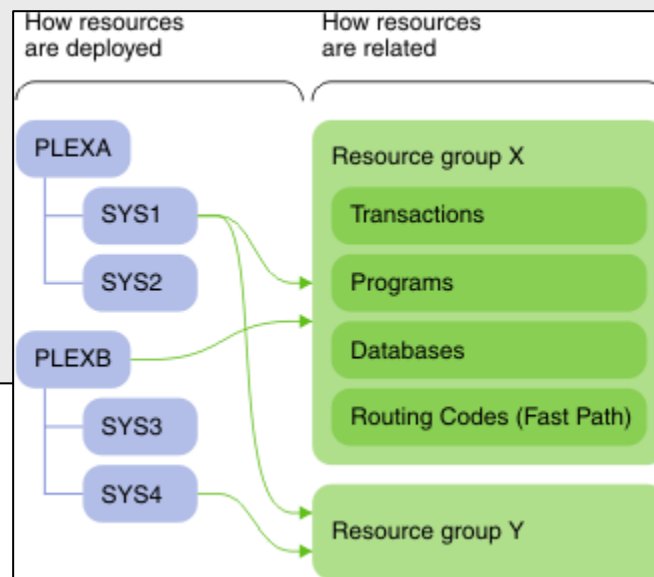
Resources are placed in logical groups

```

File Help
-----
Resource Groups                                     Row 1 of 4 More: <>
Command ==> _____ Scroll ==> PAGE

Select a Resource Group to process.

/ Resource Group      Description
___ BANKING           Banking application definitions
___ COMMON            Definitions common to all applications
___ HR                HR application definitions
___ PAYROLL           Payroll application definitions
***** Bottom of data *****
    
```



Each group contains all related resource definitions

```

File Help
-----
EDIT                               Resource Group                               Row 1 of 7 More: <>
Command ==> _____ Scroll ==> PAGE

Resource Group . : BANKING
Description . . . Banking application definitions          Notes...

Select a resource to update its definition.

/   Name      Prompt      Type      Created      Changed      ID
/   *         *         *         *         *         *
___ BANKL      PROGRAM    2010-01-25  2010-01-25  10.28.03  REA
___ BANKN      PROGRAM    2010-01-25  2010-01-25  10.28.15  REA
___ CUSTDB     DATABASE   2010-01-25  2010-01-25  10.28.51  REA
___ TX001      TRAN       2010-01-25  2010-01-25  10.25.09  REA
___ TX002      TRAN       2010-01-25  2010-01-25  10.25.26  REA
___ TX003      TRAN       2010-01-25  2010-01-25  10.27.36  REA
___ TX004      TRAN       2010-01-25  2010-01-25  10.29.48  REA
***** Bottom of data *****
    
```

Use filters to browse resources within the group

```

File Help
-----
EDIT                               Resource Group                Row 1 of 4 More: <>
Command ==> _____          Scroll ==> PAGE

Resource Group . : BANKING
Description . . . Banking application definitions      Notes...

Select a resource to update its definition.

/   Name      Prompt      Type      PSBName    AOCMD    Class    CmtMode    Conv    DCLWA
___ *         _____  _____  _____  _____  _____  _____  _____  _____
___ TX001      _____  TRAN      BANKL      N         1         SNGL      N         _____
___ TX002      _____  TRAN      BANKL      N         1         SNGL      N         _____
___ TX003      _____  TRAN      BANKL      N         1         SNGL      N         _____
___ TX004      _____  TRAN      BANKN      N         1         SNGL      N         _____
***** Bottom of data *****
    
```

Simple forms for resource attributes

```

File Help
-----
EDIT Transaction TX001
Command ===> _____

Update transaction definition.

Transaction . : TX001
Description . : You can use descriptions and notes -----> Notes...
                                                    More:      +

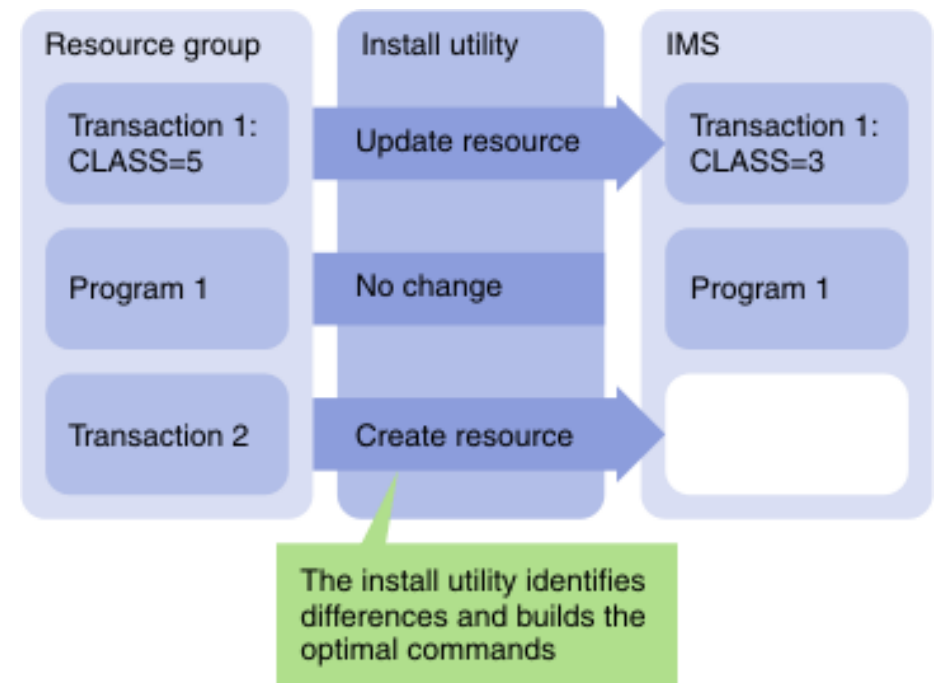
Attribute                Description
AOCMD . . . . . N      AOI command option (CMD, N, TRAN, Y)
CLASS . . . . . 1      Class (1-999)
CMTMODE . . . . . SNGL   Commit mode (SNGL, MULT)
CONV . . . . . N      Conversational (Y, N)
DCLWA . . . . . -      Log write-ahead option (Y, N)
DIRROUTE . . . . . N      MSC direct routing option (Y, N)
EDITRTN . . . . . _____ Input edit routine
EDITUC . . . . . Y      Edit to uppercase (Y, N)
EMHBSZ . . . . . _____ EMH buffer size (12-30720)
EXPRTIME . . . . . 0      Expiration time (0-65535)
FP . . . . . N      Fastpath processing option (N, E, P)
INQ . . . . . N      Inquiry option (Y, N)
LCT . . . . . 65535   Limit count (1-65535)

```

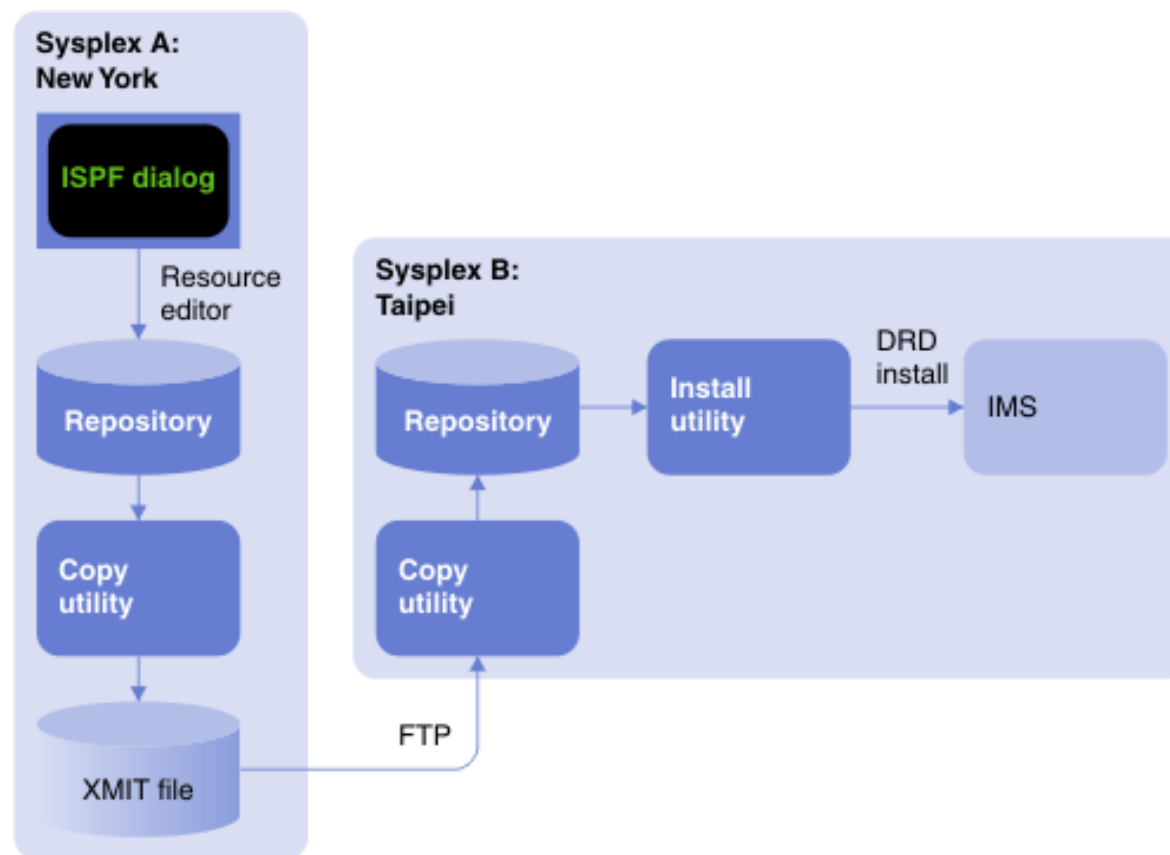
- Context sensitive help
- Extensive validation
- Notes

IMS Configuration Manager resource installer

- The installer provides enhanced services on top of the IMS type-2 command interface
- Autonomously determines whether an install or update is required
- Rollback option
- Full-logging and auditing of install activity



ICM Processes – installing to remote sites



ICM Processes – Exporting from the repository

- You can export resources from the repository as either:
 - Type II commands
 - Stage 1 source
- Selectively export based on resource type and name mask

Parameter management

- Enhanced parameter listing and search
 - Semantic search: finds parameters and members based on keywords; identifies missing parameters and members
 - Listing of PROCLIB members that are active on a given system
 - Edit history for all members
- Enhanced ISPF edit session that provides:
 - Checking of parameter syntax
 - Ability to insert parameters from a model
 - Context sensitive help for all parameters
 - Retains many ISPF edit functions
 - Does not alter or modify the member in anyway (unless you explicitly add or modify parameters)
 - Allows you to back up members before saving them
 - In the future will be extended to perform checking of entire PROCLIBs

Parameter semantic search

```

File Help
-----
EDIT      DVP.IBDF.VB10.PROCLIB                      Row 11 of 32
Command ==>> _____ Scroll ==>> CSR

Search . . . DRD
-----

Member
/ *
- DFSDFDVP      1  2009/02/11  2009/02/11 13:26:45  NMC2
  COMMON_SERVICE_L=...
  MODBLKS=...      How MODBLKS resources are changed
  DYNAMIC_RESOURCE=...
  AUTOEXPORT=...   Definitions exported at checkpoint time
  AUTOIMPORT=...   Definitions automatically imported in COLD
  DCLWA=...        Default log write ahead option for created
  IMPORTERR=...    Action on error during automatic import
  RDDSERR=...      Action on error when accessing RDDS
  RDDSDSN=...      List of DSNs for RDDS processing
-----
- DFSDF000      1
  COMMON_SERVICE_L=...
  MODBLKS=DYN      /* DRD ENABLED;MODBLKS OLC
  DYNAMIC_RESOURCE

```

Finds members and parameters even if they do not exist
Help for each parameter

```

File Edit Edit_Settings Help
-----
EDIT          REA.CLIST(DFSDFBLN) - 01.01          columns 00001 00072
Command ==> _____ Scroll ==> CSR
CHECK validate the member syntax
MODEL Insert a new parameter with syntax assistance
HELP Press F1 to request parameter sensitive help
***** ***** Top of Data *****
000001 /***** */
000002 /* Dynamic Resource Definition Section */
000003 /***** */
000004 <SECTION=DYNAMIC_RESOURCES>
000005 RDDSDSN=IMSTESTL.IMS1.RDDS1,
=====+.....
==MSG> Unmatched parenthesis. RDDSDSN=IMSTESTL
000006         IMSTESTL.IMS1.RDDS2,
000007         IMSTESTL.IMS1.RDDS3,)
000008 AUTOIMPORT=AUTO
000009 AUTOEXPORT=AUTO
000010 IMPORTER=ABORT
=====+.....
==MSG> Unknown parameter: 'IMPORTER
000011 RDDSERR=ABORT
000012 /***** */

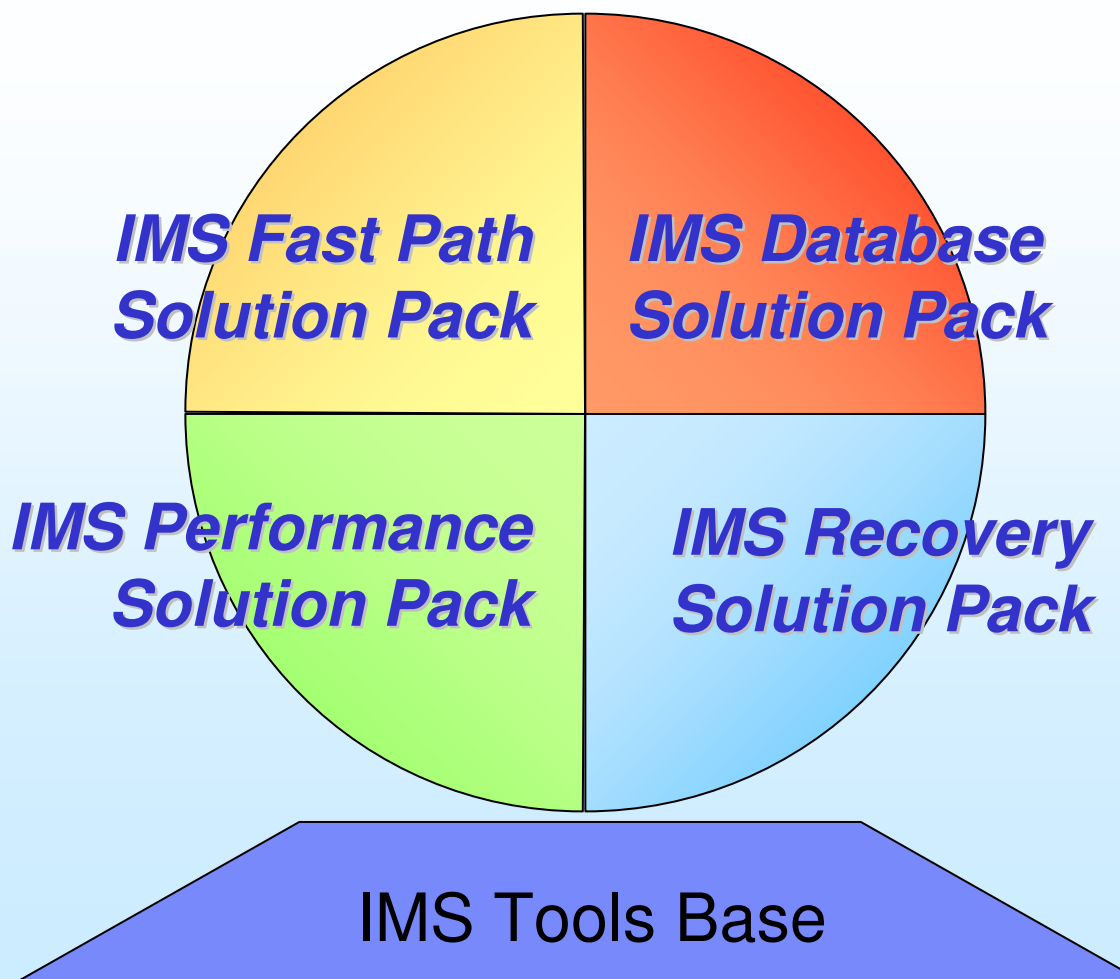
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New parameter smart editor
 Syntax validation
 Parameter value validation
 Context sensitive help
 Works with existing members

Conclusions

- IMS Configuration Manager simplifies the management of IMS resources and parameters
- The resource installation process is streamlined making it easy to synchronize offline source with online systems
- The availability of rollback helps customers introduce changes as a unified set
- IMS Configuration Manager provides a foundation from which an end-to-end IMS administration and management system can evolve

Everything you need for...



New Year – New Message!

- **IMS Tools Solution Packs**

- Related products packaged together to provide end-to-end IMS solutions
 - **Database, Fast Path, Recovery, Performance**
- Lay the foundation for new IMS Tools in the pipeline via a no-charge Base Pack which contains necessary common code (Generic Exits, DAI, ITKB, etc.)



- **What's the value to customers?**

- The customer receives a complete solution for all of their needs rather than having to purchase multiple tools
- Solution Packs are discounted, offering real value

**Reduce CPU
Consumption**



**Reduce DBA
Labor Costs**



**Eliminate
Application
Downtime**



Deliver faster return on your investment!

IMS Database Solution Pack for z/OS



- IMS Database Reorganization Expert
- IMS High Performance Unload
- IMS High Performance Load
- IMS High Performance Prefix Resolution
- IMS Index Builder
- IMS High Performance Pointer Checker
- IMS High Performance Image Copy
- IMS Library Integrity Utilities
- IMS Database Repair Facility

IMS Recovery Solution Pack for z/OS



- IMS Recovery Expert
- IMS Database Recovery Facility
- IMS Index Builder
- IMS High Performance Change Accumulation
- IMS High Performance Image Copy

IMS Performance Solution Pack for z/OS



- IMS Connect Ext
- IMS Performance Analyzer
- IMS Problem Investigator

IMS Fast Path Solution Pack for z/OS



- IMS Fast Path Advanced Tools
- IMS Fast Path Basic Tools
- IMS Fast Path Online Tools
- IMS Library Integrity Utilities
- IMS High Performance Image Copy
- IMS Database Repair Facility

IMS Tools Base for z/OS



- IMS Tools Knowledge Base
- IMS Tools Generic Exits
- Policy Services
- Distributed Access Infrastructure
- IMS Hardware Data Compression Extended



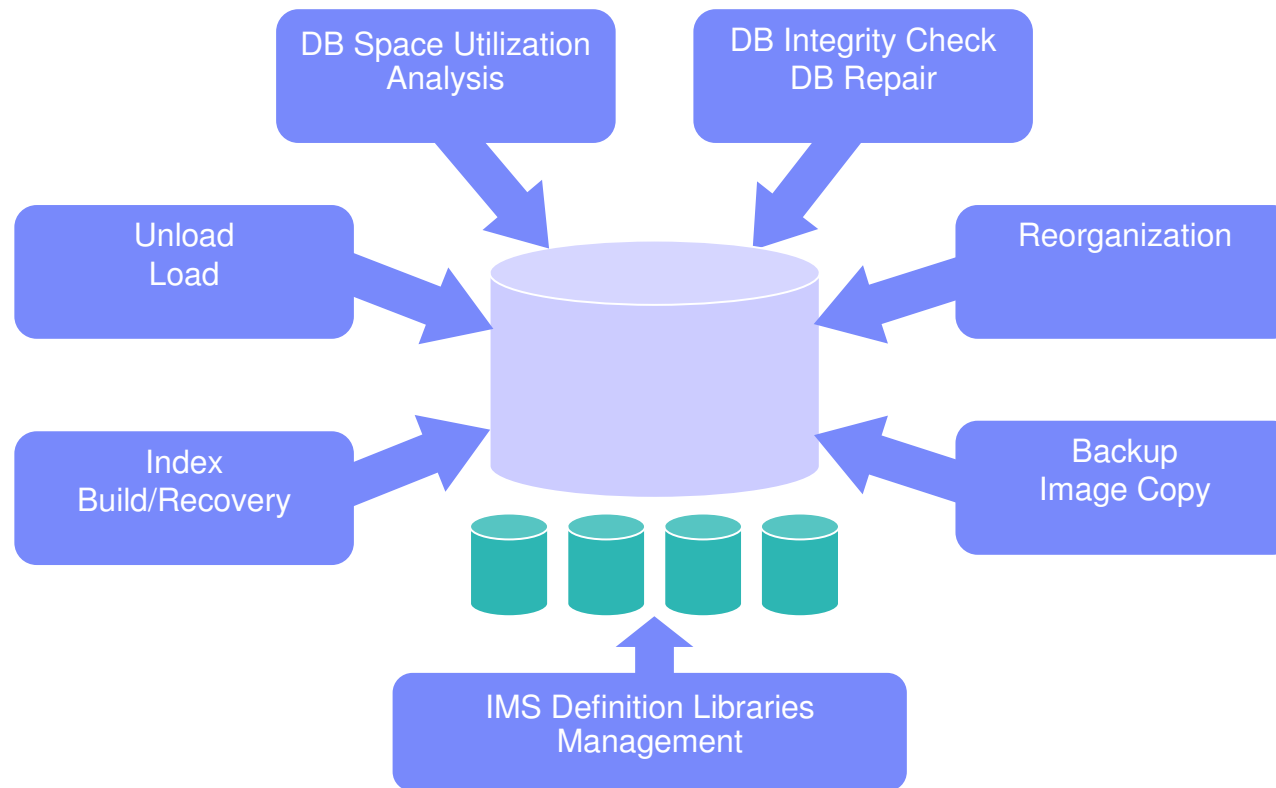
IMS Database Reorganization Expert and IMS Database Solution Pack

What is IMS Database Solution Pack?

- IMS Database Solution Pack is comprised of the following tools:
 1. **IMS Database Reorganization Expert for z/OS V4R1** (*new product*)
 2. **IMS High Performance Image Copy for z/OS V4R2** (*new release*)
 3. **IMS High Performance Load for z/OS V2R1**
 4. **IMS High Performance Pointer Checker for z/OS V3R1**
 - Including **IMS Database Repair Facility**
 5. **IMS High Performance Prefix Resolution for z/OS V3R1**
 6. **IMS High Performance Unload for z/OS V1R2**
 7. **IMS Index Builder for z/OS V3R1**
 8. **IMS Library Integrity Utilities for z/OS V2R1**
- Each of these tools is also shipped as a separate product
- The Solution Pack requires **IMS Tools Base for z/OS V1.1**

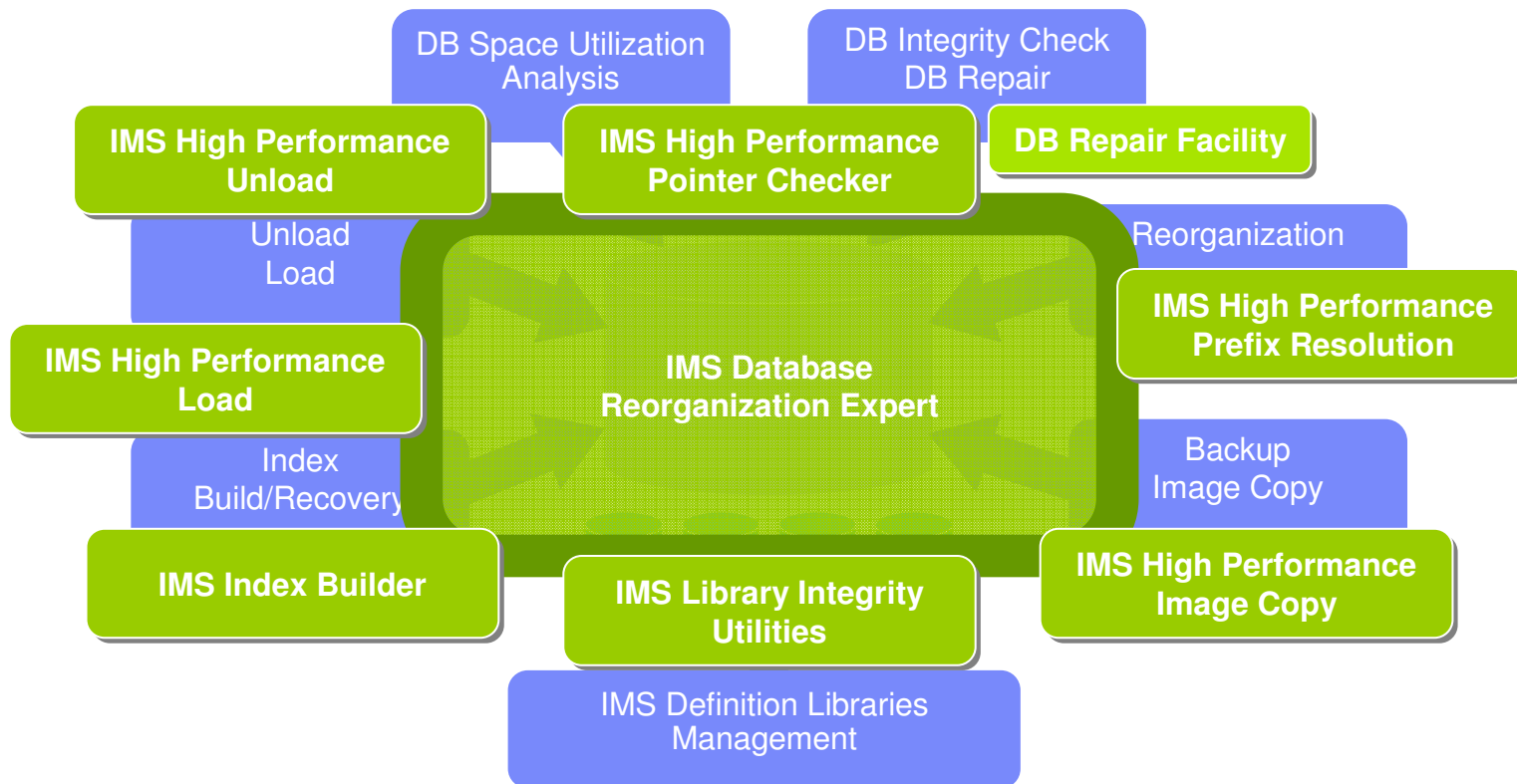
Tools for daily DBA tasks in a Pack

- DB Solution Pack simplifies and accelerates the database maintenance tasks for IMS full-function databases



DB Solution Pack helps daily DBA tasks

- DB Solution Pack provides a complete set of high performance tools to unload, load, reorganize, build indexes for, backup, verify, and report on full-function databases



Benefits of IMS DB Solution Pack (1)

- Benefits of individual tools
 - High performance for operational efficiency
 - Unload, Load, Index Build, Prefix resolution
 - Pointer integrity check and space utilization analysis
 - Image copy
 - Rich functions not available standard IMS database utilities
 - Keyword-based easy-to-use control statements
 - Dynamic allocation of database data sets and image copy data sets
 - User defined unload record format (HP Unload, HP Load)
 - User exits for HP Unload and HP Load
 - Detailed reporting (HPPC, HP Unload, HP Load)
 - Threshold detection and exception notification (HPPC)
- Integrated operation for further processing efficiency
 - Image Copy with Hash Check (HPIC + HPPC)

Benefits of IMS DB Solution Pack (2)

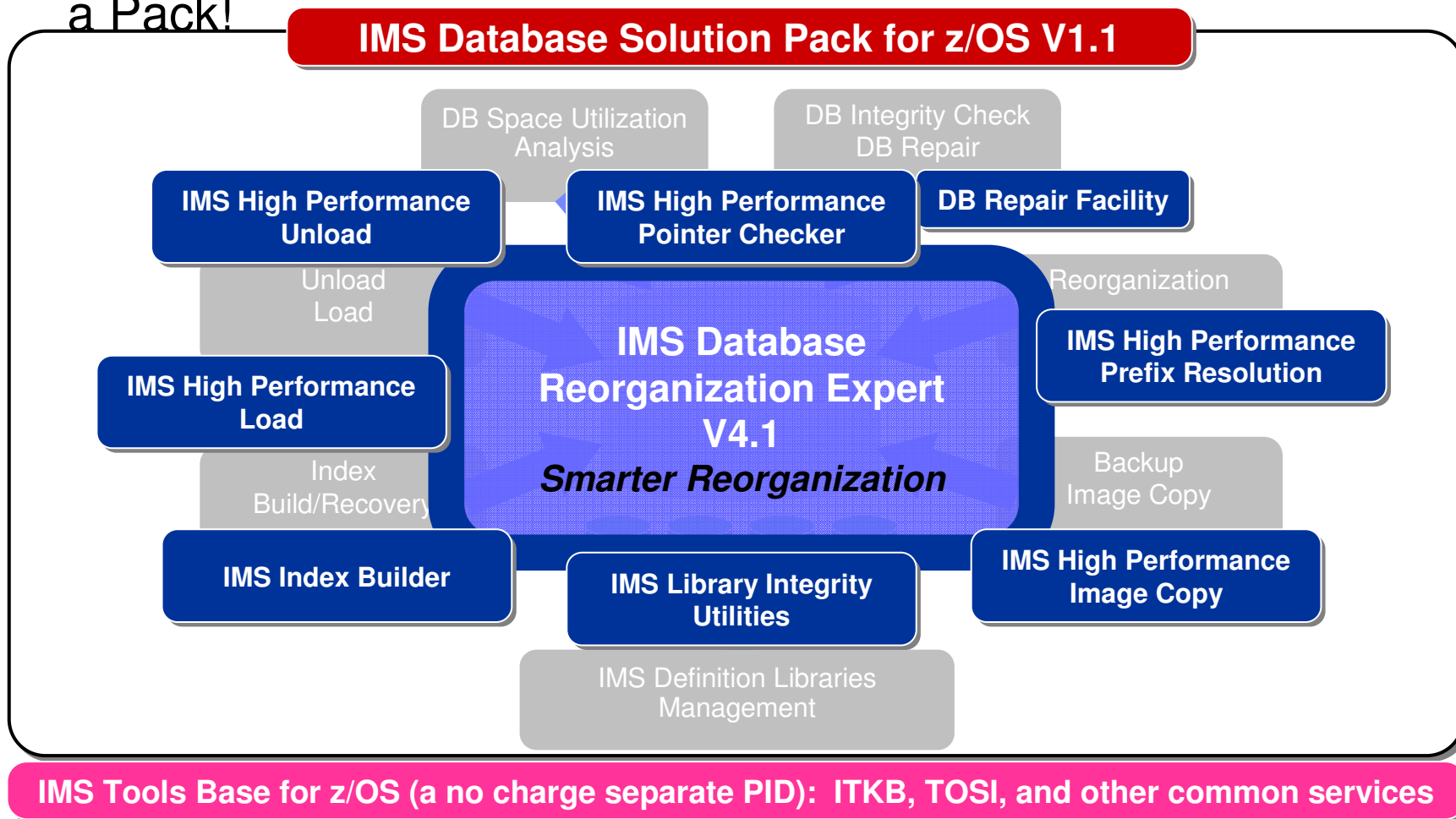
- Reorg Expert normalizes complicated stats analysis to make it easier
 - Policy-based database diagnosis
 - Policy-based conditional reorganization
- Reorg Expert automates reorganization tasks for further efficiency
 - Execution of the following tools for reorg are automated:
 - HP Unload
 - HP Load
 - Index Builder
 - HP Prefix Resolution
 - HPIC + HPPC for Image Copy with Hash Check
 - Library Integrity Utilities
 - All these tools are packaged in this Solution Pack!

IMS Tools Base provides common services

- Tools in IMS Database Solution Pack optionally use following services in IMS Tools Base:
 - IMS Tools Generic Exits
 - IMS Tools Knowledge Base (ITKB)
 - IMS Tools Online System Interface (TOSI)
 - Policy Services
- Most of the tools in the Pack can use ITKB for centralized report repository
- Reorg Expert uses ITKB for policy repository and sensor data repository
- HPIC and Reorg Expert use TOSI (and Generic Exits) for automated IMS online command operation

Summary

- Everything you need in daily IMS database administration is in a Pack!



IMS Database Reorganization Expert V4.1

- Background and requirements
- Reorg Expert solutions
- Features overview
- Solutions details
- Installation and setup
- Summary

Background

- **Reorganization and definition change are necessary**
for better space utilization of IMS full-function databases
- **To help this work, various tools have been provided from IBM and other vendors. e.g.,**
 - Pointer checker tools for database pointer/space analysis
 - Reorganization tools for faster reorganization
 - Integrated reorg tools for simplified operation and performance
- **But, still deep knowledge and skills of IMS space management are needed**
to perform IMS database reorganization and definition change
effectively

Background...

However, ...

- Skilled IMS DBAs are dwindling
- Knowledge of skilled DBAs for IMS DB space management are not necessarily well documented in many shops
- Thus, it is often difficult to train DBAs of other DBMSs or new hires to do effective space management as a skilled DBA does

Typical questions on IMS DB space management

- **In determining whether to reorganize a database**
 - What exceptional states should be observed for the database?
 - What database statistics can and should be observed to detect such exceptional states?
 - What states of the database are considered so critical that an immediate reorganization or restructure of the database is needed?
- **After a database has been reorganized**
 - Was this reorganization effective?
 - What exceptions were removed and what were not by this reorganization?
 - What should I do next if the reorganization was not effective for the database?

Reorg Expert solutions

1. Central management of information and data

Reorg Expert offers IMS DBAs the capability of centrally controlling the information and statistics data that are needed to plan and perform reorganization of IMS databases effectively

Necessary info/data are always there in well-defined format

2. Policy-based database space management

Reorg Expert reduces the amount of work and expertise required to perform complex report analysis for determining reorganization need

Decision criteria and actions are documented in policies

3. Conditional reorganization

Reorg Expert helps avoid unnecessary reorganizations that are based on fixed schedules that do not consider if a reorganization is actually required or what type of reorganization is appropriate

Reorganization need/effectiveness are evaluated and notified

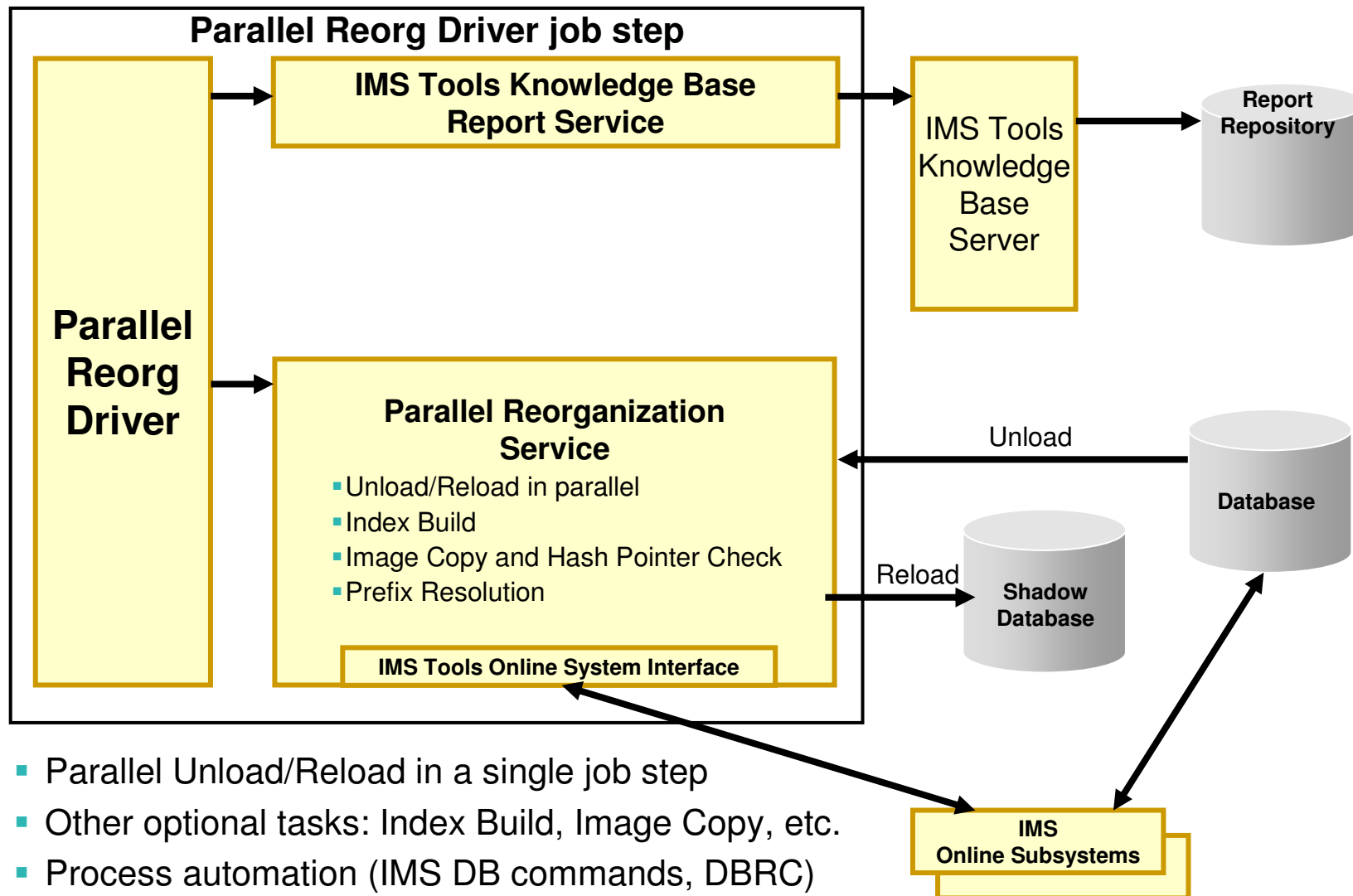
IMS Database Reorganization Expert for z/OS V4R1

- Is positioned as the follow-on product of IMS Parallel Reorganization (IPR) V3R2 (Program Number: 5655-M28)
- IMS Parallel Reorg Driver will be renamed to “*Smart Reorg*” and will support the following features:
 1. Collecting *statistics data for database space management*
 - ✧ We will call this data *the sensor data*
 2. Defining and managing the *reorganization policy* for detecting space management exceptions
 3. Utilizing the policy for *conditional reorganization*
 4. Utilizing the policy for *exception notification and reporting*
 5. Tracking detected exceptions and *effectiveness of reorganization*
- IPR Unload, IPR Reload, and IPR DB Scan utilities are also included and are fully compatible with those in IPR

IMS Tools Base for z/OS

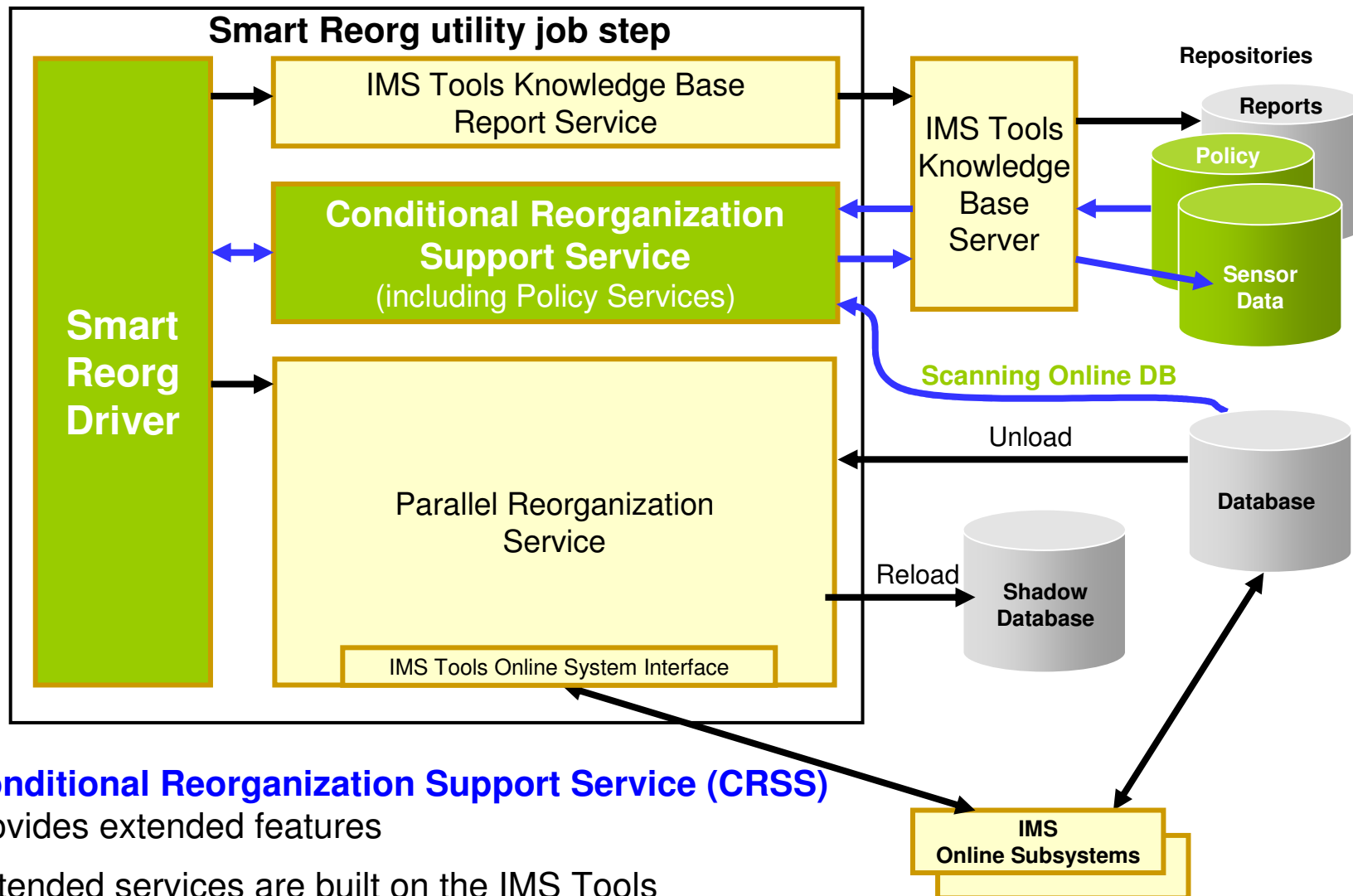
- Reorg Expert uses IMS Tools Knowledge Base and Policy Services
 - These are components of **IMS Tools Base for z/OS**
- The following services of **IMS Tools Knowledge Base** are used by Reorg Expert:
 - **Input Repository** as the centralized policy repository
 - **Output Repository** as the centralized report repository
 - **Sensor Data Repository** (*new*) as the centralized stats repository
 - **ISPF report search/browse interface** for tracking detected exceptions and reorganization process
- The following services of **Policy Services** are used by Reorg Expert:
 - **Sensor data store and read**
 - **ISPF interface for policy definition and customization**
 - **Policy evaluation and action determination**
 - **Exception notification**

Parallel Reorg Driver in IPR V3R2



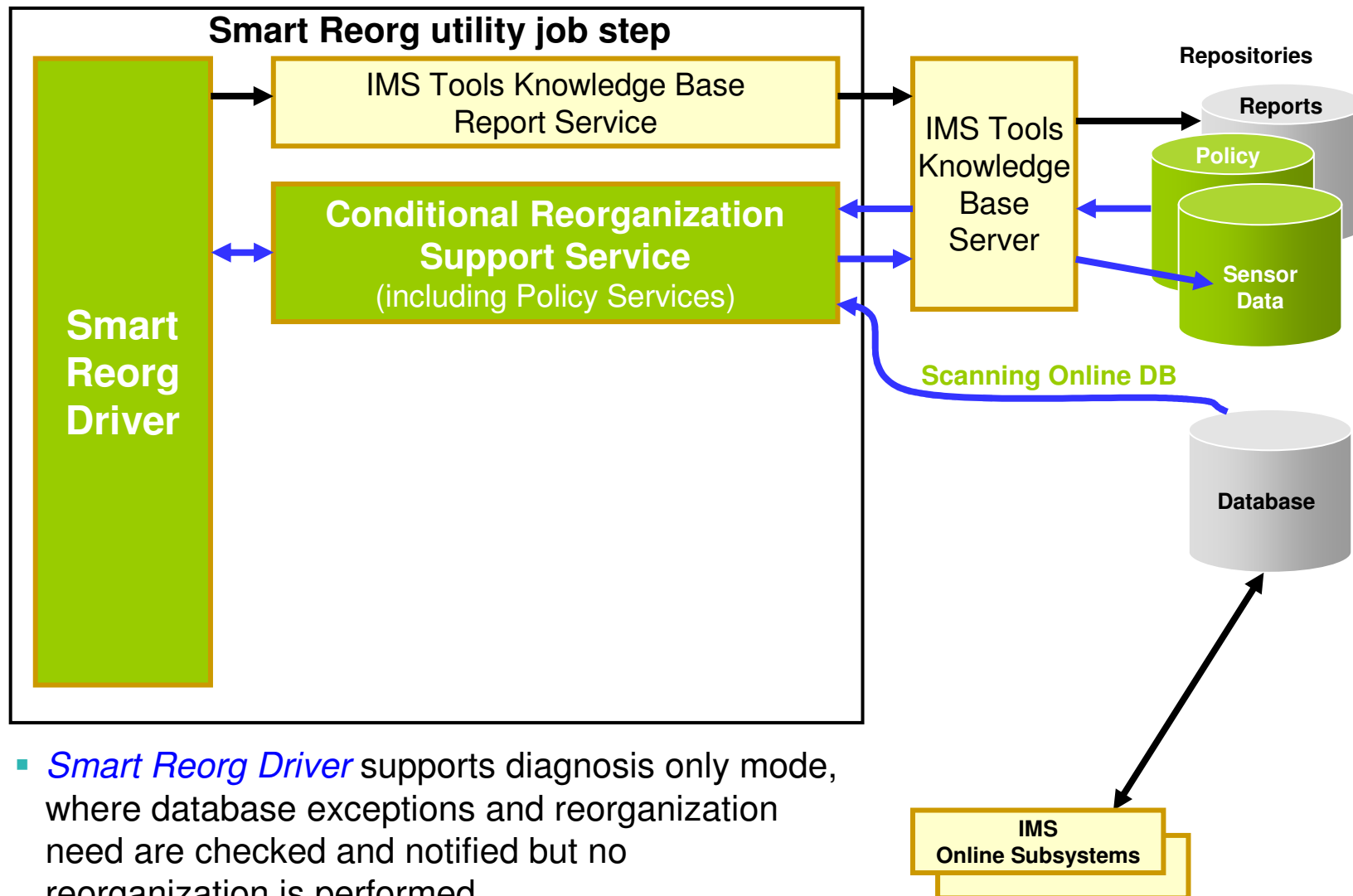
- Parallel Unload/Reload in a single job step
- Other optional tasks: Index Build, Image Copy, etc.
- Process automation (IMS DB commands, DBRC)
- Support for IMS Tools KB report repository

Smart Reorg utility in Reorg Expert



- **Conditional Reorganization Support Service (CRSS)** provides extended features
- Extended services are built on the IMS Tools Knowledge Base (IMS Tools KB) and Policy Services

Smart Reorg utility in Diagnosis Only mode



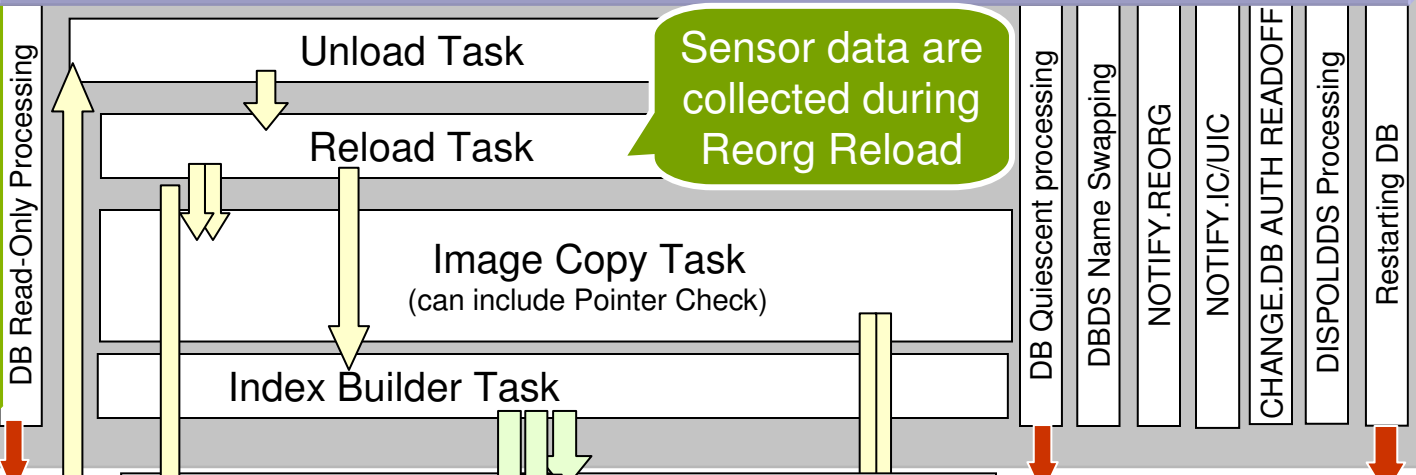
- *Smart Reorg Driver* supports diagnosis only mode, where database exceptions and reorganization need are checked and notified but no reorganization is performed

Smart Reorg Driver (IPR Driver)

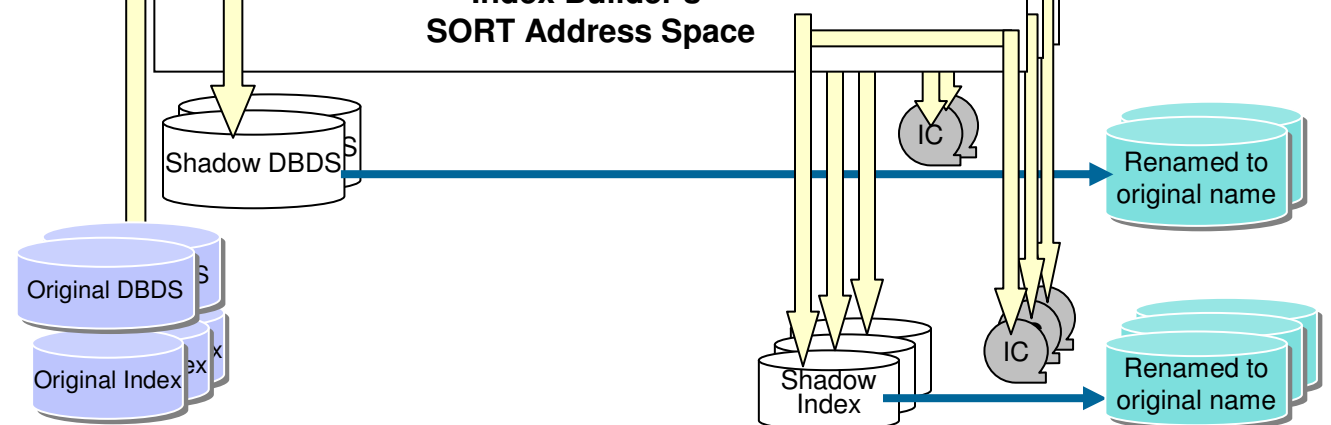
Parallel Reorganization Service (used only when reorg needed)

CRSS Pre-process

CRSS Post-process

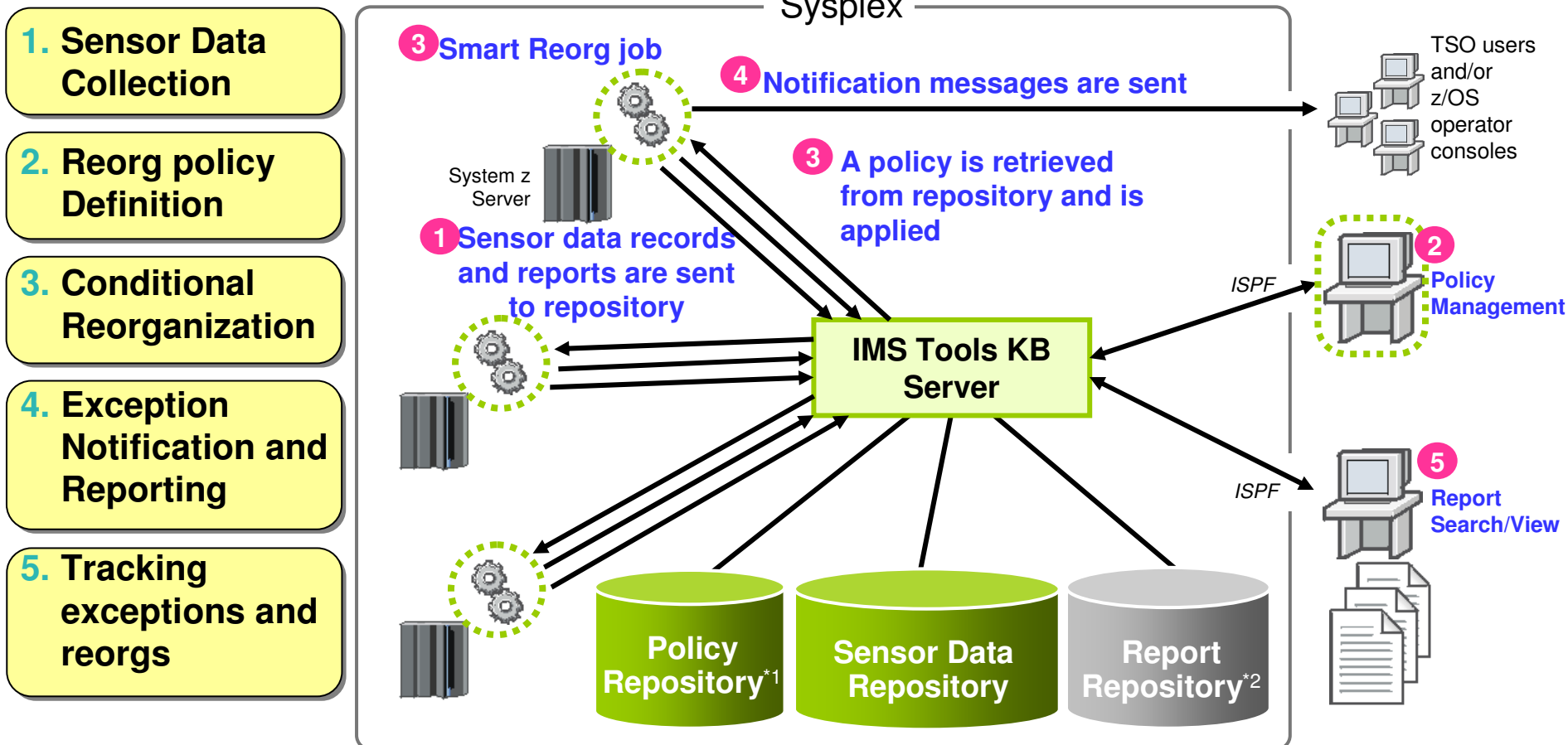


/DBD DB /DBR DB /STA DB



Online Read-Only Access to On-line DB DB is Off-lined Online

Smart Reorg utility features at a glance



- All information are stored in and managed by IMS Tools KB repositories
- Sysplex-wide access to these repositories is supported by IMS Tools KB Server

*1: ITKB Input Repository is used as the Policy Repository.

*2: ITKB Output Repository is used as the Report Repository.

Reorg Expert Solution #1

Necessary info/data are always there
in well-defined format

Database sensor data and data elements

- *Sensor data* is the data collected by an IMS Tools product (e.g., Reorg Expert's Smart Reorg job)
- This sensor data is information captured at an instance in time that represents the condition, or state, of one or more databases
- We will see the following later in this session:
 - ✓ Policies consists of a set of rules that each define threshold limits for specific types of database conditions
 - ✓ The policy service mechanism evaluates these threshold limits against actual data

List of sensor data collected in V4R1

Database Record Statistics (per database or HALDB partition)

- Nbr. of DB records
- Avg. DB record length

Randomizer Statistics (per HDAM or PHDAM partition)

- Nbr. of total RAPs
- Nbr. of unused RAPs
- % of number of unused RAPs
- Nbr. of synonyms
- % of number of synonyms
- Nbr. of root not on home block
- % of root not on home block
- % of segment data in overflow
- Nbr. of roots in overflow
- % of number of roots in overflow
- Bytes of segments in RAA

Volume/Extents Statistics (per data set)

- Allocation type (CYL, TRK, ...)
- Primary allocation amount
- Secondary allocation amount
- SMS-managed or not
- Max. nbr of extents for the d.s.
- Max. nbr. of extents for the volume
- Nbr. of extents allocated
- Nbr. of volumes used
- Nbr. of unused volumes
- Nbr. of unused assigned volumes
- Nbr. of unused candidate volumes
- Nbr. of available remaining extents determined by the max. nbr. of data set extents and the max. nbr. of extents available on volumes assigned to the data set

Data Set Space Usage Statistics (per data set)

- Block/CI size
- Nbr. of blocks/CIs used
- Max. size of the data set
- % of data set size against the max.
- High-Allocated-RBA
- High-Used-RBA

IMS Space Utilization Statistics (per data set)

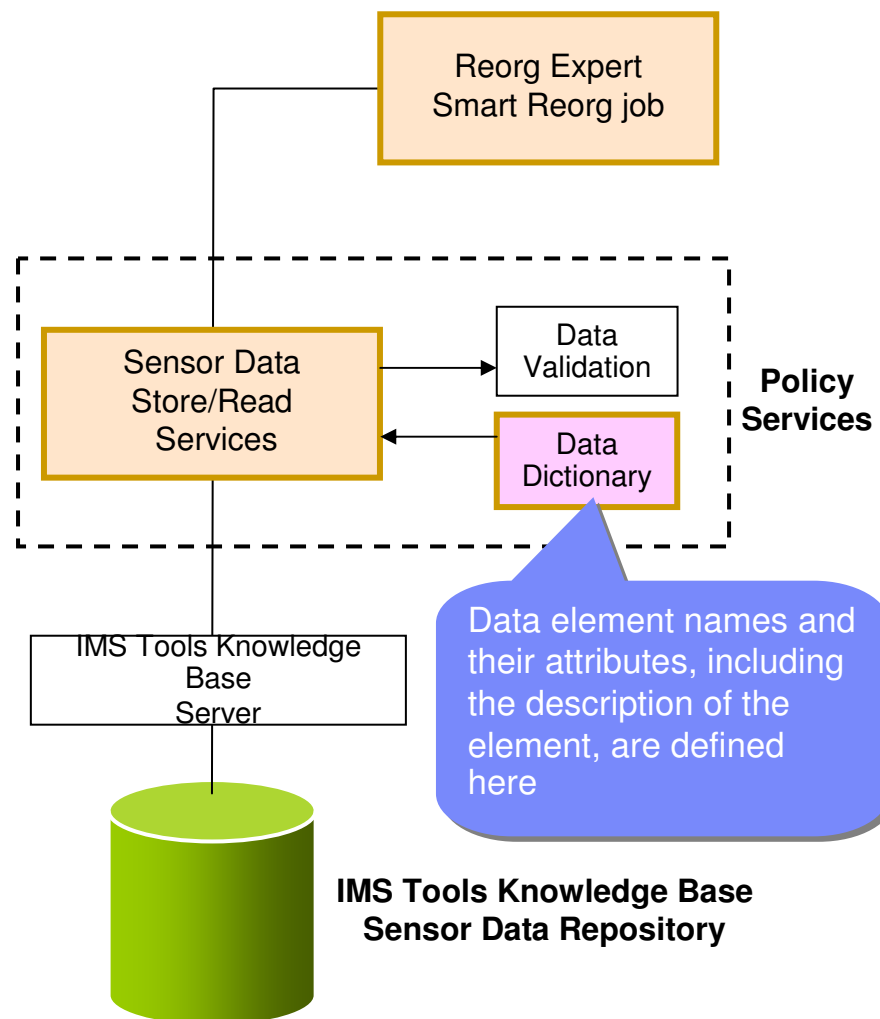
- Total bytes of segment data
- Total bytes of free spaces
- Total bytes of slack bytes
- % of free spaces
- % of segment data
- % of unused bytes in the data set
- Total nbr. of segments
- Total nbr. of VL segments
- Total nbr. of VL-split segments
- % of nbr. of VL-split segments
- Total nbr. of slack bytes
- Avg. nbr. of slack bytes per block
- Total nbr. of FSEs
- Avg. nbr. of FSEs per block
- Nbr. of FSEs valid for shortest segments
- Nbr. of FSEs valid for longest segments
- Avg. nbr. of non-reusable FSEs
- Total nbr. of pointers
- Total nbr. of ptrs pointing external block
- % of nbr. Of ptrs pointing ext. block

HISAM/SHISAM Statistics (for HISAM)

- Logical record length
- Total nbr. of CI splits
- % of nbr. of CI splits
- Total nbr. of CA splits
- % of nbr. of CA splits
- Total nbr. of HISAM delete bytes
- % of nbr. of HISAM delete bytes

Sensor Data Repository

- The sensor data is stored in the *Sensor Data Repository* as records made up of *data elements*
- The data record is stored in a well-understood and flexible format
 - This allows its use years and multiple product releases later in time
- The data and its format is understandable between products and releases to ensure reliable functionality



Reorganization policy

- Smart Reorg utility uses *reorganization policies* (policies in the *policy domain* “REORG”) to define criteria for exception detection/notification, and reorganization decision
 - For a database type, a database, or a group of databases
- A *policy* is the definition that is used by Policy Services to evaluate specific database states

An example

The state of space utilization at a specific instance in time

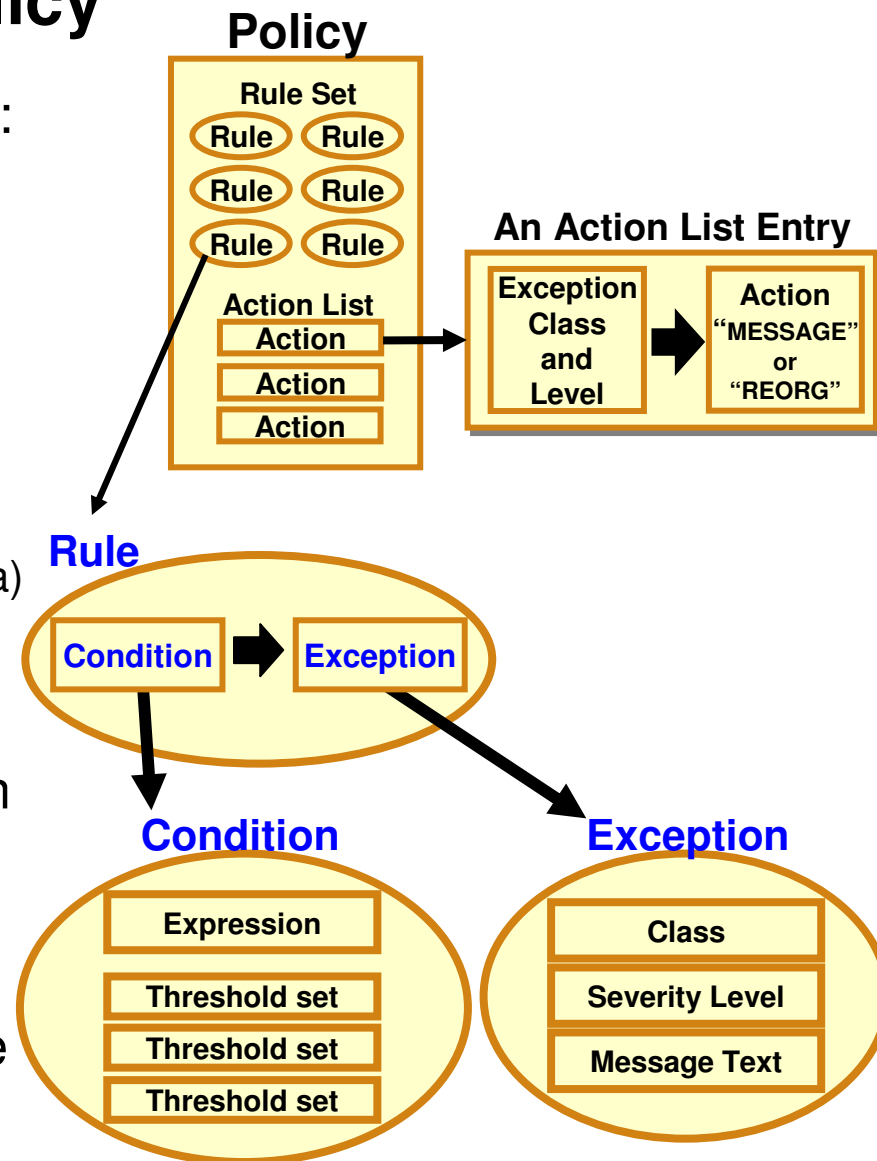
- The policy definition specifies how Policy Services responds to any events that reach or exceed the threshold limits specified for a state observed for a given database
- An *ISPF user interface* for policy management is provided by Policy Services
- Policies are stored in the IMS Tools KB Input Repository

Reorg Expert Solution #2

Decision criteria and actions are documented in policies

Major components of a policy

- Policy has two major components:
 - **Rules** that detect **exceptions**
 - **Exception-to-Action mapping**
- Rule Set for exception detection
 - Rule has two elements:
 - **Condition** (a threshold check formula)
 - **Exception** (a named state of a DB)
- Action List for action mapping
 - An Action List entries defines an exception-action mapping
 - The sequence of Action List entries defines whether to reorganize the subject database



Exception detection condition is defined in a rule

Sample Data Elements

DB_PCT_OF_MAX_DS_SIZE

The percentage of allocated bytes (bytes for High Allocated RBA) compared to the maximum size (4 GB or 8 GB).

DB_PCT_BYTES_FREE_SPACE

The percentage of bytes of total free spaces to the total used bytes for the data set.

A Sample Condition Description

```

Help
REORG/OPERATION                               Evaluation Formula Descrip Row 1 to 10 of 10
Command ==>

Rule name . . . . . : IBM.DBDS_GROWTH.20   Locale . . : $IVP
Value set for threshold . : MED
&1=85, &2=20,
Evaluation formula description
Both of the following thresholds have been reached or
exceeded in a database data set. This condition indicates
the possibility that high percentage of unusable free
spaces has caused the growth in data set size.
- Threshold on the percentage of data set size against
its allowable maximum size:
  &1(85)
- Threshold on the percentage of total free spaces against
the used space that is allocated for the data set:
  &2(20)
***** Bottom of data *****
    
```

A Sample Set of Threshold Values

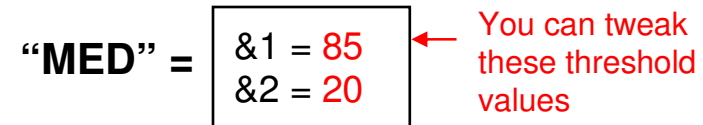
```

Commands Help
DOMAIN: REORG                               View Threshold Values   Row 1 to 2 of 2
Command ==>

View threshold values and press End to exit.
Locale . . . . . : $IVP           Rule name : IBM.DBDS_GROWTH.20
Value set for threshold : MED
ID#  value      Description
&1  85          Numeric, range: 0 to 100
          The percentage of allocated bytes (bytes for High allocated
          RBA) in the maximum size (4 GB or 8 GB).
&2  20          Numeric, range: 0 to 100
          The percentage of bytes of total free spaces compared to the
          total used bytes for the data set.
***** Bottom of data *****
    
```

Threshold Set

A named set of threshold values for the threshold variables that are referred to in the condition description above is called *a threshold set*.



Attributes of an exception

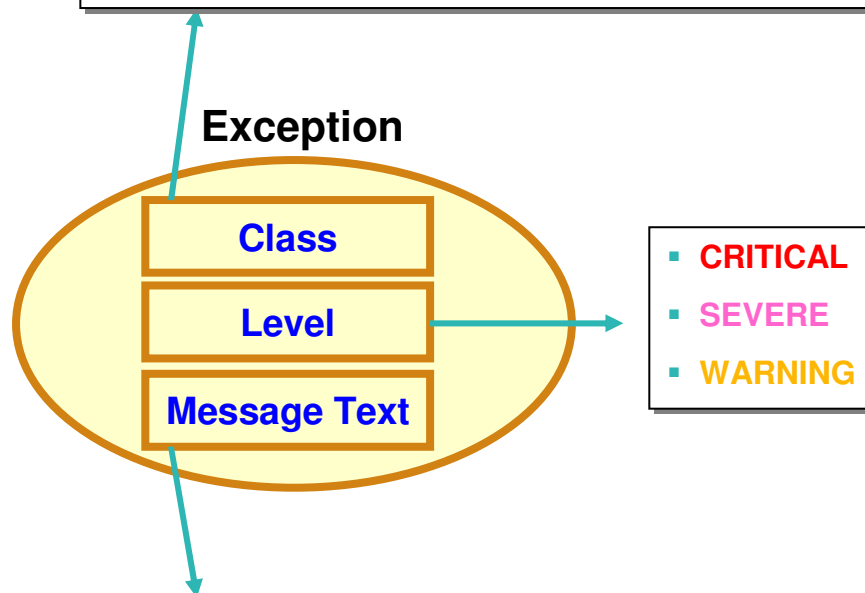
- **Exception class**
 - Represents the specific database event category being monitored
- **Exception severity level**
 - Is a category representing the severity of the detected exception
 - There are fixed three levels:
 - WARNING
 - SEVERE
 - CRITICAL
- **Exception message**
 - Is the text that can be used by the resulting policy action to describe the database event that crossed a rule threshold set
 - Users can modify the message text

An Example of Exception Class

Exception Class:

FRAGMENTED_FREE_SPACES

* Name of the rule that detects the this exception:
IBM.FRAGMENTATION.10



An Example of Exception Message

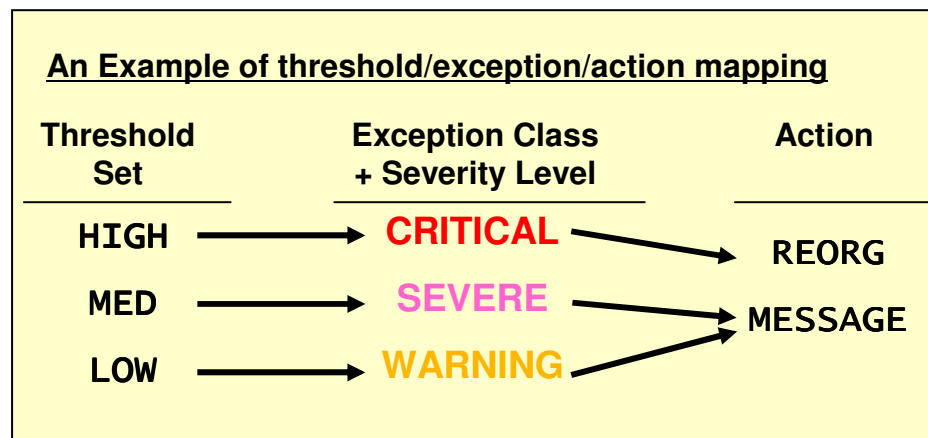
“The fragmentation of free space in %RESOURCE% has increased”

* The symbol %RESOURCE% is replaced by a DBD name or a partition name.

Exception-to-Action mapping

- An *action* is the result of a rule condition being reached or exceeded during a policy evaluation
- A rule threshold set has been mapped to a severity level for the exception class associated with the rule
- In turn, the severity level is mapped to an action

Note: In IBM-provided REORG policies, severity-level-to-action mappings are fixed for each exception class and are not customizable.



```

Commands Help
REORG/OPERATION Associate Actions With Rule Thres Row 1 to 3 of 3
Command ==>
Select actions. Then press Enter to be prompted to choose the associated rule
thresholds. Press End to cancel all selections.
Locale . . : BSNGLOBL Policy name . . : SYS.DBDBTYPE.HDAM
Locale . . : BSNGLOBL Rule name . . . : IBM.DBDS.GROWTH.20
Description : Simple rule on the size of data sets that have certain

A: Row Actions: S - Select Actions. (You will then be prompted to choose
                U - Unselect.
                thresholds from a list.)

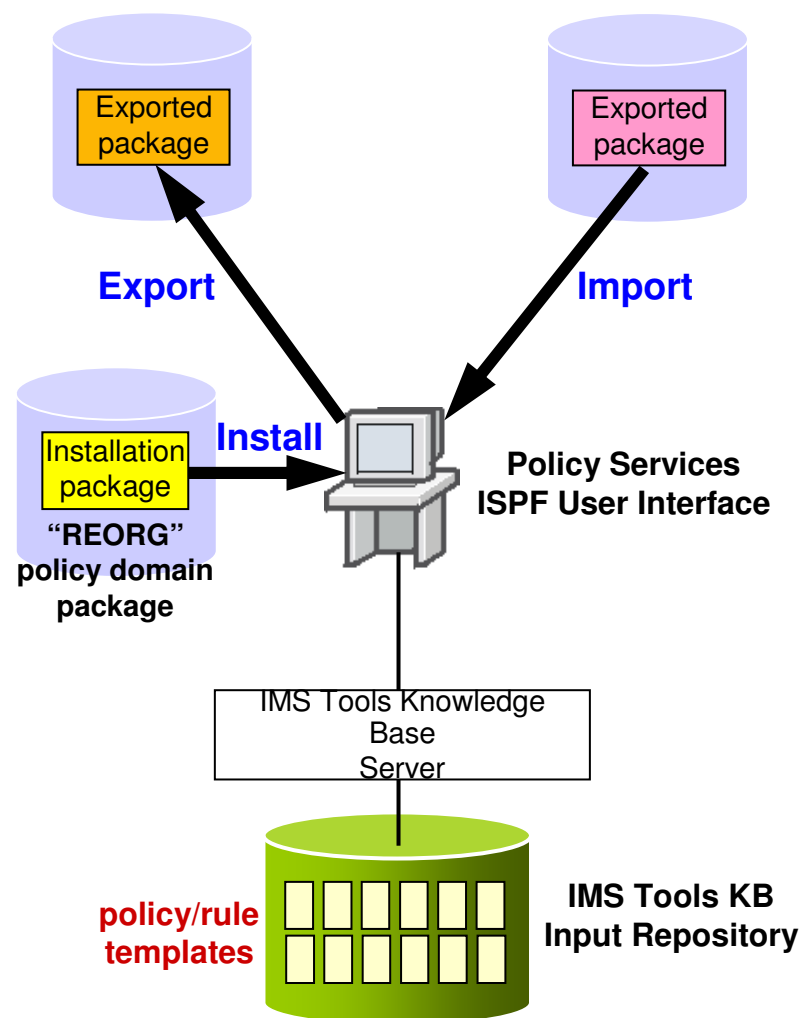
S: Status:      S - Selected.
                O - Pre-selected from original policy. (Update only).

A  S Action      Level      Threshold
-  O REORG      CRITICAL  HIGH
-  O MESSAGE    SEVERE    MED
-  O MESSAGE    WARNING   LOW

F1=Help  F3=End  F5=RFind  F7=Up    F8=Down  F10=Actions
F12=Cancel
  
```

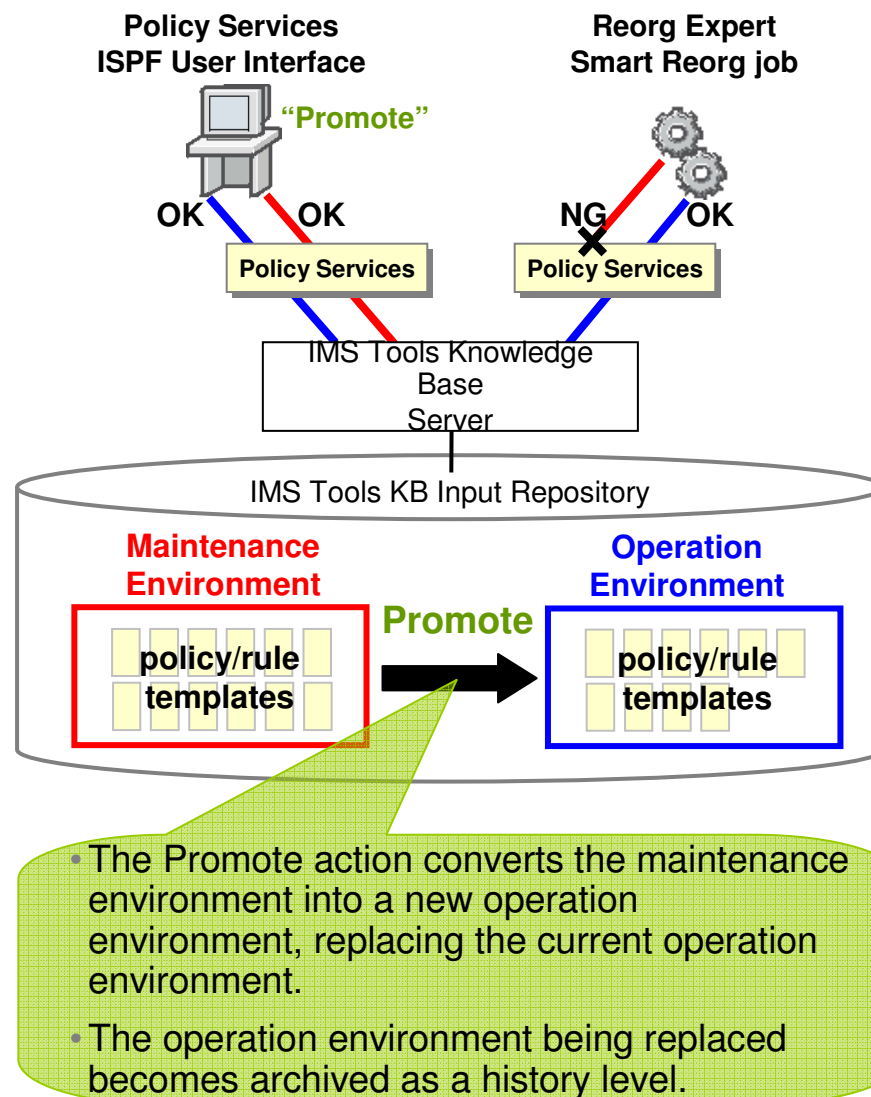
Installing, Exporting, and Importing Policies

- A package of IBM-provided policies and rules is installed as a PDS member
- This package is installed into IMS Tools KB Input Repository as a set of policy/rule “templates”
 - ※ Policy/rule templates describe the contents of a policy and ultimately are transformed into policy streams when a policy lookup is requested by the Policy Services
- The installed policy/rule templates can be copied and customized
- The copied/customized templates can be exported and imported
 - For moving them to another environment
 - For backup



Policy Services Environments

- Updating/importing policy/rules can have broad impacts on the policy environment because the environment is destabilized until all customizations are completed
- To avoid the problem, Policy Services provides two type of policy management environments:
 - Operation environment**
 - Is available to any participating IMS Tools product, e.g., Smart Reorg, to perform the evaluation of sensor data for a given policy request made by the IMS Tools product
 - Maintenance environment**
 - Prevent impacting the operation environment where policy evaluations take place, disruptive changes to the Policy Services configuration should be performed in a maintenance environment



Reorg Expert Solution #3

Reorganization need/effectiveness
are evaluated and notified

Associating a database with a policy

- Smart Reorg utility provides three types of policy association:
 - By database type
 - This is the default.
 - IBM-provided SYS.DBDTYPE.*type* policies is selected
 - By database name
 - This is intended to be used to specify a database specific policy
 - By policy name
 - This is intended to be used to specify a same policy for a group of databases

```
//CREORG EXEC PGM=HPSGMAIN, PARM='DBD=SAMPLEDB, DBRC=Y'
//STEPLIB DD DISP=SHR, DSN=IMSTOOL.LOADLIB
// DD DISP=SHR, DSN=IMS.SDFSRESL
// DD DISP=SHR, DSN=USER.PGMLIB
//IMSDALIB DD DISP=SHR, DSN=IMS.MDALIB
//IMS DD DISP=SHR, DSN=IMS.DBDLIB
//HPSIN DD *
(REORG)
  CONDREORG=YES
  ITKBSRVR=FPQSVR00
  SPACEALLOC=YES
  NAMESWAP=YES
  (CONDREORG)
  POLICYBY=DBTYPE
/*
```

By database type

POLICYBY=DBTYPE

(*type* = HDAM, HIDAM, PHDAM, PHIDAM, HISAM, or SHISAM)

Policy to be selected

➔ **SYS.DBDTYPE.*type***

By database name

POLICYBY=DBDNAME

➔ **SYS.DBDNAME.*dbname***

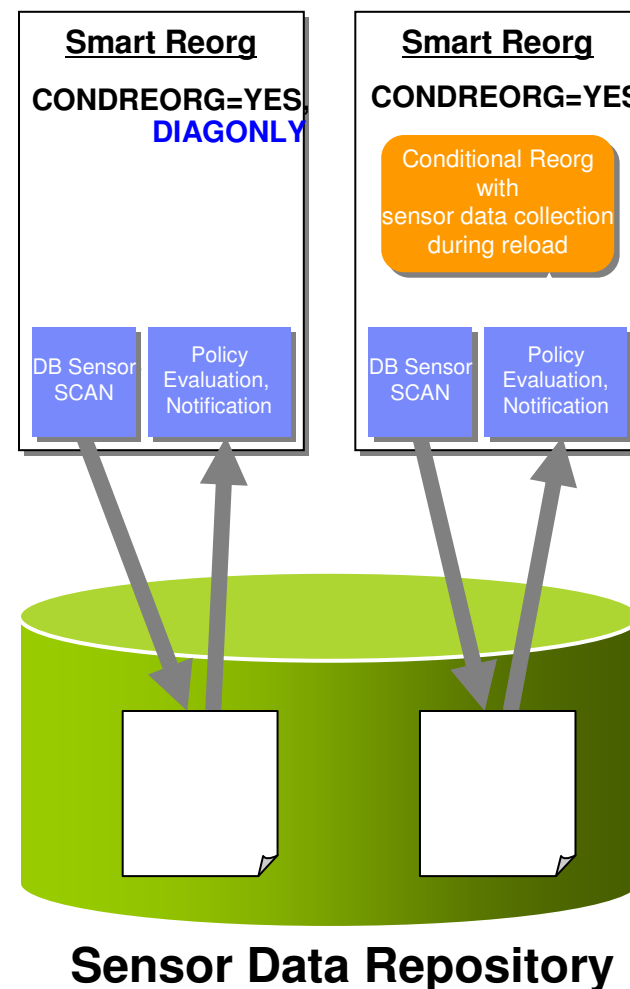
By policy name

**POLICYBY=NAME
POLICYNM=MY.POLICY.GROUP1**

➔ **MY.POLICY.GROUP1**

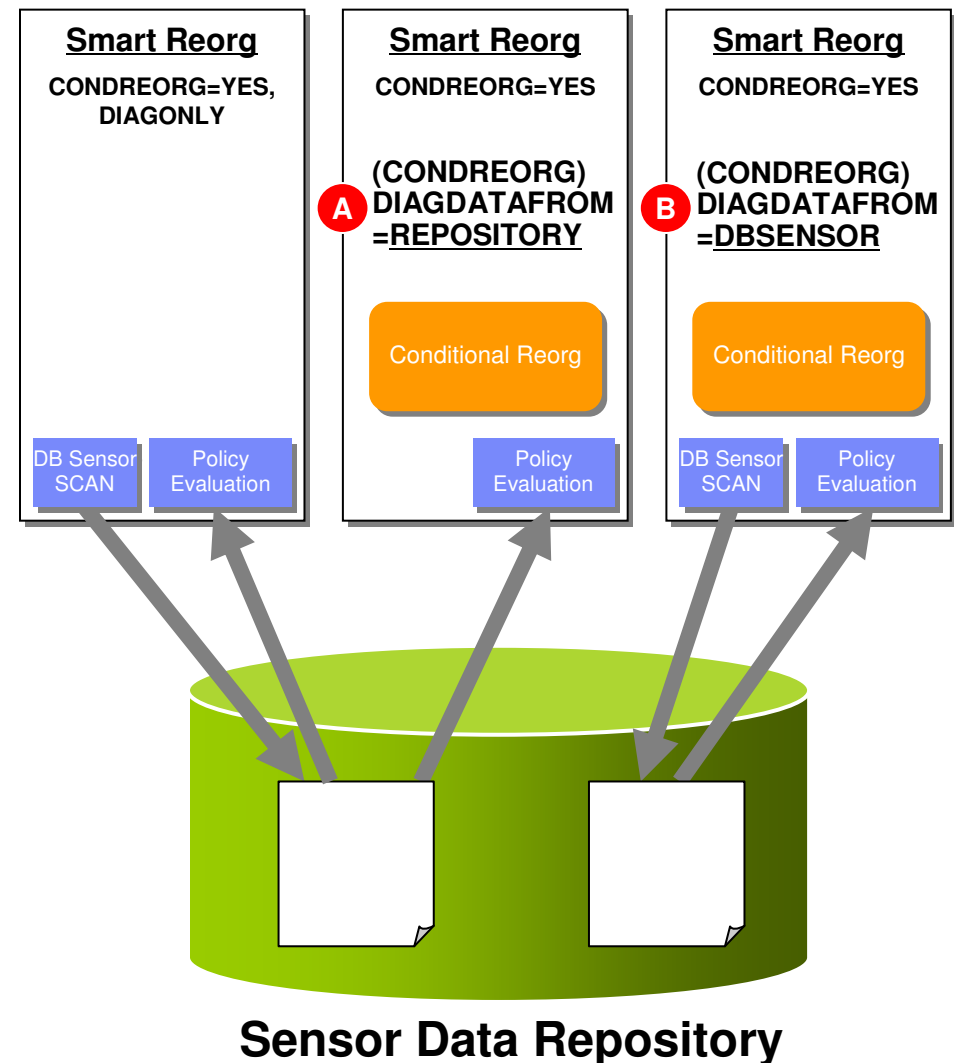
Types of data collection/evaluation in Smart Reorg

- Smart Reorg utility has three modes:
 - 1. Diagnosis mode**
 - CONDREORG=YES,DIAGONLY
 - 2. Conditional Reorg mode**
 - CONDREORG=YES
 - 3. Unconditional Reorg mode**
 - CONDREORG=NO (default)
- Sensor data are collected and stored in modes 1 and 2
- In Diagnosis mode, stored sensor data are evaluated and exceptions are just reported
 - The job return code can be changed for controlling succeeding batch job steps when a critical exception is detected



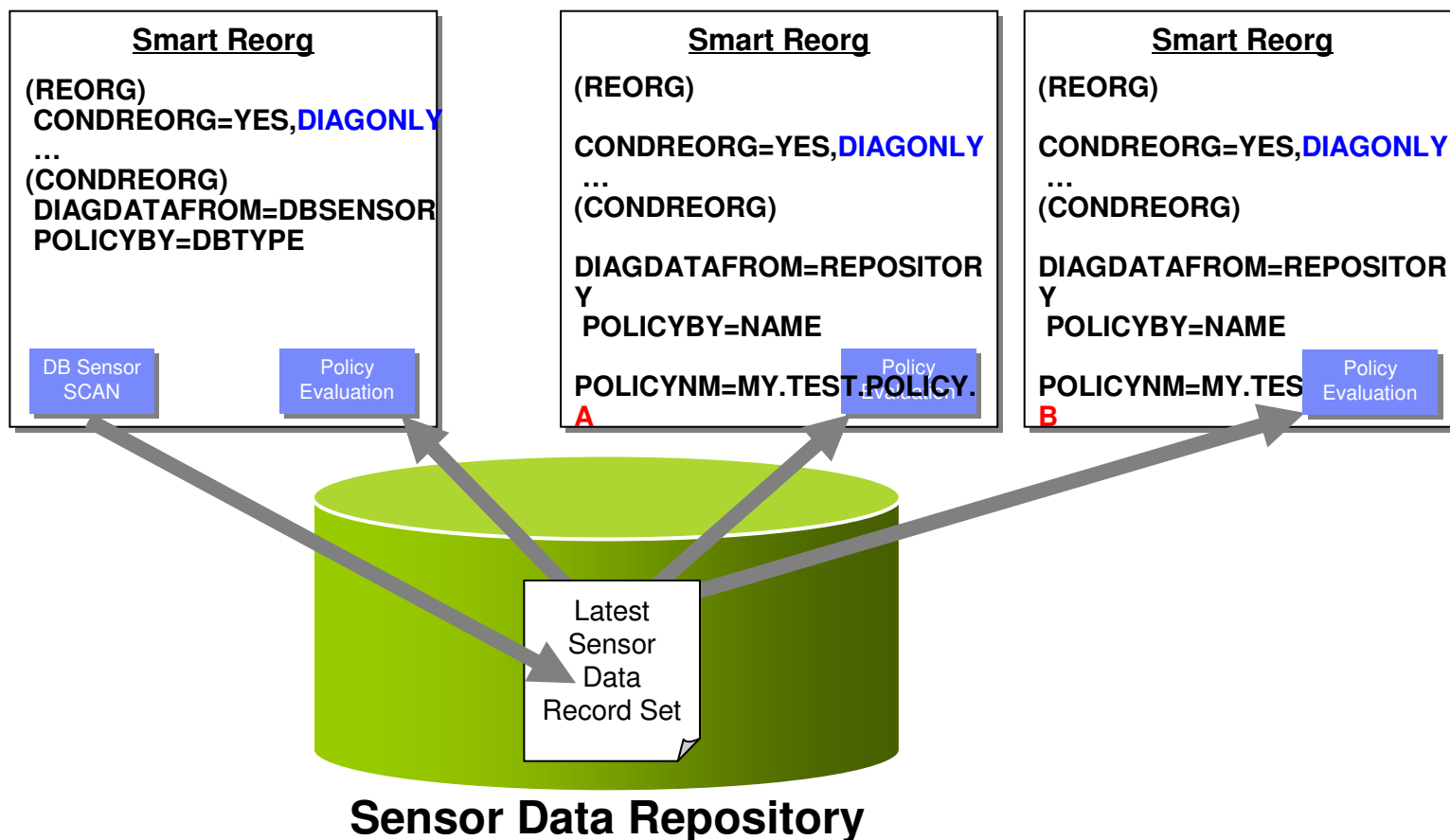
Conditional Reorg mode

- In Conditional Reorg mode, reorganization is performed conditionally based on the result of sensor data evaluation
- Smart Reorg utility can use one of the following sensor data for a database:
 - A) The sensor data last stored in the Sensor Data Repository
 - B) The sensor data collected (and stored) at the time the Smart Reorg job run



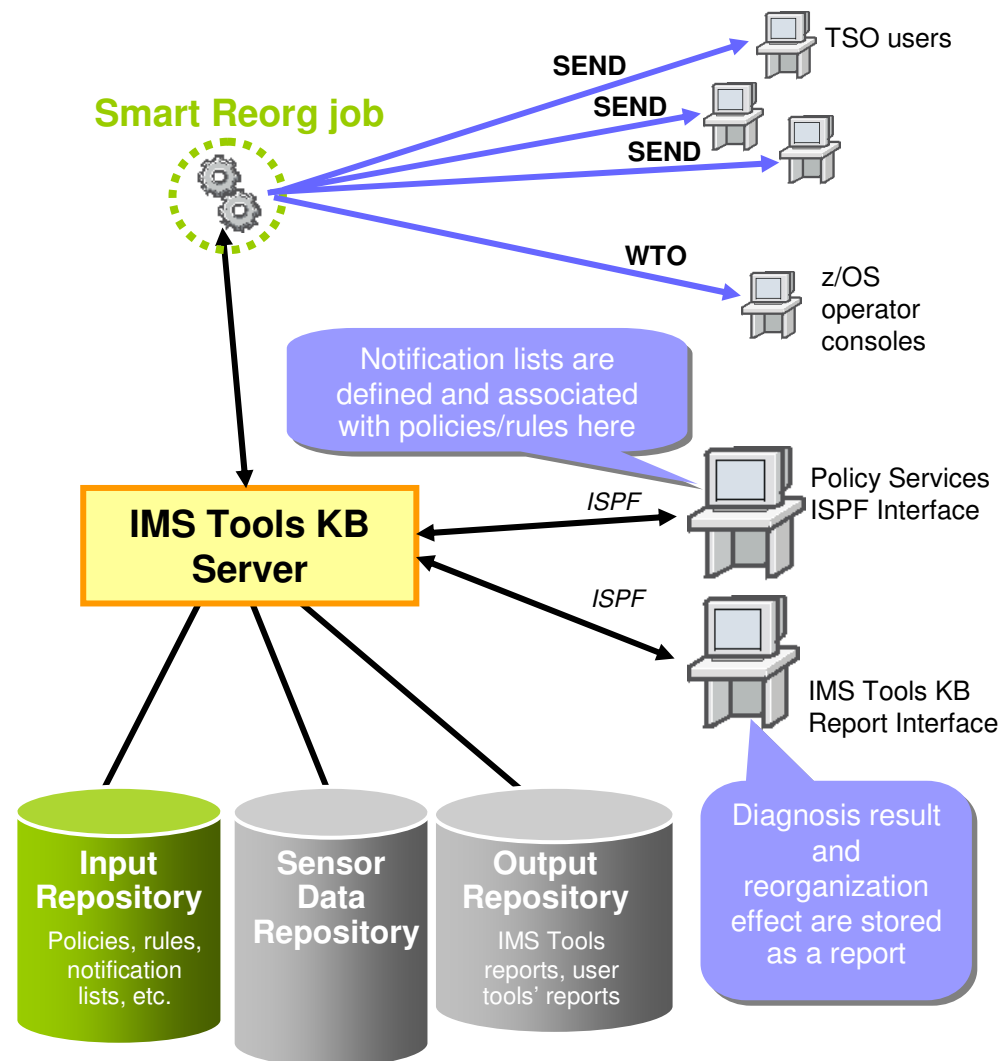
Using stored sensor data for policy customization

- You can use the Diagnosis mode of the Smart Reorg utility to tune/customize your policies



Exception notification

- Exceptions detected by a Smart Reorg job can be notified to designated TSO users and/or z/OS operator consoles
- The target users and consoles are specified in *notification lists*
 - They can be created by using the Policy Services ISPF user interface and can be shared among multiple policies
- One or more notification lists can be associated with a policy and/or individual rule used in the policy

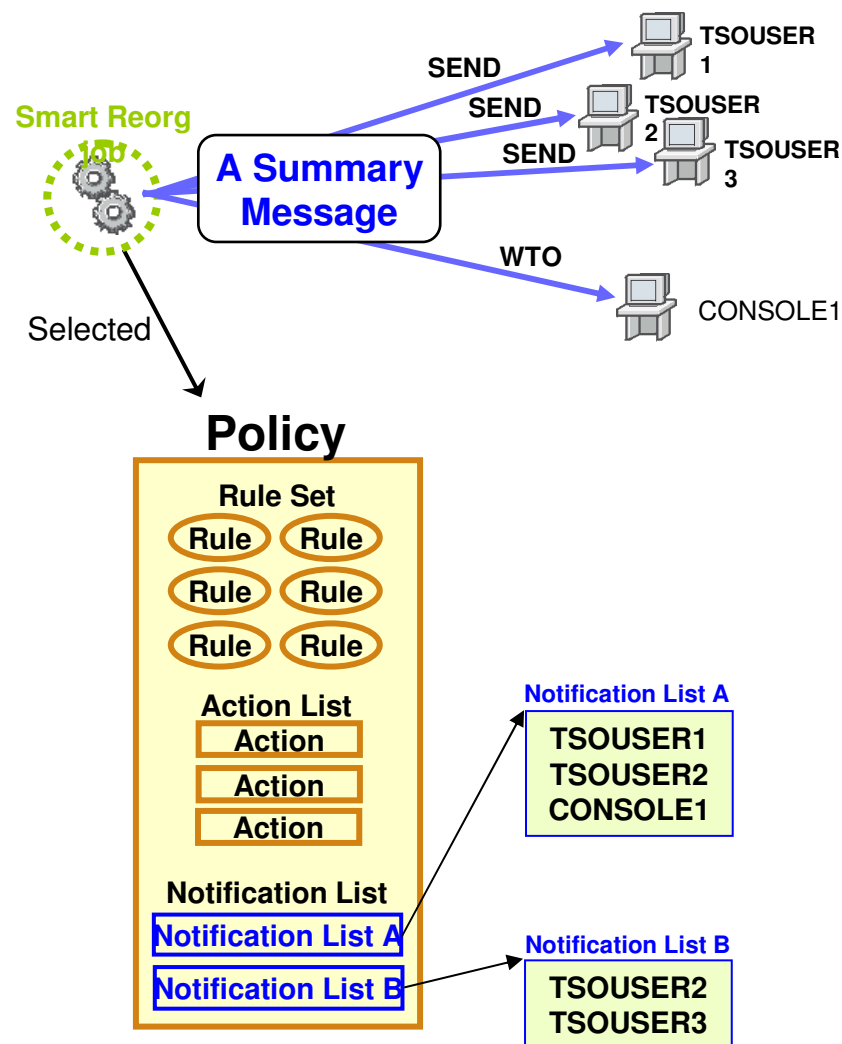


Notification Lists

- **A notification list**

- Is a mechanism for grouping users into a list that represents a unique business category, such as all DBAs, or all users who represent an installation application area or a set of databases associated with a given application or location
- Is identified by a name
- Can be created, exported, and imported by using the Policy Services ISPF User Interface

- The figure shows how you can relate one or more notification lists to a policy
- A policy evaluation *summary message* is sent to each destination specified in the notification lists



Database Diagnosis Report

- Processing result of Smart Reorg job is summarized in the *Database Diagnosis Report*
- The report provides the following information:
 - **Summary of Policy Evaluation**
 - Policy that was applied to the database
 - Reorganization need
 - Result of policy evaluation
 - Result of policy evaluation after reorganization if reorganization was performed
 - *Evaluation summary message (in the previous chart)*
 - **Sensor data values before and after reorganization**
 - And their differences

Report Example – Title Page

- Basic attributes of the subject database is printed in the title page.

```
IMS DB Reorg Expert - V4R1      Database Diagnosis Report      Page:
5655-S35                        Date: 12/16/2009      Time: 00.05.14 1
                                14
Summary of Database Definition
-----
Database..... BKDB
Database Type..... HIDAM
Data Set Organization..... VSAM
Number of Data Set Groups..... 1
```

The following sections follow this title page:

- Summary of Policy Evaluation
- Sensor data values before and after reorganization
 - Database Record Statistics section
 - Randomizing Statistics section (only for HDAM and PHDAM)
 - Volume and Extent Statistics section
 - Data Set Space Usage Statistics section
 - IMS Space Utilization Statistics section
 - HISAM Statistics section (only for HISAM and SHISAM)
- ※ Sections 3 through 5 are printed for each data set group

Report Example – Summary of Policy Evaluation

Policy name
 The locale where the policy is defined
 Result of decision on reorganization need

Exceptions detected before the reorganization. In this example,

- Three CRITICAL exceptions were detected
- Two of them can be removed by REORG (unload and reload)
- One sever exception was detected

Result of the reorganization processing (success/failure)

Exceptions that still remain after the reorganization. In this case, one CRITICAL exception remains.

Summary message, which shows that a CRITICAL exception still remains after the reorganization.

```

IMS DB Reorg Expert - V4R1          Database Diagnosis Report          Page: 2
5655-S35                          Date: 12/16/2009          Time: 00.05.14

Summary of Policy Evaluation (DBD: BKDB )
-----
Name of Policy Applied..... SYS.DBDBTYPE.HIDAM
Policy Locale..... Global
Reorganization Need..... Yes

Exceptions before Reorganization
-----
1 The number of available extents for a data set of BKDB is small
  Class: DATA_SET_EXTENTS_AVAILABILITY      Level: CRITICAL
  Rule:  G:IBM.DBDS_EXTENTS.10              Threshold Set: HIGH
2 The size of a data set in BKDB, which still has a certain amount of free space
  has increased
  Class: GROWING_DBDS_WITH_FREE_SPACES      Level: CRITICAL      -> REORG
  Rule:  G:IBM.DBDS_GROWTH.20              Threshold Set: HIGH
3 The fragmentation of free space in BKDB has increased
  Class: FRAGMENTED_FREE_SPACES            Level: CRITICAL      -> REORG
  Rule:  G:IBM.FRAGMENTATION.10           Threshold Set: HIGH
4 A data set of BKDB has many pointers that point to other bocks or CIs
  Class: EXCESSIVE_SEGMENT_SCATTERING      Level: SEVERE
  Rule:  G:IBM.SEGM_SPREAD.10             Threshold Set: MED

Exceptions after Reorganization
-----
BSN2800I GENERAL STATUS: RESOURCE=BKDB ACTION_NAME=REORG
EXECUTION_STATUS=SUCCESSFUL

1 The number of available extents for a data set of BKDB is small
  Class: DATA_SET_EXTENTS_AVAILABILITY      Level: CRITICAL
  Rule:  G:IBM.DBDS_EXTENTS.10              Threshold Set: HIGH

Summary of Policy Evaluation and Action:
-----
BSN2904I BKDB      HAS BEEN REORGANIZED, BUT IT IS STILL IN A CRITICAL STATE
    
```

Report Example – Database Record Statistics

The number of database records

Average database record length

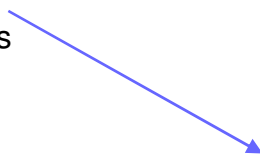
```

IMS DB Reorg Expert - V4R1      Database Diagnosis Report      Page: 3
5655-S35                        Date: 12/16/2009      Time: 00.05.14

Database Statistics (DBD: BKDB  )
-----
                        =====
                        Database Record Statistics
                        =====

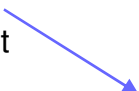
Note: The mark * in column P means that the data element is used in the policy.

Data Element Name      P      Before Reorg      After Reorg      Difference
-----
DB_NUM_ROOT            *      8,560,000         8,560,000
DB_AVG_DBREC_LENGTH    *           288.06           288.06
    
```



Report Example – Volume/Extent Statistics

Information on data set allocation parameters and DFSMS environment



Information on extents and used/unused volumes for the subject data set



Estimation for extent availability



```

...
Data Set Statistics (DBD: BKDB      , DSG: 01)
-----
                               =====
                               Volume/Extent Statistics
                               =====

Note: The mark * in column P means that the data element is used in the policy.

Data set definition and environment information
=====
Data Element Name      P      Before Reorg      After Reorg      Difference
-----
DB_FLAG_SPACE_TYPE                C                C      No change
DB_NUM_PRI_SPACE              1,000            1,000
DB_NUM_SEC_SPACE              100              100
DB_FLAG_SMS                    *                Y      No change
DB_MAX_EXT_DS                 251              251
DB_MAX_EXT_VOL                 123              123

Data set usage information
=====
Data Element Name      P      Before Reorg      After Reorg      Difference
-----
DB_NUM_EXT                  37              32
DB_NUM_VOL                   3               3
DB_NUM_UNUSED_VOL           0               0
DB_NUM_UNUSED_VOL_SER       0               0
DB_NUM_UNUSED_VOL_CAND     *                0

Remaining available data set extent estimation
=====
Data Element Name      P      Before Reorg      After Reorg      Difference
-----
DB_AVAIL_EXT_LESS_100    *                Y      No change
DB_NUM_AVAIL_EXT        *                0      +11
DB_AVAIL_EXT_LIMIT      VOL_FREE_EXTENTS VOL_FREE_EXTENTS      No change

Remark: If DB_NUM_UNUSED_VOL_CAND is not zero, more extents than those
indicated by DB_NUM_AVAIL_EXT might be available.
    
```

Report Example – Data Set Space Usage Statistics

```

IMS DB Reorg Expert - V4R1      Database Diagnosis Report      Page: 5
5655-s35                        Date: 12/16/2009      Time: 00.05.14

Data Set Statistics (DBD: BKDB      , DSG: 01)
-----
                        =====
                        Data Set Space Usage Statistics
                        =====

Note: The mark * in column P means that the data element is used in the policy.

Data Element Name      P      Before Reorg      After Reorg      Difference
-----
DB_BLOCK_SIZE          4,096
DB_NUM_DBDS_BLOCKS    999,179      673,780      -325,390
DB_MAX_DS_SIZE        4G          4G
DB_PCT_OF_MAX_DS_SIZE *      96%          65%
DB_RBA_HIGH_ALLOC     4,128,788,000      2,801,664,000      -1,327,104,000
DB_RBA_HIGH_USED      4,092,641,280      2,759,806,976      -1,332,834,304
  
```

This shows that, within data elements in this category, only the value for the data element DB_PCT_OF_MAX_DS_SIZE is referred to in one or more rules defined in the selected policy.

You can see that the size of data set is reduced by the reorganization.

Report Example – IMS Space Utilization Statistics

```

IMS DB Reorg Expert - V4R1      Database Diagnosis Report      Page:
5655-s35                        Date: 12/16/2009      Time: 00.05.14
Data Set Statistics (DBD: BKDB      , DSG: 01)
-----
                    =====
                    IMS Space Utilization Statistics
                    =====

Note: The mark * in column P means that the data element is used in the policy.

Data Element Name      P      Before Reorg      After Reorg      Difference
-----
DB_BYTES_SEG           2,465,800,000      2,465,800,000
DB_BYTES_FREE_SPACE    1,610,723,680      283,136,678      -1,327,587,002
DB_BYTES_UNIDENTIFIED  *                110                0                -110
DB_PCT_BYTES_FREE_SPACE *                39%                10%
DB_PCT_BYTES_SEG       *                60%                89%
DB_PCT_UNUSED_BYTES    *                1%                1%
DB_NUM_SEG             85,620,000         85,620,000
DB_NUM_VLSEG           8,560,000         8,560,000
DB_NUM_VLSEG_SPLIT    *                0                0
DB_PCT_NUM_VLSEG_SPLIT *                0%                0%
DB_NUM_UNIDENTIFIED   *                51                0                -51
DB_AVG_NUM_UNIDENTIFIED *                0                0
DB_NUM_FSE             *                23,728,638        673,759        -23,054,879
DB_AVG_NUM_FSE         *                23.75             1.00           -22.75
DB_NUM_FSE_MIN         *                23,558,660        673,759        -22,884,901
DB_NUM_FSE_MAX         *                718,662           673,759        -44,903
DB_AVG_NUM_NOREUSE_FSE *                .17               0
DB_NUM_PTR             85,070,408        84,946,241      -124,167
DB_NUM_PTR_DIFF_BLK   *                32,424,879        663,666        -31,761,213
DB_PCT_NUM_PTR_DIFF_BLK *                38%                1%
    
```

Allocated space is more efficiently used by segment data.

Free spaces fragmentation on each database block has been resolved by unload and reload of the database.

Segments of a database record fit in a single database block in almost all database records.

Database diagnosis history in ITKB repository

- A copy of Diagnosis Report can be stored in ITKB Output Repository
- Historical copies of the Diagnosis Report are preserved for each database or HALDB partition
- Smart Reorg sets the following IMS Tools KB index entries:
 - The standard index entries:
 - DBD name
 - Partition name (only for a HALDB partition)
 - Job/jobstep names
 - Job/jobstep timestamps
 - Job userid
 - etc.
 - Report completion code (RCC)

Summary

- IMS Database Reorganization Expert provides a smarter reorganization solution
- Benefits of Policy Services and Smart Reorg utility:
 - DBAs can centrally control the information that are needed to plan and perform reorganization of IMS databases effectively

Necessary info/data are always there in well-defined format

- DBA expertise required to perform reorganization can be minimized and knowledge of skilled DBA can become shared

Decision criteria and actions are documented in policies

- Unnecessary reorg can be avoided with its reason documented and effectiveness of reorg, if performed, can easily be verified

Reorganization need/effectiveness are evaluated and notified

Software Requirements for Reorg Expert V4R1

- z/OS releases supported
 - z/OS V1R9 or later
- IMS versions supported
 - V9, V10, and V11

- **Mandatory Requirements:**
 - **IMS High Performance Unload for z/OS V1R2 (5655-E06)**
 - **IMS High Performance Load for z/OS V2R1 (5655-M26)**
 - **IMS Tools Base for z/OS V1.1 (5655-V93)**

Optional Requirements

- **IMS Index Builder for z/OS, V2R3 (5655-E24) or V3R1 (5655-R01)**
 - For the index building function
- **IMS High Performance Image Copy for z/OS, V4R1 or V4R2 (5655-N45)**
 - For the image copy function
- **IMS High Performance Pointer Checker for z/OS, V3R1 (5655-U09)**
 - For the HASH pointer checking function
- **IMS High Performance Prefix Resolution for z/OS, V3R1 (5655-M27)**
 - For the prefix update and resolution function
- **IMS Library Integrity Utilities for z/OS, V2R1 (5655-U08)**
 - For the DBD decoding function or the DMB verification function

IMS Tools Product Portfolio – pre Feb 2010

HALDB Toolkit HD Compression-Extended Library Integrity Utilities Sequential Randomizer Generator IMS Tools Knowledge Base	IMS Cloning Tool IMS Database Control Suite High Performance Fast Path Utilities High Performance Unload High Performance Load IMS Index Builder High Performance Prefix Resolution IMS Parallel Reorganization Online Reorganization Facility High Performance Pointer Checker	IMS Recovery Expert Database Recovery Facility High Performance Image Copy High Performance Change Accumulation DEDB Fast Recovery	Batch Terminal Simulator Batch Backout Manager IMS Connect Extensions Program Restart Facility
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Data Base Administration

Utility Management

Backup and Recovery

Application Management

IMS DATA BASE TOOLS

Performance Management

Transaction Management

System Administration

Regulatory Compliance

Buffer Pool Analyzer
 Network Compression Facility
 Performance Analyzer
 Problem Investigator
 OMEGAMON XE for IMS

Command Control Facility
 ETO Support
 HP Sysgen Tools
 Queue Control Facility
 IMS Workload Router

IMS Parameter Manager
 IMS Sysplex Manager

IMS Audit Management Expert
 IBM Data Encryption for IMS and DB2 Databases

IMS Tools Product Portfolio

IMS Tools Base for z/OS

HALDB Toolkit
Sequential Randomizer
Generator

IMS Fast Path Solution Pack for z/OS

IMS Database Solution Pack for z/OS

IMS Reorganization Expert
Online Reorganization Facility
IMS Cloning Tool
IMS Database Control Suite

IMS Recovery Solution Pack for z/OS

IMS HP Image Copy
DEDB Fast Recovery

Batch Terminal Simulator
Batch Backout Manager
Program Restart Facility

Data Base Administration

Utility Management

Backup and Recovery

Application Management

IMS DATA BASE TOOLS

Performance Management

Transaction Management

System Administration

Regulatory Compliance

IMS Performance Solution Pack for z/OS

Buffer Pool Analyzer
Network Compression Facility

Command Control Facility
ETO Support
HP Sysgen Tools
Queue Control Facility
IMS Workload Router

IMS Configuration Manager
IMS Sysplex Manager

IMS Audit Management Expert
IBM Data Encryption for IMS and DB2 Databases

More information

- Contact: Janet LeBlanc
leblancj@ca.ibm.com
- IBM DB2 and IMS Tools website:
<http://www.ibm.com/software/data/db2imstools/>