IMS Tools Solution Packs

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Agenda

- Announcement Feb 9, 2009

- 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 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**

Everything you need for…

IMS Fast Path Solution Pack

IMS Database Solution Pack

IMS Performance Solution Pack

IMS Recovery Solution Pack
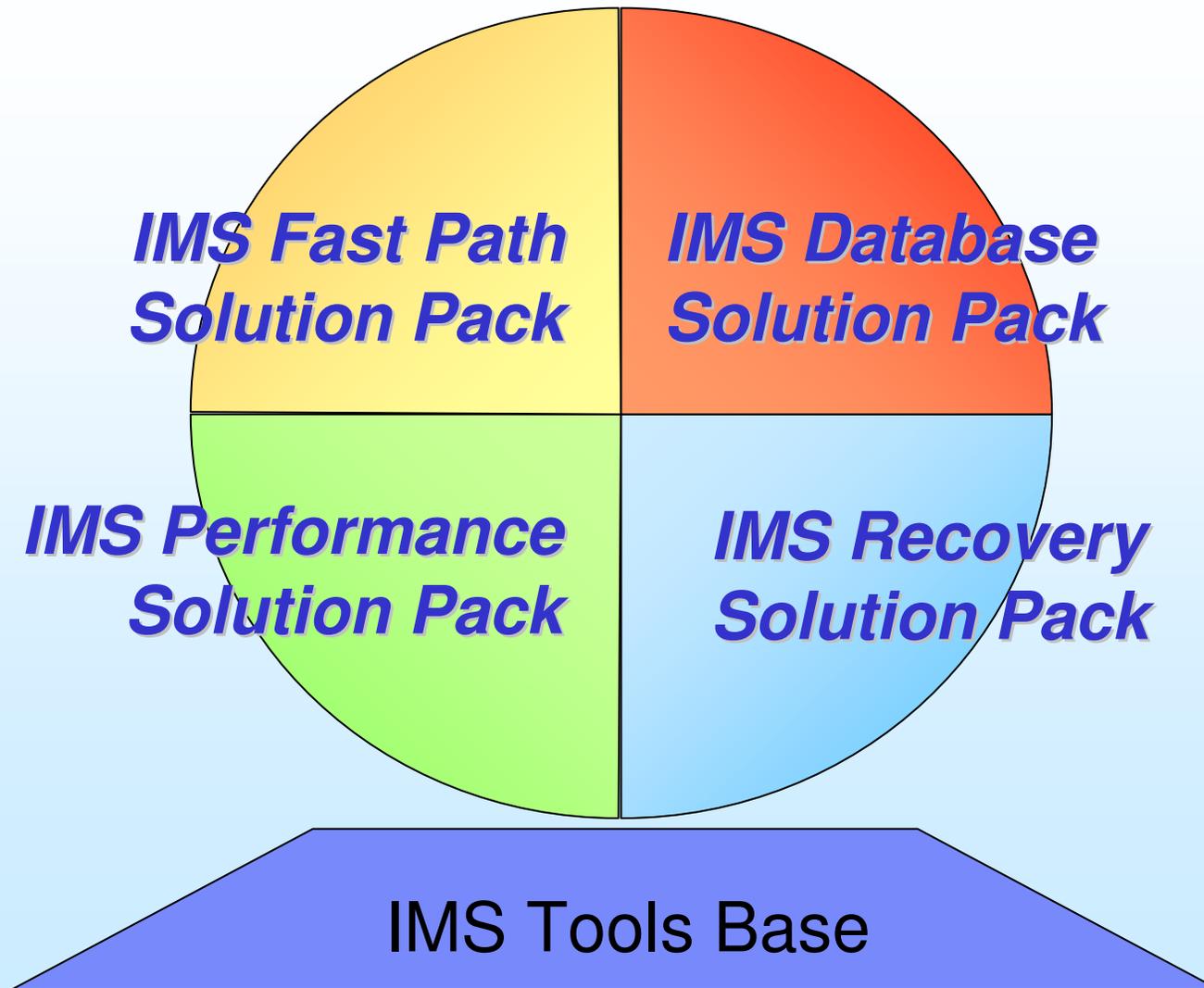
IMS Tools Base

New Year – New from IBM!

- ## 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 <u>real</u> value

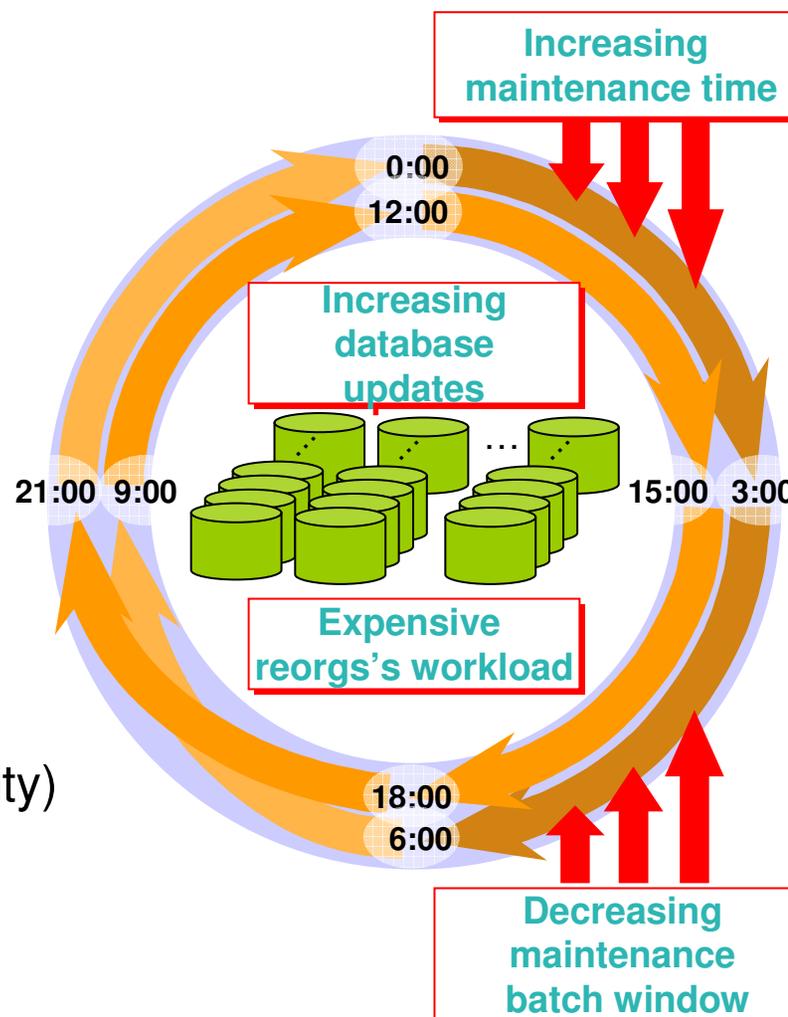**Reduce CPU Consumption** + **Reduce DBA Labor Costs** + **Eliminate Application Downtime** =

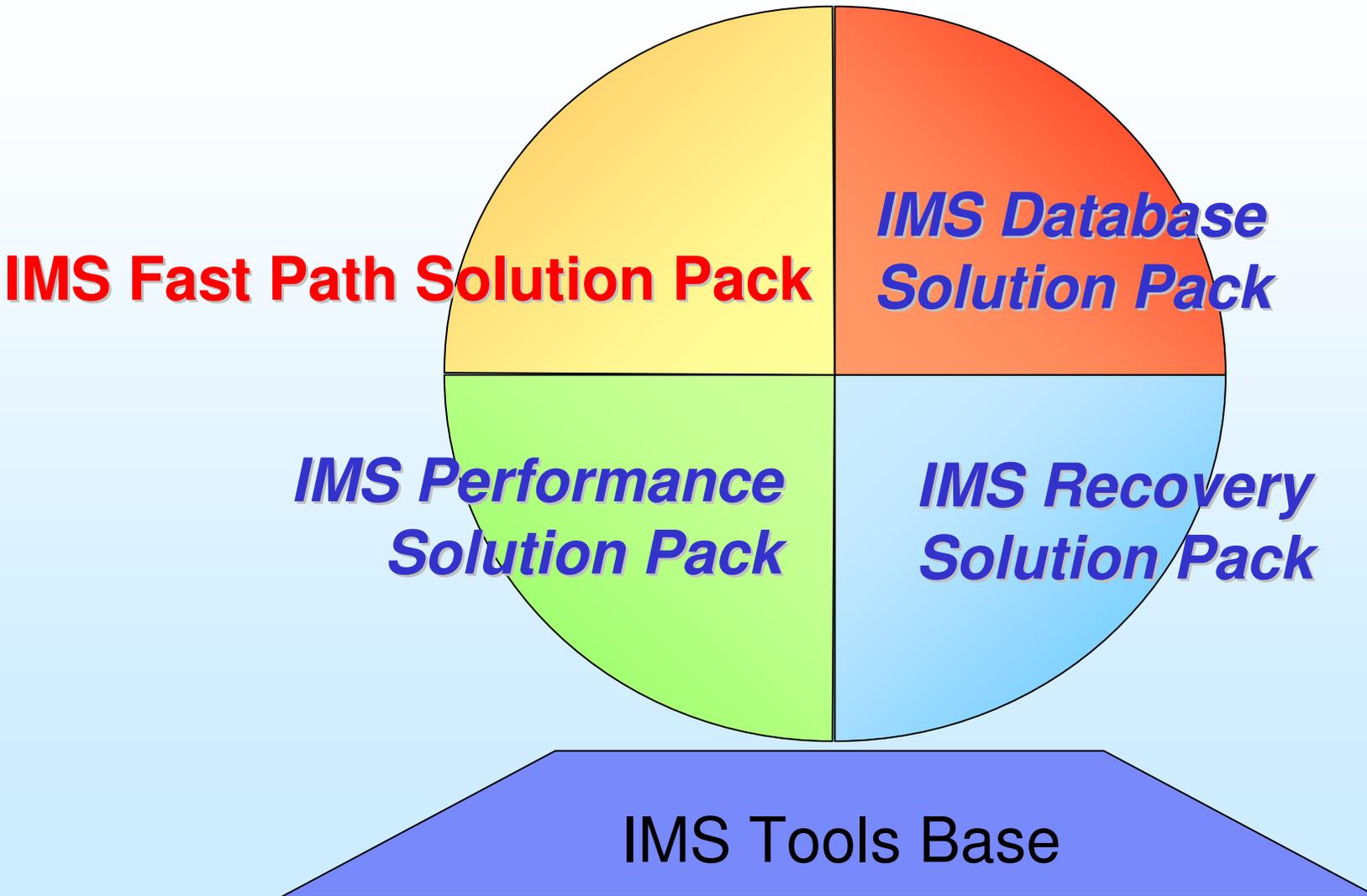**Deliver faster return on your investment!**

Why Solution Packs ?

- Background
  - Applications perform slowly
    - ✖ IMS SLAs being missed
    - ✖ Customer satisfaction declining
  - Reorgs seem to take forever
  - Maintenance batch window
    - ✖ Decreasing
    - ✖ Can't take databases offline (24 x 7 availability)
  - Expensive reorganization process
- The Challenge
  - Increases system online availability in maintaining the databases
  - Reduces the total maintenance time
  - Ease of installation for mainframes

Increasing maintenance time

0:00
12:00

Increasing database updates

...

21:00 9:00

15:00 3:00

Expensive reorgs's workload

18:00
6:00

Decreasing maintenance batch window

Everything you need for…

IMS Fast Path Solution Pack

IMS Database Solution Pack

IMS Performance Solution Pack

IMS Recovery Solution Pack

IMS Tools Base
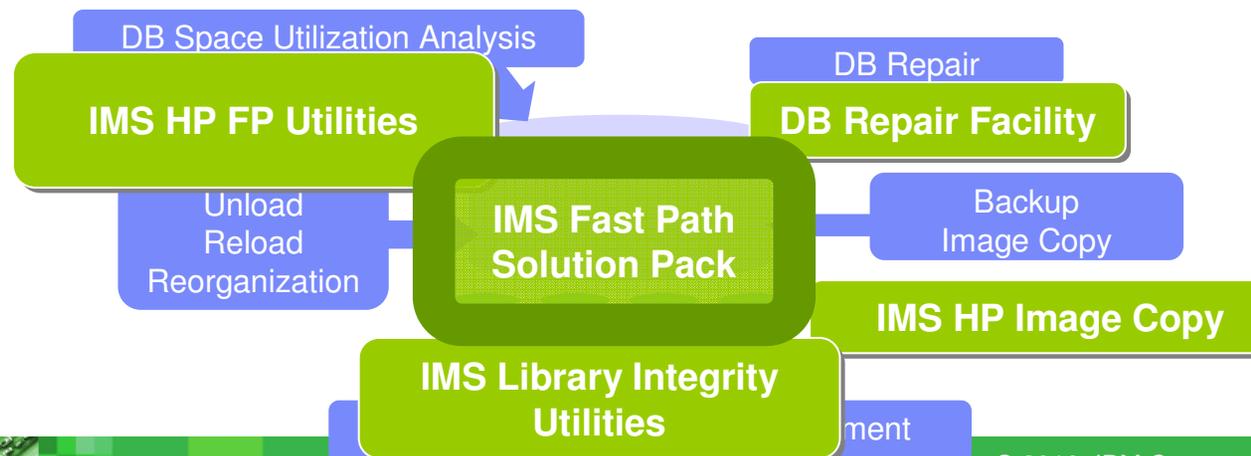
What is IMS Fast Path Solution Pack ? ..

- "An All-In-One Fast Path full maintenance solution"

1. IMS High Performance Fast Path Utilities (HPFPU)

2. IMS High Performance Image Copy for z/OS V4R2 (HPIC) *(new release)*

3. IMS Library Integrity Utilities for z/OS V2R1 (LIU)

4. IMS Database Repair Facility (DB Repair)

- ✓ Each of these tools is also shipped as a separate product
- ✓ One program directory, combined sample installation JCL, and simplified SMP/E install
- ✓ IMS Tools Base for z/OS is required

DB Space Utilization Analysis

IMS HP FP Utilities

DB Repair

DB Repair Facility

Unload
Reload
Reorganization

IMS Fast Path Solution Pack

Backup
Image Copy

IMS HP Image Copy

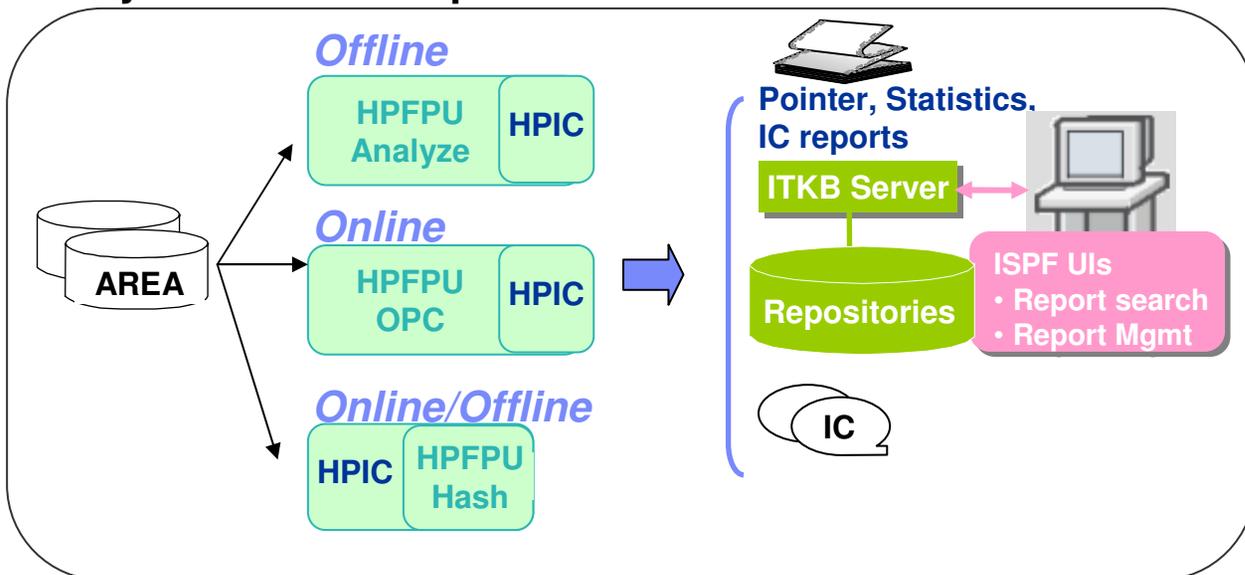**IMS Library Integrity Utilities**

ment

Benefits

- Provides a complete set of high performance utilities
  - unload, reload, reorganize, backup, verify and report on DEDB areas and tune-up the libraries

- Saves time and money and Reduces resource requirement
  - Reducing CPU and elapsed time
  - Parallel processing of DEDB multiple areas in a single step
  - Eliminating I/Os for intermediate data sets by enabling unload, reload, analyze and backup tasks to run in a single step
  - R
    us

- Pro

  - re
    DEDB areas

Challenge

- **Increases system online availability in maintaining the databases**

- **Reduces the total maintenance time**

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Example user scenario

- Analyzes DEDB areas in online and offline
  - Verifies the integrity of all IMS pointer values and repairs the DEDB area containing pointer or data errors
  - Analyzes the free space utilization of the DEDB areas to judge the timing of the reorgs

Analyzes and Back-ups DEDB areas

Offline
HPFPU Analyze | HPIC

Online
HPFPU OPC | HPIC

Online/Offline
HPIC | HPFPU Hash

AREA

Pointer, Statistics, IC reports
ITKB Server
Repositories
ISPF UIs
• Report search
• Report Mgmt
IC

Repairs DEDB areas

Offline
DB Repair
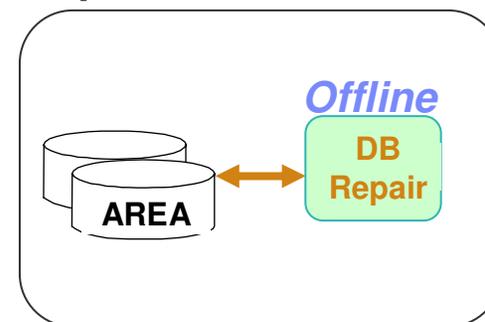
AREA

Example user scenario..

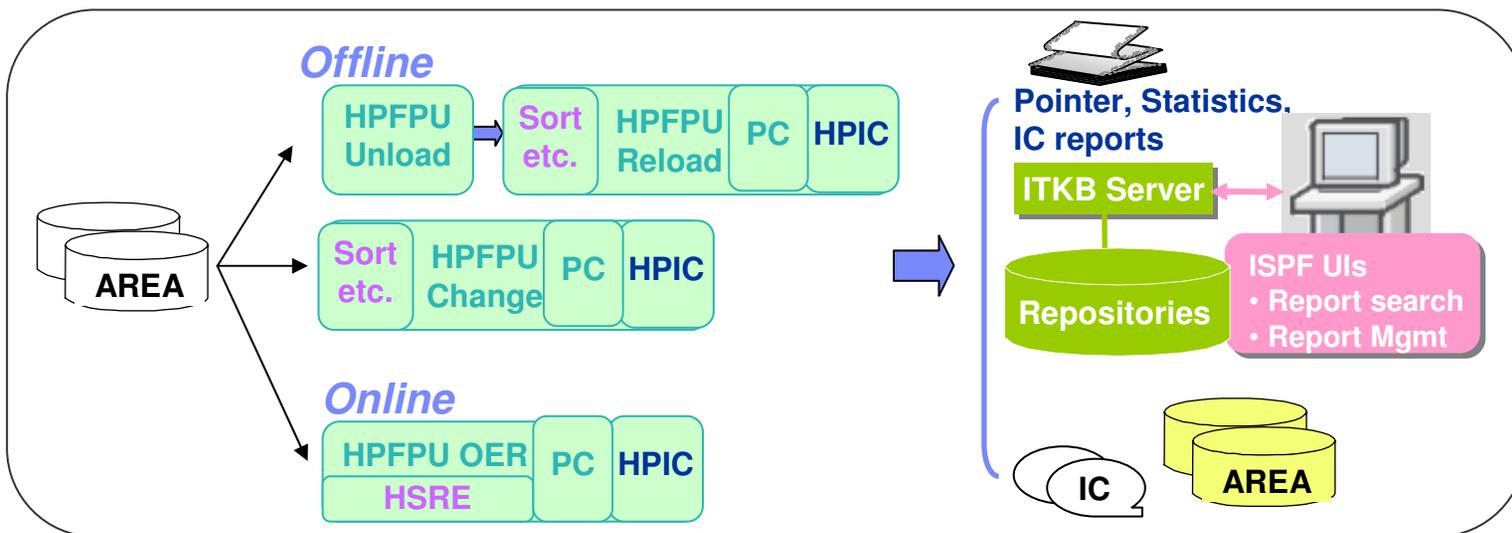- Reorganize to attain better free space usage

  - Reorganization or Restructures in online or offline

  - Backup and analyzes the new DEDB areas

Reorganize/Restructure DEDB areas

Extend DEDB areas in online
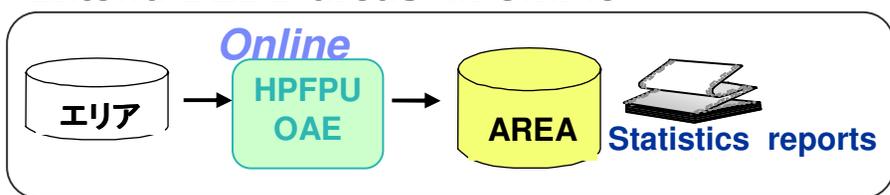
Ex.) Efficient Fast Path solutions – Reorganize

- Online Reorganization (OER)
  - Reorganizes only the UOWs based on the user-defined thresholds
  - Reduces the reorgs time to specify maximum number of UOWs
- Offline tools (FPA Change, Unload/Reload)
  - Reduces the reorgs time if you can take offline the DEDB areas

Fast Path Area Reorgs Elapsed Time
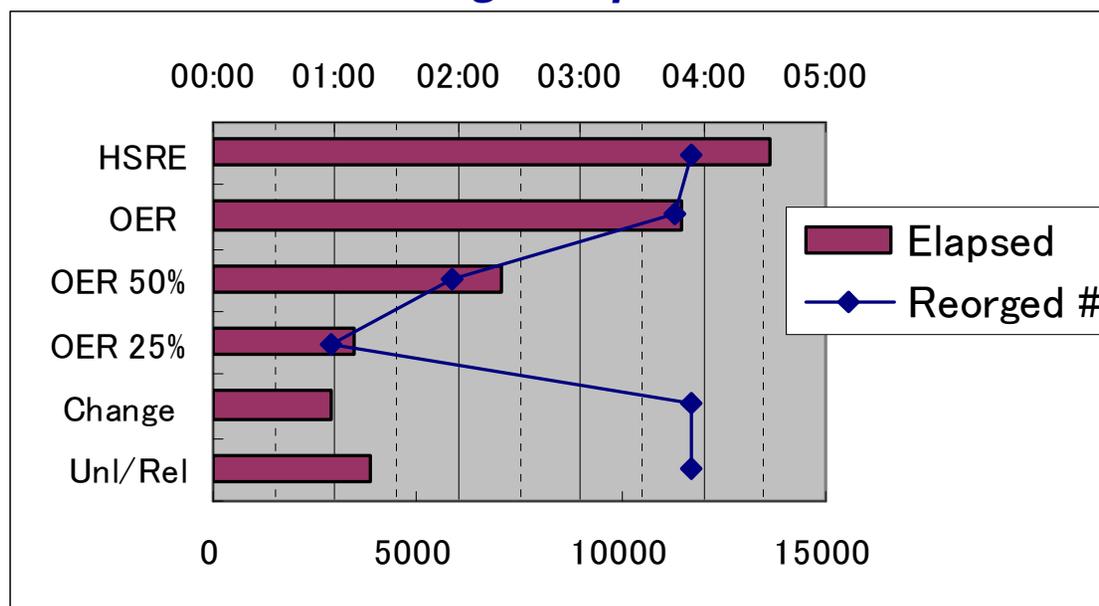
HSRE: IMS HS Reorg Utility (DBFUHDR0)

Everything you need for…

IMS Fast Path
Solution Pack

IMS DB Solution Pack

IMS Performance
Solution Pack

IMS Recovery
Solution Pack

IMS Tools Base
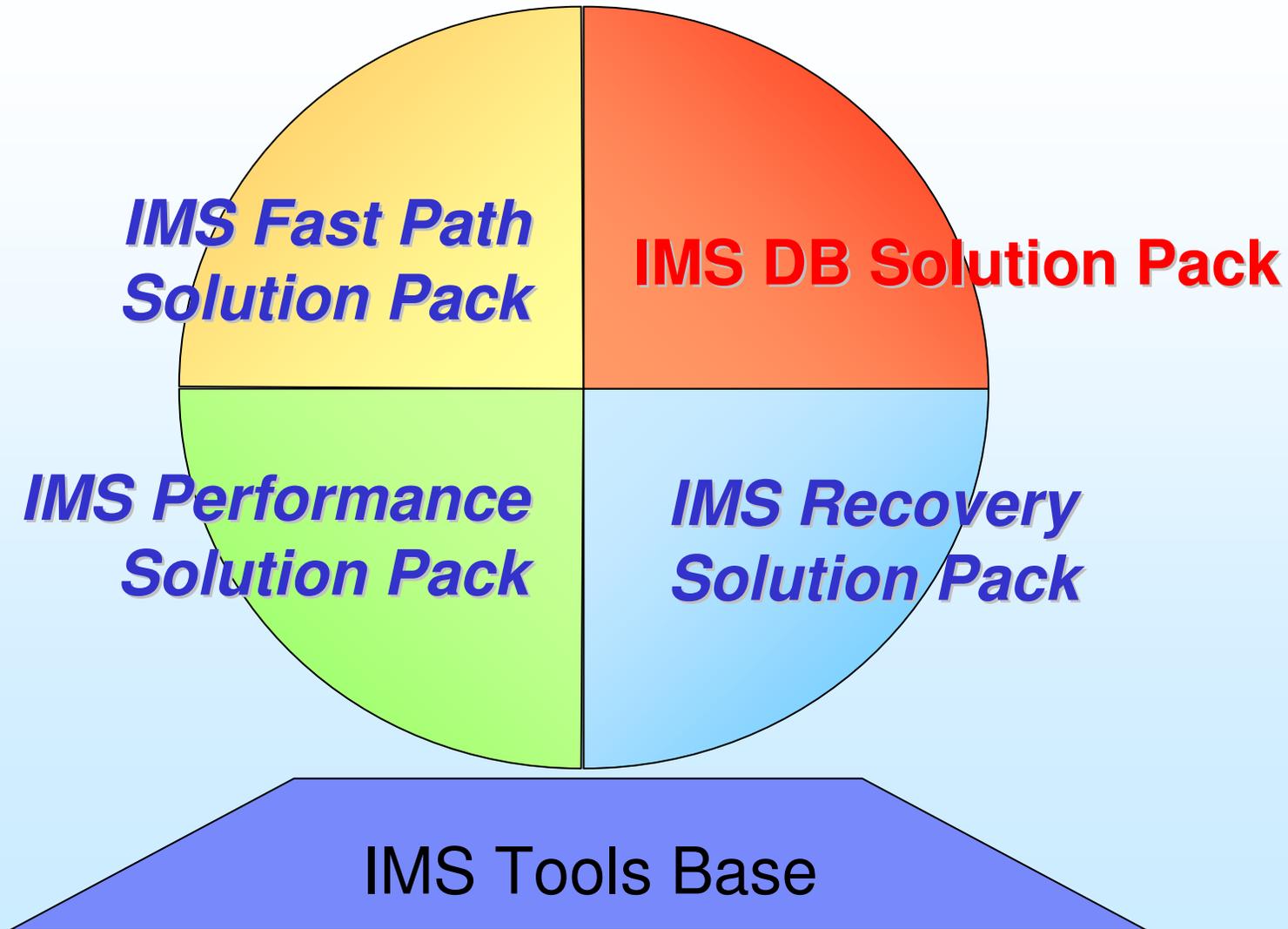
DB Solution Pack helps daily DBA tasks

- 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

DB Space Utilization Analysis

DB Integrity Check
DB Repair

IMS High Performance Unload

IMS High Performance Pointer Checker

DB Repair Facility

Unload
Load

Reorganization

IMS High Performance Prefix Resolution

IMS High Performance Load

IMS Database Reorganization Expert

Index Build/Recovery

Backup
Image Copy

IMS Index Builder

IMS Library Integrity Utilities

IMS High Performance Image Copy

IMS Definition Libraries Management

Benefits of IMS DB Solution Pack

- 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

- 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!

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

IMS Database Solution Pack for z/OS V1.1

DB Space Utilization Analysis

DB Integrity Check DB Repair

IMS High Performance Unload

IMS High Performance Pointer Checker

DB Repair Facility

Unload Load

Reorganization

IMS High Performance Load

IMS Database Reorganization Expert V4.1
Smarter Reorganization

IMS High Performance Prefix Resolution

Index Build/Recovery

Backup Image Copy

IMS Index Builder

IMS Library Integrity Utilities

IMS High Performance Image Copy

IMS Definition Libraries Management

IMS Tools Base for z/OS (a no charge separate PID): ITKB, TOSI, and other common services

Reorg Expert

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

Smart Reorg utility features at a glance

Sysplex

3 Smart Reorg job

4 Notification messages are sent

System z Server

1 Sensor data records and reports are sent to repository

3 A policy is retrieved from repository and is applied

IMS Tools KB Server

TSO users and/or z/OS operator consoles

ISPF **2** Policy Management

ISPF **5** Report Search/View

Policy Repository *1

Sensor Data Repository

Report Repository *2

1. **Sensor Data Collection**
2. **Reorg policy Definition**
3. **Conditional Reorganization**
4. **Exception Notification and Reporting**
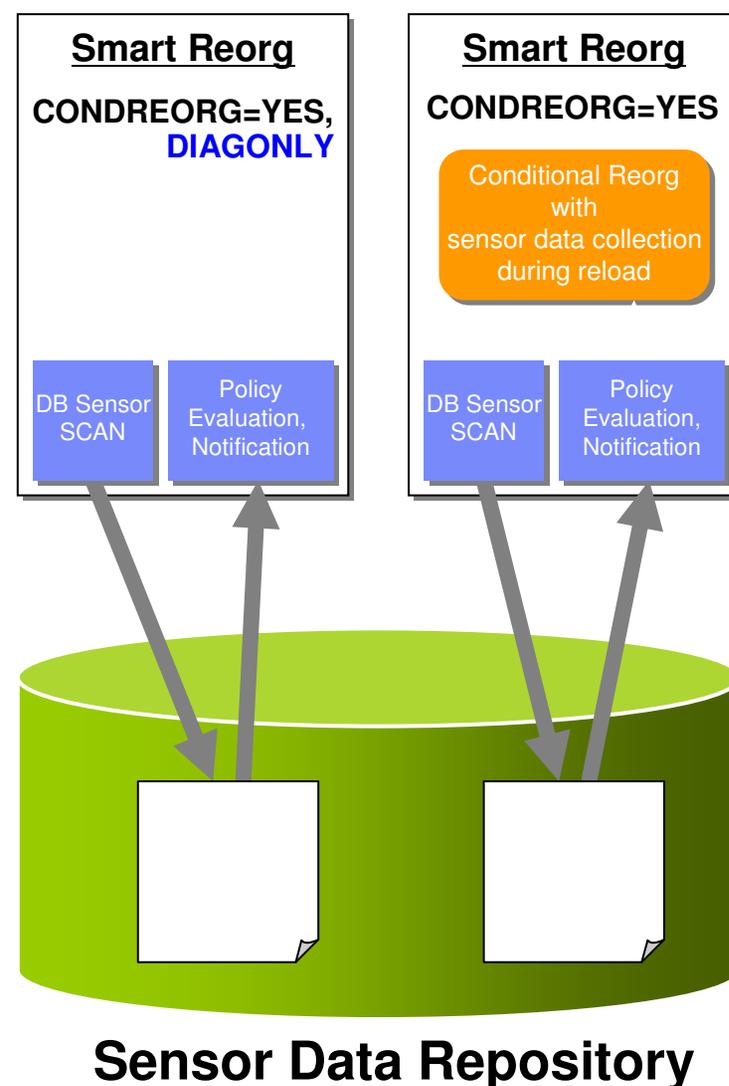5. **Tracking exceptions and reorgs**
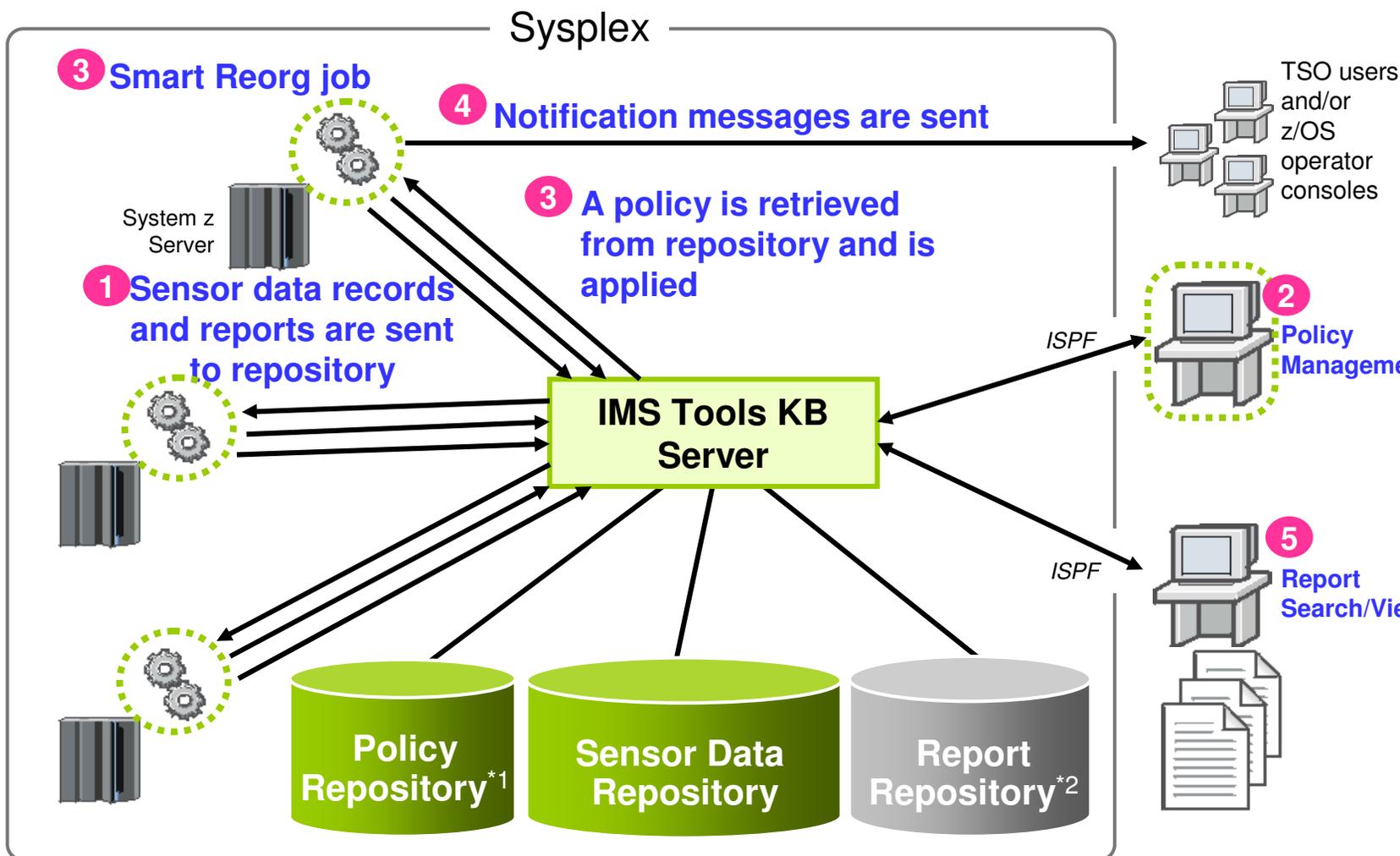
- All information are stored in and managed by IMS Tools KB repositories
- Sysplex-wide access to these repositories is supported by IMS Tools KB Server

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

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

Smart Reorg

CONDREORG=YES, DIAGONLY

DB Sensor SCAN	Policy Evaluation, Notification

Smart Reorg

CONDREORG=YES

Conditional Reorg with sensor data collection during reload

DB Sensor SCAN	Policy Evaluation, Notification

Sensor Data Repository

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

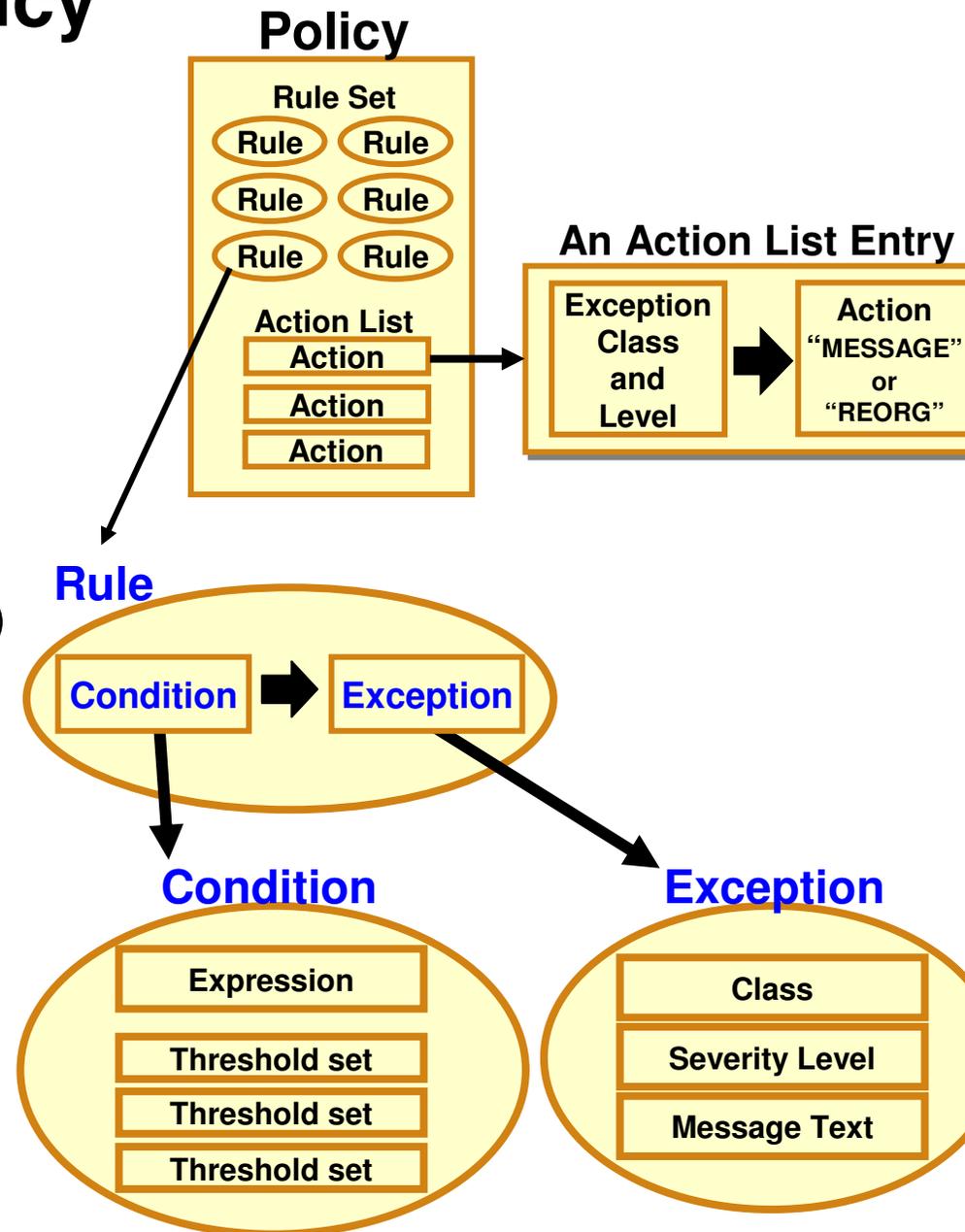   <u>An example</u>

    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

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

Policy

Rule Set

Rule   Rule

Rule   Rule

Rule   Rule

Action List

Action

Action

Action

An Action List Entry

Exception Class and Level → Action "MESSAGE" or "REORG"

Rule

Condition ➡ Exception

Condition

Expression

Threshold set

Threshold set

Threshold set

Exception

Class

Severity Level

Message Text

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
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 descrition above is called *a threshold set*.

"MED" =

&1 = 85
&2 = 20

You can tweak these threshold values

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
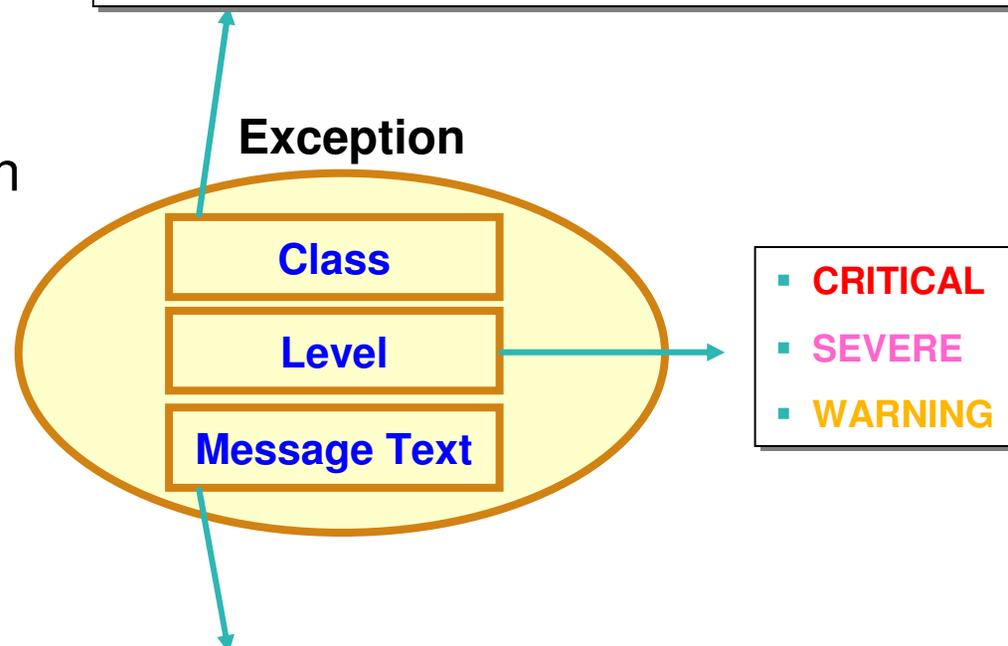
Exception Class:
> FRAGMENTED_FREE_SPACES

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

Exception

Class

Level

Message Text

- **CRITICAL**
- **SEVERE**
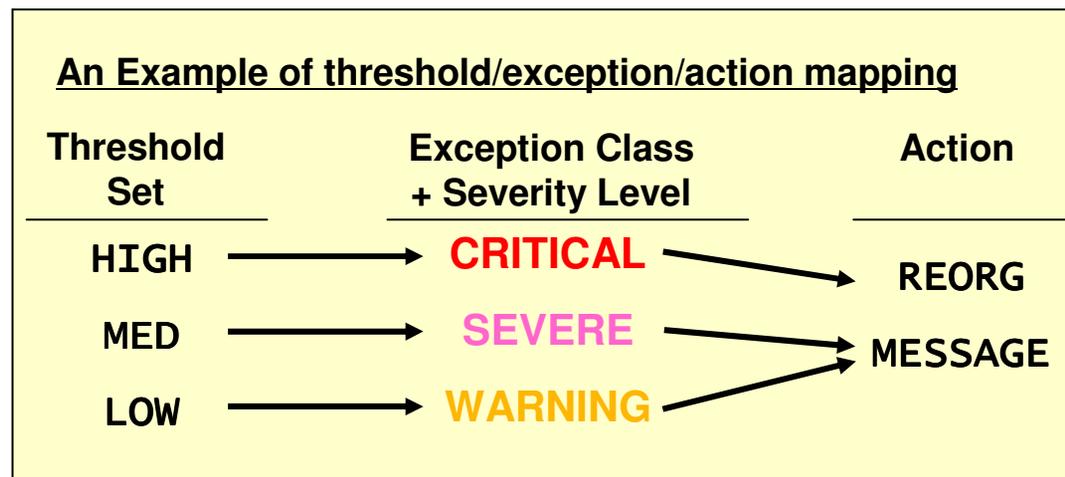- **WARNING**

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.

An Example of threshold/exception/action mapping

Threshold Set	Exception Class + Severity Level	Action
HIGH	→ CRITICAL	→ REORG
MED	→ SEVERE	→ MESSAGE
LOW	→ WARNING	

```
  Commands  Help

REORG/OPERATION                 Associate Actions With Rule Thres Row 1 to 3 of
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.DBDTYPE.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
                    thresholds from a list.)
               U - Unselect.

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
```

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	Policy to be selected
POLICYBY=DBTYPE	➡ SYS.DBDTYPE.*type*

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

By database name	
POLICYBY=DBDNAME	➡ SYS.DBDNAME.*dbdname*

By policy name	
POLICYBY=NAME POLICYNM=MY.POLICY.GROUP1	➡ MY.POLICY.GROUP1

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 CRICTICAL 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.DBDTYPE.HIDAM
Policy Locale..................... Global
Reorganization Need............... Yes


Exceptions before Reorganization
------------------------------------------------------------------------------
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
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
The fragmentation of free space in BKDB has increased
    Class: FRAGMENTED_FREE_SPACES            Level: CRITICAL    -> REORG
    Rule:  G:IBM.FRAGMENTATION.10    Threshold Set: HIGH
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

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
------------------------------------------------------------------------------
```

Everything you need for…

IMS Fast Path Solution Pack

IMS Database Solution Pack

IMS Performance Solution Pack

IMS Recovery Solution Pack

IMS Tools Base
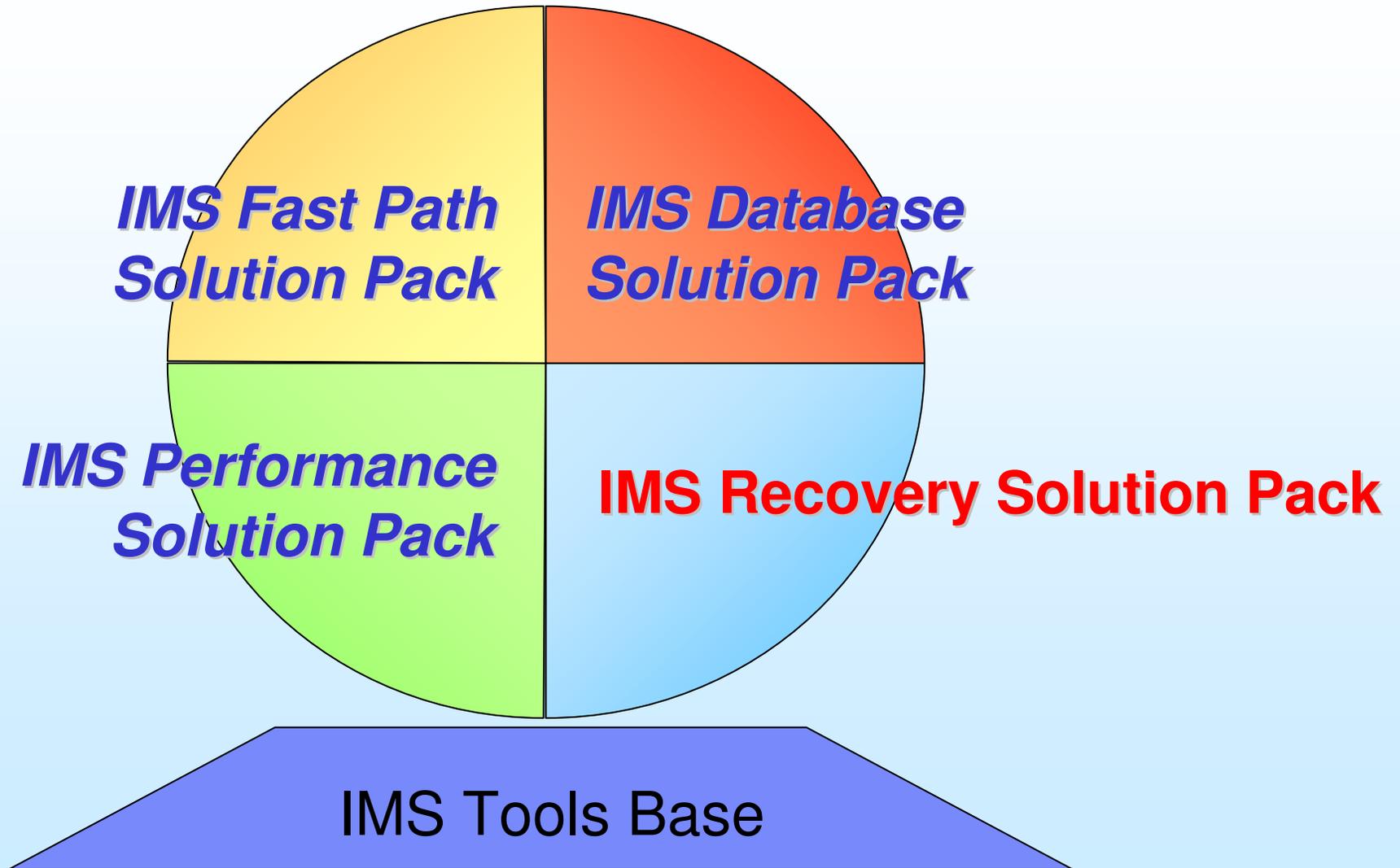
A solution for your Backup and Recovery needs

IMS Recovery Solution Pack V1.1

Database Recovery

Database Recovery Facility

Change Accumulation

IMS HP Change Accum

Incremental Image Oopy

IMS Recovery Solution Pack

Backup Image Copy

IMS HP Image Copy

Recovery Expert

Recovery Health Check

Recovery Health Check
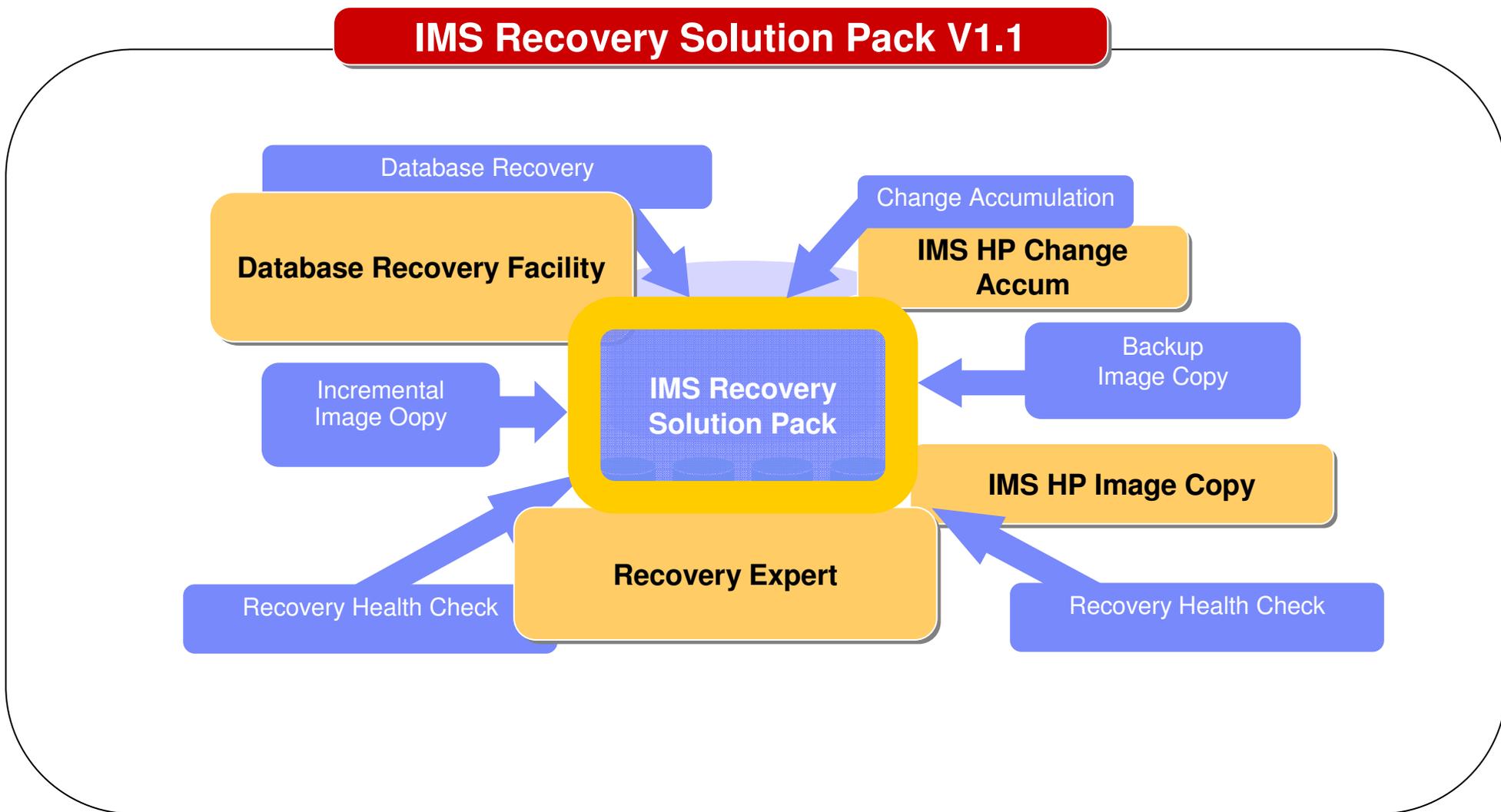
Log Management Enhanced Solution

High Performance Change Accumulation

- Enhancement to the base IMS Change Accumulation utility
- Improved performance through parallel technology
- Multiple IMS CA "*jobs*" in a single job step
- Multiple jobs spawned to create multiple CAs
- Utilizes GENJCL for JCL creation
- Invokes IMS CA dynamically
- Parallel streaming of input and output data
- Parallel allocation and open of logs
- Report / diagnostic improvements
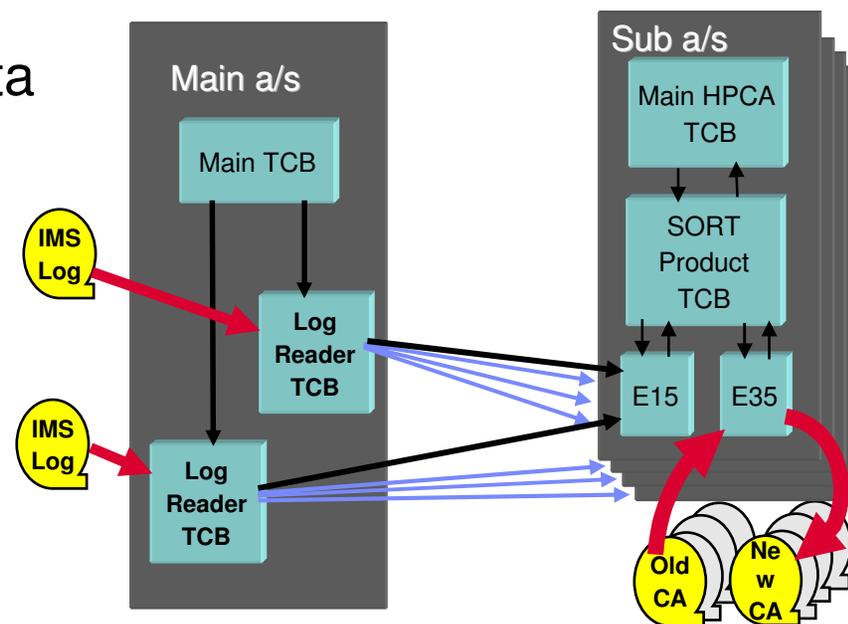
Log Management Enhanced Solution

Point-in-Time Change Accumulation

- Ability to create a CA to a specific point in time and include ONLY committed updates on the CA up to that time
- IC+PITCA is used in recovery but no additional log input is allowed
- PITCA cannot be used as input to subsequent CA creation because spill records are discarded
- PITCA is most useful in a Disaster Recovery environment
- DRF has been enhanced to recover using the HPCA PITCA using the RCVTIME(*timestamp*,PITCA) or RCVTYPE(LASTPITCA) keyword
- Problem comes in when customer wants to create a PITCA to a point prior to an existing CA – GENJCL does not like that very much

Backup Enhanced Solution

High Performance Image Copy

- With Enhanced capabilities
  - → Allow Parallel IC processing
    - → Copy multiple DBDS at the same time
  - → Enable hash pointer checking during image copy
    - → Not available with Concurrent Image Copy
  - → Support compressed image copy output
  - → Copy image copies with/without compression
  - → Allow stacking of multiple output datasets on tape
  - → Dynamic allocation of input and output datasets
  - → Integration with the IMS Tools Online System Interface (TOSI)
    - → Stop and Start DB around creation of batch IC

Backup Enhanced Solution

High Performance Image Copy - continued

- **Advanced Copy Services**
  - → Implemented using DFSMSdss API to invoke DUMP and COPY commands
  - → Based on the concept of Logical Copy and Physical Copy
    - → Logical copy takes short time and DB is available afterward
    - → Physical copy (IC) is created from logical copy
  - → Utilize combination of software and hardware available
    - → Concurrent Copy support for cached subsystems
    - → SnapShot support for RAMAC Virtual Array (RVA) devices
    - → FlashCopy support for IBM TotalStorage Enterprise Storage Server (ESS) and IBM TotalStorage DS8000 devices (similar support for OEM devices)
  - → Available for both clean and fuzzy image copy processing

- **More**
  - → Integration of High Performance I/O engine for read and write processing
  - → Automatic restart for failed image copies
  - → Improved Data Recording Capability (IDRC) automatic recognition for output tape

Recovery Enhanced Solution

IMS Database Recovery Facility

- High Performance IMS Database Recovery Solution
  - → Recover multiple DBDS in a single job step
  - → Multiple address space architecture to improve throughput
  - → Parallel processing of Input / Output
  - → Single pass of log and CA data sets
  - → CA not required even in data sharing environment
  - → Integration with IMS Tools Online System Interface
    - → /DBR before recovery, /STA after recovery
  - → Create duplicate copies of databases for auditing or test
  - → Automatic delete/define of database data sets
  - → VERIFY mode lists recovery assets and can validate the input
  - → Full DBRC Integration

Recovery Enhanced Solution

IMS Database Recovery Facility - continued

- **Recovery Options**
  - → Recover to End of Logs
    - → Full recovery to current time
    - → Uses IC + logs / CA
    - → DBDS must be unallocated at recover-to time
  - → Time Stamp Recovery
    - → Recover to a specific time
    - → Uses IC + logs / CA
    - → DBDS must be unallocated at recover-to time
  - → Point-In-Time Recovery
    - → Recover to any point in time
    - → Uses IC + logs / CA
    - → DBDS may be allocated or unallocated at recover-to time
    - → Only committed updates are recovered
    - → List of Open UOW reported

Recovery Enhanced Solution

IMS Database Recovery Facility - continued

- A 'one-button' recovery solution!

- During Recovery phase

  - → IMS HP Image Copy
    - → Produce image copies as part of recovery processing
    - → Image copies are registered with DBRC
    - → Block by block image copy
  - → Pointer Checker using IMS HP PC or IMS HP Fast Path Utilities DEDB PC
    - → Hash check pointer validation run as part of recovery processing
    - → Block by block pointer check, not post processed

- In Post Recovery phase

  - → IMS Index Builder
    - → Build primary and secondary index data sets during the recovery process
  - → IMS Index/ILDS Rebuild utility (DFSPREC0)
    - → HALDB Primary Index and Indirect List Data Set (ILDS) rebuild

Recovery Enhanced Solution

IMS Database Recovery Facility - continued

- Database Copy Generation
  - → Create copies of database data sets without accessing production copies
  - → Input is prior IC + logs / CA
  - → Copies can be created to any point in time

- Incremental Image Copy
  - → Create a new image copy using a prior IC + logs / CA
    - → Production DB is not accessed
  - → IC is either batch or concurrent, depending on state of DB
  - → IC can be created to any point in time
  - → Requires IMS High Performance Image Copy

- Automatic Delete/Define of Database Data Sets
  - → Output data sets are created as part of the recovery process

- Allocate/Open Option on START VERIFY
  - → Logical and physical validation of data set availability prior to running the actual recovery job

Recovery Enhanced Solution

IMS Index Builder

- Enables you to build (or rebuild):
  - → IMS secondary indexes
  - → Hierarchical Indexed Direct Access Method (HIDAM) primary indexes
  - → Indirect List Data Sets (ILDS) (new IB v3.1 feature)
- Supports full-function non-partitioned databases and partitioned high availability large databases (HALDB)
- Rebuild instead of IC and recover
- Streamlines process by creating multiple indices in a single job step
- Uses both parallel sort and parallel load whenever more than one index is being built, reducing the time needed to build multiple indexes of a single physical database
- Index build can be integrated with the DRF recovery process

Everything you need for…

IMS Fast Path Solution Pack

IMS Database Solution Pack

IMS Performance Solution Pack

IMS Recovery Solution Pack

IMS Tools Base

IBM

IMS Performance Solution Pack V1.1

Dashboard

Custom FORMs based reports

IMS Connect Event Collection

Rules Based Routing

IMS Performance Analyzer

IMS Connect Extensions

IMS Performance Solution Pack

Transit Reports

IMS Transaction Index

IMS Problem Investigator

Log data:
**IMS
DB2
Websphere MQ
IMS Connect
OMEGAMON**

ISPF dialog

Reports

Extracts

IMS Connect Extensions

- IMS Connect Extensions is a key tool for managing access to IMS through IMS Connect

- Key benefits:
  - Provides event collection and instrumentation for IMS Connect
  - Streamlines operational management of IMS Connect and its clients
  - Assists in the development of TCP/IP clients and the transition to an SOA
  - *NEW* Eclipse Operations GUI

MS Connect - All systems/Group - IMS Connect Extensions for z/OS - Operations Console

Edit   Navigate   Project   Status Monitor   Sessions   Window   Help

IMS Connect

Systems ✕		
All systems		
Development Billing		
▶ ICOND00 : ICON Demo system		
Status Monitor		
Sessions		
Commands		
Message Log		
▶ ICOND01 : ICON Demo system		
Development Payroll		
Test Billing		
Test Payroll		

ICOND00 (fts1:8900)/System   Development Payroll/Group   All systems/Group

Cancel sessions

Session wait time (seconds):   0

Include persistent sockets ☐   Display limit (rows): 5000

Row 1

System	Port	Wait Time	Predicted Session Status	Start Time	R/Exit Init. Client id.
ICOND00	8940	0-00.00.21.064498	P002 - Waiting for reply from datastore=ACCNT01	2009-08-04 09.37.40.169442	DEMCLI40
ICOND00	8940	0-00.00.18.735867	P003 - Waiting for ACK/NAK from remote client	2009-08-04 09.37.42.474117	ATM001
ICOND00	8940	0-00.00.16.684739	P014 - Reading remote client input	2009-08-04 09.37.44.552742	
ICOND01	8941	0-00.00.15.091071	P002 - Waiting for reply from datastore=ACCNT02	2009-08-04 09.37.46.160938	DEMCLI41
ICOND02	8942	0-00.00.13.120730	P002 - Waiting for reply from datastore=ACCNT01	2009-08-04 09.37.48.147530	DEMCLI42

Single consolidated view of sessions running on *all* systems (or view activity for individual systems or user-defined groups)

Status Monitor   Sessions

Console   Properties ✕

Property	Value	
▬ Event record trace		
	49 READ socket	
	3C Prepare READ socket	
▤ IMS Connect		
Event key	C495DEC3A3926320	
Last Trace Time	2009-08-04 09.37.44.554227	
Port	8940	
Session Wait time	0-00.00.16.684739	
Socket	9	
Start Time	2009-08-04 09.37.44.552742	
System	ICOND00	
▤ Misc		
Predicted Session Status	P014 - Reading remote client input	
▤ Read Exit		
Read Exit Client ID		

The system view shows the status of all systems

Extensive details on individual sessions

Event record trace

42

IBM

IMS Connect - ICOND00/System - IMS Connect Extensions for z/OS - Operations Console

File   Edit   Navigate   Project   Status Monitor   Sessions   Commands   Message Log   Window   Help

IMS Connect

Systems ⊠

- All systems
- Development Billing
  - ▶ ICOND00 : ICON Demo system
    - Status Monitor
    - Sessions
    - Commands
    - Message Log
  - ▶ ICOND01 : ICON Demo system
  - Development Payroll
- Test Billing
- Test Payroll

ICOND00 (fts1:8900)/System ⊠   Development Payroll/Group   All systems/Group

Enter Command: VIEWHWS   ▼   Run

Response:
```
09.42.40 CEX5053I VIEWHWS
F ICOND00,QUERY MEMBER TYPE(IMSCON) SHOW(ALL)
HWSC0001I    HWS ID=ICOND00   RACF=N   PSWDMC=R
HWSC0001I       MAXSOC=20000   TIMEOUT=8888
HWSC0001I       NUMSOC=8       WARNSOC=80%   WARNINC=5%
HWSC0001I       RRS=N    STATUS=REGISTERED
HWSC0001I       VERSION=V11 IP-ADDRESS=172.017.069.025
HWSC0001I       SUPER MEMBER NAME=       CMO ACK TOQ=
HWSC0001I    ADAPTER=Y
HWSC0001I    ODBM AUTO CONNECTION=Y
HWSC0001I    ODBM TIMEOUT=20000
HWSC0001I    ODBM IMSPLEX MEMBER=IMSPLEX2       TARGET MEMBER=PLEX2
HWSC0001I    DATASTORE=ACCNT01   STATUS=ACTIVE
HWSC0001I       GROUP=XCFGDEVT MEMBER=GCCNT01A
HWSC0001I       TARGET MEMBER=XCFMI9DV       STATE=N/A
HWSC0001I       DEFAULT REROUTE NAME=HWS$DEF
HWSC0001I       RACF APPL NAME=
HWSC0001I       OTMA ACEE AGING VALUE=2147483647
HWSC0001I       OTMA ACK TIMEOUT VALUE=120
HWSC0001I       OTMA MAX INPUT MESSAGE=5000
HWSC0001I       SUPER MEMBER NAME=SM01   CMO ACK TOQ=
HWSC0001I    DATASTORE=ACCNT02   STATUS=ACTIVE
HWSC0001I       GROUP=XCFGDEVT MEMBER=GCCNT02A
HWSC0001I       TARGET MEMBER=XCFMI9DV       STATE=N/A
HWSC0001I       DEFAULT REROUTE NAME=HWS$DEF
HWSC0001I       RACF APPL NAME=
HWSC0001I       OTMA ACEE AGING VALUE=2147483647
HWSC0001I       OTMA ACK TIMEOUT VALUE=120
```

Display limit (lines):   20000

Status Monitor   Sessions   Commands   Message Log

Console   Properties ⊠

You can submit IMS Connect commands against systems and receive the output
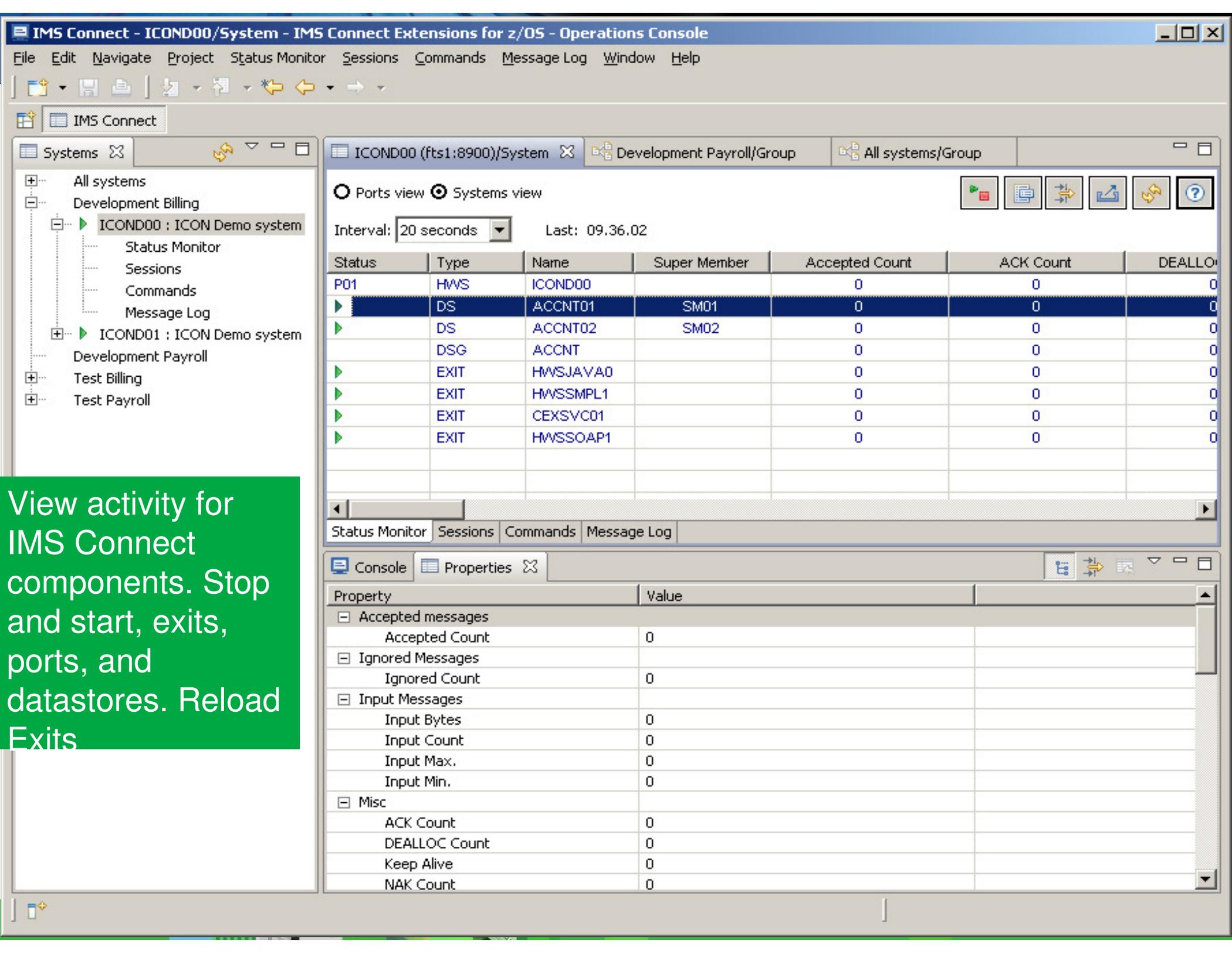
© 2010 IBM Corporati

IMS Connect - ICOND00/System - IMS Connect Extensions for z/OS - Operations Console

File   Edit   Navigate   Project   Status Monitor   Sessions   Commands   Message Log   Window   Help

IMS Connect

Systems

- All systems
- Development Billing
  - ICOND00 : ICON Demo system
    - Status Monitor
    - Sessions
    - Commands
    - Message Log
  - ICOND01 : ICON Demo system
  - Development Payroll
- Test Billing
- Test Payroll

ICOND00 (fts1:8900)/System | **Development Payroll/Group** | **All systems/Group**

○ Ports view ⊙ Systems view

Interval: 20 seconds   Last: 09.36.02

Status	Type	Name	Super Member	Accepted Count	ACK Count	DEALLO
P01	HWS	ICOND00		0	0	0
▶	DS	ACCNT01	SM01	0	0	0
▶	DS	ACCNT02	SM02	0	0	0
	DSG	ACCNT		0	0	0
▶	EXIT	HWSJAVA0		0	0	0
▶	EXIT	HWSSMPL1		0	0	0
▶	EXIT	CEXSVC01		0	0	0
▶	EXIT	HWSSOAP1		0	0	0

Status Monitor | Sessions | Commands | Message Log

Console   **Properties**

Property	Value
⊟ Accepted messages	
Accepted Count	0
⊟ Ignored Messages	
Ignored Count	0
⊟ Input Messages	
Input Bytes	0
Input Count	0
Input Max.	0
Input Min.	0
⊟ Misc	
ACK Count	0
DEALLOC Count	0
Keep Alive	0
NAK Count	0

View activity for IMS Connect components. Stop and start, exits, ports, and datastores. Reload Exits

Rules-based routing

- The simplest way to gain the benefits of IMS Connect Extensions' routing

- Create rules that, for a given DESTID, determine a primary and fallback collection of candidate datastores

- IMS Connect Extensions will balance workload between the datastores in the primary collection

- If none of the datastores in the primary collection are available or if all datastores in that collection are in flood, then IMS Connect Extensions spreads workload between the fallback collection

- Compatible with transactional messages, Send Only, Resume TPIPE, Synchronous callout, and Asynchronous callout

- Benefits: improved availability and performance; simplified management of clients; better capacity management

Distributed IMS database access

Distributed

WebSphere

Other application

TCP/IP

LPAR A

IMS Connect

ODBM

IMS DB

LPAR B

ODBM

IMS DB
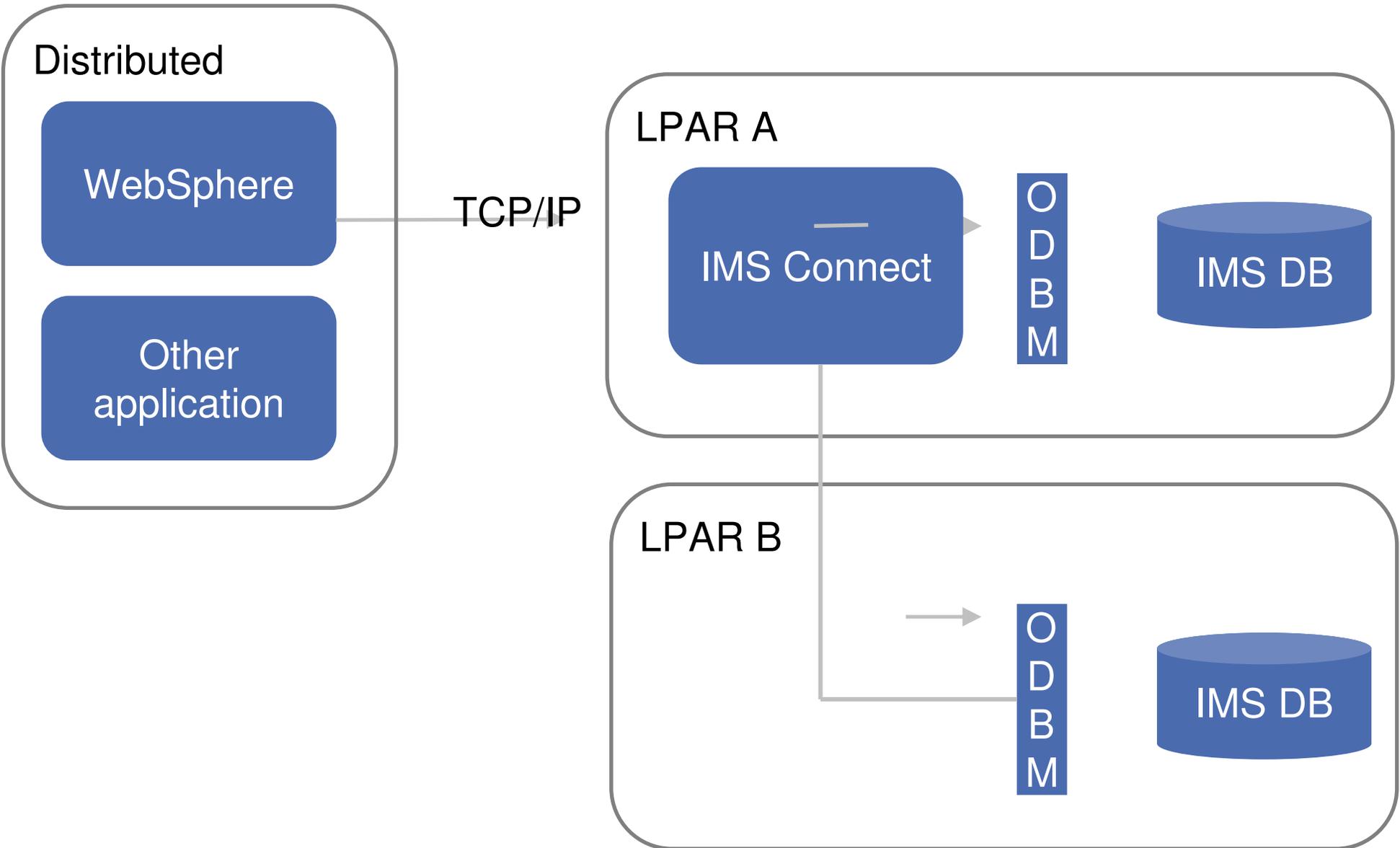
Distributed Database Access

Distributed Database Lifecycle

IMS Connect   ODBA   DB

TCP/IP
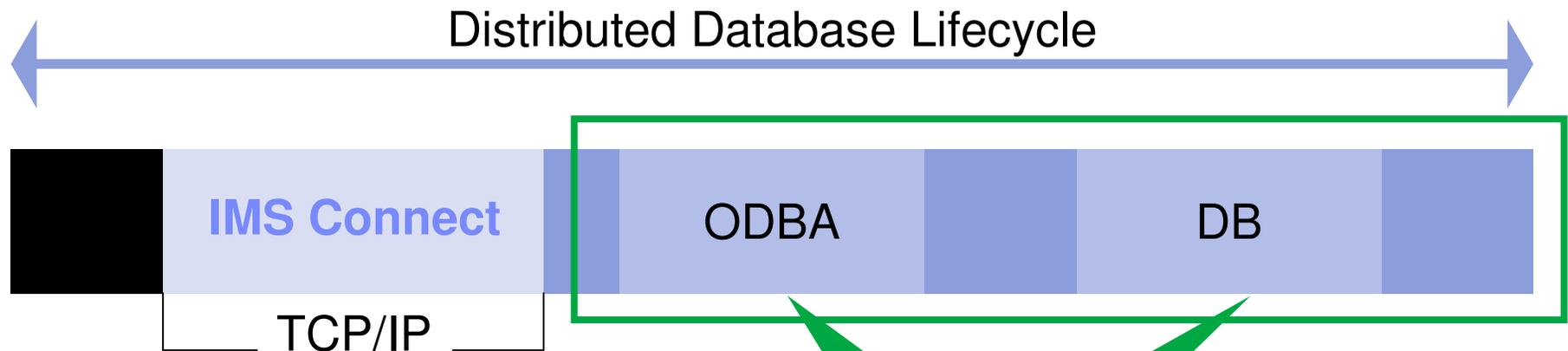
What was the response time?

What happened?

Which parts of the lifecycle do we care about?

IMS Problem Investigator

- Analysis of IMS event data can help identify problematic applications and identify system performance issues.

- IMS Problem Investigator provides an ISPF interface and batch reporting capabilities that enable th investigator to interactively navigate, investigate, and analyze:
  - IMS log
  - IMS / DB monitor records,
  - IMS Common Queue Server (CQS) log records,
  - IMS Connect event data,
  - SMF records
  - Omegamon TRF log and extract,
  - Omegamon ATF call trace
  - DB2 log,
  - Websphere MQ log extract.

- Key Features include:
  - Browse, analyze, and interpret logs
  - Gain an end-to-end picture of transactions in the Sysplex.
  - Understand IMS log record with detailed field description and global fields.

- The TX line action will connect records associated with the same transaction across all logs.

- IMS Problem Investigator complements IMS Performance Analyzer for enhanced log analysis and reporting.

Log data:
IMS
DB2
Websphere MQ
IMS Connect
OMEGAMON

IMS Problem Investigator

Formats logs
Merges logs
Tracks transactions across logs

ISPF dialog

Reports

Extracts
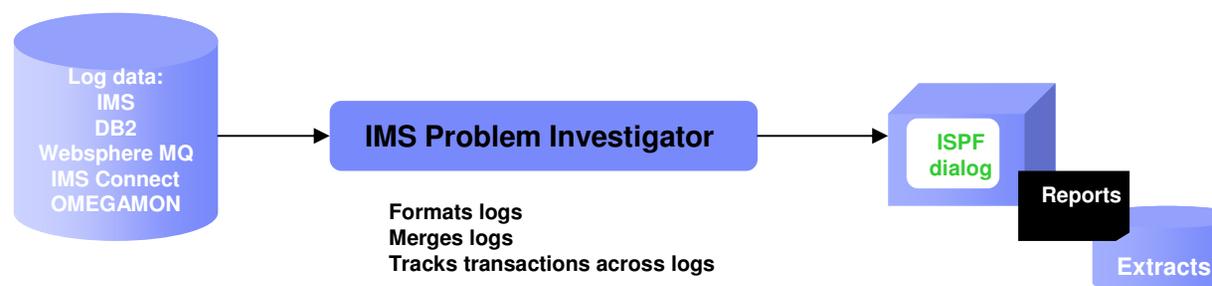
IMS Problem Investigator:
Format and navigate log files quickly and easily

- IMS PI allows you to interactively browse and analyze log records

- Instantaneous view of the logs

- Navigate by the time of day

- Select records to drill down right to the values of individual flag bits

① Select a record to view all of its fields

```
Forwards / Backwards . . 00.00.00.000100    Time of Day . . 01.10.30.000000
Code Description                    Date 2006-03-17 Friday    Time (Local)
/   ---- -------------------------------------------------  -----------------
S   01   Input Message                                       01.10.56.574109
         UTC=17.10.56.568088 TranCode=ATMWDRAW Userid=NEWYORK LTerm=NEWYORK
         Terminal=NYATM001 OrgUOWID=I9DE/BE8300F4C92D4A23
    ------------------------------------------------------------------------
_   08   Application Start                                   01.10.56.574110
         UTC=17.10.56.574100 TranCode=ATMWDRAW Region=0002
         RecToken=I9DF/0000000300000000 RegTyp=MPP TClass=01 TPrty=08
    ------------------------------------------------------------------------
_   31   DLI
         UTC=
         OrgU
    ------------------------------------------------------------------------
_ 5616 Sta
         Reg
    ------------------------------------------------------------------------
_   03   Outp
         UTC=
         OrgU
```

```
Form     ===> _____  +                        Format ===> FORM
*************************************** Top of data ***************************************
+0004  Code... 01    Input Message
+0166  STCK... BE8300EDBF897D01       LSN....
       Date... 2006-03-17 Friday      Time...
------------------------------------------
+0000  MSGLRLL.... 0176         MSGLRZZ.... 0000        MSGLCODE... 01
+0005  MSGFLAGS... C1           MSGDFLG2... 81          MSGFPADL... 94
+0008  MSGMDRRN... 08000009     MSGRDRRN... 08000009    MSGPRFLL... 0166
+0012  MSGCSW      00           MSGDFLG3... 02
```

② Zoom on a field to view a detailed description of its value

```
Field Zoom
+0007  MSGFPADL... 94    Prefix Additional Info Flag

On    MSGFPRSP... 80    Response Mode
Off   MSGSACMD... 40    Scheduled APPL issued 'CMD'
Off   MSGAOIUE... 20    Message generated by AOI user exit
On    MSGSYSEG... 10    System Segment exists
Off   MSGSSPND... 08    Message is on SMB Suspend queue
On    MSGFPINR... 04    Input message is non-recoverable
```

```
A754C703
A754C703

MSGDRBN.... 00000000

tem ID = 81
MSGCFLG1... 00
MSGCQSF1... 00
```

OMEGAMON ATF

OMEGAMON V4.2 ATF provides IMS transaction call trace for all DLI, DB2 and MQ calls

DLI calls

```
BROWSE       JCH.INDEX                              Record 00427482 More: < >
Command ===>                                          Scroll ===> PAGE
  Forwards / Backwards
  Code Description
  ---- ----------------
  01   DLI GHU
  01   DLI REPL
  50   Database Update
  01   DLI GHU
  01   DLI DLET
  50   Database Update
  50   Database Update
  01   DLI ISRT
  50   Database Update
  50   Database Update
```

```
BROWSE     JCH.INDEX                                Record 00427491 Line
*************************************** Top of data ***********************
+0012   Code... 01    DLI GHU
+001C   STCK... C476657D89349520       LSN.... 000000000000079C
        Date... 2009-07-10 Friday      Time... 16.50.06.575433.320

+0013   ATRSTYPE... 62            ATRPST..... 0001
+0016   ATRCOR..... C9C1C4C70001C476656EDA182902
+0024   ATRCRE..... C9C1C4C74040404000000002300000000
+0034   ATRSTART... C476657D89349520              ATRELAPS... 0.0
+0084   DATABASE... 'DI21PART'

+0094   ATRDL
+0094   ATRVE

+0128   ATRDX
+0000
+0010
```

DB2 calls

```
BROWSE     JCH.INDEX                                Record 00427518 More: < >
Command ===>                                          Scroll ===> CSR
  Forwards / Backwards . . HH.MM.SS.THMIJU
  Code Description                  Date 2009-07-10 Friday       Time (Relative
  ---- ----------------
  87   Generic ESS TranCode=MQATREQ1 Region=0001 SSID=DB3A      +0.00819
  5600 Sign-on to ESAF Region=0001 SSID=DB3A                    +0.00859
  5600 Thread created for ESAF SSID=DB3A                        +0.00860
       Code=MQATREQ1 Region=0001 SSID=DB3A                      +0.00861
       3A STMT=12 PROGRAM=MQATPGM                               +0.00932
       3A STMT=13 ELAPSE=0.000910                               +0.00975
       3A STMT=13 ELAPSE=0.000847                               +0.01046
       3A STMT=13 ELAPSE=0.000415                               +0.01080
       3A STMT=13 ELAPSE=0.000417                               +0.01109
       3A STMT=13 ELAPSE=0.000314                               +0.01141
       3A STMT=13 ELAPSE=0.000276                               +0.01173
       3A STMT=13 ELAPSE=0.000198                               +0.01205
       3A STMT=13 ELAPSE=0.000372                               +0.01269
       3A STMT=13 ELAPSE=0.000516                               +0.01298
       ode=MQATREQ1 Region=0001 SSID=DB3A                       +0.01329
       ry Control - Begin UR                                    +0.01531
       ce in a Data Page                                        +0.01533
       3A STMT=14 PROGRAM=MQATPGM                               +0.01567
       DB3A STMT=15 ELAPSE=0.000116                             +0.01600
                                                                +0.01607
       a Data Page                                              +0.01616
       A STMT=16 ELAPSE=0.000219                                +0.01648
       Data Page                                                +0.01664
```

MQ calls

```
BROWSE     JCH.INDEX                                Record 00427518 More: < >
Command ===>                                          Scroll ===> CSR
  Forwards / Backwards . . HH.MM.SS.THMIJU  Time of Day . . HH.MM.SS.THMIJU
  Code Description                  Date 2009-07-10 Friday       Time (Relative)
  ---- ----------------
  87   Generic ESS TranCode=MQATREQ1 Region=0001 SSID=CSQ6    +0.039065
  5600 Sign-on to ESAF Region=0001 SSID=CSQ6                  +0.039240
  5600 Thread created for ESAF SSID=CSQ6                      +0.039256
  87   Generic ESS TranCode=MQATREQ1 Region=0001             +0.039260
  88   MQ CONN SSID=CSQ6                                      +0.039471
  88   MQ OPEN SSID=CSQ6 QNAME=PROD_IN_QUEUE                  +0.039874
  88   MQ GET  SSID=CSQ6 QNAME=PROD_IN_QUEUE                  +0.040321
  88   MQ GET  SSID=CSQ6 QNAME=PROD_IN_QUEUE                  +0.075995
  88   MQ GET  SSID=CSQ6 QNAME=PROD_IN_QUEUE                  +0.101618
  88   MQ CLOS SSID=CSQ6 QNAME=PROD_IN_QUEUE                  +0.572026
  88   MQ OPEN SSID=CSQ6 QNAME=PROD_OUT_QUEUE                 +0.572366
  88   MQ PUT  SSID=CSQ6 QNAME=PROD_OUT_QUEUE                 +0.572817
  88   MQ CLOS SSID=CSQ6 QNAME=PROD_OUT_QUEUE                 +0.576998
  88   MQ DISC SSID=CSQ6 QNAME=PROD_OUT_QUEUE                 +0.590434
```

Reporting on IMS Performance
- IMS Performance Analyzer

The premier IMS tools for…

- ✓ Maintaining service levels and capacity planning

- ✓ Response time analysis

- ✓ Monitoring enterprise-wide indicators that can adversely affect IMS performance

Extract data from the logs, monitor, and IMS Connect

- ✓ Shared Queue support - merge logs to produce end to end transaction response times

- ✓ 100's of fields can be summarized and analysed

Forms-based reporting to identify specific processing deficiencies

- ✓ Reporting on IMS through ISPF dialogs or batch commands

IMS Performance Analyzer

Disk or tape:

SLDS (or OLDS)

IMS Log records

IMS Connect Extensions journal data sets

IMS Connect records

IMS Monitor data sets

IMS Monitor records

OMEGAMON
TRF Extractor data sets

**IMS PA
ISPF dialog**

Generates
& submits

JCL

Report/extract request
with input file ddnames

Specified input files

Batch job: report/extract request

Reports

Extracts
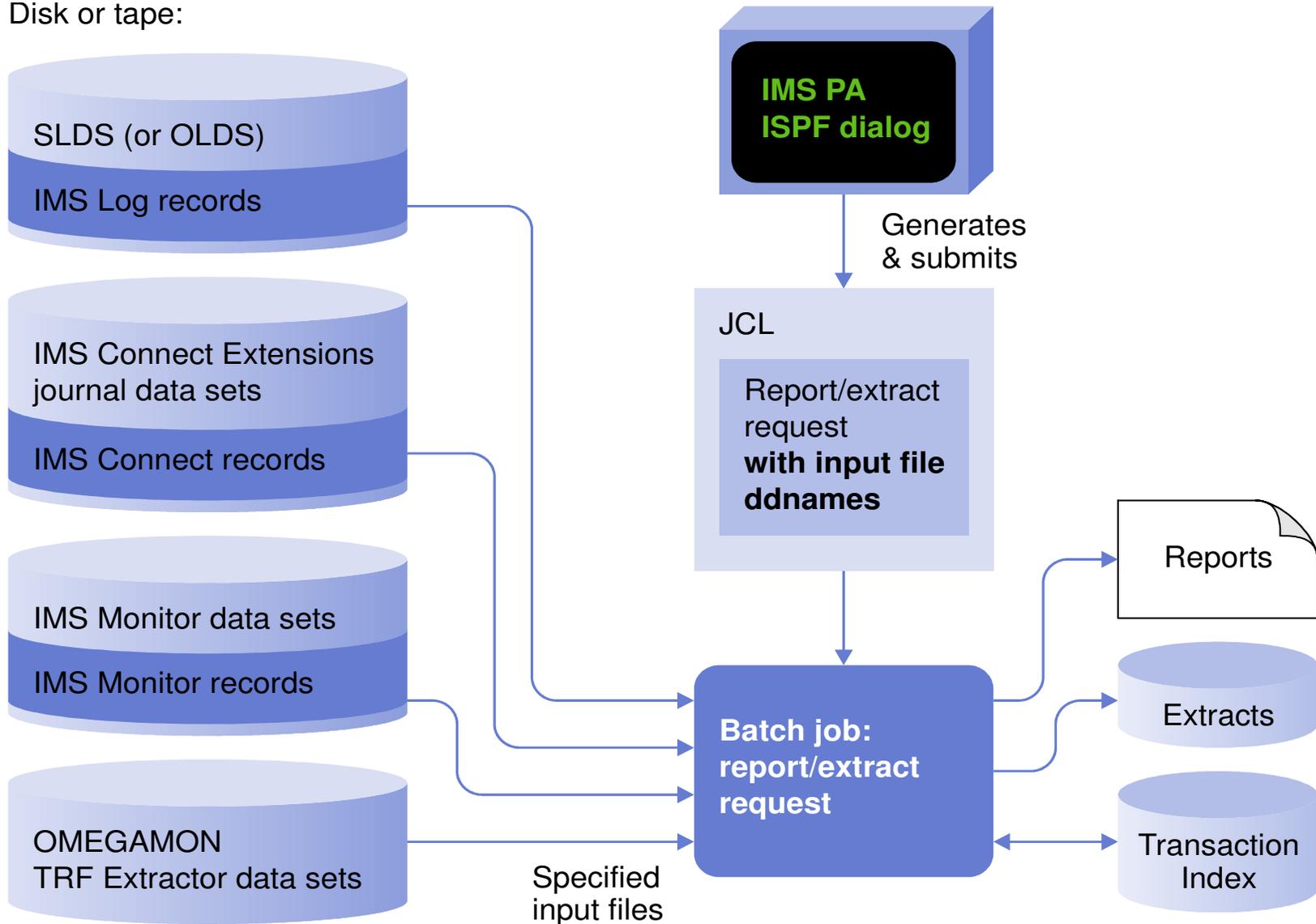
Transaction Index

Recent new features

Cold start analysis

- Analyzes what would happen after an emergency cold start of IMS at *some point in time* (for example, now or at end of log)

  – Identifies what messages would be lost

  – What in flight transactions with external subsystems be lost

Gap analysis

- Gap analysis identifies periods of time where log records are not being cut

- Can highlight an external system event that may have caused IMS to slow down

- Ability to set thresholds to reduce the number of "false positives"

- Can run across all systems in the IMSplex

- Can be used for IMS Connect Extensions journals

Everything you need for…

IMS Fast Path
Solution Pack

IMS Database
Solution Pack

IMS Performance
Solution Pack

IMS Recovery
Solution Pack
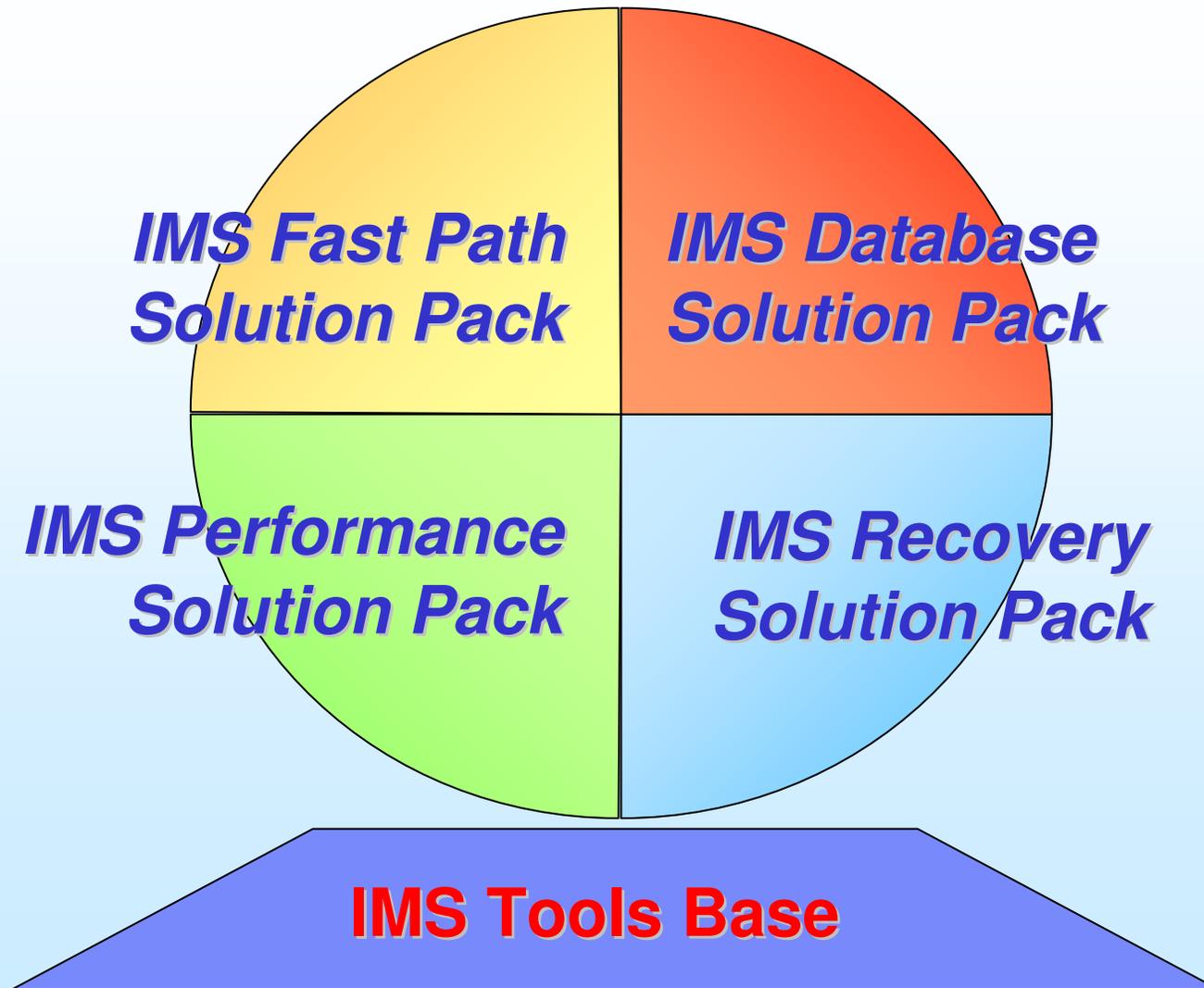
IMS Tools Base

IMS Tools Base for z/OS provides common services

- Tools in IMS Solution Packs optionally use following services in IMS Tools Base:

  - IMS Tools Generic Exits

  - IMS Tools Knowledge Base (ITKB)

  - IMS Tools Online System Interface (TOSI)

IMS Tools Resources On-line

- **IMS Tools on the Web**

  http://www.ibm.com/software/data/db2imstools/products/ims-tools.html

- **IMS Tools Support for IMS V11**

  http://www.ibm.com/support/docview.wss?rs=434&uid=swg21296180

- **IMS Tools Users Guides and Documentation**

  http://www.ibm.com/software/data/db2imstools/imstools-library.html

IMS Tools Product Portfolio

IMS Fast Path Solution Pack for z/OS

IMS Database Solution Pack for z/OS

IMS Tools Base for z/OS

ALDB Toolkit
quential Randomizer
enerator

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

ffer Pool Analyzer
etwork Compression Facility
MEGAMON XE for IMS

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

IMS Configuration Manager
IMS Sysplex Manager

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