

ARTICLE

# Dramatic performance and speed gains enhance IMS Recovery Solution Pack V2.1

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There is very little compromise—businesses that depend on databases and transaction management systems today require 24/7 online availability, 100% data accuracy, and 100% security in the management of their customers' data.

But the reality is that business data environments can be negatively impacted due to user error (such as data damage, loss, or corruption), hardware issues (such as failed disks and tapes), or a full catastrophic disaster event. Crucial to the success of any business is a well-designed database backup and recovery plan and process.

A successful backup and recovery strategy must consider the very serious financial and reputation consequences to a business that can occur when data is not available and accurate for the customer.

The time it takes to recover from a database outage translates directly to the time and costs of a business dependent on that database being available.

Industry surveys regularly examine and analyze the varying costs of unplanned database downtime on businesses of all sizes and economic sectors. Many of these surveys report that even very average per hour costs can range from \$50,000 to \$150,000 and more.

Database recovery is also aggravated by the increasing size of database environments, and by continual advancements in hardware, such as larger memories and disk drives, as well as in multi-core CPUs. Backup and recovery software is therefore constantly challenged to keep pace with these changes.

# IBM IMS Recovery Solution Pack for z/OS V2.1

IMS Recovery Solution Pack V2.1 is a suite of software products that provides proven solutions to help protect your IMS data environment through intelligent backup and recovery processes.

The IMS Recovery Solution Pack provides complete local IMS application recovery and disaster recovery solutions using IMS image copies, archived IMS log data sets, IMS change accumulation data sets, IMS Point-In-Time Change Accumulation (PITCA) data sets, and IMS System Level Backups (SLB).

To specifically address the time it takes to recover from a database outage event, the IMS Recovery Solution Pack has been updated with enhancements that dramatically improve the speed and performance of the recovery process. These enhancements are available to the IMS Recovery Solution Pack V2.1 release through the application of a recent maintenance stream update (PI86870 / UI52787).

The remainder of this article explores the details and results of this performance and speed gain.

## Performance enhancement goals

Database backup and recovery speed and performance is determined by the complex interaction of many components. For its recent enhancements to the recovery process, IMS Recovery Solution Pack addressed the following goals:

- Reduce total elapsed recovery time, especially in high-volume recovery circumstances.
- Reduce CPU utilization and memory requirements across all address spaces that participate in the recovery process.
- Improve read speed for IMS System Log Data Sets (SLDS), IMS Recovery Log Data Sets (RLDS), and Change Accumulation data sets, and improve write speed for the recovered database data sets.
- Enhance user-controlled parameters to allow custom tuning of the product to the specific installation environment. Parameters are provided for hardware (including CPU, Memory, I/O devices), the IMS system, and the recovery resource environment.
- Reduce DBRC interface overhead and RECON contention.
- Introduce more control over the management of auxiliary utility report data sets.
- Increase parallelism capability so that more databases can be recovered, image copied, and pointer checked simultaneously.

## Example test scenario and results

Performance enhancements results can vary depending on the state of the IMS systems where the databases are being recovered. For example;

- Whether the IMS systems are online and if they are in data-sharing groups.
- Whether the databases being recovered are online or offline.
- The number of database updates since the last image copy was taken.
- Whether the image copies and IMS logs are on disk or tape.
- Whether IMS Database Recovery Facility settings have been tuned appropriately to the specific recovery environment.

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The following environment was used to test the product enhancements. The test results show the performance improvements over an equivalent environment using IMS Recovery Solution Pack V1.1.

- **IMS system environment and IMS Tools in use:**
  - Two IMS V14 systems in the data-sharing group
  - IMS Recovery Solution Pack V2.1
  - IMS Fast Path Solution Pack V1.3 (for its DEDB Pointer Checker feature)
- **IMS Database Recovery Facility environment:**
  - Point in Time recovery, which requires image copies and logs to be read, the use of the most sophisticated code paths, and greater use of memory, CPU, and I/O resources.
  - Three parallel IMS Database Recovery Facility master address space jobs with 125 parallel recovery address spaces running under each job.
  - Each IMS Database Recovery Facility master address space using three parallel log reader tasks.
  - Auxiliary Utility reports collected on recovery address space job logs instead of the IMS Database Recovery Facility master address space job log.
  - IMS Database Recovery Facility SORTPARM parameters related to DFSORT:
    - › **DYNALLOC(25)**  
Number of dynamically allocated sort work data sets for each recovery address space.
    - › **FILSZ(500000)**  
Estimated number of records to be sorted.
    - › **MAINSIZE(30)**  
Region size in megabytes for each recovery address space involved in sorting.
- **Auxiliary utilities running in parallel:**
  - **IMS High Performance Image Copy**  
Making image copies of databases in parallel with recovery.
  - **IMS High Performance DEDB Pointer Checker**  
Hash-checking database pointers in parallel with recovery.
- **Recovery resources and databases recovered:**
  - 30,000 Fast Path DEDB Areas recovered.
  - 30,000 batch image copy data sets read.
  - 1500 disk archived logs read, 1000 cylinders each.
- **Performance improvements (as compared to an equivalent test scenario using IMS Recovery Solution Pack V1.1):**
  - 80% improvement in total elapsed time.
  - 80% reduction in CPU time.
  - 85% reduction in read time for log data sets.
  - 30% reduction in DBRC interface overhead.
  - 35% reduction in I/Os related to log read and database write.

## Product architecture change details

The following updates to the product architecture were made to accomplish the speed and performance enhancement goals:

- Increased parallelism by allowing IMS Database Recovery Facility to start a greater number of recovery address spaces.
- Greater user control over parallelism, allowing tuning to a specific recovery environment (such as CPU speed, I/O device types, and memory availability).
- Decreased memory usage by changing to algorithms that allow for more frequent log buffer flushing.
- Decreased total disk I/O by reducing the need to spill storage buffers to disk.
- Decreased read time of IMS System Log Data Sets (SLDS), IMS Recovery Log Data Sets (RLDS), Change Accumulation data sets, and Image Copy data sets by changing access methods and increasing parallelism.
- Decreased numbers of data sets created and total disk I/O by adding user controls to manage auxiliary utility reports according to an installation's needs.
- Decreased elapsed time when using auxiliary utilities for image copy and hash pointer checking. This is accomplished with greater parallelism and by reducing the number of data set open and close calls.
- Reduced DBRC interface calls and RECON contention by batching DBRC notifications together, rather than making individual notification calls.
- More efficient writing of recovered databases replacing VSAM and OSAM I/O with IMS Tools High Performance I/O technology (HPIO).
- Identified and eliminated CPU hotspots in the code path by using real-time analysis tools.
- Reduced number of data spaces by improving searching and sorting algorithms that create and remove them.

## Conclusions

The Database Administrator (DBA) must be prepared for situations where an unplanned outage impacts the availability, integrity, and usability of a database. Responding to service disruptions is a key component of the DBA's job.

In addition to troubleshooting the database failure itself, the time it takes to recover a database can significantly add to the business financial costs, contribute to missed project dates and deadlines, and compromise the overall customer experience.

IMS Recovery Solution Pack V2.1 supports the DBA's vital work by providing significant speed, performance, and efficiency enhancements that dramatically shorten database recovery time.