IBM's Comprehensive IMS Database Recovery Solution
A Key Component in Mission Critical IMS Database Support

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About this Whitepaper

This whitepaper demonstrates the business value that IBM's IMS database recovery solution can deliver. Specifically, this paper demonstrates the major role that IMS Tools from IBM can play in reducing your systems' downtime and potential loss of revenue in the face of an outage and, in turn, improve the return on your investment (ROI).

The examples that are used in this whitepaper were developed by IBM's Silicon Valley Laboratory IMS Tools software group for use by the IBM marketing and sales teams, as well as by IMS customers to help them better understand the value that can be gained by using the IBM IMS database recovery solution. These examples have been derived from laboratory tests and are not intended to apply to all IMS environments. Each IMS environment is unique in terms of industry, line of business, staffing, applications, system configuration, policies, procedures, and other variables; therefore, the validity of these examples is dependent on the unique aspects of each IMS environment. Your IBM Technical Sales representative can assist you with customizing your IMS environment so that these examples can be applied and validated on your own system.

The Importance of a Recovery Solution

A reliable recovery plan is critical to the health and stability of your business. Your mainframe databases represent a huge investment. When your data is unavailable for any reason, you are not receiving the expected return on that investment. And in this On Demand world, only those businesses that are consistently available and operational 24 hours a day, 365 days a year, can survive and flourish.

To illustrate the financial impact of database downtime, consider the power blackout that occurred on August 14, 2003 that affected huge parts of the northeastern and midwestern United States. According to independent surveys, business losses from this one-day event ranged from $50,000 to $1 million for each hour of downtime.[1] The following figure shows the average cost of database downtime for different industries (source: Giga group).

Application Segment Affected	Average Cost of Downtime (measured per hour)
Package Shipping	**$28,000**
Tele-Ticket Sales	**$69,000**
Airline Reservations	**$90,000**
Home Shopping TV	**$113,000**
Pay-Per-View TV	**$150,000**
Credit Card Sales	**$2,600,000**
Brokerage Operations	**$6,450,000**

[1] 1 The Electricity Consumers Resource Council (ELCON), "The Economic Impacts of the August 2003 Blackout," February 9, 2004, p 2.

Database outages come in two varieties: planned and unplanned. Planned database outages, such as application database maintenance, data migration, database design change implementation, hardware maintenance or upgrades, and disaster recovery preparation and testing, are accompanied by well-thought-out strategies for mitigating the downtime that is associated with taking systems offline. However, the highest impact outages are of the unplanned variety. These include hardware failures, application errors, user errors, operations errors, batch cycle errors, fallback from migration activities, as well as natural and man-made disasters such as fires, floods, and power outages.

When an unplanned outage occurs, a recovery solution that is complicated and time consuming to prepare and execute will result in increased downtime and loss of revenue. These days, software-based recovery tools are not an optional luxury -- they are a critical component of your day-to-day database environment. IBM recognizes the importance of having an efficient and reliable recovery solution. IMS database recovery is a notoriously complex task, quite prone to errors, and generally difficult to manage. IMS base utilities use serial processing, which adds to the time that data is unavailable. Combine these issues with a lack of automation and IMS database recovery becomes a very manual, labor intensive set of tasks, with a high potential for error. And while your IT department is struggling to get your IMS databases back online and available, your critical business needs are going unmet.

Although some businesses rely on a hardware-based recovery solution in which redundant systems are set up and maintained, this approach covers only what was mirrored. Also, sending all of your company's business critical data off site is expensive. In addition, even with a hardware-based solution, software-based recovery tasks are still needed to get your IMS databases back up and running.

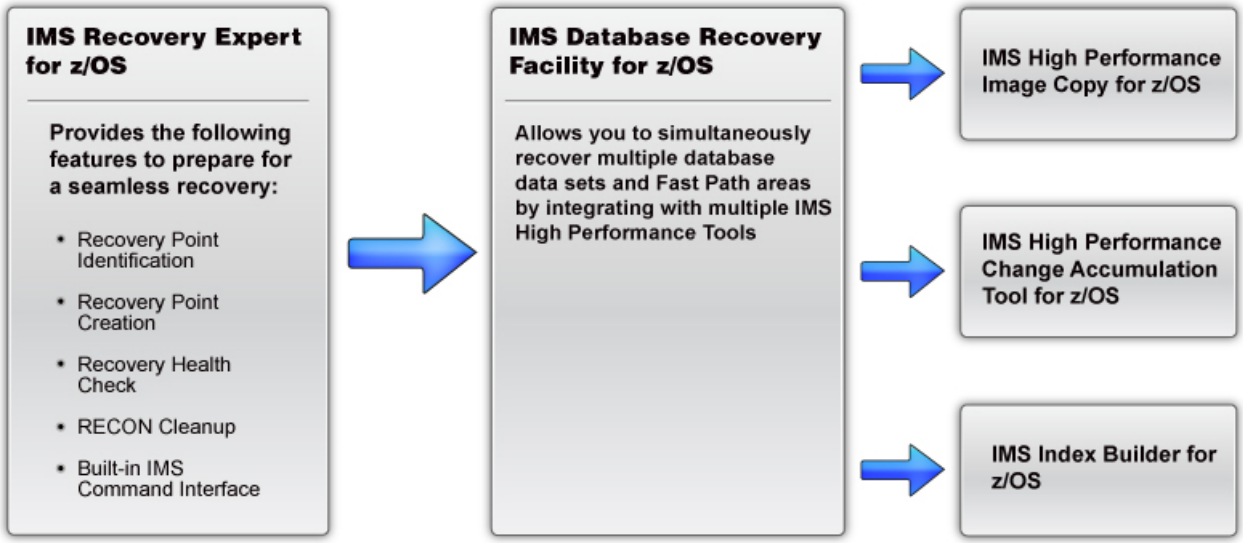
The IBM IMS Tools Recovery Solution

The IBM IMS Tools recovery solution provides an effective and efficient approach to recovering your IMS data quickly and accurately. The following five tools combine to form an integrated and automated solution to meet your recovery needs:

- IMS Recovery Expert for z/OS
- IMS Database Recovery Facility for z/OS
- IMS High Performance Image Copy for z/OS
- IMS High Performance Change Accumulation Utility for z/OS
- IMS Index Builder for z/OS

IMS Recovery Expert for z/OS is a new addition to the IMS Tools product portfolio that you can use to help ensure that your IMS database environment is recoverable before you have to do a recovery. This

tool inspects information that is stored in the RECON data sets, system catalogs, and in the repositories of the IBM IMS Tools Knowledge Base and detects problems that can affect database recovery.



As a first step, this tool provides a Recovery Point Identification feature that reads information in the RECON data sets to determine common recovery points for one or more databases. Next, a Recovery Point Create feature allows you to create a recovery point for one or more databases by issuing /DBR or /DBD commands, waiting for the databases to become unallocated, and then restarting them.

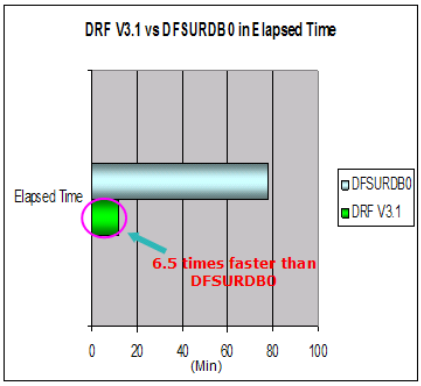
Before the actual recovery takes place, IMS Recovery Expert for z/OS can verify your recovery assets for you by examining the RECON data sets and generating a list of the recovery assets that are needed in order to recover one or more of your IMS databases via its Recovery Health Check feature. A RECON Clean Up feature is available to allow you to prepare a set of RECON data sets for your disaster recovery environment by modifying the contents to match your disaster recovery site. Finally, a built-in IMS command interface allows you to issue commands in batch to active IMS subsystems and to view the output from those commands.

IMS Database Recovery Facility for z/OS provides the next step in the end-to-end recovery solution by using the recovery JCL that you created by using IMS Recovery Expert in conjunction with other high performance tooling from IBM, including IMS High Performance Image Copy, IMS High Performance Change Accumulation, and IMS Index Builder.

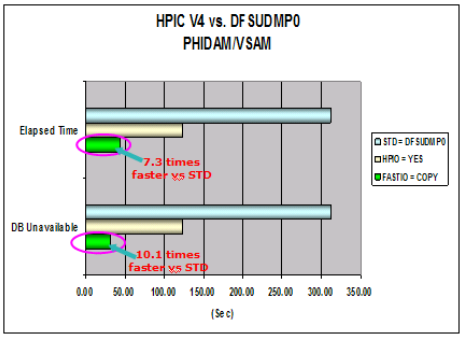
Among its many features, IMS Database Recovery Facility for z/OS can be used for database copy generation. By using image copy, change accumulation, and log data sets as input, you can create copies of database data sets to any point in time via point-in-time recovery without having to access production copies. IMS Database Recovery Facility also provides automatic delete and define capabilities for database data sets. Output data sets are created automatically as part of the recovery process, which reduces the manual tasks that would otherwise be performed by IT personnel.

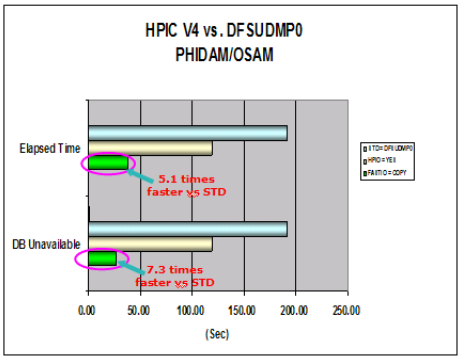
Through integration with IMS High Performance Image Copy, an incremental image copy feature is provided. This feature can create an image copy to any point in time without accessing the production database. The image copy is created by using a prior image copy and archived log data sets. In addition, to ensure a smooth and seamless recovery, IMS Database Recovery Facility validates the logical and physical availability of your database data sets prior to running the actual recovery job.

In terms of performance, IMS Database Recovery Facility consistently outperforms the base IMS utility DFSURDB0 in elapsed time. As the following figure illustrates, IMS Database Recovery Facility executes 6.5 times faster than DFSURDB0, saving you precious time when your critical IMS databases are unavailable.

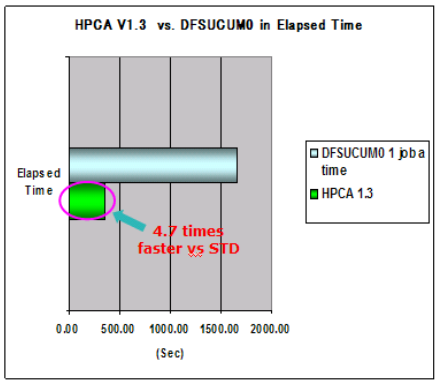


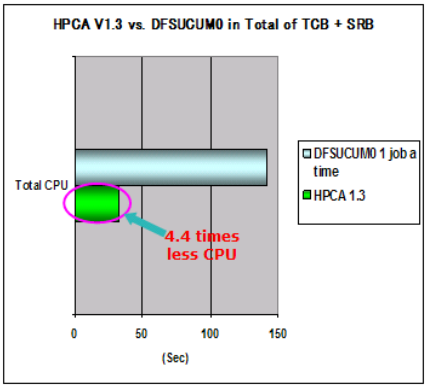
IMS High Performance Image Copy for z/OS, another tool in the IBM IMS Tools recovery solution, helps ensure that your critical IMS data is safe and secure by providing support for concurrent copy, FlashCopy, and SnapShot copy of your IMS databases. IMS High Performance Image Copy minimizes CPU utilization and elapsed time by using High Performance Input/Output functionality for the processing of reads and writes. In addition, this tool decreases the need for JCL handling during restarts by performing automatic checkpoints and restarts, stopping and starting IMS databases automatically. As the following figures illustrate, IMS High Performance Image Copy executes 7.3 times faster than the standard IMS utility DFSUDMP0 for PHIDAM/VSAM databases, and 5.1 times faster in elapsed time for PHIDAM/OSAM databases.





IMS High Performance Change Accumulation Utility for z/OS is a tool that expedites and simplifies the change accumulation process by reading multiple logs in parallel, processing that data, and sending it to multiple address spaces for multiple change accumulation groups. In addition, IMS High Performance Change Accumulation Utility processes both input data from RLDSs and output data (new Change Accumulations) in parallel to shorten the elapsed execution time. IMS High Performance Change Accumulation Utility also includes reports that consolidate the status of associated address spaces into one single report, which makes it easier to locate this information quickly.

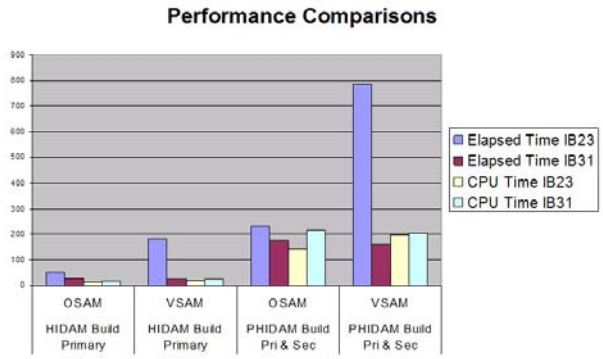




As the previous figures illustrate, IMS High Performance Change Accumulation Utility executes 4.7 times faster than the standard IMS utility DFSUCUM0 in terms of elapsed time, and uses 4.4 times less CPU, which equates to a faster, more efficient change accumulation solution.

IMS Index Builder for z/OS is the final piece in the IBM IMS Tools recovery solution. This tool eliminates the need for recoverable indexes, which in turn eliminates the need to create image copy indexes and reduces IMS log volume. In addition, IMS Index Builder builds or rebuilds primary and secondary indexes quickly by using parallel scan and creates multiple indexes in one simple JCL job step.

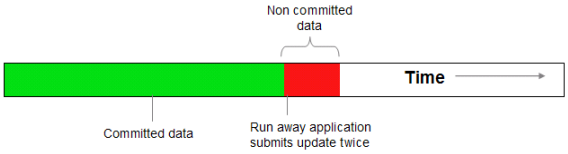
The latest version of IMS Index Builder also incorporates major performance improvements in terms of CPU usage and elapsed time over previous versions. The following figure shows these drastic improvements when IMS Index Builder is used on OSAM and VSAM databases.



Typical Recovery Scenarios

The following examples show how the IBM IMS Tools recovery solution can help reduce your downtime and get your IMS systems back up and running in a variety of critical recovery scenarios.

In the event of an application error, when point-in time recovery (PITR) is required, the first thing you need to determine is which application had the error and when that error occurred. You can use the IMS Tools recovery solution from IBM to recover the affected databases. With the previously mentioned tools, you can recover all databases in parallel, read multiple logs in one pass, and recover only committed data to the specified time. This sequence makes the entire PITR process fast and efficient.



You can also use the IBM IMS recovery solution to produce an audit copy of your databases. When used in combination, these tools enable you to produce copies without accessing production databases. You can build copies from image copies, change accumulations, and log data sets. In addition, you can generate data set names using a prefix or suffix, date, time, high-level qualifier, and/or literal.

The last, but very critical, piece of a recovery solution is the ability to recover your data in the event of a disaster. A typical disaster recovery strategy is based on cost, the amount of time that it will take to recover compromised data, and your organization's ability to absorb any permanent loss of data. Typical disaster recovery strategies often involve sending image copies, change accumulations, and logs to a remote site. To minimize the amount of data sent, as well as the resulting expense and complexity, you can use change accumulation as input to create an incremental image copy and send this image copy to a remote site. Regardless of the amount of data that is sent, the IBM IMS Tools recovery solution will enable you to restore your critical IMS data efficiently and effectively.

Conclusion

The IMS Tools recovery solution gives you the ability to prepare for, implement, and execute an end-to-end recovery for your critical IMS data.

IMS Recovery Expert provides tooling that helps you prepare your IMS environment for disaster recovery so that when you need to recover data, you can do so quickly and efficiently.

IMS Database Recovery Facility, the cornerstone of the IMS Tools recovery solution, integrates the power of image copy, change accumulation, and index builder tooling under a single interface.

IMS High Performance Image Copy supports a variety of image copy formats as input including concurrent copy, FlashCopy, and SnapShot copy and leverages High Performance Input/Output functions. IMS High Performance Change Accumulation Utility quickly and efficiently reads multiple logs in parallel, processes that data, and sends it to multiple address spaces for multiple change accumulation groups. Lastly, the IMS Index Builder eliminates the need for recoverable indexes, which in turn eliminates the need to image copy indexes and reduces IMS log volume.

Resources

Visit the IMS Tools Database Recovery Solution on the Web:

IBM IMS Tools Web site
http://www.ibm.com/software/data/db2imstools/products/ims-tools.html

IMS Recovery Expert
http://www.ibm.com/software/data/db2imstools/imstools/recovery-expert/

IMS Database Recovery Facility
http://www.ibm.com/software/data/db2imstools/imstools/imsonlinerecov.html

IMS High Performance Image Copy
http://www.ibm.com/software/data/db2imstools/imstools/imsice.html

IMS High Performance Change Accumulation Utility
http://www.ibm.com/software/data/db2imstools/imstools/imshpchgaccum.html

IMS Index Builder
http://www.ibm.com/software/data/db2imstools/imstools/ims-index-builder/