



IBM's Comprehensive IMS Database Reorganization Solutions Significantly Reduce IMS's Total Cost of Ownership



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About this Whitepaper

This whitepaper demonstrates the business value that is associated with IBM's IMS database reorganization solutions. Specifically, this paper demonstrates how two IMS database reorganization solutions, **IMS Parallel Reorganization for z/OS** and **IMS Online Reorganization Facility for z/OS** can contribute to reducing the overall total cost of ownership (TCO) of IMS and, in turn, improve the return on investment (ROI) for IMS customers.

Note that 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 IBM IMS database reorganization solutions. 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.

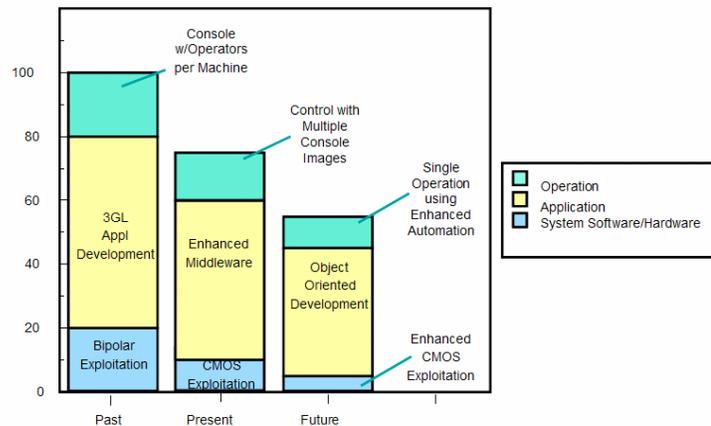
IMS, IMS Tools, and Total Cost of Ownership

IMS is IBM's premier transaction and hierarchical database management system. It is the product-of-choice for critical online operational applications and data in which support for high availability, performance, capacity, integrity, and low cost are key requirements. Today, IMS manages the world's most mission-critical data and has been a key reason for the resurgence of mainframe usage.

Over the last three years, significant changes in the mainframe's total cost of ownership (TCO), in conjunction with changes in the typical computer workload, have led to mainframe TCO advantages of between 5 and 60 percent over typical Linux, UNIX, and Windows alternatives.

IMS has significantly contributed to reducing the cost of the mainframe and computing as a whole. As shown in the following figure, IMS operational and other systems management improvements have continued to bring down the costs of operations. In addition, enhanced IMS solutions and Object Oriented Programming have helped reduce application costs. Finally, by exploiting the CMOS technology and other advances in technology in the hardware and operating systems, IMS has helped lower the system's software and hardware costs.

Cost of Computing Evolution



It should be noted however, that the total cost of ownership of any database management system (DBMS) is comprised of more than software and hardware costs. To determine the total cost, you must factor in scalability, reliability, systems management, the cost of database professionals to program, support, and administer the DBMS, and the cost of the computing resources that are required to operate the DBMS. For example, in terms of energy expense, the majority of mainframe servers use less energy than racks of equivalent Linux, UNIX, and Windows (LUW) servers.

IMS Tools from IBM further lower IMS's TCO by enabling personnel who have less IMS and mainframe experience to perform common tasks, while freeing up more experienced personnel to focus on complex or strategic tasks. All of these benefits can be realized by implementing IBM's IMS Database Reorganization solutions.



IBM's IMS Database Reorganization Solutions

Keeping IMS databases reorganized helps ensure that your IMS applications perform at their optimal levels. IBM has two solutions that can help reduce the time that is required to keep databases in top condition, while enhancing your ability to manage IMS databases. These solutions are:

- **IMS Parallel Reorganization for z/OS**
- **IMS Online Reorganization Facility for z/OS**

The normal process for reorganizing an IMS database consists of the following steps:

1. Unloading the database and indexes (this step might require several job steps depending on number of indexes and related databases that are involved)
2. Reloading the databases and indexes
3. Copying all databases (image copy)
4. Checking all DB pointers (pointer check)

These steps are scheduled in a serial fashion -- each step depends on the completion of the prior step before the next step can begin -- which can make the normal reorganization process a complicated and time-consuming endeavor. For example, a database with two indexes might require as many as fifteen job steps to complete the reorganization. IBM's advanced solutions require only one job step. Furthermore, IBM's solutions operate in a parallel mode to reduce elapsed times.

These IMS Tools solutions are truly integrated, end-to-end processes that are designed to work with the basic IMS High Performance (HP) Utilities from IBM, which include:

- IMS HP Unload for z/OS
- IMS HP Load for z/OS
- IMS Index Builder for z/OS
- IMS HP Prefix Resolution for z/OS
- IMS HP Image Copy for z/OS
- IMS HP Pointer Checker for z/OS

Key Challenges and Business Value

Your business relies on the speed of database operation to ensure that your IMS applications perform at their peak. Yet the availability of resources and expertise to manage the performance of these assets can be a constant challenge. IBM's IMS database reorganization

solutions help you deal effectively and efficiently with the following issues:

- **Shrinking batch windows.** As processing volumes increase, more work needs to get done in shorter and shorter offline periods.
- **24x7 operations.** Many businesses today are moving toward 24x7 operation; to do so, key databases must be available around the clock.
- **Lack of adequate IT resources and skills.** Highly skilled IT resources are at a premium, Competitive businesses cannot afford to have their best people tied up with repetitive database maintenance tasks.

By leveraging parallel processing and the full suite of IMS High Performance Tools that are available from IBM, these reorganization solutions can improve database performance and high availability, reduce resource usage, simplify processes, and improve the productivity of your IMS IT Specialists.

IMS Parallel Reorganization for z/OS

Fully integrated with IBM's High Performance Utilities, IMS Parallel Reorganization for z/OS provides a faster, more effective way to reorganize IMS Databases by running the various reorganization and backup utilities in parallel. The normal database reorganization requires an Unload, Load, Image Copy, and Pointer Check, and each of these steps is executed in a serial fashion. IMS Parallel Reorganization performs the Unload, Load, Index Build, Image Copy, and Pointer Check as a parallel operation, which is more CPU efficient and significantly faster than using standard IMS utilities. In practical terms, the parallel approach to reorganization means that customer batch window requirements can be significantly reduced and the databases can be made available sooner to support 24x7 businesses.

IMS Parallel Reorganization is designed to operate as a single job step. The one-time setup process is simple and straightforward. When IMS Parallel Reorganization is used with IMS Database Control Suite for z/OS, the Control Suite will generate accurate JCL for IMS Parallel Reorganization based on parameter values that you supply via the Control Suite's ISPF interface. IMS Parallel Reorganization's ease of operation and high degree of integration



means fewer IT resources will be required to keep IMS databases in top operating condition.

Tests prove that IMS Parallel Reorganization for z/OS is significantly faster and more efficient than standard IMS utilities. When tested on root-only databases with 11 million occurrences, 110 cylinders (0.8 GB) of HIDAM and VSAM structure, and no secondary indexes, IMS Parallel Reorganization was 6.6 times faster and consumed 5.2 times less CPU than standard IMS utilities.

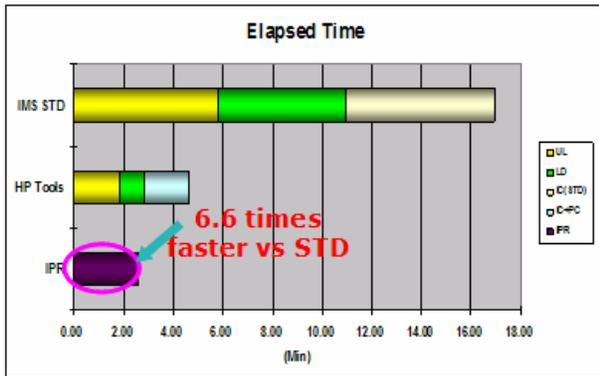


Figure 1. IMS Parallel Reorganization Elapsed Time (HIDAM/VSAM root only)

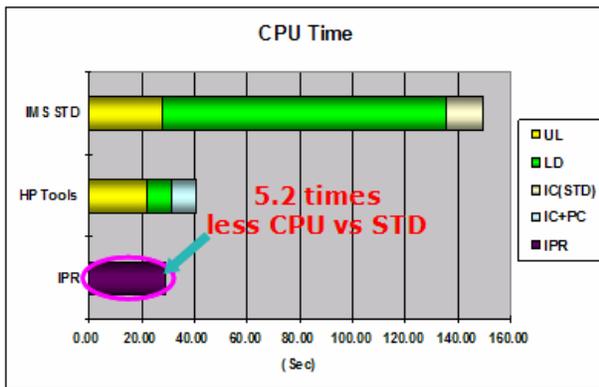


Figure 2. IMS Parallel Reorganization CPU Time (HIDAM/VSAM root only)

When tested on 20 segment types databases with 49 million occurrences, 1700 cylinders (1.3 GB) of HIDAM and OSAM structure, and two secondary indexes, IMS Parallel Reorganization was 7.5 times faster and consumed 4.6 times less CPU than standard IMS utilities.

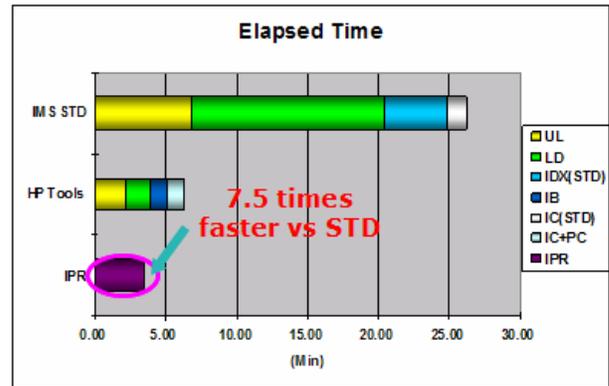


Figure 3. IMS Parallel Reorganization Elapsed Time (HIDAM/OSAM 20 segment types)

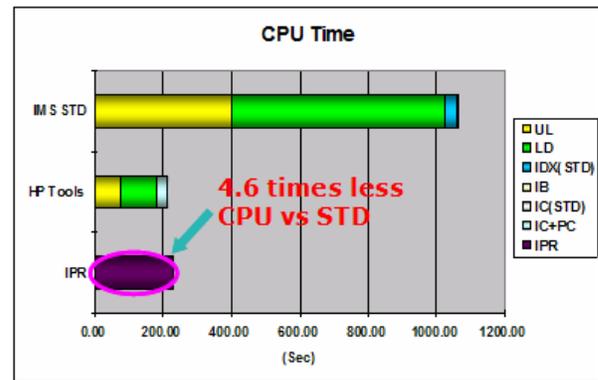


Figure 4. IMS Parallel Reorganization CPU Time (HIDAM/OSAM 20 segment types)

These tests were conducted using the IMS High Performance Tooling including HP Unload, HP Load, Index Builder, HP Image Copy, and HP Pointer Checker. The results were compared against standard IMS utilities that included HD Unload, HD Load, and Image Copy with no pointer checking.

IMS Online Reorganization Facility for z/OS

IMS includes a fully integrated online reorganization function that makes use of IMS's services and facilities. This integrated online reorganization function (IMS OLR) is ideal for applications that require 100% availability of their data during the reorganization process. However, IMS OLR can be used only with HALDB partitions. Another option is the IMS Online Reorganization Facility for z/OS, which supports both HALDB and non-HALDB



databases. Like IMS Parallel Reorganization, IMS Online Reorganization Facility for z/OS is fully integrated with IBM's High Performance Utilities. IMS Online Reorganization Facility is designed for those customers that require certain databases be available on a 24x7 basis. IMS Online Reorganization Facility makes a copy of the target databases and reorganizes the copy.

While that phase is being processed, IMS Online Reorganization Facility captures any updates that were made since the first copy was taken and processes those recent updates against the reorganized copy until all of the updates have been applied. After the updates have been applied, a brief outage of several seconds occurs during which the database's data sets are swapped and the new reorganized database becomes available. You can schedule when this outage occurs by using IMS Online Reorganization Facility's flexible contingency options. Besides the obvious benefit of high availability and support of non-HALDB databases (as mentioned previously), IMS Online Reorganization Facility has further advantages over IMS OLR. Most IMS shops require an image copy and pointer check to ensure database validity and a reliable point for recovery. IMS Online Reorganization Facility is highly integrated with High Performance Image Copy, High Performance Pointer Checker, and Index Builder, ensuring automatic execution. These operations are more difficult to set up and use with the standard IMS solution.

Once again, tests prove the efficiency of this IMS Tool. IMS Online Reorganization Facility V1.1 was tested on a 4-cp 2064 machine with ESS-F20 DS8000 DASD, which was running z/OS V1.6 and IMS V9. During this test, IMS Online Reorganization Facility was compared against IMS OLR running at pacing rates of 50 and 100 (IMS OLR's pacing feature allows you to adjust the pace to minimize the impact on system resources).

During that test, IMS Online Reorganization Facility was able to reorganize 1 GB of PHIDAM and OSAM databases while processing 3-4 transactions per second. Compared to IMS OLR running at a pacing rate of 50%, IMS Online Reorganization Facility was 1.8 times faster in terms of elapsed time, while still maintaining near 100% online availability.

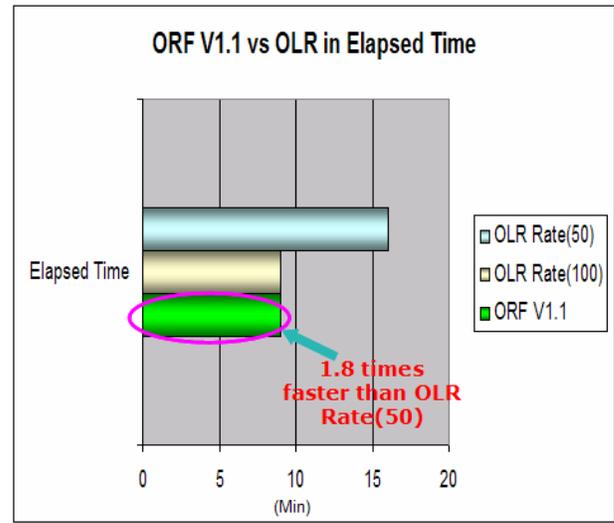


Figure 5. IMS Online Reorganization Facility vs. IMS OLR in Elapsed Time

In the same test, IMS Online Reorganization Facility used 2.9 times less CPU than IMS OLR, while also maintaining near 100% online availability.

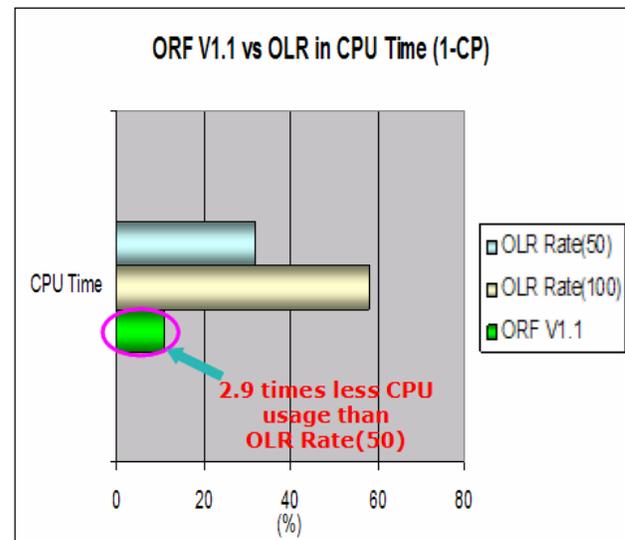


Figure 6. IMS Online Reorganization Facility vs. IMS OLR in CPU Time



Conclusion

Doing business in today's world requires a high rate of availability and responsiveness. IMS Tools from IBM help you to maximize your investment in IMS and meet your customers' demands more effectively and efficiently.

Whether your databases require 24x7 operation or not, IMS Reorganization Solutions from IBM can save you time and money by working with other High Performance IMS Tools in a true end-to-end solution. IMS Parallel Reorganization and IMS Online Reorganization Facility for z/OS have repeatedly outperformed standard IMS utilities in terms of elapsed time and CPU usage, in turn reducing IMS's total cost of ownership now and into the future.

Resources

Visit IMS Tools Reorganization Solutions on the Web:

IMS Parallel Reorganization for z/OS
<http://www.ibm.com/software/data/db2imstools/imstools/imsparreorg.html>

IMS Online Reorganization Facility for z/OS
<http://www.ibm.com/software/data/db2imstools/imstools/imSORF.html>