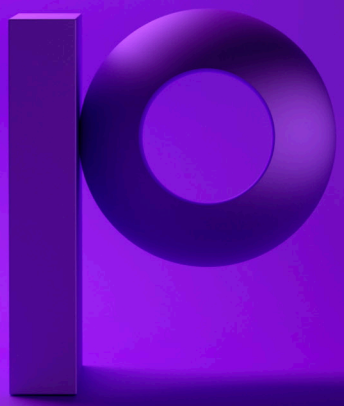
Syncsort™ MFX

The high-performance sort/copy/join utility for mainframe



Overview

Syncsort™ MFX is a high-performance sort, copy and join utility designed to exploit the advanced facilities of the z/OS operating system and IBM® Z mainframes. Used in over 85 countries, Precisely's Syncsort™ MFX solution is the most frequently installed third party software product on IBM and plug-compatible mainframes. Syncsort™ MFX has a 45+ year history of specialized sorting expertise and exploits every significant hardware and operating system advancement for easy implementation and cost effectiveness. Superior sort performance, documented in benchmark tests, is the hallmark of Syncsort™ MFX technology. However, Syncosrt MFX provides more than performance; it is a comprehensive product, with demonstrated benefits in key areas:

- Performance
- Resource management
- Data utilities
- Transparency
- Support
- Encryption

Performance

Sort performance is a significant component of system efficiency. Industry studies have shown that sort-related processing can approach 25% of CPU time. Thus, reducing resources used for sorting can significantly increase overall system efficiency.

Syncsort™ MFX is an easily implemented, fully transparent response to the need for sort efficiency. However, internally Syncsort™ MFX is a complex and highly sophisticated software product that exploits current system architecture with a combination of proprietary sorting algorithms, advanced access methods and dynamic optimization techniques.

Syncsort™ MFX optimization procedures dynamically monitor and respond to system status, including CPU utilization, DASD contention, controller caching, central storage availability, paging rates and the specific make and model computer Syncsort™ MFX is running on. Syncsort™ MFX also exploits advanced parallel access volume (PAV) technology to minimize the elapsed time of sort executions.

Additional High-Performance Products

Precisely offers several optional features that enhance the performance and functionality of Syncsort™ MFX:

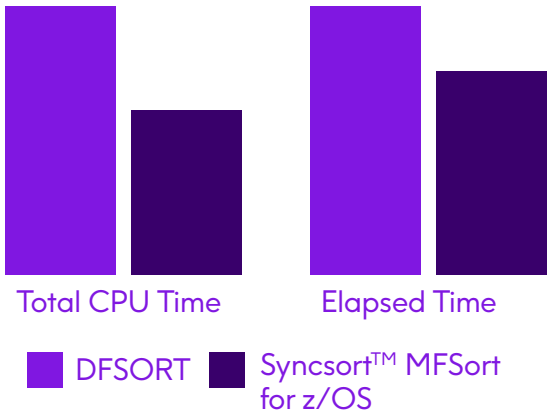
Syncsort™ ZPSaver can offload up to 90% of all Sort, Copy & SMS Compression CPU cycles to the IBM z Integrated Information Processor (zIIP), saving money while delivering even faster processing for the mainframe. Syncsort™ ZPSaver executes transparently with current JCL and control statements.

Syncsort™ PROCsort, a high performance, transparent replacement for SAS® provided PROCSORT, reduces CPU time required for sorting within SAS applications up to 40% and cuts sort elapsed time up to 25%. Because sort processing within SAS programs often consumes up to 30% of CPU time and is very I/O intensive, Syncsort™ PROCsort's efficiency results in noticeable improvements in overall system throughput.

Syncsort™ Pipesort simultaneously executes up to eight differently sequenced sorts from a single pass of the input data. It uses advanced parallel sorting technology to cut total elapsed time by more than 50% compared to running separate sorts.

Syncsort™ MFX exploits the Modified Indirect Address Word (MIDAW), IBM System z High Performance FICON (zHPF), and the IBM z Integrated Information Processor (zIIP). Syncsort™ MFX's use of the MIDAW and zHPF facilities reduces CPU time and elapsed time. Syncsort™ MFX's zIIP support allows many sorts to have a portion of their processing directed to the zIIP, thereby lowering the CPU time cost associated with sorting. The zIIP exploitation also frees General Processor CPU cycles for use by other applications that do not exploit the zIIP facility.

Syncsort™ MFX's design sophistication improves sort performance while optimizing overall system efficiency. The result is significant superiority to IBM's DFSORT in terms of reduced total CPU time, reduced elapsed time, and improved overall system throughput.

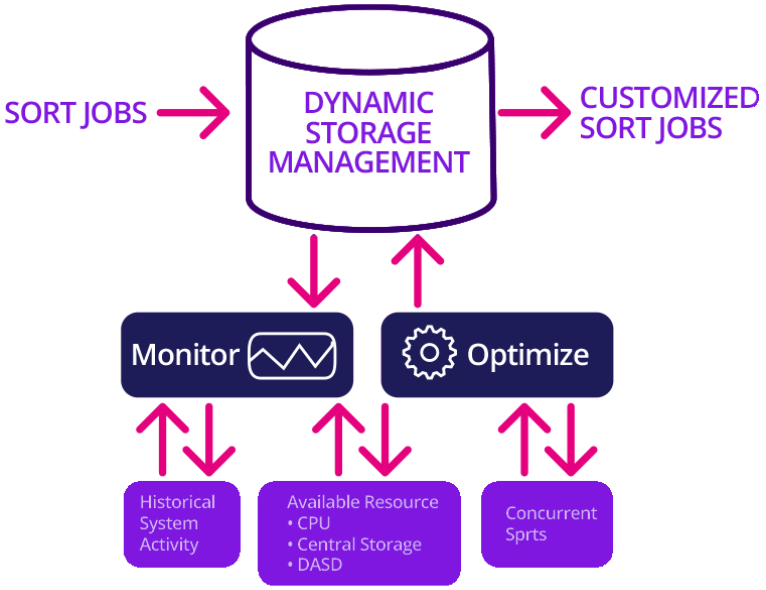


Resource Management

Syncsort™ MFX includes four unique facilities that enable more efficient resource utilization than other mainframe sort solutions:

1. **Dynamic Storage Management (DSM)** is an advanced Syncsort™ MFX proprietary system that monitors and dynamically controls sort performance and resource use. DSM performs two basic functions:

- Monitoring. DSM continually monitors central storage availability and the performance and workload of DASD and DASD I/O channel paths. The information acquired is recorded in a special history database.
- Optimization. DSM analyzes the history database along with current levels of resource use and individual sort job characteristics. DSM then decides how to allocate resources to concurrently running sort jobs based on a balance among their needs, system load, and the needs of other jobs on the system. Guided by DSM, Syncsort™ MFX uses the optimum amount of address space and dataspace and selects available SORTWK devices with the least contention and highest transfer rates.



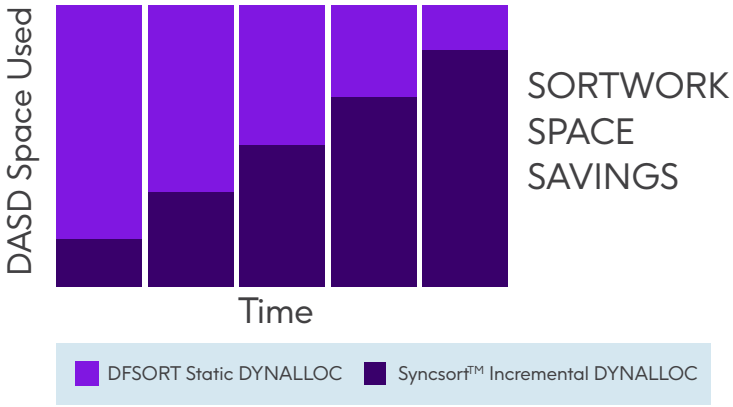
Unlike DFSORT, DSM evaluates historical data acquired in the monitoring process to anticipate recurring variations in system activity. Using a combination of historical tracking and current system monitoring, DSM adjusts resource use for overall system efficiency.

2. **PARASORT** uses specially designed parallel techniques to reduce the elapsed time of sorts with large multivolume and/or concatenated tape data set input. This breakthrough technology allows Syncsort™ MFX to read data from two, three, or four tape drives simultaneously.

   PARASORT can improve elapsed time up to 20% when two volumes are processed in parallel and up to 33% when four volumes are processed.

3. **Dynamic Sortwork Allocation** employs a unique incremental sort work allocation technique that minimizes the use of DASD resources for sorting while preventing abends due to unavailable DASD space or inaccurate file size estimates. Incremental sort work allocation can save up to 25% of overall sort workspace.

   Unlike DFSORT's static DYNALLOC, Syncsort™ MFX's dynamic sort work allocation technique acquires sort work as required during the sort step instead of allocating all anticipated space at sort initiation. In this way, Syncsort™ MFX prevents sort work abends without over allocating DASD space. Also unlike DFSORT's DYNALLOC, Syncsort™ MFX retries if DASD space is unavailable.



4. **MAXSORT** makes it possible to sort large datasets with minimal DASD space. This capability is useful for shops where DASD work space is limited or it is unacceptable to monopolize the available DASD for long periods. MAXSORT dynamically segments the input data, sorts the segments, stores them on tape, then merges them – all in a single job step.

An automatic breakpoint/restart function facilitates restarting after a planned or unplanned interruption.

Thus, you can stop MAXSORT, process a higher priority job, then easily resume MAXSORT at your convenience.

Transparency

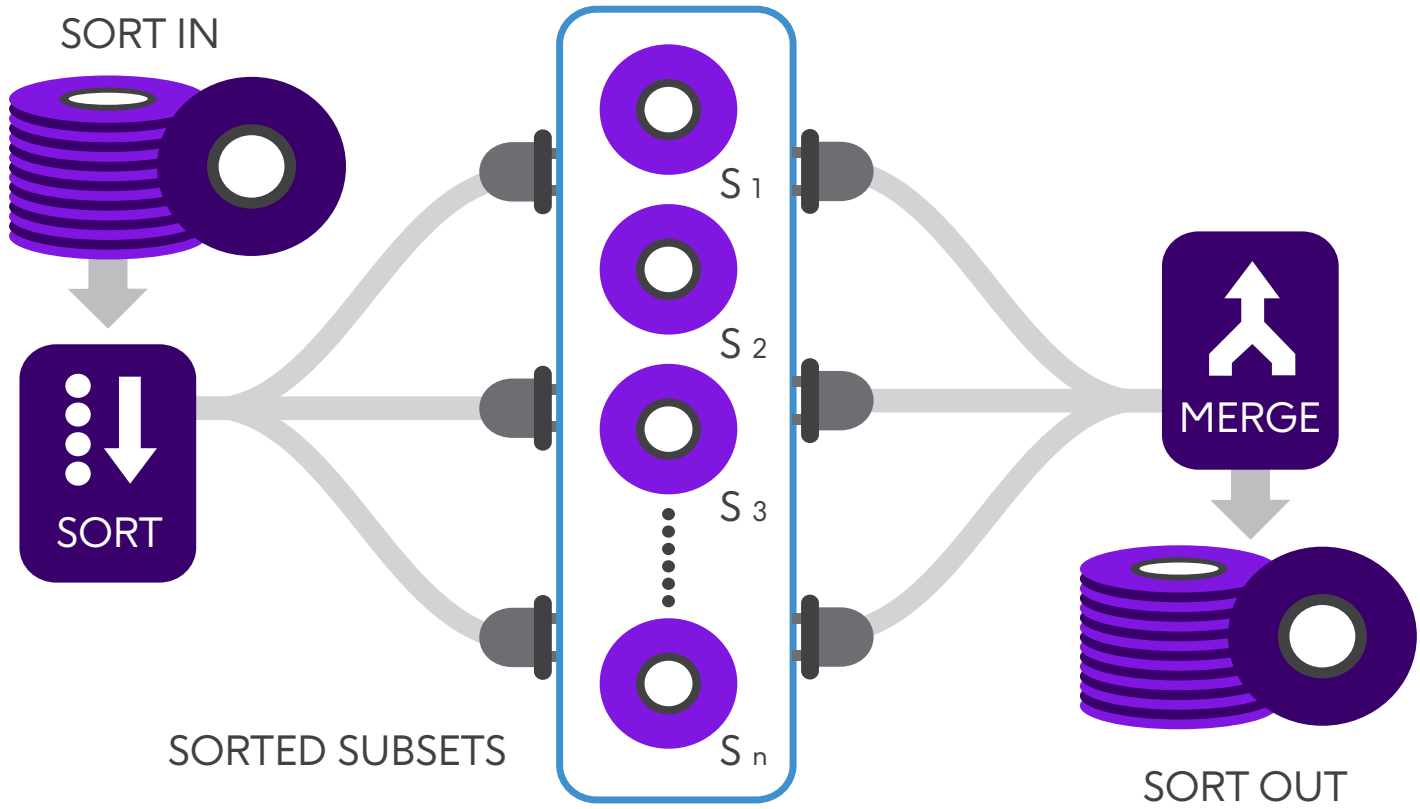
Syncsort™ MFX is a transparent replacement for DFSORT and is fully compatible with all current z/OS operating systems and hardware. When converting from another sort product, it is not necessary to change JCL, control statements, parameter lists, exits, invoking applications, or installed system software, including Db2 and IMS utility sorts. No recompiling or relink-editing of user exits or invoking programs is required Installation options provide full compatibility between sort products.

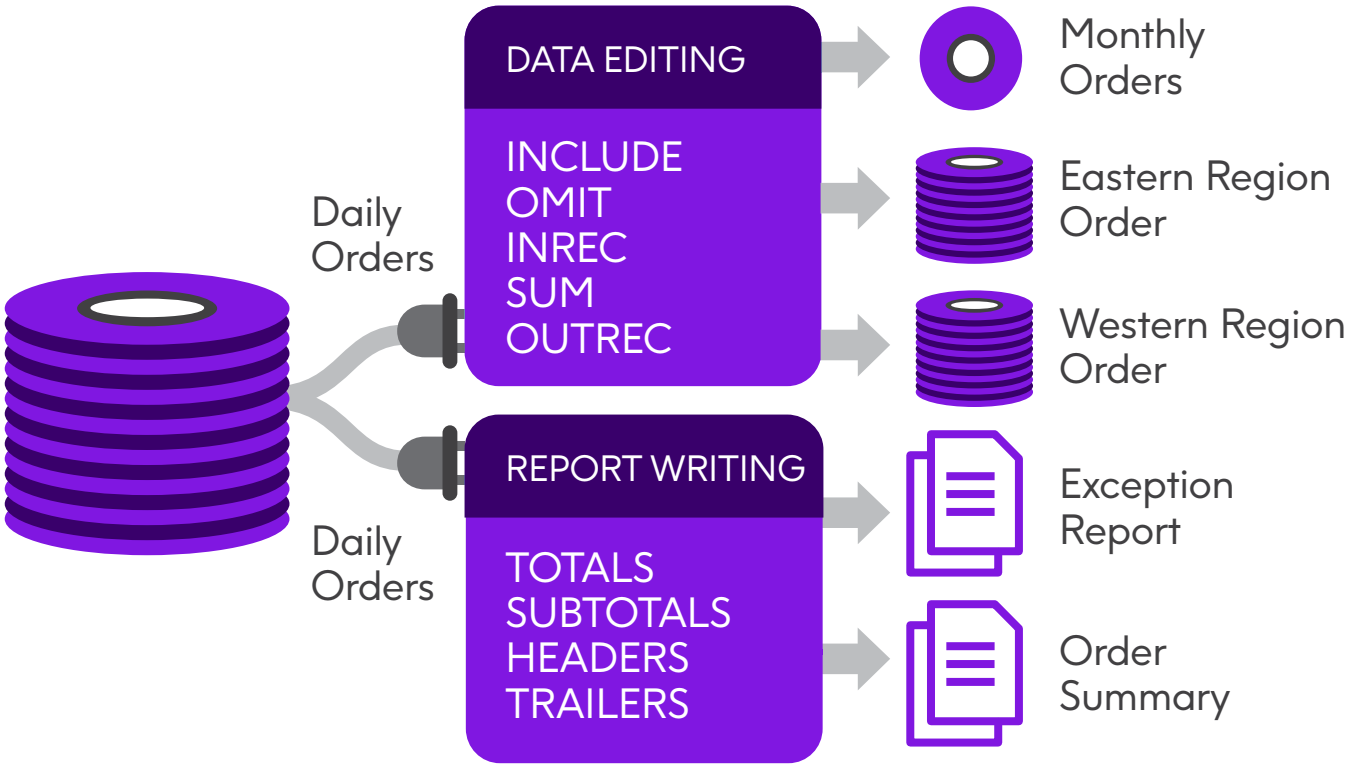
Encryption

Syncsort™ MFX encrypts SORTWORK data sets to provide enhanced security and compliance with regulations such as GDPR. Encryption will be done on a CP for MFSort and on a zIIP when using Elevate ZPSaver.

Data Utilities

Powerful features retrieve Db2 data, edit records, join records, produce multiple output files, and generate reports. These data editing features allow you to perform a range of data manipulation functions without COBOL programming.





- The Db2 Query feature allows Syncsort™ MFX SORT or COPY operations to directly retrieve data from a Db2 database based on a query specified by an SQL SELECT statement. The Db2 Query feature improves performance over Db2's DSNTIAUL program by eliminating the need for setup steps and user-written exits. Most Syncsort™ MFX data manipulation and report functions can be applied to the records created by the query operation.

- Syncsort™ MFX can select input and output records (INCLUDE/OMIT) and reformat them (INREC/OUTREC). Reformatting includes extracting fields, adding or deleting characters, performing arithmetic calculations, converting numeric fields to printable format or other formats, and editing with Syncsort™ MFX-supplied or user-defined editing masks. Syncsort™ MFX can extract fields that are of variable length or position in a record. This is useful for records imported from other platforms.

- Syncsort™ MFX can convert a variable-length input file to a fixed-length output file (CONVERT) or a fixed-length input file to a variable-length output file (FTOV).

- Syncsort™ MFX can consolidate records with equal sort keys, optionally total values in specified fields, or write eliminated records to a separate data set (SUM, XSUM). In addition to these functions Syncsort™ MFX can calculate the average, maximum, or minimum values in specified fields (DUPKEYS).

- Join Processing joins records from two source files based on keys specified in the JOIN KEYS statement. Equally-keyed records from the two files are combined into one or more records. The REFORMAT statement defines the fields selected and record layout of the resultant records. Syncsort™ MFX supports left, right, inner and outer joins.

- The OUTFIL OUTPUT feature provides the ability to create an output file in a PDF, HTML or RTF format. Any of these files can be e-mailed as an attachment to one or more recipients.

- The Dictionary Feature provides the ability to create symbolic names for fields, constants and output columns, and use these names in Syncsort™ MFX control statements.

- Multiple Output provides the ability to create differently selected and reformatted data groups, which can be assigned to multiple output datasets. The entire process (records selected, editing, multiple output) requires only one sort pass. This effectively combines applications, saving system resources by eliminating multiple passes through the same data.

- Sort Writer creates high-performance report writing applications without COBOL programming.