Informix
SOFTWARE

Informix® C-ISAM® is a library of C-language functions that efficiently manages indexed sequential access method (ISAM) files. C-ISAM bypasses the overhead of an entire relational database management system (RDBMS), and enables fast and efficient access directly to records from applications. C-ISAM has been the industry-standard ISAM for UNIX® in the U.S. and Europe for more than 15 years, and Informix C-ISAM complies with the X/Open® standard.

Technical Overview

Organizations can use C-ISAM to take advantage of larger-sized disks and the increased capabilities of newer operating systems. C-ISAM version 7.25 supports 2-GB files on systems that provide for 2-GB+ file sizes. Before version 7.25, corruption could occur if data, index, audit, or transaction log files were larger than 2 GB.

The Informix C-ISAM for ISAM file management is an ideal solution for quick data access for application development, low-level ISAM access without the RDBMS overhead, and high levels of reliability. C-ISAM offers a wide variety of benefits, including:

• Quick data retrieval
• X/Open standards compliance
• Flexible indexing options
• Data integrity
• ISAM system maintenance
• File compatibility

Quick Data Retrieval

With C-ISAM, sifting through records to get to specific data is unnecessary. The C-ISAM B+ tree-index architecture makes data retrieval fast and easy. It uses index entries as keys that point to records, which allow specific pieces of data to be found without examining extra records. In addition, C-ISAM uses techniques to compress the keys for efficient index storage and processing. The reduced key size means faster response and better performance for the end user.

X/Open Standards Compliance

C-ISAM is the worldwide UNIX industry standard file access method. X/Open standards-compliant C-ISAM is designed to pass the X/Open XPG3 test suite for ISAM, and includes variable-length record support as well as additional status-variable support, as specified in XPG4.

X/Open Global Language Support

C-ISAM 7.25 uses Informix global language support (GLS) to support native languages. The Informix implementation of GLS is based upon the X/Open XPG4 specification. GLS supports single-byte and multi-byte characters to allow C-ISAM to collate character strings, print dates, and accept currency input in the rules and formats required by the country where the products are being used. X/Open-compliant GLS also provides worldwide support of database applications, so applications can be migrated to multiple languages while maintaining the same functionality.

Flexible Indexing Options

C-ISAM indexing capabilities allow any number of ISAM file indexes. Each of these indexes can be in from one to eight parts, with each part a different data type.

Indexes can be built on multiple fields, a single field, or parts of a field. Ascending or descending order for data in different parts of the same indexes can be specified. C-ISAM also allows duplicate and unique key values. After indexes have been created, C-ISAM automatically updates the indexes while the records are changed, to make tasks easier.

Data Integrity

C-ISAM provides several mechanisms to keep data safe. Transaction management and logging and recovery features allow you to recover your data in the event of a system or disk failure, and locking mechanisms manage the concurrency of the data. A bcheck utility ensures the integrity of indexes.

Transaction Management

C-ISAM has built-in routines for transaction management that provide additional security for managing your data. With these routines, you can treat multiple operations as a single transaction by defining where the transaction should begin and where it should end (commit point). If necessary, you can roll back to the beginning of the transaction to ensure data integrity and avoid partially completed transactions.

Logging and Recovery

Logging facilities help to ensure data integrity by recording each transaction in a log file. If the work in progress must be rolled back, the ISAM files can be restored from the log file. The log file also provides a recovery mechanism if the ISAM file becomes corrupted or destroyed.

Locking

C-ISAM has locking options that ensure data integrity when multiple users concurrently access the same row. When a transaction begins, the C-ISAM routines that modify records also lock records. The records remain locked until the transaction is either committed or rolled back. These field-level and record-level locking capabilities help prevent multiple users from interfering with each other and causing data inconsistency.

bcheck

The bcheck program is a C-ISAM utility program that checks and repairs ISAM index files to maintain data integrity. This program can be run whenever the integrity of an index may have been compromised—generally because of a system failure while updating the index.

ISAM System Maintenance

C-ISAM streamlines ISAM system maintenance, and the C-ISAM built-in routine reduces the time for writing maintenance tasks. After linking C-ISAM with applications, built-in routines perform the following maintenance tasks:

- Create indexed file systems
- Add and delete indexes
- Add, delete, and modify records
- Reorder data records
- Rename and erase ISAM files
- Lock records or files

File Compatibility

Because C-ISAM is the base of Informix-Standard Engine (SE), all applications built with Informix development tools can be used against SE-compatible, or appropriately constructed C-ISAM files. Compatibility at the ISAM level allows data to be transferred

between Informix products to combine the strengths of the various features. For example, C-ISAM fast file access and high-level forms utilize Informix-SQL and Informix-SE reports for easy access to complex data.

Technical Configuration

Operating System File Organization

A C-ISAM file consists of two operating system files: one to hold the data records and another to hold the index information. The data file extension is ".dat" and the index file extension is ".idx." These two operating system files are always used together as a single, logical ISAM file.

Index Organization

C-ISAM indexes are organized in B+ trees that contain keys. Keys, the individual entries in an ISAM index file, are values from the data record such as an employee number, for example, that points to a record or multiple records, identified by record numbers. B+ trees also contain pointers that are arranged in a hierarchy. These pointers indicate another level in the index tree or a data record.

To find a record, the appropriate C-ISAM function is executed and the key value for the search is supplied. The C-ISAM function rapidly performs the search through the index. If it finds a match on the key value, it uses the pointer to read the data record. C-ISAM then returns the data record to the program that requested the data.

C-ISAM Data Types

The C-ISAM data storage method is machine-independent, eliminating any confusion about machine-dependent data representation. The C-ISAM data types and their C- language equivalents are listed below:

C-ISAM Data Type	C Language Data Type
CHARTYPE	char
INTTYPE	int
LONGTYPE	long
FLOATTYPE*	float
DOUBLETYPE*	double
DECIMALTYPE**	typedef struct decimal
	dec_t

*stored machine-independently
**C structure (struct decimal)

About Informix

Informix Software is the technology leader in software infrastructure and solutions for the Internet. Informix brings a focused set of products and services that integrate e-business and business intelligence on an Internet infrastructure. The Company's highly scalable database engines, in addition to its business intelligence, content management, and e-commerce solutions, enable customers to succeed in the new economy. For more information, contact the nearest Informix sales office or visit the Web site at www.informix.com.

PRODUCT AVAILABILITY

Informix C-ISAM is available on the following platforms:

- Compaq/Digital UNIX
- Fujitsu-Siemans Reliant-Unix
- Hewlett-Packard HP-UX
- IBM AIX
- Linux for IBM S/390
- Linux for Intel
- SCO Open Server
- SCO UnixWare
- Sun Solaris
- Windows NT
- Other UNIX Systems

SPECIFICATIONS

The following C-ISAM disk storage requirements are approximations:

Programs	355 kilobytes
Libraries	230 kilobytes
Include Files	18 kilobytes
Demo Files	29 kilobytes
Miscellaneous	79 kilobytes
Total	**711 kilobytes**

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