

# eXtremeDB® In-Memory Database System (IMDS) for Financial Applications

*“eXtremeDB enabled us to reduce latency to the sub-millisecond level per order while implementing a complex risk and compliance system.”*

-- NSE.IT

eXtremeDB, the real-time embedded database for devices that are eXtremely innovative

## Financial Systems: The Database Challenge

*A real-time database system provides a reliable, low-latency foundation for algorithmic trading and other time-sensitive financial applications.*

The volume of data processed by real-time trading systems is skyrocketing. Success for capital markets technology hinges on acting instantly on price changes, delivering up-to-the-second analytics, aggregating information in meaningful ways and performing other real-time tasks. This, in turn, depends heavily on applications' underlying approach to managing data. But conventional relational database management systems (RDBMSs) often cannot deliver the needed speed and flexibility.

That's why developers in the financial sector are turning to McObject's eXtremeDB In-Memory Database System (IMDS), a database system that acts as an accelerator, rather than a bottleneck, for application performance. eXtremeDB's unique architecture "designs out" database latency and maximizes responsiveness and predictability. And with a competitive feature set that includes SQL, clustering and support for very large databases, eXtremeDB is the ideal choice for fast, efficient and reliable database management in a variety of financial applications.

## Designed to Eliminate Latency Spikes

System latency can spell the difference between a successful trade and a missed opportunity. eXtremeDB's design is based on a core in-memory database system that eliminates performance-draining I/O, caching logic, inter-process communication, and other sources of latency that are "hard-wired" into traditional RDBMSs. eXtremeDB's execution path is very short: a code size of approximately 150K points to McObject's unrelenting focus on eliminating extraneous processing and paying attention to even small potential sources of latency.

In-process architecture contributes to eXtremeDB's superior speed. The database system runs entirely within the application process, eliminating inter-process communication (IPC) between client and server modules. In contrast, IPC messaging is an inherent source of latency in RDBMSs and in some in-memory database systems based on client/server design.



**eXtremeDB is the low-latency, high-reliability database system in real-time financial applications.**

While eXtremeDB supports standard SQL, developers can use a native C/C++ API for greater speed and predictability. eXtremeDB also provides the ability to store records directly as C/C++ data types (such as structures, vectors and arrays), eliminating the overhead of conversion to SQL data types. These and other factors enable eXtremeDB to deliver ultra-low latency in data sorting, retrieval and storage, which in turn enables financial systems developers to meet critical performance goals, such as achieving sub-millisecond order processing in algorithmic trading applications.

## Tools for Reliability and Flexibility

Built on the core in-memory database engine, McObject's eXtremeDB product family delivers specialized editions and sophisticated features that address real-time financial software's data management challenges. Developers can choose between using the native C/C++ API or a SQL ODBC interface (eXtremeSQL) that supports industry standards. They can also combine these APIs in an application, using the native interface for time-sensitive code and developing with eXtremeSQL where high-level access and interoperability with ODBC-compliant external systems is required. eXtremeDB also provides native Java and C# APIs that enable developers to work entirely with "plain old" objects in these languages (no external database definition is required).

## Superior Scalability

Positioned at the forefront of IMDS scalability, *eXtremeDB* provides features to maximize throughput and fully leverage multi-core CPUs:

- **64-bit support** (*eXtremeDB*-64) enables in-memory databases to scale to terabyte-plus sizes
- With ***eXtremeDB* Fusion**, on-disk database size is limited only by available file system space (32- or 64-bit implementations)
- An optional **multi-version concurrency control** (MVCC) transaction manager eliminates "pessimistic" locking to accelerate multi-threaded applications running on multi-core hardware
- ***eXtremeDB* Cluster** spreads database processing across multiple hardware nodes, to leverage the processing power of many CPUs simultaneously

How fast is an in-memory database at scale? In the first benchmark of an IMDS exceeding one terabyte in RAM, *eXtremeDB*-64 achieved near linear performance gains while scaling from one core up to 160 cores, and demonstrated performance exceeding 87 million query transactions per second (download the free report at <http://www.mcobject.com/terabyte-plus-benchmark>).

## Application Areas

Brokerage front office systems, algorithmic trading, arbitrage, ticker plants, risk management, exchange-based trading platforms, portfolio management, analytic libraries, fund management.

## Additional Features and Benefits

- **Event notifications** "inform" application when something of interest in the database changes
- Open replication: ***eXtremeDB* Data Relay** technology facilitates selective data sharing between real-time applications based on *eXtremeDB*, and external systems such as enterprise RDBMSs
- Security: page-level **cyclic redundancy check** (CRC) detects unauthorized changes and **RC4 encryption** blocks tampering
- *eXtremeDB* Fusion's **cache prioritization** enables applications to influence how long certain pages remain in cache, to accelerate time-sensitive tasks
- *eXtremeDB*'s native C/C++ API is **type-safe**. Data typing errors are caught during compilation, eliminating a potential source of run-time bugs
- **Database striping/mirroring**: *eXtremeDB* Fusion can exploit multi-disk (solid state or spinning) configurations with its support for RAID-like data striping and mirroring

- **Querying methods** include B-tree, KD-tree, R-tree, Patricia trie, hash table and custom indexes.
- **Source code and object code** licenses are available
- **Industry-tested solution** – capital markets technology based on *eXtremeDB* includes brokerage front office and algorithmic trading solutions, exchange-based trading platforms, ticker plant, risk management and more
- **Custom Collations**. Specify the character sorting sequence (collation) for text, including collations supporting more than one language
- **Pattern Search**. Use wildcards to search tree index entries for single and multiple character matches

## Architectures Supported

32-bit, 64-bit, x86, x64, SPARC, Itanium, PowerPC and others.

## Operating Systems Supported

HP-UX, Sun Solaris, Windows, Linux and others.



**Eliminating system latency spells the difference between successful trades and missed opportunities.**