eXtremeDB® In-Memory Database System (IMDS) For Consumer Electronics

The right embedded database cuts manufacturing costs, builds in reliability and improves the end-user experience.

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*eXtreme*DB, the real-time embedded database for devices that are eXtremely innovative

Overview

In the race to offer advanced features, consumer electronics devices manage growing volumes of increasingly complex data. Portable media players organize content via meta-data and user input such as playlists and ratings. Embedded gaming software demands concurrent data access, event notification and fast, flexible search. Set-top boxes offer a rich store of programming choices, and smartphones must organize messages—often in multiple formats—logically, and retrieve them quickly. Device features must respond instantly to deliver a snappy end-user experience.

Consumer electronics manufacturers rely on McObject's *eXtreme*DB embedded database system product family to meet the stringent performance, reliability and form factor demands, as well as the RAM and CPU limits, of new devices. *eXtreme*DB offers stability, flexibility, a shorter development cycle, and performance proven in years of deployment.

Fast, Efficient In-Memory Database System

The core product, *eXtreme*DB In-Memory Database System (IMDS) edition, manages records entirely in main memory. This design eliminates disk and file I/O, cache management and other processes linked to persistent storage, to deliver maximum performance. *eXtreme*DB's streamlined design — built from scratch for embedded applications—makes for a code size of approximately 150K, and developers have reduced this to as small as 50K by using *eXtreme*DB features selectively. This tiny footprint enables use of less RAM and lower-end processors, resulting in manufacturing cost savings that drop to the bottom line.

*eXtreme*DB Fusion: Maximum Flexibility

For unparalleled flexibility, manufacturers can integrate the *eXtreme*DB Fusion edition, which combines in-memory and persistent (disk or flash) data storage in a single embedded database. With *eXtreme*DB Fusion, the developer chooses persistent storage for a particular record type with a simple notation in the database schema (design). These persistent records are stored and accessed using highly flexible caching policies, while the rest of the database stays in main memory, with attendant speed and efficiency benefits.

eXtremeDB's support for custom collations enables Loewe Opta's electronic programming guide (EPG) software to support multiple languages, expanding the market where a digital TV model can be sold.

*eXtreme*DB Fusion enables developers to optimize embedded software for speed, persistence, cost and form factor. In-memory data management excels at real-time performance. Yet byte-for-byte, disk storage can be cheaper than memory. Disk storage can also take less physical space. So for small form-factor devices with large storage needs, such "spinning memory" might be preferred. In addition, a manufacturer's product line for a particular device will often include both disk-less and disk-enabled models, to accommodate different price points or features. *eXtreme*DB Fusion enables the manufacturer to embed the same database system across the product family, saving development costs and reducing time-to-market.

*eXtreme*DB Features and Benefits

- **Lower costs** – Streamlined architecture enables striking efficiency gains, leading to lower component (RAM and CPU) costs.
- **Shorter time-to-market** – *eXtreme*DB is an ideal commercial, off-the-shelf (COTS) database system to replace proprietary ("homegrown") database code in a device, slashing development and Q&A time and simplifying maintenance.
- **Highly Portable** – McObject supports *eXtreme*DB on multiple platforms and offers porting source code. With this flexibility, manufacturers avoid being locked into a hardware/software environment.

Precision Data Management

- **Better, safer code** – Type-safe, intuitive C/C++ API shortens database learning curve, produces more easily maintained code, and eliminates costly run-time errors. Also available: SQL ODBC and native Java and C# APIs.
- **Concurrent access** – Databases can be created in local or shared memory. Multiple processes or threads can share databases; a remote interface allows network access.
- **Industry-tested solution** – DirecTV, Siemens, Phillips, JVC, ST Microelectronics, Loewe Opta and MOD Systems are among industry leaders that have chosen McObject's database to manage the growing volumes of data in consumer electronics.

Technical Specs

- Code size from 50K to 300K, depending on the platform and features.
- Source code and object code licenses are available.
- Transaction performance measured in microseconds.
- Security: page-level cyclic redundancy check (CRC) detects unauthorized changes and can be used to strengthen digital rights management; RC4 encryption blocks tampering.
- Custom collations: use multiple character sorting sequences (collations) simultaneously, to support text in different languages on one device.
- In-memory and on-disk data storage co-exist within *eXtreme*DB Fusion database instances, via simple database schema declarations.
- Other data persistence & durability options include streaming in-memory data to disk, non-volatile RAM (NV-RAM) support, Transaction Logging, High Availability and Cluster editions.
- Provides general purpose and specialized data indexes including B-tree, R-tree (for GIS/mapping), Patricia trie (for telecom/networking), KD-tree, hash table and more.
- Supports virtually all data types, including structures, arrays, vectors, BLOBs and Unicode.
- The database can exist in one file, to simplify maintenance, limit I/O (*eXtreme*DB Fusion) and reduce size.
- *eXtreme*DB Fusion: developers can specify a maximum database size, which is especially important when the 'disk' is a flash memory file system.
- *eXtreme*DB Fusion: cache prioritization enables applications to influence how long certain pages remain in cache, to accelerate time-sensitive tasks.
- *eXtreme*DB Fusion: database cache can be saved and re-used across sessions – for example, when a user restarts a device.

Application Areas

Set-top boxes; digital media players; smartphones; gaming devices and consoles; digital cameras; digital video recorders; GPSs; Internet and VoIP phones; home media servers; PDAs and handheld computers; robots; gateways, servers and wireless access points.

Architectures Supported

32-bit, 64-bit, ARM, DSP, Embedded Intel® (Pentium, Embedded Intel® Architecture etc.), Freescale (Coldfire, MCORE, HC08 etc), MIPS, Power Architecture™ (including PowerPC), x86.

Operating Systems Supported

VxWorks, INTEGRITY, QNX Neutrino, Linux and embedded Linux distributions (Wind River, MontaVista, LynuxWorks etc.), Windows Embedded, Mentor Graphics, eCos, LynxOS, uCLinux, µC/OS-II, Bare bones boards (no operating system required).

JVC's portable stereo and MP3 player technology integrates the *eXtreme*DB In-Memory Database System to handle meta-data for stored content.