eXtremeDB® for Military and Aerospace Applications

For MilAero systems that demand high performance, simplified development, and the utmost in safety and reliability.

"eXtremeDB proved to be more cost-effective and allowed us to develop the application for the customer within a shorter timeframe."

-- BAE Systems

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

Overview

Military and Aerospace (MilAero) systems have evolved into substantial computing platforms that are tightly integrated and continuously share information, both internally and with other systems. This growing volume of complex data presents multifaceted embedded database requirements, including high performance, concurrent access, high availability, and efficient searching.

Above all, defense and aerospace applications must be dependable and secure. Any component software part – including an embedded database engine – must be predictable, immune from crashes, and must not harm or interfere with other application processes.

McObject's *eXtreme*DB is a real-time commercial, off-the-shelf (COTS) embedded database system that meets the critical need for a fast and reliable MilAero embedded database. *eXtreme*DB offers a tiny footprint (approximately 150K code size) alongside advanced capabilities including high availability and clustering, hybrid in-memory/on-disk data storage, and unique features to ensure ultra-reliable code. Defense and aerospace manufacturers are enjoying its performance, reliability, and time-to-market benefits.

Reliable and Secure by Design

*eXtreme*DB reflects a development focus on safety and security, from the product's features down to the coding techniques used to implement them. The system avoids dynamic memory allocation, eliminating a potential hurdle in the airborne software certification process. A type-safe API catches data-typing errors at compile-time, removing a potential source of database corruption at run-time. Built-in error handling provides diagnostics to help ensure that *eXtreme*DB is being used properly.

*eXtreme*DB features also provide database persistence. With *eXtreme*DB Fusion, a simple schema notation implements storage on disk (or flash) for specified database tables. The *eXtreme*DB Transaction Logging edition provides recovery capabilities in the event of device or system failure. *eXtreme*DB also supports data storage in non-volatile RAM (NVRAM, or battery-backed RAM).

Avionics in the Panavia Tornado GR4 combat jet integrate the *eXtreme*DB In-Memory Database System (IMDS). (Photo: Copyright 2009, BAE Systems.)

Diverse Product Family

The *eXtreme*DB In-Memory Database System (IMDS) edition operates near the speed of RAM access and eliminates unpredictable latency inherent in file operations and client/server network communication. Building on this core in-memory engine, McObject provides the *eXtreme*DB product family with specialized editions addressing multiple MilAero computing challenges.

With "eager, 2-safe" replication implemented via a time-cognizant protocol, the *eXtreme*DB High Availability edition provides unsurpassed uptime, with automatic failover. *eXtreme*DB Cluster dramatically increases available net processing power by managing the database across multiple hardware nodes. *eXtreme*DB Cluster also lowers system expansion costs (by enabling use of low-cost "commodity" hardware), and maximizes scalability and reliability for the most data-intensive applications.

*eXtreme*DB Fusion combines on-disk and in-memory data storage in a single embedded database system, so developers can optimize applications for speed and persistence, while adopting the most cost-effective and physical space-conserving data storage. A 64-bit version, *eXtreme*DB-64, is compatible with the editions mentioned above and delivers terabyte-plus scalability for databases stored in RAM.

Precision Data Management

*eX*treme**DB Features & Benefits**

Hybrid data management - *eX*tremeDB Fusion combines in-memory and on-disk storage in one embedded database system, to optimize applications for persistence, speed, cost and form factor.

Better, safer code – A type-safe, intuitive native C/C++ API shortens the database learning curve, produces more easily maintained code, and eliminates costly run-time errors. *eX*tremeDB's design avoids dynamic memory allocation.

High Availability- With synchronous replication implemented via a time-cognizant, two-phase commit protocol, or ultra-fast asynchronous replication, *eX*tremeDB-HA delivers the highest degree of database reliability for applications that cannot afford to fail.

Clustering – The *eX*tremeDB Cluster edition's distributed architecture leverages the processing power of multiple CPUs, maximizes uptime and increases scalability.

Slashes time-to-market – as a COTS solution, *eX*tremeDB cuts months from development and QA cycles, compared to using proprietary database code.

Highly portable – *eX*tremeDB supports the widest range of RTOS, desktop and server platforms. To maximize portability, *eX*tremeDB source code minimizes reliance on operating system features. *eX*tremeDB source code is available for less common RTOS/hardware platforms.

Proven Solution – MilAero industry leaders including BAE Systems, EADS, SAIC, Lockheed Martin, Northrop Grumman, IAI, Sandel Avionics and Boeing enjoy *eX*tremeDB's technological and time-to-market benefits.

Application Areas

Navigation and targeting; flight control; sensor data fusion; tactical data link integration; simulators and testing equipment; radio; telecom and netcom equipment; command and control systems; pilot assistance; training software; mission planning.

Technical Specs

- Supported indexes include R-trees for geospatial data, Patricia tries for IP/telecom, KD-trees for multi-dimensional data and Query-by-Example (QBE), B-trees, hash indexes and more.
- Optional multi-version concurrency control (MVCC) transaction manager eliminates "pessimistic" locking to enhance speed and scalability of multi-threaded applications running on multi-core CPUs.
- Transaction performance measured in microseconds.
- APIs: native, type-safe C/C++ API is generated when the database schema is compiled, thus reflecting the application's data model and purpose; high-performance SQL ODBC interface; native Java and C# APIs.
- Source code and object code licenses are available.
- 32K tables per database, 32K columns per table, 32K indexes per database, and 32K columns per index. Maximum in-memory database size 3GB (32-bit) or available memory (64-bit).

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, XScale.

Operating systems supported

VxWorks, INTEGRITY, QNX Neutrino, Linux and embedded Linux distributions (Wind River, MontaVista, LynuxWorks etc.), Windows Embedded, eCos, LynxOS, uCLinux, uC/OS-II, HP-UX, Sun Solaris, bare bones boards (no operating system required).

eX*tremeDB's streamlined design and in-memory deployment deliver the near-zero-latency responsiveness required for advanced systems like avionics. Integrating a commercial, off-the-shelf DBMS cuts developer-months from an application's time-to-market.