

*eXtremeDB’s IoT SDK offers complete oversight over network connection losses.*

### Overview

The first DBMS of its kind, the new *eXtremeDB* IoT SDK features Active Replication Fabric™. This is a unique new capability designed specifically to help solve IoT application needs by continuously aggregating data during network malfunctions or outages, then sending all the relevant historical data to the network as soon as the connection is reestablished. Included in the SDK is support for the device, gateway and server. By eliminating the need to piece together individual platform components, or write them yourself, it provides a high-performance DBMS for any platform and streamlines the development process saving time and money.

*eXtremeDB* provides the best of both worlds, marrying in-memory database technology with the traditional disk-based database system. The result is a hybrid database for resource-constrained and high-performance systems that affords developers the ultimate in flexibility.

### McObject’s *eXtremeDB*

Since its introduction, McObject’s *eXtremeDB* has set the standard for small footprint, in-memory embedded database systems, offering benefits including:

- **Active Replication Fabric**
- **Tiny code size** of approximately 300K or less
- Blazing speed: **micro-second transactions** even on modest hardware
- C/C++ developers benefit from a **type-safe, intuitive API** with extensive checking to speed development
- Optional **SQL** and **XML** interfaces
- **Java Native Interface (JNI)** affords Java developers the ease of working with “plain old Java objects” (POJOs)
- **High Availability Edition**, with asynchronous (1-safe) or synchronous (2-safe) replication, for applications requiring complete fault tolerance
- **Available source code**, for porting to new platforms and highest degree of control over development
- **64-bit edition** scales beyond 1TB in-memory data
- **Multi-version concurrency control (MVCC)** transaction manager and advanced memory management fully leverage multi-threaded, multi-core systems

### *eXtremeDB* Hybrid Data Management

*eXtremeDB* enables the developer to easily combine in-memory *and* on-disk paradigms in a single database system. Specifying that data will be stored in memory (transient), or on disk (persistent), requires a simple database schema declaration, as shown below.

```
transient class classname {
    [fields]
};

persistent class classname {
    [fields]
};
```

The resulting system retains in-memory strengths (speed, footprint, etc.), yet leverages the potential cost savings and durability of an on-disk database.

### Key Features

*eXtremeDB’s* on-disk features are uniquely configurable, including:

- Three transaction logging policies – Undo, Redo and No Logging – to meet the target system’s footprint, performance and durability needs
- Synchronous or asynchronous transaction logging
- Developers can specify the maximum database size, which is especially important when the ‘disk’ is actually a flash memory file system
- Database cache can be saved and re-used across sessions – for example, so a user can resume some activity when a device is switched back on
- The database can exist in one file, to simplify maintenance, limit I/O and reduce size
- Logical Database Devices feature can spread a database across multiple disks, including in a RAID, with the database striped across RAID disks
- Or, pages can be written simultaneously to multiple RAID disks for perpetual backup

With these tools, the developer fine-tunes the database according to the speed, footprint and other requirements of the target system. *eXtremeDB* puts the developer in charge.

## Highly efficient indexing

For transient classes, rather than storing duplicate data, *eXtremeDB*'s diverse indexes contain only a reference to data, minimizing memory requirements. Supported indexes include:

- Hash indexes for exact match searches
- Tree indexes for pattern match, range retrieval and sorting
- R-tree indexes for geospatial searches
- KD-tree for spatial and Query-By-Example (QBE)
- Patricia trie indexes for network, telecom
- Object-identifier references, for direct access
- Custom indexes

## Additional Features

*eXtremeDB*'s many extras help developers and application end-users get the most from the database.

- **HTML database browser/editor.** Retrieve database and class statistics and lists of classes; generate schema in the form of a Data Definition Language (DDL) file
- **XML Extensions.** Generates interfaces to create or update an object in the database from the content of an XML document, export an object as an XML document, and to generate an XML schema
- **Remote procedure call mechanism (MCORPC).** Framework enables remote processes to read/update an *eXtremeDB* in-memory or persistent database
- **Database calculator.** Collect information needed to choose ideal page size and to optimize schema designs, storage layout and performance
- **Pattern search.** Use wildcards to search tree index entries for single and multiple character matches

## Supported Platforms

### Embedded Platforms:

- Linux (Various distributions)
- Windows 2000 and later including RT
- Apple iOS and MacOS X
- QNX 6.x
- SUN Solaris
- HP Inc HP-UX
- IBM AIX
- LynxOS
- eCos
- WindRiver Linux and VxWorks
- Green HillsSoftware INTEGRITY
- GNU CygWin and MinGW32
- And more
- Bare bones board (no operating system required)

### Development environments

- GNU toolchain (gcc 2.96 and higher)
- Tornado 2.0 and 2.2 (GNU and Diab compilers)
- QNX Momentics IDE (C, C++, Embedded C++)
- Elipse
- XCode
- GreenHills Multi
- Microsoft Visual Studio (C/C++, .NET)

### Server and Desktop Platforms:

- Solaris
- HP-UX
- Linux distributions
- Windows
- MacOS X
- QNX 6x
- AIX

## Database Specifications

Maximum objects per database

32-bit: 2<sup>32</sup>

64-bit: 2<sup>64</sup>

Maximum classes per database: 65,535

Maximum indexes per database: 65,535

Maximum fields per class: 65,535

Maximum fields per index: 65,535

Maximum elements per vector: 65,535

Code Size: As little as 300K

Maximum database connections: configurable

Maximum open databases: configurable

## Supported Data types

- 1, 2, 4, 8-byte signed/unsigned integers
- float, double
- date, time
- char (fixed length)
- string (variable length)
- rect(angle)
- Unicode
- boolean (array of bits)
- enum
- fixed-size array
- variable-length vector
- structs (embedded to any depth)
- autoid (auto-increment)
- user-defined object-id and references



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