ITTIA DB SQL Embedded Database and VxWorks

ITTIA DB SQL^{TM} is a small-footprint, high-performance relational database engine for embedded systems and intelligent devices. Device manufacturers embed ITTIA DB SQL in firmware and other applications to effectively reduce development time and cost by empowering engineering resources to focus on their own products and benefit from a reliable existing solution. This approach saves significant development time and eases future maintenance headaches. In addition, manufacturers may fully incorporate ITTIA DB SQL into their applications to provide complete database functionality that is invisible to end-users. The goal of this whitepaper is to introduce a great benefit of ITTIA DB SQL and Wind River® VxWorks® real time operating system. When manufacturers choose to embed ITTIA DB SQL in a VxWorks application, they experience an out-of-the-box database that is fully relational and easy to use, easy to maintain with no long-term administration costs.

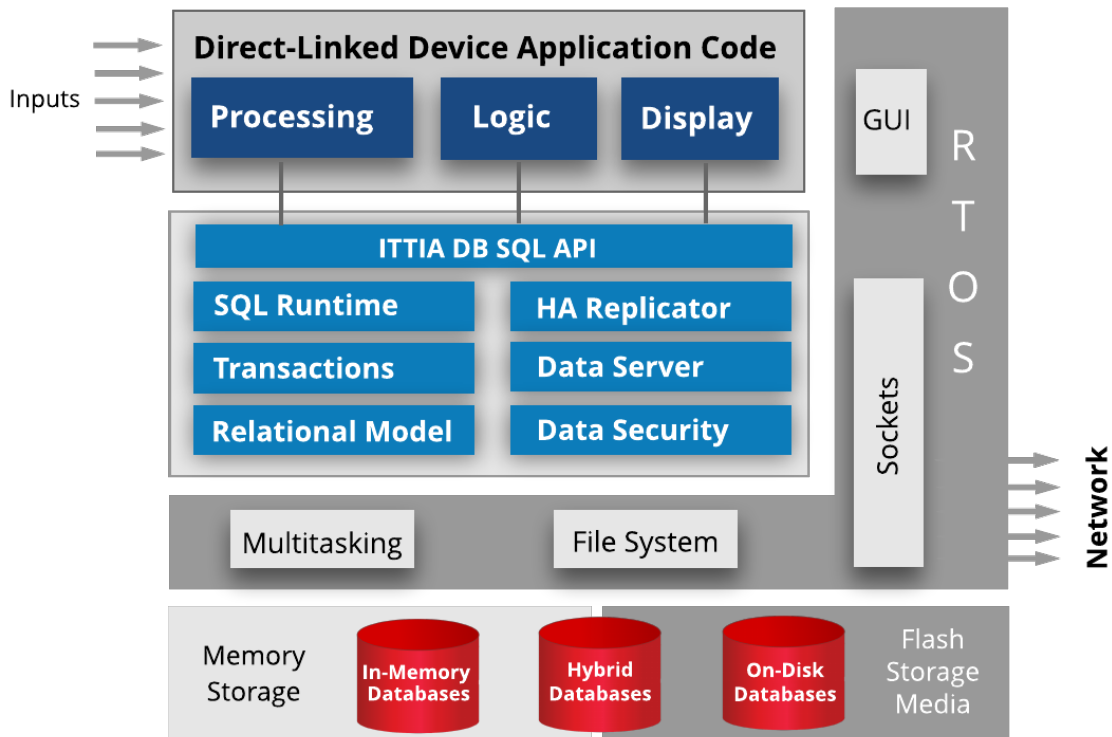## Benefits of ITTIA DB SQL and VxWorks

ITTIA DB SQL and VxWorks are ideal for embedded device manufacturers and Internet of Things development. In both products, developers can select the precise combination of features and components to support specific target hardware and firmware requirements. This shared design philosophy drives down per-unit costs and improves efficiency when applications are integrated with ITTIA DB SQL and VxWorks.

Connected devices built with VxWorks often communicate information on an irregular schedule. ITTIA DB SQL database replication makes it easy to share data stored locally with other database peers and remote systems, without blocking other concurrent data processing tasks. Multitasking applications also benefit from row-level database concurrency with local and remote SQL query execution.

To ensure that customers can focus on the unique requirements of their own product, ITTIA offers quality technical support with direct access to VxWorks database experts. Whether you are developing a monolithic firmware image in a single address space or leveraging protected memory with real-time processes, VxWorks and ITTIA DB SQL provide a complete development solution with the flexibility to manage critical data both safely and efficiently.

ITTIA DB SQL empowers developers to:

- Create highly optimized and reliable systems with low total cost of ownership by leveraging a modular architecture
- Build robust, high-value products that store, manage, analyze, connect, and distribute data with no database administrator
- Target ARM Cortex-A, ARM Cortex-M, x86, and many other embedded platforms, ensuring that product designers are not locked in to a single platform
- Access local data with runtime SQL, using powerful features such as hybrid memory/disk storage, in-place encryption, isolation levels, dynamic schema alteration, and database replication
- Synchronously and asynchronously communicate data changes with back-end services and other devices with per-table replication rules and policies
- Secure data at rest and in motion with database file encryption, SCRAM authentication, and TLS replication.

ITTIA Delivers an "Out-of-the-Box" VxWorks Experience

Developers spend serious time and resources to integrate and test various software and hardware components. With ITTIA DB SQL and VxWorks, developers embed a full relational database library that reduces development time for data storage, analysis, and communication.

When creating software, developers should focus on the functionality of their product and rely on other products that are already integrated and tested. When developers receive ITTIA DB SQL for their desired VxWorks BSP, they receive a pre-configured package that is fully tested and supported. Database files can be created on HRFS, rawFS, ROMFS, or any other VxWorks file system.

Using the relational model, ITTIA DB SQL offers ease of maintainability and interoperability with other devices. ITTIA DB SQL for VxWorks is a fully relational database with interfaces that are already familiar to many developers. Key relational database features include:

- High performance indexes on one or more columns
- SQL statements prepared and executed at runtime
- ACID transactions
- Multiple storage back-ends, including on-disk and in-memory
- Local and remote database replication
- Multi-threaded shared database access and single-threaded access
- Elegant C and C++ API functions
- Drivers for ODBC, JDBC, .NET, and other platforms
- Support for scripting languages, such as Lua, Python, and PHP

ITTIA DB SQL Makes Development with VxWorks Faster, Easier and More Reliable

Developers are generally experts in their domain of expertise, but most developers are not interested in developing and maintaining low-level database routines. They prefer to rely on a vendor to provide database expertise, selecting database software with ease of use and development even for non-experts. With the full relational model, ITTIA DB SQL provides developers with a straightforward development platform that any C or C++ developer can easily deploy and gain the required development knowledge. ITTIA DB SQL is well-known for its ease of use and embedded management functions that eliminate the database administrator.

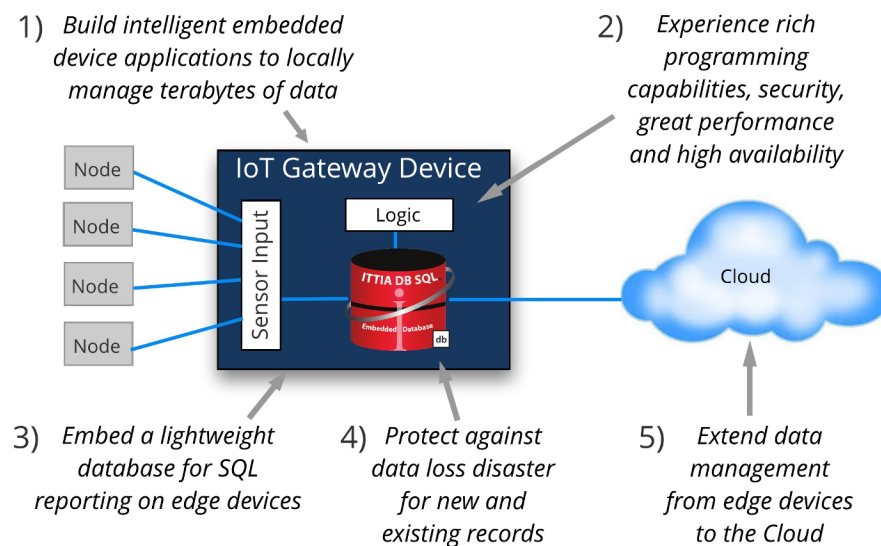## ITTIA DB SQL and VxWorks Offer Complete Device Security

ITTIA DB SQL on VxWorks provides the secure technologies and expertise required in the ongoing fight against cyber threats. Built-in AES database encryption and SCRAM authentication ensure that local data is protected, effectively blocking unauthorized access and tampering.

With Security Profile for VxWorks, a lightweight TLS data server built-in to the ITTIA DB SQL library enables remote replication and SQL query execution that is encrypted and authenticated. VxWorks applications can securely and efficiently share data stored on local flash media through ITTIA DB SQL.

ITTIA DB SQL Replication and Transactions Protect Valuable Information

Powerful embedded hardware makes sophisticated data processing possible on even edge devices, but the data must be stored in an efficient and accessible format. ITTIA DB SQL database software enables applications to perform SQL queries that search, analyze and report on information stored on devices with limited memory overhead.

ITTIA DB SQL offers superior interoperability and maintainability for medical devices, industrial automation, automotive, and other embedded systems. ITTIA DB SQL provides an easy path for the device to collect, process, and intelligently respond to real-world data and events.

1) *Build intelligent embedded device applications to locally manage terabytes of data*

2) *Experience rich programming capabilities, security, great performance and high availability*

IoT Gateway Device

Sensor Input

Logic

ITTIA DB SQL
Embedded Database
db

Node
Node
Node
Node

Cloud

3) *Embed a lightweight database for SQL reporting on edge devices*

4) *Protect against data loss disaster for new and existing records*

5) *Extend data management from edge devices to the Cloud*

Ensuring accuracy and precision is very important before sharing that information. With two different storage models, on-disk and in-memory, ITTIA DB SQL can meet the performance and durability needs of applications that log data or frequently look up records.

When mission-critical data for the Internet of Things device becomes unavailable, the entire system is put at risk. Support for high availability maximizes the protection and availability of data. Replication is used to share information between devices and across storage media to improve reliability, fault-tolerance, or accessibility. Replication makes it easy to keep devices up-to-date with each other, even when connections are unreliable.

A database uses transactions to protect data from inconsistency and corruption. Each transaction combines one or more database operations into a single atomic commit. If an error occurs during a transaction, any incomplete changes are rolled back, ensuring that the data remains consistent. Even if the error results in a crash, committed transactions are automatically recovered the next time the database is opened.

Short Time to Develop, Market and Sell Makes Embedded Data Management Most Effective

The success of a product in the market is always important to the product manufacturer. With the rich features and functionalities of ITTIA DB SQL, manufacturers license a database platform that is ready to build, deploy, and market in their products. With competitive licensing costs, comprehensive documentation, and extensive training programs available, ITTIA DB SQL enables rapid development and short time to market. ITTIA provides support during prototyping, design, development, and deployment phases. Reliability, performance, and scalability are among the key considerations for embedded systems manufacturers when they select ITTIA DB SQL.

ITTIA Customer Support

To obtain more information about ITTIA DB SQL and VxWorks, please visit us at: http://www.ittia.com/platforms/vxworks

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Database Software & Services