

w h i t e p a p e r

Engineering Truly Adaptive and Dynamic Planning

Solution Architecture of Q from Quantum Retail Technology

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INTRODUCTION

The Retailer's Challenge

Most retail forecasting, replenishment, allocation and inventory planning taking place today suffers from significant performance and scalability issues. This constrains retailers' ability to improve business performance and further scale these processes and systems.

The current use of centralized systems and processes means that most retailers have to work with aggregated information, months in advance, and miles away from the action. Planners use historical data which can be as old as two or three years, a timeframe during which the customer landscape is likely to have altered dramatically. These approaches cannot take into account rapid changes in consumer behavior, the altering strategies of competitors, the evolution of product ranges or the variety of consumer buying behaviors at individual store and even SKU level. With systems and strategies defined by historical data, retailers are making key planning and forecasting decisions on the basis of outdated information.

To get around the technology scalability and performance constraints, today's systems have to apply simplifications and assumptions in the solution approach that lead to inaccuracies in results and a loss of opportunity. The retail environment is only getting more complex, further straining the ability of these systems to give accurate and timely information. Today's systems also require highly skilled individuals to operate and maintain, as they have many levers, dials and attributes that users must set – but knowing which to use and understanding prior decisions is very difficult. Retailers cannot scale and are struggling to process the volumes of data required in the time available.



Different Approach:

With Q, Quantum Retail takes a completely different approach to solving the problems of scalability and performance that beset today's forecasting, replenishment, allocation and inventory planning systems.

In developing Q, Quantum Retail looked at the issues that were constraining the people, processes and systems of the retailer. The company started with a blank sheet of paper to design a system capable of supporting retailers today, and as they exponentially grow in complexity and scale in the future.

Uniquely, Q does not need to process two or three years' worth of historical data every time it runs to drive its forecasting, fulfillment and inventory planning processes – which is every day. Q processes the current inventory and sales transactions and learns from that information to update its recommendations. Unlike other solutions, Q processes continuously and there is no need to allocate system time for processing. Q's continuous processing cycle also delivers near real-time updates for unparalleled responsiveness, agility and adaptability in decision making.

This same learning process means that Q is uniquely able to modify and update the way that it chooses to fulfill to each and every SKU and location based on its own behavior and goals. Q can detect and react to micro trends at store and unit level and does so without having to analyze or maintain massive historical data sets, and without needing the user to change the configuration.

Application Architecture:

Q's application architecture has been designed specifically to ensure it enables retailers to solve real operational and technology problems. It is a 100% Web-based application, which means there is no client install. Depending on customer preferences it can be hosted by Quantum Retail for zero in-house IT overhead or deployed on site by the retailer. The application has been designed to minimize hardware outlay and total cost of ownership.

Q has been designed for focused client side data manipulation, with the right information to empower the user to make the right commercial decisions, Q uses server side functions for all database transactions. The database layer is totally discrete. The data access layer consists of PL/SQL for complex transactions and Q hibernates ORM for simple queries. The backend executes directly against the database server and Q utilizes embedded SQL for complex queries.



The application architecture also features an isolated data model which prevents data contention between the user interface and backend data. Simulation processing is performed in a separate cycle and on an isolated model keeping operational and simulation functions separate: today's learning and tomorrow's decisions never cross. Q also offers database partitioning options to lowest level product and/or location set. The full separation of business, process and data logics makes it easy to manipulate one without affecting any of the others.

From the ground up, Q has been designed to be a highly robust and scalable solution with minimal IT overhead, delivering responsive results that ensure retailers simultaneously maximize product availability while minimizing the need for markdowns.

Scalability and Performance:

Q operates on a continuous processing cycle and does not retain historical data. These fundamental features combined with the fact that it separates critical path processing (execution) from simulation (learning) to allow parallel processing, makes Q uniquely able to scale at the lowest level possible.

In application performance and volume tests Q has consistently indicated true linear scalability on various platforms including 2-way and 4-way HP servers; 4-way IBM Blade Centers and 16-way Sun Solaris.

Application throughput has been measured to in excess of 6000 rps on a 4-way server: the sort of results that place Q's performance beyond compare with current systems and architectures.

In recent customer volume and performance tests, the application was proven to scale linearly to actively manage 25,000 products at over 1,000 locations. All processing completed within a constrained window.

Q scales quickly and effectively with the growth of the retailer's business, with no exponential drop-off in system performance as the enterprise and transactional data continue to grow.

Q also utilizes built-in resource management techniques to allow simulation processing to run throughout the online day without impact to user performance. This provides a more even resource usage profile for the application and minimizes overall hardware requirements.

Integration

Q utilizes integration techniques such as:

- master data changes capture and synchronization
 - specialized operational data stores (that can leverage existing custom ODS if available)
 - comprehensive integration staging data approach for interfacing with legacy systems
 - simple view only approach for synchronizing with other Oracle based systems
 - JMS messaging and webservices framework for application integration
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Technical Architecture

Q leverages open standards in all of the architecture choices it has made. There is no proprietary technology in Q.

- Oracle 10g database
 - J2SE Java 1.5 backend processing
 - JMS Integration - (near real-time integration)
 - JSP 2.0 User Interface allows tooling and configuration to be easily managed and displayed in other applications, such as IBM
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About Quantum Retail Technology, Inc.

Quantum Retail Technology, Inc. is a leading provider of software solutions that enable demand driven supply networks. Quantum's flagship solution, Q, helps retailers continually achieve the merchandise and financial goal for every item in every location. By leveraging item assortment strategies and goals, Q links the art of merchandising with the science of inventory fulfillment. Quantum Retail solutions allow retailers to optimize inventory availability and supply network performance with low risk and high ROI.

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