

Case History

PageMart Wireless Systems

Customer:	PageMart Wireless Systems
Customer Since:	1995
Location:	Dallas,Tx
Sales Rep:	Steve Fox
Customer Contact:	Ted Bendor
Application Type:	Telecommunications. Messaging and Network Management
Environment:	Windows NT 4.0
Tools:	VisualWorks v2.5, Visual C++ v5.0, VisualWave v3.0, EnvyDeveloper,
	Visigenix Visibroker ORB, Hammer Technologies testing harness

Background: Pagemart Wireless is the fifth largest paging company in the U.S. and the fastest growing. Their success is based on innovative technology and low operational costs. Pagemart pioneered the concept of satellite based paging which revolutionized the paging industry. In 1994 PageMart purchased PCS frequencies in order to develop next generation communications services. The E.S.P. (Enhanced Services Platform) project was started in 1995, the goal of this project was the development of a polymorphic object oriented messaging architecture.

Why Use an Object Database ?

The decision to use an ODBMS was based on two factors.

- Rapid Development: PageMart's past successes were based on bringing effective technology solutions to the market quickly. The modern telecommunications industry is extremely fast paced, and quick development and delivery of new services is an essential component of successful businesses in this industry. Object Oriented methodologies were seen as a requirement in this rapid development environment. The Spiral iterative development method was selected. Smalltalk was chosen as the prototype development environment for its RAD (Rapid Application Development) capabilities. C++ was to be used in performance critical components. The decision on a final development language was to be deferred until a later cycle.
- 2. Distributed Architecture: PageMart's largest operational cost was long distance charges. Most PageMart customers were issued an 800 number with their pager. All calls nationwide were routed to Dallas where processing would take place. A distributed architecture would allow the routing of calls to local POPs (Points of Presence) resulting in significant savings in the most important fixed cost in the PageMart operation. Objectivity, with its support for object migration, seemed a perfect fit for this part of the problem.

Why Objectivity ?

7 DBMS products were originally under consideration. Two products were selected for a head to head benchmark. The benchmark simulated several use cases of the ESP system in a multi-user distributed environment. These test cases included account lookup, voice message deposit/retrieval, account migration, and pager registration. Objectivity was selected as a benchmark candidate due to its heterogeneous language and data migration support. Versant was selected as the second benchmark candidate for the same reasons.

A rigorous benchmark was performed in a sophisticated test environment that included 10 workstations, 2 T1 connections and an automated test bed product called 'The Hammer'. The test focused on determining the scalability and failure modes of the two products. The tests were performed at progressively higher loads until failure occurred. Objectivity was found to scale higher and fail in a more predictable way. Some key areas where Objectivity performed well were:

1. Distribution and The Federated Database:

The concept of an overarching federation that represented physically distributed resources was a perfect fit for PageMart. ESP was designed as the infrastructure for PageMart's 2-way paging network. In 2-way paging, the pager registers itself with the nearest transmitter/receiver as it is carried by its user. If a user is registered in a city outside of their normal region a lookup in their profile would determine whether their data should follow them. With a simple call to the Objectivity API, pertinent customer information would physically move to the new region, potentially reducing long distance costs by routing all traffic to a nearby POP.

2. High Availability:

The quorum based replication is delivered through Objectivity's FTO (Fault Tolerant Option). This was seen as superior to the traditional master slave approach.

- Overlapped I/O: Message storage and playback was seen as the most resource intensive function of the system. Because the message data was spread across several disk drives the distributed architecture of Objectivity provided improved overlapped I/O performance. ESP was able to support playback to multiple users without degrading overall system performance.
- 4. Clustering: Objectivity provides advanced clustering capabilities, allowing users to optimize the most performance critical part of a database application, secondary storage management. Given that disk access is slower by orders of magnitude than CPU and network operations, optimizing the use of the disk drives greatly improves system performance. By taking advantage of Objectivity's page based architecture ESP was able to pre-fetch needed data. This was especially useful with voice data. The clustering directives ensured that once voice data began streaming the disk head rarely required repositioning.
- 5. **Scalability**: Objectivity performed much better than Versant in the streaming audio tests. Objectivity was able to support 30+ users on a single P200 Compaq server with UltraSCSI drives. This was due to the fast page based Objectivity storage architecture.

Development Team: An Iterative development methodology was chosen. Most of the work was done by ObjectSpace, an OOT consultancy in Dallas,Tx. The team consisted of 3 managers, 2 architects, 6 Smalltalk developers, 2 C++ developers, and 3 testers.

Current Status: (Winter 1999)

ESP has been renamed Axis. Over the next two years the Axis system will be deployed in stages. Axis has been successfully deployed in a beta test in Austin,Tx. This release supports 2-way paging with acknowledgement (a.k.a. 1 ½ way paging). In fall 1998 PageMart began selling paging with acknowledgement to the general public. ESP is also the basis for PageMart's

strategy for the "Final Internet Mile for Wireless Devices". This strategy includes services such as telemetry for remote systems, remote meter reading for utilities, and support for next generation wireless devices like the Microsoft AutoPC and PalmPilot VII.